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	2.5-93	02-01	May 2002		2.5-130	00-01	December 2000
	2.5-94	00-01	December 2000		2.5-131	00-01	December 2000
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	2.5-96	00-01	December 2000		2.5-133	00-01	December 2000
	2.5-97	00-01	December 2000		2.5-134	02-01	May 2002
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	2.5-99	00-01	December 2000		2.5-136	00-01	December 2000
	2.5-100	00-01	December 2000		2.5-137	00-01	December 2000
	2.5-101	00-01	December 2000		2.5-138	02-01	May 2002
	2.5-102	02-01	May 2002		2.5-139	00-01	December 2000
	2.5-103	02-01	May 2002		2.5-140	00-01	December 2000
	2.5-104	00-01	December 2000		2.5-141	00-01	December 2000
	2.5-105	02-01	May 2002		2.5-142	00-01	December 2000
	2.5-106	00-01	December 2000		2.5-143	00-01	December 2000
	2.5-107	00-01	December 2000		2.5-144	00-01	December 2000
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	2.5-110	02-01	May 2002		2.5-147	00-01	December 2000
	2.5-111	00-01	December 2000		2.5-148	00-01	December 2000
	2.5-112	00-01	December 2000		2.5-149	00-01	December 2000
	2.5-113	00-01	December 2000		2.5-150	00-01	December 2000
	2.5-114	00-01	December 2000		2.5-151	00-01	December 2000
	2.5-115	02-01	May 2002		2.5-152	00-01	December 2000
	2.5-116	00-01	December 2000		2.5-153	00-01	December 2000
	2.5-117	00-01	December 2000		2.5-154	00-01	December 2000

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	2.5-156	00-01	December 2000		2.5-193	02-01	May 2002
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	2.5-158	00-01	December 2000		2.5-195	97-01	August 1997
	2.5-159	00-01	December 2000		2.5-196	97-01	August 1997
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	2.5-161	00-01	December 2000		2.5-198	97-01	August 1997
	2.5-162	00-01	December 2000		2.5-199	97-01	August 1997
	2.5-163	00-01	December 2000		2.5-200	02-01	May 2002
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	2.5-166	00-01	December 2000		2.5-203	97-01	August 1997
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	2.5-168	97-01	August 1997		2.5-205	02-01	May 2002
	2.5-169	97-01	August 1997		2.5-206	02-01	May 2002
	2.5-170	97-01	August 1997		2.5-207	02-01	May 2002
	2.5-171	02-01	May 2002		2.5-208	02-01	May 2002
	2.5-172	02-01	May 2002		2.5-209	97-01	August 1997
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	2.5-174	97-01	August 1997		2.5-211	97-01	August 1997
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	2.5-176	02-01	May 2002		2.5-213	97-01	August 1997
	2.5-177	02-01	May 2002		2.5-214	97-01	August 1997
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	2.5-181	02-01	May 2002		2.5-218	97-01	August 1997
	2.5-182	02-01	May 2002		2.5-219	97-01	August 1997
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	2.5-184	02-01	May 2002		2.5-221	97-01	August 1997
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	2.5-189	02-01	May 2002		2.5-226	97-01	August 1997
	2.5-190	02-01	May 2002		2.5-227	97-01	August 1997
	2.5-191	02-01	May 2002		2.5-228	97-01	August 1997

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	2.5-230	97-01	August 1997		2.5-267	97-01	August 1997
	2.5-231	97-01	August 1997		2.5-268	97-01	August 1997
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	2.5-233	97-01	August 1997		2.5-270	97-01	August 1997
	2.5-234	97-01	August 1997		2.5-271	97-01	August 1997
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	2.5-236	02-01	May 2002		2.5-273	97-01	August 1997
	2.5-237	02-01	May 2002		2.5-274	97-01	August 1997
	2.5-238	02-01	May 2002		2.5-275	97-01	August 1997
	2.5-239	97-01	August 1997		2.5-276	02-01	May 2002
	2.5-240	97-01	August 1997		2.5-277	97-01	August 1997
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	2.5-242	97-01	August 1997		2.5-279	97-01	August 1997
	2.5-243	97-01	August 1997		2.5-280	02-01	May 2002
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	2.5-245	97-01	August 1997		2.5-282	97-01	August 1997
	2.5-246	97-01	August 1997		2.5-283	02-01	May 2002
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	2.5-252	97-01	August 1997		2.5-289	97-01	August 1997
	2.5-253	02-01	May 2002		2.5-290	97-01	August 1997
	2.5-254	97-01	August 1997	Fig.	2.5-1	0	August 1984
	2.5-255	97-01	August 1997		2.5-2	0	August 1984
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	2.5-257	02-01	May 2002		2.5-4	0	August 1984
	2.5-258	02-01	May 2002		2.5-5	0	August 1984
	2.5-259	02-01	May 2002		2.5-6	0	August 1984
	2.5-260	97-01	August 1997		2.5-7	0	August 1984
	2.5-261	02-01	May 2002		2.5-8	0	August 1984
	2.5-262	97-01	August 1997		2.5-9	0	August 1984
	2.5-263	97-01	August 1997		2.5-10	0	August 1984
	2.5-264	97-01	August 1997		2.5-11	0	August 1984
	2.5-265	97-01	August 1997		2.5-12	0	August 1984

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Fig.	2.5-13	0	August 1984	Fig.	2.5-50	0	August 1984
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	2.5-19	0	August 1984		2.5-56	0	August 1984
	2.5-20	0	August 1984		2.5-57	0	August 1984
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	2.5-43	0	August 1984		2.5-80	0	August 1984
	2.5-44	0	August 1984		2.5-81	98-01	April 1998
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	2.5-46	0	August 1984		2.5-83	0	August 1984
	2.5-47	0	August 1984		2.5-84	0	August 1984
	2.5-48	0	August 1984		2.5-85	0	August 1984
	2.5-49	0	August 1984		2.5-86	0	August 1984

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Fig.	2.5-87	0	August 1984	Fig.	2.5-111 (6 of 9)	0	August 1984
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	2.5-89	0	August 1984		2.5-111 (8 of 9)	0	August 1984
	2.5-90	0	August 1984		2.5-111 (9 of 9)	0	August 1984
	2.5-90a	0	August 1984		2.5-112 (1 of 13)	0	August 1984
	2.5-90b	0	August 1984		2.5-112 (2 of 13)	0	August 1984
	2.5-90c	0	August 1984		2.5-112 (3 of 13)	0	August 1984
	2.5-90d	0	August 1984		2.5-112 (4 of 13)	0	August 1984
	2.5-90e	0	August 1984		2.5-112 (5 of 13)	0	August 1984
	2.5-91	0	August 1984		2.5-112 (6 of 13)	0	August 1984
	2.5-92	0	August 1984		2.5-112 (7 of 13)	0	August 1984
	2.5-93	0	August 1984		2.5-112 (8 of 13)	0	August 1984
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	2.5-96	0	August 1984		2.5-112 (11 of 13)	0	August 1984
	2.5-97	0	August 1984		2.5-112 (12 of 13)	0	August 1984
	2.5-98	0	August 1984		2.5-112 (13 of 13)	0	August 1984
	2.5-99	0	August 1984		2.5-113 (1 of 3)	0	August 1984
	2.5-100	0	August 1984		2.5-113 (2 of 3)	0	August 1984
	2.5-101	0	August 1984		2.5-113 (3 of 3)	0	August 1984
	2.5-102	0	August 1984		2.5-114 (1 of 13)	0	August 1984
	2.5-103	0	August 1984		2.5-114 (2 of 13)	0	August 1984
	2.5-104	0	August 1984		2.5-114 (3 of 13)	0	August 1984
	2.5-105	98-01	April 1998		2.5-114 (4 of 13)	0	August 1984
	2.5-106	Deleted			2.5-114 (5 of 13)	0	August 1984
	2.5-107	98-01	April 1998		2.5-114 (6 of 13)	0	August 1984
	2.5-108	98-01	April 1998		2.5-114 (7 of 13)	0	August 1984
	2.5-109	02-01	May 2002		2.5-114 (8 of 13)	0	August 1984
	2.5-110 (1 of 4)	0	August 1984		2.5-114 (9 of 13)	0	August 1984
	2.5-110 (2 of 4)	0	August 1984		2.5-114 (10 of 13)	0	August 1984
	2.5-110 (3 of 4)	0	August 1984		2.5-114 (11 of 13)	0	August 1984
	2.5-110 (4 of 4)	0	August 1984		2.5-114 (12 of 13)	0	August 1984
	2.5-111 (1 of 9)	0	August 1984		2.5-114 (13 of 13)	0	August 1984
	2.5-111 (2 of 9)	0	August 1984		2.5-115	0	August 1984
	2.5-111 (3 of 9)	0	August 1984		2.5-116	0	August 1984
	2.5-111 (4 of 9)	0	August 1984		2.5-117 (1 of 3)	0	August 1984
	2.5-111 (5 of 9)	0	August 1984		2.5-117 (2 of 3)	0	August 1984

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Fig.	2.5-117 (3 of 3)	0	August 1984
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	2.5-120 (1 of 17)	0	August 1984
	2.5-120 (2 of 17)	0	August 1984
	2.5-120 (3 of 17)	0	August 1984
	2.5-120 (4 of 17)	0	August 1984
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	2.5-120 (7 of 17)	0	August 1984
	2.5-120 (8 of 17)	0	August 1984
	2.5-120 (9 of 17)	0	August 1984
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	2.5-120 (11 of 17)	0	August 1984
	2.5-120 (12 of 17)	0	August 1984
	2.5-120 (13 of 17)	0	August 1984
	2.5-120 (14 of 17)	0	August 1984
	2.5-120 (15 of 17)	0	August 1984
	2.5-120 (16 of 17)	0	August 1984
	2.5-120 (17 of 17)	0	August 1984
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	2.5-122	0	August 1984
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	2.5-123 (2 of 2)	0	August 1984
	2.5-124 (1 of 2)	0	August 1984
	2.5-124 (2 of 2)	0	August 1984
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	2.5-127	0	August 1984
	2.5-128	0	August 1984
	2.5-129	0	August 1984
	2.5-130	0	August 1984
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	2.5-132	0	August 1984
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	2.5-134	98-01	April 1998
	2.5-135	98-01	April 1998

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	2.5-142 (3 of 4)	0	August 1984
	2.5-142 (4 of 4)	0	August 1984
	2.5-143 (1 of 4)	0	August 1984
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	2.5-143 (4 of 4)	0	August 1984
	2.5-144 (1 of 4)	0	August 1984
	2.5-144 (2 of 4)	0	August 1984
	2.5-144 (3 of 4)	0	August 1984
	2.5-144 (4 of 4)	0	August 1984
	2.5-145 (1 of 4)	0	August 1984
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	2.5-145 (3 of 4)	0	August 1984
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	2.5-146	0	August 1984
	2.5-147	0	August 1984
	2.5-148	0	August 1984
	2.5-149 (1 of 3)	0	August 1984
	2.5-149 (2 of 3)	0	August 1984
	2.5-149 (3 of 3)	0	August 1984
	2.5-150 (1 of 8)	0	August 1984
	2.5-150 (2 of 8)	0	August 1984
	2.5-150 (3 of 8)	0	August 1984
	2.5-150 (4 of 8)	0	August 1984
	2.5-150 (5 of 8)	0	August 1984
	2.5-150 (6 of 8)	0	August 1984
	2.5-150 (7 of 8)	0	August 1984
	2.5-150 (8 of 8)	0	August 1984
	2.5-150a	0	August 1984

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Fig.	2.5-151 (1 of 2)	0	August 1984	Fig.	2.5-172	0	August 1984
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	2.5-152 (3 of 4)	0	August 1984		2.5-176	0	August 1984
	2.5-152 (4 of 4)	0	August 1984		2.5-177	0	August 1984
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	2.5-153 (2 of 7)	0	August 1984		2.5-179	0	August 1984
	2.5-153 (3 of 7)	0	August 1984		2.5-180	0	August 1984
	2.5-153 (4 of 7)	0	August 1984		2.5-181	0	August 1984
	2.5-153 (5 of 7)	0	August 1984		2.5-182	0	August 1984
	2.5-153 (6 of 7)	0	August 1984		2.5-183	0	August 1984
	2.5-153 (7 of 7)	0	August 1984		2.5-184	0	August 1984
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	2.5-155a	0	August 1984		2.5-188	0	August 1984
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	2.5-162	0	August 1984		2.5-194 (6 of 9)	0	August 1984
	2.5-163	0	August 1984		2.5-194 (7 of 9)	0	August 1984
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	2.5-166	0	August 1984		2.5-194a	0	August 1984
	2.5-167	0	August 1984		2.5-194b	0	August 1984
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	2.5-199	0	August 1984
Page	2A-1	97-01	August 1997
	2A-2	97-01	August 1997
	2A-3	97-01	August 1997
	2A-4	97-01	August 1997
	2B-1	02-01	May 2002
	2B-2	02-01	May 2002
	2B-3	02-01	May 2002
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	2B-5	02-01	May 2002
	2B-6	02-01	May 2002
	2C-1	02-01	May 2002
	2C-2	02-01	May 2002
	2C-3	02-01	May 2002
	2C-4	02-01	May 2002
	2C-5	02-01	May 2002
	2D-1	02-01	May 2002
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	2D-6	0	August 1984
Page	2E-1	97-01	August 1997
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Fig.	2E-5	0	August 1984
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	2E-19a	0	August 1984
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	2E-22	0	August 1984
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	2E-44a	0	August 1984		2E-79	0	August 1984
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	2E-46	0	August 1984		2E-80a	0	August 1984
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	2E-53	0	August 1984		2E-89	0	August 1984
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	2E-64	0	August 1984		2F-9	97-01	August 1997

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	2F-35	97-01	August 1997		2F-72	97-01	August 1997
	2F-36	97-01	August 1997		2F-73	97-01	August 1997
	2F-37	97-01	August 1997		2F-74	97-01	August 1997
	2F-38	97-01	August 1997		2F-75	97-01	August 1997
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	2F-44	97-01	August 1997		2F-81	97-01	August 1997
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2.0 SITE CHARACTERISTICS

NOTE 2.1
Section 2.1 is being retained for historical purposes only (per RN 00-081).

02-01

2.1 GEOGRAPHY AND DEMOGRAPHY

2.1.1 SITE LOCATION

The Virgil C. Summer Nuclear Station site is located in Fairfield County, South Carolina, approximately 15 miles Southwest of the county seat of Winnsboro and 26 miles Northwest of Columbia, the state capital. The site is in a sparsely populated rural area. The nearest community is Jenkinsville, located approximately 3 miles Southeast of the site. The Broad River is located approximately 1 mile West of the site and flows in a southerly direction. Lake Murray is a 50,000 acre reservoir utilized for hydroelectric power generation and recreation, located 12 miles South of the site. Figures 2.1-1, Regional Location Map, and 2.1-2, Site Location Map, indicate the plant location with respect to local and regional cultural features.

The reactor building is located at latitude N34°17’54.1" and longitude W81°18’54.6". 02-01
Universal Transverse Mercator (UTM) grid coordinates, Zone 17, for the reactor building are N3,795,086 and E470,996.

2.1.2 SITE DESCRIPTION

The Site Area Map presented on Figure 2.1-3 indicates the site boundary, plant property line and the location of principal plant structures in relation to existing cultural features in the area. The exclusion area consists of a zone within approximately 1 mile of the reactor building. This area encompasses parts of the Monticello Reservoir and the Fairfield Pumped Storage Facility. SCE&G has acquired, by purchase, all land within the site boundary. For purposes related to the operation of the nuclear facilities the plant property line is considered to coincide with the site boundary. The plant property, 02-01
as defined herein, covers approximately 2,200 acres.

The representation of the reservoir and its boundaries on Figure 2.1-3 is an approximation of the final configuration of the area. The increase in surface level of the 02-01
existing Parr Reservoir is also depicted on Figure 2.1-3.

2.1.2.1 Exclusion Area Control

Licensees will maintain absolute ownership of all land contained within the site boundary for the Virgil C. Summer Nuclear Station. The site boundary also serves as the site exclusion area and is identified in Figure 2.1-3. SCE&G, as an owner and the manager of the nuclear station, retains the right to maintain control of both station and non-station related activities within the exclusion area. Mineral rights within this area are jointly owned by SCE&G and SCPSA, and are under the control of SCE&G as manager of the plant.

The exclusion area for the nuclear station is not and will not be traversed by other than wholly owned land accesses. The closest primary public road, South Carolina State Highway 215, lies approximately 6,800 feet East of the Reactor Building centerline and is outside the exclusion area.

The Broad River is approximately 6,050 feet West of the Reactor Building and is outside the exclusion area. The southern portion of the Monticello Reservoir lies within the exclusion area. The closest railroad not owned by SCE&G and SCPSA lies approximately 5,850 feet to the Southwest on the outside edge of the site boundary. Figure 2.1-3 shows river, reservoir and railroad locations.

Licensees own and maintain some railroad facilities within the exclusion area. These facilities are used for receipt and shipment of carload freight to and from the Virgil C. Summer Nuclear Station in accordance with an agreement between Southern Railway Company and the licensees. The licensees are the sole authority for control and operation of these rail facilities.

A 68’ right-of-way has been granted through the exclusion area for a 115 KV transmission line owned by Duke Power Company. Terms of this agreement provide for the licensees to retain authority to determine all activities within the exclusion area.

The only other non-station related activities conducted within the exclusion area are those related to the Fairfield Pumped Storage Facility.

The location of the Fairfield Pump Storage Facility is shown on Figure 2.1-3. Personnel of this facility are limited to employees of SCE&G and therefore are subject to administrative controls of the company. The pumped storage facility is staffed by approximately 10 people during the day shift and one operator for each night shift. The estimated time to evacuate all personnel from this facility is 10 minutes if the plant is not running and 20 minutes if the units must be shut down.

Licensees own all property within the exclusion area and has the authority to determine all activities, including exclusion or removal of personnel and property from the area.

Licensees maintain the right to limit access to and control evacuation from the exclusion area. Normal evacuation of persons within the exclusions area is estimated to take no more than 20 minutes.

The term "transportable property" as used in the Amended ROW agreement is self-explanatory and includes all properties of the Grantee which are not part of its permanent transmission line facilities. These facilities are fixtures which are attached to the land and are steel frame transmission towers and high voltage conductors. The Amended ROW agreement dated April 5, 1978, clearly states in paragraph 4, that

SCE&G (Grantor) has the right to either exclude or require the immediate removal of all personnel and transportable (nonfixed) property from the exclusion area. SCE&G does not anticipate conditions which would require the removal of fixed facilities as being "hazardous to the public health and safety" of 10 CFR 100. The requirements of Section 100.3 (a) are satisfied by the Amended ROW agreement.

"Nontransportable" property within the ROW corridor consists of fixed steel frame transmission towers and high voltage conductors. Personnel and/or public use and access to properties within the exclusion zone is defined in Section 2.1.2.1.

The Amended ROW agreement fully meets the requirements of Section 100.3 (a). The document does not state or imply that "prior" notification to Grantee is required, but that he will immediately remove all personnel and transportable property from the exclusion zone upon notification from Grantor to do so.

The original ROW agreement was specifically amended to define the limits of the exclusion zone and to incorporate the requirements of Section 100.3 (a). Further amendment would be superfluous.

Figure 1.2-1 clearly shows the ROW corridor with respect to plant structures. Incorporated plats within and made a part of the Amended ROW agreement read in conjunction with supportive text within the agreement itself clearly define the location of the ROW within the exclusion zone. The plat identified as "Duke Power Company Relocation of Great-Falls Newberry Transmission Line Crossing Property of South Carolina Electric and Gas Company" defines the corridor width as 68’.

2.1.2.2 Boundaries for Establishing Effluent Release Limits

Control of personnel and access to the Virgil C. Summer Nuclear Station exclusion area are discussed in Sections 13.3 and 13.7. The site exclusion area, identified as the "site boundary" on Figure 2.1-3, is the selected boundary for establishing effluent release limits. The release points for both liquid and gaseous effluents are described in Sections 11.2.7 and 11.3.7; these sections also provide the minimum distances between the various release points and the exclusion area boundary.

The site boundary is located approximately 5,350 feet South, East, and North from the Reactor Building, and is at least 5,850 feet from the Reactor Building in a westerly direction. Routine operational radiological effluent concentrations at and beyond this area boundary are within the limits prescribed by 10 CFR 20 and 10 CFR 50 Appendix I. 02-01

2.1.3 POPULATION AND POPULATION DISTRIBUTION

The location of the site in relation to the surrounding cities and towns within a 50 mile radius is shown on Figure 2.1-1. Those communities for which Census population data are available are listed, together with their 1970 populations, in Table 2.1-1 (all incorporated cities, towns, villages, and unincorporated places of 1,000 or more persons).

The base (1970) population distribution has been developed for the Virgil C. Summer Nuclear Station. Projections are based on estimates produced in December 1975, by the Bureau of Economic Analysis (BEA) for the U. S. Army Corps of Engineers, South Atlantic Division. [1]

Within the 10 mile radius, population distribution was based on a house count using county highway maps prepared from aerial photographs. A household population size of 3.5 was used in converting the house count into population. This factor is an average of the household size for Fairfield and Newberry Counties, taken from the 1970 Census of Population.

Beyond the 10 mile radius, the 1970 population distribution utilized the smallest geographic unit for which Census data were available: city, town, unincorporated place, or Census county division. The population wheel, composed of 10 annular rings and 16 segments, was superimposed upon a map of these Census geographic units. The Census units within each cell of the wheel were identified, and the population associated with each unit was proportioned into the appropriate cell, assuming uniform population distribution.

Two population projections thus derived are presented in Sections 2.1.3.1 and 2.1.3.2 below. The low projection is based upon the rates of change for counties in South Carolina recently projected by the BEA. [1] These local area projections are an extension of the OBERS* water resources program which produced projections for the nation and its subareas. Both studies utilized the Bureau of Census Series E projections which assumed a complete cohort fertility rate of 2.11 children per woman. The high projection utilized alternate rates presented in Appendix B of the 1975 Corps of Engineers/BEA study. This alternate projection reflects the future growth estimates of the South Carolina Division of Research and Statistics. The higher growth rates are based upon the fact that South Carolina appears atypical of the nation as a whole. Between 1970 and July, 1974, South Carolina experienced a considerably higher growth rate than the Series E projections anticipated. This rapid population growth has resulted from increased economic development and gains in employment opportunities which induced a high net in-migration, reversing the historical net out-migration which had been experienced by the state for decades. [2] Historical and projected populations for counties all or partially within the 50 mile radius are presented in Table 2.1-2.

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* Office of Business, Economic and Economic Research Services

Projections for 1980, 1990, 2000, 2010, and 2020 were prepared by the following method: 1970 values for each cell were broken down into the component parts related to each county within a cell. This was done on an areal basis, assuming population homogeneity. Each component value was increased or decreased according to the county's rate of change, and then the components were summed to reach the new cell total.

Differences between population projections for 2010 in this report and those presented in the PSAR for the Virgil C. Summer Nuclear Station result from the fact that the PSAR reflected more heavily local area projections prepared at the county level, while this report utilizes more recently available county projections made by agencies at the State and Federal level (though representatives of local agencies participated in the preparation of the projections made by the higher level agencies).

The high estimate, based on BEA's alternate projections, is only 1.6 percent lower for the 50 mile area than the PSAR projection. Counties which are generally lower include Greenwood, Saluda, and portions of Richland. New estimates for Lexington, Kershaw, Chester, Spartanburg and the counties bordering Spartanburg (Cherokee, Union and Laurens Counties) are higher. The new estimates for the Rock Hill portion of York County are slightly lower, but higher for the balance of the county.

Growth in the Camden area is now projected to be higher, while estimates for Columbia, Newberry and Greenwood have dropped.

The population projected within the 0-10 mile area is 21 percent higher than the earlier projection (8,552 persons versus 7,072 persons). This is more likely to be a function of the projection methodology used for this report which assumed even population distribution when applying the county growth projections.

Population distributions for the area within 10 miles (discussed in Section 2.1.3.1) and between 10 and 50 miles (discussed in Section 2.1.3.2) appear on Figures 2.1-4 through 2.1-19.

2.1.3.1 Population Within 10 Miles

Within 10 miles of the plant the 1970 estimated population was 6,370 (a density of 20.3 persons per square mile). The following communities included in the 1970 Census of Population are within the 10 mile radius:

	1970 Population	Distance (in miles) and Direction from Site
Peak	87	4 S
Pomaria	264	6 WSW
Little Mountain	240	9 SW
Chapin	342	9 SSW

Other communities within the 10 mile radius, not included in the 1970 Census published data are Parr, Jenkinsville, Monticello, and Blair.

Within 5 miles the 1970 estimated population was 1,203 (a density of 15.3 persons per square mile). The communities within 5 miles are Peak, Parr, Jenkinsville, and Monticello.

The highest population densities out to 10 miles are in the three sectors between South-southwest and West-southwest and are partly related to the presence of the communities of Pomaria, Chapin, Little Mountain, and a generally better developed local road system than exists in the remaining portions of the 10 mile area.

The 1980 projected population within 5 miles ranges from 1,214 (15.5 persons per square mile) to 1,275 (16.2 persons per square mile). Within 10 miles, the 1980 projections range from 6,543 (20.8 persons per square mile) to 6,934 (22.1 persons per square mile). No major population increase is projected by the two alternate methods utilized, nor any major redistribution of population.

Research undertaken at the time of the PSAR revealed that some population decreases may occur in some of the subareas within a 5 mile radius of the plant due to the abandonment of some small, marginal farms. These changes are too small, however, to be reflected in the population wheels which were produced from the BEA Series E and BEA Alternate projections described above.

The 2020 low and high projections for the 10 mile radius are 7,122 and 8,871 with an average density of 22.7 and 28.3 persons per square mile, compared with a 1970 density of 20.3. Thus, the changes are not anticipated to be great. The high projection results in a large percentage change but increases density by only eight persons per square mile.

By the year 2020, the projected end of plant life, the low and high projections for the 5 mile radius are 1,261 and 1,584, respectively, an absolute increase from 58 to 381 persons. These increases would result in an average density ranging from 16.1 to 20.2 persons per square mile compared with 15.3 in 1970.

As noted above, future projections were made by applying uniformly the County growth rates. This may have the effect of increasing population estimates of the rural inner 10 miles too rapidly. This method of population estimation is, however, as accurate a method as the application of subjective judgement on changes within small geographic areas over a span of 40 years.

2.1.3.2 Population Between 10 and 50 Miles

The largest accumulated population in the site region in 1970 was within the 20 to 30 miles circles, with the highest concentration of people being in the southeast and south-southeast segments. This area includes Columbia*, West Columbia, Cayce, and Forest Acres. Seventy percent of the total for this annulus occurs in the cell in which Columbia and its suburbs are located. The second highest population is found between the 40 and 50 mile area with concentrations in the north-northeast, northeast, west and west-northwest segments. Centers of population within the 40 to 50 mile northern segments include York, Rock Hill, and Lancaster; Greenwood, Laurens and Clinton account for most of the population in the westerly segments.

The highest population density (2,138 persons per square mile) occurred in the cell formed by the southeast sector and 20 to 30 mile annulus, and was accounted for by the city of Columbia. The second highest density (288 persons per square mile) was in the area of Rock Hill, 40 to 50 miles north-northeast. No other cell exceeded a density of 250 persons per square mile.

Projections for 1980, the first year of plant life, for 2020, the projected last year of plant life, and for each decenial year from 1980 to 2020 are presented on Figures 2.1-9, 2.1-11, 2.1-13, 2.1-15, and 2.1-19.

Not included in these projections are some qualitative predictions of probable growth for two portions of the 10 to 50 mile area which are based upon information received from the South Carolina Division of Research and Statistical Services [3]. These estimates are not reliably quantifiable either as to magnitude or point of time. They have not been included by the State in their official projections for countries. Consequently, they are treated here descriptively rather than quantitatively. The first area is Fairfield County, especially the east and east-northeast sectors between 10 and 30 miles. It is anticipated that growth will be accelerated in this area by the future construction of Interstate 77. This major route will provide vastly improved access south to Columbia and north to Charlotte, North Carolina, opening the area into the industrial heart of Ohio. This new access, together with the new county tax revenues which will be generated by the Virgil C. Summer Nuclear Station, is expected to cause some in-migration into Fairfield County, probably centering in the Winnsboro and Ridgeway areas. More growth there may also result from an overflow of population north from Columbia.

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* Including Fort Jackson

Another growth area is anticipated to be that portion of Lexington County west and northwest of Columbia (the southeast sector between 10 and 30 miles). The area is served by Interstate 26, providing access to Columbia, and this advantage, together with the attraction of Lake Murray, is already generating rapid suburban development as well as industrial growth. Much of this growth, including a planned new community of 25,000 (Harbison) will occur in the area between 10 and 20 miles southeast of the site.

Figure 2.1-20 graphically presents the estimated cumulative population for the entire 50 mile radius for the year 1980, the year of initial plant operation, compared with a hypothetical cumulative population which would result from a uniform density of 500 persons per square mile. Figure 2.1-21 presents the projected population for the year 2020 compared with a hypothetical population of 1,000 persons per square mile. Only the high projections have been plotted, since they are well below the hypothetical values.

2.1.3.3 Low Population Zone

In accordance with criteria specified in 10 CFR 100, the outer boundary of the low population zone (LPZ) is at a distance of 3 miles from the reactor building. These criteria include the low population within the area; the small number of institutions, recreation facilities, and places of employment; and the presence of public surface routes for evacuation purposes.

Figure 2.1-22 illustrates significant cultural features within the low population zone (LPZ). Table 2.1-3 indicated weighted transient and projected residential populations within the LPZ. In 1970, approximately 365 persons lived within the zone. It is expected by 2020 that the total residential population will be 470, excluding transient population.

The community of Jenkinsville lies within the LPZ, as do portions of Parr Reservoir and Monticello Reservoir. The only school within the low population zone is Whitehall Elementary, located north of Jenkinsville off S. C. 215, on County Road 209. The school had a 1976 enrollment of 111 pupils with approximately nine staff members [4]. Whitehall School has been closed, but the building still remains. Two industries located within the LPZ, the Nylene Corporation, in Jenkinsville [5], and Interstate Materials, Inc., a quarry operation located near Monticello [6], are now closed. The Fairfield Pumped Storage Facility, the Parr Hydroelectric Facility and the Virgil C. Summer Nuclear Plant have expected staff levels of approximately 900 employees during normal operational shifts [7].

Transient populations also include highway traffic along major thoroughfares within the LPZ. Average daily traffic along S. C. 215 in the plant vicinity was 1,600 in 1975. S. C. 213, connecting S. C. 215 to Winnsboro, average 950 vehicles per day. Other roads in the LPZ averaged less than 200 vehicles per day [8]. Highway traffic is not included in Table 2.1-3.

Future transient population within the LPZ associated with recreational use of the Monticello Reservoir is expected to be minor. Most of the developed recreational facilities will be located at the northernmost end of the reservoir, outside the LPZ [9]. In addition, routes to and from the recreation areas are not limited to highways passing through the LPZ.

Seasonal population movements in the LPZ are also expected to be minor, although recreational users of the reservoir will probably increase during the summer months. Also, the Carlisle Game Management Area, which surrounds the site and is partially located within the LPZ, attracts hunters during game seasons. Highest visitation rates occur during deer season. Estimated visitation figures within the LPZ are included in Table 2.1-3.

2.1.3.4 Transient Population

Three types of transient population generators are discussed in this section: recreation attractions, industrial facilities, and communities. The purpose is to determine where population concentrations may occur on a daily or seasonal basis in excess of that indicated by residential distributions. In the study region, manufacturing has tended to locate in rural areas along major highways, introducing patterns of cross-commuting between rural areas and urban centers which tend to offset any significant in-migration into the areas associated with worker commuting.

Population concentrations on the periphery of the 50 mile radius, along with recreational areas, are the more significant transient population generators with respect to the daily or seasonal spatial redistribution of population into the 50 mile area from outside.

Six categories of communities, based on size, have been identified within the 50 mile radius. These indicate the relative ability of the communities to provide economic, cultural, institutional and administrative functions for surrounding areas, thereby generating population concentrations on a temporary basis. The communities, their 1970 populations and their size category are shown in Table 2.1-1. It is expected that these communities will continue to dominate the spatial organization of population in the region.

Recreation facilities tend to generate seasonal, temporary population peaks, especially if the facilities are associated with outdoor activities such as hunting, camping, water sports, etc. During these times of seasonal activity the facilities will not only concentrate populations from the general vicinity but may also attract persons outside the study region, thereby increasing overall population levels within the area. Within 50 miles of the site are seven state parks, three administrative units of the Sumter National Forest, and several areas used for public hunting and fishing. Users of these recreational facilities, excluding Lake Murray, totaled approximately 1.7 million during 1975. Of these, it is estimated that approximately 2 to 10 percent were campers using the facilities on an overnight basis. Table 2.1-4 indicates where these facilities are in relation to the site and the total usage of each area during 1975. Figure 2.1-23 is an areal representation of the areas in relation to the site.

The most significant recreation attraction within 20 miles of the site is Lake Murray, a 50,000 acre reservoir 10 miles northwest of Columbia. Due to its proximity to Columbia and to two interstate highways in the area, the lake is becoming a major recreational attraction. A shoreline survey of the lake in 1973 identified 4,910 homes of which 1,651 were year-round residences. Private homes and condominiums for fulltime residence near the eastern end of the lake were a significant part of the development. Total annual visitor days on the lake in 1973 for non-residential users were estimated at 1.8 million [10].

Figure 2.1-24 is a graphic illustration of cumulative residential and weighted transient populations for the years 1980 and 2020 compared with hypothetical populations at a density of 500 and 1,000 persons per square mile, respectively. The results of these graphs may be misleading, since some of the population is being double-counted. Many users of the recreation facilities reside within the radii locating the facility and thus are tabulated twice. However, determination of user origins is precluded by lack of data. Most of the recreational areas around the Monticello Reservoir are expected to be located outside the low population zone, approximately 4 to 6 miles from the reactor building [9].

2.1.3.5 Population Center

The nearest population center as defined by 10 CFR 100 is the city of Columbia, the capital of the state of South Carolina. The nearest corporate limits are 23 miles southeast of the site, 7.7 times the radius of the low population zone. Transient population has not been considered in establishing the population center because it is estimated that cross-commuting between the city and outlying industrial developments results in no significant in-migration of working population. Other institutional population (notably that related to the University of South Carolina and Fort Jackson) was included in resident population since it was included in the 1970 Census of Population which formed the basis for distribution of base population.

If the present suburban development now occurring along Interstate 26 northwest of Columbia continues (especially with the development of Harbison), it is estimated there will be a contiguous population grouping of over 25,000 (not necessarily an incorporated city) within 15 miles south-southeast of the plant within the lifetime of the facility. Official projections do not include this possible growth.

Additionally, it is possible that the Winnsboro/Winnsboro Mills area, 15 miles east-northeast of the facility, may grow to a population of 25,000 if the economic development of that area is sufficiently stimulated by the construction of Interstate 77 and through potential tax advantages to Fairfield County resulting from the operation of the plant.

2.1.3.6 Public Facilities and Institutions

Table 2.1-5 indicates schools, hospitals, nursing care facilities, prisons and jails within 10 miles of the site, their location in respect to the reactor and present populations of these facilities. There are no state parks within 10 miles of the nuclear plant. A discussion of recreation attractions within 50 miles of the site is found in Section 2.1.3.4.

2.1.4 LAND USE

2.1.4.1 General

The general classes of land use in the 50 mile region (see Table 2.1-6 and Figure 2.1-25) are derived from county statistics obtained from the publication, "South Carolina Soil and Water Conservation Needs Inventory," dated May, 1970 [11]. These land-use categories are further described below:

1. Federal Land - Federally owned land except cropland operated under lease or permit, and Indian lands under trusteeship but owned by individuals or tribes.

2. Urban and Built-up Areas - Areas that include

    a. cities, villages, and built-up areas of more than 10 acres;

    b. industrial sites (except strip mines, borrow and gravel pits), railroad yards, cemeteries, airports, golf courses, and so forth;

    c. institutional and public administrative sites and similar types of areas.

3. Cropland - Land in tillage rotation, orchards, vineyards, bush fruits, and open land recently cropped.

4. Pasture - Land in grass or other long-term forage growth that is used primarily for grazing.

5. Forest - Lands which are at least 10 percent stocked by forest trees, including commercial forest land, farm woodlots, and afforested (planted) areas; and also, land of less than 10 percent stocking that has not been developed for other uses.

6. Other - Includes non-productive farm land occupied by buildings, road, ditches, etc., and other non-farm land such as built-up areas less than 10 acres in size, gravel pits, and borrow pits.

Land use and general topography within 10 miles of the site are illustrated on Figure 2.1-26, utilizing information presented in general soil maps of Newberry, Fairfield and Richland Counties. Soils at the site in general consist of a surficial zone of silty, clayey materials, underlain by sandy silt and silty sand. These materials, in general, are typical of soil conditions in the vicinity. Topography and soil conditions have an effect on future land use and their consideration provides an aid in predictions of future land use.

Forestry is the most extensive land use within the region. Data from 1967 (Table 2.1-6) indicate forests occupied approximately 53 percent of the land in Richland County and 80 percent in Fairfield County. The average for the site region was about 64 percent forest land, representing a 2.9 percent increase over 1958. Within 10 miles of the site, 69 percent of the land was in forest in 1967 which represented an increase of 3.8 percent occurring between 1958 and 1967.

The Enoree/Tyger division of the Sumter National Forest lies within a 50 mile distance. The southern boundary is 5 miles northwest of the site. Harbison State Forest lies 16 miles southeast of the site. Agricultural land use is second in importance to forestry with 22 percent of the land within 50 miles of the site and 17 percent within 10 miles devoted to this use (Table 2.1-6).

The chief crops grown in the region are cotton, soybeans, small grains, and vegetables. Livestock enterprises, mainly beef and dairy cattle operations, are increasing at the expense of land devoted to field crops, resulting in a gradual shift from cropland to more pastureland in the region (Table 2.1-6).

The area within 10 miles of the site lies principally in Fairfield County and Newberry County. Data for these two counties indicate that agriculture is relatively unimportant in the site vicinity, particularly in the Fairfield County portion. Farming activity is devoted to small grains, pasture, feed crops, and beef cattle. Most farms are owned and operated by part-time farmers whose main livelihood comes from employment in industries or other commercial activities within neighboring communities.

2.1.4.2 Urban Development

2.1.4.2.1 Fairfield County

The western half of Fairfield County, in which the Virgil C. Summer Nuclear Station is located, is sparsely developed area characterized by small rural communities which have developed at the crossroads of major highways. Future growth in the area is expected to be minor with some residential development occurring along those sections of S. C. 215 in the vicinity of the nuclear plant site. Since much of the northwestern part of the county is in National Forest holdings, the amount of land available for urban development is quite limited, ensuring the continued rural nature of the area [12].

By comparison, the eastern half of the county, including the Winnsboro area, is more developed and is likely to experience greater development than the western half. Most of the present urban development is within the vicinity of Winnsboro or along U. S. 21. The completion of Interstate 77, which passes through the area, is expected to be a growth factor. When completed, this interstate will connect the area with the cities of Cleveland and Akron in Ohio. The state has also planned to construct a small reservoir in the vicinity of Winnsboro for recreation, residential and employment center (industrial and commercial) use [12].

2.1.4.2.2 Newberry County

The city of Newberry is the geographic and economic center of Newberry County. Interstate 26 has influenced moderate development around Newberry and is expected to remain a growth factor. Predictions are for the eventual linking of Newberry, Prosperity, and Little Mountain by development associated with the interstate highway. Other parts of the county are not expected to grow at the levels associated with the Newberry area. Much of the northern portions of the county are in National Forest land holdings and therefore unavailable for urban development [12].

2.1.4.2.3 Richland-Lexington Counties

Major development in these two counties is expected to occur in the suburbs of Columbia and northwestward along Interstate 26 and the north shore of Lake Murray. Growth radiating outward along major highways from the central urban area is already evident. Future growth along Interstate 77, U.S. 176, and U.S. 76 northward from Columbia is also expected [12]. 02-01

2.1.5 REFERENCES

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2.1.6 MAP REFERENCES

1. South Carolina State Highway Department, General Highway Maps: Lexington County 1958, Revised 1970; Newberry County 1961, Revised 1970; Fairfield County 1962, Revised 1970; Richland County 1963, Revised 1969.

2. South Carolina State Highway Department, Primary Highway System Map, 1975.

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5. U. S. Department of Agriculture, Soil Conservation Service, General Soil Maps of Newberry County 1967; Fairfield County 1966; Richland County 1968.

6. U. S. Department of the Interior, Geological Survey, Map of Spartanburg, South Carolina/North Carolina, NI 17-5; 1:250,000, 1969 Revision.

7. U. S. Department of the Interior, Geological Survey, Map of South Carolina, 1:500,000, 1970

8. U. S. Department of the Interior, Geological Survey, 7-1/2 Topographic Quadrangle Maps: Blair (1969), Chapin (1971), Irmo (1971), Irmo NE (1971), Jenkinsville (1969), Lake Murray East (1971), Lake Murray West (1971), Lebanon (1969), Little Mountain (1971), Newberry East (1968), Pomaria (1969), Prosperity (1970), Rion (1969), Richtex (1971), Salem Crossroads (1969), Winnsboro (1969), Winnsboro Mills (1969).

2.1.7 AERIAL PHOTOGRAPHY REFERENCES

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2. Dames & Moore, False Color, Infrared, Scale: 1:24,000, April 10, 1976.

TABLE 2.1-1

COMMUNITIES WITHIN 50 MILES OF THE
VIRGIL C. SUMMER NUCLEAR STATION, 1970

1970 Population Category	Place	Distance From Site (Miles)	Direction	1970 Population
Over 100,000	Columbia[a]	26	SE	113,542
35,000 - 99,999	None	--	--	--
10,000 - 34,999	Greenwood	48	W	21,069
	Laurens	43	W	10,298
	Rock Hill	46	NNE	33,846
	Union	34	NNW	10,775
5,000 - 9,999	Camden	40	E	8,532
	Cayce	27	SE	9,967
	Chester	29	N	7,045
	Clinton	35	W	8,138
	Forest Acres	27	SE	6,808
	Lancaster	44	NE	9,186
	Newberry	17	W	9,218
	West Columbia	26	SE	7,838
	York	47	N	5,081
1,000 - 4,999	Baldwin-Argon Mills	29	N	1,042
	Batesburg	30	SSW	4,036
	Buffalo	37	NW	1,461
	Edgefield	49	SW	2,750
	Eureka	29	SSW	1,524
	Great Falls	30	NE	2,727
	Irwin	38	NE	1,424
	Joanna	30	WNW	1,631
	Johnston	42	SW	2,552
	Jonesville	43	NNW	1,447
	Kershaw	47	ENE	1,818
	Lancaster Mills	44	NE	2,558
	Leesville	28	SSW	1,907

a Includes population at Fort Jackson, South Carolina

COMMUNITIES WITHIN 50 MILES OF THE
VIRGIL C. SUMMER NUCLEAR STATION, 1970

1970 Population Category	Place	Distance From Site (Miles)	Direction	1970 Population
1,000 - 4,999 (continued)	Monarch	33	NNW	1,726
	Ninety-Six	40	W	2,166
	Pacolet	50	NNW	1,418
	Pacolet Mills	49	NNW	1,666
	Saluda	33	SW	2,442
	Sandy Run	40	SSE	2,169
	South Congaree	29	SSE	1,434
	Springdale	27	SSE	2,638
	Springdale	39	NE	3,193
	Watts Mills	39	WNW	1,181
	Whitmire	22	NW	2,226
	Winnsboro	15	ENE	3,411
	Winnsboro Mills	15	ENE	2,312
0 - 999	Arcadia Lakes	28	SE	741
	Ardincaple	28	SE	726
	Boyden Arbor	27	SE	416
	Carlisle	22	NNW	670
	Chapin	9	SSW	342
	Forest Lake	27	SE	39
	Gilbert	26	S	186
	Irmo	16	SSE	517
	Lexington	22	SSE	969
	Little Mountain	9	SW	240
	Peak	4	S	87
	Pineridge	29	SSE	633
	Pomaria	6	WSW	264
	Prosperity	14	WSW	762
	Ridgeway	22	E	437
	Silverstreet	22	W	156
	Summit	26	SSW	130

Source: U. S. Department of Commerce, Bureau of the Census, 1970 Census of Population: Number of Inhabitants, South Carolina, PC(1)-A42, S. C., June, 1971.[13]

TABLE 2.1-2

POPULATION FOR SELECTED SOUTH CAROLINA COUNTIES, 1930 to 2020
(IN THOUSANDS)

County	1930	1940	1950	1960	1970	1974	1980	1990	2000	2010	2020	1960-1970 % Change	1970-1974 % Change (Est.)
Aiken	47.4	49.9	53.1	81.0	91.0	93.7	92.4	94.0	93.8	94.6	95.0	12.3	2.9
Calhoun	16.7	16.2	16.2	14.8	10.8	10.6	10.5	12.0	12.5	13.2	13.5	-12.0	-1.5
Cherokee	32.2	33.3	34.9	35.2	36.8	39.7	40.8	43.2	44.2	45.4	46.4	4.5	8.0
Chester	31.8	32.6	32.6	30.9	29.8	30.7	31.9	33.3	33.8	34.1	34.4	-3.5	3.1
Edgefield	19.3	17.9	16.6	15.7	15.7	16.4	14.9	14.7	14.5	14.4	14.3	-0.3	4.5
Fairfield	23.3	24.2	21.8	20.7	20.0	19.8	20.2	21.1	21.2	21.1	21.1	-3.4	-0.8
Greenwood	36.1	40.1	41.6	44.3	49.7	51.8	54.6	59.9	63.0	65.7	67.9	12.2	4.3
Kershaw	32.1	32.9	32.3	33.6	34.7	35.8	37.8	44.9	49.5	53.3	55.8	3.4	3.1
Lancaster	28.0	33.5	37.1	39.4	43.3	45.3	45.8	48.1	49.0	49.7	50.2	10.1	4.5
Laurens	42.1	44.2	47.0	47.6	49.7	49.7	50.0	53.0	55.9	57.0	NA	4.4	---
Lexington	36.5	36.0	44.3	60.7	89.0	111.5	129.1	174.1	204.4	227.5	251.4	46.6	25.2
McCormick	11.5	10.4	9.6	8.6	8.0	8.2	7.3	7.1	6.6	6.2	NA	-7.8	2.6
Newberry	34.7	33.6	31.8	29.4	29.3	30.2	30.0	31.0	31.2	31.3	31.3	-0.5	3.1
Orangeburg	63.9	63.7	68.7	68.6	69.8	76.0	76.8	83.1	86.7	89.1	91.1	1.8	8.9
Richland	87.7	104.8	142.6	200.1	233.9	249.3	245.0	271.2	289.1	318.0	340.1	16.9	6.6

TABLE 2.1-2 (Continued)

POPULATION FOR SELECTED SOUTH CAROLINA COUNTIES, 1930 to 2020
(IN THOUSANDS)

County	1930	1940	1950	1960	1970	1974	1980	1990	2000	2010	2020	1960-1970 % Change	1970-1974 % Change (Est.)
Saluda	18.1	17.2	15.9	14.5	14.5	14.6	15.5	16.0	16.2	16.5	16.9	-0.2	0.2
Spartanburg	116.3	127.7	150.3	156.8	173.7	189.9	205.6	239.1	260.9	281.6	297.5	10.8	9.3
Sumter	45.9	52.5	57.6	74.9	79.4	82.6	85.0	89.7	94.2	97.9	101.6	6.0	4.0
Union	30.9	31.4	31.3	30.0	29.2	30.2	31.8	33.4	34.1	34.9	33.7	-2.9	3.4
York	53.4	58.7	71.6	78.8	85.2	92.5	92.2	101.5	106.7	111.2	114.7	8.2	8.6

References:

a) Years 1930-1960: Petty, Julian J., Twentieth Century Changes in South Carolina Population, Bureau of Business and Economic Statistics, University of South Carolina, 1962 [14].

b) Years 1970 and 1974: South Carolina Division of Research and Statistical Services, State Budget and Control Board, News Release Regarding Estimates of the Population of South Carolina Counties 1970-1974, February 13, 1975 [15].

c) Years 1930-2020: U.S. Army Corps of Engineers and BEA, Projections of Economic Activity in South Carolina (Series E Population), December, 1975 [16].

Note: - Figures for 1980-2020 represent the low estimate (BEA, Series E). The high estimate added the following percentage rate to the low estimate: 1980 - +6.5%; 1990 - +5.6%; 2000 - +4.6%; 2010 - +3.6%; 2020 - +2.8%.

TABLE 2.1-3

ESTIMATED POPULATIONS IN THE LOW POPULATION ZONE, 1975
(RESIDENTIAL AND TRANSIENT) [a,g]

Sector	Distance (Miles) 0-1	1-2	2-3	0-3 (Total)
N	0+(83)[b]	23	23	129
NNE	0	23	27	50
NE	0	41	58[d]	99
ENE	0	109[c]	74	183
E	0	41	25	66
ESE	0	55	0	55
SE	0	41	39[h]	80
SSE	0	23	18	41
S	0	23	0	23
SSW	0	23	51[e]	74
SW	0	23	23	46
WSW	0	23	23	46
W	0	23	34	57
WNW	0	38[f]	23	61
NW	0	23	23	46
NNW	0	23	30	53
	83	555	471	1109

Source:

a Transient population numbers are weighted to reflect the proportion of a 24-hour day during which people are present at the facility. Resident and transient population may be double-counted within the low population zone. Resident populations come from 1970 Census figures. Transient populations for 1975.

b Includes Virgil C. Summer Nuclear Station employees (7).

c Includes weighted population associated with Whitehall Elementary School (4).

d Includes weighted population associated with Interstate Materials, Inc. (6).

e Includes weighted population associated with Parr Steam and Hydroelectric Plants (7).

f Includes weighted population associated with Fairfield Pump Storage Facility (7).

g Weighted population of Central Piedmont Hunt Unit included (17).

h Includes weighted transient population associated with Nylene Corporation (5).

TABLE 2.1-4

RECREATIONAL USE WITHIN 50 MILES OF THE VIRGIL C. SUMMER NUCLEAR STATION, 1975

Recreation	Distance From Site (Miles)	Direction	Visitor Annual Overnight	Visitor Annual Daytime	Visitor Peak Monthly	Visitor Low Monthly	Total Annual Visitor Days	Weighted Annual Transient Population
Sumter National Forest[a]								
Enoree Adm. Unit	5-30	N, NNW, NW, WNW, W	1,700	83,700	N.A.	N.A.	85,400	29,597
Tyger Adm. unit	10-40	N, NNW, NW, WNW, W	11,500	146,500	N.A.	N.A.	158,000	60,328
Edgefield Admin Unit, Including Parson's Mtn. & Forks-Key Bridge Game Mgmt. Areas	40-50	WSW	2,500	127,400	N.A.	N.A.	129,000	44,924
Chester State Park[b]	27	N	4,475	127,069	20,728	3,288	131,544	46,789 02-01
Dreher Island State Park	16	SSW	5,985	12,008	2,449	388	17,993	9,984
Greenwood State Park	37	WSW	34,704	439,492	99,896	6,448	474,196	181,055
Sesquicentennial	25	SE	16,874	347,234	77,168	9,948	364,108	132,503
Rose Hill State Park	29	NW	None	53,708	7,772	2,396	53,708	17,885

(N.A. - Not Available)

TABLE 2.1-4 (Continued)

RECREATIONAL USE WITHIN 50 MILES OF THE VIRGIL C. SUMMER NUCLEAR STATION, 1975

Recreation	Distance From Site (Miles)	Direction	Visitor Annual Overnight	Visitor Annual Daytime	Visitor Peak Monthly	Visitor Low Monthly	Total Annual Visitor Days	Weighted Annual Transient Population
N. R. Goodall State Park	45	E	None	101,059	23,528	1,420	101,059	33,683
Landsford Canal State Park	40	NE	--	--	--	--	Under Construction	--
Lake Murray[c]	12-20	SSE, S, SSW, SW	N.A.	N. A.	N. A.	N. A.	1,791,442	596,550
Central Piedmont[d] Hunt Unit, Including Broad River, Fair Forest, Enoree, and Carlisle Game Management Areas	1-50	N, NNW, NW, WNW, W	N. A.	50,000	N.A.	N. A.	50,000	16,665
Wateree Lake and Adjacent Game Management Areas of Dutchman Creek and Wateree	20-40	NE, ENE, E	N.A.	75,000	N.A.	N. A.	75,000	24,998
Lake Greenwood (at Greenwood State Park)	35-40	W	N.A.	60,000	N.A.	N.A.	60,000	19,998
Congaree Region	30-50	SE	N.A.	20,000	N.A.	N.A.	20,000	6,666

(N.A. - Not Available)

TABLE 2.1-4 (Continued)

RECREATIONAL USE WITHIN 50 MILES OF THE VIRGIL C. SUMMER NUCLEAR STATION, 1975

Source:

a Sumter National Forest: Personal Communication, John Connell, U.S. Forest Service [18].

b State Parks: Personal Cummical, Frances B. Coleman, South Carolina Department of Parks, Recreation and Tourism [19].

c Lake Murray: Saluda River Hydroelectric Development Relicensing Application South Carolina Electric & Gas, 1974 Appendix R [10].

d Hunting & Fishing Recreation Areas: Personal Communication, John Davis, South Carolina Wildlife & Marine Resources Dept. 1975 Estimates [17].

TABLE 2.1-5

SCHOOLS, HOSPITALS AND PRISONS WITHIN 10 MILES
OF THE VIRGIL C. SUMMER NUCLEAR STATION, 1996

Schools [a]	Distance from Site (Miles)	Direction	Population [a] (Pupils/Staff)
Pomaria-Garmany Middle	7.0	WSW	260/22
McCrorey-Liston	7.0	N	300/40
Chapin Elementary	11.0	S	893/87
Chapin Middle	11.0	S	475/65
Chapin High	9.0	S	700/85
Little Mountain Elementary	9.0	SW	252/22
Kelley-Miller	11.0	E	200/35
Mid-Carolina High	10.5	WSW	550/43
Mid-Carolina Middle	10.5	WSW	460/45

Hospitals [b] - None

Rest Homes [c] - None

Prisons/Jails [d] - None

Source:

a County Civil Defense Directors, March 11, 1996

b Riley, Henry M., Jr., Director of Licensing, April 15, 1976, Department of Health and Environmental Control, Personal Communication [20].

c Booknight, Sara, Staff Member, May 7, 1976, Lowman Home Institutional Care Facility, Personal Communication [21].

d Teagle, Marimac, Statistician, and Strickland, Jessie, Director of Regional Operations, May 1976, South Carolina Department of Corrections, Personal Communications [22].

TABLE 2.1-6

LAND USE IN SITE REGION [a, b], 1958-1967

Total County Land (Acres)		Chester 374,000	Fairfield 447,000	Greenwood 286,000	Kershaw 503,000	Average 12 County Area
Federal Land (%)	1958	3.2	2.7	3.5	0	3.9
	1967	3.2	2.7	3.5	0	3.9
						0 % Change
Urban & Built Up (%)	1958	4.3	1.3	5.2	2.1	4.2
	1967	4.2	2.8	6.3	2.9	6.4
						+2.2 % Change
Cropland (%)	1958	15.2	11.2	17.9	19.1	18.4
	1967	12.4	6.0	11.2	13.0	13.1
						-5.3 % Change
Pasture (%)	1958	12.1	7.5	10.8	2.0	7.2
	1967	11.4	7.1	14.1	3.2	8.9
						+1.7 % Change
Agricultural (Cropland plus Pasture) (%)	1958	17.6	18.7	28.7	21.1	24.2
	1967	24.2	13.1	25.3	16.2	22.0
						-2.2 % Change
Forest (%)	1958	61.7	75.5	60.0	72.8	61.3
	1967	66.6	80.0	63.1	77.7	64.2
						+2.9 % Change
Other Land (%)	1958	3.5	1.7	2.1	3.9	3.6
	1967	1.8	0.9	1.4	2.9	2.2
						-1.4 % Change

02-01

02-01

TABLE 2.1-6 (Continued)

LAND USE IN SITE REGION [a, b], 1958-1967

Total County Land (acres)		Lancaster 323,000	Laurens 449,000	Lexington 445,040	Newberry 405,120	Average 12 County Area	
Federal Land (%)	1958	0	4.5	0	13.6	3.9	
	1967	0	4.5	0	13.6	3.9	
						0 % Change	
Urban & Built Up (%)	1958	2.3	3.9	6.9	4.4	6.2	02-01
	1967	9.3	5.4	10.5	4.3	6.4	
						+2.2 % Change	
Cropland (%)	1958	16.9	24.2	22.6	19.8	18.4	
	1967	10.0	15.0	20.9	12.4	13.1	
						-5.3 % Change	
Pasture (%)	1958	5.4	9.4	2.7	4.3	7.2	
	1967	6.6	11.1	3.5	8.8	8.9	
						+1.7 % Change	
Agricultural (Cropland plus Pasture) (%)	1958	25.3	23.6	25.3	24.1	24.2	
	1967	16.6	26.1	24.6	21.2	22.0	
						-2.2 % Change	
Forest (%)	1958	66.9	54.7	64.3	55.1	61.3	
	1967	69.3	61.2	61.2	58.3	64.2	
						+2.9 % Change	
Other Land (%)	1958	7.4	3.1	2.8	2.5	3.6	02-01
	1967	3.7	2.4	2.4	2.1	2.2	
						-1.4 % Change	

LAND USE IN SITE REGION [a, b], 1958-1967

Total County Land (acres)		Richland 479,000	Saluda 283,000	Union 330,000	York 438,000	Average 12 County Area
Federal Land (%)	1958	11.5	1.4	17.0	0.7	3.9
	1967	11.5	1.7	17.0	0.7	3.9
						0 % Change
Urban & Built Up (%)	1958	10.2	0.8	2.7	6.0	4.2
	1967	17.6	1.2	3.2	9.2	6.4
						+2.2 % Change
Cropland (%)	1958	15.6	25.2	12.0	21.2	18.4
	1967	13.1	19.5	7.6	15.3	13.1
						-5.3 % Change
Pasture (%)	1958	3.5	11.8	6.5	10.4	7.2
	1967	2.9	17.3	9.4	11.8	8.9
						+1.7 % Change
Agricultural (Cropland plus Pasture) (%)	1958	19.1	37.0	18.5	31.6	24.2
	1967	16.0	36.8	17.0	27.1	22.0
						-2.2 % Change
Forest (%)	1958	56.1	57.6	55.6	55.7	61.3
	1967	52.7	57.0	61.2	58.0	64.2
						+2.9 % Change
Other Land (%)	1958	2.7	2.8	6.1	4.8	3.6
	1967	0.7	2.8	1.5	3.5	2.2
						-1.4 % Change

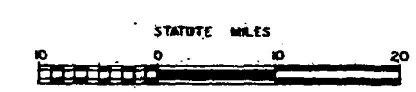
02-01

02-01

a The area within 50 miles of the site takes in all or parts of the 12 counties listed in this table.

b Reference: South Carolina Soil and Water Conservation Needs Inventory, May, 1970 [11].

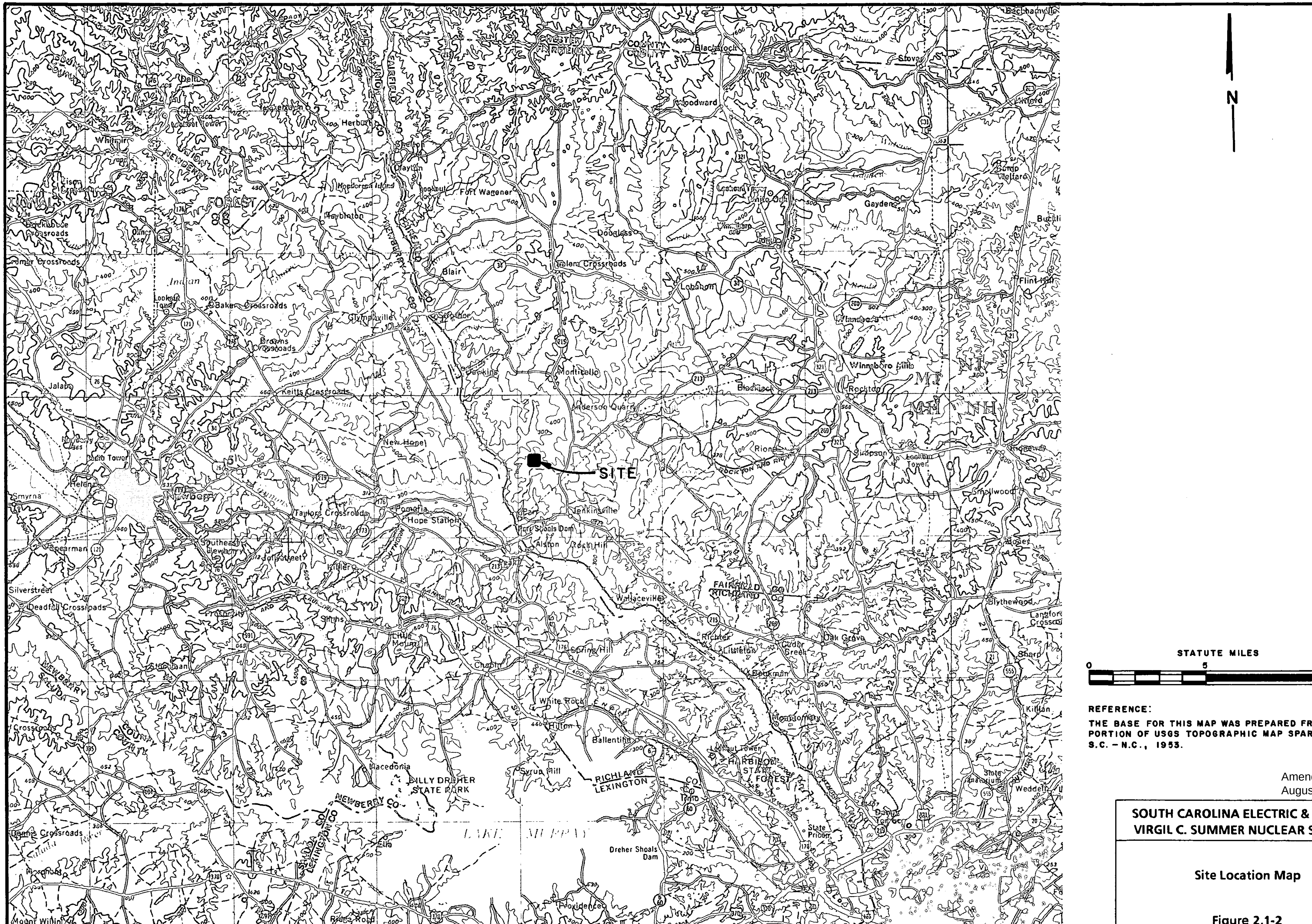
REFERENCE:
THE BASE OF THIS MAP WAS PREPARED FROM A PORTION OF USGS STATE OF GEORGIA, 1970.



AMENDMENT 02-01
MAY 2002

South Carolina Electric & Gas Co. Virgil C. Summer Nuclear Station
Regional Location Map Figure 2.1-1

RN 01-045



REFERENCE:

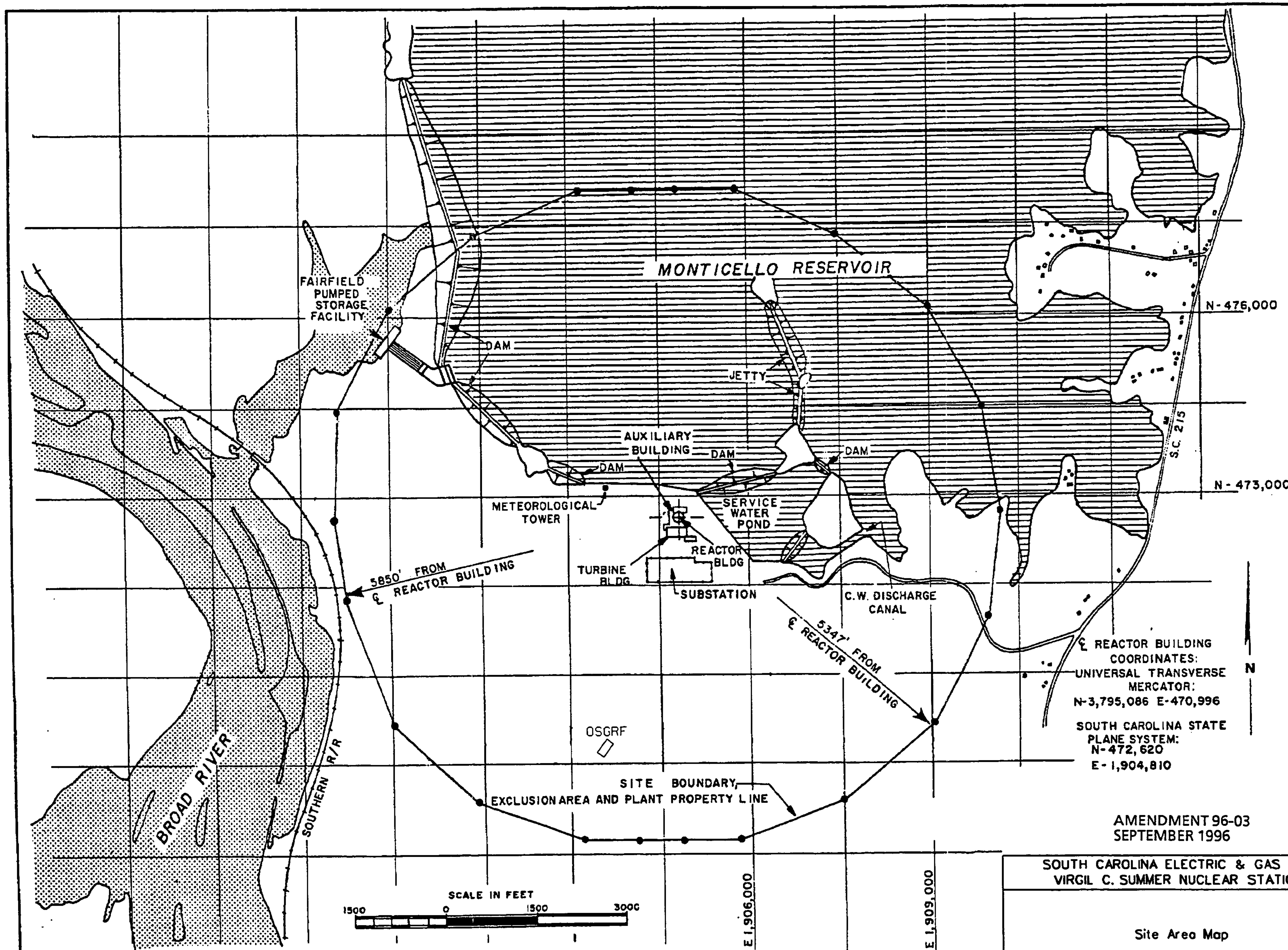
THE BASE FOR THIS MAP WAS PREPARED FROM A PORTION OF USGS TOPOGRAPHIC MAP SPARTANBURG, S.C. – N.C., 1953.

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Site Location Map

Figure 2.1-2

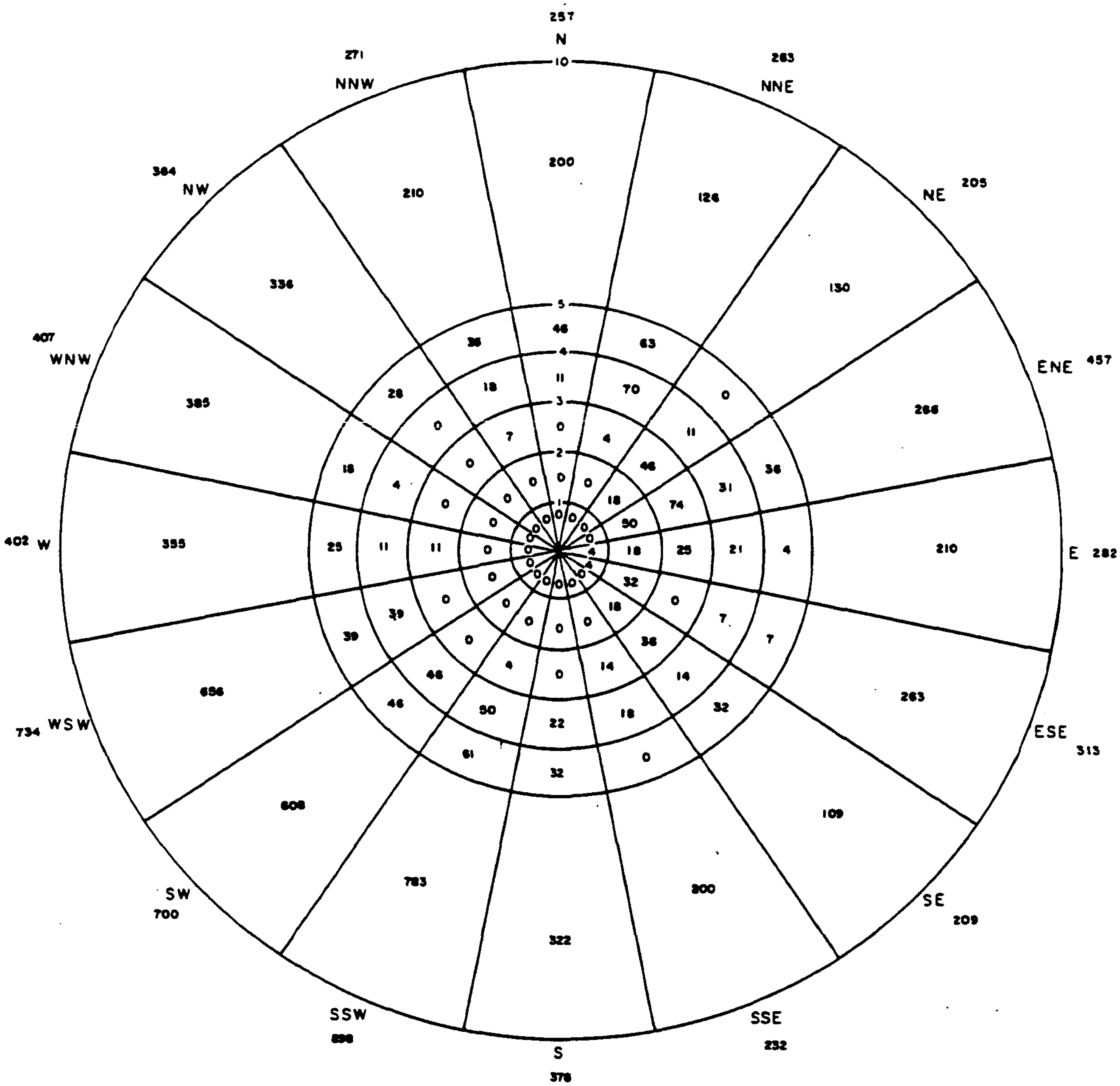


AMENDMENT 96-03
SEPTEMBER 1996

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Site Area Map

Figure 2.1-3



POPULATION BY ANNULAR RING

0-1 MI	1-2 MI	2-3 MI.	3-4 MI	4-5 MI	5-10 MI	0-10 MI TOTAL
8	136	221	373	473	5,159	6,370

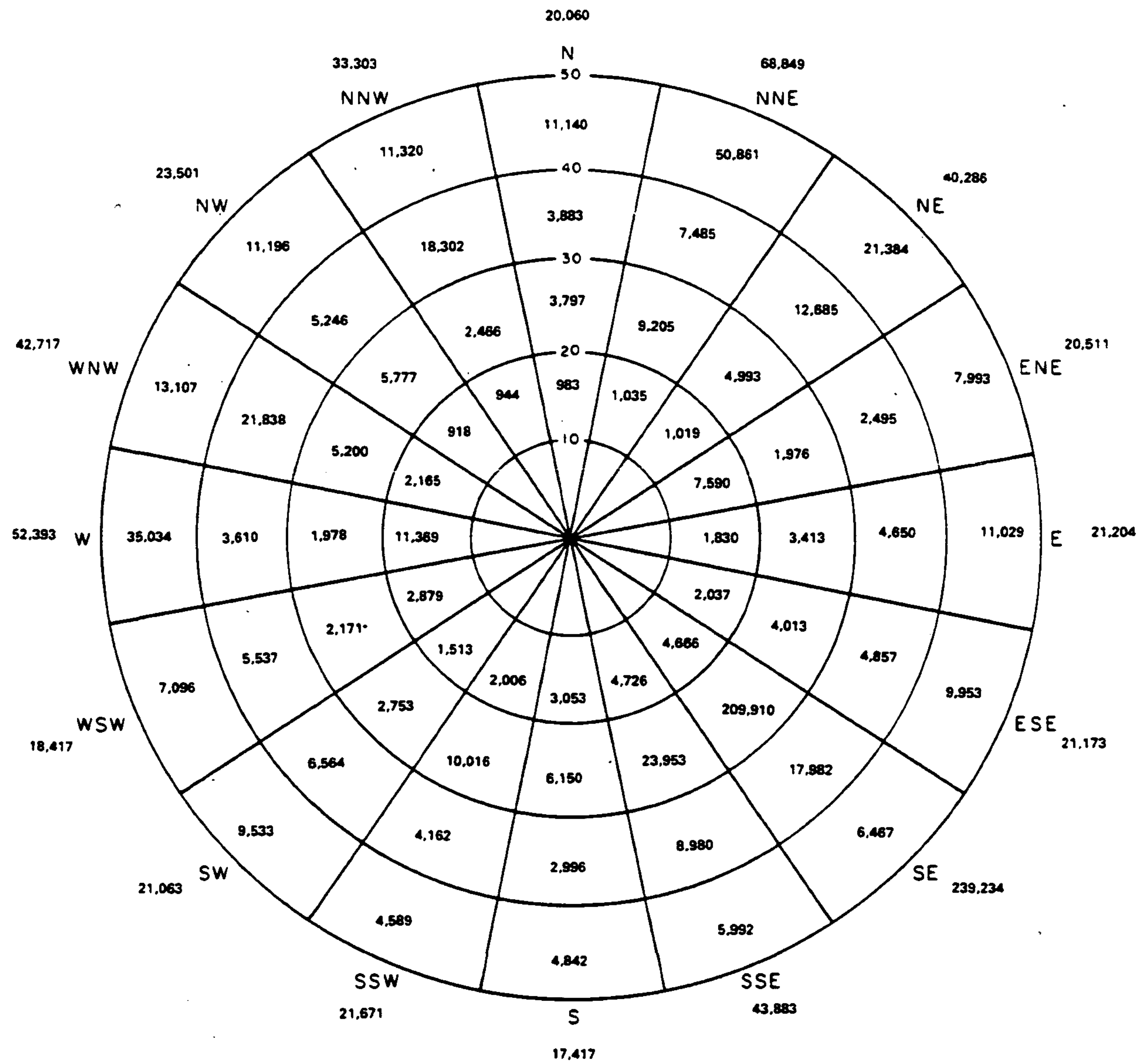
Sector Totals on Outer Circumference

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Resident Population Distribution
Up to 10 Miles, 1970

Figure 2.1-4



POPULATION BY ANNULAR RING

0-10 MI	10-20 MI	20-30 MI	30-40 MI	40-50 MI	10-50 MI	0-50 MI TOTAL
6,370	48,733	297,771	131,272	221,536	699,312	705,682

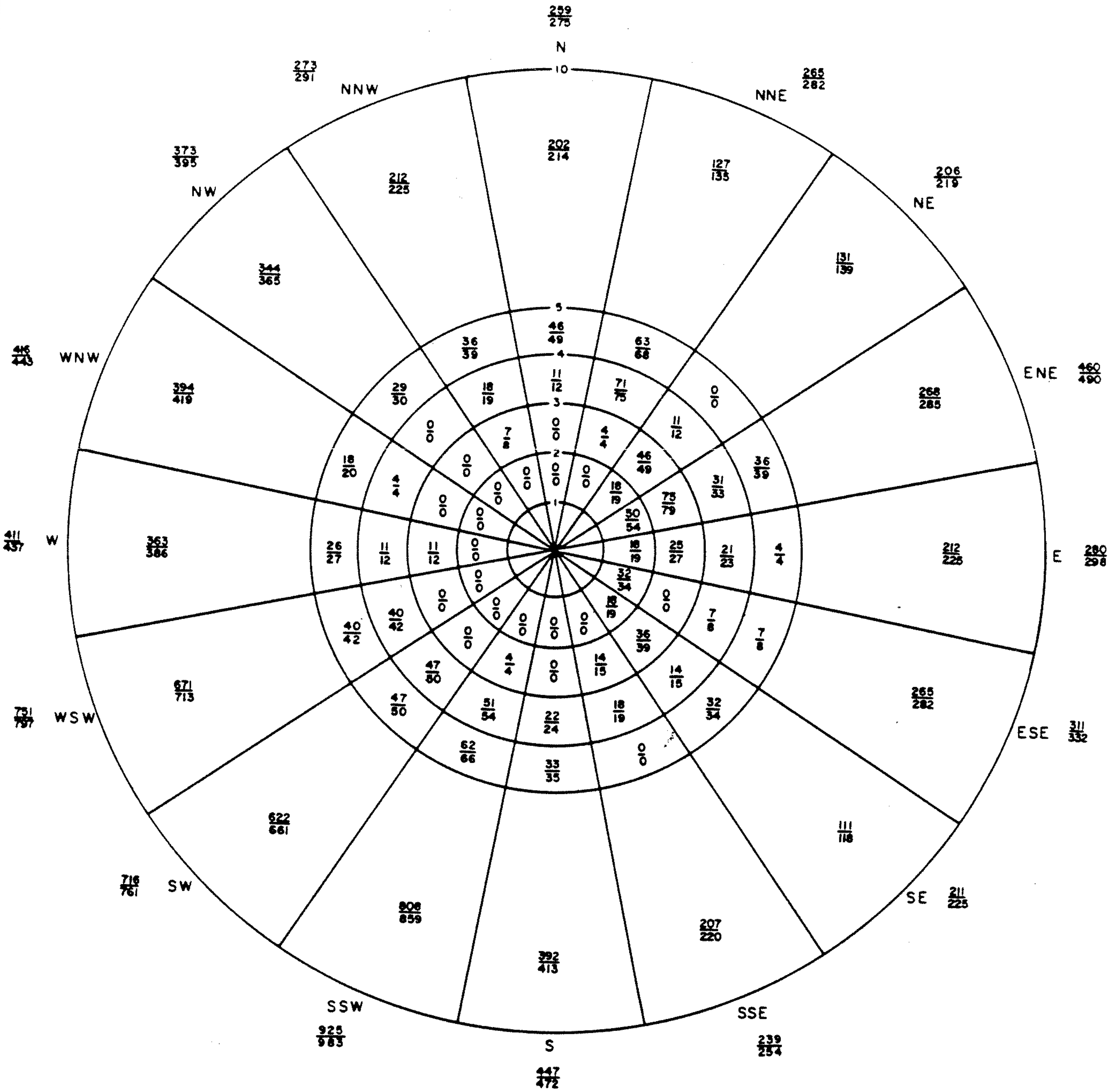
Sector Totals on Outer Circumference
0 to 10 mile populations are found on
0 to 10 mile rose

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Resident Population Distribution
Between 10 and 50 Miles, 1970

Figure 2.1-5



POPULATION BY ANNULAR RING

PROJECTION	0-1 MI	1-2 MI	2-3 MI	3-4 MI	4-5 MI	5-10 MI	0-10 MI TOTAL
LOW	0	136	222	377	479	5,329	6,543
HIGH	0	145	237	402	511	5,659	6,964

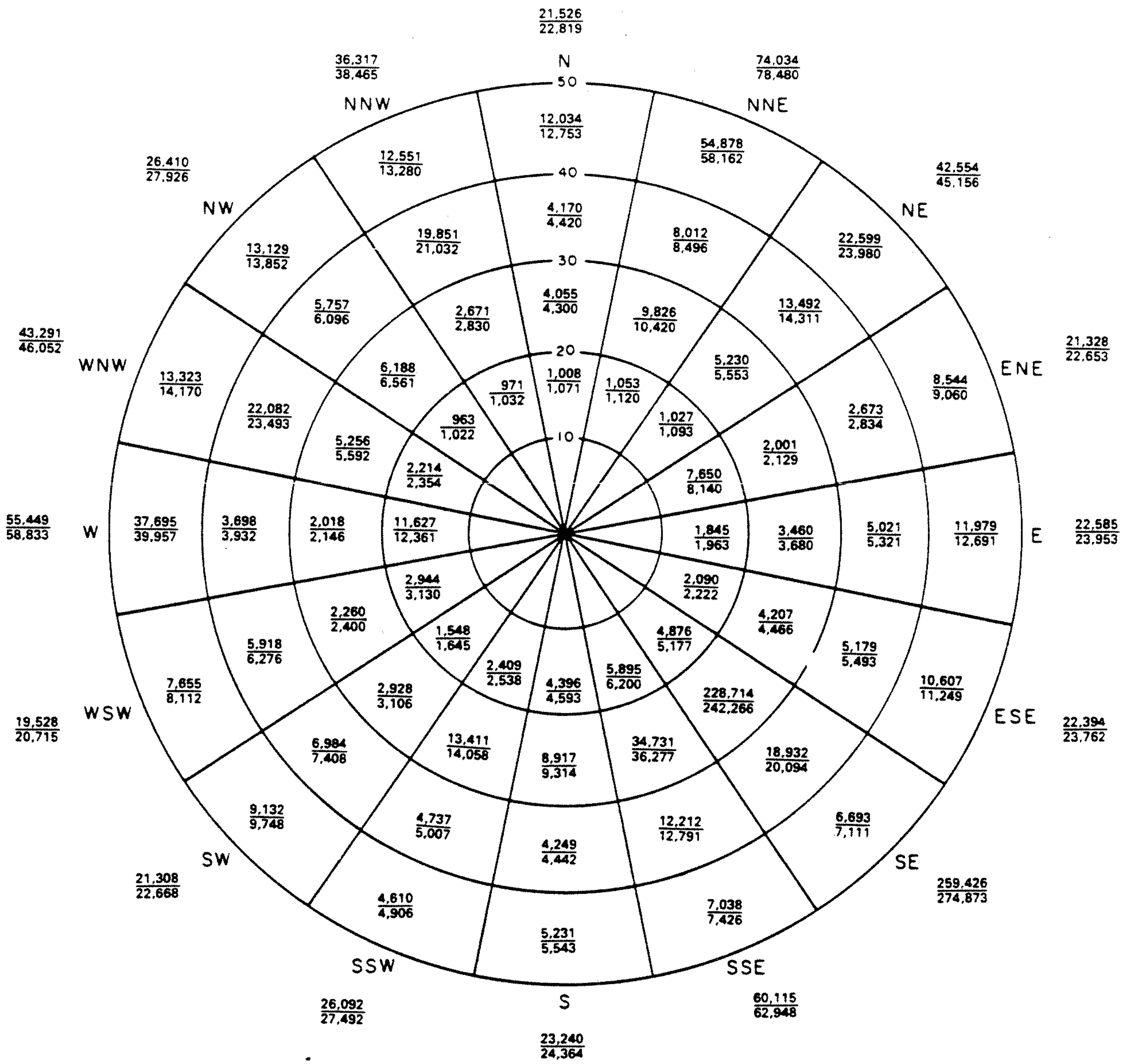
Key:
805 = Low Projections (BEA Series E)
851 = High Projections (BEA Alternate Method)
Sector Totals on Outer Circumference
All 0-1 Mile Sectors Have Zero Population

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Projected Resident Population Distribution Up to 10 Miles, 1980

Figure 2.1-8



POPULATION BY ANNULAR RING

PROJECTION	0-10 MI	10-20 MI	20-30 MI	30-40 MI	40-50 MI	10-50 MI	0-50 MI TOTAL
LOW	6,543	52,516	335,873	142,967	237,698	769,054	775,597
HIGH	6,954	55,661	355,098	151,446	252,000	814,205	821,139

Key:
805 = Low Projections (BEA Series E)
851 = High Projections (BEA Alternate Method)

Sector Totals on Outer Circumference

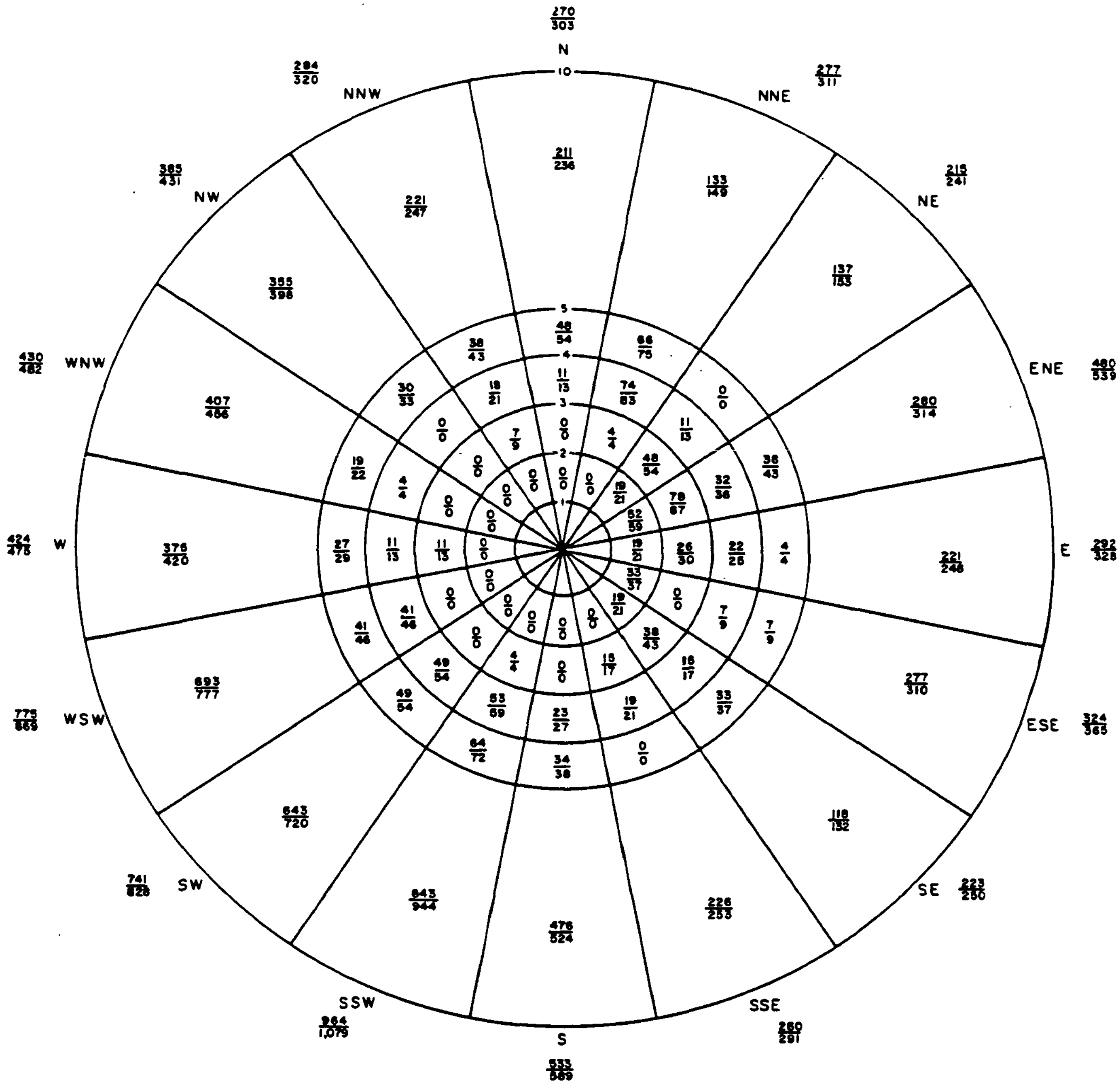
0 to 10 Mile Populations are found on
0 to 10 Mile Rose

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Projected Resident Population Distribution Between 10 and 50 Miles, 1980

Figure2.1-9



POPULATION BY ANNULAR RING

PROJECTION	0-1 MI	1-2 MI	2-3 MI.	3-4 MI	4-5 MI	5-10 MI	0-10 MI TOTAL
LOW	0	142	231	390	498	5616	6,877
HIGH	0	159	261	441	559	6281	7,701

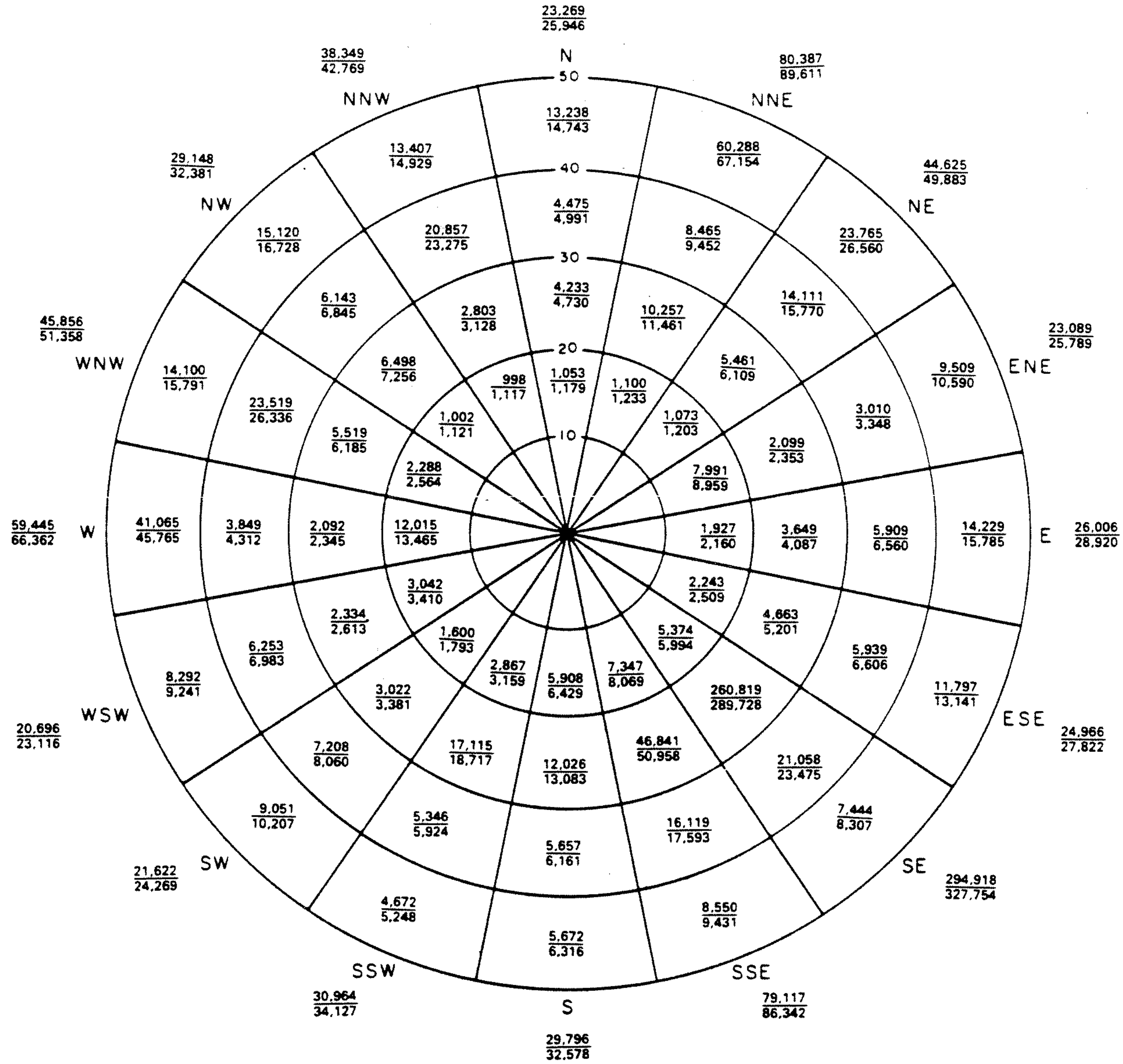
Key:
805 = Low Projections (BEA Series E)
851 = High Projections (BEA Alternate Method)
Sector Totals on Outer Circumference
All 0-1 Mile Sectors Have Zero Population

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Projected Resident Population Distribution Up to 10 Miles, 1990

Figure 2.1-10



POPULATION BY ANNULAR RING

PROJECTION	0-10 MI	10-20 MI.	20-30 MI	30-40 MI	40-50 MI	10-50 MI	0-50 MI TOTAL
LOW	6,877	57,828	389,431	157,918	260,199	865,376	872,253
HIGH	7,701	64,364	431,335	175,691	289,936	961,326	969,027

Key:
805 = Low Projections (BEA Series E)
851 = High Projections (BEA Alternate Method)

Sector Totals on Outer Circumference

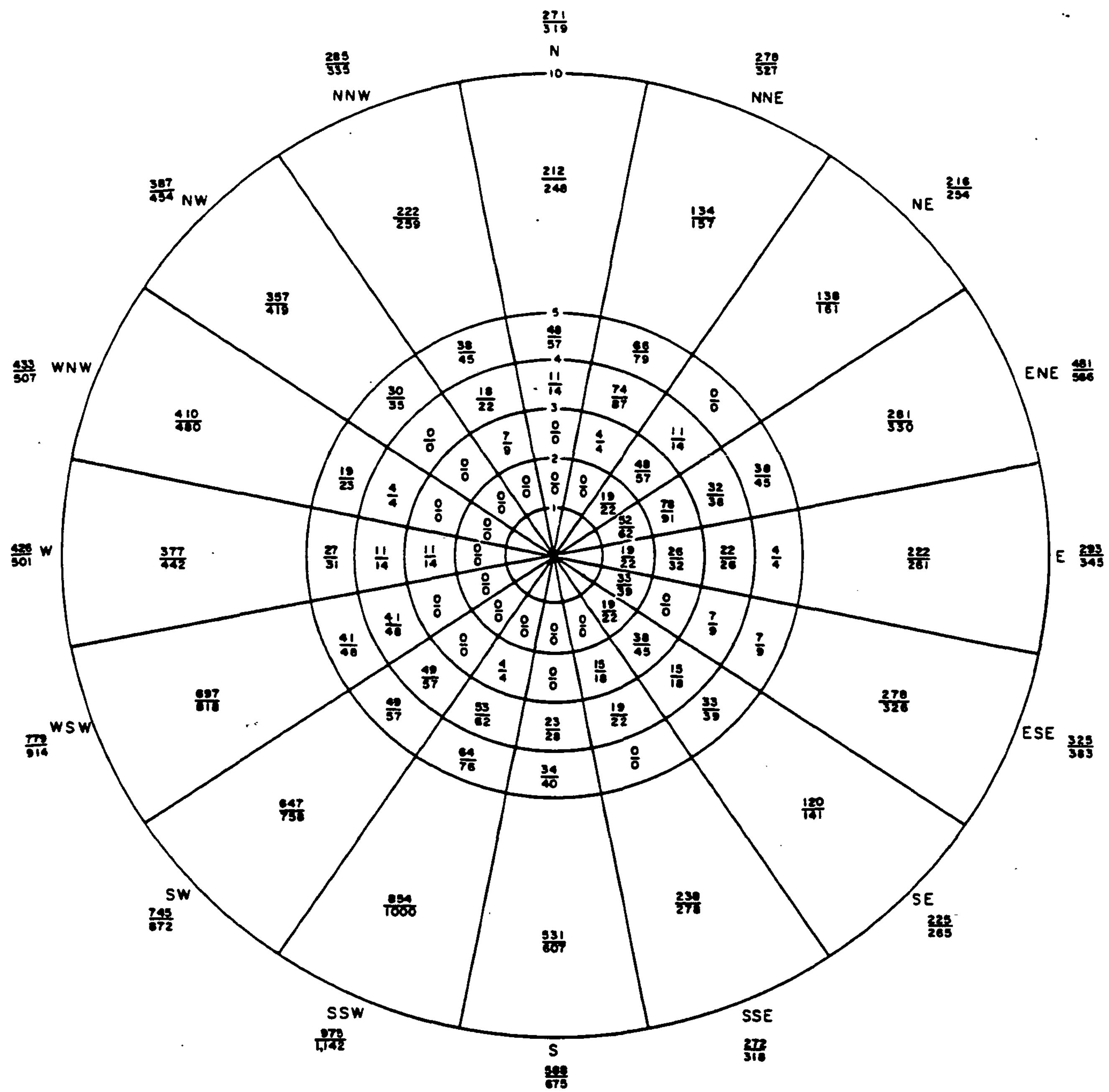
0 to 10 Mile Populations are found on
0 to 10 Mile Rose

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Projected Resident Population Distribution Between 10 and 50 Miles, 1990

Figure 2.1-11



POPULATION BY ANNULAR RING

PROJECTION	0-1 MI	1-2 MI.	2-3 MI.	3-4 MI.	4-5 MI.	5-10 MI	0-10 MI TOTAL
LOW	0	142	231	390	498	5,718	6,979
HIGH	0	167	274	463	588	6,685	8,177

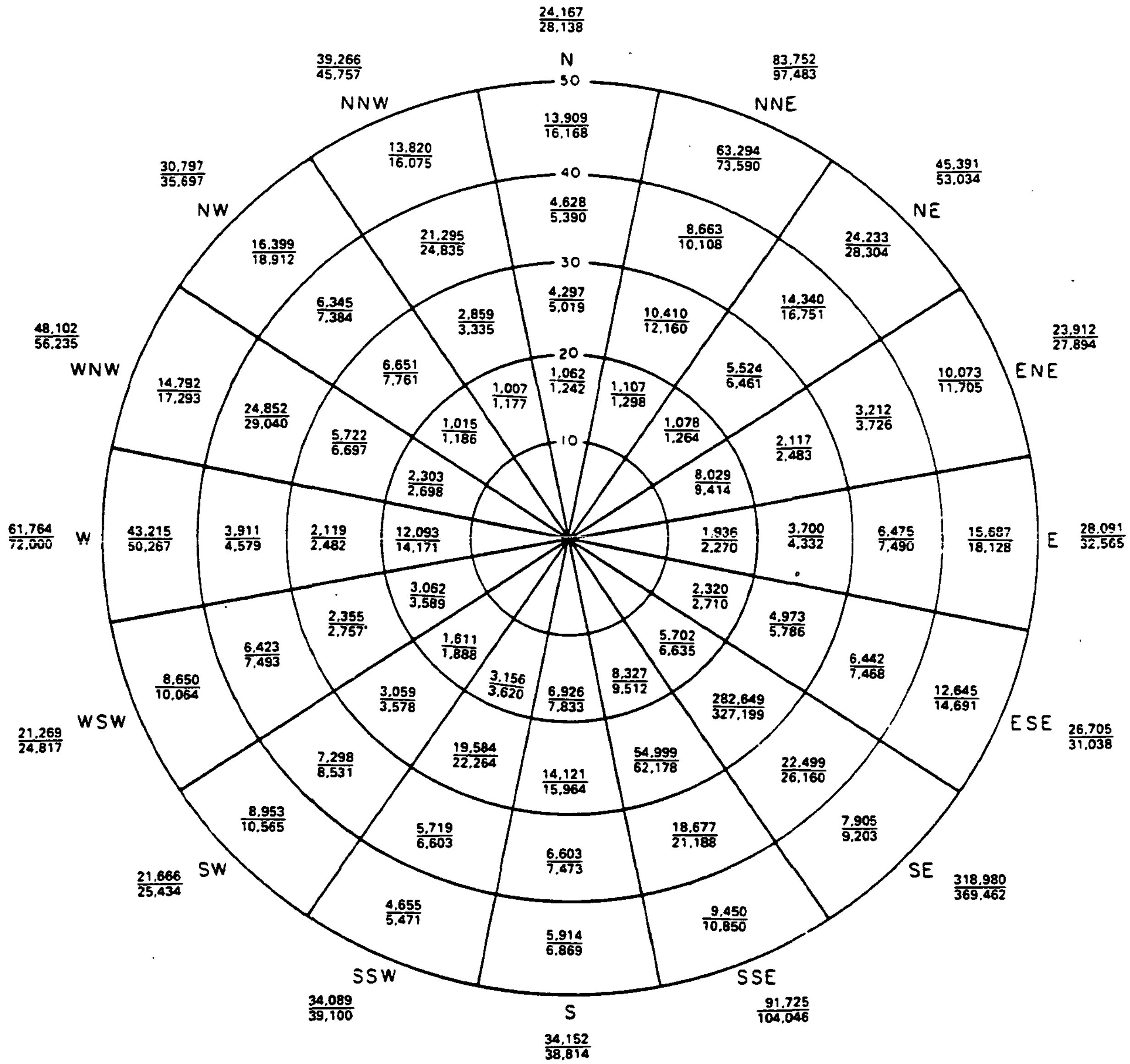
Key:
805 = Low Projections (BEA Series E)
851 = High Projections (BEA Alternate Method)
Sector Totals on Outer Circumference
All 0-1 Mile Sectors Have Zero Population

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Projected Resident Population Distribution Up to 10 Miles, 2000

Figure 2.1-12



POPULATION BY ANNULAR RING

PROJECTION	0-10 MI	10-20 MI.	20-30 MI	30-40 MI	40-50 MI	10-50 MI	0-50 MI TOTAL
LOW	6,979	60,734	425,139	167,382	273,594	926,849	933,828
HIGH	8,177	70,507	490,456	194,219	318,155	1,073,337	1,081,514

Key:
805 = Low Projections (BEA Series E)
851 = High Projections (BEA Alternate Method)

Sector Totals on Outer Circumference

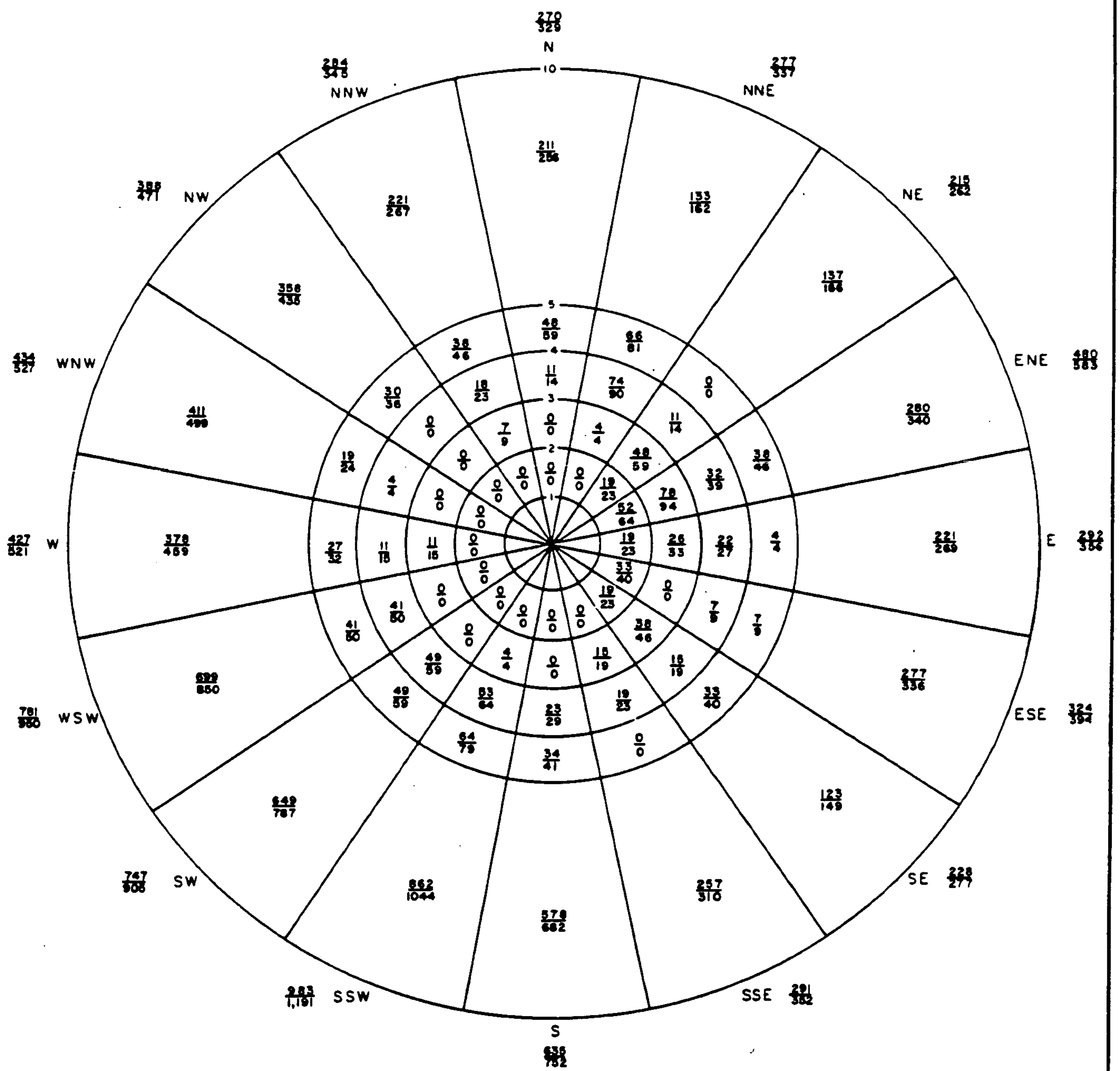
0 to 10 Mile Populations are found on
0 to 10 Mile Rose

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Projected Resident Population Distribution Between 10 and 50 Miles, 2000

Figure 2.1-13



POPULATION BY ANNULAR RING

PROJECTION	0-1 MI	1-2 MI	2-3 MI	3-4 MI	4-5 MI	5-10 MI	0-10 MI TOTAL
LOW	0	142	231	390	498	5,795	7,056
HIGH	0	173	283	479	606	7,011	8,552

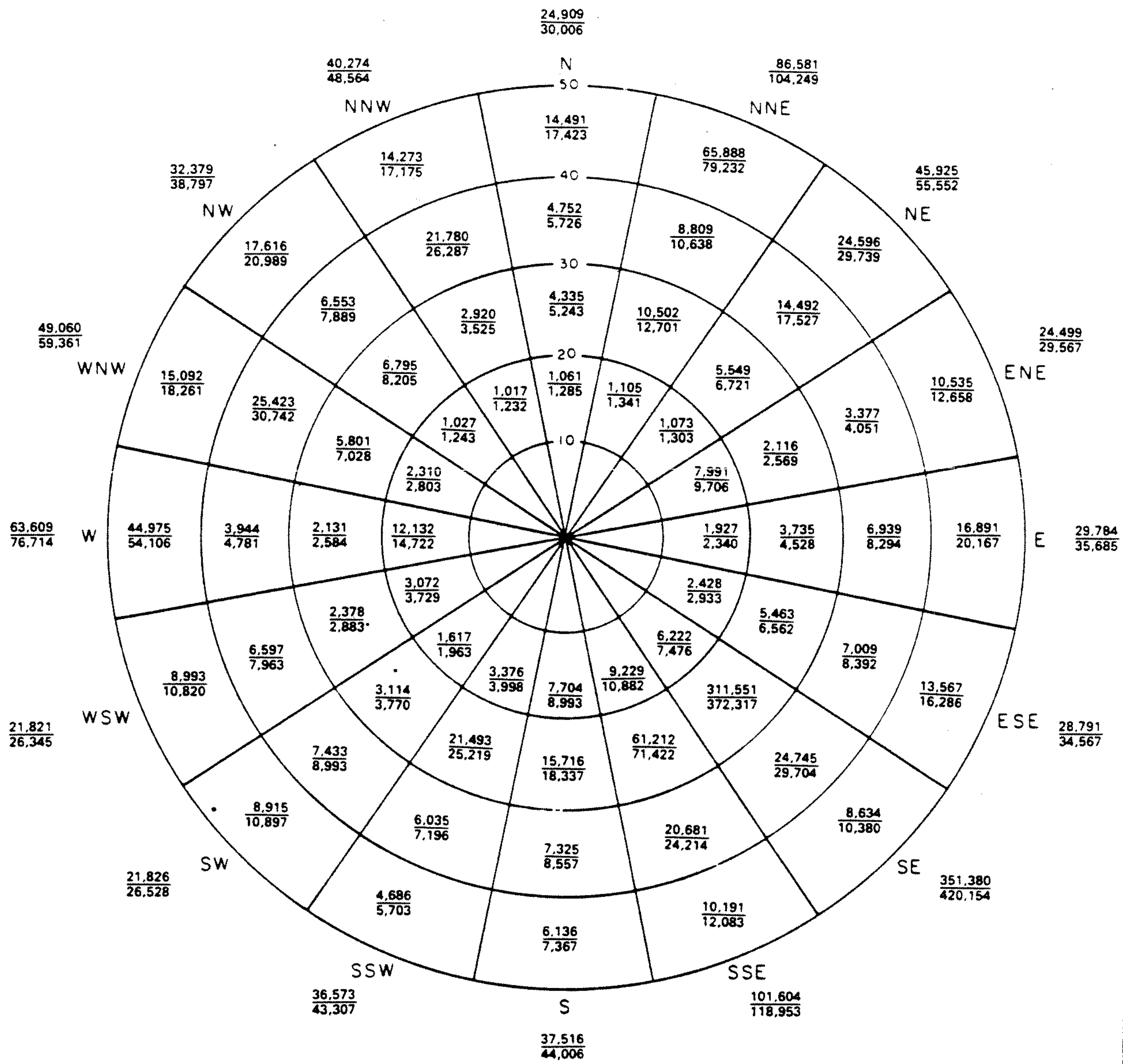
Key:
805 = Low Projections (BEA Series E)
851 = High Projections (BEA Alternate Method)
Sector Totals on Outer Circumference
All 0-1 Mile Sectors Have Zero Population

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Projected Resident Population Distribution Up to 10 Miles, 2010

Figure 2.1-14



POPULATION BY ANNULAR RING

PROJECTION	0-10 MI	10-20 MI	20-30 MI	30-40 MI	40-50 MI	10-50 MI	0-50 MI TOTAL
LOW	7,056	63,291	464,811	175,894	285,479	989,475	996,531
HIGH	8,552	75,949	553,614	210,954	343,286	1,183,803	1,192,355

Key:
$\frac{805}{851}$ = Low Projections (BEA Series E)
= High Projections (BEA Alternate Method)

Sector Totals on Outer Circumference

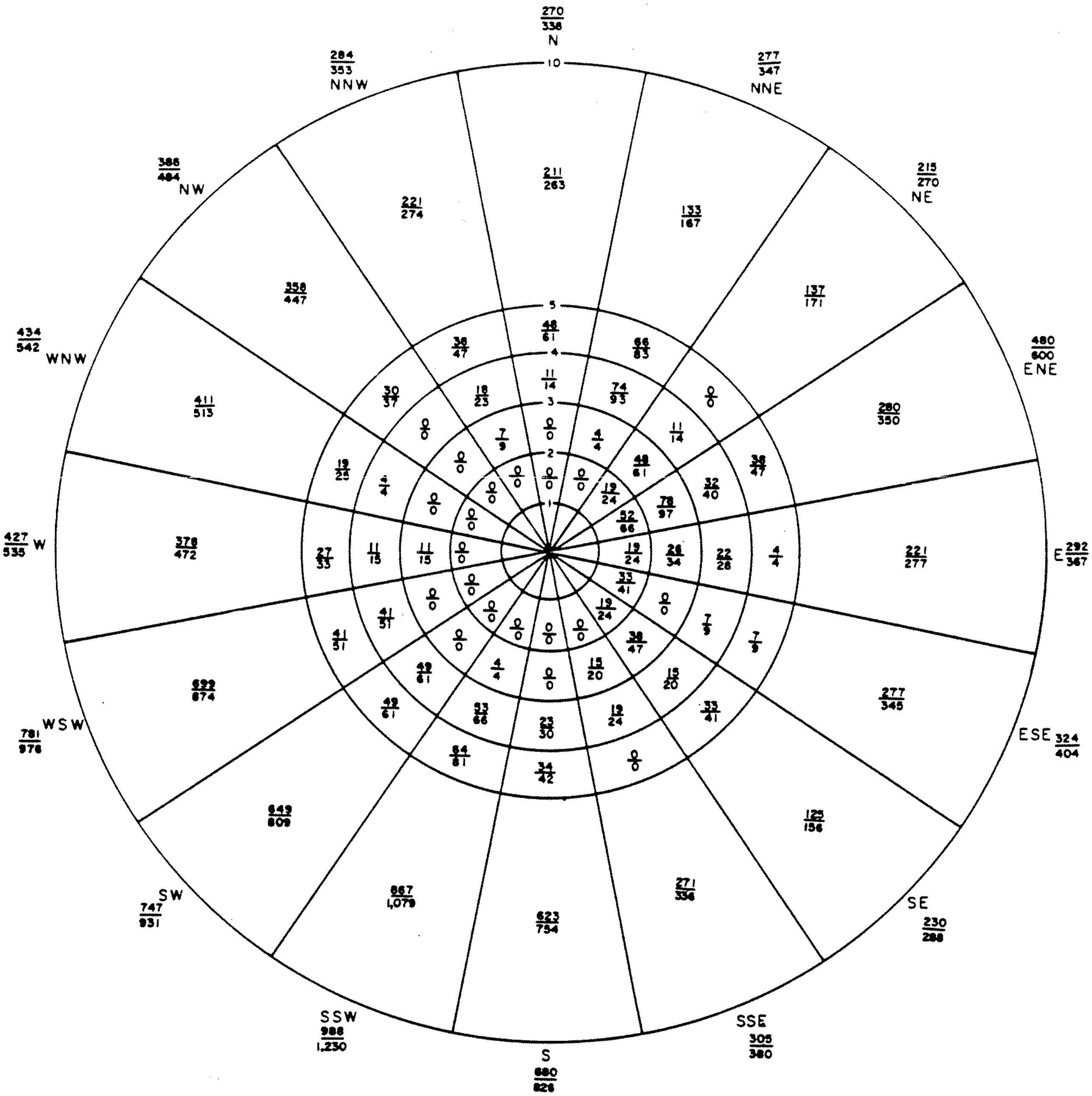
0 to 10 Mile Populations are found on
0 to 10 Mile Rose

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Projected Resident Population Distribution Between 10 and 50 Miles, 2010

Figure 2.1-15



POPULATION BY ANNULAR RING

PROJECTION	0-1 MI	1-2 MI	2-3 MI	3-4 MI	4-5 MI	5-10 MI	0-10 MI TOTAL
LOW	0	142	231	390	498	5,861	7,122
HIGH	0	179	291	492	622	7,287	8,871

Key:
805 = Low Projections (BEA Series)
851 = High Projections (BEA Alternate Method)

Sector Totals on Outer Circumference

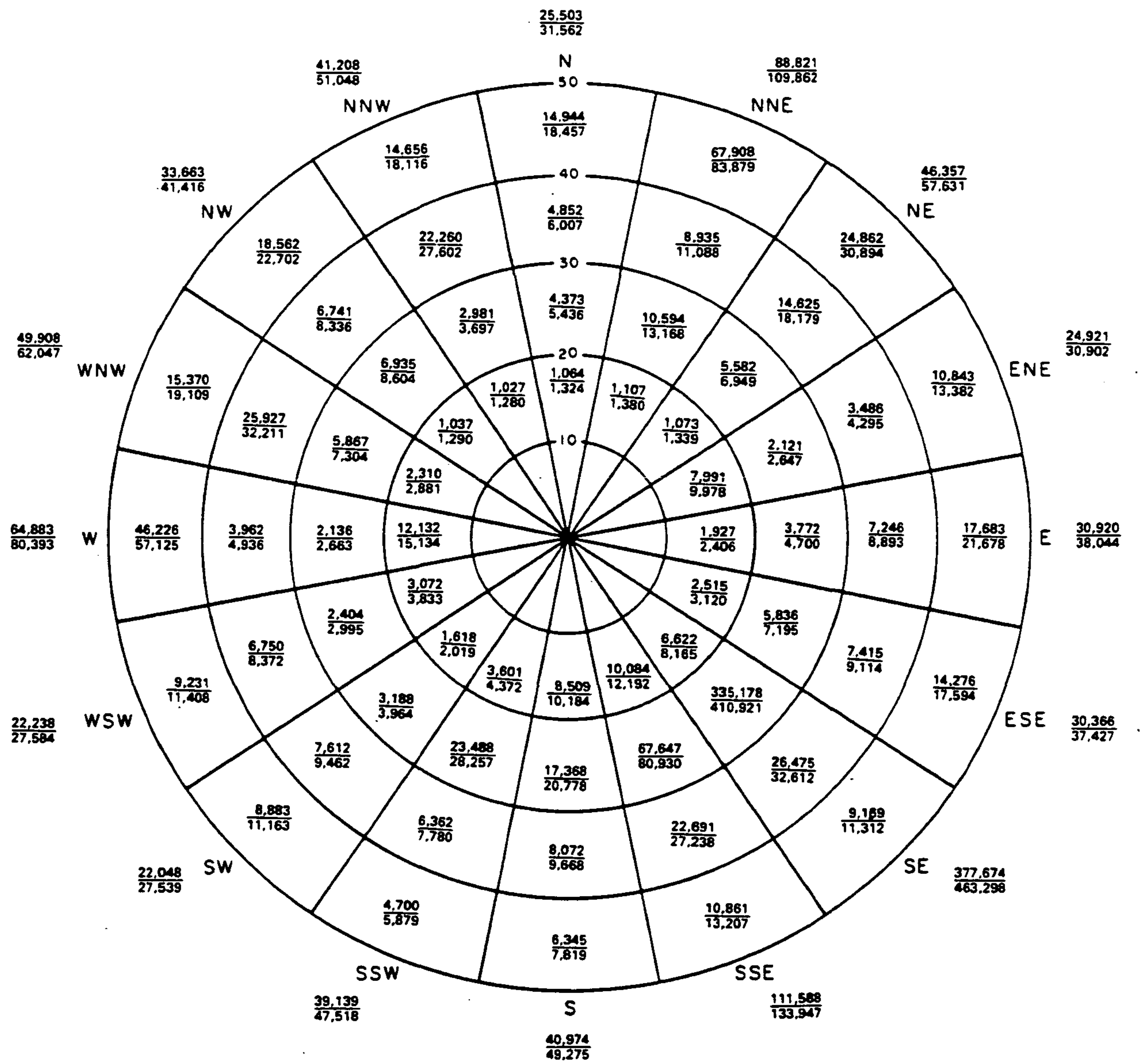
All 0-1 Mile Sectors Have Zero Population

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Projected Resident Population Distribution Up to 10 Miles, 2020

Figure 2.1-18



POPULATION BY ANNULAR RING

PROJECTION	0-10 MI	10-20 MI.	20-30 MI	30-40 MI	40-50 MI	10-50 MI	0-50 MI TOTAL
LOW	7,122	65,689	499,470	183,411	294,519	1,043,089	1,050,211
HIGH	8,871	80,897	610,208	225,793	363,724	1,280,622	1,289,493

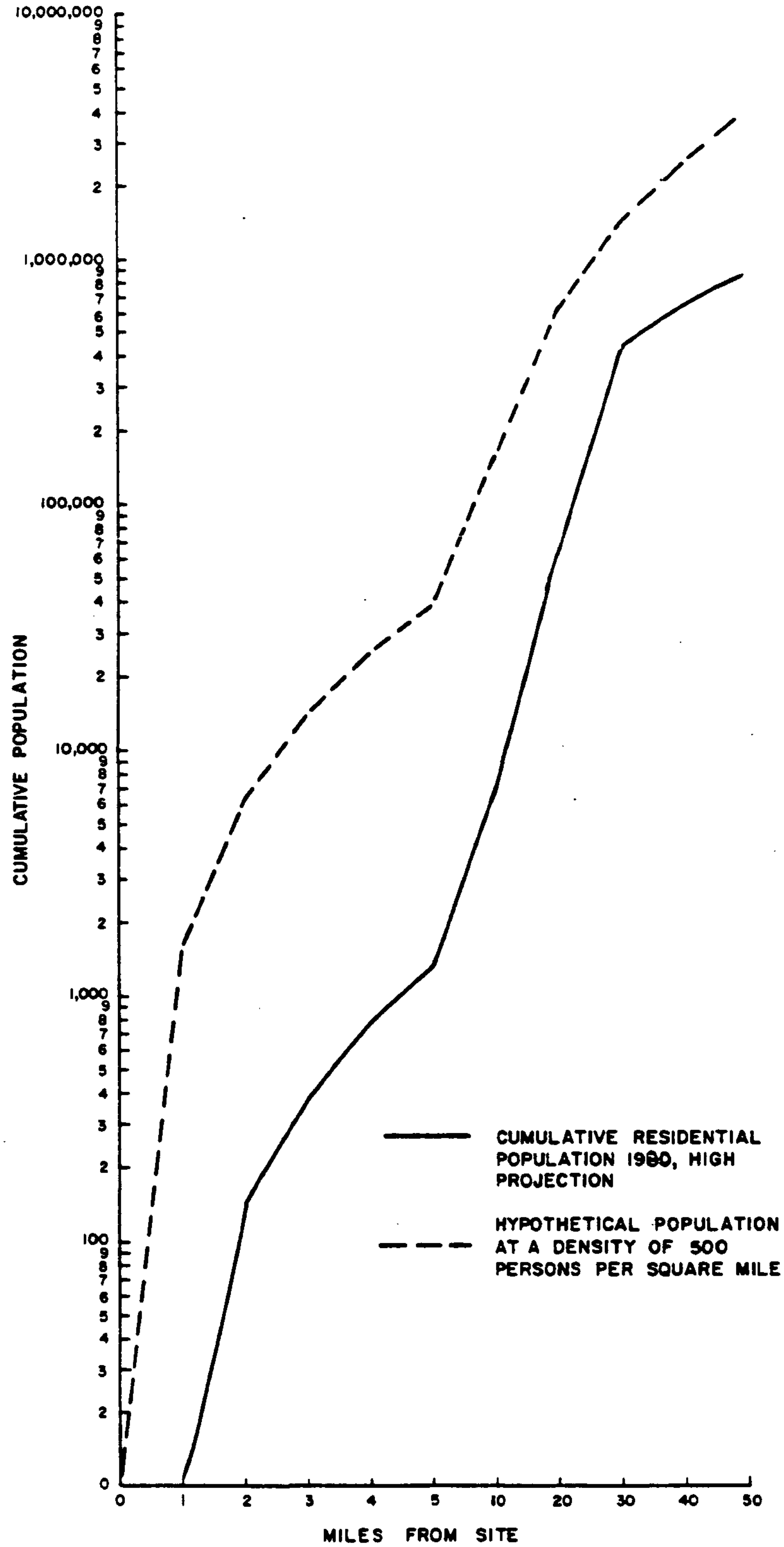
Key:
805 = Low Projections (BEA Series E)
851 = High Projections (BEA Alternate Method)
Sector Totals on Outer Circumference
0 to 10 Mile Populations are found on 0 to 10 Mile Rose

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Projected Resident Population Distribution Between 10 and 50 Miles, 2020

Figure 2.1-19

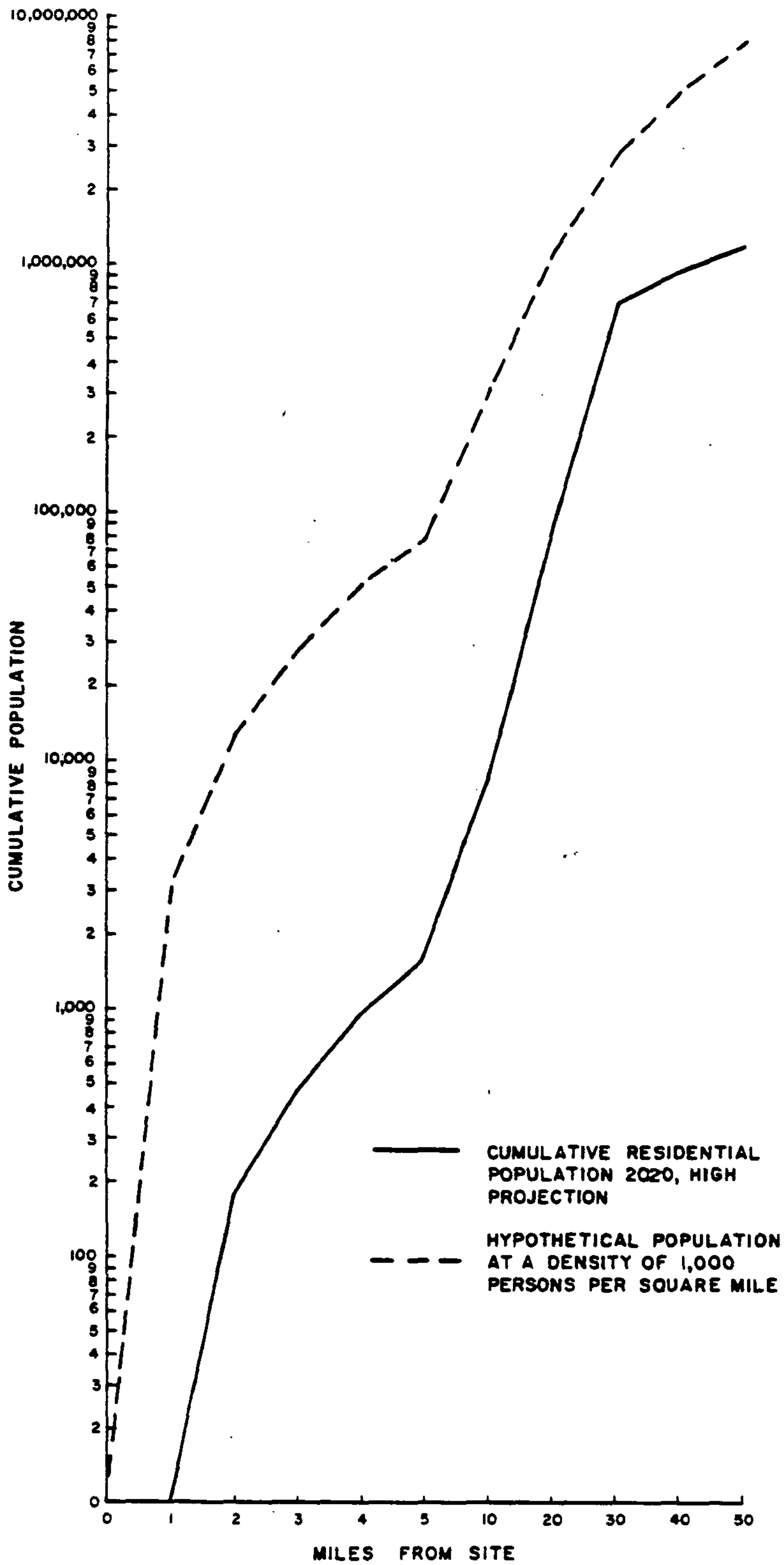


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Projected Cumulative Residential Population - 1980

Figure 2.1-20

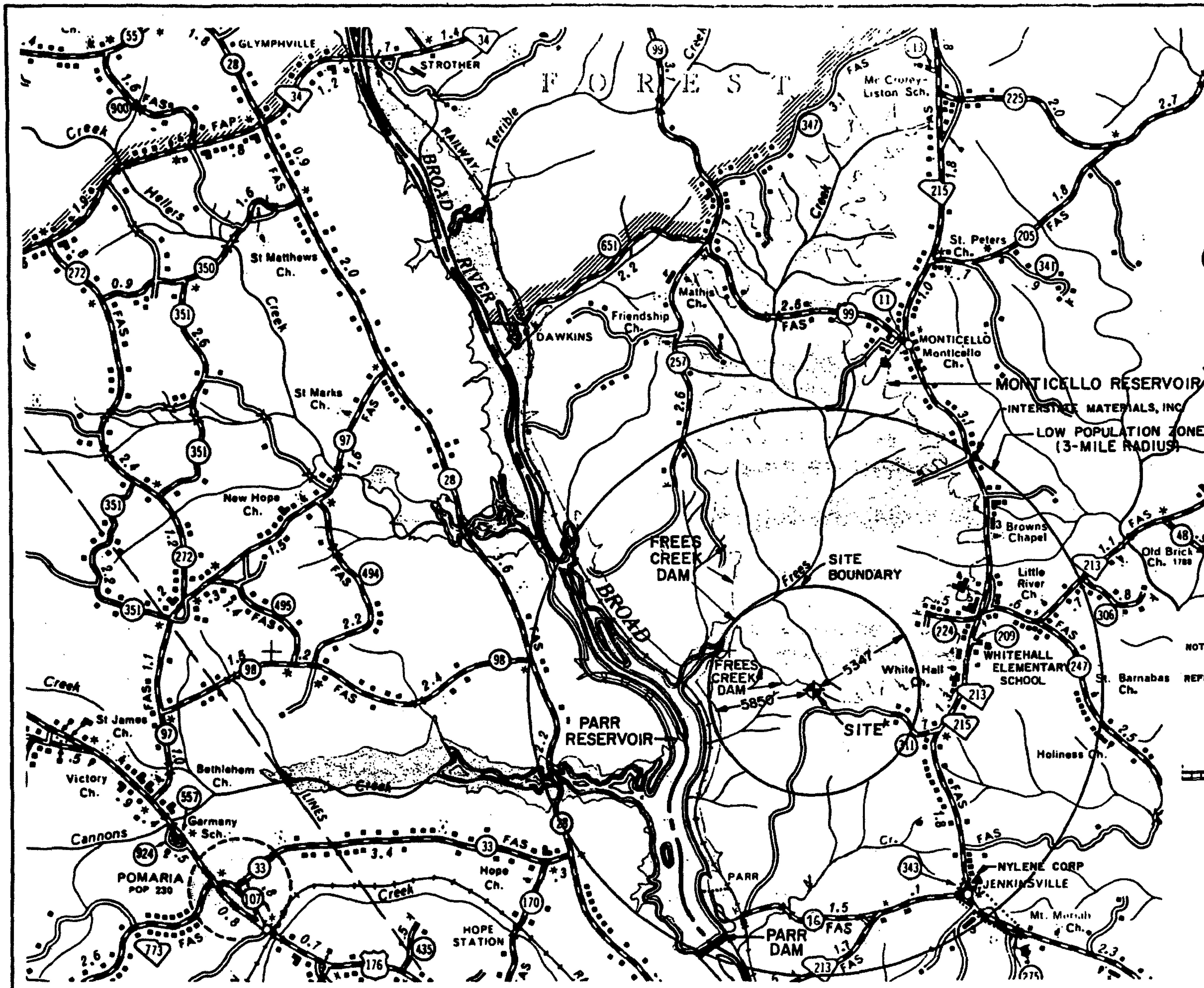


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Projected Cumulative Residential Population - 2020

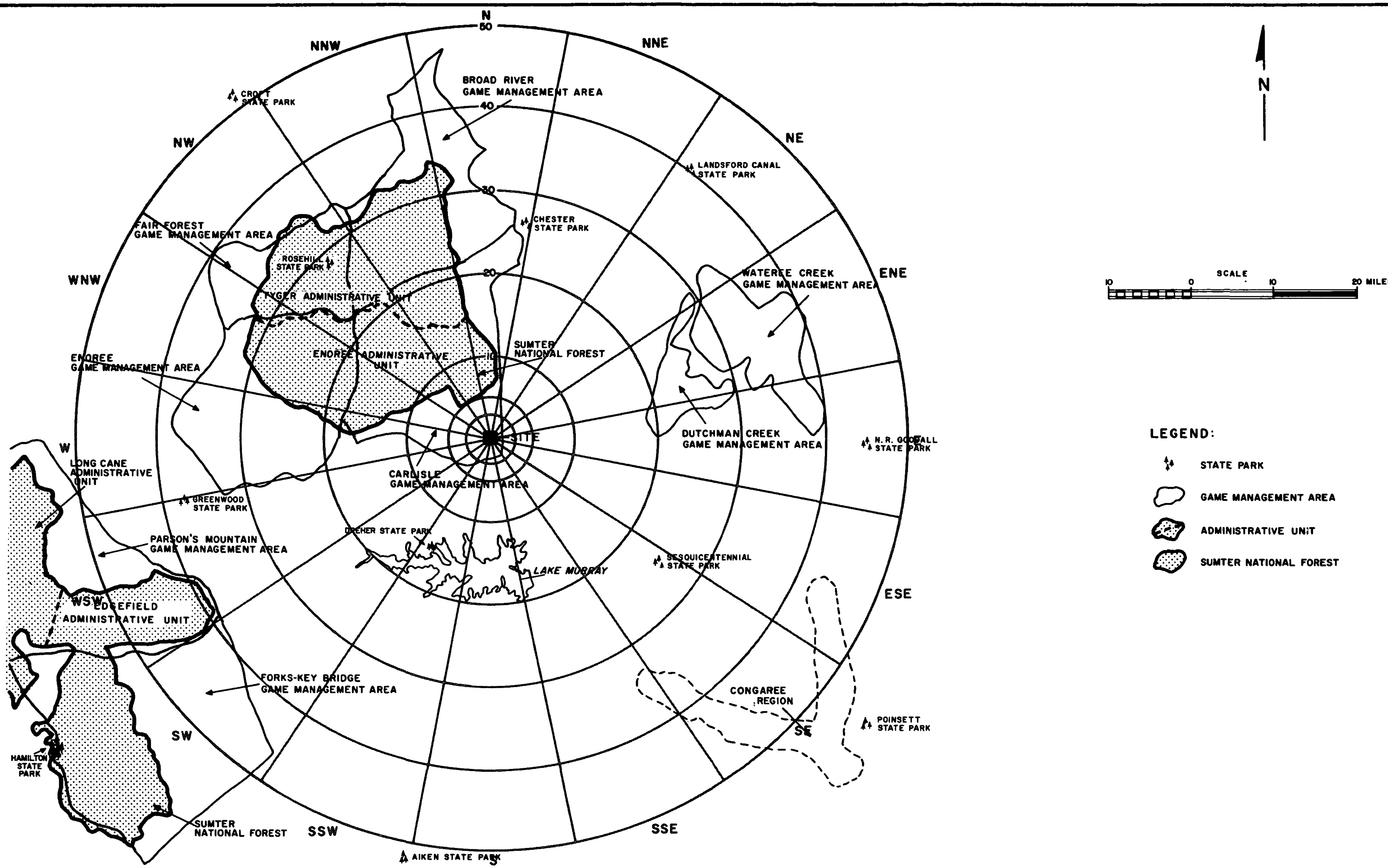
Figure 2.1-21



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Plan of the Virgil C. Summer Nuclear Station

Figure 2.1-22



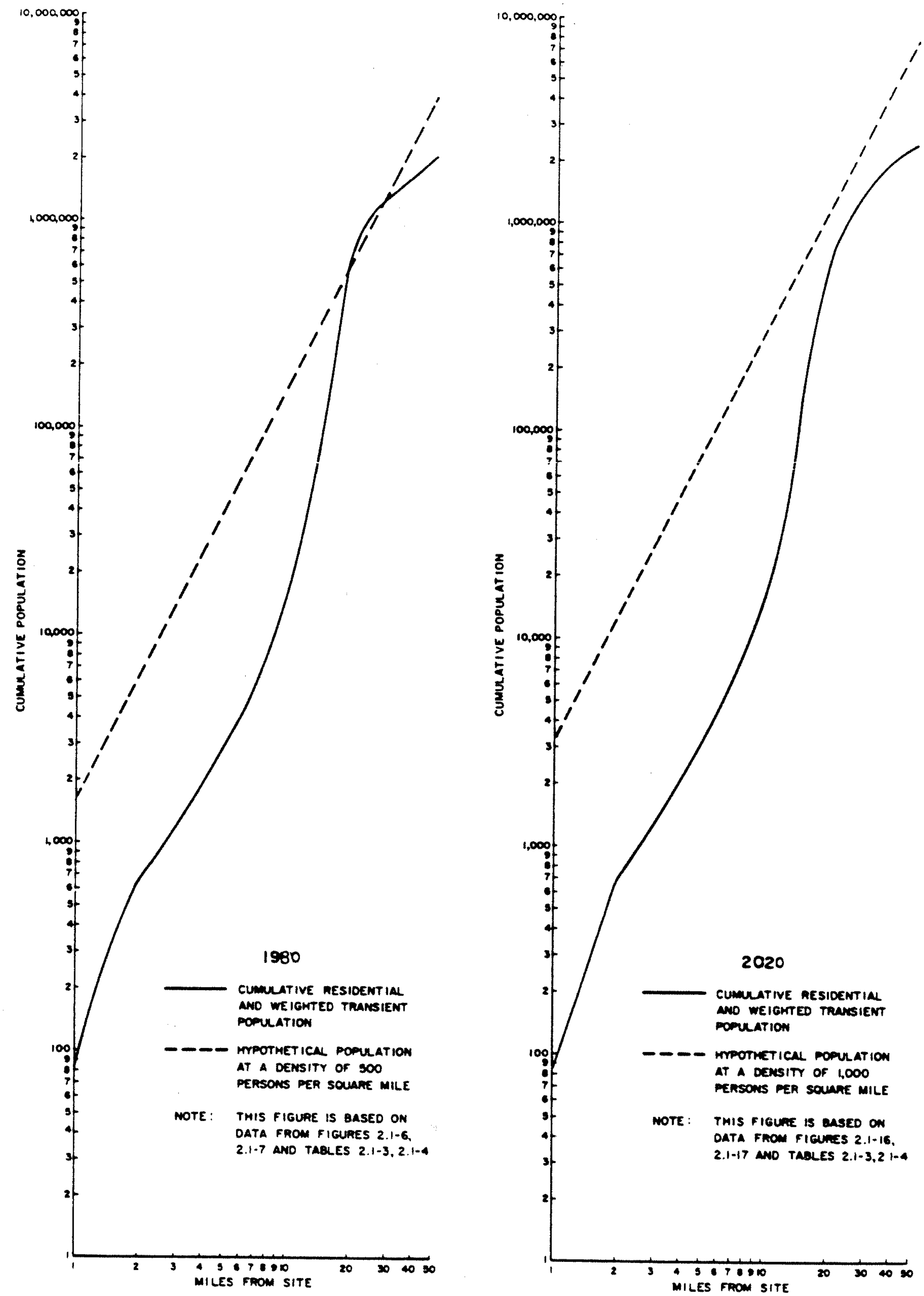
REFERENCE: BASE MAP FROM U.S.G.S. MAP, SOUTH CAROLINA, 1:500,000 1970. PARK FEATURES FROM SOUTH CAROLINA 1975 PRIMARY HIGHWAY SYSTEM MAP. NATIONAL FOREST FEATURES FROM U.S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE, SUMTER NATIONAL FOREST MAP, 1964. GAME MANAGEMENT AREAS FROM U.S. ARMY CORP OF ENGINEERS, ENVIRONMENTAL RECONNAISSANCE INVENTORY OF THE CHARLESTON DISTRICT, 1973.

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

National Forests, State Parks and Selected Recreation Areas Within 50 Miles Of The Site

Figure 2.1-23



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Projected Cumulative Residential and Weighted Transient Population - 1980 and 2020

Figure 2.1-24

N

LEGEND:

U = % OF COUNTY WHICH IS URBAN BUILT UP
F = % FEDERAL LAND
C = % CROP LAND
P = % PASTURE
T = % FOREST
O = % OTHER LAND WHICH IS ASSOCIATED WITH FARMS OR LAND AVAILABLE FOR WILDLIFE OR RECREATION PURPOSES

REFERENCE:

THE BASE FOR THIS MAP WAS PREPARED FROM A PORTION OF USGS STATE OF SOUTH CAROLINA, 1970.

SOUTH CAROLINA SOIL & WATER CONSERVATION NEEDS INVENTORY, MAY, 1970

STATUTE MILES

10 0 10 20

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Regional Land Use, 1967

Figure 2.1-25

2.2 NEARBY INDUSTRIAL, TRANSPORTATION AND MILITARY FACILITIES

NOTE 2.2
Section 2.2 is being retained for historical purposes only (per RN 00-081).

02-01

2.2.1 LOCATIONS AND ROUTES

2.2.1.1 Industrial Facilities

The only industrial facilities within 5 miles of the Virgil C. Summer Nuclear Station site not associated with the proposed project are those in or near Jenkinsville and Monticello, located 2.5 miles southeast and 4.5 miles north-northeast of the plant site, respectively. Both towns are located in Fairfield County. The industrial (and commercial) facilities are shown on the Site Vicinity Map, Figure 2.2-1, and are described in Table 2.2-1. Industrial facilities located at distances greater than 5 miles of the plant site are shown on Figure 2.2-3. Facilities within 20 miles are described in Table 2.2-3.

The nuclear station is located within Fairfield County, as are several other South Carolina Electric & Gas Company facilities: the Fairfield Pumped Storage Facility, and the Parr Hydro Station. The Parr Hydro Station is located on the Broad River approximately 2.5 miles southwest of the nuclear station. The decommissioned Carolinas-Virginia Tube Reactor (CVTR) lies within a short distance of the east end of Parr Dam. The Fairfield Pumped Storage Facility is located at Frees Creek, about 1/2 mile east of the Broad River and about 1 mile west of the nuclear plant. Pipeline information is included in Section 2.2.2.3 and shown on Figure 2.2-1.

2.2.1.2 Transportation Facilities

Highway access to the plant is via S. C. 215 from Columbia, or by Interstate 26 to S. C. 176 and then to S. C. 213, as shown on Figure 2.2-1. Routes 215 and 213 merge at the center of Jenkinsville and continue north together for 3.2 miles. Route 215 continues on in a northerly direction; Route 213 veers off to the northeast. S. C. 215/213 transects the eastern sector of the 5 mile zone from north to south at an approximate distance of 6,800 feet due east from the Reactor Building; this is the nearest approach of a primary state highway to the plant. County road 311 (secondary road system) is 0.7 miles in length, generally oriented east-west connecting Route 215/213 to the site area. Its primary use is as an access road for the Virgil C. Summer Nuclear Station.

Two railroad lines, one of the Norfolk-Southern Railway and one of the CSX Railroad are located within 10 miles of the plant site, as shown on Figure 2.2-1. Alston, S.C., located 2 rail miles southeast of Parr, functions as an active junction for freight operations of the Norfolk-Southern Railway. The line running northerly from Alston through Parr and Strother passes west of the site along the east bank of the Broad River, approximately 1 mile from the Reactor Building. This line provides rail access to the Virgil C. Summer Nuclear Station with a spur track leading off the main line from a switch southwest of the site. This spur branches into several sidings within the plant area. Two freight trains per day utilize the main line of the Southern Railway with a 1970 traffic of about 150 cars each. No passenger traffic utilizes this line.

The other line belongs to the CSX Railroad, running between Columbia and Laurens. This line connects with the Norfolk-Southern Railway line just east of Prosperity. This railway's closest approach to the site occurs near Little Mountain, at a distance of over 7.5 miles.

The locations of airports and significant flight paths occurring within the general area of the site are shown on the Airport Facilities Map, Figure 2.2-2. Airports within 30 miles of the plant site are listed in Table 2.2-2. The closest major airport is Columbia Metropolitan Airport, located approximately 24 miles southeast of the site. The Columbia Metropolitan Airport serves Delta, Eastern, Southern and Piedmont Airlines. The remaining ten airports within 30 miles of the site serve general aviation, including the closest to the site, Fairfield County Airport, located approximately 10 miles east-northeast of the plant. This 106.5 acre airport has one asphalt runway 3,200 feet in length, oriented approximately northeast-southwest.

There is one Low Altitude Federal Airway (18,000' MSL and lower) which is within 5 miles of the plant. Airway V53 passes approximately 3 miles southwest of the plant on a heading of 331° from the Columbia VORTAC. Jet Airway J47 is also located on this heading. 02-01

The Virgil C. Summer Nuclear Station is located approximately 1 mile east of the Broad River. In 1965, the Army Corps of Engineers compiled a listing of navigable rivers in relation to bridge construction planning. This study indicated that there was no commercial navigation on the Broad River; there is presently no commercial navigation on the river. In the vicinity of the nuclear plant, the Broad River is about 2,000 feet wide and quite shallow, ranging from a few feet to about 15 feet in depth.

2.2.1.3 Military Facilities

There are no military facilities within 10 miles of the site, but four military bases are located within a 50 mile radius. These are Fort Jackson Army Base, approximately 25 miles southeast of the site; McEntire Air National Guard Base, approximately 37 miles southeast of the site; Shaw Air Force Base, approximately 50 miles southeast of the site; and North Air Field, approximately 47 miles south-southeast of the site. North Air Field is designated as a "bare base" and is listed as closed on aeronautical charts. It is utilized for limited military training functions.

Shaw Air Force Base maintains Military Training Route 157, but this route is located approximately 20 to 35 miles southwest of the site.

2.2.2 DESCRIPTIONS

2.2.2.1 Industrial Facilities

Industrial facilities located within 5 miles of the plant are listed in Table 2.2-1. Significant industries located within 20 miles of the plant are listed in Table 2.2-3; these industries have been considered because of their use and/or storage of hazardous materials.

2.2.2.2 Products and Materials

A description of the products and materials utilized by industrial facilities within 5 miles of the plant, including the number of employees, hazardous materials, and distances from the plant site, is presented in Table 2.2-1. Listed in Table 2.2-3 are other products and materials used by industrial facilities located out to a radius of approximately 20 miles which may present a possible hazard to the plant due to the products they manufacture and/or the amounts of hazardous materials they utilize or store. Table 2.2-3 also presents the tonnage of plastic materials and petrochemicals used by each industry, the amounts of explosives stored, or the gallons of bulk propane storage at each facility.

2.2.2.3 Pipelines

A buried natural gas pipeline extends from the southeast to the Parr Steam Plant as shown on Figure 2.2-1. The closest approach of the pipeline to the Virgil C. Summer Nuclear Station occurs at the steam plant, a distance of approximately 2.5 miles to the southwest. The pipeline does not lie within the Monticello Reservoir watershed. The line was installed approximately 6 years ago to utilize natural gas which may be available to SCE&G for fuel at the steam plant. The pipeline is 12 inches in diameter, buried at a depth of 3 feet, and has a maximum operating pressure of 700 psi. Isolation of the line is obtained with a 12 inch Cameron ASA 600 ball valve located approximately 13,800 feet south of the nuclear plant. There is no gas storage at the Parr Steam Plant other than that in the pipeline. The consumption of natural gas through this line is intermittent, occurring only at those times when this fuel is available. There are no plans to utilize the pipeline for the propagation of materials other than natural gas.

2.2.2.4 Waterways

The Broad River is the most prominent hydrologic feature in the vicinity of the Virgil C. Summer Nuclear Station. The plant is located approximately 1 mile east of the Broad River. Monticello Reservoir provides the cooling water for the nuclear plant. There is no commercial navigation on the Broad River, but it is used for recreational purposes.

2.2.2.5 Airports

There are no airports within 5 miles of the nuclear plant. The locations of airports within the general area of the site are shown on Figure 2.2-2. Fairfield County Airport lies approximately 10 miles east of the site and is the closest airport facility. This airport has three single-engine planes permanently based at the facility. The asphalt runway is 3,200 feet in length; its orientation is 40° and 220° . The airport is unattended, but 02-01
yearly operations have been estimated at 3,000 to 5,000 (an operation consists of a take-off or a landing). Between the 20 mile and the 10 mile radius, there are four active general aviation airports. These are Gilbert Shealy's Airport, 14 miles southwest; Newberry Municipal Airport, 18 miles west; Oxner's Airport, 19 miles northwest; and Sabie Cathcart Airport, 13 miles northeast. The Winnsboro Airport, 14.5 miles northeast, has been closed and is replaced by the Fairfield County Airport facility. The 20 to 30 mile annulus encompasses four general aviation airports: Owens Field, J. Sexton, Connelly Field and Clemson (Pontiac) Experimental Station Airstrip, all private facilities. Columbia Metropolitan Airport, 24 miles southeast of the site, is the largest facility in the area and provides FAA services. Delta, Eastern, Piedmont and Southern Airlines operate at Columbia, as well as general aviation aircraft. The Columbia airport has two asphalt runways: one is 7,550 feet in length, oriented 110° and 290°; the other 02-01
is 5,000 feet in length, oriented 50° and 230°. No approach patterns to Columbia lie within 5 miles of the nuclear plant. Two companies, Eagle Aviation and Miller Aviation, have a combined total of 91 single-engine and twin-engine planes and one small jet permanently based at Columbia. Yearly operations for 1975 reported by Columbia Metropolitan Airport totaled 118,182, of which about 68 percent were in general aviation. Information pertaining to airports within 30 miles of the site, with exception of military facilities, is presented in tabular form in Table 2.2-2. This table includes distance and direction from the site, number and type of aircraft based at the airport, largest type of aircraft likely to land at the airport facility, runway orientation and length, runway composition, hours attended, and yearly operations.

2.2.2.5.1 General Aviation Traffic

Available data for general aviation do not permit a direct evaluation of the number of flights over the site area. An indirect estimate of the traffic flux was made by assuming an isotropic flux of traffic from every general aviation airport within a 30 mile radius of the plant. This estimate counts very short flights, such as crop dusting and training exercises, but excludes long distance overflights not originating in the 30 mile radius. Since the 30 mile radius includes the general aviation activities near Columbia, a major hub of South Carolina air traffic, it is unlikely that any substantial number of general aviation overflights are omitted.

The isotropic model assumes that flights in all directions are equally likely, such that the number of flights passing through a 1 mile zone at the site is inversely proportional to the distance from the originating airport. Airport operations statistics include each landing and each take-off as separate operations; hence, both inbound and out bound flights are counted. Air traffic flux estimates based upon the isotropic model are:

Airport	General Activation Operations (Annually)	Distance From Site (Miles)	Traffic Flux Per Perimeter Mile	02-01
Columbia Metropolitan	79,700	24	529	
Owens Field	76,000	27	448	
Newberry Municipal	10,800	18	95	
Oxner's	9,000 (est.)	19	75	
Fairfield County	5,000	10	80	
Gilbert Shealy's	400 (est.)	14	5	
Sabie Cathcart	1,000	13	12	02-01
J. Sexton	400	27	2	
Connelly Field	700	25	4	
Clemson Experimental Station	200 (est.)	28	1	
		Total	1,251	

Since there are no approach or takeoff patterns near the site, the isotropic flux assumption is a conservative one.

An analysis of the probability of an aircraft collision at the site and the effects of the collision on the safety related components of the plant are provided in Section 3.5.

2.2.2.5.2 Scheduled Air Carriers

The maximum flux of scheduled carriers near the plant utilizing Low Altitude Federal Airway V53 (3 miles southwest of the site) is estimated to be four flights daily, or 1,460 annually. It is unlikely that this traffic level is achieved, due to reduced schedules, etc. Aircraft in these corridors in the vicinity of the site fly at very high altitudes. Jet Airway J47 passes over the site area at a minimum altitude of 18,000 feet; this corridor is located above Low Altitude Federal Airway V53.

2.2.2.5.3 Military Airport Facilities and Air Activities

Fort Jackson Army Base is located approximately 25 miles southeast of the site. The total acreage of the installation is 52,727 acres. Restricted Area R-6001, artillery range operations, is located within the installation, approximately 27 miles southeast of the plant site at the nearest approach. Projectiles fired from the base reach altitudes of 10,000 to 12,000 feet. Impact is absorbed by the base. Fort Jackson has an aviation detachment located at Columbia Metropolitan Airport, approximately 24 miles southeast of the site. Activities of the aviation section include transporting personnel, flying support missions, and training missions. Contact (take-off and landing) training is conducted within the immediate vicinity of the airport (approximately 1 mile), usually on the east side. Instrument training is conducted under air traffic control clearances. Standard procedures of air traffic control operate the aircraft within a 10 nautical mile radius of the airport. Approaches to the airport are along the same paths utilized by civilian aircraft, and are made by instrument procedures. There are two types of aircraft, U8 Delta twin-engine and T42 Alpha twin-engine; both are fixed wing, propeller aircraft. A total of 13 aircraft are based at the Fort Jackson Army Aviation Section, seven of which belong to the Army Reserve. Fort Jackson Army Aviation Section also has MAST (Military Assistance to Traffic Safety) Unit 4th Platoon, 498th Medical Company. The MAST Unit is on call at all times to aid in cases of emergency within the state of South Carolina. MAST aircraft consist of six helicopters, type UH1H, operating out of Columbia Metropolitan Airport.

McEntire Air National Guard Base is located approximately 37 miles southeast of the site. The total acreage of the base is 2,397 acres. Air National Guard aircraft fly daily training missions. McEntire air traffic has no flight patterns within 30 miles of the plant site. The operations and training zones utilized by McEntire military aircraft lie primarily to the east of the base, and therefore are located more than 37 miles from the site.

The South Carolina Army National Guard is also stationed at McEntire Air National Guard Base. The Guard's Aviation Section has 57 helicopters and two light aircraft. Helicopters fly to Spartanburg and Greenville for assigned military training missions, which may bring them into the vicinity of the plant.

North Air Field, located approximately 47 miles south-southeast of the plant, is listed as closed on aeronautical charts. However, this field is still utilized, on a limited basis, by military organizations. The field is designated as a "bare base" and has no permanently based aircraft, no regular flight training programs, no tower control, no refueling facilities, and no assigned personnel with the exception of a single grounds keeper. The runway is 10,000 feet in length, 500 feet wide, and is oriented along coordinates of 33°37'N and 81°05'W. The primary user, Charleston Air Force Base, S. C., flies approximately 15 C-141 cargo training missions per week. Limited paratroop drops occur, and some Reserve Officer Training Corps detachments use the area for weekend encampment and training on an as-requested basis. Expansion of the present facilities or activities conducted at North Air Field is not expected.

Shaw Air Force Base is located approximately 50 miles southeast of the site. The total acreage of the installation is 3,257 acres for the base, plus an additional 8,038 acres for Poinsett Gunnery Range (R-6002), located approximately 52 miles southeast of the plant site at its nearest point. Military aircraft at Shaw Air Force Base are used primarily for tactical reconnaissance training (aerial photography). Shaw has 83 RF-4C Phantom II reconnaissance jet aircraft and three T-39 aircraft assigned to the 363rd Tactical Reconnaissance Wing. The 507th Tactical Air Control Group has seven OV-10 and seventeen 0-2 aircraft and four CH-3 helicopters assigned. Officials at Shaw Air Force Base do not foresee increased flight operations or larger aircraft at Shaw in the near future. Shaw's air operations utilize two parallel runways running north and south. One runway is 10,000 feet long; the other is 8,000 feet long. Shaw controls Poinsett Gunnery Range (restricted area R-6002 shown on Figure 2.2-2), which is used currently by RF-4C, 0-2, and OV-10 aircraft from Shaw Air Force Base; F-4C aircraft from Seymour-Johnson Air Force Base, North Carolina; Navy A-7 aircraft from Atlanta, Georgia; Air National Guard/Reserve units flying A-7 aircraft from Santurce, Puerto Rico and McEntire Air National Guard Base, South Carolina; A-37 aircraft out of bases in Youngstown, Ohio, Baltimore, Maryland, Hartford, Connecticut, Sergeant Bluff, Iowa, and Terre Haute, Indiana; F-100 aircraft from Dobbins Air National Guard Base, Georgia; and F-105 aircraft from Sandston, Virginia[1].

Training Route 157 is also controlled by Shaw Air Force Base, utilizing the same aircraft and altitude restrictions as those applied to Training Route 47. Training Route 157 is located approximately 20 to 35 miles southwest of the site, and is therefore not considered a hazard.

Three Military Operating Areas (MOA) for aircraft are located east of the site, as shown on Figure 2.2-2. Air operations within these MOA are under the control of Shaw Air Force Base. These areas are utilized for general military aviation training and exercises. The nearest approach to the plant site of any of the three MOA is approximately 27 miles.

2.2.2.5.4 Future Aircraft Expansion

The only general aviation airport expansion cited in the South Carolina Statewide Aviation Plan (1970) within the 30 mile radius of the site is the now completed Fairfield County Airport. Communications with the South Carolina Aeronautical Commission revealed the following tentative plans:

1. Newberry Municipal Airport - Plan possible extension of the existing runway to 6,000 feet, or the construction of a new airport.

2. Columbia Metropolitan Airport - The addition of a parallel east-west runway is under construction. Improvements on the current facility are under way.

3. A "master plan study" shall be conducted at Columbia Metropolitan Airport to possible examine Columbia Metropolitan air facilities with respect to expandability for privately owned aircraft, and to investigate possible joint use of McEntire Air Force Base.

4. Owens Field is under investigation by Richland County for future plans not yet disclosed.

2.2.2.6 Projections of Industrial Growth

The Virgil C. Summer Nuclear Station is located in a sparsely populated rural area, with little existing or projected urban or industrial development within a 10 mile radius. Most future industrial development within 10 to 20 miles of the site is expected to be in the vicinity of Winnsboro in Fairfield County, and in the Irmo area in Lexington and Richland Counties[2,3]. Industrial growth in the Winnsboro area, located approximately 15 miles east-northeast of the site, is expected as the result of the completion of Interstate 77 between Columbia and Charlotte, North Carolina, and because of increased tax revenues to Fairfield County from the Virgil C. Summer Nuclear Station. This increase in tax base may be used by the county to lower tax rates and/or to increase the level of public services. Such actions could be a strong inducement for the location of new industry in the county. This is most likely to occur in the Winnsboro area because the urban infrastructure is more developed there than in most parts of the county. Good access (via Interstate 77) to major market areas will be an additional inducement.

The Irmo area, located about 16 miles south-southeast of the site, has already experienced rapid industrial growth during the past 5 to 7 years because of its proximity to Columbia, its location on Interstate 26, and the growing labor force in Lexington County. These factors are expected to continue to attract industry to the area, although there are no known plans for major developments at this time. The community of Harbison, with an anticipated 1995 population of 25,000, is located just to the southeast of Irmo, and new industry is part of the projected development.

2.2.3 EVALUATIONS

2.2.3.1 Determination of Design Basis Events

2.2.3.1.1 Toxic Gases

Potential sources of toxic gases which might reach the facility from accidental releases due to transportation accidents are limited to rail tank cars and tank trucks. The capacity of tank trucks is typically 16 tons, and the capacity of present-day rail tank cars is approximately 90 tons. The transport of ammonia, chlorine, or other toxic chemicals considered in Regulatory Guide 1.78 by tank truck on Routes 213-215 in the site vicinity is unlikely. No regular use of these commodities is indicated in the industries within a 30 mile radius of the plant, and the adjacent highways do not attract through traffic due to their limited access. Rail transport of these commodities is more likely; however, due to the lesser elevation of the railroad bed in the vicinity of the site, only volatile chemicals are considered as a potential hazard. Chlorine-producing plants operate in southeastern Georgia, and there is a chlorine repackager in northwest South Carolina.

The dispersion of toxic gases from transportation spills has been studied by Simmons et al [4]. The 1,000 ppm-minute dosage isopleth may be used as a criterion to determine whether a downwind plume will affect a particular area. This isopleth constitutes a lethal (LD-50) zone, but most persons would have time to leave the affected area and avoid lethal exposure. The centerline downwind plume lengths can be determined from a standard dosage formula* for a spectrum of meteorological conditions:

	Land Spill	Water Spill
wind 2.2 m/sec, D stability	0.93 miles	2.4 miles
wind 1.0 m/sec, E-F stability	2.55 miles	6.6 miles
wind 0.57 m/sec, F stability (5 percentile condition)	3.92 miles	10.1 miles

These distances are determined assuming initial flashoff of 16 tons of chlorine due to a spill from a 90 ton tank car onto land, and full flashoff of a spill into water. The horizontal dispersion parameters are of the form $AX^{0.91}$, where A has the values 0.13, 0.077, and 0.069 for the above conditions, respectively (values in meters). The dispersion parameters are further augmented 25 percent, following Simmons, to account for the dispersion time interval. Vertical dispersion is conservatively estimated at 1/5 that of the horizontal for chlorine dispersion. The average effective distance of the plume would be about 3 miles, based upon statistical weights of the above values of 30 percent, 15 percent and 5 percent for the respective stabilities, and equal weight between land and water spills.

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* Dosage $\frac{Q}{\pi\sigma_y\sigma_z U}$ exp $\left(-y^2/2\sigma^2 y\right)$ where Q is the mass of vapor released nearly instantaneously, y is the distance normal to the downwind centerline, U is the wind speed, and σ_y, and σ_z are the Pasquill-Gifford atmospheric dispersion parameters, or equivalents. 02-01

The cargo loss rate estimated by the Association of American Railroads for 90 ton tank cars is about 2.3 x 10^{-5} per trip. If the average trip per car is conservatively estimated at about 500 miles, the change of accidental cargo spillage would be about 5 x 10^{-8} per mile per car. The chance that a car would have an accident within 3 miles of the site is about 2.8 x 10^{-7} (5.6 miles track length x 5 x 10^{-8}). The probability that such an accidental release on the rail line would cover the plant is estimated to be approximately 2 percent because of the narrowness of the zone of severe effects under the plume, assuming that wind direction preferences are negligible. Therefore, the chance that a toxic chlorine gas plume would reach the plant in a given year will be less than 1.0 x 10^{-7} if fewer than 17 tank cars per year pass through Alston. The result will be the same if a larger radius is considered because the chances of affecting the plant from more distant releases decreases at about the same rate that the release probability would increase. 02-01

However, Simmons et al note that chlorine shipments, as a subset of all 90-ton tank car shipments, have a loss rate which is 10 times better than that for an average tank car. On this basis, the traffic of chlorine shipments would be as high as 170 per year before the chance of affecting the plant reaches 1.0 x 10^{-7}.

The lethal dosage for anhydrous ammonia was estimated to be 90,000 ppm-minutes. The length of a lethal plume comparable to the example for chlorine would be reduced to about one-tenth that for the chlorine. If the accidental release rate for ammonia is taken to be ten times that of chlorine, then the hazard from ammonia is roughly equivalent to that for chlorine. Thus, the toxic gas hazard from rail shipments will be less than 1.0 x 10^{-7} per year if fewer than 170 tank cars of both chlorine and ammonia are shipped through Alston. Assessment of Southern Railway traffic records indicates that far fewer than 170 tank cars of chlorine or ammonia are shipped annually on the near-site rail lines (11 such shipments were counted for 1975). Railway traffic records also indicate that the only other volatile chemical considered hazardous in Regulatory Guide 1.78 and which occurs as annual traffic through the general area in significant quantity is methanol. Rail traffic in the market area which contains the site included 30 carloads of methanol during 1976. Methanol is shipped non-pressurized and has an evaporation rate sufficiently low to prevent exceeding guideline levels of concentration at the site in the event of a railroad accident.

Other offsite sources which might accidentally release toxic gases, such as smoke from plastics containing sulfur or halogenated compounds, were considered out to the 20 mile radius (see Table 2.2-3). Since none of the smoke is as toxic as raw chlorine and ammonia, it is concluded that such sources are too small or too distant to constitute a toxic gas hazard at the plant.

Two 150 pound capacity bottles of liquid chlorine are used onsite at the east side of the water treatment building, approximately 300 feet southeast of the Control Building. There are not reliable data for determining the chance of chlorine bottle ruptures. As a rough approximation, the number of chlorine bottles in use is on the order of 10^4 to 10^6. The lower number is recorded in interstate shipments; the higher can be estimated from chlorine consumption. The number of ruptures can be estimated at 1 to 10 annually. The number of chlorine exposures is of order 10^2 annually, but a large portion of these are from defective fittings and leaks which do not create concentrated flash puffs. Thus the annual chance of bottle rupture can be estimated to be of order 10^{-5}. The chance of a fatal release if lower, with only 4 incidents recorded (bottle ruptures) over a 50 year span. An annual probability of a fatal bottle rupture can be estimated from this at 10^{-6} to 10^{-7}. The worst case situation for an accidental release of gas from the chlorine bottles would be the rupture of both bottles outside of the storage shed during a time of wind drift directly toward a Control Building air intake. The concentration at ground level of a puff of gas resulting from flashoff of the chlorine is given by:

$$C = \frac{2Q}{(2\pi)^{3/2}\sigma_x\sigma_y\sigma_z}$$

where C is the plume centerline peak concentration by weight at ground level, Q is the mass of vapor released, $\sigma_x = \sigma_y = 0.069\ x^{0.91}$, $\sigma_z = 0.2\sigma_y$, and x is the downwind distance in meters. The dispersion coefficients are for worst case (F stability) meteorology, and are in meters. The amount of chlorine flashing at rupture would be approximately 27 kilograms, or 20 percent of the volume. The puff concentration by volume at a distance of 300 feet would be approximately 7.6 percent. Should Pasquill C dispersion conditions prevail instead of the F stability assumed, then the concentration at 300 feet would be reduced to 0.3 percent.

Plume and puff dispersion models are not suitable for near-field travel of fumes because of local effects such as exhaust fan currents, breeze fluctuations, etc., which can completely change the local trajectory of a puff. However, chlorine vapors have negative buoyancy in air, and the upward dispersion of a lethal puff would be between 4 and 12 meters after travel of 300 feet. An air intake located well above ground level might avoid any intake of a flash puff, dependent upon the upwash/downwash local currents of the air flow about the facility buildings.

Outside of the chance of drawing in a concentrated puff of vapors during a rupture, the chlorine does not represent a severe hazard. The reach of the 1,000 ppm-minute isopleth along the plume centerline for undisturbed dispersion under F stability conditions and 0.57 meter/second wind (5 percentile meteorology) would be approximately 1,310 meters, or 0.8 mile, for release of the entire 300 lbs. of gas. Persons not trapped or stunned by the initial exposure could escape from the affected area, but this lethal exposure is a good measure of the affected area.

The annual probabilities previously established at 10^{-6} to 10^{-7} for fatal chlorine bottle rupture are considered conservative. Furthermore, unique meteorological conditions would be required for a plume of chlorine to reach the Control Room air intake, including relatively continuous direction and altitude parameters with little variance. These requirements would significantly decrease the already conservative probabilities. Control Room habitability is also discussed in Section 6.4. 02-01

2.2.3.1.2 Delay Vapor Explosions

The worst case condition for buildup of an explosive concentration of flammable gases would be from a large accidental release of vapor in a railway accident. As an example, a source of 10 tons per hour of propane vapor, 1 mile downwind of the plant, is examined. This corresponds to a rail accident of a severity realized in less than 1 percent of all accidents, excluding loading and unloading of the tank cars. The ground level plume centerline concentrations (by weight) downwind can be described for the 5 percentile condition (F stability, 0.57 meter/second wind speed) by a standard equation:

$$\text{Concentration Fraction} = \frac{Q}{\pi \sigma_y \sigma_z U R}$$

Where Q is the release rate

$\sigma_y = 0.069\ x^{0.91}$ downwind distance in meters.
$\sigma_z = 0.2\sigma_y$.
U is the wind speed.
R is the air density.

The flammability limits of propane in air are given as 2 to 10 percent by volume, with the theoretical concentration for complete combustion estimated at 4 percent. These correspond to weight percents of 3.0, 6.3 and 14.4. For the conditions assumed, the combustive zone downwind of a 10-ton-per-hour source will lie between 230 and 540 meters from the release point. The point of complete propane combustion would be at approximately 340 meters. This can be assumed as the most likely point for detonation of a pocket of the propane-air mixture.

The explosive power of a propane-air mixture is about 430 calories per gram, or about 40 percent of the TNT weight equivalent. This estimate is based upon a typical Chapman-Jouget type of detonation, achieving a stagnation pressure of 25 atmospheres and a stagnation temperature of 3,500 degrees Rankine. The explosion of a pocket of 80,000 cubic meters of gas (100 x 20 x 40 meters) mixture 340 meters downwind of the source (4,000 feet from the plant) can be estimated from TM 5-1300, Figure 4-11[5], by determining the scaled distance. 02-01

$$\text{Scaled distance} = 4{,}000\ \text{feet}/3\sqrt{(40\%)(216{,}000)} = 90\ \text{feet.}$$

The peak incident overpressure at the Reactor Building location from such a blast would be of the order 1.0 psi, which would have little or no effect upon the plant's structures.

The probability of such an accident occurring can be estimated at about 8 x 10^{-10} per year per rail car, assuming that at most 1 percent of the accidents would create the postulated conditions. This estimate is conservative because of the implicit assumption of delayed ignition. Most accidents of this severity generally ignite flammable vapors readily. The accident probability will be less than 10^{-7} if fewer than 125 rail cars of liquefied propane (or equivalent) are shipped between Alston and Strother each year. Information from Southern Railway indicates that approximately 70 carloads per year of flammable compressed gases are shipped into the general area extending 100 miles from Columbia, S. C. It is conservatively estimated that no more than 35 carloads per year are shipped via the nearby rail line west of the site.

Propane storage facilities were inventoried to determine whether they constituted any hazard at the facility. From the considerations above, it is evident that the fuel storage amounts listed in Table 2.2-3 are too distant from the facility to create a blast or explosive vapor hazard.

The buried natural gas pipeline that serves the Parr Steam Plant is located, at its closest point, approximately 13,000 feet to the south of the nuclear plant site. The pipeline is used intermittently, dependent upon the availability of natural gas. The line is 12 inches in diameter and is operated at a maximum pressure of 700 psi. The escape rate in the event of total rupture would be approximately 70,000 standard cubic feet (scf) per minute, or 40 kg per second of methane. The flammability limits of methane in air are 5 percent to 15 percent by volume, corresponding to weight percentages of 3 percent to 9 percent. The centerline weight concentration is given by:

$$\frac{Q}{\pi \sigma_y \sigma_z U R}$$

where Q is release rate, U is wind speed, R is air density, X is downwind distance, $\sigma_y = 0.069\ x^{0.91}$, and $\sigma_z = 0.5\sigma_y$. 02-01

The dispersion coefficients are given for stable (adverse) conditions, with the relation between horizontal and vertical appropriate for 300-500 meters. The plume distances corresponding to 3 and 9 percent at 0.57 meter/second wind speed (5 percentile condition) are approximately 135 to 245 meters (400 to 800 feet). Unconfined methane will not detonate, but ignites readily. The flammability zone is more than 2 miles from the site, and the amount of material ignitable is too small to create a radiant flux hazard. There would be no blast wave hazard. Because the pipeline is buried, it must also be considered that a cratering explosion of gases in soil could be generated, but the affected distance from rupture would be no more than 500 feet.

2.2.3.1.3 Explosives and Projectiles

Two companies within the 5 mile radius of the site carry substantial inventories of explosive materials. Interstate Materials, Inc., located near the intersection of Routes 215 and 213, stocks up to 40 tons of high explosive Torpex (ammonium nitrate-gelignite) for rock quarrying. Farm Milling Service, at Monticello, carries up to 200 tons of ammonium nitrate as fertilizer. Trucks transporting materials to and from these companies carry lesser amounts of explosives than those stockpiled, and the effect of a truck exploding at its closest approach to the plant, on Route 215, would be far less than that due to an accident at Interstate Materials, Inc., or Farm Milling Services.

Operations at the Interstate Materials quarry site, about 2-1/2 miles from the site, are 90 percent related (by volume of crushed stone produced) to construction of the Virgil C. Summer Nuclear Station and Fairfield Pumped Storage Facility projects, and may be discontinued upon completion of these projects.

Ammonium nitrate and ammonium nitrate slurries (5-10 percent concentration in fluids, which may be water or other solvents) have an explosive strength of about 60 percent TNT weight equivalent. The theoretical detonation velocities range from 11,350 feet/second, dry, and up to 15,750 feet/second at the 5 percent slurry concentration. High temperature and/or pressure are required to achieve detonation, and the theoretical detonation velocities are seldom attained. Representative detonation velocities for material samples greater than 9 inches in diameter are 3,940 to 4,900 feet/second. The blasting material used at Interstate Materials is Torpex, in which a more easily detonable material is mixed into the ammonium nitrate as a propagator of the detonation. The explosive is tightly packed to achieve full brisance (shock power). In contrast, fertilizer is loosely packed and can be detonated only with great difficulty.

Incident peak overpressures which would be felt at the site if all of the materials at either of these companies were fully detonated can be estimated from TM 5-1300, Figure 4-11[5], for a ground wave resulting from a surface burst. For Interstate Materials, the scaled distance would be equal to 15,840 feet/$3\sqrt{(60\%)(80{,}000)}$ = 435 feet. For Farm Milling Service, about 3.6 miles distant, scaled distance equals 19,000 feet/$3\sqrt{(60\%)(400{,}000)}$ = 305 feet. The limiting peak incident overpressure for a scaled distance of 305 feet would be about 0.1 psi*, and less for 435 feet. It is unlikely that a full detonation in a single blast could ever be achieved accidentally with fertilizer materials. 02-01

* extrapolated

Since Torpex may be encased, primary fragments could be generated. From TM 5-1300 (page 4-66 ff), the maximum primary fragment velocity realizable from a cylindrical casing is about $\sqrt{2}$ times the Gurney Energy constant, which is 7,450 feet per second for Torpex. The velocity decay in air is given by:

$V_r/V_o = \exp(-0.004\ r/W_f^{1/3})$

where V_o is the initial velocity, V_r is the velocity at distance r (feet), and W_f is the fragment weight in ounces. For a final velocity of 0.1 feet/second (a velocity that would not result in damage to either facilities or personnel), the maximum range of fragments from the Torpex casing would be:

$r = 250\ W_f^{1/3}\ \mathrm{Ln}\ 105{,}000$

= 2,900 feet for a 1-ounce fragment,
5,250 feet for a 6-ounce fragment.

Primary fragments are improbable with fertilizer, since metals are unlikely to be directly in contact with the explosive. By hypothesizing that a sheet of steel falls into a fertilizer container or pile before a blast, then a maximum primary fragment velocity of $\sqrt{3}$ times the Gurney Energy constant might be realizable. A Gurney constant of 5,000-5,500 feet/-second would probably apply for the loosely packed material, but the Torpex value can be used to estimate the range. For a 1 ounce fragment, the range would be about 2,940 feet and for a 6 ounce fragment, about 5,340 feet. Secondary blast wave fragments from disintegration of the surrounding structure would not approach the range of the primary fragments.

The recommended standard distance (Armed Services Explosives Safety Board, December 1, 1955) for inhabited buildings from an unbarricaded magazine is about 2,800 feet for 50,000 pounds of TNT (the quarry equivalent), and 4,310 feet for 250,000 pounds of TNT (the fertilizer equivalent). The distance to the site is nearly five times the recommended standard in the first case, and over four times the standard in the second.

It can be concluded from these basic calculations that the plant site would be beyond the zone of penetrating primary fragment scatter and strong blast wave effects from postulated explosions at Farm Milling Service or the Interstate Materials quarry. Minor effects associated with the arrival of a blast wave of incident overpressure 0.1 psi could be experienced at the site, one of which would be a startling noise. Mitigating factors to the postulated hazards are (1) the quarry explosive inventory will be eliminated or substantially reduced when construction of the power projects is completed, and (2) detonation of ammonium nitrate fertilizer is very difficult to achieve, making the likelihood extremely remote of an accidental detonation in a single blast of all of the material inventory.

Munitions shipped on the railroad are another potential source of projectiles. The rail accident rate for other than grade crossing accidents has been estimated at 0.08 per million railcar miles[6], and about 1 percent of the accidents would be severe enough to damage a munitions cargo. The annual probability that a munitions explosion might occur within 10 miles of the site will be less than 10^{-7} if fewer than three carloads per year are shipped on the Alston-Strother section of line, five carloads per year on the Alston-Pomaria section of the Southern Railway lines, or eight carloads for the Columbia-Newberry-Laurens section of line. Southern Railway shipments of hazardous cargo within approximately 100 miles of Columbia, S. C., were reviewed. Not a single carload of code 41 049 (explosives) was included during 1975, indicating that shipments approaching or exceeding the aforementioned numbers designated for the pertinent near-site rail lines would only possibly occur in case of escalation to wartime levels. The chance that a projectile would strike the site if there were a munitions detonation on the railroad would not be large (on the order of 1 percent), providing an additional margin of safety[6].

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2.2.3.1.4 Forest Fire Smoke and Heat Fluxes

Newberry and Fairfield Counties maintain active forest products industries, with 79 and 86 percent, respectively, of the land classed as commercial forest, most of which is in private individual ownership. A 1975 directory of timber buyers lists 10 dealers, 10 loggers and yards in Fairfield County; and 9 mills, 5 dealers, and 7 loggers and yards in Newberry County. Pulpwood is the primary forest product for the two counties.

The average annual loss of acreage due to fire in South Carolina over the 5 year period 1970 to 1975 has been 22,700 acres in 4,240 fires, for a 5.3 acre average per burn. In 1974-75, only 0.1 percent of the fires were larger than 100 acres in extent, and all of these were Class D (199-299 acres). However, rainfall over the past 5 years has been 11 percent above the long-term average, which has helped in producing such favorable fire statistics.

The smoke hazard from forest fires in the Southern Region (which includes the Southeast) is rated by the Environmental Protection Agency as the lowest for any section of the United States except for the Great Basin forests. This is due primarily to the low average available fuel loading per acre for wildfires -- 9 tons/acre, compared to up to 60 tons/acre for the Pacific Northwest. The available fuel loading per acre is the average amount of material actually burned in wildfires and is not the total combustible material per acre. Emission per ton burned for Southern fires is the same as for U. S. averages: 8.5 kg. of particulates, 70 kg. of carbon monoxide, 12 kg. of hydrocarbons, and 2 kg. of nitrogen oxides per metric ton burned [7].

Because of the low smoke emission characteristics which would be expected for the region, fires outside the exclusion area should not create smoke hazards or high radiant energy fluxes at the plant site. Additional mitigating factors for the site are the open, moist areas created by the Broad River, Monticello Reservoir, and Parr Reservoir.

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Less than 35 percent of the exclusion area consists of woodland, and the heavily wooded area closest to the reactor building lies approximately 1/2 mile southeast to southwest. Woodland fires inside the exclusion area of the plant could create smoke nuisance, but there would be no problem of high thermal heat exposure to the reactor building.

2.2.3.1.5 Collisions and Spills at Intake Structure

The intake structure at Monticello Reservoir is not located on a navigable waterway. The structure is located within the exclusion area. Control of the exclusion area is discussed in Section 2.1.2.1.

The possibility of liquid spills into the reservoir is extremely remote. No interstate petroleum or gas lines are located in the Frees Creek watershed. The only potential source of liquid spills would be from tanker trucks which might enter the upper watershed. The dilutive effects of the reservoir would mitigate any effects of a tank truck spill. For example, a spill of 100 barrels of fuel oil into the upper reservoir area, a typical size spill for a tank carrier, would spread out to a film of about .003 inches thickness on the surface of the reservoir within about 6 hours after entering the waters. The design of the intake structure precludes the introduction of such a spill into the intake structure. Spills from rail tank cars near the site would not enter the Frees Creek watershed but would drain toward the Broad River.

2.2.3.1.6 Release of One Rail Car Load of Methanol

The shortest distance from the control room air intakes to a postulated accidental release of one rail car load of methanol is approximately one mile (see Figure 2.2-1). The estimated wetted area following an accident along the railroad tracks opposite the site, assuming blockage of the railroad bed drainage, would be 2000 ft^2. For analytical purposes, a wetted area of 4000 ft^2 is assumed.

The estimate of evaporation rates for methanol is extrapolated from climatological data for water vapor. Evaporation is controlled by the difference in vapor pressure between the evaporating fluid and the overlying vapor. The emission of molecules from the surface of the liquid would be proportional to the vapor pressure and inversely proportional to the square root of the molecular weight. The vapor pressure buildup in the overlying gas is influenced by the diffusivity of the vapor molecules. This diffusivity is lower for methanol than for water vapor because of the greater molecular weight. The extrapolation does not consider the latter difference and, thus, is conservative. To obtain a conservative estimate of water vapor evaporation, wind speeds are assumed to be higher than would be applicable under the F-stability conditions at the Virgil C. Summer Nuclear Station site. Lower ambient relative humidity is also assumed for analytical purposes. Evaporation rates of 55 inches over the warmest 6 months of the year have been measured at Yuma, Arizona[8]. This rate (0.3 in/day) is extrapolated to 1.1 in/day of methanol. Evaporation of 1.1 in/day of methanol over a 4000 ft^2 area would result in a release rate of about 0.09 kg/sec from the railcar spill.

The dispersion equation (see Reference [4]) is as follows:

$$X = \frac{Q / Mm}{\pi \sigma_y \sigma_z UR / Ma}$$

Where:

X = Maximum concentration along plume centerline.

Q = Release rate, 0.09 kg/sec.

Mm = Molecular weight of methanol, 32.

σ_y = Lateral dispersion coefficient, $0.69d^{0.91}$

σ_z = Vertical dispersion coefficient, 0.2 σ_Y, for heavier than air vapors.

U = Wind speed, 0.57 m/sec.

R = Density of air, 1.25 kg/m^3.

Ma = Molecular weight of air, 29.

d = Distance, 1 mile (1610 m).

The methanol concentration at the control room air intakes, calculated using the above equation and estimated parameters, is 53 ppm. This concentration is substantially less than the 400 ppm toxicity limit recommended by Regulatory Guide 1.78.

The methanol vapor concentration inside the control room is dependent upon operation of the air conditioning system. In the normal mode of operation, outside air is supplied to the Control room (design flow rate is 3700 cfm). In the emergency mode of operation, dampers isolate the outside air intakes.

The odor of methanol would be readily detected by the operator in the control room and would result in a rapid operator response to switch from the normal to emergency mode.

If it is assumed that the air conditioning system is operated in the normal mode for an extended period of time following the methanol spill, concentration of vapor inside the control room is calculated using the follow equation:

$$r = 1 + C - \frac{1 + C}{(1 + C)^n}$$

Where:

r = Ratio of vapor concentration inside control room to vapor concentration at the control room air intakes. 02-01

c = Ratio of outside supply air, 3700 cfm, to control room free volume, 224,940 ft^3.

n = Elapsed time from initial arrival of the methanol plume at the air intakes.

The period of time calculated for methanol vapor concentration inside the control room to increase to the concentration outside (i.e., 53 ppm) is 253 minutes. This period of time is more than adequate for appropriate corrective action.

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TABLE 2.2-1

INDUSTRIAL FACILITIES WITHIN 5 MILES OF THE SITE

Company	Distance from Plant Site (Miles)	Products	Hazardous Material	Current Employment
Nylene Corp.	2.6 SE	Nylon pellets Brush bristle Monofilament fish line	42,000 lbs. caprolactan	10
Farm Milling Service	3.6 NE	Animal Feed Fertilizer	150-200 tons Ammonium nitrate (Solid & liquid)	7
Interstate Materials, Inc. Division of Clement Bros. Co.	3.0 NE	Crushed stone (granite)	25,000 lbs. Ammonium nitrate & Torpex (water gel) 50,000 lbs. Ammonium nitrate & fuel oil (ANFOPrill)	35
Interstate Materials, Inc. Division of Clement Bros. Co.	4.8 NW	Sand	None	6
Winnsboro Granite Corp.	4.8 NE	Dimension stone	100 lbs. black powder 200 blasting caps	20

02-01

TABLE 2.2-2

AIRPORTS WITHIN 30 MILES OF THE SITE

Airport	Distance (mi) And Direction Site	No. and Type of Aircraft Based at the Airport	Largest Type of Aircraft Likely to Land at the Airport	Runway Direction and Length (Feet)	Runway Composition	Hours Attended	Yearly Operations	
Gilbert Shealy's Airport	≈ 14 SW	2 Single Engines	182 Cessna	120°+300° 1200'	Turf	Unattended	Private - Not Available	
Owens Field	≈ 27 SE	99 Single & Twin Engines	DC-3	70°+250° 3456' 150°+330° 3607'	Asphalt Asphalt	7:00 AM - 10:00 PM	75,696	02-01
Newberry Municipal	≈ 18 W	11 Single Engines	Citation Cessna	40°+220° 3500'	Asphalt	8:00 AM -7:00 PM	10,800	
Airport		2 Twin Engines		100°+280° 2400'	Turf			
Oxner's Airport	≈ 19 NW	2 Single Engines	310 Cessna	90°+270° 2950'	Turf	8:00 AM - 5:00 PM	Private - Not Available	
J. Sexton	≈ 27 W	1 Single Engine	182 Cessna	90°+270° 1700'	Turf	Unattended	≈ 400	
Connelly Field	≈ 25 W	3 Single Engines	182 Cessna	50°+230° 2000'	Turf	Unattended	≈ 600-700	
Fairfield Co. Airport	≈ 10 E	3 Single Engines	C-47 Twin Engine	40°+220° 3200'	Asphalt	Unattended	≈ 3,000 - 5,000	
Sabie Cathcart	≈ 13 NE	1 Single Engine	Light Twin	150°+330° 2000'	Turf	Unattended	1,000	
Winnsboro Airport	≈ 14 1/2 NE	CLOSED		CLOSED			CLOSED	
Clemson (Pontiac) Experimental Station Airstrip	≈ 28 SE	Information not available						
Columbia Metropolitan Airport	≈ 24 SE	91 Single + Twin Engines 1 Small Jet	C-5 Transport Plane	110°+290° 7550' 50°+230° 5000'	Asphalt Asphalt	24 Hours	118,182	02-01

TABLE 2.2-3

INDUSTRIAL FACILITIES WITH HAZARDOUS MATERIALS WITHIN 20 MILES OF THE SITE

Company	Location	Petrochemical & Plastics	Bulk Propane Storage (A.G.W.G)	Maximum Amount of Explosives Stored	Product
Allied Chemical Corp.	Irmo	4,500 tons	(2) - 30,000[1]		Nylon staple, Nylon & polyester fil yarn
Chrysler Corp. (Airtemp S.C., Inc.)	Winnsboro		(1) - 18,000 (1) - 12,000		Air Conditioning & heating products
Corena Mfg. Company	Winnsboro		(1) - 30,000		Lawn & casual furniture
Uniroyal Fibers Textiles	Winnsboro		(2) - 30,000		Tire Cord-rayon Nylon polyester steel
United States Rubber Company*	Winnsboro		(1) 18,000		
General Electric Company	Irmo	Urea-Formaldehyde [Genol] 2 tons 100,000 gals, Fuel			Capacitors
Lone Star Industries (Quarry)	Blair			Atlas Powder 12,300 lbs. Ammonium Nitrate 700 bags	Crushed stone
Martin Marietta Aggregates (Quarry)	Rion			Ammonium Nitrate 14,600 lbs. Dynamite [Hydrive] 5,500 lbs.	Crushed stone

[ ] Indicates trade name of explosive

* Not listed in 1975 South Carolina Industrial Directory

A.G.W.G. denotes Above Ground Water Gallons Capacity Storage

L.P.G.D. denotes Liquefied Petroleum Gas Dealer

1 Number of tanks - Capacity in gallons

TABLE 2.2-3 (Continued)

INDUSTRIAL FACILITIES WITH HAZARDOUS MATERIALS WITHIN 20 MILES OF THE SITE

Company	Location	Petrochemical & Plastics	Bulk Propane Storage (A.G.W.G)	Maximum Amount of Explosives Stored	Product	
Nylene Corporation **	Jenkinsville	42,000 lbs caprolactam			Nylon Pellets, Brush bristles, monofilament fish line	
Farm Milling Service **	Monticello			Ammonium Nitrate 150-200 tons	Animal feed & fertilizer	
Interstate Materials, Inc. ** (Quarry)	Jenkinsville			Ammonium Nitrate 25,000 lbs.	Crushed Stone	02-01
				Ammonium Nitrate & Fuel Oil [ANFO Prill] 50,000 lbs.		
Winnsboro Granite Corporation **	Jenkinsville			Black Powder 100 lbs. 200 blasting caps	Dimension stone	02-01
Clinton-Newberry Gas Authority (Utility)	Newberry		(5) - 30,000[1]			
Farmers Ice & Fuel Company (L.P.G.D.)	Newberry		(1) - 18,000		Liquefied Petroleum Gas	
Pargas of Newberry (L.P.G.D.)	Newberry		(1) - 30,000 (4) - 4,000		Liquefied Petroleum Gas	
Porter Gas Service (L.P.G.D.)	Winnsboro		(1) - 18,000		Liquefied Petroleum Gas	
Superior Gas Company (L.P.G.D.)	Winnsboro		(1) - 30,000 (1) - 18,000		Liquefied Petroleum Gas	

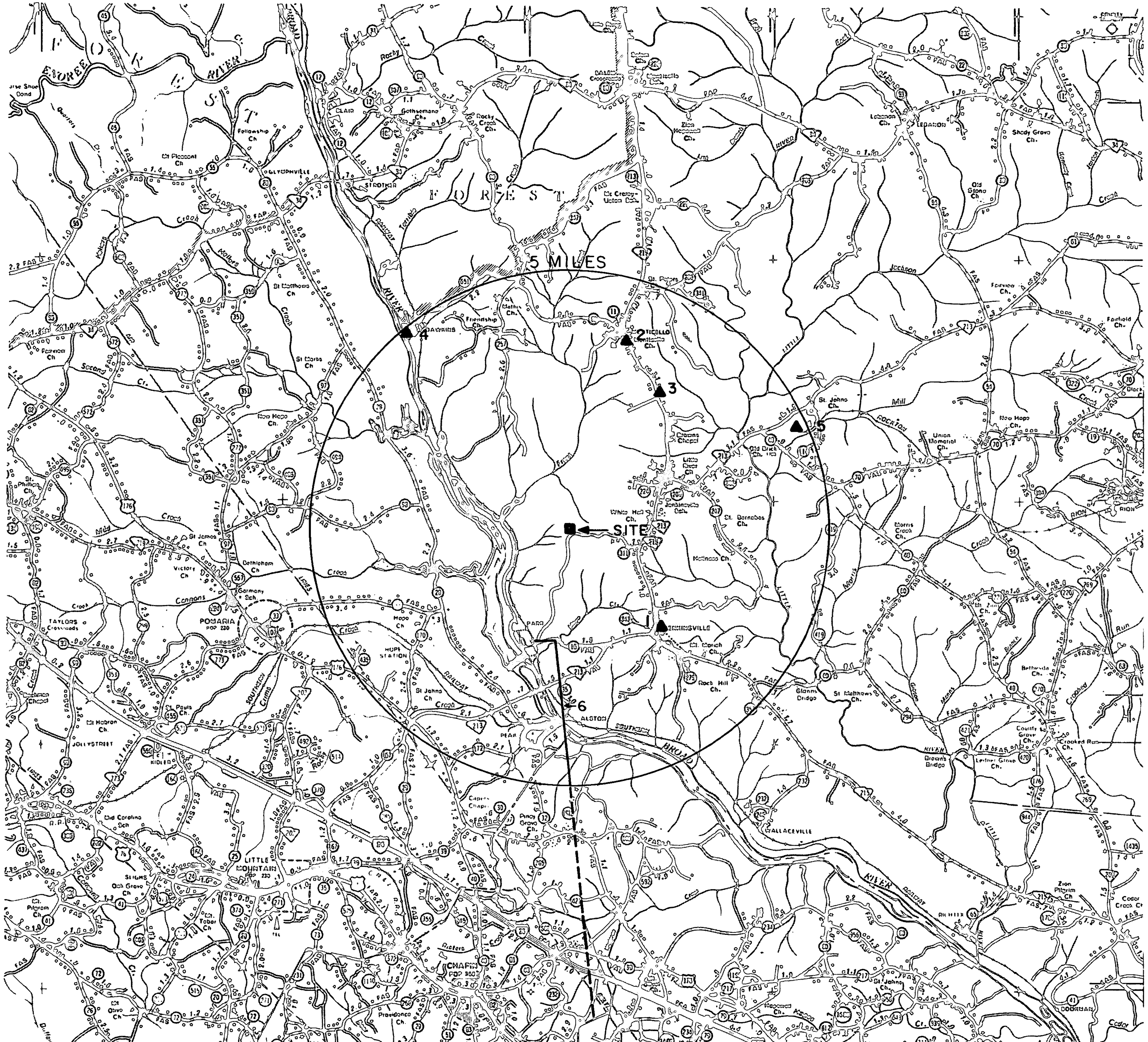
[ ] Indicates trade name of explosive

** Located on Fig. 2.2-1

A.G.W.G. denotes Above Ground Water Gallons Capacity Storage

L.P.G.D. denotes Liquefied Petroleum Gas Dealer

1 Number of tanks - Capacity in gallons



LEGEND:

1. NYLENE CORPORATION
2. FARM MILLING SERVICE
3. INTERSTATE MATERIALS, INC. DIVISION OF CLEMENT BROS.
4. INTERSTATE MATERIALS, INC. DIVISION OF CLEMENT BROS.
5. WINNSBORO GRANITE CORP.
6. BURIED 12" NATURAL GAS PIPELINE.

REFERENCE:

THE BASE FOR THIS MAP WAS PREPARED FROM ENLARGED PORTIONS OF THE FOLLOWING S.C. STATE HWY. DEPT., GENERAL HWY. MAPS: LEXINGTON COUNTY 1958, REVISED 1970, NEWBERRY COUNTY, 1961, REVISED 1970, FAIRFIELD COUNTY 1962, REVISED 1970, AND RICHLAND COUNTY 1963, REVISED 1969.

STATUTE MILES

0 1 2 3

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Site Vicinity Map

Figure 2.2-1

N

0 10 20 30
STATUTE MILES

NOTE: TRAINING ROUTES AND MILITARY OPERATING AREAS PERTAIN TO SHAW AIR FORCE BASE.

REFERENCE: THE BASE FOR THIS MAP WAS PREPARED FROM A PORTION OF THE SOUTH CAROLINA AERONAUTICAL CHART, 1975-1976 PREPARED BY THE SOUTH CAROLINA AERONAUTICS COMMISSION

LEGEND:

RESTRICTED AREAS

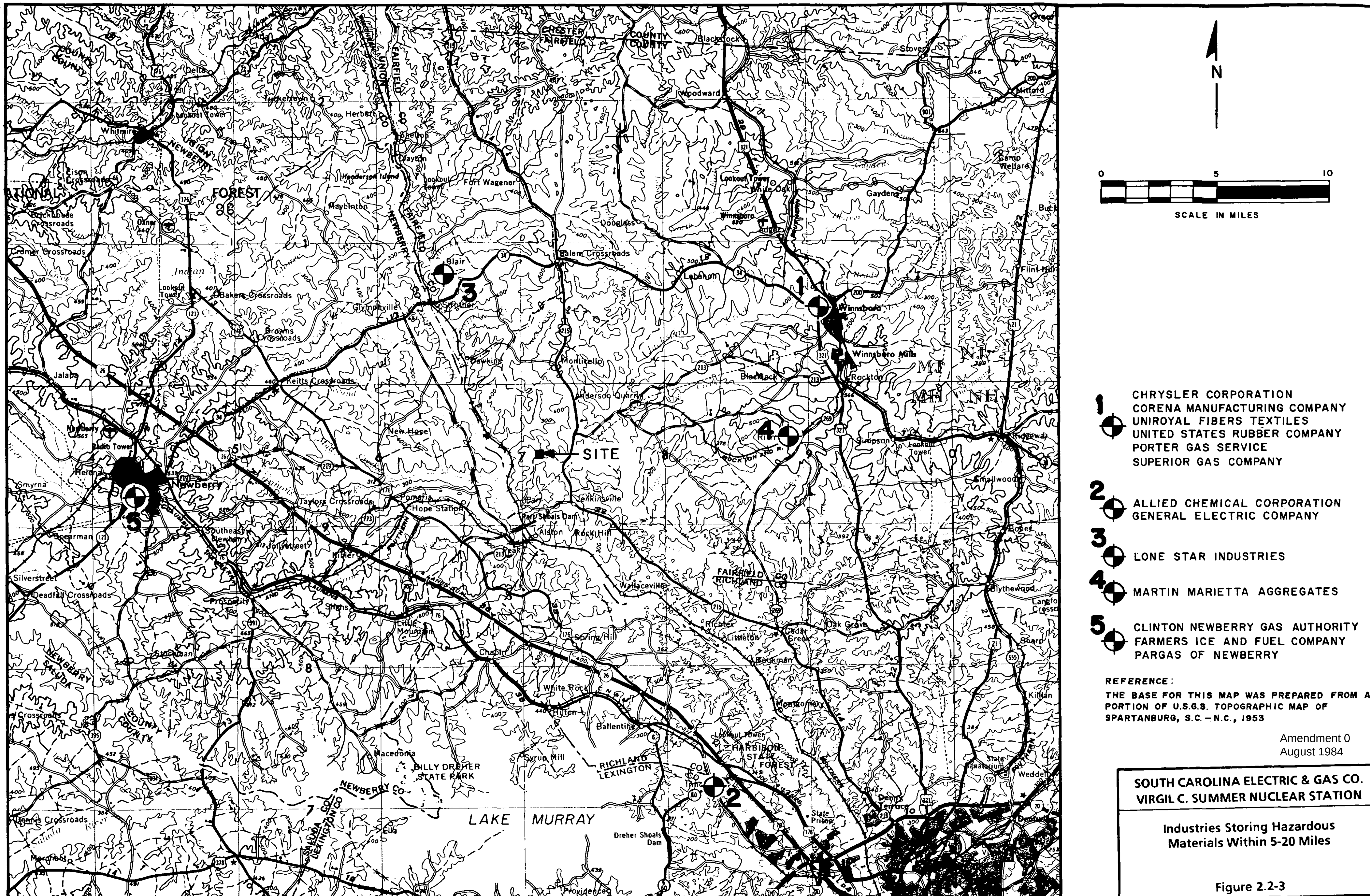
AIRCRAFT FACILITIES DISCUSSED IN TEXT

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Airport Facilities Map

Figure 2.2-2



Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Industries Storing Hazardous Materials Within 5-20 Miles

Figure 2.2-3

2.3 METEOROLOGY

NOTE 2.3
Section 2.3 is being retained for historical purposes only (per RN 00-081).

02-01

2.3.1 REGIONAL CLIMATOLOGY

Figure 2.3-1 shows the relative locations of the site and available climatological stations for use in the evaluation of the climatology of the region.

2.3.1.1 Data Sources

Sources used in the preparation of the regional climatology include:

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2.3.1.2 General Climate

The Virgil C. Summer Nuclear Station site is located in the Piedmont Physiographic Province. The site is 26 miles northwest of Columbia, South Carolina (Figure 2.3-1). The terrain consists of rolling hills; elevations range from 200’ near Columbia to over 600’ near Little Mountain. The Broad River lies approximately 1 mile to the west, and Parr Dam is located approximately 2-1/2 miles southwest. The site is located near the center of the state, approximately 140 miles northwest of the Atlantic Ocean and 100 miles southeast of the Appalachian Mountains. Plant elevation is approximately 435’ above mean sea level.

The climate in this region is temperate, having long hot summers and cool winters. The Appalachian Mountain chain frequently retards the approach of cold fronts during the winter months.

In summer, the Bermuda High is the greatest single weather factor influencing the area. This semi-permanent high pressure system blocks the entry of cold fronts so that many stall before reaching central South Carolina. Also, the southwesterly flow around this system supplies moisture from the Gulf of Mexico for the many summer thunderstorms. Typically, summer has approximately 50 days with temperatures of 90° F or above and 6 days with temperatures of 100° F or above. Summer is the rainiest season of the year, contributing about 33 percent of the annual total rainfall. The summer rains are largely in the form of local thundershowers, occurring on an average of 11 days per month during this season. About once or twice a year, effects of passing tropical storms are felt by way of strong winds and heavy rains. The incidence of these storms is greatest in September, although they represent a possible threat from summer to late fall. Rainfall during the late fall (October and November) is at an annual minimum.

Winter weather in this region is largely made up of polar outbreaks that reach the area in a much modified form. On rare occasions, arctic air masses push through this region and cause some of the coldest temperatures. On the average, the minimum temperature can be expected to drop to 32° F or lower on 45 to 50 days, and at or below 20° F on 5 days during this season. A day or more with snowfall is probable during 9 out of 11 winters. A day with more than 1 inch of snowfall is likely to occur in 1 out of 5 winters. Winter rainfall accounts for 22 percent of the annual total.

Spring is the most changeable season of the year in this area due to the alternating effects of polar and maritime tropical air masses. Spring rainfall accounts for 25 percent of the annual total. While tornadoes are infrequent, they occur most frequently during this season. Hailstorms are not frequent, with the annual incidence at a maximum in spring and early summer (Data Source 2.3.1-A).

The prevailing surface winds tend to be either from the northeast or southwest due to the presence and orientation of the Appalachian Mountains. The prevailing wind direction during the winter, spring and summer seasons is southwest; northeast or north-northeast winds prevail during the fall (Data Sources 2.3.1-B and C). The wind direction frequencies observed at the nuclear plant onsite meteorological tower show the same prevailing directions as those cited from other sources, providing evidence that the site climate is controlled by regional synoptic processes rather than by local influences such as the Broad River valley terrain features.

Annually, values of relative humidity of 90 percent or greater are recorded 25 percent of the time. Values of relative humidity in this range occur most frequently during the hours from 0000 to 0700 local time (Data Source 2.3.1-C).

The mean percentage of possible sunshine in the state varies from a low of 59 percent in January to a high of 68 percent in April and October (Data Sources 2.3.1-A, B, D and E).

2.3.1.3 Severe Weather

2.3.1.3.1 General

Severe weather conditions (significant departures from the general climate) include heavy precipitation, ice storms, thunderstorms, hail, lightning, tornadoes, hurricanes, and high air-pollution potential.

2.3.1.3.2 Precipitation

Maximum rainfall, estimated by statistical analysis of regional precipitation data, is given on Table 2.3-1 for return periods of 1 to 100 years and for rainfall durations of 30 minutes to 24 hours (Data Source 2.3.1-F).

The maximum recorded point rainfall for durations of 5 minutes to 24 hours at Greenville, Spartanburg, and Columbia, are presented in Table 2.3-2. For plant design criteria, the "probable maximum precipitation" estimates of extreme rainfall are used to provide complete assurance of plant operability. The probable maximum precipitation is defined as the critical depth- duration- area dependent rainfall for a particular area that would result if conditions during an actual storm in the region were increased to represent the most critical meteorological conditions that are considered probable. The critical meteorological conditions are determined for each season through the analyses of the historical synoptic conditions during past storms, air-mass properties associated with these storms (temperature, winds, etc.), topography, and particular location of the area of interest. Estimates of probable maximum precipitation for a 10 square mile area in the vicinity of the site are as follows (Data Source 2.3.1-H).

Duration	Inches
6 Hr.	31.4
12 Hr.	34.2
24 Hr.	36.7
48 Hr.	39.5

Extreme snowfalls for representative stations in the area are given in Table 2.3-3 (Data Sources 2.3.1-A, I and J). The 100 year return period, antecedent snow and ice pack for the area in which the plant is located, in terms of snow load on the ground and water equivalent is listed below (Data Source 2.3.1-K):

Snow Load		13 lbs/ft^2
Water Equivalent	=	2.5 inches

Using the 100 year return period snow load above, the weight of snow and ice on the roof of each Seismic Category 1 structure is presented in Table 2.3-4. Buildings are designed to the Southern Standard Building Code which includes snow loadings of 20 lbs/ft^2.

2.3.1.3.3 Ice Storms

Ice storms, attributed to precipitation in the form of freezing rain, generally occur from one to three times per winter in the northern half of South Carolina. Moderate to heavy ice storms can be quite damaging to utility lines and trees, as well as being a serious traffic hazard. One of the most severe ice storms occurred in February 1969 in several north-central and northeastern counties. Power and telephone services were seriously disrupted over a large area and timber losses were tremendous (Data Source 2.3.1-B).

The extreme thickness of glaze ice observed on utility wires during a 9 year period (1928-1937) in central South Carolina was approximately 1.0 inch (Data Source 2.3.1-L). The estimated probability of this occurring in any one year is 0.05 (Data Source 2.3.1-M). Buildings are designed to the Southern Standard Building code which includes ice loadings of 20 lbs/ft^2.

Table 2.3-4 in the FSAR presents the maximum values of the Seismic Category 1 roof loading due to extreme winter precipitation. This table is based on the 100-year return period information presented in ANSI A58.1 (1972). To illustrate the conservative nature of this number, the maximum recorded depth of snow recorded in Columbia, South Carolina for the period of 1887-1975 has been 15 inches (February 1973). (Local Climatological Data, U. S. Department of Commerce, National Oceanic and Atmospheric Administration, February 1973, and Ludlum, David M., Weather Record Book United States and Canada, Weatherwise Press, Princeton N. J. 1971). The depth associated with the 13 lbs/ft^2 is 26 inches.

The maximum ground level depths at this site are associated with a single snow storm of short duration (less than 48 hours). The maximum ground depth of 15.0 inches remained for less than one day; no snow remained on the ground four days after this snowfall. Due to the fact that the maximum snowfalls cause the maximum depth of snow and since the period of retention of the snow in this region is limited, new storms adding additional snows to these maximum snowfall depths are a very unlikely occurrence. RN 01-045

The design loading for buildings in this region is 20 lbs/ft^2, representing the weight of 40 inches of snow. This value permits using the maximum recorded snowfall for a given month during the 89 year period, 15.7 inches for February 1973 and the application of a drift factor of 2.55. This coefficient is based on no snow present prior to the storm, as indicated in the previous paragraph. The coefficient is also near the maximum value of the adjustment coefficients, based on roof shapes and building configurations, as given in ANSI A58.1 (1972). Thus the design snow loadings as given in Section 2.3.1.3 are adequate for winter precipitation loads in this region of South Carolina.

The normal range of snow density, the ratio of the volume of melted snow to the volume of snow, is from 0.07 to 0.15 for freshly fallen snow to 0.91 for compacted snow. Snow accumulation in Columbia, South Carolina is an unusual event as more than 3 days of sustained snow cover is rare. A day with more than 1 inch of snowfall is likely to occur in only one out of five winters. This, plus the fact that only one third of the days in winter have minimum temperatures below freezing indicates the lack of sufficient time needed to have accumulated snow exist long enough to pack. Therefore, to represent the snow density at the site, a value of 0.1 was used as a representative value of new fallen snow.

As indicated in footnote 1 of Table 2.3-4, the weight of snow and ice given in this table was based on the 100-year return period ground snow load of 13 lbs/ft^2 without considering roof shapes and building configuration adjustments given by ANSI A58.1 (1972). However, seismic Category 1 buildings at the Summer site are actually designed for snow loadings of 20 lbs/ft^2, representing the weight of 40 inches of snow, in accordance with the Southern Standard Building Code.

The snow loads which would be exerted if the 48-hour probable maximum winter precipitation (PMWP) was in the form of snow are not appropriate as a component of the design basis snow load in southern locations. The 48- hour PMWP value is based on "a critical depth-duration-area rainfall relations for a particular area during various seasons of the year that would result if conditions during an actual storm in the region were increased to represent the most critical meteorological conditions that are considered probable of occurrence." One of the critical meteorological conditions which contributes to the PMWP is the requirement that the atmosphere over the site be warm and near saturation. The atmosphere at temperatures approaching or below freezing cannot contain sufficient moisture at the Summer site to cause the PMWP.

Design basis events which are uncontrollable by the plant operator, such as tornadoes and floods, should have an extremely low probability of occurrence. However, the accumulation of snow loads on building roofs does not fall in the category for two reasons:

a. The maximum accumulated loads can only build up over an extended period of time measured in hours and days, and

b. The plant operational procedures include requirements for the removal of snow from roofs to prevent the buildup of excessive loads.

An appropriate criteria to ensure structured integrity of safety related structures due to snow load conditions at Summer would be to select, as the design basis of the structures, load conditions with return interval representative of the plant life, no more than 50 years, combined with operational procedures to ensure that snow is removed from roofs to prevent the buildup of excessive loads.

Seismic Category 1 buildings at the Virgil C. Summer Nuclear Station site are actually designed for snow loadings of 20 pounds per square foot, representing the weight of 40 inches of snow. This load does include consideration of roof shapes and building configuration.

During periods of inclement weather, the Operations group will monitor the building roofs for accumulation of snow or ice. This will be accomplished by operations logs. Accumulations of snow exceeding 30 inches in depth or of ice exceeding 3 inches in depth will then be removed.

2.3.1.3.4 Hail

The most commonly reported hailstones are 1/2 to 3/4 inch in diameter and cause little or no property damage. During the 13 year period from 1955-1967, hail 3/4 inch in diameter or greater occurred on 14 occasions within the 1° latitude-longitude square 02-01
containing the site (Data Source 2.3.1-N). This gives a mean annual frequency of 1.1 potentially damaging hailstorms for the region as a whole.

The monthly and seasonal breakdown of hail 3/4 inch or greater in diameter for the state of South Carolina for the 13 year period, 1955-1967, is listed in Table 2.3-5 (Data Source 2.3.1-N). Damaging hailstorms occur most frequently between March and July, with May having by far the greatest number of occurrences.

2.3.1.3.5 Thunderstorms

The largest number of thunderstorms occur in late spring and summer with a minimum during the winter months. The most severe thunderstorms accompany the squall lines and active cold fronts of spring. There is an average of 50-60 thunderstorms per year in this area of South Carolina. The monthly and seasonal distributions at several cities around the site are displayed in Table 2.3-6 (Data Sources 2.3.1-A, I and O).

2.3.1.3.6 Lightning

A typical thunderstorm is believed to produce one to three cloud-to-ground flashes each minute. The number of lightning strikes per square mile has been determined from photographs, records of strikes to power lines, and from electrical lightning counters. The combined results of several studies indicate that the number of flashes to ground per square mile per year is equal to between 0.05 and 0.8 times the number of thunderstorm-days per year (Data Source 2.3.1-P).

Applying these results to the thunderstorm data for Columbia in Table 2.3-6, the seasonal and annual estimates of lightning strikes are:

Winter	0.1 - 1.6	Summer	1.6 - 25.6
Spring	0.7 - 10.4	Fall	0.3 - 4.8
		Annual	2.7 - 43.2

(Sum of seasonal values do not equal annual due to round-off errors.)

These data indicate that the annual expectancy of lightning strikes for a square mile area in the site vicinity is between 3 and 43.

The expected lightning strikes to the safety-related structures at the site, based on the attractive area of each building, are presented in Table 2.3-6A. The number of thunderstorm days, seasonally and annually, are presented in Table 2.3-6. (Data Source: 2.3.1-A, I, and O) RN 01-045

2.3.1.3.7 Tornadoes

From 1955 through 1967 a total of 12 tornadoes occurred within the 1°-square containing the site (Data Source 2.3.1-N). This gives a mean annual frequency of 0.92. The probability of a tornado hitting a point in a given year is:

$$P = \left(2.8209\bar{t}/A\right)$$

where A is the area in square miles of a one-degree square centered on the point, the $\bar{t}$ is the mean annual frequency of tornadoes in the area (Data Source 2.3.1-Q). The return period is the reciprocal of P. For the nuclear plant site, $\bar{t}$ is 0.92 and A is approximately 3,930 square miles. Therefore, the probability of a tornado hitting the site in any given year is 0.00066 with a return frequency of once every 1,514 years.

Based on the 13 year period of record from 1955-1967, the mean seasonal and annual number of occurrences of tornadoes for the entire state are (Data Source 2.3.1-N):

Winter	1.1	Summer	4.5
Spring	5.2	Fall	2.2
		Annual	12.9

(Sum of seasonal values do not equal due to round-off errors.)

Storm Data publications[1] were examined for the period of 1 January 1950 to 30 November 1976. Tornado data were extracted for a 16 county area encompassing the site. The selection of counties was biased to the west and southwest in order to correlate with normal paths of tornadoes. A listing of the counties included in this study is given in Table 2.3-6B. Table 2.3-6C consists of a chronological listing of all tornadoes in the study area, their path lengths (if known), and corresponding intensity and damage area information.

Areal analysis and classification was based upon the system developed by Fujita[1]. The four area classes used are as follows: 1-Micro, less than 0.1 square miles of damage area; 2-Meso, 0.1 to 1.0 square miles of damage; 3-Regular, 1.0 to 10 square miles of damage; 4-Giant, greater than ten square miles of damage. Intensity classes are based on damage descriptions. The categories used in this study are given in Table 2.3-6D. It must be realized that the data are very dependent on public observations and, therefore, both sightings and damage reports are more frequent in the more densely populated areas.

(2.3.1-N1) [1]Storm Data is a monthly publication by the National Climatic Center in Ashville, North Carolina.

(2.3.1-N2) [1]Theodore Fujita, "Estimate of Areal Probability of Tornadoes from Inflationary Reporting of Their Frequencies." SMRP Research Paper #89, October 1970.

The following additional parameters pertinent to the design and operation of a nuclear plant in this region are listed below (Data Source 2.3.1-R):

Translational Speed	70 mph
Rotational Speed	290 mph
Maximum Wind Speed	360 mph (sum of translational and rotational speed)
Maximum Pressure Drop	3.0 psi
Rate of Pressure Drop	2.0 psi/sec

2.3.1.3.8 Hurricanes

Tropical cyclones, including hurricanes, lose strength rapidly as they move inland. Of concern during these storms are potential effects from both wind and excessive rainfall. The precipitation concern has been addressed in Section 2.3.1.3.2. The probability of excessive winds due to tropical storms is discussed below.

The tropical cyclone season for South Carolina extends from June to October; occurrences outside this period are extremely rare. The peak months are August through October. Two separate studies have been reviewed to determine expected frequency of occurrences of tropical storms and to present the wind speeds measured at Columbia during these storms.

From a study [1] published by the South Carolina Disaster Preparedness Agency, 1973, at least 169 tropical storms have affected South Carolina for the period of 1686-1972. This number may not represent all storms as currently defined since earlier records may have been lost or incomplete. During a more recent period, 1900-1972, the number of tropical storms affecting South Carolina was 89, representing a frequency of 1.2 per year.

A second study covering the period 1931-1960 reports that a total of 60 tropical storms affected South Carolina during the period (Data Source 2.3.1-S). This study reports more storms than the previous study due, most likely, to different definitions of when a storm affected the state. Of the 60 tropical storms recorded during this period, only 9 of these are reported as having hurricane intensity winds of 74 mph or greater in South Carolina and are expected only within the coastal regions of the state.

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(1) Purvis, John C., and H. Landers, "South Carolina Hurricanes or a Descriptive Listing of Tropical Cyclones That Have Affected South Carolina." The South Carolina Disaster Preparedness Agency, 1973.

Because the Summer Station is about 25 miles more distant from the coast than Columbia, the winds recorded at the Columbia National Weather Service Station, during tropical storms and hurricanes provide a conservative indication of the winds to be expected at the Summer Station from such storm phenomena. Inspection of the Columbia, South Carolina National Weather Service monthly weather records for the tropical storms and hurricanes reported by Purvis and Landers from 1900 through 1964 shows that the maximum (5 minute average) wind speed achieved at Columbia was 42 mph during this 64 year period of record (2). Six tropical storms affecting South Carolina during 1964 to 1972 were also evaluated (3), none of which produced significant wind speeds.

For further confirmation of the lack of hurricane winds at Columbia, the nine reported storms of hurricane intensity affecting South Carolina during the period of 1931 through 1960 were investigated (Data Source 2.3.1-S).

From investigations of hourly meteorological observations it was found that the highest wind speed recorded at Columbia, South Carolina during these hurricanes was a gust of 58 miles per hour. Based on the above records, it is seen that hurricane force winds associated with tropical storms have never been recorded in the Columbia area.

2.3.1.3.9 Extreme Winds

Estimated extreme winds (fastest mile) for the general area based on the Frechet distribution are (Data Source 2.3.1-T):

Return Periods (Years)	Fastest Mile (Miles/Hr.)
2	50
10	70
50	81
100	101

Fastest mile winds are sustained winds, normalized to 30 feet above ground and include all meteorological phenomena except tornadoes.

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(2) Monthly records of the Columbia, South Carolina, National Weather Service. Reviewed by SCE&G.

(3) Purvis, John C., and H. Landers, op. cit.

From 1955 through 1967, a total of 22 windstorms with wind speed of 58 miles/ hour or greater occurred within the 1° latitude-longitude square containing the site (Data Source 2.3.1-N). The diurnal distribution of windstorms (of 58 miles/hour or greater) for the entire state of South Carolina over the 13 year period of record is presented in Table 2.3-7. A definite peak occurs at 1600 hours with a total of 29 occurrences.

2.3.1.3.10 Air Pollution Potential

In January 1972, Holzworth (Data Source 2.3.1-U) published a study on mixing heights, wind speeds, and potential for urban air pollution throughout the continuous United States. Surface and upper air data from the National Weather Service Station at Charleston, S.C., and Athens, Georgia were included in the analyses made for this study. The data covered the 5 year period from 1960 through 1964.

The mixing height (or depth) as used in the study is defined as the height above the surface through which relatively vigorous vertical mixing occurs. The morning mixing height was calculated as that existing around the morning commuter rush hours. The afternoon mixing height may be considered to coincide approximately with the usual mid-afternoon minimum concentration of slow-reacting urban pollutants.

Wind speeds for both morning and afternoon were computed as arithmetic averages of speeds observed at the surface and aloft within the mixing layer. Mean mixing heights and corresponding wind speeds are presented for the site area in Table 2.3-8. These data show that, on the average, the greatest air pollution potential (lowest mixing height and lowest wind speed) occurs on autumn mornings.

The persistence of high meteorological potential for air pollution is indicated by parameters called episodes and episode days by Holzworth. An episode occurs if a mixing depth of 2,000 meters or less, combined with a wind speed of 6 meters per second or less, persists without precipitation for 2 or more days (five consecutive computations at morning and afternoon). Holzworth determined the frequency of 2 day and 5 day (11 consecutive computations) episodes at several intensities, where intensity is greater at slower winds and shallower mixing depths. Episode days are the total number of days included in the episodes.

The number of episodes in 5 years at Columbia, S.C., lasting 2 or more days and 5 or more days are presented in Table 2.3-8 (Data Source 2.3.1-U).

During this period, there were no episodes with a mixing height below 500 meters.

Based on a 30 year period of record (1936-1965), Korshover tabulated the number of time stagnating anticyclones persisted for 4 or more and 7 or more days (Data Source 2.3.1-V). Occurrences of stagnation were determined primarily on the basis of a surface pressure-gradient analysis.

In the general area of the site, there were 82 stagnation cases which persisted for at least 4 days during the 30 year period. The total number of stagnation days was 395. There were seven stagnation cases which persisted for 7 or more days during this same period. Approximately 40 percent of the stagnation cases which persisted for at least 4 days occurred during the fall.

The above data for the air pollution potential indicates very few stagnations are expected at the site persisting for 4 or more days. Less than 3 percent of the days, based on 30 years of record, are involved with stagnation of this magnitude. This, combined with the relatively low pollution potential (presented in Table 2.3-8), should enable operation without significant effects on the diffusion climatology due to these conditions.

2.3.1.3.11 Ultimate Heat Sink

The meteorological parameters used for the evaluation of the performance of the ultimate heat sink, with respect to maximum evaporation and minimum water cooling, are presented in Section 9.2.5.3. That section describes the basis and procedures used for the selection of the critical meteorological data.

2.3.1.3.12 Extreme Temperatures

General climatic temperature variations, including extremes, are discussed in Section 2.3.1.2. The design basis air temperatures considered in the design of systems and components are as follows:

1. Minimum Air Temperatures:

   a. Outdoor air temperature for heating, ventilating and air conditioning (HVAC) system design, 19° F.

   b. Outdoor air temperature for safety related components located outdoors, - 2° F.

2. Maximum Air Temperatures:

   a. Outdoor air temperatures for HVAC system design, 95° F dry bulb, 77° F wet bulb.

   b. Outdoor air temperature for safety related components, 107° F.

The bases for the selection of the design of systems and components are as follows:

1. HVAC design air temperatures are based upon data presented in the American Society of Heating, Refrigerating and Air Conditioning Engineers, ASHRAE Handbook for weather stations in the general vicinity of the site. The temperatures used represent values that are equaled or exceeded less than one percent of the time. Dry bulb and coincident wet bulb temperatures are presented for summer or maximum temperature conditions. Only dry bulb values are presented for winter or minimum temperature conditions.

2. Minimum and maximum air temperatures for safety related components are the extreme minimum and maximum temperatures presented in the Preliminary Safety Analysis Report, Table 2.3-1. Although Table 2.3-49 indicates that these design basis temperatures have been exceeded (the minimum temperature is -4° F versus a design basis of -2° F; maximum temperature is 108° F versus a design basis of 107° F), the differences are very small and are insignificant for engineering design purposes. A significant difference between the design basis temperatures and the observed extreme temperatures is considered to be a temperature variance that could materially affect the operation and integrity of safety related components.

3. Persistent low outside air temperature would have negligible effect upon safety related equipment since heating systems are designed to maintain ambient temperatures substantially above freezing. Safety related equipment susceptible to sustained high temperature is located in areas served by mechanical cooling systems. Mechanical cooling systems are designed with sufficient safety margin to preclude operating problems. Moisture buildup in buildings housing safety related equipment would generally not be a problem for the following reasons:

    a. Relative humidity of outside air supplied to the buildings is usually low in winter.

    b. Cold outside air is heated prior to being supplied to the buildings.

    c. Ventilation systems are designed for frequent air changes.

    d. Due to the "flywheel" effect of large masses of concrete in the buildings, average inside ambient temperatures will not vary rapidly.

Main steam isolation valves are located inside the intermediate building which has adequate heating to prevent freezing (see Section 9.4).

The diesel generator building and service water pumphouse have large labyrinth type air intakes that are not susceptible to ice blockage (see Sections 9.4 and 9.5). Also, there are no dampers in the diesel generator building air intakes.

Service water system valves and instrument lines are located indoors in adequately heated spaces (see Section 9.4).

Persistence of extreme outdoor air temperature has been thoroughly considered in the environmental design of safety related components. Most safety related components are located in indoor spaces which have heating and cooling equipment of sufficient capacity to moderate even the most extreme outdoor temperatures. The reactor makeup storage tank, refueling water storage tank, and sodium hydroxide storage tank, 99-01
safety related piping, instrument lines and level transmitters located outdoors are protected from extremely low temperatures by heat tracing designed for an ambient temperature of -7° F.

Recirculation of condensate between the condensate storage tank and condenser hotwell will maintain the temperature of condensate storage tank contents well above freezing.

These measures ensure that the safety related components will continue to operate without impairment.

Most building spaces housing safety related components that require cooling are equipped with air recirculation systems that will function with a minimum or no outside air during the winter. The remaining spaces, equipped with other than air recirculation systems, are the diesel generator building (air intakes addressed above) and the battery rooms (see Section 9.4).

The battery room cooling system will operate with a minimum amount of outside air. The outside air is introduced through a roof ventilator designed for weather protection.

Freeze protection is provided, as required, for portions of systems and components located outdoors. Such protection is discussed in Sections 6.2.2, 6.3.2, 9.1.3, 9.2.6 and 9.2.7.

2.3.2 LOCAL METEOROLOGY

2.3.2.1 Data Sources

2.3.2-A "Climatography of the United States No. 82-38, Summary of Hourly Observations - Columbia, South Carolina, 1941-1960", U.S. Department of Commerce, Weather Bureau, Washington, D.C., 1963.

2.3.2-B On-Site Local Meteorological Data, Virgil C. Summer Nuclear Site, South Carolina Electric & Gas Co., Dames and Moore Job #5182-070, Atlanta, Georgia, 1975.

2.3.2-C "Local Climatological Data," Columbia, South Carolina; U.S. Department of Commerce, NOAA, Environmental Data Service, 1973.

2.3.2-D "Local Climatological Data," Greenville-Spartanburg, South Carolina; U.S. Department of Commerce, NOAA, Environmental Data Service, 1973.

2.3.2-E "Climatography of the United States No. 86-33, Climatic Summary of the United States - Supplement for 1951-1960, South Carolina." U.S. Department of Commerce, Weather Bureau, Washington, D.C., 1965.

2.3.2-F "Local Climatological Data, Columbia, South Carolina- Observations at 3-Hour Internals." U.S. Department of Commerce, NOAA, Environmental Data Service, 1971-1975.

2.3.2-G "Climatic Summary of the United States, Section 93, Western South Carolina." U.S. Department of Agriculture, Weather Bureau, Washington, D.C., 1933.

2.3.2-H "Wind Distribution by Pasquill Stability Classes, 1965-1969, Columbia, S.C.," U.S. Department of Commerce, NOAA, Environmental Data Service, 1971.

2.3.2-I Turner, D.B., "A Diffusion Model For An Urban Area," Journal of Applied Meteorology, February, 1964.

2.3.2-J Wind Distribution by Pasquill Stability Classes, 1975, Columbia, S.C., "U.S. Department of Commerce, NOAA, Environmental Data Service, 1976.

2.3.2-K "Persistence of Surface Wind Direction by Wind Speed, 1965-1969, Columbia, S.C.," U.S. Department of Commerce, NOAA, Environmental Data Service, 1971.

2.3.2-L Allen, R.G., and Courtney, F.E., "The Meteorological Program at Parr, South Carolina." CVNA-172, for Carolinas Virginia Nuclear Associates, Inc., by Lockheed Nuclear Products, Lockheed-Georgia Company, April 1963.

2.3.2-M Appendix D, Meteorological and Diffusion Study, "Preliminary Safety Analysis Report for Atlantic Richfield Reprocessing Center, Atlantic Richfield Company," date unknown.

2.3.2-N "Wind Distribution by Pasquill Stability Classes, 1956-1975, Columbia, S.C.," U.S. Department of Commerce, NOAA, Environmental Data Service.

2.3.2-O Van der Hoven, "Atmospheric Transport and Diffusion at Coastal Sites," Nuclear Safety, Vol. 8 No. 5 (Sept. - Oct., 1967).

2.3.2.2 Normal and Extreme Values of Meteorological Parameters

2.3.2.2.1 General

In this section, the normal and extreme statistics of wind, temperature, water vapor, precipitation, fog, and atmospheric stability are described. Long-term data from proximal weather stations (see Figure 2.3-1) have been used to supplement the shorter term onsite data.

2.3.2.2.2 Surface Winds

The percent frequency distribution of surface wind at Columbia, for the years 1951-1960 are shown on an annual and monthly basis in Tables 2.3-9 through 2.3-21 (Data Source 2.3.2-A). According to Table 2.3-9, the maximum frequency of surface wind on an annual basis, 10.1 percent, is from the southwest. The annual average wind speed is 7.0 miles per hour, including 14.4 percent calms. Onsite wind frequency distributions at the 10.5 and 61.5 meter levels are included in Tables 2.3-86A through 2.3-111B, discussed in Section 2.3.3 (Data Source 2.3.2-B). Similar to the offsite distribution, the maximum frequency of surface wind on an annual basis, 9.4 percent, is from the southwest, while the annual average wind speed is slightly lower, averaging 6.1 miles per hour (see Table 2.3-98B). RN 01-045

The "fastest mile" wind of record at Columbia and Greenville-Spartanburg for each month is presented in Table 2.3-22 (Data Sources 2.3.2-C and D).

Frequency distributions of wind direction persistence, determined from observations at 3 hourly intervals over a 5 year period (1965-1969) from Columbia, S.C. (Data Source 2.3.2-K) are presented in Figures 2.3-2 and 2.3-3. Persistence values illustrated are for one sector and for three sectors and within four wind speed classes. Persistence was maintained through calm or missing observations if it was maintained subsequent to them. Because of these criteria, the persistence intervals defined by the consecutive observations tend to have a bias toward long duration. Monthly and annual wind direction persistence, determined from hourly onsite observations at both the 10.5 and the 61.5 meter levels in 1975 (Data Source 2.3.2-B) are presented in Tables 2.3-23 through 2.3-48. These tabulated distributions, which have not considered stability class, indicate that most cases of persistence are less than 10 hours in duration. The maximum duration, 21 hours, occurred in the NNE sector.

2.3.2.2.3 Temperatures

Monthly and annual values of daily mean temperature, and average and extreme daily maximum and minimum temperatures are shown in Table 2.3-49 based on data records at Parr and Little Mountain (Data Source 2.3.2-E). Parr is located 3 miles southwest of the site at an elevation of 258’ and Little Mountain is located 9 miles southwest of the site at an elevation of 710’. Based on these data, the annual mean temperature in the site area is approximately 63° F. The monthly averages indicate that July is the hottest month and December the coldest month.

The monthly and annual diurnal distribution of temperature at the site during 1975 are shown in Tables 2.3-50 through 2.3-62 (Data Source 2.3.2-B). Values of the mean, absolute maximum and minimum, and average daily maximum and minimum temperatures for each month are also presented. The annual mean temperature from Table 2.3-62 is 17.2°C which is equivalent to the long-term mean of 63° F for the site area.

2.3.2.2.4 Water Vapor

Monthly and annual values of relative humidity for four different times of day, based on 7 years of record (1967-1973) at Columbia, are given in Table 2.3-63 (Data Source 2.3.2-C). Based on these data the annual average relative humidity is estimated to be about 73 percent.

Monthly and annual average dewpoint temperatures and extreme maximum and minimum dewpoint temperatures are shown in Table 2.3-64. These values are based on 1971-1975 data from Columbia, S.C. (Data Source 2.3.2-F). The monthly and annual diurnal distribution of dewpoint temperature, and relative humidity at the site during 1975 are shown in Tables 2.3-50 through 2.3-62 (Data Source 2.3.2-B). Values of the mean, absolute maximum and minimum, and average daily maximum and minimum for both parameters are also presented. The annual average relative humidity from Table 2.3-62 is 69 percent or slightly lower than the estimated long-term average of 73 percent.

2.3.2.2.5 Precipitation

Estimated monthly precipitation normals and mean number of days with precipitation equal to or greater than 0.5 inches at the site are presented in Table 2.3-65, based on data from Little Mountain, Santuck, and Winnsboro (Data Source 2.3.2-E). These data indicate that the rainfall is fairly well distributed throughout the year with an annual average of 45 inches. Monthly maximum precipitation as recorded at Columbia and Greenville- Spartanburg are also presented in Table 2.3-65 (Data Sources 2.3.2-C and D). The maximum value, 16.72 inches, occurred during August 1949 at Columbia.

Monthly and annual average snowfall expected at the site is given in Table 2.3-66, based on data from Little Mountain, Santuck, and Winnsboro (Data Source 2.3.2-E). These data give an annual expectancy of 2.4 inches of snow in the site area. Monthly maximum snowfall amounts at selected stations in the region are also presented in Table 2.3-66 (Data Sources 2.3.2-C. D, E, and G).

2.3.2.2.6 Fog

Heavy fog is defined as that fog which reduces visibility to one-fourth mile or less. The average number of days with heavy fog at Columbia and Greenville-Spartanburg are listed in Table 2.3-67 (Data Sources 2.3.2-C and D). These data indicate that there is a slight predominance of heavy fog days in winter with a minimum in late spring.

2.3.2.2.7 Atmospheric Stability

Based on data for the period 1965-1969 at Columbia, S.C., the monthly and annual frequency distributions of stability classes are shown in Table 2.3-68 (Data Source 2.3.2-H). The stability classes are based on the Pasquill classification (Data Source 2.3.2-I) and are summarized in Table 2.3-68. These data indicate that the frequency of stable classes reach a peak during the fall season.

Monthly summaries of the diurnal distribution of stability and stability persistence are presented in Tables 2.3-69 through 2.3-81 based on onsite data for the year 1975 (Data Source 2.3.2-B). Stability is determined from the 10-61 meter delta temperature measurements onsite and the class intervals specified in NRC Regulatory Guide 1.23.

The annual percentages by stability class are as follows:

A	B	C	D	E	F	G
3.6	2.0	5.4	35.0	31.6	12.9	9.5

These frequencies are not directly comparable to the long-term frequencies at Columbia, S.C., since the distributions are based on a different criteria for determining Pasquill stability classes.

The frequencies of seasonal and annual mixing heights are included and discussed in Section 2.3.1.3.

2.3.2.2.8 Representativeness of the Onsite Data

To demonstrate that the onsite data sample is representative of a long-term climatological average, concurrent data from Columbia S.C. (January through December, 1975) were compared to a longer data record for Columbia (January through December, 1956-1975). Comparisons of the wind frequency distributions and the stability class frequency distributions are presented in Table 2.3-82 (Data Sources 2.3.2-J and 2.3.2-N).

The wind frequencies are in good agreement with the exception of calm occurrences. Calms occur about 58 percent more frequently during the 1 year period as compared to the 20 year period of record. Telephone discussions with Columbia National Weather Service Station personnel indicate that there has been no change in wind sensor location or type during the period of comparison. The stability distributions are in excellent agreement. The major difference within any stability class was no more than about 2 percent. In conclusion, the comparison implies that the onsite data used in the Section 2.3 analyses are generally representative of longer term climatological conditions. The large percentage of calms during 1975 indicates that the diffusion meteorology for this year is probably below normal; yielding larger values of relative concentration than would occur over a longer period of record.

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

2.3.2.3.1 Impact of Physical Buildings

Potential modifications of the local meteorology at the site, resulting from the construction and operation of the Virgil C. Summer Nuclear Station, are believed to be small. The containment building and associated facilities are expected to have some small influence on local air flow; specifically, mechanical turbulence is expected downwind of the plant due to building wake effects.

2.3.2.3.2 Impact of Monticello Reservoir

The Monticello Reservoir can influence the micro-climate of the site. An evaluation of the influence is presented herein from two viewpoints: the influence of the reservoir on the diffusion climate and its relation to dispersion of accidental or routine releases of radionuclides, and the influence of the reservoir on other aspects of the local climate. The results of this evaluation have been found to be relatively insensitive to reservoir heat loading; effects of the reservoir are similar under equilibrium and heat loading conditions. The influence of this reservoir on the diffusion climate of the site has been investigated, and the findings are summarized as follows:

1. Table 2.8-83 presents the changes in the diffusion parameters (wind speed, sigma theta, and horizontal diffusion coefficient) measured as air moves offshore over the Chesapeake Bay. These data show the effect of water 2° F warmer than the air to water 7° F or more colder than the air. In general, the wind speeds increase, the wind range decreases, and the horizontal dispersion will tend to decrease as air moves over low-friction water surface, independent of temperature differences. The combination of these changes are generally offsetting, thereby having negligible effects on the diffusion climatology of the site.

2. Temperature differences between the reservoir and the ambient air boundary layer do have a significant influence on the site diffusion climate. Further, such temperature differences will operate to modify the climate for all receptors downwind of the reactor whether the over-water portion of the trajectory occurs before or after it passes the reactor. The effects are adverse when the water is colder than the air and favorable when the water is warmer than the air; these effects were numerically evaluated using the annual set of onsite air temperatures, and the achievement of projectional reservoir surface water temperatures.

3. The reservoir influence on the site diffusion characteristics was found to be ameliorative and significant, as most of the ambient air temperatures were below the water temperatures, especially during stable atmospheric conditions. Specifically, the 5 percentile hourly accident relative concentrations, which was calculated from σ_z values derived from ΔT measurements and σ_y values from wind range measurements, was predicted to drop from 3.3×10^{-4} to 2.15×10^{-4} seconds per cubic meter, as a result of reservoir modifications to the ΔT defined Pasquill Class.

4. It is recognized that neither surface roughness nor surface temperature changes are immediately effective in modifying atmospheric stability conditions. Our initial investigation used results obtained by Craig, Prophet and Van der Hoven and assumed that water warmer or colder than the air required 20 minutes of over water trajectory to significantly modify the air boundary layer stability. The simulation modeling evaluation, therefore, did not permit reservoir air temperature differences to be effected unless a 20 minute or more over water trajectory had occurred. It should also be noted that this study addresses the surface roughness changes on both low level turbulence and on wind speeds and found that although each was significant, considered by itself, the effect of both on dispersion at the reservoir were largely offsetting.

5. The impact of the Monticello Reservoir on the relative concentrations (C/Q) considering the applicability of modifications in the meteorological parameters and temperature differences between air and water surfaces are presented in Appendix B of the Virgil C. Summer Nuclear Station Environmental Report - Construction Stage. RN 01-045

6. The impact of the reservoir on the vertical plume spread is given in detail in Appendix B of the Virgil C. Summer Nuclear Station Environmental Report - Construction Stage.

7. The C/Q values determined without "reservoir modifications" were developed, as indicated, on the Appendix B, using Parr meteorological tower data; about 3 miles from the Virgil C. Summer Nuclear Station site. Although these meteorological data are different from that used in the FSAR, the effects of the simulation modeling, applied to either data set, must be quite similar. RN 01-045

The evaluation of the potential impact of Monticello Reservoir upon atmospheric conditions other than the diffusion climate was presented in Appendix B of the Virgil C. Summer Nuclear Station Environmental Report - Construction Permit Stage. The results of these evaluations, based on the achievement of the projected reservoir temperatures, remain valid and are summarized below:

1. The existence of Monticello Reservoir will alter the frictional coefficients of the land surface; however, the impact of this upon the wind speed and direction will be limited to the immediate vicinity of the reservoir.

2. No significant changes in the amount of precipitation are anticipated in the area.

3. Monticello Reservoir could warm the air as much as 5° F in periods of calm winds. This warming should only last for several hundred yards from the reservoir's shore before the warmed air mixes with the ambient air and approaches its original temperature.

4. The possible increase in the frequency of fogs was evaluated for two types of fog, advection and steam fog. For the more significant advection-type fog, the frequency increase was estimated to be greatest during the colder months; 3.6 percent was the greatest increase for those months considered. The summer months were estimated to have no change. Most of the increased fog frequency for advection fog was due to an earlier onset or a later dissipation (i.e., a longer duration) of an observed fog situation. Increases of up to 16 percent were estimated for the less significant, steam-type fog. The nature of this type of fog, however, would limit its effects to the air immediately over Monticello Reservoir and only a short distance inland. From this analysis, it is estimated that there will be an increase in the frequency of fog; however, it will not constitute a significant impact upon the atmospheric environment, except in the immediate vicinity of the reservoir.

2.3.2.4 Topographical Description

A detailed description of the topography within 5 miles of the site is shown in Figure 2.3-4. The radial lines shown in the figure bisect each of the 16 wind direction sectors. The maximum elevation along each of these radials and the corresponding distance from the plant are listed in Table 2.3-84. For comparison, the site elevation is approximately 435'.

General topographic features for a radius of 50 miles from the plant are shown in Figure 2.3-5.

Variable terrain has a potential to influence local diffusion characteristics. One possible influence, drainage wind conditions in the Broad River Valley, has been investigated using the CVNPA tower data. This valley is oriented north-northwest to south-southeast, and the tower stands on a bluff next to the river, but its base is lower than the nearby valley ridge lines.

When measured over three sectors (67.5°), the 23 foot level winds on the CVNPA tower show a primary directional frequency in those sectors centered on west (Data Source 2.3.2-L). The secondary frequency maximum is in the three sectors centered on east-northeast. These wind directions cross rather than parallel, the Broad River Valley. Similar wind distributions are observed at Charlotte, Columbia, and Greenville, with bimodel maxima near the west and east- northeast sectors (Data Source 2.3.2-M). It is evident that these frequency maxima are not local conditions caused by terrain influences.

The three wind sectors centered on north- northwest include all down-valley winds, and the three sectors centered on south- southeast include all up-valley winds. A comparison of the 23 foot level with the 195 foot level tower winds falling within these six sectors shows that the up-valley and down- valley winds are almost twice as frequent at the higher tower elevation than at the lower (Data Source 2.3.2-L). Drainage winds are, therefore, quite infrequent or non-existent in the portion of the Broad River Valley occupied by the Parr Reservoir.

An examination of the terrain near the plant, see Figure 2.3-4, shows that if valley drainage winds do occur occasionally over the Parr Reservoir, or in the Little River Valley tributary to the east of the plant, the plant and condenser-warmed Monticello Reservoir would be above and to the side of cool air circulation fields. It is concluded that valley drainage winds will not influence the diffusion climate of the Virgil C. Summer Nuclear Station.

2.3.3 ONSITE METEOROLOGICAL PROGRAMS

2.3.3.1 Pre-Operational Program

The pre-operational onsite meteorological program was designed to measure the parameters needed to evaluate the dispersive characteristics of the site for both the routine operational and the hypothetical accidental releases of radionuclides to the atmosphere. 02-01

The onsite preoperational meteorological monitoring program at Virgil C. Summer Station began with the initial delivery and set up of the system in June, 1973. System refinement for optimum availability, data recovery, and minimization of susceptibility to lightning damage continued through October, 1974. During this period corrective measures were undertaken (including re-wiring and regrounding of the system) along 02-01 with the development of detailed maintenance procedures in order to obtain the one year of Site Meteorological data required pursuant to Regulatory Guide 1.23 (Sept. 72) and license requirements (CPPR 550-3, 4-2-73) applicable to the Virgil C. Summer Nuclear Station. The date of initiation of the current measurements program was November, 1974. The required year of record for the onsite Meteorological Monitoring program ended on January, 1976 though the equipment has continued to be maintained and calibrated as explained in Section 2.3.3.1.2. In 1976 the instrumentation housing for the large tower site was relocated due to construction activities and a more accurate dew point measurement system installed.

2.3.3.2 Operational Program

The operational meteorological monitoring program for the Virgil C. Summer Nuclear Station is basically a continuation of selected parameters of the preoperational program. The purposes of the operational program are to provide: 02-01

1. Meteorological data useful in the estimation of short term diffusion characteristics to plant personnel on a timely basis.

2. A data base of certain meteorological information for the assessment of plant operational impacts.

The meteorological instrumentation accuracies for primary measurements meet the recommendations stated in Regulatory Guide 1.23, Revision 0 (September 1972). 02-01
(Reference DC09690-001)

The onsite meteorological tower is located at approximately the same elevation as the Reactor Building and far enough away from plant structures such that their influence on observed conditions is small. Both of these conditions contribute to the representativeness of the observed data for describing atmospheric dispersion conditions from the Reactor Building to the site boundary and the LPZ.

Section 2.3.2.3.2 discusses the influence of the reservoir on the diffusion climate. During winds from north-northwest through northeast, some modifications of atmospheric conditions may occur: first as the trajectory moves over the reservoir surface; and subsequently as it returns to land, passes the tower and the Reactor Building, and onto the site boundary and the LPZ. At all times with these wind directions the tower is likely to record higher wind speeds than prevail through the balance of a trajectory to the site boundary and the LPZ. However, the reduction in wind speed because of the friction of land surfaces will be accompanied by increased turbulence; the wind energy is converted to turbulent energy. The resultant dispersion values are not significantly altered by this conversion process.

On clear nights during light onshore wind conditions, the thermal stability of the air column may increase while the air column moves from the tower toward the site boundary and the LPZ. The evaluation mentioned above shows that with winds more than 3 mph, the over water trajectory is not likely to have modified the thermal stability significantly. In these cases the tower will observe the air column stability near its overland equilibrium value and its readings will be representative of the thermal stability which will prevail throughout the site boundary and LPZ trajectory. With winds in these directions at 3 mph or less, departures from overland stability values will be sensed at night by the tower, and the air column will move toward its more stable overland values during the trajectory from the reservoir shore to the site boundary and the LPZ. Conditions when the tower observed data may be somewhat unrepresentative and more favorable than the actual dispersion conditions downwind of the Reactor Building include the following:

1. When the wind direction is from the north-northwest through northeast, and

2. The wind speed is 3 mph or less, and

3. Overland thermal stabilities have equilibrium values of Pasquill E, F, or G, and

4. During night-time hours.

Onsite meteorological tower data for 1975 indicates the first three of these conditions occur about 5 percent of the time. If daytime conditions were eliminated, this percentage may be somewhat smaller. By comparison, winds from these four directions occur about 22 percent of the time.

In conclusion only about 5 percent or less of the time, tower stability observations may be somewhat nonconservative when used to represent dispersion conditions at the Summer Station. Wind speed may be higher than the representative overland values for about 22 percent of the time, but downwind modification to overland speeds are likely to be offset by compensatory increases in mechanically induced turbulence. The tower location is about as representative of the overall dispersion meteorology as any other available site location.

To account for the possible unconservative meteorological measurements at the tower when the reservoir is in operation, specific operating instructions have been developed. These operating instructions will only affect the night-time hours when the wind speeds are less than 3 mph and for wind directions from the north-northwest through northeast, stabilities of D, E, and F, with associated wind speeds of 3 mph or less, multiply the relative concentration calculated based on observed measurements by:

Time Periods of Concern	Factor
0-8 hours	2.35
> 8 hours	1.72
Annual average	1.60

These factors are applicable to distances from release to the LPZ.

Parameters to be measured on a continuing basis for the operational estimation of diffusion characteristics on site include differential temperature, wind speed, wind direction, and precipitation. Primary meteorological system wind speed, wind direction, and differential (10-61M) temperature observations are stored on the Integrated Plant Computer System (IPCS). 02-01

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The Integrated Plant Computer System (IPCS) located in the Control Building TSC Computer Room (CB-436) is used to acquire the meteorological data from the Weather Station located at the meteorological tower. This computer will perform data acquisition, averaging, display, and trending (short term). Permanent historical storage of data is performed on the General Data Processing Computers located in the Auxiliary Service Building Computer Room, to which the IPCS is linked. 02-01

The IPCS performs engineering unit conversion and calculates 15 minute averages using a minimum of 90 ten second samples.

2.3.3.2.1 Data Output and Recording System

Each parameter required by Technical Specification Section 3.3.3.4 is available for observation in the control room on a dedicated information display screen (TOC Meteorological and Rad Monitoring System) accessed from the VC Summer IPCS. All meteorological data is available for observation, trending, and historical data extraction using network workstations with the VC Summer IPCS. Meteorological data is recorded (stored) on the IPCS. RN 06-037

2.3.3.2.2 Data Processing

Data analysis for both wind distribution and diffusion characteristics of the site requires three basic atmospheric variables. These three variables together with the primary and secondary (backup) measurements for each are as follows:

Horizontal wind speed:	primary measurement - 10 meter wind speed secondary measurement - 61 meter wind speed
Horizontal wind direction:	primary measurement - 10 meter wind direction secondary measurement - 61 meter wind direction
Delta temperature:	primary measurement - 10 to 61 meters secondary measurement - 10 to 40 meters

The secondary measurements are needed only during periods of outage of the primary system. It should be noted that the entire wind measurement (wind speed and direction both) is replaced with secondary sensor data when either the primary wind speed or wind direction is invalid. Since the 1975 data period had almost 100 percent recovery of the primary variables, no substitution of the secondary variables was used in the data analyses.

The final step in the data reduction program is the listing, in sequential order, of the concurrent, hourly averaged values of the meteorological variables observed at the site. A sequential listing of the hourly data for a full year constitutes the annual meteorological record of the site. The annual record provides the input data for all types of meteorological analyses needed to define the site atmospheric dispersive qualities.

2.3.3.2.3 Instrumentation

Wind and temperature sensors are installed on a 62 meter self-supporting tower. A dewpoint sensor is installed separately next to the base of the tower. A precipitation sensor is installed on a 4 foot pedestal near the tower. A barometric sensor is installed in a data processor at the base of the tower. Two instrument elevators (primary and backup), with 8 foot instrument booms are installed on the tower, each providing a full set of wind and temperature measurements. The environmentally capable digital weather system processor is located at the base of the tower. The tower is located about 1500 feet west of the reactor complex at elevation 438'. The tower mounted sensors are as follows:

1. At 61 meters above ground level, the upper wind sensor and upper temperature sensor for the 10-61 meter differential temperature measurement are mounted on an 8 foot boom attached to the instrument elevator.

2. At 40 meters above ground level, the upper temperature sensor for the 10-40 meter differential temperature measurement is mounted on an 8 foot boom attached to the instrument elevator. RN 06-037

3. At 10 meters above ground level, the lower wind sensor and lower temperature sensor for the 10-61 meter and the 10-40 meter differential temperature measurements are mounted on an 8 foot boom attached to the instrument elevator.

Descriptions and accuracies of the instruments employed on the tower are given in Table 2.3-85F. Design Calculation # DC09690-001.

The major hardware of the totally digital meteorological system consists of the following major components for measurement, data processing, transmission, storage, and display.

A. Wind Speed/Direction sensors (10 and 61 meters) - The sensors are state of the art integrated speed and direction ultrasonic digital sensors.

B. Temperature Elements (10 and 61 meters) - The sensors are high quality RTDs connected directly to the main processor. Each RTD is installed in a powered aspirator.

C. Dewpoint Measurement (1.5 meters) - The dewpoint is calculated by the processor using a dedicated humidity probe with an integrated temperature measurement.

D. Precipitation (1.2 meters) - A tipping bucket type sensor is stationed locally.

E. Barometric Pressure - An integrated pressure sensor is built within the weather station cabinet.

F. Weather Station - The integrated digital weather station is a dedicated digital processor capable of receiving and processing all installed sensor inputs. It then processes all measurements for transmission via an RS-485 communications link to a fiber optic modem. The processor can be accessed locally for direct reading of data and retrieval of stored historical data. The weather station is battery backed for continued monitoring and data storage operation for up to 48 hours given a loss of the normal reliable power source.

G. Data Transmission - The digital data from the meteorological tower is communicated from the weather station to the plant computer via fiber optic cable.

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H. Data Storage - The primary storage location is the plant computer data storage files. All measured meteorological data is stored in dedicated files on the plant computer. The data is then processed for user applications and made available on any network workstation.

I. Data Display - The primary (technical specifications required) metrological information is provided for plant operations access on a dedicated display. This includes two levels of wind speed and direction (61 and 10 meters), ambient temperature (10 meters), two differential temperatures (61-10 and 40-10 meters), and precipitation. All current and historical meteorological data is available for access by any user on a plant network workstation.

2.3.3.2.4 Calibration and Maintenance

To assure data quality and accuracy, the weather instruments are calibrated in accordance with approved plant procedures. Manual field calibrations will be conducted in accordance with Technical Specification requirements. The procedures include the inspection of tower hardware, electronic component calibration when required, and verification of data communications.

Normal service includes various operational checks to reasonably assure 90 percent data recovery. A preventive maintenance schedule has been established for the purpose of performing routine instrument servicing and calibration. 02-01

The calibration of the meteorological system is performed when required according to accepted Nuclear Industry practices. The instrumentation used to calibrate the meteorological system (where applicable) has been maintained such that their recordings can be traced to the National Bureau of Standards. These procedures and the test instrument qualities ensure the quality of the meteorological measurements obtained from the Virgil C. Summer Nuclear Station. RN 06-037

In addition to the above calibration of the meteorological system, the following operational procedures are enforced: 02-01

- Daily Checks — To identify any abnormal functions (at least two per week)
- Biweekly Calibration Review — To identify need for maintenance or calibration

During the daily checks the verification is made that at least one data channel is functioning.

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The calibration review is made every two weeks or any time a channel is suspected to be malfunctioning.

The calibration review is performed by dedicated software analysis of the instrument performance.

These On-line Calibration Verification Programs, periodic calibrations, biweekly calibration checks, and daily checks, ensure that the measurements of the meteorological variables at Virgil C. Summer Nuclear Station are valid. Further verification that the procedures for the maintenance, data collection, and data reduction are in accordance with the recommendations of Regulatory Guide 1.23 (September 1972) is demonstrated by the greater than 90% data recovery for primary variables. 02-01 System calibration techniques have been upgraded beyond the requirements of Regulatory Guide 1.23 to reflect the current Nuclear Industry accepted practices of on-line monitoring and performance based directed calibration intervals. These techniques also reflect the modernization of sensors that are digital based with different associated calibration techniques.

2.3.3.3 Wind Roses by Pasquill Stability Classes

Annual monthly wind roses for each Pasquill stability class (and all classes combined) for the 1975 period of record at the Virgil C. Summer Nuclear Station are shown in Tables 2.3-86A through 2.3-111B. The first 13 tables are based on wind distributions at the 10.5 meter level while the last 13 tables are based on wind distributions at the 61.5 meter level. RN 01-045 The stability classifications for all tables are based on the 10-61 meter delta temperature measurements.

A discussion of the representativeness of the onsite data is provided in Section 2.3.2.2.8.

2.3.4 SHORT-TERM (ACCIDENT) DIFFUSION ESTIMATES

2.3.4.1 Objective

To evaluate potential health effects for the design basis accidents, hypothetical accidents are postulated to predict upper-limit activity concentrations and doses that might occur in the event of release to the atmosphere. Site-specific meteorological data was used to estimate atmospheric dispersion factors at the site boundary/exclusion area boundary (EAB), low population zone (LPZ) and control room.

According to 10 CFR Part 100, it is necessary to consider the doses for various time periods immediately following the onset of a postulated containment release at the EAB and for the duration of exposure for the LPZ. The relative air concentrations (χ/Qs) are estimated for various time periods ranging from 2 hours to 30 days.

Onsite meteorological data has been used to determine various postulated accident conditions as specified in Regulatory Guide 1.145 [1]. Compared to an elevated release, a ground-level release usually results in higher ground-level concentrations at downwind receptors because of less dilution from shorter traveling distances. Since the ground-level release scenario provides a bounding case, all of the releases were conservatively assumed to occur at the ground level.

2.3.4.2 Diffusion Calculations for EAB and LPZ RN 12-034

The NRC-sponsored PAVAN computer code, as described in NUREG/CR-2858 [2] has been used to estimate ground-level χ/Qs for potential accidental releases of radioactive material to the atmosphere. The term χ/Q (sec/m^3) is an expression of the relative dispersion occurring between a source (release) location and a receptor location. This relative dispersion can then be used to determine the expected atmospheric concentration at some defined distance away from the source for a known quantity of effluent released. The receptor locations in this analysis are defined as the VC Summer Unit 1 (EAB) and (LPZ) distances of 1 mile (1609 meters) and 3 miles (4828 meters used), respectively.

The PAVAN program implements the guidance provided in Regulatory Guide 1.145. Primarily, the code computes χ/Qs at the EAB and the LPZ boundary for each combination of wind speed and atmospheric stability class for each of 16 downwind direction sectors (*i.e.,* north, north-northeast, northeast, etc.). The χ/Q values calculated for each direction sector are then ranked in descending order, and an associated cumulative frequency distribution is derived based on the frequency distribution of wind speeds and stabilities for the complementary upwind direction sector. The χ/Q value that is equaled or exceeded 0.5% of the total time becomes the maximum sector-dependent χ/Q value.

The χ/Q values calculated above are also ranked independently of wind direction into a cumulative frequency distribution for the entire site. The PAVAN program then selects the χ/Qs that are equaled to or exceeded 5% of the total time.

The larger of the two values (*i.e.,* the maximum sector-dependent 0.5% χ/Q or the overall site 5% χ/Q) is used to represent the χ/Q value for a 0–2 hour time period. To determine χ/Qs for longer time periods, the program calculates an annual average χ/Q value using the procedure described in Regulatory Guide 1.111 [3]. The program then uses logarithmic interpolation between the 0 – 2 hour χ/Qs for each sector and the corresponding annual average χ/Qs to calculate the values for intermediate time periods (*i.e.,* 0 - 8 hours, 8 - 24 hours, 24 - 96 hours, and 96 - 720 hours). As suggested in NUREG/CR-2858, each of the sector-specific 0 – 2 hour χ/Qs provided in the PAVAN output file are examined for "reasonability" by comparing them with the ordered χ/Qs also presented in the model output.

The PAVAN model has been configured to calculate offsite χ/Q values, assuming both wake-credit allowed and wake-credit not allowed.

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The PAVAN model input data is presented below:

- Met data: joint frequency distributions of hourly averages of wind speed for each of the 16 standard azimuthal sectors for the 36 month period from 7/1/2003 to 6/30/2006
- Type of release: ground-level (a default height of 10 meters is used)
- Wind sensor height: 10 meters
- Vertical temperature difference: (60 meters – 10 meters)
- Number of wind speed categories: 12 (including calm)
- Building cross sectional area: 1740 meters^2

The minimum distance to the EAB as a function of direction from the plant is shown in Table 2.3-112. The resulting calculated χ/Qs are shown on Table 2.3-117 for the EAB and Table 2.3-118 for the LPZ.

2.3.4.3 Control Room Diffusion Estimates

Conservative estimates of the site specific control room diffusion factors (χ/Qs) for the control room were made using an atmospheric dispersion model and onsite meteorological data. The meteorological data consists of hourly data, covering the period from January 1, 2002, through December 31, 2006. Each record of the hourly data contains a location identifier, Julian day, hour, lower level (10 m) direction, lower level speed, stability class, upper level (60 m) direction, and upper level speed.

NRC's ARCON96 computer code [4] was used to calculate short term accident χ/Q values for the control room. The maximum predicted χ/Q values were determined in accordance with NRC Regulatory Guide 1.194 [5].

Input to the ARCON96 model other than the site specific meteorological data consisted of the data provided in Table 2.3-121. Table 2.3-122 provides the release and receptor elevations and the horizontal distance between the release and receptor points. RN 12-034

The resultant control room χ/Qs are provided in Table 2.3-123.

2.3.5 LONG-TERM (ROUTINE) DIFFUSION ESTIMATES

2.3.5.1 Objective

The 1975 onsite meteorological data record is used to provide realistic estimates of annual average atmospheric dilution factors to a distance of 50 miles (80.5 km) from the plant for use in calibrating the dispersion through air pathways of radionuclides released during routine plant operations.

2.3.5.2 Calculations

The average annual dilution factors which are applicable to routine venting or other routine gaseous effluent releases, have been evaluated from the data record using the technique presented in Regulatory Guide 1.111.

The equation used, for ground level release, is:

$$\chi/Q\ (i, n) = \frac{2.032T}{nD} \sum_{j=1}^{n} \frac{K}{\bar{\mu}(j)[\sigma_z^2(j) + \frac{cV^2}{\pi}]^{1/2}} \qquad \text{(Equation 2.3-3)}$$

Where:

χ/Q (i, n)	=	average dilution factor (seconds/meter^3) over n hours in sector i at distance D.
σ_z (j)	=	vertical dispersion coefficient for hour j (dependent on Pasquill class) at distance D.
$\bar{\mu}$(j)	=	average wind speed (meter/second) for hour j.
D	=	distance from reactor containment building to various distances up to 80 kilometers.
V	=	height of highest adjacent building (50.9 meters).
c	=	building wake shape factor (0.5).
K	=	wind direction dependent variable: 1 if wind blowing to sector I. 0 if wind not blowing to sector i.

T = terrain correction factor; open terrain, valley flow, or other factor for χ/Q adjustment (distance dependent).
n = number of hourly observations in data period.

The wake factor ($cV^2/\wp$) influence is limited such that the resultant χ/Q may not be reduced greater than a factor of $\sqrt{3}$; i.e., [χ/Q] wake $\geq$ ($1/\sqrt{3}$)(χ/Q) no wake]. Calm conditions are included in the calculations by setting the wind speed to one half the threshold value of the speed or direction sensor and distributing them among the 16 direction sectors in proportion to the directional frequencies of the 1 and 2 mph speed class intervals in the appropriate stability class. RN 01-045

Equation 2.3-3 is the straight-line trajectory model defined in NRC Regulatory Guide 1.111 assuming a ground level release mode; that is, the release occurs at an elevation less than or equal to the adjacent building height. Since the site is basically in open terrain with gently rolling hills, the T factor in Equation 2.2-3 is the open terrain correction factors given in Regulatory Guide 1.111.

Annual average dilution factors to a distance of 50 miles from the plant are shown in Table 2.3-119. The maximum value at the minimum EZB distance of 1 mile, 5.3×10^{-6} seconds/meter^3 occurs southeast of the plant. There are no higher values beyond the site boundary since for ground level releases, concentrations monotonically decrease from the release point to all locations downwind.

Long term dilution factor estimates for distances out to 5 miles are displayed on Figure 2.3-7. Estimates out of 50 miles are illustrated on Figure 2.3-8.

The annual average dilution factors given in Table 2.3-119 and Figures 2.3-7 and 2.3-8 are quite conservative for the reasons given in the last paragraph of Section 2.3.4.2.4. It is expected that over a long period of operation after the Monticello Reservoir is functioning as a heat sink the actual dilution factors will average significantly less than these values at all distances from the site.

The annual average dilution factors are based upon the total meteorological data available for the year of record. These data are representative and applicable to releases of a continuous nature or intermittent (batch) release occurring randomly throughout the year.

Section 11.3 states that planned discharges for gases stored by the GWPS will be made during periods of favorable meteorological conditions. Since the releases will occur throughout the year, the annual average dispersion conditions during these releases will be greater than those depicted by the annual average χ/Q values using all meteorological observations during the year. That is, the resultant annual average χ/Q values using meteorological conditions during releases will be less than the annual average χ/Q values, given in the FSAR, using the full year of data. Therefore, the annual average χ/Q values presented in the FSAR are conservative when used to estimate the diffusion from these intermittent controlled releases.

The actual methodology for determining the conditions for gaseous releases from the GWPS are based on the averaged values of the annual average relative concentrations, normalized by the frequency of occurrence, at the exclusion area boundary (EAB) and the low population zone (LPZ). Using these average relative concentrations for the two distances, the wind speeds associated with each Pasquill stability class that would yield this annual average concentration can be determined. These wind speeds for the two locations were compared and the maximum value used in establishing criteria for releases. These criteria are presented in Table 2.3-120. For a given observation of differential temperature (ΔT) or Pasquill stability class, the wind speeds must be equal to or greater than the value indicated in Table 2.3-120 in order to have conditions permitting the initiation of GWPS gaseous effluent releases.

2.3.6 REFERENCES

1. U. S. NRC, *Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants,* Regulatory Guide 1.145, Revision 1, November 1982.

2. U. S. NRC, NUREG/CR-2858, *PAVAN: An Atmospheric-Dispersion Program for Evaluating Design-Basis Accidental Releases of Radioactive Materials from Nuclear Power Stations*, PNL-4413, November 1982.

3. U. S. NRC, *Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors,* Regulatory Guide 1.111, Revision 1, July 1977. RN 12-034

4. U. S. NRC, NUREG/CR-6331, *Atmospheric Relative Concentrations in Building Wakes*, PNNL-10521, Revision 1, May 1997.

5. U. S. NRC, *Atmospheric Relative Concentrations for Control Room Radiological Habitability Assessments at Nuclear Power Plants*, Regulatory Guide 1.194, June 2003.

TABLE 2.3-1

ESTIMATED POINT RAINFALL MAXIMA (INCHES) FOR THE SITE AREA

	Return Period (Years)						
Duration	1	2	5	10	25	50	100
30 Min.	1.10	1.35	1.70	2.00	2.20	2.45	2.80
1 Hr.	1.40	1.65	2.15	2.40	2.80	3.15	3.40
2 Hr.	1.75	2.00	2.60	2.90	3.40	3.80	4.25
3 Hr.	1.80	2.25	2.80	3.35	3.80	4.15	4.65
6 Hr.	2.25	2.65	3.40	3.90	4.60	5.00	5.75
12 Hr.	2.60	3.10	4.00	4.60	5.15	6.00	6.55
24 Hr.	3.00	3.50	4.50	5.40	6.00	6.90	7.60

Data Source: 2.3.1-F

TABLE 2.3-2

MAXIMUM RECORDED POINT RAINFALL (INCHES)
FOR SELECTED STATIONS IN THE REGION

	Greenville (1918-1932; 1938-1961)[1]		Spartanburg (1941-1961)		Columbia (1897-1973)	
Duration	Amount	Date	Amount	Date	Amount	Date
5 Min.	0.80	7/4/56	0.50[3]	9/22/51	0.74	8/20/11
10 Min.	1.27	7/4/56	0.95[3]	9/22/51	1.05	7/26/22
15 Min.	1.52	7/4/56	1.24[3]	9/22/51	1.39	7/26/22
30 Min.	2.30	7/9/28	1.85[3]	9/22/51	2.40	1965
60 Min	3.63	9/6/51	3.20	9/22/51	3.90	1965
2 Hr.	4.49	9/6/51	3.53	9/22/51	5.03	1965
3 Hr.	5.29	9/6/51	4.42	10/6/49	5.03	1965
6 Hr.	5.78	9/6/51	6.19	10/6/49	5.03	1965
12 Hr.	6.20	9/6/51	6.67	10/6/49	6.77	8/16/49
24 Hr.	8.20	5/7/10[2]	7.00[4]	8/15/28	7.66[5]	8/16/49

1. Period of record is in parentheses on this and succeeding tables except as otherwise indicated.
2. Period of record is 1893 through 1961.
3. Period of record is 1951 through 1961.
4. Period of record is 1897 through 1961.
5. Period of record is 1887 through 1973.

Data Source: 2.3.1-A and G.

TABLE 2.3-3

EXTREME SNOWFALLS (INCHES)
AT SELECTED STATIONS IN THE REGION

	Greenville (1905-1970)		Spartanburg (1899-1970)		Columbia (1897-1973)	
Period	Amount	Date	Amount	Date	Amount	Date
24 Hr.	14.4	12/16-17/30	15.0	2/14-15/02	15.7	2/73
Calendar Month	15.3	3/60	15.0	2/02	16.0	2/73
Season	20.4	1935-36	17.5	1901-02	18.2	1972-73

Month	Greenville - Spartanburg Airport (1963-1973)		Columbia (1947-1973)	
	Amount	Year	Amount	Year
January	9.1	1966	2.2	1973
February	6.9	1969	16.0	1973
March	6.6	1971	3.2	1960
April	0.0		0.0	
May	0.0		0.0	
June	0.0		0.0	
July	0.0		0.0	
August	0.0		0.0	
September	0.0		0.0	
October	0.0		0.0	
November	1.9	1968	T [1]	1968 [2]
December	11.4	1971	9.1	1958

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1 Trace, an amount too small to measure.

2 Amount also occurred on earlier date(s).

Data Source: 2.3.1-A, I, and J.

TABLE 2.3-4

WEIGHT OF SNOW AND ICE ON ROOF OF EACH SEISMIC CATEGORY I STRUCTURE

Name of Safety-Related Structure	Estimated Horizontal Roof Area (ft^2)	Weight of Snow And Ice (total lbs) [1]
Auxiliary Building	15,240	198,120
Reactor Building	14,070	182,910
Control Room	12,030	156,390
Intermediate Building	21,500	279,500
Diesel Generating Building	4,730	61,490
Condensate Storage Tank	1,300	16,900
Fuel Handling Building	6,410	83,330
Service Water Intake Structure	3,170	41,210

1 Based on the 100 year return period ground snow load of 13 lbs/ft^2 without applying snow load coefficients given in Data Source 2.3.1-K.

TABLE 2.3-5

AVERAGE MONTHLY AND SEASONAL
NUMBER OF OCCURRENCES OF HAIL
3/4 INCH IN DIAMETER OR GREATER IN SOUTH CAROLINA (1955-1967)

January	0.0	July	0.6
February	0.0	August	0.2
March	0.9	September	0.0
April	1.0	October	0.1
May	1.9	November	0.1
June	0.8	December	0.1
Winter	0.1	Summer	1.5
Spring	3.8	Autumn	0.2

Annual 5.6

Data Source: 2.3.1-N

TABLE 2.3-6

MEAN NUMBER OF THUNDERSTORM DAYS [1]
AT SELECTED STATIONS IN THE REGION

Period	Columbia (1948-1973)	Greenville (1884-1930)	Greenville-Spartanburg Airport (1963-1973)
January	1	* [2]	*
February	1	1	*
March	3	3	3
April	4	4	3
May	6	8	6
June	9	9	6
July	13	13	12
August	10	9	7
September	4	6	3
October	1	1	1
November	1	1	1
December	*	1	1
Winter	2	2	1
Spring	13	15	12
Summer	32	31	25
Autumn	6	8	5
Annual	54	56	43

1 Defined as a day on which thunder is heard at the station.
2 Less than one half.

Data Source: 2.3.1-A, I, O

TABLE 2.3-6A

SEASONAL/ANNUAL ESTIMATES OF LIGHTNING STRIKES TO SAFETY-RELATED STRUCTURES

Safety-Related Structure	Winter (DJF)	Spring (MAM)	Summer (JJA)	Fall (SON)	Annual
Auxiliary Building	0.006	0.024	0.059	0.011	0.099
Reactor Building	0.026	0.115	0.282	0.053	0.476
Control Room	0.007	0.029	0.071	0.013	0.120
Intermediate Building	0.008	0.034	0.085	0.016	0.143
Diesel Generating Building	0.002	0.010	0.025	0.005	0.043
Fuel Handling Building	0.007	0.029	0.072	0.014	0.122
Service Water Intake Building	0.001	0.004	0.011	0.002	0.018

* Reference: Marshall, J. L., Lightning Protection, 1973. (2.3.1-P1)

TABLE 2.3-6B

SOUTH CAROLINA COUNTIES IN
THE TORNADO STUDY AREA

Chester	Union
Fairfield	Laurens
Saluda	Lexington
Richland	Calhoun
Kershaw	Orangeburg
Aiken	Barnwell
Edgefield	McCormick
Greenwood	Newberry

TABLE 2.3-6C

CHRONOLOGICAL LISTING OF TORNADOES
IN VIRGIL C. SUMMER STUDY AREA (1950-1976)

Number	Date	Initial County	Length Miles	Area Class[1]	Intensity Class[2]
1	3/3/52	Orangeburg	U*	MI	4
2	5/11/52	Barnwell	45	GI	2
3	6/12/52	Barnwell	U	MI	3
4	6/1/53	Orangeburg	10	MI	3
5	2/28/54	Richland	U	MI	1
6	3/14/54	Orangeburg	U	MI	2
7	3/14/54	Aiken	1	ME	4
8	3/31/54	Kershaw	U	MI	3
9	3/31/54	Lexington	U	MI	1
10	3/31/54	Orangeburg	U	MI	1
11	5/23/54	Chester	U	MI	1
12	3/13/55	Saluda	10	MA	5
13	4/6/55	Chester	1.5	ME	4
14	5/24/55	Aiken	U	ME	2
15	6/11/55	Richland	U	MI	3
16	4/5/57	Lexington	25	ME	4
17	4/5/57	Newberry	3	ME	2
18	4/8/57	Union	14.5	MA	5
19	4/22/58	Greenwood	U	MI	2
20	4/22/58	Calhoun	16	MA	3
21	4/29/59	Orangeburg	< 0.1	MI	1
22	3/30/60	Laurens	10	ME	4
23	3/30/60	Newberry	6	ME	4
24	2/24/61	Aiken	0.5	MI	2
25	2/24/61	Aiken	0.5	MI	2
26	2/24/61	Orangeburg	0.5	MI	2
27	11/23/61	Orangeburg	0.1	MI	2
28	1/6/62	McCormick	1	MI	4
29	7/24/62	Orangeburg	1	MI	2
30	4/30/63	Barnwell	1	ME	1
31	8/20/63	Orangeburg	0.3	MI	3
32	9/28/63	Orangeburg	0.5	MI	2
33	9/28/63	Lexington	2	ME	1
34	4/8/64	Barnwell	U	MI	1
35	4/8/64	Orangeburg	< 0.1	MI	1
36	7/3/64	Richland	< 0.1	MI	2

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*U = unknown by Weather Bureau

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TABLE 2.3-6C (Continued)

Number	Date	Initial County	Length Miles	Area Class[1]	Intensity Class[2]
37	8/29/64	Richland	1	MI	3
38	8/29/64	Kershaw	0.1	MI	2
39	3/26/65	Richland	< 0.1	MI	1
40	5/24/65	Orangeburg	< 0.1	MI	1
41	7/23/65	Orangeburg	< 0.1	MI	2
42	8/16/65	Kershaw	3	MI	3
43	8/25/65	Aiken	< 0.1	MI	1
44	4/7/67	Kershaw	2	MA	2
45	5/29/67	Richland	0.5	MI	4
46	11/24/67	Richland	1	MI	4
47	4/18/69	Newberry	4	ME	2
48	4/18/69	Kershaw	0.5	ME	4
49	4/18/69	Kershaw	0.8	MI	3
50	4/18/69	Newberry	2	ME	3
51	2/22/71	Calhoun	10	ME	3
52	3/3/71	Orangeburg	6	ME	2
53	5/12/71	Richland	0.3	MI	1
54	1/10/72	McCormick	2	ME	1
55	1/10/72	Lexington	6	ME	4
56	1/13/72	Barnwell	10	ME	5
57	5/24/73	Barnwell	40	ME	1
58	2/22/74	Lexington	1	MI	2
59	3/21/74	McCormick	< 1	ME	5
60	3/21/74	Edgefield	1	MI	5
61	3/21/74	Calhoun	0.5	MI	3
62	2/18/75	Barnwell	3	ME	4
63	5/15/75	Chester	0.1	MI	4
64	5/15/75	Newberry	0.1	MI	3
65	9/17/75	Aiken	1	MI	2
66	11/12/75	Edgefield	0.5	MI	5
67	3/16/76	Orangeburg	< 0.1	MI	2
68	5/15/76	Orangeburg	3	MI	2
69	5/15/76	Richland	4	MI	3
70	5/28/76	Barnwell	3.5	MI	3
71	5/28/76	Barnwell	0.5	MI	1

1 MI = Micro
ME = Meso
MA = Regular
GI = Giant

2 Intensity Classes are defined in Table 2.3-6D

TABLE 2.3-6D

CATEGORIES FOR DAMAGING WINDS

Category	Wind Speed (mph)	Expected Damage
1	50 - 90	Trees uprooted, blown down
2	80 - 120	Partial roof damage, house trailers moved or rolled
3	100 - 150	Total roof removal, minor home damage
4	120 - 180	Small buildings damaged, partial to extensive home damage, weak structures demolished
5	150 - 250	Homes destroyed, substantial buildings damaged
6	225 - 300+	Catastrophic destruction, substantial buildings destroyed

TABLE 2.3-7

DIURNAL DISTRIBUTION OF WIND STORMS FOR SOUTH CAROLINA (1955-1967)

Time	Number of Occurrences [1]	Times	Number of Occurrences
0100	3	1300	7
0200	2	1400	8
0300	0	1500	18
0400	0	1600	29
0500	2	1700	15
0600	1	1800	10
0700	0	1900	18
0800	3	2000	8
0900	2	2100	6
1000	4	2200	3
1100	2	2300	0
1200	2	2400	1

1. During the one-hour period ending at the indicated time.
   Data Source: 2.3.1-N

TABLE 2.3-8

ESTIMATED MIXING HEIGHTS AND WIND SPEEDS
FOR THE GENERAL SITE AREA

	Morning		Afternoon	
Season	Mixing Height (Meters)	Wind Speed (Meters/Second)	Mixing Height (Meters)	Wind Speed (Meters/Second)
Winter	380	6.0	1000	7.0
Spring	380	5.3	1640	7.4
Summer	400	4.5	1600	5.6
Fall	300	4.5	1350	6.0
Annual	370	5.4	1400	6.6

EPISODES OF HIGH AIR POLLUTION POTENTIAL LASTING
TWO OR MORE DAYS AT COLUMBIA, SOUTH CAROLINA

Mixing Height (Meters)	Wind/Speed (Meters/Second)		
	≤ 2	≤ 4	≤ 6
≤ 500	0	0	0
≤ 1000	0	2	13
≤ 1500	0	15	60
≤ 2000	0	30	100

EPISODES OF HIGH AIR POLLUTION POTENTIAL LASTING
FIVE OR MORE DAYS AT COLUMBIA, SOUTH CAROLINA

Mixing Height (Meters)	Wind/Speed (Meters/Second)	
	≤ 4	≤ 6
≤ 500	0	0
≤ 1000	0	0
≤ 1500	1	3
≤ 2000	2	13

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Data Source: 2.3.1-U

TABLE 2.3-9

ANNUAL PERCENT FREQUENCY DISTRIBUTION OF WIND
AT COLUMBIA, S. C. (1951-1960)

Wind Direction	Wind Speed (miles/hour) 0-3	4-7	8-12	13-18	19-24	≥ 25	Total	Mean Speed
N	0.5	2.2	1.6	0.5	+	+	4.9	7.7
NNE	0.6	2.6	2.4	0.9	0.1	+	6.5	8.3
NE	0.9	3.4	2.8	0.9	+	+	8.1	7.7
ENE	0.7	2.6	1.6	0.5	+	+	5.3	7.1
E	0.6	2.1	0.9	0.2	+	+	3.7	6.4
ESE	0.3	1.5	1.1	0.2	+	+	3.1	7.3
SE	0.4	1.6	0.9	0.2	+	+	3.1	7.1
SSE	0.4	1.3	0.8	0.4	0.1	+	3.0	8.0
S	0.6	1.8	1.3	0.7	0.1	+	4.5	8.1
SSW	1.0	2.7	2.3	1.3	0.2	+	7.4	8.6
SW	1.3	3.9	3.0	1.6	0.3	+	10.1	8.4
WSW	0.9	2.7	1.9	1.5	0.4	0.1	7.4	9.1
W	0.9	1.9	1.3	1.0	0.3	+	5.4	8.8
WNW	0.5	1.5	1.3	1.1	0.2	+	4.7	9.5
NW	0.5	1.8	1.3	0.6	0.1	+	4.3	8.4
NNW	0.4	1.6	1.4	0.6	0.1	+	4.1	8.3
Calm	14.4						14.4	
Total	24.8	35.0	25.9	12.1	1.8	0.3	100.0	7.0

"+" indicates percentages less than .05 but greater than zero

Data Source: 2.3.2-A

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TABLE 2.3-10

JANUARY PERCENT FREQUENCY DISTRIBUTION OF WIND AT COLUMBIA, S.C. (1951-1960)

Wind Direction	Wind Speed (miles/hour) 0-3	4-7	8-12	13-18	19-24	≥25	Total	Mean Speed
N	0.5	1.8	1.1	0.7	.1		4.1	8.0
NNE	0.4	1.6	1.5	0.5	.1	+	4.1	8.2
NE	0.9	2.9	2.2	0.6	+		6.6	7.3
ENE	0.7	1.9	1.2	0.4			4.2	7.0
E	0.6	1.7	0.6	0.1	+		3.0	5.7
ESE	0.4	0.9	0.3	0.1	+		1.6	6.3
SE	0.5	1.0	0.3	+			1.8	5.6
SSE	0.4	0.8	0.4	0.3	0.1	+	2.1	8.5
S	0.7	1.5	0.8	0.6	0.1		3.6	7.7
SSW	1.0	2.0	1.9	1.5	0.3	0.1	6.9	9.3
SW	1.4	4.0	2.7	2.4	0.4	+	10.9	9.0
WSW	1.3	3.3	2.3	2.3	0.5	+	9.7	9.4
W	1.3	2.4	1.7	1.9	0.6	0.1	7.9	9.6
WNW	0.7	1.8	1.6	1.6	0.3	+	6.1	9.7
NW	0.8	2.1	2.0	1.4	0.1		6.4	8.8
NNW	0.5	1.8	2.0	1.1	0.1		5.5	9.1
Calm	15.6						15.6	
Total	27.6	31.2	22.7	15.5	2.8	0.3	100.0	7.2

"+" indicates percentages less than .05 but greater than zero

Data Source: 2.3.2-A

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TABLE 2.3-11

FEBRUARY PERCENT FREQUENCY DISTRIBUTION OF WIND
AT COLUMBIA, S. C. (1951-1960)

Wind Direction	Wind Speed (miles/hour) 0-3	4-7	8-12	13-18	19-24	≥ 25	Total	Mean Speed
N	0.5	2.0	1.4	0.4	+		4.4	7.6
NNE	0.6	2.4	2.5	0.8	+		6.3	8.0
NE	0.7	3.0	2.8	1.3	+		7.7	8.3
ENE	0.8	2.7	1.4	0.4			5.3	6.9
E	0.6	2.5	1.0	0.2			4.3	6.4
ESE	0.3	1.1	0.6	0.1			2.1	6.5
SE	0.4	1.0	0.5	0.2		+	2.1	7.0
SSE	0.3	1.0	0.6	0.5	0.2	+	2.7	9.3
S	0.4	1.2	1.0	1.0	0.3	+	3.9	9.9
SSW	0.8	1.8	2.1	1.8	0.4	0.1	7.1	10.1
SW	1.1	2.9	3.0	2.4	0.5	0.1	10.0	9.8
WSW	0.9	2.3	2.0	2.0	0.5	0.2	7.8	10.2
W	1.0	2.1	2.1	1.9	0.4	+	7.5	9.8
WNW	0.6	2.0	2.1	1.8	0.4	0.1	7.0	10.1
NW	0.4	1.8	1.4	0.7	+	0.1	4.4	8.6
NNW	0.4	1.7	1.8	0.6	+		4.5	8.2
Calm	12.6						12.6	
Total	22.4	31.7	26.3	16.2	2.8	0.7	100.0	7.8

"+" indicates percentages less than .05 but greater than zero

Data Source: 2.3.2-A 02-01

TABLE 2.3-12

MARCH PERCENT FREQUENCY DISTRIBUTION OF WIND AT COLUMBIA, S. C. (1951-1960)

Wind			Wind Speed (miles/hour)					Mean
Direction	0-3	4-7	8-12	13-18	19-24	≥25	Total	Speed
N	0.4	2.1	1.6	0.6	0.1		4.7	8.1
NNE	0.5	1.9	2.1	0.7	0.1		5.3	8.3
NE	0.5	3.1	2.6	0.8	+		6.9	7.9
ENE	0.3	2.2	2.1	0.8	+		5.5	8.2
E	0.6	1.8	1.2	0.2	+		3.8	6.8
ESE	0.3	1.3	0.7	0.3			2.4	7.4
SE	0.2	1.1	0.8	0.3	+		2.4	8.2
SSE	0.2	1.0	0.6	0.7	0.1	+	2.7	9.7
S	0.2	1.0	1.1	1.0	0.2	+	3.5	10.5
SSW	0.6	1.7	2.3	1.9	0.4	0.1	6.9	10.5
SW	0.9	3.2	2.9	2.5	0.7	0.1	10.3	10.2
WSW	0.7	2.3	2.0	2.3	0.9	0.3	8.5	11.4
W	0.8	2.4	1.9	2.0	0.7	0.1	7.9	10.6
WNW	0.6	1.8	2.0	2.4	0.8	0.1	7.5	11.4
NW	0.3	1.9	1.7	1.4	0.2	+	5.4	9.7
NNW	0.3	2.1	2.3	1.0	0.1		5.9	9.0
Calm	10.3						10.3	
Total	17.5	30.8	27.8	18.8	4.3	0.8	100.0	8.6

"+" indicates percentages less than .05 but greater than zero

Data Source: 2.3.2-A

TABLE 2.3-13

APRIL PERCENT FREQUENCY DISTRIBUTION OF WIND
AT COLUMBIA, S. C. (1951-1960)

Wind			Wind Speed (miles/hour)					Mean
Direction	0-3	4-7	8-12	13-18	19-24	≥ 25	Total	Speed
N	0.2	1.2	1.7	0.7	0.1		3.9	9.4
NNE	0.2	1.0	1.3	0.7	0.2	+	3.5	10.3
NE	0.7	1.7	1.8	0.6	0.1		4.8	8.0
ENE	0.5	1.7	1.6	0.6	+		4.4	8.0
E	0.4	2.2	1.0	0.3			4.0	6.8
ESE	0.2	1.6	1.5	0.3			3.7	8.2
SE	0.3	1.7	1.3	0.6	0.1	+	3.9	8.3
SSE	0.3	1.4	1.6	1.3	0.3	0.1	4.9	10.4
S	0.5	1.8	2.6	1.6	0.3		6.9	10.0
SSW	0.6	2.9	3.8	2.9	0.6	0.2	11.1	10.8
SW	0.7	3.5	3.2	2.7	0.7	0.1	10.9	10.2
WSW	0.7	2.2	2.0	2.2	1.0	0.2	8.4	11.4
W	0.6	1.8	1.1	1.4	0.7	0.1	5.6	10.7
WNW	0.2	1.1	1.8	1.6	0.5	0.1	5.3	11.8
NW	0.3	1.4	1.4	0.7	0.1	+	4.0	9.0
NNW	0.2	1.3	1.4	0.9	0.1	+	3.8	9.7
Calm	10.9						10.9	
Total	17.5	28.5	29.1	19.2	4.8	1.0	100.0	8.8

“+” indicates percentages less than .05 but greater than zero

Data Source: 2.3.2-A

TABLE 2.3-14

MAY PERCENT FREQUENCY DISTRIBUTION OF WIND
AT COLUMBIA, S. C. (1951-1960)

Wind Direction	Wind Speed (miles/hour) 0-3	4-7	8-12	13-18	19-24	≥25	Total	Mean Speed
N	0.3	2.1	1.3	0.3	+		4.2	7.5
NNE	0.2	2.2	1.6	0.7	0.1		4.8	8.4
NE	0.3	2.3	2.3	1.2	0.1		6.2	8.8
ENE	0.5	2.7	2.2	0.5			5.9	7.6
E	0.5	2.1	1.5	0.3			4.4	7.2
ESE	0.3	1.4	1.9	0.3			3.8	7.8
SE	0.5	1.8	1.4	0.3	+		4.0	7.3
SSE	0.5	1.2	1.2	0.4			3.2	7.6
S	0.6	2.1	1.3	0.6	+		4.5	7.5
SSW	1.0	2.8	2.9	1.1	0.1	+	8.1	8.3
SW	1.3	4.5	3.6	1.5	0.2	+	11.1	8.1
WSW	0.9	3.7	2.8	1.5	0.3		9.3	8.5
W	0.7	2.4	1.4	1.0	0.2	0.1	5.8	8.5
WNW	0.3	1.5	1.6	1.3	0.1	+	4.8	9.8
NW	0.4	2.1	1.9	0.8	+		5.2	8.2
NNW	0.2	1.7	1.3	0.3	+		3.6	7.7
Calm	11.2						11.2	
Total	19.9	36.5	30.2	12.1	1.2	0.1	100.0	7.2

"+" indicates percentages less than .05 but greater than zero

Data Source: 2.3.2-A

TABLE 2.3-15

JUNE PERCENT FREQUENCY DISTRIBUTION OF WIND
AT COLUMBIA, S. C. (1951-1960)

Wind Direction	0-3	4-7	Wind Speed (miles/hour) 8-12	13-18	19-24	≥ 25	Total	Mean Speed
N	0.3	1.9	1.0	0.3	+		3.6	7.3
NNE	0.7	2.1	1.8	0.5	+	+	5.1	7.7
NE	1.0	3.1	2.5	0.7	+		7.3	7.4
ENE	0.9	3.2	1.6	0.3	+		6.1	6.6
E	0.6	2.0	1.1	0.1			3.8	6.6
ESE	0.3	2.1	1.8	0.4			4.6	7.6
SE	0.6	2.4	1.4	0.4	+	+	4.9	7.3
SSE	0.7	2.2	1.2	0.4	+		4.6	7.1
S	1.0	2.4	1.6	0.6	0.1		5.7	7.2
SSW	0.9	4.0	2.5	1.2	0.1	+	8.7	7.7
SW	1.2	4.4	3.9	1.4	0.2		11.0	8.1
WSW	0.5	2.9	2.0	1.5	0.1		7.1	8.7
W	0.6	2.0	1.2	0.6	0.1		4.4	7.7
WNW	0.4	1.7	1.5	0.7	+		4.4	8.3
NW	0.5	2.0	1.3	0.4			4.2	7.2
NNW	0.3	1.3	0.9	0.4			2.8	7.7
Calm	11.8						11.8	
Total	22.2	39.7	27.6	9.9	0.6	+	100.0	6.7

"+" indicates percentages less than .05 but greater than zero

Data Source: 2.3.2-A

TABLE 2.3-16

JULY PERCENT FREQUENCY DISTRIBUTION OF WIND
AT COLUMBIA, S. C. (1951-1960)

Wind Direction	0-3	4-7	Wind Speed (miles/hour) 8-12	13-18	19-24	≥ 25	Total	Mean Speed
N	0.4	1.5	0.9	0.2	+		3.0	7.1
NNE	0.5	2.3	1.6	0.4	0.1	+	4.9	7.5
NE	1.1	2.8	2.1	0.6	+		6.8	7.3
ENE	0.7	3.0	1.9	0.7			6.3	7.3
E	0.4	2.4	1.2	0.3			4.4	6.8
ESE	0.4	2.3	1.7	0.4			4.7	7.4
SE	0.3	2.4	1.7	0.3	+		4.8	7.4
SSE	0.5	2.1	1.5	0.4	0.1		4.5	7.4
S	0.8	3.1	2.2	0.8	+		6.8	7.5
SSW	1.1	4.7	3.5	1.2	0.1		10.4	7.7
SW	1.0	6.0	4.4	1.8	0.1		13.2	7.9
WSW	0.6	2.8	2.2	1.0	+		6.6	8.1
W	0.6	1.5	1.1	0.5	+		3.7	7.6
WNW	0.3	1.5	1.0	0.4	0.1		3.4	8.0
NW	0.5	1.5	0.7	0.2	0.1		3.0	6.5
NNW	0.2	0.9	0.6	0.1	+	0.1	2.0	8.1
Calm	11.6						11.6	
Total	21.0	40.7	28.3	9.3	0.6	0.1	100.0	6.7

"+" indicates percentages less than .05 but greater than zero

Data Source: 2.3.2-A

TABLE 2.3-17

AUGUST PERCENT FREQUENCY DISTRIBUTION OF WIND
AT COLUMBIA, S. C. (1951-1960)

Wind Direction	0-3	4-7	Wind Speed (miles/hour) 8-12	13-18	19-24	≥ 25	Total	Mean Speed
N	0.7	2.5	1.6	0.7	0.1	+	5.5	7.8
NNE	0.7	3.0	2.5	0.9	0.1	+	7.3	8.1
NE	1.3	4.0	2.5	0.4	+	+	8.2	6.8
ENE	0.6	2.9	1.5	0.3			5.3	6.9
E	0.5	2.5	1.0	0.1		+	4.1	6.3
ESE	0.3	1.8	1.5	0.3			3.9	7.5
SE	0.7	2.0	1.1	0.2	+		4.1	6.7
SSE	0.6	1.8	0.7	0.2	+		3.3	6.6
S	1.0	2.7	1.6	0.5	+		5.7	6.8
SSW	1.2	4.5	2.8	0.6			9.1	6.9
SW	1.2	6.0	3.5	0.6	+	+	11.4	7.0
WSW	0.6	3.1	1.4	0.4	0.1		5.5	6.9
W	0.6	1.8	0.8	0.2			3.4	6.6
WNW	0.6	1.2	0.7	0.3	+		2.7	6.9
NW	0.6	1.8	0.8	0.3	0.1		3.6	7.0
NNW	0.5	1.3	1.0	0.4	0.1	+	3.3	8.2
Calm	13.6						13.6	
Total	25.1	42.9	24.9	6.5	0.5	0.1	100.0	6.1

"+" indicates percentages less than .05 but greater than zero

Data Source: 2.3.2-A

TABLE 2.3-18

SEPTEMBER PERCENT FREQUENCY DISTRIBUTION OF WIND
AT COLUMBIA, S. C. (1951-1960)

Wind Direction	0-3	4-7	Wind Speed (miles/hour) 8-12	13-18	19-24	≥ 25	Total	Mean Speed
N	0.7	3.2	2.0	0.4	0.1	0.1	6.5	7.5
NNE	0.9	5.0	4.4	1.3	0.1	+	11.7	8.0
NE	1.3	5.8	5.1	2.2	0.1	+	14.5	8.2
ENE	1.1	3.8	2.8	0.8		+	8.5	7.4
E	0.8	2.7	1.2	0.3			4.9	6.3
ESE	0.3	1.6	1.5	0.3		+	3.7	7.9
SE	0.4	1.8	1.0	0.2	+		3.5	6.9
SSE	0.4	1.5	0.7	0.2		+	2.8	6.6
S	0.6	2.2	1.1	0.3	+	+	4.2	6.9
SSW	0.9	2.0	1.3	0.5	0.1		4.8	7.3
SW	1.3	2.6	1.5	0.4	+		5.8	6.7
WSW	0.7	1.3	0.9	0.2	+		3.1	6.8
W	0.5	0.7	0.4	0.2			1.9	6.3
WNW	0.4	0.8	0.4	0.1			1.7	6.2
NW	0.4	1.5	0.6	0.3	+		2.8	6.8
NNW	0.6	1.5	0.9	0.6	0.1	+	3.7	8.1
Calm	15.8						15.8	
Total	27.1	37.9	25.9	8.4	0.5	0.2	100.0	6.2

"+" indicates percentages less than .05 but greater than zero

Data Source: 2.3.2-A

TABLE 2.3-19

OCTOBER PERCENT FREQUENCY DISTRIBUTION OF WIND
AT COLUMBIA, S. C. (1951-1960)

Wind Direction	Wind Speed (miles/hour) 0-3	4-7	8-12	13-18	19-24	≥ 25	Total	Mean Speed
N	0.6	3.8	3.5	1.1	+		9.0	8.2
NNE	0.6	4.3	4.9	2.3	0.1		12.2	9.0
NE	1.4	4.5	4.5	1.7	0.1		12.1	8.1
ENE	0.9	2.6	1.3	0.3			5.1	6.5
E	0.4	1.7	0.5	0.1			2.7	6.1
ESE	0.3	1.4	0.7				2.4	6.2
SE	0.3	1.3	0.4	0.1			2.0	5.9
SSE	0.4	0.7	0.5	0.1			1.7	6.5
S	0.5	1.1	0.7	0.3			2.5	7.1
SSW	0.9	1.7	0.9	0.2			3.8	6.2
SW	1.7	2.4	1.5	0.6	+		6.2	6.8
WSW	1.1	1.9	1.1	0.7	0.1		5.0	7.6
W	1.1	1.4	0.6	0.5	0.1		3.6	6.7
WNW	0.7	1.3	0.6	0.4	+		3.1	7.3
NW	0.6	1.6	1.1	0.2	+		3.5	6.9
NNW	0.6	2.3	2.1	0.4	+		5.3	7.6
Calm	19.8						19.8	
Total	31.7	33.9	24.9	8.9	0.6	0.0	100.0	6.0

"+" indicates percentages less than .05 but greater than zero

Data Source: 2.3.2-A

TABLE 2.3-20

NOVEMBER PERCENT FREQUENCY DISTRIBUTION OF WIND
AT COLUMBIA, S. C. (1951-1960)

Wind Direction	Wind Speed (miles/hour) 0-3	4-7	8-12	13-18	19-24	≥ 25	Total	Mean Speed
N	0.7	2.3	1.3	0.4	+		4.7	7.1
NNE	0.7	2.7	2.7	1.0	+		7.2	8.2
NE	0.9	3.7	2.4	0.6			7.6	7.1
ENE	0.6	2.0	1.0	0.2			3.7	6.5
E	0.4	1.2	0.4	+			2.1	5.8
ESE	0.3	1.2	0.4	+			1.9	6.1
SE	0.3	1.1	0.3	0.1			1.8	6.0
SSE	0.4	0.7	0.4	0.3	+		1.9	7.8
S	0.7	1.2	0.7	0.5	0.1	+	3.2	7.9
SSW	1.3	1.7	1.8	1.1	0.1	+	6.1	8.2
SW	2.2	3.2	2.4	1.4	0.1		9.3	7.6
WSW	1.7	2.9	1.6	1.8	0.3	+	8.3	8.4
W	1.4	2.1	1.5	1.1	0.2	+	6.3	8.1
WNW	0.7	1.6	1.3	1.0	0.2	+	4.9	9.0
NW	0.7	2.2	1.4	0.6	+		4.9	7.4
NNW	0.5	2.2	1.9	0.7			5.3	7.9
Calm	20.8						20.8	
Total	34.3	31.9	21.6	10.9	1.2	0.1	100.0	6.1

"+" indicates percentages less than .05 but greater than zero

Data Source: 2.3.2-A

TABLE 2.3-21

DECEMBER PERCENT FREQUENCY DISTRIBUTION OF WIND AT COLUMBIA, S. C. (1951-1960)

Wind Direction	Wind Speed (miles/hour) 0-3	4-7	8-12	13-18	19-24	≥ 25	Total	Mean Speed
N	0.7	2.4	1.3	0.3	+		4.7	6.9
NNE	0.8	2.4	1.7	0.8	0.2	+	6.0	8.2
NE	1.1	4.0	2.9	0.4			8.4	7.0
ENE	0.8	2.3	0.9	0.1			4.1	6.0
E	0.8	2.0	0.3				3.2	5.1
ESE	0.4	1.2	0.3				1.9	5.4
SE	0.4	1.1	0.4	+	+		1.9	5.8
SSE	0.3	0.8	0.5	0.3			1.9	7.3
S	0.5	1.4	0.9	0.7	0.1		3.6	8.2
SSW	1.1	2.1	1.3	1.0	0.3	0.1	6.0	8.6
SW	1.8	4.0	3.6	1.5	0.2		11.2	8.0
WSW	1.2	3.2	2.2	2.0	0.5	0.1	9.2	9.3
W	1.1	2.3	1.5	1.3	0.3	+	6.5	8.7
WNW	0.8	1.7	1.2	1.0	0.5	+	5.2	9.4
NW	0.5	1.7	1.2	0.6	0.1		4.0	12.6
NNW	0.3	1.6	1.4	0.4	+		3.9	7.7
Calm	18.3						18.3	
Total	31.2	34.3	21.6	10.5	2.2	0.2	100.0	6.6

"+" indicates percentages less than .05 but greater than zero

Data Source: 2.3.2-A

TABLE 2.3-22

MONTHLY VARIATION OF EXTREME "FASTEST MILE" WINDS AT COLUMBIA AND GREENVILLE-SPARTANBURG

	Columbia (1954-1973)			Greenville-Spartanburg (1963-1973)		
Month	Speed (mph)	Direction	Year	Speed (mph)	Direction*	Year
January	46	W	1964	44	SW	1967
February	40	SSW	1966+	44	SW	1966
March	60	W	1954	38	W	1963
April	40	W	1961	44	SW	1970
May	46	SW	1958	36	SW	1967
June	40	SW	1957	35	NW	1969
July	40	N	1965	52	NE	1966
August	44	SSE	1961	34	N	1973+
September	38	ESE	1959	31	NE	1964
October	27	SSW	1968+	31	NE	1964+
November	35	N	1967	32	S	1968
December	30	WNW	1954	47	NE	1963
Year	60	W	March 1954	52	NE	July 1966

* Direction recorded to 8 compass points only.

+ Record also occurred in earlier year (s)

Data Source: 2.3.2-C, D

TABLE 2.3-23

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: JANUARY, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	4	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	9	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	4	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	3	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	3	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	6	4	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	5	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	8	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	9	1	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	10	1	1	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	6	3	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	5	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	6	4	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	5	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2.06	3.53	0.	0.	0.	0.	0.	4.80	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	2.81	1.30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.10	2.51	2.83	3.82	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	3.08	3.05	2.05	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	2.74	0.	2.15	0.	3.74	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.82	0.	0.	6.05	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	3.01	2.37	0.	8.59	0.	3.83	3.70	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	3.30	4.87	4.27	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	3.69	2.94	5.13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	3.15	2.91	3.43	0.	6.09	0.	4.35	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	3.64	3.32	4.29	0.	5.49	4.74	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	3.43	3.93	2.34	2.42	7.65	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	2.39	3.01	2.85	1.35	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	2.35	2.26	1.68	0.	0.	0.	0.	0.	6.81	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	2.57	7.87	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	2.15	2.31	4.28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 744
TOTAL NO. OF INVALID OBSERVATIONS = 1

Data Source: 2.3.2-B

TABLE 2.3-24

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: FEBRUARY, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	4	2	2	1	1	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	6	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	2	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	2	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	6	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	4	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
S	2	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	5	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	6	2	5	1	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
WSW	12	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	6	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	4	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2.08	99.99	3.10	2.34	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	1.69	2.98	2.55	2.59	3.78	4.50	0.	4.30	0.	3.98	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.15	3.17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	2.47	2.53	0.	2.40	0.	0.	0.	3.51	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	2.07	3.81	3.63	0.	2.54	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.88	2.88	0.	0.	0.	0.	3.87	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	2.36	3.07	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	6.08	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	2.84	0.	4.68	0.	2.88	4.21	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	2.50	0.	4.24	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	3.41	2.32	3.84	5.11	3.77	0.	3.92	0.	0.	0.	0.	0.	4.50	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	3.15	4.72	0.	0.	0.	0.	0.	6.90	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	3.61	3.10	5.21	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	4.27	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	2.45	3.59	1.55	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	3.16	0.	2.34	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	2.41	2.70	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 672
TOTAL NO. OF INVALID OBSERVATIONS = 0

Data Source: 2.3.2-B

TABLE 2.3-25

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: MARCH, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	5	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	7	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	6	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	4	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	6	5	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
SSW	6	7	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	8	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	6	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	8	4	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
WNW	2	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	6	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	6	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	6	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	1.93	1.53	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	2.78	2.81	3.58	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	3.22	2.94	3.86	3.43	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	2.80	2.53	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	3.56	3.26	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	4.15	4.84	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	4.50	2.83	0.	0.	0.	3.56	0.	4.75	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	2.67	4.28	4.48	0.	5.74	0.	0.	0.	0.	0.	0.	4.69	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	4.28	3.97	4.57	5.80	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	3.89	5.79	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	4.92	5.92	7.10	4.54	3.03	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	3.35	4.46	0.	0.	3.09	0.	0.	0.	0.	0.	0.	0.	0.	0.	5.64	7.62	0.	0.	0.	0.	0.	0.	0.	0.
WNW	3.84	4.18	4.74	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	3.88	4.07	4.20	5.77	5.65	3.82	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	3.33	4.28	0.	0.	0.	5.02	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	3.98	2.37	0.	2.94	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 744
TOTAL NO. OF INVALID OBSERVATIONS = 2

TABLE 2.3-26

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: APRIL, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	2	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	6	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	8	4	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	11	0	4	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	9	3	0	3	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	4	6	5	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	7	2	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	6	2	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	14	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	5	7	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	4	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2.07	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	1.96	.60	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.35	3.87	2.97	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	3.07	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	3.73	2.40	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.50	0.	2.40	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	2.75	4.12	5.69	3.79	0.	3.98	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	4.79	0.	2.94	6.09	0.	0.	0.	5.71	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	3.07	4.13	0.	4.64	4.64	5.94	0.	5.91	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	3.08	3.91	3.49	0.	3.70	5.72	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	2.63	2.94	5.50	0.	0.	0.	3.50	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	2.80	3.20	9.34	0.	0.	0.	0.	0.	3.17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	2.60	6.95	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	3.88	6.00	4.75	7.77	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	3.70	3.81	0.	4.53	0.	0.	4.44	3.65	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	2.08	2.86	.55	3.40	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 720
TOTAL NO. OF INVALID OBSERVATIONS = 0

Data Source: 2.3.2-B

AMENDMENT 97-01
AUGUST 1997

TABLE 2.3-27

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: MAY, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	7	3	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	7	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	5	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	4	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	8	3	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	10	2	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	9	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	6	4	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	7	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	8	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	6	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	4	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	1.83	2.07	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	1.87	1.29	3.10	3.12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.44	2.92	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	1.84	2.58	3.17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	2.73	.67	0.	3.85	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	3.03	2.68	2.82	0.	4.48	3.07	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	3.29	2.48	0.	5.48	0.	0.	0.	4.17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	2.82	1.50	2.79	4.18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	3.08	2.44	3.69	0.	3.55	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	2.65	2.42	3.26	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	2.06	3.24	3.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	2.76	3.02	0.	5.01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	3.04	3.19	2.94	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	3.13	2.34	0.	0.	1.75	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	1.42	0.	2.07	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	1.90	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 744
TOTAL NO. OF INVALID OBSERVATIONS = 0

TABLE 2.3-28

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: JUNE, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	6	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	4	7	3	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	6	4	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	3	2	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	4	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	6	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	5	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	7	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	9	3	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	10	5	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	4	2	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	5	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	6	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2.82	3.22	0.	0.	4.92	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	2.87	2.91	3.81	2.31	2.46	5.45	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	3.39	3.35	3.54	3.25	3.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	3.04	2.55	3.93	0.	4.72	0.	4.77	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	3.24	3.43	0.	3.06	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	3.96	0.	3.81	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	3.13	3.35	2.99	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	3.94	2.70	3.29	3.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	2.64	3.41	2.53	2.27	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	2.40	3.56	3.68	1.79	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	2.99	3.23	1.73	2.71	5.75	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	2.58	2.08	3.17	3.13	0.	4.81	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	2.50	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	2.54	1.86	3.08	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	2.62	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	2.94	2.59	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 720
TOTAL NO. OF INVALID OBSERVATIONS = 0

Data Source: 2.3.2-B

AMENDMENT 97-01
AUGUST 1997

TABLE 2.3-29

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: JULY, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	4	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	5	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	8	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	15	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	14	1	4	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	13	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	9	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	8	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	1.13	1.08	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	2.78	3.23	1.10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	1.75	2.29	0.	2.01	0.	0.	0.	0.	3.99	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	2.78	2.17	2.62	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	3.20	2.18	3.68	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.05	3.31	0.	0.	0.	3.50	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	2.66	2.87	3.84	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	2.50	3.01	2.93	3.98	3.76	1.37	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	2.76	2.86	3.25	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	2.72	3.14	3.11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	2.48	0.	3.27	2.49	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	3.29	1.86	0.	3.03	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	2.49	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	2.28	1.12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	1.79	0.	[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	1.10	1.55	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 744
TOTAL NO. OF INVALID OBSERVATIONS = 3

Data Source: 2.3.2-B

2.3-73

AMENDMENT 97-01
AUGUST 1997

TABLE 2.3-30

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: AUGUST, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	3	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	4	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	[illegible]	1	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	5	1	0	3	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	11	8	3	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	20	8	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	8	4	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	1.07	2.73	0.	0.	1.02	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	1.46	1.95	0.	1.33	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	1.80	2.67	2.32	0.	2.82	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	1.23	1.85	2.25	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	1.34	2.44	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	1.49	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	1.72	2.38	2.26	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	1.57	2.10	0.	2.02	.94	1.67	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	2.30	1.98	2.48	2.79	2.24	0.	2.21	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	2.20	1.91	2.97	3.34	.77	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	1.94	1.83	2.41	3.31	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	2.01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	1.27	2.22	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	1.42	1.45	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	.69	1.62	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	1.41	.96	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 744
TOTAL NO. OF INVALID OBSERVATIONS = 0

Data Source: 2.3.2-B

TABLE 2.3-31

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: SEPTEMBER, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	7	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
NE	6	8	3	1	1	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
ENE	7	4	1	3	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
ESE	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	6	1	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
SSE	4	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	5	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	6	2	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	4	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	4	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2.64	1.34	0.	3.40	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.68	0.	0.	0.	0.
NE	2.00	2.97	2.51	4.79	5.44	7.06	0.	2.62	0.	0.	0.	0.	3.84	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	1.49	2.31	2.80	3.92	0.	6.38	0.	0.	4.34	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	.74	0.	0.	2.45	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.95	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	2.53	3.74	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.49	2.43	0.	0.	3.55	3.81	0.	0.	0.	0.	0.	0.	4.48	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	4.73	3.57	2.44	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	2.67	1.51	0.	6.90	3.56	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	2.59	3.17	0.	4.54	0.	0.	3.30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	1.79	0.	0.	0.	5.29	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	2.15	2.40	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	1.84	.70	2.33	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	2.11	0.	0.	2.06	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	1.89	0.	0.	1.64	0.	2.27	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	1.53	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	2.35	2.69	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 720
TOTAL NO. OF INVALID OBSERVATIONS = 3

TABLE 2.3-32

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: OCTOBER, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	7	3	1	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	5	4	2	1	1	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
ENE	8	3	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	3	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	5	2	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	11	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	4	3	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	4	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	17	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	7	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2.55	2.28	5.59	0.	3.37	0.	3.78	0.	0.	7.38	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	3.40	2.65	2.41	2.47	4.45	0.	5.13	0.	0.	2.87	0.	3.25	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.72	3.30	2.05	0.	0.	0.	3.44	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	1.91	0.	0.	2.80	2.56	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	2.05	3.17	2.69	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.22	3.39	0.	6.61	0.	0.	0.	3.07	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	4.34	0.	0.	0.	0.	4.28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	4.95	2.91	2.64	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	2.33	1.37	2.06	3.36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	1.67	3.53	4.69	3.67	0.	2.85	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	1.74	0.	0.	3.70	0.	0.	3.19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	2.34	1.01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	1.64	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	1.74	3.05	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	2.16	2.16	3.45	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	1.87	2.07	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 744
TOTAL NO. OF INVALID OBSERVATIONS = 1

Data Source: 2.3.2-B

TABLE 2.3-33

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: NOVEMBER, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	3	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	5	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	3	3	0	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	10	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	2	2	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	6	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	5	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	6	4	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	5	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	6	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	11	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	6	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2.26	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	2.23	2.09	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.54	2.70	1.41	3.37	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	1.67	3.77	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	2.47	3.13	0.	3.53	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.51	3.34	0.	3.61	3.43	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	3.62	0.	0.	3.46	4.10	2.06	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	1.55	4.49	6.91	5.07	0.	0.	0.	0.	3.30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	2.46	0.	1.21	5.16	3.64	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	1.70	1.96	3.07	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	1.62	2.98	2.46	0.	0.	6.25	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	2.27	0.	2.56	0.	3.28	0.	0.	0.	2.52	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	1.33	.44	1.16	0.	0.	3.96	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	1.66	.91	0.	0.	0.	6.60	0.	5.71	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	1.36	.83	3.87	0.	3.08	0.	2.41	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	1.05	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 720
TOTAL NO. OF INVALID OBSERVATIONS = 0

Data Source: 2.3.2-B

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: DECEMBER, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	7	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	11	5	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	3	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	3	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	2	2	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
SSW	7	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	9	2	6	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	6	0	1	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	9	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	8	2	0	0	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	6	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2.08	0.	2.61	2.62	3.21	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	1.81	2.27	4.12	0.	0.	0.	2.74	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.36	2.76	2.92	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	2.61	2.63	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	2.42	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	1.71	3.32	0.	0.	3.09	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	2.71	0.	5.22	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	1.94	2.65	0.	3.71	0.	0.	0.	0.	0.	0.	0.	1.63	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	2.76	2.93	2.49	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	2.06	3.24	3.95	3.92	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	2.23	0.	7.93	0.	.89	0.	0.	4.08	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	1.75	1.53	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	1.74	1.64	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	2.17	1.62	0.	0.	2.37	0.	3.63	1.53	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	3.19	1.39	0.	0.	0.	0.	0.	0.	4.09	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	1.63	0.	5.13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 744
TOTAL NO. OF INVALID OBSERVATIONS = 0

Data Source: 2.3.2-B

TABLE 2.3-35

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: ANNUAL, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	56	14	5	4	4	0	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
NE	67	41	15	7	4	3	2	2	0	3	0	1	1	0	0	0	0	0	0	0	0	0	0	0
ENE	68	37	15	9	2	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	33	18	6	3	2	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
ESE	36	17	4	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	61	17	3	4	6	3	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
SSE	76	21	9	6	2	5	1	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
S	65	20	16	12	5	5	0	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
SSW	97	42	21	10	4	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	95	46	28	9	5	4	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
WSW	64	25	13	7	4	3	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	65	22	7	4	3	1	0	0	3	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
WNW	43	13	5	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	91	21	8	3	4	3	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	44	15	5	1	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	47	16	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2.20	2.30	3.40	2.04	3.13	0.	3.76	4.80	0.	7.38	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.68	0.	0.	0.	0.
NE	2.24	2.51	2.94	2.62	4.03	5.67	3.93	3.46	0.	3.56	0.	3.25	3.64	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.36	2.95	2.82	3.40	2.91	6.38	3.44	0.	4.17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	2.45	2.65	2.77	2.55	3.64	0.	4.77	3.51	0.	0.	0.	0.	0.	3.95	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	2.72	2.93	3.04	3.37	3.14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.61	3.27	3.01	4.44	3.57	3.46	3.87	3.07	0.	0.	0.	0.	4.48	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	3.20	3.12	3.45	5.33	4.10	3.54	3.70	4.46	0.	0.	0.	0.	6.08	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	3.07	3.32	3.46	3.69	3.37	2.06	0.	5.71	3.30	0.	0.	3.16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	2.64	2.96	3.09	4.36	3.52	5.94	2.75	5.91	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	2.59	3.04	3.60	3.43	3.92	4.26	4.13	0.	0.	0.	0.	0.	4.50	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	2.73	3.12	3.64	3.43	3.79	5.25	3.34	5.02	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	2.06	2.44	3.96	3.52	4.67	4.81	0.	0.	4.17	0.	0.	0.	0.	0.	5.64	7.62	0.	0.	0.	0.	0.	0.	0.	0.
WNW	2.40	3.12	3.30	1.95	0.	3.96	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	2.43	2.93	2.91	5.66	2.91	4.23	3.63	3.62	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	2.55	3.42	2.44	4.53	3.08	5.02	3.42	3.85	4.09	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	2.27	2.34	3.32	3.26	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 8760
TOTAL NO. OF INVALID OBSERVATIONS = 10

TABLE 2.3-36

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: JANUARY, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	6	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	8	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	5	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	2	2	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	3	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	3	3	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	4	5	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	7	7	2	4	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	10	5	2	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	3	5	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	3	3	2	2	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	6.33	0.	0.	0.	0.	0.	0.	6.49	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	4.15	4.08	5.18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	3.16	4.32	5.50	5.02	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	4.09	3.32	2.79	4.38	5.85	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	4.01	4.32	7.22	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.60	3.64	5.68	0.	0.	0.	0.	5.93	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	3.46	5.43	0.	6.75	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	4.46	4.71	2.86	0.	0.	6.08	0.	6.26	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	5.76	5.89	6.02	6.34	7.06	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	4.14	4.28	4.03	6.17	5.31	0.	9.17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	4.65	6.15	5.87	6.52	7.38	6.04	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	4.71	4.40	0.	0.	10.78	0.	0.	0.	9.47	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	3.39	3.34	4.13	2.62	4.92	0.	0.	4.77	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	3.03	2.54	2.07	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	5.82	0.	10.09	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	4.25	4.51	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 744
TOTAL NO. OF INVALID OBSERVATIONS = 11

Data Source: 2.3.2-B

TABLE 2.3-37

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: FEBRUARY, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	4	1	2	0	2	2	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	6	4	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	3	1	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	7	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	2	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	7	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
S	5	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	6	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	8	4	4	1	1	0	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
WSW	10	4	2	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	4	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	5.36	99.99	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	4.00	99.99	4.70	0.	5.49	5.6	0.	0.	5.25	5.91	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	3.95	4.51	0.	0.	3.47	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	4.19	4.08	5.19	0.	0.	0.	0.	4.55	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	4.67	6.02	0.	0.	0.	0.	7.36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	5.42	5.47	0.	1.90	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	4.61	3.81	0.	0.	7.14	0.	0.	0.	0.	0.	0.	0.	8.15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	6.14	0.	5.65	0.	3.35	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	3.56	6.40	6.56	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	5.02	6.46	5.33	8.41	5.45	0.	5.19	0.	0.	0.	0.	0.	7.19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	5.77	5.36	5.00	7.56	0.	0.	9.14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	6.01	5.08	7.17	3.39	5.14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	4.20	5.51	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	1.77	4.44	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	3.81	0.	4.87	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	4.76	5.59	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 672
TOTAL NO. OF INVALID OBSERVATIONS = 1

Data Source: 2.3.2-B

TABLE 2.3-38

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: MARCH, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	8	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	4	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	5	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	4	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	5	2	0	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	8	3	3	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	7	3	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	6	3	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	4	2	3	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
WNW	3	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	5	1	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	4	4	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	4	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	4.10	4.54	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	3.95	0.	0.	4.54	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	4.32	4.59	5.55	5.36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	3.66	6.44	0.	0.	5.19	0.	0.	0.	6.04	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	4.40	4.12	3.96	4.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	6.73	7.84	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	5.47	7.01	0.	0.	0.	7.74	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	4.92	6.58	0.	7.19	0.	0.	0.	0.	7.62	6.73	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	3.77	4.16	6.56	6.66	9.36	4.86	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	6.67	7.80	0.	0.	5.53	0.	0.	5.81	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	7.61	6.01	4.72	0.	0.	5.24	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	6.25	7.02	5.46	5.52	5.21	9.98	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	10.62	0.	0.	0.	0.	0.	0.
WNW	5.37	5.74	6.30	6.02	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	5.90	4.46	0.	0.	6.35	0.	5.91	5.72	6.62	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	3.44	5.02	3.61	0.	0.	4.46	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	3.25	4.19	5.00	3.42	4.18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 744
TOTAL NO. OF INVALID OBSERVATIONS = 6

Data Source: 2.3.2-B

TABLE 2.3-39

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: APRIL, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	4	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	10	1	2	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	12	3	0	0	1	0	2	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	4	6	1	4	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	4	2	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	4	2	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	6	5	1	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	7	3	1	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	1	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	0.	5.87	0.	0.	5.75	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	4.79	6.36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	5.12	4.61	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	4.33	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	2.56	5.64	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	4.05	2.42	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	3.63	6.50	5.45	5.44	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	5.98	2.44	5.26	0.	0.	0.	5.46	6.76	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	3.90	5.97	0.	0.	7.77	0.	7.28	6.43	0.	0.	7.38	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	3.49	4.59	6.59	6.27	7.09	5.84	0.	11.02	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	6.66	5.45	0.	0.	7.36	0.	0.	5.50	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	6.47	4.75	0.	0.	0.	4.26	6.11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	3.64	11.49	6.20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	5.59	4.45	6.94	7.90	0.	0.	0.	0.	0.	0.	6.41	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	6.19	5.77	4.54	7.77	0.	0.	0.	5.72	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	1.61	5.83	0.	5.19	4.70	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 720
TOTAL NO. OF INVALID OBSERVATIONS = 10

Data Source: 2.3.2-B

TABLE 2.3-40

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: MAY, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	9	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	6	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	7	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	9	3	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	7	4	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	6	4	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	8	5	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	8	5	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	6	5	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	9	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2.56	2.48	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	3.67	0.	2.94	3.67	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	4.26	3.68	4.20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	3.70	3.98	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	4.76	2.28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	4.91	4.15	5.04	5.47	5.71	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	4.13	4.60	6.15	4.30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	3.21	4.88	0.	4.55	0.	6.07	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	4.07	3.47	6.39	0.	5.64	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	3.94	3.28	3.57	4.56	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	3.34	4.08	3.64	4.91	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	3.65	2.69	4.74	7.02	4.46	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	2.88	4.01	4.29	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	2.68	0.	4.06	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	2.71	0.	4.19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	2.44	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 744
TOTAL NO. OF INVALID OBSERVATIONS = 2

Data Source: 2.3.2-B

TABLE 2.3-41

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: JUNE, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	8	6	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	7	6	4	0	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	8	5	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	6	2	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	4	4	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	6	3	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	4	7	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	8	4	2	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	7	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	4	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	4.11	3.40	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	3.69	4.34	0.	0.	0.	5.70	0.	0.	4.77	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	4.32	4.09	6.26	0.	3.35	6.66	0.	3.66	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	3.47	3.62	4.90	4.91	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	6.08	5.06	0.	5.48	0.	0.	0.	0.	5.46	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	5.11	5.70	2.95	0.	4.28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	4.44	4.55	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	6.44	6.08	4.45	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	4.68	4.95	4.40	5.19	6.70	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	3.16	4.47	5.35	6.34	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	4.30	4.17	4.08	0.	6.96	3.47	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	4.16	3.40	0.	3.41	4.09	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	4.27	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	3.00	3.25	3.97	3.67	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	3.48	4.43	1.73	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	3.18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 720
TOTAL NO. OF INVALID OBSERVATIONS = 1

AMENDMENT 97-01
AUGUST 1997

TABLE 2.3 42

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: JULY, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	3	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	3	2	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	7	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	2	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	6	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	10	1	2	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	14	1	2	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	14	1	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	10	3	2	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	9	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2.35	2.04	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	1.74	2.74	3.44	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	4.07	2.32	3.70	2.45	2.82	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	3.26	4.90	49.99	0.	49.99	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	3.06	4.35	3.62	3.77	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	3.21	0.	0.	0.	0.	0.	0.	0.	4.60	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	4.19	99.99	4.84	0.	5.97	0.	5.30	4.44	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	3.67	2.99	2.80	4.02	4.81	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	3.54	3.70	5.36	4.67	5.07	0.	3.76	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	3.77	3.46	5.70	4.46	5.33	4.67	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	3.52	4.22	3.86	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	4.55	5.62	0.	3.33	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	3.40	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	5.50	1.74	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	2.73	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	1.12	0.	3.39	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 744
TOTAL NO. OF INVALID OBSERVATIONS = 7

Data Source: 2.3.2-B

TABLE 2.3-43

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: AUGUST, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	3	3	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	7	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	4	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	2	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	11	5	4	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	17	6	5	7	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	5	1	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	4.41	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	3.69	1.68	4.24	3.54	4.13	0.	4.41	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	3.53	4.65	0.	3.44	4.44	0.	0.	4.07	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	3.20	3.25	3.91	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	2.99	4.51	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.97	1.70	5.16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	3.51	2.86	6.87	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	3.31	3.22	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	4.48	4.23	4.76	3.42	0.	0.	0.	0.	0.	5.53	5.12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	3.36	4.26	4.82	4.14	4.42	0.	3.07	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	3.94	4.68	3.77	0.	4.28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	3.43	2.21	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	2.66	2.39	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	2.37	1.43	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	2.30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	2.10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 744
TOTAL NO. OF INVALID OBSERVATIONS = 0

TABLE 2.3-44

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: SEPTEMBER, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	4	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
NE	9	4	5	1	1	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
ENE	8	6	2	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	4	2	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
ESE	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	4	4	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
SSE	2	4	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	6	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	5	6	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	5	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	8	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	5	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	4	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	4.70	3.99	5.42	4.28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	4.69	0.	0.	0.	0.
NE	3.20	3.58	4.93	5.55	7.91	0.	8.21	0.	6.62	0.	0.	4.64	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	3.74	5.24	3.51	4.77	0.	0.	0.	0.	0.	5.14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	2.75	2.42	0.	0.	5.27	0.	0.	0.	0.	0.	0.	0.	0.	5.26	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	3.62	3.78	6.26	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	3.05	2.99	0.	5.91	0.	5.28	0.	0.	0.	0.	0.	0.	0.	0.	5.57	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	5.04	5.27	0.	3.46	5.66	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	4.17	4.85	0.	8.54	4.60	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	3.34	3.95	0.	6.15	0.	0.	0.	4.78	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	3.39	3.47	2.14	0.	6.82	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	2.81	4.25	2.30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	3.26	1.18	3.49	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	2.94	1.92	0.	3.28	0.	0.	0.	0.	3.44	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	2.41	3.64	0.	2.66	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	0.	1.34	0.	0.	4.13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	3.43	4.34	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 720
TOTAL NO. OF INVALID OBSERVATIONS = 5

Data Source: 2.3.2-B

TABLE 2.3-45

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: OCTOBER, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	6	2	1	1	1	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
NE	8	3	2	1	2	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
ENE	4	2	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	3	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	4	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	3	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	5	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	4	5	1	2	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
WSW	5	3	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	7	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	7	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	3.85	4.23	7.69	2.66	5.23	5.88	0.	4.54	0.	0.	0.	0.	6.59	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	2.21	4.43	4.89	5.59	4.70	0.	4.51	0.	0.	7.32	0.	0.	0.	0.	0.	5.67	0.	0.	0.	0.	0.	0.	0.	0.
ENE	3.88	5.48	3.65	3.45	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	2.02	2.76	0.	0.	0.	0.	4.41	5.29	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	4.02	5.04	0.	5.74	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	4.12	6.55	5.84	7.68	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	5.92	6.65	0.	0.	4.76	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	3.99	11.88	4.81	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	3.83	2.23	4.40	5.01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	3.87	4.94	5.61	4.54	0.	0.	0.	0.	5.23	0.	0.	0.	0.	0.	0.	0.	0.	5.00	0.	0.	0.	0.	0.	0.
WSW	4.11	4.29	6.41	4.90	0.	0.	5.53	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	4.80	1.48	0.	0.	0.	2.23	0.	5.82	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	0.	3.84	2.59	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	2.95	3.15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	2.44	0.	3.42	0.	0.	0.	0.	4.14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	3.19	3.55	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 744
TOTAL NO. OF INVALID OBSERVATIONS = 8

TABLE 2.3-46

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: NOVEMBER, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	6	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	2	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	4	2	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	8	2	2	1	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	4	7	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	4	2	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	4	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	5	3	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	7	5	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	4	2	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	3	5	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	5	4	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	4	3	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	4	1	1	0.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	3.28	2.89	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	4.53	4.61	0.	1.54	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.64	4.25	0.	4.32	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	3.05	4.55	4.55	0.	0.	0.	4.50	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	4.39	4.88	4.06	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.90	3.91	6.21	3.66	6.57	0.	0.	6.54	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	4.10	4.52	4.13	7.61	0.	0.	5.64	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	4.32	5.21	0.	0.	6.71	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	4.72	4.28	6.20	3.83	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	3.88	4.24	5.60	0.	5.17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	3.18	5.27	1.13	6.42	6.36	8.72	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	5.07	5.94	3.22	0.	0.	0.	5.43	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	2.72	3.21	0.	0.	0.	6.22	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	4.44	4.65	1.52	0.	0.	0.	7.60	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	2.08	4.48	4.70	0.	0.	0.	0.	4.23	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	2.55	2.79	3.88	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 720
TOTAL NO. OF INVALID OBSERVATIONS = 1

Data Source: 2.3.2-B

TABLE 2.3-47

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: DECEMBER, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	3	1	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	4	2	3	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	5	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	5	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	1	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	5	5	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	7	2	3	2	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	4	1	2	1	0	2	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	2	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	4	0	3	1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	4	2	0	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	4.05	4.22	2.84	3.97	4.51	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	2.96	2.97	5.20	0.	0.	4.40	0.	0.	5.61	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	3.74	3.72	4.34	6.27	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	3.37	5.03	4.56	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	4.49	1.48	4.05	6.11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	0.	3.98	0.	0.	0.	0.	4.77	2.56	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	3.64	6.90	0.	6.11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	1.63	6.75	6.20	.70	5.97	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	4.97	4.09	5.97	4.26	5.71	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	3.40	5.09	6.02	5.44	5.33	0.	0.	6.27	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	3.97	4.63	4.12	3.31	0.	5.74	0.	6.58	5.81	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	2.60	3.58	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	3.12	0.	2.95	0.	0.	0.	4.11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	4.02	0.	4.64	5.34	5.23	5.26	6.14	0.	0.	0.	2.52	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	3.84	7.67	0.	4.57	6.97	1.46	0.	0.	0.	.51	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	2.56	0.	6.73	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 744
TOTAL NO. OF INVALID OBSERVATIONS = 2

TABLE 2.3-48

WIND DIRECTION PERSISTENCE
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: ANNUAL, 1975

WIND DIRECTION PERSISTENCE - PASQUILL ALL
1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	32	17	3	3	4	1	0	2	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
NE	79	28	20	7	6	4	3	0	4	2	0	1	0	0	0	1	0	0	0	0	0	0	0	0
ENE	72	16	14	15	6	1	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	60	26	11	3	4	0	2	1	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
ESE	44	18	7	5	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	43	25	9	6	4	1	1	3	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
SSE	51	34	10	6	4	1	2	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
S	63	23	10	7	10	2	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	65	46	18	13	9	1	4	2	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	66	52	29	23	11	3	5	4	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
WSW	82	38	19	8	6	7	2	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	64	22	8	5	5	3	3	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
WNW	40	21	8	4	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	49	23	10	6	2	1	3	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	42	14	10	2	2	2	0	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	34	12	4	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	3.57	3.66	5.33	3.70	5.00	5.88	0.	5.57	0.	0.	0.	0.	6.59	0.	0.	0.	0.	0.	0.	4.69	0.	0.	0.	0.
NE	3.59	4.35	4.5[illegible]	4.02	5.40	5.36	5.71	0.	5.61	6.88	0.	4.64	0.	0.	0.	5.67	0.	0.	0.	0.	0.	0.	0.	0.
ENE	3.88	4.40	4.74	4.44	1.56	6.40	0.	3.96	0.	5.14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	3.55	4.07	4.45	4.73	5.50	0.	4.75	4.55	6.04	0.	0.	0.	0.	5.26	0.	4.64	0.	0.	0.	0.	0.	0.	0.	0.
ESE	4.37	4.60	4.68	5.39	4.10	0.	7.36	0.	5.46	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	4.90	4.49	5.35	5.45	5.78	5.28	4.77	5.34	4.60	0.	0.	0.	0.	0.	5.57	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	4.56	4.99	5.63	5.76	5.88	7.74	5.54	4.44	0.	0.	0.	0.	8.15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	4.39	5.16	4.72	5.36	5.13	6.08	5.46	6.51	7.82	6.73	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	4.13	4.42	5.83	5.15	6.52	4.[illegible]6	6.11	5.61	0.	5.53	6.25	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	4.07	4.71	5.35	5.33	5.55	5.06	5.55	7.34	5.23	0.	0.	0.	7.19	0.	0.	0.	0.	5.00	0.	0.	0.	0.	0.	0.
WSW	4.62	5.02	5.05	5.63	6.55	6.42	7.33	6.22	5.81	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	4.34	4.08	4.79	4.53	5.94	5.49	5.65	5.82	4.47	0.	0.	0.	0.	0.	0.	0.	0.	10.62	0.	0.	0.	0.	0.	0.
WNW	3.60	4.21	4.20	3.64	4.42	6.22	4.11	4.77	3.94	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	3.94	3.79	4.25	5.90	5.79	5.26	6.56	5.72	6.62	0.	4.47	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	3.66	5.14	4.61	6.17	5.55	4.96	0.	4.95	0.	.51	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	3.06	4.44	4.75	4.55	4.44	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 8760
TOTAL NO. OF INVALID OBSERVATIONS = 54

Data Source: 2.3.2-B

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TABLE 2.3-49

VALUES OF MEAN, AVERAGE AND EXTREME DAILY MAXIMUM, AND AVERAGE AND EXTREME DAILY MINIMUM SURFACE TEMPERATURES (°F) IN THE SITE AREA

Month	Mean [1]	Average Daily Maximum [1]	Extreme Maximum [2]	Average Daily Minimum [1]	Extreme Minimum [3]
January	46.5	59.4	84	33.5	5
February	48.1	61.3	82	35.0	-4
March	52.5	65.6	92	39.3	9
April	63.2	77.1	97	49.2	23
May	70.7	84.0	102	57.4	35
June	77.4	90.5	107	64.3	43
July	79.9	92.0	108	67.8	52
August	79.1	91.3	107	67.0	50
September	73.3	85.4	106	61.1	39
October	63.5	76.8	103	50.1	21
November	52.8	66.8	89	38.7	13
December	45.5	58.9	81	32.1	4
Annual	62.7	75.8	108	49.6	-4

1. Based on 13-14 years of record (1947-1960) at Parr.
2. Based on 68 years of data (1893-1960) at Little Mountain, but no higher values were recorded at Parr from 1947-1960.
3. Based on 1893-1960 period of record at Little Mountain and the 1947-1960 period of record at Parr. Value in table is lowest monthly temperature using both records.

Data Source: 2.3.2-E

TABLE 2.3-50

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: JANUARY 1, 1975 TO JANUARY 31, 1975

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: JANUARY 1, 1975 TO JANUARY 31, 1975

DATA SOURCE: ON-SITE
TABLE GENERATED: 08/05/76. 21.30.47.

VIRGIL C SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO: 5182-070-39

METEOROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR	WIND SPEED	WIND DIR	DELTA TEMP 10.00	STAB CLASS 10.00
	10.00	10.00	10.00	10.50	10.50	61.50	61.50	61.00	61.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	8.3	2.9	70.8	2.8	216	5.2	228	.7	E
2	7.8	2.8	72.9	2.7	232	5.0	234	.7	E
3	7.[illegible]	2.9	74.8	2.5	212	4.7	233	.7	F
4	7.1	2.9	76.1	2.5	212	4.9	222	.7	F
5	6.9	3.0	77.8	2.4	221	4.8	237	.7	F
6	6.6	3.0	79.3	2.3	226	4.6	228	.9	F
7	6.4	3.0	80.8	2.4	236	4.6	231	.9	F
8	6.2	3.2	81.4	2.4	256	4.5	251	.8	F
9	6.2	3.3	82.0	2.5	246	4.6	246	.7	F
10	6.9	3.8	81.7	2.5	249	4.4	234	.4	F
11	7.8	3.6	77.2	2.8	253	4.0	238	-.2	E
12	9.2	3.4	70.1	3.3	265	4.3	252	-.5	D
13	10.5	3.6	64.2	3.5	270	4.5	253	-.6	D
14	11.7	3.7	60.6	3.6	269	4.5	260	-.6	D
15	12.5	3.9	59.0	3.9	267	4.8	261	-.6	D
16	13.1	4.3	59.1	3.9	244	4.9	241	-.6	D
17	13.4	4.2	56.6	3.9	242	4.9	244	-.5	D
18	13.2	4.2	58.1	3.6	237	4.7	240	-.4	D
19	12.5	4.1	59.4	2.9	215	4.3	224	-.1	E
20	11.7	4.0	62.0	2.6	193	4.6	208	.2	E
21	10.9	4.0	64.4	2.8	204	5.1	212	.6	E
22	10.2	3.7	65.4	2.9	183	5.1	195	.7	F
23	9.6	3.5	66.9	2.9	211	5.1	207	.8	F
24	9.0	3.4	69.4	3.2	217	5.6	227	.8	F
ABSOLUTE MAX	25.8	17.8	98.6	9.1		11.7			
AVG DAILY MAX	14.4	7.7	86.8	5.2		7.5			
MEAN	9.4	3.5	69.3	3.0	236	4.7	234	.3	E
CLIMATIC MEAN	9.6	3.5	68.3	3.0		4.8			
AVG DAILY MIN	4.9	-.6	49.9	.9		2.2			
ABSOLUTE MIN	-3.7	-10.5	16.2	0.0		.4			
STANDARD DEV	6.2	6.6	20.8	1.7		2.3			
VALID OBS	743	707	707	743	743	735	733	742	742
INVALID OBS	1	37	37	1	1	9	11	2	2
TOTAL OBS	744	744	744	744	744	744	744	744	744
DATA RECOVERY	99.9	95.0	95.0	99.9	99.9	98.8	98.5	99.7	99.7

AMENDMENT 97-01
AUGUST 1997

TABLE 2.3-51

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: FEBRUARY 1, 1975 TO FEBRUARY 28, 1975

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: FEBRUARY 1, 1975 TO FEBRUARY 28, 1975

DATA SOURCE: ON-SITE
TABLE GENERATED: 08/05/76. 21.30.47.

VIRGIL C SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO: 5182-070-09

METEOROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR	WIND SPEED	WIND DIR	DELTA TEMP 10.00	STAB CLASS 10.00
	10.00	10.00	10.00	10.50	10.50	61.50	61.50	61.00	61.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	9.4	3.8	69.1	3.0	165	5.6	187	.7	E
2	8.9	3.8	71.0	2.8	159	5.5	173	.8	F
3	8.4	3.6	72.2	3.0	148	5.5	170	.8	F
4	8.0	3.6	73.8	2.8	154	5.3	166	.7	E
5	7.5	3.4	75.5	2.9	142	5.4	166	.8	F
6	7.0	3.5	78.3	2.9	132	5.3	146	.9	F
7	6.5	3.3	79.4	2.6	207	5.1	180	.9	F
8	6.2	3.0	79.8	2.5	217	5.1	181	.8	F
9	6.0	2.9	80.5	2.4	181	5.0	186	.8	F
10	6.6	3.2	79.0	2.7	189	4.6	201	.5	F
11	8.3	3.3	72.2	3.0	165	4.1	189	-.3	D
12	10.3	3.6	65.6	3.4	228	4.2	214	-.5	D
13	11.3	3.6	62.5	3.4	228	4.2	222	-.6	D
14	12.4	3.5	58.1	3.5	246	4.4	237	-.6	D
15	13.3	3.7	56.0	3.7	250	4.6	243	-.6	D
16	13.7	3.6	54.3	3.5	245	4.4	236	-.5	D
17	14.2	3.7	53.3	3.6	234	4.5	228	-.5	D
18	14.2	3.6	52.9	3.6	230	4.7	226	-.4	D
19	13.	3.9	55.3	3.4	209	4.8	210	-.2	E
20	12.7	3.9	57.9	3.1	206	5.0	206	.0	E
21	11.7	3.9	60.9	3.2	186	5.5	189	.3	E
22	11.0	3.9	63.3	3.2	200	5.6	186	.5	E
23	10.2	3.7	65.4	3.2	186	5.6	184	.7	E
24	9.7	3.8	67.9	3.1	185	5.7	191	.7	E
ABSOLUTE MAX	24.1	18.7	96.8	7.2		9.7			
AVG DAILY MAX	15.3	7.0	84.1	5.0		7.7			
MEAN	10.0	3.6	66.9	3.1	207	5.0	201	.2	E
CLIMATIC MEAN	10.1	3.5	66.3	3.2		5.2			
AVG DAILY MIN	4.9	-.1	48.6	1.4		2.6			
ABSOLUTE MIN	-2.7	-9.1	18.3	0.0		0.0			
STANDARD DEV	6.0	6.8	21.1	1.4		1.9			
VALID OBS	671	671	671	665	665	641	641	672	672
INVALID OBS	1	1	1	7	7	31	31	0	0
TOTAL OBS	672	672	672	672	672	672	672	672	672
DATA RECOVERY	99.9	99.9	99.9	99.0	99.0	95.4	95.4	100.0	100.0

TABLE 2.3-52

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: MARCH 1, 1975 TO MARCH 31, 1975

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: MARCH 1, 1975 TO MARCH MARCH 31, 1975

DATA SOURCE: ON-SITE
TABLE GENERATED: 08/05/76. 21.30.47.

VIRGIL C SUMMER NUCLEAR STATION
PARR,SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO: 5182-070-09

METEOROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB 10.00	DEW POINT 10.00	REL HUMID 10.00	WIND SPEED 10.50	WIND DIR 10.50	WIND SPEED 61.50	WIND DIR 61.50	DELTA TEMP 10.00 61.00	STAB CLASS 10.00 61.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	10.2	3.4	64.5	3.7	218	6.2	218	.4	E
2	9.6	3.6	67.2	3.4	221	5.8	220	.4	E
3	9.1	3.5	68.6	3.3	233	5.7	232	.5	F
4	8.5	3.2	69.3	3.2	225	5.4	228	.5	F
5	9.1	3.0	70.1	3.0	256	5.1	254	.7	E
6	7.8	2.9	70.8	2.9	241	5.1	260	.7	E
7	7.5	2.8	71.6	3.0	229	5.2	250	.8	F
8	7.1	2.7	73.4	2.9	224	4.9	250	.9	F
9	7.3	2.8	72.9	3.0	239	4.9	261	.5	F
10	8.9	3.4	69.2	3.4	234	4.7	234	-.2	E
11	10.2	2.6	60.6	3.9	260	5.0	244	-.5	D
12	12.0	2.7	55.3	4.3	239	5.3	237	-.6	D
13	13.2	2.6	51.8	4.6	243	5.6	240	-.6	D
14	14.0	2.7	50.6	4.5	249	5.6	247	-.6	D
15	14.8	3.0	49.8	4.6	261	5.7	256	-.6	D
16	15.3	3.1	48.6	4.5	251	5.5	250	-.6	D
17	15.6	3.2	48.6	4.4	244	5.6	242	-.6	D
18	15.5	2.7	47.2	4.4	254	5.5	246	-.5	D
19	14.9	2.7	48.1	4.1	256	5.3	250	-.3	D
20	13.8	3.1	52.9	3.7	270	5.4	253	-.0	E
21	12.7	3.0	55.7	3.8	254	5.9	236	.3	F
22	11.8	2.8	57.5	3.7	203	6.3	204	.5	F
23	11.2	3.1	60.2	3.6	186	6.2	192	.5	E
24	10.6	3.3	62.7	3.5	187	6.1	191	.4	E
ABSOLUTE MAX	24.5	18.3	96.2	11.1		15.2			
AVG DAILY MAX	16.7	7.6	82.3	6.2		8.7			
MEAN	11.2	3.0	60.3	3.7	241	5.5	239	.1	F
CLIMATIC MEAN	11.2	3.3	61.0	4.0		5.8			
AVG DAILY MIN	5.8	-1.0	40.9	1.8		2.9			
ABSOLUTE MIN	-5.2	-12.6	13.5	.5		.4			
STANDARD DEV	6.7	8.3	23.8	1.9		2.4			
VALID OBS	741	738	738	742	742	738	738	742	742
INVALID OBS	3	6	6	2	2	6	6	2	2
TOTAL OBS	744	744	744	744	744	744	744	744	744
DATA RECOVERY	99.6	99.2	99.2	99.7	99.7	99.2	99.2	99.7	99.7

TABLE 2.3-53

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: APRIL 1, 1975 TO APRIL 30, 1975

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: APRIL 1,1975 TO APRIL 30, 1975

DATA SOURCE: ON-SITE
TABLE GENERATED: 08/05/76. 21.30.47.

VIRGIL C SUMMER NUCLEAR STATION
PARR,SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO: 5182-070-09

METEOROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR	WIND SPEED	WIND DIR	DELTA TEMP	STAB CLASS
	10.00	10.00	10.00	10.50	10.50	61.50	61.50	10.00 61.00	10.00 61.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	14.8	6.9	60.8	3.2	193	5.6	204	.9	F
2	14.3	7.0	63.1	3.1	201	5.8	208	1.0	F
3	13.6	7.0	65.8	3.0	205	5.5	214	1.0	F
4	13.0	7.1	68.9	2.8	203	5.3	226	1.0	F
5	12.4	7.1	71.0	2.6	227	5.1	265	1.1	F
6	11.9	7.3	74.5	2.4	245	4.7	275	1.2	F
7	11.6	7.0	74.2	2.4	261	4.8	283	1.1	F
8	11.3	7.0	75.3	2.5	251	4.9	277	1.2	F
9	12.2	7.4	72.8	2.9	259	4.7	263	.4	E
10	14.3	7.0	63.0	3.6	269	4.6	265	-.5	D
11	16.1	6.5	55.7	4.2	276	5.1	271	-.7	D
12	17.6	6.4	51.0	4.1	257	4.8	252	-.7	D
13	18.8	6.5	47.6	4.1	261	4.8	249	-.8	D
14	19.8	6.2	44.3	4.1	256	4.8	249	-.8	D
15	20.6	6.1	42.3	4.2	254	5.1	252	-.7	D
16	21.1	6.0	41.1	4.4	257	5.2	252	-.7	D
17	21.4	5.9	40.3	4.4	258	5.2	249	-.7	D
18	21.4	5.[illegible]	40.0	4.3	251	5.2	242	-.6	D
19	21.0	6.0	41.2	4.0	244	5.1	242	-.4	D
20	20.0	6.3	44.4	3.6	227	5.2	230	-.1	E
21	19.7	6.6	48.4	3.4	196	5.5	205	.3	E
22	17.6	6.8	52.1	3.5	190	6.0	197	.7	E
23	16.6	7.0	55.6	3.3	190	5.8	199	.7	E
24	15.9	7.2	58.4	3.3	189	5.9	202	.8	F
ABSOLUTE MAX	30.5	19.2	95.6	10.2		13.6			
AVG DAILY MAX	22.0	10.1	80.3	5.7		8.1			
MEAN	16.5	6.7	56.4	3.5	239	5.2	237	.2	E
CLIMATIC MEAN	16.3	6.7	57.9	3.6		5.4			
AVG DAILY MIN	10.7	3.2	35.5	1.6		2.7			
ABSOLUTE MIN	1.4	-10.6	11.3	0.0		.5			
STANDARD DEV	4.1	8.2	23.2	1.9		2.3			
VALID OBS	719	714	714	720	720	709	708	720	720
INVALID OBS	1	6	6	0	0	11	12	0	0
TOTAL OBS	720	720	720	720	720	720	720	720	720
DATA RECOVERY	99.9	99.2	99.2	100.0	100.0	98.5	98.3	100.0	100.0

TABLE 2.3-54

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: MAY 1, 1975 TO MAY 31, 1975

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: MAY 1,1975 TO MAY 31,1975

DATA SOURCE: ON-SITE
TABLE GENERATED: 08/05/76. 21.30.47.

VIRGIL C SUMMER NUCLEAR STATION
PARR,SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO: 5182-070-09

METEOROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR	WIND SPEED	WIND DIR	DELTA TEMP 10.00	STAB CLASS 10.00
	10.00	10.00	10.00	10.50	10.50	61.50	61.50	61.00	61.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	20.1	16.6	80.5	2.3	142	4.7	168	1.1	F
2	19.6	16.3	81.5	2.2	124	4.7	165	1.1	F
3	19.1	16.1	83.1	2.1	143	4.5	170	1.0	F
4	18.8	15.9	83.3	2.1	145	4.2	182	1.0	F
5	18.5	15.7	84.4	2.1	137	4.1	172	.9	F
6	18.1	15.7	86.3	1.8	137	3.6	173	.9	F
7	17.8	15.7	87.7	1.7	140	3.4	175	.9	F
8	17.9	16.0	88.2	1.7	97	3.3	104	.6	E
9	19.1	16.5	84.5	2.1	88	3.1	95	-.1	E
10	20.9	16.9	78.3	2.3	317	2.6	24	-.5	D
11	22.6	17.2	72.3	2.4	223	2.7	203	-.7	D
12	24.1	17.3	66.7	2.5	261	2.8	249	-.8	C
13	25.2	17.0	61.7	2.7	278	3.1	208	-.8	C
14	26.0	16.6	57.5	2.8	229	3.0	219	-.8	C
15	26.7	16.3	54.2	2.9	212	3.3	207	-.8	C
16	26.9	16.3	52.7	3.2	213	3.6	211	-.7	D
17	26.9	16.4	53.7	3.5	207	4.0	206	-.7	D
18	26.2	16.4	56.5	3.3	203	3.9	204	-.6	D
19	25.6	16.7	59.6	3.0	172	3.8	181	-.4	D
20	24.3	17.0	65.3	2.8	147	4.2	162	-.2	E
21	23.0	17.0	70.1	2.6	140	4.5	157	.2	E
22	22.1	17.1	73.9	2.5	143	4.7	155	.6	E
23	21.4	17.0	76.8	2.6	155	5.0	163	1.0	F
24	20.7	16.9	79.3	2.5	155	5.0	171	1.1	F
ABSOLUTE MAX	33.7	23.1	97.4	8.2		11.7			
AVG DAILY MAX	27.5	18.6	90.7	4.7		6.9			
MEAN	22.1	16.5	72.5	2.5	168	3.8	178	.1	E
CLIMATIC MEAN	22.5	16.5	70.2	2.8		4.2			
AVG DAILY MIN	17.5	14.5	49.8	.9		1.6			
ABSOLUTE MIN	11.7	6.5	33.1	0.0		0.0			
STANDARD DEV	4.6	3.1	17.7	1.2		1.7			
VALID OBS	742	742	741	744	744	742	742	744	744
INVALID OBS	2	2	3	0	0	2	2	0	0
TOTAL OBS	744	744	744	744	744	744	744	744	744
DATA RECOVERY	99.7	99.7	99.6	100.0	100.0	99.7	99.7	100.0	100.0

AMENDMENT 97-01
AUGUST 1997

TABLE 2.3-55

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: JUNE 1, 1975 TO JUNE 30, 1975

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: JUNE 1, 1975 TO JUNE 30, 1975

DATA SOURCE: ON-SITE
TABLE GENERATED: 08/05/76. 21.30.47.

VIRGIL C SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO: 5182-070-09

METEOROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR	WIND SPEED	WIND DIR	DELTA TEMP 10.00	STAB CLASS 10.00
	10.00	10.00	10.00	10.50	10.50	61.50	61.50	61.00	61.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	22.4	18.1	77.2	2.5	156	5.1	174	.9	F
2	21.8	18.2	79.9	2.2	161	4.6	179	.9	F
3	21.4	18.0	81.5	2.2	165	4.4	185	.9	F
4	20.9	17.9	82.9	2.1	212	4.3	210	.8	F
5	20.4	17.6	84.2	2.1	246	4.0	272	.9	F
6	20.1	17.4	84.7	2.1	289	4.2	11	.9	F
7	19.8	17.2	85.3	2.0	321	4.0	20	.9	F
8	20.3	17.4	83.8	2.2	356	3.7	31	.4	E
9	21.9	17.8	77.7	2.6	14	3.2	43	-.4	D
10	23.9	18.1	70.0	3.0	28	3.4	50	-.7	D
11	25.7	17.8	62.2	3.3	17	3.6	38	-.8	C
12	27.0	17.3	55.6	3.5	20	4.0	43	-.8	C
13	28.0	16.9	51.6	3.7	46	4.3	102	-.9	C
14	28.8	16.6	48.1	3.6	335	4.1	144	-.9	B
15	29.4	16.6	46.4	3.9	325	4.4	135	-.9	C
16	29.6	16.8	46.6	3.9	273	4.5	231	-.8	C
17	29.6	16.9	46.5	4.1	221	4.6	185	-.8	C
18	29.2	16.9	48.1	4.0	193	4.8	186	-.7	D
19	28.5	17.0	50.7	3.7	142	4.5	146	-.6	D
20	27.5	17.5	55.5	3.2	117	4.3	132	-.4	D
21	26..	17.8	61.2	3.1	121	4.8	142	.0	E
22	24.8	18.0	66.7	2.8	136	4.8	147	.5	E
23	24.0	17.9	69.4	2.5	142	4.7	152	.7	E
24	23.2	18.0	72.7	2.3	172	4.8	179	1.0	F
ABSOLUTE MAX	34.2	23.0	95.0	9.7		12.3			
AVG DAILY MAX	30.1	19.8	88.4	5.1		6.9			
MEAN	24.8	17.5	66.2	2.9	133	4.3	148	.0	E
CLIMATIC MEAN	24.8	17.5	65.8	3.1		4.5			
AVG DAILY MIN	19.6	15.3	43.1	1.1		2.1			
ABSOLUTE MIN	16.3	9.2	31.6	0.0		0.0			
STANDARD DEV	3.9	2.5	18.5	1.3		1.6			
VALID OBS	719	719	719	720	720	719	719	720	720
INVALID OBS	1	1	1	0	0	1	1	0	0
TOTAL OBS	720	720	720	720	720	720	720	720	720
DATA RECOVERY	99.9	99.9	99.9	100.0	100.0	99.9	99.9	100.0	100.0

TABLE 2.3-56

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: JULY 1, 1975 TO JULY 31, 1975

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: JULY 1, 1975 TO JULY 31, 1975

DATA SOURCE: ON-SITE
TABLE GENERATED: 08/05/76. 21.30.47.

VIRGIL C SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO: 5182-070-09

METEOROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB 10.00	DEW POINT 10.00	REL HUMID 10.00	WIND SPEED 10.50	WIND DIR 10.50	WIND SPEED 61.50	WIND DIR 61.50	DELTA TEMP 10.00 61.00	STAB CLASS 10.00 61.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	23.0	20.5	86.4	2.3	181	4.4	189	.5	F
2	22.6	20.4	87.5	2.3	184	4.4	195	.5	E
3	22.3	20.3	88.7	1.9	183	3.8	198	.6	F
4	22.0	20.2	89.4	1.9	176	3.7	191	.5	E
5	21.7	20.1	90.2	1.9	175	3.6	191	.5	E
6	21.4	20.0	91.2	1.6	176	3.4	189	.6	E
7	21.2	20.0	92.4	1.6	176	3.4	194	.6	F
8	21.5	20.2	92.4	1.7	181	3.1	197	.4	E
9	22.4	20.4	88.3	1.9	197	2.7	209	.1	E
10	23.9	19.7	83.5	2.3	192	2.6	199	-.0	F
11	25.2	21.1	77.8	2.4	185	2.6	168	-.0	E
12	26.4	20.9	71.8	2.6	195	3.0	181	-.0	F
13	27.4	20.7	67.6	2.8	202	3.2	193	.1	F
14	27.9	20.7	65.6	2.9	200	3.4	199	-.0	E
15	28.4	20.2	62.1	3.1	199	3.6	205	-.2	F
16	29.4	20.0	61.6	3.4	199	4.0	194	.0	E
17	28.3	19.9	61.7	3.7	199	4.3	207	-.1	F
18	29.0	19.8	62.4	3.4	161	4.2	170	-.1	E
19	27.1	20.0	66.9	3.4	156	4.5	165	-.2	F
20	26.3	20.3	71.2	2.9	169	3.9	172	-.1	E
21	25.4	20.5	75.3	2.4	162	4.0	173	.1	F
22	24.7	20.5	78.6	2.3	153	4.1	170	.4	E
23	24.1	20.6	81.5	2.4	155	4.3	171	.6	F
24	23.5	20.6	84.0	2.4	163	4.7	178	.6	E
ABSOLUTE MAX	33.5	25.2	100.0	9.9		12.5			
AVG DAILY MAX	29.4	21.8	93.7	4.9		6.7			
MEAN	24.7	20.3	78.3	2.5	177	3.7	186	.2	F
CLIMATIC MEAN	25.2	19.8	75.3	2.8		4.2			
AVG DAILY MIN	21.1	17.8	56.8	.8		1.7			
ABSOLUTE MIN	18.4	-17.3	35.3	0.0		0.0			
STANDARD DEV	3.4	2.3	16.3	1.2		1.5			
VALID OBS	736	733	732	741	741	643	643	741	741
INVALID OBS	8	11	12	3	3	101	101	3	3
TOTAL OBS	744	744	744	744	744	744	744	744	744
DATA RECOVERY	98.9	98.5	98.4	99.6	99.6	86.4	86.4	99.6	99.6

TABLE 2.3-57

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: AUGUST 1, 1975 TO AUGUST 31, 1975

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: AUGUST 1, 1975 TO AUGUST 31, 1975

DATA SOURCE: ON-SITE
TABLE GENERATED: 08/05/76. 21.30.47.

VIRGIL C SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO: 5182-070-09

METEOROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR	WIND SPEED	WIND DIR	DELTA TEMP 10.00 61.00	STAB CLASS 10.00 61.00
	10.00	10.00	10.00	10.50	10.50	61.50	61.50		
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	24.4	21.1	81.8	1.4	183	4.0	192	.8	F
2	23.8	21.1	84.5	1.2	194	3.8	207	.7	F
3	23.5	21.0	85.7	1.3	204	3.8	216	.7	F
4	23.1	20.9	87.2	1.2	207	3.7	221	.7	F
5	22.6	20.8	89.1	1.2	223	3.7	235	.8	F
6	22.4	20.6	89.8	1.1	228	3.7	244	.8	F
7	22.0	20.5	90.8	1.1	238	3.6	242	.8	F
8	22.0	20.5	91.0	1.0	236	3.4	261	.6	E
9	23.1	21.0	87.6	1.4	246	2.7	245	-.1	E
10	25.2	21.5	79.4	1.7	264	2.5	243	-.7	D
11	27.3	21.5	70.4	2.0	276	2.9	242	-.8	C
12	28.8	21.3	63.5	2.2	266	3.1	235	-.8	C
13	29.9	20.6	57.2	2.5	243	3.5	219	-.9	B
14	30.7	20.1	53.0	2.5	239	3.4	215	-.9	B
15	31.3	19.7	49.9	2.6	226	3.4	201	-.9	B
16	31.2	19.4	49.1	2.8	212	3.9	195	-.8	C
17	31.0	19.5	50.2	2.7	202	3.9	191	-.7	D
18	30.8	19.5	51.0	2.5	203	3.5	195	-.6	D
19	30.2	19.8	54.1	2.3	189	3.6	182	-.6	D
20	28.9	20.5	60.8	1.9	164	3.7	171	-.2	E
21	27.5	20.9	67.3	1.8	157	4.1	165	.3	E
22	26.4	21.1	72.4	1.6	162	4.4	171	.6	E
23	25.6	21.0	76.0	1.5	170	4.1	180	.7	F
24	24.9	21.1	79.2	1.4	184	3.9	189	.7	E
ABSOLUTE MAX	36.5	23.9	96.3	5.5		10.3			
AVG DAILY MAX	31.8	22.2	91.8	3.2		5.9			
MEAN	26.5	20.6	71.7	1.8	207	3.6	204	.0	E
CLIMATIC MEAN	26.8	20.5	69.3	1.9		3.8			
AVG DAILY MIN	21.9	18.9	46.7	.7		1.6			
ABSOLUTE MIN	18.9	14.6	31.1	0.0		0.0			
STANDARD DEV	3.9	1.5	17.0	.8		1.5			
VALID OBS	744	744	744	744	744	744	744	744	744
INVALID OBS	0	0	0	0	0	0	0	0	0
TOTAL OBS	744	744	744	744	744	744	744	744	744
DATA RECOVERY	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 2.3-58

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: SEPTEMBER 1, 1975 TO SEPTEMBER 30, 1975

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: SEPTEMBER 1, 1975 TO SEPTEMBER 30, 1975

DATA SOURCE: ON-SITE
TABLE GENERATED: 08/05/76. 21.30.47.

VIRGIL C SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO: 5182-070-09

METEOROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR	WIND SPEED	WIND DIR	DELTA TEMP	STAB CLASS
								10.00	10.00
	10.00	10.00	10.00	10.50	10.50	61.50	61.50	61.00	61.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	20.9	18.2	84.7	2.3	136	4.6	133	.5	F
2	20.6	18.0	85.4	2.2	96	4.3	131	.5	E
3	20.2	17.9	86.3	2.2	74	4.1	100	.3	E
4	19.9	17.5	86.5	2.3	56	4.3	67	.3	E
5	19.5	17.3	86.9	2.3	54	4.2	56	.3	E
6	19.3	17.2	87.4	2.2	51	3.9	35	.3	E
7	19.1	17.1	87.8	2.2	50	3.8	23	.3	E
8	19.0	17.0	88.1	2.3	58	4.0	49	.2	F
9	19.3	17.1	86.8	2.4	45	3.6	45	-.2	E
10	20.5	17.4	82.5	2.9	51	3.7	56	-.5	D
11	22.0	17.7	76.7	3.2	61	3.8	67	-.6	D
12	23.5	17.9	71.6	3.0	74	3.6	79	-.8	D
13	24.8	18.1	67.2	3.1	67	3.7	73	-.8	C
14	25.6	17.9	63.3	3.3	81	3.8	92	-.8	C
15	26.3	17.9	60.7	3.3	98	4.0	117	-.8	C
16	26.6	17.7	59.2	3.4	81	4.1	118	-.7	D
17	26.7	17.6	58.7	3.2	101	4.0	120	-.7	D
18	26.1	17.6	60.5	3.2	86	4.0	107	-.6	D
19	25.1	17.8	65.1	2.8	88	4.0	97	-.3	D
20	23.-	18.1	70.5	2.7	85	4.3	80	-.0	E
21	23.0	18.2	75.0	2.7	111	4.8	108	.3	E
22	22.2	18.2	78.4	2.5	121	4.9	115	.7	E
23	21.7	18.1	80.5	2.3	111	4.8	112	.7	E
24	21.1	18.1	83.0	2.4	121	4.8	117	.6	E
ABSOLUTE MAX	35.7	24.1	98.1	10.1		12.4			
AVG DAILY MAX	27.1	19.9	91.4	4.6		6.8			
MEAN	22.4	17.7	76.4	2.7	81	4.1	92	-.1	E
CLIMATIC MEAN	22.8	17.9	74.1	2.9		4.5			
AVG DAILY MIN	18.4	15.9	56.8	1.2		2.2			
ABSOLUTE MIN	10.4	5.1	34.4	0.0		0.0			
STANDARD DEV	4.7	4.3	15.6	1.5		1.8			
VALID OBS	719	719	719	717	717	717	714	715	715
INVALID OBS	1	1	1	3	3	3	6	5	5
TOTAL OBS	720	720	720	720	720	720	720	720	720
DATA RECOVERY	99.9	99.9	99.9	99.6	99.6	99.6	99.2	99.3	99.3

TABLE 2.3-59

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: OCTOBER 1, 1975 TO OCTOBER 31, 1975

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: OCTOBER,1, 1975 TO OCTOBER 31, 1975

DATA SOURCE: ON-SITE
TABLE GENERATED: 08/05/76. 21.30.47.

VIRGIL C SUMMER NUCLEAR STATION
PARR,SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO: 5162-070-09

METEOROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR	WIND SPEED	WIND DIR	DELTA TEMP	STAB CLASS
	10.00	10.00	10.00	10.50	10.50	61.50	61.50	10.00 61.00	10.00 61.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	16.2	12.9	81.0	2.1	38	4.7	113	2.0	F
2	15.8	12.7	82.2	2.2	36	4.5	124	1.7	F
3	15.4	12.5	83.0	2.1	43	4.4	120	1.6	F
4	14.9	12.4	84.9	2.1	6	4.3	49	1.5	F
5	14.4	12.1	86.4	2.0	349	4.2	9	1.5	F
6	14.0	11.9	87.4	2.0	1	4.3	358	1.4	F
7	13.8	11.7	87.2	2.0	351	4.3	356	1.4	F
8	13.6	11.5	87.3	2.1	10	4.3	10	1.3	F
9	14.0	11.8	86.6	2.2	18	4.0	26	.9	F
10	15.6	12.2	80.8	2.7	40	3.7	40	.0	E
11	17.7	12.9	74.2	3.1	42	3.7	45	-.4	D
12	19.7	13.0	66.7	3.1	45	3.6	49	-.6	D
13	21.4	12.8	59.5	3.2	44	3.5	50	-.7	D
14	22.7	12.6	53.5	3.4	3	3.7	18	-.8	D
15	23.4	12.4	50.6	3.5	71	4.0	142	-.7	D
16	23.8	12.4	49.7	3.5	31	4.0	294	-.7	D
17	23.8	12.3	49.7	3.5	72	4.0	74	-.6	D
18	23.1	12.4	52.0	3.0	91	3.8	99	-.4	D
19	21.9	12.9	57.7	2.6	113	4.1	121	.0	E
20	20.6	13.0	62.3	2.5	100	4.6	79	.6	E
21	19.3	13.0	67.8	2.5	100	4.9	91	1.3	F
22	18.1	12.9	72.0	2.4	120	5.0	122	1.8	F
23	17.2	12.7	75.3	2.2	66	4.8	115	1.9	F
24	16.4	12.5	77.9	2.1	77	4.8	120	2.0	F
ABSOLUTE MAX	28.8	22.0	99.3	10.4		13.1			
AVG DAILY MAX	24.0	15.1	90.0	4.4		6.7			
MEAN	18.2	12.5	71.7	2.6	44	4.2	56	.7	E
CLIMATIC MEAN	18.5	12.5	68.9	2.8		4.4			
AVG DAILY MIN	13.0	9.9	47.9	1.1		2.1			
ABSOLUTE MIN	3.3	-4.8	19.8	.4		0.0			
STANDARD DEV	5.3	5.9	18.6	1.5		2.1			
VALID OBS	738	732	732	743	743	737	736	744	744
INVALID OBS	6	12	12	1	1	7	8	0	0
TOTAL OBS	744	744	744	744	744	744	744	744	744
DATA RECOVERY	99.2	98.4	98.4	99.9	99.9	99.1	98.9	100.0	100.0

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TABLE 2.3-60

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: NOVEMBER 1, 1975 TO NOVEMBER 30, 1975

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: NOVEMBER 1,1975 TO NOVEMBER 30, 1975

DATA SOURCE: ON-SITE
TABLE GENERATED: 08/05/76. 21.30.47.

VIRGIL C SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO: 5182-070-09

METEOROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR	WIND SPEED	WIND DIR	DELTA TEMP 10.00	STAB CLASS 10.00
	10.00	10.00	10.00	10.50	10.50	61.50	61.50	61.00	61.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	10.9	6.6	75.0	2.1	189	4.7	184	2.3	G
2	10.3	6.6	77.7	1.9	187	4.4	191	2.4	G
3	9.8	6.5	80.0	1.9	196	4.3	195	2.4	G
4	9.5	6.5	81.4	1.9	189	4.2	195	2.4	G
5	9.0	6.2	81.9	2.0	208	4.0	208	2.4	G
6	8.9	6.0	82.0	1.9	208	4.0	235	2.2	G
7	8.4	5.9	83.9	1.7	234	3.9	271	2.2	G
8	8.1	5.9	85.6	1.7	206	3.9	305	2.2	G
9	9.2	6.2	87.2	2.0	218	4.1	352	2.2	G
10	9.2	6.8	84.5	2.2	292	3.6	328	1.3	F
11	11.5	7.4	76.1	2.4	296	3.2	304	.1	F
12	14.1	7.6	66.0	2.6	280	3.1	254	-.5	D
13	16.0	7.5	58.2	2.8	261	3.2	253	-.7	D
14	17.0	7.3	54.9	2.9	260	3.4	254	-.7	D
15	17.9	7.0	50.9	3.2	239	3.7	238	-.7	D
16	18.3	6.9	49.3	3.3	247	3.8	240	-.6	D
17	18.2	6.8	49.2	3.0	224	3.6	225	-.5	D
18	17.7	6.9	50.9	2.5	222	3.3	220	-.3	D
19	16.7	6.9	53.8	2.3	169	3.5	196	.1	E
20	15.6	7.2	58.5	2.4	162	4.1	166	.8	F
21	14.4	7.3	63.0	2.4	173	4.7	187	1.6	F
22	13.3	7.4	67.6	2.4	179	4.9	186	2.1	G
23	12.4	7.3	71.5	2.3	167	4.9	182	2.2	G
24	11.9	7.2	73.2	2.2	172	4.9	181	2.1	G
ABSOLUTE MAX	26.1	20.4	100.0	7.7		9.8			
AVG DAILY MAX	18.8	10.3	89.9	4.1		6.8			
MEAN	12.8	6.8	69.3	2.3	217	4.0	211	1.1	F
CLIMATIC MEAN	13.0	6.8	67.9	2.6		4.2			
AVG DAILY MIN	7.1	3.4	45.8	1.0		1.6			
ABSOLUTE MIN	-1.4	-7.5	23.4	.4		0.0			
STANDARD DEV	7.1	7.7	19.6	1.5		2.2			
VALID OBS	719	719	719	720	720	719	719	720	720
INVALID OBS	1	1	1	0	0	1	1	0	0
TOTAL OBS	720	720	720	720	720	720	720	720	720
DATA RECOVERY	99.9	99.9	99.9	100.0	100.0	99.9	99.9	100.0	100.0

TABLE 2.3-61

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: DECEMBER 1, 1975 TO DECEMBER 31, 1975

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: DECEMBER 1, 1975 TO DECEMBER 31, 1975

DATA SOURCE: ON-SITE
TABLE GENERATED: 08/05/76. 21.30.47.

VIRGIL C SUMMER NUCLEAR STATION
PARR,SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO: 5182-070-09

METEOROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB 10.00	DEW POINT 10.00	REL HUMID 10.00	WIND SPEED 10.50	WIND DIR 10.50	WIND SPEED 61.50	WIND DIR 61.50	DELTA TEMP 10.00 61.00	STAB CLASS 10.00 61.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	6.1	.9	69.0	2.2	186	5.3	211	1.5	F
2	5.5	.7	71.2	2.0	226	4.9	221	1.5	F
3	5.0	.5	72.1	2.0	283	4.6	224	1.5	F
4	4.7	.4	73.4	2.0	141	4.5	232	1.5	F
5	4.3	.5	75.6	1.8	25	4.2	249	1.5	F
6	3.9	.4	77.3	1.8	307	4.0	268	1.7	F
7	3.5	.4	79.1	1.9	232	4.1	253	1.8	F
8	3.3	.5	80.5	1.8	218	4.1	243	1.9	F
9	3.2	.5	80.9	1.9	260	3.9	268	1.8	F
10	3.7	.8	79.7	2.0	278	3.9	277	1.5	F
11	5.3	1.4	75.1	2.2	279	3.5	272	.4	E
12	7.5	1.9	68.1	2.6	270	3.3	242	-.3	D
13	9.2	2.0	61.8	2.8	276	3.4	266	-.5	D
14	10.1	1.1	56.1	3.0	285	3.4	277	-.6	D
15	11.2	1.4	54.4	3.2	275	3.8	269	-.6	D
16	11.5	1.4	53.5	3.3	277	3.9	278	-.6	D
17	11.7	1.2	52.1	3.1	277	3.8	274	-.5	D
18	11.2	1.0	52.9	2.8	281	3.7	276	-.3	D
19	10.3	1.0	55.2	2.6	242	4.0	255	.1	E
20	9.3	.8	57.4	2.8	232	4.7	252	.5	E
21	8.2	.9	61.2	2.5	221	4.8	244	1.0	F
22	7.4	.9	63.9	2.4	203	5.0	219	1.4	F
23	6.8	.7	65.6	2.4	154	5.0	202	1.5	F
24	6.4	.7	67.3	2.4	176	5.3	204	1.4	F
ABSOLUTE MAX	21.9	16.9	96.6	9.1		12.7			
AVG DAILY MAX	12.7	4.5	84.3	4.3		7.2			
MEAN	7.1	.9	66.8	2.4	264	4.2	251	.8	F
CLIMATIC MEAN	7.1	.8	65.3	2.7		4.4			
AVG DAILY MIN	1.5	-2.9	46.3	1.0		1.6			
ABSOLUTE MIN	-9.4	-15.8	14.6	.4		0.0			
STANDARD DEV	6.3	7.5	21.3	1.5		2.3			
VALID OBS	742	742	742	744	744	742	742	744	744
INVALID OBS	2	2	2	0	0	2	2	0	0
TOTAL OBS	744	744	744	744	744	744	744	744	744
DATA RECOVERY	99.7	99.7	99.7	100.0	100.0	99.7	99.7	100.0	100.0

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AUGUST 1997

TABLE 2.3-62

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: JANUARY 1, 1975 0100 EST TO DECEMBER 31, 1975 2400

STATISTICS AND DIURNAL VARIATION OF METEOROLOGICAL PARAMETERS
DATA PERIOD: JANUARY 1, 1975 0100 EST TO DECEMBER 31, 1975 2400

DATA SOURCE: ON-SITE
TABLE GENERATED: 08/05/76. 18.49.58.

VIRGIL C SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO: 5182-070-09

METEOROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR	WIND SPEED	WIND DIR	DELTA TEMP	STAB CLASS
								10.00	10.00
	10.00	10.00	10.00	10.50	10.50	61.50	61.50	61.00	61.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	15.6	11.1	75.1	2.5	178	5.0	188	1.0	F
2	15.1	11.0	77.1	2.4	179	4.8	195	1.0	F
3	14.6	10.9	78.6	2.3	180	4.6	200	1.0	F
4	14.2	10.8	79.8	2.2	185	4.5	205	1.0	F
5	13.8	10.7	81.1	2.2	203	4.4	224	1.0	F
6	13.5	10.6	82.5	2.1	222	4.2	244	1.0	F
7	13.2	10.5	83.4	2.0	242	4.2	257	1.1	F
8	13.1	10.5	83.9	2.1	236	4.1	263	.9	F
9	13.6	10.7	82.3	2.3	252	3.9	263	.6	E
10	15.0	11.0	77.6	2.6	293	3.7	263	.1	E
11	16.7	11.2	70.8	2.9	302	3.7	252	-.4	D
12	18.4	11.2	64.3	3.1	258	3.6	234	-.6	D
13	19.7	11.1	59.3	3.3	253	3.9	234	-.6	D
14	20.6	10.8	55.4	3.3	251	4.0	237	-.7	D
15	21.3	10.8	53.0	3.5	247	4.2	238	-.7	D
16	21.7	10.7	52.1	3.6	243	4.3	234	-.6	D
17	21.7	10.7	51.7	3.6	230	4.4	227	-.6	D
18	21.4	10.6	52.7	3.4	220	4.3	219	-.5	D
19	20.7	10.8	55.6	3.1	198	4.3	207	-.3	D
20	19.6	11.0	59.9	2.9	173	4.5	169	.1	E
21	18.4	11.2	64.2	2.8	160	4.9	176	.5	F
22	17.5	11.2	67.7	2.7	159	5.1	171	.9	F
23	16.8	11.1	70.4	2.6	161	5.0	173	1.0	F
24	16.1	11.1	73.0	2.6	170	5.1	181	1.0	F
ABSOLUTE MAX	36.5	25.2	100.0	11.1		15.2			
AVG DAILY MAX	22.5	13.8	87.9	4.8		7.2			
MEAN	17.2	10.9	68.8	2.7	209	4.4	207	.3	E
CLIMATIC MEAN	17.4	10.8	67.6	3.0		4.6			
AVG DAILY MIN	12.2	7.9	47.3	1.1		2.1			
ABSOLUTE MIN	-4.4	-17.3	11.3	0.0		0.0			
STANDARD DEV	8.6	9.3	20.5	1.6		2.1			
VALID OBS	8733	8680	8678	8743	8743	8586	8579	8748	8748
INVALID OBS	27	80	82	17	17	174	181	12	12
TOTAL OBS	8760	8760	8760	8760	8760	8760	8760	8760	8760
DATA RECOVERY	99.7	99.1	99.1	99.8	99.8	98.0	97.9	99.9	99.9

TABLE 2.3-63

MONTHLY AND ANNUAL AVERAGE RELATIVE HUMIDITY (%) AT COLUMBIA (1967-1973)

	Hour (Local Standard Time)			
Month	0100	0700	1300	1900
January	80	83	55	66
February	74	80	48	57
March	74	83	48	54
April	77	84	45	50
May	84	88	49	61
June	88	90	54	64
July	89	91	57	72
August	91	93	59	74
September	92	94	56	75
October	89	92	54	76
November	84	88	49	71
December	80	85	55	71
Annual	84	88	53	66

Data Source: 2.3.2-C

TABLE 2.3-64

MONTHLY AND ANNUAL MEAN, AND EXTREME MAXIMUM AND MINIMUM DEWPOINT TEMPERATURES (°F) AT COLUMBIA, S.C. (1971-1975)

Month	Mean	Extreme Maximum	Extreme Minimum
January	41	68	-06
February	36	69	01
March	43	68	09
April	48	72	17
May	60	74	28
June	66	76	39
July	71	79	52
August	71	77	57
September	67	78	41
October	54	75	17
November	44	72	09
December	41	71	02
Annual	53	79	-06

Data Source: 2.3.2-F

TABLE 2.3-65

MONTHLY AND ANNUAL PRECIPITATION MEANS
AND EXTREMES IN THE SITE AREA
(INCHES)

Month	Mean[1]	Mean No. of Days > 0.5 Inches[2]	Maximum Precipitation[3] Columbia (1948-1973)	Greenville-Spartanburg (1963-1973)
January	3.79	3	7.62 (1972)	6.14 (1972)
February	3.78	3	8.68 (1961)	7.43 (1971)
March	4.45	4	10.89 (1973)	9.66 (1963)
April	3.81	2	5.89 (1958)	11.30 (1964)
May	3.29	2	8.85 (1967)	8.89 (1972)
June	3.29	2	14.81 (1973)	9.59 (1969)
July	5.35	3	13.87 (1959)	7.44 (1964)
August	4.91	3	16.72 (1949)	7.51 (1967)
September	3.63	3	8.78 (1953)	7.98 (1966)
October	2.61	2	12.09 (1959)	10.24 (1964)
November	2.54	1	7.20 (1957)	5.31 (1972)
December	3.59	2	7.43 (1953)	7.55 (1973)
Annual	45.04	30	16.72 (Aug. 1949)	11.30 (Apr. 1964)

1. Based on 30 years of record (1931-1960) at Little Mountain, Santuck, and Winnsboro.

2. Based on 10 years of record (1951-1960) at Little Mountain, Santuck, and Winnsboro.

3. Year of occurrence is given in parentheses.

Data Source: 2.3.2-C, D, and E

TABLE 2.3-66

MONTHLY AND ANNUAL AVERAGE SNOWFALL FOR THE SITE AREA
AND EXTREMES FOR SELECTED STATIONS
(INCHES)

Month	Mean[1]	Maximum Snowfalls [2] Columbia (1884-1930;1948-1973) [3]	Greenville (1884-1930) [3]	Greenville-Spartanburg (1963-1973)
January	0.6	5.9 (1912)	12.9 (1893)	9.1 (1966)
February	0.9	16.0 (1973)	15.0 (1902)	6.9 (1969)
March	0.4	3.2 (1960)	9.7 (1927)	6.6 (1971)
April	T[4]	T	T	0.0
May	T	0.0	0.0	0.0
June	0.0	0.0	0.0	0.0
July	0.0	0.0	0.0	0.0
August	0.0	0.0	0.0	0.0
September	0.0	0.0	0.0	0.0
October	T	0.0	T	0.0
November	0.1	3.3 (1901)	0.3 (1918)	1.9 (1968)
December	0.4	9.3 (1958)	14.4 (1930)	11.4 (1971)
Annual	2.4	16.0 (Feb. 1973)	15.0 (Feb. 1902)	11.4 (Dec 1971)

02-01

1. Based on 68 years of record (1893-1960) at Little Mountain, 65 years of record (1896-1960) at Santuck and 64 years of record (1897-1960) at Winnsboro. 02-01

2. Year of occurrence is given in parentheses.

3. Monthly extremes that occurred in 1930 or before are based on greatest amount in 24 hours and greatest snow depth of record.

4. T = trace, an amount too small to measure.

Data Source: 2.3.2-C, D, E, and G

TABLE 2.3-67

MONTHLY AND ANNUAL AVERAGE NUMBER OF DAYS WITH HEAVY FOG

Month	Columbia (1948-1973)	Greenville-Spartanburg (1963-1973)
January	2	4
February	2	3
March	2	4
April	1	3
May	1	1
June	2	1
July	2	2
August	2	3
September	3	2
October	3	2
November	3	3
December	3	6
Annual	27	34

Data Source: 2.3.2-C and D

TABLE 2.3-68

MONTHLY AND ANNUAL STABILITY CLASS PERCENT FREQUENCY DISTRIBUTIONS AT COLUMBIA, S.C. (1965-1969)

	Stability Class *						
Month	A	B	C	D	E	F	G
January	0.0	3.2	10.7	47.4	11.3	14.5	12.9
February	0.0	3.2	9.7	51.8	11.3	15.0	9.1
March	0.4	6.3	10.4	40.9	13.4	19.0	9.6
April	1.8	7.0	14.8	44.5	13.6	11.8	6.5
May	1.7	13.4	17.1	32.7	14.0	13.4	7.7
June	1.4	14.7	16.3	31.1	12.7	15.9	7.9
July	2.2	16.1	16.8	29.0	15.3	13.9	6.8
August	2.2	16.1	16.8	29.0	15.3	13.9	6.8
September	0.3	6.9	13.9	31.4	12.0	18.7	16.8
October	0.4	8.5	12.4	32.0	10.0	19.8	16.9
November	0.0	5.8	9.1	40.2	10.0	18.5	16.5
December	0.0	2.4	8.9	47.1	11.9	17.3	12.5
Annual	0.9	8.4	13.1	38.1	12.3	16.1	11.1

02-01

* Definition of Pasquill Stability Classes

Stability Class	Definition
A	Extremely stable
B	Unstable
C	Slightly unstable
D	Neutral
E	Slightly stable
F	Stable
G	Extremely stable

Data Source: 2.3.2-I

TABLE 2.3-69

STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION
(BASED ON 10-61 METER ΔT)
JANUARY 1975

STABILITY PERSISTENCE SUMMARY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 1/ 1/75 TO 1/31/75
DATE AND TIME OF RUN 08/09/76. 10.23.44.

NUMBER OF HOURS

NUMBER OF CONSECUTIVE HOURS	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-
2	3	2	7	228	201	78	39
3	1	0	1	186	155	52	28
4	0	0	0	152	129	34	22
5	0	0	0	124	106	22	17
6	0	0	0	99	84	14	14
7	0	0	0	75	68	10	11
8	0	0	0	52	54	6	8
9	0	0	0	35	43	3	6
10	0	0	0	23	34	1	4
11	0	0	0	17	26	0	3
12	0	0	0	11	20	0	2
13	0	0	0	6	15	0	1
14	0	0	0	2	11	0	0
15	0	0	0	0	7	0	0
16	0	0	0	0	3	0	0
17	0	0	0	0	1	0	0
18	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0

2 INVALID HOUR(S).

DIURNAL DISTRIBUTION OF STABILITY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 1/ 1/75 TO 1/31/75
DATE AND TIME OF RUN 08/09/76. 10.23.44.

NUMBER OF HOURS

TIME OF DAY (LST)	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
0	0	0	0	4	14	10	3	31
1	0	0	0	2	15	10	4	31
2	0	0	0	3	18	6	4	31
3	0	0	0	3	16	8	4	31
4	0	0	0	4	16	8	3	31
5	0	0	0	4	17	6	4	31
6	0	0	0	4	14	8	5	31
7	0	0	0	4	14	7	6	31
8	0	0	0	6	13	9	3	31
9	0	0	0	11	14	3	3	31
10	0	0	0	21	7	2	0	30
11	0	0	3	26	2	0	0	31
12	2	1	4	24	0	0	0	31
13	2	3	3	22	1	0	0	31
14	2	1	5	23	0	0	0	31
15	0	0	3	27	0	0	0	30
16	0	0	0	31	0	0	0	31
17	0	0	0	29	2	0	0	31
18	0	0	0	7	24	0	0	31
19	0	0	0	5	22	4	0	31
20	0	0	0	4	14	12	1	31
21	0	0	0	5	11	10	5	31
22	0	0	0	4	14	8	5	31
23	0	0	0	3	15	8	5	31
ALL	6	5	18	276	263	119	55	742

2 INVALID HOUR(S).

TABLE 2.3-70

STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION
(BASED ON 10-61 METER ΔT)
FEBRUARY 1975

STABILITY PERSISTENCE SUMMARY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 2/ 1/75 TO 2/28/75
DATE AND TIME OF RUN 08/09/76. 10.26.25.

NUMBER OF HOURS

NUMBER OF CONSECUTIVE HOURS	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-
2	0	2	4	245	163	71	38
3	0	0	0	209	136	53	28
4	0	0	0	183	116	39	20
5	0	0	0	163	97	27	13
6	0	0	0	147	81	19	7
7	0	0	0	132	69	12	5
8	0	0	0	118	58	8	4
9	0	0	0	107	47	6	3
10	0	0	0	99	37	4	2
11	0	0	0	94	28	2	1
12	0	0	0	90	22	1	0
13	0	0	0	88	16	0	0
14	0	0	0	86	11	0	0
15	0	0	0	85	8	0	0
16	0	0	0	84	5	0	0
17	0	0	0	83	4	0	0
18	0	0	0	82	3	0	0
19	0	0	0	81	2	0	0
20	0	0	0	80	1	0	0
21	0	0	0	79	0	0	0
22	0	0	0	78	0	0	0
23	0	0	0	77	0	0	0
24	0	0	0	76	0	0	0
>24	0	0	0	75	0	0	0

0 INVALID HOUR(S).

DIURNAL DISTRIBUTION OF STABILITY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 2/ 1/75 TO 2/28/75
DATE AND TIME OF RUN 08/09/76. 10.26.25.

NUMBER OF HOURS

TIME OF DAY (LST)	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
0	0	0	0	5	11	9	3	28
1	0	0	0	5	11	9	3	28
2	0	0	0	5	11	9	3	28
3	0	0	0	5	11	10	2	28
4	0	0	0	5	11	8	4	28
5	0	0	0	4	12	6	6	28
6	0	0	0	6	11	6	5	28
7	0	0	0	6	11	6	5	28
8	0	0	0	6	11	6	5	28
9	0	0	0	12	8	4	4	28
10	0	0	0	19	9	0	0	28
11	0	1	1	22	4	0	0	28
12	0	1	5	21	1	0	0	28
13	2	3	1	21	1	0	0	28
14	0	2	6	20	0	0	0	28
15	1	1	4	21	0	1	0	28
16	0	0	2	25	1	0	0	28
17	0	0	0	26	2	0	0	28
18	0	0	0	16	12	0	0	28
19	0	0	0	7	20	1	0	28
20	0	0	0	8	14	6	0	28
21	0	0	0	7	13	5	3	28
22	0	0	0	7	10	7	4	28
23	0	0	0	7	11	6	4	28
ALL	3	8	19	286	206	99	51	672

0 INVALID HOUR(S).

TABLE 2.3-71

STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION
(BASED ON 10-61 METER ΔT)
MARCH 1975

STABILITY PERSISTENCE SUMMARY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 3/ 1/75 TO 3/31/75
DATE AND TIME OF RUN 08/09/76. 10.28.11.

NUMBER OF HOURS

NUMBER OF CONSECUTIVE HOURS	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-
2	0	0	15	260	203	42	24
3	0	0	5	219	158	21	22
4	0	0	2	185	130	10	17
5	0	0	0	154	108	5	13
6	0	0	0	137	89	3	10
7	0	0	0	117	72	1	7
8	0	0	0	97	59	0	4
9	0	0	0	74	46	0	1
10	0	0	0	63	34	0	0
11	0	0	0	52	23	0	0
12	0	0	0	41	15	0	0
13	0	0	0	33	10	0	0
14	0	0	0	26	6	0	0
15	0	0	0	21	3	0	0
16	0	0	0	16	1	0	0
17	0	0	0	12	0	0	0
18	0	0	0	9	0	0	0
19	0	0	0	8	0	0	0
20	0	0	0	7	0	0	0
21	0	0	0	6	0	0	0
22	0	0	0	5	0	0	0
23	0	0	0	4	0	0	0
24	0	0	0	3	0	0	0
>24	0	0	0	2	0	0	0

2 INVALID HOUR(S).

DIURNAL DISTRIBUTION OF STABILITY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 3/ 1/75 TO 3/31/75
DATE AND TIME OF RUN 08/09/76. 10.28.11.

NUMBER OF HOURS

TIME OF DAY (LST)	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
0	0	0	0	3	20	6	2	31
1	0	0	0	5	20	2	4	31
2	0	0	0	4	21	2	4	31
3	0	0	0	3	21	3	4	31
4	0	0	0	4	18	6	3	31
5	0	0	0	5	17	5	4	31
6	0	0	0	4	19	4	4	31
7	0	0	0	3	18	5	5	31
8	0	0	0	11	13	2	5	31
9	0	0	0	19	7	3	0	29
10	0	0	3	27	1	0	0	31
11	2	0	6	22	1	0	0	31
12	0	3	7	21	0	0	0	31
13	0	1	8	22	0	0	0	31
14	1	2	5	23	0	0	0	31
15	0	0	6	25	0	0	0	31
16	0	0	4	26	1	0	0	31
17	0	0	0	29	2	0	0	31
18	0	0	0	25	6	0	0	31
19	0	0	0	12	19	0	0	31
20	0	0	0	9	14	8	0	31
21	0	0	0	7	12	11	1	31
22	0	0	0	4	18	9	0	31
23	0	0	0	4	17	9	1	31
ALL	3	6	39	317	265	75	37	742

TABLE 2.3-72

STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION
(BASED ON 10-61 METER ΔT)
APRIL 1975

STABILITY PERSISTENCE SUMMARY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 4/ 1/75 TO 4/30/75
DATE AND TIME OF RUN 08/09/76. 10.29.53.

NUMBER OF HOURS

NUMBER OF CONSECUTIVE HOURS	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-
2	6	2	28	192	178	46	52
3	3	0	10	147	146	28	43
4	1	0	4	114	123	18	35
5	0	0	3	91	100	8	26
6	0	0	2	75	80	3	22
7	0	0	1	63	65	1	16
8	0	0	0	55	51	0	11
9	0	0	0	47	39	0	7
10	0	0	0	40	29	0	4
11	0	0	0	33	21	0	2
12	0	0	0	28	13	0	0
13	0	0	0	24	6	0	0
14	0	0	0	22	1	0	0
15	0	0	0	20	0	0	0
16	0	0	0	18	0	0	0
17	0	0	0	16	0	0	0
18	0	0	0	14	0	0	0
19	0	0	0	12	0	0	0
20	0	0	0	10	0	0	0
21	0	0	0	8	0	0	0
22	0	0	0	6	0	0	0
23	0	0	0	4	0	0	0
24	0	0	0	3	0	0	0
>24	0	0	0	2	0	0	0

0 INVALID HOUR(S).

DIURNAL DISTRIBUTION OF STABILITY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 4/ 1/75 TO 4/30/75
DATE AND TIME OF RUN 08/09/76. 10.29.53.

NUMBER OF HOURS

TIME OF DAY (LST)	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
0	0	0	0	3	17	5	5	30
1	0	0	0	3	15	8	4	30
2	0	0	0	2	16	7	5	30
3	0	0	0	2	16	5	7	30
4	0	0	0	3	13	7	7	30
5	0	0	0	2	15	3	10	30
6	0	0	0	4	13	5	8	30
7	0	0	0	7	10	5	8	30
8	0	0	0	14	9	4	3	30
9	0	0	1	26	3	0	0	30
10	1	2	6	21	0	0	0	30
11	3	1	10	16	0	0	0	30
12	5	3	7	15	0	0	0	30
13	2	7	8	13	0	0	0	30
14	2	2	10	15	1	0	0	30
15	1	3	10	16	0	0	0	30
16	0	2	8	20	0	0	0	30
17	0	0	2	27	1	0	0	30
18	0	0	0	26	4	0	0	30
19	0	0	0	10	20	0	0	30
20	0	0	0	3	23	4	0	30
21	0	0	0	2	17	9	2	30
22	0	0	0	3	18	6	3	30
23	0	0	0	3	18	5	4	30
ALL	14	20	62	256	229	73	66	720

0 INVALID HOUR(S).

TABLE 2.3-73

STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION
(BASED ON 10-61 METER ΔT)
MAY 1975

STABILITY PERSISTENCE SUMMARY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 5/ 1/75 TO 5/31/75
DATE AND TIME OF RUN 08/09/76. 10.34.10.

NUMBER OF HOURS

NUMBER OF CONSECUTIVE HOURS	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-
2	29	3	21	191	125	68	36
3	19	0	8	145	80	47	26
4	11	0	4	110	51	30	19
5	6	0	2	84	31	18	14
6	2	0	1	69	22	9	10
7	0	0	0	57	15	4	6
8	0	0	0	48	10	1	4
9	0	0	0	42	6	0	2
10	0	0	0	36	2	0	1
11	0	0	0	30	0	0	0
12	0	0	0	24	0	0	0
13	0	0	0	20	0	0	0
14	0	0	0	18	0	0	0
15	0	0	0	16	0	0	0
16	0	0	0	14	0	0	0
17	0	0	0	13	0	0	0
18	0	0	0	12	0	0	0
19	0	0	0	11	0	0	0
20	0	0	0	10	0	0	0
21	0	0	0	9	0	0	0
22	0	0	0	8	0	0	0
23	0	0	0	7	0	0	0
24	0	0	0	6	0	0	0
>24	0	0	0	5	0	0	0

0 INVALID HOUR(S).

DIURNAL DISTRIBUTION OF STABILITY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 5/ 1/75 TO 5/31/75
DATE AND TIME OF RUN 08/09/76. 10.34.10.

NUMBER OF HOURS

TIME OF DAY (LST)	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
0	0	0	0	3	9	13	6	31
1	0	0	0	4	11	12	4	31
2	0	0	0	1	14	10	6	31
3	0	0	0	4	14	9	4	31
4	0	0	0	2	18	6	5	31
5	0	0	0	3	14	9	5	31
6	0	0	0	4	16	6	5	31
7	0	0	0	7	16	4	4	31
8	0	0	0	22	7	2	0	31
9	0	1	3	25	2	0	0	31
10	3	3	6	19	0	0	0	31
11	6	4	9	12	0	0	0	31
12	12	0	4	15	0	0	0	31
13	10	1	7	13	0	0	0	31
14	7	6	9	8	1	0	0	31
15	5	3	8	15	0	0	0	31
16	1	3	6	21	0	0	0	31
17	0	0	5	23	3	0	0	31
18	0	0	0	29	2	0	0	31
19	0	0	0	16	15	0	0	31
20	0	0	0	10	16	5	0	31
21	0	0	0	5	13	12	1	31
22	0	0	0	2	12	10	7	31
23	0	0	0	2	11	12	6	31
ALL	44	21	57	265	194	110	53	744

0 INVALID HOUR(S).

TABLE 2.3-74

STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION
(BASED ON 10-61 METER ΔT)
JUNE 1975

STABILITY PERSISTENCE SUMMARY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 6/ 1/75 TO 6/30/75
DATE AND TIME OF RUN 08/09/76. 10.37.35.

NUMBER OF HOURS

NUMBER OF CONSECUTIVE HOURS	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-
2	31	3	31	176	127	46	34
3	14	1	14	127	92	28	23
4	7	0	5	94	69	19	13
5	4	0	2	75	53	11	6
6	1	0	1	65	40	5	2
7	0	0	0	58	28	2	0
8	0	0	0	52	19	0	0
9	0	0	0	47	13	0	0
10	0	0	0	42	9	0	0
11	0	0	0	38	6	0	0
12	0	0	0	34	3	0	0
13	0	0	0	30	1	0	0
14	0	0	0	27	0	0	0
15	0	0	0	24	0	0	0
16	0	0	0	21	0	0	0
17	0	0	0	18	0	0	0
18	0	0	0	15	0	0	0
19	0	0	0	13	0	0	0
20	0	0	0	11	0	0	0
21	0	0	0	9	0	0	0
22	0	0	0	8	0	0	0
23	0	0	0	7	0	0	0
24	0	0	0	6	0	0	0
>24	0	0	0	5	0	0	0

0 INVALID HOUR(S).

DIURNAL DISTRIBUTION OF STABILITY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 6/ 1/75 TO 6/30/75
DATE AND TIME OF RUN 08/09/76. 10.37.35.

NUMBER OF HOURS

TIME OF DAY (LST)	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
0	0	0	0	3	14	8	5	30
1	0	0	0	3	14	7	6	30
2	0	0	0	5	13	6	6	30
3	0	0	0	6	11	10	3	30
4	0	0	0	5	13	7	5	30
5	0	0	0	4	14	7	5	30
6	0	0	0	5	14	3	8	30
7	0	0	0	11	8	10	1	30
8	0	0	0	24	6	0	0	30
9	1	0	5	24	0	0	0	30
10	2	6	8	14	0	0	0	30
11	9	3	9	9	0	0	0	30
12	10	7	8	5	0	0	0	30
13	11	5	7	7	0	0	0	30
14	13	4	7	6	0	0	0	30
15	11	2	8	9	0	0	0	30
16	7	2	9	12	0	0	0	30
17	1	1	9	19	0	0	0	30
18	0	0	2	26	2	0	0	30
19	0	0	0	25	5	0	0	30
20	0	0	0	9	21	0	0	30
21	0	0	0	7	13	9	1	30
22	0	0	0	3	15	8	4	30
23	0	0	0	1	16	6	7	30
ALL	65	30	72	242	179	81	51	720

0 INVALID HOUR(S).

TABLE 2.3-75

STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION
(BASED ON 10-61 METER AT)
JULY 1975

STABILITY PERSISTENCE SUMMARY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 7/ 1/75 TO 7/31/75
DATE AND TIME OF RUN 08/09/76. 10.39.24.

NUMBER OF HOURS

NUMBER OF CONSECUTIVE HOURS	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-
2	13	8	6	100	260	63	17
3	3	1	2	59	207	33	11
4	0	0	0	34	169	22	10
5	0	0	0	20	133	14	9
6	0	0	0	13	107	9	8
7	0	0	0	10	87	6	7
8	0	0	0	8	70	4	6
9	0	0	0	6	55	3	5
10	0	0	0	4	41	2	4
11	0	0	0	2	29	1	3
12	0	0	0	1	18	0	2
13	0	0	0	0	12	0	1
14	0	0	0	0	9	0	0
15	0	0	0	0	6	0	0
16	0	0	0	0	4	0	0
17	0	0	0	0	2	0	0
18	0	0	0	0	1	0	0
19	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0

3 INVALID HOUR(S).

DIURNAL DISTRIBUTION OF STABILITY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 7/ 1/75 TO 7/31/75
DATE AND TIME OF RUN 08/09/76. 10.39.24.

NUMBER OF HOURS

TIME OF DAY (LST)	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
0	0	0	0	1	22	7	1	31
1	0	0	0	1	25	2	3	31
2	0	0	0	2	22	4	3	31
3	0	0	0	4	18	8	1	31
4	0	0	0	3	21	5	2	31
5	0	0	0	1	21	7	2	31
6	0	0	0	2	19	9	1	31
7	0	0	0	4	18	7	1	30
8	0	0	0	14	13	2	1	30
9	1	1	1	13	9	4	1	30
10	1	2	6	8	9	4	1	31
11	1	4	5	6	9	5	1	31
12	4	3	4	7	5	7	1	31
13	6	1	1	11	5	6	1	31
14	7	2	2	8	9	2	1	31
15	2	4	4	8	6	6	1	31
16	3	4	2	11	7	4	0	31
17	2	1	2	12	12	2	0	31
18	0	0	1	18	10	2	0	31
19	0	0	0	16	13	2	0	31
20	0	0	0	9	18	3	1	31
21	0	0	0	2	23	5	1	31
22	0	0	0	4	16	9	2	31
23	0	0	0	3	20	4	4	31
ALL	27	22	28	168	350	116	30	741

3 INVALID HOUR(S).

TABLE 2.3-76

STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION
(BASED ON 10-61 METER ΔT)
AUGUST 1975

STABILITY PERSISTENCE SUMMARY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 8/ 1/75 TO 8/31/75
DATE AND TIME OF RUN 08/09/76. 10.41.33.

NUMBER OF HOURS

NUMBER OF CONSECUTIVE HOURS	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-
2	64	3	11	148	140	78	25
3	40	0	5	107	104	52	16
4	22	0	3	66	75	34	9
5	11	0	1	70	53	21	6
6	4	0	0	61	38	14	5
7	1	0	0	53	26	8	4
8	0	0	0	46	15	3	3
9	0	0	0	39	8	1	2
10	0	0	0	34	4	0	1
11	0	0	0	30	2	0	0
12	0	0	0	26	1	0	0
13	0	0	0	23	0	0	0
14	0	0	0	20	0	0	0
15	0	0	0	18	0	0	0
16	0	0	0	16	0	0	0
17	0	0	0	14	0	0	0
18	0	0	0	12	0	0	0
19	0	0	0	11	0	0	0
20	0	0	0	10	0	0	0
21	0	0	0	9	0	0	0
22	0	0	0	8	0	0	0
23	0	0	0	7	0	0	0
24	0	0	0	6	0	0	0
>24	0	0	0	5	0	0	0

0 INVALID HOUR(S).

DIURNAL DISTRIBUTION OF STABILITY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 8/ 1/75 TO 8/31/75
DATE AND TIME OF RUN 08/09/76. 10.41.33.

NUMBER OF HOURS

TIME OF DAY (LST)	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
0	0	0	0	4	13	10	4	31
1	0	0	0	4	14	11	2	31
2	0	0	0	3	17	9	2	31
3	0	0	0	4	15	10	2	31
4	0	0	0	4	12	12	3	31
5	0	0	0	4	15	7	5	31
6	0	0	0	4	16	5	6	31
7	0	0	0	6	15	6	4	31
8	0	0	0	18	9	4	0	31
9	0	1	4	26	0	0	0	31
10	7	4	8	12	0	0	0	31
11	13	2	6	10	0	0	0	31
12	16	2	5	8	0	0	0	31
13	18	2	3	8	0	0	0	31
14	19	2	5	5	0	0	0	31
15	16	2	5	7	1	0	0	31
16	7	8	5	9	1	0	1	31
17	0	3	13	12	2	1	0	31
18	0	0	1	29	1	0	0	31
19	0	0	0	20	11	0	0	31
20	0	0	0	7	19	5	0	31
21	0	0	0	5	13	13	0	31
22	0	0	0	5	12	12	2	31
23	0	0	0	3	14	10	4	31
ALL	96	26	55	217	200	115	35	744

0 INVALID HOUR(S).

TABLE 2.3-77

STABILITY - PERSISTENCE AND DIURNAL DISTRIBUTION
(BASED ON 10-61 METER ΔT)
SEPTEMBER 1975

STABILITY PERSISTENCE SUMMARY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 9/ 1/75 TO 9/30/75
DATE AND TIME OF RUN 08/09/76. 10.43.37.

NUMBER OF HOURS

NUMBER OF CONSECUTIVE HOURS	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-
2	30	2	11	237	182	32	16
3	21	0	5	198	140	13	9
4	15	0	3	171	110	5	6
5	9	0	1	152	84	2	4
6	4	0	0	136	63	1	3
7	1	0	0	121	47	0	2
8	0	0	0	109	34	0	1
9	0	0	0	97	25	0	0
10	0	0	0	86	19	0	0
11	0	0	0	76	14	0	0
12	0	0	0	67	10	0	0
13	0	0	0	59	6	0	0
14	0	0	0	53	2	0	0
15	0	0	0	47	0	0	0
16	0	0	0	42	0	0	0
17	0	0	0	37	0	0	0
18	0	0	0	33	0	0	0
19	0	0	0	29	0	0	0
20	0	0	0	25	0	0	0
21	0	0	0	22	0	0	0
22	0	0	0	20	0	0	0
23	0	0	0	18	0	0	0
24	0	0	0	16	0	0	0
>24	0	0	0	14	0	0	0

5 INVALID HOUR(S).

DIURNAL DISTRIBUTION OF STABILITY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 9/ 1/75 TO 9/30/75
DATE AND TIME OF RUN 08/09/76. 10.43.37.

NUMBER OF HOURS

TIME OF DAY (LST)	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
0	0	0	0	4	16	7	3	30
1	0	0	0	6	17	6	1	30
2	0	0	0	5	20	4	1	30
3	0	0	0	7	20	2	1	30
4	0	0	0	7	19	2	2	30
5	0	0	0	9	16	2	3	30
6	0	0	0	10	14	3	3	30
7	0	0	0	10	15	3	2	30
8	0	0	0	17	11	2	0	30
9	0	0	2	25	3	0	0	30
10	1	1	6	21	1	0	0	30
11	9	2	2	17	0	0	0	30
12	7	5	3	14	0	0	0	29
13	7	2	6	14	0	0	0	29
14	8	0	5	16	0	0	0	29
15	6	0	6	16	0	0	0	28
16	4	4	3	19	0	0	0	30
17	1	0	3	25	1	0	0	30
18	0	0	0	23	7	0	0	30
19	0	0	0	9	21	0	0	30
20	0	0	0	5	19	6	0	30
21	0	0	0	4	14	10	2	30
22	0	0	0	5	14	7	4	30
23	0	0	0	4	14	10	2	30
ALL	43	14	36	292	242	64	24	715

5 INVALID HOUR(S).

TABLE 2.3-78

STABILITY - PERSISTENCE AND DIURNAL DISTRIBUTION
(BASED ON 10-61 METER ΔT)
OCTOBER 1975

STABILITY PERSISTENCE SUMMARY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 10/ 1/75 TO 10/31/75
DATE AND TIME OF RUN 08/09/76. 10.45.18.

NUMBER OF HOURS

NUMBER OF CONSECUTIVE HOURS	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-
2	1	3	16	159	146	72	104
3	0	0	6	105	111	47	91
4	0	0	1	68	91	29	79
5	0	0	0	49	75	21	68
6	0	0	0	36	61	15	58
7	0	0	0	27	50	10	44
8	0	0	0	29	39	6	46
9	0	0	0	14	29	3	31
10	0	0	0	9	22	0	22
11	0	0	0	6	15	0	14
12	0	0	0	5	11	0	8
13	0	0	0	4	8	0	4
14	0	0	0	3	5	0	1
15	0	0	0	2	2	0	0
16	0	0	0	1	1	0	0
17	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0

0 INVALID HOUR(S).

DIURNAL DISTRIBUTION OF STABILITY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 10/ 1/75 TO 10/31/75
DATE AND TIME OF RUN 08/09/76. 10.45.18.

NUMBER OF HOURS

TIME OF DAY (LST)	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
0	0	0	0	1	9	10	11	31
1	0	0	0	1	12	9	9	31
2	0	0	0	1	14	7	9	31
3	0	0	0	2	14	5	10	31
4	0	0	0	2	14	6	9	31
5	0	0	0	3	16	3	9	31
6	0	0	0	3	15	4	9	31
7	0	0	0	4	12	8	7	31
8	0	0	0	5	16	4	6	31
9	0	0	0	22	5	3	1	31
10	1	0	2	23	3	2	0	31
11	0	1	7	20	2	1	0	31
12	2	3	9	15	2	0	0	31
13	2	4	12	12	1	0	0	31
14	6	1	8	15	1	0	0	31
15	0	1	9	21	0	0	0	31
16	0	0	0	31	0	0	0	31
17	0	0	0	30	1	0	0	31
18	0	0	0	2	29	0	0	31
19	0	0	0	1	16	14	0	31
20	0	0	0	1	7	17	6	31
21	0	0	0	2	6	12	11	31
22	0	0	0	2	6	9	14	31
23	0	0	0	2	8	8	13	31
ALL	11	10	47	221	209	122	124	744

0 INVALID HOUR(S).

TABLE 2.3-79

STABILITY - PERSISTENCE AND DIURNAL DISTRIBUTION
(BASED ON 10-61 METER ΔT)
NOVEMBER 1975

STABILITY PERSISTENCE SUMMARY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 11/ 1/75 TO 11/30/75
DATE AND TIME OF RUN 08/09/76. 10.47.31.

NUMBER OF HOURS

NUMBER OF CONSECUTIVE HOURS	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-
2	0	3	11	164	112	56	146
3	0	0	5	137	73	37	129
4	0	0	1	102	53	23	115
5	0	0	0	74	38	16	102
6	0	0	0	51	26	11	89
7	0	0	0	32	19	7	77
8	0	0	0	20	14	4	65
9	0	0	0	11	10	2	54
10	0	0	0	5	6	1	43
11	0	0	0	2	3	0	34
12	0	0	0	0	1	0	25
13	0	0	0	0	0	0	16
14	0	0	0	0	0	0	8
15	0	0	0	0	0	0	2
16	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0

0 INVALID HOUR(S).

DIURNAL DISTRIBUTION OF STABILITY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 11/ 1/75 TO 11/30/75
DATE AND TIME OF RUN 08/09/76. 10.47.31.

NUMBER OF HOURS

TIME OF DAY (LST)	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
0	0	0	0	4	10	3	13	30
1	0	0	0	4	11	3	12	30
2	0	0	0	4	8	6	12	30
3	0	0	0	6	7	5	12	30
4	0	0	0	3	8	7	12	30
5	0	0	0	3	10	5	12	30
6	0	0	0	3	10	6	11	30
7	0	0	0	2	13	3	12	30
8	0	0	0	5	10	3	12	30
9	0	0	0	10	9	3	8	30
10	0	0	0	18	6	4	2	30
11	1	1	3	21	4	0	0	30
12	1	3	6	20	0	0	0	30
13	0	4	7	19	0	0	0	30
14	0	0	8	22	0	0	0	30
15	0	0	5	25	0	0	0	30
16	0	0	0	28	2	0	0	30
17	0	0	0	20	10	0	0	30
18	0	0	0	3	26	1	0	30
19	0	0	0	2	10	18	0	30
20	0	0	0	4	5	11	10	30
21	0	0	0	5	4	9	12	30
22	0	0	0	5	7	6	12	30
23	0	0	0	5	8	5	12	30
ALL	2	8	29	241	178	98	164	720

TABLE 2.3-80

STABILITY - PERSISTENCE AND DIURNAL DISTRIBUTION
(BASED ON 10-61 METER ΔT)
DECEMBER 1975

STABILITY PERSISTENCE SUMMARY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 12/ 1/75 TO 12/31/75
DATE AND TIME OF RUN 08/09/76. 10.49.24.

NUMBER OF HOURS

NUMBER OF CONSECUTIVE HOURS	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-
2	0	0	5	235	190	23	128
3	0	0	1	196	148	14	114
4	0	0	0	164	125	9	101
5	0	0	0	138	104	5	88
6	0	0	0	117	85	2	77
7	0	0	0	101	66	1	66
8	0	0	0	90	52	0	55
9	0	0	0	84	40	0	45
10	0	0	0	79	31	0	36
11	0	0	0	74	23	0	28
12	0	0	0	70	16	0	22
13	0	0	0	67	11	0	16
14	0	0	0	64	8	0	10
15	0	0	0	61	5	0	6
16	0	0	0	58	3	0	0
17	0	0	0	55	2	0	0
18	0	0	0	52	1	0	0
19	0	0	0	50	0	0	0
20	0	0	0	48	0	0	0
21	0	0	0	46	0	0	0
22	0	0	0	44	0	0	0
23	0	0	0	42	0	0	0
24	0	0	0	40	0	0	0
>24	0	0	0	35	0	0	0

0 INVALID HOUR(S).

DIURNAL DISTRIBUTION OF STABILITY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 12/ 1/75 TO 12/31/75
DATE AND TIME OF RUN 08/09/76. 10.49.24.

NUMBER OF HOURS

TIME OF DAY (LST)	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
0	0	0	0	5	13	3	10	31
1	0	0	0	6	12	2	11	31
2	0	0	0	5	13	2	11	31
3	0	0	0	6	13	2	10	31
4	0	0	0	6	14	2	9	31
5	0	0	0	5	15	2	9	31
6	0	0	0	5	11	4	11	31
7	0	0	0	5	12	3	11	31
8	0	0	0	6	10	4	11	31
9	0	0	0	7	12	2	10	31
10	0	0	1	14	10	1	5	31
11	0	1	0	19	10	1	0	31
12	1	1	1	24	4	0	0	31
13	0	1	3	25	2	0	0	31
14	0	0	5	24	2	0	0	31
15	0	0	3	27	1	0	0	31
16	0	0	0	31	0	0	0	31
17	0	0	0	22	9	0	0	31
18	0	0	0	6	25	0	0	31
19	0	0	0	7	15	9	0	31
20	0	0	0	8	9	5	9	31
21	0	0	0	5	12	5	9	31
22	0	0	0	5	13	3	10	31
23	0	0	0	5	12	5	9	31
ALL	1	3	13	278	249	55	145	744

0 INVALID HOUR(S).

TABLE 2.3-81

STABILITY - PERSISTENCE AND DIURNAL DISTRIBUTION
(BASED ON 10-61 METER ΔT)
JANUARY TO DECEMBER 1975

STABILITY PERSISTENCE SUMMARY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 1/ 1/75 TO 12/31/75
DATE AND TIME OF RUN 06/09/76. 10.51.15.

NUMBER OF HOURS

NUMBER OF CONSECUTIVE HOURS	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-
2	177	31	166	2355	2033	678	665
3	101	2	62	1835	1560	429	542
4	56	0	23	1463	1252	278	449
5	30	0	9	1198	994	177	372
6	11	0	4	1006	788	113	309
7	2	0	1	846	623	69	254
8	0	0	0	715	483	38	205
9	0	0	0	608	368	23	160
10	0	0	0	519	273	11	121
11	0	0	0	454	193	4	88
12	0	0	0	397	132	1	61
13	0	0	0	354	86	0	39
14	0	0	0	321	53	0	19
15	0	0	0	294	31	0	7
16	0	0	0	270	17	0	0
17	0	0	0	248	9	0	0
18	0	0	0	224	5	0	0
19	0	0	0	215	2	0	0
20	0	0	0	201	1	0	0
21	0	0	0	188	0	0	0
22	0	0	0	177	0	0	0
23	0	0	0	166	0	0	0
24	0	0	0	156	0	0	0
>24	0	0	0	146	0	0	0

12 INVALID HOUR(S).

DIURNAL DISTRIBUTION OF STABILITY

VIRGIL C. SUMMER NUCLEAR STATION
PARR, SOUTH CAROLINA
SOUTH CAROLINA ELECTRIC AND GAS COMPANY
DAMES AND MOORE JOB NO 5182-070-09
DATA PERIOD FROM 1/ 1/75 TO 12/31/75
DATE AND TIME OF RUN 06/09/76. 10.51.15.

NUMBER OF HOURS

TIME OF DAY (LST)	PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
0	0	0	0	40	168	91	66	365
1	0	0	0	44	177	81	63	365
2	0	0	0	40	187	72	66	365
3	0	0	0	52	176	77	60	365
4	0	0	0	48	177	76	64	365
5	0	0	0	47	182	62	74	365
6	0	0	0	54	172	63	76	365
7	0	0	0	69	162	67	66	364
8	0	0	0	148	128	42	46	364
9	2	3	16	220	72	22	27	362
10	16	18	46	217	46	13	8	364
11	44	20	61	200	32	7	1	365
12	60	32	63	189	12	7	1	364
13	60	34	66	187	10	6	1	364
14	65	22	75	185	14	2	1	364
15	42	16	71	217	8	7	1	362
16	22	23	34	264	12	4	1	365
17	4	5	34	274	45	3	0	365
18	0	0	4	210	148	3	0	365
19	0	0	0	130	187	48	0	365
20	0	0	0	77	179	82	27	365
21	0	0	0	56	151	110	48	365
22	0	0	0	49	155	94	67	365
23	0	0	0	42	164	88	71	365
ALL	315	173	475	3959	2764	1127	835	[illegible]

TABLE 2.3-82

COMPARISON OF 1 AND 20 YEAR WIND AND STABILITY CONDITIONS
FOR COLUMBIA, S.C.
Wind Frequency Distribution (%)

Wind Direction	1 Year [1]	20 Year [2]
N	5.48	6.84
NNE	3.73	6.47
NE	4.86	7.88
ENE	5.41	7.00
E	6.20	6.25
ESE	4.62	4.42
SE	3.36	3.29
SSE	2.23	2.62
S	5.55	6.30
SSW	4.59	6.40
SW	7.98	10.67
WSW	6.68	9.83
W	6.51	8.38
WNW	3.73	5.45
NW	3.77	4.19
NNW	3.42	4.01
CALM	21.88	13.83

Stability Class Frequency Distribution and Mean Speed

	1 Year [1]		20 Year [2]	
Pasquill-Turner Classification	Frequency (%)	Mean Speed (mps)	Frequency (%)	Mean Speed (mps)
A	1.23	1.70	0.91	1.65
B	9.90	2.22	8.05	2.42
C	11.34	3.51	13.11	3.76
D	38.46	3.79	38.81	4.43
E	10.92	3.04	11.70	3.14
F & G	28.15	0.88	27.42	2.39
All Classes	100.00	2.68	100.00	3.14

1 January 1, 1975, through December 13, 1975; concurrent with onsite meteorological record used in this report.

2 January, 1956, through December, 1975.

TABLE 2.3-83

AVERAGE CHANGES IN CERTAIN DIFFUSION PARAMETERS AS AIR MOVES OFFSHORE OVER WATER SURFACES

	Relationship of Water to Air Temperatures			
	> 7°F Colder	Between -7 and +2	> 2°F Warmer	
$\bar{U}$, mph				
Day	15.6 to 18.1	11.6 to 16.8	12.9 to 18.7	02-01
Night	11.0 to 13.2	11.4 to 16.6	7.9 to 15.9	
σ_θ^1, deg				
Day	11.5 to 5.0	10.3 to 5.3	10.4 to 5.8	02-01
Night	10.1 to 4.3	10.1 to 5.1	9.5 to 5.2	
σ_y^2, meters @ 500m				
Day	42 to 27	38 to 27	39 to 29	
Night	39 to 25	39 to 27	37 to 27	

1 Wind Direction Variability
2 Horizontal Diffusion Coefficient

Data Source: 2.3.2-O 02-01

Reformatted Per Amendment 02-01

TABLE 2.3-84

MAXIMUM ELEVATION VERSUS DISTANCE WITHIN
A 5 MILE RADIUS OF THE PLANT

Sector	Maximum Elevation (Feet, MSL)	Distance From Plant (Hundreds of Feet)
N	436	plant site
NNE	490	247
NE	480	158
ENE	510	137
E	470	41
ESE	490	65
SE	470	43; 103
SSE	450	135
S	460	36
SSW	460	50
SW	450	24
WSW	436	plant site
W	436	plant site
WNW	436	plant site
NW	436	plant site
NNW	510	165
ALL	510	137; 165

TABLE 2.3-85

METEOROLOGICAL INSTRUMENTATION
VIRGIL C. SUMMER NUCLEAR STATION

Measurement	Level (meters)	Instrument	Instantaneous Accuracy	Nominal Threshold	Nominal Operating Conditions	Nominal Calibrated Range	
Wind Speed	10 & 61	Ultrasonic	± 0.3 mph (0-10 mph) ± 3% of Reading (10-100 mph) ± 5% of Reading (110-125 mph)	0 mph	-50° to +125°F	0 - 125 mph	RN 06-037 02-01
Wind Direction	10 & 61	Ultrasonic	± .5%	0 mph	-50° to +125°F	0° - 359°	
Temperature	10	Platinum RTD Probe	± .16°F	N/A [1]	-58° to 122°F	-20° to +120°F	
Dewpoint	1.5	Computed	± .4°F	N/A	-50° to +150°F	-15° to + 85°F	
Delta Temperature	10-61 10-40	Platinum RTD Probe	± .32°F	N/A	-58° to +122°F	-7° to + 18°F	RN 06-037
Precipitation	1.5	Tipping Bucket Rain Gage	± 10%	.01 inch	Above 32°F	N/A	

1 N/A - Not applicable

Reformatted Per
Amendment 02-01

Table 2.3-85A
Table 2.3-85B
Table 2.3-85C
Table 2.3-85D 02-01
Table 2.3-85E

Deleted Per RN 01-030

TABLE 2.3-85F

METEOROLOGICAL MONITORING SYSTEM ACCURACIES [1]

	Parameter	Reg. Guide 1.23, Revision 0 System Accuracy Design, Basis	Minimum Digital Systems Accuracy (for 15 minute period)	Minimum Digital System Accuracy (for 5 minute period)
A.	Wind Speed	± 0.50 mph [2]	± 0.125 mph	± 0.200 mph
B.	Wind Direction	± 5 degrees	± 0.250 degrees	± 0.500 degrees
C.	Dew Point	± 0.90°F [2]	± 0.20°F	± 0.30°F
D.	Ambient Temperature	± 0.90°F [2]	± 0.100°F	± 0.100 mph
E.	Differential Temperature	± 0.18°F [2]	± 0.040°F	± 0.075°F
F.	Total Precipitation	± 10% [3]	± 10%	± 10%

RN 06-037

1 Reference DC09690-001
2 Time Averaged Value
3 Total Precipitation accuracy is given in proposed Revision 1 to Reg. Guide 1.23.

TABLE 2.3-86A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: JANUARY, 1975

PASQUILL "A" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	1	0	0	0	0	0	0	0	1	0	2	6.35
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	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.
SE	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.
S	0	0	1	0	0	0	0	0	0	0	0	0	1	2.10
SSW	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.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	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.
NW	0	0	2	0	0	0	0	0	0	0	0	0	2	2.10
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													1	.60
TOTAL	0	0	4	0	0	0	0	0	0	0	1	0	6	3.47

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "B" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.60
NE	0	0	0	0	0	0	0	0	0	1	0	0	1	9.50
ENE	0	0	0	1	1	0	0	0	0	0	0	0	2	3.90
E	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.
SE	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.
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	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.
WSW	0	0	1	0	0	0	0	0	0	0	0	0	1	2.40
W	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.
NW	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	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	1	1	2	0	0	0	0	1	0	0	5	4.84

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "C" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	1	0	0	0	0	0	1	6.90
ENE	0	0	0	0	0	1	0	1	1	2	2	0	7	8.71
E	0	0	0	0	0	0	0	0	0	0	1	0	1	10.50
ESE	0	0	0	0	0	0	1	0	0	0	0	0	1	6.30
SE	0	0	0	1	0	0	0	0	0	0	0	0	1	3.40
SSE	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	0	0	0.
SSW	0	0	1	0	0	0	0	0	0	0	0	0	1	2.80
SW	0	0	0	0	0	0	0	0	0	0	0	1	1	13.20
WSW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.30
W	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	1	0	1	10.80
NW	0	0	0	0	0	1	1	0	0	0	0	0	2	6.05
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	1	0	0	1	9.40
CALM													0	0.
TOTAL	0	0	1	1	1	2	3	1	1	3	4	1	18	7.84

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "D" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	1	1	1	0	2	0	3	0	1	4	13	8.73
NE	1	0	3	3	2	1	1	0	0	1	0	0	12	4.09
ENE	0	0	1	1	3	3	2	1	3	2	0	0	16	6.20
E	0	0	1	1	0	4	1	2	3	1	0	1	14	6.88
ESE	0	0	0	2	3	0	2	3	2	2	0	0	14	6.65
SE	0	0	0	1	1	1	1	0	0	0	0	4	8	9.90
SSE	0	0	0	0	2	2	0	0	0	0	0	0	4	5.10
S	0	0	0	0	0	0	0	0	0	2	1	2	5	12.10
SSW	0	0	0	1	0	0	0	0	0	1	0	9	11	11.[illegible]
SW	0	0	2	3	1	1	1	1	4	0	2	2	17	7.00
WSW	0	0	1	2	1	1	0	1	6	5	7	11	[illegible]	10.28
W	0	0	2	3	2	5	3	3	3	1	3	17	42	10.36
WNW	0	1	3	4	3	3	5	4	1	0	0	0	24	5.17
NW	0	1	1	5	10	2	1	2	1	2	2	0	27	5.57
NNW	0	0	3	3	1	3	3	0	1	2	0	2	18	6.27
N	0	2	0	0	5	0	1	1	2	0	0	0	11	5.25
CALM													0	0.
TOTAL	1	4	18	30	35	26	21	20	29	21	16	52	275	7.19

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-86B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: JANUARY, 1975

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	1	3	3	2	2	1	2	0	0	0	14	5.26
NE	0	0	0	1	4	1	4	2	2	0	0	0	14	6.06
ENE	0	1	0	3	3	7	1	0	0	0	0	0	15	4.70
E	0	0	3	3	0	3	5	1	0	0	0	0	15	5.07
ESE	0	0	0	2	1	3	0	0	0	0	0	0	6	4.67
SE	0	0	0	1	1	0	1	0	1	0	0	1	5	7.64
SSE	0	0	1	0	1	2	7	4	2	0	1	6	24	9.60
S	0	0	2	1	2	1	3	2	0	5	2	3	21	7.80
SSW	0	1	3	3	2	3	2	0	2	5	1	3	25	7.02
SW	0	1	2	3	1	2	2	3	1	9	1	8	33	8.48
WSW	0	0	2	5	1	1	2	2	1	2	4	4	24	7.70
W	0	0	0	1	4	2	3	2	0	1	2	2	17	7.27
WNW	0	1	1	3	1	2	3	1	1	0	0	0	13	5.15
NW	0	1	1	2	1	2	1	0	0	0	0	1	9	5.56
NNW	0	0	2	3	3	0	0	0	0	0	0	3	11	7.53
N	1	0	2	5	1	0	2	0	1	2	0	1	15	5.52
CALM													2	.60
TOTAL	1	5	20	39	29	31	38	18	13	24	11	32	263	6.98

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	1	1	0	1	2	0	0	0	0	0	0	5	3.84
NE	0	1	0	1	4	0	0	0	0	0	0	0	6	3.88
ENE	1	0	1	2	1	1	2	0	0	0	0	0	8	4.36
E	0	1	0	0	2	1	0	0	0	0	0	0	4	3.95
ESE	0	2	0	0	1	0	1	1	0	0	0	0	5	4.36
SE	0	0	0	0	0	1	1	1	1	0	0	0	4	7.25
SSE	0	1	1	1	1	2	1	5	2	1	1	0	16	6.64
S	0	1	0	0	1	1	1	0	0	0	0	0	4	4.75
SSW	0	0	1	1	2	3	3	5	0	0	0	0	15	6.61
SW	1	1	0	0	5	4	5	3	0	0	0	0	19	5.71
WSW	0	0	0	3	4	5	0	0	0	0	0	0	12	4.76
W	0	0	1	0	0	2	0	0	0	0	0	0	3	4.57
WNW	0	1	1	0	1	0	0	0	0	0	0	0	3	2.70
NW	0	0	0	2	0	1	1	0	1	0	0	0	5	5.56
NNW	0	3	1	1	0	0	0	0	0	0	0	0	5	2.22
N	0	2	1	0	1	0	0	0	0	0	0	0	4	2.65
CALM													1	.60
TOTAL	2	14	8	11	24	23	15	15	4	1	1	0	115	5.53

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "G" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	3	0	1	0	0	0	0	0	0	0	4	3.07
NE	1	0	0	0	0	0	0	0	0	0	0	0	1	.90
ENE	0	1	1	0	1	1	0	0	0	0	0	0	4	3.77
E	0	1	2	0	0	0	1	1	0	0	0	0	5	4.02
ESE	1	1	0	0	0	1	2	0	0	0	0	0	5	4.66
SE	0	0	0	1	0	1	0	0	0	0	0	0	2	4.65
SSE	0	0	0	2	1	0	1	1	1	0	0	0	6	5.77
S	0	1	2	0	0	0	0	0	0	0	0	0	3	2.23
SSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SW	0	1	0	0	0	0	0	0	0	0	0	0	1	1.70
WSW	0	0	1	0	1	0	0	0	0	0	0	0	2	3.30
W	0	0	1	0	0	0	0	0	0	0	0	0	1	2.40
WNW	0	0	1	3	0	0	0	0	0	0	0	0	4	3.37
NW	1	1	0	1	0	1	0	0	0	0	0	0	4	2.82
NNW	0	1	1	0	0	0	0	0	0	0	0	0	2	2.05
N	0	1	2	1	2	0	0	0	0	0	0	0	6	3.03
CALM													6	.42
TOTAL	3	8	14	8	6	4	4	2	1	0	0	0	56	3.20

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	1	7	4	7	4	4	1	5	0	2	4	39	6.05
NE	2	1	3	5	10	2	6	2	2	2	0	0	35	4.98
ENE	1	2	4	7	9	13	5	2	4	4	2	0	53	5.48
E	0	2	6	4	2	8	7	4	3	1	1	1	39	5.60
ESE	1	3	0	4	5	4	6	4	2	2	0	0	31	5.46
SE	0	0	0	4	2	3	3	2	2	0	0	5	21	7.78
SSE	0	1	2	3	5	6	9	10	5	1	2	6	50	7.80
S	0	2	5	1	3	2	4	2	0	7	3	5	34	7.62
SSW	0	1	5	5	4	6	5	5	2	8	1	12	54	7.79
SW	1	3	4	6	7	7	8	7	5	9	3	11	71	7.26
WSW	0	0	5	10	8	7	2	5	7	7	11	15	77	8.25
W	0	0	4	4	6	9	6	5	3	2	5	19	63	9.11
WNW	0	1	6	10	5	5	8	5	2	3	1	0	46	4.96
NW	1	3	4	10	11	7	4	2	2	2	2	1	49	5.26
NNW	0	4	7	7	4	3	1	0	1	3	0	5	35	5.68
N	1	5	5	6	4	0	3	1	3	1	0	1	[illegible]	4.65
CALM													9	.41
TOTAL	7	31	67	90	97	86	83	57	48	50	33	85	743	6.61

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-87A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: FEBRUARY, 1975

PASQUILL "A" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	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.
SE	0	0	0	1	1	0	0	0	0	0	0	0	2	3.80
SSE	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	0	0	0.
SSW	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.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	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.
NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NNW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.60
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	0	2	1	0	0	0	0	0	0	0	3	3.73

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 672

PASQUILL "B" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	1	0	1	0	0	0	0	0	2	5.60
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	1	0	0	0	0	0	0	0	0	1	3.80
SE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.50
SSE	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	0	0	0.
SSW	0	0	0	0	0	0	0	0	0	0	1	0	1	11.00
SW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WSW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.10
W	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.
NW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.60
NNW	0	0	1	0	0	0	0	0	0	0	0	0	1	2.80
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	1	2	2	1	1	0	0	0	1	0	8	5.17

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 672

PASQUILL "C" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.40
ENE	0	0	0	0	0	0	1	0	1	0	0	0	2	7.35
E	0	0	0	0	0	1	0	0	0	0	0	0	1	5.10
ESE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.30
SE	0	0	0	1	0	0	0	1	0	0	0	0	2	5.60
SSE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.20
S	0	0	0	0	1	0	2	0	0	0	0	0	3	5.83
SSW	0	0	0	0	0	1	0	0	0	0	0	0	1	5.60
SW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.10
NW	0	0	0	2	1	0	0	1	1	0	0	0	5	5.60
NNW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.60
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	0	4	4	4	1	2	2	0	0	0	19	5.57

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 672

PASQUILL "D" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	1	0	2	1	2	4	0	1	0	0	11	6.65
NE	0	0	2	1	3	4	4	9	4	11	9	4	51	8.26
ENE	0	0	1	1	2	4	2	7	2	0	1	0	20	6.62
E	0	0	1	1	1	1	2	4	5	1	0	0	16	6.96
ESE	0	0	0	1	1	0	1	0	0	0	0	0	3	5.03
SE	0	0	0	1	0	2	1	1	0	0	0	0	5	5.78
SSE	0	0	0	1	1	0	1	1	1	0	1	1	7	7.51
S	0	1	1	2	0	1	2	2	1	1	0	2	13	6.78
SSW	0	0	0	1	1	1	3	3	1	2	2	4	18	8.71
SW	0	0	0	1	2	2	7	2	5	6	9	11	45	9.30
WSW	0	1	0	0	1	1	2	3	1	4	3	14	30	10.93
W	1	0	0	0	1	0	1	3	2	6	4	3	21	8.86
WNW	0	0	0	1	0	1	1	3	2	2	0	2	12	8.67
NW	0	1	0	1	1	0	2	0	0	2	0	1	8	6.71
NNW	0	0	1	0	0	1	0	1	0	1	2	0	6	7.43
N	0	0	0	0	1	2	4	1	2	2	0	0	12	8.03
CALM													1	.20
TOTAL	1	3	7	12	17	21	35	44	26	39	31	42	279	8.23

NUMBER OF INVALID OBSERVATIONS = 7
TOTAL NUMBER OF OBSERVATIONS = 672

TABLE 2.3-87B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: FEBRUARY, 1975

PASQUILL "E" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
					UPPER CLASS INTERVALS OF WIND SPEED (MPH)									
NNE	0	0	1	2	2	7	2	2	0	0	0	0	16	5.29
NE	0	0	0	2	2	4	3	2	2	0	0	0	15	6.04
ENE	0	0	1	1	1	1	0	1	0	0	0	0	5	4.00
E	0	0	0	0	2	1	3	0	0	0	0	0	6	5.62
ESE	0	0	0	2	0	0	1	0	0	0	0	0	3	4.43
SE	0	0	0	0	1	2	2	0	0	2	2	0	9	7.67
SSE	0	0	0	0	2	2	4	0	0	2	1	12	23	10.72
S	0	0	0	0	4	5	1	2	3	2	3	1	21	7.40
SSW	0	0	0	0	1	2	4	4	0	0	0	4	15	8.21
SW	0	0	0	0	6	2	4	4	6	5	5	5	37	8.25
WSW	0	1	0	1	2	5	3	4	1	2	2	1	22	6.97
W	0	0	0	0	2	5	1	2	0	0	0	0	10	5.86
WNW	0	0	0	1	0	2	0	0	0	0	0	0	3	4.97
NW	0	2	1	0	0	0	1	0	0	0	1	0	5	4.36
NNW	0	0	2	0	2	3	0	1	0	1	0	0	9	5.34
N	0	0	0	0	0	2	1	2	0	0	0	1	6	7.45
CALM													1	.60
TOTAL	0	3	5	9	27	43	30	24	12	14	14	24	206	7.23

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 672

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
					UPPER CLASS INTERVALS OF WIND SPEED (MPH)									
NNE	0	0	0	2	2	1	0	0	0	0	0	0	5	4.22
NE	0	1	0	4	4	1	0	0	0	0	0	0	10	3.94
ENE	0	0	1	4	1	0	0	0	0	0	0	0	6	3.43
E	0	0	2	1	0	2	2	1	0	0	0	0	8	5.15
ESE	0	1	0	1	1	3	0	4	1	2	0	0	13	6.35
SE	0	0	0	0	1	0	1	5	1	1	1	0	10	7.66
SSE	0	0	2	0	1	5	1	0	0	0	0	0	9	5.00
S	0	0	0	0	1	1	1	0	0	1	0	0	4	6.62
SSW	0	0	0	1	0	2	1	0	0	0	0	0	4	5.30
SW	0	1	0	3	0	2	0	0	0	0	0	0	6	4.03
WSW	0	1	0	1	2	1	0	0	0	0	0	0	5	4.12
W	0	0	1	1	1	0	2	1	0	0	0	0	6	5.17
WNW	0	0	0	1	1	0	0	0	0	0	0	0	2	3.75
NW	0	0	1	1	2	0	0	0	0	0	0	0	4	3.90
NNW	0	0	0	1	1	0	0	0	0	0	0	0	2	3.60
N	0	1	0	2	0	0	0	0	0	0	0	0	3	3.10
CALM													2	.60
TOTAL	0	5	7	23	18	18	8	11	2	4	1	0	99	4.94

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 672

PASQUILL "G" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
					UPPER CLASS INTERVALS OF WIND SPEED (MPH)									
NNE	0	0	1	0	0	0	0	0	0	0	0	0	1	3.00
NE	0	0	2	0	3	0	0	0	0	0	0	0	5	3.62
ENE	0	2	0	0	2	1	0	0	0	0	0	0	5	3.64
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	1	1	0	1	0	0	0	3	7.07
SE	0	0	0	0	0	0	1	2	0	0	0	0	3	7.20
SSE	0	0	0	0	0	0	0	2	0	0	1	0	3	8.33
S	0	0	0	0	0	1	0	0	0	0	0	0	1	5.10
SSW	0	1	0	1	2	0	1	0	0	0	0	0	5	4.24
SW	0	0	1	2	0	2	0	0	0	0	0	0	5	4.02
WSW	0	0	1	1	0	0	0	1	0	0	0	0	3	4.47
W	0	2	1	2	0	0	0	0	0	0	0	0	5	2.40
WNW	0	0	2	0	0	0	0	0	0	0	0	0	2	2.95
NW	0	0	3	1	0	0	0	0	0	0	0	0	4	2.92
NNW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.60
N	0	0	1	0	0	0	0	0	0	0	0	0	1	2.20
CALM													4	.60
TOTAL	0	5	12	8	7	5	3	5	1	0	1	0	51	4.01

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 672

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
					UPPER CLASS INTERVALS OF WIND SPEED (MPH)									
NNE	0	0	3	4	6	9	4	6	0	1	0	0	33	5.65
NE	0	1	4	7	13	9	7	11	6	11	9	4	82	6.99
ENE	0	2	3	6	7	6	4	8	3	0	1	0	40	5.53
E	0	0	3	2	3	5	7	5	5	1	0	0	31	6.17
ESE	0	1	0	5	2	5	3	4	2	2	0	0	24	5.93
SE	0	0	0	3	3	5	5	9	1	3	3	0	32	6.87
SSE	0	0	2	1	4	8	6	3	1	2	3	13	43	8.70
S	0	1	1	2	6	8	6	4	4	4	4	3	43	7.04
SSW	0	1	0	3	4	6	9	7	1	2	2	8	43	7.66
SW	0	1	1	6	8	8	11	6	11	11	14	16	93	8.25
WSW	0	3	1	3	6	7	5	8	2	6	5	15	61	8.56
W	1	2	2	3	4	5	4	6	2	6	4	3	42	6.85
WNW	0	0	2	3	2	3	1	3	2	2	0	2	20	6.19
NW	0	3	5	6	4	0	3	1	1	2	1	1	27	4.96
NNW	0	0	4	4	3	4	0	2	0	2	2	0	21	5.40
N	0	1	1	2	1	4	5	3	2	2	0	1	22	6.62
CALM													8	.60
TOTAL	1	16	32	60	76	92	80	86	43	57	48	66	665	6.97

NUMBER OF INVALID OBSERVATIONS = 7
TOTAL NUMBER OF OBSERVATIONS = 672

TABLE 2.3-88A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: MARCH, 1975

PASQUILL *A* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	1	0	0	0	1	8.60
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	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.
SE	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.
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	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.
WSW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.40
W	0	0	1	0	0	0	0	0	0	0	0	0	1	2.90
WNW	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.
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	1	1	0	0	0	0	1	0	0	0	3	4.97

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL *B* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	1	0	0	0	0	0	1	5.70
NE	0	0	0	0	0	0	0	0	0	1	0	0	1	9.10
ENE	0	0	0	0	0	1	0	0	0	0	0	0	1	6.00
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	0	0	1	0	0	0	0	1	7.40
SE	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.
S	0	0	0	0	1	0	0	0	0	0	0	0	1	4.10
SSW	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.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	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.
NW	0	0	0	0	0	0	0	0	0	0	0	1	1	17.00
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	0	0	1	1	1	1	0	1	0	1	6	8.38

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL *C* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	1	1	0	1	0	0	0	0	3	6.07
NE	0	0	0	0	0	0	1	1	1	2	0	0	5	8.36
ENE	0	0	0	0	0	0	0	2	1	0	0	0	3	8.03
E	0	0	0	0	0	0	1	1	1	0	0	0	3	7.60
ESE	0	0	0	0	0	0	0	0	1	0	0	0	1	8.80
SE	0	0	0	0	1	2	0	0	0	0	0	0	3	5.17
SSE	0	0	0	0	0	0	1	0	0	0	0	0	1	6.30
S	0	0	1	0	0	0	0	0	0	0	0	0	1	2.40
SSW	0	0	0	0	1	0	1	0	0	0	0	0	2	5.30
SW	0	0	0	1	0	0	0	0	1	0	0	0	2	5.80
WSW	0	0	0	0	0	1	0	0	0	0	0	0	1	5.10
W	0	0	0	0	2	0	0	0	0	0	0	0	2	4.70
WNW	0	0	0	0	2	0	0	0	0	0	0	1	3	7.33
NW	0	0	0	0	1	0	0	0	0	0	1	4	6	11.33
NNW	0	0	0	0	0	0	0	1	0	0	0	0	1	7.20
N	0	0	0	0	1	0	0	1	0	0	0	0	2	6.10
CALM													0	0.
TOTAL	0	0	1	1	9	4	4	7	5	2	1	5	39	7.14

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL *D* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	1	2	1	1	1	1	2	0	0	0	0	9	4.67
NE	0	1	0	1	1	2	1	3	3	0	0	0	12	6.12
ENE	0	0	0	1	1	0	5	5	6	3	3	0	24	7.98
E	0	0	0	2	4	2	2	2	2	2	0	1	17	6.94
ESE	0	0	0	3	0	0	1	3	0	0	1	1	9	7.21
SE	0	0	0	0	0	1	1	0	0	0	0	2	4	9.67
SSE	0	0	0	1	0	0	1	0	3	0	0	2	7	9.14
S	0	0	0	0	0	3	1	2	3	2	2	5	18	10.22
SSW	0	0	0	1	1	1	5	1	3	2	5	16	35	10.80
SW	0	1	0	1	0	0	0	1	5	2	4	10	24	11.13
WSW	0	0	0	0	2	1	1	1	3	0	2	22	32	11.90
W	0	0	0	0	1	4	2	0	1	2	1	35	46	14.56
WNW	0	0	1	0	1	1	1	0	1	5	2	7	19	9.77
NW	0	1	0	1	1	0	2	2	2	1	1	10	21	10.41
NNW	0	0	2	2	2	1	1	0	0	0	0	8	18	8.47
N	0	0	0	0	2	4	3	6	4	0	0	1	22	8.00
CALM													0	0.
TOTAL	0	4	5	14	17	21	30	28	36	19	23	120	317	10.13

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-88B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: MARCH, 1975

PASQUILL "E" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	3	2	1	1	0	1	1	1	0	0	10	5.14
NE	0	0	0	3	3	0	2	0	0	0	0	0	8	4.66
ENE	0	0	1	1	3	1	4	3	0	0	0	1	14	6.16
E	0	0	0	3	1	4	5	0	1	0	0	0	14	5.59
ESE	0	1	0	1	2	3	2	1	0	0	0	1	11	6.17
SE	0	0	0	0	0	1	0	1	1	3	0	4	10	10.35
SSE	0	0	0	0	1	1	2	3	1	4	1	6	19	9.97
S	0	0	0	0	2	2	2	2	3	9	5	11	36	10.02
SSW	0	0	0	0	3	0	5	1	1	1	2	6	19	9.32
SW	0	0	0	2	3	1	1	2	1	1	0	2	13	7.35
WSW	0	0	0	0	1	1	2	2	3	0	2	1	12	8.23
W	0	0	0	2	2	1	4	7	3	3	1	2	25	7.63
WNW	0	0	1	1	0	2	1	1	1	4	0	1	12	7.50
NW	0	0	1	4	2	2	1	3	3	2	1	5	24	7.88
NNW	0	0	1	4	1	6	2	3	0	1	3	3	24	7.05
N	0	0	0	1	4	7	1	0	0	1	0	0	14	5.38
CALM													0	0.
TOTAL	0	1	7	24	29	33	34	30	19	30	15	43	265	7.77

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.70
NE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.30
ENE	0	2	0	0	3	0	2	1	1	0	0	0	9	5.06
E	0	0	0	0	3	1	3	1	0	0	0	0	8	5.90
ESE	0	1	0	1	0	0	1	1	0	0	0	0	4	4.67
SE	0	0	0	0	0	0	0	0	2	1	1	0	4	9.02
SSE	0	0	0	0	0	0	0	1	3	2	2	0	8	9.22
S	0	0	1	0	0	1	1	1	0	0	0	3	7	8.01
SSW	0	0	0	0	5	0	2	1	1	0	0	0	9	5.84
SW	0	0	0	3	2	0	0	0	0	0	0	0	5	4.04
WSW	0	0	1	0	2	2	0	0	0	0	0	0	5	4.70
W	0	0	2	0	1	1	2	0	0	0	0	0	6	4.93
WNW	0	1	1	0	1	0	0	0	0	0	0	0	3	2.57
NW	0	0	0	2	1	0	0	0	0	0	0	0	3	3.90
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	1	0	1	0	0	0	0	0	0	0	0	2	2.25
CALM													0	0.
TOTAL	0	5	5	7	20	5	11	6	7	3	3	3	75	5.81

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "G" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	1	0	0	0	0	0	0	0	0	0	1	2.20
NE	0	2	1	1	0	0	0	0	0	0	0	0	4	2.40
ENE	0	0	0	0	2	0	0	0	0	0	0	0	2	4.90
E	0	0	0	2	0	0	0	0	0	0	0	0	2	3.35
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	1	0	0	0	0	0	0	0	0	0	1	2.50
SSE	0	0	0	2	1	0	1	0	1	0	0	0	5	5.20
S	0	0	0	3	2	0	0	0	0	0	0	0	5	3.92
SSW	0	1	0	1	0	0	0	0	0	0	0	0	2	2.55
SW	0	1	1	0	2	0	0	0	0	0	0	0	4	3.20
WSW	0	0	3	0	1	1	0	0	0	0	0	0	5	3.70
W	0	0	0	1	1	0	0	0	0	0	0	0	2	3.60
WNW	0	0	1	0	0	0	0	0	0	0	0	0	1	2.40
NW	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	0	0	0.
N	0	0	2	0	1	0	0	0	0	0	0	0	3	3.17
CALM													0	0.
TOTAL	0	4	10	10	10	1	1	0	1	0	0	0	37	3.55

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	1	6	3	4	3	2	4	1	1	0	0	25	5.01
NE	0	3	1	5	5	2	4	4	5	3	0	0	32	5.83
ENE	0	2	1	2	9	2	11	11	8	3	1	1	51	6.65
E	0	0	0	7	8	7	11	4	4	2	0	1	44	6.20
ESE	0	2	0	5	2	3	4	6	1	0	1	2	26	6.44
SE	0	0	1	0	1	4	1	1	3	4	1	6	22	8.80
SSE	0	0	0	3	2	1	5	4	8	6	3	8	40	9.02
S	0	0	2	3	5	6	4	5	6	11	7	19	68	9.22
SSW	0	1	0	2	10	1	13	3	5	3	7	22	67	9.30
SW	0	2	1	7	7	1	1	3	7	3	4	12	48	8.48
WSW	0	0	4	1	6	6	3	3	6	0	4	23	56	9.47
W	0	0	3	3	7	6	8	7	4	5	4	35	82	11.09
WNW	0	1	4	1	4	3	2	1	2	9	2	9	38	8.10
NW	0	1	1	7	5	2	3	5	5	3	3	20	55	9.10
NNW	0	0	1	6	3	7	5	4	0	1	3	11	41	7.65
N	0	1	2	2	8	11	4	7	4	1	0	3	43	6.66
CALM													0	0.
TOTAL	0	14	29	57	86	65	81	72	69	55	42	172	742	8.14

NUMBER OF INVALID OBSERVATIONS = 2
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-89A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: APRIL, 1975

PASQUILL "A" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
			UPPER CLASS INTERVALS OF WIND SPEED (MPH)											
NNE	0	0	0	0	0	0	0	1	0	0	0	0	1	7.50
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	1	0	0	0	0	0	1	6.10
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	0	1	0	1	0	0	0	0	2	6.50
SSE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.10
S	0	0	0	0	1	0	0	1	0	0	0	1	3	8.30
SSW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.70
SW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	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.
NW	0	0	0	1	1	0	0	0	0	0	0	0	2	4.30
NNW	0	0	0	0	0	0	0	0	0	0	1	0	1	10.40
N	0	0	0	0	0	2	0	0	0	0	0	0	2	5.60
CALM													0	0.
TOTAL	0	0	0	1	4	[illegible]	1	3	0	0	1	1	14	6.49

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "B" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
			UPPER CLASS INTERVALS OF WIND SPEED (MPH)											
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	1	1	11.30
ENE	0	0	0	0	0	2	0	0	0	0	0	0	2	5.60
E	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.
SE	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.
S	0	0	0	0	1	0	0	1	0	0	0	2	4	9.92
SSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SW	0	0	0	0	0	1	1	0	0	0	0	0	2	6.15
WSW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.30
W	0	0	0	0	0	1	0	0	0	0	0	0	1	5.10
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	0	1	0	0	1	0	4	6	12.75
NNW	0	0	0	0	0	0	0	0	0	2	0	1	3	11.20
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	0	1	1	4	2	1	0	3	0	8	20	9.65

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "C" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
			UPPER CLASS INTERVALS OF WIND SPEED (MPH)											
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.30
ENE	0	0	0	0	0	0	0	1	1	0	0	0	2	7.80
E	0	0	0	0	0	0	1	0	0	0	0	0	1	6.70
ESE	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.
SSE	0	0	0	0	1	1	0	0	0	0	0	0	2	5.10
S	0	0	0	0	2	2	0	1	0	0	0	2	7	7.99
SSW	0	0	0	0	0	1	1	0	3	1	0	3	9	10.27
SW	0	0	0	1	0	0	1	0	1	0	0	0	3	6.47
WSW	0	0	1	0	1	0	1	0	0	0	0	0	3	4.70
W	0	0	0	0	0	1	0	0	0	0	0	0	1	5.30
WNW	0	0	0	0	0	0	0	1	0	0	0	2	3	12.20
NW	0	0	0	0	1	0	1	3	3	2	1	10	21	11.81
NNW	0	0	0	0	0	0	0	0	2	0	1	4	7	14.17
N	0	0	0	0	0	0	0	0	0	0	1	1	2	10.75
CALM													0	0.
TOTAL	0	0	1	1	6	5	5	6	10	3	3	22	62	10.14

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "D" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
			UPPER CLASS INTERVALS OF WIND SPEED (MPH)											
NNE	0	0	1	0	0	2	1	0	0	0	0	0	4	5.13
NE	0	0	0	0	0	0	0	0	0	1	0	0	1	9.20
ENE	0	0	0	2	1	2	1	2	3	2	1	1	15	7.39
E	0	0	1	0	0	1	0	2	1	1	1	0	7	7.46
ESE	0	0	0	0	1	2	1	0	0	0	1	0	5	6.38
SE	0	0	0	2	3	2	1	1	1	1	0	0	11	5.87
SSE	0	0	0	3	2	2	1	0	1	1	0	6	16	8.48
S	0	0	1	1	0	2	1	0	1	3	0	6	15	9.19
SSW	0	0	1	1	3	0	0	2	2	4	1	15	29	11.30
SW	0	1	0	0	4	3	1	2	6	2	2	16	37	10.57
WSW	0	0	1	1	2	2	6	0	5	2	0	8	27	8.47
W	0	0	1	1	2	2	3	2	4	0	0	4	19	8.61
WNW	0	0	0	2	3	2	3	3	1	2	1	4	21	8.73
NW	0	0	0	1	1	2	1	3	2	1	1	9	21	10.29
NNW	0	0	1	0	0	3	1	1	4	1	1	7	23	10.05
N	0	0	0	0	0	1	1	0	0	1	1	0	4	8.30
CALM													1	.60
TOTAL	0	1	7	14	22	28	22	20	31	24	10	76	256	9.11

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

TABLE 2.3-89B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: APRIL, 1975

PASQUILL #E# (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	1	0	1	0	2	0	0	0	0	0	4	5.37
NE	0	3	0	4	0	2	1	1	0	0	0	0	11	3.99
ENE	0	0	1	0	0	1	1	0	0	1	1	0	5	6.82
E	0	0	1	1	2	1	1	0	0	0	0	0	6	4.42
ESE	0	0	0	1	1	0	0	0	0	1	0	0	3	5.90
SE	0	0	1	1	2	1	0	2	0	0	0	0	7	4.89
SSE	0	0	0	1	2	8	2	2	0	3	3	2	23	7.55
S	0	0	0	2	5	1	5	5	4	1	1	13	37	9.35
SSW	0	1	1	1	3	0	0	1	3	8	3	9	30	9.14
SW	0	0	2	4	1	6	4	2	10	2	2	1	34	6.93
WSW	0	0	0	1	0	2	1	3	1	0	0	0	8	6.37
W	0	0	0	2	2	2	6	2	1	0	1	2	18	7.75
WNW	0	0	0	1	1	0	1	1	0	0	0	0	4	5.55
NW	0	1	0	0	1	1	0	3	0	1	1	5	13	9.50
NNW	0	0	0	0	1	1	1	2	1	2	3	5	16	9.44
N	0	1	1	2	1	1	1	0	1	0	0	0	8	4.59
CALM													2	.60
TOTAL	0	6	8	21	21	27	26	24	21	19	15	37	229	7.54

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL #F# (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	1	0	0	0	1	0	0	0	0	0	2	4.95
NE	0	0	1	0	0	0	0	0	0	0	0	0	1	2.70
ENE	0	0	0	1	0	0	0	0	0	0	0	0	1	3.80
E	0	0	1	0	0	0	0	1	0	0	0	0	2	4.85
ESE	0	1	0	0	0	1	2	1	0	0	0	0	5	5.58
SE	0	0	1	0	1	0	1	2	1	0	0	0	6	6.17
SSE	0	0	1	1	2	1	0	2	2	4	3	0	16	7.74
S	0	0	0	0	0	0	1	0	0	0	0	0	1	6.10
SSW	0	0	0	1	2	3	2	0	0	0	0	0	8	5.66
SW	0	0	0	1	1	0	1	0	0	0	0	0	3	6.97
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	1	2	1	0	1	0	0	0	0	5	5.16
WNW	0	1	0	2	3	2	2	1	1	0	0	0	12	5.29
NW	0	0	0	1	1	1	0	0	0	0	0	0	3	4.67
NNW	0	0	0	1	2	1	0	0	0	0	1	0	5	5.82
N	0	0	1	0	0	2	0	0	0	0	0	0	3	4.56
CALM													0	0.
TOTAL	0	2	6	9	14	12	10	8	4	4	4	0	73	5.81

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL #G# (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	1	0	2	1	0	1	0	0	0	0	0	5	4.06
NE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.40
ENE	0	1	0	0	1	0	0	0	0	0	0	0	2	2.85
E	0	1	0	0	0	2	0	0	0	0	0	0	3	4.10
ESE	0	1	0	2	0	0	0	0	0	0	0	0	3	2.69
SE	0	0	2	3	1	1	0	0	0	0	0	0	7	3.69
SSE	0	1	0	1	0	0	1	0	0	0	0	0	3	3.43
S	0	0	0	0	1	0	0	0	0	0	0	0	1	4.60
SSW	0	1	1	0	1	0	0	0	0	0	0	0	3	2.40
SW	0	0	1	0	0	0	0	0	0	0	0	0	1	2.10
WSW	0	2	1	0	0	0	0	0	0	0	0	0	3	1.90
W	1	0	1	0	1	0	0	0	0	0	0	0	3	2.53
WNW	0	1	2	0	0	0	0	0	0	0	0	0	3	2.17
NW	0	0	2	3	1	0	0	0	0	0	0	0	6	3.17
NNW	0	1	6	3	2	0	0	0	0	0	0	0	12	2.87
N	0	1	1	0	2	2	0	0	0	0	0	0	6	3.62
CALM													2	.60
TOTAL	1	11	17	14	14	5	2	0	0	0	0	0	64	3.21

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	1	3	2	2	2	5	1	0	0	0	0	17	6.00
NE	0	3	1	4	2	2	1	1	0	1	0	1	16	4.74
ENE	0	1	1	3	2	5	2	3	4	1	2	1	27	6.71
E	0	1	3	1	2	4	3	3	1	1	1	0	20	5.67
ESE	0	2	0	3	2	3	3	1	0	1	1	0	16	5.37
SE	0	0	4	6	7	5	2	6	2	1	0	0	33	5.21
SSE	0	1	1	6	8	12	4	4	3	8	6	8	51	7.51
S	0	0	1	3	12	5	7	8	5	4	1	24	70	8.09
SSW	0	2	3	3	10	4	1	3	8	13	4	27	80	9.16
SW	0	1	1	6	6	10	8	4	17	4	4	17	80	8.44
WSW	0	2	3	3	1	4	8	3	6	2	0	8	62	7.21
W	1	0	2	4	7	7	9	5	5	5	1	6	47	7.18
WNW	0	2	2	5	7	4	6	6	2	2	1	6	43	7.15
NW	0	1	2	6	6	4	1	9	6	5	3	28	72	9.83
NNW	0	1	7	4	5	5	2	6	7	7	7	11	67	8.89
N	0	2	1	2	1	8	2	0	1	1	2	1	25	5.57
CALM													5	.60
TOTAL	1	20	19	61	84	84	68	62	66	51	33	144	720	7.00

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

TABLE 2.3-90A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: MAY, 1975

PASQUILL *A* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	1	0	1	0	0	0	0	0	2	5.40
NE	0	0	0	0	0	2	3	1	1	0	0	0	7	6.74
ENE	0	0	0	0	2	1	1	0	0	0	0	0	4	5.35
E	0	0	0	0	0	0	1	0	0	0	0	0	1	6.50
ESE	0	0	0	0	0	1	0	1	0	0	0	0	2	6.45
SE	0	1	0	0	0	0	0	0	0	0	0	1	2	10.05
SSE	0	0	0	1	1	0	0	1	0	0	1	0	4	6.42
S	0	0	0	1	0	0	1	1	2	0	1	1	7	8.10
SSW	0	0	0	1	1	1	0	1	0	0	0	0	4	5.00
SW	0	0	0	0	0	1	0	0	0	0	0	0	1	6.00
WSW	0	0	0	0	0	2	0	0	0	0	0	0	2	5.50
W	0	0	0	0	1	0	0	0	0	0	0	0	1	4.90
WNW	0	0	0	0	0	1	0	0	0	0	0	0	1	5.30
NW	0	0	0	0	2	0	0	0	0	0	0	0	2	4.75
NNW	0	1	1	0	0	0	0	0	0	0	0	0	2	2.45
N	0	0	0	0	1	1	0	0	0	0	0	0	2	4.80
CALM													0	0.
TOTAL	0	2	1	3	9	10	7	5	3	0	2	2	44	6.23

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL *B* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.50
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.50
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.80
SE	0	0	0	0	2	0	0	1	0	0	0	0	3	5.40
SSE	0	0	0	0	0	0	1	1	0	0	1	0	3	8.23
S	0	0	0	0	0	0	0	0	0	0	1	0	1	10.80
SSW	0	0	0	1	0	0	0	0	0	0	0	1	2	7.60
SW	0	0	0	0	0	0	2	0	0	0	0	0	2	6.50
WSW	0	0	0	0	0	1	1	0	0	0	0	0	2	6.40
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.30
NW	0	0	0	1	0	2	0	1	0	0	0	0	4	5.57
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	0	2	4	5	4	3	0	0	2	1	21	6.43

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL *C* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	1	1	0	0	0	0	0	0	2	5.25
NE	0	0	1	0	0	1	0	0	0	0	0	0	2	4.20
ENE	0	0	0	0	2	0	0	0	1	1	1	0	5	7.44
E	0	0	0	0	1	0	0	0	0	0	0	0	1	4.50
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	0	0	0	1	0	0	0	1	2	10.00
SSE	0	0	0	0	1	0	0	0	0	0	0	2	3	10.13
S	0	0	0	0	1	0	0	0	0	0	0	0	1	4.80
SSW	0	0	0	1	2	0	2	0	1	2	0	0	8	6.67
SW	0	0	0	0	1	3	1	1	1	0	0	0	7	6.03
WSW	0	0	0	1	1	2	4	1	1	1	0	0	11	6.45
W	0	0	0	0	1	2	1	0	0	0	0	0	4	5.60
WNW	0	0	0	0	2	0	0	1	1	0	0	0	4	6.20
NW	0	0	0	0	2	1	0	0	0	0	0	0	3	4.60
NNW	0	0	0	1	3	0	0	0	0	0	0	0	4	4.50
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	1	3	18	10	8	4	5	4	1	3	57	6.34

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL *D* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	1	4	3	1	1	0	0	0	0	0	1	11	4.22
NE	0	2	2	3	3	3	4	4	1	0	1	0	23	5.51
ENE	0	0	2	2	3	5	7	1	2	2	0	0	24	5.96
E	0	0	1	2	3	3	1	2	1	2	0	0	15	5.91
ESE	0	0	1	1	3	1	4	0	0	0	1	1	12	6.03
SE	0	0	1	3	2	1	2	2	2	2	3	2	20	7.32
SSE	0	0	0	0	0	2	1	3	2	2	5	7	22	9.81
S	0	0	1	0	1	1	4	6	1	0	0	0	14	6.45
SSW	0	0	1	1	3	3	3	5	0	1	1	1	19	6.59
SW	0	0	0	0	5	5	1	2	5	1	0	0	19	[illegible]
WSW	0	0	1	1	4	2	2	4	4	2	0	0	20	6.40
W	0	1	0	6	1	5	1	4	2	2	1	4	27	7.01
WNW	0	0	0	1	1	2	2	1	4	0	1	0	12	7.02
NW	0	0	0	1	0	4	0	2	1	1	1	0	10	6.07
NNW	0	0	0	2	4	1	1	0	0	0	0	0	8	6.81
N	0	1	0	1	0	1	0	2	0	0	1	0	6	6.15
CALM													1	[illegible]
TOTAL	0	5	14	27	34	42	33	38	25	15	15	16	265	[illegible]

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-90B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: MAY, 1975

PASQUILL "E" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	2	1	5	2	0	0	0	0	0	0	0	10	3.13
NE	0	0	1	5	1	1	1	0	0	0	0	0	9	4.36
ENE	0	0	2	1	4	1	0	0	1	1	0	1	11	5.69
E	0	0	3	3	2	6	1	1	1	0	1	1	19	5.53
ESE	1	0	0	2	1	4	3	2	1	0	0	1	15	5.03
SE	0	0	1	1	0	4	7	3	2	0	0	0	18	6.38
SSE	0	1	1	1	3	4	3	4	2	2	0	1	22	6.41
S	0	0	0	0	4	2	4	3	1	1	1	0	16	6.71
SSW	1	0	1	0	2	1	4	1	2	2	0	0	14	5.26
SW	0	0	0	2	0	1	2	3	1	0	0	0	9	6.23
WSW	0	1	2	3	0	0	2	0	0	0	1	1	10	5.70
W	0	0	1	2	0	2	0	1	0	0	0	0	6	4.87
WNW	2	1	1	0	2	3	0	0	0	0	0	0	9	3.46
NW	0	1	2	4	2	1	1	1	0	0	0	0	12	4.06
NNW	0	0	2	2	0	1	0	0	0	0	0	0	5	3.54
N	1	2	0	2	0	0	0	1	0	0	0	0	6	3.12
CALM													3	.43
TOTAL	5	6	18	33	23	31	25	20	11	6	3	5	196	5.36

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	1	1	0	1	0	0	0	0	0	0	0	3	2.77
NE	0	1	4	3	2	1	0	0	0	0	0	1	12	4.12
ENE	0	2	0	2	1	2	0	0	0	0	0	0	7	3.90
E	1	1	0	1	0	1	0	0	0	0	0	0	4	2.45
ESE	0	0	1	2	1	4	1	1	0	0	0	0	10	5.05
SE	0	0	0	0	0	3	4	4	0	0	0	0	11	6.44
SSE	0	0	1	4	1	2	0	2	0	0	0	0	10	4.75
S	0	0	2	4	1	4	2	0	0	0	0	0	13	4.61
SSW	0	2	1	3	1	1	0	2	2	0	0	0	12	5.07
SW	0	3	1	1	1	0	0	0	0	0	0	0	6	2.43
WSW	0	0	1	0	2	1	0	0	0	0	0	0	4	4.15
W	0	2	0	1	0	0	0	0	0	0	0	0	3	2.46
WNW	0	0	0	1	0	0	0	0	0	0	0	0	1	4.00
NW	0	0	0	3	1	0	1	0	0	0	0	0	5	4.22
NNW	0	1	0	0	1	0	0	0	0	0	0	0	2	3.20
N	0	0	2	0	1	0	0	0	0	0	0	0	3	3.57
CALM													4	.63
TOTAL	1	13	14	25	14	19	8	9	2	0	0	1	110	4.29

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "G" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	1	1	0	0	0	0	0	0	0	0	0	2	2.15
NE	2	0	0	2	0	0	0	0	0	0	0	0	4	2.25
ENE	1	1	0	0	0	0	0	0	0	0	0	0	2	1.35
E	0	1	0	0	0	0	0	0	0	0	0	0	1	1.20
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	0	0	0	2	0	0	0	0	2	7.30
SSE	0	0	1	0	0	0	0	0	0	0	0	0	1	2.60
S	0	1	0	0	0	0	1	0	0	0	0	0	2	3.75
SSW	0	1	2	1	0	0	0	0	0	0	0	0	4	2.55
SW	0	0	2	5	1	0	0	0	0	0	0	0	8	3.55
WSW	0	0	3	4	0	0	0	0	0	0	0	0	7	3.07
W	0	0	1	0	1	0	0	0	0	0	0	0	2	4.00
WNW	1	0	1	0	0	0	0	0	0	0	0	0	2	1.80
NW	0	1	1	1	2	0	0	0	0	0	0	0	5	3.32
NNW	0	0	0	0	0	1	0	0	0	0	0	0	1	5.10
N	0	0	0	1	0	0	0	0	0	0	0	0	1	3.70
CALM													0	.22
TOTAL	4	6	12	14	4	1	1	2	0	0	0	0	43	2.73

...BER OF INVALID OBSERVATIONS = 0

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	5	7	8	6	5	1	0	0	0	0	1	33	3.80
NE	2	1	6	13	6	8	8	5	2	0	1	1	57	4.87
ENE	1	3	4	5	12	10	8	1	4	4	1	1	54	5.55
E	1	2	4	6	6	10	3	3	2	2	1	1	41	5.20
ESE	1	0	2	5	6	10	9	4	1	0	1	2	40	5.76
SE	0	1	2	4	4	8	13	13	4	2	3	4	58	6.95
SSE	0	1	3	6	6	8	5	11	4	4	7	10	65	7.54
S	0	1	3	5	7	7	12	10	4	1	3	1	54	6.10
SSW	1	1	5	8	9	6	9	9	5	5	1	2	63	5.90
SW	0	1	1	8	9	10	6	6	7	1	0	0	52	5.63
WSW	0	1	7	9	7	8	9	5	5	3	1	1	56	5.71
W	0	3	2	9	4	9	2	5	2	2	1	4	43	6.17
WNW	1	1	2	2	6	6	2	2	5	0	1	0	30	5.26
NW	0	2	3	10	9	8	2	4	1	1	1	0	41	4.57
NNW	0	[illegible]	3	5	9	3	1	0	0	0	0	0	22	4.13
N	1	1	2	4	2	2	0	1	0	0	1	0	11	4.47
CALM													17	.42
TOTAL	10	16	40	107	106	118	89	81	46	25	21	28	744	[illegible]

NUMBER OF INVALID OBSERVATIONS = 0

2.3-145

AMENDMENT 97-01
AUGUST 1997

TABLE 2.3-91A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: JUNE, 1975

PASQUILL *A* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	5	2	4	11	10.63
NE	0	0	0	0	1	1	2	0	1	0	1	8	14	10.43
ENE	0	0	0	0	0	2	1	0	0	1	0	0	4	7.02
E	0	0	0	0	0	1	0	0	0	0	1	1	3	8.90
ESE	0	0	0	0	0	0	0	1	1	0	0	0	2	8.10
SE	0	0	0	0	0	1	0	0	2	0	0	0	3	7.73
SSE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.20
S	0	0	0	0	0	0	0	0	0	0	0	1	1	13.40
SSW	0	0	0	1	0	0	0	0	0	0	0	1	2	8.40
SW	0	0	0	0	1	1	1	0	0	0	0	0	3	5.60
WSW	0	0	0	0	1	3	2	1	0	0	0	0	7	5.91
W	0	0	0	0	1	0	2	0	0	0	0	0	3	5.87
WNW	0	0	0	0	1	2	0	1	0	0	0	0	4	5.67
NW	0	0	0	0	0	0	1	0	0	0	0	0	1	7.00
NNW	0	0	0	0	0	0	1	0	0	0	0	0	1	6.80
N	0	0	0	0	0	1	1	1	0	1	1	0	5	8.02
CALM													0	0.
TOTAL	0	0	0	1	5	13	11	4	4	7	5	15	65	8.46

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL *B* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	1	0	0	0	1	8.80
NE	0	0	0	0	0	0	0	2	0	2	0	3	7	11.46
ENE	0	0	0	0	0	0	1	1	1	0	0	0	3	7.33
E	0	0	0	0	1	0	1	1	0	1	2	0	6	8.35
ESE	0	0	0	0	0	0	0	1	0	0	0	0	1	8.00
SE	0	0	0	0	0	0	0	0	0	0	0	1	1	11.20
SSE	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	0	0	0.
SSW	0	0	0	0	0	0	0	0	0	0	0	1	1	12.50
SW	0	0	0	0	2	1	1	0	1	0	0	0	5	5.64
WSW	0	0	0	1	1	0	0	0	0	0	0	0	2	4.45
W	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.
NW	0	0	0	0	0	0	0	0	1	0	0	0	1	8.30
NNW	0	0	0	0	0	0	0	0	1	0	0	0	1	8.60
N	0	0	0	0	0	0	1	0	0	0	0	0	1	6.80
CALM													0	0.
TOTAL	0	0	0	1	4	1	4	5	5	3	2	5	30	8.50

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL *C* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	2	1	1	1	1	1	0	1	8	7.02
ENE	0	0	0	0	0	0	0	0	0	1	1	2	4	12.75
E	0	0	0	0	0	0	0	0	4	4	2	3	13	9.82
ESE	0	0	0	0	0	0	0	0	1	0	1	0	2	9.85
SE	0	0	0	0	0	0	0	0	1	0	1	0	2	9.40
SSE	0	0	0	0	0	0	1	0	0	0	0	0	1	6.70
S	0	0	0	0	0	0	1	1	0	0	0	1	3	8.53
SSW	0	0	0	0	0	1	0	2	0	0	0	0	3	7.10
SW	0	0	1	0	3	3	1	0	0	0	0	0	8	4.89
WSW	0	0	0	0	0	5	3	2	1	1	0	2	14	7.66
W	0	0	0	0	0	2	1	1	0	0	0	0	4	6.10
WNW	0	0	0	1	1	0	1	0	0	0	0	0	3	4.93
NW	0	0	0	0	1	0	1	0	0	0	0	0	2	5.90
NNW	0	0	0	0	1	0	1	0	0	0	1	0	3	7.37
N	0	0	0	0	0	0	1	1	0	0	0	0	2	6.95
CALM													0	0.
TOTAL	0	0	1	1	8	12	12	8	8	7	6	9	72	7.78

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL *D* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	1	2	1	1	1	3	9	10.61
NE	0	0	1	0	3	1	3	6	1	2	1	0	18	6.96
ENE	0	0	0	0	3	2	7	6	5	2	2	2	29	7.78
E	0	0	0	0	2	1	2	2	1	0	2	1	11	7.68
ESE	0	0	0	0	0	0	1	4	4	2	2	3	16	9.34
SE	0	0	0	0	0	1	1	0	0	1	2	3	8	10.31
SSE	0	0	0	1	0	0	0	3	2	0	1	1	8	7.97
S	0	0	0	0	0	2	1	2	1	1	0	3	10	8.85
SSW	0	0	0	1	2	1	4	1	0	1	0	3	13	7.94
SW	0	0	0	0	2	0	4	2	6	3	1	2	20	8.28
WSW	0	0	0	1	6	4	9	4	3	0	2	6	35	7.66
W	0	0	0	1	1	5	2	5	2	3	2	5	26	8.17
WNW	0	0	1	0	1	5	1	1	0	1	0	1	11	6.17
NW	0	0	0	1	1	3	4	1	1	1	0	0	12	6.39
NNW	0	0	0	0	1	1	1	1	0	1	0	0	5	6.80
N	0	0	0	0	2	3	3	1	0	1	0	1	11	6.75
CALM													0	0.
TOTAL	0	0	2	5	24	29	44	41	27	20	16	34	242	7.54

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

TABLE 2.3-91B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: JUNE, 1975

PASQUILL "E" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	1	3	3	1	0	0	3	0	0	0	0	11	4.36
NE	0	0	1	0	7	4	3	3	1	0	0	0	19	5.65
ENE	0	0	2	1	1	1	4	2	1	2	0	0	14	6.21
E	0	0	0	0	4	0	2	1	0	0	0	0	7	5.71
ESE	0	0	0	1	1	3	3	2	0	0	0	0	10	5.95
SE	0	0	2	0	1	2	0	0	0	0	0	0	5	4.02
SSE	0	0	1	0	4	5	3	4	0	0	0	1	18	6.12
S	0	1	1	2	1	2	3	0	2	0	2	0	14	5.95
SSW	0	0	1	1	3	6	2	1	0	0	0	0	14	5.19
SW	0	0	2	2	6	5	1	0	0	0	0	0	16	4.59
WSW	0	0	0	0	6	5	3	0	0	2	0	0	16	5.88
W	0	0	0	2	2	3	0	1	0	0	0	0	8	5.04
WNW	1	0	0	0	0	3	0	0	0	0	0	0	4	4.40
NW	0	0	0	1	2	1	1	0	0	1	0	0	6	5.67
NNW	0	1	0	0	1	1	1	0	0	0	0	0	4	4.50
N	1	1	2	4	2	1	1	0	0	0	0	0	12	3.61
CALM													1	.60
TOTAL	2	4	15	17	42	42	27	17	4	5	2	1	179	5.31

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	1	0	0	0	0	0	0	0	0	0	0	1	1.20
NE	0	1	1	1	0	1	0	0	0	0	0	0	4	3.12
ENE	0	1	0	1	2	2	0	0	0	0	0	0	6	4.10
E	0	1	0	1	1	1	0	0	0	0	0	0	4	3.80
ESE	1	0	1	0	1	0	1	1	0	0	0	0	7	4.96
SE	0	1	1	0	0	0	1	1	0	0	0	0	4	4.55
SSE	0	0	2	0	0	0	0	0	0	0	0	0	2	2.45
S	0	0	1	0	1	0	1	2	1	0	0	0	6	6.15
SSW	1	0	0	1	3	2	3	0	0	0	0	0	10	5.05
SW	0	0	1	2	2	2	0	0	0	0	0	0	7	4.37
WSW	0	0	2	2	1	2	0	0	0	0	0	0	7	3.99
W	0	1	1	5	1	0	0	0	0	0	0	0	8	3.37
WNW	0	1	0	1	0	1	0	0	0	0	0	0	3	3.41
NW	0	1	0	1	2	1	0	0	0	0	0	0	5	4.04
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	1	1	1	1	0	0	0	0	0	0	0	4	2.82
CALM													3	.63
TOTAL	2	9	11	16	15	12	8	4	1	0	0	0	81	4.04

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "G" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	2	1	0	0	0	0	0	0	0	0	3	2.97
NE	1	1	1	2	0	0	0	0	0	0	0	0	5	2.64
ENE	0	1	0	2	0	0	0	0	0	0	0	0	3	2.77
E	0	0	1	0	0	0	0	0	0	0	0	0	1	2.19
ESE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.10
SE	0	0	1	0	0	1	0	0	0	0	0	0	2	4.30
SSE	0	0	0	0	1	0	2	0	0	0	0	0	3	6.17
S	0	0	0	1	0	0	0	0	0	0	0	0	1	3.80
SSW	0	2	1	1	3	3	0	1	0	0	0	0	11	4.40
SW	0	0	2	0	2	1	0	0	0	0	0	0	5	4.10
WSW	0	1	0	1	2	0	0	0	0	0	0	0	4	3.47
W	0	1	1	0	0	0	0	0	0	0	0	0	2	2.15
WNW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.20
NW	1	0	1	0	0	0	0	0	0	0	0	0	2	1.70
NNW	0	2	1	0	0	0	0	0	0	0	0	0	3	1.77
N	0	0	0	0	1	0	0	0	0	0	0	0	1	4.30
CALM													1	.63
TOTAL	2	8	11	8	10	6	2	1	0	0	0	0	51	3.63

NUMBER OF INVALID OBSERVATIONS = 0

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	2	5	4	1	0	1	5	2	6	3	7	36	7.76
NE	1	2	4	3	11	8	9	12	4	5	2	12	75	7.21
ENE	0	2	2	4	6	7	13	9	7	6	3	4	63	7.89
E	0	1	1	1	8	3	5	4	5	5	7	5	45	7.69
ESE	1	0	1	1	2	4	7	9	6	2	3	3	39	7.52
SE	0	1	4	0	1	5	2	1	3	1	3	4	25	7.10
SSE	0	0	3	1	5	6	6	7	2	0	1	2	31	5.34
S	0	1	2	3	2	4	6	5	4	1	2	5	36	7.19
SSW	1	2	2	5	11	11	9	5	0	1	0	5	54	6.02
SW	0	0	6	4	18	11	8	2	7	3	1	2	74	5.67
WSW	0	1	2	5	17	19	17	7	6	3	2	2	65	6.63
W	0	2	2	8	5	10	5	7	2	3	2	5	51	6.19
WNW	1	1	1	2	4	11	2	2	0	1	0	1	36	5.48
NW	1	1	1	3	6	5	7	1	2	2	0	0	29	5.56
NNW	0	1	1	0	1	2	4	1	1	1	1	0	17	5.41
N	1	2	1	5	6	5	7	1	0	2	1	1	16	5.33
CALM													7	.63
TOTAL	6	21	40	49	108	115	108	80	49	42	31	64	720	

TABLE 2.3-92A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: JULY, 1975

PASQUILL "A" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	1	0	0	0	0	0	1	6.60
NE	0	0	0	0	0	0	0	1	0	0	0	0	1	7.60
ENE	0	0	0	1	0	0	0	0	0	0	0	0	1	4.00
E	0	0	0	0	0	2	1	0	0	0	0	0	3	5.90
ESE	0	0	0	1	1	0	0	0	0	1	0	0	3	5.93
SE	0	0	1	0	0	1	1	0	0	0	0	0	3	4.77
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	0	0	0	2	0	0	1	1	0	1	0	5	6.94
SSW	0	0	0	0	1	0	1	0	0	0	0	1	3	7.47
SW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WSW	0	0	0	0	0	1	0	0	0	0	0	0	1	5.60
W	0	0	0	0	0	1	0	0	0	0	0	0	1	5.80
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	1	0	0	1	0	0	0	1	0	0	0	3	4.87
NNW	0	0	0	0	0	1	0	1	0	0	0	0	2	6.65
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	1	1	2	5	6	4	3	2	1	1	1	27	6.09

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "B" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	1	0	1	10.50
ENE	0	0	0	1	2	0	0	0	0	1	0	0	4	5.57
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	1	0	0	2	0	0	0	0	0	3	5.53
SE	0	0	0	0	0	0	0	1	0	0	0	0	1	7.30
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	0	0	0	0	1	0	0	0	0	0	0	1	5.30
SSW	0	0	0	1	0	0	0	1	0	0	2	0	4	7.87
SW	0	0	0	0	0	1	0	0	0	1	0	1	3	9.00
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	1	0	0	0	0	1	0	0	2	6.90
WNW	0	0	0	0	0	1	0	0	0	0	0	0	1	5.30
NW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.40
NNW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.50
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	0	3	5	3	2	2	0	3	3	1	22	6.75

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "C" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	1	0	0	0	0	0	0	0	0	1	3.30
ENE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.40
E	0	0	0	0	0	0	0	1	1	0	0	0	2	7.85
ESE	0	0	0	0	1	1	0	0	0	1	0	0	3	6.43
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSE	0	0	1	0	0	0	0	0	0	0	0	0	1	2.40
S	0	0	0	0	0	0	1	1	1	0	1	0	4	8.42
SSW	0	0	0	1	0	0	0	1	1	0	0	0	3	6.50
SW	0	0	0	0	0	0	1	3	0	2	0	0	6	7.92
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	1	1	0	1	0	0	0	0	0	3	4.60
WNW	0	0	0	0	1	1	0	1	0	0	0	0	3	6.03
NW	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	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	1	1	22.10
CALM													0	0.
TOTAL	0	0	1	3	4	2	3	7	3	3	1	1	28	7.14

NUMBER OF INVALID OBSERVATIONS = 0

PASQUILL "D" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.40
NE	1	0	1	0	0	0	0	0	0	0	0	0	2	1.45
ENE	0	1	1	1	0	1	0	0	0	0	0	0	4	3.27
E	0	0	0	0	0	2	0	0	1	0	0	0	3	6.53
ESE	0	0	0	0	1	0	0	0	0	0	1	0	2	7.60
SE	0	0	0	1	0	2	0	2	2	1	0	3	11	8.51
SSE	0	0	0	0	0	2	6	3	1	0	5	3	20	8.58
S	0	0	1	1	2	1	3	7	2	5	1	4	27	8.13
SSW	0	1	0	1	3	2	5	7	3	2	2	0	26	6.99
SW	0	0	2	0	3	1	7	8	2	1	0	2	26	6.91
WSW	0	0	1	0	1	3	4	5	2	0	1	1	18	7.05
W	0	0	0	2	3	1	3	2	3	0	2	0	16	6.75
WNW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.20
NW	0	1	0	2	0	0	1	0	0	0	1	0	5	4.16
NNW	0	0	1	1	0	1	0	0	0	0	0	0	3	3.83
N	0	1	0	1	1	0	0	0	0	0	0	0	3	2.87
CALM													0	0.
TOTAL	1	4	7	10	15	17	29	14	16	9	11	11	168	7.07

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-92B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: JULY, 1975

PASQUILL "E" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	3	4	1	0	0	0	1	0	0	0	0	9	3.00
NE	0	1	1	7	1	3	4	1	2	0	0	1	21	5.43
ENE	0	2	3	3	1	1	1	0	0	0	0	0	11	3.46
E	0	1	2	5	3	2	0	0	0	0	0	0	13	3.73
ESE	0	0	1	4	2	1	3	2	2	2	0	1	18	6.36
SE	0	1	1	8	9	5	6	5	1	2	0	0	37	5.44
SSE	0	0	2	5	4	4	8	5	1	1	2	2	34	6.37
S	1	3	4	6	6	13	13	4	1	0	0	0	51	5.09
SSW	0	1	2	1	12	8	9	7	2	1	0	1	44	6.11
SW	0	3	2	6	7	7	9	5	2	0	0	0	41	5.29
WSW	0	0	1	3	8	5	0	2	1	0	0	0	20	5.01
W	1	0	1	0	2	1	0	1	0	0	0	0	6	4.23
WNW	0	0	0	4	1	0	0	1	0	0	0	0	6	4.[illegible]
NW	0	1	3	3	1	2	0	1	0	0	1	1	13	5.16
NNW	0	2	3	0	0	2	0	0	0	0	0	0	7	3.00
N	0	3	0	4	0	0	1	0	2	0	0	0	10	4.13
CALM													7	.63
TOTAL	2	21	30	60	58	54	54	35	14	6	3	6	350	5.14

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	1	2	3	1	2	0	0	0	0	0	0	0	9	2.74
NE	0	1	3	1	1	1	2	0	0	0	0	0	9	3.92
ENE	0	0	2	2	1	2	2	2	3	3	2	0	19	6.89
E	0	0	2	1	2	1	2	1	0	0	0	0	9	4.74
ESE	1	0	0	3	1	1	1	1	0	0	0	0	8	4.60
SE	0	1	1	1	3	6	2	0	0	0	0	0	14	4.72
SSE	0	1	1	2	4	1	0	1	1	0	0	0	11	4.72
S	0	2	4	2	2	0	0	0	0	0	0	0	10	3.05
SSW	0	0	1	0	3	1	0	0	0	0	0	0	5	4.26
SW	0	0	4	0	1	0	0	0	0	0	0	0	5	2.[illegible]
WSW	0	0	0	0	4	1	0	0	0	0	0	0	5	4.62
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	1	0	0	0	0	0	0	0	0	1	0	2	6.15
NW	0	1	4	0	0	0	0	0	0	0	0	0	5	2.30
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	1	1	0	0	0	0	0	0	0	0	2	2.[illegible]
CALM													1	[illegible]
TOTAL	2	9	26	14	24	14	9	5	4	3	3	0	116	4.39

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "G" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	1	0	0	0	0	0	0	0	0	0	1	2.60
NE	0	0	2	0	0	0	0	0	0	0	0	0	2	2.70
ENE	1	1	0	5	1	1	0	0	0	0	0	0	9	3.24
E	0	0	0	0	5	1	2	0	0	0	0	0	8	5.21
ESE	0	0	0	0	0	0	1	0	0	0	0	0	1	6.60
SE	0	2	0	0	0	0	0	0	0	0	0	0	2	1.55
SSE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.79
S	0	0	0	0	1	0	0	0	0	0	0	0	1	4.60
SSW	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.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	1	0	0	0	0	0	0	0	0	1	4.00
NW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.40
NNW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.30
N	0	0	0	1	0	0	0	0	0	0	0	0	1	3.60
CALM													1	[illegible]
TOTAL	1	3	3	8	9	2	3	0	0	0	0	0	30	[illegible]

OF INVALID OBSERVATIONS = 0
UMBER OF OBSERVATIONS = 744

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	1	5	8	2	2	1	1	1	0	0	0	0	21	4.15
NE	1	2	7	9	2	4	6	2	2	0	1	1	37	[illegible]
ENE	1	4	6	13	6	5	3	2	1	4	2	0	47	[illegible]
E	0	1	4	6	10	8	5	2	2	0	0	0	38	[illegible]
ESE	1	0	1	9	6	3	7	3	2	4	1	1	38	[illegible]
SE	0	4	3	10	11	14	9	8	3	3	0	1	[illegible]	[illegible]
SSE	0	1	4	7	9	7	14	9	3	1	7	5	67	[illegible]
S	1	5	9	9	14	15	17	13	5	5	1	4	[illegible]	[illegible]
SSW	0	2	3	4	19	11	15	14	6	1	4	2	[illegible]	[illegible]
SW	0	1	8	6	11	9	17	14	4	4	0	3	[illegible]	[illegible]
WSW	0	0	2	3	13	10	4	7	1	0	1	1	[illegible]	[illegible]
W	1	0	1	3	7	3	4	3	3	1	2	0	[illegible]	[illegible]
WNW	0	1	0	5	3	2	0	2	0	0	1	0	[illegible]	[illegible]
NW	0	4	7	6	4	2	1	1	1	0	2	1	[illegible]	[illegible]
NNW	1	1	4	1	2	4	0	1	0	0	0	0	14	[illegible]
N	0	4	1	7	1	0	1	0	2	0	0	1	17	[illegible]
CALM													11	[illegible]
TOTAL	6	38	68	100	120	98	104	[illegible]	[illegible]	[illegible]	24	22	741	[illegible]

NUMBER OF INVALID OBSERVATIONS = 3
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-93A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: AUGUST, 1975

PASQUILL "A" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	1	[illegible]	1	0	0	0	0	0	0	5	4.60
NE	0	0	0	0	1	0	0	0	0	0	0	0	1	5.00
ENE	0	0	0	2	1	4	2	0	0	0	0	0	9	5.08
E	0	0	1	1	1	2	2	0	0	0	0	0	7	4.91
ESE	0	0	0	0	1	0	3	0	0	0	0	0	4	6.10
SE	0	0	1	0	2	0	0	0	0	0	0	0	3	3.87
SSE	0	0	0	1	0	0	0	0	0	0	0	0	1	3.00
S	0	0	0	1	1	2	0	0	0	0	0	0	4	4.70
SSW	0	0	0	0	1	2	1	1	3	3	0	0	11	7.59
SW	0	0	0	3	8	3	3	1	2	1	0	0	21	5.57
WSW	0	0	2	0	4	2	2	0	0	0	0	0	10	4.81
W	0	0	3	0	1	0	0	0	0	0	0	0	4	3.22
WNW	0	0	0	2	0	1	0	0	0	0	0	0	3	4.07
NW	0	0	1	2	2	0	0	0	0	0	0	0	5	3.94
NNW	0	0	2	2	2	0	0	0	0	0	0	0	6	3.38
N	0	0	0	0	2	0	0	0	0	0	0	0	2	4.40
CALM													0	0.
TOTAL	0	0	10	15	10	17	13	2	5	4	0	0	96	5.10

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "B" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	1	1	0	0	0	0	0	0	2	5.10
NE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.20
ENE	0	0	0	1	0	0	1	0	0	0	0	0	2	5.10
E	0	0	0	0	1	0	1	0	0	0	0	0	2	5.70
ESE	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.
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	0	0	1	0	0	0	0	0	0	0	0	1	3.20
SSW	0	0	1	0	0	1	0	0	2	0	0	0	4	6.27
SW	0	0	0	0	0	3	1	1	2	1	1	0	9	7.57
WSW	0	0	0	1	0	0	0	0	0	0	0	0	1	4.00
W	0	0	0	0	1	0	0	0	0	0	0	0	1	4.10
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	1	1	0	0	0	0	0	0	0	0	2	3.35
NNW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.00
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	2	5	4	5	3	1	4	1	1	0	26	5.81

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "C" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	1	0	0	0	0	0	0	0	0	1	3.10
NE	0	0	1	0	0	0	0	1	0	0	0	0	2	4.40
ENE	0	0	0	0	0	1	7	0	0	0	0	0	8	6.50
E	0	0	0	1	0	0	0	0	0	0	0	0	1	3.20
ESE	0	0	0	0	2	0	0	0	0	0	0	0	2	4.50
SE	0	0	1	0	1	0	0	0	0	0	0	0	2	3.30
SSE	0	0	0	0	1	1	0	0	0	0	0	0	2	5.10
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	0	0	0	0	0	2	1	1	0	2	0	0	6	7.55
SW	0	0	0	0	1	1	6	1	1	2	0	0	14	6.74
WSW	0	0	0	2	3	2	1	0	0	0	0	0	8	4.84
W	0	0	1	0	0	0	0	0	0	0	0	0	1	3.00
WNW	0	0	1	2	2	0	0	0	0	0	0	0	5	4.04
NW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.40
NNW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.80
N	0	0	0	1	0	0	0	0	0	0	0	0	1	3.80
CALM													0	0.
TOTAL	0	0	4	8	11	9	15	3	1	4	0	0	55	5.61

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "D" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	3	1	1	0	1	0	0	0	0	0	6	3.57
NE	0	0	7	5	2	5	3	0	1	0	0	0	23	4.45
ENE	0	2	3	1	7	5	2	0	0	0	0	0	20	4.41
E	0	0	1	2	5	1	0	0	0	0	0	0	9	4.19
ESE	0	0	1	3	1	1	0	0	0	0	0	0	6	3.75
SE	0	0	1	2	0	0	0	0	0	0	0	0	3	3.40
SSE	0	0	0	3	0	2	0	0	0	0	0	0	5	4.20
S	0	1	1	2	4	1	0	1	0	0	0	0	10	4.13
SSW	0	0	0	2	9	6	2	2	0	0	0	0	21	5.20
SW	0	1	1	7	9	7	4	2	1	0	0	0	[illegible]	5.14
WSW	0	0	4	6	1	4	10	5	2	0	0	0	[illegible]	[illegible]
W	0	0	2	3	1	4	3	1	1	0	0	0	15	5.26
WNW	0	1	3	1	0	1	0	0	0	0	0	0	6	3.25
NW	0	0	6	8	1	2	0	0	0	0	0	0	17	[illegible]
NNW	0	0	3	0	0	0	0	0	0	0	0	0	3	2.77
N	0	0	1	1	2	0	0	1	0	0	0	0	5	[illegible]
CALM													0	0.
TOTAL	0	5	37	47	45	40	25	12	7	0	0	0	277	4.74

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-93B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: AUGUST, 1975

PASQUILL "E" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	2	7	1	0	0	0	0	0	0	0	0	10	2.44
NE	0	0	10	0	0	0	0	0	0	0	0	0	10	2.57
ENE	0	0	4	2	0	0	0	0	0	0	0	1	7	4.24
E	0	0	2	5	0	0	0	1	0	0	0	0	8	3.72
ESE	0	0	2	3	0	0	0	0	0	0	0	0	5	3.28
SE	0	1	0	1	0	1	1	0	0	0	0	0	4	4.12
SSE	0	0	0	3	3	1	2	0	0	0	0	0	9	4.84
S	0	2	11	9	13	4	0	0	0	0	0	0	39	3.75
SSW	0	4	6	14	20	3	0	0	0	0	0	0	47	4.00
SW	0	3	12	8	2	0	0	0	0	0	0	0	25	2.96
WSW	1	1	3	1	1	0	0	0	0	0	0	0	7	2.73
W	0	3	4	1	0	0	0	0	0	0	0	0	8	2.17
WNW	1	1	3	0	0	0	0	0	0	0	0	0	5	2.14
NW	0	0	1	0	0	0	0	0	0	0	0	0	1	2.86
NNW	1	2	1	0	0	0	0	0	0	0	0	0	4	1.45
N	0	1	4	0	0	0	0	0	0	0	0	0	5	2.24
CALM													6	.44
TOTAL	3	20	70	48	39	9	3	1	0	0	0	1	200	3.30

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	2	3	0	0	0	0	0	0	0	0	0	5	2.0[illegible]
NE	0	4	1	2	0	0	0	0	0	0	0	0	7	2.21
ENE	0	3	2	3	0	0	0	0	0	0	0	0	8	2.44
E	0	1	1	0	0	0	0	0	0	0	0	0	2	2.[illegible]
ESE	1	0	1	0	0	0	0	0	0	0	0	0	2	1.[illegible]
SE	0	3	1	2	1	0	0	0	0	0	0	0	[illegible]	[illegible]
SSE	0	0	3	4	1	1	0	0	0	0	0	0	11	[illegible]
S	0	7	4	1	8	2	0	0	0	0	0	0	22	3.1[illegible]
SSW	0	0	7	1	4	0	0	0	0	0	0	0	12	3.2[illegible]
SW	0	2	5	2	0	0	0	0	0	0	0	0	[illegible]	2.[illegible]
WSW	0	3	5	1	0	0	0	0	0	0	0	0	[illegible]	2.21
W	0	1	1	0	0	0	0	0	0	0	0	0	2	2.00
WNW	0	1	1	0	0	0	0	0	0	0	0	0	2	1.7[illegible]
NW	1	2	1	0	0	0	0	0	0	0	0	0	4	1.77
NNW	0	1	0	0	0	0	0	0	0	0	0	0	1	1.[illegible]
N	1	3	2	0	0	0	0	0	0	0	0	0	[illegible]	1.[illegible]
CALM													4	.[illegible]
TOTAL	3	33	38	16	18	3	0	0	0	0	0	0	115	2.67

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "G" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	4	0	0	0	0	0	0	0	0	0	0	4	1.77
NE	0	2	1	0	0	0	0	0	0	0	0	0	3	1.73
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	1	0	0	0	0	0	0	0	0	0	1	2.19
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	1	0	0	1	1	0	0	0	0	0	0	3	4.09
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	3	1	0	0	0	0	0	0	0	0	0	4	2.25
SSW	0	1	3	0	0	0	0	0	0	0	0	0	4	2.12
SW	0	0	4	0	0	0	0	0	0	0	0	0	4	2.12
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	2	0	0	0	0	0	0	0	0	0	0	2	1.50
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	2	1	0	0	0	0	0	0	0	0	0	3	1.77
NNW	2	0	0	0	0	0	0	0	0	0	0	0	2	.95
N	0	1	1	0	0	0	0	0	0	0	0	0	2	2.09
CALM													1	.43
TOTAL	2	16	12	0	1	1	0	0	0	0	0	0	35	2.00

NUMBER OF INVALID OBSERVATIONS = 0
AL NUMBER OF OBSERVATIONS = 744

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	8	13	4	5	2	1	0	0	0	0	0	33	3.62
NE	0	6	20	7	4	5	3	1	1	0	0	0	47	3.57
ENE	0	5	9	9	8	10	12	0	0	0	0	1	54	4.54
E	0	1	6	9	7	3	3	1	0	0	0	0	30	4.12
ESE	1	0	4	6	4	1	3	0	0	0	0	0	19	4.04
SE	0	5	4	5	7	2	1	0	0	0	0	0	24	3.55
SSE	0	0	3	11	7	5	2	0	0	0	0	0	28	4.21
S	0	13	17	14	26	9	0	1	0	0	0	0	80	3.[illegible]
SSW	0	5	17	17	34	14	4	4	5	5	0	0	105	4.71
SW	0	6	22	20	20	16	14	5	8	4	1	0	116	4.84
WSW	1	4	14	11	11	8	13	5	2	0	0	0	[illegible]	4.[illegible]
W	0	6	11	4	3	4	3	1	1	0	0	0	33	3.73
WNW	1	3	8	5	2	2	0	0	0	0	0	0	21	3.14
NW	1	4	11	11	4	2	0	0	0	0	0	0	33	3.[illegible]
NNW	[illegible]	3	6	4	2	0	0	0	0	0	0	0	16	2.53
N	1	[illegible]	[illegible]	2	4	0	0	1	0	0	0	0	[illegible]	2.[illegible]
CALM													11	.[illegible]
TOTAL	6	76	173	139	148	93	59	19	17	9	1	1	744	4.[illegible]

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-94A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: SEPTEMBER, 1975

PASQUILL *A* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	1	0	0	1	0	0	1	0	0	3	6.53
NE	0	0	0	1	0	0	1	0	0	0	0	0	2	5.05
ENE	0	0	0	1	0	0	0	0	0	0	0	0	1	3.30
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.90
SE	0	0	0	0	2	0	0	0	0	0	0	0	2	4.50
SSE	0	0	0	0	0	1	0	0	0	1	0	0	2	7.65
S	0	0	0	0	0	2	1	1	1	1	0	0	6	7.17
SSW	0	0	0	1	0	1	2	0	0	0	0	0	4	5.53
SW	0	0	1	0	0	0	0	0	0	0	0	0	1	2.20
WSW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.30
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	2	0	0	0	0	0	0	0	0	2	3.25
NW	0	0	0	2	1	3	1	0	0	0	0	0	7	4.64
NNW	0	0	0	2	2	0	0	0	0	0	0	0	4	4.00
N	0	0	0	1	2	1	2	0	0	0	0	0	6	5.17
CALM													0	0.
TOTAL	0	0	1	12	8	8	8	1	1	3	0	0	42	5.24

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL *B* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	1	2	0	0	0	0	0	0	3	5.33
NE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.[illegible]
ENE	0	0	0	0	0	0	0	0	1	0	0	0	1	8.1[illegible]
E	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.
SE	0	0	0	0	0	0	1	0	0	0	0	1	2	9.1[illegible]
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	0	0	0	1	0	0	0	1	0	0	0	2	6.[illegible]
SSW	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.
WSW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.1[illegible]
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	1	0	0	0	0	0	1	6.[illegible]
NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NNW	0	0	1	1	0	0	0	0	0	0	0	0	2	1.[illegible]
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	1	1	3	3	2	0	2	0	0	1	13	6.[illegible]1

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL *C* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	1	0	0	0	0	2	1	1	0	5	8.25
NE	0	0	0	1	1	0	0	0	0	0	0	1	3	6.40
ENE	0	0	1	0	0	0	0	1	2	0	1	4	9	9.71
E	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.
SE	0	0	0	0	1	0	0	1	0	2	0	1	5	8.68
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	0	0	0	1	0	0	0	1	0	0	0	2	6.40
SSW	0	0	0	0	0	0	1	0	0	0	0	0	1	6.40
SW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.80
WSW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.50
W	0	0	0	0	1	0	0	0	0	0	0	0	1	4.50
WNW	0	0	1	2	0	0	0	0	0	0	0	0	3	3.57
NW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.40
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	1	1	0	0	0	0	1	1	0	0	4	5.93
CALM													0	0.
TOTAL	0	0	3	6	6	0	1	2	6	4	2	6	36	7.29

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL *D* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	1	5	3	1	3	1	9	8	1	1	2	[illegible]	6.87
NE	0	2	6	4	1	3	5	6	1	5	1	12	[illegible]	8.14
ENE	0	2	6	3	4	5	1	5	1	5	0	7	43	7.11
E	0	0	0	0	3	2	1	1	5	4	2	1	19	8.02
ESE	0	0	0	1	1	0	0	1	3	0	0	0	6	6.86
SE	0	1	0	0	0	2	2	3	2	0	1	5	16	9.44
SSE	0	0	0	0	0	0	2	1	1	3	0	3	10	12.15
S	0	0	1	0	0	1	2	3	2	0	0	4	13	9.[illegible]
SSW	0	0	0	0	2	7	2	4	1	2	0	2	20	7.36
SW	0	0	0	0	1	1	2	2	0	2	1	4	15	8.57
WSW	0	0	1	0	4	8	1	1	0	1	0	0	16	5.40
W	0	0	3	3	3	1	2	3	0	0	1	0	15	6.51
WNW	0	0	0	2	1	1	0	2	1	0	0	0	7	5.91
NW	0	0	2	2	0	1	0	1	0	0	0	0	6	6.30
NNW	0	0	1	1	1	0	0	1	0	0	0	0	4	4.50
N	0	0	3	0	1	1	2	2	0	0	0	0	11	5.00
CALM													1	.[illegible]
TOTAL	0	7	28	19	27	36	25	47	26	35	8	40	[illegible]	7.[illegible]

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 720

TABLE 2.3-94B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: SEPTEMBER, 1975

PASQUILL "E" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	2	3	1	2	0	3	7	1	0	0	0	19	5.43
NE	0	2	1	4	3	7	4	3	3	1	2	6	36	6.96
ENE	0	1	5	3	3	1	2	0	0	0	0	0	15	3.79
E	0	1	2	2	2	3	0	0	0	0	1	0	11	4.63
ESE	0	0	0	1	2	1	0	0	2	1	1	0	8	7.04
SE	0	0	2	1	1	2	8	1	1	4	2	0	22	6.93
SSE	0	1	1	2	6	1	3	0	6	1	0	0	21	5.98
S	1	0	0	5	5	2	1	2	0	0	0	1	17	5.08
SSW	0	2	4	1	2	1	3	3	2	1	0	0	19	5.26
SW	0	2	1	1	0	1	0	1	0	0	0	0	6	3.68
WSW	0	0	0	1	1	2	2	0	0	0	0	0	6	5.28
W	0	1	1	5	2	3	0	0	0	0	0	0	12	3.79
WNW	0	2	1	4	9	0	1	2	0	0	0	0	19	4.26
NW	1	1	5	0	2	4	0	1	0	0	0	0	14	3.62
NNW	0	0	3	1	1	0	1	0	0	0	0	0	6	4.00
N	1	1	2	3	0	0	0	0	0	0	0	0	7	2.66
CALM													4	.65
TOTAL	3	16	31	35	41	28	28	20	15	8	6	7	242	5.21

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	1	1	0	0	0	1	0	0	0	0	3	4.4[illegible]
NE	0	0	0	0	3	5	2	1	1	0	0	0	12	5.01
ENE	0	0	1	1	0	1	0	0	0	0	0	0	3	3.41
E	0	2	2	0	0	2	0	0	0	0	0	0	6	1.17
ESE	0	0	1	0	0	0	0	0	0	0	0	0	1	2.[illegible]
SE	0	1	1	1	2	1	0	1	0	1	0	0	6	4.62
SSE	0	1	0	2	0	1	0	0	0	0	0	0	4	[illegible]
S	0	0	2	1	2	0	0	1	0	0	0	0	6	4.17
SSW	0	0	1	0	0	0	0	0	0	0	0	0	1	2.[illegible]0
SW	1	1	3	1	0	0	0	0	0	0	0	0	6	2.33
WSW	0	0	2	1	0	0	0	0	0	0	0	0	3	2.[illegible]
W	0	1	1	1	0	0	0	0	0	0	0	0	1	2.57
WNW	1	1	0	0	1	1	0	0	0	0	0	0	4	1.10
NW	0	1	0	0	2	0	0	0	0	0	0	0	3	1.77
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													1	.[illegible]0
TOTAL	2	6	15	9	10	11	2	4	1	1	0	0	64	1.[illegible]

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "G" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	1	1	0	0	0	0	0	0	0	2	3.05
ENE	0	1	0	1	0	0	0	0	0	0	0	0	2	2.60
E	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.
SE	0	1	0	0	0	0	0	0	0	0	0	0	1	1.10
SSE	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	0	0	0.
SSW	0	0	1	0	0	0	0	0	0	0	0	0	1	2.30
SW	0	2	0	0	0	0	0	0	0	0	0	0	2	1.60
WSW	0	1	1	1	0	0	0	0	0	0	0	0	3	2.23
W	0	3	1	0	0	0	0	0	0	0	0	0	4	2.10
WNW	0	0	0	1	0	0	0	0	0	0	0	0	1	1.70
NW	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	0	0	0.
N	1	0	0	0	0	0	0	0	0	0	0	0	1	.90
CALM													7	.60
TOTAL	1	8	3	4	1	0	0	0	0	0	0	0	24	1.13

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	3	9	7	4	5	5	17	11	5	2	2	70	6.13
NE	0	4	7	11	9	16	12	10	7	6	5	19	106	7.[illegible]
ENE	0	4	13	9	7	7	5	6	7	6	2	11	77	6.60
E	0	3	4	2	5	7	1	1	5	4	4	1	37	6.11
ESE	0	0	1	2	4	1	0	3	5	1	1	0	18	6.[illegible]
SE	0	3	3	2	6	5	11	6	3	7	3	7	56	7.41
SSE	0	2	1	4	6	3	5	1	7	5	0	3	37	7.48
S	1	0	3	6	9	5	4	7	5	1	0	5	47	6.[illegible]
SSW	0	2	6	2	4	9	8	8	3	1	0	2	47	6.11
SW	1	5	5	2	4	2	2	3	0	2	1	4	41	5.76
WSW	0	1	4	4	7	10	3	1	0	1	0	0	41	4.11
W	0	5	6	9	6	4	2	3	0	0	0	0	35	3.[illegible]
WNW	1	1	2	11	11	2	2	4	1	0	0	0	37	4.[illegible]
NW	1	2	7	6	5	8	1	2	0	0	0	0	31	4.11
NNW	0	[illegible]	5	5	4	0	1	1	0	0	0	0	16	4.[illegible]
N	2	1	6	6	5	2	4	2	1	1	0	0	[illegible]	[illegible].41
CALM													11	.[illegible]
TOTAL	6	38	82	86	9[illegible]	86	[illegible]	75	55	42	18	54	71[illegible]	6.[illegible]

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 720

TABLE 2.3-95A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: OCTOBER, 1975

PASQUILL "A" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	1	0	0	1	0	0	0	0	0	2	4	11.60
NE	0	0	0	0	0	0	0	0	1	0	0	0	1	8.70
ENE	0	0	0	0	0	0	1	1	0	0	0	0	2	7.00
E	0	0	0	0	0	0	0	1	0	0	0	0	1	7.60
ESE	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.
SSE	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	0	0	0.
SSW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.50
SW	0	0	0	1	0	0	0	0	0	0	0	0	1	[illegible]
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	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.
NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NNW	0	0	1	0	0	0	0	0	0	0	0	0	1	2.30
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	2	2	0	1	1	2	1	0	0	2	11	7.61

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "B" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	1	0	0	0	0	0	2	3	[illegible]
NE	0	0	0	0	0	0	0	0	0	1	0	0	1	[illegible]
ENE	0	0	0	0	0	0	1	1	1	0	0	0	3	[illegible]
E	0	0	0	0	0	0	0	1	0	0	0	0	1	[illegible]
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	1	0	0	0	0	0	0	0	1	[illegible]
SSE	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	0	0	0.
SSW	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.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	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.
NW	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	0	0	0.
N	0	0	0	0	0	1	0	0	0	0	0	0	1	[illegible]
CALM													0	0.
TOTAL	0	0	0	0	1	2	1	2	1	1	0	2	10	[illegible]

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "C" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	1	1	1	0	0	1	4	9.52
NE	0	0	0	0	2	2	0	0	1	1	1	0	7	6.91
ENE	0	0	0	0	0	0	4	1	0	2	0	0	7	[illegible]
E	0	0	0	1	0	0	1	0	0	0	0	0	2	[illegible]
ESE	0	0	0	0	0	1	1	0	0	0	0	0	2	6.10
SE	0	0	0	0	1	0	0	0	0	0	0	0	1	[illegible]
SSE	0	0	0	0	0	0	0	0	0	0	1	0	1	[illegible]
S	0	0	0	1	1	0	0	1	0	0	0	0	3	5.10
SSW	0	0	1	0	0	2	1	0	0	0	0	0	4	[illegible]
SW	0	0	1	0	0	1	1	0	1	0	0	0	4	[illegible]
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	1	0	0	0	0	0	0	0	0	1	[illegible]
NW	0	0	0	0	0	1	0	1	0	0	1	0	3	[illegible]
NNW	0	0	0	1	1	1	1	0	1	0	0	1	6	[illegible]
N	0	0	0	1	0	0	0	0	0	0	0	0	1	[illegible]
CALM													0	0.
TOTAL	0	0	2	5	5	8	10	4	4	[illegible]	[illegible]	2	46	[illegible]

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "D" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	1	1	0	0	6	[illegible]	1	1	1	4	20	[illegible]
NE	0	0	1	0	2	2	0	[illegible]	1	4	0	[illegible]	[illegible]	[illegible]
ENE	0	0	0	0	2	6	1	2	[illegible]	0	1	1	[illegible]	7.44
E	0	0	0	1	[illegible]	5	3	0	0	0	0	0	[illegible]	[illegible]
ESE	0	0	0	1	[illegible]	2	0	0	0	0	0	0	12	[illegible]
SE	0	0	0	1	0	0	1	0	0	0	1	0	7	[illegible]
SSE	0	0	0	0	0	1	1	1	0	0	1	1	4	[illegible]
S	0	0	1	0	0	0	0	0	0	[illegible]	1	2	[illegible]	[illegible]
SSW	0	0	0	2	2	[illegible]	1	1	0	0	0	2	[illegible]	[illegible]
SW	0	0	0	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	1	[illegible]	0	[illegible]	[illegible]
WSW	0	1	0	1	[illegible]	1	1	[illegible]	1	2	[illegible]	0	[illegible]	[illegible]
W	0	0	0	[illegible]	2	1	2	[illegible]	1	1	0	0	[illegible]	[illegible]
WNW	0	0	1	1	[illegible]	[illegible]	1	1	0	0	0	0	11	[illegible]
NW	0	1	0	[illegible]	1	[illegible]	[illegible]	[illegible]	1	1	0	0	7	[illegible]
NNW	0	0	1	1	1	1	[illegible]	2	2	1	[illegible]	1	[illegible]	[illegible]
N	0	0	1	1	[illegible]	1	1	0	0	[illegible]	0	1	7	[illegible]
CALM													[illegible]	[illegible]
TOTAL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

AMENDMENT 97-01
AUGUST 1997

TABLE 2.3-95B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: OCTOBER, 1975

PASQUILL "E" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	1	3	0	2	3	0	4	1	2	4	20	7.47
NE	0	1	2	6	4	8	5	3	4	3	0	0	36	5.02
ENE	0	1	0	1	1	1	2	0	0	0	0	0	6	4.77
E	0	0	1	2	2	0	2	0	0	0	0	0	7	4.40
ESE	0	0	0	0	4	1	3	0	2	1	0	0	11	6.47
SE	0	0	0	0	1	2	1	3	1	0	0	4	12	9.33
SSE	0	0	1	0	1	1	0	0	0	0	0	3	6	12.23
S	0	0	1	2	0	1	1	0	1	0	0	2	8	9.15
SSW	0	0	1	2	2	2	4	2	3	0	0	0	16	6.16
SW	0	0	1	3	1	0	3	3	1	1	0	1	14	6.27
WSW	0	1	2	0	1	1	5	6	1	0	1	0	19	6.65
W	0	1	2	1	2	1	4	1	0	0	0	0	12	4.51
WNW	0	0	1	1	1	2	0	0	0	0	0	0	5	4.34
NW	0	1	3	2	2	1	1	0	0	0	0	0	10	3.75
NNW	0	1	5	2	1	2	0	0	0	0	0	0	11	3.54
N	0	0	1	5	1	1	1	1	0	0	0	0	12	4.52
CALM													0	0.
TOTAL	0	6	22	30	24	26	35	21	17	6	3	16	209	6.24

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	1	1	2	2	3	1	0	0	0	0	0	10	4.45
NE	0	0	3	1	5	2	4	2	2	2	0	0	21	5.73
ENE	0	0	2	2	4	1	1	0	0	0	0	0	10	4.12
E	0	0	2	0	0	1	1	0	0	0	0	0	4	4.53
ESE	0	1	2	0	1	2	2	0	0	0	0	0	8	4.17
SE	0	0	1	0	0	2	4	5	1	0	0	0	13	6.44
SSE	0	1	0	1	1	2	0	1	0	0	0	0	6	4.17
S	0	0	0	0	1	4	2	0	0	0	0	0	7	5.61
SSW	0	0	3	1	0	4	2	0	0	0	0	0	10	4.64
SW	0	0	0	0	3	1	1	0	0	0	0	0	5	5.30
WSW	0	1	1	0	0	2	0	0	0	0	0	0	4	3.42
W	0	1	0	0	0	1	0	0	0	0	0	0	2	3.7[illegible]
WNW	0	2	1	2	0	0	0	0	0	0	0	0	5	2.53
NW	0	1	5	0	0	1	0	0	0	0	0	0	7	2.[illegible]
NNW	0	1	1	0	0	0	0	0	0	0	0	0	2	2.0[illegible]
N	0	2	2	1	1	2	0	1	0	0	0	0	8	4.[illegible]
CALM													0	0.
TOTAL	0	11	26	10	17	28	18	9	3	2	0	0	122	4.73

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "G" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	2	8	1	0	0	0	0	0	0	0	0	11	2.36
NE	0	3	1	1	0	0	0	0	0	0	0	0	5	2.28
ENE	0	0	1	1	1	0	0	0	0	0	0	0	3	3.57
E	0	0	0	0	1	1	0	0	0	0	0	0	2	4.66
ESE	0	1	0	0	1	0	0	0	0	0	0	0	2	2.60
SE	0	2	1	0	1	0	1	0	0	0	0	0	5	3.50
SSE	0	4	2	0	0	0	0	1	0	0	0	0	7	2.83
S	0	1	3	0	0	1	0	0	0	0	0	0	5	3.16
SSW	0	5	3	2	2	1	1	0	0	0	0	0	14	3.00
SW	0	5	4	1	1	0	0	0	0	0	0	0	11	2.35
WSW	0	2	1	0	0	0	0	0	0	0	0	0	3	2.10
W	1	3	2	0	0	0	0	0	0	0	0	0	6	1.41
WNW	0	7	3	1	0	0	0	0	0	0	0	0	11	2.13
NW	0	9	8	2	1	0	0	0	0	0	0	0	20	2.27
NNW	1	4	4	1	0	0	0	0	0	0	0	0	10	2.17
N	1	4	3	1	0	0	0	0	0	0	0	0	9	1.97
CALM													0	0.
TOTAL	3	52	44	11	4	3	2	1	0	0	0	0	124	2.43

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "ALL" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	3	12	7	2	7	11	6	5	2	3	13	72	7.46
NE	0	4	7	8	14	16	9	10	11	11	1	9	97	6.[illegible]
ENE	0	1	3	4	4	8	10	5	5	2	0	3	50	7.27
E	0	0	3	4	5	7	7	2	0	0	0	0	29	5.[illegible]
ESE	0	2	2	1	10	6	6	0	2	1	0	0	30	5.26
SE	0	2	2	1	4	4	7	8	2	0	1	5	36	7.2[illegible]
SSE	0	5	3	1	2	4	1	4	0	2	2	5	28	7.14
S	0	1	5	3	2	6	4	1	1	0	0	4	26	6.06
SSW	1	4	8	8	6	12	9	3	3	0	0	0	54	4.77
SW	0	4	6	8	7	7	9	8	8	2	6	1	67	[illegible]
WSW	0	6	4	1	4	4	4	10	2	2	4	0	44	6.1[illegible]
W	1	5	4	1	4	1	6	1	1	1	0	0	31	5.17
WNW	0	5	6	6	1	5	1	1	0	0	0	0	29	4.72
NW	0	12	16	7	4	11	4	6	1	1	2	0	66	3.44
NNW	1	6	12	5	[illegible]	6	5	2	3	1	0	2	48	4.[illegible]
N	1	6	7	0	[illegible]	1	2	2	0	0	0	1	18	4.[illegible]
CALM													0	0.
TOTAL	4	71	100	77	83	124	96	70	47	26	19	63	743	[illegible]

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-96A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: NOVEMBER, 1975

PASQUILL "A" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	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.
SE	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.
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	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.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	1	0	0	0	0	0	0	0	0	0	0	1	1.80
NW	0	0	1	0	0	0	0	0	0	0	0	0	1	2.10
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	1	1	0	0	0	0	0	0	0	0	0	2	1.65

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "B" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	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.
SE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.[illegible]
SSE	0	0	1	0	0	0	0	0	0	0	0	0	1	2.[illegible]
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SW	0	0	1	0	0	0	0	0	0	0	0	0	1	3.[illegible]
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	1	0	0	0	0	0	0	0	0	1	4.00
WNW	0	0	1	0	0	0	0	0	0	0	0	0	1	2.[illegible]
NW	0	0	0	2	0	0	0	0	0	0	0	0	2	3.65
NNW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.30
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	3	4	0	1	0	0	0	0	0	0	[illegible]	3.[illegible]

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "C" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	0	1	0	1	0	0	0	0	2	6.65
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	0	1	1	1	1	0	0	4	8.05
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSE	0	0	0	0	1	1	1	1	0	0	0	0	4	6.10
S	0	0	2	0	0	0	0	0	0	0	1	0	3	5.27
SSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SW	0	0	0	1	1	0	0	0	0	0	0	0	2	4.20
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	3	0	0	0	0	0	0	0	0	3	3.23
WNW	0	0	2	0	0	0	0	0	0	0	0	0	2	2.71
NW	0	0	1	0	2	0	0	0	0	0	0	1	4	7.62
NNW	0	0	1	1	0	0	0	0	0	0	0	0	2	3.15
N	0	1	0	0	1	0	0	0	0	1	0	0	3	5.20
CALM													0	0.
TOTAL	0	1	6	5	5	2	2	3	1	2	1	1	29	5.[illegible]

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "D" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	1	0	0	0	3	1	0	0	0	0	0	5	4.54
NE	0	0	0	1	0	1	4	1	0	0	0	0	7	5.99
ENE	0	0	0	0	0	3	2	5	1	0	0	0	11	6.88
E	0	0	0	2	0	1	0	1	2	1	0	0	7	6.59
ESE	0	0	0	1	1	1	0	1	0	0	0	0	4	5.27
SE	0	0	0	2	0	1	2	1	1	3	0	2	12	7.87
SSE	0	0	1	1	2	0	1	1	5	0	3	0	14	7.43
S	0	0	2	0	1	1	1	3	2	2	2	5	19	9.54
SSW	0	0	2	0	0	1	0	1	4	2	0	2	12	8.02
SW	0	0	0	2	1	3	0	0	1	2	0	0	9	6.11
WSW	0	1	1	2	11	4	3	0	0	1	2	7	32	7.29
W	0	0	1	4	3	5	2	6	3	0	0	2	26	6.40
WNW	0	0	4	2	0	0	2	3	1	3	0	0	15	6.00
NW	0	0	3	1	2	5	1	1	0	1	0	15	29	9.59
NNW	0	2	2	6	3	8	2	3	3	1	0	2	32	5.71
N	0	0	0	2	2	2	0	1	0	0	0	0	7	4.43
CALM													0	0.
TOTAL	0	4	16	26	26	39	21	28	21	16	7	15	241	7.[illegible]

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

TABLE 2.3-96B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: NOVEMBER, 1975

PASQUILL "E" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	3	0	0	2	0	0	0	0	0	0	5	3.60
NE	0	1	3	2	3	1	1	0	0	0	0	0	11	3.60
ENE	0	0	0	2	3	4	1	0	0	0	0	0	10	5.65
E	0	1	3	0	0	1	0	0	0	0	0	0	5	2.60
ESE	0	0	0	0	3	0	2	0	0	1	0	0	6	6.12
SE	0	0	0	1	4	3	1	3	1	4	2	3	22	7.81
SSE	0	0	1	0	3	2	3	4	2	1	2	4	22	8.16
S	0	0	0	1	2	1	3	2	0	3	0	4	16	8.74
SSW	0	0	2	0	2	4	1	2	1	2	1	2	17	6.64
SW	0	1	2	3	6	0	0	1	0	0	0	0	13	4.04
WSW	0	1	1	2	2	2	1	0	0	0	0	0	9	4.41
W	0	1	1	4	4	1	1	0	0	1	0	1	14	5.02
WNW	0	1	1	0	0	1	0	2	0	0	1	0	6	5.97
NW	0	1	3	0	2	0	0	0	0	1	0	0	7	3.99
NNW	0	3	1	3	1	2	1	1	0	0	0	0	12	3.47
N	0	1	0	1	1	0	0	0	0	0	0	0	3	3.20
CALM													0	0.
TOTAL	0	11	21	19	36	24	15	15	4	11	6	14	178	5.92

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	1	3	2	0	0	0	0	0	0	0	0	6	2.71
NE	0	1	0	4	0	1	1	0	0	0	0	0	7	5.01
ENE	0	1	3	2	0	1	2	0	0	0	0	0	9	3.19
E	0	1	1	0	0	1	1	0	0	0	0	0	4	4.07
ESE	0	0	1	0	4	3	1	0	1	0	0	0	10	5.33
SE	0	0	1	1	2	3	5	1	1	0	0	1	15	6.21
SSE	0	0	2	0	1	1	0	0	2	1	1	0	10	7.05
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	0	0	1	0	2	1	0	0	0	0	0	0	4	4.20
SW	0	0	2	0	2	3	1	0	0	0	0	0	8	4.91
WSW	0	4	2	0	0	1	0	0	0	0	0	0	7	2.41
W	0	1	2	0	0	0	0	0	0	0	0	0	3	2.51
WNW	0	4	0	0	0	0	0	0	0	0	0	0	4	1.57
NW	0	2	2	1	0	0	0	0	0	0	0	0	5	2.16
NNW	0	2	0	0	0	0	0	0	0	0	0	0	2	1.50
N	0	1	3	0	0	0	0	0	0	0	0	0	4	2.10
CALM													0	0.
TOTAL	0	18	23	10	11	15	11	1	4	1	1	1	96	4.[illegible]

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "G" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	4	3	0	0	0	0	0	0	0	0	0	7	2.04
NE	0	1	4	1	1	0	0	0	0	0	0	0	7	2.80
ENE	0	2	1	2	1	0	0	0	0	0	0	0	6	2.72
E	0	3	0	1	0	1	0	0	0	0	0	0	5	2.76
ESE	0	1	2	0	0	0	0	0	0	0	0	0	3	2.17
SE	0	1	3	1	1	0	1	0	0	0	0	0	7	1.56
SSE	0	0	0	1	0	1	0	0	0	0	0	0	2	4.70
S	0	1	1	0	1	0	0	0	0	0	0	0	3	2.90
SSW	0	3	4	1	1	0	0	0	0	0	0	0	9	2.52
SW	0	2	4	1	4	0	0	0	0	0	0	0	11	3.18
WSW	0	5	5	1	0	1	0	0	0	0	0	0	12	2.37
W	0	3	7	0	0	0	0	0	0	0	0	0	10	2.16
WNW	0	13	10	3	0	0	0	0	0	0	0	0	26	2.14
NW	2	14	7	1	0	0	0	0	0	0	0	0	24	1.81
NNW	0	13	2	0	0	0	0	0	0	0	0	0	15	1.55
N	1	12	4	0	0	0	0	0	0	0	0	0	17	1.73
CALM													0	0.
TOTAL	3	76	57	13	9	3	1	0	0	0	0	0	164	2.2[illegible]

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	7	9	2	0	6	1	1	0	0	0	0	25	4.51
NE	0	3	7	8	4	3	6	1	0	0	0	0	32	4.11
ENE	0	1	4	6	4	8	5	5	1	0	0	0	37	4.91
E	0	5	4	3	0	4	1	1	2	1	0	0	21	4.29
ESE	0	1	3	1	8	4	4	2	2	2	0	0	27	5.57
SE	0	1	4	5	7	8	9	5	3	7	2	6	57	6.85
SSE	0	0	5	2	7	5	5	6	9	4	6	4	53	7.37
S	0	1	5	1	4	2	4	5	2	5	3	9	41	7.00
SSW	0	1	9	1	5	6	1	3	5	4	1	4	42	7.06
SW	0	1	9	7	14	6	1	1	1	2	0	0	44	4.10
WSW	0	11	9	5	13	8	4	0	0	1	2	7	60	[illegible]
W	0	5	11	12	7	6	1	1	3	1	0	3	57	4.06
WNW	0	15	10	5	0	1	2	4	1	1	1	0	55	1.7[illegible]
NW	2	17	17	5	6	5	1	1	0	2	0	16	72	5.51
NNW	0	20	6	11	4	10	1	4	1	1	0	2	64	4.15
N	1	15	7	1	4	2	0	1	0	1	0	0	56	2.[illegible]
CALM													0	0.
TOTAL	3	111	127	77	87	84	50	47	32	34	15	51	720	[illegible]

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

TABLE 2.3-97A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: DECEMBER, 1975

PASQUILL "A" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
			UPPER CLASS INTERVALS OF WIND SPEED (MPH)											
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0.	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	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.
SE	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.
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	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.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	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.
NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NNW	0	0	1	0	0	0	0	0	0	0	0	0	1	2.20
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	1	0	0	0	0	0	0	0	0	0	1	2.20

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "B" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
			UPPER CLASS INTERVALS OF WIND SPEED (MPH)											
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	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.
SE	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.
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	0	1	0	1	0	0	0	0	0	0	0	0	2	2.[illegible]
SW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.[illegible]
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	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.
NW	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	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	1	0	1	1	0	0	0	0	0	0	0	[illegible]	[illegible]

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "C" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
			UPPER CLASS INTERVALS OF WIND SPEED (MPH)											
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.[illegible]
E	0	0	0	0	1	0	0	0	0	0	0	0	1	5.00
ESE	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.
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	0	0	0	1	0	0	0	0	0	0	0	1	4.80
SSW	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.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	1	2	1	0	0	0	0	0	0	0	0	4	2.[illegible]
NW	0	0	0	0	0	0	0	0	1	0	0	0	1	8.[illegible]
NNW	0	0	0	0	0	0	0	0	0	1	0	4	5	12.[illegible]
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	1	2	1	2	1	0	0	1	1	0	4	13	7.60

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "D" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
			UPPER CLASS INTERVALS OF WIND SPEED (MPH)											
NNE	0	0	1	4	5	7	4	5	0	0	0	2	28	6.[illegible]
NE	0	0	1	5	4	11	11	1	0	1	0	1	42	5.[illegible]
ENE	0	0	1	1	2	3	2	4	0	0	0	0	13	5.[illegible]
E	0	0	1	0	2	0	3	1	0	0	0	0	7	5.[illegible]
ESE	0	0	1	0	0	2	0	0	1	0	0	0	4	5.[illegible]
SE	0	0	0	1	0	1	1	1	1	0	0	0	5	6.[illegible]
SSE	0	0	0	0	1	0	0	0	0	0	0	2	3	10.[illegible]
S	0	0	2	2	0	1	0	0	0	0	0	0	[illegible]	[illegible]
SSW	0	0	2	1	0	4	4	1	0	1	0	0	13	5.[illegible]
SW	0	0	0	1	1	0	1	[illegible]	1	2	2	10	[illegible]	10.[illegible]
WSW	0	0	1	1	1	1	2	2	2	0	0	14	[illegible]	10.11
W	0	1	[illegible]	2	[illegible]	2	2	1	0	0	0	0	14	4.[illegible]
WNW	0	2	0	5	6	4	1	1	1	0	0	0	20	4.[illegible]
NW	0	0	4	4	3	5	5	3	2	3	4	2	[illegible]	6.[illegible]
NNW	0	0	4	5	3	4	1	2	1	2	2	2	[illegible]	6.[illegible]
N	0	0	0	0	1	1	1	0	0	1	0	4	10	[illegible]
CALM													0	0.
TOTAL	0	[illegible]	21	[illegible]	[illegible]	46	40	27	11	10	8	[illegible]	[illegible]	[illegible]

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-97B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: DECEMBER, 1975

PASQUILL "E" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	3	1	2	6	2	1	0	0	0	0	0	15	3.88
NE	0	1	2	1	3	2	1	1	0	0	0	0	11	4.47
ENE	0	0	0	1	6	7	4	0	0	0	0	0	18	5.32
E	0	0	0	0	3	3	2	0	0	1	0	0	9	5.98
ESE	0	0	0	2	2	3	1	0	0	0	0	0	8	4.95
SE	0	0	0	0	0	1	2	0	0	0	0	0	3	6.23
SSE	0	0	1	0	2	3	0	0	0	1	2	2	11	7.55
S	0	0	1	5	3	1	2	3	3	3	1	4	26	7.34
SSW	0	0	1	4	3	3	4	2	0	4	4	2	27	7.20
SW	0	2	3	6	3	7	0	4	2	1	0	5	33	6.49
WSW	0	2	4	3	7	3	0	0	0	0	0	0	19	4.01
W	2	2	3	4	1	1	1	0	1	0	0	0	15	3.61
WNW	0	0	4	2	2	1	0	0	0	0	0	0	9	3.57
NW	0	7	3	5	5	0	2	0	0	0	1	0	23	3.59
NNW	0	0	3	2	2	0	1	2	0	0	2	0	12	5.57
N	0	2	2	0	5	0	0	0	0	0	1	0	10	3.93
CALM													0	0.
TOTAL	2	19	28	37	53	37	21	12	6	10	11	13	249	5.42

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	1	2	0	0	0	0	0	0	0	0	3	3.07
NE	0	1	0	0	1	2	0	0	0	0	0	0	4	4.35
ENE	0	0	0	0	1	1	0	0	0	0	0	0	2	5.15
E	0	0	1	1	0	1	0	0	0	0	0	0	3	4.07
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	0	0	2	3	0	0	1	0	6	7.50
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	0	2	5	2	1	0	0	1	0	0	0	11	4.15
SSW	0	0	1	0	0	1	0	2	1	0	0	0	5	6.10
SW	0	0	1	0	1	1	0	0	0	0	0	0	3	3.97
WSW	0	1	0	0	1	0	0	0	0	0	0	0	2	3.20
W	0	1	1	0	0	1	0	0	0	0	0	0	3	3.23
WNW	0	0	0	2	0	0	0	0	0	0	0	0	2	3.65
NW	0	2	0	4	0	0	0	0	0	0	0	0	6	3.07
NNW	0	1	2	0	0	0	0	0	0	0	0	0	3	2.47
N	0	0	1	1	0	0	0	0	0	0	0	0	2	2.60
CALM													0	0.
TOTAL	0	6	10	15	6	8	2	5	2	3	1	0	55	4.33

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "G" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	6	5	0	2	0	0	0	0	0	0	0	13	2.31
NE	0	6	6	4	0	2	0	0	0	0	0	0	18	2.49
ENE	0	2	0	1	0	0	0	0	0	0	0	0	3	2.00
E	0	2	1	2	0	0	0	0	0	0	0	0	5	2.42
ESE	0	0	4	2	2	0	0	0	0	0	0	0	8	3.25
SE	0	3	1	1	1	3	0	0	0	0	0	0	9	3.44
SSE	0	0	1	2	1	3	1	0	0	0	0	0	8	4.84
S	0	2	3	1	0	2	0	0	0	0	0	0	8	3.10
SSW	1	2	3	4	2	0	0	0	0	0	0	0	12	3.04
SW	1	1	0	6	2	1	0	0	0	0	0	0	11	3.52
WSW	0	5	2	3	0	0	0	0	0	0	0	0	10	2.47
W	1	5	4	1	1	0	0	0	0	0	0	0	12	2.30
WNW	0	2	1	0	0	0	0	0	0	0	0	0	3	1.73
NW	2	7	2	0	0	0	0	0	0	0	0	0	11	1.49
NNW	0	3	1	1	0	0	0	0	0	0	0	0	5	2.22
N	0	8	1	0	0	0	0	0	0	0	0	0	9	1.61
CALM													0	0.
TOTAL	5	54	35	28	11	11	1	0	0	0	0	0	145	2.72

NUMBER OF INVALID OBSERVATIONS = 0
TOT/ MBER OF OBSERVATIONS = 744

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	9	8	8	11	9	5	5	0	0	0	2	57	4.54
NE	0	8	9	10	11	17	12	2	0	1	0	3	75	4.80
ENE	0	2	1	3	9	12	6	4	0	0	0	0	37	5.28
E	0	2	3	3	6	4	5	1	0	1	0	0	25	4.69
ESE	0	0	5	4	4	5	1	0	1	0	0	0	20	4.14
SE	0	3	1	2	1	5	5	4	1	0	1	0	23	5.41
SSE	0	0	2	2	4	6	1	0	0	1	2	4	22	6.92
S	0	2	8	13	6	5	2	3	4	3	1	4	51	5.56
SSW	1	1	7	10	5	8	8	5	1	5	4	2	59	5.12
SW	1	1	4	11	8	9	1	9	5	3	2	15	73	7.21
WSW	0	8	9	7	11	4	2	2	2	0	0	14	59	6.43
W	1	9	11	7	5	4	3	1	1	0	0	0	44	3.69
WNW	0	6	7	10	8	5	1	1	1	0	0	0	38	3.69
NW	2	16	9	13	8	5	7	3	3	3	5	2	76	4.75
NNW	0	4	11	8	5	4	2	4	1	1	4	6	52	5.57
N	0	10	4	1	6	1	3	0	0	1	1	4	31	4.73
CALM													0	0.
TOTAL	7	64	99	114	112	103	66	44	20	21	20	56	744	5.16

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-98A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: ANNUAL, 1975

PASQUILL "A" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	2	2	4	2	3	1	0	6	3	6	29	8.39
NE	0	0	0	1	2	3	6	2	4	0	1	8	27	8.64
ENE	0	0	0	4	3	7	5	1	0	1	0	0	21	5.55
E	0	0	1	1	1	5	5	1	0	0	1	1	16	6.17
ESE	0	0	0	1	3	1	3	2	1	1	0	0	12	6.35
SE	0	1	2	1	5	3	1	1	2	0	0	1	17	5.82
SSE	0	0	0	2	2	2	0	1	0	1	1	0	9	6.20
S	0	0	1	2	4	4	2	4	4	1	2	3	27	7.17
SSW	0	0	0	4	4	4	4	2	3	3	0	2	26	6.65
SW	0	0	1	4	9	5	4	1	2	1	0	0	27	5.60
WSW	0	0	2	2	5	8	4	1	0	0	0	0	22	5.13
W	0	0	4	0	3	1	2	0	0	0	0	0	10	4.41
WNW	0	1	0	4	1	4	0	1	0	0	0	0	11	4.48
NW	0	1	4	5	7	3	2	0	1	0	0	0	23	4.38
NNW	0	1	5	5	4	1	1	1	0	0	1	0	19	4.13
N	0	0	0	1	5	5	3	1	0	1	1	0	17	5.95
CALM													1	.60
TOTAL	0	4	22	39	62	58	45	20	17	15	10	21	314	6.13

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 8760

PASQUILL "B" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	3	5	1	0	1	0	0	2	12	7.99
NE	0	0	0	0	1	1	0	2	0	5	1	4	14	9.96
ENE	0	0	0	3	4	4	4	2	3	1	0	0	21	6.04
E	0	0	0	0	2	0	2	2	0	1	2	0	9	7.72
ESE	0	0	0	2	1	0	2	2	0	0	0	0	7	5.80
SE	0	0	0	0	3	2	1	2	0	0	0	2	10	6.87
SSE	0	0	1	0	0	0	1	1	0	0	1	0	4	6.50
S	0	0	0	1	3	1	0	1	1	0	2	2	11	7.94
SSW	0	1	1	3	0	1	0	1	2	0	2	2	13	6.91
SW	0	0	1	0	3	6	5	1	3	2	1	1	23	6.87
WSW	0	0	1	3	3	1	1	0	0	0	0	0	9	4.60
W	0	0	0	1	2	1	0	0	0	1	0	0	5	5.60
WNW	0	0	1	0	1	1	1	0	0	0	0	0	4	4.75
NW	0	0	1	5	1	2	1	1	1	1	0	5	18	8.08
NNW	0	0	2	3	1	0	0	0	1	2	0	1	10	6.12
N	0	0	0	0	0	1	1	0	0	0	0	0	2	6.00
CALM													0	0.
TOTAL	0	1	8	21	28	26	20	15	12	13	9	19	172	7.03

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 8760

PASQUILL "C" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	2	2	3	1	3	3	1	1	1	17	7.34
NE	0	0	2	2	7	4	3	3	3	4	1	2	31	6.55
ENE	0	0	1	0	3	3	12	6	7	6	5	6	49	8.29
E	0	0	0	2	2	1	3	2	6	4	3	3	26	8.14
ESE	0	0	0	0	3	3	3	1	3	2	1	0	16	7.11
SE	0	0	1	2	4	2	0	3	1	2	1	2	18	6.85
SSE	0	0	1	0	4	4	3	1	0	0	1	2	16	6.66
S	0	0	3	1	7	2	4	4	2	0	2	3	28	6.71
SSW	0	0	2	2	3	7	7	4	5	5	0	1	38	7.31
SW	0	0	2	3	7	10	11	5	5	4	0	1	48	6.31
WSW	0	0	1	3	7	10	9	3	2	2	0	2	39	6.29
W	0	0	1	4	5	5	3	1	0	0	0	0	19	4.87
WNW	0	1	6	7	9	1	1	1	1	0	1	3	31	5.48
NW	0	0	1	3	9	3	3	5	5	2	3	15	49	9.17
NNW	0	0	1	5	5	1	2	1	3	1	2	9	30	8.79
N	0	1	1	3	2	0	1	2	1	1	1	2	17	7.44
CALM													0	0.
TOTAL	0	2	23	39	79	59	66	47	47	36	22	54	476	7.21

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 8760

PASQUILL "D" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	4	19	14	12	21	20	27	13	6	4	16	156	6.76
NE	2	5	24	23	26	33	36	35	16	25	14	28	267	8.56
ENE	0	5	15	13	28	39	34	38	30	16	7	13	238	8.76
E	0	0	6	11	23	23	15	17	21	12	5	4	137	8.66
ESE	0	0	3	13	16	9	10	14	10	4	6	5	90	6.63
SE	0	1	2	14	6	14	11	11	9	8	7	22	107	8.01
SSE	0	0	1	10	8	11	14	13	16	8	16	27	124	8.76
S	0	2	11	8	8	14	15	26	13	16	6	33	152	8.30
SSW	0	1	6	12	25	29	29	28	14	20	11	52	228	8.32
SW	0	1	5	18	31	28	32	32	46	22	27	57	301	8.33
WSW	0	1	13	15	42	32	43	30	29	17	20	83	327	8.46
W	1	2	12	27	23	35	26	32	22	15	15	68	278	8.58
WNW	0	4	11	19	17	23	17	19	12	13	4	14	153	6.60
NW	0	5	16	30	21	32	20	20	10	11	11	37	215	7.26
NNW	0	2	19	21	16	26	16	13	11	11	5	22	162	6.82
N	0	4	5	6	21	16	18	15	8	5	2	9	109	6.53
CALM													6	.60
TOTAL	1	41	170	256	326	385	358	370	280	211	160	490	3050	7.71

NUMBER OF INVALID OBSERVATIONS = 9
TOTAL NUMBER OF OBSERVATIONS = 8760

TABLE 2.3-98B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
10.5 METER LEVEL: ANNUAL, 1975

PASQUILL *E* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	13	29	23	18	16	13	15	8	2	2	4	143	4.91
NE	0	9	21	35	31	33	29	16	14	4	2	7	201	5.43
ENE	0	5	19	19	26	26	20	6	2	4	1	3	131	5.07
E	0	3	17	24	21	24	21	4	2	1	2	1	120	4.91
ESE	1	1	3	19	19	19	18	7	7	6	1	3	104	5.88
SE	0	2	7	14	19	24	29	18	8	15	6	12	154	6.82
SSE	0	2	9	12	32	34	37	26	14	15	12	39	232	7.81
S	2	6	20	33	47	35	38	25	18	24	15	39	302	6.97
SSW	1	9	22	27	55	33	38	24	16	24	11	27	287	6.52
SW	0	12	27	40	38	32	26	28	24	19	8	22	276	6.25
WSW	1	7	15	20	29	27	21	21	8	6	10	7	172	6.00
W	3	8	13	24	23	22	20	17	5	5	4	7	151	5.66
WNW	4	6	13	17	19	16	6	8	2	4	1	1	97	4.74
NW	1	16	23	21	20	14	8	9	3	5	5	12	137	5.49
NNW	1	9	23	17	15	18	7	9	1	4	8	11	123	5.69
N	4	12	14	27	17	12	8	4	4	3	1	2	108	4.39
CALM													26	.63
TOTAL	18	120	275	372	429	385	339	237	136	141	89	197	2764	5.97

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 8760

PASQUILL *F* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	1	9	15	10	9	6	2	1	0	0	0	0	53	3.45
NE	0	11	13	17	21	14	9	3	3	2	0	1	94	4.45
ENE	1	9	12	20	14	11	9	3	4	3	2	0	88	4.62
E	1	7	12	5	8	12	9	4	0	0	0	0	58	4.40
ESE	3	6	7	7	10	14	12	10	2	2	0	0	73	5.01
SE	0	6	7	5	12	16	21	23	7	3	3	1	104	6.00
SSE	0	4	13	15	14	16	2	12	10	10	7	0	103	5.66
S	0	10	16	13	19	14	9	4	2	1	0	3	91	4.59
SSW	1	2	16	9	22	18	13	10	4	0	0	0	95	5.02
SW	2	8	17	13	18	13	8	3	0	0	0	0	82	4.00
WSW	0	10	14	8	16	15	0	0	0	0	0	0	63	3.73
W	0	8	10	9	5	6	4	2	0	0	0	0	44	3.87
WNW	1	13	4	9	7	4	2	1	1	0	1	0	43	3.63
NW	1	10	13	15	9	4	2	0	1	0	0	0	55	3.45
NNW	0	9	4	3	4	1	0	0	0	0	1	0	22	3.22
N	1	11	14	7	3	4	0	1	0	0	0	0	41	2.95
CALM													18	.61
TOTAL	12	133	187	165	191	168	102	77	34	21	14	5	1127	4.47

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 8760

PASQUILL *G* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	18	25	4	4	0	1	0	0	0	0	0	52	2.52
NE	4	15	18	12	6	2	0	0	0	0	0	0	57	2.68
ENE	2	12	3	12	9	3	0	0	0	0	0	0	41	3.11
E	0	8	5	5	6	5	3	1	0	0	0	0	33	3.49
ESE	1	4	6	4	3	3	4	0	1	0	0	0	26	3.87
SE	0	10	9	6	5	7	3	4	0	0	0	0	44	3.97
SSE	0	5	4	8	5	4	6	4	2	0	1	0	39	4.84
S	0	9	10	5	7	4	1	0	0	0	0	0	36	3.31
SSW	1	17	18	11	11	4	2	1	0	0	0	0	65	3.14
SW	1	12	19	15	12	4	0	0	0	0	0	0	63	3.14
WSW	0	16	18	11	4	2	0	1	0	0	0	0	52	2.80
W	3	19	19	4	4	0	0	0	0	0	0	0	49	2.34
WNW	1	23	21	9	1	0	0	0	0	0	0	0	55	2.35
NW	6	34	25	10	4	1	0	0	0	0	0	0	80	2.21
NNW	3	24	15	6	3	1	0	0	0	0	0	0	52	2.22
N	3	27	15	4	6	2	0	0	0	0	0	0	57	2.10
CALM													14	.61
TOTAL	25	253	230	126	90	42	20	11	3	0	1	0	815	2.62

NUMBER OF INVALID OBSERVATIONS = 0
T[illegible] NUMBER OF OBSERVATIONS = 8760

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 10.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	1	44	90	55	52	53	41	47	25	15	10	29	462	5.68
NE	6	40	78	90	94	90	83	61	40	40	19	50	691	5.92
ENE	3	31	51	71	87	93	84	56	47	32	16	22	593	5.87
E	1	18	41	48	63	70	58	31	29	18	14	9	400	5.66
ESE	5	11	19	46	55	49	52	36	24	15	8	8	328	5.81
SE	0	20	28	42	54	68	68	63	27	28	17	40	455	6.60
SSE	0	11	29	47	65	71	63	58	42	34	39	68	527	7.16
S	2	27	61	63	95	74	69	64	40	42	27	83	647	6.76
SSW	3	30	65	68	121	96	93	71	44	52	24	86	753	6.66
SW	1	15	72	93	118	98	86	70	80	48	16	81	[illegible]	6.55
WSW	1	36	64	62	106	95	78	56	39	25	30	92	684	6.49
W	7	17	59	69	65	70	55	52	27	21	19	75	536	6.63
WNW	6	48	58	65	55	49	27	32	16	17	7	18	398	5.10
NW	8	66	81	89	71	59	36	35	21	21	19	69	[illegible]	5.92
NNW	4	45	69	60	40	48	26	26	16	18	17	43	418	5.73
N	4	55	49	48	54	40	31	23	13	12	5	13	351	4.77
CALM													[illegible]	[illegible]
TOTAL	58	554	916	1016	1203	1121	950	779	530	430	307	788	8743	6.14

NUMBER OF INVALID OBSERVATIONS = 17
TOTAL NUMBER OF OBSERVATIONS = 8760

TABLE 2.3-99A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: JANUARY, 1975

PASQUILL "A" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	1	1	12.90
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	1	0	0	0	0	0	0	0	0	0	1	2.20
ESE	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.
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	0	1	0	0	0	0	0	0	0	0	0	1	2.10
SSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SW	0	1	0	0	0	0	0	0	0	0	0	0	1	1.30
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	1	0	0	0	0	0	0	0	0	0	0	1	1.80
WNW	0	1	0	0	0	0	0	0	0	0	0	0	1	1.80
NW	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	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	3	2	0	0	0	0	0	0	0	0	1	6	3.68

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "B" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	1	0	0	0	0	0	0	0	1	5.00
NE	0	0	0	0	0	0	0	0	0	0	0	1	1	11.60
ENE	0	0	0	1	0	1	0	0	0	0	0	0	2	4.40
E	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.
SE	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.
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	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.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	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.
NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NNW	0	1	0	0	0	0	0	0	0	0	0	0	1	1.70
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	1	0	1	1	1	0	0	0	0	0	1	5	5.42

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "C" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	2	0	0	0	2	8.30
ENE	0	0	0	0	0	0	0	1	0	0	1	5	7	11.23
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	0	1	0	0	0	0	0	1	7.00
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSE	0	0	1	0	0	0	0	0	0	0	0	0	1	2.80
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.60
SW	0	0	0	0	1	0	0	0	0	0	0	1	2	12.00
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	1	0	0	0	0	1	2	9.65
NW	0	0	0	0	0	0	1	0	0	0	0	0	1	6.60
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	1	1	12.00
CALM													0	0.
TOTAL	0	0	1	1	1	0	3	1	2	0	1	8	18	9.44

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "D" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	1	1	0	0	1	2	0	0	2	0	8	15	10.8[illegible]
NE	1	0	0	1	0	2	1	1	0	1	1	1	9	7.12
ENE	0	0	0	2	2	1	2	1	1	1	3	4	17	8.16
E	0	0	2	1	1	1	2	2	1	2	0	2	14	7.24
ESE	0	0	0	0	2	0	1	1	1	1	3	0	9	8.12
SE	0	0	0	0	2	2	0	1	1	1	1	6	14	11.28
SSE	0	0	0	0	2	1	1	0	0	0	0	0	4	5.22
S	0	0	0	0	0	0	0	0	0	0	2	2	4	12.16
SSW	0	0	0	1	0	0	0	0	0	0	1	11	13	16.26
SW	0	0	1	1	4	2	2	0	1	2	0	9	22	9.19
WSW	0	0	0	0	1	4	1	0	0	0	4	28	38	16.62
W	0	1	1	1	1	0	2	0	1	5	1	20	33	15.11
WNW	0	1	3	[illegible]	4	5	4	5	3	1	1	1	[illegible]	[illegible]
NW	0	0	0	1	5	4	4	1	0	2	0	3	[illegible]	6.56
NNW	0	0	0	2	1	1	2	1	2	0	1	1	11	8.72
N	0	0	0	0	1	0	2	2	0	0	0	1	6	7.55
CALM													0	0.
TOTAL	1	3	8	12	26	24	26	15	11	20	20	101	[illegible]	10.[illegible]1

NUMBER OF INVALID OBSERVATIONS = 9
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-99B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: JANUARY, 1975

PASQUILL "E" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	1	0	2	1	0	2	0	4	10	9.57
NE	0	0	0	0	1	0	5	1	1	3	2	10	23	10.13
ENE	0	0	1	0	0	2	0	0	1	2	3	1	10	8.49
E	0	0	0	0	0	1	2	4	1	2	6	8	24	10.03
ESE	0	0	0	0	0	1	0	0	2	0	0	0	3	7.79
SE	0	0	0	0	0	1	2	0	1	1	0	2	7	9.30
SSE	0	0	0	1	2	1	0	1	0	2	0	10	17	13.43
S	0	1	0	0	0	0	0	0	0	1	4	11	17	12.31
SSW	0	0	1	0	0	0	0	1	2	0	2	20	26	13.38
SW	0	0	1	2	1	2	1	1	5	4	1	21	39	12.75
WSW	0	0	0	1	0	1	2	2	2	0	1	23	32	14.06
W	0	0	0	0	4	0	1	1	3	2	1	5	17	9.35
WNW	0	0	0	0	0	1	2	1	3	1	3	2	13	8.97
NW	0	0	1	1	1	0	1	1	0	0	0	1	6	8.08
NNW	0	0	0	0	1	0	0	1	0	0	0	4	6	16.95
N	0	0	0	0	1	0	1	1	1	2	1	4	11	10.32
CALM													0	0.
TOTAL	0	1	4	5	12	10	19	16	22	22	24	126	261	11.56

NUMBER OF INVALID OBSERVATIONS = 2
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	1	1	0	0	0	0	0	0	1	1	0	4	6.00
NE	0	0	0	0	0	0	0	1	1	0	1	3	6	10.45
ENE	0	1	0	0	0	0	1	1	0	2	1	5	11	10.04
E	0	0	0	0	0	0	0	1	0	2	0	1	4	9.62
ESE	0	0	0	1	0	1	0	0	0	0	1	2	5	9.90
SE	0	0	0	0	0	0	0	0	0	0	0	5	5	14.52
SSE	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	8	8	14.91
SSW	0	0	0	0	0	0	0	0	0	0	1	5	6	13.02
SW	0	1	1	0	0	0	0	1	1	2	1	23	30	12.49
WSW	0	0	2	1	0	0	0	1	0	1	3	10	18	10.65
W	0	0	0	0	1	0	1	0	0	0	0	3	5	10.56
WNW	0	0	0	0	0	1	0	1	1	2	2	2	9	9.[illegible]
NW	0	1	0	0	0	1	0	0	0	0	0	0	2	3.20
NNW	1	0	0	0	0	0	1	0	0	1	0	1	4	7.75
N	0	0	0	1	0	0	0	0	0	0	1	0	2	7.25
CALM													0	0.
TOTAL	1	4	4	3	1	3	3	6	3	11	12	68	119	11.05

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "G" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	1	0	0	0	0	0	1	0	0	0	2	5.95
NE	0	0	0	0	0	0	1	1	0	1	0	1	4	9.67
ENE	0	0	0	1	0	1	0	1	0	0	1	1	5	8.04
E	0	0	0	0	0	0	0	1	0	0	0	0	1	7.50
ESE	0	0	0	0	0	0	0	0	1	0	0	5	6	14.88
SE	0	0	0	0	0	0	0	0	0	0	0	2	2	13.75
SSE	0	0	1	0	0	0	0	0	1	2	1	0	5	8.32
S	0	0	1	1	2	0	2	0	2	1	1	2	12	7.78
SSW	0	1	0	0	0	0	0	1	0	0	0	0	2	4.50
SW	0	0	0	0	0	1	1	0	0	1	0	2	5	9.22
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	1	0	0	0	0	0	0	1	5.60
WNW	0	0	0	0	0	1	0	0	1	0	0	3	5	10.18
NW	0	0	0	1	1	0	0	0	0	0	1	0	3	6.20
NNW	0	0	0	0	0	0	0	0	0	0	0	1	1	17.00
N	0	0	0	0	0	1	0	0	0	0	0	0	1	5.80
CALM													0	0.
TOTAL	0	1	3	3	3	5	4	4	6	5	4	17	55	9.01

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	2	3	0	2	1	4	1	1	5	1	13	33	9.45
NE	1	0	0	1	1	2	7	4	4	5	4	16	45	9.43
ENE	0	1	1	4	2	5	3	4	2	5	9	16	52	8.87
E	0	0	3	1	1	2	4	8	2	6	6	11	44	8.97
ESE	0	0	0	1	2	2	2	1	4	1	4	7	24	10.08
SE	0	0	1	0	2	3	2	1	2	2	1	16	30	11.10
SSE	0	0	2	1	4	2	1	1	1	4	1	10	27	11.00
S	0	1	2	1	2	0	2	0	2	2	7	23	42	11.25
SSW	0	1	1	2	0	0	0	2	2	0	4	36	48	12.99
SW	0	2	3	3	6	5	4	2	7	9	2	56	99	11.57
WSW	0	0	2	2	1	5	3	3	2	1	8	61	88	13.19
W	0	2	1	1	6	1	4	1	4	7	2	28	57	12.50
WNW	0	2	3	0	4	8	7	7	8	6	8	11	64	8.00
NW	0	1	1	5	7	5	6	2	0	2	1	4	34	6.50
NNW	1	1	0	2	2	1	3	2	2	1	1	9	25	10.34
N	0	0	0	1	2	1	3	3	1	2	2	6	21	9.10
CALM													0	0.
TOTAL	2	13	23	25	44	43	55	42	44	58	61	323	733	10.[illegible]

NUMBER OF INVALID OBSERVATIONS = 11
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-100A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: FEBRUARY, 1975

PASQUILL "A" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.10
SE	0	0	0	1	1	0	0	0	0	0	0	0	2	3.85
SSE	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	0	0	0.
SSW	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.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	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.
NW	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	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	0	1	1	1	0	0	0	0	0	0	3	4.33

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 672

PASQUILL "B" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	1	0	1	0	0	0	0	2	6.15
E	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.
SE	0	0	1	0	1	0	1	0	0	0	0	0	3	4.43
SSE	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	1	1	12.80
SSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.50
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.60
NW	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	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	1	1	2	1	1	1	0	0	0	1	8	5.84

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 672

PASQUILL "C" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	1	0	0	0	0	0	1	6.10
ENE	0	0	0	0	0	0	0	1	0	1	0	0	2	8.50
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	1	1	0	0	0	0	0	2	6.20
SE	0	0	0	0	1	0	0	0	1	0	0	0	2	6.25
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	0	0	0	1	1	1	1	0	0	0	0	4	6.07
SSW	0	0	0	0	0	0	1	0	0	0	0	0	1	6.90
SW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.50
NW	0	0	0	1	1	0	0	1	1	0	0	0	4	6.22
NNW	0	0	0	0	0	1	0	0	0	0	0	0	1	5.10
N	0	0	0	0	1	0	0	0	0	0	0	0	1	4.60
CALM													0	0.
TOTAL	0	0	0	2	4	3	4	3	2	1	0	0	19	6.17

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 672

PASQUILL "D" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	1	0	0	0	0	0	0	1	1	1	4	8.77
NE	0	0	0	0	1	1	1	2	3	3	6	26	43	11.61
ENE	0	0	1	0	1	1	2	2	2	5	5	2	21	8.80
E	0	0	1	1	1	1	1	0	1	4	4	2	16	8.43
ESE	0	0	0	1	1	0	0	0	1	0	0	0	3	5.43
SE	0	0	0	0	0	2	0	0	1	2	0	0	5	7.86
SSE	0	0	0	1	0	0	2	0	1	1	0	2	7	8.40
S	0	2	0	0	1	1	1	2	0	1	1	3	12	8.14
SSW	0	1	1	1	1	3	1	1	1	1	0	8	19	8.82
SW	0	0	0	0	0	0	1	3	5	4	3	35	50	13.12
WSW	0	1	1	0	0	1	1	0	0	1	1	24	30	14.41
W	0	0	0	0	0	0	2	0	0	1	0	16	19	[illegible]
WNW	0	0	0	0	1	0	1	1	0	2	2	5	12	10.84
NW	0	0	1	0	0	0	0	1	1	1	0	0	4	6.97
NNW	0	0	0	0	1	2	1	1	1	1	0	2	9	8.88
N	0	0	0	0	0	0	0	0	0	0	1	0	1	10.80
CALM													0	0.
TOTAL	0	4	6	4	8	12	14	13	17	27	24	126	255	11.61

NUMBER OF INVALID OBSERVATIONS = 11
TOTAL NUMBER OF OBSERVATIONS = 672

TABLE 2.3-100B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: FEBRUARY, 1975

PASQUILL "E" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	0	0	1	0	0	1	2	3	7	10.57
NE	0	1	1	0	0	0	1	2	0	2	4	12	23	10.11
ENE	0	0	0	0	0	0	0	0	1	1	0	3	5	10.90
E	0	0	0	0	0	0	1	1	0	0	1	2	5	9.68
ESE	0	0	0	0	0	1	2	0	0	0	1	2	6	9.15
SE	0	0	0	0	0	0	1	0	0	2	2	3	8	11.39
SSE	0	0	0	0	0	1	0	0	0	2	2	16	21	15.79
S	0	0	0	0	0	0	0	2	2	4	2	6	16	10.97
SSW	0	0	0	0	0	0	2	2	3	1	0	12	20	12.59
SW	0	1	1	0	0	0	0	2	4	3	3	30	44	12.71
WSW	0	0	0	0	0	0	1	0	2	3	1	16	23	13.31
W	0	0	0	0	0	1	1	0	1	2	0	4	9	10.43
WNW	0	0	0	0	0	0	0	0	0	1	0	1	2	10.70
NW	0	0	0	0	1	0	0	0	0	1	0	1	3	8.57
NNW	0	0	0	0	1	0	0	0	0	0	2	3	6	10.50
N	0	0	0	0	0	0	0	0	0	1	3	4	8	11.79
CALM													0	0.
TOTAL	0	2	2	0	2	3	10	9	13	24	23	118	206	12.03

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 672

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	0	0	1	0	0	1	0	0	2	7.90
NE	0	0	0	0	0	0	1	1	1	1	1	3	8	10.16
ENE	0	0	0	0	0	0	0	0	0	1	0	5	6	11.00
E	0	0	0	0	0	0	0	0	0	1	3	4	8	11.05
ESE	0	0	0	0	0	0	0	1	1	1	0	14	17	14.69
SE	0	0	0	0	0	0	1	0	0	0	0	4	5	12.52
SSE	0	0	0	0	0	0	0	0	1	0	1	8	10	13.52
S	0	0	0	0	0	1	0	0	0	0	1	4	6	12.13
SSW	0	0	0	0	0	0	1	1	0	0	0	1	3	8.77
SW	0	0	0	0	0	0	0	0	0	0	1	6	7	12.77
WSW	0	0	0	0	0	0	1	0	2	1	1	5	10	10.76
W	0	0	0	0	0	0	0	0	0	0	0	3	3	14.13
WNW	0	0	0	0	1	0	0	0	0	0	1	2	4	10.42
NW	0	0	0	0	1	0	0	1	1	3	1	0	7	9.57
NNW	0	0	0	0	0	0	1	0	0	0	0	0	1	5.79
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													2	[illegible]
TOTAL	0	0	0	0	2	1	6	4	6	9	10	59	69	11.75

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 672

PASQUILL "G" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	1	0	0	0	0	0	0	0	0	1	0	2	6.05
ENE	0	0	0	1	0	1	0	1	0	0	0	2	5	9.24
E	0	0	0	0	1	2	0	0	1	0	2	3	9	9.50
ESE	0	1	0	0	0	0	0	0	1	1	0	2	5	11.74
SE	1	0	1	0	0	0	0	0	0	0	0	3	5	9.68
SSE	0	0	0	1	2	0	0	0	0	0	0	2	5	8.76
S	0	0	1	0	0	0	0	0	0	0	0	1	2	9.75
SSW	0	0	0	0	0	0	1	0	0	0	0	1	2	11.75
SW	0	0	0	0	0	0	0	0	0	0	1	5	6	13.27
WSW	0	0	0	0	0	0	0	1	0	0	0	3	4	13.42
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	0	1	0	1	2	10.60
NW	0	0	0	0	0	0	0	0	0	0	1	1	2	12.15
NNW	0	0	0	0	0	0	0	1	0	1	0	0	2	8.80
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	1	2	2	2	1	1	1	1	2	1	5	24	51	10.51

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 672

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	1	0	0	0	2	0	0	1	3	4	11	9.71
NE	0	2	1	0	1	1	4	5	4	6	12	41	77	10.80
ENE	0	0	1	1	1	3	2	5	3	8	5	12	41	9.43
E	0	0	1	1	2	3	2	1	2	5	10	11	38	9.42
ESE	0	1	0	1	1	3	3	1	1	2	1	16	34	11.50
SE	1	0	2	1	1	2	3	0	2	4	2	10	30	9.21
SSE	0	0	0	2	2	1	2	0	2	3	3	26	43	11.27
S	0	2	1	0	2	3	2	5	2	5	4	15	41	9.91
SSW	0	1	1	1	1	3	6	4	4	2	0	22	45	10.56
SW	0	1	1	0	1	0	1	5	9	6	8	76	108	12.86
WSW	0	1	1	0	0	1	3	1	4	5	3	48	67	13.45
W	0	0	0	0	0	1	1	0	1	3	0	23	31	12.07
WNW	0	0	0	2	2	0	1	1	0	4	3	9	22	10.06
NW	0	0	1	1	3	0	0	3	3	5	2	2	20	8.14
NNW	0	0	0	0	2	3	2	2	1	2	2	5	19	9.21
N	0	0	0	0	1	0	0	0	0	1	4	4	10	10.77
CALM													2	[illegible]
TOTAL	1	6	11	10	22	24	36	33	40	64	72	328	641	11.17

NUMBER OF INVALID OBSERVATIONS = 31
TOTAL NUMBER OF OBSERVATIONS = 672

2.3-165

AMENDMENT 97-01
AUGUST 1997

TABLE 2.3-101A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: MARCH, 1975

PASQUILL "A" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	1	0	1	10.20
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	1	0	0	0	0	0	0	0	0	1	3.60
ESE	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.
SSE	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	0	0	0.
SSW	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.
WSW	0	0	1	0	0	0	0	0	0	0	0	0	1	2.30
W	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.
NW	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	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	1	1	0	0	0	0	0	0	1	0	3	5.37

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "B" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	1	0	0	0	0	1	7.00
NE	0	0	0	0	0	0	1	0	0	0	1	0	2	8.60
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	0	0	0	1	0	0	0	1	8.70
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.60
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	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.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	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.
NW	0	0	0	0	0	0	0	0	0	0	0	1	1	19.[illegible]
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	0	0	1	0	1	1	1	0	1	1	6	[illegible].72

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "C" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	1	1	1	1	0	0	0	4	7.25
NE	0	0	0	0	0	0	0	0	1	1	0	2	4	10.20
ENE	0	0	0	0	0	0	0	0	1	2	1	0	4	9.77
E	0	0	0	0	0	0	0	1	0	1	0	0	2	8.70
ESE	0	0	0	0	0	0	1	0	0	1	0	0	2	8.05
SE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.70
SSE	0	0	1	0	0	1	0	0	0	0	0	0	2	4.00
S	0	0	0	0	0	0	0	2	0	0	0	0	2	7.25
SSW	0	0	0	0	0	0	0	0	0	1	0	0	1	9.20
SW	0	0	1	0	0	0	0	0	0	0	0	0	1	2.50
WSW	0	0	0	0	1	1	0	0	0	0	0	0	2	5.05
W	0	0	0	1	0	1	0	0	0	0	0	0	2	4.45
WNW	0	0	0	0	1	0	0	0	0	0	0	1	2	9.10
NW	0	0	0	1	1	0	0	0	0	0	0	5	7	11.40
NNW	0	0	0	0	0	1	0	1	0	0	0	0	2	6.40
N	0	0	0	0	0	0	0	0	1	0	0	0	1	8.60
CALM													0	0.
TOTAL	0	0	2	2	4	5	2	5	4	6	1	8	39	8.22

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "D" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	1	0	0	1	0	0	0	2	2	1	1	10	7.36
NE	1	0	0	1	1	0	0	1	2	2	4	1	13	9.22
ENE	0	0	0	0	1	1	0	1	2	8	3	11	27	10.57
E	0	0	0	0	3	0	2	1	3	0	1	5	15	9.15
ESE	0	0	0	0	2	3	1	0	0	1	0	3	10	8.06
SE	0	0	0	0	0	0	0	2	0	0	0	2	4	10.87
SSE	0	0	0	0	0	0	1	0	0	0	1	2	4	12.47
S	0	0	0	1	0	1	1	0	1	3	2	8	17	12.25
SSW	0	0	0	0	0	1	3	4	2	1	4	24	39	12.78
SW	0	0	0	0	1	1	0	1	0	1	3	19	26	15.22
WSW	0	0	0	0	1	0	0	2	0	1	2	31	37	16.48
W	0	0	0	1	0	1	1	2	1	0	1	32	39	19.00
WNW	0	0	1	0	0	0	0	0	1	0	3	13	18	17.57
NW	0	0	0	0	0	1	0	1	0	0	2	15	19	13.00
NNW	0	1	1	2	0	2	0	4	1	0	0	7	18	11.50
N	0	0	1	0	1	1	2	1	1	4	1	4	20	8.72
CALM													0	0.
TOTAL	1	2	3	5	15	12	11	20	18	23	28	178	316	11.07

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-101B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: MARCH, 1975

PASQUILL "E" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
			UPPER CLASS INTERVALS OF WIND SPEED (MPH)											
NNE	0	0	0	0	0	0	1	1	0	1	2	1	6	9.47
NE	0	0	0	0	1	1	4	1	0	0	3	4	14	8.81
ENE	0	0	0	0	0	2	2	1	0	0	0	5	10	9.66
E	0	0	0	0	0	0	1	1	0	1	1	10	14	12.42
ESE	0	0	0	0	1	1	1	1	2	2	2	7	17	10.06
SE	0	0	0	0	0	0	0	0	0	0	0	8	8	15.97
SSE	0	0	0	0	1	1	0	1	0	1	0	11	15	14.69
S	0	0	0	0	0	1	1	1	0	1	2	27	33	14.66
SSW	0	0	0	1	2	0	0	1	1	1	2	20	28	13.13
SW	0	0	0	1	0	0	0	0	0	0	1	11	13	13.42
WSW	0	0	0	1	0	0	1	0	1	0	2	10	15	12.45
W	0	0	0	0	1	0	1	1	1	0	0	21	25	13.41
WNW	0	0	0	0	0	1	0	0	0	0	0	8	9	13.94
NW	0	0	1	0	0	0	0	1	4	0	4	16	26	12.04
NNW	0	0	0	0	0	0	1	0	2	2	1	9	15	12.71
N	0	0	0	0	0	2	2	1	0	3	3	4	15	9.36
CALM													0	0.
TOTAL	0	0	1	3	6	9	15	11	11	12	23	172	263	12.55

NUMBER OF INVALID OBSERVATIONS = 2
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
			UPPER CLASS INTERVALS OF WIND SPEED (MPH)											
NNE	0	0	1	0	0	0	0	0	0	1	0	0	2	6.00
NE	0	0	0	0	0	0	0	0	0	0	0	1	1	13.70
ENE	0	0	0	0	0	0	0	0	1	1	2	3	7	11.69
E	0	0	0	1	0	0	0	0	0	0	2	8	11	13.15
ESE	0	0	0	0	0	0	0	0	0	0	0	3	3	13.00
SE	0	0	0	0	0	0	0	0	0	0	0	2	2	16.75
SSE	0	0	0	0	0	1	0	0	0	0	0	8	9	14.14
S	0	0	0	0	0	0	0	0	0	0	0	5	5	15.26
SSW	0	0	0	0	0	0	0	0	0	0	0	2	2	15.10
SW	0	0	0	0	0	0	1	0	0	2	1	11	15	12.15
WSW	0	0	0	0	0	0	0	0	0	1	0	1	2	10.45
W	0	0	0	0	0	0	0	0	1	0	0	6	7	12.21
WNW	0	0	0	0	1	1	0	0	0	0	0	2	4	9.87
NW	0	0	0	0	0	0	0	0	0	0	0	1	1	11.10
NNW	0	0	0	0	0	0	1	1	0	1	0	0	3	7.90
N	0	0	0	0	0	0	0	1	0	0	0	0	1	7.90
CALM													0	0.
TOTAL	0	0	1	1	1	2	2	2	2	6	5	53	75	12.75

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "G" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
			UPPER CLASS INTERVALS OF WIND SPEED (MPH)											
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	1	1	15.20
E	0	1	0	0	0	0	0	0	1	0	1	1	4	8.95
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.90
SSE	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	5	5	13.84
SSW	0	0	3	0	0	0	0	0	0	1	0	1	5	5.60
SW	0	0	0	1	0	0	0	0	0	0	0	1	2	7.85
WSW	0	0	0	0	0	1	0	0	0	0	0	0	1	5.80
W	0	1	0	1	0	0	0	1	0	0	1	1	5	7.24
WNW	0	0	0	0	1	0	0	1	0	1	0	1	4	8.45
NW	0	0	0	0	0	0	0	0	1	1	0	1	4	9.47
NNW	0	0	0	1	0	2	0	0	0	0	0	0	3	5.07
N	0	0	0	1	0	1	0	0	0	0	0	0	2	4.55
CALM													0	0.
TOTAL	0	2	3	4	2	4	0	2	2	3	2	12	36	8.36

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
			UPPER CLASS INTERVALS OF WIND SPEED (MPH)											
NNE	0	1	1	0	1	1	2	3	3	4	3	2	23	7.80
NE	1	0	0	1	2	1	5	2	3	3	9	8	35	8.63
ENE	0	0	0	0	1	3	2	2	4	11	6	20	49	10.55
E	0	1	0	2	3	0	3	3	4	2	5	24	47	10.97
ESE	0	0	0	0	1	4	3	1	3	4	2	13	33	9.80
SE	0	0	0	0	2	0	0	2	0	0	0	12	16	13.40
SSE	0	0	1	0	2	1	1	1	0	1	1	21	31	13.49
S	0	0	0	1	0	2	2	3	1	4	4	45	62	14.66
SSW	0	0	3	1	2	1	3	5	3	4	6	47	75	12.47
SW	0	0	1	2	1	1	1	1	0	3	5	42	57	11.93
WSW	0	0	1	1	2	2	1	2	1	2	4	42	58	14.58
W	0	1	0	3	1	2	2	4	3	0	2	60	78	15.87
WNW	0	0	1	0	1	2	0	1	1	1	3	25	37	12.14
NW	0	0	1	1	1	1	0	2	5	1	6	39	47	12.61
NNW	0	1	1	3	0	5	2	6	3	3	1	16	41	10.64
N	0	0	1	1	1	4	4	3	4	7	4	8	19	8.73
CALM													0	0.
TOTAL	1	4	11	16	22	32	31	41	38	50	61	424	738	12.31

NUMBER OF INVALID OBSERVATIONS = 6
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-102A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: APRIL, 1975

PASQUILL *A* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	1	0	0	0	1	8.40
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	1	0	0	0	0	0	1	6.90
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	0	0	1	1	0	0	0	0	2	6.80
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	0	0	0	2	0	0	0	1	0	0	1	4	8.15
SSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SW	0	0	0	0	0	1	0	0	0	0	0	0	1	5.20
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	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.
NW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.15
NNW	0	0	0	0	0	0	0	0	0	0	0	1	1	11.70
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	0	0	3	1	2	1	2	0	0	2	11	7.62

NUMBER OF INVALID OBSERVATIONS = 3
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL *B* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	1	1	14.10
ENE	0	0	0	0	0	1	1	0	0	0	0	0	2	6.15
E	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.
SE	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.
S	0	0	0	0	0	1	0	1	0	0	0	1	3	9.60
SSW	0	0	0	0	0	0	0	0	0	0	0	1	1	15.10
SW	0	0	0	1	0	1	0	1	0	0	0	0	3	5.70
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	1	0	0	0	0	0	0	1	5.10
WNW	0	0	0	0	0	0	1	0	0	0	0	0	1	6.70
NW	0	0	0	0	0	0	0	0	0	1	2	4	7	14.[illegible]
NNW	0	0	0	0	0	0	0	0	0	0	0	1	1	16.40
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	0	1	0	4	2	2	0	1	2	8	20	10.78

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL *C* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.60
ENE	0	0	0	0	0	0	0	0	1	0	1	0	2	9.35
E	0	0	0	0	0	0	0	1	0	0	0	0	1	7.60
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	0	0	1	0	0	0	0	0	1	6.20
SSE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.60
S	0	0	0	0	0	2	2	0	1	0	0	2	7	8.69
SSW	0	0	0	0	1	0	0	1	2	1	1	3	9	11.[illegible]
SW	0	0	0	0	1	0	0	0	1	1	0	0	3	7.53
WSW	0	0	1	0	0	0	0	1	0	0	0	0	2	6.90
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	1	0	0	0	3	4	13.52
NW	0	0	0	0	1	0	0	2	2	3	2	10	20	13.76
NNW	0	0	0	0	0	1	0	0	1	1	0	4	7	13.71
N	0	0	0	0	0	0	0	0	0	0	0	2	2	12.65
CALM													0	0.
TOTAL	0	0	1	0	5	3	3	6	8	6	4	24	60	11.51

NUMBER OF INVALID OBSERVATIONS = 2
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL *D* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	1	0	0	0	0	0	1	0	0	0	2	5.60
NE	0	0	0	0	0	0	0	0	1	1	0	2	4	10.77
ENE	0	0	0	0	0	1	0	0	2	1	2	4	10	10.73
E	0	0	0	1	1	1	0	0	1	1	0	3	8	8.77
ESE	0	0	0	0	0	2	3	0	0	0	0	1	6	6.98
SE	0	0	0	1	2	3	0	1	0	1	1	0	9	6.38
SSE	0	0	0	3	1	1	3	0	1	0	0	6	15	9.25
S	0	1	0	3	1	1	0	1	0	1	3	8	19	10.05
SSW	0	0	0	1	1	1	0	0	1	0	3	17	24	11.82
SW	0	1	0	0	2	3	2	3	0	1	4	28	44	14.22
WSW	0	0	1	2	3	1	0	1	1	2	3	11	25	10.70
W	0	0	0	0	1	0	3	1	5	2	0	7	19	11.71
WNW	0	0	0	1	1	1	1	1	2	1	2	7	17	12.24
NW	0	0	0	0	1	2	2	1	4	1	1	8	20	11.[illegible]
NNW	0	0	1	1	0	1	0	2	0	3	3	11	22	11.[illegible]
N	0	0	0	0	0	0	0	1	1	0	1	2	5	10.[illegible]
CALM													0	0.
TOTAL	0	2	3	13	14	18	14	12	20	15	23	115	269	11.47

NUMBER OF INVALID OBSERVATIONS = 7
TOTAL NUMBER OF OBSERVATIONS = 720

TABLE 2.3-102B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: APRIL, 1975

PASQUILL *E* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	1	0	0	0	0	0	0	2	3	9.57
NE	0	1	0	0	0	0	0	1	1	1	1	2	7	9.59
ENE	0	0	0	1	0	1	1	1	0	0	0	4	8	10.02
E	0	0	1	0	1	0	0	0	0	2	0	0	4	6.57
ESE	0	1	0	1	0	0	1	1	0	1	4	1	10	8.66
SE	0	0	1	0	0	0	0	0	0	0	1	1	3	9.17
SSE	0	0	0	0	1	0	1	2	1	1	2	5	13	11.22
S	0	0	0	0	0	0	1	3	3	1	4	18	30	13.07
SSW	0	0	0	0	2	1	2	3	2	0	0	35	45	13.66
SW	0	0	0	0	0	1	3	1	3	2	2	22	34	12.66
WSW	0	0	0	0	0	0	2	1	0	1	0	9	13	14.26
W	0	0	0	0	0	0	4	0	1	0	0	11	16	11.17
WNW	0	1	0	0	0	1	0	0	0	1	0	1	4	7.10
NW	0	0	0	0	0	0	0	1	0	1	0	12	14	14.34
NNW	0	0	1	0	0	0	0	0	0	2	2	15	20	14.19
N	0	0	1	0	2	0	0	0	0	1	0	1	5	6.60
CALM													0	0.
TOTAL	0	3	4	2	7	4	15	14	11	14	16	139	229	12.35

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL *F* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	0	0	0	0	0	0	0	2	2	11.[illegible]
NE	0	0	0	0	1	0	0	0	0	0	0	1	2	8.[illegible]
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	1	0	0	0	0	1	2	10.[illegible]
ESE	0	0	0	0	0	0	0	0	0	1	0	2	3	14.[illegible]
SE	0	0	0	0	2	0	0	0	1	1	0	3	7	9.[illegible]
SSE	0	0	0	0	0	1	0	1	0	0	0	9	11	14.7[illegible]
S	0	0	0	0	0	0	0	1	0	0	0	8	9	13.[illegible]
SSW	0	0	0	0	0	0	1	1	0	1	0	4	7	10.[illegible]
SW	0	0	0	0	0	0	0	0	0	0	1	2	3	12.4[illegible]
WSW	0	0	0	0	0	0	0	0	0	0	0	1	1	11.[illegible]
W	0	0	0	0	0	0	0	0	0	0	0	2	2	11.[illegible]
WNW	0	0	0	0	0	0	0	0	0	1	1	0	2	10.0[illegible]
NW	0	0	0	0	0	0	0	2	0	1	1	7	11	12.[illegible]
NNW	0	0	0	0	0	0	0	0	0	2	0	3	5	12.36
N	0	0	0	0	0	0	0	0	0	0	1	5	6	11.[illegible]
CALM													0	0.
TOTAL	0	0	0	0	3	1	2	5	1	7	4	50	73	12.[illegible]

NUMBER OF INVALID OBSERVATIONS = [illegible]
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL *G* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	0	0	0	1	0	0	1	8	10	12.51
NE	0	0	0	0	0	0	0	0	0	1	0	5	6	13.02
ENE	0	0	0	0	0	0	1	0	0	0	1	1	3	10.40
E	0	0	0	1	0	0	0	0	2	1	1	0	5	8.18
ESE	0	0	0	0	0	0	0	0	0	0	0	2	2	14.55
SE	0	0	0	0	0	0	0	0	0	0	0	2	2	11.60
SSE	0	0	0	1	0	1	0	1	0	2	0	3	8	8.90
S	0	0	1	1	0	1	0	2	0	0	0	1	6	6.18
SSW	0	0	0	0	0	1	1	0	0	0	0	2	4	8.97
SW	0	0	0	0	0	0	0	0	0	1	1	0	2	10.05
WSW	0	0	0	0	0	0	0	1	1	0	0	0	2	7.85
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	1	0	0	0	0	0	1	6.50
NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NNW	0	0	0	0	0	0	1	1	2	1	2	0	7	9.00
N	0	0	0	0	0	0	0	0	3	0	2	3	8	10.61
CALM													0	0.
TOTAL	0	0	1	3	0	3	4	6	8	6	8	27	66	10.01

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	1	0	1	0	0	1	2	0	1	12	18	10.[illegible]
NE	0	1	0	0	2	0	0	1	2	3	1	11	21	10.66
ENE	0	0	0	1	0	3	3	1	3	1	4	9	25	9.90
E	0	0	1	2	2	1	2	1	3	4	1	4	21	8.25
ESE	0	1	0	1	0	2	4	1	0	2	4	6	21	9.[illegible]
SE	0	0	1	1	4	3	2	2	1	2	2	6	24	[illegible].29
SSE	0	0	0	4	1	3	4	4	2	1	2	23	40	10.[illegible]
S	0	1	1	4	1	5	3	8	5	2	7	39	78	11.66
SSW	0	0	0	1	4	3	4	5	5	2	4	62	90	13.6[illegible]
SW	0	1	0	1	1	6	5	5	4	5	6	52	90	12.81
WSW	0	0	2	2	1	1	2	4	2	3	3	21	41	11.65
W	0	0	0	0	1	1	7	1	6	2	0	20	38	11.33
WNW	0	1	0	1	1	2	3	2	2	3	3	11	29	11.1[illegible]
NW	0	0	0	0	1	2	2	6	6	7	6	41	73	13.0[illegible]
NNW	0	0	2	1	0	2	1	3	3	[illegible]	7	35	44	12.44
N	0	0	1	0	2	0	0	1	4	1	4	13	26	10.5[illegible]
CALM													0	0.
TOTAL	0	5	9	19	12	14	42	46	50	4[illegible]	57	365	708	11.[illegible]

NUMBER OF INVALID OBSERVATIONS = 12
TOTAL NUMBER OF OBSERVATIONS = 720

TABLE 2.3-103A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: MAY, 1975

PASQUILL "A" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	1	1	0	0	0	0	0	0	2	4.90
NE	0	0	1	0	0	1	3	1	0	2	0	0	8	6.40
ENE	0	0	0	0	0	0	1	1	0	0	0	0	2	7.35
E	0	0	0	0	1	1	0	1	1	0	0	0	4	6.37
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	1	0	1	0	0	0	0	0	0	1	3	9.50
SSE	0	0	0	0	1	0	0	0	1	0	0	1	3	8.27
S	0	0	0	2	0	0	0	1	2	1	0	2	8	8.17
SSW	0	0	0	1	1	0	0	1	0	0	0	0	3	5.33
SW	0	0	0	1	0	2	1	0	0	0	0	0	4	5.50
WSW	0	0	0	0	1	0	0	0	0	0	0	0	1	5.00
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	1	1	0	0	0	0	0	0	2	5.20
NW	0	0	0	2	0	0	0	0	0	0	0	0	2	4.00
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	1	0	0	0	0	0	0	1	5.70
CALM													0	0.
TOTAL	0	0	2	6	7	7	5	5	4	3	0	4	43	6.75

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "B" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	1	0	0	0	0	0	1	6.50
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	1	0	0	0	0	0	1	6.50
E	0	0	0	0	1	0	0	0	0	0	0	0	1	4.90
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	1	1	0	0	1	0	0	0	0	3	5.47
SSE	0	0	0	0	0	0	1	1	0	0	0	1	3	8.73
S	0	0	0	0	0	0	0	0	0	0	0	1	1	12.10
SSW	0	0	0	0	0	0	0	1	0	0	0	1	2	9.75
SW	0	0	0	1	0	0	1	1	0	0	0	0	3	5.53
WSW	0	0	0	0	0	0	0	1	0	0	0	0	1	7.10
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	2	0	1	0	0	0	0	0	0	3	4.67
NW	0	0	0	0	0	1	0	1	0	0	0	0	2	6.70
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	0	4	2	2	4	6	0	0	0	3	21	6.73

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "C" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	1	1	0	0	0	0	0	2	5.75
NE	0	0	2	0	0	0	0	0	0	0	0	0	2	2.90
ENE	0	0	0	0	1	0	0	0	0	0	1	2	4	9.72
E	0	0	0	1	1	0	1	0	0	0	0	0	3	5.03
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	1	0	0	0	1	0	0	1	3	9.23
SSE	0	0	0	0	2	0	0	0	0	0	0	2	4	9.88
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	0	0	0	1	1	0	0	2	0	1	1	1	7	7.74
SW	0	0	1	0	1	3	0	2	0	1	0	0	8	6.27
WSW	0	0	0	1	1	0	3	3	1	1	1	0	11	7.24
W	0	0	0	1	1	2	0	1	0	0	0	0	5	5.58
WNW	0	0	0	0	0	0	0	0	2	0	0	0	2	8.70
NW	0	0	0	2	0	0	0	0	0	0	0	0	2	3.80
NNW	0	0	0	0	2	0	0	0	0	0	0	0	2	4.75
N	0	0	0	1	1	0	0	0	0	0	0	0	2	4.15
CALM													0	0.
TOTAL	0	0	3	7	12	6	5	8	4	3	1	6	57	6.80

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "D" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	1	2	3	0	4	0	0	0	0	1	11	5.60
NE	0	0	1	3	2	3	1	1	6	3	1	2	23	7.37
ENE	0	0	0	2	1	1	4	1	3	2	2	2	18	7.79
E	0	0	2	1	1	3	4	2	1	2	2	2	20	7.33
ESE	0	0	2	0	3	2	2	0	0	0	1	0	10	5.53
SE	0	0	0	1	2	2	0	1	2	3	2	8	21	9.42
SSE	0	0	0	1	0	3	3	1	1	0	5	13	27	11.26
S	0	0	0	0	2	1	1	4	3	0	1	3	15	8.45
SSW	0	0	0	1	2	3	1	6	2	1	1	2	19	7.79
SW	0	0	0	1	0	3	5	1	0	3	3	1	17	8.44
WSW	0	1	1	0	3	1	3	4	2	1	6	3	25	7.92
W	0	1	0	1	4	2	2	1	1	3	2	7	24	8.73
WNW	0	0	0	1	1	1	1	1	1	2	1	1	10	7.70
NW	0	0	0	1	1	0	1	1	3	0	2	1	10	8.13
NNW	0	0	0	1	0	3	0	1	0	1	0	0	7	6.27
N	0	0	1	1	1	1	1	0	0	1	0	1	7	6.50
CALM													1	.50
TOTAL	0	2	8	19	26	27	33	25	25	20	29	49	264	8.16

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-103B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: MAY, 1975

PASQUILL *E* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	1	1	0	1	2	2	0	1	0	1	2	11	7.81
NE	0	1	0	2	0	0	2	1	1	2	0	0	9	6.33
ENE	0	0	0	1	0	0	0	5	1	1	0	1	9	7.88
E	0	0	0	0	1	2	1	2	2	4	1	7	20	10.66
ESE	0	0	0	1	1	0	1	0	0	3	2	5	13	10.35
SE	0	2	1	0	1	1	0	1	1	1	5	11	24	9.75
SSE	0	0	1	1	0	1	1	1	2	1	1	8	17	10.42
S	0	0	0	0	0	0	0	3	2	2	2	9	18	11.07
SSW	0	0	0	0	0	0	0	2	1	2	1	10	16	11.92
SW	0	1	0	0	1	1	2	1	1	3	2	9	21	9.80
WSW	0	0	0	0	1	0	1	0	1	1	0	1	5	11.20
W	0	0	0	0	0	1	0	2	0	3	0	1	7	8.97
WNW	0	0	1	1	1	0	0	1	2	2	0	1	9	7.24
NW	0	1	0	0	0	0	0	1	2	0	1	0	5	7.44
NNW	0	0	0	0	0	2	0	1	0	1	0	0	4	7.10
N	0	0	1	0	1	1	2	0	0	0	0	0	5	5.12
CALM													1	.70
TOTAL	0	6	5	6	9	11	12	21	17	26	16	65	194	9.51

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL *F* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	1	0	0	0	0	1	8.60
NE	0	0	1	1	0	1	0	0	0	1	0	5	9	10.01
ENE	0	1	0	0	0	0	0	0	1	3	0	3	8	9.67
E	0	1	1	0	1	0	0	0	0	0	0	0	3	2.40
ESE	0	0	0	1	0	0	0	0	0	0	0	5	6	12.37
SE	0	0	0	0	0	1	0	0	0	0	0	8	9	12.56
SSE	0	0	0	0	1	0	0	1	1	0	0	7	10	11.74
S	0	0	2	0	0	0	0	0	0	2	0	6	10	11.09
SSW	0	0	0	1	0	3	0	0	2	2	1	6	15	10.59
SW	0	1	0	0	2	1	0	0	1	1	1	2	9	7.01
WSW	1	0	0	0	1	1	0	0	1	0	0	5	9	9.23
W	0	0	0	1	0	1	2	0	1	1	0	1	7	7.11
WNW	0	0	0	0	0	0	0	1	0	0	0	0	1	7.10
NW	0	0	0	0	1	0	0	0	0	1	0	2	4	10.30
NNW	0	0	0	1	1	1	0	1	0	1	0	0	5	6.16
N	0	0	0	1	0	0	0	0	2	1	0	0	4	7.20
CALM													0	0.
TOTAL	1	3	4	6	7	9	2	4	9	13	2	50	110	9.74

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL *G* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	1	1	2	0	0	0	0	4	6.65
NE	0	0	0	0	0	0	1	0	0	0	0	1	2	9.20
ENE	0	0	1	0	0	0	0	0	0	0	0	0	1	2.30
E	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.
SE	0	0	1	0	0	0	0	0	0	0	0	1	2	7.60
SSE	0	0	0	0	0	0	0	0	0	0	0	1	1	12.50
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	0	0	1	0	0	0	0	0	1	0	0	0	2	5.30
SW	0	0	0	0	0	1	0	0	0	1	1	1	4	9.25
WSW	0	0	0	0	0	0	1	2	0	1	2	5	11	10.18
W	0	0	0	0	0	0	0	2	0	4	2	3	11	10.11
WNW	0	0	0	0	0	0	0	0	0	0	0	1	1	11.70
NW	0	1	0	0	0	0	0	0	1	0	1	1	4	8.55
NNW	0	0	0	1	0	0	0	0	2	0	1	3	7	10.49
N	0	0	0	0	1	0	0	0	0	0	0	0	1	4.20
CALM													2	.50
TOTAL	0	1	3	1	1	2	1	6	4	6	7	17	51	8.87

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	1	2	2	5	5	9	3	1	0	1	3	32	6.56
NE	0	1	5	6	2	5	7	3	7	8	1	8	53	7.65
ENE	0	1	1	3	2	1	6	7	5	6	1	8	41	8.16
E	0	1	3	2	6	6	6	5	4	6	1	9	51	8.12
ESE	0	0	2	2	4	2	3	0	0	1	3	10	29	9.10
SE	0	2	3	2	6	4	0	3	4	4	7	10	45	9.86
SSE	0	0	1	2	4	4	5	4	5	1	6	13	45	10.74
S	0	0	2	2	2	1	1	8	7	5	3	21	52	9.85
SSW	0	0	1	4	4	6	1	12	6	6	4	20	64	9.34
SW	0	2	1	3	4	9	9	6	2	0	7	15	66	8.26
WSW	1	1	1	1	7	2	8	10	5	4	9	14	63	8.59
W	0	1	0	5	5	6	4	6	2	9	4	12	54	8.55
WNW	0	0	1	4	3	3	1	3	5	4	1	3	28	7.18
NW	0	2	0	5	2	1	1	3	6	1	4	4	29	7.20
NNW	0	0	0	3	3	6	0	3	2	3	1	3	24	7.49
N	0	0	2	3	4	3	3	0	2	2	0	1	20	5.90
CALM													4	.55
TOTAL	1	12	25	49	61	64	64	75	61	71	57	196	742	8.57

NUMBER OF INVALID OBSERVATIONS = 2
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-104A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: JUNE, 1975

PASQUILL "A" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	0	0	0	1	1	0	1	0	3	8.93
NE	0	0	0	1	0	0	0	1	0	0	4	12	18	11.74
ENE	0	0	0	0	0	0	1	1	0	1	0	6	9	12.67
E	0	0	0	0	0	1	1	1	0	0	0	0	3	6.57
ESE	0	0	0	0	0	0	0	0	0	2	0	2	4	11.17
SE	0	0	0	0	0	1	0	0	1	1	0	0	3	8.20
SSE	0	0	0	0	0	0	1	0	0	0	0	0	1	6.60
S	0	0	0	0	0	0	0	0	0	0	0	1	1	14.50
SSW	0	0	0	0	0	0	0	0	0	0	0	1	1	15.00
SW	0	0	1	0	0	3	2	0	0	0	0	0	6	5.34
WSW	0	0	0	0	1	0	1	2	0	0	0	0	4	6.67
W	0	0	0	0	1	2	2	0	0	0	0	0	5	5.82
WNW	0	0	0	0	0	0	1	1	0	0	0	0	2	7.00
NW	0	0	0	0	1	0	0	0	1	0	0	0	2	6.15
NNW	0	0	0	0	0	0	0	1	0	0	0	0	1	7.40
N	0	0	0	0	0	1	0	0	0	0	0	0	1	5.70
CALM													0	0.
TOTAL	0	0	1	1	3	8	9	8	3	4	5	22	64	9.45

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "B" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	0	0	0	1	0	2	0	0	3	8.67
NE	0	0	0	0	0	1	0	0	0	0	2	0	3	8.50
ENE	0	0	0	0	0	0	0	1	3	0	1	3	8	11.32
E	0	0	0	0	0	0	1	0	0	1	0	0	2	8.05
ESE	0	0	0	0	0	0	0	0	0	1	0	3	4	11.77
SE	0	0	0	0	0	0	0	0	0	0	0	1	1	12.56
SSE	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	0	0	0.
SSW	0	0	0	0	0	0	0	0	0	0	0	1	1	14.10
SW	0	0	0	0	1	0	1	0	0	1	0	0	3	[illegible]
WSW	0	0	0	1	2	0	1	0	0	0	0	0	4	[illegible]
W	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.
NW	0	0	0	0	0	0	0	0	1	0	0	0	1	[illegible]
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	0	1	3	1	3	2	4	5	3	8	30	[illegible]

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "C" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	0	0	0	1	0	0	0	0	1	8.00
NE	0	0	0	0	2	0	1	0	0	1	1	0	5	7.14
ENE	0	0	0	0	0	1	0	0	0	0	0	3	4	13.42
E	0	0	0	0	0	0	0	1	0	1	5	4	11	10.93
ESE	0	0	0	0	0	0	0	0	0	1	1	5	7	12.39
SE	0	0	0	0	0	0	0	0	0	1	0	1	2	10.65
SSE	0	0	0	0	0	0	1	1	0	0	0	0	2	7.10
S	0	0	0	0	0	1	0	1	0	0	0	1	3	8.70
SSW	0	0	0	0	0	1	0	0	2	0	0	0	3	7.33
SW	0	0	0	0	1	2	2	0	0	0	0	0	5	5.64
WSW	0	0	1	0	0	4	2	2	0	1	0	3	13	8.32
W	0	0	0	0	0	2	2	2	0	0	0	0	6	6.50
WNW	0	0	0	0	0	0	1	0	0	0	0	0	1	6.70
NW	0	0	0	1	2	1	0	1	0	0	0	0	5	5.18
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	1	2	0	0	0	1	4	8.50
CALM													0	0.
TOTAL	0	0	1	1	5	12	10	11	2	5	7	18	72	8.74

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "D" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	0	1	1	0	1	1	0	0	4	[illegible]
NE	0	0	0	0	0	1	4	2	3	3	1	5	19	10.09
ENE	0	0	1	0	0	3	0	6	6	7	1	8	32	9.29
E	0	0	0	0	0	1	3	2	2	2	2	2	14	9.66
ESE	0	0	0	0	0	0	0	0	3	1	5	7	16	11.88
SE	0	0	0	0	0	1	1	0	1	1	0	6	10	11.72
SSE	0	0	0	0	0	0	1	0	1	2	1	4	9	11.67
S	0	0	0	0	0	0	1	2	2	0	1	3	9	[illegible]
SSW	0	0	0	0	0	3	0	1	0	2	2	5	13	[illegible]
SW	0	0	0	0	0	1	1	1	2	3	3	9	20	11.21
WSW	0	0	0	0	1	5	2	3	6	4	1	12	34	10.14
W	0	0	0	0	0	2	0	1	6	1	1	3	14	[illegible]
WNW	0	0	0	0	1	1	2	1	1	0	1	4	11	[illegible]
NW	0	0	0	0	1	1	2	2	3	1	0	2	12	[illegible]
NNW	0	0	0	1	1	3	0	3	1	2	0	1	12	[illegible]
N	0	0	0	1	1	2	0	1	2	0	0	2	9	[illegible]
CALM													0	0.
TOTAL	0	0	1	2	5	25	18	25	40	30	[illegible]	73	[illegible]	[illegible]

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

TABLE 2.3-104B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: JUNE, 1975

PASQUILL #E# (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
			UPPER CLASS INTERVALS OF WIND SPEED (MPH)											
NNE	0	0	0	0	1	0	0	1	0	1	0	2	5	8.79
NE	0	0	1	1	0	0	1	1	2	1	3	1	11	8.39
ENE	0	0	0	1	1	1	1	4	4	4	1	10	27	9.94
E	0	0	2	0	1	0	1	2	1	3	2	7	19	9.42
ESE	0	0	0	0	0	0	1	1	0	2	2	2	8	10.36
SE	0	0	0	0	1	0	0	0	1	2	0	4	8	10.56
SSE	0	0	0	0	0	0	1	0	1	2	2	4	10	10.81
S	0	0	0	0	0	0	0	1	1	1	1	5	9	11.79
SSW	0	0	0	1	0	0	1	2	4	1	2	7	18	9.99
SW	0	0	0	0	1	1	0	1	2	3	4	5	17	9.72
WSW	0	0	0	0	0	0	0	1	1	0	2	9	13	11.82
W	0	0	0	0	0	0	2	2	3	3	1	1	12	8.84
WNW	0	0	1	0	0	0	0	3	1	0	0	1	6	8.00
NW	0	0	0	0	0	1	2	2	0	1	0	1	7	7.91
NNW	0	0	1	0	0	0	2	0	2	0	0	1	6	7.42
N	0	0	0	1	0	0	0	0	1	0	0	0	2	5.65
CALM													1	.70
TOTAL	0	0	5	4	5	3	12	21	24	24	20	60	179	9.67

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL #F# (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
			UPPER CLASS INTERVALS OF WIND SPEED (MPH)											
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	1	1	1	0	0	0	0	0	0	3	4.73
ENE	0	0	0	0	0	2	0	0	1	2	0	0	5	7.64
E	0	0	0	0	0	1	0	0	1	1	1	3	7	10.20
ESE	0	0	0	0	0	0	1	0	0	0	0	4	5	11.98
SE	0	0	0	0	0	1	0	1	1	0	2	2	7	10.73
SSE	0	0	0	0	0	0	1	0	0	2	0	1	4	10.07
S	0	0	0	0	0	0	0	0	0	0	0	1	1	16.30
SSW	0	0	0	0	0	0	0	0	2	0	0	4	6	11.82
SW	0	0	0	0	1	2	0	0	2	0	0	9	14	11.56
WSW	0	0	0	0	0	1	0	0	0	1	0	2	4	10.35
W	0	0	0	0	1	0	0	0	1	0	0	2	4	9.77
WNW	0	0	0	0	0	0	0	2	0	0	0	1	3	9.10
NW	0	0	0	0	1	1	1	0	4	4	1	1	13	8.45
NNW	0	0	1	0	0	0	0	0	2	0	0	1	4	7.78
N	0	0	0	0	0	0	1	0	0	0	0	0	1	5.60
CALM													0	0.
TOTAL	0	0	1	1	4	9	4	3	14	10	4	31	61	9.92

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL #G# (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
			UPPER CLASS INTERVALS OF WIND SPEED (MPH)											
NNE	0	0	0	0	0	1	0	0	1	1	0	0	3	7.90
NE	0	0	0	0	0	0	0	2	1	0	0	2	5	10.30
ENE	0	0	0	0	0	0	0	0	0	0	0	1	1	12.10
E	0	0	0	0	0	0	0	0	2	1	0	1	4	10.00
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	1	0	0	1	0	0	0	0	2	6.15
SSE	0	0	0	0	0	0	0	0	1	0	0	1	2	11.30
S	0	0	0	0	0	1	0	0	0	0	0	3	4	10.99
SSW	0	0	0	0	0	0	0	0	0	0	0	2	2	14.85
SW	0	0	0	0	0	0	0	0	0	1	1	4	6	12.15
WSW	0	0	0	0	1	0	0	0	1	0	1	2	5	10.48
W	0	0	1	1	0	0	0	0	0	0	0	0	2	2.80
WNW	0	0	0	0	0	0	1	1	0	1	0	1	4	9.47
NW	0	0	0	1	1	1	0	0	0	1	0	0	4	5.75
NNW	0	0	1	0	0	1	0	0	0	1	1	0	4	6.87
N	0	0	0	0	1	1	0	0	1	0	0	0	3	6.33
CALM													0	0.
TOTAL	0	0	2	2	4	5	1	4	7	6	3	17	51	9.29

NUMBER OF INVALID OBSERVATIONS = 0
T NUMBER OF OBSERVATIONS = 720

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
			UPPER CLASS INTERVALS OF WIND SPEED (MPH)											
NNE	0	0	0	0	1	2	1	4	3	5	1	2	19	8.41
NE	0	0	1	3	3	3	6	6	6	5	11	20	64	9.73
ENE	0	0	1	1	1	7	2	12	14	14	3	31	86	10.24
E	0	0	2	0	1	3	6	6	6	9	10	17	60	9.44
ESE	0	0	0	0	0	0	2	1	3	7	8	23	44	11.62
SE	0	0	0	0	2	3	1	2	4	5	2	14	33	10.54
SSE	0	0	0	0	0	0	5	1	3	6	3	10	28	10.61
S	0	0	0	0	0	2	1	4	3	1	2	14	27	11.19
SSW	0	0	0	1	0	4	1	3	8	3	4	20	44	10.82
SW	0	0	1	0	4	9	6	2	6	8	8	27	71	9.93
WSW	0	0	1	1	5	10	6	8	8	6	6	28	79	9.71
W	0	0	1	1	2	6	6	5	10	4	4	6	45	8.26
WNW	0	0	1	0	1	1	5	8	2	1	1	7	27	8.19
NW	0	0	0	2	6	5	5	5	9	7	1	4	44	7.60
NNW	0	0	3	1	1	4	2	4	5	3	1	3	27	7.11
N	0	0	0	2	2	4	2	3	4	0	0	1	20	7.37
CALM													1	.70
TOTAL	0	0	11	12	29	61	57	74	94	84	65	229	719	9.61

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 720

TABLE 2.3-105A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: JULY, 1975

PASQUILL "A" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.50
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	1	0	0	0	1	0	0	0	2	6.70
E	0	0	0	1	0	0	1	2	0	0	0	0	4	6.17
ESE	0	0	0	0	1	2	0	0	0	0	0	1	4	6.72
SE	0	0	0	0	0	0	0	1	0	0	0	0	1	7.20
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	0	0	0	1	2	0	0	0	1	0	1	5	7.20
SSW	0	0	0	0	0	0	0	0	0	0	0	1	1	12.40
SW	0	1	0	0	0	0	0	1	0	0	0	0	2	4.50
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	2	0	0	0	0	0	0	2	5.65
WNW	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.
NNW	0	0	0	0	0	0	0	0	1	1	0	0	2	8.60
N	0	0	0	0	0	1	0	0	0	0	0	0	1	5.50
CALM													0	0.
TOTAL	0	1	0	1	4	7	1	4	2	2	0	3	25	6.75

NUMBER OF INVALID OBSERVATIONS = 2
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "B" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.90
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	1	0	1	1	0	0	0	1	0	4	6.47
E	0	0	0	0	1	0	0	0	0	0	0	1	2	8.10
ESE	0	0	0	0	0	0	0	0	1	1	0	0	2	8.95
SE	0	0	0	0	0	0	0	0	1	0	0	0	1	9.00
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	0	0	0	1	1	0	0	0	0	0	0	2	5.25
SSW	0	0	0	0	0	0	0	0	1	0	0	2	3	10.53
SW	0	0	0	0	0	1	0	0	0	0	0	2	3	10.87
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	1	0	0	1	9.50
WNW	0	0	0	0	3	0	0	0	0	0	0	0	3	4.50
NW	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	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	0	1	6	3	1	0	3	2	1	5	22	7.85

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "C" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	1	1	28.00
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	1	1	0	0	0	0	0	0	2	4.50
E	0	0	0	0	0	0	0	1	0	1	0	0	2	8.90
ESE	0	0	0	0	0	1	0	1	0	0	0	0	2	6.90
SE	0	0	0	0	0	0	0	0	0	0	1	0	1	10.70
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	0	0	0	0	0	0	2	0	1	0	1	4	8.90
SSW	0	0	0	1	0	0	0	1	0	1	0	0	3	7.13
SW	0	0	0	0	0	0	0	1	2	1	1	1	6	9.23
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	1	0	0	0	1	0	0	0	0	2	5.60
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	1	0	1	0	0	0	0	0	2	5.25
NNW	0	0	0	1	0	0	0	0	1	0	0	0	2	5.75
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	0	3	2	2	1	7	3	4	2	3	27	8.16

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "D" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.60
NE	0	1	2	0	0	0	0	0	0	0	0	0	3	2.03
ENE	0	0	0	0	0	0	0	1	0	0	0	0	1	7.10
E	0	0	0	2	0	0	1	1	0	1	0	0	5	5.96
ESE	0	0	1	0	0	1	0	1	0	0	0	0	3	4.93
SE	0	0	0	0	0	0	0	2	2	2	0	5	11	10.61
SSE	0	0	0	0	0	1	0	1	2	2	1	8	15	11.71
S	0	0	0	0	0	2	1	4	6	4	2	8	27	9.88
SSW	0	0	0	2	0	2	2	4	4	5	3	2	24	8.30
SW	0	0	1	1	1	0	4	2	1	5	4	5	24	9.10
WSW	0	0	1	0	0	2	2	4	2	7	2	4	24	8.65
W	0	0	0	0	1	1	1	2	2	1	0	2	10	8.81
WNW	0	0	1	0	1	0	0	0	0	0	0	2	4	8.20
NW	0	0	0	2	0	0	1	0	0	0	0	3	6	8.[illegible]
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	1	1	0	0	0	0	0	0	0	0	2	1.50
CALM													0	0.
TOTAL	0	1	7	8	3	10	12	22	19	27	12	39	160	8.91

NUMBER OF INVALID OBSERVATIONS = 8
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-105B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: JULY, 1975

PASQUILL "E" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
				UPPER CLASS INTERVALS OF WIND SPEED (MPH)										
NNE	0	0	1	1	1	2	0	0	0	0	0	0	5	4.20
NE	0	0	1	0	6	2	1	3	3	1	2	1	20	6.90
ENE	0	0	0	3	2	2	2	2	1	0	1	2	15	7.12
E	0	1	0	1	1	1	1	1	0	3	1	1	11	7.49
ESE	0	0	0	0	2	0	1	0	6	3	1	4	17	9.34
SE	0	0	0	1	3	3	1	2	2	3	0	4	19	7.67
SSE	0	0	0	1	3	3	1	2	3	3	5	13	34	9.74
S	0	0	0	1	2	5	4	2	2	3	2	11	32	9.27
SSW	0	3	0	0	5	6	3	6	5	2	5	10	45	8.14
SW	0	0	1	0	4	5	3	4	6	3	5	20	51	9.52
WSW	0	0	0	1	0	2	1	3	3	3	6	3	22	9.12
W	0	0	0	0	0	1	1	0	0	3	0	1	6	8.20
WNW	0	0	0	1	0	0	0	0	1	0	0	0	2	5.80
NW	0	0	0	0	0	0	1	1	1	0	0	2	5	10.78
NNW	0	0	0	1	0	1	0	0	1	2	0	1	6	8.30
N	0	1	0	0	1	1	0	1	1	1	1	0	7	6.97
CALM													1	.60
TOTAL	0	5	3	11	30	34	20	27	35	36	29	73	298	8.69

NUMBER OF INVALID OBSERVATIONS = 52
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
				UPPER CLASS INTERVALS OF WIND SPEED (MPH)										
NNE	0	0	0	1	0	0	0	0	0	0	0	1	2	7.90
NE	0	0	2	1	0	1	1	0	0	0	0	0	5	4.16
ENE	0	0	1	1	2	2	5	2	0	1	0	2	16	6.65
E	0	0	0	1	0	0	0	1	3	0	2	2	9	9.29
ESE	0	0	0	0	0	0	1	2	1	2	0	0	6	8.25
SE	0	0	0	0	0	1	0	1	0	0	0	1	3	6.53
SSE	0	0	1	1	0	0	0	0	0	3	1	4	10	9.74
S	0	1	3	1	1	0	2	1	1	0	1	4	15	7.11
SSW	0	1	0	0	1	0	4	3	0	1	2	0	12	7.26
SW	0	0	0	2	2	1	0	0	0	1	1	0	7	[illegible]
WSW	0	1	1	0	0	2	1	0	0	0	0	0	5	4.36
W	0	0	0	1	1	0	1	0	0	0	0	0	3	[illegible]
WNW	0	0	0	0	0	0	0	1	0	0	0	0	1	[illegible]
NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NNW	0	0	1	1	0	0	0	0	0	0	0	0	2	3.50
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	3	9	10	7	7	15	11	5	8	7	14	96	7.16

NUMBER OF INVALID OBSERVATIONS = 20
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "G" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
				UPPER CLASS INTERVALS OF WIND SPEED (MPH)										
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	1	0	0	1	0	0	0	2	7.00
E	0	0	0	0	1	0	0	0	1	0	0	0	2	6.80
ESE	0	0	1	0	0	0	1	0	0	0	0	0	2	4.40
SE	0	0	0	0	0	0	0	0	0	1	0	1	2	10.25
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	0	0	0	1	0	0	0	0	0	0	1	2	8.65
SSW	0	0	0	0	0	0	0	0	1	1	0	0	2	8.85
SW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WSW	0	0	0	1	0	0	0	0	0	0	0	0	1	4.00
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	1	1	0	0	0	0	0	0	0	2	3.90
NW	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	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	1	2	3	1	1	0	3	2	0	2	15	6.90

NUMBER OF INVALID OBSERVATIONS = 15
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
				UPPER CLASS INTERVALS OF WIND SPEED (MPH)										
NNE	0	0	1	2	3	3	0	0	0	0	0	2	11	7.25
NE	0	1	5	1	6	3	2	3	3	1	2	1	28	5.49
ENE	0	0	1	5	6	7	8	5	3	1	2	4	42	6.77
E	0	1	0	5	3	1	3	6	4	5	3	4	35	7.66
ESE	0	0	2	0	3	4	3	4	8	6	1	5	36	8.08
SE	0	0	0	1	3	4	1	6	5	6	1	11	38	8.96
SSE	0	0	1	2	3	4	1	3	5	[illegible]	7	25	59	10.27
S	0	1	3	2	6	10	7	9	9	9	5	26	87	8.95
SSW	0	4	0	3	6	8	9	14	11	10	10	15	90	8.17
SW	0	1	2	3	7	7	7	8	9	10	11	28	93	[illegible]
WSW	0	1	2	2	0	6	4	7	5	10	8	7	52	[illegible]
W	0	0	0	2	2	4	3	3	2	5	0	3	24	7.19
WNW	0	0	1	2	5	0	0	1	1	0	0	2	12	[illegible]
NW	0	0	0	2	1	0	3	1	1	0	0	5	13	[illegible]
NNW	0	0	1	[illegible]	[illegible]	1	0	0	3	[illegible]	6	1	12	[illegible]
N	0	1	1	1	1	2	0	1	1	1	1	0	10	[illegible]
CALM													1	[illegible]
TOTAL	0	10	20	36	55	64	51	71	70	75	51	139	643	8.30

NUMBER OF INVALID OBSERVATIONS = 101
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-106A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: AUGUST, 1975

PASQUILL "A" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
					UPPER CLASS INTERVALS OF WIND SPEED (MPH)									
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.70
ENE	0	0	0	1	1	0	3	2	2	1	0	0	10	7.17
E	0	0	1	0	2	0	2	2	1	1	1	0	10	6.74
ESE	0	0	0	1	2	0	1	0	0	1	2	0	7	7.10
SE	0	0	0	0	1	1	0	0	0	0	0	0	2	4.05
SSE	0	0	1	2	2	0	0	0	0	0	0	0	5	3.72
S	0	0	0	1	3	0	1	2	0	0	0	0	7	6.54
SSW	0	0	1	1	3	0	0	0	2	0	2	3	12	7.77
SW	0	0	0	3	0	11	4	2	2	0	1	4	27	7.00
WSW	0	0	0	1	1	2	0	1	1	0	0	0	6	5.80
W	0	0	1	1	1	1	0	0	0	0	0	0	4	3.77
WNW	0	0	1	1	0	2	0	0	0	0	0	0	4	4.32
NW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.40
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	5	12	17	18	11	9	8	3	6	7	96	6.61

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "B" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
					UPPER CLASS INTERVALS OF WIND SPEED (MPH)									
NNE	0	0	0	0	0	0	1	0	0	0	0	0	1	6.60
NE	0	0	0	0	0	1	0	1	0	0	0	0	2	6.65
ENE	0	0	0	0	0	1	0	0	1	0	0	0	2	7.05
E	0	0	0	0	0	0	0	0	1	1	0	0	2	6.85
ESE	0	0	0	1	0	0	0	0	0	0	0	0	1	3.70
SE	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.
S	0	0	0	1	0	0	0	0	0	0	0	0	1	3.20
SSW	0	0	0	0	0	0	1	0	1	0	2	0	4	9.15
SW	0	0	0	0	1	0	2	1	1	0	0	4	9	9.12
WSW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.70
W	0	0	1	0	0	0	0	0	0	0	0	0	1	2.60
WNW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.10
NW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.50
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	1	2	4	2	4	2	4	1	2	4	26	7.59

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "C" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
					UPPER CLASS INTERVALS OF WIND SPEED (MPH)									
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	1	0	1	2	11.10
ENE	0	0	0	0	0	1	0	0	0	1	1	1	8	9.87
E	0	0	0	0	0	0	0	1	0	0	0	0	1	7.20
ESE	0	0	0	0	0	0	1	0	0	0	0	0	1	6.60
SE	0	0	1	0	1	2	0	0	0	0	0	0	4	4.60
SSE	0	0	0	1	0	0	0	0	1	0	0	0	2	6.10
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	0	0	0	1	0	0	0	2	0	0	1	3	7	9.69
SW	0	0	0	0	0	1	2	4	4	1	0	3	15	8.72
WSW	0	1	0	0	1	3	0	2	0	0	0	0	7	5.46
W	0	0	0	1	1	0	0	0	0	0	0	0	2	3.85
WNW	0	0	1	0	3	0	0	0	0	0	0	0	4	4.97
NW	0	0	0	0	1	1	0	0	0	0	0	0	2	5.00
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	1	2	3	7	8	1	9	5	5	2	10	55	7.57

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "D" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
					UPPER CLASS INTERVALS OF WIND SPEED (MPH)									
NNE	0	0	0	0	0	0	1	0	1	0	1	0	3	8.80
NE	0	0	0	0	0	1	2	4	3	9	4	1	26	9.36
ENE	0	0	2	0	0	0	0	4	6	2	1	1	18	8.59
E	0	0	2	1	1	0	3	1	1	1	0	1	11	6.42
ESE	0	0	0	1	0	1	2	0	0	1	2	0	7	7.30
SE	0	0	1	2	2	0	0	0	0	0	0	0	5	[illegible]
SSE	0	0	0	1	0	0	0	3	0	0	0	1	5	7.04
S	0	0	0	0	0	2	1	1	1	1	2	0	8	8.10
SSW	0	0	0	0	1	2	2	3	2	6	1	2	19	8.60
SW	0	1	0	3	3	2	2	5	3	4	5	12	40	8.83
WSW	0	0	1	1	2	3	4	3	7	6	4	5	36	8.34
W	0	0	0	1	2	1	2	4	2	1	1	1	15	7.60
WNW	0	0	1	0	1	1	2	3	0	0	0	0	8	6.17
NW	0	0	1	2	1	2	1	1	2	0	0	1	11	[illegible]
NNW	0	0	0	1	0	1	1	0	1	0	0	0	4	6.12
N	0	0	0	0	0	0	0	0	1	0	0	0	1	8.00
CALM													0	0.
TOTAL	0	1	8	13	13	16	21	12	19	11	21	29	217	[illegible]

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-106B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: AUGUST, 1975

PASQUILL "E" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	0	1	0	1	1	1	0	1	5	8.56
NE	0	0	1	0	0	1	1	2	2	4	0	0	11	7.49
ENE	0	0	0	0	1	1	0	4	0	1	2	1	10	8.25
E	0	0	0	0	0	1	2	3	0	2	0	2	10	9.10
ESE	0	0	0	1	0	0	0	0	3	2	0	0	6	8.08
SE	0	1	0	0	1	0	0	0	2	0	0	0	4	5.77
SSE	0	0	1	1	0	0	0	1	1	0	1	5	10	11.67
S	0	1	1	0	1	1	2	1	2	0	1	6	16	8.76
SSW	1	0	0	0	0	2	1	5	7	3	5	20	44	10.32
SW	0	0	1	0	2	2	2	3	4	9	6	22	51	10.23
WSW	0	1	0	0	2	1	1	1	4	1	1	2	14	7.90
W	0	0	0	1	1	0	2	1	1	3	0	0	9	7.36
WNW	0	1	0	1	1	2	0	0	0	0	0	0	5	4.26
NW	0	0	0	1	1	0	0	0	0	0	0	0	2	4.10
NNW	0	0	0	0	0	0	0	1	0	0	0	0	1	7.20
N	0	0	0	0	0	0	1	0	0	0	0	0	1	6.70
CALM													1	.50
TOTAL	1	4	4	5	10	12	12	23	27	26	16	59	200	9.13

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	1	0	1	2	0	0	1	5	8.48
ENE	0	1	0	0	0	0	0	0	0	2	0	3	6	9.70
E	0	0	0	0	0	0	0	0	0	0	0	1	1	11.90
ESE	0	0	0	0	0	0	0	0	0	0	1	0	1	10.10
SE	0	0	0	0	1	0	0	0	0	0	1	2	4	10.12
SSE	0	1	0	3	0	2	1	3	0	0	1	2	13	6.55
S	0	1	1	1	2	0	0	1	2	0	3	3	14	8.41
SSW	0	0	0	0	0	2	3	4	2	2	0	13	26	10.33
SW	0	2	0	1	2	1	1	6	2	2	1	3	21	7.48
WSW	0	0	1	0	0	0	0	0	0	0	3	1	5	9.20
W	0	1	1	1	0	0	1	0	1	1	0	1	7	6.11
WNW	0	0	0	1	1	0	1	1	1	0	0	0	5	6.24
NW	0	0	0	2	0	0	0	0	0	0	0	0	2	3.90
NNW	0	1	0	0	1	0	1	0	0	0	0	0	3	4.30
N	0	1	0	0	0	0	0	0	0	0	0	0	1	1.30
CALM													1	[illegible]
TOTAL	0	8	3	9	7	6	8	16	10	7	10	30	115	8.13

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "G" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	1	0	0	1	0	0	1	3	8.67
ENE	0	0	2	0	0	0	0	0	0	0	0	0	2	2.40
E	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.
SE	0	0	0	0	0	0	0	0	1	0	0	2	3	11.27
SSE	0	0	0	1	0	0	0	0	1	0	0	1	3	7.90
S	0	0	0	0	0	0	0	0	2	0	0	0	2	8.55
SSW	0	0	1	0	0	0	1	0	0	3	0	0	5	7.47
SW	0	0	1	0	0	1	1	0	0	0	0	0	3	4.83
WSW	0	0	0	0	0	0	0	1	0	0	0	0	1	7.10
W	0	0	0	0	1	1	1	0	0	0	0	0	3	5.61
WNW	0	0	0	0	1	1	1	0	0	0	0	0	5	5.58
NW	0	0	0	0	0	0	0	0	1	0	0	0	1	8.80
NNW	0	0	0	0	0	0	0	0	0	1	0	0	1	9.80
N	0	0	0	0	0	1	0	0	1	0	0	0	2	6.85
CALM													1	.50
TOTAL	0	0	4	1	2	7	4	1	7	4	0	4	35	6.91

NUMBER OF INVALID OBSERVATIONS = 0
OTAL NUMBER OF OBSERVATIONS = 744

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	0	1	2	1	2	1	1	1	9	8.62
NE	0	0	1	0	0	6	3	8	8	14	4	6	50	8.75
ENE	0	1	4	1	2	3	3	10	9	9	4	10	56	8.30
E	0	0	3	1	3	1	7	7	3	5	1	4	35	7.59
ESE	0	0	0	4	2	1	4	0	3	4	5	0	23	7.44
SE	0	1	2	2	6	3	0	0	3	0	1	4	22	6.55
SSE	0	1	2	9	2	2	1	7	3	0	2	9	38	7.79
S	0	2	2	3	6	3	4	5	7	1	6	9	48	7.95
SSW	1	0	2	2	4	6	8	14	14	14	11	41	117	9.54
SW	0	3	2	7	8	16	14	21	16	16	13	48	166	8.76
WSW	0	2	2	2	7	9	5	8	12	7	8	8	70	7.76
W	0	1	3	5	6	3	6	5	4	5	1	2	41	6.39
WNW	0	1	3	3	8	8	4	4	1	0	0	0	32	5.22
NW	0	0	1	5	5	3	1	1	1	0	0	1	20	5.91
NNW	0	1	0	1	1	1	2	1	1	1	0	0	9	6.06
N	0	1	0	0	0	1	1	0	2	0	0	0	5	6.10
CALM													1	.50
TOTAL	1	14	27	45	60	69	65	92	91	77	57	141	744	8.56

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-107A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: SEPTEMBER, 1975

PASQUILL *A* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	1	1	2	0	1	0	5	8.28
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	1	1	0	0	0	0	0	0	2	4.85
ESE	0	0	0	0	0	0	0	0	0	0	1	0	1	10.40
SE	0	0	0	1	0	1	1	1	0	0	0	0	4	5.47
SSE	0	0	0	2	0	0	0	0	0	0	1	1	4	7.62
S	0	0	0	0	0	0	2	1	0	2	1	1	7	8.40
SSW	0	0	1	1	0	0	0	1	1	0	0	0	4	5.57
SW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.50
WSW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.70
W	0	0	0	0	0	1	1	1	0	0	0	0	3	6.57
WNW	0	0	0	1	2	1	0	0	0	0	0	0	4	4.17
NW	0	0	0	0	1	0	2	2	0	0	0	0	5	6.40
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	1	7	4	4	7	7	3	2	4	2	41	6.81

NUMBER OF INVALID OBSERVATIONS = 2
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL *B* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	2	0	0	0	0	0	2	6.63
ENE	0	0	0	0	0	0	0	0	1	1	0	0	2	9.75
E	0	0	0	0	0	0	0	1	0	0	0	0	1	8.00
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	0	0	0	1	0	0	0	1	2	10.65
SSE	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	1	1	11.[illegible]
SSW	0	0	0	0	0	0	1	0	0	0	0	0	1	6.10
SW	0	0	0	1	0	0	0	0	0	0	0	0	1	[illegible]
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	1	0	0	0	1	8.00
NW	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	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	0	1	0	0	3	2	2	1	0	2	11	8.15

NUMBER OF INVALID OBSERVATIONS = 3
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL *C* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	2	1	2	5	10.88
NE	0	0	0	0	0	0	1	0	0	0	0	2	3	11.87
ENE	0	0	0	0	1	0	0	0	1	2	0	3	7	10.41
E	0	0	0	1	0	0	0	0	0	0	0	0	1	3.40
ESE	0	0	0	0	0	1	0	0	0	0	0	0	1	6.00
SE	0	0	0	1	1	0	0	0	0	0	0	3	5	9.22
SSE	0	0	0	0	0	0	0	0	1	0	0	0	1	8.40
S	0	0	0	1	0	0	1	0	0	1	0	0	3	6.50
SSW	0	0	0	0	0	0	0	1	0	0	0	0	1	8.00
SW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.70
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	1	2	0	0	0	0	0	0	0	3	4.43
WNW	0	0	1	0	0	1	0	0	0	0	0	0	2	4.10
NW	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	0	0	0.
N	0	0	0	0	0	0	0	0	0	1	1	0	2	10.45
CALM													0	0.
TOTAL	0	0	1	4	5	2	2	1	2	6	2	10	35	8.72

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL *D* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	1	0	0	0	3	2	2	5	7	6	10	36	9.58
NE	0	0	0	1	0	6	5	6	6	4	8	18	54	10.36
ENE	0	1	0	1	1	3	4	2	8	5	1	10	36	9.64
E	0	0	1	1	1	2	4	2	2	2	4	10	29	9.36
ESE	0	0	0	0	1	0	0	0	3	1	1	0	6	8.30
SE	0	0	0	0	1	1	0	0	2	2	2	9	17	12.25
SSE	0	0	0	0	0	0	0	2	1	0	3	5	11	14.28
S	0	0	0	0	0	0	2	4	1	0	1	4	12	11.82
SSW	0	0	0	0	1	2	4	0	3	3	2	5	20	9.69
SW	0	0	0	0	1	3	2	3	0	2	0	7	18	10.12
WSW	0	1	2	0	3	7	2	0	1	0	0	1	17	5.58
W	0	1	2	2	1	2	1	4	1	0	1	0	15	5.61
WNW	0	0	0	0	1	0	1	1	1	0	1	1	6	8.67
NW	0	0	0	0	2	2	0	0	0	0	0	0	4	5.22
NNW	0	0	0	0	0	0	1	1	1	1	0	0	4	7.92
N	0	0	0	0	0	0	2	1	1	0	2	0	6	8.25
CALM													1	.69
TOTAL	0	4	5	5	13	31	30	28	36	27	32	80	292	9.54

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

TABLE 2.3-107B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: SEPTEMBER, 1975

PASQUILL "E" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	2	0	0	1	0	0	0	4	7	14	10.11
NE	0	0	0	5	0	1	2	6	0	4	4	16	38	10.94
ENE	0	0	1	0	0	0	2	2	3	3	1	5	17	9.40
E	0	1	0	0	2	1	0	4	2	0	1	3	14	8.64
ESE	0	0	0	0	1	0	0	0	2	0	1	5	9	11.36
SE	0	2	0	0	1	0	0	1	2	3	1	10	20	10.31
SSE	0	0	0	0	0	0	0	2	3	3	4	8	20	11.49
S	0	0	0	0	0	0	1	0	2	3	1	5	12	10.62
SSW	0	1	0	0	0	4	2	2	0	6	2	11	28	9.47
SW	0	1	0	0	0	2	0	1	0	2	0	3	9	9.32
WSW	0	0	0	2	0	0	0	1	0	0	1	0	4	6.31
W	0	0	1	2	1	0	1	1	1	0	1	1	9	6.54
WNW	0	0	1	2	1	1	1	5	6	2	3	1	23	7.47
NW	0	0	3	1	0	1	1	3	1	3	0	0	13	6.46
NNW	0	0	2	0	2	0	0	0	1	3	1	1	10	7.36
N	0	0	0	1	2	0	0	0	0	1	0	0	4	5.60
CALM													0	0.
TOTAL	0	5	8	15	10	10	11	26	23	33	25	76	242	9.77

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	1	0	0	0	0	0	0	0	1	2	[illegible]
NE	0	0	0	0	1	0	0	0	0	0	0	10	11	13.26
ENE	0	0	0	0	0	0	0	0	0	0	2	2	4	11.15
E	0	0	0	0	0	1	0	0	0	0	0	2	3	10.47
ESE	0	0	0	0	0	0	0	1	1	0	0	0	2	8.15
SE	0	0	0	0	1	0	4	0	1	0	1	0	7	7.14
SSE	0	0	0	0	0	0	1	0	0	0	1	3	5	10.88
S	0	0	0	1	0	1	0	0	0	0	0	5	7	11.17
SSW	0	0	0	0	0	0	1	0	0	1	0	0	2	[illegible]
SW	0	0	0	0	0	0	0	2	0	1	0	2	5	10.44
WSW	0	0	0	0	0	0	0	0	1	2	1	1	5	9.78
W	0	0	0	0	0	0	0	1	0	0	0	1	2	9.35
WNW	0	0	0	0	0	1	2	0	0	0	0	0	3	6.47
NW	0	0	0	1	0	0	0	1	0	0	1	0	3	7.13
NNW	0	0	0	0	0	0	0	0	0	2	0	0	2	9.27
N	0	0	0	0	1	0	0	0	0	0	0	0	1	[illegible]
CALM													0	0.
TOTAL	0	0	0	3	3	3	8	5	3	6	6	27	64	9.94

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "G" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	1	1	13.90
ENE	0	0	0	0	0	0	0	0	0	0	1	1	2	11.30
E	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.
SE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.40
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	0	1	0	0	0	0	0	0	0	0	0	1	2.90
SSW	0	0	0	0	0	0	1	0	0	0	0	0	1	6.60
SW	0	0	0	1	2	2	1	0	0	0	0	0	6	5.25
WSW	0	0	0	0	0	0	1	0	1	0	0	0	2	7.75
W	0	0	0	0	0	1	0	1	0	1	0	1	4	8.62
WNW	0	0	0	0	0	0	1	1	2	0	0	0	4	7.90
NW	0	0	0	0	0	0	0	0	1	1	0	0	2	9.10
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	1	1	3	3	4	2	4	2	1	3	24	7.67

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	1	0	3	0	3	4	3	7	9	12	20	62	9.49
NE	0	0	0	6	1	7	10	10	6	9	12	47	108	10.85
ENE	0	1	1	1	2	3	6	4	13	11	5	23	70	9.60
E	0	1	1	2	4	5	4	7	4	2	5	16	51	8.51
ESE	0	0	0	0	2	1	0	1	6	1	3	5	19	9.72
SE	0	2	0	2	5	2	5	3	5	5	4	23	56	10.01
SSE	0	0	0	2	0	0	1	4	5	[illegible]	0	17	41	11.71
S	0	0	1	2	0	1	6	6	3	6	3	16	43	10.47
SSW	0	1	1	1	1	6	9	5	4	10	4	16	58	[illegible]
SW	0	1	0	3	4	7	4	[illegible]	0	5	0	12	41	[illegible]
WSW	0	1	2	3	1	7	3	1	1	2	2	2	[illegible]	6.49
W	0	1	1	5	4	4	3	6	2	1	2	3	[illegible]	6.37
WNW	0	0	2	1	4	4	5	7	10	2	4	2	41	7.31
NW	0	0	1	2	1	1	1	1	2	4	1	1	[illegible]	[illegible]
NNW	0	0	2	0	2	0	1	1	2	1	1	1	[illegible]	7.79
N	0	0	0	1	1	0	2	1	1	2	1	0	[illegible]	[illegible]
CALM													1	[illegible]
TOTAL	1	[illegible]	16	[illegible]	38	53	65	72	73	76	76	283	716	9.26

NUMBER OF INVALID OBSERVATIONS = 4
TOTAL NUMBER OF OBSERVATIONS = 720

TABLE 2.3-108A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: OCTOBER, 1975

PASQUILL *A* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	0	0	0	0	0	0	0	2	2	23.35
NE	0	0	0	0	0	1	0	0	0	1	0	0	2	7.70
ENE	0	0	0	0	0	0	0	0	1	0	0	0	1	8.70
E	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.
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSE	0	0	0	1	0	0	0	0	0	0	0	0	1	3.80
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.40
SW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	1	0	0	0	0	0	0	0	0	0	1	2.60
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	1	0	0	0	0	0	0	0	0	0	0	1	1.60
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	1	1	2	0	1	0	0	1	1	0	2	9	9.21

NUMBER OF INVALID OBSERVATIONS = 2
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL *B* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	0	0	0	0	0	0	0	2	2	23.35
NE	0	0	0	0	0	0	0	1	0	0	1	0	2	8.45
ENE	0	0	0	0	0	0	0	0	1	0	1	0	2	9.20
E	0	0	0	0	0	0	0	0	1	0	0	0	1	8.70
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	1	0	0	0	0	0	0	0	1	4.80
SSE	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	0	0	0.
SSW	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.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	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.
NW	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	0	0	0.
N	0	0	0	0	0	2	0	0	0	0	0	0	2	5.65
CALM													0	0.
TOTAL	0	0	0	0	1	2	0	1	2	0	2	2	10	10.78

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL *C* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	1	0	0	1	2	1	0	1	0	1	7	8.31
NE	0	0	0	1	0	1	0	0	1	0	1	2	6	9.70
ENE	0	0	0	0	1	1	0	3	0	0	1	0	6	7.17
E	0	0	0	0	0	1	0	1	1	0	0	0	3	7.13
ESE	0	0	0	0	0	0	1	0	0	0	0	0	1	6.80
SE	0	0	0	0	1	0	1	0	0	0	0	0	2	5.60
SSE	0	0	0	1	0	0	0	0	0	0	0	1	2	7.65
S	0	0	0	1	1	0	0	0	1	0	0	0	3	5.33
SSW	0	0	1	0	0	0	2	0	0	0	0	0	3	5.07
SW	0	0	0	0	0	1	1	0	0	1	0	0	3	7.27
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	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.
NW	0	0	0	0	1	0	0	0	1	0	0	1	3	7.83
NNW	0	0	0	2	0	1	0	1	1	0	0	1	6	7.02
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	2	5	4	6	7	6	5	2	2	6	45	7.26

NUMBER OF INVALID OBSERVATIONS = 2
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL *D* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	1	0	1	0	2	2	5	4	8	21	11.50
NE	0	0	0	0	2	0	1	1	3	4	1	8	20	10.42
ENE	0	0	1	0	3	2	4	3	2	4	1	4	24	9.22
E	0	0	0	0	1	2	3	1	1	0	0	0	8	6.40
ESE	0	0	0	0	2	2	2	1	0	0	0	0	7	5.81
SE	0	0	0	1	0	0	0	1	0	0	0	3	5	12.14
SSE	0	0	1	0	0	1	0	0	2	0	0	3	7	8.63
S	0	1	0	2	0	0	0	0	0	0	0	3	6	14.75
SSW	0	0	0	1	1	1	1	0	1	0	0	0	6	5.93
SW	0	0	2	0	1	2	3	4	5	4	5	9	35	9.23
WSW	0	0	0	0	2	2	1	1	0	3	1	5	15	9.21
W	0	0	0	2	1	0	1	3	0	0	0	2	9	7.47
WNW	0	0	0	1	1	2	1	1	1	0	0	0	7	5.67
NW	0	0	0	0	2	4	1	5	2	0	1	1	18	7.00
NNW	0	0	2	2	1	1	2	3	2	5	0	2	20	7.67
N	0	0	0	1	1	2	0	1	1	0	0	1	7	7.59
CALM													0	0.
TOTAL	0	1	6	11	17	26	22	21	22	25	14	49	[illegible]	8.78

NUMBER OF INVALID OBSERVATIONS = 4
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-108B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: OCTOBER, 1975

PASQUILL "E" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	1	2	1	0	4	1	0	2	15	26	11.32
NE	0	0	1	0	1	1	3	3	3	5	7	14	38	10.55
ENE	0	0	0	1	0	0	0	0	3	0	2	2	8	9.11
E	0	0	1	0	2	2	2	0	0	0	0	1	8	5.80
ESE	0	0	0	0	0	0	3	1	0	0	1	7	12	12.06
SE	0	0	0	0	0	0	1	0	0	0	1	11	13	14.60
SSE	0	0	0	0	0	0	0	0	0	0	0	3	3	25.71
S	0	0	0	0	1	1	0	0	0	0	1	2	5	13.00
SSW	0	0	0	0	0	2	0	0	0	1	2	6	11	11.42
SW	0	0	0	0	1	1	3	1	1	2	1	12	22	10.74
WSW	0	0	0	0	1	0	1	0	1	0	1	14	18	11.89
W	0	1	2	1	1	0	1	0	1	0	1	10	18	9.60
WNW	0	0	0	0	2	0	0	1	0	0	1	0	4	6.77
NW	0	0	1	1	1	0	1	1	0	0	0	0	7	5.01
NNW	0	1	0	0	2	1	0	1	0	1	0	0	6	5.42
N	0	1	0	0	2	0	1	2	2	0	2	0	10	7.61
CALM													0	0.
TOTAL	0	3	5	4	18	9	16	14	12	9	22	97	209	10.59

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	1	0	0	1	0	0	0	0	0	6	8	10.75
NE	0	0	0	1	0	1	0	0	1	1	2	16	22	12.09
ENE	0	0	1	0	0	0	0	1	0	1	4	4	11	10.65
E	0	0	0	1	0	0	0	0	2	0	2	4	9	10.60
ESE	0	0	0	0	0	0	1	0	1	0	3	5	10	11.19
SE	0	0	0	1	0	0	0	0	0	0	0	8	9	13.12
SSE	0	0	0	0	0	0	0	0	0	0	0	5	5	15.[illegible]
S	1	0	0	0	0	0	0	0	0	2	0	1	4	8.27
SSW	0	0	0	0	0	0	0	1	0	0	2	7	10	11.44
SW	0	0	1	0	0	0	0	0	0	1	0	8	10	12.43
WSW	0	0	0	0	0	0	0	0	0	0	2	0	2	10.60
W	0	0	0	0	1	0	1	1	1	0	0	3	7	9.16
WNW	0	0	0	0	0	0	1	0	1	0	0	1	3	8.[illegible]
NW	0	0	0	0	0	0	0	0	0	1	0	0	1	4.[illegible]
NNW	0	0	1	2	1	1	0	1	0	0	0	1	7	5.[illegible]
N	0	0	0	0	0	1	1	2	0	0	0	0	4	[illegible]
CALM													0	0.
TOTAL	1	0	4	5	2	4	4	6	6	6	15	69	122	11.12

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL "G" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	3	0	0	0	0	0	0	2	1	2	8	7.36
NE	0	0	3	1	2	1	0	1	0	1	1	4	14	7.47
ENE	0	1	1	1	2	1	0	0	2	0	0	2	10	6.48
E	0	1	2	0	0	0	0	0	0	1	1	4	9	9.51
ESE	0	0	1	0	0	0	0	0	0	0	0	0	1	2.60
SE	0	0	0	0	0	0	1	0	0	0	0	4	5	12.52
SSE	0	1	0	1	0	0	0	0	0	0	1	1	4	6.62
S	0	1	1	0	0	0	1	0	0	1	0	0	4	5.22
SSW	0	0	0	3	1	0	0	0	2	0	0	1	7	6.23
SW	0	0	0	2	0	0	2	0	3	1	0	7	15	9.99
WSW	0	0	0	3	0	1	0	0	2	4	2	4	16	8.76
W	0	0	0	0	1	0	1	1	2	0	0	2	9	7.73
WNW	0	0	1	1	0	0	1	0	0	0	0	0	3	4.10
NW	0	0	0	1	0	1	0	0	1	0	0	0	3	5.90
NNW	0	0	0	1	1	0	2	0	1	0	0	0	5	5.49
N	0	0	2	2	0	0	1	0	0	1	2	0	10	6.70
CALM													1	.70
TOTAL	0	4	14	16	9	4	9	2	11	11	8	31	124	7.71

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	5	2	2	4	2	7	3	8	7	36	76	11.2[illegible]
NE	0	0	4	3	5	5	4	6	8	12	14	44	[illegible]	10.63
ENE	0	1	3	2	6	4	4	7	9	5	9	12	62	9.[illegible]
E	0	1	3	1	3	5	5	2	5	1	1	9	38	8.12
ESE	0	0	1	0	2	2	7	2	1	0	4	12	31	9.36
SE	0	0	0	2	2	0	1	1	0	0	1	27	35	12.06
SSE	0	1	1	1	0	1	0	0	2	0	1	11	22	11.89
S	1	2	1	1	2	1	1	0	1	1	1	6	22	10.15
SSW	0	0	1	5	1	5	3	1	1	1	4	14	38	9.02
SW	0	0	1	2	2	4	9	5	4	9	6	16	65	10.64
WSW	0	0	0	3	3	3	2	1	1	7	6	21	51	10.04
W	0	1	1	3	6	0	4	5	4	0	1	17	44	9.55
WNW	0	0	1	2	1	2	3	2	2	0	1	1	17	6.29
NW	0	1	1	2	6	5	4	4	4	1	1	2	11	6.[illegible]
NNW	0	1	1	7	5	4	4	6	4	1	0	4	44	6.17
N	0	1	2	1	1	5	1	5	1	1	4	1	11	7.00
CALM													1	.70
TOTAL	1	9	32	43	51	50	56	56	61	56	62	[illegible]	7[illegible]	9.44

NUMBER OF INVALID OBSERVATIONS = 8
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-109A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: NOVEMBER, 1975

PASQUILL "A" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	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.
SE	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.
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	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.
WSW	0	1	0	0	0	0	0	0	0	0	0	0	1	1.33
W	0	1	0	0	0	0	0	0	0	0	0	0	1	1.59
WNW	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.
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	2	0	0	0	0	0	0	0	0	0	0	2	1.45

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "B" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.75
SE	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.
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	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.
WSW	1	1	0	0	0	0	0	0	0	0	0	0	2	1.61
W	0	0	0	0	1	0	0	0	0	0	0	0	1	4.46
WNW	0	0	1	2	0	0	0	0	0	0	0	0	3	3.13
NW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.30
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	1	1	1	3	1	1	0	0	0	0	0	0	8	3.24

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "C" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	1	0	0	0	1	8.00
NE	1	0	0	0	0	0	0	0	0	0	0	0	1	1.09
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	0	0	0	0	1	0	1	2	10.75
SE	0	0	1	1	0	0	0	1	2	0	0	0	5	6.24
SSE	0	0	0	0	0	1	2	0	0	0	0	0	3	5.93
S	0	0	0	0	0	0	0	0	0	0	0	1	1	11.50
SSW	0	1	0	1	0	0	0	0	0	0	0	0	2	2.65
SW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.50
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	1	0	0	0	0	0	0	0	0	0	1	1.06
WNW	0	0	0	1	0	0	0	0	0	0	0	0	1	1.29
NW	0	0	1	1	0	1	0	0	0	0	0	1	4	7.85
NNW	0	1	0	0	0	0	0	0	0	0	0	0	1	1.59
N	0	1	0	1	1	0	1	0	0	0	1	0	5	5.16
CALM													0	0.
TOTAL	1	3	3	5	2	2	3	1	3	1	1	3	28	6.00

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "D" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	1	1	1	0	0	1	0	0	2	1	7	7.14
NE	0	0	0	0	1	2	0	1	1	2	1	2	10	8.82
ENE	0	0	0	0	0	1	1	1	2	1	1	0	7	8.05
E	0	0	1	1	0	1	2	0	2	0	0	3	10	7.55
ESE	0	0	0	0	0	2	1	0	0	1	0	0	4	6.82
SE	0	0	0	0	2	1	0	0	1	1	1	4	10	9.07
SSE	0	1	0	0	1	1	1	2	1	4	[illegible]	3	14	8.59
S	0	0	0	0	0	0	0	0	1	0	4	11	[illegible]	12.3[illegible]
SSW	1	0	0	0	0	0	1	1	1	2	2	5	13	10.65
SW	0	[illegible]	1	0	1	4	1	1	1	1	[illegible]	[illegible]	1[illegible]	8.78
WSW	1	2	1	0	2	7	2	[illegible]	1	[illegible]	1	10	2[illegible]	10.14
W	1	1	4	0	1	3	1	1	1	2	2	10	2[illegible]	[illegible].41
WNW	0	0	2	1	0	1	1	0	0	1	1	11	1[illegible]	10.91
NW	0	1	2	0	4	0	0	0	0	1	2	14	2[illegible]	11.6[illegible]
NNW	0	0	4	2	0	1	1	2	1	4	4	7	[illegible]	9.2[illegible]
N	0	1	1	0	1	1	0	0	0	[illegible]	0	1	[illegible]	5.1[illegible]
CALM													[illegible]	[illegible]
TOTAL	[illegible]	12	17	5	14	22	12	16	13	24	21	65	[illegible]	[illegible]

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

2.3-182

AMENDMENT 97-01
AUGUST 1997

TABLE 2.3-109B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: NOVEMBER, 1975

PASQUILL "E" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	0	0	0	2	0	0	0	1	3	8.47
NE	0	0	0	0	0	2	0	0	0	0	0	2	4	10.25
ENE	0	1	0	0	0	0	1	3	3	3	0	1	12	8.99
E	0	0	0	1	0	0	1	0	1	1	1	1	6	8.33
ESE	1	0	1	0	0	0	0	2	1	2	2	3	12	9.65
SE	0	1	0	0	1	0	1	1	5	0	0	12	21	12.15
SSE	0	0	0	0	2	0	0	0	0	1	4	11	18	12.37
S	0	0	0	0	0	1	0	1	0	1	2	9	14	14.84
SSW	0	0	0	0	0	1	1	1	1	0	2	10	16	11.40
SW	1	0	0	0	0	2	0	0	1	1	1	9	15	10.10
WSW	1	0	0	1	0	0	0	1	0	0	1	6	10	10.[illegible]
W	0	1	0	0	1	0	1	0	0	2	3	8	16	11.07
WNW	0	0	0	2	1	0	1	1	1	0	0	4	10	8.79
NW	0	1	0	0	0	0	1	0	1	0	3	1	7	8.91
NNW	0	0	0	0	0	0	0	0	2	1	1	2	6	10.67
N	0	2	2	1	0	0	1	0	0	0	0	0	6	3.07
CALM													2	.60
TOTAL	3	6	3	5	5	6	9	12	16	12	20	80	178	10.48

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	1	0	0	1	0	0	0	0	2	6.05
NE	0	0	0	2	0	0	0	1	0	0	0	1	4	8.42
ENE	0	0	0	0	1	0	1	1	0	0	2	2	7	10.30
E	0	0	0	1	0	1	0	0	0	2	1	3	8	10.10
ESE	0	0	1	0	0	1	0	1	0	1	1	2	7	7.11
SE	0	0	0	1	1	0	1	0	0	1	0	14	18	12.61
SSE	0	1	0	0	1	1	2	0	3	1	0	6	15	11.14
S	0	1	0	0	0	0	0	0	0	0	0	1	2	9.30
SSW	0	0	1	0	0	1	0	0	0	0	0	0	2	4.50
SW	0	0	0	0	0	1	0	0	1	0	0	1	3	5.77
WSW	0	1	0	0	0	0	0	0	0	0	0	5	6	12.06
W	1	0	0	0	0	0	0	1	0	0	1	3	6	9.[illegible]
WNW	0	0	1	0	0	0	3	0	1	1	1	0	7	7.30
NW	0	1	0	0	0	0	0	1	2	1	0	0	5	7.12
NNW	0	0	0	0	1	0	0	0	0	1	0	0	2	7.25
N	0	0	0	0	0	2	0	0	1	0	0	0	3	6.30
CALM													1	.56
TOTAL	1	4	3	4	5	7	7	6	8	8	6	[illegible]	[illegible]	9.07

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL "G" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	1	1	0	0	2	1	2	1	3	0	0	11	5.59
NE	0	0	1	1	0	3	0	1	2	0	1	1	10	7.52
ENE	0	0	0	0	0	1	0	0	1	0	0	0	2	7.21
E	0	1	0	0	0	0	1	7	1	2	1	6	19	9.38
ESE	0	0	0	1	0	1	0	1	1	0	0	0	6	6.15
SE	0	1	1	1	4	2	1	2	0	0	0	1	13	5.36
SSE	0	0	0	2	0	0	0	0	1	0	0	3	6	9.65
S	1	0	1	1	0	2	0	1	0	0	0	2	8	6.51
SSW	0	2	0	2	0	0	0	0	0	0	1	0	5	4.02
SW	0	1	0	1	0	0	0	1	0	1	0	5	9	9.31
WSW	0	1	0	0	1	1	2	0	1	0	0	10	16	10.49
W	0	0	2	1	[illegible]	1	1	0	1	2	2	2	14	7.66
WNW	0	0	2	0	0	1	2	0	0	0	0	0	7	4.49
NW	0	2	0	1	2	2	0	0	1	2	0	0	10	5.38
NNW	1	2	0	0	2	6	0	0	1	1	0	0	13	4.88
N	0	0	0	0	0	1	1	1	1	1	0	0	7	7.10
CALM													8	.56
TOTAL	2	11	8	11	11	27	11	16	12	12	5	30	164	6.97

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 720

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	1	2	1	2	2	1	6	2	3	2	2	24	7.60
NE	1	0	1	3	1	7	0	3	3	2	2	6	29	8.26
ENE	0	1	0	0	1	2	3	5	6	4	3	3	28	8.58
E	0	1	1	3	5	2	4	7	4	5	3	11	41	8.08
ESE	1	0	2	1	0	7	1	4	2	5	3	6	32	8.65
SE	0	2	2	3	6	3	3	4	8	2	1	11	67	10.16
SSE	0	2	0	2	4	3	5	2	5	0	4	23	56	10.16
S	1	1	1	1	0	3	0	2	1	1	[illegible]	24	41	11.71
SSW	1	3	1	3	0	2	2	2	2	2	[illegible]	15	[illegible]	9.31
SW	1	1	1	1	2	7	1	2	1	1	1	10	[illegible]	8.56
WSW	1	6	1	1	1	8	4	1	2	2	2	11	[illegible]	10.07
W	2	1	7	1	5	1	3	2	2	6	8	21	[illegible]	7.17
WNW	0	1	6	6	1	4	7	1	2	2	2	15	[illegible]	8.10
NW	0	7	1	3	6	1	1	1	4	4	5	16	[illegible]	9.12
NNW	1	1	4	2	1	7	1	2	4	7	[illegible]	9	[illegible]	7.95
N	0	[illegible]	1	2	2	4	5	1	2	3	1	1	[illegible]	[illegible]
CALM													14	[illegible]
TOTAL	11	19	[illegible]	33	[illegible]	65	41	45	52	57	[illegible]	[illegible]	[illegible]	8.[illegible]

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 720

TABLE 2.3-110A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: DECEMBER, 1975

PASQUILL *A* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	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.
SE	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.
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	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.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	1	0	0	0	0	0	0	0	0	0	0	1	2.00
NW	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	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	1	0	0	0	0	0	0	0	0	0	0	1	2.[illegible]

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL *B* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	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.
SE	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.
S	0	1	0	0	0	0	0	0	0	0	0	0	1	1.[illegible]
SSW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.90
SW	0	0	0	0	0	1	0	0	0	0	0	0	1	5.70
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	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.
NW	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	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	1	0	0	1	1	0	0	0	0	0	0	3	4.[illegible]

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL *C* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	1	0	0	0	0	0	0	0	0	0	0	0	1	.80
ENE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.10
E	0	0	0	0	1	0	0	0	0	0	0	0	1	4.60
ESE	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.
SSE	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	0	0	0.
SSW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.90
SW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WSW	0	1	0	0	0	0	0	0	0	0	0	0	1	1.10
W	0	1	0	0	0	0	0	0	0	0	0	0	1	2.00
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	0	0	0	1	0	1	0	2	9.60
NNW	0	0	0	0	0	0	0	0	0	0	0	4	4	17.55
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													1	.[illegible]
TOTAL	1	2	0	0	2	1	0	0	1	0	1	4	11	8.36

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL *D* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	1	1	3	1	1	1	2	2	8	24	9.19
NE	0	1	0	2	3	9	6	2	5	5	5	4	40	7.98
ENE	0	0	1	0	1	3	2	1	0	4	2	4	18	8.42
E	0	1	0	1	0	1	3	0	0	2	0	0	8	6.15
ESE	0	0	1	1	0	2	0	0	0	1	0	0	5	5.40
SE	0	0	0	0	1	0	1	1	1	1	0	0	5	7.24
SSE	0	0	0	0	1	0	0	0	0	0	0	1	2	10.15
S	0	2	2	1	0	1	0	0	0	0	0	0	6	2.[illegible]
SSW	0	1	2	0	2	1	0	2	2	1	0	0	11	5.70
SW	0	1	2	1	1	0	0	1	4	2	2	16	30	12.11
WSW	0	0	0	1	1	1	0	0	3	2	1	17	26	15.35
W	0	0	1	1	4	2	2	0	1	[illegible]	2	1	14	7.63
WNW	0	2	2	2	0	2	5	2	1	[illegible]	0	1	[illegible]	5.76
NW	0	1	0	1	0	2	1	1	2	3	1	15	[illegible]	10.9[illegible]
NNW	0	1	0	0	2	0	1	1	0	1	1	9	16	10.8[illegible]
N	0	[illegible]	0	1	0	0	1	1	2	1	0	5	1[illegible]	[illegible]
CALM													1	[illegible]
TOTAL	[illegible]	12	11	13	12	21	21	15	24	9	18	81	27[illegible]	9.11

NUMBER OF INVALID OBSERVATIONS = 2
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-110B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: DECEMBER, 1975

PASQUILL *F* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	1	0	3	3	1	2	0	0	0	10	6.53
NE	0	0	0	0	0	1	2	2	3	3	1	5	17	9.42
ENE	0	0	1	2	0	0	2	1	2	6	1	4	19	9.45
E	0	1	0	0	0	0	0	5	1	2	0	6	15	9.67
ESE	1	0	0	0	0	1	0	0	3	0	0	3	8	9.24
SE	0	0	0	0	0	0	1	1	0	0	0	2	4	11.15
SSE	0	0	0	0	0	0	1	2	0	0	0	5	8	12.17
S	0	2	0	0	1	0	0	0	0	0	0	8	11	12.51
SSW	0	0	0	0	1	3	0	0	0	3	3	19	29	12.16
SW	0	0	0	0	1	0	1	3	5	2	2	22	36	12.49
WSW	0	0	0	0	0	2	0	0	4	2	3	15	26	11.15
W	0	0	1	0	0	0	0	1	2	2	1	3	10	9.53
WNW	0	0	0	0	0	1	0	1	1	1	2	1	7	9.36
NW	0	0	0	3	0	1	2	0	2	0	3	15	26	10.20
NNW	0	0	0	1	1	1	0	4	1	1	0	3	12	9.05
N	0	0	1	0	0	1	0	1	0	0	0	0	3	5.43
CALM													8	.52
TOTAL	1	3	3	7	4	14	12	22	26	22	16	111	249	10.27

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL *F* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	0	0	0	3	1	0	0	4	8.85
NE	0	0	0	0	0	1	0	0	0	1	0	3	5	12.04
ENE	0	0	0	0	0	0	0	0	0	0	0	1	1	14.70
E	0	0	0	0	1	0	1	0	0	1	1	2	6	9.75
ESE	0	1	0	0	0	0	0	0	0	0	0	0	1	1.90
SE	0	0	0	0	0	0	0	0	0	0	0	3	3	13.63
SSE	0	0	0	0	0	0	0	0	0	0	0	3	3	16.07
S	0	0	0	0	0	1	1	0	0	1	0	1	4	8.85
SSW	0	0	0	0	0	0	0	0	0	0	1	8	9	13.79
SW	0	0	0	0	0	0	0	0	0	0	1	3	4	11.35
WSW	0	0	0	0	0	0	0	0	0	1	0	1	2	12.25
W	0	0	0	0	0	0	0	0	1	0	1	0	2	9.23
WNW	0	0	0	0	0	0	0	0	1	0	2	0	3	9.70
NW	0	0	0	0	0	0	0	0	0	1	0	3	4	12.19
NNW	0	0	1	0	0	0	1	0	0	1	0	1	4	8.62
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	1	1	0	1	2	3	0	5	7	6	29	55	11.25

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 744

PASQUILL *G* (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	1	0	0	0	0	0	0	0	0	0	0	1	1.10
NE	0	1	1	1	0	0	0	0	0	0	0	3	6	8.10
ENE	0	0	0	0	1	0	1	0	0	0	0	2	4	11.15
E	0	0	0	0	0	0	0	2	2	1	0	1	6	8.93
ESE	0	2	0	0	1	0	1	1	1	0	1	5	12	8.94
SE	0	1	1	0	1	0	1	1	3	2	0	4	14	8.44
SSE	0	0	0	0	0	0	0	0	0	0	0	3	3	13.57
S	0	0	1	1	0	2	0	0	0	0	0	10	14	10.90
SSW	0	0	0	0	2	0	1	1	0	2	0	5	11	9.55
SW	0	1	0	1	1	0	0	1	0	0	3	5	12	9.91
WSW	0	1	0	0	2	0	0	1	1	4	3	12	24	10.65
W	0	0	0	0	0	0	2	0	2	1	0	0	5	8.12
WNW	1	0	0	0	0	0	0	1	0	2	1	2	7	8.79
NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NNW	1	0	0	0	1	0	0	0	2	0	0	0	4	5.57
N	0	0	0	0	1	0	0	0	0	0	0	1	2	8.49
CALM													20	.57
TOTAL	2	7	3	3	10	2	6	8	11	12	8	51	145	8.27

(NUMB)ER OF INVALID OBSERVATIONS = 0
(TOT)AL NUMBER OF OBSERVATIONS = 744

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	1	0	2	3	6	4	2	8	3	2	8	39	8.26
NE	1	2	1	3	1	11	6	4	8	9	6	15	69	9.54
ENE	0	0	2	2	2	4	5	2	2	10	3	11	43	9.20
E	0	2	0	1	2	1	4	7	1	6	1	9	36	8.65
ESE	1	1	1	1	1	3	1	1	4	1	1	8	26	8.08
SE	0	1	1	0	2	0	3	3	4	3	0	9	26	9.25
SSE	0	0	0	0	1	0	1	2	0	0	0	12	16	12.91
S	0	5	3	2	1	4	1	0	0	1	0	19	36	9.57
SSW	0	1	2	0	7	4	1	3	2	6	4	12	62	10.55
SW	0	2	2	2	1	1	1	5	9	4	6	46	83	12.01
WSW	0	2	0	1	1	3	0	1	8	7	7	45	79	12.20
W	0	1	2	1	4	2	4	1	6	3	6	4	32	7.72
WNW	1	1	2	2	0	3	5	4	3	5	5	4	17	7.32
NW	0	1	0	4	0	3	3	3	5	3	7	33	64	10.23
NNW	1	1	1	1	4	1	2	5	3	3	1	17	42	9.05
N	0	2	1	1	1	1	3	2	2	1	0	6	20	8.36
CALM													32	.53
TOTAL	4	11	18	23	37	47	44	45	67	61	49	78	742	9.45

NUMBER OF INVALID OBSERVATIONS = 2
TOTAL NUMBER OF OBSERVATIONS = 744

TABLE 2.3-111A

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: ANNUAL, 1975

PASQUILL "A" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	2	1	1	2	4	0	2	3	15	10.05
NE	0	0	1	1	0	3	3	2	0	3	5	12	30	9.90
ENE	0	0	0	1	2	0	5	4	4	2	0	6	24	9.27
E	0	0	2	2	4	3	5	6	2	1	1	0	26	6.14
ESE	0	0	0	1	3	3	1	0	0	3	3	3	17	8.06
SE	0	0	1	2	3	3	2	3	1	1	0	1	17	6.79
SSE	0	0	1	5	3	0	1	0	1	0	1	2	14	6.02
S	0	0	1	3	6	2	3	4	3	4	1	6	33	7.63
SSW	0	0	2	4	4	0	0	2	3	0	2	5	22	7.40
SW	0	2	1	5	0	17	7	3	2	0	1	4	42	6.25
WSW	0	1	1	2	3	2	1	3	1	0	0	0	14	5.27
W	0	2	2	1	2	6	3	1	0	0	0	0	17	4.78
WNW	0	2	1	2	3	4	1	1	0	0	0	0	14	4.50
NW	0	1	0	2	4	0	2	2	1	0	0	0	12	5.42
NNW	0	0	0	0	0	0	0	1	1	1	0	1	4	9.22
N	0	0	0	0	0	3	0	0	0	0	0	0	3	5.63
CALM													0	0.
TOTAL	0	8	13	31	39	47	35	34	23	15	16	43	304	7.17

NUMBER OF INVALID OBSERVATIONS = 11
TOTAL NUMBER OF OBSERVATIONS = 8760

PASQUILL "B" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	0	0	2	0	2	2	0	2	0	2	10	10.45
NE	0	0	0	0	0	2	3	2	0	0	4	2	13	9.68
ENE	0	0	0	2	0	5	3	2	6	1	3	3	25	8.59
E	0	0	0	0	2	0	1	1	2	2	0	1	9	7.96
ESE	0	0	0	1	0	1	0	0	2	2	0	3	9	9.23
SE	0	0	1	1	3	0	1	2	1	0	0	2	11	7.06
SSE	0	0	0	0	1	0	1	1	0	0	0	1	4	7.79
S	0	1	0	1	1	2	0	1	0	0	0	4	10	7.97
SSW	0	0	0	0	1	0	2	1	2	0	2	5	13	9.84
SW	0	0	0	3	3	3	4	3	1	1	0	6	24	7.66
WSW	1	1	0	1	3	0	1	1	0	0	0	0	8	4.29
W	0	0	1	0	1	1	0	0	0	1	0	0	4	5.40
WNW	0	0	1	5	4	1	1	0	1	0	0	0	13	4.55
NW	0	0	0	1	1	1	0	1	1	1	2	5	13	11.55
NNW	0	1	0	0	0	0	0	0	0	0	0	1	2	9.05
N	0	0	0	0	0	2	0	0	0	0	0	0	2	5.65
CALM													0	0.
TOTAL	1	3	3	15	22	18	19	17	16	10	11	35	170	8.11

NUMBER OF INVALID OBSERVATIONS = 3
TOTAL NUMBER OF OBSERVATIONS = 8760

PASQUILL "C" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	0	1	0	0	3	4	3	2	3	1	4	21	9.42
NE	2	0	2	1	3	1	3	0	4	3	2	7	28	7.91
ENE	0	0	0	0	4	5	0	5	3	8	6	16	47	9.70
E	0	0	0	2	2	1	1	6	1	3	5	4	25	8.56
ESE	0	0	0	0	0	3	5	1	0	3	1	6	19	9.31
SE	0	0	2	2	6	2	2	1	4	1	1	5	26	7.31
SSE	0	0	2	2	3	2	3	1	2	0	0	3	18	6.86
S	0	0	0	2	2	4	4	6	2	2	0	5	27	7.78
SSW	0	1	1	5	3	1	3	7	4	4	3	7	39	8.26
SW	0	0	2	0	6	7	5	7	7	5	1	5	45	7.65
WSW	0	2	2	1	3	8	5	8	1	2	1	3	36	6.86
W	0	1	1	5	4	5	2	4	0	0	0	0	22	5.14
WNW	0	0	2	2	4	1	2	1	2	0	0	5	19	7.77
NW	0	0	1	6	8	3	2	4	5	3	3	17	52	9.89
NNW	0	1	0	3	2	4	0	2	3	1	0	9	25	9.45
N	0	1	0	2	3	0	2	2	1	1	2	4	18	7.80
CALM													1	.60
TOTAL	2	6	16	33	53	50	43	58	41	39	26	100	468	8.27

NUMBER OF INVALID OBSERVATIONS = 7
TOTAL NUMBER OF OBSERVATIONS = 8760

PASQUILL "D" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													
NNE	0	3	5	5	10	10	11	6	15	20	17	38	140	9.19
NE	2	2	3	8	10	25	19	21	33	37	32	72	264	9.46
ENE	0	1	6	5	10	17	19	23	34	40	22	52	229	9.63
E	0	1	9	10	10	13	28	12	15	17	13	30	158	7.99
ESE	0	0	4	3	11	15	12	3	8	7	12	11	86	7.88
SE	0	0	1	5	12	12	2	9	11	14	7	43	116	10.00
SSE	0	1	1	6	5	8	12	9	10	9	11	48	120	10.46
S	0	6	2	7	4	9	8	18	15	10	19	53	151	10.24
SSW	1	2	3	7	8	21	15	22	19	22	19	81	220	10.26
SW	0	5	7	7	15	19	21	25	22	31	32	155	341	11.13
WSW	1	5	8	4	19	34	18	16	23	29	28	151	338	11.36
W	1	4	8	11	16	11	18	19	21	14	13	101	237	11.65
WNW	0	3	10	6	12	14	19	16	11	11	14	48	164	8.52
NW	0	6	4	9	17	18	15	16	17	8	11	63	184	9.46
NNW	0	4	8	12	6	15	9	19	10	14	9	42	152	9.07
N	0	5	4	5	8	7	10	8	11	8	5	17	88	7.92
CALM													8	.57
TOTAL	5	48	83	110	173	268	238	244	275	295	274	1005	2996	9.91

NUMBER OF INVALID OBSERVATIONS = 63
TOTAL NUMBER OF OBSERVATIONS = 8760

TABLE 2.3-111B

WIND FREQUENCY DISTRIBUTIONS
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION
61.5 METER LEVEL: ANNUAL, 1975

PASQUILL "E" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
				UPPER CLASS INTERVALS OF WIND SPEED (MPH)										
NNE	0	1	2	5	7	9	10	11	5	6	11	38	105	9.30
NE	0	3	5	8	9	9	22	21	16	26	27	67	213	9.60
ENE	0	1	3	9	4	9	11	23	19	21	11	39	150	9.07
E	0	3	4	2	8	8	12	23	8	20	14	48	150	9.44
ESE	2	1	1	3	5	4	10	6	19	15	16	39	121	9.89
SE	0	6	2	1	8	5	7	6	14	12	10	68	139	10.79
SSE	0	0	2	4	9	7	5	12	11	16	21	99	186	12.28
S	0	4	1	1	5	9	9	14	14	17	22	117	213	12.06
SSW	1	4	1	2	10	19	12	25	26	20	26	180	326	11.37
SW	1	3	4	3	11	17	15	18	32	34	28	186	352	11.25
WSW	1	1	0	6	4	6	10	10	19	11	19	108	195	11.75
W	0	2	4	4	9	3	15	9	14	20	8	66	154	10.17
WNW	0	2	3	7	6	7	4	13	15	8	9	20	94	8.66
NW	0	2	6	7	6	3	9	11	11	6	11	49	121	9.83
NNW	0	1	4	2	7	5	3	8	9	13	7	39	98	10.66
N	0	4	5	3	9	5	8	6	5	9	10	13	77	7.81
CALM													14	.55
TOTAL	5	38	67	67	117	125	162	216	237	254	250	1176	2708	10.52

NUMBER OF INVALID OBSERVATIONS = 56
TOTAL NUMBER OF OBSERVATIONS = 8760

PASQUILL "F" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
				UPPER CLASS INTERVALS OF WIND SPEED (MPH)										
NNE	0	1	3	2	1	1	1	2	3	4	1	10	29	9.66
NE	0	0	3	6	1	6	2	4	5	4	4	44	81	10.72
ENE	0	3	2	1	1	4	7	5	3	13	11	30	82	9.66
E	0	1	1	4	2	1	2	2	8	7	12	31	71	10.47
ESE	0	1	1	2	0	2	1	5	4	5	6	37	66	11.62
SE	0	0	0	2	5	1	6	2	3	2	4	52	70	11.51
SSE	0	2	1	4	2	5	5	5	5	5	4	56	95	11.78
S	1	3	6	1	3	3	3	3	1	5	5	47	85	10.92
SSW	0	1	1	1	1	6	10	10	6	7	7	50	100	10.81
SW	0	4	2	3	7	6	2	9	7	10	8	70	128	10.66
WSW	1	2	4	1	1	4	2	1	4	7	10	32	69	10.10
W	1	1	1	3	4	1	6	3	6	2	2	25	55	9.19
WNW	0	0	1	1	1	3	7	6	5	4	7	8	45	8.58
NW	0	2	0	3	3	2	1	5	7	12	4	14	53	9.30
NNW	1	1	4	4	4	2	5	3	2	9	0	7	42	7.37
N	0	1	0	2	1	1	2	3	3	1	2	5	23	8.23
CALM													4	[illegible]
TOTAL	4	23	30	42	43	54	64	68	72	98	87	518	1107	10.31

NUMBER OF INVALID OBSERVATIONS = 20
TOTAL NUMBER OF OBSERVATIONS = 8760

PASQUILL "G" (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
				UPPER CLASS INTERVALS OF WIND SPEED (MPH)										
NNE	0	2	5	0	0	4	2	5	3	6	2	10	39	8.29
NE	0	2	5	3	2	5	2	5	4	3	3	19	53	8.75
ENE	0	1	4	3	3	5	2	2	4	0	3	11	38	8.22
E	0	3	2	1	2	2	1	10	10	6	6	16	59	9.16
ESE	0	3	2	1	1	3	2	2	4	1	1	14	34	9.77
SE	1	2	4	1	8	2	3	4	4	3	0	20	52	8.48
SSE	0	1	1	6	2	1	0	1	4	4	2	15	37	9.20
S	1	1	7	4	3	6	3	3	4	2	1	25	60	8.76
SSW	0	3	5	5	3	1	5	2	4	7	1	12	48	7.65
SW	0	2	1	6	3	5	5	2	3	6	7	30	70	9.57
WSW	0	2	0	4	4	1	4	6	7	9	8	36	81	10.02
W	0	1	3	3	6	4	5	5	5	8	5	9	54	7.41
WNW	1	0	3	2	3	7	7	4	3	5	1	9	45	7.55
NW	0	3	0	4	4	4	0	0	6	5	3	3	32	7.14
NNW	2	2	1	3	4	9	3	2	8	5	4	4	47	7.09
N	0	0	2	3	3	5	4	1	6	4	4	4	36	7.64
CALM													12	.14
TOTAL	5	28	45	49	51	65	48	56	79	76	51	237	[illegible]	8.26

NUMBER OF INVALID OBSERVATIONS = 16
TOTAL NUMBER OF OBSERVATIONS = 8760

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-61 METERS)
WINDS AT 61.5 METER LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
				UPPER CLASS INTERVALS OF WIND SPEED (MPH)										
NNE	0	7	16	12	22	28	31	31	32	41	14	105	359	9.16
NE	4	7	19	27	27	51	56	55	62	77	77	223	683	9.51
ENE	0	6	15	21	25	45	47	64	73	85	56	159	597	9.12
E	0	8	18	21	30	10	50	60	44	56	51	131	490	8.66
ESE	2	5	8	11	20	31	33	17	37	36	39	113	352	9.54
SE	1	8	12	14	45	27	23	27	18	33	22	192	442	10.03
SSE	0	4	8	27	25	23	27	29	33	35	19	224	474	11.05
S	2	15	17	21	24	35	30	49	41	40	48	257	579	10.55
SSW	2	11	13	26	33	48	47	70	66	60	60	160	719	10.62
SW	1	16	17	27	45	74	61	67	74	87	77	456	1002	10.56
WSW	4	14	15	19	37	57	41	47	66	58	66	110	743	10.71
W	2	11	20	27	42	31	49	41	46	45	28	101	563	10.09
WNW	1	7	21	25	35	37	41	41	37	28	11	90	396	8.37
NW	0	14	11	12	41	11	29	39	48	35	14	151	427	[illegible]
NNW	1	10	17	24	23	15	20	35	33	47	20	103	320	9.11
N	0	11	11	15	26	25	26	20	26	21	21	61	267	[illegible]
CALM													[illegible]	[illegible]
TOTAL	22	154	[illegible]	347	498	600	609	692	761	786	[illegible]	[illegible]	8619	9.77

NUMBER OF INVALID OBSERVATIONS = 141
TOTAL NUMBER OF OBSERVATIONS = 8760

TABLE 2.3-112

MINIMUM DISTANCE FROM THE REACTOR CONTAINMENT STRUCTURE TO THE EXCLUSION ZONE BOUNDARY

Direction From Plant	Minimum Distance (Meters)
N	1609 *
NNE	1639
NE	1639
ENE	1639
E	1639
ESE	1639
SE	1639
SSE	1651
S	1651
SSW	1687
SW	1759
WSW	1820
W	1820
WNW	1808
NW	1747
NNW	1663

* Minimum Exclusion Distance

TABLE 2.3-117

0 – 2 HOURS χ/Q AT EAB

Downwind Sector	Distance (Meters)	0-2 hr χ/Q With Wake (sec/m^3)	0-2 hr χ/Q Without Wake (sec/m^3)
S	1609	3.21E-05	3.21E-05
SSW	1609	3.15E-05	3.16E-05
SW	1609	2.89E-05	2.89E-05
WSW	1609	2.62E-05	2.62E-05
W	1609	3.21E-05	3.32E-05
WNW	1609	3.01E-05	3.01E-05
NW	1609	4.47E-05	4.47E-05
NNW	1609	8.49E-05	8.69E-05
N	1609	1.07E-04	1.08E-04
NNE	1609	1.07E-04	1.07E-04
NE	1609	1.20E-04	1.20E-04
ENE	1609	1.24E-04	1.24E-04
E	1609	1.22E-04	1.22E-04
ESE	1609	9.21E-05	9.21E-05
SE	1609	5.55E-05	5.55E-05
SSE	1609	3.15E-05	3.15E-05
MAX χ/Q		1.24E-04	1.24E-04

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TABLE 2.3-118

0 – 30 DAY χ/Q AT LPZ

Downwind Sector	Distance (meters)	Distance (miles)	0-8 hr χ/Q With Wake sec/m^3	8-24 hr χ/Q With Wake sec/m^3	1-4 d χ/Q With Wake sec/m^3	4-30 d χ/Q With Wake sec/m^3	0-8 hr χ/Q Without Wake sec/m^3	8-24 hr χ/Q Without Wake sec/m^3	1-4 d χ/Q Without Wake sec/m^3	4-30 d χ/Q Without Wake sec/m^3
S	4828	3	3.82E-06	264E-06	1.19E-06	3.75E-07	3.85E-06	2.67E-06	1.21E-06	3.88E-07
SSW	4828	3	3.79E-06	2.66E-06	1.23E-06	4.05E-07	3.82E-06	2.69E-06	1.25E-06	4.18E-07
SW	4828	3	3.71E-06	2.68E-06	1.32E-06	4.81E-07	3.73E-06	2.70E-06	1.34E-06	4.92E-07
WSW	4828	3	3.34E-06	2.39E-06	1.15E-06	4.07E-07	3.36E-06	2.41E-06	1.17E-06	4.17E-07
W	4828	3	4.18E-06	2.90E-06	1.31E-06	4.18E-07	4.22E-06	2.94E-06	1.34E-06	4.33E-07
WNW	4828	3	3.58E-06	2.42E-06	1.03E-06	3.02E-07	3.62E-06	2.45E-06	1.06E-06	3.16E-07
NW	4828	3	5.67E-06	3.83E-06	1.63E-06	4.80E-07	5.74E-06	3.90E-06	1.69E-06	5.07E-07
NNW	4828	3	1.31E-05	8.88E-06	3.82E-06	1.13E-06	1.33E-05	9.12E-06	3.99E-06	1.22E-06
N	4828	3	1.80E-05	1.23E-05	5.33E-06	1.61E-06	1.84E-05	1.27E-05	5.63E-06	1.76E-06
NNE	4828	3	1.85E-05	1.27E-05	5.59E-06	1.72E-06	1.89E-05	1.31E-05	5.88E-06	1.87E-06
NE	4828	3	2.28E-05	1.58E-05	7.09E-06	2.25E-06	2.33E-05	1.63E-05	7.48E-06	2.45E-06
ENE	4828	3	2.36E-05	1.62E-05	7.09E-06	2.17E-06	2.42E-05	1.68E-05	7.55E-06	2.40E-06
E	4828	3	2.30E-05	1.57E-05	6.79E-06	2.05E-06	2.36E-05	1.62E-05	7.23E-06	2.27E-06
ESE	4828	3	1.49E-05	9.88E-06	4.04E-06	1.12E-06	1.53E-05	1.02E-05	4.27E-06	1.22E-06
SE	4828	3	7.20E-06	4.83E-06	2.03E-06	5.83E-07	7.33E-06	4.96E-06	2.12E-06	6.26E-07
SSE	4828	3	3.60E-06	2.46E-06	1.08E-06	3.32E-07	3.64E-06	2.50E-06	1.11E-06	3.48E-07
MAX χ/Q							2.42E-05	1.68E-05	7.55E-06	2.40E-06

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TABLE 2.3-119

AVERAGE ANNUAL RELATIVE CONCENTRATION (SEC/CUBIC METER)
PERIOD OF RECORD: 01/01/75 TO 12/31/75

	BASE DISTANCE IN MILES/KILOMETERS							
AFTD SECT	.06/ .10	.31/ .50	.62/ 1.00	1.00/ 1.61	1.86/ 3.00	3.00/ 4.83	4.35/ 7.00	5.59/ 9.00
NNE	1.7E-04	3.7E-05	1.3E-05	4.5E-06	1.1E-06	4.3E-07	2.2E-07	1.5E-07
NE	1.9E-04	4.0E-05	1.4E-05	4.8E-06	1.2E-06	4.6E-07	2.4E-07	1.6E-07
ENE	1.6E-04	3.4E-05	1.2E-05	4.1E-06	1.0E-06	3.9E-07	2.0E-07	1.3E-07
E	1.5E-04	3.3E-05	1.1E-05	3.9E-06	9.6E-07	3.8E-07	2.0E-07	1.3E-07
ESE	1.5E-04	3.2E-05	1.1E-05	3.7E-06	9.2E-07	3.7E-07	1.9E-07	1.3E-07
SE	2.2E-04	4.7E-05	1.5E-05	5.3E-06	1.3E-06	5.3E-07	2.8E-07	1.9E-07
SSE	1.5E-04	3.1E-05	1.0E-05	3.6E-06	8.9E-07	3.5E-07	1.8E-07	1.2E-07
S	1.6E-04	3.5E-05	1.1E-05	4.0E-06	1.0E-06	4.0E-07	2.1E-07	1.4E-07
SSW	1.5E-04	3.2F-05	1.1E-05	3.8E-06	9.4E-07	3.7E-07	1.9E-07	1.3E-07
SW	1.9E-04	4.0E-05	1.4E-05	4.8E-06	1.2E-06	4.6E-07	2.4E-07	1.6E-07
WSW	1.4E-04	3.1E-05	1.0E-05	3.7E-06	9.1E-07	3.6E-07	1.8E-07	1.2E-07
W	1.0E-04	2.1E-05	7.2E-06	2.6E-06	6.4E-07	2.5E-07	1.3E-07	8.6E-08
WNW	8.3E-05	1.8E-05	5.9E-06	2.1E-06	5.4E-07	2.1E-07	1.1E-07	7.3E-08
NW	1.0E-04	2.2E-05	7.4E-06	2.7E-06	6.6E-07	2.6E-07	1.4E-07	9.1E-08
NNW	1.0E-04	2.2E-05	7.4E-06	2.7E-06	6.7E-07	2.6E-07	1.4E-07	9.0E-08
N	1.4E-04	3.0E-05	1.0E-05	3.7E-06	9.2E-07	3.6E-07	1.9E-07	1.2E-07

	BASE DISTANCE IN MILES/KILOMETERS							
AFTD SECT	6.21/ 10.00	12.43/ 20.00	18.64/ 30.00	24.85/ 40.00	31.07/ 50.00	37.29/ 60.00	43.51/ 70.00	49.72/ 80.00
NNE	1.3E-07	4.6E-08	2.7E-08	1.9E-08	1.4E-08	1.1E-08	9.3E-09	8.0E-09
NE	1.3E-07	4.9E-08	2.9E-08	2.0E-08	1.5E-08	1.2E-08	9.9E-09	8.4E-09
ENE	1.1E-07	4.1E-08	2.4E-08	1.7E-08	1.3E-08	1.0E-08	8.3E-09	7.1E-09
E	1.1E-07	4.0E-08	2.4E-08	1.6E-08	1.2E-08	9.8E-09	8.1E-09	6.9E-09
ESE	1.1E-07	4.0E-08	2.4E-08	1.6E-08	1.2E-08	9.9E-09	8.2E-09	7.0E-09
SE	1.6E-07	5.8E-08	8.4E-08	2.4E-08	1.8E-08	1.4E-08	1.2E-08	1.0E-08
SSE	1.0E-07	3.9E-08	2.3E-08	1.6E-08	1.2E-08	9.5E-09	7.9E-09	6.7E-09
S	1.2E-07	4.4E-08	2.6E-08	1.8E-08	1.4E-08	1.1E-08	9.1E-09	7.8E-09
SSW	1.1E-07	4.0E-08	2.4E-08	1.6E-08	1.2E-08	9.9E-09	8.2E-09	6.9E-09
SW	1.4E-07	4.9E-08	2.9E-08	2.0E-08	1.5E-08	1.2E-08	1.0E-08	8.5E-09
WSW	1.0E-07	3.8E-08	2.2E-08	1.5E-08	1.2E-08	9.2E-09	7.6E-09	6.5E-09
W	7.3E-08	2.7E-08	1.6E-08	1.1E-08	8.2E-09	6.5E-09	5.4E-09	4.6E-09
WNW	6.2E-08	2.3E-08	1.3E-08	9.2E-09	7.0E-09	5.6E-09	4.6E-09	3.9E-09
NW	7.7E-08	2.8E-08	1.7E-08	1.2E-08	8.8E-09	7.0E-09	5.8E-09	5.0E-09
NNW	7.7E-08	2.8E-08	1.6E-08	1.1E-08	8.6E-09	6.8E-09	5.7E-09	4.8E-09
N	1.0E-07	3.8E-08	2.2E-08	1.5E-08	1.2E-08	9.2E-09	7.6E-09	6.5E-09

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TABLE 2.3-120

CRITERIA FOR GASEOUS RELEASE FROM GWPS (WASTE GAS DECAY TANKS)

Differential Temperature (°F/30m)	Differential Temperature (°F/51m)	Pasquill Stability Class	Minimum Wind Speed (mph)	
$\Delta T \leq -1.03$	$\Delta T \leq -1.74$	A	NA	RN 00-061
$-1.03 < \Delta T \leq -0.92$	$-1.74 < \Delta T \leq -1.56$	B	NA	
$-0.92 < \Delta T \leq -0.81$	$-1.56 < \Delta T \leq -1.38$	C	1.3	
$-0.81 < \Delta T \leq -0.27$	$-1.38 < \Delta T \leq -0.46$	D	3.1	RN 00-061
$-0.27 < \Delta T \leq 0.81$	$-0.46 < \Delta T \leq 1.38$	E	3.5	
$0.81 < \Delta T \leq 2.16$	$1.38 < \Delta T \leq 3.67$	F	5.2	
$2.16 < \Delta T$	$3.67 < \Delta T$	G	7.0	

TABLE 2.3-121

ARCON96 INPUT

Meterological Input

Lower measurement height	10 meters
Upper measurement height	61 meters
Wind speed units	meters/second

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Source Input

Release Type	ground level
Building Area	1740 m^2
Vertical Velocity	0
Stack Flow	0
Stack Radius	0

TABLE 2.3-122

RELEASE POINT AND RECEPTOR LOCATION INPUT

Release Point	Release Height (Height – 436') m	Direction from Intake to Release		Straight-line Horizontal Distance (m)	
		Intake 'A'	Intake 'B'	Intake 'A'	Intake 'B'
Main Plant Vent	524'-3" (26.9 m)	38°	42°	89.0	86.9
Purge Exhaust	524'-0" (26.8 m)	38°	42°	87.5	86.3
MS POR 'A'	504'-0" (20.7 m)	64°	59°	64.0	63.1
MS SR's 'A'	495'-0" (B, C, D, E) (18.0 m) 503'-0" (A) (20.4 m)	57°	64°	60.0	60.0
MS POR 'B'	470'-0" (10.4 m)	72°	78°	80.8	82.0
MS SR's 'B'	495'-0" (18.0 m)	71°	76°	75.6	78.0
MS POR 'C'	470'-0" (10.4 m)	69°	73°	105.8	105.8
MS SR's 'C'	495'-0" (18.0 m)	73°	76°	104.5	103.6
Pressure Relief Area	463'-0" (8.2 m)	73°	78°	67.4	69.5
RB Nearest Point	0	63°	57°	61.0	61.0
RWST Overflow	468'-0" (9.8 m)	22°	18°	51.9	55.7

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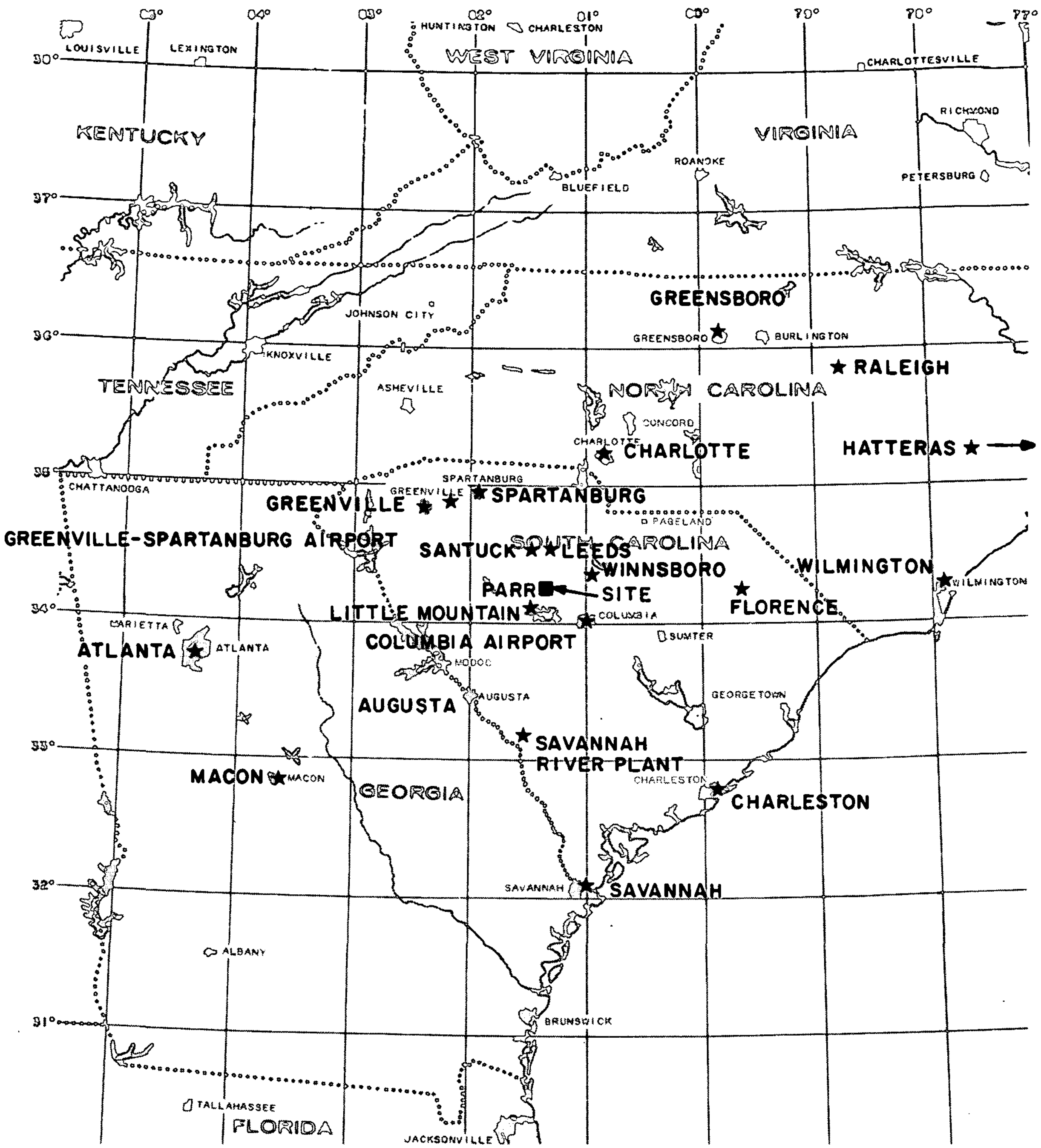
Plant north aligns with true north.

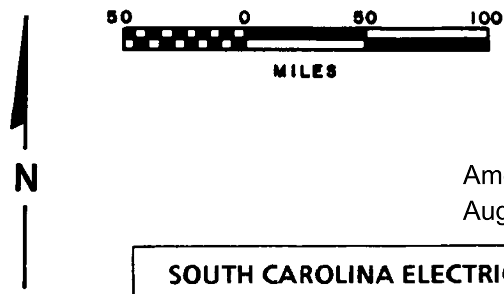
TABLE 2.3-123

CONTROL ROOM DIFFUSION VALUES

Release Point	Time	Control Room Location Intake 'A' χ/Q (sec/m³)	Control Room Location Intake 'B' χ/Q (sec/m³)	Release Point	Control Room Location Intake 'A' χ/Q (sec/m³)	Control Room Location Intake 'B' χ/Q (sec/m³)
RB Nearest Point				MS POR 'B'		
	0-2 hr	1.39E-03	1.30E-03		8.69E-04	8.31E-04
	2-8 hr	1.17E-03	1.09E-03		7.16E-04	6.89E-04
	8-24 hr	5.70E-04	5.27E-04		3.44E-04	3.23E-04
	1-4 d	4.17E-04	3.90E-04		2.49E-04	2.33E-04
	4-30 d	3.00E-04	2.82E-04		1.84E-04	1.69E-04
Main Plant Vent				MS SR 'B'		
	0-2 hr	7.11E-04	7.43E-04		9.61E-04	9.29E-04
	2-8 hr	5.05E-04	5.41E-04		7.64E-04	7.08E-04
	8-24 hr	2.51E-04	2.75E-04		3.67E-04	3.39E-04
	1-4 d	2.04E-04	2.16E-04		2.65E-04	2.44E-04
	4-30 d	1.39E-04	1.49E-04		1.98E-04	1.79E-04
Purge Exhaust				MS POR 'C'		
	0-2 hr	7.23E-04	7.57E-04		5.18E-04	5.10E-04
	2-8 hr	5.24E-04	5.47E-04		4.37E-04	4.34E-04
	8-24 hr	2.59E-04	2.78E-04		2.09E-04	2.05E-04
	1-4 d	2.13E-04	2.19E-04		1.51E-04	1.49E-04
	4-30 d	1.44E-04	1.51E-04		1.11E-04	1.08E-04
IB Pressure Relief Area				MS SR 'C'		
	0-2 hr	1.22E-03	1.12E-03		5.36E-04	5.44E-04
	2-8 hr	1.01E-03	9.16E-04		4.10E-04	4.18E-04
	8-24 hr	4.79E-04	4.32E-04		1.99E-04	2.00E-04
	1-4 d	3.48E-04	3.12E-04		1.44E-04	1.44E-04
	4-30 d	2.53E-04	2.24E-04		1.06E-04	1.06E-04
MS SR 'A' (Reliefs B, C, D, E)				MS POR 'A'		
	0-2 hr	1.50E-03	1.51E-03		1.34E-03	1.37E-03
	2-8 hr	1.15E-03	1.17E-03		1.01E-03	1.03E-03
	8-24 hr	5.64E-04	5.75E-04		4.97E-04	5.07E-04
	1-4 d	4.23E-04	4.18E-04		3.64E-04	3.77E-04
	4-30 d	3.03E-04	3.10E-04		2.69E-04	2.72E-04
MS SR 'A' (A Relief only)				RWST		
	0-2 hr	1.50E-03	1.51E-03		1.96E-03	1.64E-03
	2-8 hr	1.12E-03	1.15E-03		1.45E-03	1.18E-03
	8-24 hr	5.51E-04	5.67E-04		7.02E-04	5.61E-04
	1-4 d	4.15E-04	4.13E-04		5.39E-04	4.19E-04
	4-30 d	2.97E-04	3.02E-04		3.73E-04	2.95E-04

RN 12-034





Amendment 0
August 1984

KEY:

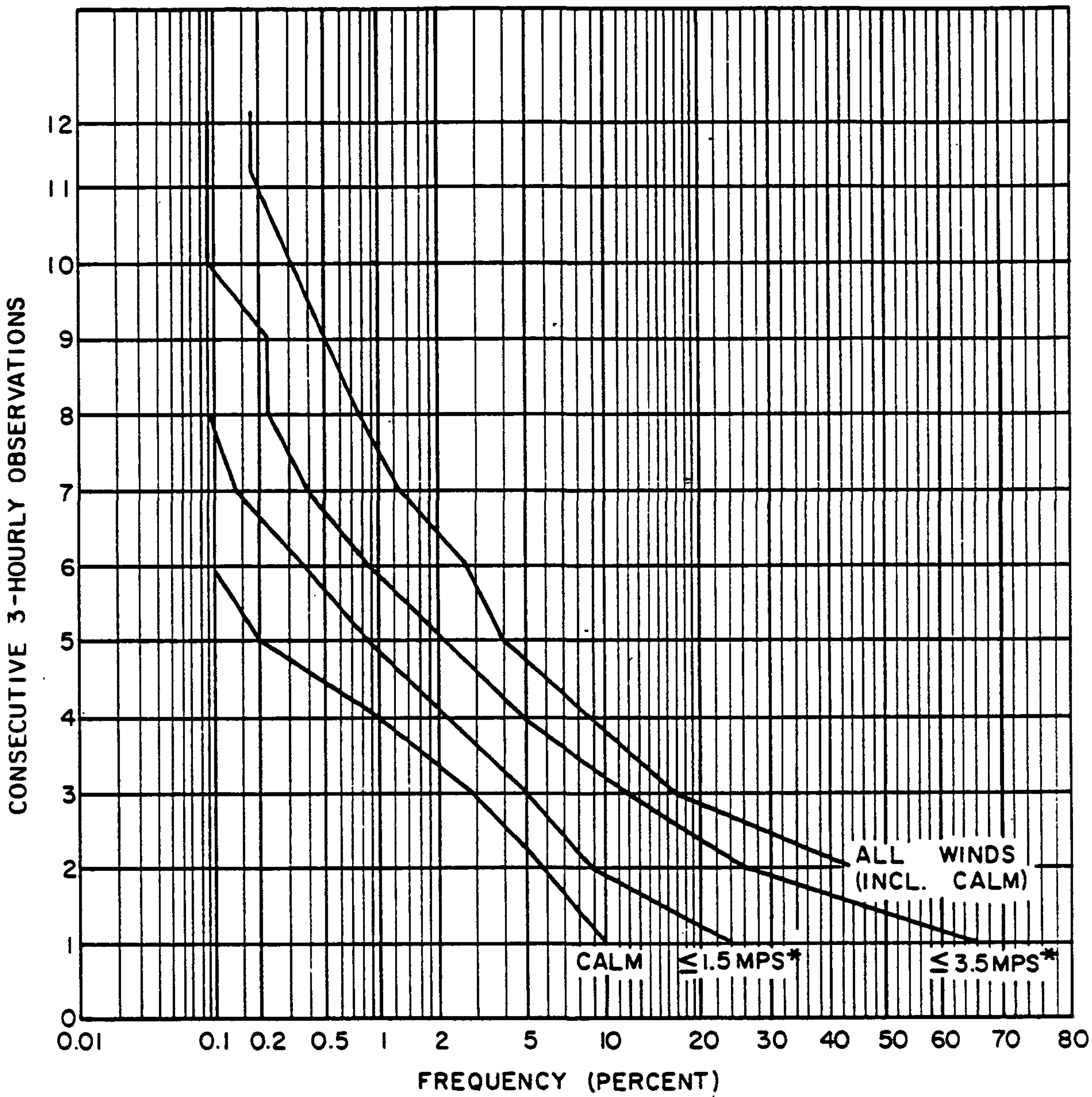
★ INDICATES METEOROLOGICAL STATIONS

REFERENCE: THE BASE FOR THIS MAP WAS PREPARED FROM A PORTION OF THE U.S.G.S. "IFR WALL PLANNING CHART, EAST & WEST, 1967."

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Meteorological Data Sources

Figure 2.3-1



*Meters per second

Amendment 0
August 1984

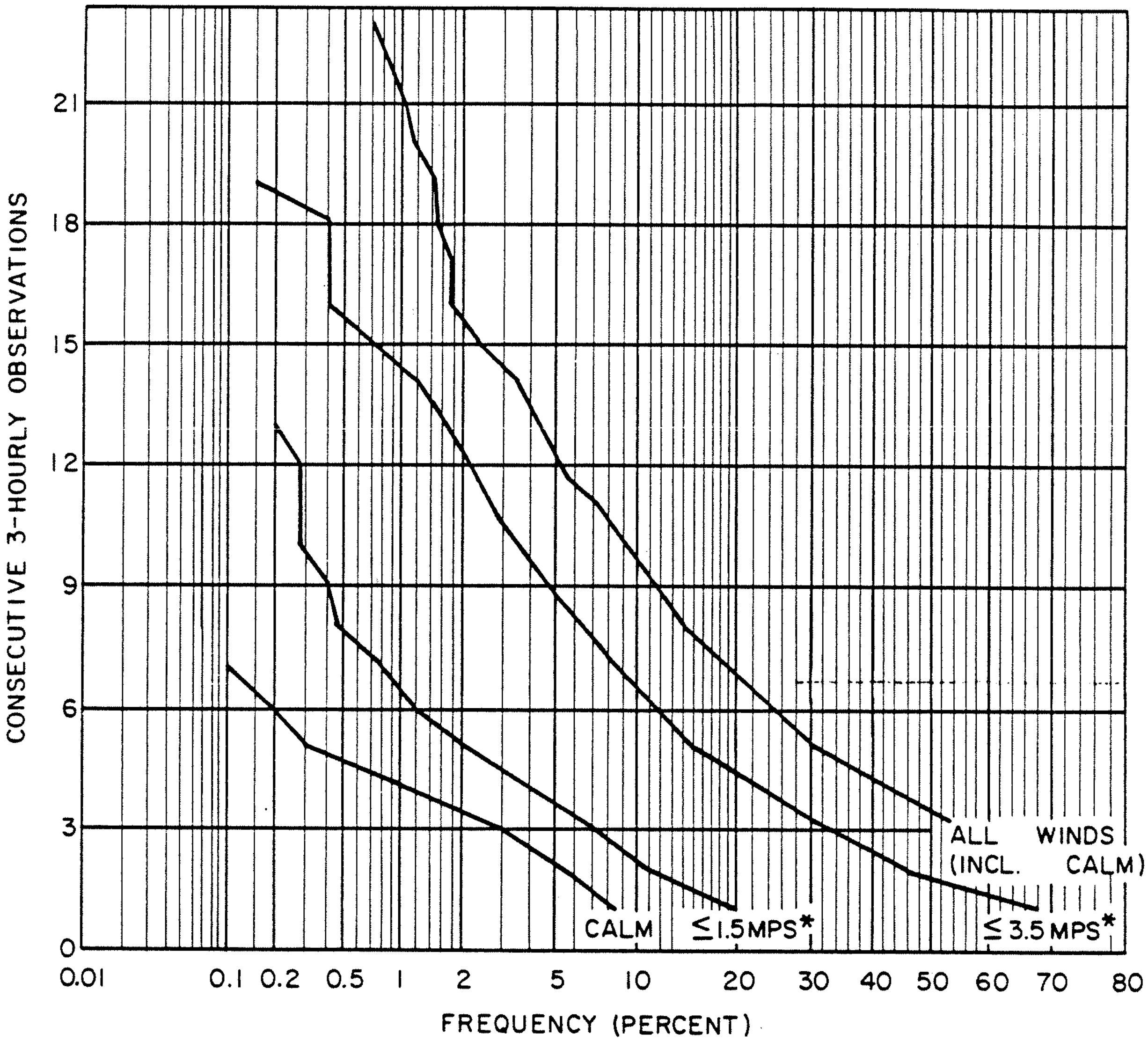
Data: 30-Foot Winds for 1965-69
for Columbia Airport

Data Source: 2.3.2-K

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Frequency of One-Sector (22.5°) Persistence - Columbia

Figure 2.3-2



*Meters per second

Amendment 0
August 1984

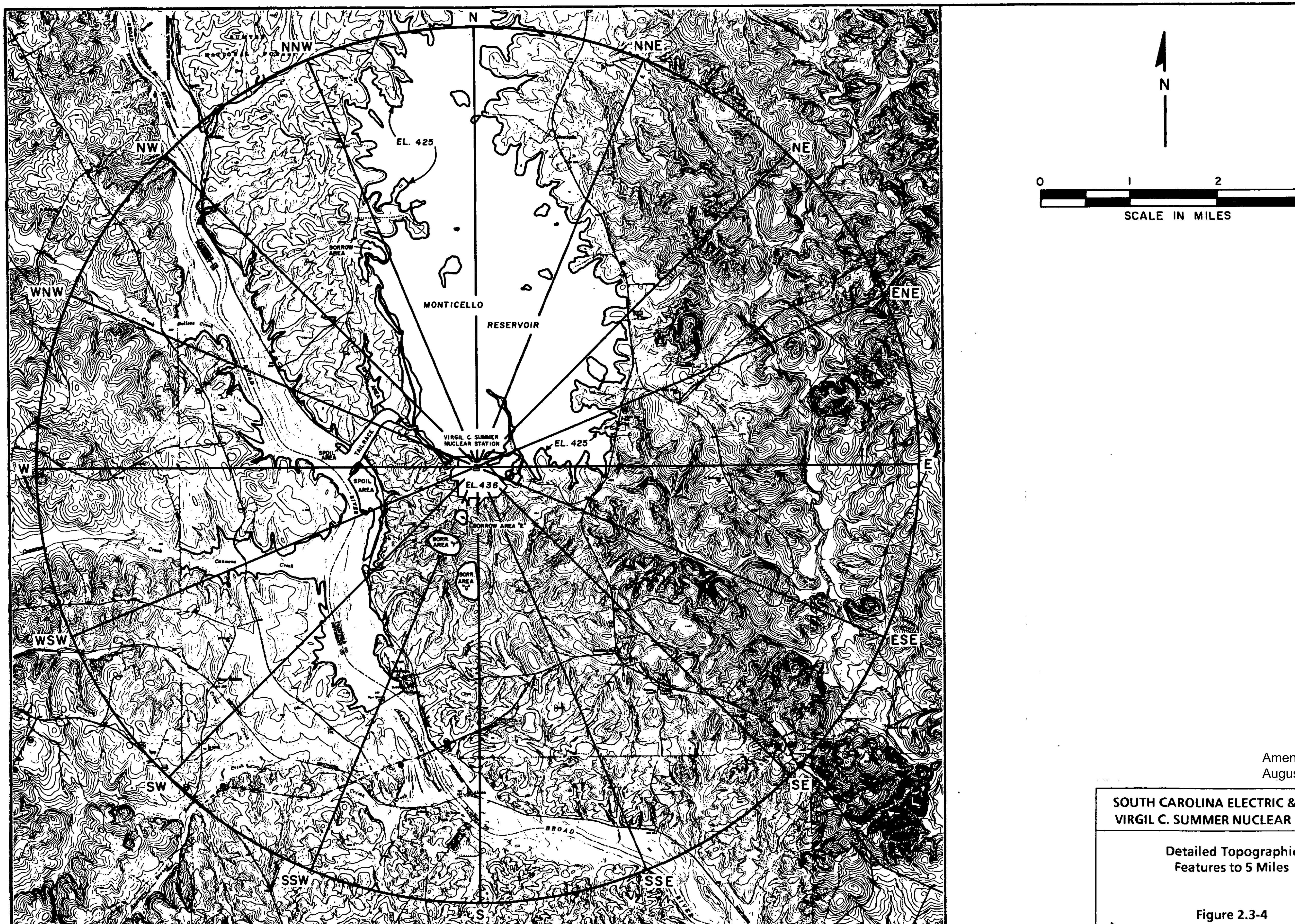
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Data: 30-Foot Winds for 1965-69 for Columbia Airport

Data Source: 2.3.2-K

Frequency of Three-Sector (67.5°) Persistence - Columbia

Figure 2.3-3



Amendment 0
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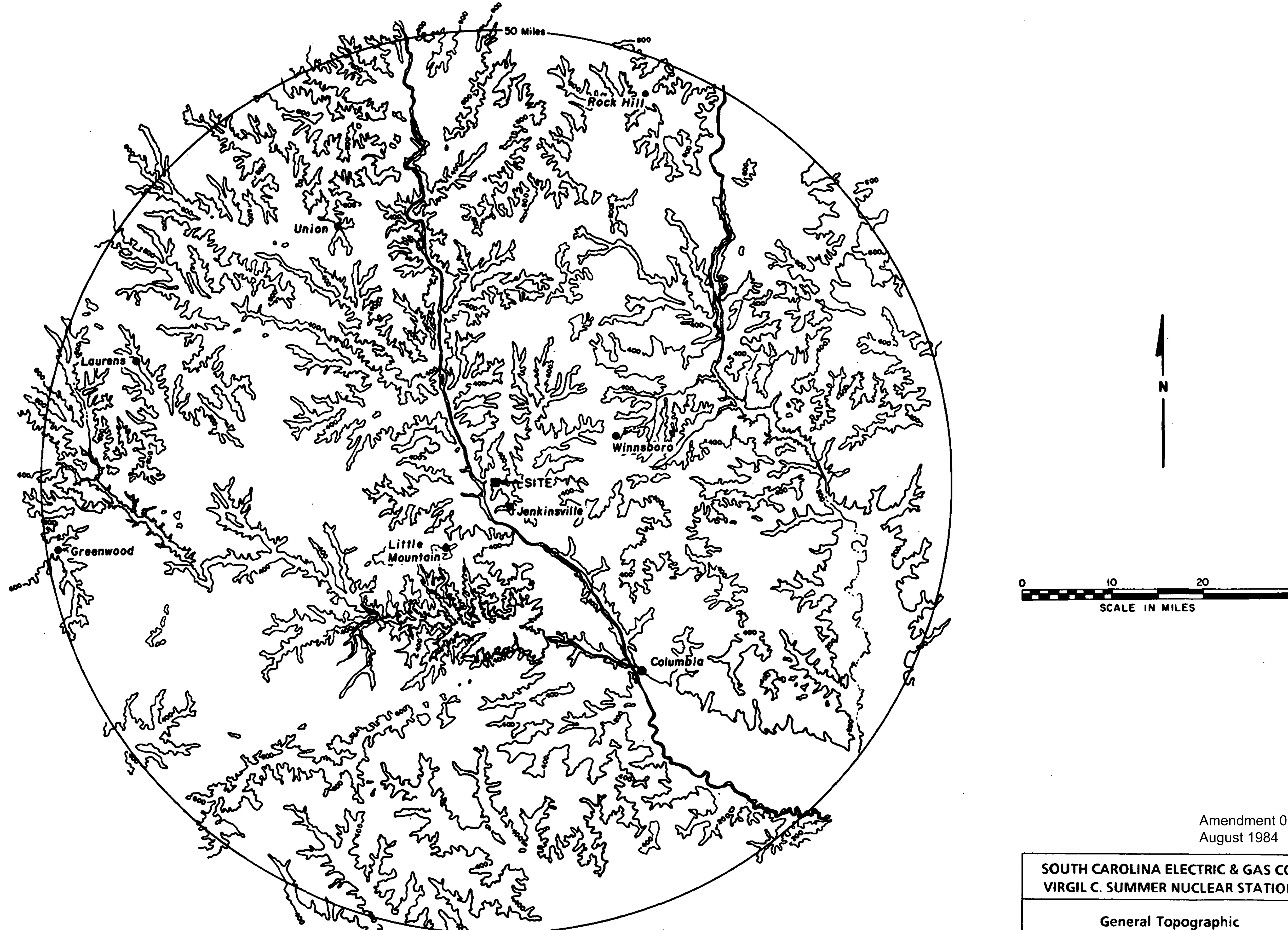
Detailed Topographic
Features to 5 Miles

Figure 2.3-4



Amendment 0
August 1984

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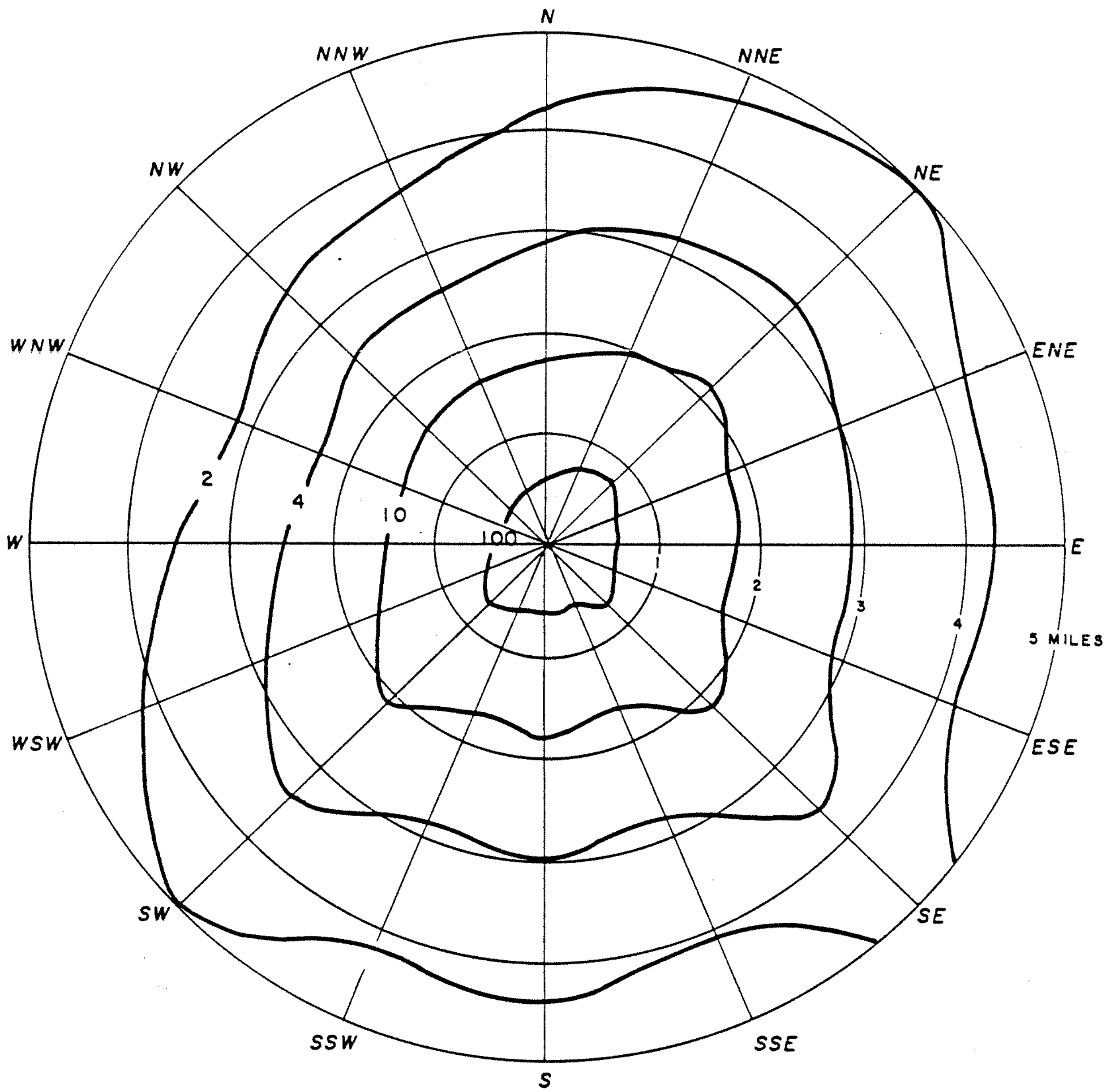
General Topographic
Features to 50 Miles

Figure 2.3-5



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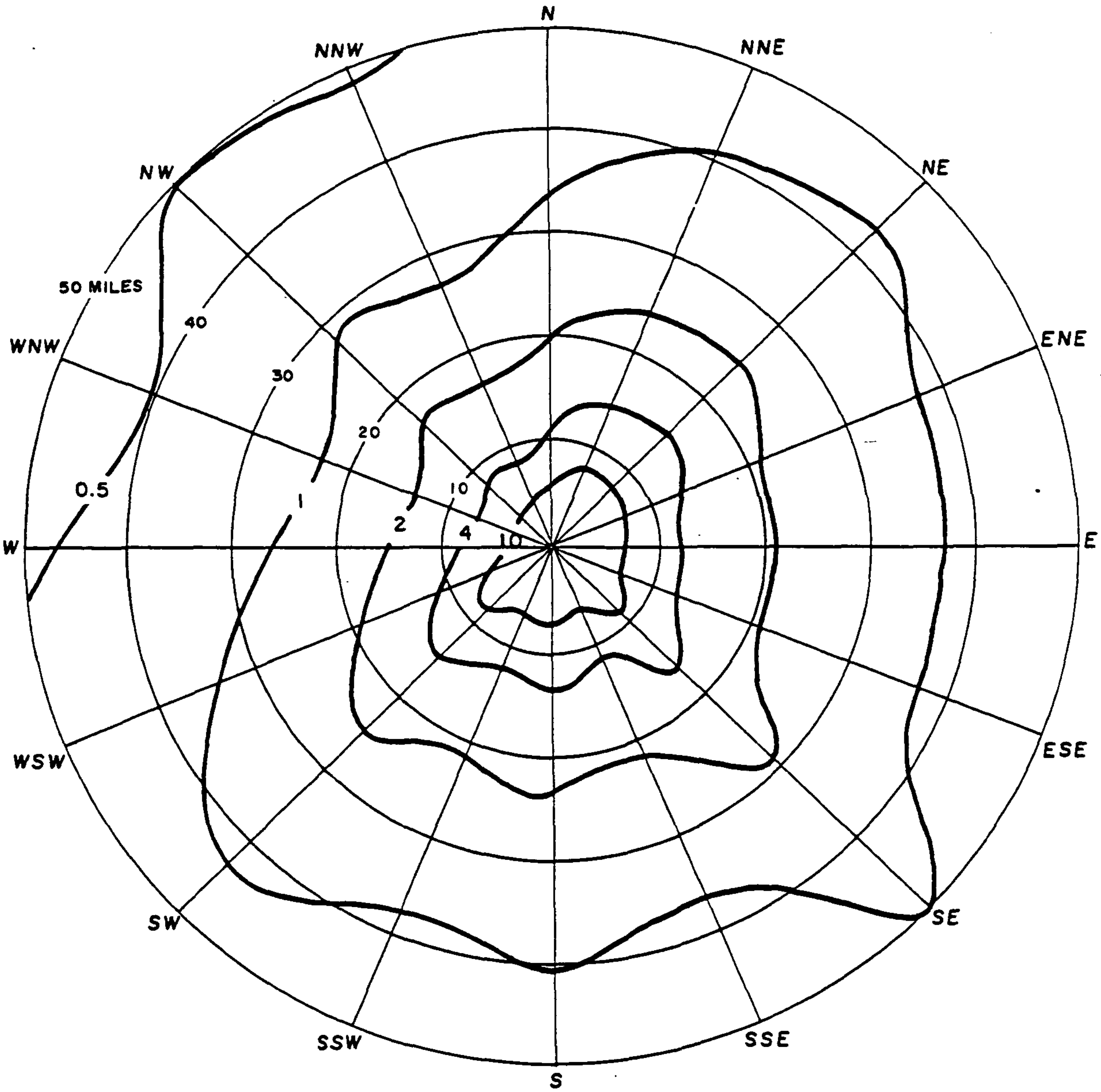
Dilution Factors - Long Term (x 10^{-7} Seconds/Meter^3) 0 to 5 Miles

Figure 2.3-7



Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
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Dilution Factors - Long Term (x 10^{-8} Seconds/Meter^3) 0 to 50 Miles

Figure 2.3-8

2.4 HYDROLOGIC ENGINEERING

RN 13-019 RN 00-081

2.4.1 HYDROLOGIC DESCRIPTION

2.4.1.1 Site and Facilities

The Virgil C. Summer Nuclear Station is located in Fairfield County, South Carolina, approximately 1 mile east of the Broad River and 2.5 miles northeast of Parr Dam. The site is situated on a hilltop at an average elevation of 435.0' mean sea level, * about 180 feet above the Broad River floodplain.

Figure 2.4-1 is a site map showing the general site features, layout, topography, and changes to the natural drainage. As shown in this figure, a berm at elevation 438.0' is located along the north boundary of the site adjacent to Monticello Reservoir, coupled with dams forming the service water pond to the east. Site drainage, except for a narrow strip along the edge of the service water pond, is intercepted and conveyed by storm sewers to the south and west away from Monticello Reservoir. The details of the local drainage system are discussed in Section 2.4.3.1.3.

The plant site is not susceptible to flooding from the Broad River due to its relative height above the river. Plant grade is approximately 10 feet above the maximum operating level of Monticello Reservoir which is at elevation 425.0'. Protection of safety-related structures, exterior access, equipment, and systems against flooding from Monticello Reservoir is provided through the location, arrangement, and design of the above with respect to the shoreline and possible storm-generated waves, as discussed in the following sections.

2.4.1.2 Hydrosphere

Included in this section is a description of the location, size, shape, and other hydrologic characteristics of the streams and reservoirs comprising the surface water hydrosphere. A description of the ground water environments influencing plant siting is included in Section 2.4.13.1.

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* All elevations are referenced in feet above the mean sea level (MSL) datum.

2.4.1.2.1 Rivers and Streams

The region surrounding the site is characterized by a network of small tributaries and a few large rivers draining the rolling, low-profile terrain. The Broad River, the principal hydrologic feature in the site vicinity, drains an extensive basin above the site of about 4,550 square miles formed between 2 southeast-northwest trending ridges stretching from Columbia, South Carolina, to the headwaters about 100 miles northwest in North Carolina. The average annual precipitation is 45 inches with a runoff about 17 inches, equivalent to a runoff volume of 4.3 million acre-feet. In the vicinity of the site, the Broad River is about 2000 feet wide, with depths ranging from a few feet to around 15 feet. Many streams and creeks carry runoff and ground water drainage into this watercourse. Important rivers draining into the Broad River include the Enoree, the Tyger, and the Pacolet. The Broad River joins the Saluda forming the Congaree River near Columbia, South Carolina [1].

Downstream of the site, the nearest U. S. Geological Survey (USGS) streamflow gaging station on the Broad River is gage 1615 at Richtex, South Carolina. The Richtex station is located about 14 miles downstream of the site, and has a contributing drainage area of approximately 4,850 square miles. Streamflow measurements began in October 1925, and an average discharge of over 6,000 cubic feet per second (cfs) has been observed over the period of record [2]. A map of the Broad River drainage basin at the Richtex gaging station is shown on Figure 2.4-2.

Upstream of the site, the nearest USGS streamflow gaging station on the Broad River is gage 1565 near Carlisle, South Carolina. Streamflow measurements began in October 1938, and an average discharge of almost 4,000 cfs has been recorded over the period of record. The Carlisle station is located about 21 miles upstream of the site, and has a contributing drainage area of approximately 2,790 square miles [2]. As shown on Figure 2.4-2, the Carlisle gaging station is located upstream of the confluences of the Tyger and Enoree Rivers. Its drainage area is nearly 40% less than the 4,550 square miles area of the site, which is located downstream of these 2 tributaries. However, the drainage area at the Richtex gaging station is only about 7% greater than at the site. This fact, plus the longer period of record at the Richtex gage, makes it the more suitable location from which to estimate flow characteristics at the site.

2.4.1.2.2 Lakes and Reservoirs

The nearest body of water to the site is Monticello Reservoir, the upper pool of the Fairfield Pumped Storage Facility and the source of cooling and makeup water for the Virgil C. Summer Nuclear Station. Monticello Reservoir has a drainage area of about 17 square miles, and is formed by the Frees Creek Dams. The main Frees Creek Dam has a maximum height of 180 feet and a crest length of approximately 5,000 feet. Three smaller saddle dams have lengths of 3,400 feet, 1,700 feet, and 900 feet, with maximum heights from 50 to 90 feet. The dams have crest elevations of 434.0’ and are of earthfill construction with appropriate riprap protection [3]. These dams are shown on Figure 2.4-3. Due to the size of these structures, Frees Creek channel is submerged to an average depth of 70 feet in the site vicinity.

A 400 foot wide, 600 foot long intake channel is located in the south abutment of the main Frees Creek Dam, terminating at a gated intake structure at invert elevation 375.0’, with four 26 foot diameter surface penstocks bifurcating into eight 18 foot diameter concrete-encased penstocks connecting to the Fairfield powerhouse. The powerhouse contains eight reversible pump-turbine units having a minimum capability of 83,000 hp each, at a minimum head of 150 feet, directly coupled to eight motor-generators, each with a nameplate rating of 64,800 kW in the generating mode and 100,000 hp when operating as a motor. Other appurtenant facilities to the Fairfield system include a switchyard at the powerhouse and two 6,000 foot long, 230 kV transmission lines connecting Fairfield with the Virgil C. Summer Nuclear Station [3].

Monticello Reservoir has a surface area of about 6,800 acres and a storage volume of about 400,000 acre-feet at normal maximum water surface elevation 425’0". The maximum daily withdrawal for generating purposes is 29,000 acre-feet, lowering the pool to elevation 420.5’ and reducing the surface area to approximately 6,500 acres. Pumping operations during periods of off-peak power demand refill the reservoir. Figure 2.4-4 presents area and storage capacity curves for Monticello Reservoir [3].

The service water pond is a Seismic Category 1 impoundment constructed adjacent to Monticello Reservoir to supply water for the Service Water System under normal and emergency operations. The design of the service water pond and its interconnecting pipe to Monticello Reservoir is discussed in detail in Sections 2.4.8 and 9.2.5. This impoundment is formed by the north, east and south dams and the west embankment as shown on Figure 2.4-1. The three dams and the west embankment are Seismic Category 1 structures.

The north, east and south dams have a crest elevation of 438.0’ and crest lengths of about 1,500 feet, 1,150 feet and 765 feet, respectively. The crest of the west embankment is at elevation 435.0’, coinciding with the adjoining plant yard grade, and is about 1,900 feet long.

The interconnecting pipe, through the operation of a butterfly isolation valve, permits the
service water pond to be supplied from Monticello Reservoir. For normal operating 00-01
conditions, the Monticello Reservoir and service water pond levels will fluctuate
between elevations 420.5’ and 425.0’. For a water elevation of 425.0’, the service water
pond has a volume of 1,408 acre-feet and a surface area of approximately 41 acres. In 02-01
the event of loss of Monticello Reservoir while the isolation valve is open, the invert 00-01
elevation at the high point of the interconnecting pipe will limit the drop of the pond level
to its low water level of elevation 415.0’. For a minimum water elevation of 415.0’, the
volume of the service water pond is 1,035 acre-feet and the surface area is 34.5 acres. 02-01

Parr Reservoir constitutes the lower pool of the Fairfield Pumped Storage Facility, and is located approximately 1 mile to the west of the Virgil C. Summer Nuclear Station on the Broad River. This reservoir is formed by Parr Dam, owned by South Carolina Electric and Gas Company, located about 2.5 miles southwest of the site. Parr Dam is a 2,715 foot long, approximately 48 feet high structure, having a 2,000 foot long concrete gravity spillway section with 9 foot high spillway crest gates, with a crest elevation of 266.0'. The dam is joined on the westerly end by an earth dike about 300 feet long and on the easterly end by a 300 foot long integral powerhouse section, a 90 02-01
foot long concrete non-overflow section, and a 25 foot long earth-fill section. Other facilities at Parr Dam include a steel framed brick powerhouse containing six generators rated at 2,480 kilowatts each, and a transmission tie to the 13,200 volt bus at the nearby Parr Internal Combustion Plant [3].

Parr Reservoir originally had a surface area of 1,850 acres with normal pool elevation of 257.0’, extending about 8.5 miles upstream. The Parr Dam crest was raised 02-01
approximately 9 feet by the installation of spillway crest gates. With the gates in the raised position, a maximum pool elevation of 266.0’ is achieved. At elevation 266.0’, Parr Reservoir extends approximately 13 miles upstream and has a usable storage capacity of 29,000 acre-feet with a surface area of approximately 4,400 acres. At normal minimum pool elevation of 256.0’, the surface area is about 1,400 acres with a 02-01
dead storage volume of about 2,500 acre-feet. The operating drawdown of the pool is 10 feet. Figure 2.4-5 presents area and storage capacity curves for Parr Reservoir [3].

In addition to Parr and Monticello, a number of reservoirs exist upstream and downstream of the site on the Broad River and its tributaries. These projects are generally small, low-head dams for hydroelectric power generation and water supply. Most of these dams were constructed in the late 1800’s and early 1900’s. The pertinent data for these projects are included in Table 2.4-1 and their locations indicated on Figure 2.4-2 [3].

There have been several studies on the Broad River for construction of major dams (4,5). The latest study [5] reports that the only reasonably feasible location for a major dam is at the Clinchfield site. As shown on Figure 2.4-2, this site is located in the upper reaches of the Broad River basin in North Carolina, approximately 100 river miles upstream of the Virgil C. Summer Nuclear Station. If constructed, this dam would have a drainage area of 571 square miles and a crest elevation of 830.0’, 153 feet above the Broad River streambed. The conservation pool would be at elevation 810.5’, with 830,500 acre-feet of storage and 20,220 acres surface area. The flood control pool would be at elevation 820.0’, with 1,036,000 acre-feet of storage and 23,180 acres surface area. A volume of 716,000 acre-feet would be allocated for water supply, 90,000 acre-feet for water quality management and 205,000 acre-feet for flood control. The maximum water surface elevation of 825.0’ would be reached with the occurrence of the Spillway Design Flood (SDF) coincident with the full flood control pool.

2.4.1.2.3 Water Use

Downstream of the Virgil C. Summer Nuclear Station, surface water is withdrawn by a number of municipalities and industries. The single largest downstream surface water user is the City of Columbia, located approximately 28 miles from the site. Columbia has an average daily use of 23.0 million gallons, with all the municipal water being obtained from the Broad River. Table 2.4-2 includes a summary of other significant downstream surface water users, their location, average daily use, and source of supply [6]. A tabulation of ground water users is included in Section 2.4.13.2.

2.4.2 FLOODS

2.4.2.1 Flood History

Information on historical floods since 1925 is available at the Richtex gaging station [2]. These data indicate two flood seasons, one from January to April and the other from July to October. Floods in the later period are generally associated with hurricanes and have usually been of greater magnitude than those occurring from January to April [7]. The flood of record at Richtex had a peak discharge of 228,000 cfs, which occurred on October 3, 1929. Table 2.4-3 presents a summary of the major historical floods at Richtex, their peak discharge rates and maximum water surface elevations. Also included is an estimate of the corresponding discharges and elevations at Parr Dam. The discharge estimates at Parr were obtained by multiplying the values at Richtex by the ratio of the 2 drainage areas, 4,500/4,850. Elevations were estimated using the weir equation, with Parr Dam having a 2,000 foot crest at the original elevation 257.0’. A weir discharge coefficient of 3.97 was adopted for the spillway section [8]. Backwater losses have not been included, since the site is only 2 miles upstream from the dam, and they would be minor when the river is in flood stage. The average flow and associated water surface elevations at Richtex and Parr Dam have also been included in Table 2.4-3 for reference.

2.4.2.2 Flood Design Considerations

Sections 2.4.3 through 2.4.7 summarize and identify the individual types of flood-producing phenomena, and combinations of these events that were considered to establish the flood design basis for the plant safety related features.

The adopted design basis flood is based on an analysis considering the Probable Maximum Flood (PMF) on Frees Creek and Monticello Reservoir, coincident with the maximum operating water level of Monticello Reservoir and related wind setup and wave runup [7].

Other areas of analysis included the PMF and seismically induced potential dam failures on the Broad River. Because this is a "dry site" from the standpoint of the Broad River, the very conservative analytical procedures delineated herein result in water levels well below site grade elevation. Seiching potential in Monticello Reservoir was found to be negligible. Potential flooding due to tsunamis and ice conditions are not applicable due to the location of the site and the historical lack of significant ice cover in the region.

Regulatory Guide 1.59 and Regulatory Guide 1.27 are addressed in Appendix 3A.

2.4.3 PROBABLE MAXIMUM FLOOD (PMF) ON STREAMS AND RIVERS

The conditions producing the PMF as defined by the Corps of Engineers are the hypothetical flood characteristics (peak discharge, volume, and hydrograph shape) that are considered to be the most severe, yet "reasonably possible" at a particular location, based on a relatively comprehensive hydrometeorological analysis of critical runoff-producing precipitation (and snowmelt, if pertinent) and hydrologic factors favorable for maximum flood runoff. The PMF for the Virgil C. Summer Nuclear Station was derived for the two water bodies that could affect site flooding, the Broad River and Frees Creek. There are no other adjacent streams that would have impact on plant flooding. Because the Virgil C. Summer Nuclear Station is a flood-dry site (relative to the Broad River) and the equivalent of a dry site as defined in RG 1.102 (relative to Frees Creek), approximate techniques were used coupled with conservative assumptions to maximize water level elevations. RN 13-019

Parr Reservoir, on the Broad River, presents no flooding hazard to the site. A maximum PMF water elevation of 290.5' was calculated at Parr Reservoir in the site vicinity. This is about 150 feet below site grade elevation of 435.0'. Considering coincidental dam breaching, the maximum water surface elevation was very conservatively estimated to be 390.0', still 45 feet below plant grade and clearly demonstrating that the site is "dry" from Broad River influences. Seismically induced floods due to landslides in the site area pose no threat due to the site elevation and the generally flat to rolling terrain.

Another source of potential flooding is from Monticello Reservoir on Frees Creek. The PMF with superposition of wind-wave activity is discussed in Section 2.4.3.6.2. RN 13-019

2.4.3.1 Probable Maximum Precipitation (PMP)

2.4.3.1.1 Broad River

Three different methods were considered in evaluating the PMP over the 4,550 square mile watershed of the Broad River tributary to Parr Reservoir. The first method was extrapolation of data in Hydrometeorological Report (HMR) No. 33 to include an area of 5,000 square miles [9]. The second was doubling the precipitation values for the Standard Project Storm obtained from Civil Engineering Bulletin (CEB) No. 52-8 [10]. The third was multiplying by 1.40 [7] (to obtain saturated atmospheric conditions) the maximum average depth of rainfall, for various durations, for the storm of record which occurred on July 13 to 17, 1916 [11]. The values of the PMP for different durations evaluated by the three methods are shown on Table 2.4-4 [7].

The values shown for HMR No. 33 and CEB 52-8 are so close that the values for the latter were used in evaluating PMF. The rainfall values used from the 1916 storm are for 4,550 square miles and were obtained by interpolating values from the Pertinent Data Sheet [11] between 2,000 and 5,000 square miles. The values of rainfall from CEB 52-8 and from the 1916 storm were then arranged in 6 hour sequences in a manner which yields maximum discharge hydrographs. A total storm duration of 72 hours was adopted [7].

2.4.3.1.2 Frees Creek

The Frees Creek drainage area contributing to Monticello reservoir is 16.5 square miles based on the digital elevation model (DEM) from the South Carolina Department of Natural Resources' (SCDNR) Geodatabase using the terrain surface data for Fairfield County, SC. The DEM is used in conjunction with USGS topographic maps in a GIS software program (Global Mapper) to delineate the drainage area for Monticello Reservoir. According to Section 4.4.3.3 of HMR 52,300 mi² is the smallest storm area for which a reduction should be applied for orientation. Therefore, the Probable Maximum Precipitation (PMP) determination for Monticello Reservoir is determined from Figures 18 through 27 of HMR 51. RN 13-019

The 72-hour duration PMP for the drainage area is 47.7 inches depth. No rainfall losses are deducted from the PMP and entire storm was assumed to be stored in Monticello Reservoir.

2.4.3.1.3 Effects of Local Intense Precipitation

In accordance with the direction contained in U. S. Nuclear Regulatory Commission (NRC), "Request for Information Pursuant to Title 10 of the Code of Federal Regulations (10 CFR), Section 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident," March 12, 2012 [34], the Local Intense Precipitation (LIP) was reevaluated. The design rainfall to be analyzed for LIP flooding is 19.0 inches which is the 1-hour, 1-square mile PMP as defined by Section 3.2 of NUREG/CR-7046[36]. Based upon HMR No. 33[9], the PMP is about 30.30 inches in 6 hours. The distribution sequence for this 6-hour PMP, RN 13-019 according to a U.S. Army Corps of Engineering procedure [10] is as tabulated in Table 2.4-5. The 6-hour PMP was used to analyze LIP flooding for the service water pond.

The underground storm drainage system is not credited to provide flood protection from the LIP. With the storm drainage system assumed blocked, LIP runoff builds up on the surface of the site until it flows overland to lower elevations. In the power block area, this flow direction is toward to service water pond (SWP).

The storm water drainage analyses model for the LIP included current site topography, structures, and features based on current surveys including the new Independent Spent Fuel Storage Installation (ISFSI). An additional margin was included in the analyses to account for potential future structure additions to the site. Based on the analysis results the design site flood elevation is set at elevation 438.5 feet on the west side of the power block, at elevation 438.0 feet on the north and south sides of the power block, and at elevation 437.5 feet on the east side of the power block. Flood protection against entry of storm water into the buildings where such entry could jeopardize the design function of safety related systems and components is provided by a combination of permanent structures and removable flood protection devices. The flood protection devices are designed to provide protection to at least the design flood elevations defined above. The design site flood elevations defined above incorporate a minimum freeboard of 1 foot above the water level determined by analyses. RN 13-019

Interim corrective action has been implemented as a result of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident [35] to ensure flood protection at plant exterior near grade doorways from the license basis flooding due to the LIP. Further development of the interim local flood protection measures at doorways into the power block buildings installs the permanent flood protection design features to mitigate the postulated low probability LIP event. The permanent design consists of features such as sandbag dikes, removable door bulkheads, increasing the height of curbing around the RWST Pit, and other similar measures.

Roof drains discharge directly into the storm drainage system and are designed for an average intensity of 6 in/hr. If the underground storm drainage system becomes blocked, roof drainage will overflow from the inlets at grade and become part of the surface runoff flow. Holes (scuppers) are provided at various locations to allow overflow during locally intense precipitation of more than 6 in/hr, including PMP. The roof edge blocking and gravel stops are provided and designed so that maximum ponding, at only a few locations is 4 inches. The roofs are designed to withstand this water accumulation. It is, therefore, concluded that no hazard to safety-related facilities results from PMP.

2.4.3.2 Precipitation Losses

In order to determine the PMP rainfall excess for the Broad River drainage basin, an initial loss of 1.0 inch followed by an infiltration rate of 0.10 inch per hour was adopted[7]. These values are consistent with those used by the Corps of Engineers in a study of a proposed reservoir site in the Broad River basin [5]. The PMP calculation for Frees Creek assumed no initial or infiltration losses. RN 13-019 RN 13-019

2.4.3.3 Runoff Models

2.4.3.3.1 Broad River

The storm of August 10 to 17, 1940 was selected for developing a unit hydrograph at the Richtex gage, since a series of isohyetal maps of the storm were available for use [12]. Average rainfall values over the Broad River drainage basin above Richtex for several time periods were determined and the discharge hydrograph was plotted as shown on Figure 2.4-7 [13]. A baseflow estimate was made and the volume of storm runoff was determined to be 1.66 inches over the total area. The hyetograph of rainfall, infiltration and excess rainfall is shown on Figure 2.4-7, along with the hydrographs. The storm runoff was divided between the two 12 hour periods of excess rainfall, one having a runoff of 1.345 inches and the other 0.315 inches, and unit hydrographs were derived for each period. By trial and error, the process was repeated until the 2 unit hydrographs were essentially similar in shape and displaced by 12 hours, by means of the S-curve technique (14,7).

A 6 hour unit hydrograph was then derived from the 12 hour unit hydrograph. The derived 6 hour unit hydrograph is shown on Figure 2.4-7, and was used in subsequent calculations [7]. Since the PMF water level determined in Section 2.4.3.5.1 is nearly 150 feet below site grade, no adjustments of the unit hydrograph for non-linearity were made.

2.4.3.3.2 Frees Creek

Since Monticello Reservoir inundates nearly 70% of the Frees Creek drainage basin, a traditional unit hydrograph runoff model is not appropriate. Precipitation on the reservoir will raise its level directly. The entire 72-hour PMP of 47.7 inches of rainfall was assumed to enter Monticello Reservoir. The resulting water surface was calculated based on reservoir topography to yield the still water surface elevation to be used in wave height determination. RN 13-019

2.4.3.4 Probable Maximum Flood (PMF) Flow

2.4.3.4.1 Broad River

Infiltration losses were subtracted from the 2 PMP rainfall patterns to determine the hyetographs of rainfall excess, as shown on Figure 2.4-8. These rainfall excess values were then applied sequentially to the derived 6 hour unit hydrograph to yield the 2 hydrographs at Richtex. The discharge values at Richtex, with a drainage basin of 4,850 square miles, were converted to discharge values at Parr Dam, with a drainage basin of 4,550 square miles, by the ratio of drainage areas, and are shown on Figure 2.4-8. The larger flood hydrographs, which are those obtained from the CEB 52-8 rainfall patterns, were adopted for use in subsequent analyses. This storm resulted in a peak PMF discharge of 960,000 cfs [7] at Parr Dam.

As discussed in Section 2.4.1, existing dams in the Broad River basin which might contribute to the PMF flooding due to their potential failure are generally small, low head structures constructed in the late 1800's and early 1900's. The proposed Clinchfield Dam would be designed to withstand the PMF at that location [7], thereby attenuating the 960,000 cfs peak discharge at Parr Dam. No credit was taken for this potential reduction, and a domino-type failure assuming vanishment of the five existing dams on the Broad River between Clinchfield and the site was assumed to occur coincident with the peak PMF discharge attributable to the PMP. These were the only dams within range of influencing the estimated total site PMF. The dam failure method of analysis, discussed in Section 2.4.4, results in a peak discharge of 4,391,000 cfs at the site. This value, when added to the previously determined PMP-derived discharge of 960,000 cfs, results in a total discharge of 5,351,000 cfs. While the adopted techniques are very conservative, they demonstrate in Section 2.4.3.5.1 the margin of safety against flooding which exists for the Virgil C. Summer Nuclear Station.

2.4.3.4.2 Frees Creek

Releases from Monticello Reservoir are controlled by the intake channel and penstocks connected to the Fairfield Pumped Storage Facility, as discussed in Section 2.4.1.2.2. Assuming that Monticello Reservoir is at its maximum operating level at the beginning of the PMP and no releases are made through the Fairfield Pumped Storage Facility, the remaining storage of Monticello Reservoir is sufficient to completely contain the storm runoff. The analysis of the peak PMF water level in Monticello Reservoir is presented in Section 2.4.3.5.2; therefore, a discussion of the PMF flow in Frees Creek, which is submerged by Monticello Reservoir, is not appropriate.

2.4.3.5 Water Level Determinations

2.4.3.5.1 Broad River

The PMF hydrograph shown on Figure 2.4-8, having a peak discharge of 960,000 cfs, is the inflow hydrograph to Parr Reservoir. The resulting depth of water behind Parr Dam is influenced by the operation of the spillway crest gates which when raised provide a crest elevation of 266.0’. During flood discharges, the gates are lowered to the concrete ogee dam crest at elevation 257.0’ to reduce reservoir flood stage [7].

Analyses have been performed using very conservative assumptions to evaluate the Parr Reservoir stage for the PMF. The following assumptions were adopted:

1. Spillway crest gates on Parr Dam are held at elevation 266.0’, rather than lowered to elevation 257.0’.

2. Maximum discharge is 960,000 cfs.

3. No attenuation of the peak discharge is assumed; 960,000 cfs passes over spillway.

Computations using these conservative assumptions indicate the depth of water would be 24.5 feet above the dam crest. This results in a Parr Reservoir flood stage at elevation 290.5’, nearly 150 feet below the site grade of elevation of 435.0’ [7].

When considering the PMF with coincident upstream dam failures, it is unlikely that Parr Dam would remain intact with the passage of a peak discharge of 5,351,000 cfs. The slope-area method was used to determine the water level on the Broad River. It was assumed that Parr Dam had either failed or, due to the great submergence, had no significant upstream influence. In the site vicinity, the flood plain has an average width of 2,000 feet at elevation 260.0’ and valley side slope of about 9:1 (horizontal:vertical). The average river bed slope, from Parr Dam to Columbia, is approximately 0.07%. In a recent flood hazard information report, the Corps of Engineers has determined Manning’s "n" to be 0.03 to 0.04 for the Broad River and 0.065 for its overbank areas [15]. Conservatively adopting a Manning’s "n" of 0.065 for the entire cross section, the depth of flow would be about 130 feet. Therefore, the maximum water surface elevation under these extremely conservative conditions is approximately 390.0’, still well below site grade elevation of 435.0’.

2.4.3.5.2 Frees Creek

It was calculated that the stage increase in Monticello Reservoir resulting from the PMP runoff and direct PMP on the reservoir surface is 6.07 feet in 72 hours. It is conservatively assumed that Monticello Reservoir will be at the maximum pool elevation of 425.0’ at the beginning of the storm, and that no reservoir releases through the Fairfield Pumped Storage Facility are made during the storm period. On this basis, the 72 hour PMP results in a maximum pool elevation of 431.07’ [7]. RN 13-019

2.4.3.6 <u>Coincident Wind Wave Activity</u>

2.4.3.6.1 Broad River

Since the PMF water level with coincident dam failures determined in Section 2.4.5.3.1 is 45 feet below plant grade, an analysis of coincident wind wave activity was not performed since this situation is not a design basis at the Virgil C. Summer Nuclear Station.

2.4.3.6.2 Frees Creek

Procedures used in evaluating wind setup and waves are described in Engineering Technical Letter No. 1110-2-8 [16]. The setup will accumulate on the lee side of the reservoir, and the waves will runup on the bank or on manmade structures. The magnitude of the setup and runup are dependent upon the reservoir fetch, depth, and other parameters. For these analyses, an effective fetch of 3 miles was determined from Figure 2.4-9. The average reservoir depth, about 70 feet, is great enough to consider deep wave conditions [7].

Other parameters in this evaluation included wind velocity, bank slope and cover, and wave height spectrum. A conservative 50 mph overland wind speed along the central fetch was adopted. This velocity has been used by the Corps of Engineers for large reservoirs in the region and thus is considered appropriate for use at the site. A range of bank slopes from 20:1 to 1.5:1 were evaluated, for both smooth and riprapped surfaces. Runup on a vertical wall was also considered. The value of the upper 1%, termed the maximum wave height, was utilized. The results of evaluations using these parameters are shown on Figure 2.4-10 [7].

Reference to Figure 2.4-10 indicates that for a 2:1 riprapped slope, the wave runup plus setup would be 5.93 feet. It is conservatively assumed that there would be no release of water through the Fairfield Pumped Storage Facility during the PMP, and that the reservoir level would be at a maximum pool elevation of 425.0’ during the storm. This, together with the 72 hour PMP of 6.07 feet, results in a maximum water elevation of 437.00’. Along the shoreline of Monticello Reservoir to the north of the plant, the slope is 2:1 and extends upward to nominal elevation 438.0’ by a 3 foot high riprapped berm constructed above site grade. The dams and the islands of natural area between the dams are also protected to nominal elevation 438.0’ to prevent damage on the reservoir side. In no case is the local elevation of these protective structures less than 437.5’. The design bases for these protective structures is presented in Section 2.4.10. Since the maximum water elevation of 437.00’ is less than the nominal crest elevations of 438.0’ as well as less than the minimum local elevation of 437.5’, there are no adverse effects on safety class structures and equipment due to the coincidental wind wave activity [7].

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An evaluation of the wind setup and waves within the service water pond, made in accordance with procedures described in Engineering Technical Letter No. 1110-2-8 [16], was conservatively based on an effective fetch of 1,288 feet and 80 mph winds blowing for 30 minutes. This analysis indicated that deep water wave conditions would exist and that the wave runup plus wind setup would be 1.8 feet. This, together with the PMP for 1 hour, results in a value of 7.5 feet [7].

2.4.4 POTENTIAL DAM FAILURES (SEISMICALLY INDUCED)

The following conditions were considered for the evaluation of potential seismically induced dam failures:

1. Full flood control reservoirs with 25 year flood coincident with an earthquake equivalent to the Safe Shutdown Earthquake (SSE);

2. Full flood control reservoirs with Standard Project Flood (SPF) coincident with an earthquake to the maximum historical earthquake, and a domino-type failure due to inadequate flood control capacity.

Since the above conditions would require a rigorous analysis of dam stability under earthquake forces, a more conservative approach was taken to simplify calculations and demonstrate a greater margin of plant safety. Computations were based on the complete and instantaneous vanishment of the dams which could affect plant safety coincident with full flood control pools during the SPF. These structures included the proposed Clinchfield Dam and five existing structures between Clinchfield and Parr Dam. A complete description of the reservoirs, potential modes of failure, and methods of analysis are presented in the following sections.

2.4.4.1 Reservoir Description

A description of the significant existing dams, and the proposed Clinchfield Dam, located in the Broad River basin is presented in Section 2.4.1. Pertinent data has been provided on Figures 2.4-2 through 2.4-5 and Table 2.4-1.

2.4.4.2 Dam Failure Permutations

As discussed in Section 2.4.1, existing dams in the Broad River basin are generally small, low-head structures for hydroelectric power generation and water supply. The only feasible location for a major dam is at the Clinchfield site, located on the Broad River about 100 miles upstream of the Parr Dam.

Applying the conservative assumptions it was postulated that the Clinchfield Dam would be instantaneously removed, coincident with the full flood control pool and the Spillway Design Flood (SDF). The SDF is larger than the SPF, and results in a greater dam breach discharge than would the SPF. The resulting flood wave was routed to the site and combined with 1/2 the PMF on the Broad River as determined in Section 2.4.3.

Five smaller dams (Gaston Shoals, Cherokee Falls, 99 Islands, Lockhart, and Neal Shoals) are located on the Broad River between the Clinchfield site and Parr Dam, as indicated on Figure 2.4-2. To be conservative, the passage of the flood wave from Clinchfield was assumed to cause a domino-type failure of the other dams. For each dam, a peak discharge corresponding to the complete and instantaneous removal of the structure with reservoir depth equal to the maximum height of the dam was determined. These values were added directly to the previously determined Clinchfield discharge with 1/2 PMF at Parr Dam. No credit was taken for the reductions of discharge due to tailwater effects or flood wave attenuation. All peak discharges were assumed to occur coincidentally at the site.

The above outlined compound dam failure mechanism results in the largest conceivable flood at Parr Dam. While the adopted techniques are extremely conservative, they demonstrate in Section 2.4.4.4 the margin of safety which exists. Other dams located further upstream on the Broad River or on its tributaries were not considered due to their relatively small size and/or great distance from the site.

Because of the low topographic relief of the region surrounding Monticello Reservoir, the possibility of a slope failure and a resulting landslide which could produce a local slide induced flood wave is extremely remote. During the PMP over the Frees Creek drainage basin, the maximum still water elevation in Monticello Reservoir is 431.07', as discussed in Section 2.4.3.5.2. Since this elevation is nearly 4 feet below site grade elevation 435.0', the seismically induced failure of the Frees Creek Dams presents no flooding threat to Seismic Category 1 plant facilities. As is shown on Figure 2.4-3, the nearest Frees Creek Dam is located approximately 1/4 mile from the plant site area. Therefore, the hypothesized failure of this saddle dam would result in no scour and erosion of the plant foundation.

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The seismic failure of the Frees Creek Dams and other downstream dams identified in Section 2.4.1.2.2 with regard to low water considerations is addressed in Section 2.4.11.

2.4.4.3 Unsteady Flow Analysis of Potential Dam Failures

The discharge hydrograph at the proposed Clinchfield Dam, under instantaneous removal was evaluated by the method shown in Henderson [8]. The maximum discharge thus determined was 3.61 x 10^6 cfs and was assumed to continue for about 58 minutes. It was assumed that after this time the flow would decrease linearly until the reservoir was empty. This falling limb of the hydrograph would last an additional 6 hours [7].

This hydrograph was routed downstream by the method of Gilcrest [17]. Routing coefficients were estimated from the time of passage of the Flood of 1940 at various gaging stations downstream of Clinchfield. The routing was performed from the Clinchfield to the Gaffney gaging station and from there to the Carlisle gaging station. The peak discharge at Gaffney was found to be 810,000 cfs and at Carlisle 280,000 cfs. Routing to Richtex would result in additional attenuation. A peak discharge of 260,000 cfs at the site was adopted. This value when added to 1/2 of the PMF discharge, 480,000 cfs, results in a total discharge of 740,000 cfs [7].

For the five dams located downstream of Clinchfield, the failure discharge was derived by the method of Stoker [18]. Using this technique, the peak discharge at a dam assuming complete and instantaneous removal is computed by 1.68 $LH^{3/2}$, where L and H are the length and height, respectively, of the dam failure plane. A summary of the computations is presented in Table 2.4-6. The peak discharge of 4,391,000 cfs for the five dams, when added to the previously determined 740,000 cfs, results in a total discharge of 5,131,000 cfs.

2.4.4.4 Water Level at Plant Site

Since the above discharge is less than the Broad River PMF discharge with coincident dam failures, 5,351,000 cfs, no further consideration is required. The resulting water level would be more than 45 feet below site grade elevation.

2.4.5 PROBABLE MAXIMUM SURGE AND SEICHE FLOODING

2.4.5.1 Probable Maximum Winds and Associated Meteorological Parameters

The adopted design basis flood and associated winds are discussed in Section 2.4.3.

2.4.5.2 Surge and Seiche History

The site is not located in a coastal area and there are no natural bodies of water in the site vicinity that could be affected by either surges or seiches.

2.4.5.3 Surge and Seiche Sources

The adopted design basis flood and associated winds are discussed in Section 2.4.3.

2.4.5.4 Wave Action

Wave action is discussed in Section 2.4.3.6.

2.4.5.5 Resonance

Approximating Monticello Reservoir as a closed rectangular basin having a major axis of 5.5 miles and minor axis of 2.6 miles, the longitudinal period is approximately 21 minutes while the transverse period is approximately 10 minutes. Since these periods are much greater than wave periods associated with this type of system, wind-generated wave amplification is not possible.

Monticello Reservoir has a surface area of approximately 12 square miles, too small for seiching and resonance due to atmospheric pressure differentials.

2.4.5.6 Runup

Runup is discussed in Section 2.4.3.6.

2.4.5.7 Protective Structures

Protective structures are discussed in Section 2.4.10.

2.4.6 PROBABLE MAXIMUM TSUNAMI FLOODING

The Virgil C. Summer Nuclear Station is located nearly 150 miles from the nearest coastal area. Therefore, tsunami effects are not a safety-related consideration.

2.4.7 ICE FLOODING

The climate of the site vicinity is temperate, and there is no record of ice effects [2]. Broad River temperature data is available at Carlisle, 21 miles north of the site; Richtex, 14 miles south of the site; and at the Parr Steam Plant intake. These data indicate that a minimum monthly mean temperature in the low 40's occurs in December and January [1].

Besides the remote chances of natural ice formation, the ambient surface water temperature of Monticello Reservoir and the service water pond are increased due to the discharge of waste heat from plant cooling water. For example, in winter months the service water pond surface temperatures are about 11°F warmer than the ambient water temperatures [1]. This would prevent ice formation and the possibility of blockage and forces on the plant intake structures.

Due to these factors, an analysis of ice effects is not considered a design basis for the Virgil C. Summer Nuclear Station.

2.4.8 COOLING WATER CANALS AND RESERVOIRS

A safety class impoundment is constructed in a small arm of Monticello Reservoir to supply water for the Service Water System under normal and emergency operating conditions. It is possible to safely shutdown the nuclear plant at any time using only the service water pond, without any reliance upon Monticello Reservoir. As shown in the plot plan, Figure 2.4-1, the impoundment is created by three earth dams and the west site embankment and is designed and constructed in accordance with Regulatory Guide 1.29 (see Appendix 3A). The service water intake is located along the northwest shoreline of the service water pond on the west embankment.

The service water intake, schematically shown on Figure 2.4-11, provides adequate water from either the service water pond or Monticello Reservoir. Cooling water enters the intake chamber from the service water pond through a tunnel, or from the reservoir through a pipe from the circulating water intake structure by opening the normally closed isolation valve. A profile along the interconnecting pipe and through the service water and circulating water intakes is shown on Figure 2.4-12. A discharge structure for the Service Water System is constructed on the southwest edge of the service water pond along the west embankment. 00-01

2.4.8.1 Design Bases

2.4.8.1.1 Capacity

The volume of water stored within the service water pond and surface area as related to water surface elevation are shown on Figure 2.4-13. Following the postulated loss of Monticello Reservoir coincident with the cross connect isolation valve being open, the service water pond level falls with the reservoir level to elevation 415.0'. At this elevation air enters the exposed reservoir end of the 36 inch diameter pipe interconnecting the condenser circulating water intake and the service water intake. This venting and the invert elevation at the high point of the interconnecting pipe limits the drop in pond level to elevation 415.0' (excluding evaporation losses). 00-01

The interconnecting pipe is the only hydraulic connection between the service water pond and Monticello Reservoir. It is designed using the conventional design bases, except for the vertical section, which is part of the Safety Class 2b intake structure. The volume of water remaining in the service water pond below elevation 415.0' is adequate to ensure safe shutdown of the plant and continued cooling for a minimum of 30 days, as required by Regulatory Guide 1.27 (see Appendix 3A) and described in Section 9.2.5. Cooling water is supplied from Monticello Reservoir through the interconnecting pipe and the circulating water intake structure.

During the initial filling of the service water pond, the 36" interconnecting pipe was flow tested to ensure that the requirement for 32,000 gpm for the Service Water System (2 pumps at high speed) was met. During this test, the valve on the interconnecting pipe vent line was closed, since the service water pumps were not operational at that time. Under normal operation of the service water pumps this vent line will be open and the air venting system will be in operation, thus resulting in additional flow rate through the interconnecting line. Venting systems are normally installed for elevation or hydraulic considerations. This venting system, which includes an air ejector, was installed for that purpose.

An annual surveillance of the earthwork above the pipe at ground elevation will be performed to ensure the integrity of the pipe.

The emergency drawdown elevation of 418.0' (Figure 2.4-12) is identified in the SCE&G application for a Federal Power Commission license as the drawdown level for emergency electrical production to represent the worst case operating conditions.

00-01

2.4.8.1.2 Operating Conditions

A butterfly isolation valve is installed in the interconnecting pipe to allow chemical treatment of the Service Water system without discharging chemicals to the environment. Chemically treating the Service Water system is one action to address Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment." The isolation valve is normally closed. The operation of the valve is administratively controlled so that Monticello Reservoir level must be higher than the 00-01 service water pond before the valve is opened; thus ensuring flow only in the direction from Monticello Reservoir to the service water pond.

When the isolation valve is open, the magnitude of flow in the interconnecting pipe is 00-01 governed by the water levels in the service water pond and reservoir. The 4.5 foot rise and fall of the reservoir level due to operation of the Fairfield Pumped Storage Facility (8 hour generation, 9.6 hour pumping, 6.4 hour slack) produces an approximate 1 foot normal fluctuation in the service water pond level.

The minimum water levels in the central pump chamber of the service water intake used in the safety evaluation during normal operation, normal shutdown and LOCA conditions 02-01 is discussed in Section 9.2.5.3.2.

2.4.8.2 Protection Against Probable Maximum Precipitation, Waves and Blockages 02-01

Neglecting outflow from the service water pond, the 10 foot minimum freeboard of the 00-01 dams and embankments surrounding the pond provides capacity for storing considerably more than the 19.0 inch PMP (see Section 2.4.3) plus the overland runoff RN 13-019 from the plant site assuming complete blockage of the underground storm drainage system. Since the service water pond is an arm of Monticello Reservoir, impounded by dams, protection of downstream residents is not a consideration.

Refer to Section 2.4.10 for discussion of protection against wind waves, etc.

At the entrance of the tunnel to the service water pump house, a protruding pier prevents complete blockage of the bar racks. Within the Service Water Pump House, a completely separate chamber with bar rack, traveling screen and stop log grooves for maintenance is provided for each pump. Partition walls separating the chambers prevent loss of function in one chamber from affecting operation of the other chambers.

2.4.9 CHANNEL DIVERSIONS

Monticello Reservoir and the service water pond, which provide the sources of plant cooling water, are not subject to upstream diversions. The Fairfield Pumped Storage Facility is operated in such a manner to maintain a water surface elevation between 420.5’ and 425.0’ in both bodies of water. Therefore, channel diversion effects at the Virgil C. Summer Nuclear Station is not a design basis.

2.4.10 FLOODING PROTECTION REQUIREMENTS

The maximum flood elevation of Parr Reservoir due to the PMF and effect of dam break at Clinchfield site has been analyzed. The resulting maximum flood elevations are considerably lower than the site grade elevation (see Sections 2.4.2 and 2.4.3). The site grade is at nominal elevation 435.0’ adjacent to Monticello Reservoir, an RN 13-019 approximate 6,800 acre reservoir which is created by constructing a series of dams across Frees Creek, a tributary of the Broad River. Monticello Reservoir is impounded

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to a nominal pool elevation of 425.0’ under typical normal operation range for the pumped storage facility.

Shoreline protection in the vicinity of the plant is designed for wave runup and wind setup due to an overland wind velocity of 50 mph superimposed on the maximum flood elevation of the Monticello Reservoir resulting from the coincidence of 72 hour PMP. RN 13-019 The analysis indicates that for a riprap slope as shown on Figure 2.4-10, the wave runup including wind setup is a maximum of 5.93 feet. This, together with the 72 hour PMP results in a value of 12.00 feet. RN 13-019 If it is conservatively assumed that there is no release of water through the Fairfield Pumped Storage Facility during the PMP and that the Monticello Reservoir level is at a maximum pool elevation of 425.0’ during the storm, then the maximum flood elevation resulting from the coincidence of the PMP, wave runup on a riprapped slope and wind setup is elevation 437.0’. RN 13-019 The shoreline along Monticello Reservoir north of the plant and west of the north dam has a 2 to 1 slope (horizontal to vertical) extended upward to nominal elevation 438.0’ by a 3 foot high dike (north berm) constructed above site grade. RN 13-019 The minimum local elevation along the North berm is 437.5’. The slope is protected with two 9 inch filter zones placed beneath 36 inches of riprap.

The west embankment and three earth dams of the service water pond are the only Seismic Category 1 structures which require protection against wind setup and wave runup. The slopes of the west embankment, north, east, and south dams within the service water pond are protected with riprap 2 feet thick laid over 2 filters, each 9 inches in thickness. The wave runup plus the wind setup coincidental with the 72 hour PMP results in a water elevation of 432.50’ within the service water pond. The slopes have been protected up to nominal elevations 435.0’ and 438.0’ for the west embankment RN 13-019 and the three dams, respectively. The minimum local elevations for the top of the west embankment and three dams are 434.5’ and 437.5’, respectively.

The exterior slope of the north dam is protected by riprap consisting of one uniformly graded primary layer 6 feet in thickness, with 2.5 feet of underlayer and 2 filters each 9 inches in thickness. The exterior of the south dam has 2 feet of riprap with 2 filters each 9 inches in thickness. The exterior slope of the east dam has 3 feet of riprap laid over 2 filters, each 9 inches in thickness. The slopes have been protected up to the nominal RN 13-019 top elevation of 438.0’.

For detailed design and gradation of filters and riprap zones for the service water pond dams and west embankment, see Section 2.5.6.

The roofs of safety related buildings are designed to safely dispose of or store to a maximum of 4 inches of local intense precipitation. The site drainage system is sufficient to prevent flooding by a localized PMP. For details, refer to Section 2.4.3.1.3.

Provisions for protection against internal flooding due to equipment malfunction are discussed in Section 7.6.

2.4.11 LOW WATER CONSIDERATIONS

2.4.11.1 Low Flow in Rivers and Streams

2.4.11.1.1 Low Flow Resulting from Dam Failures

Monticello Reservoir and the service water pond, which provide the sources of plant cooling water, obtain make-up water from Parr Reservoir on the Broad River. The Fairfield Pumped Storage Facility is operated in such a manner to provide a minimum normal pool elevation of 420.5'. If the level of Monticello Reservoir is further reduced, either by accidental releases through the Fairfield system or any failure mode of the Frees Creek Dams, the service water pond level falls with the reservoir level to elevation 415.0'. As long as water level in Monticello Reservoir is higher than elevation 415.0', water is interchanged between the service water pond and Monticello Reservoir through an interconnecting pipe. The invert elevation at the high point of the 36 inch pipe is 415.0'. Therefore, a complete loss of cooling water cannot occur due to this hypothesized accident.

In the event of the failure of the downstream Parr Dam, a complete loss of cooling water availability does not occur. Even in the very conservative case where it is assumed that Parr Dam fails coincident with Frees Creek Dam, a pool having elevation 415.0' remains in the service water pond as discussed above. If Parr Dam is assumed to fail, the only consequence is the loss of make-up water from Parr Reservoir to Monticello Reservoir. It is demonstrated in the following section that a loss of make-up water coincident with the 100-year drought on the Broad River does not result in a depletion of the nonsafety related water supply for the Virgil C. Summer Nuclear Station.

A failure of other structures located downstream of Parr Dam, as identified in Section 2.4.1.2.2, has no influence on the safety or nonsafety related water supplies for the Virgil C. Summer Nuclear Station.

2.4.11.1.2 Low Flow Resulting from Hydrometeorologic Conditions

During normal plant operation, ambient evaporation from Monticello Reservoir has been estimated to be 33 cfs, with an additional 13 cfs latent evaporation from condenser water [1]. The total evaporation rate of 46 cfs corresponds to an average daily evaporation loss of 92 acre-feet. Conservatively, no inflow to the reservoir has been assumed in these calculations. To lower Monticello Reservoir by 2.5 feet from its normal minimum pool level to elevation 418.0', which corresponds to the crown of the 36 inch connecting pipe, a total of 21,000 acre-feet of water would have to be removed. More than 1/2 year is required to evaporate this volume of water from Monticello Reservoir. Seepage to the ground water has not been considered, since this loss is negligible due to accumulated sediments as the reservoir matures. Conservatively, no inflow to the Monticello Reservoir has been assumed for those calculations.

Low flow characteristics for the Broad River are available at the Richtex gaging station [20]. Based on data from October 1925 to September 1965, the drought having a return period of 40 years over periods of 120 and 274 consecutive days results in average low flows of 1,060 and 1,970 cfs, respectively. If these data are graphically extrapolated to the 100-year return period, average low flows of approximately 830 and 1,650 cfs, respectively, are obtained for the 2 durations. The average low flow for the 100-year drought over a period of 1/2 year is between these 2 values, or approximately 1,000 cfs. However, it is demonstrated above that more than 1/2 year is required to evaporate a sufficient volume of water from Monticello Reservoir to lower its elevation from minimum pool at 420.5' to elevation 418.0' assuming no make-up from the Broad River. Therefore, the 100-year drought on the Broad River does not result in a depletion of the nonsafety-related water supply for the Virgil C. Summer Nuclear Station.

2.4.11.2 Low Water Resulting from Surges, Seiches, or Tsunami

Low water considerations are discussed in Section 2.4.11.1.

The effects of seiche, tsunami and ice are not applicable to the site.

2.4.11.3 Historical Low Water

Information on historic low flows is available at the Richtex gaging station. The lowest observed average daily flow has been 149 cfs, which occurred on October 13, 1935 and on September 2, 1957. The instantaneous minimum flow of record is 105 cfs [7].

Since statistical methods were not used to extrapolate flows and/or levels to probable minimum conditions, no further discussion is presented.

2.4.11.4 Future Control

No future uses and/or controls for Monticello Reservoir and the service water pond which could affect the ability of safety-related facilities to function adequately are planned for the lifetime of the project.

2.4.11.5 Plant Requirements

A minimum cooling water flow rate of 12,000 gpm is required for the operation of safety-related components supplied by the Service Water System under normal operating conditions. The Service Water Pump House has three service water pumps, each with a design capacity of 16,800 gpm at high speed. The sump invert is at 99-01
elevation 389.0'. The weir in the Service Water Pump House maintains a minimum water level at elevation 399.0' to ensure adequate pump submergence. The service water pond level varies from elevation 422.7' to 423.25' during normal operation (see Section 9.2.5). The emergency drawdown level in Monticello Reservoir is elevation 418.0'. The corresponding equilibrium elevation in the service water pond is 417.5'. In the event of loss of Monticello Reservoir coincident with the cross connect line isolation 00-01
valve being open, service water pond level would drop to a minimum of elevation 415.0'. For details, see Sections 2.4.8 and 9.2.5.

There are no institutional restraints on the use of water.

2.4.11.6 Heat Sink Dependability Requirements

Under normal and emergency operating conditions cooling water for the service water system is supplied from the service water pond, from Monticello Reservoir through an interconnecting pipe or from both sources simultaneously. The design basis for shut down of the plant utilizes the service water pond without reliance upon Monticello Reservoir. For details, see Sections 2.4.8 and 9.2.5.

2.4.12 ENVIRONMENTAL ACCEPTANCE OF EFFLUENTS

2.4.12.1 Surface Water Flow Paths

The following presentation of dispersion, dilution, and travel times of accidental releases of liquid effluents is based upon the highly unlikely postulated spillage of liquid radwastes into the surface water system along overland flow paths. In the event of such an accident, however, the effluent would most likely reach the ground water system as discussed in Section 2.4.13.3. A related analysis of a postulated ground water spillage ultimately reaching the surface water system and downstream users is presented in Section 2.4.12.2.

The site is located approximately 1 mile east of the Broad River and 2.5 miles northeast of Parr Dam on an irregularly shaped ridge about 180 feet above the Broad River floodplain. The ridge is the natural drainage divide between Frees Creek (to the north) and Mayo Creek (to the south).

Besides these 2 creeks, the plant site area is laced with numerous other drainage swales which feed into the Broad River, as is shown on Figure 2.4-15. Based on operation procedures and topographic considerations it is highly unlikely that radioactive material from any postulated accident can ever reach Monticello Reservoir. If such an unlikely event occurred the large volume of water in Monticello Reservoir would provide a very large dilution, since even at minimum pool elevation 420.5’ the storage volume is 371,000 acre-feet. Maximum dilution would be achieved with maximum pool elevation of 425.0’, corresponding to a storage volume of 400,000 acre-feet. The operation of the Fairfield Pumped Storage Facility could be terminated to prevent the highly diluted radwaste from reaching the Broad River and the downstream surface water users identified in Section 2.4.1.2.3. If this was not done, a maximum of 29,000 acre-feet of water could be released during the Fairfield generating phase over 1 day. This highly diluted spilled material would be further diluted in Parr Reservoir. Assuming a very conservative minimum pool elevation of 256.0’, Parr Reservoir has a storage volume of 2,500 acre-feet. Further dilution would result from the natural streamflow into Parr Reservoir. The minimum daily flow observed at Richtex gaging station was 149 cfs during October 13, 1935 and September 2, 1957 [2]. To be very conservative this minimum river flow into Parr Reservoir is assumed, resulting in a total volume of 315 acre-feet over a 24 hour period available for mixing. Additional dilution would be obtained from tributary inflow at downstream locations. The Broad River between Parr Dam and Columbia, S. C. has a typical width of approximately 1,000 feet and a typical depth of about 3 feet. Therefore, travel time may be estimated using Manning's equation for a wide rectangular channel. The average river bed slope from Parr Dam to Columbia is approximately 0.07%. Manning's roughness coefficient, "n", was estimated by the Corps of Engineers to be approximately 0.04 [15]. From the Manning formula, the typical streamflow velocity is about 2.0 feet per second, or about 1.4 miles per hour. The City of Columbia, the nearest downstream surface water user, is located approximately 28 miles below Parr Dam. Therefore, the travel time to Columbia for the highly diluted accidental radwaste released from Parr Dam would be about 20 hours. During the assumed drought conditions, the travel time would be greater due to the smaller streamflow velocities since typical conditions were assumed for the Broad River.

For a postulated accident condition along a surface water flow path, it is somewhat more conceivable that liquid radwaste could be conveyed instead by the site interior drainage system away from Monticello Reservoir. The accidentally spilled material would ultimately reach the Broad River after an overland flow distance of approximately 1 mile (generally southwestward), as may be seen on Figure 2.4-3. An average overland flow velocity of 1 mph, as determined in Section 2.4.3.3.2, is representative for the rolling terrain surrounding the site. Therefore, the centroid of the radwaste spill would reach the Broad River in approximately 1 hour. If the spill reaches Parr Reservoir, a large volume of water will be available for dilution. To be very conservative a coincidental minimum pool elevation of 256.0' is assumed in Parr Reservoir corresponding to a storage volume of 2,500 acre-feet. Maximum dilution would be achieved at a maximum pool elevation of 266.0', corresponding to a storage volume of 29,000 acre-feet. If the spill reaches the Broad River downstream of Parr Reservoir, this dilution would not be available. Further dilution would be achieved by the natural streamflow into Parr Reservoir, as is discussed in the earlier analysis of spillage into Monticello Reservoir. Additional dilution would be obtained from tributary inflow at downstream locations along the Broad River. As determined above, the travel time to Columbia, S. C. for the diluted radwaste released from Parr Dam would conservatively be about 20 hours.

2.4.12.2 Ground Water Flow Paths

In addition to the overland flow paths which are discussed in the previous section, it is conceivable that an accidental radioactive release could originate in the local ground water system, and ultimately reach the surface water system and downstream users. An analysis of such accidental conditions, resulting from the hypothesized rupture of the waste holdup tank, is presented in Section 2.4.13.3. The analysis computes the peak concentrations of various radionuclides at 2 points, corresponding to the locations where 2 possible ground water flow paths would reach the ground surface. The most critical isotope and flow path are determined to be Cs^{137} being emitted from the local aquifer at discharge point A, as shown on Figure 2.4-15. The resulting peak concentration is computed to be 1.7×10^{-3} μCi/ml, as shown in Table 2.4-12, and would occur at the centerline of the spillage flow path.

02-01

RN 02-030

For the purpose of evaluating the effects of the spill material in the surface water system downstream of the discharge point, the average concentration and discharge of the highly diluted radwaste being emitted from the aquifer must be determined. The spill material would not be emitted only at discharge point A, but also on either side of the flow path centerline due to the lateral dispersion of the spill material in the aquifer. The average width of the portion of the local aquifer which could conceivably be contaminated between the waste holdup tank and discharge point A has been estimated to be approximately 1,650 feet. On the basis of the ground water transport model discussed in Section 2.4.13.3, the maximum concentration of Cs^{137} across this width would vary from the previously determined peak of 1.7×10^{-3} μCi/ml to much smaller values at points away from the plume centerline. The spatially-averaged Cs^{137} peak concentration across the effective width of the contaminated local aquifer would be 3.7×10^{-5} μCi/ml. On the basis of Darcy's Equation, this highly diluted spill material would be emitted at a rate of about 0.12 cfs.

02-01

RN 02-030

RN 12-019

Prior to reaching the Broad River, the spill material being emitted would be further diluted by water which originated in uncontaminated portions of the local aquifer tributary to the flow path downstream of discharge point A. Again using Darcy's Equation, the discharge from this uncontaminated portion of the local ground water system is computed to be 0.52 cfs. Therefore, the total flow rate of the highly diluted spill material upon reaching the Broad River would be 0.12 + 0.52 or 0.64 cfs. The corresponding peak concentration of Cs^{137} would be $(0.12/0.64)\ 3.7 \times 10^{-5}$ or 6.9×10^{-6} μCi/ml.

RN 12-019

RN 02-030

Upon reaching the Broad River, further dilution of the spill material would result from the natural streamflow into Parr Reservoir. The minimum daily flow observed at the Richtex gaging station on the Broad River was 149 cfs during both October 13, 1935 and September 2, 1957 [2]. Even under these extreme drought conditions, an additional dilution factor of $0.64/(149 + 0.64)$ or 4.3×10^{-3} is achieved. Hence, the peak concentration of Cs^{137} would be $(4.3 \times 10^{-3})(6.9 \times 10^{-6})$ or 3.0×10^{-8} μCi/ml. This concentration is a factor of 33 below the effluent concentration limit for Cs^{137} for unrestricted areas from Appendix B of 10 CFR 20.

RN 02-030

The above analysis of the ground water spill material reaching the surface water system has conservatively neglected the initial dilution provided by the water impounded in Parr Reservoir. Even at its minimum pool elevation of 256.0', Parr Reservoir has a storage volume of 2,500 acre-feet available for dilution. Nor has any credit been taken for the additional dilution provided by tributary inflow at downstream locations along the Broad River. As is discussed in Section 2.4.12.1, the travel time of the spill material in the Broad River from Parr Dam to Columbia, S. C., is conservatively estimated to be about 20 hours.

2.4.13 GROUND WATER

2.4.13.1 Description and Onsite Use

2.4.13.1.1 Regional Ground Water Conditions

The region within a 20 mile radius of the site lies within the Piedmont Physiographic Province, except for a small portion to the southeast near Columbia, which is in the Coastal Plain Province.

The bedrock underlying the region principally consists of Paleozoic crystalline metamorphics and igneous intrusives of the Charlotte Belt and Carolina Slate Belt. Information on the bedrock sequence is not detailed because there are few outcrops -- these being confined somewhat preferentially to the more deeply entrenched drainages and some prominent knobs of resistant rock.
The metamorphic and igneous rocks weather to overburden soils of clayey, silty, and sandy composition. The character of the overburden is related to the type of bedrock and degree of weathering. The overburden thickness ranges up to 100 feet or more, but varies considerably from place to place depending on degree of incision of drainages and bedrock composition.

Ground water in the region occurs in 2 types of formations: (1) jointed and fractured crystalline bedrock, and (2) the lower zones in the residual soil overburden. Recharge to these formations is principally by infiltration of precipitation falling on the upland areas. Some of the water infiltrating the surface soils evaporates, transpires from plants, or re-emerges at the surface downslope at short distances from points of infiltration. A small portion of the water percolates to perched water zones, or deeper into the water table in the lower soils and the underlying jointed bedrock.

The ground water table, in general, follows the land surface but with more subdued relief. Ground water discharges as visible seeps and springs and/or percolates through the ground into creeks and streams. Some ground water is discharged via wells, but the amount pumped is very small because the formations generally are not pervious enough to sustain well yields greater than a few gallons per minute.

2.4.13.1.2 Pre-Reservoir Impoundment Ground Water Conditions

RN
10-002

Investigations performed at the site reveal that geologic and hydrologic conditions in the site area are essentially the same as the regional conditions described in Section 2.4.13.1.1. Local surface topography plays a dominant role in ground water occurrence.

The site is located about 1 mile east of the Broad River on the north flank of an irregularly shaped relatively narrow ridge. The ridge is presently confined between Frees Creek on the north and Mayo Creek on the south, and is laced with numerous drainage swales which feed into the creeks. Both creeks are tributaries to the Broad River. Previous to grading for construction, the site portions of the ridge ranged from elevation 400.0’ to 500.0’. The upgraded ground surface at the site slopes irregularly downward in a general northeast direction.

Test borings drilled at the Virgil C. Summer Nuclear Station location encountered metamorphic and igneous rock of the Charlotte Belt at depths ranging from 40 to 95 feet below the original ground surface. The upper 5 to 10 feet of original residual soil overburden consisted of stiff, impervious clayey and silty soils, containing variable quantities of sand. Underlying the upper materials were soils of relatively low permeability, consisting generally of silty sand and sandy silt. These soils graded into weathered and partially decomposed bedrock which overlies the fresh bedrock. The bedrock is impervious except along joints.

Ground water at and around the site occurs principally under water table conditions within jointed bedrock generally at depths of 30 to 90 feet (elevation 350.0’ to 420.0’) below the original ridge topography, although infrequent lenses of perched water occur in overburden soils.

2.4.13.1.3 Onsite Use of Ground Water

Ground water will not supply any of the water required for operation of the plant.

2.4.13.2 <u>Sources</u>

2.4.13.2.1 Regional Use of Ground Water

Ground water within the region is principally used for individual households and for livestock. Within 2 to 20 miles of the site approximately 100 wells have been reported for municipal, industrial, and domestic purposes. Data for these wells are listed in Table 2.4-7. The well locations within approximately 2 to 20 miles of the site are shown on Figure 2.4-14. The data presented for ground water use were primarily taken from South Carolina Department of Health & Environmental Control compilations, providing the latest and most accurate information available. Except for a few cases, data were not available for water levels, elevations, and drawdowns.

Wells in the region range from 62 to 365 feet deep, but are commonly less than 200 feet deep and yield about 10 gpm or less. Yields of up to 55 gpm have been reported. However, such yields are obtainable only from a small fraction of the region’s wells. When water requirements are large, surface water must be developed because large yields usually cannot be obtained from wells in either bedrock or overlying soil. Ground water within a 20 mile radius of the site is currently used for domestic and small industry purposes. Since it is generally not possible to develop wells in the area with yields greater than a few tens of gallons per minute, it is likely that the aforementioned well and ground water use parameters will not change significantly in the future. Consumption of ground water should increase in proportion with the area’s resident population increase. Estimates of the region’s population growth are presented in Section 2.1.

2.4.13.2.2 Local Use of Ground Water

The site is located in a relatively undeveloped area. There are no wells or domestically used springs downgradient from the site. The nearest location of ground water withdrawal is a well approximately 1 mile eastward, just outside of the site boundary. The nearest large group of domestic water wells is along Route 215 about 1.5 miles east of the site and in Jenkinsville approximately 2.5 miles southeast of the site.

Locations of wells within an approximate 2 mile radius were compiled by interviewing residents. These wells are shown on Figure 2.4-15, and are listed in Table 2.4-8. These local wells supply water for 42 residences and 4 stores. The wells extend into rock, range from 65 to 365 feet in depth, and typically yield less than 10 gpm. The water quality is generally acceptable for domestic use.

The only nearby public water supply is the Jenkinsville Water Company. Three of its five wells are within approximately 2 miles of the site. The Jenkinsville Water Company supplies water to 51 residences and one business within 2 miles of the site. Sixteen of the residences are also connected to operable private wells.

Predicted future use of regional ground water is discussed within Section 2.4.13.2.1. Future use of local ground water is also considered related to the area's resident population projections. It is estimated that the resident population within 2 miles of the site will remain approximately static through the year 2019. Local ground water consumption should not, therefore, experience significant deviations from approximate current levels.

2.4.13.2.3 Site and Vicinity Ground Water Levels and Flow Directions

Perforated pipes were installed in 19 exploratory borings to observe water levels at the site. Repeated observations of water levels were made to obtain static level information. Analysis of this information indicated that the principal direction of flow at the site is toward the northeast into Frees Creek, a tributary to the Broad River. Movement of ground water is from the ridge axis toward its flanks as illustrated by the water table contours shown on Figure 2.4-16. The ultimate flow of site ground water is into the Broad River. The estimated rate of flow is expected to be up to 1 foot per day on the steeper ridge flanks.

Observations of water levels in exploratory borings indicated that the ground water table at and around the site occurs at depths ranging from approximately 20 to 90 feet (elevation 350.0' to 420.0') below the original ground surface, generally in jointed bedrock. Local lenses or perched water in soil occur, indicated by seepage high on the ridge flanks. Static water levels and water level contours developed from these data are presented on Figure 2.4-16.

An evaluation of ground water conditions at the site indicates the following:

1. The preconstruction water table slopes downward toward the northeast in the direction of the sloping land surface.

2. The water table gradient is quite flat (0.005 to 0.01, foot/foot) on top of the ridge and steeper (0.02 to 0.07 foot/foot) on the ridge flank.

3. Recharge occurs locally, from surface infiltration, and discharges into Frees Creek.

4. No wells or springs used for water supply are located down gradient of the site.

Ground water levels measured in existing wells within about 2 miles of the site range from 22 to 90 feet in depth.

The overburden soils release water slowly to the lower, more pervious saprolitic and jointed rock zones. As a result of this storage effect, yields of wells and flows of springs remain rather constant, and are sustained during periods of deficient moisture. Review of the available information does not indicate that well dewatering is a problem in the site area, and ground water fluctuations are, therefore, considered to be minor.

2.4.13.2.4 Permeability of Onsite Materials

Laboratory permeability tests have been performed on selected samples obtained from borings drilled at the site of the Virgil C. Summer Nuclear Station structures. The results of these tests are summarized on Table 2.4-9. Permeability tests performed on silty sand to sandy silt samples of soil obtained below the surficial clayey zone indicate a permeability ranging from 3.35×10^{-1} to 4.8×10^{-4} feet per day. A test performed on a sample of the surficial clayey soils indicates a permeability of 6.8×10^{-2} feet per day. These tests are indicative of vertical permeabilities of the site soils.

Field permeability tests have been performed in various soil and rock horizons in borings located in the service water pond. The results of the field permeability tests are presented on Table 2.4-10, and are considered indicative of the horizontal permeabilities of the materials tested. Additional permeability test data are presented in Section 2.5.6.

The locations of borings in which field permeability tests were conducted and associated data are included in Section 2.5.6. Field permeabilities on soils, saprolites, and partially decomposed rock ranged from 5.9 to 5.1×10^{-3} feet per day, with higher values obtained locally in the valley bottom along the north dam grout curtain.

Table 2.4-10 also presents results of additional laboratory permeability tests on soils and rock which are indicative of the vertical permeabilities. The methods utilized for the determination of the permeabilities presented on the tables are described within Section 2.5.6.

The laboratory and field test data indicate that the site subsurface strata generally have low permeability. The ground water velocity is not expected to exceed 1 foot per day.

2.4.13.2.5 Changes in Ground Water Recharge Patterns and Reversibility of Ground Water Flow

Construction of the Virgil C. Summer Nuclear Station includes excavation to a site grade of elevation 435.0'. After Monticello Reservoir is impounded to elevation 425.0', ground water occurrence, movement, recharge and discharge at the site and around the reservoir are expected to change.

In general, the area surrounding the reservoir ranges in maximum elevation from about elevation 450.0' to 500.0'. After Monticello Reservoir is filled, the reservoir surface will be higher than the existing water table at the site. It is estimated that the water table will ultimately rise from its present level, between approximate elevations of 350.0' to 420.0', and approach an approximate elevation of 420.0'. It is anticipated that wells in the area of the reservoir with water levels below elevation 420.0' will experience an increase in water level elevation. The amount of water level rise will be dependent on the present well water elevation and its distance from the reservoir.

The ground water direction will probably be reversed from northeast to the south and west toward Broad River tributaries, and will move at an estimated velocity of less than 1 foot per day. There are no domestic or industrial wells downgradient of the predicted reversal of ground water flow. Ground water observation wells, as described in Section 2.4.13.4, will be monitored during and after the filling of Monticello Reservoir. Changes in site ground water conditions will be documented as they occur.

2.4.13.2.6 Ground Water Quality

Jointed bedrock is not a good aquifer for municipal and industrial water wells. The quality of ground water is acceptable for most uses, but an objectionably high iron content is found in some supplies. The water quality is highly mineralized, due to prolonged contact with, and solution of, rock minerals. The following chemical analyses pertain to water samples obtained from site area borings and are expected to be indicative of typical ground water quality:

	Boring N-23	Boring 3-14	Boring 3-2
pH	6.6	6.7	7.0
Alkalinity (phenolphthalein)	0 ppm *	0 ppm	0 ppm
Alkalinity (methyl orange)	29 ppm	50 ppm	45 ppm
Sodium Chloride	7.37 ppm	10.36 ppm	5.38 ppm
Total hardness	16 ppm	42 ppm	28 ppm
Calcuim Hardness	12 ppm	30 ppm	16 ppm
Magnesium Hardness	4 ppm	12 ppm	12 ppm
Conductivity	60 μmho **	140 μmho	100 μmho

Dissolved Solids	50 ppm	608 ppm	332 ppm
Silica	4.7 ppm	22.5 ppm	16.5 ppm
Iron	2.6 ppm	2.7 ppm	4.9 ppm
Copper	0.8 ppm	0.7 ppm	1.0 ppm

____

* parts per million

** micromho

2.4.13.2.7 Site Dewatering

Following impoundment of Monticello Reservoir, full pool elevation for both the reservoir and the service water pond has been 425.0 feet above mean sea level (msl). As previously described, the proximity of Monticello Reservoir and the service water pond has resulted in a raised water table throughout the site and a reversal from natural ground water flow.

A 2003 ground water study found predominate flow in the shallow aquifer was towards the west-southwest, ultimately feeding into the Broad River. Local ground water elevations ranged from 425.0 to 420.0 feet msl. Site ground water contours are illustrated on Figure 2.4-17. This study was initiated due to persistent issues with ground water intrusion into some plant buildings at elevations below the ground water table. The study sought to determine water sources, identify subsurface flow paths, and characterize site hydrogeology. This effort, which included significant subsurface exploration, was utilized to assess the feasibility of future dewatering efforts.

In 2008, a non-safety dewatering system was installed in proximity to the plant structures experiencing water intrusion issues. This system consists of 16 wells, installed to various depths, ranging from 85 to 180 feet. Most well heads are located within an underground concrete vault and include a submersible pump, level transmitter, and controller to automatically regulate well drawdown levels to a pre-determined setpoint. Well yield is dependent upon permeability of local resident soils and was the bases for pump sizing. Level setpoints were largely determined from water intrusion into nearby structures. RN 10-002

Pumped water is discharged into the local storm drainage system, where it is conveyed by storm sewers to the south and west, away from Monticello Reservoir. This water ultimately enters tributaries of the Broad River. Existing NPDES permitting was revised to address this additional effluent of approximately 70,000 gallons per day (steady state). The storm drainage system has been evaluated to ensure this additional discharge flow does not adversely impact interception and conveyance of overland drainage flow resulting from a postulated 6-hour PMP (Section 2.4.3.1.3).

Settlement of adjoining buildings and structures was evaluated in advance and monitored during the incremental drawdown of the water table. Following stabilization of the ground water regime, observed displacements were within acceptable limits established in the structural evaluation (i.e., settlement was not structurally significant).

A subsequent review of ground water conditions was performed in August 2009 and found subsurface flows toward the installed dewatering wells in all directions. Generally, ground water was flowing south from Monticello Reservoir, west from the service water pond, and north from the Transformer area. Ground water intrusion into plant structures had been mitigated and ground water depth maintained in the installed wells ranged from 402.0 to 372.0 feet msl. Site ground water contours are illustrated on Figure 2.4-18.

FSAR Sections 2.4.12.1 and 2.4.12.2 discuss dispersion, dilution, and travel times associated with an accidental release of liquid radwaste effluents into the surface water (site drainage system and overland flow) and ground water (soil mass) systems, respectively. Additionally, an analysis describing a postulated accidental release of radionuclides into the ground water system is presented in Section 2.4.13.3. Operation of the subject dewatering system does not alter these discussions and conclusions. RN 10-002

Applicable plant procedures secure the dewatering pumps if groundwater contamination is discovered.

2.4.13.3 Accident Effects

2.4.13.3.1 Introduction

An accidental release of radionuclides into the ground at the site will not affect local or regional ground water supplies. The direction of future ground water flow is expected to reverse and no local or regional domestic, municipal, or industrial ground water sources lie downgradient of the site.

A rupture of a waste holdup tank results in the worst case potential impact to the local surface and groundwater sources. RN 02-030

The following analysis describes the potential effect of an accidental rupture of the waste holdup tank, located 21 feet south and 85 feet west of the center of the reactor building, on ground water quality. The bottom of the tank is located approximately at elevation 375.0'. The tank is supported on a 9 inch pad overlying a concrete structural mat 4 feet in thickness, and 2 feet of lean concrete fill which rests directly on bedrock.

At the location of the tank, the material at foundation level consists of highly weathered to moderately weathered crystalline rock, composed of granodiorite or migmatite; these materials are in the transition zone between fresh rock and saprolite. The saprolite in this area may generally be classified as a micaceous silty sand containing small to large fragments of slightly weathered rock.

The capacity of the tank is 10,000 gallons. For conservatism, it is assumed that at the time of rupture the tank is full and has an isotopic composition equivalent to the composition of reactor coolant with an assumed failed fuel fraction of 0.12% consistent with NUREG-0017 [33]. At the time of the accident, it is assumed that the tank, the entire underlying foundation, and the adjoining walls rupture. Thus, the liquid in the waste holding tank would make immediate contact with the saturated geologic materials adjacent to the tank. The problem analyzed, therefore, is the disposition of a 10,000 gallon slug of liquid radwaste which has been instantaneously introduced into the local ground water regime. RN 02-030

It is assumed that at the time of rupture the Monticello Reservoir is at elevation 425.0', and that the resulting elevation of the water table adjacent to the waste holding tank has reached equilibrium level, approximately at elevation 420.0'. At this time the general water table gradient will probably be toward the west and the south. Two (2) possible flow paths are suggested. The contaminants could move west-southwest toward a small tributary flowing west toward the Broad River (Figure 2.4-15). In this case the likely point of discharge to the surface would be about 3,070 feet from the waste holdup tank, at the point where the tributary becomes a perennially flowing stream due to discharging ground water (discharge point A, Figure 2.4-15). The other flow path would be in a south-southeast direction from the tank toward Mayo Creek (Figure 2.4-15). It is assumed the ground water would be discharged 3,680 feet from the tank, at the point where this creek also becomes a perennially flowing stream (discharge point B, Figure 2.4-15). As described in Section 2.4.13.3.2, an analytical model has been used to estimate the concentration of radionuclides in the ground water at these 2 discharge points following the postulated accidental rupture.

No water wells or developed springs occur between the waste holdup tank and the general vicinities of the 2 discharge points.

2.4.13.3.2 Description of Model

The equation utilized for the analysis was derived from the Equation # 1 for the instantaneous introduction of a slug having an infinitesimally small volume [21]:

$$\frac{C_i}{m} = \frac{1}{n\left(4\pi D'_x t\right)^{1/2}\left(4\pi D'_y t\right)} \exp - \left\{ \frac{\left(x - U'_x t\right)^2}{4D'_x t} + \frac{y^2}{4D'_y t} + \frac{z^2}{4D'_y t} + \lambda_i t \right\} \qquad (\#\ 1)$$

for the case where $U_y = U_z = 0$, and where $D_y = D_{z'}$ where,

- c = Quantity of radionuclide cation per ml of interstitial solution, at any time t and at any point x,y,z,
- m = Total quantity of radionuclide introduced in slug,
- n = Porosity of the aquifer,
- x = Distance from point of injection in direction of ground water flow to the point of interest,
- y = Distance laterally, perpendicular to ground water flow,
- z = Distance vertically, below level at which slug introduced.
- λ_i = Decay coefficient = $.693/T^{1/2}$, where $T^{1/2}$ is the radionuclide half life,
- t = Time since introduction of slug of liquid,
- U'_x = The average velocity of the radionuclide in the x direction,
- U'_x = $(R_f)\ (U_x)$, where,
  - U_x = seepage velocity in the x direction,
  - R_f = the reduction factor due to cation exchange

$$= \frac{1}{1 + \left(\frac{P_B}{n}\right)\left(\frac{Q'}{C}\right)(E)} \quad [22]$$

where,

- P_B = bulk density of the aquifer (gm/ml),
- Q' = concentration of native cations absorbed on the exchange complex the aquifer material (meq/gm), *
- C = total concentration of native cations in the ground water at equilibrium (meq/ml),
- E = equilibrium exchange constant for exchange process for radionuclide cation displacing native cations on the exchange complex,

*meq. = milliequivalents

D'_x = reduced dispersion coefficient in the x direction:

= $D_x R'_f$ [23]

D'_y = reduced dispersion coefficient in the y direction

= $D_y R'_f$

where,

D_x is the dispersion coefficient in the x direction, and
D_y is the dispersion coefficient in the y direction
= D_z.

Equation #1 was then integrated over the volume of the prismatic slug of finite volume. The right-hand side of Equation #1 was integrated with respect to x, y, and z, over the limits $x\text{-}x_0/2$ to $x+x_0/2$, $y\text{-}y_0/2$ to $y+y_0/2$ and $z\text{-}z_0/2$ to $z+z_0/2$, respectively. Here x_0, y_0, and z_0 are the dimensions of the slug in the soil in the respective axes at time zero, and x, y, and z are measured from the center of the prismatic volume of soil occupied by the slug. The resulting expression for the general case where $D_y \neq D_z$ is given as Equation # 2:

$$c_i = \frac{m}{8nx_0y_0z_0}\left\{\text{erf}\left(\frac{x+x_0/2-U'_xt}{\sqrt{4D'_xt}}\right)-\text{erf}\left(\frac{x-x_0/2-U'_xt}{\sqrt{4D'_xt}}\right)\right\}$$
$$X\left\{\text{erf}\left(\frac{y+y_0/2}{\sqrt{4D'_yt}}\right)-\text{er f}\left(\frac{y-y_0/2}{\sqrt{4D'_yt}}\right)\right\}$$
$$X\left\{\text{erf}\left(\frac{z+z_0/2}{\sqrt{4D'_zt}}\right)-\text{erf}\left(\frac{z-z_0/2}{\sqrt{4D'_zt}}\right)\right\}\left\{\exp\left(-\lambda_i t\right)\right\} \qquad (\#\ 2)$$

This equation holds for the case of a slug introduced instantaneously into a saturated porous medium, where the slug has a finite volume at t = 0. The inclusion of the factor, exp ($-\lambda_i t$), means that radionuclide decay is accounted for in the calculated concentration (c).

Two (2) certified computer programs, which solve Equation # 2, were used in the analysis - ATIME5 and SLUG3D. ATIME5 provides a sensitivity analysis for each parameter in the range of the parameters applicable for a given site. SLUG3D, in this case, was used to calculate the values of concentration at the particular points of interest over the range of time during which peak occurs.

2.4.13.3.3 Selection of Parameters

1. Horizontal Hydraulic Conductivity (K_h)

   The highest horizontal hydraulic conductivity applicable to the highly weathered to moderately weathered bedrock at the level where the waste holding tank lies is 6.0 ft/day. This value was derived by analysis of the results of packer tests performed in the bedrock and saprolite at the site, described in Section 2.5.6, and was obtained in a narrow zone of atypically higher permeability.

2. Distance to Discharge Points (x)

   As discussed in Section 2.4.13.3.1, the distances to the estimated discharge points A and B are:

   Flow Path A (WSW) - 3,070 feet;
   Flow Path B (SSE) - 3,680 feet.

3. Ground water Gradient (i)

   For flow path A the elevation of the estimated discharge point is 310.0' and that for flow path B is 330.0'. Assuming a ground water elevation of 420.0' at the tank, the resulting overall hydraulic gradients are:

   Flow Path A - 0.036;
   Flow Path B - 0.025.

4. Porosity (n)

   The sensitivity analysis showed that for the conditions at the site, lower porosities result in greater contaminant concentrations at the points of interest. Thus, for conservatism, the lowest porosity determined for the pertinent geologic materials must be selected. Porosity can be estimated from bulk dry density (P_B) by:

   $n = 1 - P_B/P_S$,

   where P_S is the particle density, estimated to be 2.65 gm/ml. To obtain the lowest porosity, the value of P_B representing the highest dry density must be used. The highest value for P_B in the lower saprolite was 117 lbs/ft^3, or 1.88 gm/ml, as reported in the PSAR. The resulting value for n is 0.29.

5. Seepage Velocity (U_x)

   The seepage velocity is determined by a modification of Darcy's Equation:

   $U_x = K_h\ i/n$

The resulting values for the 2 flow paths are:

Flow Path	U_x (ft^2/day)
A	0.74
B	0.52

6. Dispersion Coefficients

The sensitivity analysis indicates a smaller dispersion coefficient results in a larger concentration. Relatively small values for D_x (longitudinal dispersion coefficient) can be estimated using empirical equations derived from laboratory studies using columns of glass beads or sand [24], [25]. One such equation is provided by Fried and Combarnous [24].

$$D_x = D_0 \left[0.67 + 0.5 \left(\frac{U_x d_{50}}{D_0} \right)^{1.2} \right]$$

where d_{50} is the mean particle size and D_0 is the molecular diffusion coefficient in bulk water. D_0 is approximately equal to 9.7×10^{-4} ft^2/day, and d_{50} is estimated to be 0.10 cm (.0033 ft.) for the geologic materials near the waste holdup tank. The resulting values are:

Flow Path	D_x (ft^2/day)
A	2.1×10^{-3}
B	1.6×10^{-3}

However, field studies indicate that actual field values of the dispersion coefficients may be increased by 2 orders of magnitude greater than those obtained from laboratory experiments [26], [27]. Biggar and Nielsen [26] found that for field surficial soils the longitudinal dispersion coefficient is given by:

$D_x = 0.6 + 2.93\ U_x^{1.11}$, where

U_x is in cm/day, and D_x is in cm^2/day. The resulting values for this accident analysis would be:

Flow Path	D_x (ft^2/day)
A	0.10
B	0.067

In an effort to strike a compromise between low values for longitudinal dispersion coefficients required for conservatism, and high values which appear to hold in the field, the results of laboratory experiments reported by Klotz and Moser are used [28]. Their studies indicate that longitudinal dispersion coefficients generally fall between the 2 extremes. For the seepage velocities indicated above, a uniformity coefficient of 12.5 and a d_{50} of 0.10 cm., extrapolation in Figure 10 by Klotz and Moser [28] yields:

Flow Path	D_x (ft^2/day)
A	0.033
B	0.022

These are the values adopted for this analysis.

Lateral Dispersion coefficients (D_y) are estimated from data by Lenda and Zuber, Figure 7 (curve No. 5) [29]. The results are:

Flow Path	D_y/D_x	D_x (ft^2/day)
A	0.47	0.015
B	0.52	0.012

Other references (such as Harleman and Rumer [30]) give higher D_y/D_x ratios (approaching 1.0) for seepage velocities of the magnitude involved in this study, but the values from Lenda and Zuber [29] are used for conservatism.

The lateral dispersion coefficients in the vertical direction (D_z) were assumed to be very low because of the proximity of bedrock to the tank. A value of $D_z = 1.08 \times 10^{-7}$ ft^2/day (1.00×10^{-4} cm^2/day) was assumed for both flow paths.

7. Cation Exchange Capacity (Q)

The logs of borings in the immediate area do not indicate the presence of any significant clay content in the decomposed rock at the location of the waste holdup tank and downgradient. It is, therefore, conservatively assumed that the material has essentially no cation exchange capacity.

8. Concentration of Native Cations in Ground Water (C)

Because Q = 0, the concentration of native cations in the ground water has no effect, and can be set arbitrarily to 1.0.

9. Equilibrium Exchange Constant (E)

Because Q = 0, there is no equilibrium exchange constant for any of the radionuclides involved.

10. Size and Dimensions of Slug

The sensitivity analysis indicates that the concentration at the points of interest increases as the slug approaches the dimensions of a cube. Thus,

$[(10{,}000 \text{ gallons}/7.481 \text{ gal/ft}^3)/0.29]^{1/3} = 16.64$ ft.
and, $x_0 = y_0 = z_0 = 16.64$ feet.

11. Radionuclides

Four of the radionuclides present in the waste holding tank are of special interest from the point of view of public health based on their long half lives and concentration, and were studied in the analysis. Table 2.4-11 lists each of the four radionuclides, their respective half lives, and their assumed quantities in the tank. RN 02-030

2.4.13.3.4 Computational Results

The SLUG3D computer code was executed using the above parameters and an isotopic source based on reactor coolant activities with an assumed failed fuel fraction of 1%. Resulting peak concentrations were adjusted to be consistent with an isotopic source based on reactor coolant activities with an assumed failed fuel fraction of 0.12% consistent with NUREG-0017 [33] and are presented in Table 2.4-12. Comparing the concentrations at the discharge points in Table 2.4-12 with the 10CFR20 Effluent Concentration Limits (ECL) from 10CFR20, Appendix B, it is seen that the dominant isotope is Cs^{137}. It is demonstrated in Section 2.4.12.2 that the CS^{137} concentration is reduced to well below the ECL value for unrestricted areas due to dilution provided by the local ground water aquifer and flow in the Broad River. RN 02-030

2.4.13.4 Monitoring and Safeguards Requirements

Seven observation wells will be installed at the site, located to define the ground water flow regime during and subsequent to the impoundment of Monticello Reservoir. The observation wells will provide data on water levels, water table gradient, and direction of flow. Generally, the observation wells will consist of perforated PVC plastic pipe placed in open borings 50 to 80 feet deep. The depth of individual wells will depend on the depth of the fresh rock/saprolite interface. Water levels in the observation wells will be measured quarterly during filling of the reservoir and for a year after the reservoir is filled. The observation wells will be utilized to provide samples for analysis of the ground water in the event of inadvertent spillage.

2.4.13.5 Design Bases for Subsurface Hydrostatic Loading

Upon completion of the filling of Monticello Reservoir, the ground water level elevations are expected to increase. It is conservatively estimated that the ground water at the principal plant structures ultimately will rise to a maximum approaching elevation 420.0'. During normal operations of the Fairfield Pumped Storage Facility, the Monticello Reservoir water level will fluctuate from elevation 420.5' to 425.0'. These safety-related structures are designed to withstand the ground water-induced hydrostatic forces, based on a ground water level of elevation 420.0'.

Ground water did not constitute a major problem during construction and dewatering was not critical to the integrity of the safety-related plant structures (Section 2.5.4.6). A permanent, non-safety dewatering system has subsequently been installed to address nuisance water intrusion into plant buildings (Section 2.4.13.2.7). RN 10-002

2.4.14 TECHNICAL SPECIFICATION AND EMERGENCY OPERATION REQUIREMENTS

Safety-related facilities constructed at the plant grade elevation of 435.0' are protected as described in Section 2.4.10. Therefore, emergency protective measures and appropriate technical specifications are not required.

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2.4.17 PERSONS AND AGENCIES INTERVIEWED

Mr. J. S. Brown, Well Driller, Chester, South Carolina. *

Mr. James Duke, South Carolina Water Resources Commission, Columbia, South Carolina.

Mr. E. L. Frick, Well Driller, Lexington, South Carolina. *

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Mr. O. Z. Kinard, Well Driller, Pomaria, South Carolina.

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Mr. John S. Stallings, District Chief, U. S. Geological Survey, Water Resources Division, Columbia, South Carolina.

Mr. W. B. Waldrop, Well Driller, White Rock, South Carolina. *

Mr. John Woods, Williams Engineering, Rock Hill, South Carolina. *

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* Phone conversation.

RESERVOIRS LOCATED IN THE BROAD RIVER BASIN

Plant Name Owner	Lake Lure Town of Lake Lure	Tuxedo Duke Power Co.	Turner Duke Power Co.	Cliffside Cone Mill Corp.	Shelby Lily Mills Co.	Gaston Shoals Duke Power Co.
River	Broad (1)	Green	Green	Second Broad	First Broad	Broad (1)
River mile	161	42	23	2	4	110
Drainage area, sq. mi.	95	42	126	211	285	1,250
Mean flow, cfs.	170	90	280	295	380	2,030
Spillway design, cfs.	-	6,300	34,000	-	-	-
Elevations, feet, msl						
Top of dam	-	2,020.8	922.6	-	-	613.4
Max. water surface	-	2,017.4	918.6	-	-	614.2
Top of gates	991	-	-	702	660	605.4
Crest of spillway	-	2,012,6	911.6	698	658	599.4
Max. power pool	991	2,012.6	911.6	702	660	605.4
Min. power pool	975	2,005.6	908.6	698	660	600.4
Normal tailwater	887	1,717.1	825.9	672	635	558.6
Min. tailwater	883	1,715.3	822.8	672	635	553.4
Reservoir						
Max. power pool, acre-ft	-	10,204	11,927	-	-	-
Min. power pool, acre-ft	-	8,069	10,657	-	-	-
Usable for power, acre-ft	13,500	2,135	1,270	Pondage	-	1,150
Max. area, acres	900	324	438	-	-	251
Heads, feet						
Gross static	108	297.3	88.8	30	25	52.0
Net effective	100	285.5	83.2	28	25	46.5
Min. net	84	278.5	80.2	26	25	41.5
Power Plant						
Installed capacity, kw	3,600	5,000	5,500	1,625	600	9,140
Auxiliary capacity, kw	0	0	0	0	0	125
Min. head capacity, kw	3,000	5,900	5,600	1,300	600	7,200
Avg. ann. generation, mwh	10,000	21,300	14,600	2,900	1,800	30,100
Construction dates	1927	1920	1925	1933	1900	1908

(1) River mileage in the Broad River is measured upstream from its point of confluence with the Saluda River.

Plant Name Owner	Cherokee Falls Burlington Industries	99 Islands Duke Power Co.	Spartanburg Comm. of Pub. Wks.	Clifton No. 3 Dan River Mills	Clifton No.1 Dan River Mills	Clifton No. 2 Dan River Mills
River	Broad (1)	Broad (1)	South Pacolet	Pacolet	Pacolet	Pacolet
River mile	102	91	2	33	32	31
Drainage area, sq. mi.	1,500	1,500	93	318	319	320
Mean flow, cfs.	2,350	2,400	150	440	440	440
Spillway design, cfs.	-	-	-	-	-	-
Elevations, feet, msl						
Top of dam	-	523.6	-	-	-	-
Max. water surface	-	524.6	-	-	-	-
Top of gates	543	511.1	778	626	-	575
Crest of spillway	539	509.1	773	621	597	572
Max. power pool	543	511.1	778	625	597	575
Min. power pool	541	506.1	761	620	592	571
Normal tailwater	524	442.9	722	598	576	558
Min. tailwater	523	437.4	720	597	575	557
Reservoir						
Max. power pool, acre-ft	-	-	4,462	-	-	-
Min. power pool, acre-ft	-	-	1,074	-	-	-
Usable for power, acre-ft	Pondage	4,127	Pondage	Pondage	Pondage	Pondage
Max. area, acres	-	885	1,914	-	-	-
Heads, feet						
Gross static	20	73.7	58	28	22	18
Net effective	19	67.9	56	27	21	17
Min. net	17	62.9	39	22	16	13
Power Plant						
Installed capacity, kw	1,750	18,000	1,000	1,100	800	532
Auxiliary capacity, kw	0	250	0	0	0	0
Min. head capability, kw	-	16,300	1,000	1,000	500	500
Avg. ann. generation, mwh	5,000	65,600	4,000	2,800	3,000	2,100
Construction date	1955	1910	1925	1903	1929	1888

(1) River mileage in the Broad River is measured upstream from its point of confluence with the Saluda River.

Plant Name Owner	Pacolet Pacolet Mfg. Co.	Lockhart Lockhart Power Co.	Neal Shoals SCE&G Co.	Print Crash Startex Mills	Parr [2] SCE&G Co.	Columbia SCE&G Co.
River	Pacolet	Broad [1]	Broad [1]	Middle Tyger	Broad [1]	Broad [1]
River mile	23	72	60	10	28	2
Drainage area, sq. mi.	460	2,600	2,730	72	4,750	5,230
Mean flow, cfs.	620	3,640	3,800	95	5,600	6,300
Spillway design, cfs.	-	-	-	-	-	-
Elevations, feet, msl						
Top of dam	-	410	340.8	-	272.2	171.0
Max. water surface	-	-	-	-	-	-
Top of gates	524	-	334.1	755		-
Crest of spillway	521	400	330.8	753	257.2	153.8
Max. power pool	524	396	334	755	266.0	153.8
Min. power pool	518	390	331	749	256.0	148.8
Normal tailwater	498	344	310	701	223.0	119.3
Min. tailwater	497	343	308	701	223.0	118
Reservoir						
Max. power pool, acre-ft	-	-	-	-	-	-
Min. power pool, acre-ft	-	-	-	-	-	-
Usable for power, acre-ft	Pondage	Pondage	Pondage	Pondage	Pondage	Pondage
Max. area, acres	-	300	600	-	2,925	265
Heads, feet						
Gross static	27	53	26	54	35.0	36.0
Net effective	26	52	24	54	33.0	32.0
Min. net	20	46	21	48	31.0	27.0
Power Plant						
Installed capacity, kw	800	12,300	5,200	1,200	14,880	10,600
Auxiliary capacity, kw	0	0	0	0	0	0
Min. head capability, kw	600	13,000	0	1,000	13,000	7,000
Avg. ann. generation, mwh	2,700	70,000	30,000	2,300	75,000	50,500
Construction date	1937	1920	1905	1895	1914	1928

(1) River mileage in the Broad River is measured upstream from its point of confluence with the Saluda River.
(2) Prior to installation of the spillway crest gates

Plant Name Owner	Green River EPIC, Inc.	
River	Pulliam Cr. (Upper)	Green River (Lower)
River mile	-	
Drainage area, sq. mi.	105 (2.0 upper reservoir + 103.0 lower reservoir)	
Mean flow, cfs.		
Spillway design, cfs.	70,000	
Elevations, feet, msl		
Top of dam	2130 upper	1160 lower
Max. water surface	2120 upper	1134 lower
Top of gates		1150 lower
Crest of spillway	2120 upper	
Max. power pool	2120 upper	1134 lower
Min. power pool	1950 upper	1100 lower
Normal tailwater	-	
Min. tailwater	-	
Reservoir (Upper)		
Max. power pool, acre-ft	43,500 upper	83,000 lower
Min. power pool, acre-ft	3,500 upper	43,000 lower
Usable for power, acre-ft	40,000 upper	40,000 lower
Max. area, acres	467 upper	934 lower
Heads, feet		
Maximum net head	990	
Normal net head	920	
Power Plant		
Installed capacity, kw	2,000,000 (ultimate)	
Auxiliary capacity, kw	-	
Min. head capability, kw	-	
Avg. ann. generation, mwh	-	
Construction date	-	

TABLE 2.4-2

SIGNIFICANT DOWNSTREAM SURFACE WATER USERS

	Water User	Location	Average Daily Use (MGD)	Source of Supply
1.	City of Columbia, S. C.	Richland County, S. C.	23.0	Broad River
2.	Carolina Eastman Co.	Calhoun County, S. C.	15.8	Congaree River
3.	Georgia Pacific	Berkeley County, S. C.	0.1	Lake Moultrie
4.	Santee Wool Combing Co.	Berkeley County, S. C.	0.366	Santee River
5.	City of Charleston, S. C.	Berkeley County, S. C.	1.5	Back River Reservoir
6.	Verona Div. Baychem Corp.	Berkeley County, S. C.	(1)	Back River Reservoir
7.	The Dupoint Co.	Berkeley County, S. C.	(1)	Back River Reservoir
8.	S. C. Electric & Gas Co.	Berkeley County, S. C.	(1)	Back River Reservoir
9.	Amoco (Future Plant)	Berkeley County, S. C.	(1)	Back River Reservoir
10.	Unknown User	Georgetown County, S. C.	(1)	N. Santee River

(1) Note: Average daily use not specified for new, future, and unknown users.

TABLE 2.4-3

MAJOR HISTORICAL FLOODS AND AVERAGE FLOW ON THE BROAD RIVER

	Observed at Richtex Gaging Station		Estimated at Parr Dam	
Date	Peak Discharge (cfs)	Water Elevation (Feet, msl)	Peak Discharge (cfs)	Water Elevation (Feet, msl)
October 3, 1929	228,000	215.54	214,000	266.0
August 17, 1928	222,000	214.94	208,000	265.8
April 8, 1936	157,000	209.80	147,000	264.0
August 16, 1940	120,000	205.92	113,000	262.9
October 18, 1964	102,000	204.09	96,000	262.3
Average Flow	6,000	185.20	5,600	257.8

TABLE 2.4-4

PROBABLE MAXIMUM PRECIPITATION
(Inches)

Source	TIME IN HOURS 6	12	24	48	72
HMR No. 33	11.3	14.3	15.9	19.4	
CEB No. 52-8	11.2 (1)	13.6 (1)	16.0 (1)	19.8 (1)	21.4 (1)
1.4 x 1916 Storm	5.5	10.3	15.2	18.8	19.3

(1) These values are twice those contained in this source

TABLE 2.4-5

DISTRIBUTION SEQUENCE FOR 6 HOUR POINT PROBABLE MAXIMUM PRECIPITATION

Hour	Percent	Amount (inches)
1	10	3.03
2	12	3.64
3	15	4.55
4	38	11.51
5	14	4.24
6	11	3.33
	Total	30.30 inches

RN 13-019

TABLE 2.4-6

DAMS ON THE BROAD RIVER BETWEEN CLINCHFIELD AND PARR DAM

Name of Dam	Approximate Stream Distance Upstream of Site (Miles)	Maximum Length (Feet)	Maximum Height (Feet)	Peak Discharge at Failure Plane (cfs)
Gaston Shoals	80	1542	60	1,204,000
Cherokee Falls	70	1500 (1)	20	225,000
99 Islands	60	1567	94	2,399,000
Lockhart	40	1035	25	217,000
Neal Shoals	30	1087	33 (2)	346,000

(1) Assumed Value
(2) Distance from top of dam to minimum tailwater.

REPORTED MUNICIPAL, INDUSTRIAL, AND DOMESTIC WELLS WITHIN 2 - 20 MILES OF SITE *

Well Location	Owner	Source Description	Average Yield (MGD)	Remarks
#1	City of Carlisle	3 wells		
#2	Big Boy Truck Stop	1 well		
#3	Rocky Creek Point	1 well	0.004	
#4	City of Ridgeway	3 wells	0.080	
#5	City of Jenkinsville	3 wells	0.100	
#6	Mid County Water District	2 wells	0.002	
#7	Nylene Corp.	4 wells	0.072	
#8	Arrowood S/D **	2 wells	0.016	
#9	Royal Hills S/D **	2 wells	0.040	
#10	McCrorey Liston	2 wells		
#11	Richard Winn Acad.	1 well		
#12	Greenbrier	1 well		
#13	Kelly Miller	1 well		
#14	J. H. Kennedys Store	1 well		
#15	Willinghams	1 well		
#16	Triangle Restaurant	1 well		
#17	Genes Cafe Groc.	1 well		
#18	City of Chapin	3 wells	0.022	
#19	Woodlake Shores	1 well	0.004	
#20	Lakewood Estate	1 well		
#21	Lakeland Shores	2 wells	0.008	
#22	Blackgate Band	1 well	0.004	
#23	Murry Lodge Estate	2 wells	0.003	
#24	Stephenson Lake	2 wells		
#25	Indian Cove	2 wells	0.001	

* Information presented was obtained by interview with the persons and agencies listed in Section 2.4.17.
** S/D - Subdivision

02-01

Well Location	Owner	Source Description	Average Yield (MGD)	Remarks
#26	Dutchman Shores	3 wells	0.001	
#27	Milmont Shores	2 wells	0.002	
#28	Vanarsdale S/D**	2 wells	0.004	
#29	Lesene Woods	1 well		
#30	Hallmark Shores	2 wells	0.014	
#31	Arrowhead Shore	2 wells	0.015	
#32	Laurel Meadows	2 wells	0.004	
#33	Selwood Shores	1 well		
#34	Tri City Trailer Pk.	1 well	0.002	
#35	Hoods Trailer Pk.	1 well		
#36	Irmo Trailer Pk.	1 well	0.001	
#37	Wates Trailer Pk.	2 wells		
#38	Hendrix Trailer Pk.	1 well	0.002	
#39	Taylor Landing	2 wells		
#40	Taylors Landing	1 well		
#41	Jakes Boat Landing	2 wells	0.075	
#42	Lake Murray TP	2 wells		
#43	Lindlers Trailer Pk.	1 well		
#44	Moore Mob. Ho. Pk.	1 well	0.011	
#45	Weeds Mob. Ho. Pk.	1 well		
#46	Rikard Nursing	3 wells		
#47	Utopia School	1 well		
#48	Watergate Conds.	1 well	0.064	
#49	Cemitha Court	2 wells	0.029	
#50	Dutchman Cove	1 well		

** S/D - Subdivision

02-01

Well Location	Owner	Source Description	Average Yield (MGD)	Remarks
#51	Cold Stream Country Club	2 wells		
#52	Prosperity, S. C.	well field	0.270	
#53	Little Mountain, S. C.	2 wells		
#54	Old School Mfg.	1 well	0.005	
#55	Kendall Co. Oakl.	1 well	0.080	
#56	Hollands Landing	2 wells		
#57	Shealy Trailer Pk.	2 wells	0.001	
#58	Brigmans	1 well		
#59	White Mob. Homes	2 wells	0.022	
#60	Koon Trailer Pk.	1 well		
#61	Bill Werts Trailer Pk.	1 well	0.001	
#62	Gateway TP	3 wells		
#63	Buddy Neel Pk.	2 wells		
#64	Bedenbough TP	1 well		
#65	Rikard Elem. School	1 well		
#66	Pomaria Elem.	1 well		
#67	Garmany School	1 well		
#68	Mid Carolina High	1 well		
#69	Boys Farm, Inc.	1 well		
#70	Summer Dr. Inn	1 well		
#71	Hilltop Dr. Inn	1 well		
#72	Bonners Snack Shop	1 well		
#73	Dowd Truck Stop	1 well		
#74	Newberry Inn	1 well		
#75	Sunset Dr. Inn	1 well		
#76	Hailes Truck Stop	1 well		

02-01

Well Location	Owner	Source Description	Average Yield (MGD)	Remarks
#77	Mill Dera Apts.	1 well		
#78	Whitakers Lodge	2 wells		
#79	Mollys Rock Rec.	1 well		
#80	Hollands 66 Marina	1 well		
#81	Holiday Acres	1 well		
#82	Dutch Village	4 wells		
#83	Ballentine Est.	1 well	0.008	
#84	Lincolnshire	8 wells	0.629	
#85	Crane Forest	4 wells	0.015	
#86	Raintree Acres	2 wells		
#87	Tiffany Gardens	2 wells		
#88	Lowman Home	6 wells		
#89	Blythewood School	2 wells		
#90	Bethel	1 well		
#91	Wells Marina	2 wells	0.002	
#92	Jones Steak House	1 well		
#93	Whales Tail	1 well		
#94	Jacks Tourist Court	1 well		
#95	South Carolina Electric & Gas	1 well	0.019	Well 62' deep; 4" diameter Monitored by S. C. Div. of Radiological Health
#96	South Carolina Electric & Gas	1 well	0.043	Well 120' deep 6" diameter
#97	Winnsboro Granite Co.	1 well		Supplies 2 homes
#98	Winnsboro Granite Co.	1 well		Supplies finishing plant
#99	Winnsboro Granite Co.	1 well		Supplies 5 homes
#100	Rion Crushed Stone (Martin Marietta)	1 well		Well 100' deep 6" diameter Cased 20'

TABLE 2.4-8

WELLS AND SPRINGS WITHIN 2 MILES OF SITE

Well No.	Name of Owner	Well Depth (Ft.)	Water Level (Ft.) Depth	Water Level (Ft.) Elev.	Casing Depth (Ft.)	Pump Type/ Yield (GPM)	Remarks
1	Bernice Brown	-	-	-	-	-	Well
2	John Henry Ginyard	-	-	-	-	-	Well
3	Clara Spencer	-	-	-	-	-	Well
4	Alex Harper III	-	-	-	-	-	Well for 2 houses
5	R. E. Harper, Sr.	141	69	-	40	Jet/6	Well * +
6	Wilbert Gladney	-	-	-	-	-	Well
7	John Henry Stevenson	-	-	-	-	-	Well
8	Bubba Crompton	-	-	-	-	-	Well
9	Ellie Harper	-	-	-	-	-	Well
10	Mae Francie Burns	-	-	-	-	-	Well
11	Mary White	-	-	-	-	-	Well
12	Olin Summers	-	-	-	-	Submersible	Well
13	Andrew Wilson	-	-	-	-	-	Well for 2 houses
14	Mae Richards	-	-	-	-	-	Well
15	Henry Mills	-	-	-	-	-	Well
16	Henry Johnson	185	30	-	-	Jet	Well for store & 4 house trailers
17	Eddie Thompson	185	40	398	-	Submersible	Well *

TABLE 2.4-8 (Continued)

Well No.	Name of Owner	Well Depth (Ft.)	Water Level (Ft.) Depth	Water Level (Ft.) Elev.	Casing Depth (Ft.)	Pump Type/ Yield (GPM)	Remarks
18	Nathan Harper	168	90	-	88	Jet/7	Well for 1 house & 1 trailer *
19	Eddie Martin	207	-	-	-	Jet	Well
20	James Thompson	300+	-	-	-	Jet	Well
21	Carrie Lee Martin	-	-	-	-	-	Well for 1 house & 1 trailer
22	Clement Brothers Cons. (1)	-	-	-	-	Submersible	Well
23	Jenkinsville Water Co. Well No. 3	365	60	-	56	Submersible/50	Well 6" diameter
24	W. Martin	115	-	-	-	Jet	Well *
25	B. T. Martin	104	89	-	80+	Jet/3	Well for 2 homes *
26	B. T. Martin	65	-	-	-	Jet	Well for store
27	Siles Eubanks	75	-	-	-	-	Well for 3 houses
28	Whitehall Church	-	-	-	-	-	Well *
29	Robert Martin	235	47	399	-	Jet	Well for 2 houses

(1) Use to be terminated upon operation of the plant.

Well No.	Name of Owner	Well Depth (Ft.)	Water Level (Ft.) Depth	Elev.	Casing Depth (Ft.)	Pump Type/ Yield (GPM)	Remarks
30	Wendel Martin	-	-	-	-	-	Well for 3 houses *
31	Nathan F. Rabb	-	-	-	-	-	Well for 2 houses *
32	Whitehall School	-	-	-	-	Jet	Well*+ 02-01
33	M. W. Hollins, Sr.	76	35	-	-	Jet	Well
34	Jenkinsville Water Co. Well No. 1	265	60	-	85	Submersible/19	Well 6" diameter +
35	Mario Hollins	-	-	-	-	-	Well
36	James Tuck Baten	65	-	-	-	-	Well for store & 1 house
37	Willie Mark Baten	220	-	-	-	Jet	Well for 2 houses +
38	James Edwards	-	-	-	-	Submersible	Well
39	Ruby Martin	-	-	-	-	-	Well
40	Ella B. Martin	-	-	-	-	-	Well for 2 houses +
41	Jenkinsville Water Co. Well No. 2	355	42	-	86	Submersible/30	Well 6" diameter +
42	Celese Cook	-	-	-	-	Submersible	Well for store & 1 house+
43	Eilean Baten	65	22	417	-	Jet	Well

TABLE 2.4-8 (Continued)

Well No.	Name of Owner	Well Depth (Ft.)	Water Level (Ft.) Depth	Water Level (Ft.) Elev.	Casing Depth (Ft.)	Pump Type/ Yield (GPM)	Remarks
44	W. G. Heron	120	-	345	-	Jet	Well currently not operating *
45	-	-	-	-	-	-	Spring Currently not used
46	-	-	-	-	-	-	"
47	C. J. Shealy	-	-	-	-	-	Well +

* Dwellings connected with Jenkinsville Water Co. having operable wells not in use at present.
\+ Wells for which S. C. Dept. of Health & Environmental Control, Div. of Radiological Health periodically

TABLE 2.4-9

LABORATORY PERMEABILITY TEST DATA - MAJOR PLANT STRUCTURE AREA

Soil Description	Boring	Depth (Feet)	Permeability (ft/day)	Permeability (cm/sec)	
Micaceous fine sandy silt	N-19	65	4.8×10^{-4}	1.7×10^{-7}	
Micaceous silty fine to medium sand	N-22	40	4.0×10^{-2}	1.4×10^{-5}	
Micaceous silty fine to medium sand	3-2	40	13.6×10^{-2}	4.8×10^{-5}	
Silty fine to medium sand	3-3	60½	17.0×10^{-2}	6.0×10^{-5}	
Sandy silty clay	3-5	5½	6.8×10^{-2}	2.4×10^{-5}	
Micaceous silty fine to medium sand	3-9	75½	33.5×10^{-2}	11.8×10^{-5}	02-01
Micaceous silty fine to medium sand	3-17	30	16.8×10^{-2}	5.9×10^{-5}	

TABLE 2.4-10

FIELD AND LABORATORY PERMEABILITY TEST DATA - SERVICE WATER POND AREA

		Field Permeability		Laboratory Permeability		
Horizon	Boring No	Depth Range of Tests (ft.)	Average Permeability (cm/sec x 10-5)	Boring No. and Sample Depth	Consolidation Pressure (tsf)	Average Permeability (cm/sec x 10-5)
Colluvium/ Residual Soils	SD-5b	5.0-14.5	0.18	SD- 5 (2')	2.0	1.5
	SD-8b	6.4-16.0	0.48		4.0	0.58
	ED-4	5.5-10.0	1.1	SD- 5 (6')	2.0	0.16
	SS-3	4.0-7.0	0.62	ED- 2 (12')	2.0	0.48
Saprolite	ND-7	8.0-15.0	2.3	ND- 4 (10')	0.0	0.37
	ND-13	4.0-27.0	0.70	ED- 2 (27')	2.0	4.1
		27.0-30.0	7.6		3.9	1.7
		30.0-33.0	150.0*			
	ND-11a	14.0-15.5	29.0**			
		19.0-25.5	6.4			
	ND-20	13.0-24.5	3.7			
	ND-23	9.0-25.0	0.96			
	ND-25	9.0-14.0	0.18			
		14.0-29.0	2.2			
	SD-6	4.2-8.2	0.34			
		14.6-18.0	1.2			
	ED-4	14.6-37.0	3.0			
	SS-3	7.0-37.0	5.9			
Decomposed Rock	ND-7	15.0-136.0	0.94	ND- 4 (18')	2.0	0.20
	ND-9	4.0-20.0	0.55	ND-14 (7')	2.0	1.2
	ND-9a	20.5-35.0	0.54		4.0	0.98
		35.0-45.0	1.80	ND-14 (12')	0.0	0.16
		45.0-70.0	0.46			
	ND-20	25.0-38.8	0.60			
	ND-22a	4.0-30.0	0.77			

FIELD AND LABORATORY PERMEABILITY TEST DATA - SERVICE WATER POND AREA

Horizon	Boring No	Field Permeability: Depth Range of Tests (ft.)	Field Permeability: Average Permeability (cm/sec x 10-5)	Laboratory Permeability: Boring No. and Sample Depth	Laboratory Permeability: Consolidation Pressure (tsf)	Laboratory Permeability: Average Permeability (cm/sec x 10-5)
Decomposed Rock (Continued)	ND-23	25.0-40.0	1.80			
		40.0-54.0	2.50			
	ND-24	4.0-29.0	0.64			
	SD- 5b	14.5-18.0	0.54			
		18.0-20.8	3.60			
	SD- 6	18.0-38.0	2.50			
	SD- 8b	19.2-25.0	4.10			
	ED- 4	37.0-40.0	1.70			
Fractured Rock	ND-13	33.0-34.0	1000.0 (est)			
	ND-25	29.0-30.0	320.0			
	SD- 5	35.5-44.0	33.0			
	SD- 8	42.0-55.0	25.0			
Intact Rock	ND- 1	21.0-38.5	5.60			
	ND-11a	40.0-146.5	4.50			
	ND-21	29.5-146.5	0.60			
	SD- 5	44.0-146.5	4.20			
	SD- 6	38.0-52.0	2.60			
	ED- 4	40.0-48.5	2.40			

*Influenced by fractured rock at 34 feet
** Influenced by very loose alluvium at 13.5 feet
Note: Additional test data are provided in Sections 2.5.6.2 and 2.5.6.6.

TABLE 2.4-11

RADIONUCLIDES CONSIDERED IN ACCIDENT ANALYSIS

Nuclide	Half Life (days)	Quantity in Tank (µCi)
H^3	4474.9	3.79×10^7
Co^{60}	1934.5	4.54×10^4
Cs^{134}	748.3	5.72×10^5
Cs^{137}	11,092.4	4.09×10^5

RN
02-030

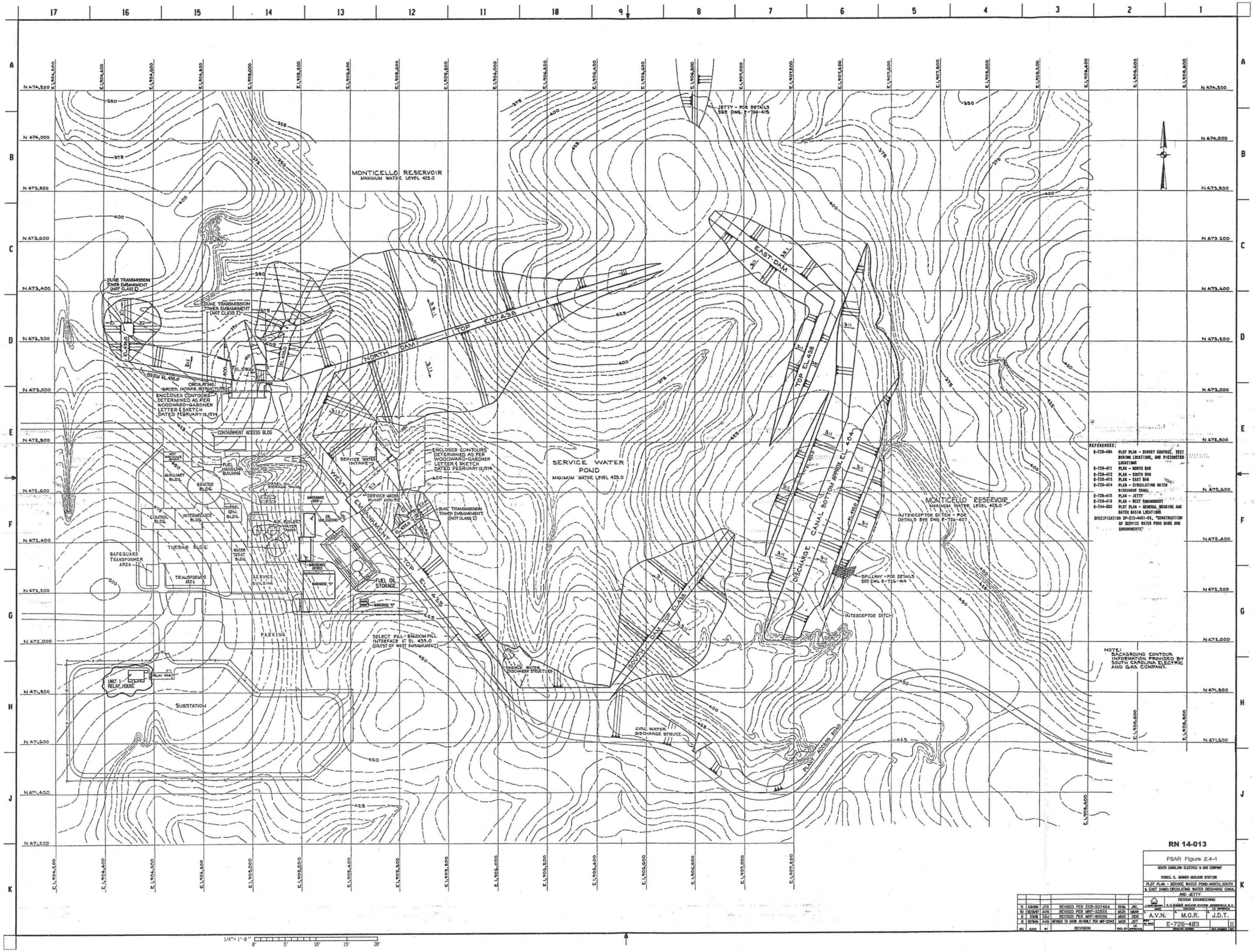
TABLE 2.4-12

CONCENTRATIONS OF RADIONUCLIDES AT TWO DISCHARGE POINTS DOWNGRADIENT OF THE WASTE HOLDUP TANK FOLLOWING POSTULATED ACCIDENTAL RUPTURE

	Peak Concentration (μCi/ml)				
	Discharge Point A		Discharge Point B		Effluent Concentration Limit
Radionuclide	Concentration	Time at Peak (days after rupture)	Concentration	Time at Peak (days after rupture)	unrestricted areas * (μCi/ml)
H^3	1.1×10^{-1}	4121	5.7×10^{-2}	7114	1×10^{-3}
Co^{60}	5.8×10^{-5}	4121	1.6×10^{-5}	7113	3×10^{-6}
Cs^{134}	9.1×10^{-5}	4121	4.6×10^{-6}	7113	9×10^{-7}
Cs^{137}	1.7×10^{-3}	4121	1.2×10^{-3}	7114	1×10^{-6}

RN 02-030

* Taken from Appendix B of 10CFR20


MONTICELLO RESERVOIR
MAXIMUM WATER LEVEL 425.0
NORTH DAM TOP EL. 438
EAST DAM
SOUTH DAM TOP EL. 438
WEST EMBANKMENT TOP EL. 438
SERVICE WATER POND
MAXIMUM WATER LEVEL 425.0
DISCHARGE CANAL BOTTOM APPROX. EL. 404
TOP EL. 438
JETTY - FOR DETAILS SEE DWG. E-726-415
DUKE TRANSMISSION TOWER EMBANKMENT (NOT CLASS I)
CIRCULATING WATER INTAKE STRUCTURE
ENCLOSED CONTOURS DETERMINED AS PER WOODWARD-GARDNER LETTER & SKETCH DATED FEBRUARY 12, 1974
CONTAINMENT ACCESS BLDG
SERVICE WATER INTAKE
SERVICE WATER PUMP HOUSE
REACTOR BLDG.
AUXILIARY BLDG.
FUEL HANDLING BUILDING
CONTROL BLDG.
INTERMEDIATE BLDG.
DIESEL GEN. BLDG.
TURBINE BLDG.
SAFEGUARD TRANSFORMER AREA
TRANSFORMER AREA
WATER TREAT. BLDG.
SERVICE BUILDING
FUEL OIL STORAGE
PARKING
SELECT FILL-RANDOM FILL INTERFACE AT EL. 435.0 (CREST OF WEST EMBANKMENT)
SERVICE WATER DISCHARGE STRUCTURE
CIRC. WATER DISCHARGE STRUC.
INTERCEPTOR DITCH - FOR DETAILS SEE DWG. E-726-407
INTERCEPTOR DITCH
SPILLWAY - FOR DETAILS SEE DWG. E-726-414
UNIT 1 RELAY HOUSE
SUBSTATION
PLANT ACCESS ROAD
REFERENCES:
E-726-404 PLOT PLAN - SURVEY CONTROL, TEST BORING LOCATIONS, AND PIEZOMETER LOCATIONS
E-726-411 PLAN - NORTH DAM
E-726-412 PLAN - SOUTH DAM
E-726-413 PLAN - EAST DAM
E-726-414 PLAN - CIRCULATING WATER DISCHARGE CANAL
E-726-415 PLAN - JETTY
E-726-416 PLAN - WEST EMBANKMENT
E-744-052 PLOT PLAN - GENERAL GRADING AND CATCH BASIN LOCATIONS
SPECIFICATION SP-212-4481-00, "CONSTRUCTION OF SERVICE WATER POND DAMS AND EMBANKMENTS."
NOTE: BACKGROUND CONTOUR INFORMATION PROVIDED BY SOUTH CAROLINA ELECTRIC AND GAS COMPANY.
RN 14-013
FSAR Figure 2.4-1
SOUTH CAROLINA ELECTRIC & GAS COMPANY
VIRGIL C. SUMMER NUCLEAR STATION
PLOT PLAN - SERVICE WATER POND: NORTH, SOUTH & EAST DAMS: CIRCULATING WATER DISCHARGE CANAL AND JETTY
DESIGN ENGINEERING
V. C. SUMMER NUCLEAR STATION JENKINSVILLE, S.C.
A.V.N.
M.G.R.
J.D.T.
E-726-403
11
11 4/9/2014 JTS REVISED PER ECR-50748A RHM JWL
10 02/20/97 AVN REVISED PER MRF-22555 MGR MMW
9 7/8/96 DDJ REVISED PER MRF-90008 MGR DDK
8 02/18/94 AVN REVISED TO SHOW AS-BUILT PER MRF-22142 MGR JDT
NO. DATE BY REVISION CKD. BY LE APPROVAL
1/4"=1'-0"

LEGEND:

- • DAM LOCATIONS
- ⊙ 1565 GAGING STATION

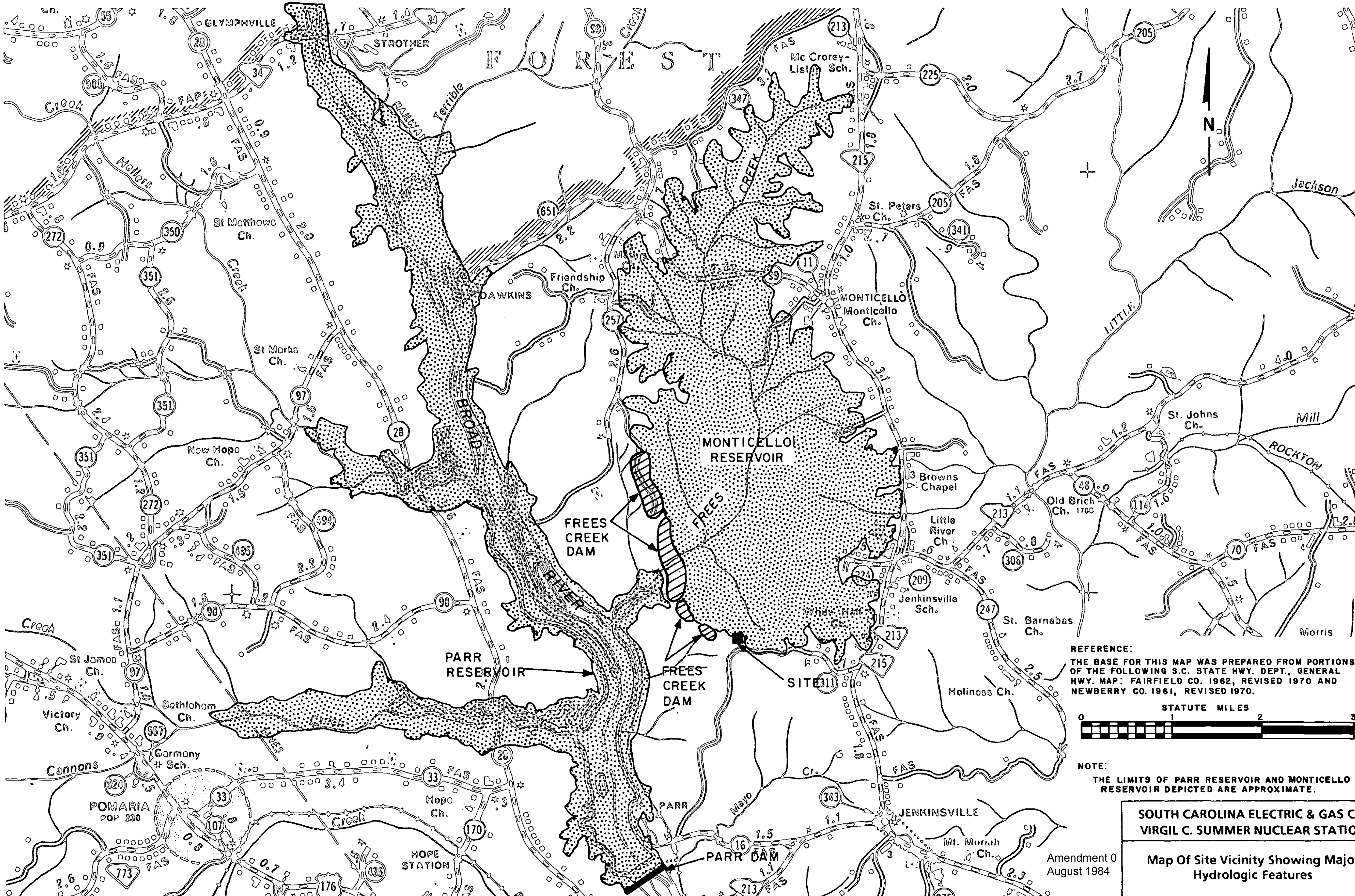
STATUTE MILES 5 0 5 10 15

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

The Broad River Watershed At Richtex, S. C., Including Significant Existing And Proposed Dams

Figure 2.4-2

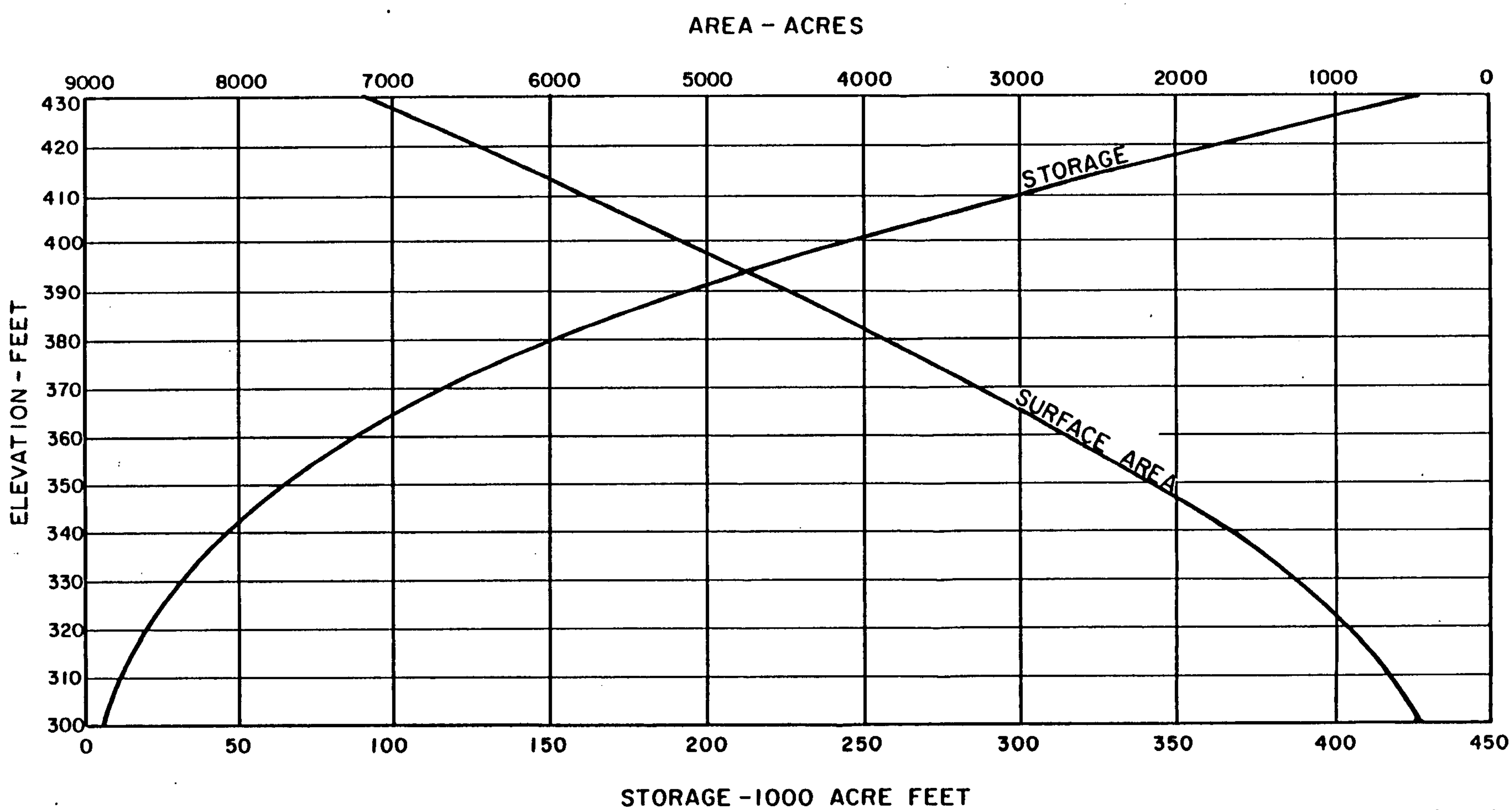


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Map Of Site Vicinity Showing Major Hydrologic Features

Figure 2.4-3

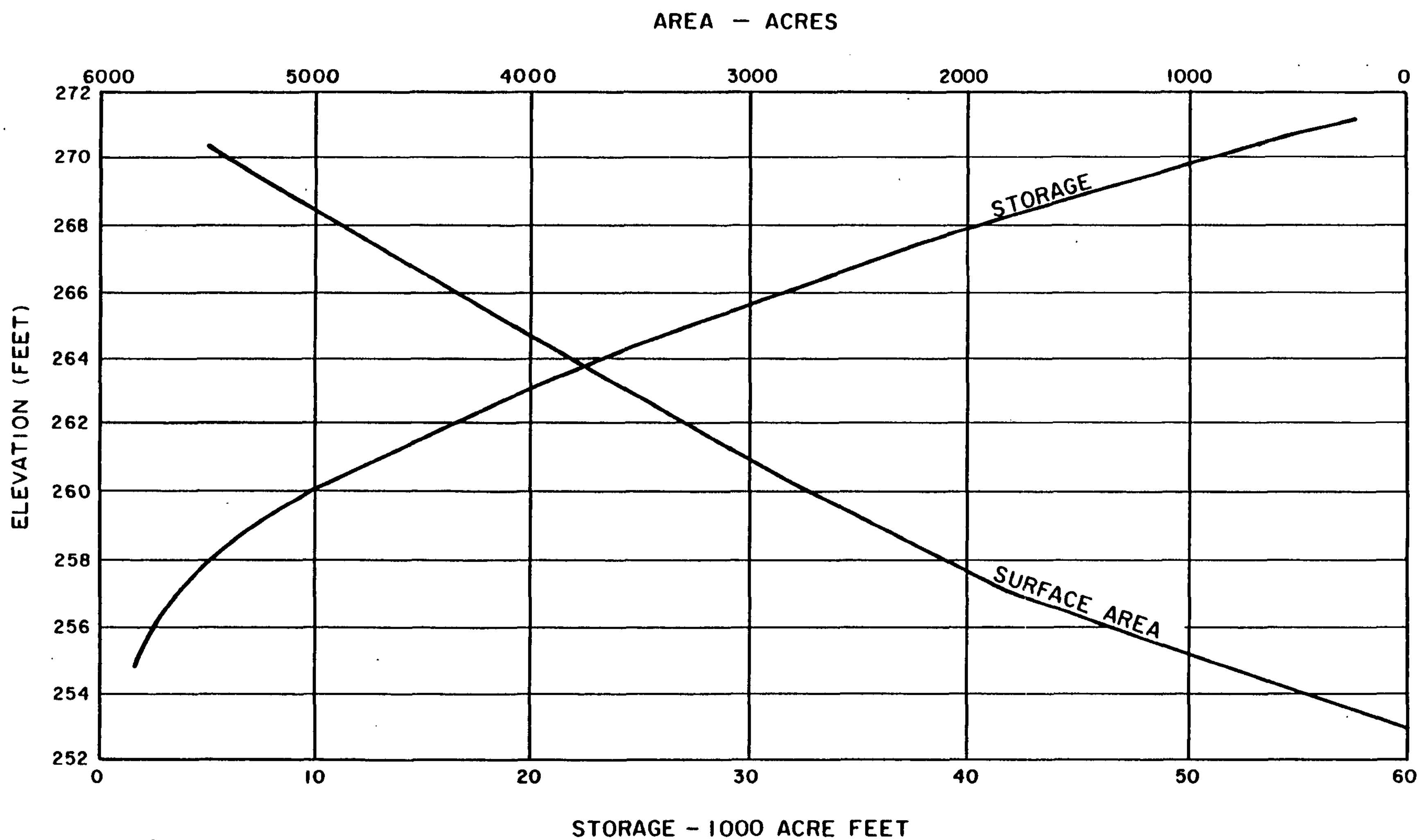


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Monticello Reservoir Area
and Capacity Curves

Figure 2.4-4

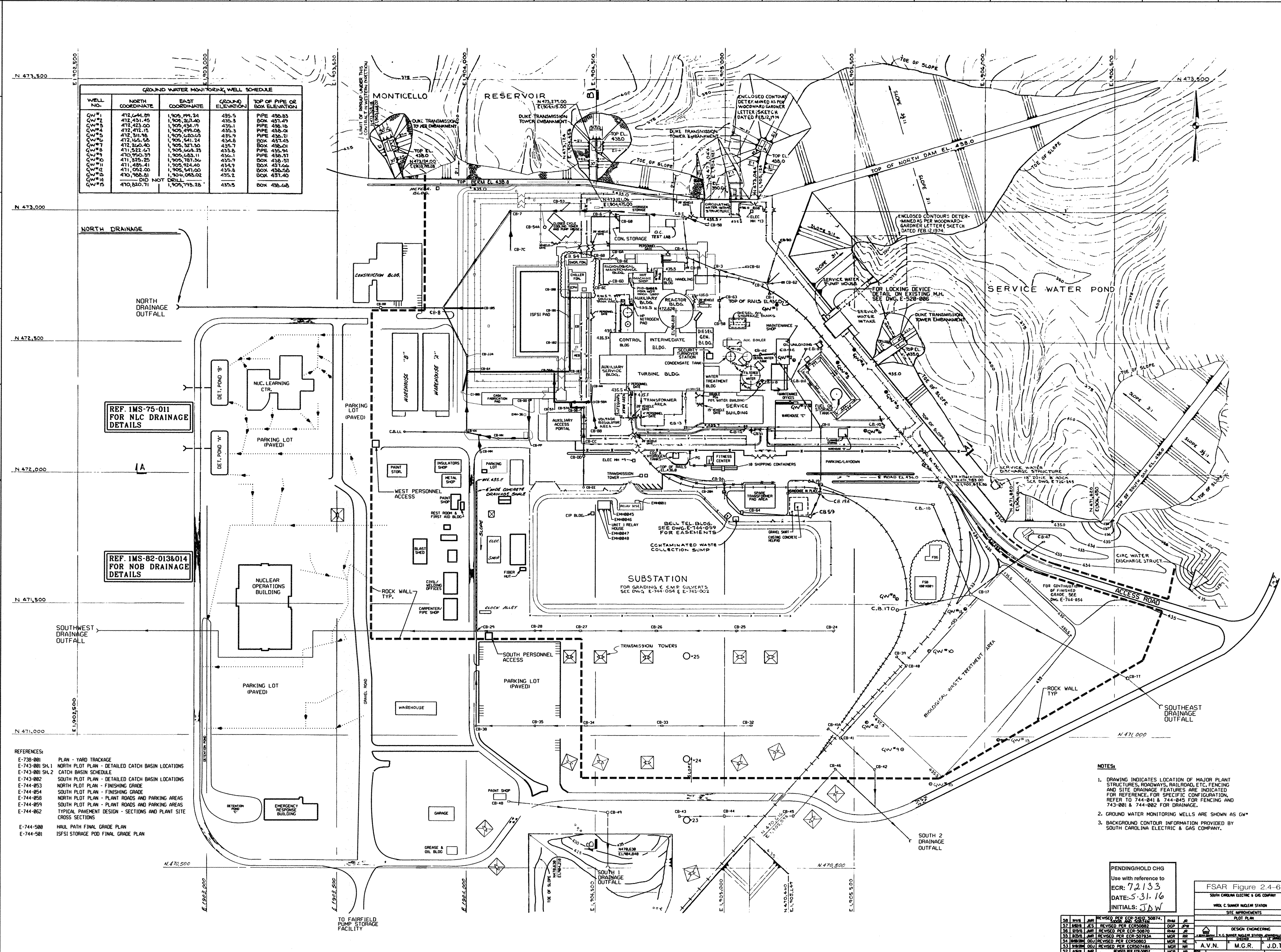


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Parr Reservoir Area
and Capacity Curves

Figure 2.4-5



GROUND WATER MONITORING WELL SCHEDULE

WELL NO.	NORTH COORDINATE	EAST COORDINATE	GROUND ELEVATION	TOP OF PIPE OR BOX ELEVATION
GW*1	472,644.89	1,905,199.24	435.5	PIPE 438.83
GW*2	472,431.45	1,905,267.40	435.3	BOX 437.49
GW*3	472,423.00	1,905,434.19	435.1	PIPE 438.18
GW*4	472,472.13	1,905,499.08	435.3	PIPE 438.01
GW*5	472,311.98	1,905,620.63	435.9	PIPE 438.21
GW*6	472,165.58	1,905,541.24	434.8	BOX 437.43
GW*7	472,260.40	1,905,327.30	435.7	BOX 438.01
GW*8	471,522.67	1,905,663.23	433.8	PIPE 435.94
GW*9	470,950.39	1,905,683.11	436.1	PIPE 438.37
GW*10	471,325.25	1,905,787.36	435.9	BOX 438.37
GW*11	471,485.41	1,905,924.40	434.9	BOX 437.66
GW*12	471,052.00	1,905,547.00	435.8	BOX 438.58
GW*13	470,988.81	1,906,053.02	435.2	BOX 437.40
GW*14	DID NOT DRILL			
GW*15	470,820.71	1,905,793.28	435.5	BOX 438.68

REFERENCES:

E-738-001	PLAN - YARD TRACKAGE
E-743-001 SH. 1	NORTH PLOT PLAN - DETAILED CATCH BASIN LOCATIONS
E-743-001 SH. 2	CATCH BASIN SCHEDULE
E-743-002	SOUTH PLOT PLAN - DETAILED CATCH BASIN LOCATIONS
E-744-053	NORTH PLOT PLAN - FINISHING GRADE
E-744-054	SOUTH PLOT PLAN - FINISHING GRADE
E-744-058	NORTH PLOT PLAN - PLANT ROADS AND PARKING AREAS
E-744-059	SOUTH PLOT PLAN - PLANT ROADS AND PARKING AREAS
E-744-062	TYPICAL PAVEMENT DESIGN - SECTIONS AND PLANT SITE CROSS SECTIONS
E-744-500	HAUL PATH FINAL GRADE PLAN
E-744-501	ISFSI STORAGE POD FINAL GRADE PLAN

NOTES:

1. DRAWING INDICATES LOCATION OF MAJOR PLANT STRUCTURES, ROADWAYS, RAILROAD, ETC. FENCING AND SITE DRAINAGE FEATURES ARE INDICATED FOR REFERENCE. FOR SPECIFIC CONFIGURATION, REFER TO 744-041 & 744-045 FOR FENCING AND 743-001 & 744-002 FOR DRAINAGE.
2. GROUND WATER MONITORING WELLS ARE SHOWN AS GW*
3. BACKGROUND CONTOUR INFORMATION PROVIDED BY SOUTH CAROLINA ELECTRIC & GAS COMPANY.

PENDING/HOLD CHG
Use with reference to
ECR: 72133
DATE: 5.31.16
INITIALS: JDW

NO.	DATE	BY	REVISION	CHD. BY	LE APPROVAL
58	11/4/16	JMR	REVISED PER ECR-51012, 50874, 51008 AND 50874N	RHM	JR
57	6/02/16	JES	REVISED PER ECR50882	DGP	JPW
56	12/8/15	JMR	REVISED PER ECR-50870	RHM	JR
55	8/25/15	JMR	REVISED PER ECR-50793A	MGR	RR
54	10/08/2014	DDJ	REVISED PER ECR50803	MGR	NE
53	9/18/2014	DDJ	REVISED PER ECR50748A	MGR	NR
52	4/6/11	JMR	REVISED PER ECR-50857	MGR	AB

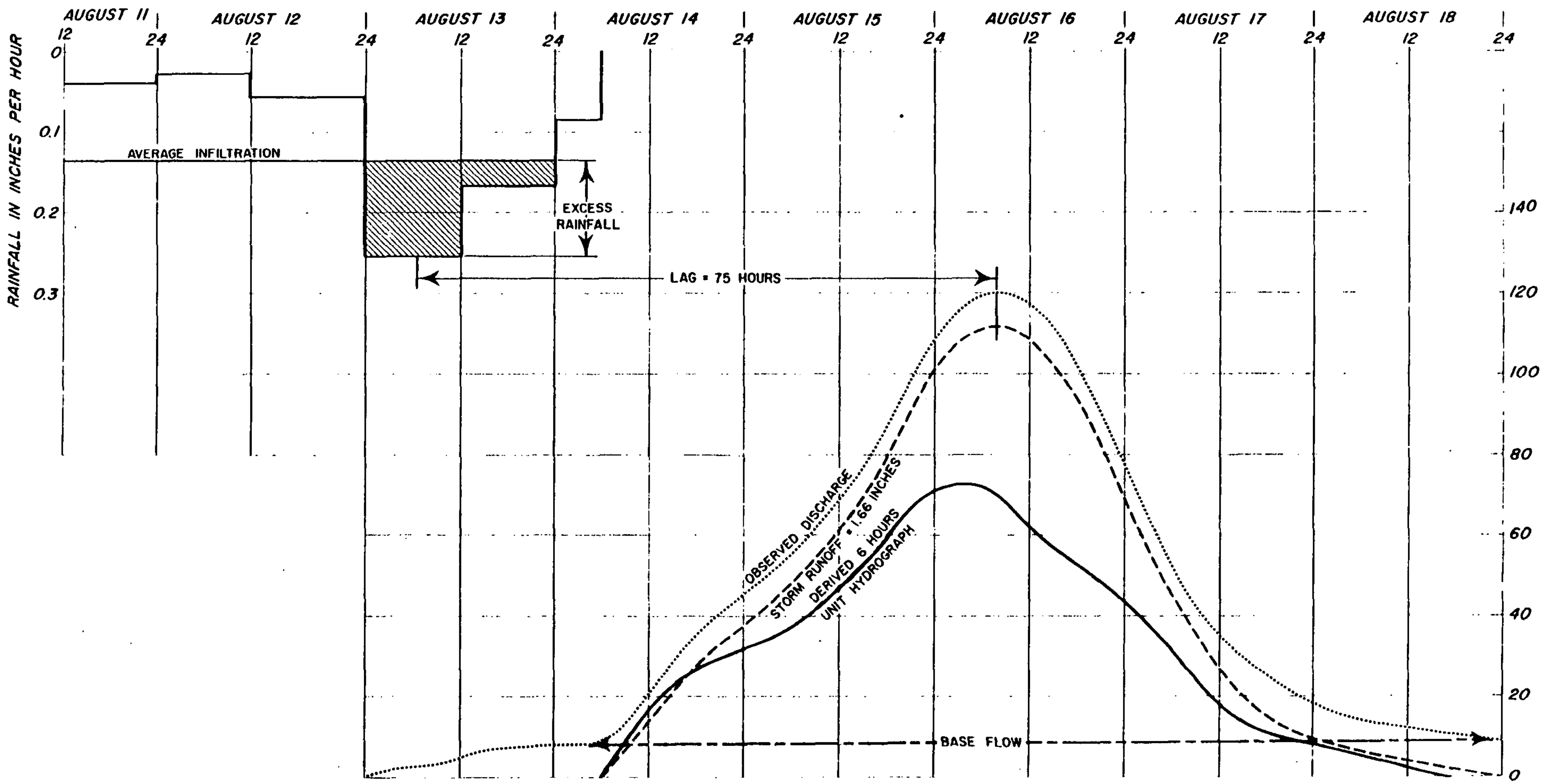
FSAR Figure 2.4–6

SOUTH CAROLINA ELECTRIC & GAS COMPANY
VIRGIL C. SUMMER NUCLEAR STATION
SITE IMPROVEMENTS
PLOT PLAN

DESIGN ENGINEERING
V. C. SUMMER NUCLEAR STATION JENKINSVILLE, S.C.

MADE	CHECKED	LE APPROVAL
A.V.N.	M.G.R.	J.D.T.

SCALE: NO SCALE
DRAWING NUMBER: E-744-052
REV: 58

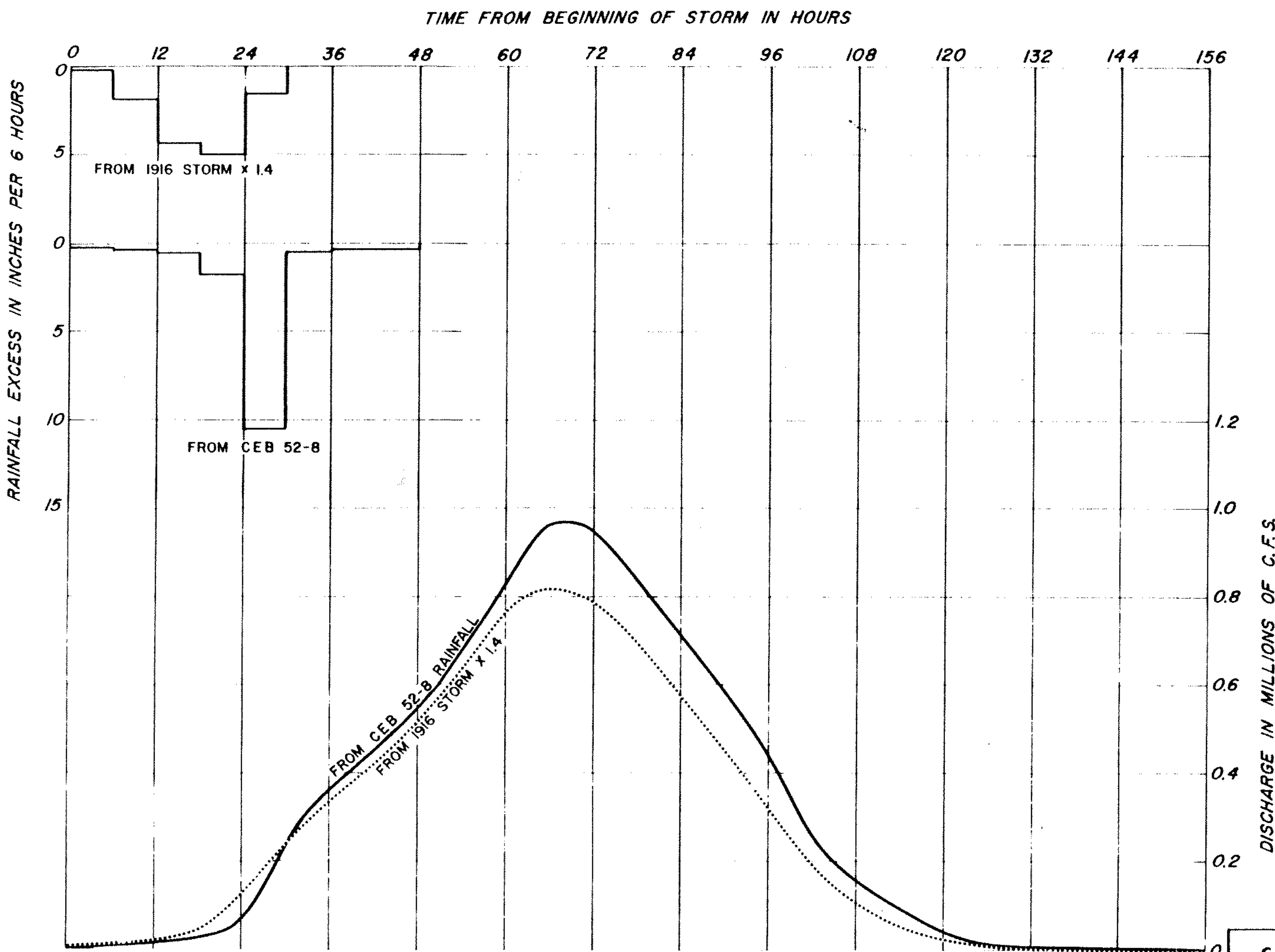


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Hyetograph of Watershed Rainfall and Hydrograph of Discharge at Richtex, S. C. - August 10 - 17, 1940 Storm

Figure 2.4-7

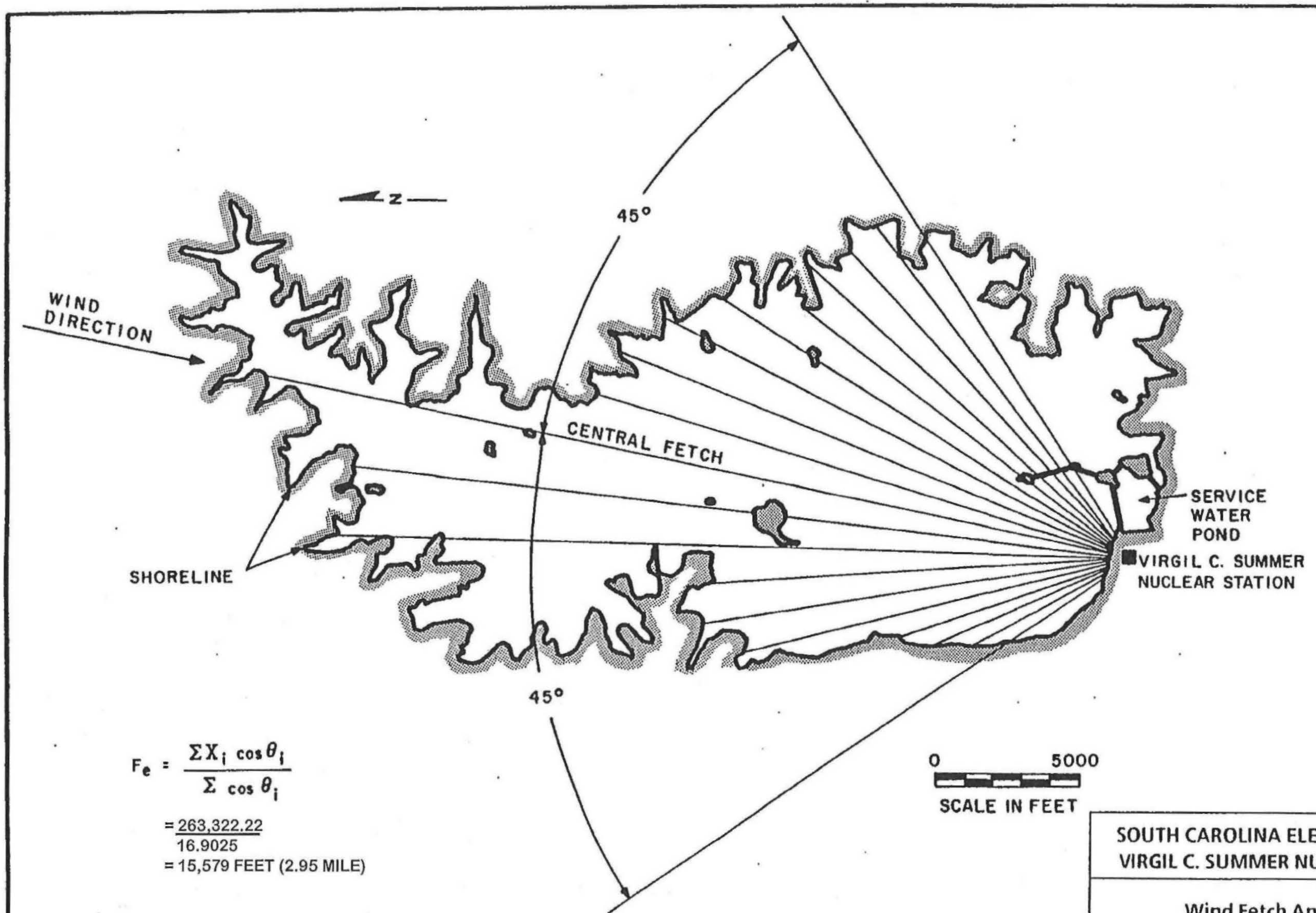


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Hyetograph of Watershed Rainfall and Derived Probable Maximum Flood Hydrographs at Parr, South Carolina

Figure 2.4-8



$$F_e = \frac{\Sigma X_i \cos\theta_i}{\Sigma \cos\theta_i}$$

$$= \frac{263{,}322.22}{16.9025}$$

= 15,579 FEET (2.95 MILE)

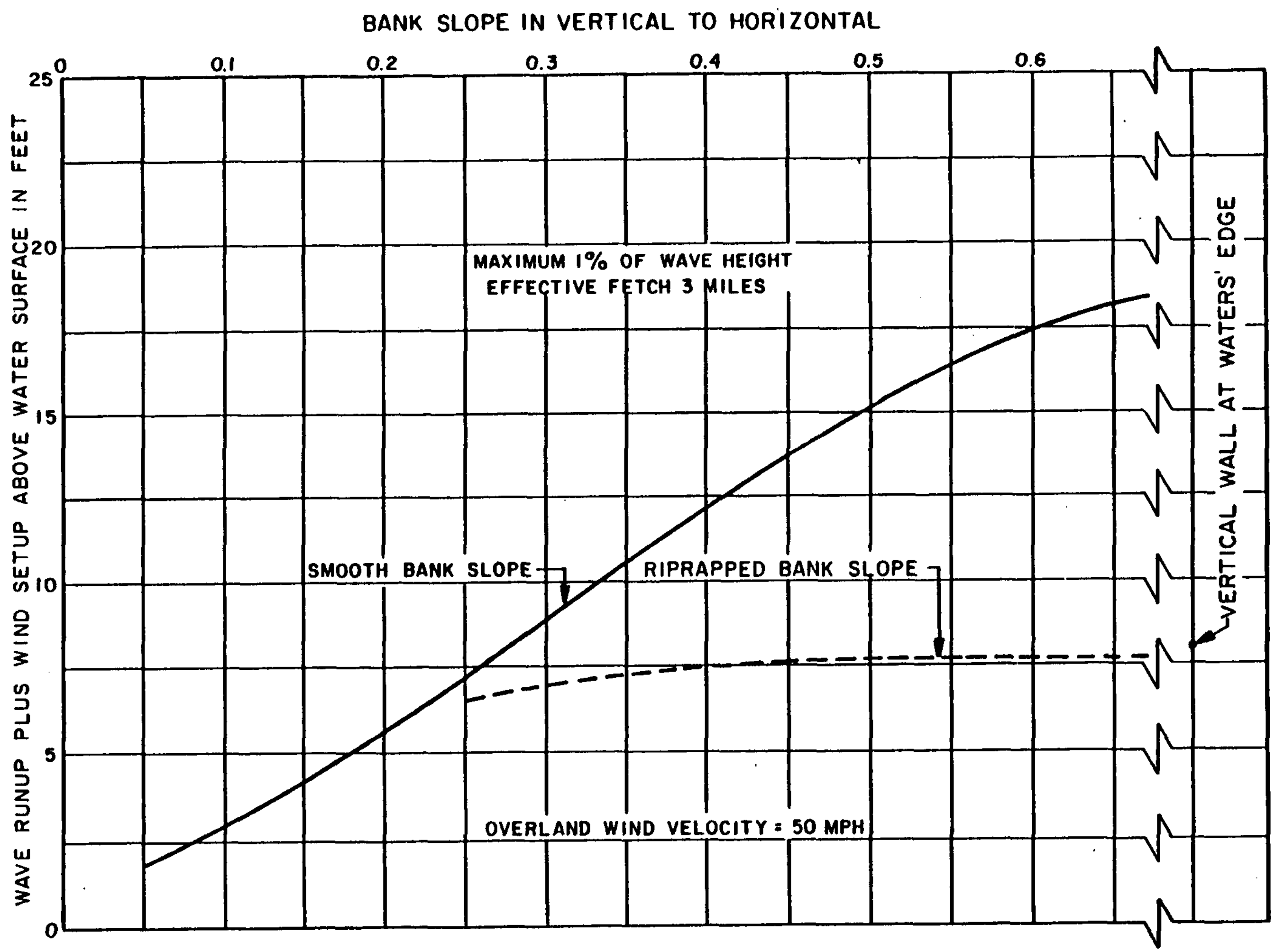
Reset
March 2017

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

RN 13-019

Wind Fetch Analysis for Monticello Reservoir

Figure 2.4-9

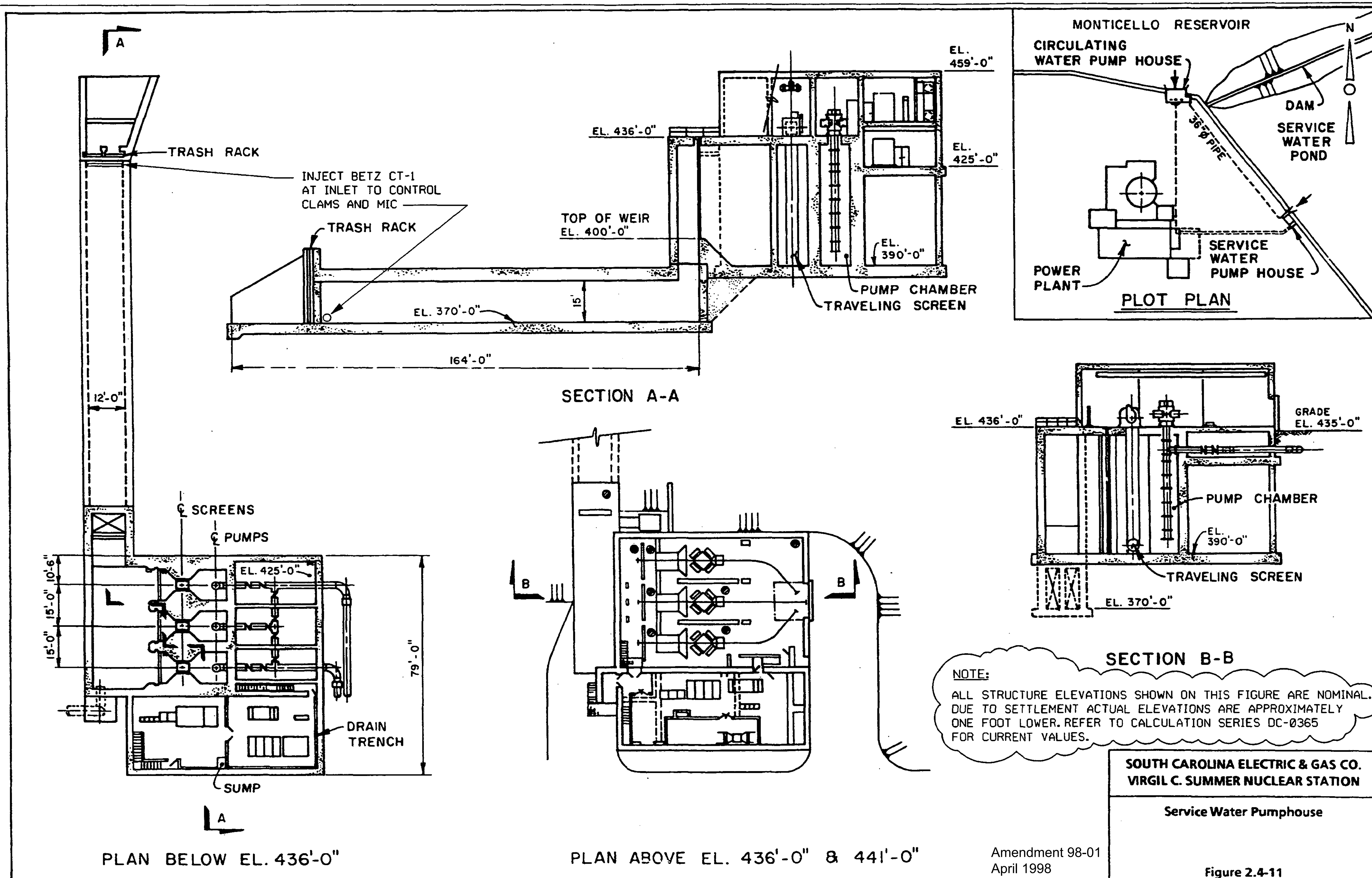


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Wave Runup Plus Wind Setup for Maximum One Percent of Wave Heights on Monticello Reservoir

Figure 2.4-10

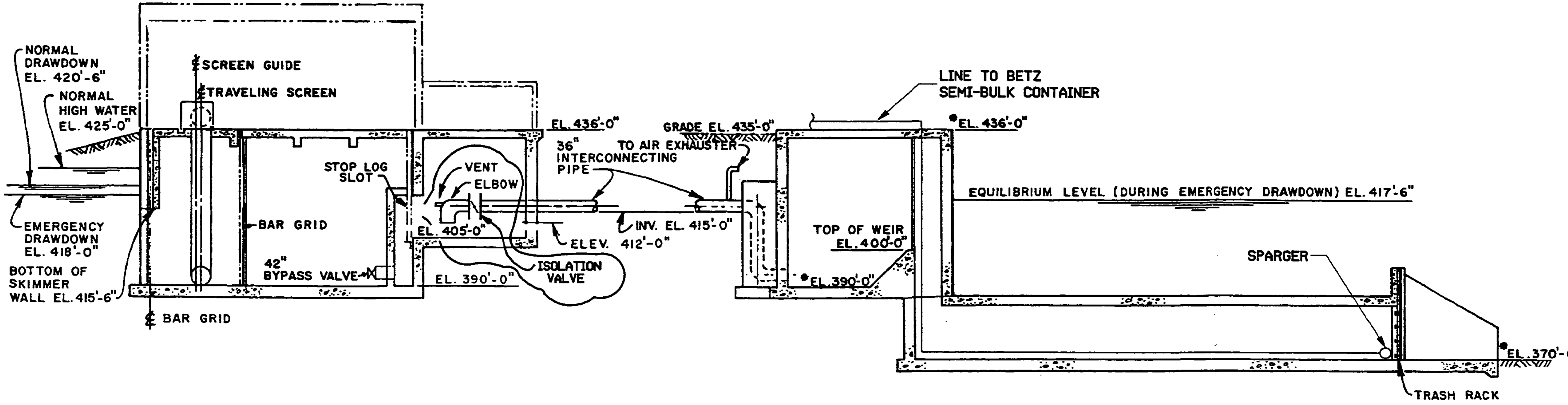


Amendment 98-01
April 1998

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

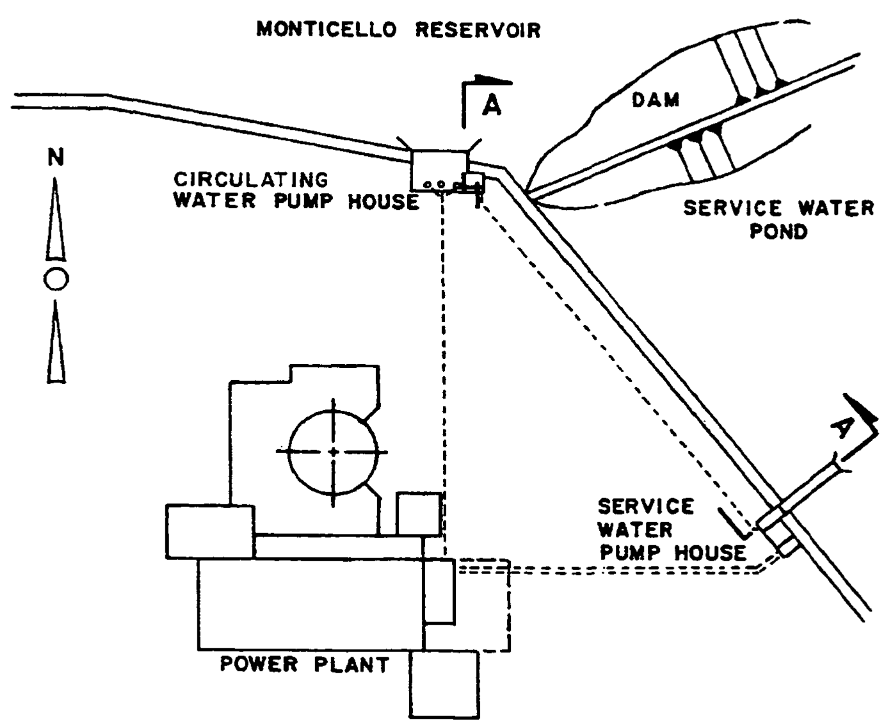
Service Water Pumphouse

Figure 2.4-11



SECTION A-A

*SEE NOTE ON FIGURE 2.4-11



PLAN

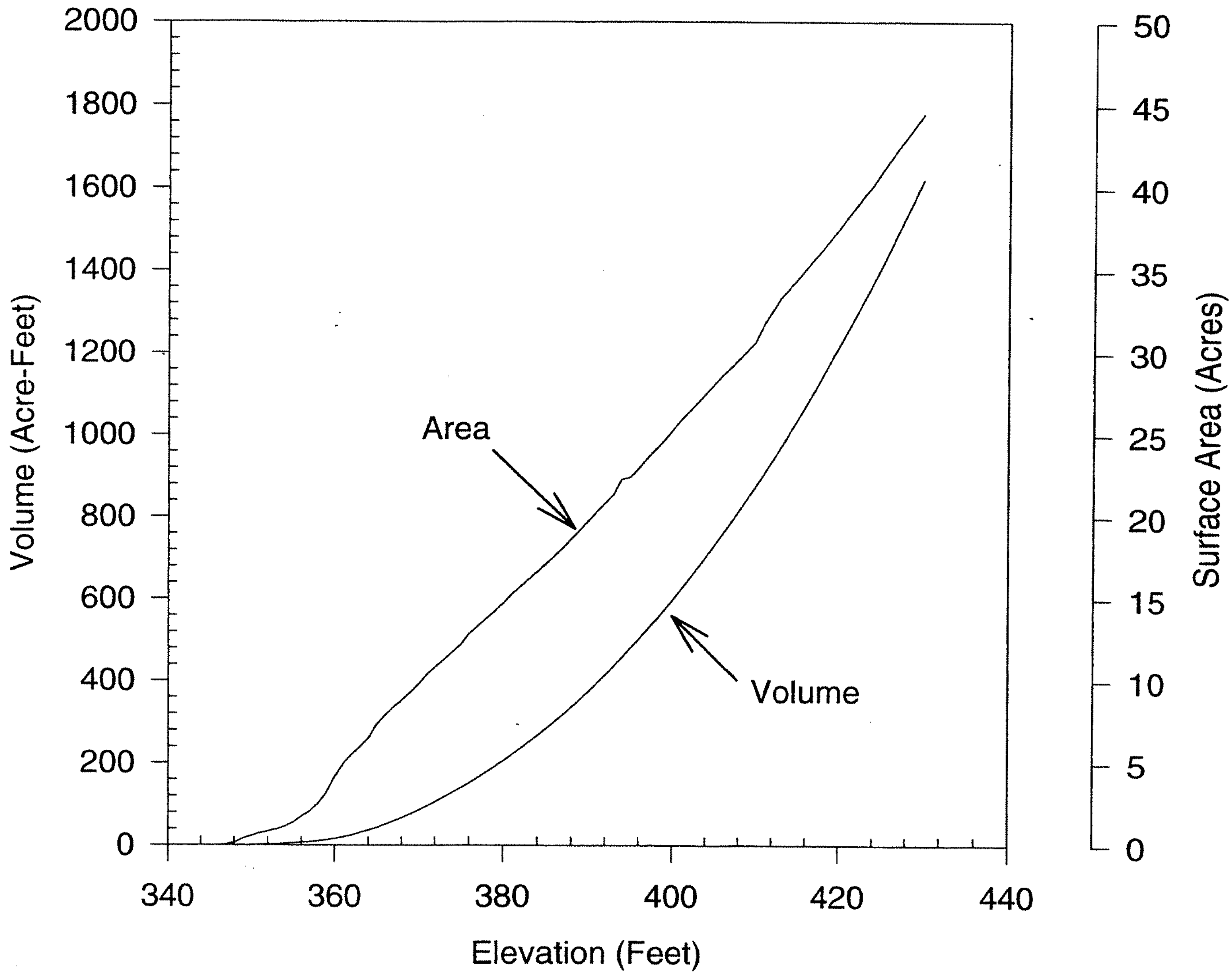
AMENDMENT 00-01
DECEMBER 2000

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Interconnection Pipe Between Intake Structures

Figure 2.4-12

...\ondeck\2086\fsar2412.dgn Sep. 27, 1999 09:52:57

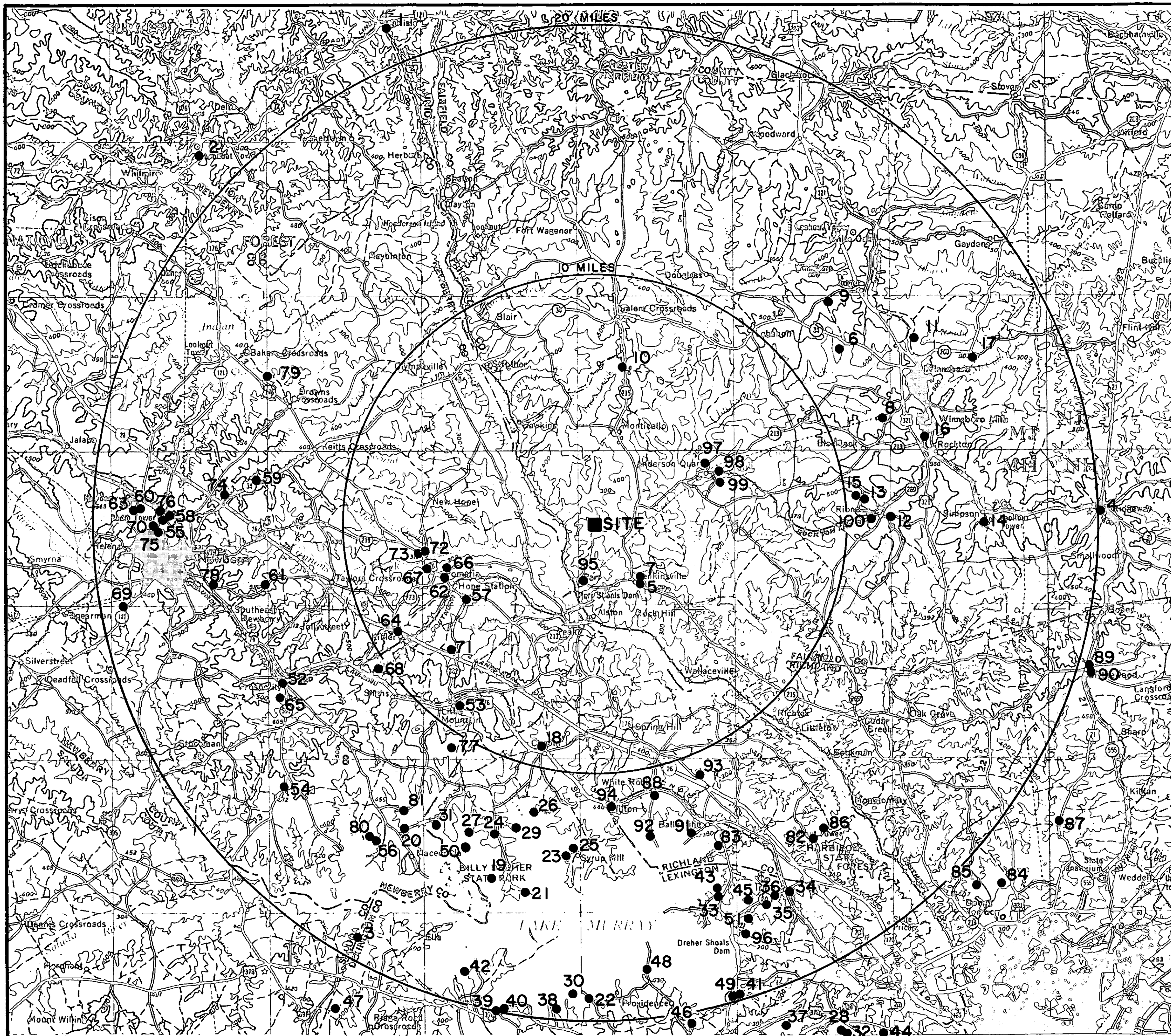


AMENDMENT 02-01
MAY 2002

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Service Water Pond Area
And Capacity Curves

Figure 2.4-13



STATUTE MILES

0 5 10

REFERENCE:

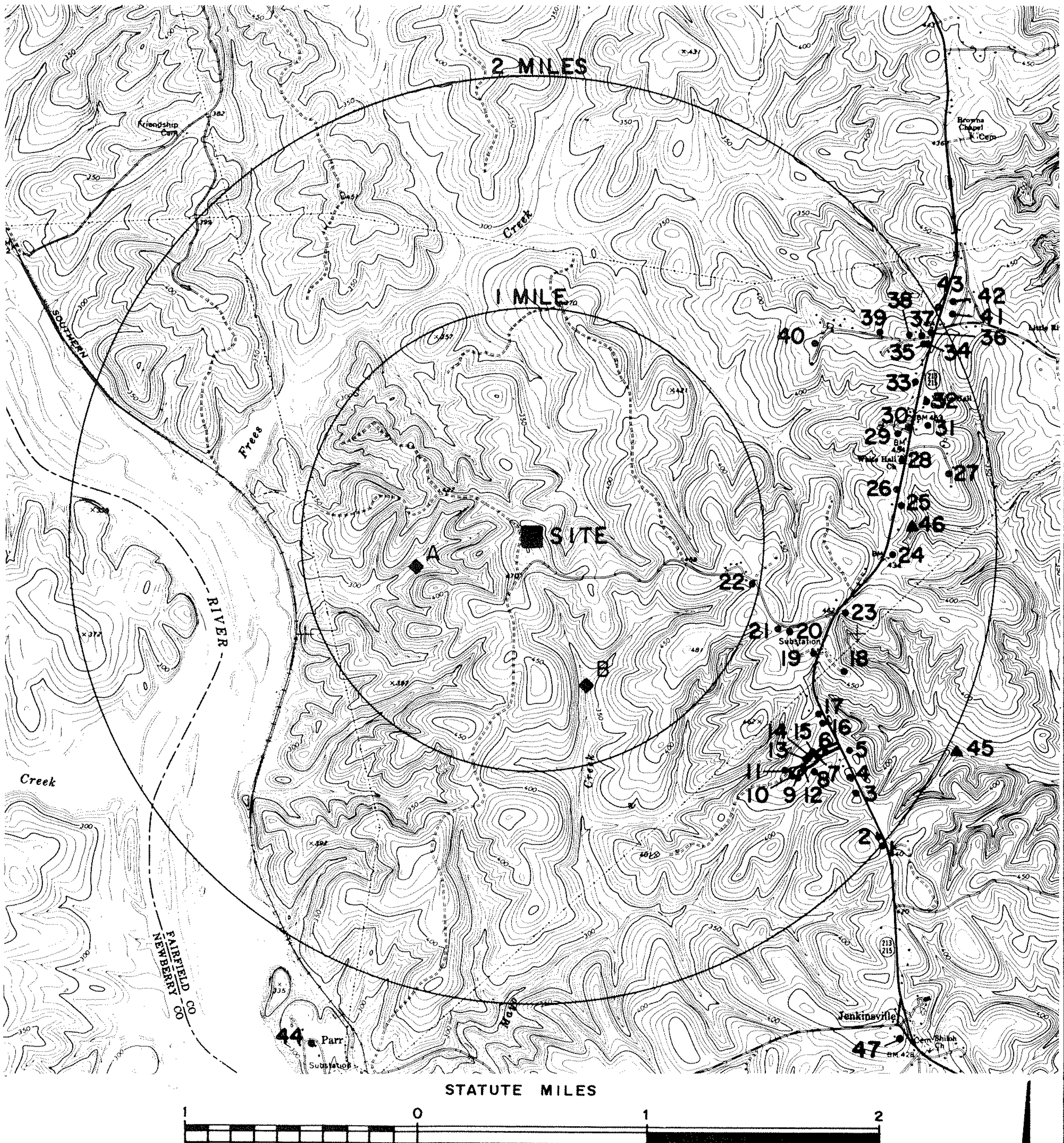
THE BASE FOR THIS MAP WAS PREPARED FROM A PORTION OF USGS TOPOGRAPHIC MAP SPARTANBURG, S.C.-N.C., 1953.

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Reported Municipal, Industrial, and Domestic Well Locations 2-20 Miles

Figure 2.4-14



REFERENCE: THE BASE FOR THIS MAP WAS PREPARED FROM PORTIONS OF THE 7.5 JENKINSVILLE QUADRANGLE, 1969, U.S. GEOLOGICAL SURVEY.

KEY:

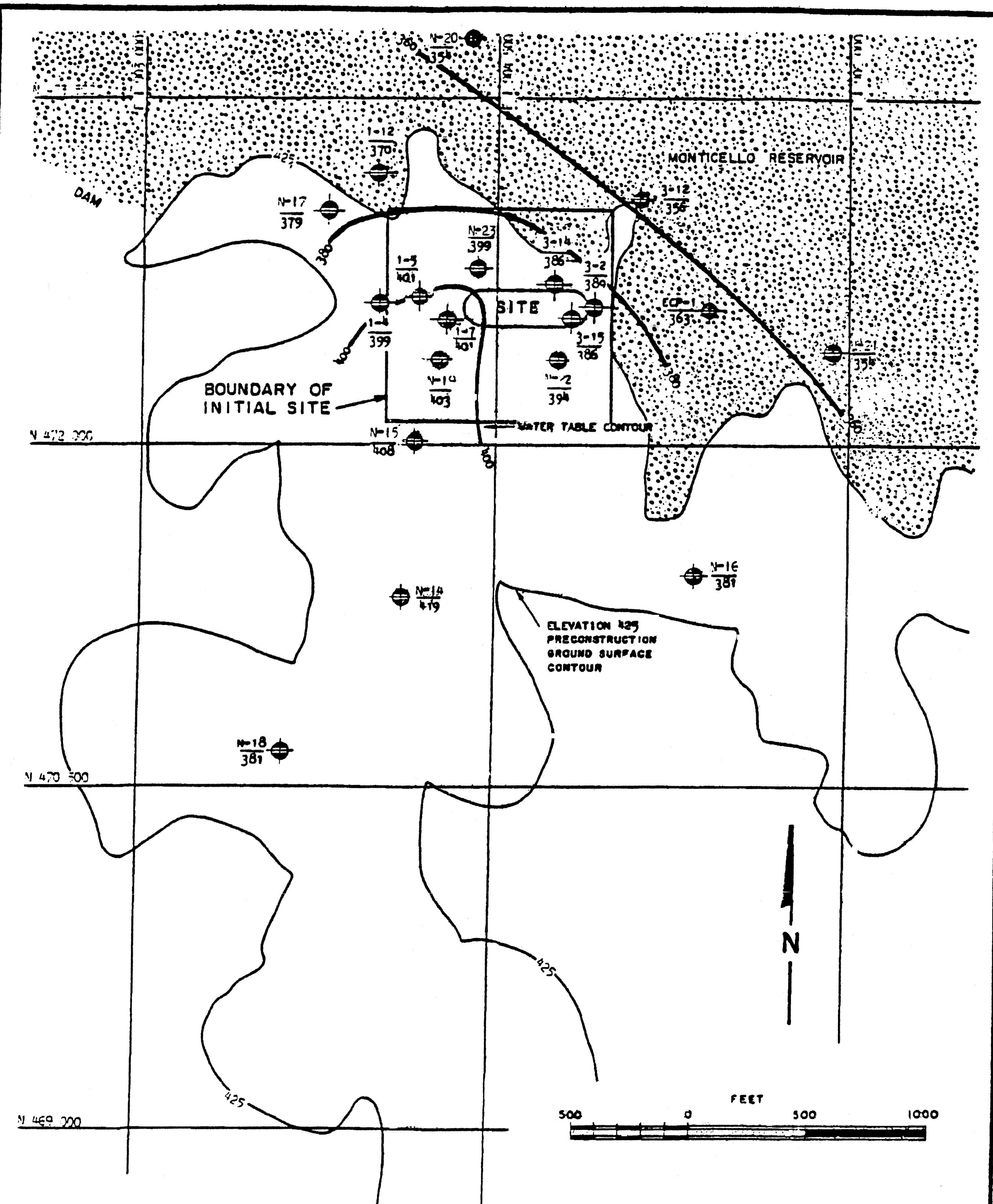
- ● DOMESTIC WELL
- ▲ SPRING
- ◆ DISCHARGE POINT

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Domestic Well And Spring Locations, 0-2 Miles

Figure 2.4-15



KEY:

N-19 BORING NUMBER

403 ELEVATION OF STATIC GROUND WATER LEVEL OBSERVED IN BORING.

NOTE:

CONTOURS OF WATER TABLE EVALUATED FROM WATER OBSERVATIONS ON BORINGS PRIOR TO FILLING OF MONTICELLO RESERVOIR. ONLY BORINGS IN WHICH WATER LEVELS WERE TAKEN ARE SHOWN. N-24 333

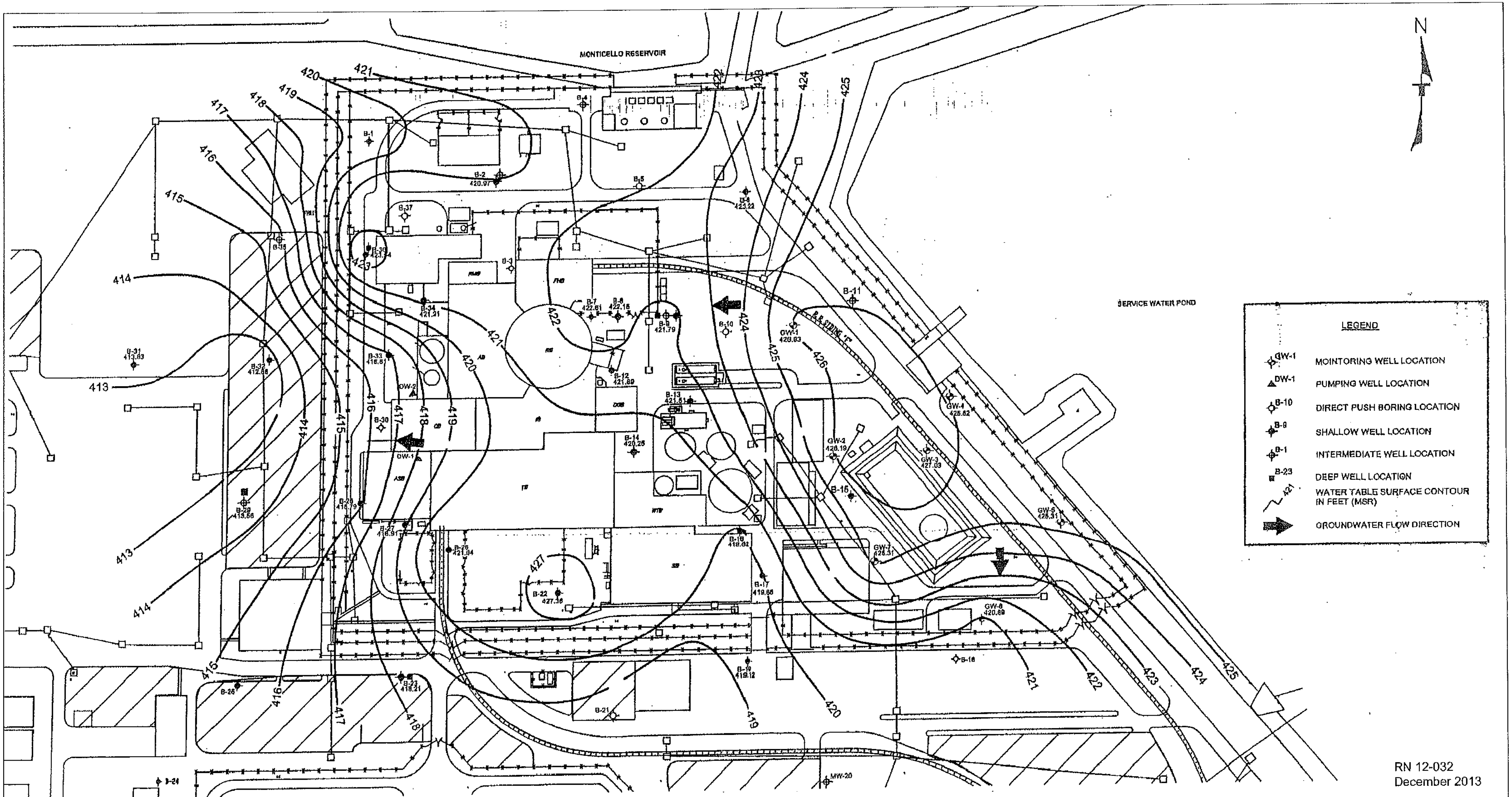
RN 10-002
June 2010

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

SITE WATER TABLE

PRE- RESERVOIR IMPOUNDMENT

Figure 2.4-16



RN 12-032
December 2013

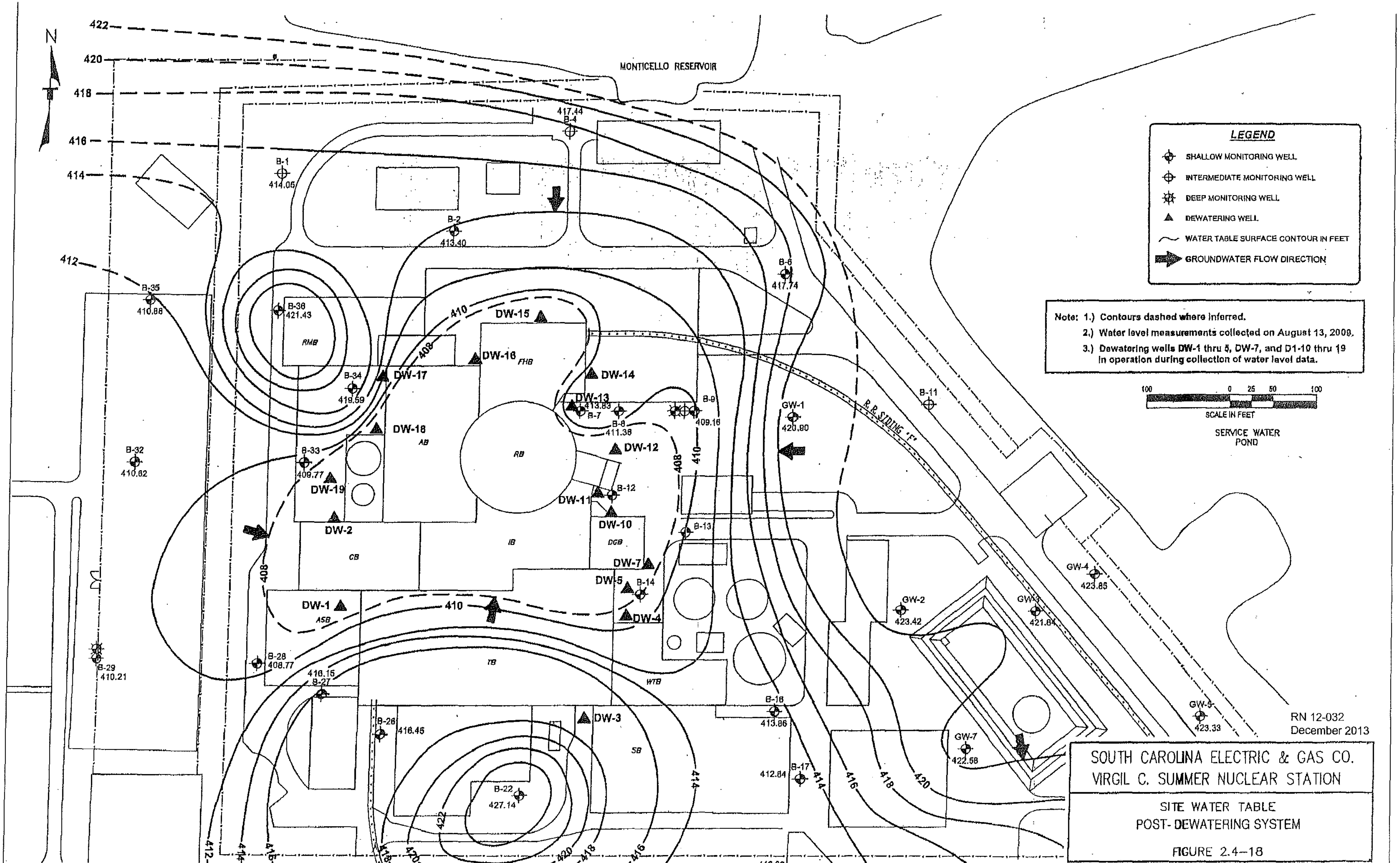
Note: 1.) Contours dashed where inferred.
2.) Water level measurements collected on October 21, 2003.
3.) Pumping wells DW-1 and DW-2 in operation during collection of water level data.

GRAPHIC SCALE
150 0 150
(FEET)

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

SITE WATER TABLE
PRE- DEWATERING SYSTEM

FIGURE 2.4–17



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

SITE WATER TABLE
POST- DEWATERING SYSTEM

FIGURE 2.4–18

2.5 GEOLOGY AND SEISMOLOGY

NOTE 2.5
Section 2.5 is being retained for historical purposes only (per RN 00-081).

RN 03-012

This section presents the results of the evaluation of geologic and seismic conditions of the region and area around the Virgil C. Summer Nuclear Station. This evaluation was made in sufficient detail to ensure the safe design of the nuclear power facility. Results of the literature review, field studies, foundation exploration, and laboratory test programs are presented. A list of references is provided at the end of this section.

The site is located in Fairfield County, S.C., approximately 3 miles northeast of the town of Parr and 1 mile east of the Broad River. It lies within the Charlotte Belt metamorphic zone of the Piedmont Physiographic Province.

The surface of the Piedmont Physiographic Province is characterized by elevated, gently rolling hills which are separated on the northwest from the intensely folded and faulted Appalachian Mountains by the intervening hills of the Blue Ridge Province and bordered on the southeast by the Atlantic Coastal Plain. The province is underlain by a sequence of at least 15,000 feet of late Precambrian to early Paleozoic age metamorphic rocks which mantle Precambrian gneiss estimated to be 1,100 million years old. The general site area is underlain by a complex series of almandine-amphibolite facies metamorphic rocks consisting of gneisses, amphibolites, schists, and migmatite formed by the intrusion of plutons of granite to granodiorite composition.

Rocks of the Piedmont have been deformed, apparently under a more confined environment than the Appalachians to the west. As a result of confinement, metamorphism of varying grades has accompanied regional folding and faulting resulting in greater mobility and a corresponding lessening of shear forces in the rocks. The major faults in the region are the Brevard, Towaliga, Gold Hill, Jonesboro, and Eastern Piedmont (Goat Rock). The closest approach of any of these features to the site is a splay off the Eastern Piedmont (Goat Rock) system which is located about 13 miles south of the site. These structures are considered to be normal or high angle reverse faults with the exception of the Brevard, which is generally believed to be a strike slip fault. These faults are believed to have formed subsequent to metamorphism, probably toward the close of the Paleozoic era. Most have been intruded by middle to late Paleozoic igneous plutons, cross-cut by undisplaced Triassic-Jurassic (?) diabase dikes, and in places overlain non-conformably by undisplaced sediments of Cretaceous age.

RN 03-012

There are no capable faults within 5 miles of the site. The closest fault which could be considered capable is the Belair Fault which is located approximately 75 miles southwest of the site near Augusta, Georgia. Preliminary investigation of this fault indicates that movement has probably occurred within the last 50 million years. Studies are continuing to accurately determine the age of last movement. There is no known seismic activity associated with this feature, and it is not considered of significance in establishing the safe shutdown earthquake.

Minor shearing of the type commonly found in the Piedmont is present in the bedrock underlying the site. The maximum net displacement observed is no greater than 7 feet. The shears are not an integral part of any known fault system. However, the orientation of the shears is consistent with the regional joint pattern. The shears do not penetrate through the soil profile to the ground surface. Subsequent to the termination of all movement hydrothermal minerals were introduced along joints and shears. These minerals include the zeolite laumontite which is present as unsheared subhedral to euhedral crystals. In places laumontite crystals completely fill the shears, having grown inward from both walls. Hydrothermal events within the Piedmont are often associated with Triassic-Jurassic diabase dike emplacement. There are no known occurrences of hydrothermal activity within the stability field of laumontite in the Piedmont since the mid-Mesozoic.

The results of radiometric age determinations indicate that movement along the shears could not have occurred later than 45 million years (m.y.) ago, and, in all probability, the shears have been inactive since 150 to 300 million years before present (BP).

In situ rock stresses at the site are relatively low and the direction of principal stress in the horizontal plane is approximately normal to the shear plane.

The site is located in a broad diffuse zone of seismic activity. There have been 101 shocks with intensities of V or greater within 250 miles of the site. The largest was the 1886 MM (Modified Mercalli) Intensity X Charleston event which dominates the seismic history of the east coast. The largest earthquake within a 50 mile radius was the 1913 MM VI-VII Union County event located about 35 miles northwest of the site. The closest shock to the site was the 1945 MM VI event located approximately 5 miles west-southwest of the site.

Correlation between seismic events and the existence of the shears cannot be made. The possibility of reactivation of the shears, or the inducement of significant earthquake activity related to impoundment of Monticello Reservoir is remote. 02-01

No physical evidence was found as a result of the geologic and seismic investigations performed which would indicate adverse behavior of the surficial and subsurface geologic materials to seismic events. The Safe Shutdown Earthquake is considered an MM Intensity VII at the site resulting from a shock similar to the 1913 Union County earthquake occurring close to the site. The design ground motions of 0.15g and 0.25g for rock and soil, respectively, are considered conservative.

Geophysical and foundation engineering investigations have been performed to evaluate the static and dynamic engineering properties of the subsurface materials at the plant site. Based on these field and laboratory investigations, the stability of the Seismic Category 1 structures has been analyzed relative to the foundation type and supporting media. The bearing capacity and settlement of mat foundations (founded on rock and soil) and caisson foundations have been evaluated. The liquefaction potential of the subsurface materials beneath the soil-supported Seismic Category 1 structures, along the west embankment at the plant site, were evaluated for the SSE and OBE conditions. The dynamic (earthquake loading) lateral earth pressure against the rigid Seismic Category 1 foundation walls was also designed in accordance with the results of these evaluations.

Studies for Seismic Category 1 embankments have included stability analyses of slopes and foundations under static and dynamic conditions, seepage analyses, and settlement analyses.

Work performed in Section 2.5 was done under the direction of Dames & Moore and Woodward-Clyde Associates. Independent consultants in geology and seismology were retained to assist the geologic and seismologic investigations. These consultants were Dr. Paul D. Fullager (University of North Carolina) - radiometric analyses; Dr. Todd M. Gates (Teledyne Isotopes) - radiometric analyses; Dr. Roy Ingram (University of North Carolina) - X-ray diffraction analyses; Dr. Paul C. Ragland (University of North Carolina) - X-ray diffraction analyses; Dr. Gerry L. Stirewalt (University of North Carolina) - structural geology; Dr. Pradeep Talwani (University of South Carolina) - local seismicity; and Dr. H. D. Wagener - petrology.

Geologic and seimologic information developed by the investigations described herein are consistent with pertinent criteria outlined in Appendix A to 10 CFR 100. Based upon the investigations and studies performed, it is concluded that site related geologic, seismologic, and geotechnical engineering conditions do not introduce any potential for ground surface rupture, loci for significant seismic activity, or any other condition requiring modification of the existing design.

2.5.1 BASIC GEOLOGIC AND SEISMIC INFORMATION

Basic geologic and seismic data were obtained for the Virgil C. Summer Nuclear Station site from 1971 to the present, including the PSAR and a series of 5 subsequent geologic reports, all of which have been filed with the NRC on this docket.

The geologic and seismic programs conducted in 1971 for the PSAR included the following:

1. A thorough review of pertinent geologic and seismic literature (published and unpublished) and interviews with geologists knowledgeable with the site area.

2. Geologic mapping of the site and surrounding area within a 10 mile radius.

3. Petrographic analyses of thin sections.

4. Magnetic anomaly survey of the site.

5. Test borings.

6. Seismic refraction survey.

7. Surface wave survey.

8. Micro-motion measurements.

In 1973 and 1974, a detailed geologic investigation was performed at the site of the Reactor Building excavation after the discovery of minor shearing in the bedrock. This investigation, entitled "Supplemental Geologic Investigation, Virgil C. Summer Nuclear Station - Unit One," dated January 14, 1974, included:

1. Detailed geologic mapping and sampling.

2. Excavation of trenches.

3. Drilling of an inclined boring.

4. Petrofabric analyses.

5. Structural analyses.

6. Radiometric age dating.

7. X-ray diffraction analyses.

8. In situ stress measurements.

9. Literature search with emphasis on recent tectonic displacements.

10. Air photo and ERTS-1 imagery analysis.

11. Gravity and magnetic data analysis.

12. Evaluation of potential movement along shears due to the filling of Monticello Reservoir.

13. Review of local microseismic data.

14. Correlation of Piedmont seismic activity with reservoir impoundments.

During 1974 and 1975, the detailed geologic mapping was extended to include the staging area excavation, the Control Building excavation, the Intermediate Building excavation, and the Service Water Pond north dam excavation. Results of these investigations were presented in Addenda I, II, III, and IV, respectively, to the Supplemental Geologic Investigation report.

All of the aforementioned studies have been utilized in the preparation of the following sections.

2.5.1.1 Regional Geology

South Carolina lies principally within 2 major geologic provinces: the Piedmont Physiographic Province, underlain by a complex sequence of deformed crystalline rocks, and the Coastal Plain Physiographic Province, underlain by younger relatively undisturbed sediments. The Virgil C. Summer Nuclear Station site is located within the Piedmont Province. Regional deformation during and at the end of the Paleozoic Era, accompanied by periods of igneous intrusion, resulted in consolidation, folding, faulting, and metamorphism of the Piedmont rocks which were originally deposited as a thick sequence of sediments. The latest tectonic episode in the Piedmont has been determined by recent radiometric dating to have occurred about 200 million years ago, and is represented by late- or post-Triassic (?) diabase dikes. No younger tectonism has been identified in the Piedmont.

2.5.1.1.1 Physiography

The Virgil C. Summer Nuclear Station site lies within the Piedmont Physiographic Province. The site location relative to the physiographic provinces of South Carolina is shown on the Regional Physiographic Map, Figure 2.5-1. The surface of the Piedmont Province consists of elevated, gently rolling hills which are separated on the northwest from the intensely folded and faulted Appalachian Mountains by intervening hills of the Blue Ridge Physiographic Province. The Piedmont Province is essentially a dissected peneplain and is characterized by northeast-southwest trending belts of crystalline metamorphic and plutonic rocks. In South Carolina, northwest from the Coastal Plain, 6 belts are recognized; these are the Carolina Slate Belt, Charlotte Belt, Kings Mountain Belt, Inner Piedmont Belt, Brevard Belt, and the Blue Ridge Belt. These belts are shown on the Geologic Belt Map of South Carolina, Figure 2.5-2. It is thought that these belts resulted from variations in regional metamorphism and tectonic activity on originally similar sedimentary and volcanic rocks [1]. Folding, faulting, regional and contact metamorphism, and igneous intrusions have modified the rocks presently exposed. Most major streams and some tributaries in the Piedmont have cut down through great thicknesses of residual soil and are flowing on, or very close to, the crystalline bedrock.

In general, rocks in the Piedmont were formed under many different combinations of heat and pressure, and represent a complex succession of geologic events. The complex geology of these rocks is not well known, and only a small part of the South Carolina Piedmont has been closely studied.

The general distribution of rocks in the site region is illustrated on the Regional Geologic Map, Figure 2.5-3. Most data shown on Figure 2.5-3 have been summarized from a provisional geologic map prepared by the USGS [1]. Much of the data shown on the USGS map was developed by geologic interpretation of agricultural soil maps, published and unpublished geological maps representing but a small part of the state, and a field reconnaissance of a portion of the state [2].

2.5.1.1.2 Stratigraphy

The Piedmont Province is underlain by at least 15,000 feet of a meta- sedimentary sequence of deformed rocks of late Precambrian to early Paleozoic age which mantle Precambrian gneiss estimated to be 1,100 million years old. The crystalline rocks of the Piedmont Province are unconformably overlain by the sedimentary rocks of the Coastal Plain Province to the southeast and are bordered on the northwest by rocks of the Blue Ridge Province. Elongated Triassic basins containing unmetamorphosed, nearly flat-lying sedimentary rocks occur within the Piedmont from the South Carolina-North Carolina line northward. These basins trend parallel to the Appalachian's regional northeast-southwest trending structures. Isolated basins of Triassic sedimentary rocks have also been identified within Piedmont-type crystalline rock underlying the Coastal Plain from the Georgia-South Carolina line, northward [3,4,5]. Pre-orogenic mafic intrusives, and pre- and post-orogenic granitic plutons and diabase dikes are common.

The geologic belts within the Piedmont differ from each other predominantly by the degree of change in the original rocks. Modifications that resulted from folding, regional metamorphism, and igneous intrusions are reflected in the presently exposed rocks. Overstreet and Bell [1] believe the geologic belts represent metamorphic zones superimposed on a regional stratigraphic sequence. Folding in 1 metamorphic belt persists in trend into another belt; for example, large anticlines and synclines in the Charlotte Belt persist into the Carolina Slate Belt, Figure 2.5-3, supporting this hypothesis in the general site vicinity.

Three (3) metamorphosed sedimentary and volcanic sequences, each with a related intrusive episode, have been postulated to explain the succession of metamorphic and igneous rocks encountered in the Piedmont. Because of insufficient data, these sequences are not universally accepted. This postulation provides a reasonable explanation for some of the complex stratigraphy of Piedmont rocks, and is shown in summary in Table 2.5-1.

The Piedmont rocks generally consist of gneisses, amphibolites, schists, and other metamorphic rocks (country rocks) which are intruded by massive igneous materials of predominantly granitic character. Various types of migmatite border the major granitic plutons. The pre-metamorphic and possible mafic character of these rocks has been largely obscured by injection of quartzofeldspathic dikes and sills, and partial or complete assimilation of large areas of the original country rocks.

Near the eastern edge of the Piedmont in South Carolina, a thick sequence of metamorphosed shales, siltstones, and volcanic rocks crop out in the Carolina Slate Belt. Although the exact age of these rocks is uncertain, they appear to be equivalent in age to some of the lower Paleozoic rocks encountered in the Valley and Ridge Physiographic province west of the Piedmont. Overstreet [1] suggests that rocks of the Slate Belt connect westward with the more intensely metamorphosed rocks of the Kings Mountain Belt in South Carolina, and overlie the variably metamorphosed rocks of the Inner Piedmont Belt and southern part of the Charlotte Belt. Although some geologists postulate a fault boundary between the Slate Belt and Charlotte Belt rocks, this boundary in the site area is interpreted to be a metamorphic transition [6,7].

Interpretations of recent aeromagnetic maps flown over the Coastal Plain of South Carolina, North Carolina, Georgia, and Alabama in a cooperative project between the USGS, the Coastal Plain Regional Commission, the NRC, and state geological surveys have revealed that the basement rocks underlying the Piedmont are different from those underlying the Coastal Plain. The magnetic grain of the Piedmont basement is predominantly NE-SW whereas the magnetic grain of the basement rocks underlying the Coastal Plain is E-W [8]. It is believed that the Piedmont basement may be continental crust whereas the basement underlying the Coastal Plain may be island arc or oceanic crust. A recent 2,598 foot test hole in the Charleston, S.C., area bottomed in approximately 138 feet of amygdaloidal basalt confirming the contrast in basement lithology [9]. Geophysical and depth analyses indicate that 2 magnetic basements are present, 1 consisting of volcanic rock and dikes within the sedimentary section, and a deeper basement associated with larger intrusive bodies [10].

2.5.1.1.3 Geologic Structure

Rocks of the Piedmont have been deformed, apparently under a more confined environment than the Appalachians to the west. As a result of confinement, metamorphism of varying grades has accompanied regional Piedmont folding resulting in greater mobility and a corresponding lessening of shear forces in the rocks. What probably once was a high-standing sequence of fold structures parallel to the Appalachians has since been eroded down to a peneplain. Subsurface orientations of some of these features are indicated on Figures 2.5-4 and 2.5-5, Location of Regional Geologic Section and Generalized Regional Geologic Section, respectively. Remnants of these presumed structures exist as the previously mentioned parallel belts of metamorphic rock, which generally increase in metamorphic grade westward.

As indicated on the Regional Tectonic Map, Figure 2.5-6, the Appalachian region is strongly deformed. Southeastward from this region to the Coastal Plain the deformation decreases, and relatively few displacements of regional magnitude occur. Results of seismic profiling in the region [125] have yielded evidence that the crystalline rocks of the southern Appalachians are an allochthonous thrust sheet, 6 to 15 km thick, which have been thrust some 260 km to the west, and overlie relatively flat lying and undeformed sedimentary rocks that cover an extensive area of the central and southern Appalachians. Along the Coastal Plain, a probable basement upwarping, expressed as a broad northwest-southwest trending anticlinal feature, runs through Cape Fear, North Carolina [11]. This broad upwarping has been referred to as the Cape Fear Arch, and is bordered by the Salisbury Embayment to the northeast and the Georgia Embayment to the southeast. These embayments are broad sediment-filled basement flexures located 150 miles or more from the site.

2.5.1.1.3.1 Faulting

The known or implied major faults affecting the crystalline rocks of the region are shown on the Regional Tectonic Map, Figure 2.5-6. The largest is the Brevard zone, located adjacent to the Blue Ridge Mountains in the extreme northwestern corner of South Carolina, approximately 100 miles from the site. This fault separates the eastern metamorphic belts from the Blue Ridge metamorphic belts on the west. The Brevard zone, trending northeast-southwest, is believed by some to be a strike-slip fault parallel to, and probably contemporaneous with, the regional tectonism marking the formation of the Appalachian Mountains about 260 million years ago. Displacement may be on the order of hundreds of miles [12]. This type of faulting may be anomalous when considered in light of the regional thrust faulting that accompanied the Appalachian orogeny. A more recent hypothesis suggests that the Brevard fault zone marks the plane of an overthrust from the southeast [13], or an eastward-dipping splay off the main sole thrust previously mentioned [125]. Whatever the mechanism involved, the Brevard fault zone can be traced from Alabama through north Georgia, the northwest corner of South Carolina, and well into western North Carolina, a distance of some 450 miles.

The similarly trending Towaliga, Eastern Piedmont (Goat Rock), Gold Hill, and Jonesboro Faults, Figure 2.5-6, are considered to be normal or high angle faults. All are believed to have formed subsequent to metamorphism, probably at the close of the Paleozoic era. RN 03-012

The Towaliga and Eastern Piedmont (Goat Rock) Faults, which were previously believed to die out in Georgia, have been extended through South Carolina into North Carolina by Talwani and Howell [14,15]. The extension of the Towaliga fault zone lies approximately along the contact between the Kings Mountain and Charlotte Belt metamorphic zones. Evidence for extending the fault consists of a sharp contrast in lithology, the presence of cataclastic rocks, and a marked change in the gravity gradient [15]. Howell [14] has interpreted the Towaliga as a thrust sheet which was subsequently cut by a high angle fault that possibly dips to the northwest. The trace of the fault zone represents the trace of this high angle fault, not the extent of the overthrust, which probably extended farther to the northwest. The closest approach of the extension of the fault to the site is approximately 37 miles to the northwest. RN 03-012

The extension of the Eastern Piedmont (Goat Rock) fault northeastward from the vicinity of Columbia, S.C. is based principally on aeromagnetic lineation. Howell [14] feels that the Eastern Piedmont (Goat Rock) is not a single fault but is made up of many faults, splays, folds, etc., and is more correctly referred to as the Eastern Piedmont (Goat Rock) Fault System. Howell has proposed the name Modoc Fault for the splay of the Eastern Piedmont (Goat Rock) System that extends from Modoc, S.C. to the area of Lake Murray, S.C. The Modoc Fault of Howell is the same fault shown by Overstreet and Bell [1] and described by Tewhey [16] as extending southwestward from the southwest shore of Lake Murray, west of Columbia, and passing into Georgia near Modoc, S.C. Tewhey [16] considered the formation of this high angle fault to be associated with post-metamorphic activity, and that highly resistant ultra-mylonites are responsible for the straight line portion of the fault at Lake Murray. Based on aeromagnetic lineation, Howell has extended the fault northeastward from the northeastern edge of Lake Murray to just north of Columbia. The closest approach of the extension of this fault to the site is approximately 13 miles to the south. Undisplaced N30W trending diabase dikes of probable Triassic age cross this structure, indicating a pre-Triassic age for this fault [16]. RN 03-012

According to Talwani and Howell [15], plotted epicenters of historic and recent seismic activity generally fall along the proposed extension of both the Towaliga and Eastern Piedmont (Goat Rock) Systems. Howell [14] believes that the seismic activity "does not represent fault movement" as he has seen no evidence of displacement of Triassic (?) and/or Jurassic (?) age dikes which cross both faults. He has also seen areas where the Coastal Plain sediments over lie the Eastern Piedmont (Goat Rock) with no evidence of offset. The presence of undisplaced dikes and Coastal Plain sediments indicate that the last significant movement along these faults occurred prior to Cretaceous time, and probably previous to the Jurassic or Triassic periods. RN 03-012

The Gold Hill fault of North Carolina has been extended into South Carolina for the first time by Howell [14]. Howell has traced the fault southward as far as the Edgemore Granite, approximately 40 miles northeast of the site. A 600 foot core taken in the Edgemore Granite revealed weathered and brecciated zones which Howell believes represent the Gold Hill Fault. The granite has been dated at 340 m.y., establishing a maximum age for the fault. The fault cannot be traced southwestward from the Edgemore Granite.

Based on the interpretation of Bouguer anomaly maps, Levander and Talwani [17] have traced an unnamed fault located approximately 48 miles northeast of the site, from the vicinity of Gastonia, N.C., southwestward as far as Hickory Grove, S.C. This northeast trending fault, terminating near Hickory Grove into a northwest trending anticline, lies along the contact mapped between the Kings Mountain and Charlotte belts, and is located in an area of 2 reported earthquakes (Mb 3.4 and 3.8) that occurred on March 7, 1975. Howell [18] believes that this fault could be an extension of the Towaliga Fault system. The Towaliga system has shown no evidence of movement later than Jurassic/ Triassic.

The Taxahaw (Wildcat Creek) fault near Pageland, S.C., approximately 50 miles northeast of the site, appears to be related to the northeast trending Jonesboro Fault of North Carolina and may be a southwestward extension of the Jonesboro. Both faults are associated with Triassic (?) basins and are considered to be Triassic in age. According to Howell [18], the Taxahaw fault bounds the eastern edge of the Wadesboro and Crowburg Triassic basins. The Crowburg is a small basin approximately 4 miles in length located southwest of the Wadesboro basin, and is the southernmost outcropping of Triassic sediments in eastern North America [19]. The location of these and other buried Triassic (?) basins in the Piedmont and Coastal Plain Provinces are shown on Figure 2.5-7.

The Orangeburg Scarp is the local name for a more extensive escarpment called the Citronelle Escarpment that extends from Georgia through South Carolina into North Carolina. The Orangeburg Scarp is located in Orangeburg County, approximately 70 miles southeast of the site. It is believed by some investigators [10,20] that a portion of this feature may be tectonically controlled. This hypothesis is based on a change in the magnetic lineation in the basement rocks underlying the scarp, geomorphic evidence, strong lineaments along the scarp observed on Earth Resources Technology Satellite (ERTS) imagery, and Tertiary stratigraphic patterns. However, there is no evidence of stratigraphic offset across the scarp in the Cretaceous and overlying rocks [21], indicating a pre-Cretaceous age for any basement feature.

About 10 miles north of Lake Murray in the vicinity of Little Mountain, McKenzie [22] has postulated a series of northwest trending faults of unknown length with 1,500 feet of displacement. McKenzie mapped primary fractures at N10W with secondaries at N50E. McKenzie states, "Joints and faults are all part of the same system of fractures." The existence of these faults has not been corroborated.

Possible faults mapped by Secor [23] and Wagener [24], which lie within a 10 mile radius of the site, with 1 exception, have been shown by later work not to exist [6,7]. The exception is a possible east-west trending fault near the southern boundary of the 10 mile radius. However, the existence of this short fault could not be confirmed, as no field evidence of it was found during the detailed investigation.

The NNE-SSW trending line near Wallaceville, S.C., mapped by Secor and Wagener (1968) as a fault was initially based on the premise that the abrupt lithologic change associated with the feature seemed incompatible with the Slate Belt Stratigraphy as it was known at that time. With the accumulation of additional stratigraphic information, the abrupt change "no longer seems so unusual" (Secor, 1974 personal comm.). Secor therefore feels that "there is not compelling evidence for major faulting along this line near Wallaceville."

In late 1973, Wagener performed additional and more detailed field work on 3 faults postulated in 1968 (Geology of the Southern 2/3 of the Winnsboro Quadrangle: S. C. State Devel. Board, Div. of Geol., MS-17, 1970) in areas bordering the site on the east. The results of Wagener's findings are:

1. "Fault extending from the central-western border of the 1970 map along Jackson Creek to Jordan Branch. There is a pronounced lithologic boundary along the line of this "fault" within the 1970 map area. However, west of the map area, along 3 traverses across the extended fault line, I could find no evidence of faulting. Therefore, if I were to remap the area today, I would not postulate the existence of this fault."

2. "Fault extending southward from Kennedy Branch, which displaces the Jackson Creek "fault." This fault was postulated in part because of the inferred existence of the Jackson Creek fault (postulation upon postulation). More detailed field study in 1973 failed to yield any evidence of faulting along the line of this fault. It definitely appears that no fault exists here."

3. "Fault extending eastward from the southwest corner of the map. My attempts to re-examine this fault in 1973 were cut short well prior to completion. The fault was inferred in 1968 because of my inability (within the allotted time frame) to reconcile structural complexities west of Little River on the basis of faulting. In my opinion, the existence of this fault remains a possibility."

4. "The fault extending through Simpson (SE corner of the map) was plotted along a lithologic boundary as an extension of a fault mapped by Secor to the southwest. Secor has since determined that this fault is a lithologic contact (conformable) rather than a fault. Consequently, I hereby withdraw my inference that the fault through Simpson exists."

Relatively minor east-west and northeast-southwest trending faults mapped by Secor and Wagener are shown north and west of Columbia on the Regional Geologic Map, Figure 2.5-3. The features and associations discussed can best be illustrated on the regional map, and therefore have not been shown on the Areal Geologic Map, Figure 2.5-13. The bifurcated east-west trending fault north of Columbia appears to be steeply dipping and cuts across east-northeast fold trends at a slight angle. Secor feels that large displacements are involved and further states that "The faults have been intruded by late Paleozoic granitic plutons and are cut by northwest trending Mesozoic diabase dikes." Portions of these faults also are nonconformably overlain by undisplaced Coastal Plain Cretaceous sediments, and are therefore older than those deposits. A portion of the northernmost of these faults is approximately 10 miles south of the site. Clarke [25] found what is probably a westward extension of 1 of these faults in the White Rock-Chapin area, but could not determine the direction or amount of displacement.

The diabase dike-fault relationship discussed by Secor is supported by geophysical work in the Cedar Creek community by Thompson [26]. Thompson's work supersedes an incomplete diabase dike study conducted by Privett [27]. The community of Cedar Creek is located about 20 miles north northwest of Columbia. Based on the results of a magnetic anomaly survey, Thompson feels he has identified 9 diabase dikes (in the subsurface) crossing the east-west trending fault mapped by Secor and Wagener [23]. Thompson indicates that no appreciable offset has occurred since the intrusion of what he refers to as "Mesozoic diabase dikes." He feels, considering the relatively large fault displacement postulated by Secor, that little or no movement has occurred since dike emplacement. Triassic and Jurassic diabase dikes tend to follow northwest-oriented faults which transect the Triassic basin and other rock types of the Piedmont. These dikes are generally fairly easy to trace (via magnetic anomalies and field checking) and can be considered indicators to faulting of Triassic age. Locations of all known diabase dikes in the regional and site areas are shown on Figures 2.5-3 and 2.5-13; none of these closely approaches the site. Reinemund [28], in discussing diabase dikes of the Deep River Coal Field of North Carolina, indicates that where dikes extend to northeast trending Triassic basin faults, they commonly change direction, becoming irregular in width and follow along the fault for short distances. A few dikes extend across faults with little break in continuity. Reinemund [28] suggests that where dikes are offset by faulting, they are probably formed in the final stages of faulting near the end of the Triassic, but they may be younger.

Other faults previously mapped by Secor and Wagener [23] beyond the 10 mile radius have been shown by later work not to exist [6,7,24].

Based primarily on unpublished magnetic data (open file, USGS, 1971 Aeromagnetic Map of the southern half of the Knoxville 2 Sheet, scale 1:250,000), Howell [18,30] postulates a northwest-southeast trending "structural anomaly" from Spartanburg, S.C., to Hendersonville, N.C. Geophysical evidence for the postulated feature ends at Spartanburg. No field evidence exists for a southeastward extension, and his preliminary conclusions concerning the northwestward projection have not been substantiated by geologic field investigation.

Known faults cutting both Coastal Plain sediments and Piedmont rocks are very localized, rather small features. Zupan and Abbott [31] describe an exposure a few miles northwest of Columbia, S.C., where Carolina Slate Belt argillite is unconformably overlain by post-Eocene (?) to pre-late Miocene (?) sediments. A number of high and low angle reverse faults were observed at the exposure, and a maximum of 5 feet of displacement was reported. A small horst was described that brought argillite in contact with the sediments. Near the fault plane the sediments exhibited drag, and a number of clastic dikes originating in the argillite cut the younger sediments. The faults were not visible in overlying sediments and could not be traced along the ground surface.

The dikes and associated reverse faulting mapped at the exposure are attributed by Zupan and Abbott (1975) to southeast-northwest compressional forces affecting the Paleozoic basement and overlying post-Eocene (?) sediments.

The clastic dikes originate in the argillite (Paleozoic in age) and transect overlying post-Eocene (?) sediments. Zupan and Abbott believe that some of the faults mapped affected the overlying post-Eocene (?) sediments. The post-Eocene (?) sediments are the youngest sediments shown by Zupan and Abbott as affected by the clastic dikes and faults. The youngest sediment shown as not affected consists of surficial material of undetermined age which overlies the post-Eocene (?) sediment.

The exposure reported by Zupan and Abbott (1975) was located approximately 21 miles southeast of the plant site, immediately west of and adjacent to Interstate 26 at the Highway 36 intersection. The exposure was destroyed following investigation by Zupan and Abbott, and did not exist at the time of publication. All published information pertaining to the exposure is found in "Geologic Notes," Volume 19, No. 1, Spring 1975, South Carolina State Development Board, Division of Geology.

A northeast trending fault apparently terminates approximately 9 miles northwest of the subject exposure; this fault intersects undisplaced diabase dikes of probable Triassic age. The fault may be a northeast extension of the Eastern Piedmont (Goat Rock) Fault, or may be a splay of more complicated "Eastern Piedmont (Goat Rock) Fault System." The Eastern Piedmont (Goat Rock) Fault is generally considered to be a high angle structure. An extension of the "Eastern Piedmont (Goat Rock) Fault System" has been proposed, based principally upon aeromagnetic lineation, which apparently passes near the exposure reported by Zupan and Abbott. The Zupan and Abbott structures do not correlate with observed ERTS photo linears. RN 03-012

The general strikes of the aforementioned faults fail within the range of strikes observed by Zupan and Abbott. The range of fault strikes and dips observed by Zupan and Abbott is not compatible with the structure mapped at the plant site. The Zupan and Abbott faults exhibited a wide range of northeasterly strikes with northwest to north dips which varied from shallow to steep; most of the northeast oriented shears at the plant site dip steeply to the southeast with a few dipping steeply northwestward, and some northwest striking shears also occur.

The maximum displacement of the Zupan and Abbott structures was measured in the Paleozoic argillite; displacement of the post-Eocene sediments was indicated by upturned gravel layers, and data indicating maximum offset of the post-Eocene material are not available.

Whether displacement occurred in all or only a portion of the originally deposited post-Eocene column of sediments is not known, and the age of the surficial material mapped by Zupan and Abbott is not indicated.

Howell and Zupan [32] describe exposures northwest of Cheraw, S.C., where the Cretaceous (?) Middendrof formation overlies argillites of the Carolina Slate Belt. An exposure on U.S. Highway 52 shows concordant folding of the Cretaceous (?) material and the argillite. A few clastic dikes originating in the argillite cut the overlying

Cretaceous (?) sediments. An exposure along Chesterfield County Road 61 exhibits an apparent high angle reverse fault where the argillite thrusts up and overturns several layers of the overlying sediments. These structures are located on the southern limb of the Cape Fear Arch and could be related to the Tertiary tectonic activity that formed the arch [32].

The Belair fault zone near Augusta, Georgia, approximately 75 miles southwest of the site, has probably experienced movement within the last 50 million years (Dept. of Interior News Release; 18 November 1976) [33]. The fault zone, which contains at least 7 individual en echelon faults, is traceable for at least 13 miles extending in a northeasterly direction from 10 miles southwest of Augusta to about 5 miles north of the city, and generally parallels the structural grain of the Piedmont. The feature contains reverse faults in which phyllites on the hanging wall (eastern block) have been thrust over high grade metamorphic rocks on the foot wall (western block). Material in the overlying sediments has been offset, and has been dated by radiocarbon methods; however, later studies indicate that the dates obtained may be inaccurate, and investigations continue to determine the age of last movement with precision. Recent studies of the Belair fault cited possible left lateral strike displacement of the Augusta fault along this feature as much as 23 km, with attendant vertical separation of unconformities at the base of the Upper Cretaceous and Eocene of 30 m and 10 m, respectively [126]. Current detailed studies have been made northward along the postulated strike of the Belair fault where it should intersect the east/northeast-trending Modoc zone which separates the Carolina Slate Belt and Kiokee Belt [127]. There is no significant offset in the well-marked unconformity at this locale, suggesting that the Belair fault is not present as a major left-lateral strike-slip fault. The mechanism of movement, whether by creep or sudden seismic displacement, has not been determined, although several hypothetical models have been recently advanced [127] to explain the nature of the apparent displacement along this structure. None of the information available at this time indicates that this feature could be related to structure close to the site, and there is no evidence of historic or recent seismic activity in the area of the fault trace.

A north-south trending normal fault has recently been postulated in the Chapin, S.C. area based on geologic mapping by Professor Donald Secor of the University of South Carolina. The geologic mapping is part of a program funded by the Earthquake 02-01 Hazards Division of the U.S. Geologic Survey. The entire mapping program covers 4, 7-1/2' quadrangles (Chapin, Jenkinsville, Pomaria, and Little Mountain) which would 02-01 eventually be mapped in detail by the University of South Carolina Geology Department.

The fault has a north-south orientation and displaces metamorphic rocks of the Carolina Slate Belt in a down-to-the-east fashion. The fault roughly parallels Wateree Creek from just north of Hilton, S.C., to about the Broad River, where it has a slightly northwest orientation. Evidence of faulting includes: Discontinuity of magnetic anomaly patterns; apparent drag indicated by disturbed bedding or compositional layering, foliation and lineation patterns; occurrence of silicified and unsilicified fault breccia; occurrence of open extension fractures partially filled with quartz; apparent offset of stratigraphic contacts and the Carolina Slate Belt/Charlotte Belt border zone; apparent offset of older northwest trending silicified breccia zones; and possible offset of a northwest trending diabase dike. Field work is continuing in this area, and at present, the closest approach of this structure is about 4 to 5 miles south of the site. No evidence at present demonstrates any recency of movement on this structure. The Applicant plans to stay abreast of this mapping and report any significant findings to the NRC prior to the ASLB hearings. During the ASLB hearings, Professor Donald Secor testified that the postulated Wateree Creek fault had been dead for a long time, would not extend to the Jenkinsville quadrangle, and would not reactivate due to its unfavorable orientation for activation. The above conclusions were submitted to the NRC ASLB on 2/16/82 by SCE&G in the Applicant Proposed Finding of Facts and Conclusions. The same conclusions were also published in the paper 'Geology of the Area of Induced Seismicity at Monticello Reservoir, SC', Journal fo Geophysical Research, by Secor, et al. Vol. 87, No. B8, August 10, 1982. 02-01

2.5.1.1.3.2 Jointing and Foliation

Foliation usually has been found to be correlative with regional structure and pre-metamorphic depositional banding except where it is in contact with plutons. Granitic plutons are partially concordant with regional structure, but clearly discordant where they distort the foliation of country rocks. The regional trend of individual plutons, wherever mapped in the Piedmont Province, shows a general northeastward orientation parallel to the regional structure [34].

A pronounced N10W to N30W fracture direction is prominent within the Charlotte Belt. This direction corresponds to 1 of the angular drainage patterns containing a considerable number of streams. Another drainage pattern direction ranges from N50E to N70E, which corresponds to a second fracture direction and also the regional strike. Diabase dikes of late Triassic (?) age are generally oriented parallel to a joint pattern throughout the Piedmont.

2.5.1.1.3.3 Geophysical Features

The Regional Bouguer Gravity Anomaly map is presented on Figure 2.5-8. Bouguer Gravity anomalies sometimes coincide with features of the Tectonic Belt. Based on comparison of the available regional gravity anomaly data with the positions of known regional faulting as shown on Figure 2.5-6, there are not sufficient gravity gradient contrasts to permit even major fault identification in the site area.

Magnetic anomalies generally reflect regional lithologic and structural trends and are very sensitive reflectors of Triassic diabase dikes in the lower Piedmont and Coastal Plain Provinces [35]. Regional magnetic data are available for the eastern continental margin of the United States and extend as far west as the site. The broad flightline spacing (aeromagnetic survey) did not resolve small-scale features but does permit tracing of major regional magnetic lineations.

The areas of greatest magnetic relief within the Paleozoic rocks of the Piedmont appear to be associated with basaltic igneous bodies. The variable magnetic patterns within the crystalline Piedmont, therefore, could represent intrusive conditions rather than structural boundaries.

Sharp fault contacts between sedimentary rocks of low magnetic susceptibility and crystalline rocks appear to be identifiable by magnetic anomaly mapping. Beneath the Coastal Plain of North Carolina and South Carolina, there are several northeast-southwest trending buried basins, believed to be of Triassic age, which appear to be identifiable on the Regional Aeromagnetic Anomaly Map, Figure 2.5-9, as does the trace of a portion of the Jonesboro Fault within the Piedmont. A previously unmapped buried Triassic (?) basin lying athwart the South Carolina-Georgia line has been confirmed by deep borings. This feature is quite prominent on a detailed magnetic map by Petty [3] .

A pronounced positive magnetic anomaly northeast of the site, Figure 2.5-9, can be directly related to the Dutchman's Creek gabbro [36]. This anomaly continues north and west of the site, possibly reflecting a deep crustal extension of the gabbro. Sharp anomalies on either side of the site, as shown on Figure 2.5-22, Areal Magnetic Anomaly Map, may be related to unexposed gabbroic intrusives.

As discussed in Section 2.5.1.1.2, recent aeromagnetic data from the Coastal Plain of South Carolina has revealed a difference in magnetic grain in the basement rocks compared to the rocks underlying the Piedmont [8]. The magnetic grain in the Coastal Plain basement is predominantly E-W whereas the Piedmont magnetic grain is NE-SW. This change in magnetic grain is interpreted as a difference in the basement lithologies, with the Coastal Plain being underlain by predominantly oceanic and island arc crust whereas the Piedmont is underlain by continental crust.

2.5.1.1.3.4 Linear Topographic Elements

Linear features were studied from ERTS images and topographic maps. The linears identified on the Regional ERTS Photolinear Map, Figure 2.5-10, are generally consistent in orientation with the regional joint pattern. The number of linears identified around the site area reflects the greater effort in examining that area for linears. As distance from the site increases, only the most prominent and readily identifiable linears were recorded. The linears observed may represent lithologic boundaries, folds, faults, or jointing. For comparison, the known major structural features and igneous dikes are also shown on Figure 2.5-10. Although numerous dikes are shown on published geologic maps, none of the ERTS linears are correlative with them; however, many of the northwest trending linears do have similar orientation. The major faults such as the Gold Hill, Jonesboro, and Modoc show relatively good correlation with linears identified from the imagery.

Smaller linear features were identified by study of the 7-1/2 minute USGS Jenkinsville, S.C., topographic map, Figure 2.5-11, which shows trends of linears or curvilinear topographic features which seem to correspond to a regional fracture system. Close correspondence between trends on Figure 2.5-10, Figure 2.5-11, and fracture system data collected at and around the site suggests a direct relationship between regional fracture systems and shears exposed at the site.

2.5.1.1.4 Geologic History

Most metamorphic rocks presently exposed in the Piedmont were originally deposited as a thick sequence of sediments in the Appalachian Geosyncline between 250 and 600 million years ago [34]. A generalized geologic time table is presented in Table 2.5-2. An episode of folding, regional metamorphism, and igneous intrusion apparently followed each of 3 long sedimentation intervals. In South Carolina, from oldest to youngest, these episodes have been referred to as A, B, and C [1], Table 2.5-1. Near the end of the final depositional period, the previously formed metamorphic rocks and the unmetamorphosed sediments in the geosyncline underwent a final metamorphism of regional magnitude. This third metamorphic episode elevated the Piedmont, and was accompanied by fracture deformation, folding, and intrusion of discordant plutons of episode C. This event correlates with an orogeny that marked the close of the Paleozoic era. During this disturbance, thrust faulting occurred on a major scale in the southern Appalachians, but has not been demonstrated conclusively in the adjacent Piedmont plateau.

This mountain building increased erosion which, by mid-Triassic time, had worn down much of the Piedmont to a broad peneplain which truncated the exposed complex rock structures. A gradual re-elevation of the region followed, probably accompanied by relaxation of compressive stresses. Subsequent development of numerous sets and/or zones of fractures in the Piedmont crystalline rocks provided appropriate conditions for the formation of graben-type fault blocks. These graben-like troughs are elongated and generally parallel to regional northeast-southwest trending Appalachian structures. As they sank, these structural troughs or basins accumulated sediments eroded from the higher crystalline Piedmont to the northwest and southwest until the end of Triassic time. Sediment-filled Triassic basins are exposed in the Piedmont as low-lying structurally controlled valleys north of the South Carolina-North Carolina boundary. Similar Triassic (?) sediments have been encountered within Piedmont-type crystalline rocks underlying the Coastal Plain sediments from the Georgia-South Carolina line northward.

In late Triassic or early Jurassic time, further uplift was accompanied by the intrusion of numerous northwest-southwest trending diabase dikes along pre-existing fractures in the Triassic sediment and surrounding Piedmont crystalline rocks. After another erosional cycle, during which the Piedmont was once again reduced to a plain, continental uplift elevated the region now occupied by the Appalachians and adjacent Piedmont areas; the region lying to the south and east was tilted downward, so that the sea encroached upon and somewhat beyond the present Fall Zone. The Fall Zone, which is oriented northeast- southwest, roughly defines the boundary between the Piedmont and the Coastal Plain and can be traced as far north as New Jersey and as far south as Alabama.

The most recent igneous activity known in the eastern U.S. consists of intrusive rocks of Eocene age [37]. Felsitic (andesitic) intrusive rocks of the Valley and Ridge Province in Highland County, Virginia, and adjacent West Virginia, some 250 miles north of the site, are frequently associated with thermal springs. The 47 million year old andesite dikes and sills have been mapped as intruding mid-Paleozoic strata. Dennison and Johnson [37] hypothesize that these Tertiary intrusions represent the most recent pulse of volcanism which has been intermittently active in Virginia at least since the Triassic and probably since late Pre-cambrian time.

The sequence of poorly consolidated sediments overlying the southeastward sloping crystalline rocks beneath the Coastal Plain is the result of several depositional and erosional cycles occurring from the Cretaceous to the present. The unconformity formed by the irregularly eroded crystalline surface at the base of the Coastal Plain sequence is generally thought to slope southeastward at a gradient of about 20 feet per mile.

In most places in the Piedmont, a mantle of residual soil and saprolite covers bedrock. Relict features such as foliation, jointing, and cleavage are often recognizable in the saprolite.

2.5.1.2 Site Geology

The site is located within the Charlotte Belt metamorphic zone of the Piedmont Physiographic Province. The area is underlain by a complex series of interlayered and folded almandine-amphibolite facies metamorphic rocks, all of which have been intruded by plutons of granite to granodiorite composition. The detailed structure of the mapped area is difficult to determine due to the complex geologic history, diverse rock types, and limited exposures. Minor shearing with maximum observed displacements of about 7 feet has occurred within the Reactor Building area. The results of detailed investigations of these shears indicate that movement along the shears could not have occurred later than 45 million years ago, and in all probability the shears have been inactive since 150 to 300 million years BP. The geology of the general site area is discussed in Section 2.5.1.2.1 while the detailed geology of the excavations for Seismic Category 1 structures is discussed in Section 2.5.1.2.2.

2.5.1.2.1 General Site Area

An intensive geologic field study was conducted within a 10 mile radius of the site. Areas previously mapped by others south, east, and west of the site were examined and data correlated where possible. Subsurface conditions were explored by drilling over 200 borings ranging in depth from 6 to 235 feet below the ground surface. Petrographic analyses of thin sections were performed to aid in rock classification, and in the evaluation of the possible existence of faults near the site. Joint and foliation statistical analyses were used as supporting evidence for structural hypotheses. A general site area magnetic anomaly survey was conducted which substantiated geologic interpretations. A geologic map of the general site area was prepared and is presented on Figure 2.5-13, Areal Geologic Map.

2.5.1.2.1.1 Site Physiography

The site is located within the Piedmont Physiographic Province in Fairfield County, approximately 3 miles northeast of Parr, S.C. The site is about 1 mile east of the Broad River, and is in a forested area. Topography of the general area is characterized by gently to steeply rolling hills and generally well-drained mature valleys which empty, ultimately, into the Broad River. Superimposed on the topography of the general area can be found steep scattered erosional gullies, possibly resulting from past agricultural practices. Maximum topographic relief in the general site area is approximately 250 feet. An aerial perspective view of the general site area is presented on Figure 2.5-12, Diagrammatic View Parallel to Broad River. This figure shows typical physiographic features discussed.

Drainage follows either a dentritic or trellised pattern, the former sometimes indicating plutonic activity, the latter reflecting either a joint system (approximately N30W, N45E and N67E) or the site area strike (N40E to N75E). The Broad River and its larger tributaries have developed a relatively narrow flood plain with occasional, poorly formed, natural levees. Alluvial deposits consisting of clays and sands range in thickness from a few inches to several feet.

2.5.1.2.1.2 Lithology and Petrology - General Site Area

Excellent agreement of lithologic data was obtained between rock units to the east, geologically mapped by Wagener [24], and rock units found in the general site area. Secor [23] and Wagener [24], and McCauley [38] have geographically mapped the area south and west of the site, respectively. Different mappable units were used in those studies, but there is a general agreement of lithologic data between the site and those associated areas.

Five (5) mappable rock units were defined during the field investigation: Charlotte Belt Gneiss, Carolina Slate Belt Rocks, Migmatite, Granodiorite, and "Granofels". The surface distribution, structure, and inferred subsurface orientation of the rock units are shown on the Areal Geologic Map, Figure 2.5-13. This figure was prepared from test boring data and field mapping of the surface distribution of saprolites and rock exposures.

The term Charlotte Belt Gneiss is used to denote the complex almandine-amphibolite facies metamorphic rocks of the Charlotte Belt [12]. The unit as defined here underlies most of the area mapped and consists of the following observed rock types:

1. Light grey and black, fine- to medium-grained hornblende-plagioclase gneiss which exhibits macroscopic banding and/or foliation. Bands consist of mineral segregations forming color and textural variations.

2. Tan to yellow-tan, fine- to medium-grained quartz-feldspar gneiss which is low in mafic mineral content.

3. Light grey to black, fine- to medium-grained, banded, hornblende-amphibolite gneiss and black greenish-black hornblende amphibolite formed by increasing hornblende content.

4. Black and white, fine- to medium-grained, banded, biotite gneiss which usually contains excellent foliation by alignment of biotite.

5. Black to light brown, fine- to medium-grained biotite/muscovite schist.

In poorly exposed or extremely weathered road cuts, the Charlotte Belt Gneiss may often be recognized by the remains of compositional or color banding. The unit is cut by large feldspar and secondary quartz dikes, the remnants of which may be observed as blocky float. Folding, where observable, is of a very broad and gentle nature. Varieties of the more salic bands within the gneiss closely resemble igneous and "granofels" type rocks found in the site area. Some of these bands may represent an injection (lit-par-lit) and assimilation process. Some rock cores obtained from the Charlotte Belt Gneiss and Migmatite Units exhibit an increasingly granitic texture with depth, indicating the possibility of subsurface plutons below the depths penetrated by borings.

The Carolina Slate Belt Unit [39], which is confined to the southernmost portion of the mapped area, contains greenschist facies metamorphic rock types as follows:

1. Tan, fine- to medium-grained quartz-feldspar-muscovite/biotite schist. This rock is generally low in mica content, containing only enough to form moderate schistosity. Quartz content of the schist varies, sometimes forming impure quartzites.

2. Black, fine-grained hornblende amphibolite, observed as massive exposures in stream beds.

3. Various colored (light) relatively pure, very hard quartzites, derived gradationally from the schistose rocks described in rock type 1 above. These rocks exert topographic control from Peak, S.C., southward.

The Migmatite Unit contains a gradational assortment of migmatitic rock types which generally are associated with mapped plutonic phenomena. "Migmatite," as used herein, is defined by Turner and Verhoogen [40] as consisting of 2 lithological elements intimately mixed: country rock variously altered by metamorphism and metasomatism, and granitic. Three (3) general migmatite rock types are defined within the mapped area:

1. Migmatite of gneissic composition which resembles rock of the Charlotte Belt Gneiss Unit, but exhibits disruption, flowage, perfectly healed shears.

2. A contact breccia in which angular to subrounded fragments of fresh-appearing to altered dark grey to black fine-grained country rocks are strewn throughout a fine-grained granitic matrix.

3. Migmatite of granodiorite composition which contains slight to well-foliated characteristics and/or some relic inclusions of altered country rocks. Contact phenomenon (alteration of texture, composition, and individual minerals) sometimes are observable. This is generally fine- to coarse-grained hornblende-plagioclase rock which is sometimes quite similar to ordinary igneous diorite or granodiorite, apparently produced by homogenization of hornblende-plagioclase gneisses through partial fusion, metasomatism, recrystallization, or combinations of these processes. The observable feldspars generally are not zoned, in contrast to the zoned feldspars of the granodiorites.

Field data associate the Migmatite Unit rocks with plutons. Generally, migmatites are present beyond the perimeter of a pluton, and extend a few hundred to over a thousand feet between the pluton and country rocks. Highly contorted gneisses and observed close interlayering of Charlotte Belt gneisses, granodiorites, and granofels were mapped as mignatite. The structure of migmatite zones has been disrupted over large areas, apparently by mobilization of quartz-feldspur gneiss and granofels.

The Granodiorite Unit occurs in an irregular pattern across the central mapped area and consists of 2 types of plutonic rocks:

1. One (1) is a light gray medium- to coarse-grained post-metamorphic or synmetamorphic rock of general granodiorite composition which is similar to the mafic phase of the nearby Winnsboro Adamellite [24]. It also resembles the coarse-grained hornblende-plagioclase migmatite previously described (Type 3), but is distinguished by zones alkali feldspar crystals (phenocrysts). Exposures of this rock are characterized by a coarse-grained, granitic texture and an occasional presence of boulders.

2. The second is a light gray to tannish fine-grained, post-metamorphic rock of approximate granodiorite composition which is similar to the nearby Rion Adamellite [24].

It is characteristically exposed as large boulders, exhibiting a fine, equigranular, granitic texture. Thin planar dikes of aplite and pegmatite sometimes are present (most exposures do not show these dikes). This rock probably was injected into the older coarse-grained granodiorite shortly after crystallization. Rocks of the Granodiorite Unit sometimes are topographically expressed by higher relief and irregular drainage. Both concordant and discordant contacts were mapped. Due to the complex geologic history of the area, the genetic origin of these plutons is uncertain.

Plutonic rocks observed in Fairfield and Newberry Counties seem to occur along irregular patterns. Some contacts generally are concordant, following the regional strike, while some are discordant, following the prevailing joint system; others are irregularly discordant. The dip and strike of the country rocks often are erratic in the vicinity of plutons.

The Granofels Unit is a light gray to pinkish gray fine-grained rock of granitic texture which resembles the Rion Adamellite but contains slight foliation characteristics with areas showing a predominant grouping or zonation of dark minerals. Irregular veins or pods of quartz and/or pegmatite are present. It often contains a distinct cleavage of undetermined origin that may represent a flow, structural, or metamorphic phenomena. The cleavage causes weathered material to form small rod-like pieces of disc-shaped fragments which are observable on the exposure surface. This unit rarely is exposed as fresh rock, and generally is not represented by boulders. Saprolite exposures, however, are abundant and are mappable. The Granofels Unit may have either an intrusive or interlayered relationship with the gneisses. Field evidence indicates that this rock is a pre-metamorphic granite (or near equivalent) or a granofels (generally defined as a fine- to medium-grained granoblastic metamorphic rock that has the texture and usually the mineralogy of granitic rock). The designation "Granofels Unit" was selected as the most appropriate to distinguish the mappable unit. Large areas are present north and northwest of the site.

There are dikes of aplite, some of which have cleavage and closely resemble the granofels or salic gneiss, and are interlayered with the more hornblende-rich rocks. Migmatite and metamorphic zones usually contain dikes or interlayered pegmatites and/or secondary quartz, which are observable as float on the surface. These dikes may be large and irregular as opposed to the thin (8 inch maximum) uniform, and planar dikes of pegmatite and aplite which cut the post-metamorphic granodiorites (quartz float is not present in the Granodiorite Unit areas). Saprolite and soil derived from migmatite frequently contain evidence of weathered relict inclusions which often are ellipsoidal or spheroidal.

The upper 5 to 10 feet of soil, found in the original undisturbed portions of the site area, generally consist of red to reddish-brown stiff clayey and silty soils containing variable quantities of sand. These soils are usually underlain by yellow to reddish-brown micaceous sandy silt and/or silty sand which grades increasingly dense and sandy with depth to rock. Essentially all soils observed in the site area borings are residual. Some alluvium is present along Frees Creek in the valley to the north of the site and in the flatter segments of erosion gullies which incise the ridge flanks.

Geologic borings drilled indicate that the depth of rock weathering varies considerably across the site area. Three (3) subsurface geologic sections have been constructed from data from widely separated deep borings which illustrate an uneven rock surface and inconsistent thickness of soil. The locations of these sections are presented on Figure 2.5-14, Location of Site Subsurface Sections. The subsurface sections, designated A-A', B-B', C-C', are shown on Figures 2.5-15, 2.5-16, and 2.5-17. The thickness of soil found in borings, in general, varies from about 40 to 95 feet. Slight to extensive weathering of rock generally extends from depths of 40 to 120 feet. The variable depth of weathering in the general site area primarily relates to the:

1. Type of rock from which the soils were derived (parent material).

2. Angle of foliation or layering.

3. Density and orientation of jointing.

4. Amount of erosion which has occurred in a given area.

2.5.1.2.1.3 Geologic Structure - General Site Area

The results of the field mapping within a 10 mile radius of the site are presented on the Areal Geologic Map, Figure 2.5-13. According to McCauley [38,41], folding within the Carolina Slate Belt is moderately tight and has a general northwestward asymmetry. Individual folds are not traceable in the field, but frequently can be approximately outlined. The Charlotte Belt exhibits a less distinct fold pattern, but the general structural trend is the same. Two (2) inferred synclines are shown on Figure 2.5-13 approximately 5 and 8 miles south of the site that closely parallel the Charlotte Belt/Slate Belt contact, striking approximately N75E.

A statistical analysis of foliation and compositional bedding planes in the general site area indicates a major disruption of country rocks by pluton emplacement. The Areal Foliation Contour Diagram, Figure 2.5-18, presents a plot of 108 such planes from the entire mapped area, and indicates a shift from the N70E average trend in the general area to about N50E, with dips spread unevenly to the southeast and northwest. Both the shift from regional strike and the uneven distribution can be attributed to the disruption resulting from plutonic emplacements. Plutonic rocks have been mapped as fingers, irregular zones, and as small to moderately large plutons which generally trend in an east-west pattern, indicating a general concordance or structural relationship and a connection with the adamellite rock to the east mapped by Wagener [24]. A moderate size granodiorite pluton exists at the western boundary of the site (Figure 2.5-13). The northwest contact with the country rock east of Broad River is concordant, while the others are moderately discordant, probably reflecting the influence of a joint system. Smaller granodiorite plutons are found north and east of the nuclear plant site. Precise boundaries of plutons are difficult to determine because of the peripheral zones of migmatite. The altered character of the migmatites seems to increase as the plutons are approached.

The high density zone in the lower right quadrant of Figure 2.5-18 represents points north of, and adjacent to, the site. This area strikes N43E and dips moderately to the southeast, possibly forming the southeastern limb of a northeast striking anticline. The N43E strike of this area deviates approximately 25° from the usual regional strike, and the isolated density concentrations at the east, south, and west edges of the figure indicate that disturbance is present to some degree.

The density zone near the northern edge of Figure 2.5-18 represents foliation planes located several miles south of the site. The general strike of this area is N78E and closely approximates the regional strike. The dip is steep to the northwest, indicating the presence of the southern limbs of the synclines shown on Figure 2.5-13. The high density areas of this figure are much broader than foliation contour diagrams of nearby localities prepared by others [41,23], indicating a significant pluton influence within the general site area.

Figure 2.5-19, the Pluton Area Foliation Contour Diagram, represents a plot of 30 planes from areas of known pluton emplacement. The irregular distribution of high-density zones is very apparent, illustrating the disruptive effect of plutons on older metamorphic rocks. The field and core data (increasing granitization with depth) enhance the probability of subsurface plutons which disturb northeast-southwest trending folds of metamorphic rocks.

A well developed joint system was observed in most rocks in the mapped area. The Areal Joint Contour Diagram, Figure 2.5-20, represents a statistical analysis of more than 135 joints from the area mapped, and exhibits a system for which the prevailing directions are N30W with an approximate dip of 80° northeast and N67E dipping vertically. The secondary set averages N45E and dips approximately 80° northwest. These joint sets probably represent a combination of vertical diagonal shear jointing, with longitudinal and cross-tension joints, all related to folding. The joint system enhanced development of a trellised drainage pattern which alters to dendritic where influenced by pluton emplacement.

Two (2) diagrammatic sections have been constructed which show some aspects of these general structural relationships. These sections are presented on Figure 2.5-21. 02-01

Figure 2.5-21 is a diagrammatic section across a portion of the general site area. The attitudes and relationships shown are not absolute, but depict the most probable gradational subsurface relationships based on the interpretation of surface data.

Three (3) basic rock types are shown: 1) granodiorite (plutonic), 2) migmatite (granodiorite and gneissic in composition), and 3) Charlotte Belt Gneiss (country rock).

The migmatite unit consists of a gradational assortment of migmatitic rocks generally associated with plutonic emplacement. Here the unit consists of 2 lithological elements intimately mixed; country rock (CBG) and granitic (granodiorite). Field data associate the unit with plutons, and the associated mixing generally extends well beyond the perimeter of the pluton.

The plutonic rocks observed at the site (the granodiorite unit) occur along irregular patterns; some contacts are generally concordant, following the regional strike, others are discordant, following the prevailing joint system, while others are irregularly discordant. The dip and strike of the country rock (CBG) are often erratic in the vicinity of plutons.

The detailed field mapping revealed no evidence of shearing or fault displacement in the area of Frees Creek, and no evidence which would indicate the contacts shown on Figure 2.5-21 are not intrusive in nature.

Field evidence suggests a fault in the southwestern Parr area, approximately 3 miles southwest of the site as shown on Figure 2.5-13. Discordance in foliation and beds exists at Parr and 3 miles southwest on S.C. 29. Rock at the S.C. 29 exposure exhibits intense shearing in thin section, and strikes N50E toward the exposure at Parr. Similar rock, also exhibiting shear features, may be traced on strike approximately 2 miles southwest of the S.C. 29 exposure. The similarity of the strike to those proposed by others [41,23] and to shears mapped in excavations for the proposed facilities, suggest that this structure is part of a general fault zone. An approximate 90° dip reversal across a narrow disrupted zone exists on the fault strike along S.C. 213, 1 mile northeast of the S.C. 29 exposure. A thin section from this exposure also exhibits shearing. Slickensides are present in the core of 1 boring drilled on the Parr Dam. Displacement at the Parr exposure seems to be small, and could not be determined at other exposures southwest of Parr due to the lack of evidence (displacements of shears found in the excavations were less than 7 feet, and are discussed in Section 2.5.1.2.2.2). Detailed field reconnaissance for a distance of 2 miles either side of the theoretical northeast projection of this postulated fault was performed, and extended up to County Highway 48, about 6 miles northeast of Parr. Rock cores obtained from borings drilled at the site were examined, and petrographic analyses were performed on selected cores. However, no evidence of faulting was found until the excavation for the Reactor Building exposed non-capable shears in the site bedrock. These near vertical shears were exposed in the bedrock after removal of approximately 100 feet of residual overburden, and are noncontinuous en echelon features which represent oblique slip faults. A complete discussion of onsite faulting including evidence pertaining to the age of these features is presented in detail in Section 2.5.1.2.2.2, Geologic Structure of Excavations.

A ground magnetic survey was conducted to attempt magnetic correlation with geologic features. Measurements were made at 352 stations with a Varian Total Field Magnetometer. The results are presented on the Areal Magnetic Anomaly Map, Figure 2.5-22, using a 100 gamma contour interval. The data illustrates variations in the total magnetic field.

In general, the contours reflect correlation between basement lithologies and the magnetic field. The geologic map is based on observed surface outcrops and cores from test borings, while the magnetic anomaly map reflects deeper or more magnetically intense lithologies. The survey illustrates the variable geologic lithologies encountered during field mapping and in the bore holes. Anomalies of over 1,000 gammas occur within a 500 foot lateral extent. The high magnetic relief noted within the site area should not be misinterpreted as suggestive of greater variability than the surrounding area. The smoother contours farther from the site are a function of wider station spacings.

Magnetic gradients on Figure 2.5-22 have distinct northeast trends, probably related to regional folding, and distinct northwest trends which are roughly aligned with the northwest regional fracture trend. Detailed field investigations over the terrain that includes these magnetic gradients produced no evidence of faulting which would account for the magnetic trends. The northwest magnetic trends appear to be a deflection of the northeast regional magnetic isograd trends produced by the group of 6 pronounced magnetic highs surrounding the site. These highs could be reflections of magnetite-bearing intrusive stocks, such as the granodiorite exposed within the reactor excavation, which have higher magnetic susceptibilities than the surrounding high-rank metamorphic rocks.

2.5.1.2.1.4 Geologic History

The geologic history of the area is highly complex and difficult to establish. However based on the work by Wagener [24] in the USGS quadrangle immediately east of the site and the results of the radiometric age data obtained as part of the detailed investigation of the reactor excavation (Section 2.5.1.2.2.3), the probable sequence of events is as follows:

1. Deposition of quartzose, argillaceous, silty, and feldspathic arenaceous rocks, and extrusion of mafic volcanic rocks in an early Paleozoic archipelago.

2. Deep burial.

3. Complex folding, faulting, and regional metamorphism of the Charlotte Belt.

4. Intrusion, crystallization, and cooling of granodiorite/adamellite plutons.

5. Production of joints in response to a broad regional stress field.

6. Introduction of fluids which precipitated aplite and pegmatoid dike rock partly along the joint system.

7. Minor displacement along northeast-trending joint system.

8. Very minor displacement along northwest-trending joint system.

9. Hydrothermal alteration along some joints, and alteration and recrystallization of microbreccias along all segments of shears.

10. Epeirogenic uplift, weathering, and erosion.

Radiometric ages of rocks similar to those on the site have been determined [41]. Samples of typical Charlotte Belt granitic type rocks indicated ages (Pb-alpha) of 270 ± 30 million years. These ages indicate a relatively young episode of granitic emplacement in the site area. An age determination (K-alpha) of 357 million years was obtained from quartz-microcline gneiss in the Lake Murray Spillway in Lexington County, about 17 miles south of the site. This determination is interpreted as evidence supporting a much older age for the country rocks in the Piedmont. This value is considered to be close to the age of 1 of the early major regional metamorphic events [41]. Rock samples obtained from excavations for the proposed facilities have been subjected to radiometric analyses, and the ages determined agree closely with those presented above. These analyses are discussed within Section 2.5.1.2.2.3.

2.5.1.2.2 Geology of Excavations

During excavations for the Reactor and Control Building foundations, minor shearing of the type commonly found in the Piedmont was exposed in rock after the removal of about 100 feet of residual overburden. A detailed investigation was conducted to evaluate these features which include detailed geologic mapping and sampling, excavation of trenches, radiometric dating, X-ray diffraction analysis, literature search with emphasis on recent tectonic displacements, air photo and ERTS imagery analysis, gravity and magnetic data analysis, in situ stress measurements, evaluation of potential movement along shears due to the filling of Monticello Reservoir, review of local microseismic data, correlation of Piedmont seismic activity with reservoir impoundments, and offsite geologic reconnaissance. These analyses were integrated to identify the physical and chronological relationships found within the excavation. The structural history of the site was developed on the basis of established geologic principles, cross-cutting relationships, hydrothermal criteria, petrology, and radiometric dating. The detailed descriptions and results of these studies were presented in the "Supplemental Geologic Investigation, Virgil C. Summer Nuclear Station - Unit One," dated January 14, 1974.

Subsequent to this investigation, detailed geologic mapping was extended into additional areas of excavation in order to maintain a complete record of the rock exposed during construction. Description and results of these studies were presented in a series of addenda to the "Supplemental Geologic Investigation", which included an investigation of: the staging area excavation west of the reactor (Addendum I); the Control Building excavation (Addendum II); the Intermediate Building wall excavation (Addendum III); and the Service Water Pond north dam excavation (Addendum IV). The relative locations of the various areas investigated are presented on the Areas of Detailed Investigation Map, Figure 2.5-23 and on Figure 2.5-29.

The lithologies encountered within the various excavations are basically the same and are discussed in the following Section 2.5.1.2.2.1. The structural geology of each excavation is discussed in Section 2.5.2.2.2. The results of 2.5.1.2.2.3 and 2.5.1.2.2.4, respectively.

2.5.1.2.2.1 Lithology and Petrology - Excavations

The principal rock units in the excavations are consistent with the model discussed within Section 2.5.1.2.1.2. Detailed geologic maps compiled for the excavations show the distribution of the various units, and are presented on Figures 2.5-24, 2.5-26, and 2.5-29. These units are, as observed in the excavations and based on hand specimen examination:

1. A dark fine-grained hornblende-plagioclase amphibolite typical of amphibolites commonly associated with and mapped as Charlotte Belt Gneiss.

2. Fine-grained contorted biotite gneiss, partly migmatized. The foliation in this rock unit has been severely disturbed. Small-scale discontinuous tight folds (wave-lengths of a few inches) are separated in part by fine-grained granitic veinlets which tend to have diffuse boundaries. Thus, the rock can be superficially confused with the contact breccia unit. However, the deformation in the gneiss has proceeded at least to a large extent via ductile failure, thus producing a distinctive contrast with the angular rock fragments in the contact breccia.

   The contorted gneiss is involved in migmatitic relationships with the granodiorite. Veins, pods, and concordant layers of granitoid rock closely resembling or directly traceable into the granodiorite commonly occur in the gneiss within a few feet of the principal gneiss-granodiorite contact. Slab-like inclusions of gneiss in granodiorite have been ductilely extended, but generally retain their original structural orientation.

   Other facies of this unit include relatively uncontorted granitic gneiss and a fine-grained granitoid rock with easily overlooked subtle foliation.

3. A contact breccia comprised of amphibolitic or basaltic fragments up to a foot or 2 in maximum dimension in a matrix of fine-grained leucocratic granitic material. The angular melanocratic fragments exhibit clear evidence of brittle failure. Large percentages of these, however, have been subsequently rounded. The granitic matrix has foliation patterns indicative of fluid flow around the fragments. The total aspect is that of a diatremic or otherwise explosive volcanic breccia.

   Xenoliths of coarse breccia are involved in a contact breccia within certain portions of the margins of the granodiorite. The contact between the granodiorite and the contact breccia unit, however, is a sharply defined, apparently intrusive contact that is generally concordant with strike trends of other rock unit contacts in the Reactor and Control Building foundation excavations. These trends are northwest, opposed to the general northeast regional trends, but are not atypical of strikes of lithologic boundaries in this part of the Piedmont [24]. Dips of the major lithologic contacts in the excavation are steep to the northeast.

The rock association (granodiorite-migmatized, contorted gneiss-contact breccia-coarse breccia), on the scale of the exposed rock system in the excavation, especially as interrelated in the north-central portion of Figure 2.5-24, could be referred to as "migmatite," or as a migmatite zone (syntectic zone of Wagener [24]).

4. A medium- to coarse-grained, in part porphyritic, biotite-hornblende adamellite or granodiorite. For consistency, this rock will be referred to herein as granodiorite (the distinction between adamellite and granodiorite is difficult to establish in thin section and is not pertinent to this study). The quartz has undulatory extinction similar to that normally observed in granitic igneous rocks, but the rock exhibits no other sign of internal strain. Plagioclase is euhedral in part, gradationally zoned, rimmed by albite adjacent to microcline crystals, and is, in general, only slightly altered to sericite-like products. Phenocrysts, where present, are of microcline perthite. Hornblende is green-brown, euhedral, and unaltered. Biotite is generally unaltered, but occasional grains have been partly converted to clear green chlorite of the type attributable to deuteric alteration.

   The granodiorite, then, where undistrubed by fractures, exhibits no evidence of having been subjected to shearing stresses, regional chemical metamorphism, or any significant degree of hydrothermal activity.

5. Rion type adamellite or granodiorite. In the eastern portion of the Reactor Building excavation, Figure 2.5-24, 2 sill-like bodies of very fine-grained granitic rock about 2 feet thick lie within the contact breccia unit. The rock closely resembles the Rion Adamellite [24] and may be intrusive into the contact breccia.

6. Fine-grained granofels (metagranite) associated with amphibolite. This rock group is characteristic of certain Charlotte Belt rocks exposed in road cuts throughout the high-rank regionally metamorphosed portion of the eastern Piedmont. The granofels has inclusions of amphibolite, and is probably a pre-metamorphic intrusive rock.

7. Aplite-pegmatite dikes and discontinuous pegmatite veins. Several dikes from less than 1 inch to about 6 inches thick cross cut all rock types in the excavation except shear zone microbreccia. Some of the dikes are predominantly aplite (fine- to medium-grained quartz-feldspar rock), and some are coarse grained and distinctly pegmatoid. Some change from aplite to permatite (and vice versa) along strike, as is characteristic of such dikes in this part of the Piedmont. In the western portion of the Reactor Building excavation several discontinuous (en echelon) fractures up to about 3 inches thick and several feet long have been filled with quartz-rich pegmatite containing feldspar crystals up to about 1-1/2 inches long. The aplites and pegmatites tended to follow pre-existing joints in part.

2.5.1.2.2.2 Geological Structure - Excavations

Geologic structures within the site excavations illustrate responses in both ductile and brittle deformation regimes. Blocks and slivers of Charlotte Belt gneiss caught in the granodiorite intrusion show a well-developed foliation surface containing a mineral alignment lineation. Both of these structures appear distorted by the intrusion and are likely related to pre-intrusion ductile deformation. Reconnaissance of roadcuts in the vicinity of the site reveals a few mesoscopic isoclinal folds with the foliation surface acting as the axial surface of the folds. Also, crenulation of that foliation surface was noted locally which suggests that Charlotte Belt rocks in the vicinity of the site experienced polyphase folding at least on a minor scale prior to intrusion of the granodiorite. The distortion of the early ductile deformation fabrics by the intrusion make it impossible to analyze these fabrics, as observed at the site, for the purpose of obtaining any indication of the regional structure to which they are related. Although the foliation surface is locally concordant with intrusive contacts, it is most commonly discordant and sometimes shows evidence of rotations.

The brittle deformation structures include areas of brecciation possibly related to the intrusion, non-displaced joints, and shear zones, some of which show net slips of 6 to 7 feet.

Pegmatite and aplite veins occur in the site area, some of which have been injected along joints while others are cross cut by jointing. The relationships suggest at least 2 generations of veining and/or jointing. Hydrothermal mineralization occurs along some joints which show no offset; however, this mineralization occurs most strongly along shear zones which show displacement. The field analysis revealed that no joint orientations are confined exclusively to a single rock type.

<u>Reactor Building and Staging Area Excavations</u>

The near-vertical shears exposed in the Reactor Building excavation represent oblique slip faults having a left-lateral component as well as a normal component which is downthrown on the south side. The maximum net displacement is no greater than 7 feet. Individual shears range in thickness from a fraction of an inch to less than 1 foot. They are not continuous but occur as en echelon features which do not penetrate through the soil profile to the ground surface. Maximum strike separations are noted along shears 1 to 2 feet in width which trend N60E and occur in Zone 3, as shown on the Structure Map of Reactor Building and Staging Area Excavations, Figure 2.5-25. Values of net slip were obtained by the standard methods outlined in Donn and Shimer [51], with the aid of the Wulff stereonet. True displacements of the N60E shear of Zone 3 show no greater than 6 to 7 feet of net slip. The left lateral strike slip component of foot to 5 feet. This segment of the N60E shear appears to be a left-lateral oblique slip normal fault with the northwest side upthrown as indicated on Figure 2.5-25. Figure 2.5-25 also shows that the shears are discontinuous. The 3-dimensional geometry of the motions derived from the stereonet analysis is shown schematically in the Block

Diagram, Figure 2.5-33, which illustrates that the displacement decreases southwestward along the shear.

Complex displacements are indicated at the 2 locations along the N60E shear of Zone 3 where displaced veins and slickensides provided enough data upon which to base maximum net slip determinations. The occurrence of fragmented veins and at least 2 orientations of slickensides certainly indicate that shearing is not confined to a single plane but is accommodated through the entire width of the zone. Maximum possible displacement along the zone was provided by the stereonet analysis since it was based upon the relative positions of offset veins. A 45° core boring was located based upon the relative positions of offset veins (see Figure 2.5-24). The 45° core boring intersected what is likely to be the extension of this N60E shear segment of Zone 3 approximately 110 feet vertically below the present rock surface, recovering samples for analysis. These relationships are illustrated on the Profile Along Angle Boring A-1, Figure 2.5-34.

Actual displacement was also determined along a discontinuous shear surface trending N28W which was located at the southwestern end of the excavation. Left lateral strike separation along this surface was 3.5 inches. The computed net slip is 3.9 inches, and is essentially parallel to the strike of the joint. The dip slip component is essentially zero.

Planes or zones which show displacements in the excavation as well as non-displaced fractures greater than 25 feet in length have been documented and are shown on Figure 2.5-25. The N60E shear of Zone 3 shows maximum slip. At other locations where displacements are observed at the excavation, separations, in every case, amount to less than 2 feet and commonly less than 1 foot. Determination of actual net slips at these other locations was not possible; however, the 3 dimensional geometry of offset veins observed precludes slips greater than those determined for the N60E shear of Zone 3.

Discontinuous segments of Zone 3 are traceable no greater than about 170 feet northeast of the excavation. These shears were traced away from the excavation through saprolite, becoming increasingly indistinct with higher elevation. At approximately 10 to 20 feet beneath the original ground surface, visible manifestation of these features disappeared.

Figure 2.5-31 is a Stereonet Diagram showing attitudes of nondisplaced fractures; Figure 2.5-32 presents a Stereonet Diagram showing the orientation of fractures with hydrothermal mineralization and shears which show displacements. The attitudes of fractures within the excavation agree with attitudes within 10 miles of the site (Section 2.5.1.2.1.3). The northeast-striking and northwest-striking trends appear to parallel regional topographic lineaments within the USGS Jenkinsville quadrangle, Figure 2.5-11, and lineaments shown on ERTS photographs, Figure 2.5-10. The orientations of faults suggested by McCauley [38], Section 2.5.1.2.1.3, also agree with the trends of fractures and shears at the site. A complete discussion of these relationships was provided in the "Supplemental Geologic Investigation."

Displacement along the N20W to N40W shears, which offset the northeastern shears, illustrates the relative age relationships between the northwest and northeast shears. Of much importance to indicate the present stability and/or lack of geologically recent tectonism of the northeast and northwest shears is the occurrence of euhedral unsheared hydrothermal minerals in the microbreccia zones. The fact that unsheared hydrothermal mineralization occurs in both shear orientations indicates that shearing has not occurred since the hydrothermal event. The pink coloration of crushed rock within the shears and some uncrushed wallrock is related to this post-deformational hydrothermal event which pervaded northeast trending Shear Zones 1, 2, and 3 (Figure 2.5-25), and affected northwest oriented shears to a lesser extent. This event was characterized by extensive introduction of the zeolite laumontite along shear and joint surfaces. Laumontite was identified by both X-ray diffraction and petrographic techniques. X-ray diffraction analyses were performed on samples recovered from the Reactor Building excavation, the Control Building excavation, and the north dam excavation. The X-ray Diffraction Pattern of Laumontite, Figure 2.5-35, presents a diffraction pattern which is typical of those obtained during the various investigations. Results and details pertaining to typical methodology of the X-ray diffraction studies performed are presented in Appendix 2A.

Vugs up to about 18 inches long lined with euhedral pink laumontite crystals up to about 0.4 inches long were observed in all exposed shear orientations. At 2 points along a principal shear of Shear Zone 3, and elsewhere, laumontite crystals completely fill the shear, having grown inward from both walls. Similar relationships were observed in thin sections of brecciated rock from shears. Also observed in thin sections of microbreccia were the existence of euhedral to subhedral laumontite crystals and crystal groups within the fine fractures indicating the pervasive nature of the hydrothermal event. This event may, in fact, have been the annealing influence.

Laumontite is thermodynamically unstable below about 180^oC to 190^oC and at less than an equivalent pressure of 150 meters of H_2O [42,43]. Therefore, laumontite present within the shears crystallized in a pressure-temperature regime that no longer exists at the site. Furthermore, hydrothermal events within the Piedmont are often associated with Triassic (Jurassic (?)) diabase dike emplacement. There are no known occurrences of hyrothermal activity within the stability field of laumontite in the Piedmont since Triassic-Jurassic time. Apparently only 1 other mineral was introduced during the laumontite event in significant quantities, that being a microcrystalline variety of alpha quartz (identified by X-ray diffraction).

Other materials observed filling or partly filling shears are a soft black substance of the nature of wad (amorphous by X-ray diffraction) and a white clay which yielded X-ray diffractogram peaks for kaolin and alpha quartz. These materials can be produced in soils by weathering or secondary enrichment reactions.

Immediately adjacent to portions of some shears, the granodiorite, although mesoscopically appearing to be otherwise unaffected, is distinctly pink due to coloration of the feldspars. By examination of thin sections it was observed that the plagioclase feldspars contained minute granules of reddish translucent to nearly opaque material, possibly red iron oxide. Some pink granodiorite immediately adjacent to shears has been broken into wedge-shaped slices bound by greenish-black slickensided surfaces. An unfractured 2 mm cube of pyrite was observed to transect 1 such surface. Pyrite crystals also occur along several joint surfaces in the excavation.

The shears generally contain microbreccia produced from whatever rock type the shear transected. Microbreccia along shears is characteristically an inch or 2 thick, but in some shear segments up to several feet long (along strike) it widens abruptly to a maximum width of not greater than 2 feet. Thin microbreccias and pink laumontite fillings also occur along fracture segments which have no demonstrable displacement. The shears within granodiorite generally are the least affected by weathering, and thus most study specimens of microbreccia were obtained from sheared granodiorite.

Both mesoscopically and microscopically the crushed rock within the shears fits precisely the definition of microbreccia [44] produced through brittle failure. Angular rock and crystal fragments are suspended in a matrix of similar but finely comminuted material. The matrix, even at magnification 200 to 400 by polarizing microscopic, has the distinct appearance of an interlocking crystal mosaic. There is no evidence of unrecrystallized rock powder.

Laumontite occurs in varying proportions in the microbreccias, both as vein filling and as euhedral to subhedral crystals and crystal groups in microbreccia. The microbreccias, therefore, seem at least partly recrystallized (annealed) and are thoroughly permeated by hydrothermal laumontite. Neither crushed laumontite crystals nor other evidence of any shearing dislocation having postdated the hydrothermal event were observed.

Here and there in the thin sections, even delicate microscopic overgrowths on microcline crystals project into laumontite vein filling or microbreccia and have not been disturbed by shearing or crushing. The hydrothermal event, then, is the latest event of significance (other than weathering) to have affected the rock in the excavation, and certainly postdates shearing present in the excavation.

Control Building Excavation

The Control Building excavation located south of and adjacent to the Reactor Building excavation (Figure 2.5-23) also revealed northwest-trending fractures which showed evidence of displacement; these fractures are shown on the Structure Map of Control Building Excavation, Figure 2.5-27. The most prominent shear in the excavation consists of a northwest-trending displaced fracture set (NW1 on Figure 2.5-27) traceable directly into the locally displaced N15W to N40W fracture set of the Reactor Building excavation (see Figure 2.5-25). Although both northwestern and northeastern joint sets have been mineralized, recognizable slip was observed only along 02-01 northwest-trending fractures. Strike separations along discontinuous shears NW2 and NW3 (Figure 2.5-27) are less than 3.0 inches, and both show a left lateral sense of displacement which dies out locally within the Control Building excavation.

From the 3-dimensional relationship provided by a combination of offset dikes and veins in the excavation floor, an offset dike in the excavation wall, and nearly down-dip slickensides on the shear surface at several positions in the excavation wall, it was determined that Shear Zone NW1 is a reverse slip type with the easternmost block having moved upward relative to the westernmost block. The maximum calculated net slip along the shear is approximately 3 feet 2 inches, which decreases to about 2 feet over a lateral distance of approximately 25-30 feet toward the Reactor Building excavation. Displacement is concentrated along the N14W segment of NW1 rather than the N29W segment which passes into the Reactor Building area (see Figure 2.5-25). The shear is best qualified as having a reverse, nearly dip slip movement with a weak left lateral strike slip component.

As noted within the Reactor Building excavation, displacement along the northwestern shears offset northeastern-trending joints at the Control Building site to suggest that motions along the northwestern shears were the last movements to occur. Also as noted at the Reactor Building excavation, hydrothermal mineralization occurs in both the northwestern and northeastern shears and joints to indicate that hydrothermal mineralization was the latest event.

A detailed discussion of the studies conducted at the Control Building excavation is contained in Addendum II of the "Supplemental Geologic Investigation."

Intermediate Building Wall Foundation Excavation

The Intermediate Building wall foundation excavation is located south of the Reactor Building excavation (see Figure 2.5-23). The entire excavation base was situated in massive fresh rock. Only 3 joints which exceeded a few feet in length were observed. The joints are illustrated on the Structure Map of Intermediate Building Wall Excavation, Figure 2.5-28. The strike of these joints averaged about N20W with an essentially vertical dip. All of the joints were closed, and there was no evidence of mineralization or displacement. The investigation of this excavation was reported in Addendum III of the "Supplemental Geologic Investigation."

North Dam Excavation

The north dam excavation is located northeast of the Reactor Building excavation, as shown on Figure 2.5-29, Geologic Map of North Dam Excavation. The north dam excavation contains nondisplaced closed joints, joints which have been subjected to hydrothermal mineralization, fractures that exhibit evidence of minor displacements, and some well-developed mineralized fractures along which movement may have occurred. However, positive evidence of displacement along the well developed mineralized fractures was not found.

Figure 2.5-30, Structure Map of North Dam Excavation, shows that the average strike of Shear Zones 1, 2, and 3 of the Reactor Building excavation (see Figure 2.5-25) coincides with the strike of the mineralized fractures mapped in the north dam excavation indicating that these fractures are probably a northeastward extension of the shear zones mapped in the Reactor Building excavation. X-ray diffraction analysis of samples recovered from mineralized fractures identified laumontite. The locations from which the samples were obtained are shown on Figure 2.5-29. The general pattern formed by the mineralized fractures was very similar to that observed within the Reactor Building, staging area and Control Building excavations.

No evidence was found which would indicate an age younger than that established for the shears in the Reactor Building area excavation (45 ± 5 m.y.) (Section 2.5.1.2.2.3). Additionally, no evidence was found which would indicate that these mineralized fractures were not part of the same structural system mapped and studied in nearby excavations. Complete descriptions, photographs, and discussion of fractures and related features are contained within Addendum IV of the "Supplemental Geologic Investigation."

2.5.1.2.2.3 Geochronology

The results of radioisotopic age determinations on specimens of microbreccia, granodiorite, and aplite are presented in Table 2.5-3. The location of the various samples are shown on Figure 2.5-24. These data were obtained as follows: Rb-Sr ages were determined by Dr. Paul Fullager (Appendix 2B), assisted by Dr. Michael Bottino via mass spectrometry in the laboratories of the University of North Carolina at Chapel Hill; K-Ar ages were determined under the direction of Dr. Todd Gates (Appendix 2C) of Teledyne Isotopes, Inc., via mass spectrometry.

Ages of the 6 unweathered granodiorite control specimens (both Rb-Sr and K-Ar ages) are in close agreement with Rb-Sr ages previously determined by Fullagar [45] for the Winnsboro plutonic rocks, which lie only a few miles east of the site. The granodiorite in the excavation is quite similar to the Winnsboro adamellites and granodiorites. The age for the excavation granodiorite (about 300 m.y.) shows remarkable consistency between the Rb-Sr and K-Ar methods. It should be noted that the K-Ar age for the slightly weathered granodiorite control specimen SD3.1 is significantly later than 300 m.y. This difference is probably due to argon loss upon weathering of biotite, effects of which (altered edges of biotite crystals) show up in thin section. Therefore, in considering the data of Table 2.5-3, the possibility of argon loss from any weathered specimen should be considered. This would result in a conservative minimum age determination.

Rb-Sr Ages of Hydrothermally Altered Microbreccia and Granodiorite

These ages, except for Specimen SC2.4, are all considered earlier than the granodiorite age (see Table 2.5-3), a fact superficially inconsistent with the field evidence. However, the hydrothermal alteration should have increased the assumed initial Sr^{87}/Sr^{86} ratio by an amount difficult to assess, thereby causing the specimens to yield an apparent earlier age [46]. Therefore, the Rb-Sr ages of shear zone specimens SC2.2, SD3.2, and NK2.2 are maximum ages for these specimens. Because of the expectable resetting of the radiometric parameters ("radiometric clock") by pervasive low-temperature hydrothermal activity, the ages of these specimens probably represent maximum ages for the laumontite hydrothermal event. Fullager [46] is of the opinion, in consideration of his data, the expected resetting, and the petrology of the shear system, that the hydrothermal event may have followed closely upon (within a few million years after) the crystallization and cooling of the granodiorite. 02-01

K-Ar Ages of Hydrothermally Altered Microbreccia and Granodiorite

The variations in ages for these specimens (Table 2.5-3), with one exception, do not seem related to any observed lithologic differences, and probably reflect differential loss of argon attendant upon crushing, hydrothermal activity, and weathering. Specimen SC2.4 is similar to Specimen SD3.2, except the plagioclase feldspars in SC2.4 are more extensively altered. Therefore, the much later date for SC2.4 probably reflects greater argon loss during the hydrothermal event.

The average age of the 5 shear zone specimens taken from the bedrock surface is approximately 230 m.y. Assuming an age of 300 m.y. for the hydrothermal event [46] and an argon loss of 25% (a reasonable assumption for feldspathic rock, according to Gates [47]), calculation yields an apparent age of about 230 m.y. Therefore, the K-Ar data are not necessarily consistent with Fullagar's opinion that the hydrothermal event may have postdated emplacement of the granodiorite by no more than a few million years.

K-Ar Age of Hydrothermal Laumontite

A specimen consisting of hand-picked laumontite crystals from a vug in Shear Zone 3 has been dated by K-Ar procedures at 45 $\pm$ 5 m.y. (specimen X1, Table 2.5-3). This date is considered a "minimum-minimum" age of the specimen [47].

Laumontite is an open-framework silicate of approximate composition $(Ca,Na)_7Al_{12}(Al,Si)_2Si_{26}O_{80}25\ (H_2O)$. Such crystal lattices, where K is present, are subject to a high percentage of argon loss. Laumontite has a high ion exchange capacity, as do other zeolites, and thus is expected to take up such ions as the potassium ion (K^+) from water solutions in exchange for appropriate ions in the laumontite crystal lattice, or to absorb such ions on defective (locally chemically unbalanced-electrostatically negative) crystal facets [48]. Either at the time of crystallization or later, by the above mechanisms, crystals of laumontite specimen X1 obtained sufficient potassium (0.3%) to be dated by K-Ar techniques. The 45 ±5 m.y. age for these crystals, therefore, represents an absolute minimum age of the potassium ions added to the crystals, because of leakage of radiogenic argon from the crystal lattice. It also represents an absolute minimum age for formation of the crystals, which cannot have obtained the chemically inert radiogenic argon through exchanges with solutions. The radiogenic argon must have begun accumulating in the laumontite crystals when the potassium ions were introduced.

Dr. Todd Gates [47], who performed the K-Ar analyses, is of the firm opinion that due to argon leakage, the actual age of the potassium, and thus of the crystals, may be as much as about 150 m.y. This brings the possible age of the crystals into the apparent age range of the apparently youngest of the hydrothermally altered rock specimens, SC2.4 (163 ±16 m.y., Table 2.5-3).

By consideration of Rb-Sr and K-Ar radiometric age data obtained on 7 hydrothermally altered specimens from shears, 8 control specimens, and 1 pure laumontite crystal specimens from shears, 8 control specimens, and 1 pure laumontite crystal specimen, the following absolute age chronology has been established:

1. Crystallization and cooling of granodiorite approximately 300 million years ago;

2. Emplacement of aplite dikes no later than 227 million years ago;

3. Shearing along the joint systems; and

4. Hydrothermal introduction of laumontite and annealing of microbreccias within the shears no earlier than 300 and no later than 45 million years ago, and probably between 300 to 150 million years ago.

Because the hydrothermal event obviously postdates the latest movement of measurable significance along all shear zones, it is concluded that this latest movement could not have occurred later than 45 million years ago and probably occurred between 300 and 150 million years ago.

2.5.1.2.2.4 In Situ Stresses

In situ stress measurements were made on each side of Shear Zone 3 using the overcoring technique. The basic theory and procedures of this technique are described in Appendix 2D.

Hooker and Johnson [49] made a number of in situ stress measurements along the Piedmont from Georgia to Vermont. They have suggested that the major component of the horizontal compressive stress tends to align in a northeast-southwest direction along with the dominant structural trends of the area. The only apparent disagreement appears to be at a quarry located at Mt. Airy, North Carolina; however, the Mt. Airy intrusive body is post-major tectonic activity (folding and faulting of Piedmont).

Measurements were made on the northwest and southeast sides of Shear Zone 3 in rock of granodiorite composition. The locations of the 2 test holes are shown on Figure 2.4-24, and a description of the rock is contained in Section 2.5.1.2.2.1. The overcoring test at the first test site (OC-1) was taken to a depth of 11 feet, and the test in OC-2 was taken to a total depth of 18.5 feet below the surface of the rock. During overcoring tests where the core broke, the tests were stopped to prevent damage to the gage, and new tests were performed. Plots of the deformation gage digit readings versus position of the overcore bit with respect to the measuring points for the tests are given in Appendix 2D. In most instances it was necessary to continue drilling until the overcoring had progressed approximately 6 inches beyond the point where the piston of the gage was in contact with the rock. The overcored rock for each test was broken loose and used for testing to determine the modulus of elasticity.

The modulus of elasticity was determined for each test section using a biaxial testing device such as the one described by Fitzpatrick [50]. The method of calculation used for the determination is described in Appendix 2D, and the curves showing the results are also presented in that Appendix.

Using the deformation data obtained in the overcoring tests and from the modulus tests, the secondary principal stresses* in the horizontal plane were calculated using the plane stress equations presented in Appendix 2D. The results of these calculations are shown in Table 2.5-4. The map of In Situ Stresses in the Piedmont Area of the United States, Figure 2.5-36, shows the stresses plotted on a map of the east coast of the United States along with the data for other sites in the Piedmont as determined by Hooker and Johnson [49]. It can be seen that for the site the in situ stresses show some relation to the general trend as developed by Hooker and Johnson. The direction of the major compressive stress appears to trend in a general north to northwest direction. The direction of the compressive stress makes it almost perpendicular to Shear Zone 3, and the magnitude of the stresses is well below the estimated strength of the rock.

*The term “secondary” is used since τ_{zx} and τ_{zy} are not necessarily equal to zero.

2.5.2 VIBRATORY GROUND MOTION

2.5.2.1 Geological Conditions of the Site

2.5.2.1.1 Introduction

Discussion and evaluation of the seismo-tectonic characteristics of the Virgil C. Summer Nuclear Station site and surrounding region are presented in this section. The site location is shown in relation to the main regional tectonic features and the significant regional earthquakes on Figure 2.5-37, Regional Epicenter Map. Information presented in Section 2.5.1, Basic Geologic Information, and Section 2.5.4.4, Soil and Rock Characteristics, provides an important basis for conclusions drawn in this section. This information is not repeated in this section, but pertinent facts are cross referenced to other sections where appropriate.

An investigation was conducted to develop seismic design criteria for Seismic Category 1 structures at the site. This investigation included:

1. A comprehensive study of the geologic structure and tectonic history of the region.

2. A review of the seismic history of the region, primarily based on a literature search supplemented by a review of contemporary newspaper accounts and interviews with agencies and individuals.

3. An evaluation of the seismicity of the region considering the relationship of historic earthquakes to known geologic features, tectonics, and earthquake mechanisms.

4. Field geophysical measurements and laboratory testing to evaluate the physical properties of the soils and bedrock at the site (the results of these measurements and testing are presented in Sections 2.5.4, 2.5.5, and 2.5.6).

5. The selection of appropriate earthquakes for the design basis and operating basis conditions.

6. An estimate of the maximum ground acceleration to be expected at the site due to the occurrence of the Safe Shutdown and Operating Basis earthquakes.

7. The preparation of seismic design criteria in the form of response spectra.

2.5.2.1.2 Regional and Site Geology

A detailed description of the lithologic, stratigraphic, and structural geologic conditions of the site and the region surrounding the site, including its geologic history, is presented in Sections 2.5.1.1 and 2.5.1.2. Information concerning the investigation and conclusions regarding shears within the excavations for the Virgil C. Summer Nuclear Station is presented in Section 2.5.1.2.2.

2.5.2.2 Underlying Tectonic Structures

2.5.2.2.1 Regional Geologic Structure

This site is located in the Piedmont Physiographic Province. This province is bounded on the southeast by the Coastal Plain Province and on the northwest by the Blue Ridge Province. The region surrounding the site is generally characterized by rolling and/or ridge topography.

Bedrock of the area generally consists of Paleozoic crystalline metamorphic rocks, with gneisses and schists being more prevalent. These rocks have been intruded by Paleozoic igneous granitic plutons, narrow aplitic dikes, and by diabase dikes believed to be of Triassic (?) age. Bedrock usually is covered by residual soil and saprolite formed by weathering of the bedrock. This weathering generally has been moderately deep, but varies appreciably within short horizontal and vertical distances. The bedrock surface elevation is irregular.

Recent and on-going investigations are attempting to define the structural setting of the southeastern U.S. in terms of plate tectonics. Results of these studies take the form of postulated models to explain the observed seismicity.

Recent investigations in the COCORP program (Consortium for Continental Reflection Profiling) indicate that the crystalline Precambrian and Paleozoic rocks of the Blue Ridge, Inner Piedmont, Charlotte Belt, and Carolina Slate Belt constitute an allochthonous sheet, generally 6 to 15 km thick, which overlies relatively flat-lying autochthonous lower Paleozoic sedimentary rocks [125]. Major regional structures such as the Brevard Zone are thought to be rooted in the base of this horizontal thrust which may have transported the crystalline rocks of the southern Appalachians some 260 km to the west, and controlled the pervasive northeast-southwest structural grain of the Piedmont in South Carolina.

On a regional scale, the upper few kilometers of Piedmont rocks are extensively folded and moderately faulted while the sub-basement is relatively flat-lying and undisturbed.

The closest known regional faulting is a normal fault in the Lake Murray area that is considered to be a splay of the Eastern Piedmont (Goat Rock) Fault, the southwesternmost faulting in the Eastern Piedmont Fault System. RN 03-012

This structure has recently been extended such that the probable closest approach to the site is about 13 miles to the south. The fault trends southwest from Lake Murray. Evidence indicates that this fault has been inactive since at least the end of the Triassic (?) period (about 200 million years).

A north-south trending normal fault has recently been postulated in the Chapin, South Carolina area based on geologic mapping. The geologic mapping is part of a program funded by the Earthquake Hazards Division of the U.S. Geologic Survey. The entire mapping program covers 4, 7-1/2" quandrangles (Chapin, Jenkinsville, Pomaria and Little Mountain) which will eventually be mapped in detail by the University of South Carolina Geology Department.

The fault has a north-south orientation and displaces metamorphic rocks of the Carolina Slate Belt in a down-to-the east fashion. The fault roughly parallels Wateree Creek from just north of Hilton, South Carolina to about the Broad River, where it has a slightly northwest orientation. Evidence of faulting includes: Discontinuity of magnetic anomaly patterns; apparent drag indicated by disturbed bedding or compositional layering, foliation and lineation patterns; occurrence of silicified and unsilicified fault breccia; occurrence of open extension fractures partially filled with quartz; apparent offset of stratigraphic contacts and the Carolina Slate Belt/Charlotte Belt border zone; apparent offset of older northwest trending silicified breccia zones; and possible offset of a northwest trending diabase dike. Field work is continuing in this area, and at present, the closest approach of this structure is about 4 to 5 miles south of the site. No evidence at present demonstrates any recency of movement on this structure.

Northeast of the site, a northeast-trending thrust fault, the Gold Hill Fault, has been identified. This fault has been inactive since the Paleozoic Era (at least 300 million years). The Gold Hill Fault has recently been extended southward into South Carolina. The closest approach of the Gold Hill Fault extension to the site is approximately 40 miles to the northeast.

Recently preliminary work by the USGS and others in the South Carolina Coastal Plain, particularly around the Charleston, S.C. area, has shown evidence of late Tertiary and possibly later disturbance of Coastal Plain Sediments. Also the USGS is investigating faulting along the fall zone in the vicinity of Augusta, Ga. The Belair Fault Zone, trending northeast, exhibits possible evidence of a tectonic event which probably occurred within the last 50 million years. This structure, a series of southeast dipping en echelon reverse faults trends about N30°E from southwest to northwest of Augusta, Georgia and was originally thought to have displaced the east-west trending Augusta fault an estimated 23 km in the left-lateral sense [126]. Subsequent investigation has determined that the structure apparently dies out near the Savannah River since it is not present a few kilometers northeast along its projected strike. Geologic control in this study area, where a major left lateral strike-slip structure would intersect (and offset) the east/northeast-trending Modoc fault zone, discloses no apparent disruption. It has been concluded that the Belair fault is not present northeast of Augusta, Georgia, or south of the site [127].

In the vicinity of the site, several folds have been identified or postulated. These structures are shown on Figure 2.5-38, Local Epicenter Map. More detailed information on the regional tectonic framework is discussed in Section 2.5.1.1.3.

2.5.2.2.2 Site Geologic Structure

The site geology is typical of the region. The topography consists of gently rolling hills and ridges with usually gently sloping sides. Residual soils overlie the parent bedrock; the soils range in thickness from about 40 to 85 feet in borings drilled in the site area.

The soil grades from usually clayey and silty soils near the ground surface, where the weathering has been greatest, to dense sandy silt and silty sand saprolites at depth. Bedrock at the site consists primarily of metamorphic rocks of the Charlotte Belt with Paleozoic igneous intrusive zones.

During excavation for the nuclear plant facilities, several minor shear zones of the type common to the Piedmont were exposed. A detailed investigation was conducted to identify:

1. Lithologic relationships to previously mapped local geology.

2. Structural framework of the shear zones, including its geologic history.

3. Geochronological relationships of mineralization within the shear zones to the local geologic ramework.

4. In situ stress of the bedrock.

5. Association of the shear zones to local microearthquake data.

A detailed description of the analyses and results of this investigation is presented in Section 2.5.1.2.2.

2.5.2.3 Behavior During Prior Earthquakes

No physical evidence was uncovered during the geologic investigations of the surficial or subsurface materials at the site which would indicate any correlation between historic earthquake activity and site geologic structure.

2.5.2.4 Engineering Properties of Materials Underlying the Site

Dynamic and static engineering properties of residual soil, saprolite, and bedrock at the site have been evaluated for use in foundation interaction analyses. These properties were developed using field geophysical and geologic data, and static and dynamic laboratory test data.

Dynamic and static engineering properties for the foundation materials are presented in Table 2.5-5. These values are appropriate for design at strain levels corresponding to the Safe Shutdown and Operating Basis Earthquakes. The shear moduli and subgrade moduli developed from laboratory and geophysical data have been reduced using factors related to rock quality designation (RQD).

2.5.2.5 Earthquake History

2.5.2.5.1 General

The record of earthquake occurrence in South Carolina and the surrounding area dates back almost 200 years. The site is situated in a region which has experienced a moderate amount of earthquake activity. A number of earthquakes have been reported during this period. The site region has had a well-distributed population during this period, and it is probable that any severe earthquake activity (Intensity VIII* or larger) would have been reported either in local newspapers, private journals, or diaries. The absence of such documentation is indicative of the absence of major earthquake activity in the Piedmont Province during this period.

Intensity ratings of some regional earthquakes may have been overestimated. Structural damage is the rating criteria for larger shocks; and the effect of earthquakes on older structures, such as chimneys, rock walls, etc., is highly variable. Thus, intensity evaluations based on such reports are imprecise. The rather long period of record, however, and earthquake reports from an evenly distributed population provide a reasonable basis for estimates of future activity.

2.5.2.5.2 Regional Seismicity

Epicenters of earthquakes in the region with maximum intensities of V or greater are shown on Figure 2.5-37, Regional Epicenter Map. These shocks are listed in Table 2.5-7. From 1975 to date, magnitudes equal to or greater than 3.0 are also listed.

Most of the reported earthquakes have occurred in the Blue Ridge Province and the Valley and Ridge Province to the northwest of the site. These provinces are characterized by intense folding and faulting, which trend northeast-southwest. The earthquake epicenters generally follow this same structural trend.

Occasional earthquakes have occurred in the Piedmont Province in which the site is located. Some earthquakes also have occurred in the Coastal Plain Province. The majority of these have been centered near Charleston, S.C., although occasional shocks have occurred elsewhere in the Coastal Plain.

There have been 110 shocks with maximum intensities of V or greater reported within about 250 miles of the site since the end of the 18th Century. An earlier earthquake was reported in 1698; however, the data available are not sufficient to allow for an evaluation of intensity. Within 50 miles of the site, there have been 8 shocks of Intensity V or greater reported.

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*All references to intensity in this section refer to the Modified Mercalli Intensity Scale of 1931 (see Table 2.5-6).

The largest reported earthquake in the region within 250 miles of the site, was the 1886 Charleston earthquake, which is rated as having an intensity of X [53]. The epicenter of this shock was about 125 miles southeast of the site. Closer to the site, the largest reported earthquake was the 1913 Union County earthquake, which had a maximum intensity of VII. The epicenter of this shock was about 35 miles northwest of the site. The Union County Shock and other local shocks are shown on the Local Epicenter Map, Figure 2.5-38.

A discussion of the more significant shocks (within 250 miles of the site) follows. The descriptions are based on published data and personal communications [1,2,14,15] supplemented by contemporary newspaper accounts.

1. <u>Charleston, South Carolina Earthquake of August 31, 1886</u>

   This is the strongest shock in the southeastern United States in historic times (Intensity X). There were 2 main shocks occurring at 9:51 PM and 9:59 PM Eastern Standard Time. Two (2) epicentral tracts were identified, 1 near Summerville, 16 miles northwest of Charleston, and 1 about 13 miles west of Charleston. The approximate epicentral coordinates are 32.9° North Latitude, and 80.0° West Longitude, about 125 miles southeast of the site.

   It is reported that there were loud sounds near Summerville on August 27 and 28. The first shock on August 31 lasted about 35 to 40 seconds, and was accompanied by a loud sound. The main shock was followed by aftershocks, some of a rather high intensity, into the next day.

   The shock was felt in an area of about 2,000,000 square miles. The area within a distance of about 100 miles of Charleston was strongly shaken. The most serious reports came from the major population center of Charleston. The degree of damage to structures could generally be correlated with the type of design and construction, as well as with local soil conditions. Much of Charleston is constructed on "made land," including filled-in creeks. Structures in these areas experienced the greatest damage. Near the epicentral points, cracks, craterlets, and sand boils were noted and railroad rails were bent. The shock was felt as far away as Boston, Milwaukee, New York, Cuba, and Bermuda. The effect of the shock was strong, and some damage resulted in Savannah (90 miles), Augusta (100 miles), and Columbia (100 miles). It is probable that the shocks were felt in the site area with Intensity VI to VII [53].

   Occasional earthquake activity in the Charleston area has continued to date, the most recent reported felt shocks being an Intensity VI shock in November 1974 and an Intensity IV shock in April 1975.

2. Union County Earthquake of January 1, 1913

The shock occurred at 1:28 PM Eastern Standard Time. The epicenter was about 34.7° North Latitude, and 81.7° West Longitude, about 35 miles northwest of the site. The maximum intensity of the shock was VII and the total affected area was about 43,000 square miles. It was felt in an elliptical area, 55 miles by 25 miles in dimension, trending in a north-northeast south-southwest direction. The shock was accompanied by a loud noise, and lasted about 6 to 10 seconds.

At Union, near the epicenter, damage consisted of cracked brick walls, damaged plaster and mortar, and fallen chimneys. The shock was strong and some damage resulted in Colerain, 9 miles west of Union; West Spring, 11 miles northwest of Union; Crosskeys, 11 miles southwest of Union; and at Spartanburg and neighboring communities, about 20 miles northwest of the epicenter.

The shock probably was felt in the site area with about Intensity IV.

3. Lake Murray Earthquake of July 26, 1945

The shock occurred at 6:32 AM Eastern Standard Time. The epicenter was instrumentally located at 34.3° North Latitude, and 81.4° West Longitude, about 30 miles northwest of Columbia. This location is about 5 miles west-southwest of the site, but it is possible that the actual epicenter was somewhat further south toward Lake Murray. The shock was probably felt in the site area with Intensity IV. Intensity of IV was reported in a large area, including Charleston, Chester, Greenville, and portions of North Carolina. Georgia and Tennessee indicated intensities of I to III. At Columbia, people were awakened by the sharp vibrations, but no damage occurred.

Although the maximum intensity of the shock was listed as IV, the shock has been assigned a maximum intensity of VI, because of the large area over which it was felt and because of instances of cracked chimneys. The total felt area was about 25,000 square miles.

2.5.2.5.3 Local Seismicity

It is likely that the estimated Intensity VI to VII ground motion at the site during the 1886 Charleston earthquake is the greatest level of ground motion at the site in recorded history. In addition, the site area has experienced earthquake shaking from occasional nearby shocks of minor to moderate intensity. The 1913 Union County Shock and the 1945 Lake Murray shock have already been described. A discussion of earthquakes of minor to moderate intensity with epicenters within 50 miles of the site (shown on Figure 2.5-38), some of which may have been felt at the site, follows:

1. Winnsboro Earthquake of October 26, 1879

   The shock occurred at 8:00 AM, Eastern Standard Time about 15 miles northeast of the site. It was lightly felt by many in Winnsboro and vicinity. There was no damage, only a rattling of windows and doors. The maximum intensity probably was less than IV.

2. Winnsboro Earthquake of October 31, 1942

   The shock occurred at 10:20 PM, Eastern Standard Time about 15 miles northeast of the site. It was felt by many in Winnsboro and vicinity. There was no damage, only a rattling of windows and doors. The maximum intensity probably was less than IV.

3. Columbia Earthquake of April 20, 1964

   The shock occurred at 2:05 PM, Eastern Standard Time. The epicenter was located by instrumentation approximately 30 miles southeast of the site near Columbia. The felt area included Fairfield, Florence, Lexington, and Richland Counties. The maximum reported intensity was V.

   A rumbling noise accompanied the shock in Columbia. Vibrations were reported as lasting for over 4 minutes and were felt by many people. The shock was recorded by the seismograph of the University of South Carolina at Columbia. Gaston and Jenkinsville reported an intensity of V, with trembling motion that was felt by all residents. Intensity IV was reported at Cayce, Irmo and Lexington with rumbling noises but no damage. Intensity I-III was reported at Columbia, Florence, and Pelion.

4. Chester Earthquake of September 8 - 12, 1965

   There were 4 shocks. The first was felt on September 8, at 11:37 PM (Eastern Standard Time), with succeeding shocks on September 9, at 9:42 AM, September 10 at 2:32 PM, and September 12 at 1:25 PM. The shocks were felt over a 30 square mile area in Chester County, about 25 miles north-northeast of the site, with a probable maximum intensity of less than IV.

5. Columbia Earthquake of September 22, 1968

   The shock was felt at 4:41 PM Eastern Standard Time. The epicenter was about 22 miles southeast of the site. The shock had a maximum intensity of IV. The tremors were felt over approximately 400 square miles, in Richland and Lexington Counties. Gilbert, Irmo, and Lexington reported Intensity I-III.

Since the filling of the Monticello Reservoir and installation of microseismic networks in the site region (late 1977), many minor earthquakes have been recorded in the vicinity of the impoundment, as shown on Figure 2.5-38.

2.5.2.6 Correlation of Epicenters with Geologic Structure

2.5.2.6.1 General

Since the time when the PSAR was docketed (June, 1971) much work has been done investigating the relationship of seismicity to geologic structure within the 200 mile radius about the Virgil C. Summer Nuclear Station. Most of the attention has been directed to the area in and around Charleston, S.C., where USGS scientists are attempting to identify the geologic and tectonic framework responsible for the 1886 Charleston Earthquake, and the higher frequency of occurrence of seismicity in the general Charleston, S.C. region.

A seismograph network was completed by the USGS in 1974, consisting of 10 stations to monitor seismic activity in South Carolina between the Savannah and Lynch Rivers. One (1) of the stations is located in Jenkinsville, approximately 1-1/2 miles east of the site. Currently, there are about 33 stations monitoring the seismicity of South Carolina, with emphasis on the Charleston area and local seismicity associated with the impoundment of Monticello Reservoir.

2.5.2.6.2 Charleston Seismic Zone

The severest earthquake which has occurred in the southeastern United States was located near Charleston, S.C., in 1886. Since that time, numerous other shocks have occurred in the same general locale, but none have matched or exceeded the 1886 Intensity X event.

Because the 1886 event(s) influences seismic risk assessment in the southeastern U.S. Coastal region, the recurrent seismicity of the Charleston area has been well documented and re-evaluated over the years so that the long historical record, dating back to 1698, is considered complete for significant earthquakes. This zone, on the basis of these historical studies, is one of the few zones in the contiguous U.S. where the consensus of scientific opinion holds that the noted activity is correlated with a discrete structural anomaly, the character and extent of which is not known, but which confines the earthquake activity to a relatively localized area. Although a northwest trend toward the Piedmont has been postulated on the basis of very diffuse activity, there is little hard evidence at present (either tectonic or seismic) to suggest westward migration of large earthquakes.

Since 1974, the USGS has been investigating the geologic and tectonic framework of the Charleston, S.C., area, including the deployment of a seismic monitoring network. Early results indicated the possible presence of previously unrecognized faulting and zones of weakness in the basement rocks beneath and near Charleston [54,55,56].

Colquhoun [58] reported a new structure, the Stono Arch, a northwest-southeast trending fold which is probably fault-controlled, and might have been the locus of the 1886 Charleston earthquake.

More recent studies have attempted to define the tectonic setting of the Charleston area within a plate tectonic framework. Talwani and others [128] based on results from the regional seismic networks, present a model suggesting that the 2 diffuse zones of high seismicity near Bowman and Summerville lie at the intersection of a northwest-trending zone of weakness (colinear with the Blake Spur fracture zone) and 2 northeast trending buried Triassic basins which have been inferred from geophysical and drilling data to underlie each of the 2 seismic zones. Nishenko and Sykes [129] postulate that Charleston seismicity may be related to the intersection of zones of weakness formed by the Blake Spur fracture zone and a continental suture between Florida and Georgia. More localized studies have inferred a northwest-trending axis of compressive stress on the basis of in-situ stress measurements [130], or a northeast-trending compression based on focal mechanism solutions [131] for earthquakes just west of Charleston, an ambiguity which might be explained by the differences in depth between the stress measurements (300-400 m) and the fault-plane solutions (3-13 km).

An alternative explanation suggests that the horizontal nodal plane as determined in solutions for the earthquakes near the Summerville area, may represent the fault surface at a depth consistent with earthquake occurrences and reflection profiling both on and off shore, a depth of some 13 to 18 km. This interpretation would conform to the postulated Appalachian decollement previously discussed [131]. However, a definitive model for the present day structural regime is conjectural and a reliable model of earthquake generation based on a sub-horizontal shear of this magnitude is not warranted at the present state of knowledge.

Evidence for reactivation of northwest or southeast-dipping Triassic (tensional) faulting by a present northwest compressional stress has been suggested by recent investigators to explain observed seismicity [131,132]. There is general agreement that some northeast-trending structures, such as the Belair fault near Augusta, Georgia and the Cooke fault near Summerville, South Carolina may have undergone reactivation in Cenozoic time, although definitive ages for latest movement has not been determined [127,131].

A recent earthquake (Nov. 22, 1974, Intensity VI) in Middleton Gardens - Summerville, S.C., (14 miles NW of Charleston) provided a focal mechanism that is consistent with either reverse faulting on a plane dipping 78°SW or thrust faulting on a plane dipping 12°NE - with both planes striking N42W.

With respect to the largest credible event for this seismic zone, Bollinger [53] reinterpreted the intensity effects of the 1886 Charleston shock and found that his effort was in general agreement with Dutton [57]. Bollinger also stated that Dutton's maximum intensity of X for the epicentral region appeared to be appropriate. An isoseismal map prepared for the 1886 Charleston event by Dutton in 1889 is shown on Figure 2.5-39.

This map illustrates the very gross isoseismal zones prepared by Dutton. A modern map prepared by Bollinger is presently in press, which locates the site well within the Intensity VII isoseismal zone; however, based upon local reports of the earthquake's effects near the site (such as at Winnsboro; Intensity VI), an Intensity VI-VII has been assigned to the site area.

In summary, there is no conclusive evidence or general agreement which would suggest that the seismogenic structure responsible for the anomalous Charleston earthquake activity is present near, or should be extrapolated toward, the subject site, nor is there reason to believe that large events such as the 1886 Charleston earthquake might occur significantly closer to the Columbia, S.C. area.

2.5.2.6.3 Piedmont Province

As discussed previously, the Virgil C. Summer Nuclear Station site lies within the Piedmont Province. The closest maximum intensity shock to the site, the 1913 Union County earthquake, has not been related to any known geologic structure. In fact, within the Piedmont Province, there are no conclusive correlations of regions of highest intensity or epicenters to known or suspected geologic structure.

Talwani [59] has speculated that the Eastern Piedmont (Goat Rock) Fault (see Section 2.5.1.1, Regional Geology) may be extended into South Carolina based on the location of instrumental earthquake epicenters. This particular case, however, remains to be established more firmly. RN 03-012

The Belair Fault Zone near Augusta (see Section 2.5.1.1.3 and 2.5.2.2.1) cannot be correlated with any recent or historic earthquake activity and its proclivity for modern movement has not been determined.

2.5.2.6.4 Reservoir - Induced Seismicity

The Applicant installed a Microseismic Monitoring Network in 1977 to record seismic activity in the area of the Virgil C. Summer Nuclear Station and Monticello Reservoir. This network originally consisted of 4 high gain/high frequency seismometers located around Monticello Reservoir with a central recording site. In 1986, the Applicant contracted the University of South Carolina to take over the entire maintenance, operation, and data analysis of the network. At this time the network was modified by relocating several stations. Reports were prepared on a quarterly basis and submitted to the NRC by the Applicant.

In 1995, the Applicant requested the NRC for discontinuation of the network due to a continued subsidence of earthquake activity associated with Monticello Reservoir. The NRC subsequently approved the deletion of Operating License Condition 2.C [24] which eliminates this seismic monitoring program.

A South Carolina Seismic Network seismometer is currently located about 3.2 miles ESE of the Virgil C. Summer Nuclear Station, near the town of Jenkinsville, and is identified by the locator (JSC). This seismometer became operational in 1973 and is maintained and monitored by the University of South Carolina.

In 1982, the Applicant installed two strong motion accelerometers in the free-field (at ground surface and bedrock) in order to obtain a better understanding of near-field ground motion should a larger seismic event occur near the Virgil C. Summer Nuclear Station. These accelerometers were supplemental to the in-plant seismic instrumentation described in FSAR Section 3.7.4. Although approval to eliminate the seismic monitiroing program was granted by NRC in 1995 via License Amendment No. 124, this instrumentation remained in operation until 2004 when lightning strikes and obsolescence rendered the equipment useless. Since the instrumentation never recorded an earthquake in over 20 years of service, removal of this obsolete equipment was undertaken in 2005. RN 11-002

2.5.2.7 Identification of Active Faults

There are no known faults within 200 miles of the site which should be considered as "capable" faults as defined in Appendix A to 10 CFR 100. The Belair Fault Zone, located approximately 75 miles southwest of the site, is still under investigation as well as the newly discovered geologic features in the vicinity of Charleston, S.C. A more detailed appraisal of the significance of these features is included in Sections 2.5.1.1, Regional Geology, and 2.5.2.6, Correlation of Epicenters with Geologic Structure.

2.5.2.8 Description of Active Faults

There are no known faults within 200 miles of the site which should be considered "capable" faults as defined in Appendix A to 10 CFR 100. For further information see Sections 2.5.1.1, Regional Geology, 2.5.1.2, Site Geology, and 2.5.2.7, Identification of Active Faults.

2.5.2.9 Maximum Earthquake

In order to establish criteria for the Safe Shutdown Earthquake, a thorough examination was made of the degree of vibratory ground motion which is probable. The implication of both the seismic history and geologic structure of the region and the specific site area were considered simultaneously. Earthquakes considered as most significant to the site are those which have occurred within the Piedmont Province and the Charleston Seismic Zone.

There has been no correlation to date of any earthquake occurrence to geologic structure within the Piedmont Province. However, due to the requirements of 10 CFR 100, Appendix A, it must be assumed, for design purposes, that the maximum historical or likely event can occur adjacent to the site. The largest shock to have occurred within the Piedmont Province was Intensity VII, similar to the 1913 Union County, S.C., shock about 35 miles northwest of the site. The 1913 Union County shock was probably felt in the site area with Intensity IV or less [53]. The occurrence of an Intensity VII earthquake adjacent to the site would conservatively result in ground motion of about 0.13g in rock [63] and 0.20g in soil [62].

Based on a recurrence of an Intensity X shock, similar to the 1886 Charleston Earthquake, at the original 1886 epicentral area, the site would experience low Intensity VII effects [53]. While its duration would be somewhat longer than for the more local Intensity VII shock, the resultant ground motion would be conservatively less than 0.10g in rock and 0.15g in soil.

It is concluded that the maximum earthquake which would affect the site would be the occurrence of a random Intensity VII shock adjacent to the site.

2.5.2.10 Safe Shutdown Earthquake

Based on the data presented in Section 2.5.2.5 and the discussions in Section 2.5.2.9 (and in compliance with requirements in 10 CFR 100, Appendix A), the Safe Shutdown Earthquake is considered as a random occurrence of an Intensity VII earthquake near the site. The event would be similar to the 1913 Union County, S.C., earthquake which occurred some 35 miles northeast of the site. The maximum horizontal ground motion resulting from this shock at the site would conservatively be about 0.13g in rock [63] and 0.20g in soil [62]. However, more conservative factors of 0.15g and 0.25g are being utilized for the Safe Shutdown Earthquake in rock and soil, respectively. Ground motion at the site as a result of larger, more distant events (such as a recurrence of the 1886 Charleston, S.C., earthquake of Intensity X) would be 0.10g and 0.15g for rock and soil, respectively. While the duration of shaking would be longer, it is considered that the horizontal design response spectra shown on Figures 2.5-40 and 2.5-41 would adequately envelope all long period motion from such an occurrence. The corresponding vertical design accelerations used in design are 2/3 of the horizontal.

2.5.2.11 Operating Basis Earthquake

Based on the seismic history of the region and site area, there is a possibility that moderate earthquake motion may occur at the site during the economic life of the Virgil C. Summer Nuclear Station. The greatest level of earthquake motion at the site in historic time is believed to be low Intensity VII during the 1886 Charleston earthquake. The 1913 Union County earthquake and the 1945 Lake Murray earthquake probably were felt at the site with intensities of IV.

Based on the foregoing, the Operating Basis Earthquake (OBE) is considered to be that event which would generate a low Intensity VII earthquake ground motion at the site such as that caused by a distant large earthquake (near Charleston). The resulting estimated maximum horizontal accelerations for this shock at the site would be less than 0.10g in rock and 0.15g in soil. These acceleration levels are being used to quantify the Operating Basis Earthquake. The Operating Basis Earthquake acceleration is conservatively greater than 1/2 of the Safe Shutdown Earthquake which has been established as the minimum acceptable criterion by the regulatory agencies. The corresponding vertical accelerations used in design are 2/3 of the horizontal.

Design response spectra for the maximum horizontal ground accelerations from the Operating Basis Earthquake on rock and soil, respectively, are shown on Figures 2.5-42 and 2.5-43.

2.5.3 SURFACE FAULTING

2.5.3.1 Geologic Conditions of the Site

A detailed description of the regional and site geology, including discussion of the lithologies, stratigraphy, structural geology, and geologic history, is presented in Sections 2.5.1.1 and 2.5.1.2.

2.5.3.2 Evidence of Fault Offset

Minor shearing with maximum observed displacements of about 7 feet has occurred in rock underlying the Reactor Building area. The shears are not continuous but occur as en echelon features which do not penetrate through the soil profile to the ground surface. Individual shears range in thickness from a fraction of an inch to less than 1 foot. Evidence of displacement includes displaced aplite and pegmatite veins, and slickensides. The results of the detailed investigations of these shears, as presented in Section 2.5.1.2, indicate that movement along the shears could not have occurred later than 45 million years ago, and in all probability the shears have been inactive since 150 to 300 million years BP and are not considered capable as defined in Appendix A to 10 CFR 100.

2.5.3.3 Identification of Capable Faults

No capable faults have been identified within miles of the site.

2.5.3.4 Earthquakes Associated with Capable Faults

There are no earthquakes associated with faults within 5 miles of the site, and no capable faults have been identified within 5 miles of the site.

2.5.3.5 Correlation of Epicenters with Capable Faults

No capable faults have been identified within 5 miles of the site, and therefore correlation of epicenters with such structures cannot be made.

2.5.3.6 Description of Capable Faults

No capable faults have been identified within 5 miles of the site.

2.5.3.7 Zone Requiring Detailed Faulting Investigation

No capable faults have been identified within 5 miles of the site. Descriptions of the shears found at the site are presented in Section 2.5.1.2.

2.5.3.8 Results of Faulting Investigation

Detailed investigations were conducted to evaluate the minor shearing found in rock underlying the site. These investigations, which are discussed in detail in Section 2.5.1.2, included detail geologic mapping, sampling, petrographic analysis, radiometric dating, X-ray diffraction analyses, literature search with emphasis on recent tectonic displacements, aerial photography and ERTS imagery analysis, gravity and magnetic data analysis, in situ stress measurements, evaluation of potential movement along shears due to the filling of Monticello Reservoir, review of local microseismic data, correlation of Piedmont seismic activity with reservoir impoundments, and offsite geologic reconnaissance. The results of these intensive geologic investigations indicate that the shears are not capable.

2.5.3.9 Design Basis for Surface Faulting

No capable faults have been identified within 5 miles of the site, and shears present at the site do not introduce potential for ground surface rupture, loci for seismic activity, or other conditions requiring modification of the existing design.

2.5.4 STABILITY OF SUBSURFACE MATERIALS

2.5.4.1 Geologic Features

The site is underlain by a complex sequence of metamorphic and igneous rock on the Charlotte Belt metamorphic zone, consisting primarily of gneiss, amphibolite, migmatite, and granodiorite. The overburden soils at the site are primarily residual, derived by the chemical weathering of the underlying metamorphic and igneous rock. There are some alluvial and colluvial soils in stream areas and the lower slopes of some hillsides, but these are restricted to the stream valleys. Geologic features of the site are discussed in detail in Section 2.5.1.2. The subsurface conditions at the plant site and Service Water Pond site are discussed in Sections 2.5.4.10.1 and 2.5.6.2, respectively.

The loading history of the site materials has been one of weathering and erosion since the last epeirogenic uplift; it has not been subject to glaciation during the Pleistocene epoch. A crustal movement map prepared by Meade [66] shows that the site is located in an area of slight regional uplift of the order of 2 to 3 mm per year. At the site, there are no areas of actual or potential surface or subsurface subsidence. The absence of carbonate zones precludes the possibility of subsidence or collapse due to solutioning. Ground water withdrawal in the area near the site is small and limited primarily to fracture zones in the crystalline bedrock, and is therefore not a potential subsidence problem. Mining operations within 4 miles of the site are restricted to surface mining of crushed stone, dimension stone, and sand and gravel. There are no oil or gas deposits in the site vicinity, and no subsurface mining occurs or has occurred within the area.

There are no areas at the site which are subject to instability caused by faulting, shearing and/or unrelieved residual stresses in the bedrock underlying the site. Minor shearing is present in the bedrock. The maximum observed net displacement is no greater than 7 feet. The results of radiometric age dating of the shear zones indicate that shearing could not have occurred later than 45 million years ago, and probably occurred between 300 million and 150 million years ago. A detailed discussion of the shears is presented in Section 2.5.1.2.2. The results of in situ stress measurement across the shear zone indicate that the direction of the major compressive stress is almost perpendicular to the shear zone, and the magnitude of the stresses are well below the estimated strength of the rock.

There are no rocks or soils at the site that are unstable because of mineralogy, lack of consolidation or inundation, variability, high water content, or solubility. These rocks and soils have no potentially undesirable response to natural (such as seismic events) or induced site conditions. There are no areas subject to liquefaction (Sections 2.5.4.8 and 2.5.6.4).

2.5.4.2 Properties of Underlying Materials

Geologic, seismologic, geophysical, and foundation engineering studies were performed to evaluate the characteristics of the nuclear plant site. The results of the geologic and seismologic studies are given in Sections 2.5.1, 2.5.2, and 2.5.3. The results of the geophysical and foundation engineering studies for the evaluation of the static and dynamic engineering properties of the underlying natural materials of the plant site are presented in Sections 2.5.4.2.1 and 2.5.4.2.2. A description of the plant site conditions is given in Section 2.5.4.10.1.

In the area of the Service Water Pond, the static and dynamic engineering properties of the natural in situ subsurface materials and the compacted fill materials were also evaluated (Section 2.5.6.5). Because the geologic conditions are essentially the same within the study region, the engineering properties of the natural materials in the area of the Service Water Pond are similar to those at the principal plant structures. Because essentially the same type of fill material was placed and compacted in accordance with similar specifications in the Service Water Pond area and at the principal plant structures, the engineering properties of the compacted fill in the 2 areas are considered similar.

2.5.4.2.1 Geophysical Studies

Details of the geophysical studies are discussed in Section 2.5.4.4. The locations of the geophysical surveys are indicated on Figure 2.5-44. The geophysical data in combination with geologic data and static and dynamic laboratory test data were used to evaluate the dynamic engineering properties of the saprolite and bedrock at the plant site. These properties are given in Table 2.5-8. For the bedrock, the shear moduli and subgrade moduli developed from laboratory and geophysical data were reduced using factors related to rock quality designations (RQD) [67].

2.5.4.2.2 Foundation Engineering Study

The foundation engineering study included the drilling of 108 test borings and the performance of static and dynamic laboratory tests. The locations of the borings are indicated on Figures 2.5-44 through 2.5-48. The graphical representations of the boring logs are provided in Appendix 2E. Selected data from other borings about 3 miles north of the site were utilized where applicable and are presented herein, although the boring logs are not included. 02-01

Laboratory tests were performed on soil samples and rock cores obtained from the test borings at the plant site to evaluate their physical (static and dynamic), index, and chemical properties. The laboratory tests were performed in general accordance with accepted standards or state-of-the-art methods. The laboratory testing program consisted of the following:

1. Direct Shear Tests

   Consolidated-drained double direct shear tests, in general accordance with ASTM D 3080-72, were performed on selected samples of the overburden soils to evaluate their strength characteristics. Unconsolidated-undrained double direct shear tests also were performed on selected samples. The tests were performed with the samples in 2-1/2 inch O.D. brass rings in which the samples were initially obtained during sampling. The sampling procedure is described in Section 2.5.4.4.1. The test results, in terms of normal pressure and maximum shearing resistance, are presented on the boring logs in Appendix 2E. Test data are in terms of total stress except where effective stress is specifically indicated.

2. Triaxial and Unconfined Compression Tests - Soil

   Triaxial and unconfined compression tests were performed on selected samples of the overburden soils obtained from the nuclear plant site to evaluate their strength characteristics. The triaxial tests were performed in general accordance with suggested ASTM methods, while the unconfined tests were performed in general accordance with ASTM D 2166-66. The test results, in terms of confining pressure and peak deviator stress, are presented on the boring logs in Appendix 2E. Test data are in terms of total stress except where effective stress is specifically identified.

3. Triaxial, Unconfined, and Confined Compression Tests - Rock

   Representative cores of rock were subjected to triaxial and unconfined compression tests in general accordance with ASTM D2664-67 and D2938-71a to evaluate their strength and stress-strain (elasticity) characteristics. The results are presented in Table 2.5-9.

To determine the stress-strain characteristics of highly weathered rock specimens, 2 confined compression tests were performed on specimens retained in the 2-1/2 inch O.D. brass rings during sampling. The tests were performed in a manner similar to a consolidation test (ASTM D2435-70). The data are illustrated on Figures 2.5-49 and 2.5-50.

4. Consolidation Tests

Consolidation tests were performed in general accordance with ASTM D2435-70 on selected soil samples to evaluate their compressibility characteristics. The tests were performed with the samples in 2-1/2 inch O.D. brass rings in which the samples were initially obtained during sampling. These test results are presented on Figures 2.5-51 to 2.5-59. At the location of the condensate storage tank, the soil samples were obtained utilizing conventional 3 inch diameter shelby tubes (Section 2.5.4.4.1). Two (2) tests were run in accordance with ASTM D 2435-70 except that the tests were performed directly on samples confined within the shelby tubes to eliminate extrusion and trimming disturbance. The shelby tubes with the retained soil samples were carefully cut in approximately 3-1/2 inch sections to avoid distortion of the tubes, and subsequently placed in the consolidation apparatus. The results of these tests are presented on Figure 2.5-60.

5. Dynamic Torsional Shear Tests

Dynamic torsional shear (resonant column) tests were performed on representative soil samples to evaluate the modulus of rigidity of these materials. The samples were subjected to steady-state, sinusoidal, and torsional forces applied to the top of each sample. The frequency of the force application was varied until the resonant frequency (the frequency associated with the maximum steady-state amplitude) was attained. The modulus of rigidity was computed from the resonant frequency of the sample. The tests were conducted at natural moisture content, over a range of confining pressures and at varying strain levels. The results of the resonant column tests are presented in Table 2.5-10.

6. Compressional Wave Velocity Tests

Representative samples of soil and rock were tested to measure the velocity of propagation of compressional waves in the materials. The velocity observed in the laboratory was used for correlation with field velocity measurements obtained in the seismic refraction survey. In this test, samples were subjected to a physical shock and the time for the shock wave to travel the length of the sample was measured with an oscilloscope. The velocity of compressional wave propagation was then computed. All the samples were tested in an unconfined state at their natural moisture content. The test results are presented in Table 2.5-11.

7. Moisture and Density Tests- Soil

The moisture content and dry density of selected soil samples were determined in general accordance with ASTM D2216-71, and procedures similar to ASTM D2937-71. The test results are presented on the boring logs in Appendix 2E.

8. Particle Size Analysis

Representative soil samples were analyzed in general accordance with ASTM D422-63 to determine their grain size distribution. The test results are presented on Figures 2.5-61 through 2.5-76.

9. Permeability Tests

Falling head permeability tests in general accordance with suggested ASTM methods were performed on representative soil samples to evaluate permeability characteristics. The test results are presented in Table 2.5-12.

10. Atterberg Limits

Atterberg limit determinations (liquid and plastic limits) in accordance with ASTM D423-66 and D424-59 were performed on representative soil samples to evaluate plasticity characteristics. Data are presented in Table 2.5-13.

11. Resistivity Tests

Resistivity tests in general accordance with suggested ASTM methods were performed on representative soil and rock samples to aid in evaluating corrosion and electrical grounding. The test results are presented in Table 2.5-14.

12. Soil Chemical Tests

Sulphate and pH determinations in general accordance with suggested ASTM methods were made on representative samples of soil for evaluation of corrosion of buried concrete and steel. Test results are presented in Table 2.5-15.

13. Cyclic Triaxial Tests

Cyclic consolidated undrained triaxial tests were performed on representative samples of saprolite to evaluate their dynamic characteristics. The samples were obtained utilizing 3 inch diameter shelby tubes as described in Section 2.5.4.4.1. The laboratory tests included:

a. Six (6) stress controlled cyclic triaxial tests to evaluate the liquefaction characteristics under seismic loading conditions.

b. Two (2) strain controlled cyclic triaxial tests to evaluate shear modulus versus strain and damping versus strain relationships.

All the triaxial test samples were saturated under back pressure and reconsolidated under all-around effective stresses.

For the stress controlled triaxial tests, the samples were subjected to uniform cyclic deviator stresses such that the ratio of cyclic shear stress on a plane at an angle of 45° to the initial effective confining stress ($\tau / \overline{\sigma}_c$) ranged from 0.30 to 0.45. Table 2.5-16 summarizes the stress ratios ($\tau / \overline{\sigma}_c$) and the number of cycles required for 5% and 10% double amplitude axial strains. Also summarized on the table are the index properties of the samples including initial moisture contents and dry densities. 02-01

For the strain controlled triaxial tests, the stresses required to produce the test strains were measured. From the area of the stress-strain hysteresis loops, the equivalent viscous damping ratio (D) was computed. The results of the tests are summarized in Table 2.5-17.

2.5.4.3 Plot Plan

Plot plans showing the locations of the test borings and subsurface cross sections in relationship to the principal plant structures are given on Figures 2.5-44 through 2.5-48. The locations of the geophysical surveys are illustrated on Figure 2.5-44. Cross sections through the plant site showing the relationship of the foundations of Seismic Category 1 structures to the subsurface materials are given on Figures 2.5-77 through 2.5-82. Foundation types and supporting media for the Seismic Category 1 structures are presented in Section 2.5.4.10.

2.5.4.4 Soil and Rock Characteristics

The field studies and investigations to evaluate the soil and rock characteristics consisted of test borings, geological investigations, and geophysical studies that included a seismic refraction survey, a surface wave survey and micromotion measurements. The locations of the test borings, and seismic refraction, and surface wave surveys, are presented on Figures 2.5-44 through 2.5-48.

2.5.4.4.1 Test Borings

The subsurface conditions at the plant site and near vicinity were explored by drilling 108 borings to depths ranging from 12 feet to 235 feet below the original ground surface. Figures 2.5-44 through 2.5-48 show the boring locations. The boring logs are presented in Appendix 2E. Selected data from other borings about 3 miles north of the site were utilized where applicable and are presented in Section 2.5.4.2.2, although the boring logs are not included. Test borings drilled for the Service Water Pond are provided in Section 2.5.6.2.

Borings were drilled with truck-mounted rotary-wash drilling equipment except Boring 4-1, which was drilled with hollow stem augers. Overburden soil samples suitable for testing were obtained at frequent intervals, and the underlying rock was continuously cored utilizing standard NX coring equipment. The soils encountered were classified in accordance with the Unified Soil Classification System (USCS) described in Figure 2.5-83, which also presents a key to the sample and core nomenclature utilized on the boring logs. Geologic rock classifications were based on macroscopic and hand lens examination of cores, supplemented by petrographic analyses.

Percent core recovery and RQD information are presented on the boring logs in a manner described on Figure 2.5-83. A Rock Property Indicator number has been presented on each log to conveniently summarize weathering and jointing features. The Rock Property Indicators are:

Rock Property Indicator Number	Description
1	Massive fresh rock, some may be slightly jointed.
2	Moderately weathered rock, slight jointing; and slightly weathered rock, moderately to very jointed.
3	All highly weathered rock; and moderately weathered rock which is hightly jointed.

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The borings were drilled in the overburden soils by advancing a 4 inch diameter hole to the desired sampling depth. (Hollow stem augers, 3-5/8 inches I.D., were used to advance Boring 4-1.) The drill rods were then extracted, and soil samples were obtained by driving a 3-1/4 inch O.D. sampler (Dames & Moore Soil Sampler Type U) 02-01 attached to the drill rods with either a 140 pound or a 300 pound weight. The 3-1/4 inch O.D. sampler is illustrated on Figure 2.5-84 and the drive weight which was used is indicated on each boring log. In addition, samples were obtained using a 2 inch O.D. sampler driven by a 300 pound weight and also a 140 pound weight (Standard Penetration Test, ASTM D 1586-67). In Borings 4-1 through 4-8, soil samples also were obtained by hydraulically pushing 3 inch diameter shelby tubes and the 3-1/4 inch O.D. sampler with the thin walled sampling tube attachments. The soil samples were retained in the shelby tubes and thin walled tubes for shipment to the laboratory. Data correlating blow counts of the 3-1/4 inch sampler with blow counts obtained by the Standard Penetration Test methods are presented on Figure 2.5-85. A correlation inferred between soil consistency and Standard Penetration Test blows is also shown on this figure.

Drilling mud and casing were used when necessary during the drilling of overburden soils. Prior to coring the underlying rock the boring was flushed thoroughly with water.

The 3-1/4 inch O.D. sampler (Dames & Moore Soil Sampler Type U) is a split barrel type. Various types of bits are utilized depending on the type of soil to be sampled, including a thin walled sampling tube attachment (6 inches to 12 inches long) utilized to minimize sample disturbance. The soil core is retained in the thin walled tube attachment and/or in the split barrel by 2-1/2 inch O.D. by 1 inch brass rings. Over 25,000 foundation investigations have been performed utilizing this sampler.

Prior to commencement of field investigations at the nuclear plant site, various types of samplers were considered. The subsurface soils at the site generally consist of dense micaceous silty sands, and for these types of materials, it was decided to utilize the Type U sampler since it was felt that the soil samples obtained would provide satisfactory data for a conservative analysis of site conditions. Subsequent to the initial investigations, the investigation for the Seismic Category 1 soil supported facilities (i.e., Service Water intake and discharge pipes, electrical duct bank, diesel generator fuel oil storage tanks and the condensate storage tank) also utilized 3 inch shelby tubes to sample the underlying soils.

It is recognized that some sample disturbance is obtained utilizing the Type U sampler; however, this is true of all state-of-the-art samplers available today. It is believed that the samples obtained by the Type U sampler are not significantly more disturbed than samples obtained by other sampler types, for the types of soil encountered at the site.

Figure 2.5-86 shows consolidation test data for soil samples obtained by the Type U sampler and a 3 inch diameter thin wall tube Denison sampler during a site investigation for a nuclear plant in Virginia. The soils at the Virginia site were micaceous silty sands, similar to the type of soils encountered at the Virgil C. Summer Nuclear Station site. Both sites are in the Piedmont Physiographic Province. Curves A and B are the test results on samples obtained by the Type U sampler; Curves C and D present results for samples obtained with the Denison sampler. Soil samples represented by Curves B and D were obtained in borings approximately 300 feet apart. Samples obtained with the Type U sampler were recovered by driving the sampler 1 foot with a 300 pound weight falling 30 inches.

The shape of a consolidation curve is influenced by the degree of sample disturbance. It can be inferred from a comparison of the consolidation curves on Figure 2.5-86 that the samples obtained from the Type U sampler are not any more disturbed than the samples obtained with the Denison sampler. Although the consolidation tests were performed on soils which can be considered similar from a foundation standpoint, it can be noted on Figure 2.5-86 that differences in specific consolidation characteristics exist between the Type U sampler curves and the Denison sampler curves. The soils tested were residual soils and saprolites which were derived from weathering of the underlying metamorphic rocks. Because of the variations in structure and composition of the metamorphic rocks, differential weathering of these rocks produces differences in characteristics of the resulting soil types. Consequently, variations in soil properties can be expected to occur from sample to sample, depending on the parent rock type from which the soils are derived.

Comparative consolidation test data between samples obtained with the Type U sampler and a thin-wall piston sampler at another nuclear station site in Virginia are shown on Figure 2.5-87. The soil is a clayey silt with a trace of fine sand and mica; all samples were obtained in borings within a radius of 350 feet. As shown on Figure 2.5-87, the shapes of the curves are very similar, indicating that there is very little difference in the degree of sampler disturbance between the Type U sampler and the piston sampler.

Whatever sample disturbance occurs utilizing the Type U sampler at the site will result in soil strength obtained from laboratory tests that will be less than the in situ soil strengths. Design analyses, therefore, based on soil parameters obtained from laboratory tests performed on soil samples obtained by the Type U sampler will be conservative.

Two (2) inch diameter plastic pipes were installed in several borings to measure ground water levels. The ground water levels measured after completion of the test boring work are indicated on the appropriate boring logs in Appendix 2E.

2.5.4.4.2 Geologic Investigation

The geologic studies are presented in detail in Sections 2.5.1, 2.5.2, and 2.5.3. Extensive excavations to and into bedrock were made for plant structures (Section 2.5.4.5). Detailed geologic studies of the exposed bedrock were performed, including the comprehensive investigation of rock shear zones. In addition to construction excavation, trenching by drag line and bulldozer also was employed in an attempt to trace rock shears northeastward out of the excavation for the reactor building foundation construction. The need for extensive trenching was precluded by the presence of 3 roadcuts directly across the surveyed strike line of a shear within Shear Zone 3 (Figure 2.5-25). Three (3) extensive efforts were made to trace the shear, but these investigations did not disclose evidence of a shear extension.

2.5.4.4.3 Seismic Refraction Survey

A seismic refraction survey was performed to evaluate on-site rock and overburden dynamic characteristics. Two (2) refraction lines, Numbers 1 and 2, were run at locations shown on Figure 2.5-44. Survey results are presented on Figures 2.5-88 and 2.5-89. Each survey line was approximately 1100 feet long, with geophones spaced at 50 foot intervals. An Electro-Technical Labs ER-75-12 Refraction Seismograph was used to obtain photographic records of the compressional wave arrivals.

The refraction survey results indicated that there is a surficial layer which has a compressional wave velocity of approximately 2300 feet per second. The layer thickness ranges from 50 to approximately 130 feet below the ground surface. The lower 20 to 30 foot zone usually has a gradational velocity varying from 2300 feet per second up to the velocity of the underlying rock. The transition to harder rock was indicated to be very irregular, with local irregularities on the order of 20 feet. The field studies indicated that the average compressional wave velocity for the harder rock is 15,000 feet per second.

During construction, extensive excavations to and into rock were made for the principal plant structures. The compressional wave velocity of the rock was measured using a Bison Signal Enhancement Seismograph (Model 1570) to aid in the evaluation of the foundation supporting rock. Foundation rock with a measured compressional wave velocity of less than 8,000 feet per second was removed.

2.5.4.4.4 Surface Wave Survey

A surface wave survey (Line 3 on Figure 2.5-44) was performed to analyze the characteristic surface waves at the site and estimate shear wave velocity.

Two (2), 3 component Sprengnether velocity geophones were used to sense ground motions resulting from explosions at each end of Line 3. These geophones had a natural frequency of 1.0 Hz. The output was recorded on an Electro-Technical Labs SDW-100 Recording Oscillograph.

The survey results indicated that surface waves were not well developed; the amplitudes were only slightly greater than the compressional waves produced by the same shot. This indicated strong decoupling of compressional and shear body waves at the site, resulting in low amplitude surface waves.

The predominant frequencies developed by the surface waves vary between 7 and 14 Hz, with the most prominent being 10 and 14 Hz. The only surface wave coherent enough to be tentatively identified is a probable M_2 (Segawa) wave, with an approximate velocity of 1,500 feet per second and a frequency of 10 Hz. There were other surface wave arrivals after the M_2 arrival, but these were difficult to identify.

The surface waves suggested that the shear wave velocity in the materials above hard rock averages approximately 1,300 feet per second. No body shear waves were identified from the harder rock at the site.

2.5.4.4.5 Micro-motion Measurements

Measurements were made of the ambient site ground motion to provide additional information regarding dynamic characteristics. Usually, background motion results from surface waves generated by man and his activities. The gain of the Sprengnether Velocity Meter was increased 100 times, using an amplifier, for these measurements. Evaluation of the measurements indicated that the site is extremely quiet. Ambient ground motions are negligible. Construction equipment operating 1,000 or more feet from the instrument confirmed the surface wave survey by producing very small amplitude waves ranging between 7 and 10 Hz.

2.5.4.5 Excavations and Backfill

2.5.4.5.1 Excavations

After the nuclear plant site was cleared, grubbed, stripped of topsoil and organic material, and graded to elevation 435', excavations were made for the foundation mats of the Reactor, Control and Auxiliary Buildings. These excavations extended into rock. The competency of the bearing rock was evaluated by geologic and engineering inspections during construction (Sections 2.5.1.2.2 and 2.5.4.10.2). Weathered or highly fractured rock was removed. These excavations were backfilled with structural fill concrete (Section 2.5.4.5.2).

The side slopes and benches of the excavations for the rock supported mat foundations extended laterally into the areas of the adjacent Seismic Category 1 plant facilities: the Diesel Generator, Fuel Handling, and Intermediate Buildings. Excavations for these buildings were partially backfilled prior to the installation of caissons for the support of the buildings. After caissons were installed, the backfilling of the excavations to foundation grade was completed. The caissons were extended up to foundation grade in a manner described in Section 2.5.4.10.4.

The extent and depth of the excavations and the type of backfill used for the Seismic Category 1 nuclear plant facilities are presented on the cross sections of Figures 2.5-77 through 2.5-82. Dewatering of these excavations is discussed in Section 2.5.4.6.

The excavations for the Turbine Building foundations extended laterally into the area of the condensate storage tank as shown on Figures 2.5-48 and 2.5-82. In addition to this excavation, the in situ soils at the tank site were excavated to elevation 409'. For the support of the tank, compacted crushed rock (Zone III material) was used to backfill the excavation beneath the tank, as shown on Figure 2.5-82. Details of the preparation of the foundation soils for the tank are given in Section 2.5.4.10.3. Dewatering at the tank site was unnecessary.

2.5.4.5.2 Backfill Material

Six (6) types of backfill material used at the nuclear plant site are: fill concrete (1500 psi concrete), river sand, Zone 1 filter material, and Zone I, II, and III materials. Zone I and II materials are basically clay soils and saprolites, respectively. The river sand is a granular material obtained from natural deposits. Zone 1 filter material is crushed rock and is used primarily for dam and embankment construction at the Service Water Pond. Zone 1 filter material is described in detail in Section 2.5.6.4.3.3. The Zone III material is also crushed rock. The locations of the types of the backfill material are indicated on Figures 2.5-77 through 2.5-82.

Surveillance and inspection of the placement of the backfill materials at the nuclear plant site are provided by SCE&G Quality Control. An in-place density test is performed, as a minimum, for every 1500 cubic yards of soil backfill placed. The tests are performed utilizing sandcone and nuclear methods in accordance with ASTM D 1556-64 and D 2922-71, respectively.

1. Fill Concrete

   Fill concrete (1500 psi concrete) was placed directly on rock beneath the base of the structural foundation mat of the Reactor, Control and Auxiliary buildings. The concrete was designed to obtain a 28 day strength of 1500 pounds per square inch (psi). Prior to placement of the fill concrete, the subgrade rock was inspected by the resident foundation engineer. The competency of the bearing rock was determined by geologic and engineering inspections. Immediately before any concrete was placed on or against rock, the rock was cleaned of all dirt, gravel, boulders, scale, loose fragments, and other objectionable substances by air and/or water jetting. The rock surface was then dampened.

   In lieu of Zone I and II backfill, fill concrete was used below elevation 370' around the Reactor and Auxiliary Buildings. In these areas, where the fill concrete interfered with caisson installation under the Fuel Handling and Intermediate Buildings, blockouts were formed to facilitate caisson installation.

2. Zone I and II Materials

   Zone I and II materials are used as primary backfill beneath the Diesel Generator, Fuel Handling, and Intermediate Buildings which are supported on caissons. Select borrow materials from the same sources as the Zone II materials are used for the construction of the Service Water Pond dams. The static and dynamic engineering properties of these materials are discussed in Section 2.5.6.4. The locations of the borrow areas are described in Section 2.5.6.2.

   Zone I material is a reddish clayey soil classified as a CH or CL material in accordance with the USCS. Zone II material is a multicolored (ranging from red to light tan) saprolite ranging from an MH to an SM soil in accordance with the USCS.

   The Zone I and II materials are free of organic material (such as leaves, grass, and roots), stones having a maximum dimension of over 6 inches, or any other unsuitable material. In areas where Zone I or Zone II fill are utilized, the material is placed as homogeneously as possible in horizontal layers not exceeding 8 inches (loose) in thickness. The material is compacted to a dry density of at least 90% of the maximum dry density as determined by ASTM Test Designation D 1557-70, Method C. The moisture content of the placed material is held to +4%, -2% of the optimum moisture content.

3. Zone III Material

Zone III material is used for the following:

a. The support of the condensate storage tank and diesel generator fuel oil storage tanks.

b. The support of portions of the Seismic Category 1 electrical duct bank and Service Water intake pipes.

c. Around the Intermediate Building foundation wall.

d. Under portions of the caisson supported Intermediate, Fuel Handling, and Diesel Generator Buildings.

e. As a working surface in areas adjacent to Seismic Category 1 facilities where Zone I and II materials are utilized. When used in these areas, Zone III material is placed in lifts not exceeding 9 inches in thickness and at vertical intervals of not less than 8 feet.

f. The support of some nonsafety-related facilities at the nuclear plant site.

Zone III fill consists of a sound, durable rock with a choice of the following 2 gradations depending on lift thickness:

U. S Standard Sieve Size	Maximum 12 inch lift% by Weight Passing	Maximum 15 inch lift% by Weight Passing
2”	100	100
1-1/2”	90 - 100	95 - 100
1”	70 - 100	70 - 100
1/2”	50 - 80	50 - 80
No. 4	40 - 55	40 - 55
No. 30	10 - 32	10 - 32
No. 200	0 - 15	0 - 10

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Both gradations meet the following requirements for soundness and durability:

a. The percent of total weight loss measured in accordance with the Sodium Sulfate Soundness Test, ASTM C-88, performed on the No. 4 and larger fractions shall not exceed 10% after 5 test cycles.

b. The percent of total weight loss during the Los Angeles Abrasion Test, ASTM C535-69, shall not exceed 65%.

The Zone III material is placed in lifts not exceeding 12 inches and 15 inches in thickness depending on the gradation as specified above. The material is compacted using a smooth drum vibratory roller to at least 85% of relative density as determined by the Department of the Army EM-110-2-1906.

Subsequent to March 15, 1982, an alternate gradation to that shown above may be used. The gradation shall be in compliance with that shown as "Composite Mixture" in Section 305.04 of the South Carolina State Highway Department Standard Specifications for Highway Construction, Edition of 1973, as follows:

U. S Standard Sieve Size	Percent By Weight Passing
2”	100
1-1/2”	90 - 100
1”	70 - 100
1/2”	48 - 75
No. 4	30 - 50
No. 30	11 - 30
No. 200	0 - 12

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In lieu of the prequalification testing required in paragraphs a. and b. above, the supplier of the Zone III fill must produce certification that his composite mixture has been tested and does meet the requirements of Sections 302.02(a) and (b), 305.02, 305.03, and 305.04 of the South Carolina State Highway Department Standard Specifications for Highway Construction, Edition of 1973.

The "Composite Mixture" shall be placed in lifts not to exceed 12 inches.

4. River Sand

River sand is used for backfilling portions of excavations for the Service Water discharge pipes. The material is placed in layers not exceeding 12 inches and compacted to at least 75% of relative density as determined by Department of the Army EM-1110-2-1906.

River sand consists of natural deposits with the following gradation:

U. S. Standard Sieve Size	Percent Passing by Dry Weight
3/4 inch	100
No. 4	75 - 100
No. 10	50 - 90
No. 40	10 - 50
No. 200	0 - 5

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5. Zone 1 Filter Material

Zone 1 filter material is used to backfill the southern portion of the interconnecting pipe from the Circulating Water intake structure to the Service Water Pumphouse. This material is also used to backfill excavations near the entrance to the Service Water intake structure. This material is placed in layers not exceeding 12 inches and compacted to at least 70% and 75% relative density at the Service Water intake structure and interconnecting pipe, respectively, as determined by Department of the Army EM-1110-2-1906.

Zone 1 filter material consists of a sound, durable crushed stone with the following gradation:

U. S Standard Sieve Size	Percent Passing by Dry Weight
3/4 inch	100
No. 4	75 - 100
No. 10	50 - 85
No. 40	10 - 50
No. 200	0 - 5

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2.5.4.6 Ground Water Conditions

The ground water during and prior to construction was located at a significant depth below the ground surface (see Figure 2.4-16). After Monticello Reservoir is impounded (normal high water elevation 425.0' and normal drawdown elevation 420.5'), it is estimated that the ground water at the principal plant structures ultimately will rise to a maximum, approaching elevation 420'. Water levels are likely to fluctuate slightly and will be highest during periods of wet weather.

The rise in the ground water will not affect the stability of the Seismic Category 1 structures supported on rock below the ground water level. These structures are designed to withstand the hydrostatic forces. The rise in the ground water will not affect the stability of the Seismic Category 1 structures that are soil supported. The stability of the Seismic Category 1 soil-supported structures are discussed in Section 2.5.4.10.3. The effect of the rise of the ground water was considered.

Ground water did not constitute a major problem during construction of the nuclear plant facilities. Nor did the construction dewatering adversely affect the stability or the integrity of the Seismic Category 1 structures.

Ground water entering the excavations in sufficient quantities to require dewatering occurred in 3 areas:

1. The northeast corner of the Reactor Building,

2. The southeast side of the Control Building, and

3. The southwest side of the Auxiliary Building.

In the Auxiliary and Reactor Buildings, the majority of the water inflow came from joints in the rock, while in the Control Building the major portion of the inflow came from a fractured quartz dike.

The ground water in these excavations was controlled by a series of French drains and sumps. The French drains consisted of crushed rock capped with grout. Between the grout and the crushed rock, several layers of burlap were placed to prevent the grout from infiltrating the crushed rock. Each sump consisted of a 36 inch diameter corrugated metal pipe.

Only 2 French drains for the Reactor Building and 1 French drain for the Auxiliary Building were located within the perimeter of the concrete mats. The French drains in the area of the Reactor Building foundation were approximately 1 foot in width, while the French drain in the area of the Auxiliary Building foundation had a maximum width of approximately 2-1/2 feet.

After the foundation construction was above the level of the ground water inflow, the sumps were filled with fill concrete. Only the sump for the Control Building was located within the perimeter of the concrete mat.

Caissons were installed for the support of the Diesel Generator, Fuel Handling, and Intermediate Buildings. During construction of the caissons, ground water from joints in the rock sockets entered many of the caisson shafts. Caisson construction is discussed in Section 2.5.4.10.4.

The excavation for the condensate storage tank did not require dewatering.

The permeability of the subsurface materials at the site is discussed in Section 2.4.13.2.4. The results of laboratory permeability tests performed on various types of soil and rock are summarized in Table 2.4-9. The results of the field permeability tests are presented in Table 2.4-10.

Ground water levels during the life of the plant are discussed in Section 2.4.13.2.5. Ground water fluctuations are discussed in Section 2.4.13.2.3.

Monitoring plans for plant observation wells are discussed in Section 2.4.13.4.

Direction of ground water flow, gradients, and velocities are discussed in Section 2.4.13.2.3. Site ground water contours are illustrated on Figure 2.4-16.

2.5.4.7 Response of Soil and Rock to Dynamic Loading

The testing performed to evaluate the dynamic properties and characteristics of the soil and rock at the nuclear plant site are discussed in Sections 2.5.4.2 and 2.5.4.4. Evaluation of the liquefaction potential at the nuclear plant site is discussed in Section 2.5.4.8. The soil structure interaction analyses are discussed in Section 3.7.2.4. The dynamic response of buried pipelines and earthworks is described in Sections 3.7.3.12 and 2.5.6.5, respectively. 02-01

2.5.4.8 Liquefaction Potential

The principal plant facilities are supported on mats or caissons founded on the underlying rock and are therefore not susceptible to the phenomenon of liquefaction. However, facilities such as the Service Water intake and discharge pipes, electrical duct bank, diesel generator fuel oil storage tanks, and the condensate storage tank are supported on soil, as shown on Figures 2.5-46, 2.5-47, and 2.5-48. The potential for liquefaction and settlement under cyclic loading of soils under level ground in this area is evaluated in this section. The stability of the adjacent west embankment and liquefaction potential of the Service Water intake, pumphouse, and discharge structures are discussed in Section 2.5.6.

The general subsurface conditions in the area under consideration are shown on Figures 2.5-80, 2.5-81, and 2.5-82. The facilities involved are founded on compacted fill or on residual soils. The general site and subsurface conditions are described in Section 2.5.4.10.1 and the characteristics of the soils and rock are described in Sections 2.5.4.2 and 2.5.4.4. The upper 5 to 10 feet of the natural soils are principally clayey materials. Beneath this is a stratum of silty sand and/or sandy silt, known locally as saprolite. The characteristics of the fill material and the compaction specifications are described in Section 2.5.4.5.2.

Nine (9) borings (3-19, 4-1 through 4-8) have been drilled in the area under consideration prior to or during placement of the fill. The locations of these borings are shown in section on Figures 2.5-80 and 2.5-81, and in plan on Figures 2.5-46 through 2.5-48. The boring logs are shown in Appendix 2E.

In Boring 4-1, loose silty sand was encountered in the upper 20 feet of the natural overburden soils, but these loose soils were excavated as described in Section 2.5.4.10.3. Borings 4-2 and 4-5 encountered soft and loose fill. This condition is being evaluated and appropriate corrective action will be taken as necessary.

Cyclic triaxial tests were conducted on samples of saprolite obtained in Boring 4-1. The results of these tests are presented in Section 2.5.4.2.2, but the corrections to these results that are required to account for sample disturbance and the differences in stress and deformation boundary conditions between the laboratory tests and the field have not been defined. Rather, evaluation of the potential for liquefaction under cyclic loading of the saprolite is based on the results of standard penetration tests as suggested by Seed [68].

The general ground water conditions at the plant site are described in Section 2.5.4.6. In this evaluation of liquefaction potential, it is conservatively assumed that the ground water will rise to elevation 420' (i.e., 15 feet below plant grade) after the filling of Monticello Reservoir. The actual water table after filling will be monitored as described in Section 2.4.13.4.

The maximum horizontal accelerations generated by the postulated Safe Shutdown Earthquake have been conservatively taken to be 0.15g in rock and 0.25g in soil as discussed in Section 2.5.2.10. These accelerations are associated with the random occurrence near the site of an earthquake with an epicentral intensity of VII or a magnitude of less than 6. It should be noted that the implied amplification of motion in soil is conservative, as recent studies by Donovan [69] and Seed et al [70] have shown that peak accelerations recorded in soil tend to be attenuated relative to those in rock for accelerations exceeding about 0.1g. Thus, it appears that a peak ground surface acceleration of 0.15g is adequately conservative for evaluating the response of soils to earthquake induced shaking.

The evaluation of liquefaction potential based on standard penetration test blowcounts involves comparison of the measured blowcounts with the blowcounts which bound all known cases of liquefaction for the relevant magnitude earthquake. In both cases the actual blowcounts are modified in order to account for the effects of overburden pressure. In this evaluation the comparison is made in terms of modified penetration resistance, N_1 where $N_1 = C_nN$ in which N = standard penetration resistance.

$$C_n = 1 - 1.25 \log \frac{\sigma'_v}{1 tsf}$$

σ'_υ = effective overburden pressure

The modified penetration resistances which bound conditions causing liquefaction are computed for a given ground surface peak acceleration using the correlations presented by Seed on Figure 24 of his reference [68]. In this figure values of the cyclic stress ratio, τ/σ'_υ, causing liquefaction are given as a function of modified penetration resistance. The stress ratio, τ/σ'_υ, in which τ = average cyclic shear stress and σ'_υ = effective overburden stress are computed by use of the formula:

$$\tau/\sigma'_v = 0.65 \frac{\sigma_v}{\sigma'_v} a_{peak} r_d$$ 02-01

where

σ_v = total overburden stress

a_{peak} = peak ground surface acceleration

r_d = a depth reduction factor which accounts for flexibility of the soil column.

Computed values of the maximum modified penetration resistances for liquefaction under peak ground surface accelerations of 0.15g and 0.25g are presented in Tables 2.5-18 and 2.5-19 using the above expression and Seed's curve for Magnitude 6 earthquakes. In the computations, average total unit weights for fill and saprolite have been assumed to be 117 pcf above the water table and 120 pcf below the water table. Values of the depth reduction factor, r_d, have been taken from Seed and Idriss [71]. Average values were used with the peak ground surface acceleration of 0.15g and lower bound values of r_d were used with the peak ground surface acceleration of 0.25g, since this value requires that the peak accelerations must reduce rapidly with depth in order to be consistent with a peak acceleration of 0.15g in rock. The modified penetration resistances obtained by these computations are plotted on Figure 2.5-90.

Also plotted on Figure 2.5-90 are modified penetration resistances from Borings 3-19, 4-1, 4-3, and 4-7. These modified penetration resistances generally range between 10 and 25. While several values fall within the range indicated for liquefaction under a peak surface acceleration of 0.25g, compatibility of deformations in the field requires that the overall response to cyclic loading be determined by the average properties of the soil, and therefore a clear margin of safety against liquefaction is indicated. An even more substantial margin of safety is indicated for a peak ground surface acceleration of 0.15g.

Additional standard penetration resistances were recorded in the natural soils in Borings 4-2, 4-4, and 4-6, located near the intersection of the Service Water intake pipe and the circulating water pipe. Several of these values are relatively low; however, they have been obtained in the more clayey soils which comprise the original surface layer and on visual inspection are not the type of material shown by experience to be susceptible to liquefaction. Grain size distributions for these and selected other samples obtained in conducting standard penetration tests are shown on Figures 2.5-65 through 2.5-76.

It may be noted that the penetration resistances recorded in the saprolite will tend to be lower than those that would be recorded in alluvial deposits existing under similar states of compactness and in situ stress. This occurs because penetration resistance is a function of the compressibility of a soil as well as its shear strength [71a,71b]. Because of the relatively high percentage of fines (in the order of 20-25% passing the No. 200 sieve) and the significant mica content in the saprolite, this material will tend to be more compressible than the cleaner alluvial deposits which have shown historic evidence of liquefaction. Thus, while use of the maximum modified penetration resistances suggested by Seed, which are based on the historic occurrence of liquefaction in predominantly alluvial deposits, is generally appropriate for this site, the method will tend to be conservative in the case of the more compressible saprolite.

With respect to the fill materials (compacted in accordance with the specifications), the Zone I (clayey soil) and Zone II (crushed rock) materials are not susceptible to liquefaction. While Zone 1 filter material, river sand and Zone II material (silty sand and/or sandy silt) are potentially susceptible to liquefaction, if saturated, there is no historic evidence of the phenomenon of liquefaction in well compacted rolled fills, even under heavier levels of shaking than those postulated for the Safe Shutdown Earthquake.

An estimate of the maximum settlement of the fill and the saprolite that might be caused by cyclic loading induced by the postulated Safe Shutdown Earthquake may be obtained using data presented by Pyke [72]. Using the values of the cyclic stress ratio τ_{av}/σ'_{v}, that were computed in Table 2.5-19 and typical values of shear modulus for medium dense sands, values of the average cyclic shear strain may be computed as shown in Table 2.5-20. The maximum average cyclic shear strain is on the order of only 0.1% for an assumed peak ground surface acceleration of 0.25g. The data presented by Pyke for Jensen Fill, which is generally similar to the saprolite and fill materials at the nuclear plant site, indicates that insignificant settlements will occur for cyclic strains up to this level.

2.5.4.9 Earthquake Design Basis

The earthquake design basis is presented in Section 2.5.2.

2.5.4.10 Static Analyses

A layout of principal structures comprising the plant is shown on Figure 2.5-46. Seismic Category 1 structures of the principal plant facilities are supported on mats or caissons founded on the underlying rock. However, as shown on Figures 2.5-46, 2.5-47, and 2.5-48, in the area between the plant and the Service Water pond, facilities such as the Service Water intake and discharge pipes, electrical duct bank, diesel generator fuel oil storage tanks, and the condensate storage tank are supported on soil. The foundations for the Seismic Category 1 structures related to the Service Water Pond are discussed in Section 2.5.4.10.6. Pertinent foundation design information for principal Seismic Category 1 structures is presented in Table 2.5-21.

Cross sections illustrating building foundation elevations, general subsurface conditions, and surface topography are presented on Figures 2.5-77 through 2.5-82. The locations of the sections are shown on Figures 2.5-46 and 2.5-47.

2.5.4.10.1 Site Conditions

2.5.4.10.1.1 Surface Conditions

Prior to construction, the site and surrounding area terrain was characterized by moderately sloping ridges and hills and well developed drainage patterns. Frees Creek and Mayo Creek, tributaries to the Broad River, lie in valleys immediately north and south, respectively, of the site ridge. Grade along Frees Creek near the site was approximately elevation 260'. Along Mayo Creek, grade was approximately elevation 300'. The plant site was located on an irregularly shaped ridge approximately 1 mile east of the Broad River. The original ground surface at the plant site ranged from elevation 400' to 500'. The original ground surface sloped downward toward the north and northeast toward the base of the ridge flank. In the floor of the Service Water Pond, the existing grade was approximately elevation 350'. The site and surrounding area was heavily forested.

For construction of the nuclear facilities, the site was cleared, grubbed, stripped of topsoil and organic material, and graded. The plant site area was graded to approximately elevation 435' (finished grade), requiring the removal of very little overburden material at the northeastern portion of the plant site and up to a maximum of approximately 65 feet at the southwestern portion. For a number of the principal plant structures, excavations to and into rock were required for construction of the foundations. These excavations varied to a maximum of approximately 100 feet below finished grade. Plot plans and cross sections through the plant site are provided in Section 2.5.4.3. Excavation and backfill are discussed in Section 2.5.4.5.

2.5.4.10.1.2 Subsurface Conditions

Prior to and during construction, subsurface field investigations that included test borings and geophysical surveys were performed at the site. Details of these investigations are discussed in Section 2.5.4.4. The results of the investigations indicate that the plant site and surrounding area were initially blanketed primarily by moderately thick residual soil derived by weathering of underlying rock. In the Service Water Pond bottom, some alluvial soils were in evidence. Results of the investigations for the Service Water Pond are presented in Section 2.5.6.2. Initially the overburden thickness (based on original site grade) ranged from approximately 40 to 95 feet in the borings drilled at the principal plant structures; and, in general, the elevation of rock decreases toward the north and east. After construction, the overburden thickness (based on finish grade elevation 435') now ranges from approximately 20 to 95 feet (see cross sections provided in Section 2.5.4.3). Additional rock excavation was performed beneath a number of principal plant structures.

The upper 5 to 10 feet of natural soil usually were principally stiff clayey soils (silty clay and clayey silt) containing variable quantities of sand. Surficial alluvium, where present, appeared to be loose sand and/or silty soils. Below the surface zone was saprolite defined as rock that has weathered in place to a soil consistency, but retains diagnostic properties of the parent rock. The saprolite was medium dense to dense silty sand and/or sandy silt that exhibits a slight to low plasticity because of weak cementation. The saprolite generally became denser with depth grading into rock. After construction, soils present below the finish site grade are essentially all in situ silty sand (saprolite) and backfill (Section 2.5.4.5), except in the area between the nuclear plant and the Service Water Pond where fill overlies the upper zone of in situ clayey soils. The in situ saprolite contains small to moderate quantities of mica and occasional boulders that generally occur near the top of rock.

In a small localized area where the Seismic Category 1 electrical duct bank and the Service Water pipes cross over the circulating water pipe, borings drilled (Borings 4-2 and 4-5) to investigate the fill materials encountered soft and loose fill. This condition was evaluated and documented. The soft and loose fill was removed to competent material and replaced with material compacted in accordance with the original specification requirements.

Many borings indicate that the overburden soils are underlain by a zone of highly weathered rock which sometimes is interlayered with decomposed rock of a granular soil-like consistency. Moderately weathered rock usually is present beneath these materials, and is directly beneath the overburden soils where the highly weathered rock zone does not occur. This, in turn, is underlain by fresh rock which contains some random thin zones of weathered and/or partially decomposed rock. Moderately weathered and/or fresh rock was encountered in borings at the principal plant structures at depths (below original site grade) generally on the order of 65 to 115 feet (elevation 290' to 410'). One (1) boring (Boring 3-20) was terminated at elevation 349' in highly weathered rock. Because of differential weathering, the elevation of fresh rock and the character of weathered and decomposed rock changes appreciably over short distances (horizontal and vertical). This condition was substantiated during foundation construction. Details of the rock excavation are discussed in Sections 2.5.1.2.2, 2.5.4.5, 2.5.4.10.2, and 2.5.4.13. Caisson installation is discussed in Section 2.5.4.10.4.

The performance qualities of the rock were evaluated from detailed rock structure observed, core recovery, RQD, and a Rock Property Indicator. These data are presented on the boring logs in Appendix 2E in a manner described on Figure 2.5-83. Subsurface conditions pertaining to ground water are discussed in Sections 2.4.13 and 2.5.4.6.

2.5.4.10.2 Mat Foundations on Rock

The Seismic Category 1 structures supported on mats founded on rock are the Reactor, Control, and Auxiliary Buildings (Table 2.5-21). The excavations for these foundations are described in Sections 2.5.4.5 and 2.5.1.2.2.

Engineering inspections were performed to verify the competency of the foundation rock. Percussion rock drills were used to evaluate zones of highly weathered rock. The compressional wave velocity of the rock was measured using a Bison Signal Enhancement Seismograph, Model 1570. Rock which was excessively fractured by blasting, or which failed to meet the minimum compressional wave velocity requirement of 8,000 feet per second, was removed. These inspection methods were employed to verify that the rock quality is in compliance with the Safe Shutdown Earthquake and Operating Basis Earthquake criteria for the design of Seismic Category 1 structures supported on mat foundations founded on rock; i.e., the mats are founded on, as a minimum, moderately weathered rock with a compressional wave velocity of 8,000 to 10,000 feet per second (Section 2.5.2).

After the foundation rock was inspected and approved, the excavations were backfilled with fill concrete (Section 2.5.4.5.2).

2.5.4.10.2.1 Mat Bearing Capacity on Rock

The rock bearing capacity at the nuclear plant site was evaluated relative to the Rock Property Indicator numbers described in Section 2.5.4.4.1 and indicated on the boring logs in Appendix 2E. The strength of the foundation rock was tested in the laboratory by means of unconfined compression and triaxial compression tests performed on intact rock core samples (Section 2.5.4.2.2). The results of these tests are summarized in Table 2.5-9. From the results of these tests, the "theoretical" ultimate capacity of the bearing rock was calculated using Griffith's Strength Theory described by Coates [73].

The design allowable rock bearing capacity utilized provides for safety factors of 30 for the Number 1 rock and 20 for the Number 2 and 3 rock. The safety factors took into account the joints, fractures, and weathered zones present in the in situ rock. The ultimate and allowable bearing values relative to the Rock Property Indicator numbers are summarized in Table 2.5-22.

The pressures on the bearing rock surface caused by the Reactor, Control, and Auxiliary Building mat foundations do not exceed 25 kips per square foot. These pressures are well within the limits of the allowable bearing capacities indicated in Table 2.5-22.

2.5.4.10.2.2 Settlement of Mats on Rock

The settlements of the Reactor, Control, and Auxiliary Buildings supported on mats founded on bedrock were estimated using the elastic theory. Relative to the Rock Property Indicator numbers (Section 2.5.4.4.1), Young's modulus of elasticity was evaluated from the results of the stress-strain data obtained from triaxial, unconfined and confined compression tests performed on rock samples (Section 2.5.4.2.2), and the compressional wave velocity data (Table 2.5-8) developed from the results of the geophysical surveys. These evaluations are summarized below:

Rock Property Indicator Number	Young's Modulus of Elasticity (psi)
1	4×10^6
2	1×10^6
3	2×10^4 to 1×10^5

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The range of values for the Number 3 rock was provided to account for the variation of this rock from highly weathered to moderately weathered rock which is highly jointed.

Analysis indicated that the settlements of the Reactor, Control, and Auxiliary Buildings would be on the order of 1/4 inch for loadings ranging up to 25 kips per square foot. The stress-strain data indicates that the rock will behave essentially elastically over the range of applied stresses, and settlement will occur instantaneously as each increment of load is imposed. Therefore, post construction settlements will be practically nil.

2.5.4.10.3 Foundations on Soil

The soil supported facilities at the nuclear plant site such as the Service Water intake and discharge pipes, electrical duct bank, 2 diesel generator fuel oil storage tanks, and the condensate storage tank are shown in Figures 2.5-46 through 2.5-48. The Service Water pipes and electrical duct bank are supported below finish plant grade in compacted Zone I, II, and III material as illustrated on Figures 2.5-80 and 2.5-81.

Each diesel generator fuel oil storage tank is supported on compacted Zone III (crushed rock) material which is shaped to uniformly support the circular bottoms of the tanks. A minimum of 3 inches of sand bedding is placed over the shaped areas to smooth irregularities in the supporting grade. The bottom of both tanks are at elevation 419'. The Zone III material extends to an approximate depth of elevation 404', the depth to which the natural in situ soils are removed. Zone III material also is compacted directly around and above the tanks.

The condensate storage tank site extended over a slope cut during the excavations for the rock supported mat foundations (Section 2.5.4.5) as illustrated on Figures 2.5-48 and 2.5-82. The in situ soils at the tank site were excavated to elevation 409', a depth of approximately 26 feet below the top of the slope. All loose or unsuitable soils were removed from the foundation area. Within the foundation support zone (delineated on Figure 2.5-82 as the zone projecting 5 feet beyond the edge of the tank mat and extending downward on a 1H:2V slope), the excavation was backfilled with Zone III material to foundation grade, elevation 430'. The Zone III materials were compacted to at least 85% of relative density as determined by ASTM Test Designation D 2049-69. Beyond the foundation support zone, the excavation was backfilled with Zone I, II, or III materials in a manner described in Section 2.5.4.5.

2.5.4.10.3.1 Soil Bearing Capacity

The soil bearing pressures of the Service Water pipes, electrical duct bank, and the diesel generator fuel oil storage tanks are insignificant relative to the soil bearing capacity. The heaviest of these facilities, the fuel oil storage tanks, actually weighs less than an equal volume of compacted backfill soil. For these facilities, the safety factor against a soil bearing failure is extremely high.

For the condensate storage tank, the Zone III backfill material (crushed rock) was estimated to have an angle of internal friction of 40 degrees and a cohesion of zero. These strength parameters are conservative for crushed rock compacted with heavy vibratory equipment. For example, Lambe and Whitman [74] suggest using these values as a minimum for dense sand and gravel mixtures.

Strength properties of the overburden soils were evaluated from the results of triaxial and unconfined compression tests and direct shear tests (Section 2.5.4.2.2). From the results of these tests, the medium dense to very dense granular overburden soils were estimated to have strength parameters equivalent to at least an angle of internal friction of 32 degrees for the range of stresses produced by the condensate storage tank loadings. Beneath the condensate storage tank below elevation 409', an angle of internal friction equal to 29 degrees and a cohesion of zero for the medium dense to very dense natural soils were utilized to evaluate the bearing capacity.

The ultimate bearing capacity of the soil system beneath the condensate storage tank was computed for the most critical condition; i.e., on the basis of the strength of the weakest stratum (the natural soils below elevation 409'). The stresses on the top of the natural soils due to the tank loading were computed using the sixty degree distribution method [75,76]. The ultimate bearing capacity of the natural soils was computed using the standard semi-empirical equation for circular footings [77].

The effect of the ground water level [78] and the limited depth of the bearing stratum [79] were considered.

The ultimate bearing capacity of the natural soils at elevation 409' was calculated to be 65 kips per square foot. For the normal operating condition, the factor of safety at the top of the natural soils was computed to be approximately 45. For the normal operating bearing pressure and the dynamic bearing pressure (earthquake forces), the factor of safety at the top of the natural soils was calculated to be approximately 20. The effect of the eccentric earthquake loading was taken into consideration [80].

2.5.4.10.3.2 Settlement of the Foundations on Soil

The settlement of the Service Water pipes, electrical duct bank, and the diesel generator fuel oil storage tanks due to their own weights will be negligible. However, structure settlements of up to several inches are estimated as a result of the weight of the fill in which these facilities are placed.

The post-construction settlement of the well compacted fill is considered to be negligible. From the results of the consolidation tests performed on saprolites, the time-settlement responses indicated that the settlements will occur almost instantaneously upon the application of the loads. Therefore, post-construction settlements of the underlying saprolites will be negligible. Post-construction settlement of the principally clayey natural soils that directly underlie the fill (see Figures 2.5-80 and 2.5-81) was estimated to be less than 1 inch utilizing Terzaghi's consolidation theory [81].

Total settlement of the condensate storage tank was calculated using 4 independent methods: 1) Terzaghi's consolidation theory, 2) modified empirical method utilizing the results of the Standard Penetration Tests (SPT) and settlement chart given by Terzaghi and Peck [77], 3) Meyerhof's method [82], and 4) a simplified elastic theory [74]. The use of these methods of saprolite soils is described by Barksdale and others [83]. For the consolidation theory and the elastic theory methods, the stresses were computed using the Westergaard Stress Distribution Theory [84]. The consolidation theory utilized the results of the 1 dimensional consolidation tests (Figure 2.5-60). The elastic theory used a value of Young's modulus equal to 2.7×10^4 pounds per square inch that was derived from the results of the geophysical surveys (i.e., the shear modulus values) performed on the in situ site materials (Sections 2.5.4.4.3 and 2.5.4.4.4).

For the condensate tank, the total settlement using the 4 methods was computed to be less than 1/2 inch. Settlement within the Zone III material was estimated to be essentially nil and was neglected. Because the settlement of the saprolites will occur almost instantaneously upon the application of the loads, post-construction (after the tank is water tested) settlements will be negligible. 02-01

To verify the postulated values outlined above, settlement of the condensate storage tank was computed by comparing the elevation of the tank's concrete pad before installation of the tank with the elevation after the tank was completed and filled for a period of 6 months. The measured settlement of the pad and tank for this 2-1/2 year period since its construction has been approximately 0.04 feet (1/2 inch). This verifies the value computed above. No additional settlement is expected.

As shown by Figures 2.5-81 and 2.5-82, the diesel generator fuel oil storage tanks are supported by approximately 20 feet of Zone III fill (graded crushed rock) overlaying undisturbed natural soils, while the condensate storage tank is supported by 21-30 feet of Zone III fill over the undisturbed natural materials. Since the condensate storage tank has experienced minimal settlement as computed and verified, the diesel generator fuel oil storage tanks are likewise expected to exhibit a similar degree of settlement. Additionally, Figure 9.5-2 shows that couplings are provided in the transfer pump suction lines which could accommodate greater settlement than the minimal settlement expected. Quarterly visual inspections will be made of the ground surface in the area of the diesel generator fuel oil storage tanks for evidence indicating settlement of the tanks. If any evidence of settlement is observed, immediate investigation of the matter will be initiated.

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2.5.4.10.4 Caisson Foundations

The Seismic Category 1 structures supported on caissons embedded in rock are the Diesel Generator, Fuel Handling, and Intermediate Buildings. The caissons, 36 and 48 inches in diameter, are designed to be supported by end bearing and/or shaft resistance (skin friction) in the underlying rock. The allowable end bearing and shaft resistance for the various rock types as described in Section 2.5.4.4.1 are presented in Table 2.5-23. The caissons are designed for these allowable values with the exception that the values for the Number 2 rock are used for both the Number 1 and Number 2 rock. For the caissons designed for a combination of end bearing and shaft resistance, the full value for 1 type of resistance plus no more than 2/3 of the other resistance as indicated in Table 2.5-23 are used.

Caissons are socketed a minimum of 1 foot into Number 1 and 2 rock. The total depth of penetration of each rock socket was determined and established by the resident foundation engineer during his inspection of the rock sockets. The depths of the rock sockets are in accordance with the allowable end bearing and shaft resistance values relative to the compressional load, uplift load, and lateral resistance requirements of the individual caisson.

For the construction of each caisson, a temporary casing was installed to rock. After the casing was seated on rock, the socket was drilled with a roller bit. The foundation rock exposed in the caisson sockets was inspected by the resident foundation engineer in evaluating compliance with design requirements. Probe holes having a minimum depth of at least 2 times the caisson diameter were drilled beneath the bottom of each socket to investigate the competency of the bearing rock.

Immediately prior to concrete placement, each socket was inspected by the resident foundation engineer to insure that it was properly cleaned. Water inflow measurements were taken to determine the method of placement of concrete.

When casing was left in place, the annular space between the casing and the ground was grouted in accordance with applicable procedures.

As indicated in Section 2.5.4.5.1, the caissons were installed prior to completion of the backfilling operations. These caissons were extended to the cut-off elevations utilizing circular metal forms for caisson construction. As the caissons were constructed to the cut-off elevations, the backfilling was completed to foundation grade.

During the installation of the caissons, surveillance was provided by the resident foundation engineer and a SCE&G Quality Control inspector.

2.5.4.10.4.1 Caisson Bearing Capacity

The "theoretical" ultimate and static allowable bearing capacities of the rock relative to the Rock Property Indicator numbers (Section 2.5.4.4.1) are presented in Section 2.5.4.10.2.1. These bearing capacities are applicable for the end bearing of caissons. For short term earthquake loadings, the allowable values were increased. The static and dynamic allowable end bearing values for caissons are presented in Table 2.5-23. The safety factors for the allowable earthquake loadings relative to the "theoretical" ultimate bearing values are approximately 10 for the Number 1 and 3 rock, and approximately 7 for the Number 2 rock. The caissons are designed in accordance with the allowable end bearing values presented in Table 2.5-23 with the exception that the allowable end bearing values do not exceed 100 kips per square foot for static loadings and 300 kips per square foot for earthquake loadings. The larger allowable values for the Number 1 rock are not utilized in the design although many of the caissons are founded on Number 1 rock.

The allowable shaft resistance (shear resistance between the caisson and the side of the rock socket sometimes referred to as skin friction) was evaluated for static and short term earthquake loading conditions, the results of which are summarized in Table 2.5-23. These allowable shaft resistance values relative to the allowable end bearing capacities are in accordance with general design practice, which in many cases are very conservative. The caissons are designed in accordance with the allowable shaft resistance values presented in Table 2.5-23. The values for the Number 2 rock were also used for the Number 1 rock.

Some caissons are designed using the combined allowable end bearing and shaft resistance values. For these cases, the full value for one type of resistance plus no more than 2/3 of the other resistance are utilized in the design as indicated in Table 2.5-23.

Most of the caissons at the nuclear plant site are founded on Number 1 or Number 2 rock. Only a few caissons are founded directly on Number 3 rock.

2.5.4.10.4.2 Settlement of Caissons

Settlements of the caissons were computed using the elastic theory. Values for Young's modulus presented in Section 2.5.4.10.2.2 were utilized in the caisson settlement computations. Caissons with end bearing pressures not exceeding 100 kips per square foot and founded on Number 1 and/or Number 2 rock (the design criteria) were estimated to settle 1/4 inch or less. Settlements are due to the elastic compression of the underlying rock mass and occur immediately as the load is applied.

2.5.4.10.5 Lateral Earth Pressures

Backfill placed against the rigid foundation walls of Seismic Category 1 structures consisted of Zone I, II and III materials, compacted in accordance with the criteria discussed in Section 2.5.4.5.2. No in situ soils abutted Seismic Category 1 foundation walls.

The maximum lateral pressures exerted against the rigid foundation walls by the backfill materials are expected to result from the "at rest" lateral earth pressure conditions under the dynamic Safe Shutdown Earthquake (SSE) loadings. However, the rigid Seismic Category 1 foundation walls were designed for lateral pressures using a more conservative approach, the Mononobe-Okabe Seismic Coefficient Analysis [85,86] as modified by Kapila [87,88]. This analysis considers the passive earth pressure condition under dynamic earthquake loadings.

For the SSE, the maximum horizontal acceleration at the ground surface is 0.25g; the corresponding vertical acceleration is 2/3 of the horizontal (Section 2.5.2). For the backfill materials, average design parameters of 35 degrees for the angle of internal friction, 0 for cohesion, and 120 pounds per cubic foot for the unit soil weight were selected for the analysis. These soil parameters are conservative for the passive earth pressure analysis relative to the "at rest" earth pressure conditions that are expected to occur.

Using the modified Mononobe-Okabe analysis and the above parameters, the computer lateral earth pressures result in an equivalent fluid pressure equal to 290 pounds per cubic foot above the water level and 230 pounds per cubic foot below the water level. These values were used for the design of the rigid Seismic Category 1 foundation walls.

Static and dynamic lateral earth pressure distribution diagrams for typical cases are presented on Figures 2.5-90a and 2.5-90b.

2.5.4.10.6 Structures at the West Embankment

The Service Water Pumphouse, Service Water intake structure, and Service Water discharge structure are located at the west embankment of the Service Water Pond, as shown on Figures 2.5-46 and 2.5-47. The appropriate soil parameters used for calculations are presented in Sections 2.5.6.4 and 2.5.6.5.

2.5.4.10.6.1 Bearing Capacity and Stability

The pump house foundation mat is supported on the west embankment at elevation 386'. The ultimate bearing capacity of the west embankment fill for this structure is conservatively computed to be 50 kips per square foot at the end of construction and 40 kips per square foot upon filling of the Service Water Pond. The minimum factor of safety for bearing capacity failure is 6.

Bearing capacity is not applicable for the Service Water intake structure, since the weight of the intake structure is less than the weight of the displaced west embankment fill.

The base slab of the Service Water discharge structure is supported on decomposed rock at elevation 408'. The ultimate bearing capacity for the structure is conservatively calculated to be greater than 90 kips per square foot, resulting in a minimum factor of safety in excess of 15.

The presence of the Service Water Pumphouse and the Service Water intake and discharge structures within the west embankment does not significantly affect the stability of this slope. Detailed analysis of the west embankment slope at the locations of these structures was not considered necessary because the embankment heights at these locations are significantly less than the critical sections analyzed for the north and south dams, as described in Section 2.5.6.5. In addition, the presence of the structures does not significantly alter the stress conditions on potential failure planes.

2.5.4.10.6.2 Settlement

Estimates of Service Water Pumphouse and Service Water intake structure settlement prior to construction were 3 to 4 inches and 1.5 to 2 inches, respectively. During construction, these structures settled more than had been estimated. A special settlement study was then performed for the Service Water Pumphouse and Service Water intake structure. This study is documented in "Service Water Intake Structure Settlement Effects and Related Work," prepared by Gilbert Associates, Inc., and Woodward-Clyde Consultants in December, 1977. Additionally, the Service Water Pumphouse and intake structure will be monitored for settlement twice a year during the operating life of the plant, unless a lesser frequency can be shown to be adequate. As a minimum, Operating License condition 2.C.5 requires the following:

a. At the vicinity of the pumphouse and intake structure, four settlement points capable of monitoring both horizontal and vertical movements shall be established to monitor the embankment movements. 02-01

b. The submerged slope profile of the west embankment over the intake structure shall be established and monitored to detect any unusual movements that may affect the intake structure.

c. The schedule and reporting requirements of the above inspection shall be in accordance with the recommendations stated in Regulatory Guide 1.127.

d. The condition of the intake structure shall be monitored to detect new cracks and changes to the old grouted or ungrouted cracks. Observed changes (length or width) in existing cracks and any new cracks shall be reported to the NRC. The maximum inspection interval for this monitoring of the intake structure is five (5) years. 02-01

e. The condition of the intake structure shall also be monitored as specified in (d) above following any earthquake during which the plant seismic instrumentation indicates that the operating basis earthquake has been exceeded.

Settlement of the Service Water discharge structure, which is founded on decomposed rock, will be negligible.

2.5.4.10.6.3 Lateral Earth Pressures, Static Conditions

Lateral earth pressure diagrams for the Service Water Pumphouse are presented as Figure 2.5-90c. Static lateral earth pressures on the walls of the Service Water Pumphouse were computed for an at rest condition with an earth pressure coefficient of 0.75 for the compacted west embankment fill. For calculation of earth pressures, 122.2 pcf and 125.4 pcf were utilized for moist unit weight and saturated unit weight, respectively. The angle of internal friction used was 29°. The active earth pressure coefficient utilized was 0.35. Earth pressures were computed for the end of construction condition with the pond empty, and for normal operating condition with the Service Water Pond filled to elevation 425'.

Lateral earth pressure diagrams for the Service Water intake structure are presented as Figure 2.5-90d. Static lateral earth pressures on the walls of the Service Water intake structure were computed for an at rest condition with an earth pressure coefficient of 0.75 for the compacted west embankment fill. For calculation of earth pressures, 122.2 pcf and 125.4 pcf were utilized for moist unit weight and saturated unit weight, respectively. Earth pressures were computed for the end of constructure condition with the pond empty, and for the normal operating condition with the Service Water Pond filled to elevation 425'.

Lateral earth pressure diagrams for the Service Water discharge structure are presented as Figure 2.5-90e. At rest and active and passive earth pressure conditions were considered in the design of the service water discharge structure. The at rest earth pressure coefficient used is 0.75. Active and passive earth pressure coefficients were calculated to be 0.45 and 1.60, respectively, taking into consideration the embankment slope. For calculation of earth pressures, 122.2 pcf and 125.4 pcf were utilized for moist unit weight and saturated unit weight, respectively. The angle of internal friction utilized was 29°. Earth pressures were computed for the following conditions:

1. End of construction with the pond empty.

2. Operating condition with the phreatic surface at elevation 425' in the west embankment and the pond level at elevation 417.5'.

3. With the phreatic surface at elevation 425' in the west embankment and pond level at elevation 415' for the postulated loss of the Monticello Reservoir.

2.5.4.10.6.4 Lateral Earth Pressures, Dynamic Conditions

For dynamic loading, lateral earth pressures on the Service Water Pumphouse were computed using the FLUSH finite element program. Lateral earth pressures on the Service Water intake and discharge structures were computed using the Seed and Whitman method [88] and the Mononobe-Okabe approach [85,86], respectively. Dynamic lateral earth pressure distribution diagrams for these structures are presented as Figures 2.5-90c through 2.5-90e.

2.5.4.11 Criteria and Design Methods

The criteria for foundation support of the Seismic Category 1 nuclear plant structures are based on the properties of the underlying materials (Section 2.5.4.2) and the soil and rock characteristics (Section 2.5.4.4). The criteria for seismic design are based on the information presented in Sections 2.5.2.10 and 2.5.2.11.

The design criteria and methods of establishing the design criteria along with computed safety factors, design considerations, and conservatisms are presented in Sections 2.5.4.7, 2.5.4.8, and 2.5.4.10. The seismic design methods are presented in Section 3.7.2.1.

2.5.4.12 Techniques to Improve Subsurface Conditions

Except for the excavation of unsuitable rock during the construction of the rock supported mat foundations (Sections 2.5.4.5.1 and 2.5.4.10.2) and grouting of the annular around the caissons between the casing and the ground (Section 2.5.4.10.4), no measures to improve foundations such as grouting, vibroflotation, dental work, rock bolting, and anchors were necessary.

2.5.4.13 Subsurface Instrumentation

For rock excavation, blasting was generally required. To monitor the effects on foundations for Seismic Category 1 structures, blast monitoring during rock excavation was performed. When blasting was required, the peak particle velocity was measured and did not exceed 2 inches per second at the locations of Seismic Category 1 structures. The peak particle velocity did not exceed 4 inches per second at the Service Water Pond embankments.

Prior to the start of blasting, a series of test blasts were made to develop a curve of maximum predicted particle velocity versus the distance from the blast to the nearest structure. Based on this curve, blasting was set into 2 categories: shots which required monitoring, and shots which did not require monitoring. If the predicted maximum particle velocity was less than 1/4 of the maximum permitted particle velocity, monitoring was not required. All other shots were monitored.

When monitoring was required, the nearest Seismic Category 1 structure location was monitored using a Sprengnether 3 axis seismograph, which measures vertical, transverse, and longitudinal components of particle velocity. At no time during construction was the maximum permitted particle velocity exceeded at any structure location.

2.5.4.14 Construction Notes

There were no significant construction problems. 02-01

2.5.4.15 Seismicity Near Monticello Reservoir

An increase in seismicity near Monticello Reservoir was first observed during the last week of December, 1977, and appears to be related to the filling of the reservoir. The Applicant has installed a Microseismic Monitoring Network in the area as described in revised Section 2.5.2.6.

Applicant began the initial filling of Monticello Reservoir on December 3, 1977, achieving full pond elevation on February 8, 1978. Pronounced seismicity was observed during the last week of December, 1977, with the maximum number of occurrences of over 100 events being recorded on February 22, 1978. During the peak period (February 10 - March 5) there were approximately 30 events with a magnitude greater than 2.0. The seismicity has shown a marked decrease since March 6, 1978, and has been at a level of from 15 to 20 events per day since then. The maximum magnitude for a single event to date was approximately 2.8.

From studies being conducted by the University of South Carolina thus far, it appears that the zone of epicenters is expanding with time. The seismic activity in February, 1978, spread over approximately 60 sq. km as compared with the areal extent observed during the second half of January, 1978, which was an area of about 30 sq. km. The earthquakes have been found to be shallow with a depth of less than 4 km. The seismic activity appears to be located in 2 clusters. The first is in the vicinity of Applicant's Microseismic Site 1 and trends east-west. The second is about 2 km south of the Virgil C. Summer Nuclear Station and does not appear to show any marked trend.

Applicant secured the professional services of Dr. Gil A. Bollinger, a nationally known seismologist, who established a program and method of analysis of data obtained form the microseismic network. Calculation of focal mechanisms was not included in his recommendations. However, from discussions with Dr. Pradeep Talwani, it is understood that the University of South Carolina plans to obtain focal mechanisms as part of its overall research of the phenomena occurring within the region of Monticello Reservoir.

At this time geologic association with the observed seismic activity is not apparent. There is no evidence that the reservoir impoundment will reactivate old faults at the hypocentral depths of the recent earthquakes. The general decrease in activity and lessening magnitude of events suggests against it.

Based on the seismic activity observed thus far, it is not expected that the reservoir impoundment will trigger events larger than those already recorded, comparing Monticello Reservoir's size and depth with other reservoirs which have experienced similar earthquake activity.

Among the approximately 11,000 reservoirs worldwide, 76 are reported to have had a spatial or temporal relationship between impoundment of the reservoir and seismic activity (Woodward-Clyde Consultants, Reference [138]). Within the worldwide population of reservoirs, approximately 10,700 are shallow, i.e. having maximum water depths less than 92 m (300 feet). Among these 10,700 shallow reservoirs, induced seismicity has occurred at 26 reservoirs (Woodward-Clyde Consultants, Reference [138]).

Monticello Reservoir is a shallow reservoir with a maximum water depth of 49m (160 feet). Subsequent to impoundment of the reservoir in December, 1977, shallow microearthquakes occurred beneath the reservoir. The seismic activity consisted of events of $M < 3.0$ with focal depths of approximately 0.5 km (1600 feet) or less, based on recent hypocenter determinations by Talwani [137] .

The nature of the seismic activity at Monticello Reservoir (primarily the shallow hypocenters) and the geologic conditions at the reservoir (the absence of faults with late Cenozoic displacement - Section 2.5.1.2) place constraints on the size of the largest event which can be expected to occur at the reservoir. Large earthquakes ($M \geq 5$) are not expected to occur at focal depths of less than 0.5 km (1600 feet) because the materials at these depths would not be expected to sustain the strain accumulation necessary for large events. The strain probably would be released in small events as the rock reached the limit of its ability to accumulate strain. Events for which adequate hypocentral data are available support this concept. Examples include the Bear Valley, California event of $M = 5.0$ in 1972 which had a focal depth of 5 km (3 miles) for the main event (Ellsworth, Reference [134]); and the 1975 Oroville, California event of $M = 5.9$ which had a focal depth of approximately 7 km (4 miles) (Morrison and others, Reference [136]). Where data are available, the larger events (those of magnitude greater than 4.5 to 5.0) occur at focal depths substantially in excess of 0.5 km (1600 feet). Conversely, examples of seismic activity with well defined focal depths of 1km (3800 feet) or less are those of $M \leq 3.0$, e.g. Blue Mountain Lake, New York (Aggarwal and others, Reference [133]).

The shallow focal depth of the seismicity at Monticello Reservoir also serves to constrain the failure plane along which strain release occurs, based on considerations of seismic moment and geometry. This constraint limits the size event expected to occur. Assuming a stress drop of between 10 and 100 bars, an earthquake of approximately magnitude 5.3 would require a failure plane of approximately 10 km^2 (Kanamori and Anderson, Reference [135]). Therefore, the focal depths at Monticello of 0.5 km (1600 feet) would infer a failure with an aspect (height to width) ratio of 40:1. Such a ratio is not credible, unless total crustal rupture occurs along a major structural discontinuity such as that which probably occurred during the 1906 San Francisco event and the 1976 Guatemala earthquake. Typically, an aspect ratio of 2:1 or 3:1 would be expected. For example, the Bear Valley event of 1972 had a rupture plane (as defined by the aftershock zone) approximately 10 km (6 miles) long and 5 to 10 km (3 to 6 miles) deep or an aspect ratio of 2:1.

These lines of reasoning suggest that large events will not occur at Monticello Reservoir. This reasoning is supported by studies made at faulting at reservoirs where large events have occurred.

Of the 76 reported cases of reservoir induced seismicity, 10 have had magnitudes of $M \geq 5.0$ (Table 2.5-68). Eight (8) of these 10 reservoirs have been studied in sufficient detail to determine if faults with late Cenozoic displacement are present within the hydrologic regime of the reservoir. All 8 of these reservoirs have faults that have had displacement within the present tectonic regime and show evidence of continuing late Cenozoic movement. These data suggest that reservoir induced earthquakes of $M \geq 5$ have occurred along faults with late Cenozoic displacement. No faults with late Cenozoic displacement have been reported at Monticello Reservoir.

2.5.5 STABILITY OF SLOPES

The 3 dams and west embankment, constructed to impound the Service Water Pond, are Seismic Category 1 structures. The stability of these embankment slopes and natural slopes in the vicinity of the Service Water Pond is discussed in detail in Section 2.5.6. There are no other natural or man made slopes the failure of which would prevent safe shutdown of the plant or which pose a hazard to the plant.

2.5.5.1 Slope Characteristics

Slope characteristics are discussed in Sections 2.5.6.1 and 2.5.6.2.

2.5.5.2 Design Criteria and Analysis

Design criteria and analyses are discussed in Section 2.5.6.5.

2.5.5.3 Logs of Borings

See Section 2.5.6.2 concerning logs of borings.

2.5.5.4 Compacted Fill

Compacted fill is discussed in Section 2.5.6.4.
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2.5.6 EMBANKMENTS AND DAMS

2.5.6.1 General

The Service Water Pond is a safety class impoundment constructed adjacent to Monticello Reservoir to supply water for the Service Water System under normal and emergency conditions. The Service Water Pond site was selected to take advantage of natural topographic features immediately adjacent to the nuclear plant site. The Service Water Pond and its interconnecting pipe to Monticello Reservoir are designed to satisfy the intent of Regulatory Guide 1.27 (see Appendix 3A), as discussed in detail in Section 9.2.5. Upon a postulated loss of Monticello Reservoir coincident with the interconnectiong pipe isolation valve being open, the Service Water Pond retains water 00-01 at elevation 415'. The volume of water remaining in the Service Water Pond is sufficient to assure safe shutdown of the unit and continued cooling for a minimum of 30 days, as discussed in Sections 9.2.5 and 2.5.6.6. The constructed dams and west embankment that impound the Service Water Pond are Seismic Category 1 earth structures designed to be stable under static and dynamic conditions, and for maximum wave runup from Monticello Reservoir.

The Service Water Pond is formed by impounding a segment of a tributary to Frees Creek. Frees Creek is impounded by dams to form Monticello Reservoir. The Service Water Pond impoundment is formed by the North Dam, East Dam, South Dam and West Embankment as shown by Figure 2.5-91. The mean water level within Monticello Reservoir and Service Water Pond fluctuates between elevations 420.5' and 425'. For the Service Water Pond, the operating pool level during emergency drawdown is at elevation 418'. The low water level, elevation 415', would be attained for the postulated loss of Monticello Reservoir. Following a postulated loss of the reservoir, water would be retained on the reservoir side of the South Dam at approximately elevation 404', the 98-01 discharge canal bottom elevation. The Service Water Pond is serviced by intake and discharge structures located at the West Embankment.

The Service Water Pond is hydraulically connected with Monticello Reservoir by the interconnecting pipe that extends from the Service Water intake structure to the Circulating Water intake structure. This pipe allows Monticello Reservoir to supply makeup water to the Service Water Pond by opening a normally closed isolation valve. 00-01 In the event of loss of Monticello Reservoir coincident with the isolation valve being open, the invert elevation at the high point of the interconnecting pipe limits the drop in Service Water Pond level to elevation 415'.

The 3 dams and the West Embankment are homogeneous earth structures. The slopes on the pond side are constructed at 3 to 1 (horizontal to vertical).

The reservoir sides of the dams are constructed at 3.5 to 1. The plant side of the West Embankment joins the plant yard fill along a boundary slope beneath the plant yard at 1 to 1. Natural slopes between the dams and at the reservoir bottom have inclinations ranging from 3 to 1 to 6 to 1, or flatter. Other geometric aspects are listed in Table 2.5-24.

The West Embankment merges with the west abutments of the North and South Dams. Its crest elevation of 435' is less than for the dams, since the elevation of 438' for the dams was selected to be consistent with the maximum wave runup elevation of 436.6' for Monticello Reservoir as discussed in Section 2.4.3.6.

Conservative analyses of the 3 dams and the West Embankment demonstrate that these earth structures have an adequate safety factor against failure under both the SSE motions and under sudden drawdown resulting from a postulated loss of Monticello Reservoir, the most critical static loading condition. Dynamic response analyses using finite element techniques, together with cyclic shear testing of representative samples of the embankment and foundation materials, indicate that the lowest factors of safety against overstressing at any point within the dams and foundations are at least 1.1. The minimum static safety factor realized, assuming instantaneous drawdown conditions of the reservoir-side slope, was found to be at least 1.2. The stability of all natural slopes whose failure might endanger the integrity of the Service Water Pond was analyzed. All such slopes were found to be stable under the design loading conditions.

Graded horizontal drainage blankets and/or toe drains are built within the 3 dams to control seepage and piezometric pressures in the event of a postulated loss of Monticello Reservoir. Zoned riprap is provided on the reservoir and pond sides of the constructed slopes to protect against wave action. A grout curtain was constructed along the centerline of the North Dam and a clay blanket was constructed on the Service Water Pond bottom adjacent to the South Dam to minimize seepage losses from the Service Water Pond following a postulated loss of Monticello Reservoir.

Flood protection for the nuclear plant site is discussed in Section 2.4.

2.5.6.2 Exploration

2.5.6.2.1 General

As shown in Figure 2.5-91, the area of the Service Water Pond is situated between 2 ridges which merge to the southeast of the South Dam. Prior to construction, the floor of the "V" shaped valley between these ridges generally sloped toward the northwest, emptying into Frees Creek north of the Service Water Pond site. The topographic low of the valley was about elevation 333' and occurred at the northern limit of the North Dam. A topographic low (elevation 418') also existed as a saddle on the eastern ridge at the location of the East Dam. At the South Dam, the topographic low of the valley (at the dam centerline) was approximately elevation 370'. The original slopes of the valley containing the Service Water Pond were generally inclined at slopes of between 6 to 1 and 3 to 1 and converged to a relatively narrow valley bottom in the vicinity of the North Dam. The Service Water Pond site was well drained with the exception of a portion of the valley bottom area.

The main drainage feature of the site was a small stream that flowed through the valley from southeast to northwest. This stream was a tributary of Frees Creek and was fed by small intermittent springs, sidehill seeps, and surface runoff. Erosion gullies were present, usually in areas of surface runoff concentration.

Subsurface explorations were made along the valley bottom and sides, with exploration effort concentrated at the locations of the Service Water Pond embankments. Explorations were made beyond the Service Water Pond at locations of potential borrow areas. The explorations were performed to identify, delineate, and characterize physical parameters of the subsurface strata and to collect samples for laboratory testing. The exploration methods included test borings, auger borings, test pits, and probe soundings. Supplementing the subsurface exploration, in situ permeability tests were made in selected borings to investigate the permeability of the subsoils and rock. Cross-hole seismic surveys were conducted to investigate the elastic wave propagation properties of the subsurface materials.

Test borings and auger borings were utilized for the investigation of potential borrow sources. It was originally intended that onsite materials would be used for the Service Water Pond construction. These materials were to have been obtained from general site grading and from excavation for the discharge canal. However, nearly all of these materials were subsequently utilized for other purposes, necessitating the use of offsite borrow. Several potential offsite borrow sources were investigated, with those designated as Borrow Source F and Borrow Source G chosen for use. The locations of these 2 borrow sources with respect to the site area are shown in Figure 2.5-92.

2.5.6.2.2 Exploration and In Situ Testing Methods

The test borings were usually advanced through the soil overburden by rotary drilling methods using a 3.0 inch diameter "fishtail" bit and recirculating water to remove the soil cuttings from the bore hole. Where necessary, 3 or 4 inch diameter steel casing was inserted to maintain an open bore hole through the overburden. Upon refusal of the "fishtail" bit, a tri-cone roller rock bit was used to advance the boring through 02-01
decomposed rock zones. Below the tri-cone rock bit refusal level, diamond bit rock coring procedures were utilized.

In nearly all of the test borings, samples were taken at 3 to 5 foot intervals, by the Standard Penetration Resistance (SPR) test method, ASTM D 1586-67. These samples were visually classified and were retained for physical property testing in the laboratory.

Relatively undisturbed samples of the soil and decomposed rock were obtained from test borings using 3 inch diameter, thin wall Shelby tubes in accordance with ASTM D 1587-67. In the softer soils, the Shelby tubes were pushed into the soils using the hydraulic system of the drilling rig. In the decomposed rock horizon, the thin wall tubes were advanced by a Denison type (Pitcher) sampler, as described by Terzaghi and Peck [89].

Rock cores were obtained using either a standard NX double tube core barrel or a wire line NX double tube core barrel. The standard barrel retrieves a 2-1/8 inch diameter core, while the latter secures a core 1-1/8 inches in diameter. The wire line equipment was used on 5 deep borings.

Surface conditions for potential borrow areas were investigated by means of auger borings in addition to test borings. Six (6) inch diameter bucket augers and continuous flight, open augers were used to continuously sample the potential borrow materials. Bag samples weighing approximately 60 pounds each were generally collected for each 5 foot increment of depth for laboratory testing purposes.

Eight (8) test pits were excavated using a small, tractor mounted backhoe. These test pits were approximately 10 feet long, 3 feet wide and 10 feet deep.

In the valley bottom of the North Dam, a depth survey was made of the soft alluvium deposit. This was accomplished using a 10.5 foot long, smooth steel rod, 0.25 inches in diameter. When this rod was pushed by hand into the valley floor, a significant increase in resistance was noted when the bottom of the alluvium was reached. Using this probe with survey stadia control, an alluvium profile was established throughout the North Dam embankment foundation area. The information obtained from this survey correlated well with the borings and general geologic information and was used for estimating the quantity of unsuitable materials to be removed during foundation preparation (see Section 2.5.6.3).

Field permeability tests were made in borings by inflow methods. Constant head tests [90] and falling head tests [91] were made through open casing in soils. Constant head tests were made in intact rock, utilizing single or double packers to isolate test sections in the boreholes. Constant head tests in soils were usually made at a pressure of 5 psig and in intact rock at 20 to 30 psig.

Cross-hole seismic surveys were made at the site of each of the 3 dams to determine compressional (P) and shear (S) wave velocities in the soil and rock layers. These surveys consisted of recording the time of travel for stress waves propagated from a small explosive detonation (shot) to a recording (detector) point located in adjacent bore holes.

The depth and spacing of the shot and detector holes were selected to explore wave transmission properties of the materials encountered by the subsurface exploration. The equipment utilized in the cross-hole survey included multi-channel Electrotech Seismograph used together with HSJ-LP3D Omni-Directional Vibration Detectors.

An additional cross-hole seismic survey was conducted in the South Dam foundation, at locations shown in Figure 2.5-93, using a down-hole hammer that imparts a vertically polarized shear wave through the hammer assembly which is expanded against the borehole wall. To enhance identification of the shear wave arrivals, the impulse technique that was used reversed the polarity of the shear wave without reversing the P-wave polarity. The cross-hole measurement technique used is described by Mirafuente [92]. Results of the survey are summarized in Figures 2.5-94 and 2.5-95. A discussion of the shear wave velocities measured by the 2 different methods is presented in Section 2.5.6.4.

2.5.6.2.3 Extent of Subsurface Exploration

North Dam investigations made for earlier studies included 33 test borings, permeability testing in 14 borings, a cross-hole seismic survey, and probing for alluvium. During construction, 4 additional confirmatory borings were drilled and a geologic map of exposed subsurface materials was developed (see Section 2.5.6.2.4.6). Additional permeability testing was conducted during the installation of the North Dam grout curtain.

South Dam investigations made for earlier studies consisted of 21 test borings, 5 test pits, permeability tests, and cross-hole seismic surveys. The 5 test pits were made to investigate the condition and extent of surficial colluvium. Permeability tests were conducted in 5 borings, including SD-5 which was cored to a depth of 146 feet. During construction, a geologic map of exposed subsurface materials was developed, as discussed in Section 2.5.6.2.4.6.

East Dam investigations made for earlier studies included 6 test borings, permeability testing in 1 boring and cross-hole seismic survey. Fourteen (14) test borings made along the West Embankment for earlier studies were supplemented by 3 test pits and 7 additional borings.

For earlier studies, 7 test borings and 24 auger borings were drilled for borrow exploration in the areas of planned excavation for the discharge canal and general site development grading. The purpose of the borings was to investigate materials at these locations for use as borrow in constructing the embankments at the Service Water Pond. These soils were used to construct the West Embankment up to elevation 386'. For the remainder of the West Embankment, and for the 3 dams, offsite Borrow Sources F and G were used. Borrow Sources F and G were investigated by a total of 27 test borings, 4 auger borings, and 8 test pits.

Logs of test borings and test pits are presented in Appendix 2F. The first sheet of Appendix 2F presents a key to symbols and terms used in the logs. Prefixes for boring designations are keyed to the areas investigated as follows:

Boring No. Prefix	Area of Investigation
ND, RND	North Dam
SD	South Dam
ED	East Dam
WD, WE, RWD	West Embankment
SS	South Slopes
C	Discharge Canal
F	Offsite Borrow Source F
TBG	Offsite Borrow Source G

02-01

Test Pit No. Prefix	Area of Investigation
TP-S	Test Pit Excavations at South Dam
TP-G	Test Pit Excavations at Borrow Source G
TPW	Test Pit Excavations at West Embankment

02-01

Borings drilled to study potential borrow materials from general site grading (Prefix "A") are not included since only a relatively small amount of these materials were used (below elevation 386.0' within the West Embankment). The as-built properties of these materials are documented in Section 2.5.6.4.

The results of the initial (explosive) seismic survey are presented in Table 2.5-25 which summarizes the horizontal and vertical locations of the shot and recording stations, as well as the P and S wave measurements. An interpretation of the results of the cross-hole seismic survey is included as Table 2.5-26. This table relates the measured seismic velocities to the subsurface horizons encountered at the site. The shear modulus (G), Young's elastic modulus (E), and Poisson's ratio (μ) computed from pertinent P and S wave velocities are also summarized in Table 2.5-26. The results of the additional (down-hole hammer) seismic survey are presented in Section 2.5.6.4.1. The results of the field permeability testing are presented in Table 2.5-27.

2.5.6.2.4 Subsurface Materials

Overburden materials in the Service Water Pond area are typical of those found in the southern Piedmont Physiographic Province where in situ weathering of the parent rocks has produced a deep weathering profile, locally overlain by transported soils. Although stratification irregularities are characteristic of a weathering profile developed over diverse parent materials, the subsurface materials have been generalized into 4 horizons overlying the intact rock, as shown in Figures 2.5-96 through 2.5-103. These horizons are described in Sections 2.5.6.2.4.1 through 2.5.6.2.4.4, along with a discussion of their distribution within the area of study. Laboratory test results for the horizons are discussed in detail in Section 2.5.6.4.

2.5.6.2.4.1 Transported Soil Deposits

Materials derived from transportation by stream action (alluvial deposits) or by mass wasting from high to low elevations (colluvial deposits) were found to have an erratic and limited distribution within the area of study, being primarily limited to lower elevations. Alluvial or colluvial soils were removed where encountered at locations of the Service Water Pond embankments.

The alluvium was usually identified as loose fine sandy silt (OL/ML) to soft sandy clays (CL). The distribution of the alluvium within the embankment areas was limited to the North Dam and a small portion of the West Embankment. The thickness of the alluvial deposits, as determined from borings and probes, ranged from a few feet up to approximately 15 feet as shown by Figures 2.5-96 and 2.5-97 and up to 21 feet as determined during excavation and removal operations.

Typical colluvial deposits were identified as red-brown to gray-brown micaceous sandy silty clay (CL) and clayey silty sand/sandy silt (SM/ML) with standard penetration resistances typically ranging from 13 to 35 blows/foot. As shown by Figures 2.5-98 and 2.5-99, these firm to stiff surficial deposits ranged from a few feet to approximately 25 feet in thickness and were encountered in sizeable quantities only beneath the South Dam.

2.5.6.2.4.2 Residual Soil Horizon

Materials of the residual soil horizon, usually occurring as a surficial deposit, were classified as sandy or silty clays and clayey silts of medium to high plasticity (CL, ML, CH, and MH) which do not contain a readily discernible relic rock structure. Consistent with a penetration resistance ranging from 15 to over 50 blows/foot, the residual soils were found to have a stiff to hard consistency and to be widely distributed throughout the area of study. Residual soils were found to exist in various extents beneath the North, South, and East Dams, and beneath much of the West Embankment area. As shown by Figures 2.5-96 through 2.5-103, the most significant deposits were located beneath the South and East Dam sites and were found to have thicknesses ranging from a few feet to as much as 12.5 and 22 feet at the South and East Dams, respectively.

2.5.6.2.4.3 Saprolite Horizon

Materials which weathered in place from the parent rocks and which had retained a readily discernible relic rock structure were found throughout the entire area of study and were usually identified as a friable silty sand (SM) or sandy and clayey silt (ML) of slight to low plasticity. This saprolite, usually underlying the residual soil horizon, was typically found to become less altered and more dense with depth, with SPR values increasing from about 15 to 30 blows/foot near the base of the horizon. The thickness of the saprolite horizon within the proposed embankment areas, as shown by Figures 2.5-96 through 2.5-103, ranged from a few feet at the North Dam to as much as about 37 feet at the South and East Dams.

2.5.6.2.4.4 Decomposed and Intact Rock

Materials encountered within a transition zone between the soil-like saprolites and the intact, parent rock were identified as a decomposed and fragmented rock containing partially friable and decomposed fragments, some of which disintegrated upon drive sampling into silt and sand-size material. Typically, the decomposed rock was found to be very dense with SPR values in excess of 100 blows/foot. The decomposed rock horizon is characterized by a variable, but often appreciable, thickness and is encountered throughout the area of study. As shown by the typical subsurface cross sections, Figures 2.5-96 through 2.5-103, the thickness of the decomposed and fragmented rock zone ranges from a few feet up to a maximum of over 155 feet at the North Dam.

Intact rock, defined as material which exhibited sizeable diamond core recoveries, was encountered at extremely variable depths, consistent with the differential weathering characteristics of the parent rocks. Core samples recovered from the exploration were usually identified as migmatite of mica gneiss and granodiorite composition, although occasional quartzitic inclusions were encountered. The quality of the intact rock, as judged from RQD values and the pressure testing, was generally rated as fair to good although some jointing and fracturing of core specimens were noted, particularly within the upper portion of the formations. Consistent with the regional geology, the structure of the rocks was found to be extremely complex, and a consistent trend to the attitude of joints, foliations, etc., could not be detected from examination of the rock cores.

2.5.6.2.4.5 Groundwater

Typically, groundwater was encountered only by borings drilled in the valley bottoms and by deep borings extended into the underlying bedrock. In the valley bottoms, groundwater was typically encountered at, or a few feet below, the preconstruction ground surface. At the South Dam, some borings drilled in the valley bottom produced small groundwater flows. Borings drilled on the Service Water Pond natural slopes generally disclosed groundwater within the fractured rock zone at the level where the rock was sufficiently intact to permit rock core recovery. A perched water condition frequently was observed within the more pervious zones of the saprolite as evidenced by seeps and springs on the natural slopes. The residual soil and decomposed rock zones were found to be relatively impervious. Additional information concerning groundwater is presented in Section 2.4.13.

2.5.6.2.4.6 Geologic Mapping of Excavations

The geology of the North Dam excavation is presented in Figures 2.5-29 and 2.5-30. The major rock units in the North Dam excavation are of granitic and migmatite compositions, with the former being predominant. Except for localized areas of hard, relatively unweathered rock and sparse residual soil cover, the North Dam foundation area consists of moderately to highly decomposed rock due to weathering. The excavation contains nondisplaced closed joints, joints which have been subjected to hydrothermal mineralization, fractures that exhibit evidence of minor displacements, and some well developed mineralized fractures along which movement may have occurred. However, positive evidence of displacement along the well developed mineralized fractures was not found.

As discussed in Section 2.5.1.2, the average strike of shear zones in the Reactor Building excavation (Figure 2.5-25) coincides with the strike of the mineralized fractures mapped in the North Dam excavation, indicating that these fractures are probably a northeastward extension of the shear zones mapped in the Reactor Building excavation. X-ray diffraction analysis of samples recovered from mineralized fractures identified laumontite. Also, the general pattern formed by the mineralized fractures at the North Dam is very similar to that observed within the Reactor Building, staging area and Control Building excavations. No evidence was found which would indicate an age younger than that established for the shears in the Reactor Building excavation (minimum 45 ± 5 million years, see Section 2.5.1.2.2.3) nor was evidence found to indicate that the mineralized fractures were not part of the same structural system mapped and studied in the nearby excavations.

The geology of the South Dam excavation is shown by Figure 2.5-104. The excavation exposed mainly saprolite, rock decomposed by weathering and lesser amounts of unweathered rock. Granitic intrusive rocks and migmatite are the major rock units present. The migmatite contains discontinuous blocks of Charlotte Belt metamorphic rocks surrounded by granitic rocks which were intruded 200 to 300 million years ago. Rock joints and fractures are essentially vertical in dip and fairly random in strike. Some joints and fractures are not filled and some are mineralized, notably with laumontite, the mineral dated radiometrically at plant excavations, showing that tectonic faulting at the plant excavations ceased at least 45 million years ago (see Section 2.5.1.2).

2.5.6.3 <u>Foundation and Abutment Treatment</u>

2.5.6.3.1 North Dam

The foundation preparation for the North Dam included the removal of alluvium in the valley bottom, removal of all soft or loose surficial materials from the entire embankment foundation area, control of springs and seeps, and installation of a grout curtain and core trench along the dam centerline. The foundation was prepared mainly in very dense decomposed rock and to a lesser extent in dense saprolite. Visual inspection of these materials indicated that their properties were consistent with those determined in the preconstruction design studies.

Excavation of unsuitable foundation materials commenced June 20, 1975, and the last of the major preparation work was completed on April 12, 1976. In the valley bottom the maximum depth of excavation was 21 feet as compared to the anticipated maximum depth of 15 feet. On the abutments, the depth of stripping required was generally somewhat less than the anticipated maximum depth of 3 feet. The limit of excavation for the North Dam foundation area is shown on Figure 2.5-105.

The foundation preparation progressed from the south toe to the north toe in 5 sections. Each section was inspected and evaluated to determine the need for installing sumps, dry packing of springs with cement, or any other special preparatory work that might be needed.

As each prepared section was approved, fill placement commenced immediately to protect the foundation soils. The date each section of the foundation was approved is listed below:

Section Number	Date Approved
I	October 14, 1975
II	October 24, 1975
III	April 5, 1976
IV	April 6, 1976
V	April 14, 1976

When preparation was complete, and upon placing the initial lifts of embankment soil, the exposed foundation soils were visually estimated to be near the optimum moisture content (ASTM 1557-70, Method A), were free of organic materials and were sufficiently dense to accept construction and compaction traffic without deterioration. Decomposed or fresh rock at foundation level was dried or moistened as necessary to facilitate bonding with embankment fill. All fractures and depressions were cleaned and filled with select fill, or in a few instances, a very limited quantity of broom finished concrete. Flows from springs in the excavation were controlled by installing sumps for the larger flows and dry packing with cement for the smaller flows. The sump locations are shown on Figure 2.5-105. All sumps but 1 were subsequently removed because the springs ceased to flow as the fill height and aerial extent progressed. The only sump left in place at the North Dam is sump number 5, located at the junction of the West Embankment and North Dam. This sump is connected to a French drain extending from the base of the West Embankment fill. A detailed discussion of the French drain and sump installation is presented in Section 2.5.6.3.4.

As shown on Figure 2.5-105, all sumps were excavated at least 3 feet below the surrounding grade. The bottom of each sump was covered with at least 12 inches of Zone 2 filter (see Section 2.5.6.4.3.3) and a vertical 42 inch diameter, perforated, corrugated metal pipe was installed over the bedding material and surrounded with Zone 2 filter material. The riser pipe for sump number 5 was eventually filled with 9 cubic yards of 4,000 psi concrete on April 14, 1976, when the fill reached a depth of about 12 feet over the gravel bedding.

Springs which could be controlled by dry packing had flows of approximately 1/2 gpm or less. These spring areas were prepared by excavation to suitable foundation materials and placement of 1 or 2 sacks of Type II cement over the seep to absorb the flow while the overlying fill was placed. This treatment prevented the fill from being saturated during placement and compaction. Two (2) excavations were made in spring areas after several feet of fill were placed to expose the compacted materials in the immediate area of the seep. In both cases, the embankment was observed to be unaltered and the seep area was dry.

Numerous minor seeps of less than 0.05 gpm were also uncovered. These areas were stripped of softened materials and the select fill placed and compacted immediately, before the seep could cause the embankment material to deteriorate. Once the lower foundation areas were covered with a few feet of compacted fill, no further seepage was encountered.

The preparation of the abutment areas included removal of topsoil and organic material and trimming of the slopes to suitable solid immediately above the level of fill with a motor grader or bulldozer. As each lift was placed, the abutment was benched and the fill was mixed into the abutment foundation to bond the embankment to the natural ground.

In the area where the toe drain was constructed (see Section 2.5.6.4.3.3), most of the foundation consisted of relatively unweathered rock. Consistent with the weathering characteristics of this rock type, many potholes and broader depressions in the rock surface were uncovered and cleaned. In lieu of placing Zone A riprap material directly over the rock in these areas, potholes were filled with Zone 2 filter material to develop a level surface on which to place the Zone A riprap material for the toe drain.

A grout curtain was constructed along the North Dam centerline between Stations 4+00 and 16+75. Along the grout curtain between Stations 7+00 and 12+00, the foundation was excavated to the base of the grout pipes after grouting to attain bonding between the embankment and the foundation. A complete description of the grout certain and core trench excavation is presented in Section 2.5.6.6.

2.5.6.3.2 South Dam

The planned foundation preparation for the South Dam was to include the removal of 11 soft or loose surficial materials from the entire foundation area, which was estimated to be a maximum depth of 3 feet. This stripping of unsuitable surficial soils was expected to expose a foundation of residual materials on the abutments and colluvial soils in the valley bottom. A cutoff trench was to be excavated beneath the South Dam which would extend through the colluvial soils to the very dense decomposed rock. The cutoff trench was to be backfilled with embankment soils.

When preparing the foundation for the South Dam, the colluvial soils were found to be excessively wet and to contain large amounts of organic inclusions. Consequently, all colluvial deposits were removed. This additional excavation resulted in up to 22 feet of colluvial materials being excavated from the South Dam base to reach the underlying residual soils, saprolite soils, and decomposed rock. These are the same types of foundation materials present at the North Dam. The South Dam foundation was prepared as described for the North Dam, wherein the foundation materials attained were at a proper water content, were free of organic materials, and were sufficiently dense to allow proper compaction of the embankment materials without deterioration (see Section 2.5.6.3.1).

Foundation preparation for the South Dam began during the week of February 24, 1976, and was completed on March 2, 1976. The foundation was prepared in 4 sections, progressing from the south toe to the north toe as shown on Figure 2.5-107. The date each section was approved and fill placement commended is listed below:

Section	Date Approved and Fill Commenced
I	February 25, 1976
II	February 28, 1976
III	March 1, 1976
IV	March 2, 1976

With the exception of 1 sump located in the toe drain area, all seeps were controlled by either dry packing with Type II cement or were of such insignificant flow rates that fill was placed directly over the area without adverse affect upon the compacted materials. Only 1 sump was needed at the South Dam. This sump was located within the zoned filter areas. The sump was backfilled with Zone 2 filter material and encased in Zone 1 and 2 filter material to serve as an integral part of the toe drain filter system. Once the lower portions of the foundation were covered with a few feet of fill, no further seepage was encountered. Two (2) exploratory excavations were performed in the fill and each verified the competency of the embankment materials over seepage zones.
Figure 2.5-107 shows the location of the sump, dry packed seeps, and the final contours of the South Dam foundation.

In accordance with the directives of the NRC, the core trench area was excavated and carefully inspected for the presence of springs or seeps. Since no springs or seeps were observed in the core trench area, no grouting was performed.

Along the centerline of the South Dam, between Stations 5+50 and 7+50, the foundation material is relatively fresh rock with small depressions and mineralized fractures. The small depressions were broom cleaned and filled with 3,000 psi concrete. The surface of the concrete was broom finished to provide a roughened bond surface with the overlying select fill.

For the South Dam abutments, surficial loose or organic soils were stripped. As each lift was placed, the abutment was benched and fill was mixed into the abutment foundation to bond the embankment to the natural ground.

2.5.6.3.3 East Dam

The foundation of the East Dam was excavated from 1 to 4 feet into firm to stiff residual soil. Subsequently, the foundation was scarified and mixed with the first lift of embankment materials to provide a suitable transition between the foundation and embankment. A plan showing the limits of excavation for the East Dam is presented as Figure 2.5-108.

Prior to filling the Service Water Pond, a dewatering system at the bottom of the pond area discharged into a concrete lined channel constructed through the south abutment of the East Dam. During foundation preparation for the East Dam, the concrete lining and all disturbed soils were removed and the side slopes were trimmed to about 2 horizontal to 1 vertical slopes in stiff residual soil. Select fill was placed and compacted in this channel and the side slopes were benched to provide a bond between fill and foundation soils.

No groundwater was encountered in the preparation of the East Dam foundation.

2.5.6.3.4 West Embankment

The foundation preparation for the West Embankment included the removal of the surficial soft or loose soils and organic materials, grading of gullies and installation of a French drain and sump system for a portion of the embankment. The foundation was prepared on residual materials as transported soils were removed. Removal of unsuitable materials from the West Embankment foundation began on August 13, 1973. A plan showing the limits of excavation for the West Embankment is shown in Figure 2.5-109. In general, the depth of stripping was in accordance with the 3 foot maximum design depth, except in the valley bottom where thicker organic and saturated soft materials required undercutting up to about 15 feet deep.

A peripheral French drain and sump system was constructed to reduce the moisture content of foundation soils wetted by flow from several seeps and springs, as shown by Figure 2.5-109. The French drain and sump bedding materials consisted of a fine filter material and a coarse drainage material designed to meet conventionally accepted filter criteria [89]. Once the system was in full operation for 2 days, all springs and seeps in the foundation area ceased flowing, permitting placement of fill. Each sump riser pipe in this system was backfilled with 3,000 psi concrete or gravel when the fill depth above the bedding materials exceeded 6 feet.

Discharge from the French drain was at the junction of the West Embankment and North Dam and flowed freely into the North Dam area until foundation preparation commenced in that area. At that time, sump Number 5, shown on Figure 2.5-105, was installed and thereafter collected this water for pumping beyond the Service Water Pond area.

Abutment preparation was identical to the North Dam and was performed by trimming and benching as the fill height increased. Pre-existing erosion gullies were completely excavated and the embankment was benched into undisturbed natural soils below the original bottoms and sides of gullies. Where steep natural slopes existed, benching into the natural slopes was performed as the fill was raised.

2.5.6.4 Embankment

2.5.6.4.1 Properties of Foundation Materials

Laboratory testing was performed to determine the physical and engineering properties of the foundation materials underlying the earth structures and materials comprising the natural valley slopes. The results of these tests are presented in Table 2.5-28 and are summarized in the following sections for the various generalized stratigraphic units encountered within the area of study. Because the alluvial soils encountered by the exploration were limited in extent and were completely excavated from beneath embankment location, only visual classifications of these materials were made and no laboratory testing of these materials was performed.

2.5.6.4.1.1 Physical Properties

The following tests were conducted to determine the physical properties of the foundation materials:

1. Natural water content (ASTM D 2216-66).

2. Specific gravity (ASTM D 854-58).

3. Liquid limit (ASTM D 424-59).

4. Plastic limit (ASTM D 423-66).

5. Grain size distribution (ASTM D 422-63).

In addition to the above tests, unit weight determinations were made on relatively undisturbed Shelby tube and Pitcher samples and all laboratory test samples were visually classified. The physical property test results are presented in Table 2.5-28 according to stratigraphic unit. Grain size distribution curves are shown by Figure 2.5-110.

The colluvial soils were generally identified as red-brown to gray micaceous sandy clayey silts and sandy silty clay (ML and CL). The physical property test results for colluvium are summarized in Table 2.5-29.

Residual soils were identified as materials derived from in situ weathering but which lack discernible relic rock structure. Typically, these materials were classified as red-brown silty clay or clayey silt with high plasticity (CH and MH) to red-brown micaceous fine sandy silty clay or clayey silt with low to medium plasticity (CL and ML). The physical property test results for residual soil are summarized in Table 2.5-30.

Saprolite materials were usually identified as medium dense to very dense sandy clayey silt of low plasticity (ML) or silty medium to fine sand (SM). The results of physical property tests for saprolite materials are summarized in Table 2.5-31.

Decomposed rock was usually identified as very dense, friable to partially friable decomposed and weathered rock which usually was broken into silt, sand, and gravel size fragments during drive sampling. The results of physical property tests on decomposed rock are summarized in Table 2.5-32.

2.5.6.4.1.2 Static Shear Strength

Shear tests applicable to drained and undrained static loading conditions were performed on representative samples of foundation materials. These tests included unconfined compression tests, unconsolidated-undrained (UU) triaxial compression tests and isotropically consolidated, undrained ($\overline{\text{CIU}}$) triaxial compression tests with pore pressure measurements. The results of these tests are presented in Figures 2.5-111 through 2.5-113 and are summarized in Table 2.5-33. 02-01

2.5.6.4.1.3 Static Deformation

The static deformation characteristics of the foundation soils were investigated in the laboratory by oedometer (consolidation) tests on representative samples, using conventional double load increments. The test results are shown by Figure 2.5-114. The compression properties measured in these tests are summarized in Table 2.5-34. Additional consolidation tests were performed at the Service Water Pumphouse as presented in "Service Water Intake Structure Settlement Effects and Related Work," prepared by Gilbert Associates, Inc., and Woodward-Clyde Consultants in December, 1977.

2.5.6.4.1.4 Permeability

Laboratory permeability tests were conducted on samples representative of the various generalized horizons at selected loading stages during the consolidation testing program. The results of these tests are presented in Table 2.5-27, together with the results of the field permeability tests.

2.5.6.4.1.5 Dynamic Shear Strength

The dynamic shear strength characteristics of the foundation materials were investigated by conducting cyclic triaxial shear tests on selected, undisturbed samples of the colluvium and saprolite soils. To conservatively reflect the variation of the properties of these foundation materials, test samples were selected to reflect materials having an SRP not greater than about 15 to 20 blows/foot, a value at the lower bound of the SPR value range measured within the portion of the colluvium and saprolite which were expected to remain after foundation preparation. As discussed in Section 2.5.6.3.2, the colluvial materials tested from the South Dam foundation area were ultimately removed during the foundation treatment.

The cyclic triaxial shear tests were performed in accordance with procedures described by Lee and Seed [93]. The procedures used are briefly described by the following testing sequence: 02-01

1. Sample consolidation under isotropic consolidation pressure.

2. Application of a cyclic deviator stress of constant amplitude under undrained conditions.

3. Determination of the resulting changes in axial strain and in pore water pressure during cyclic loading.

Cyclic tests were usually continued to define a prescribed level of strain; for example, a 10 to 15% single amplitude strain level. All cyclic triaxial tests were performed using Modular Test System (MTS) equipment.

The results of cyclic triaxial tests are presented in Tables 2.5-35 and 2.5-36 and by Figures 2.5-115 and 2.5-116. As the effect of the test method is likely to cause specimens to develop failure strains at stress levels lower than those which would be realized under corresponding field conditions, adjustment of the laboratory test results is required to simulate field conditions. The adjustment factors were applied to the laboratory data as recommended by Peacock and Seed [94]. A summary of the laboratory strength parameters, the correction factors used and the resulting strength parameters applicable to the in situ soils (under field loading conditions) are presented in Table 2.5-37.

At the conclusion of the cyclic triaxial tests, classification tests were performed on the samples. These tests consisted of sieve analyses and liquid and plastic limit determinations. The results of these classification tests are presented by Figure 2.5-117.

2.5.6.4.1.6 Dynamic Response

Dynamic moduli (G) and damping factors (D) suitable for analysis of ground motions under earthquake loading conditions were derived for the major subsurface horizons from the results of field cross-hole seismic surveys and laboratory cyclic triaxial tests conducted on representative undisturbed samples.

The dynamic shear moduli at very low strain levels (G_{max}) of the foundation materials, including colluvium, saprolite, decomposed rock and intact rock, were derived from shear wave velocities obtained from cross-hole (seismic) wave propagation tests. As discussed in Section 2.5.6.2.2, 2 separate cross-hole seismic surveys were conducted, 1 using a small explosive detonation to impart the dynamic stress waves and the other, a down-hole hammer that imparts a vertically polarized shear wave. The measured shear wave velocities determined by the explosive detonation method, as listed in Table 2.5-25, indicated the range of shear wave velocities (V_s) and corresponding maximum shear moduli (G_{max}) listed in Table 2.5-38 for the foundation materials.

By comparison, the results of the cross-hold seismic survey using the vertically polarized down-hole hammer, presented by Figures 2.5-94 and 2.5-95, indicate a shear wave velocity range of between 1,200 and 3,400 ft/sec for the decomposed rock zone. The corresponding range of G_{max} was interpreted to be 41.2 and 336.4 ksi. Accordingly, the down-hole hammer cross-hole seismic survey method confirms the maximum shear modulus to be of the same order or greater than that which was determined by the explosive detonation technique.

Soil moduli and damping factors suitable for the dynamic response analyses were also obtained from cyclic triaxial shear testing, described by Seed and Idriss [95] . These results, which are applicable to a higher range of shear strain, were used to confirm the validity of the relationship between shear strain versus shear modulus and damping factor derived from cyclic torsion and field seismic tests. The variations of damping and modulus values used in the response analyses are shown by Figure 2.5-118. The K_2 parameter used to express the shear modulus versus strain relationship for each element within the finite element mesh selected to correspond to the least dense (lowest velocity) materials is shown by Figure 2.5-119. Comparison of the shear modulus and damping values obtained from the testing program with the data published for different materials indicates that the response of the saprolite and colluvium compares favorably with that of a dense sand as reported by Seed and Idriss [95].

Sonic velocity tests to determine the compressional (P) and shear (S) wave velocities of representative intact rock specimens were also conducted in the laboratory. The results of the laboratory measurements, together with the interpreted "elastic" modulus and Poisson ratio values, are summarized in Table 2.5-39.

2.5.6.4.2 Properties of Embankment Borrow (Select Fill) Materials

Original design properties for the Service Water Pond embankments were determined from laboratory tests on soil samples obtained from proposed onsite borrow (select fill) sources. As described in Section 2.5.6.2.1, these onsite materials were not used, except within the West Embankment below elevation 386.0'. As presented in the following sections, tests were subsequently conducted on soil samples from the borrow sources actually used, Borrow Sources F and G. These test results are summarized in Table 2.5-40. The soil parameters obtained were subsequently verified by laboratory tests on undisturbed block samples removed from the embankments during construction, as described in Section 2.5.6.4.6. Comparisons of the original onsite borrow material design parameters with those of the offsite borrow material and the verified as-built embankment soil properties are presented in Sections 2.5.6.5 and 2.5.6.6.

2.5.6.4.2.1 Physical Properties

The physical properties of the offsite borrow materials were determined in the same manner as described in Section 2.5.6.4.1.1, except that unit weight determinations were not made. The near-surface borrow materials are classified as residual soil and the deeper materials, as saprolite.

The physical properties of the borrow materials, differentiated as residual soil and saprolite, are presented in Table 2.5-41. Grain size distribution curves are presented by Figure 2.5-120.

2.5.6.4.2.2 Compaction Properties

The compaction characteristics of the potential borrow materials were studied by means of the modified compaction test (ASTM D 1557-70). Summary plots of these compaction tests are presented by Figures 2.5-121 and 2.5-122 for Borrow Sources F and G, respectively.

2.5.6.4.2.3 Static Shear Strength

Unconsolidated-undrained (UU) and isotropically consolidated, undrained ($\overline{CIU}$) triaxial 02-01
tests were performed on compacted borrow materials. The borrow materials were compacted to approximately 90% of the maximum modified dry density (ASTM D 1557-70) at moisture contents approximately 3 percentage points about optimum. The $\overline{CIU}$ test samples were sheared subsequent to saturation. The static shear 02-01
strength test results are presented by Figures 2.5-123 (UU tests) and 2.5-124 ($\overline{CIU}$ tests) and are summarized in Table 2.5-42. Additional strength tests at higher moisture contents are described in Section 2.5.6.4.2.8.

2.5.6.4.2.4 Static Deformation

To investigate the compressibility of the borrow materials, oedometer (1 dimensional consolidation) tests were performed on compacted samples using conventional double load increments. The test results are presented in a summary plot showing axial strain versus pressure, Figure 2.5-125.

2.5.6.4.2.5 Permeability

The permeability of the compacted borrow materials was determined during the oedometer tests at various consolidation pressures. A summary plot of the test results is shown by Figure 2.5-126.

2.5.6.4.2.6 Dynamic Shear Strength

Cyclic triaxial tests were conducted to evaluate the dynamic shear strength of the embankment soils under earthquake loading conditions. These tests were performed on reconstituted samples typical of the onsite saprolite soils to be used in constructing the embankments. During construction, when the source of onsite saprolite was depleted from nearby borrow areas, consideration of the use of the higher plasticity residual soil horizon materials from Borrow Source G necessitated performing additional cyclic triaxial shear tests on these materials.

Samples for cyclic testing of the saprolite soils were reconstituted to a moisture content and dry density which simulated anticipated field placement conditions. The maximum dry density of a composite saprolite sample was 119.5 pcf and the optimum moisture content was 13%, as determined by ASTM D 1557-70. Accordingly, the samples were reconstituted to a dry density of approximately 107.6 pcf (90% of maximum density) at a moisture content of approximately 18% (5% above optimum). As shown in Tables 2.5-43 and 2.5-44, the actual dry densities and moisture contents of the reconstituted samples were very close to the desired values.

The residual soil specimens of intermediate plasticity index (PI = 19 ±) material were reconstituted to a dry density of 95.0 pcf. This corresponds to 90% of the maximum density, as determined by ASTM D 1557-70, at a moisture content of 21.7% (2% wet of the optimum water content).

The reconstituted samples had a diameter of 2.0 inches and a height of 4.0 inches. The samples were prepared by placing and compacting the soils in layers approximately 1/2 inch thick. Compaction effort was uniformly applied to each layer using a miniature Harvard kneading compactor.

The samples were saturated and then consolidated isotropically under an all-around pressure, σ_3, in the triaxial cell. For the reconstituted samples of the embankment soils, tests were also performed on samples consolidated anisotropically, i.e., under a vertical stress, σ_1, greater then the lateral stress, σ_3.

After saturation and consolidation, the samples were subjected to an axial, sinusoidally varying, cyclic deviator stress of peak magnitude $\pm\sigma_d$. The frequency of loading was 1 cycle per second. The load trace, the axial deflection of the sample, and the pore water pressure were continuously recorded during cycling. All cyclic triaxial tests were performed using MTS equipment.

Eleven (11) tests were performed on reconstituted samples of the saprolite soils consolidated under isotropic conditions. The results of these tests, including the stresses and number of cycles required to cause initial liquefaction, ±5% peak cyclic strain, and ± 10% peak cyclic strain, are presented in Table 2.5-43. Seven (7) tests were performed on the intermediate PI residual soil materials. The results of these tests are presented in Table 2.5-45. The test results are summarized graphically by Figure 2.5-127, showing the relationship between the cyclic stress ratio, $\pm \sigma_d/2\sigma_{3c'}$ and the number of cycles causing ± 5% axial strain.

A cyclic strain of ± 5% has been used as the failure criterion for embankment foundations. Initial liquefaction precedes the development of ±5% strain. The criterion for initial liquefaction was taken as the number of cycles required to cause a peak pore water pressure in the sample equal to the initial effective confining pressure, σ_3, or the number of cycles required to cause a strain of ± 2.5%, whichever occurred first. The data for initial liquefaction were used to establish a correction factor to be applied to the stresses causing ±5% strain as described in the following paragraph.

Recent studies by Finn, Pickering and Bransby [96], Seed and Peacock [97], and Seed and Idriss [98] have shown that cyclic triaxial tests of isotropically consolidated samples provide stress values that are higher than those causing failure in the field. Therefore, correction factors to be applied to triaxial test data were established. The correction factors presented in the above studies are in terms of the relative density of a clean sand and are based upon the stresses and number of cycles required to cause liquefaction. The soils at the Virgil C. Summer Nuclear Station site contain appreciable quantities of fines. Therefore, it is difficult to describe their general behavior in terms of a relative density. However, a comparison of the results of cycle triaxial tests for the Virgil C. Summer Nuclear Station site soils with the data presented by Seed and Peacock [97] indicates that the cyclic strength characteristics of the site soils are comparable to those of a clean sand having a relative density varying from approximately 75 to 100%. (The higher relative densities correspond to tests made at the lower confining pressures. For these tests, relatively higher values of the stress ratio $\pm\sigma_d/2\sigma_3$ were required to cause failure.) Based upon the test data presented in Table 2.5-43 and on the procedures proposed by Peacock and Seed [94], the correction factors listed in Table 2.5-46 were established. The use of the correction factors listed in Table 2.5-46 to obtain the field stresses required to cause 5% strain in the embankment soils is described in a subsequent paragraph.

Twelve (12) tests were performed on reconstituted samples of the saprolite soils consolidated under anisotropic conditions. In these tests, the vertical stress during consolidation, σ_1, was greater than the lateral stress, σ_3. Thus, the consolidation ratio, $K_c = \sigma_1/\sigma_3$, was greater than 1.0. Tests were performed at values of K_c = 1.5 and K_c = 2.0. In addition, 1 test with K_c = 1.5 was performed on the intermediate PI residual soils.

The test results for the saprolite soils, showing the stresses and number of cycles required to cause a peak strain of 5% and 10%, are presented in Table 2.5-44. As reported by Seed, Lee and Idriss [99], a correction factor for triaxial test data is not required for samples consolidated anisotropically. For this reason, data on initial liquefaction of the anisotropically consolidated samples are not presented.

Cyclic tests of anisotropically consolidated samples are made in order to simulate the condition within the constructed embankment where there are initial static shear stresses on the potential failure planes. The ratio of the initial static shear stress, τ_{fc}, to the normal stress, σ_{fc}, on the plane of failure is designated α. For the constructed embankment, α is determined for various points in the embankment by static finite element analysis. For the laboratory samples, α depends primarily upon the consolidation conditions (i.e., upon the value of K_c). The relationship between K_c and α for the laboratory tests is as follows where $K_c = \sigma_1/\sigma_3$ and $\alpha = \tau_{fc}/\sigma_{fc}$: 02-01

1. For K_c = 1.0, α = 0.

2. For K_c = 1.5, α = 0.19.

3. For K_c = 2.0, α = 0.34.

The strength characteristics of the embankment soils under cyclic loading conditions are summarized in Figures 2.5-128 and 2.5-129. The data in these figures are presented in terms of the cyclic shear stresses required to cause 5% strain as a function of the initial effective normal pressure. Figure 2.5-128 presents the data for 10 stress cycles and Figure 2.5-129 for 20 stress cycles. The data are presented for samples consolidated isotropically (K_c = 1.0, α = 0) and for samples consolidated anisotropically (K_c = 1.5, α = 0.19 and K_c = 2.0, α = 0.34).

As previously noted, a correction factor need not be applied to the laboratory cyclic shear strengths for samples consolidated anisotropically. Therefore, the data presented in Figures 2.5-128 and 2.5-129 for anisotropically consolidated samples are obtained directly from the laboratory test results summarized in Figure 2.5-130. For isotropically consolidated samples, the cyclic strengths indicated by Figure 2.5-127 have been multiplied by the correction factor, C_r, summarized previously, before plotting the data in Figures 2.5-128 and 2.5-129. Thus, the relationships presented in the latter figures represent the strengths of the embankment soils in the field under cyclic loading conditions. These strengths (expressed as the cyclic shear stress required to cause 5%

strain) can then be compared to the stresses induced in the embankment during the earthquake ground motions.

As can be seen from Figures 2.5-128 and 2.5-129, the strengths determined for samples consolidated anisotropically (K_c = > 1.0, $\alpha > 0$) are not significantly different from those obtained for samples consolidated isotropically ($K_c = 1.0$, $\alpha = 0$). Therefore, the strength versus effective normal pressure relationships in Figures 2.5-128 and 2.5-130 are approximated as a single curve for all ratios of α.

2.5.6.4.2.7 Dynamic Response

The dynamic material properties required for the computation of the response of a soil mass during earthquakes include shear modulus and damping values. The maximum shear modulus (i.e., the value corresponding to very low levels of strain) and the variation of shear modulus with strain are also required.

Low amplitude cyclic torsion tests were performed on samples of the embankment soils to determine the shear modulus (G) and the damping values (D) at very low strain levels. The modulus and damping values at high strain levels were obtained from the results of cyclic triaxial shear tests.

The modulus values measured in the cyclic torsion test for the saprolite and residual soil materials are presented by Figure 2.5-131. Also shown are the relationships used in the dynamic response analyses, including the upper and lower bounds. The cyclic torsion test results for the residual soils fall within the range established for the saprolite soils, generally at or below the average. The variation in modulus values as a function of strain was developed using published curves [98] and the results of the cyclic torsion tests and the cyclic triaxial tests. The relationship used in the analysis is shown on the lower part of Figure 2.5-118.

Damping values for the embankment soils were also obtained from the cyclic torsion and triaxial tests. Variation of the damping values as a function of strain is presented on Figure 2.5-132 and is summarized on the upper part of Figure 2.5-118.

2.5.6.4.2.8 Special Testing for Soil Moisture Content

During construction of the Service Water Pond dams, significant delays were experienced due to weather conditions which resulted in in-situ moisture conditions approximately 1 to 2% above the 4% limit prescribed in the specifications. These delays are summarized by Figure 2.5-198. Consequently, an evaluation was performed to determine the effects of moisture content ranging up to 6% above the optimum defined by ASTM D-1557. This evaluation was performed by constructing a test fill at Borrow Source G and testing undisturbed block samples of the compacted soil at the higher moisture contents. A summary of the test results for the 2 block samples (UDS-21 and UDS-22) retrieved from the test fill is presented by Table 2.5-59a. Grain size distribution curves are shown by Figure 2.5-150a.

The test fills were constructed using the same techniques and equipment used in constructing the Service Water Pond dams. The moisture content of the compacted test fill soil ranged from 5.2 to 6.5% above optimum. The test program also included Atterburg limit, specific gravity, and grain size distribution determinations. Testing confirmed that the test fill materials were within specification limits and were representative of the entire borrow source.

Consolidated - undrained triaxial tests ($\overline{\text{CIU}}$) with pore pressure measurements were 02-01
performed on the block samples to determine the strength of the soil at these high moisture contents. Results of these tests are presented by Figure 2.5-153a. As shown by Figure 2.5-155a, the strength properties exceed design properties. It was concluded that a maximum allowable moisture content of up to 6% greater than optimum would be suitable and compaction specifications were changed to reflect this conclusion.

2.5.6.4.3 Embankment Features

2.5.6.4.3.1 Geometric Data

Typical cross-sections of the North Dam, South Dam, East Dam, and West Embankment are shown by Figures 2.5-133 through 2.5-136, respectively. Each structure is designed as a homogeneous embankment with riprap slope protection. The North and South Dams contain an internal horizontal drainage blanket and a rock toe to control seepage in the event of sudden drawdown of Monticello Reservoir. The South Dam also includes a relatively impervious upstream blanket for seepage control.

The Monticello Reservoir faces of the dams are inclined at 3.5 to 1. The Service Water Pond faces of the dams and the West Embankment are inclined at 3 to 1. The back slope of the West Embankment is at an inclination of 1 to 1, as shown by Figure 2.5-136. However, the plant fill adjoins the West Embankment. The backslope of the West Embankment is the interface between these 2 fills.

Other pertinent geometric aspects of the Service Water Pond structures are given in Table 2.5-24. The various design features of the structures are described in detail in the following sections.

2.5.6.4.3.2 Embankment Fill

Select fill materials for the earth embankment portion of the North, South, and East Dams and most of the West Embankment consist of residual soil and saprolite excavated from Borrow Sources F and G, except that onsite borrow soils were used for the West Embankment below elevation 386.0'. The liquid limit and plasticity index of select fill materials did not exceed 70% and 25%, respectively. The soil was placed in horizontal lifts not exceeding 8 inches in loose thickness and was compacted to a minimum dry density of 90% of the modified maximum dry density as determined by ASTM D 1557-70. The allowable compaction moisture content ranged from 1% below to 6% above the optimum moisture content as determined by ASTM D 1557-70. The results of field quality control tests and laboratory verification tests conducted on the select fill materials are presented in Section 2.5.6.4.5 and 2.5.6.4.6, respectively.

2.5.6.4.3.3 Internal Drainage

In the event of a drawdown of Monticello Reservoir, internal drainage is provided within the North and South Dams to prevent the eventual steady-state internal phreatic line from intersecting the Monticello Reservoir slope. The drainage provision consists of a horizontal blanket of coarse granular soil (Zone 2 filter) surrounded by finer granular soil (Zone 1 filter) to prevent clogging of the blanket with fines from the embankment soils [89]. The drainage blankets are designed to have sufficient discharge capacity to facilitate the expected seepage flow without excessive hydraulic gradients. The extent and configuration of the drainage blankets are shown in cross-section in Figures 2.5-133 and 2.5-134 and in plan in Figures 2.5-105 and 2.5-107. A photograph of the drainage blanket for the North Dam is presented in Figure 2.5-137.

The Zone 1 and Zone 2 filter materials consist of processed quarry screenings free of deleterious amounts of weak, flat, elongated, friable, decomposed, micaceous, or argillaceous material. The specified gradations of the materials are given in Table 2.5-47. The uniformity coefficient of both materials was required to be greater than 6.0, and the bulk saturated-surface-dry (SSD) specific gravity (ASTM C 126-68) was required to be greater than 2.50. In addition, the Zone 2 filter material was required to have a sodium sulphate loss (ASTM C 88) of not more than 10% after 5 test cycles, an abrasion loss (ASTM C 535-69) of not more than 50% and an inplace coefficient of permeability of at least 1.0 x 10^{-3} cm/sec. The filter materials were required to be placed in horizontal layers not exceeding 12 inches in loose thickness and compacted to not less than 75% relative density. The results of tests performed during construction to document these filter material properties are presented in Section 2.5.6.4.5.

In addition to the horizontal interior drain, a rock toe was provided in the North and South Dams as shown in Figures 2.5-133 and 2.5-134. The rock toe provides a further safeguard that steady seepage will not emerge from the dam slope in the event of Monticello Reservoir drawdown. The rock toes were constructed of Zone A rock, which is described in Section 2.5.6.4.3.4. A photograph showing construction of the rock toe in the South Dam is presented as Figure 2.5-138.

2.5.6.4.3.4 Slope Protection

All Service Water Pond embankments are provided with riprap slope protection to prevent erosion of the embankment fill by wave action or piping. The extent of the riprap protection is shown by the typical embankment cross-sections, Figures 2.5-133 through 2.5-136. The riprap gradations are based upon criteria developed by the U.S. Army Corps of Engineers [100]. Four (4) riprap gradations are utilized depending upon the environmental conditions at the various locations where the riprap is placed. The specified gradations are given in Table 2.5-48. The significant wave heights used in design are given in Section 2.4.

Zone A rock is utilized for the rock toes of the North and South Dams. Since the rock toes will be submerged by Monticello Reservoir, they will not be subject to wave action. Zone B rock is utilized for all of the Service Water Pond dams and embankments on the inside face of the pond above elevation 415.0' and on the outside face of the South Dam. Zone C rock is utilized on the Monticello Reservoir face on the North Dam above elevation 410.0'. Zone D rock is utilized on the Monticello Reservoir face of the East Dam and as an underlayer beneath the Zone C rock on the North Dam. The gradation also satisfies filtering criteria [89] with respect to both Zone C rock and Zone 2 filter.

The riprap is underlain by a 2 layer filter to prevent the loss of the embankment fines through the riprap. The filters consist of a minimum thickness of 9 inches of Zone 1 filter material placed against the embankment fill overlain by a minimum thickness of 9 inches of Zone 2 filter material. The specified properties of the Zone 1 and Zone 2 filter materials are given in Section 2.5.6.4.3.3. The filter gradations designs are based upon accepted filter requirements [89], which allows the flow of water from the finer to the coarser material while restricting the migration of fine soil particles. A photograph showing slope protection construction on the West Embankment is presented by Figure 2.5-139. The Zone 1 and Zone 2 filters are clearly shown adjacent to the rock toe of the South Dam in Figure 2.5-138.

In addition to the gradation requirements for the riprap, a maximum sodium sulfate loss (ASTM C 88) of 10% after 5 cycles, a maximum abrasion loss (ASTM C 535-69) of 50% and a minimum bulk SSD specific gravity (ASTM C 127-68) were required. The results of field quality control tests on these materials are presented in Section 2.5.6.4.5.4.

Prior to constructing the Service Water Pond, it was observed that deep gullying frequently developed in nonsafety class cut slopes and compacted fill slopes that were exposed to surface runoff. The gullied slopes were in residual and saprolite soils, composed mainly of micaceous silt with little or no clay binder. The gullies developed by runoff removing the noncohesive to slightly cohesive soil particles and was aggravated by flow being localized along relict joints in the cut slopes and desiccation cracks that developed in portions of some fills.

At the Service Water Pond, erosion of the slopes of the 3 dams and the West Embankment is prevented by the riprap which dissipates the energy of rainfall onto the embankments and by the filters beneath the riprap which are designed and constructed to prevent soil migration. Erosion protection of the crests of the 3 dams is provided by 12 inches of Zone 2 filter material underlain by 6 inches of Zone 1 filter material. Runoff from the plant yard is directed away from the West Embankment, thus minimizing flow across its crest.

2.5.6.4.3.5 South Dam Seepage Control Blanket

A seepage control blanket was constructed on the upstream (Service Water Pond) side of the South Dam to reduce seepage losses through the South Dam foundation materials in accordance with the AEC (currently NRC) letter of March 1, 1973, from Messrs. Scinto and Conner to Messrs. Head, McCollom, and Lyman. The extent of the blanket is shown on Figure 2.5-107. Construction procedures for placing the blanket included stripping the foundation of loose, soft, or organic materials and placing only the more plastic residual soils. Each lift was approximately 1 foot in thickness and was compacted by at least 3 phases of a self-propelled tamping foot roller.

2.5.6.4.4 Settlement Analyses

Analyses of potential settlement of the North and South Dams were performed based upon as-built dimensions and soil parameters to investigate the potential for the loss of freeboard due to post construction consolidation and the potential for cracking within the embankment due to differential settlements. The method of analysis was based upon the conservative, if not rigorous, assumption that the embankment settlement along the centerline can be expressed as the sum of immediate deformation and 1 dimensional consolidation. To assess the cracking potential, the results of a theoretical determination of tensile strains were compared to field observations of embankments constructed of similar materials which have been reported in the literature. The methods used for the settlement and cracking analyses are described in detail in the following sections, together with the results and conclusions derived therefrom.

2.5.6.4.4.1 Method of Settlement Analysis

Immediate settlement occurs in both the dam foundations and the embankment for 2 reasons: compression of the unsaturated materials, as a combination of elastic and volumetric distortion, and compression of saturated materials, as elastic distortion. For unsaturated soils with a degree of saturation less than 95%, the immediate volumetric compression can be a significant part of the ultimate soil deformation. An expression for the immediate compression of unsaturated soil can be readily derived in terms of the developed pore water pressure and the pore water pressure parameters A and B [101] in accordance with Equations (1) and (2), below:

$$S_i = \frac{a_v}{1+e_o} \int_o^h (\Delta\sigma_1 - \Delta_u) dz \qquad (1)$$

$$\Delta u = B\left[\Delta\sigma_3 - A(\Delta\sigma_1 - \Delta\sigma_3)\right] \qquad (2)$$

where:

S_i = Immediate compression.

Δu = Change in pore pressure due to imposed load.

a_v = Coefficient of compressibility.

e_o = Initial void ratio.

h = Thickness of compressible stratum.

σ_1 = Imposed major principal stress.

σ_3 = Imposed minor principal stress.

A = Pore pressure parameter.

B = Pore pressure parameter.

dz = Increment of depth.

Combining Equations (1) and (2) and rearranging the terms yields:

$$S_i = \frac{a_v}{1+e_o} \int_o^h \Delta\sigma 1 \left\{1 - B\left(A + \frac{\Delta\sigma_3}{\Delta\sigma_1}(1-A)\right)\right\} dz \qquad (3)$$

If the width of the loaded area is large with respect to the thickness of the compressible statum, the term $[(A + (\Delta\sigma_3/\Delta\sigma_1(1\text{-}A))]$ approaches unity and the compression of the unsaturated material can be expressed for materials beneath the crest of the dam in accordance with Equation (4).

$$S_i = \frac{a_v}{1+e_o} \int_o^h \Delta\sigma(1-B) dz \qquad (4)$$

Near the edges of the embankment, however, where lateral distortion is significant, settlement is most appropriately expressed by Equation (3). The parameters A and B are measured by triaxial testing of representative samples [102]. The factor a_v is determined from conventional oedometer testing [103]. 02-01

Consolidation settlement is usually calculated by direct application of results of oedometer tests assuming 1 dimensional compression, where $\Delta\sigma_1 = \Delta u$ and B = 1. Under these conditions, the consolidation settlement can be expressed for saturated soils by Equation (1) or by its equivalent, Equation (5).

$$S_c = \frac{a_v}{1+e_o} \int_o^h \Delta\sigma_1 dz \qquad (5)$$

where:

S_c = Consolidation settlement.

For most unsaturated soils it can be conservatively assumed that consolidation settlement commences upon completion of the immediate settlement and that the rate of settlement is approximately in accordance with 1 dimensional consolidation theory as proposed by Terzaghi [104].

If representative samples of unsaturated embankment materials are saturated prior to oedometer testing, the soil air voids are replaced with water and the total sample compression during testing occurs as a time dependent deformation. Combined immediate and consolidation settlements can then be expressed by Equation (6) in terms of S_c, determined from saturated samples, and B, determined from equivalent unsaturated samples, assuming that the elastic component of immediate settlement is considered by the parameter B.

Thus:

$$S_t = (1 - B)\, S_c + U\, B\, S_c \qquad (6)$$

where:

S_t = Combined immediate and consolidation settlement.

U = Percent consolidation, determined as a function of time and length of drainage path in accordance with the 1 dimensional consolidation theory [104].

2.5.6.4.4.2 Calculation Procedure

Deformation analyses of the Service Water Pond dams were performed for various locations along the dam crests using Equation (6) together with the following procedure:

1. Estimate the time to construct each dam and divide the dam into layers of equal volume, and hence equal time of construction.

2. Apply each incremental layer in sequence and calculate by superposition the imposed stress (using elastic theory) and settlement realized in the foundation and embankment at the end of construction.

3. Calculate delayed consolidation settlement in each layer as a function of the rate of loading of the layer.

4. For a conservative calculation of post construction settlement, assume the greatest drainage path length for each embankment layer.

2.5.6.4.4.3 Material Property Data

Material properties for the deformation analysis were derived from tests conducted to determine the deformation and consolidation properties of the embankment fill and the saprolite and decomposed rock foundation materials, as well as their pertinent physical properties. A description of the testing program and the results of the tests are presented in Sections 2.5.6.4.1 and 2.5.6.4.2. The material properties used in the deformation analysis are presented in Table 2.5-49. Considering that the limited range of the deformation properties measured will not materially influence the calculated post construction differential settlements, deformation property values were generally selected within the mid-range of the test data. However, the coefficient of consolidation was selected to correspond to a lower bound value to maximize the amount of post construction settlement calculated.

2.5.6.4.4.4 Analysis of Potential Transverse Cracking

The calculated post construction crest settlement was plotted at numerous points along the axis of the dam crest to provide a profile of settlement. An analysis of potential cracking due to the crest distortion was then performed in accordance with the procedure proposed by Leonards and Narain [105] which simulates the dam as a beam and calculates the longitudinal tensile strain along the crest imposed by the computed settlement profile.

2.5.6.4.4.5 Results of Settlement and Cracking Analyses

The calculated profiles of post construction settlement along the crests of the North and South Dams are shown by Figures 2.5-140 and 2.5-141, respectively. As indicated by these figures, the maximum anticipated post construction settlement is estimated to be 7.0 inches for the North Dam and 4.6 inches for the South Dam. The results of the tensile strain analysis are also shown by Figures 2.5-140 and 2.5-141. As shown by the figures, the maximum computed tensile strains are 0.06% and 0.19% along the crests of the North and South Dams, respectively. These values compare favorably with a crest tensile strain of 0.30% at cracking as calculated by Leonards and Narain [105] for the Portland Dam which is reported to be constructed by silty clay with a plasticity index of 8 and to have been compacted at approximately 4% dry of optimum moisture content. The Service Water Pond dams, with a somewhat greater plasticity index, were primarily compacted wet of optimum and hence, should be more flexible and should be able to withstand greater tensile strains without suffering transverse cracks.

2.5.6.4.5 Field Control of Embankment Materials During Construction

2.5.6.4.5.1 Control of Select Fill Materials

A rigorous program of sampling and testing was performed during construction to determine that fine grained embankment materials (select fill) were placed in accordance with specification and design requirements. The test procedures and frequencies used to control the placement of these materials are summarized in Table 2.5-50. A summary of construction control physical property test results, by structure, is presented in Table 2.5-51. Figures 2.5-142, 2.5-143, and 2.5-144 contain summaries, by structure, of the construction control gradation tests, compaction curves, and inplace density test results, respectively. Figure 2.5-145 shows, by structure, the distribution of the locations of inplace density tests.

It is seen from the above mentioned tables and figures that testing was performed generally uniformly throughout the embankment fills and that the densities and moisture contents were within required limits for placement. Materials represented by tests that did not fall within the required limits were either reworked, if appropriate, or removed and replaced with acceptable materials.

2.5.6.4.5.2 Control of Zone 1 Filter Material

Similar to select fill materials, Zone 1 filter materials were controlled by a rigorous program of sampling and testing. Table 2.5-52 summarizes the testing procedures and frequencies used to accept these materials for Service Water Pond construction.

Zone 1 filter materials were produced at Quarry A located 4 miles northeast of the site. Acceptable material was either stockpiled onsite near the east abutment of the North Dam or placed directly as necessary to construct filters and drains for all of the Service Water Pond structures.

The results of all gradation tests performed on this material are summarized by Figure 2.5-146. As shown by this figure, all material tested satisfied the requirements discussed in Section 2.5.6.4.3.3.

The results of inplace density tests performed in the horizontal drainage blanket filters at each structure are summarized on Table 2.5-53 together with a summary of specific gravity determinations. Inclined slope protection filters were compacted by at least 6 passes of the treads of a D8 Caterpillar tractor or a self-propelled smooth drum vibratory roller.

2.5.6.4.5.3 Control of Zone 2 Filter Materials

Prior to production processing of Zone 2 filter materials, also produced at Quarry A, prequalification tests were performed in accordance with Table 2.5-54. Additional testing was performed in accordance with the criteria outlined in Table 2.5-54. Results of the production gradation tests are summarized by Figure 2.5-147 which shows that these materials, with few exceptions, satisfied specification requirements. For the failing tests, 2 additional samples for each failure were retrieved from the corresponding day's production and gradation tests were performed. In all cases, the 2 additional samples tested satisfied the requirements and the material was approved.

The results of specific gravity determinations and sodium sulfate soundness tests performed during production processing are summarized on Table 2.5-55 and are compared to the specification requirements. Table 2.5-56 summarizes the results of inplace permeability tests performed in the North and South Dams and compares the results to the specification requirements.

2.5.6.4.5.4 Control of Riprap

Prior to production processing of riprap prequalification testing was performed, as listed in Table 2.5-57, to determine the quality of material being produced from the quarries. The majority of the riprap was produced at Quarry A. A limited quantity of Zone C riprap was produced at Quarry B which is located near Winnsboro, SC. Once the quarry and quarry processing operations were approved, production tests were performed in accordance with the criteria presented on Table 2.5-57.

The results of gradation tests on riprap are presented by Figures 2.5-148 and 2.5-149. A summary of the specific gravity and sodium sulfate soundness tests is presented on Table 2.5-58. All production tests satisfied specification requirements. The processed materials were either stockpiled in a designated area north of the North Dam or placed directly as necessary to construct the Service Water Pond structures. Continuous surveillance was performed so that only acceptable materials were placed and to ensure that segregation was minimized.

2.5.6.4.6 Verification Testing for As-Built Soil Parameters

To verify that design values of the various parameters used in the design of the Service Water Pond embankments were achieved or exceeded in the as-built embankments, relatively undisturbed block samples of the compacted embankment soils were obtained. These samples, generally about 1 cubic foot each in volume, were obtained at a minimum rate of 1 sample per 50,000 cubic yards of fill. The samples were taken in accordance with the United States Bureau of Reclamation procedure for hand sampling, Method E-2, Part A [90], and appropriate laboratory tests were performed. The results of testing through July 15, 1976, are presented in Table 2.5-59 and are discussed in the following sections.

2.5.6.4.6.1 Physical Properties

Physical property tests conducted on the block samples consisted of water content, liquid and plastic limits, specific gravity, unit dry weight, and grain size distribution. The results of these tests are summarized in Table 2.5-60. The grain size distribution curves are presented by Figure 2.5-150. The degree of compaction was obtained from the maximum density of the compaction curve which was used in the field for density control of the portion of fill from which each individual block was obtained. It is noted that of the 12 samples tested to date, 6 samples appear to have a degree of compaction less than the specified 90.0%. It is believed that this condition is due to the inevitable expansion of the soil during sampling, transportation, and storage since, as discussed in Section 2.5.6.4.3.2, all lifts were compacted to a minimum degree of compaction of 90.0% as controlled by field density tests.

2.5.6.4.6.2 Static Shear Strength

The static shear strength of selected block samples was determined from unconfined compression and unconsolidated-undrained (UU) triaxial compression tests for total stress parameters and from isotropically consolidated, undrained ($\overline{\text{CIU}}$) triaxial compression tests for effective stress parameters. 02-01

The results of these tests are presented by Figures 2.5-151 through 2.5-153. Summary plots of the failure envelope for these tests and the design envelopes are presented by Figures 2.5-154 and 2.5-155. As the summary plots indicate, the preponderance of the shear strength data for the compacted soil is greater than that used in design.

2.5.6.4.6.3 Static Deformation

Oedometer consolidation tests were performed on selected block samples to document the as-built compression properties of the embankment. A summary plot of the results is presented by Figure 2.5-156. The compression curves of the block samples are seen to be similar to the curves obtained for laboratory compacted samples used for design.

2.5.6.4.6.4 Permeability

Permeability tests were performed during some of the consolidation tests to document the as-built permeability of the embankments. The results are summarized by Figures 2.5-156 and 2.5-158 for vertical and horizontal permeabilities, respectively. The coefficients of permeability measured are conservative with respect to the permeability used in design (see Section 2.5.6.6).

2.5.6.4.6.5 Dispersion Tests

Pin hole dispersion tests [106] were performed to determine the dispersion characteristics of the embankment fill. The test results are presented in Table 2.5-61. In addition, Soil Conversion Service procedures [107] were used to determine dispersion characteristics. Typical test results are presented by Figure 2.5-159. All of the test results are summarized in Table 2.5-61a. It is concluded that the embankment soils are nondispersive.

2.5.6.4.6.6 Dynamic Response

The dynamic response of the compacted embankment materials (select fill) was evaluated by cyclic torsion (resonant column) tests and stress-controlled cyclic triaxial tests. The values of maximum shear modulus, G_{max}, obtained at different confining pressures from resonant column tests performed on samples from 9 block samples are shown by Figure 2.5-160. For comparison, the values for G_{max} used in the design analyses, along with the upper and lower bound values analyzed, are also shown. The apparent scatter of the block sample test results, compared to the test results for laboratory reconstituted samples, upon which the G_{max} values are based (Figure 2.5-131), is attributed primarily to small variations in the select fill materials and the degree of compaction. Also, the disturbance caused by sampling, shipment, and storage (without confining pressure) of the block samples is believed to contribute to this apparent variation in G_{max} results. As previously discussed in Section 2.5.6.5.6.1, even the dry unit weight and degree of compaction were noted to have been altered for the block samples from that which was measured in the field adjacent to the sampling locations. However, most of the G_{max} data from block samples still falls within the upper and lower bound values, except at high pressures where the values obtained are lower than the G_{max} values used. It was shown in the analyses conducted for the dynamic stability of the embankments that lower G_{max} values result in lower cyclic shear stresses (see Section 2.5.6.5.7). Therefore, the design analyses performed were conservative.

The damping values obtained from the resonant column tests are shown by Figure 2.5-160a. The relationship used in the design analyses is also shown by Figure 2.5-160a to be a good representation of the block sample test results data.

Six (6) stress-controlled cyclic triaxial tests were also performed on block samples to evaluate the dynamic shear strength. Four (4) of the 6 samples did not attain failure strain level (± 5%) even at the high stress ratios used in the tests. These tests were terminated after the application of 1,000 load cycles. The results are plotted in Figure 2.5-127 for comparison with the data obtained from reconstituted laboratory samples. The results from the cyclic triaxial tests on the block samples shown that the dynamic strength used in the analyses is quite conservative.

2.5.6.5 Slope Stability

2.5.6.5.1 Foundation and Embankment Static Shear Strength Parameters

Static shear strength properties of the foundation and embankment materials for the Service Water Pond dams were investigated as described in Sections 2.5.6.4.1.2 and 2.5.6.4.2.3, respectively. In addition, verification tests were performed on block samples removed from the embankments after compaction, as described in Section 2.5.6.4.6.2.

The strength test results on the foundation materials are presented by Figures 2.5-111 through 2.5-113 and are summarized in Table 2.5-33. Based upon these results, the following shear strength properties were adopted for design:

1. Residual Soil

   Undrained shear strength = 800 psf.

2. Saprolite

   a. Undrained shear strength = 200 psf.

   b. Effective friction angle = 36 degrees.

   c. Effective cohesion = 0 psf.

3. Decomposed Rock

   a. Effective friction angle = 38.5 degrees.

   b. Effective cohesion = 0 psf.

The undrained shear strength of decomposed rock was not determined, but has been conservatively estimated to be 3000 psf for design.

The strength test results for laboratory compacted embankment materials obtained from Borrow Sources F and G are presented by Figures 2.5-123 and 2.5-124 and are summarized in Table 2.5-42. The verification strength test results obtained from the block samples are presented by Figures 2.5-151 through 2.5-153 and are summarized by Figures 2.5-154 and 2.5-155. Based upon these results, the following strength properties were adopted for design of embankment fill:

1. Undrained shear strength = 1600 psf + σ_n tan 20°. 02-01

   Where: σ_n is the normal force on the failure plane in psf.

2. Effective friction angle = 28 degrees.

3. Effective cohesion = 300 psf.

The unconsolidated-undrained (total stress) and consolidated-undrained (effective stress) failure envelopes defined by the embankment fill design parameters are shown on the summary plots of the verification test failure envelopes in Figures 2.5-154 and 2.5-155, together with the original design failure envelopes. The undrained shear strength used in the original analysis was 600 psf, the effective friction angle was 29 degrees and the effective cohesion was 160 psf. It may be seen from these plots that the revised failure envelope used for the original analysis, is conservatively below essentially all of the verification test data within the stress range of interest (below 5 tons per square foot). Strength parameters for the rock toes of the embankments could not be practically determined experimentally. A very conservative total stress and effective stress friction angle of 35 degrees was adopted for design.

2.5.6.5.2 Method of Analysis - Static Conditions

The stability of the Service Water Pond dams was investigated using the circular arc method of analysis as described by Bishop [108]. The analysis was conducted by computer using the ICES LEASE-I Program [109]. In addition to the North and South Dams, a stability analysis was conducted on a natural slope located south of the South Dam using both the circular arc method and the sliding wedge method [110]. The West Embankment and East Dam were not analyzed; since, by comparison with the North Dam, it was determined by observation that the factors of safety of these structures are considerably greater.

2.5.6.5.3 Design Criteria - Static Loading

The various design conditions and the minimum acceptable factor of safety for each which was adopted for design are summarized as follows:

1. End of construction, FS_{min} = 1.10.

2. Submerged condition, FS_{min} = 1.30.

3. Sudden drawdown, FS_{min} = 1.20.

4. Steady seepage, FS_{min} = 1.30.

The end of construction case represents the embankment condition when construction has been completed and before the water level has been raised on either slope. The total stress (undrained) strength parameters were used for this analysis, which conservatively assumes that no consolidation of the embankment or foundation materials occurs prior to this time.

The submerged case represents the normal operating condition with both Monticello Reservoir and the Service Water Pond raised to their maximum level of elevation 425.0'. The effective stress strength parameters were used for this and the following analyses.

The sudden drawdown case represents a postulated situation wherein Monticello Reservoir is suddenly emptied. It is conservatively assumed in the analysis that the drawdown occurs instantaneously, that the Service Water Pond remains at the maximum water level of elevation 425.0' and that no drainage occurs within the fine grained embankment materials. It is noted that the minimum water level on the reservoir side of the South Dam is approximately elevation 404.0', corresponding to the 98-01
bottom elevation of the discharge canal.

The steady seepage case represents the condition at a time subsequent to a postulated sudden drawdown of Monticello Reservoir when steady-state seepage has developed from the Service Water Pond to Monticello Reservoir through the internal drainage system of the dams. The location of the steady-state phreatic line for this case is estimated by Kozeny's method [111].

A design case analyzed herein which was not considered in earlier analyses is the condition of reverse seepage. This case will develop during the testing of the Service Water Pond when Monticello Reservoir is raised to its normal high level of elevation 425.0' while the Service Water Pond is empty. It was conservatively assumed in this analysis that the test would be of sufficient duration to develop steady-state seepage conditions. The location of the steady-state phreatic line for this condition is estimated using Casagrande's method [111].

2.5.6.5.4 Analytical Results - Static Loading

The results of the static stability analyses demonstrate that all of the embankments have an adequate factor of safety against shear failure under all postulated design conditions. The results of the analyses for the North and South Dams are presented by Figures 2.5-161 and 2.5-162, respectively. These figures show the geometric configuration of the embankments, the locations of the phreatic line used for each analysis, the critical circular arcs, and the resulting factor of safety for each condition. The bottom of each structure was assumed to be horizontal, conservatively located at the elevation of maximum excavation for each structure. The true irregular bases of the structures would have the effect of increasing the factors of safety. The factors of safety found for the North and South Dams are summarized as follows:

1. North Dam

    a. End of construction, FS = 2.46

    b. Submerged condition, FS = 2.19

    c. Sudden drawdown, FS = 1.20

    d. Steady seepage, FS = 2.09

    e. Reverse seepage, FS = 1.35

2. South Dam

    a. End of construction, FS = 2.81

    b. Submerged condition, FS = 2.28

    c. Sudden drawdown, FS = 1.94

    d. Steady seepage, FS = 2.14

    e. Reverse seepage, FS = 1.48

Analysis of the natural slope located immediately adjacent to the reservoir-side toe of the South Dam indicates that this slope is stable under the normal operating (submerged) condition and the sudden drawdown (to elevation 404.0') condition. The other design conditions are not applicable to this slope. As shown by Figure 2.5-136, the respective factors of safety for the aforementioned conditions are 3.67 and 2.54 using the circular arc method, and 2.34 using the sliding wedge method for the sudden drawdown condition. A total stress analysis was used for the natural slope because the in situ materials are not subject to any future consolidation. No other natural slope could be defined, the failure of which could be postulated to affect the integrity of the Service Water Pond.

Analysis of potential failure configuration of excavated slopes associated with the discharge canal indicates that failure of these slopes would not affect the integrity of the Service Water Pond. Although the Circulating Water discharge canal is not a safety-related structure, conservative excavated slope angles have been designed and constructed to satisfy the minimum acceptable factors of safety listed in Section 2.5.6.5.3.

2.5.6.5.5 Foundation and Embankment Dynamic Properties

Dynamic shear strength and response parameters of the foundation and embankment materials for the Service Water Pond dams were investigated as described in Sections 2.5.6.4.1 and 2.5.6.4.2, respectively. In addition, verification tests were performed on block samples removed from the embankments after compaction, as described in Section 2.5.6.4.6.6.

The dynamic properties, as a function of shear strain, that were used in the seismic evaluations for the foundation and embankment materials are shown by Figures 2.5-118, 2.5-119 and 2.5-131. The foundation shear moduli, as a function of the mean principal stress, used in the dynamic analysis are summarized below:

$$G_{max} = 1000\ K_2\ (\sigma_m)^{1/2}$$ 02-01

where:

G_{max} = shear modulus at very low strain in psf.

σ_m = mean principal stress.

K_2 = 250 for decomposed rock.

K_2 = 70 for foundation soils.

The following relationships were used for the embankment materials:

1. $G_{max} = 35000\ (\sigma_m)^{1/2}$, for $\sigma_m < 2100$ psf. 02-01

2. $G_{max} = 760\ \sigma_m$, for $\sigma_m > 2100$ psf.

In the dynamic analyses, a damping of 10% was used for the embankment soils.

As part of the seismic evaluations, parametric studies were performed to evaluate the effects of variations in the dynamic moduli for both the foundation and embankment materials and in the damping value of the embankment soils. The following parametric studies were performed:

1. K_2 for the decomposed rock was varied from 200 to 500, as compared with the probable value of 250.

2. K_2 for the foundation soils was varied from 50 to 120, as compared with the probable value of 70.

3. The shear modulus of the embankment materials was varied from 30% above (upper bound) to 30% below (lower bound) the probable modulus value (see Figure 2.5-131).

4. The 10% damping value of the embankment soils was decreased by 10% to analyze a lower bound of damping.

The results of these parametric studies are summarized in Section 2.5.6.5.7.

2.5.6.5.6 Seismic Stability Evaluations

2.5.6.5.6.1 General

A detailed seismic evaluation of the proposed earth dams for the Service Water Pond was conducted. The proposed dams were evaluated for conditions representative of the SSE. An evaluation of the dams under conditions representative of the OBE was also conducted utilizing the results obtained for the SSE. In these evaluations, conservative estimates of all parameters were incorporated in the analyses.

The maximum sections of the North Dam and the South Dam were analyzed in detail. Three (3) additional heights of dam were also analyzed in detail. With the aid of these 5 analyses, it was possible to evaluate the behavior of all 3 dams.

A summary of each of the proposed dams is given herein; additional details concerning these dams are provided in Section 2.5.6.4.3. The North Dam is approximately 1500 feet long and has a maximum height of approximately 129 feet, based upon the actual depth of undercutting required during the foundation preparation. During the original design analyses, it was assumed that the maximum height of the dam would be approximately 110 feet and this was the section originally analyzed. The profile across the valley where this dam was constructed is shown in the upper part of Figure 2.5-164. The maximum section of this dam is illustrated in the lower part of Figure 2.5-164, which shows both the assumed stratification for the seismic analysis and the actual depth of undercutting performed during the foundation preparation.

The South Dam is approximately 765 feet long and has a maximum height of approximately 98 feet, based upon the depth of undercutting required during foundation preparation. It was anticipated during the design analysis that the maximum height of the South Dam would be only 67 feet. This height was based upon leaving the colluvial soils in place. However, as described in Section 2.5.6.3.2, the colluvium was removed. The profile across the valley and the maximum section of this dam are shown in Figure 2.5-165. Also shown on this figure is the actual depth of undercutting performed.

The East Dam is approximately 1150 feet long and has a maximum height of approximately 28 feet. The embankment slopes and crest elevation are the same as those of the North and South Dams.

2.5.6.5.6.2 Seismic Loading - Stability Analysis

An evaluation of the stability of earth structures and slopes under the postulated SSE and OBE was conducted in accordance with the following procedure [112]:

1. Evaluation of the time history of accelerations which are likely to be developed in the base rock underlying the site.

2. Determination of the response of the embankment and foundation system to the postulated base motion, including evaluation of shear stresses induced within the embankment and within the foundation.

3. Representation of the induced shear stress time-history by an equivalent number of uniform shear stress applications.

4. Determination of embankment stresses under static conditions, i.e., before the occurrence of an earthquake.

5. Evaluation, by appropriate cyclic shear tests on representative samples, of the cyclic shear stresses required to cause failure or excessive deformation under the simulated earthquake loading conditions.

6. Comparison of the shear stresses required to cause failure or excessive deformation with the equivalent uniform shear stresses induced by the earthquake and assessment of the failure potential.

Each of the aforementioned operations are briefly discussed in the following sections.

2.5.6.5.6.2.1 Base Rock Motions

The base rock motions applied at the level of intact rock were derived from the plant site time history reflecting an SSE acceleration of 0.15g as shown by Figure 2.5-166. The time history used for the stability analysis of the Service Water Pond dams was chosen to correspond to a damping of 10%, approximately the average damping expected within the earth embankments. The corresponding acceleration response spectrum is also shown in Figure 2.5-166.

It is noted that the maximum amplification factor of 2.0 is 33% greater than the 1.5 amplification recommended by Newmark and Hall [113] for 10% damping, reflecting an appreciable conservatism in the time history.

2.5.6.5.6.2.2 Response Analysis

Several representative sections of the proposed embankments and slopes were analyzed in detail for the postulated SSE motion using the dynamic finite element method of analysis [114,115]. Response values for embankment and slope heights not specifically analyzed were obtained by appropriate interpolation and extrapolation. Response values during the postulated OBE motions were evaluated by appropriate interpolation using the results of the detailed analysis aided by the results of a shear slice method of analysis [116,117].

The method of analysis utilized a uniform earthquake input applied at the level of rock-like materials characterized by a shear wave velocity of at least 3000 feet per second. These materials were generally identified as a differentially weathered rock, sufficiently intact to enable at least partial core recovery. The width of the dam embankments was generally found to significantly exceed 1/4 of the length of the traveling shear wave, demonstrating the validity of the uniform base motion input.

As discussed in Sections 2.5.6.4.1.6 and 2.5.6.4.2.7, the shear moduli and damping representation of the embankment and foundation materials were obtained by means of field seismic wave velocity determinations and by laboratory cyclic torsion and cyclic shear tests. The results of these tests were used to establish appropriate relationships of modulus and damping versus shear strain. Damping ratios and shear moduli used for analysis of the Service Water Pond dams were expressed as a function of strain amplitude as shown by Figure 2.5-118.

From the response analysis, the time history of the dynamic shear stresses developed within the embankment and foundation materials was used to establish an equivalent number of uniform stress cycles. The results of this interpretation indicated that the SSE could be expressed in terms of 20 equivalent uniform cycles and the OBE could be expressed in terms of 10 equivalent uniform cycles.

The response of the dams and underlying foundation layers was evaluated using the finite element method of analysis [118] for a total of 5 dam sections. The finite element representation used for the maximum section of the North Dam is shown in Figure 2.5-167. The finite element mesh used to represent the maximum section of the South Dam is shown in Figure 2.5-168. Similar finite element representations were utilized for the other 3 dam sections. The foundation layer beneath all dams analyzed extended to the intact rock at the dam site.

The North Dam was considered to be underlain by a foundation layer consisting of weathered rock as shown by Figure 2.5-164. The South Dam was considered to be underlain by a layer of colluvium and a layer of weathered rock as shown by Figure 2.5-165. As shown by the figure, the colluvium was removed during construction.

Only the horizontal component of the base motion was used in those response evaluations. The significant response value required to assess the stability of the dam is the shear stress developed during the earthquake along horizontal planes. Previous studies for dams [119] and for slopes [112] indicate that these shear stresses are not affected by the vertical component of base rock motion. Therefore, only the horizontal component was used in the present studies.

Shear stresses were computed throughout the embankment and underlying foundation layer for the duration of the applied base rock motion. These stresses were then converted to equivalent uniform shear stresses developed in 20 cycles during the ground motions using the procedure outlined by Seed and Idriss [120]. The variation of these equivalent uniform stresses along the centerline axis of the dam, and for the 5 sections analyzed, are shown by Figure 2.5-169.

The values of equivalent uniform shear stresses developed in 20 cycles along 3 typical horizontal planes within the maximum section of the North Dam are presented by Figure 2.5-170. The results shown by this figure indicate that the maximum values occur in the vicinity of the center of the dam and that the stresses increase with depth.

Similar plots of stresses developed along 3 typical horizontal planes within the originally designed maximum section of the South Dam, an 80 foot high dam, 50 foot dam, and 30 foot dam are shown in Figures 2.5-171 through 2.5-174.

The computed equivalent uniform shear stresses have been used to evaluate the stability of the dams during the postulated earthquake motions.

2.5.6.5.6.2.3 Static Stress Analyses

The static stresses in the dams have been determined using static non-linear finite element procedures [118,121]. The analyses were performed by incremental construction procedures which simulate the actual sequence of construction operations. Increments of stress for each step of the analyses, which simulate the placement of embankment fill material, were calculated and added to the values for the previous step. The values of normal stresses and shear stresses throughout the embankment were thus developed.

Values of typical static stresses computed for the normal operating (submerged) condition and for the end of construction condition (pond and reservoir empty) are presented by Figure 2.5-175. The top part of this figure shows the variation of effective normal stress along a horizontal plane for these 2 conditions. The values of effective normal stress are considerably smaller for the normal operating condition. The shear stresses along this plane (which are shown in the lower part of the figure) are somewhat lower for the normal operating condition.

The static normal effective stresses computed with the water at elevation 425' in the Service Water Pond while the reservoir is empty are presented by Figure 2.5-176 along a typical horizontal plane. The stresses for steady-state seepage, for transient seepage, and the normal effective stresses for the normal operating condition are shown in this figure.

The results presented by Figures 2.5-175 and 2.5-176 indicate that the static normal effective stresses are lowest for the normal operating condition (i.e., water at elevation 425' in both the pond and the reservoir).

2.5.6.5.6.2.4 Analysis of Stability

The shearing resistance of the foundation and embankment systems developed during earthquake motions were evaluated by cyclic triaxial compression tests as described in Sections 2.5.6.4.1.5 and 2.5.6.4.2.6. The available shearing resistance was obtained for the appropriate number of stress cycles and the normal pressure on the prescribed plane of failure predicted by the response analysis. The factor of safety of the embankments and slopes against overstressing was subsequently expressed as a ratio of adjusted cyclic shearing resistance to the sum of the static and dynamic shearing stresses derived from the response analysis.

The factor of safety was calculated as the minimum ratio of shearing resistance to shear stress at any point within the embankment induced during the postulated earthquake. Acceptable minimum factors of safety under dynamic conditions are summarized as follows:

1. Normal operating conditions, water at elevation 425' in Service Water Pond and Monticello Reservoir:

   a. Minimum factor of safety, SSE, 1.1.

   b. Minimum factor of safety, OBE, 1.3.

2. Steady-state seepage conditions, water at elevation 425' in Service Water Pond and Monticello Reservoir:

   a. Minimum factor of safety, SSE, 1.1.

   b. Minimum factor of safety, OBE, 1.3.

The extreme conservatism of this method of expressing safety factors is apparent, considering that the "safety factor" expressed is representative of only a limited zone of stress within the embankment and foundation system. A very high degree of conservatism is also inherent in the level of strain adopted to express the failure of test samples during cyclic triaxial testing.

2.5.6.5.6.3 Analytical Results - Seismic Loading

Dynamic stability analyses using recently developed analytical techniques along with conservative design conditions as described in Section 2.5.6.5.6.2 were conducted for a variety of embankment heights and for foundation conditions selected to represent the most unfavorable supporting conditions. The results of these analyses demonstrate that all embankments will be stable under SSE conditions and will have safety factors which satisfy the minimum SSE and OBE requirements. The results of the dynamic stability analyses for the SSE earthquake are presented in Table 2.5-62 as the minimum safety factors calculated at various horizontal sections within the earth embankment.

The results of the SSE analyses for the 67 foot South Dam, shown in Table 2.5-62, are also a very conservative representation of the stability of the most critical fill slope which can be defined along the West Embankment. The profile for the West Embankment is similar to that of the South Dam in that colluvial materials existed locally at the base of the fill and the maximum heights are similar.

Safety factors of the dams and the West Embankment during the OBE are greater than 1.5. As demonstrated by Table 2.5-62 and Figures 2.5-177 through 2.5-179, the lowest safety factors occur within the dam embankments at elevations which are a function of embankment height. The analyses also demonstrate that the amplification of base rock motions through the very dense decomposed rock is negligible for stratum thicknesses well in excess of those which are applicable to design conditions. For example, an amplification of less than 0.005g is indicated for a decomposed rock stratum thickness of approximately 40 feet at the North Dam. The greatest amplification effect was noted in the colluvium and saprolite horizons. However, the colluvial materials were removed from beneath the South Dam and the actual factor of safety is even greater than that indicated by the analysis which included the colluvial layer.

The calculated crest accelerations, summarized in Table 2.5-62, demonstrate a significant amplification of base rock motions through the dam embankments. Maximum values predicted for a 110 foot North Dam section, a 67 foot South Dam section, and a 30 foot East Dam section are 0.29g, 0.35g and 0.30g, respectively. In addition to the conservatism of the method of analysis previously cited, it is noted that a high degree of conservatism was also used in the selection of the dynamic material properties.

Due to undercutting and removal of marginal foundation soils, the as-built maximum heights for the North Dam, South Dam, and West Embankment are greater than anticipated in the original studies. Although the heights of dams analyzed are less than the as-built heights, the dynamic analyses show that there is no decrease in the factor of safety for dam heights greater than about 65 feet. This is illustrated by Table 2.5-62. Therefore, the minimum factor of safety for the Service Water Pond embankments under SSE conditions using the most probable values of the dynamic properties is 1.20.

2.5.6.5.7 Results of Dynamic Studies for Variation in Dynamic Material Properties

To assess the effects of possible variations in the dynamic properties of embankment material on the response and stability of the proposed dams, the following additional cases were analyzed:

1. Upper Bound on Probable Modulus Values

   The probable modulus values were increased by 30%.

2. Lower Bound on Probable Modulus Values

   The probable modulus values were decreased by 30%.

3. Lower Bound on Probable Damping Values

   The probable damping values were decreased by 10%.

The effects of these variations were investigated for the maximum section of the South Dam. The effects of variations in modulus and damping values on the stability of the dam are illustrated by Figures 2.5-180 through 2.5-184. The failure potential along the center line using the upper bound on probable modulus values is illustrated by Figure 2.5-180. The failure potential using the lower bound on modulus values is shown by Figure 2.5-181. A summary of the effects of variations in modulus values on failure potential is presented by Figure 2.5-182. The lowest value of the minimum factor of safety (approximately 1.1) is obtained using the upper bound on probable modulus values. Thus, even with a more conservative selection of modulus values, the minimum factor of safety is at least 1.1, the minimum required.

The effect of using the lower bound on the damping value is illustrated by Figures 2.5-183 and 2.5-184. This variation in the damping value has very little effect on the factor of safety against overstressing.

To assess the effects of variation in the dynamic moduli of the colluvium and weathered rock on the response and the seismic stability of the dams, the maximum sections of the South Dam and the North Dam were re-analyzed in detail. The foundation of the South Dam was considered to consist of a layer of colluvium overlying weathered rock although this colluvium was later removed during construction. The North Dam is founded on weathered rock. For the colluvium, the upper and lower bounds of modulus values were used. For the weathered rock, a reasonably conservative lower bound value was chosen but the measured upper bound value was not used. Instead, a value twice that used in the previous analyses was chosen for the upper bound in the present case. (It should be noted that the use of the measured upper bound modulus value for weathered rock would make this layer behave essentially as intact rock, i.e., the motions transmitted through this layer would be exactly those imposed at the base of the dam-foundation systems.)

For ease of reference, each case is designated either by S-MAX (for the maximum section of the South Dam) or N-MAX (for the maximum section of the North Dam) followed by a Roman numeral I, II, or III. The designation I represents the probable material properties in the foundation layers, II represents the lower bound values, and III represents the upper bound values. A summary of all the cases studied is provided in Table 2.5-63 where the maximum shear modulus parameter, $(K_2)_{max}$, is listed for each case. The results of the additional cases studied are summarized by Figures 2.5-185 and 2.5-186 for the South Dam and North Dam, respectively.

The effects of variations in the dynamic moduli of the colluvium and weathered rock on the response and seismic stability of the proposed earth dams were evaluated and the results of this evaluation led to the following basic conclusions:

1. Use of probable modulus values for the foundation layers provides a reasonable conservative basis for the assessment of the seismic stability of the South Dam; the least values of the factor of safety are obtained for this case (see Figure 2.5-184).

2. Variations in the modulus of the weathered rock have essentially no effect on the factor of safety in the North Dam embankment (see Figure 2.5-186).

Therefore, variations (within a reasonably wide range) in the modulus values of the foundation layers do not significantly affect either the response or the seismic stability of the proposed earth dams. The available data regarding the shear wave velocities in the colluvium and in the weathered rock are sufficient to define a conservative estimate of the probable modulus values in these layers.

2.5.6.5.8 Liquefaction Potential at West Embankment Structures

Three (3) structures, described in Sections 3.8.4 and 3.8.5, are founded within the West Embankment. These structures are the Service Water Pumphouse, Service Water intake structure, and Service Water discharge structure. The influence of these structures on the dynamic stability analyses described in the previous sections is discussed in the following paragraphs.

The dynamic stability (liquefaction) analysis demonstrates that the West Embankment fill at the Service Water Pumphouse location is not subject to excessive strain as a result of ground motions produced by the SSE. Maximum strains during the SSE are expected to be limited to a small zone within the soil mass beneath this structure. In this zone, the predicted strains are less than 5%, consistent with a minimum stress ratio (cyclic strength to cyclic stress) of 1.1. This stress ratio is derived from a limiting 5% strain criterion for the embankment fill materials. There are several conservatisms inherent in the analysis. The most significant include an artificial time history with a 10 second duration of strong motion and an extremely conservative content of near peak amplitudes over a broad frequency band. A more realistic design spectra with about 6 seconds of strong motion [122] would be expected to appreciably reduce the peak strain level prediction. Therefore, consistent with the conservative nature of the analysis, soil-structure interaction effects at the Service Water Pumphouse location have not been considered. 02-01

The order of magnitude of peak strain induced at the Service Water Pumphouse end of the Service Water intake structure is expected to be as described for the Service Water Pumphouse. Because of the position of the Service Water intake structure within the embankment, the expected strain level induced in the fill tends to decrease in the direction toward the Service Water Pond along the structure alignment. Therefore, soil-structure interaction effects on the dynamic stability of the fill supporting the structure are not considered to be significant.

The Service Water discharge structure is founded on very dense decomposed rock which is characterized by standard penetration resistances generally in excess of 100 blows/foot. In its intact state, the decomposed rock is essentially incompressible and mobilizes very high resistance to shear deformation. It is therefore concluded that the foundation materials beneath the Service Water discharge structure are not subject to liquefaction and will experience only very small deformations during ground motions imposed by the SSE.

2.5.6.6 Seepage Control

2.5.6.6.1 General

The permeability of the foundation materials for the Service Water Pond embankments was investigated by in situ permeability tests, as described in Section 2.5.6.2, and by laboratory tests on relatively undisturbed samples of foundation materials, as described in Section 2.5.6.4. The results of these tests are presented by Table 2.5-27. Additional field permeability testing was performed during construction of the grout curtain along the centerline of the North Dam (see Section 2.5.6.6.7). The results of these tests are presented in Table 2.5-64.

During the original design analysis, laboratory permeability tests were performed on compacted samples of the proposed onsite borrow materials. Since very little of this material was utilized in construction of the dams, the associated test data are no longer applicable and are not presented herein. Subsequent testing was performed on compacted samples from Borrow Sources F and G, as presented by Figure 2.5-126, and verification permeability tests were performed on relatively undisturbed block samples removed from the compacted embankments during construction, as presented by Figures 2.5-157 and 2.5-158.

The coefficients of permeability obtained for the foundation materials in the North Dam valley during the grout curtain construction are significantly higher than those obtained in the preconstruction design studies. The coefficients of permeability obtained for the embankments, constructed of soils from Borrow Sources F and G, are also significantly higher than those obtained for the previously proposed onsite borrow soils. Because of these significant increases in the coefficients of permeability, the potential seepage losses from the Service Water Pond have been re-analyzed as described in the following sections.

2.5.6.6.2 Permeability of Foundation and Embankment Soils

Based upon the amplified test data, the North Dam was divided into 4 permeability zones for purposes of re-analyzing seepage. These zones consist of upper and lower foundation zones in the valley (centerline stations 7+00 to 13+00) and homogeneous abutment zones. Based upon the data in Table 2.5-64, a coefficient of permeability of 1.0×10^{-3} cm/sec was chosen to represent the foundation material in the valley above elevation 260.0'. This compares to a coefficient of permeability of 3.2×10^{-5} cm/sec used for the North Dam foundation in the original analysis of underseepage. Below elevation 260.0', the original value was used. The average of the additional tests in the abutments is 3.6 x 10^{-5} cm/sec, very similar to the original design value of 3.2 x 10^{-5} cm/sec. A coefficient of permeability of 3.6 x 10^{-5} cm/sec was used for each abutment in the re-analysis. Conservatively, the reduction in permeability resulting from the installation of the North Dam grout curtain was disregarded for purposes of the analysis.

For re-analysis of the South Dam, the coefficients of permeability chosen for the South Dam foundation were based upon the test data for that location, rather than the average of the permeabilities for the entire Service Water Pond, used in the original analysis. Thus, coefficients of permeability of 2.9 x 10^{-4} cm/sec and 4.2 x 10^{-5} cm/sec were used above and below elevation 325', respectively. Also, the permeabilities in the abutments were conservatively assumed to be the same as in the valley, although the test data indicates that the abutments are less pervious.

Based upon the data obtained from the laboratory compacted samples from Borrow Sources F and G and the verification test data on block samples, the design coefficients of permeability for the compacted embankment material have been revised to 2.0 x 10^{-5} cm/sec, compared to the original design values of 1.0 x 10^{-6} cm/sec and 1.0 x 10^{-7} cm/sec in the horizontal and vertical directions, respectively. Analysis of the test data from the block samples does not indicate any significant difference between the horizontal and vertical permeabilities.

The coefficients of permeability used in both the original analyses and the re-analyses are compared in Table 2.5-65.

2.5.6.6.3 Analysis of Seepage Loss

For the most critical seepage loss case, i.e., a postulated sudden loss of Monticello Reservoir, the primary flow paths from the Service Water Pond would be through and under the North and South Dams. Seepage from the east and west sides of the Service Water Pond is considered to be negligible because of the combination of much longer flow paths and the lower permeability of the residual soils which mantle these areas.

The seepage losses at the North and South Dams were computed by considering the embankments and their foundations separately. The definitions of the geometric parameters in the equations of this section are shown schematically in Figure 2.5-187.

Seepage through the embankments was computed using the method of Kozeny as presented by Harr[111]. The seepage quantity is determined from the equation:

$$q = k\left[\left(d^2 + h^2\right)^{1/2} - d\right] \qquad (1)$$ 98-01

Where:

q = Seepage quantity per unit width.

k = Coefficient of permeability.

d = Distance from seepage entrance to horizontal drain.

h = Head of upstream reservoir.

For the portions of the embankments below the elevation of the horizontal drains, the following equation was conservatively used:

$$q = khT/b \qquad (2)$$

Where:

q = Seepage quantity per unit width.

k = Coefficient of permeability.

h = Unbalanced head.

T = Thickness of embankment below elevation of horizontal drain.

b = Distance from upstream slope to center of horizontal drain.

Equation (2) is based upon the fundamental relationship:

$$Q = kiA \qquad (3)$$

Where:

Q = Total seepage quantity.

i = Seepage gradient (h/b).

A = Area of flow.

Underseepage at the North Dam was computed in 2 parts. For the upper, more pervious foundation zone, equation (2) was used, where the length, b, was taken as the total length from toe to heel of the embankment. For the lower foundation zone, the following equations derived by Pavlovsky [111] for underseepage through a stratum of finite thickness were used:

$$q = \frac{khK'(\beta)}{2K(\beta)} \qquad (4a)$$

$$\beta = \tanh\left(\frac{\pi b}{4T}\right) \qquad (4b)$$ 02-01

Where:

q = Seepage quantity per unit width.

k = Coefficient of permeability.

h = Unbalanced head.

K (ß) = Complete elliptic integral of the first kind with modulus ß. 02-01

K' (ß) = Complementary complete elliptic integral of the first kind with modulus ß.

T = Thickness of pervious zone. 02-01

b = Width of structure.

It may be noted that equation (4a) converges with equation (2) when the ratio T/b becomes small. The maximum depth of flow was conservatively taken to be 750 feet which corresponds to the approximate radius of the Service Water Pond.

For underseepage through the upper pervious zone at the South Dam, where a clay blanket was constructed as described in Section 2.5.6.4.3.5, the Corps of Engineers blanket formulae [123] were used:

$$q = k_f h\left(\frac{d}{x_1 + L_2}\right) \qquad (5a)$$

$$x_1 = \frac{\tanh(cL_1)}{c} \qquad (5b)$$

$$c = \left(\frac{K_b}{k_f Z_b d}\right)^{1/2} \qquad (5c)$$

Where:

q = Seepage quantity per unit width.

k_f = Coefficient of permeability of foundation.

K_b = Coefficient of permeability of blanket.

h = Unbalanced head.

Z_b = Blanket thickness.

d = Thickness of pervious zone in foundation.

L_1 = Blanket length.

L_2 = Length from heel to toe of dam.

To determine the underseepage through the less pervious zone beneath the South Dam to a depth of 750 feet, Equations (4a) and (4b) were used, conservatively neglecting any effect of the upstream clay blanket.

To determine the total quantity of seepage at the North and South Dams, each dam and its foundation was divided into a number of small vertical sections (perpendicular to the axis of the dam) and the seepage for each section was computed using the appropriate geometric parameters. The total seepage was then found as the sum of the seepage at each section. The results, based upon a Service Water Pond elevation of 425.0', are summarized as follows:

1.	North Dam embankment	666	ft^3/day
2.	North Dam foundation	11,877	ft^3/day
3.	South Dam embankment	168	ft^3/day
4.	South Dam foundation	1,065	ft^3/day
5.	Total	13,776	ft^3/day

For a pond surface area of 44 acres, a seepage loss of 13,776 ft^3/day represents a loss of 2.6 inches of water from the pond during the design period of 1 month. In the original analysis, performed prior to addition of the clay blanket, the computed loss was less than 1 inch for the 1 month period and it was conservatively stated that it was not expected to exceed 3 inches. The most recent analysis, which considered the clay blanket, resulted in a computed loss of 2.6 inches. This increase in computed loss from less than 1 inch to 2.6 inches is due to the higher than anticipated permeability for the as-built embankment fill and the higher than previously measured permeability of the foundation in conjunction with the partially offsetting effect of the South Dam clay blanket.

2.5.6.6.4 High Permeability Zone

A zone of high permeability was encountered in fractured rock in Boring ND-13, as shown in Table 2.5-27. The permeability of this zone was estimated to be 1 x 10^{-2} cm/sec. Other test borings in the area indicated that this zone was localized and not continuous in extent. However, to investigate an extreme upper limit of seepage loss, a zone of comparatively high permeability within fractured and jointed rock was postulated to exist within the east abutment of the North Dam. As shown by Figure 2.5-188, a 10 foot thick, 100 foot wide, highly pervious zone, overlain by a natural blanket of 15 feet of less pervious natural soil was conservatively assumed. The seepage loss for this condition would amount to about 0.4 inches of water from the Service Water Pond in a 1 month period. Figure 2.5-188 was developed from Corps of Engineers blanket equations [123]. It is concluded, therefore, that, if such a pervious zone should exist and has not been effectively sealed by grouting, a total seepage loss from the Service Water Pond (including the loss computed in Section 2.5.6.6.3) of about 3 inches could be realized but not appreciably exceeded over an operating period of 1 month.

2.5.6.6.5 Potential for Piping Failure by Underseepage

It was postulated during the construction permit review phase of this project that failure of the Service Water Pond dams might occur by piping through a hydraulically continuous channel existing within the occasionally fractured and jointed surficial zone of the bedrock. It was noted that possible evidence of this potential in the vicinity of the North Dam was given by the existence of 2 intermittently flowing springs and of seeps observed in slope bench cuts. It was concluded, however, that the Service Water Pond dams are not subject to failure of this type for the reasons summarized in the following paragraphs.

Two (2) natural springs and seeps in 3 bench cuts, cited as evidence of a possible groundwater flow through the surficial rock zone, were approximately located as shown by Figure 2.5-189. The stratification interpolated from nearby borings, summarized in Table 2.5-66, shows the overburden at spring No. 1, spring No. 2, and bench cut locations is 21, 61, and 30 feet thick, respectively. The springs were noted to occur near topographic lows, to be flowing intermittently, and to be active only during and after periods of precipitation. The seepage in the bench cuts was observed to issue from relatively porous strata underlain by relatively impervious materials, as shown by Figure 2.5-190. This seepage decreased with time and eventually stopped. This evidence indicates that the groundwater in the Service Water Pond area existed as a perched system, including a seasonally variable, near-surface water level confined within the relatively permeable saprolite or topsoil zones by underlying, relatively impervious, decomposed rock. The near-surface groundwater movement emerged at the lower elevations of the site as intermittent springs.

The test borings drilled within the Service Water Pond area demonstrate that relatively impervious overburden materials exist throughout the area of study. The thickness of these materials ranges from 20 feet to more than 160 feet. Consistent with the residual soil development process and the boring data, a detailed surface reconnaissance of the reservoir and downstream area of the Service Water Pond did not reveal either intact or broken and fractured rock outcrops within the area of interest. The effect of this overburden is to provide a natural blanket which inhibits rapid downward seepage to the rock system. The head loss and associated slow rate of seepage through the overburden blanket and then beneath the dam embankment through a hypothetical pervious layer is demonstrated by the underseepage analysis presented in Section 2.5.6.6.4. The effect of the overburden blanket also prevents a direct hydraulic connection between the reservoir and any postulated pervious zone within the rock.

The dense decomposed rock which comprises the foundation material beneath the dams is highly resistant to piping due to its relatively high in situ shear strength. In addition, Sherard [124] reports that piping of foundation soils is most likely to occur where the surface of the foundation soil is cohesionless. The decomposed rock, however, is mantled by a layer of saprolite, as described in Section 2.5.6.2.4. This saprolite, being generally dense and having an average plasticity index of 6, would be expected to provide a relatively high degree of piping protection for the underlying decomposed rock.

A full scale seepage test was performed during the initial filling of Monticello Reservoir, as described in Section 2.5.6.6.8. This test demonstrated the resistance to piping of foundation soils underlying the dams. Seepage into the Service Water Pond primarily entered the monitoring basin below the basin water level and was locally visible below water level near the perimeter of the basin. Several small concentrated seeps and trickling flows were observed immediately adjacent to the monitoring basin and a few springs were observed in other portions of the Service Water Pond. The concentrated seeps had the visual appearance of miniature boils, with diameters ranging from about 1/2 to 3 inches, and heights of less than 1 inch. The trickling flows did not have distinct points of origin.

Many of the concentrated seeps and trickling flows were probably induced by lowering of the monitoring basin by pumping after heavy rainfalls to maintain the volume of the basin within calibration limits. Other seeps were apparently the result of the anticipated general rise of the groundwater level within the Service Water Pond area due to the filling of Monticello Reservoir. The concentrated seeps occurred in the bottom of the Service Water Pond where the surficial soil consisted of disturbed and loosened saprolite or loose soil debris from construction activities. After establishment, the concentrated seeps were essentially stable in size, although the flow quantities fluctuated, and the discharge water was clear. This provided confirmation that progressive piping was not occurring within the confined, dense saprolite soil and decomposed rock comprising the foundations of the dams.

Inspection of the Service Water Pond dams will also be conducted should draining of Monticello Reservoir occur. If any potentially detrimental downstream seepage emergence is observed, immediate remedial measures will be taken to prevent piping. Such measures would include diking of seeps or boils followed by placement of filter blankets designed as inverted filters. Sherard [124] has described several case histories of dams which have developed downstream seeps or boils for which the time interval after initial detection of piping was adequate for remedial measures to be taken to prevent failure, even where the subsoils consisted of relatively pervious alluvium. Thus, in the unlikely event that piping should occur, there would be adequate time to take remedial action.

2.5.6.6.6 Internal Drainage

The North and South Dams are provided with horizontal blankets and trapezoidal toe drains to relieve seepage pressures in the event of complete drawdown of Monticello Reservoir. The configuration of these features is discussed in Sections 2.5.6.4.3.3. The horizontal drains are designed to pass the computed seepage quantities without causing excessive hydrostatic pressures within the embankment.

2.5.6.6.7 North Dam Grout Curtain

During the design review by the AEC (currently NRC) the AEC concluded that a grout curtain should be installed along the centerline of the foundation for the North Dam. The purpose of this grout curtain would be to minimize the possibility of significant underseepage losses during emergency shutdown conditions due to the postulated loss of Monticello Reservoir. The requirement for the subsurface grout curtain is contained in the AEC letter of March 1, 1973, from Messrs. Scinto and Conner to Messrs. Head, McCollom and Lyman.

A single-line grout curtain over 1300 feet long was installed along the centerline of the North Dam, as shown by Figure 2.5-191. An auxiliary line was grouted on either side of the centerline between stations 11+61 and 12+11 to obtain a triple-line curtain where the highest permeabilities were encountered. The grout curtain extends approximately 55 feet and 45 feet beneath the foundation and the core abutments, respectively. Grout holes are spaced 2.5 feet on centers in the valley bottom where the hydraulic head of the Service Water Pond is greatest. Grout holes on the abutments are typically 10 feet apart with closer spacings locally. Grouting characteristics of angle holes, drilled in the plane of the grout curtain after construction of the curtain, confirm a significant reduction in permeability along the grout line.

The following sections describe the general grouting preparations, materials, and procedures used.

2.5.6.6.7.1 Site Preparation and Preliminary Testing

The grout curtain work area was prepared by removing the existing soft alluvial deposits and organic waste materials from the valley bottom, located approximately between Stations 8+51 through 10+71, and replacing this zone with a temporary working pad composed of compacted silty clays derived from adjacent near surface soils. The east and west abutments were stripped to suitable foundation materials that ranged from 6 inches to 24 inches deep in the higher elevations and from 2 feet to approximately 6 feet deep on the lower side slopes.

Prior to commencing the grouting, 2 test borings were drilled and logged at centerline stations 6+19 and 9+48 to verify the anticipated stratification of subsurface materials and to permit field comparisons between subsurface samples and earlier descriptions. The logs of these borings, designated ND-27 and ND-28 appear in Appendix 2F. During the grouting program, 2 more confirmatory borings were drilled at Stations 14+41 and 16+21. Their logs, designated ND-29 and ND-30, appear in Appendix 2F. These test borings were advanced by a truck mounted, rotary earth and rock drill.

Prior to grouting, and at select locations during grouting, water pressure tests were performed to obtain additional information about the permeability characteristics of the foundation materials and to aid in determining the initial grout mixes and pressures. The water pressure tests were performed utilizing driven and grouted steel casing, as shown by Figure 2.5-192.

Pressure tests were performed by pumping water into a bore hole until the pumping pressure began to increase. Excess air was then removed from the top of the hole and the hole was sealed and allowed to stabilize at a designated pressure and flow rate. At this point, the rate of water consumption was recorded at 1 minute intervals for a period of 5 minutes. In most cases, the pressure was then increased and the readings repeated to develop a graph of pressure versus flow rate. The pressure at which the flow rate exhibited a marked increase was considered the threshold pressure, above which grout leakage or damage to the foundation might occur. Threshold pressures ranged from about 20 to 40 psig. Tests of flow rates at specified pressures were made at several locations to verify the continuity of the foundation materials. Values of the coefficients of permeability for the foundation materials determined by these tests are summarized in Table 2.5-64.

2.5.6.6.7.2 Materials and Equipment

Type II cement, conforming to ASTM C 150-72, was used. Mixing water equaled the water quality for the production of safety class concrete. Sand, used on occasion in thicker mixes, was predominantly silica sand having a uniformity coefficient less than 6.

Grout mixes used for this work are defined as the ratio of cubic feet of water to sacks of cement for a standard 94 pound cement sack. In general, if water pressure tests indicated a relatively impermeable hole, grouting was started with a thin mix. For a hole which indicated high permeability, grouting was usually started with a thick mix adjusted as grouting proceeded. Typically, a neat Portland cement was used and sanded mixes were used under conditions of high grout take. The thinnest mix consisted of 7 cubic feet of water with 1 sack of cement, a 7 to 1 mix. The thickest grout used was 1 to 1. The sandiest mix used in this work was 3 cubic feet of sand to 5 sacks of cement for a 1 to 1 mix.

The circulating grout system consisted of Wagner DA32 double tub mixer, Wagner AH-36 agitator holding tub, Moyno 3L6 progressive cavity grout pumps and assorted gauges, valves, piping and tubes. A schematic diagram of the system is presented by Figure 2.5-193. All grout holes were approximately 2.5 inches in diameter and were drilled with an Atlas Copco Air Track Drill, Model R0C601, modified to use air and/or water as the drilling fluid. Water was used to advance drill holes, and air and/or water was used to clean holes once the designated depth was achieved. Steel grout casings, 2-1/2 inch ID, were installed in the valley bottom and sealed with a 1 to 1 grout mix. The casings were seated at least 5 feet and, typically, 7 feet into the foundation materials to minimize the possibility of flow to the surface during water pressure testing and grouting operations. After completing the grout curtain, these casings were undercut and removed between Stations 7+50 and 11+50.

2.5.6.6.7.3 Grouting Procedures

A split spacing method was used wherein primary holes located 40 feet apart were initially drilled and grouted. These were followed by secondary holes midway between the primary holes, and then tertiary holes at the remaining midpoints so that a 10 foot spacing was attained. As a conservative measure, 4th order (quarternary) and fifth order (quinary) holes were employed to attain a 2.5 foot spacing in the valley bottom, where the Service Water Pond hydraulic head is greatest. Also, quarternary and quinary grout holes were employed locally along the abutments where isolated zones of higher permeability were indicated.

Applicable grouting pressures were determined from water tests, supplemented by information from hole drilling and grouting characteristics as grouting operations progressed. Grouting pressures were maintained below 1 psig per foot of depth and generally were about 70 to 85% of threshold pressures determined from water pressure tests.

The grouting was performed through the surface casing seated 5 feet or more into the foundation and grouted in place. Where foundation conditions permitted, grout holes were drilled to final depth and grouted in a single stage. Otherwise, 2 or 3 stages were required. Single stage holes predominated on the abutments and multiple stage holes predominated in the valley.

Occasional leaks of grout at the ground surface were stopped, typically, by reducing the grouting pressure while continuing the grout injection, and then gradually increasing the pressure to the desired magnitude. In some instances, leakage was stopped by thickening the grout mix. In other instances, the grout was allowed to set for a short period after which the hole was cleaned and regrouted.

On the abutments 2 or 3 holes were typically grouted simultaneously, immediately after injecting initial quantities of grout in individual holes to attain comparative grout pressures. In the valley, this multiple grouting procedure was restricted to areas of higher permeability.

The grouting of any hole utilizing a mix of 3 to 1 or thicker continued until the hole refused to take grout at the maximum allowable pressure. For mixes thinner than 3 to 1, grouting continued until the rate declined to less than 1 cubic foot of grout mixture in 20 minutes for pressures up to 50 psig and 1 cubic foot in 15 minutes for pressures greater than 50 psig. In addition, quarternary holes were conservatively employed where more than 0.3 sacks of cement per linear foot of grout hole were utilized for the last stage in tertiary holes. The quarternary holes were drilled on either side of such a tertiary hole and were grouted to meet the 0.3 sacks per linear foot criterion, except where leakage to the ground surface occurred.

During the drilling of holes 11+86P and 11+76T, substantial hole caving and loss of drilling water occurred, indicating high permeability and the possibility of high grout takes. This was confirmed when the holes were grouted and the takes for the upper stages were 340 and 114 sacks of cement at 0.0 pump pressure, respectively. A triple grout line with staggered holes on either side of the centerline was then installed at this location. After drilling and logging holes on both the north and south sides of the centerline, each hole was evaluated to determine the lateral extent of the area of higher permeability. Once the area was delineated, grouting proceeded on the north and south lines to construct curtains to contain the grout in the centerline holes. After completion of the north and south grout lines, the centerline was grouted successfully. To determine the effectiveness of the triple grout line, an angle hole (11+51) was drilled and grouted across the area. The lack of caving of the inclined hole and limited amount of grout injected confirmed the effectiveness of the triple line grouting. The triple line segment of the grout curtain is shown by Figure 2.5-194, Sheet 9.

Angle holes were drilled and grouted at 4 additional locations in the single line curtain, as shown by Figure 2.5-194. Their drilling and grouting characteristics and low grout takes verified that significant reductions in permeability were attained.

2.5.6.6.8 Service Water Pond Seepage Test

A full scale field seepage test was performed that demonstrated the relative imperviousness of the North Dam, East Dam, South Dam, West Embankment, the dam, and embankment foundations and the Service Water Pond bottom. The test was performed during initial filling of Monticello Reservoir by preventing a corresponding filling of the Service Water Pond. The reservoir was filled to elevation 424' while flow was prevented from entering the Service Water Pond through the interconnecting pipe. Excess water due to rainfall and construction site discharges was removed from the Service Water Pond by pumps. This arrangement provided for a reverse seepage test, indicative of water-tightness expected for a postulated loss of Monticello Reservoir, wherein water would seep from the Service Water Pond.

Seepage monitoring was performed daily from October 6, 1977, to February 22, 1978. Measurements were begun 58 days prior to initiation of the filling of Monticello Reservoir and continued 14 days after the reservoir level reached elevation 424', which is within 1 foot of the maximum operating reservoir elevation of 425'. Seepage into the Service Water Pond under maximum differential head was significantly less than the calculated amount, indicating conservatism in previous analyses.

1. Monitoring Methods

    A monitoring basin was constructed in the bottom of the Service Water Pond. This basin was mapped by an aerial topographic survey.

    The elevation of the water surface in the basin was measured daily. The corresponding volume of water was determined using planimetered measurements of the topographic map of the basin. Seepage rates were calculated by dividing the daily incremental volumes by the corresponding lapsed time.

    Weather instruments were installed at the Service Water Pond to assist in evaluating rainfall, inflow and evaporation losses. These instruments consisted of an anemometer, rain gage, maximum-minimum thermometer and a present temperature thermometer. These instruments were read in conjunction with evaporation pan measurements, for the entire monitoring program.

2. Results

    Weather and evaporation pan data indicated negligible evaporation losses in the monitoring basin and no corrections to measured water elevations were required. Average flow rates and corresponding water levels in the Service Water Pond and Monticello Reservoir are shown in Figure 2.5-194a.

To determine the seepage rate induced by filling of Monticello Reservoir, it was first necessary to determine the rate of seepage under pre-existing conditions. The pre-existing, or baseline seepage rate is graphically distinguished from rainfall and construction site discharges in Figure 2.5-194a and is approximately 8 gpm.

For the last 14 days of the testing program, Monticello Reservoir was within approximately 1 foot of its maximum operating level. The average seepage rate for this period was approximately 25 gpm. By subtracting the 8 gpm baseline seepage, a net of approximately 17 gpm is obtained for seepage induced by filling the reservoir. This value is about 20% of the combination of seepage rates estimated in Sections 2.5.6.6.3 and 2.5.6.6.4. Therefore, the total water loss from the Service Water Pond due to a postulated loss of Monticello Reservoir would be well within the limits discussed in Section 2.4.8.1.2.

A stability analysis was performed for the reverse seepage case in the same manner as described in Section 2.5.6.5, except that the actual piezometric levels measured on February 23, 1978, were used as shown in Figure 2.5-197. The resulting factor of safety found was 1.45 compared to the previous result of 1.35 which assumed steady state reverse seepage conditions, and as compared to the project design criterion of 1.30.

3. Observed Seepage

During the monitoring program, isolated seepage was observed at scattered locations at the valley bottom and lower portions of natural slopes within the Service Water Pond. Much of the inflow apparently was into the bottom of the monitoring basin, which occupied the lowest elevation in the Service Water Pond, and was not visible due to water collected in the basin. No seepage was observed from the slopes of the 3 dams or the west embankment.

Piezometers installed in the North Dam as shown in Figure 2.5-195 and Table 2.5-66a reflected the filling of Monticello Reservoir; as expected, steady-state seepage conditions were not attained.

Water levels measured in each piezometer are shown by Figure 2.5-194b.

2.5.6.7 Diversion and Closure

The construction of the North Dam closed a natural valley, containing a small northward flowing stream, to create the Service Water Pond. The East Dam closes a natural saddle to prevent the outflow of the impounded water. The West Embankment constitutes a filling of low ground on the west side of the Service Water Pond up to the general plant site grade. The South Dam closes the uppermost portion of the valley. Surface water runoff from the southern headlands of the valley to the south are diverted by the South Dam through the discharge canal and into Monticello Reservoir as shown in Figure 2.5-91. The only connection between the Service Water Pond and Monticello

Reservoir is the interconnecting pipe discussed in Section 9.2. The methods and procedures used to handle the limited seepage and runoff of rainfall in the Service Water Pond area during construction are discussed in the following paragraphs.

The Service Water Pond site was generally well drained before construction, with all flow trending northward through the natural valley which is now closed off by the construction of the North Dam. The main drainage features were 2 small streams which originated in the area of the South Dam and West Embankment. These streams converged near the south toe of the North Dam forming 1 stream which flowed northward into Frees Creek. Both streams were fed by small springs and side hill seeps. Prior to construction, a dry season flow of these combined streams was measured with a sharp crested "V"-notch weir and was found to be less than 15 gpm which indicates the low order of magnitude of flow in the valley.

Diversion of surface runoff and closure of the North Dam, South Dam and West Embankment were performed by constructing sumps to collect and discharge the water by pumping from the Service Water Pond area and by dry packing small seeps with dry Type II cement. Detailed descriptions of the techniques employed to divert or stop this flow, permitting placement of fill under dry conditions, are discussed in Section 2.5.6.3. The East Dam is situated on higher terrain and is not influenced by seeps or springs.

During the foundation preparation phases and throughout fill placement, rainfall runoff was controlled by a series of side hill interceptor ditches. These ditches were constructed on the natural side hill slopes and dam abutments just above the fill elevations. Ditches at progressively higher elevations were constructed as the fill height increased.

2.5.6.8 Instrumentation

2.5.6.8.1 Settlement and Alignment Monitoring

Instrumentation is installed in the North and South Dams to measure post construction crest settlement and horizontal movement. The monuments are positioned at intervals of 100 feet along the dam crests as shown by Figures 2.5-195 and 2.5-195a. Monuments are installed as shown by Figure 2.5-196.

Vertical and horizontal movements measured from time of installation in December, 1977, through April, 1980, are listed in Tables 2.5-66b through 2.5-66e. This period included filling of Monticello Reservoir and the Service Water Pond. Measurements were made several times a week during filling of Monticello Reservoir and the Service Water Pond. However, since the rate of movement was extremely slow, the measurements listed in Tables 2.5-66b through 2.5-66e were selected at approximately 10 day intervals. These measurements indicate that maximum post construction settlement of the North Dam was less than 1 inch and that the North Dam is now experiencing rebound due to buoyancy. The maximum rebound to date is about 1.5 inches. Settlement of the South Dam was negligible and maximum rebound of this structure has been about 1.9 inches to date. Maximum net horizontal movements of the

North Dam are about 1.5 inches, to date, except for 2 monuments which were probably disturbed by construction activities. This disturbance is indicated by the fact that the large movements (about 2 to 4 inches) occurred suddenly and that the monuments then became relatively stable again. Also, the affected monuments were scattered along the dam crest and each is surrounded by monuments showing small movements. Maximum horizontal movements of the South Dam are less than 1/2 inch to date.

Settlement of the monuments closest to the maximum sections of the North and South Dams in relation to filling of Monticello Reservoir and the Service Water Pond is shown by Figure 2.5-196a. The measured piezometric levels in the North Dam crest piezometers (described in Section 2.5.6.8.2) are also shown in Figure 2.5-196a.

Settlement and alignment of the dams will be monitored throughout the operating life of the plant. Monitoring frequency will be in accordance with approved procedures.

2.5.6.8.2 Piezometers

A series of 4 piezometers are installed at each of 3 cross-sections of the North Dam (Stations 8+00, 10+00, and 12+50) as listed in Table 2.5-66a and shown in plan by Figure 2.5-195 and in a typical profile in Figure 2.5-197. All piezometers are conventional well point stand pipe piezometers as shown by Figure 2.5-196. The piezometers located on the crest of the North Dam and on the Service Water Pond side of the dam were used to monitor the transient phreatic water level within the dam during the reverse testing of the Service Water Pond (see Section 2.5.6.6.8). After the reverse testing was completed, the Service Water Pond side piezometers were inundated by the filling of the pond. The piezometers on the crest of the dam were monitored until the phreatic levels of the piezometer locations stabilized at approximately the water level on 98-01
both sides of the dam.

Six (6) Casagrande type piezometers have been installed in the vicinity of the Service Water Pumphouse as shown by Figure 2.5-197a. These piezometers were monitored until the groundwater level stabilized. A surface elevation monument was also installed 98-01
adjacent to each piezometer.

The piezometers located on the Monticello Reservoir side of the dam (over the horizontal drainage blanket) are installed primarily to monitor the phreatic surface near the toe of the North Dam in the event that Monticello Reservoir is emptied. The dams have been designed for the most critical seepage condition which can be postulated, the sudden drawdown condition discussed in Section 2.5.6.5. It is considered desirable, nonetheless, to have these piezometers in place so that the phreatic level above the toe drain can be monitored in the unlikely event that the reservoir is emptied or its level drastically lowered.

The phreatic levels are expected to decrease with time after a sudden drawdown of reservoir level, to a level approaching the reduced reservoir level. In the event that the phreatic level does not decline significantly, the Monticello Reservoir slope of the North Dam would be carefully examined for any evidence of excessive seepage or surface slumping which would be indicative of slope instability. If any detrimental conditions are observed, corrective measures, such as constructing a downstream berm, will be implemented. 98-01

The plant procedures for the Virgil C. Summer Nuclear Station include monitoring the Monticello Reservoir side piezometers in the event that the reservoir level should recede below the tops of the piezometers. These piezometers will be monitored until it is determined that an essentially steady-state or a noncritical condition has been obtained. The piezometers along the crest of the North Dam will also be monitored on the same basis during an emergency shutdown period involving a lowered reservoir level. 98-01 98-01

2.5.6.9 Construction Notes

Principal pieces of equipment used to prepare and construct the various features of the Service Water Pond dams and embankments are summarized by Table 2.5-67. This table presents the type and quantity of equipment available which was used as necessary to perform this work. Figure 2.5-198 presents the progress of construction for each of the structures by showing the quantity of fill placed and percent completion versus the date. It is noted that considerable delays are shown because of adverse weather conditions or rescheduling of work because of other construction commitments. A photograph of typical compaction operations is presented in Figure 2.5-199.

The 3 dams and the West Embankment were constructed in strict compliance with the specification requirements discussed in Section 2.5.6.4.5. When construction control tests indicated that specification requirements were not satisfied, the condition was corrected to satisfy the specification requirements and construction techniques were adjusted to prevent recurrence.

A few modifications of design were based upon field conditions. These modifications are discussed in Sections 2.5.6.9.1 through 2.5.6.9.4.

2.5.6.9.1 North Dam

As shown by Figure 2.5-191, a core trench was excavated between Stations 7+50 and 11+50 to the base of the grout pipes. The trench was excavated with 1 to 1 side slopes and a base width ranging from 22 feet to 29 feet. Each end was sloped at approximately 2.5 to 1 slopes.

As shown by Figures 2.5-105 and 2.5-133, a spoil berm was provided to a maximum elevation of 350.0' on the north side of the North Dam. To assure drainage from the toe drain in the event of rapid drawdown of Monticello Reservoir, a 40 foot wide Zone B riprap drainage outlet was constructed from the rock toe to the natural drainage channel. The riprap was capped with 2, 12 inch layers of Zone 2 and Zone 1 filter material to prevent the infiltration of fines.

2.5.6.9.2 South Dam

Although the design provided for leaving the colluvial deposits in place under the South Dam, soft, wet conditions and large pockets of organics rendered this material unacceptable and it was removed. Therefore, a core trench which was originally planned to extend through the colluvium was eliminated in the lower elevations. This core trench does extend up each abutment approximately 50 feet beyond the design limits and feathers into natural ground. The trench was excavated with 1 to 1 side slopes and a base width ranging from 32 feet to 40 feet.

A relatively high concentration of clay filled vertical joints occur within a small portion of the foundation area of the South Dam between stations 5+50 and 6+00 as shown in Figure 2.5-104. These joints and other isolated joints were excavated, cleaned, inspected, and were found to be relatively tight and essentially impervious. As a conservative measure to minimize the potential for foundation seepage in the event of lowering Monticello Reservoir, these joints were brushed clean, packed with slurry grout, and covered with 12 to 18 inches of 3000 psi concrete.

2.5.6.9.3 East Dam

As discussed in Section 2.5.6.3.3, a concrete lined channel was constructed through the south abutment of the East Dam as part of the Service Water Pond dewatering system. This concrete was removed and the channel was backfilled with select fill prior to embankment construction.

2.5.6.9.4 West Embankment

As discussed in Section 2.5.6.3.4, a peripheral French drain system was constructed to reduce the moisture content of the foundation soils. The location of this drain is shown by Figure 2.5-109.

To prevent erosion during construction, the riprap was extended downward from the design riprap bottom elevation of 415.0'.

2.5.6.10 <u>Operational Notes</u>

Post-construction visual inspections and instrumentation monitoring are performed and maintained in accordance with plant procedures and regulatory requirements. 98-01

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2.5.9 PERSONS AND AGENCIES INTERVIEWED

Dr. Paul Birkhead, Clemson University, Clemson, South Carolina.

Dr. Robert Butler, University of North Carolina, Chapel Hill, North Carolina.

Mr. Ed Burt, Office of Earth Resources, Department of Natural and Economic Resources, Raleigh, North Carolina.

Dr. Howard Cramer, Emory University, Atlanta, Georgia.

Dr. Paul Fullager, University of North Carolina, Chapel Hill, North Carolina.

Dr. Todd Gates, Teledyne Isotopes, Westwood, New Jersey.

Dr. Willard Grant, Emory University, Atlanta, Georgia.

Dr. George Haselton, Clemson University, Clemson, South Carolina.

Dr. Robert Hatcher, Clemson University, Clemson, South Carolina.

Ms. Brenda Higgins, U. S. Geological Survey, Reston, Virginia.

Mr. David Howell, South Carolina State Development Board, Division of Geology, Columbia, South Carolina.

Dr. L. T. Long, Georgia Institute of Technology, Atlanta, Georgia.

Mr. Bill Marsalis, Bendix Field Engineering Corporation, Atlanta, Georgia.

Mr. J. C. McKenzie, Office of Earth Resources, Department of Natural and Economic Resources, Raleigh, North Carolina.

Dr. Bruce O'Connor, Georgia State University, Atlanta, Georgia.

Mr. David Ogley, Furman University, Furman, South Carolina.

Mr. Norman Olson, South Carolina Development Board, Division of Geology, Columbia, South Carolina.

Mr. Sam Pickering, Georgia Department of Natural Resources, Earth and Water Division, Atlanta, Georgia.

Dr. Bill Pirkle, University of South Carolina, Columbia, South Carolina.

Dr. Dave Prowell, U. S. Geological Survey, Reston, Virginia.

Dr. Paul Ragland, University of North Carolina, Chapel Hill, North Carolina.

Dr. Alexander Ritchie, Furman University, Furman, South Carolina.

Dr. Donald Secor, University of South Carolina, Columbia, South Carolina.

Dr. Snorke, University of South Carolina, Columbia, South Carolina.

Dr. Pradeep Talwani, University of South Carolina, Columbia, South Carolina.

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TABLE 2.5-1

INFERRED STRATIGRAPHIC SUCCESSION AND SEQUENCE OF IGNEOUS EPISODES IN THE PIEDMONT OF SOUTH CAROLINA (ADAPTED FROM OVERSTREET AND BELL, 1965a, TABLE 2)

Inferred geologic age	Sequences of sedimentary and pyroclastic rocks and intrusive episodes	Inner Piedmont Belt	Kings Mountain Belt	Charlotte Belt	Carolina Slate Belt
		Syenite pegmatite		Minette and syenite pegmatite	Minette and syenite pegmatite
Permian	(250 MY)		Syenite	Syenite	Syenite
		Gabbro, pyroxenite, and norite	Gabbro and pyroxenite	Gabbro, pyroxenite, and norite	Gabbro, pyroxenite, and norite
Permian and Carboniferous	Intrusive episode C	Yorkville Quartz Monzonite	Yorkville Quartz Monozonite	Yorkville Quartz Monozonite	
		Muscovite pegmatite			
		Cherryville Quartz Monzonite	Cherryville Quartz Monzonite	Granite in circular plutons at Chester, Winnsboro, and Liberty Hill	Granite in circular plutons at Winnsboro, Liberty Hill, and Cayce
Carboniferous	Upper sequence	Marble* Biotite schist* Quartzite*	Marble Sericite schist* Quartzite Sericite*	Mica gneiss*	Argillite* Muscovite schist*

Unconformity

*In part

Inferred geologic age	Sequences of sedimentary and pyroclastic rocks and intrusive episodes	Inner Piedmont Belt	Kings Mountain Belt	Charlotte Belt	Carolina Slate Belt
	Middle sequence	Biotite granite gneiss			
	(450 MY)	Toluca Quartz Monzonite			
	Intrusive episode B	Metamorphosed gabbro and soapstone	Metamorphosed gabbro	Metamorphosed mafic dikes	Metamorphosed mafic dikes
			Oligoclase tonalite		
Devonian through Ordovician		Biotite schist* Marble*	Sericite schist*	Mica gneiss*	Argillite* Muscovite schist*
	Middle sequence	Quartzite* Henderson Gneiss Biotite gneiss and migmatite*			Quartzite Quartz-microcline gneiss
		Hornblende gneiss*	Hornblende schist		Amphibolite

Unconformity

Inferred geologic age	Sequences of sedimentary and pyroclastic rocks and intrusive episodes	Inner Piedmont Belt	Kings Mountain Belt	Charlotte Belt	Carolina Slate Belt
	(550 MY)				
	Intrusive episode A	Biotite gneiss at Iva, Anderson County	Not recognized	Porphyritic granite in Abbeville County and gneissic granodiorite in York County	Not recognized
Cambrian and Late Precambrian	Lower sequence	Hornblende gneiss* Biotite schist* Biotite gneiss and migmatite*	Granitoid gneiss	Granitoid gneiss (Migmatite)	Granitoid gneiss
Unconformity (not observed in Piedmont)					
	(1100 MY)				
	Basement	Unobserved in Piedmont			

TABLE 2.5-2

GENERAL GEOLOGIC TIME SCALE

ERA	PERIOD	EPOCH	APPROXIMATE AGE (in years) BEFORE PRESENT
CENOZOIC	QUATERNARY	Holocene	10,000
		Pleistocene	1,000,000
	TERTIARY	Pliocene	13,000,000
		Miocene	25,000,000
		Oligocene	36,000,000
		Eocene	58,000,000
		Paleocene	63,000,000
MESOZOIC	CRETACEOUS		135,000,000
	JURASSIC		180,000,000
	TRIASSIC		230,000,000
PALEOZOIC	PERMIAN		280,000,000
	PENNSYLVANIAN		310,000,000
	MISSISSIPPIAN		345,000,000
	DEVONIAN		405,000,000
	SILURIAN		425,000,000
	ORDOVICIAN		500,000,000
	CAMBRIAN		600,000,000
PRECAMBRIAN			

TABLE 2.5-3

SUMMARY OF RESULTS OF RADIOMETRIC AGE DETERMINATIONS

Ages in Millions of Years. For model ages, $(Sr^{87}/Sr^{86})_0$ assumed = 0.7050

Specimen	Rock Type	Condition	Rb-Sr Model Age	Rb-Sr Isochron Age	K-Ar Age	Comments
SC2.1	Granodiorite control	Unweathered	295 ± 15		291 ± 15	Biotite ages
SC2.3	Granodiorite control	Unweathered	315 ± 15		288 ± 14	Biotite ages
SD3.1	Granodiorite control	Slightly weathered	317 ± 15		264 ± 16	Biotite ages (Edge of biotite crystals in thin section altered by weathering)
SD3.3	Granodiorite control	Unweathered	314 ± 15		297 ± 18	Biotite ages
NJ1.1	Granodiorite control	Unweathered	299 ± 15		290 ± 17	Biotite ages
NK2.1	Granodiorite control	Unweathered		292 ± 10 (1)	292 ± 17	Biotite age (K-Ar)
SC2.2	Microbreccia of granodiorite	Weathered, but thoroughly lithified	345 ± 70 (2)		196 ± 18	Whole rock ages
SC2.4	Pink granodiorite with slickensides	Unweathered		299 ± 10 (3)	163 ± 16	Whole rock age (K-Ar) (Biotite largely altered to chlorite) 02-01

(1) Average of biotite + whole-rock ages
(2) Reflects low radiogenic Sr^{87}
(3) Average of biotite-chlorite + whole-rock ages.

02-01

TABLE 2.5-3 (Continued)

Ages in Millions of Years. For model ages, $(Sr^{87}/Sr^{86})_0$ assumed = 0.7050

Specimen	Rock Type	Condition	Rb-Sr Model Age	Rb-Sr Isochron Age	K-Ar Age	Comments
SD3.2	Slightly pink granodiorite wedge bounded by laumontite-filled shears	Slightly weathered	358 ± 40 (2)		256 ± 15	Biotite + chlorite age (Rb-Sr). Whole-rock age (K-Ar). 02-01
NK2.2	Microbreccia of granodiorite	Weathered	521 ± 70 (2)		264 ± 16	Whole-rock ages (Biotite altered to chlorite)
NK2.3	Microbreccia of aplite	Slightly weathered	(Rb-Sr too low for analysis)		273 ± 16	Whole-rock age 02-01
SB2.1	Sheared aplite	Slightly weathered	NOT ANALYZED		209 ± 13	Whole-rock age
SB2.2	Aplite control	Unweathered	NOT ANALYZED		227 ± 14	Whole-rock age
SH1	Granodiorite control from slant hole core	Unweathered	NOT ANALYZED		289 ± 17	Biotite age
SH4	Microbreccia of granodiorite from slant hole core	Slightly weathered	NOT ANALYZED		141 ± 8	Whole rock age
X1	Laumontite crystals	Essentially unweathered	NOT ANALYZED		45 ± 5	Hydrothermal mineral age

(2) Reflects low radiogenic Sr87

TABLE 2.5-4

OVERCORING DATA FROM OC-1 AND OC-2
VIRGIL C. SUMMER NUCLEAR STATION

Hole Number	Test	p'	Q'	θ
OC-1	a	Data questionable because core broke		
	b	97 bars (1430 psi)	44 bars (650 psi)	325°
	c	49 bars (730 psi)	40 bars (590 psi)	330°
OC-2	a	38 bars (560 psi)	-20 bars* (-290 psi)	0°
	b	42 bars (620 psi)	-0.7 bars (-10 psi)	10°
	c	31 bars (450 psi)	0.7 bars (10 psi)	15°

* Negative value indicates tension.

TABLE 2.5-5

DYNAMIC AND STATIC ENGINEERING PROPERTIES OF FOUNDATION MATERIAL

Foundation Material	Compressional Wave Velocity (ft/sec)	InSitu Density (lbs/cu ft)	Poisson's Ratio (μ)	Shear Modulus (G) or Modulus of Rigidity (lbs/sq in)	Modulus of Subgrade Reaction (lbs/cu ft)
Saprolite	1000-3000	110-135	0.35	1×10^4	$\frac{5 \times 10^6}{\sqrt{BL}}$**
Weathered and jointed rock	(12,000-13,000) *	(140-160) *	0.30	5×10^5	$\frac{2 \times 10^8}{\sqrt{BL}}$**
Sound rock	15,000	165	0.20	2×10^6	$\frac{8 \times 10^8}{\sqrt{BL}}$**

* Numbers in parentheses are estimated values.

** "BL" is contact area of square foundation. For other contact area shapes, subgrade modulus must be modified (see Barkan, 1962).

NOTE: Young's Modulus, $E = 2(1+\mu)G$

TABLE 2.5-6

<u>MODIFIED MERCALLI INTENSITY (DAMAGE) SCALE</u> (Abridged)

I. Not felt except by a very few under especially favorable circumstances. (I Rossi-Forel Scale.) 02-01

II. Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing. (I to II Rossi-Forel Scale.) 02-01

III. Felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motorcars may rock slightly. Vibration like passing of truck. Duration estimated. (III Rossi-Forel 02-01 Scale.)

IV. During the day felt indoors by many, outdoors by few. At night some awakened. Dishes, windows, doors disturbed; walls make creaking sound. Sensation like heavy truck striking building. Standing motorcars rocked noticeably. (IV to V Rossi-Forel Scale.) 02-01

V. Felt by nearly everyone, many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop. (V to VI Rossi-Forel Scale.) 02-01

VI. Felt by all, many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight. (VI to VII Rossi-Forel Scale.) 02-01

VII. Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motorcars. (VIII Rossi-Forel Scale.) 02-01

VIII. Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motorcars disturbed. (VIII+ to IX Rossi-Forel Scale.) 02-01

TABLE 2.5-6 (Continued)

IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken. (IX+ Rossi-Forel Scale.) 02-01

X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks. (X Rossi-Forel Scale.) 02-01

XI. Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.

XII. Damage total. Waves seen on ground surface. Lines of sight and level distorted. Objects thrown upward into the air.

TABLE 2.5-7

SIGNIFICANT EARTHQUAKES WITHIN 250 MILES OF SITE

(INTENSITY V OR GREATER)

YEAR	DATE	LOCAL TIME	N. LAT.	W. LONG.	LOCALITY	PERCEP-TIBLE AREA (sq mi)	MAGNI-TUDE *	EPI-CENTRAL INTEN-SITY	REFER-ENCE	02-01
1776	Nov 6		35.0	83.0	Jackson County, N.C.			IV-V		
1828	Mar 9	2200-2300			Probably Virginia	190,000		V		
1844	Nov 28	0800	36.0	84.0	Nr. Knoxville, Tenn.			VI	EQH	
1852	Apr 29	1300			Probably Virginia	150,000		VI	BOL	
1855	Feb 2	0300	37.0	78.6	Charlotte Court-house, Virginia	9,000		V	EQH	
1857	Dec 19	0904	32.8	79.8	Charleston, S.C.					
1861	Aug 31	0522			Probably Virginia	300,000		VI		
1872	June 17	1500	33.1	83.3	Milledgeville, Ga.			V	EQH	
1874	Feb 10 to Apr 17		35.7	82.1	McDowell County, N.C. (Six Shocks)	Local		V	GIT	
1875	Nov 1	2155	33.8	82.5	Northern Georgia	25,000		VI	EQH	
1875	Dec 22	2345	37.6	78.5	Arvonia, Virginia	50,000		VI	EQH	

YEAR	DATE	LOCAL TIME	N. LAT.	W. LONG.	LOCALITY	PERCEP-TIBLE AREA (sq mi)	MAGNI-TUDE *	EPI-CENTRAL INTEN-SITY	REFER-ENCE
1877	Nov 16	0238	35.5	84.0	Western N.C. and Eastern Tenn.	5,000		V	EQH
1879	Dec 13	0200	35.2	80.8	Charlotte, N.C.	Local		V	EQH
1884	Jan 18	0800	34.3	78.0	Wilmington, N.C.	Local		V	EQH
1885	Aug 6	0800	36.2	81.6	Watauga County, N.C.	Local		IV-V	EQH
1886	Aug 31	2151 2159	32.9	80.0	Near Charleston, S.C. (Two Shocks)	2,000,000	6.8/7.1	X	BOL
1886	Oct 22	0520 1445	32.9	80.0	Charleston, S.C.	30,000		VI VII	EQH GIT
1886	Nov 5	1220	32.9	80.0	Charleston, S.C.	30,000		VI	EQH
1897	May 3	1218	37.1	80.7	Near Pulaski City, Va.	150,000		VI	EQH
1897	May 31	1358	37.3	80.7	Giles County, Va.	280,000		VIII	
1897	Oct 21	2220	36.9	81.1	Wytheville, Va.	20,000		V	EQH
1898	Feb 5	1500	37.0	80.7	Western, Va.			VI	EQH
1898	Nov. 25	1500	37.0	81.0	Pulaski-Wytheville, Va.			IV-V	BOL

02-01

YEAR	DATE	LOCAL TIME	N. LAT.	W. LONG.	LOCALITY	PERCEP-TIBLE AREA (sq mi)	MAGNI-TUDE *	EPI-CENTRAL INTEN-SITY	REFER-ENCE
1899	Feb 13	0430	37.0	81.0	Western Virginia	30,000		V	EQH
1902	May 29	0230	35.1	85.3	Chattanooga, Tenn.	Local		V	EQH
1902	Oct 18	1700	35.0	85.3	Southeastern Tenn. & Northwestern Ga.	1,500		V	
1903	Jan 23	2015	32.1	81.1	Georgia & S.C.	10,000		VI	EQH
1904	Mar 4	1930	35.7	83.5	Eastern Tenn.	5,000		V	EQH
1907	Apr 19	0330	32.9	80.0	Near Charleston, S.C.	10,000		V	EQH
1911	Apr 21	2200	35.2	82.7	NC-SC Border	600		V	GIT
1912	Jun 12	0530	32.9	80.0	Summerville, S.C.	35,000		VII	EQH
1912	Jun 20		32.0	81.0	Savannah, Ga.			V	GIT
1913	Jan 1	1328	34.7	81.7	Union County, S.C.	43,000		VII	EQH
1913	Mar 28	1650	36.2	83.7	Eastern Tenn.	2,700		VII	EQH
1913	Apr 17	1130	35.3	84.2	Eastern Tenn.	3,500		V	EQH
1914	Jan 23	2224	35.6	84.5	Eastern Tenn.	Local		V	
1914	Mar 5	1505	33.5	83.5	Georgia	50,000		VI	EQH

02-01

YEAR	DATE	LOCAL TIME	N. LAT.	W. LONG.	LOCALITY	PERCEP-TIBLE AREA (sq mi)	MAGNI-TUDE *	EPI-CENTRAL INTEN-SITY	REFER-ENCE
1914	Sept 21	2130	35.0	82.6	Nr Greenville, S.C.			V	
1914	Sept 22	0204	33.0	80.3	Near Summerville, S.C.	30,000		V	EQH
1915	Oct 29	0100	35.8	82.7	Near Marshall, N.C.	1,200		V	EQH
1916	Feb 21	1739	35.5	82.5	Near Skyland, N.C.	200,000	5.0	VI	EPB
1916	Mar 1	1902	34.5	82.7	Anderson, S.C.			IV-V	GIT
1916	Aug 26	1335 1436	36.0	81.0	Western N.C. (Two Shocks)	3,800		V	EQH
1918	Jun 21	2000	36.1	84.1	Lenoir City, Tenn.	3,000		V	EQH
1920	Dec 24	0230	36.0	85.0	Eastern Tenn.	Local		V	EQH
1921	Jul 15		36.6	82.3	Near Mendota, Va.	Local		V-VI	BOL
1924	Oct 20	0330	35.0	82.6	Pickens County, S.C.	56,000		V	EQH
1924	Nov 13	0030	36.6	82.1	Bristol, Tenn-Va.			IV-V	
1924	Dec 25	2330	37.3	79.9	Roanoke, Va.	Local		V	EQH
1926	Jul 8	0450	35.9	82.1	South Mitchell County, N.C.	Local		VI	EQH

02-01

YEAR	DATE	LOCAL TIME	N. LAT.	W. LONG.	LOCALITY	PERCEP-TIBLE AREA (sq mi)	MAGNI-TUDE *	EPI-CENTRAL INTEN-SITY	REFER-ENCE
1927	June 10	0216	38.0	79.0	Near Charlottesville, Va.	2,500		V	
1928	Nov 2	2303	36.0	82.6	Tenn-N.C. Border (Western N.C.)	40,000		VI	CGS
1929	Dec 26	2156	38.1	78.5	Near Charlottesville, Va.			VI	
1933	Dec 19	0912	33.0	80.2	Summerville, S.C.	Local		IV-V	GIT
1935	Jan 1	0315	35.1	83.6	N.C.-Ga. Border	7,000		V	USE
1945	Jun 13	2225	35.0	84.5	Cleveland, Tenn.			V	
1945	Jul 26	0532	34.3	81.4	Lake Murray, S.C.	25,000		VI	USE
1949	Sep 17	0430	36.7	83.0	Lee County, Ga.			IV-V	
1952	Nov 19	1900	32.8	80.0	Charleston, S.C.			V	GIT
1954	Jan 22		35.3	84.4	Near Athens & Etowah, Tenn.			V	
1955	Sep 27	2102	36.6	81.4	N.C.-Tenn. Border	1,700		V	BOL
1956	Sep 7	0836 & 0849	35.5	84.0	Eastern Tenn. (Two Shocks)	8,300		VI	USE
1957	May 13	0925	35.7	82.0	Western N.C.	8,100		VI	EQH

02-01

YEAR	DATE	LOCAL TIME	N. LAT.	W. LONG.	LOCALITY	PERCEP-TIBLE AREA (sq mi)	MAGNI-TUDE *	EPI-CENTRAL INTEN-SITY	REFER-ENCE
1957	Jun 23	0134	36.5	84.5	Eastern Central Tenn.			V	EQH
1957	Jul 2	0433	35.5	82.5	Western N.C.			VI	EQH
1957	Nov 24	1506	35.0	83.5	N.C.-Tenn. Border	4,100		VI	EQH
1958	Mar 5	0654	34.5	77.7	Wilmington, N.C.			V	EQH
1958	Oct 20	0116	34.5	82.6	Anderson, S.C.	Local		V	GIT
1959	Apr 23	1559	37.5	80.5	Va.-W. Va. Border	3,000		VI	EQH
1959	Aug 3	0108	33.0	79.5	Southeast S.C.	25,000		VI	CGS
1959	Oct 26	2107	34.5	80.2	Northeast, S.C.	4,800		VI	GIT
1960	Mar 12	0748	33.0	79.0	Near Coast of S.C.	3,500		V	CGS
1960	Apr 15	0510	35.7	84.0	Eastern Tenn.	1,300		V	EQH
1960	Jul 23	2237	33.0	80.0	Charleston, S.C.	Local		V	GIT
1963	Oct 28	1739	36.7	81.0	Near Galax, Va. (Two Shocks)	1,300		V	CHC
1964	Feb 18	0431	34.8	85.5	Ga.-Ala. Border			V	EQH

02-01

YEAR	DATE	LOCAL TIME	N. LAT.	W. LONG.	LOCALITY	PERCEP-TIBLE AREA (sq mi)	MAGNI-TUDE *	EPI-CENTRAL INTEN-SITY	REFER-ENCE
1964	Mar 12	2020	33.2	83.4	Near Milledgeville, Ga.		4.4	V	CGS
1964	Apr 20	1405	34.0	81.0	Near Columbia, S.C.			V	GIT
1967	Oct 23	0404	33.4	80.7	Charleston-Summerville, S.C.		3.8	V	USE
1969	Jul 13	1651	36.1	84.3	Eastern Tenn.	20,000	3.5	V	EQH
1969	Nov 19	2000	37.4	81.0	Giles County, Va.			V-VI	
1969	Dec 13	0519	35.1	83.0	Nr. Highlands N.C.			V	USE
1970	Jul 30	1015	37.0	82.2	Western, Va.		4.0	V	CGS
1970	Sept 9	2041	36.1	81.4	Northwest N.C.			V	USE
1971	May 19	0754	33.3	80.6	S. Central S.C.		3.4	V	NOS
1971	Oct 9	1143	35.9	83.5	E. Tennessee		3.4	V	ERL
1972	Feb 3	1811	33.5	80.4	S. Central S.C.		4.5	V	ERL
1973	Oct 30	1758	35.7	84.0	E. Tennessee		3.4 GS	V	GS
1973	Nov 30	0248	35.8	84.0	E. Tennessee		4.6 BLA	VI	GS

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YEAR	DATE	LOCAL TIME	N. LAT.	W. LONG.	LOCALITY	PERCEP-TIBLE AREA (sq mi)	MAGNI-TUDE *	EPI-CENTRAL INTEN-SITY	REFER-ENCE
1974	Aug 2	0352	33.9	82.5	Nr. Augusta, Ga		4.9 GS	VI	GS
1974	Nov 22	0025	32.9	80.1	Nr. Charleston, S.C.		4.7	VI	GS
1975	Nov 11	0310	37.2	80.8	S.W. Virginia	--	--	VI	USE
1975	Nov 25	1018	34.9	82.6	L. Jocasse, S.C.	--	3.2	IV	GS
1976	Jan 19	0121	36.9	83.8	Kentucky	--	4.0 M_b	VI	GS
1976	Feb 4	1554	35.0	84.8	Tenn.-Ga. Border	--	3.0 M_b	VI	USE
1976	Jun 19	0054	37.4	81.6	S. W. Virginia	--	4.7 M_b	V	USE
1976	Sep 13	1355	36.6	80.8	Va.-N.C. Border	--	3.3 M_b	VI	GS
1976	Dec 27	0157	32.2	82.5	S. E. Ga.	--	3.7 M_b	V	GS
1977	Jan 18	1329	32.9	80.2	Charleston	--	3.0 M_b	V	USE
1977	Jul 27	1703	35.4	84.4	Tenn.	--	3.5 M_b	V	GS
1977	Aug 25	0420	33.4	80.7	Bowman, S.C.	--	3.1 M_b	V	GS
1977	Dec 15	1415	32.9	80.2	Charleston	--	3.0	V	GS
1978	Mar 17	1327	36.7	80.7	S. W. Virginia	--	2.8	V	GS
1979	Jan 19	0856	34.6	82.8	L. Keowee	--	3.4 M_b	--	SEN

02-01

YEAR	DATE	LOCAL TIME	N. LAT.	W. LONG.	LOCALITY	PERCEP-TIBLE AREA (sq mi)	MAGNI-TUDE *	EPI-CENTRAL INTEN-SITY	REFER-ENCE
1979	Aug 13	0519	35.2	84.3	S. E. Tenn.	--	3.7 M_b	V	GS
1979	Aug 25	2132	34.8	82.9	L. Jocassee, S. C.	--	3.7 M_{bLg}	--	SEN
1979	Sep 6	2038	35.3	83.2	West, N. C.	--	3.2 M	--	SEN
1979	Sep 12	0624	35.6	83.9	Marysville, Tenn.	--	3.2 M_b	V	GS
1979	Oct 8	0854	36.4	82.0	N. E. Tenn.	--	3.6 M	--	SEN

02-01

The following abbreviations for references were used -

BOL Bollinger (1969)
CGS Coast and Geodetic Survey
EPB Earth Physics Branch, Dept. of Ener. Mines and Res., Canada
EQH Earthquake History of the United States, Coffman and Von Hake (1973)
ERL Environmental Research Laboratories (NOAA)
GIT - Georgia Institute of Technology
BLA WWSSN, Blacksburg, Virginia
CHC WWSSN, Chapel Hill, N. C.
GS U. S. Geological Survey
NOS National Ocean Survey (NOAA)
USE U. S. Earthquakes, Yearly Publication (NOAA)
SEN Southeastern Seismic Network

* M_b Body wave
M Local (Duration)
M_{bLg} Body wave (Nuttli)

TABLE 2.5-8

FOUNDATION SEISMIC DESIGN PARAMETERS

Foundation Material	Compressional Wave Velocity (ft/sec)	In Situ Density (lbs/cu ft)	Poisson's Ratio (μ)	Shear Modulus (G) or Modulus of Rigidity (lbs/sq in)	Modulus of Subgrade Reaction (lbs/cu ft)
Saprolite	1000-3000	110-135	0.35	1×10^4	$\frac{5 \times 10^6}{\sqrt{BL}}$ * *
Weathered and jointed rock	(12,000-13,000)*	(140-160)*	0.30	5×10^5	$\frac{2 \times 10^8}{\sqrt{BL}}$ * *
Sound rock	15,000	165	0.20	2×10^6	$\frac{8 \times 10^8}{\sqrt{BL}}$ * *

* Numbers in parentheses are estimated values.

** "BL" is contact area of square foundation. For other contact area shapes, subgrade modulus must be modified (see Barkan, 1962).

Note: Young's Modulus, $E = 2(1 + \mu)G$

TABLE 2.5-9

ROCK COMPRESSION TEST RESULTS

				Triaxial Tests			
Boring	Depth (Feet)	Unit Weight (lbs/cu ft)	Unconfined Compressive Strength (lbs/sq in)	Confining Pressure (lbs/sq in)	Peak Deviator Stress (lbs/sq in)	Young's Modulus E (lbs/sq in)	Poisson's Ratio
			Borings On or Adjacent to Site				
N-15	90	163	37,700			8.1 x 106	0.18
N-16	101	169	11,300			7.4 x 106	
N-16	176	161	29,900			1.1 x 107	
N-19	88	162		8,000	81,000	5.5 x 106	
N-19	94	163		5,000	81,000	6.1 x 106	
N-22	151	170		5,000	21,600	5.0 x 106	
3-1	91	169	26,500			8.0 x 106	0.24
3-2	108	173	19,000			4.4 x 106	
3-2	117	170	31,000			9.0 x 106	0.22
3-2	118	168	32,000			8.2 x 106	
3-2	126	171	13,000			8.6 x 106	
3-6	97	172	11,000			4.9 x 106	
3-9	114	161	900			1.4 x 105	
3-14	118	173	22,000			4.9 x 106	
3-14	174	173	25,000			6.5 x 106	
3-17	120	166	32,000			4.5 x 106	
			Other Borings Approximately Three Miles North of Site				
N-2	111	169		8,000	73,500		
N-2	112	171	16,800			7.0 x 106	0.17
N-11	36	191		4,000	92,000		
N-11	36 1/2	194		3,400	92,000		
N-11	37	193	33,200			1.3 x 107	0.20

SOIL DYNAMIC TORSIONAL SHEAR TEST RESULTS

Boring:Depth: N-2 * 27 feet
Soil Type: micaceous silt and sand
Dry Density: 101 lbs. per cu. ft.
Moisture Content: 10.6 percent

Confining Pressure (lbs/sq ft)	Range of Shear Strain ($x 10^{-5}$)	Range of Modulus of Rigidity (lbs/sq ft $x 10^5$)
1000	2 to 24	4.1 to 3.7
2000	1 to 13	12.5 to 11.6
4000	1 to 10	18.4 to 17.4
8000	1 to 7	28.6 to 28.3

02-01

Boring:Depth: N-2* 32 feet
Soil Type: micaceous silt and sand
Dry Density: 84 lbs. per cu. ft.
Moisture Content: 18.7 percent

Confining Pressure (lbs/sq ft)	Range of Shear Strain ($x 10^{-5}$)	Range of Modulus of Rigidity (lbs/sq ft $x 10^5$)
1000	3 to 36	4.1 to 3.2
2000	3 to 22	6.2 to 4.3
4000	1 to 11	15.6 to 15.2
8000	1 to 8	23.2 to 22.1

02-01

Boring:Depth: N-2 * 38 feet
Soil Type: micaceous sand with silt and fine gravel
Dry Density: 117 lbs. per cu. ft.
Moisture Content: 8.6 percent

Confining Pressure (lbs/sq ft)	Range of Shear Strain ($x 10^{-5}$)	Range of Modulus of Rigidity (lbs/sq ft $x 10^5$)
1000	2 to 19	7.7 to 6.9
2000	2 to 15	11.1 to 10.3
4000	1 to 9	20.7 to 19.1
8000	1 to 6	32.3 to 32.0

02-01

* Torsional Shear Tests performed on samples recovered from borings drilled approximately 3 miles north of the site. The soils tested are similar to that at the plant site.

SOIL DYNAMIC TORSIONAL SHEAR TEST RESULTS

Boring: N-2* Soil Type: micaceous sand with silt and fine gravel
Depth: 50 feet
Dry Density: 130 lbs. per cu. ft.
Moisture Content: 7.0 percent

Confining Pressure (lbs/sq ft)	Range of Shear Strain ($x 10^{-5}$)	Range of Modulus of Rigidity (lbs/sq ft $x 10^{5}$)
1000	4 to 24	4.9 to 4.4
2000	2 to 16	12.0 to 10.0
4000	1 to 8	24.8 to 23.6
8000	1 to 5	41.3 to 40.7

02-01

Boring: 3-14 Soil Type: brown silty micaceous sand
Depth: 55 feet
Dry Density: 91 lbs. per cu. ft.
Moisture Content: 24.0 percent

02-01

Confining Pressure (lbs/sq ft)	Shear Strain ($x 10^{-5}$)	Modulus of Rigidity (lbs/sq ft $x 10^{5}$)
1000	20	6.5
2000	17	10.5
4000	11	17.2
8000	8	26.5

Boring: 3-7 Soil Type: reddish brown silty micaceous fine sand
Depth: 30.5 feet
Dry Density: 86 lbs. per cu. ft.
Moisture Content: 27.0 percent

02-01

Confining Pressure (lbs/sq ft)	Shear Strain ($x 10^{-5}$)	Modulus of Rigidity (lbs/sq ft $x 10^{5}$)
1000	20	7.8
2000	16	11.0
4000	12	16.4
8000	10	22.5

* Torsional Shear Tests performed on samples recovered from borings drilled approximately 3 miles north of the site. The soils tested are similar to that at the plant site.

TABLE 2.5-11

COMPRESSIONAL WAVE VELOCITY TEST RESULTS

Tests on Soil Samples

Boring	Depth (feet)	Dry Density (lbs/cu ft)	Moisture content (percent)	Velocity of Compressional Wave Propagation (ft/sec)
N-14	36.5	118	14.0	1100
N-15	11.5	97	13.8	1700
N-15	16.5	99	10.8	1000
N-15	46.5	90	25.0	900
N-19	6	93	25.8	1200
N-19	20	96	18.9	1000
N-22	6	96	25.9	2900
N-22	26	95	22.0	1000
N-22	61	112	11.3	1000

02-01

Tests on Rock Samples

Boring	Depth (feet)	Velocity of Compressional Wave Propagation (ft/sec)
N-16	184	16,400
N-17	60	12,400
N-17	82	14,400
N-17	97	14,100
N-17	149	14,200
N-18	223	13,400
N-19	90	10,800
N-19	123	13,400
N-19	149	13,500
3-1	111	10,400
3-2	105	12,100
3-2	124	16,700
3-17	86	12,800
3-17	106	12,900
3-17	132	11,300
N-1 *	104	11,400
N-1 *	129	13,600
N-1 *	163	15,400

* These samples were obtained from other borings drilled approximately three miles north of the Station site. The rock tested is similar to that at the plant site.

TABLE 2.5-12

PERMEABILITY TEST DATA - OVERBURDEN

Boring	Depth (feet)	Permeability (ft/day)	Permeability (cm/sec)
N-19	65	4.8×10^{-4}	1.7×10^{-7}
N-22	40	4.0×10^{-2}	1.4×10^{-5}
3-2	40	13.6×10^{-2}	4.8×10^{-5}
3-3	60 1/2	17.0×10^{-2}	6.0×10^{-5}
3-5	5 1/2	6.8×10^{-2}	2.4×10^{-5}
3-9	75 1/2	33.5×10^{-2}	11.8×10^{-5}
3-17	30	16.8×10^{-2}	5.9×10^{-5}

02-01

TABLE 2.5-13

ATTERBERG LIMIT DATA

Boring	Depth (feet)	In Situ Moisture Content (percent)	Liquid Limit	Plastic Limit	Plasticity Index
3-3	1/2	23	29	22	7
3-7	1/2	24	58	48	10
3-14	1 1/2	24	39	38	1
3-15	1/2	22	44	30	14
3-18	65	14	39	Nonplastic	
3-20	1	26	46	31	15
AR-1	1	20	46	21	25
AR-2	5	22	53	37	16
AR-3	5	21	45	Nonplastic	
AR-6	5	21	66	30	36
AR-9	1 1/2	17	36	24	12

02-01

TABLE 2.5-14

RESISTIVITY TEST RESULTS

Boring	Sample Depth (feet)	Material	Laboratory Resistivity (ohm-centimeters)
3-1	375	Rock (3)	118×10^6
3-1	375	Rock (4)	74×10^3
3-3	51	Soil (1)	159×10^3
3-3	51	Soil (2)	124×10^3
3-4	78	Rock (3)	$> 700 \times 10^6$
3-4	78	Rock (4)	66×10^3
3-6	317	Rock (3)	680×10^6
3-6	317	Rock (4)	89×10^3
3-7	66	Soil (1)	140×10^3
3-7	66	Soil (2)	72×10^3
3-8	36	Soil (1)	191×10^3
3-8	36	Soil (2)	112×10^3
3-11	88	Rock (3)	55×10^6
3-11	88	Rock (4)	44×10^3
3-14	126	Rock (3)	8×10^6
3-14	126	Rock (4)	91×10^3
3-16	21	Soil (1)	162×10^3
3-16	21	Soil (2)	77×10^3

02-01

(1) Tested at natural moisture content
(2) Tested at saturated moisture content (saturated with ground water)
(3) Tested at moisture content less than natural due to air drying of rock core
(4) Tested at saturated moisture content (saturated with ground water)

TABLE 2.5-15

SOIL CHEMICAL TEST RESULTS

Boring	Sample Depth (feet)	pH	Total Sulphates (parts/million)	Dissolved Sulphates (parts/million)
3-3	50 1/2	5.7	352.6	303.4
3-7	65	5.8	319.8	262.4
3-8	35	5.7	262.4	246.0
3-16	20	5.4	352.6	352.6

TABLE 2.5-16

SUMMARY OF STRESS CONTROLLED CYCLIC CONSOLIDATED UNDRAINED TRIAXIAL TESTS

Test No.	Boring No.	Sample No.	Depth (ft.)	Initial Moisture Content (%)	Initial Dry Density (pcf)	Moisture Content After Consolidation (pcf)	Dry Density After Consolidation (pcf)	Effective Consolidation Pressure $\bar{\sigma}_c$ (psf)	Cyclic Deviator Stress $(\sigma 1-\sigma 3)$Max. (psf)	Stress Ratio $\tau / \bar{\sigma}_3$ Max*	Number of Cycles: 5% Double Ampl. Axial Strain	Number of Cycles: l0% Double Ampl. Axial Strain
1	4-1	5	15	13.6	87.2	31.0	89.7	1750	691	0.39	6	16
2	4-1	9A	25	18.5	90.0	24.0	93.6	2475	1068	0.43	9	30
3	4-1	9B	25	11.8	92.3	28.0	95.1	2475	1006	0.41	5	11
4	4-1	11	30.5	7.9	107.8	18.6	112.6	2875	1334	0.47	6	50
5	4-1	5B	15.0	15.5	81.8	35.0	84.8	1750	553	0.32	5	10
6	4-1	13A	35.0	7.5	97.5	21.2	102.0	3165	1061	0.34	10	37

$* \ \tau = \frac{(\sigma 1 - \sigma 3)}{2} \text{Max.}$

TABLE 2.5-17

SUMMARY OF STRAIN CONTROLLED CYCLIC CONSOLIDATED UNDRAINED TRIAXIAL TESTS

Test No.	Boring No.	Sample No.	Depth (ft.)	Initial Moisture Content (%)	Initial Dry Density (pcf)	Moisture Content After Consolidation (%)	Dry Density After Consolidation (pcf)	Effective Consolidation Pressure $\bar{\sigma}_c$ (psf)	Single Ampl. Cyclic Shear Strain (%)	Shear* Modulus (ksf)	Damping Ratio (%)
1	4-1	9C	25	12.2	87.6	29.0	91.2	2475	.0047	4355	9.5
"	"	"	"	"	"	"	"	"	.0093	3305	10.5
"	"	"	"	"	"	"	"	"	.0187	2367	15.6
"	"	"	"	"	"	"	"	"	.3691	175	17.5
"	"	"	"	"	"	"	"	"	.7382	102	20.9
2	4-1	13B	35	8.1	97.0	20.8	102.1	3165	.0048	5707	7.4
"	"	"	"	"	"	"	"	"	.0095	4503	10.4
"	"	"	"	"	"	"	"	"	.0189	3178	13.8
"	"	"	"	"	"	"	"	"	.3750	205	17.6
"	"	"	"	"	"	"	"	"	.7500	106	19.3

* Poisson's Ratio assumed to be 0.50

TABLE 2.5-18

COMPUTATION OF MAXIMUM MODIFIED PENETRATION RESISTANCES FOR LIQUEFACTION UNDER PEAK GROUND SURFACE ACCELERATION OF 0.15g

Depth (feet)	σ'_V (psf)	σ_V / σ'_V	r_d	τ_{av} / σ'_V	N_1
15	1755	1.0	0.97	0.09	6.5
25	2325	1.27	0.94	0.12	8.7
35	2895	1.44	0.90	0.13	9.4
45	3465	1.55	0.80	0.12	8.7
55	4035	1.62	0.71	0.11	8.0
65	4605	1.68	0.63	0.10	7.2
75	5175	1.73	0.56	0.09	6.5

TABLE 2.5-19

COMPUTATION OF MAXIMUM MODIFIED PENETRATION RESISTANCES FOR LIQUEFACTION UNDER PEAK GROUND SURFACE ACCELERATION OF 0.25g

Depth (feet)	σ'_V (psf)	σ_V / σ'_V	r_d	τ_{av} / σ'_V	N_1
15	1755	1.0	0.95	0.15	10.9
25	2325	1.27	0.91	0.19	13.8
35	2895	1.44	0.84	0.20	14.5
45	3465	1.55	0.70	0.18	13.1
55	4035	1.62	0.55	0.15	10.9
65	4605	1.68	0.43	0.12	8.7
75	5175	1.73	0.35	0.10	7.3

TABLE 2.5-20

COMPUTATION OF AVERAGE CYCLIC SHEAR STRAINS
FOR PEAK GROUND SURFACE ACCELERATION OF 0.25g

Depth (feet)	σ' (psf)	τ_{av} / σ_v'	τ_{av} (psf)	γ_{av} (percent)
5	585	0.16	94	0.02
15	1755	0.15	263	0.04
25	2325	0.19	442	0.07
35	2895	0.20	579	0.09
45	3465	0.18	624	0.08
55	4035	0.15	605	0.07
65	4605	0.12	552	0.06

TABLE 2.5-21

FOUNDATION DESIGN INFORMATION FOR SEISMIC CATEGORY I STRUCTURES 02-01

Structure	Approximate Plan Dimensions (feet)	Approximate Foundation Elevation (feet)	Foundation Embedment Below Finish Grade (feet)	Foundation Type	Foundation Loads and Bearing Pressures
Reactor Building	134, outside diameter	396 to 408*	39	Mat	Load bearing pressures do not exceed 25 KSF
Control Building	84 x 141	407 to 411*	28	Mat	"
Auxiliary Building	120 x 190			Mat	"
North		384 to 388*	51		
South		370 to 374*	65		
Diesel Generator Building	66 x 67	394 to 421*	41 and 14	Caissons into rock	Loads on individual caissons vary. Caissons designed in accordance with values on Table 2.5-23.
Fuel Handling Building	75 x 123	409 to 430**	26 and 5	Caissons into rock	"
Intermediate Building	85 x 198	394 to 409**	39 and 26	Caissons into rock	"
Condensate Storage Tank Foundation	58 diameter	430	5	Mat on Soil	Refer to Section 2.5.4.10.3
Diesel Generator Fuel Oil Storage Tanks	Two Tanks	419	16	Soil-Supported	Refer to Section 2.5.4.10.3

Structure	Approximate Plan Dimensions (feet)	Approximate Foundation Elevation (feet)	Foundation Embedment Below Finish Grade (feet)	Foundation Type	Foundation Loads and Bearing Pressures
Service Water Pump House	70 x 79	386	49	Mat on soil	Refer to Section 2.5.4.10.6
Service Water Intake Structure	18 x 166	367	-	Mat on soil	Refer to Section 2.5.4.10.6
Service Water Discharge Structure	33 x 35	408	15	Mat on rock	Refer to Section 2.5.4.10.6

02-01

* Indicates the elevation at which the structural concrete (3000 psi concrete) is founded on the fill concrete (1500 psi concrete) which in turn is founded on bedrock. The base of the fill concrete corresponds approximately to the excavation depth contours presented on Figure 2.5-24. The approximate base of the fill concrete is as follows: 02-01

Reactor Building	Elevation (feet)
North	341
East	348
South	362
West	367
Auxiliary Building	
North	354
South	368
Control Building	366 and 371

** Elevation of Cap. Elevation of bottom of caissons vary.

TABLE 2.5-22

ULTIMATE AND ALLOWABLE ROCK BEARING CAPACITY

Rock Property Indicator Number (from Section 2.5.4.4.1)	"Theoretical" Ultimate Bearing Capacity (ksf)	Design Allowable Bearing Capacity (ksf)
#1	6,000	200
#2	2,000	100
#3	800	40

TABLE 2.5-23

CAISSON END BEARING AND SHAFT RESISTANCE

		Allowable Static Loading*		Allowable Dynamic Loadings* (Short-Term Earthquake Loadings)	
Rock Property Indicator Number (from Section 2.5.4.4.1)	"Theoretical" Ultimate End Bearing Capacity (ksf)	End Bearing Capacity (ksf)	Shaft Resistance (skin friction) (ksf)	End Bearing Capacity (ksf)	Shaft Resistance (skin friction) (ksf)
#1	6,000	200	10	600	20
#2	2,000	100	10	300	20
#3	800	25	5	75	10

* The caissons are designed in accordance with the allowable values with the exception that, for caissons founded in #1 and/or #2 rock, the values for the #2 rock are used. For design considering combined bearing and friction, the full value for one type of resistance plus no more than 2/3 of the other resistance are utilized.

TABLE 2.5-24

SUMMARY OF EMBANKMENT GEOMETRY

	NORTH DAM	SOUTH DAM	EAST DAM	WEST EMBANKMENT
Crest Elevation (feet)	438.0	438.0	438.0	435.0
Crest Width (feet)	30.0	30.0	40.0	50.0
Approximate Crest Length (feet)	1,500	765	1,150	1,900
Maximum Height (feet)	129	98	28	96
Approximate Volume (1,000 cubic yards)	785	273	44	1,169 [(1)]

NOTE:

1. Includes nonsafety class fill west of West Embankment.

TABLE 2.5-25

CROSS-HOLE VELOCITY MEASUREMENTS
NORTH, SOUTH, AND EAST DAM LOCATIONS 02-01

Recording Station		Shot Station		Horizontal	Velocity (ft/sec)	
Boring No.	Depth (ft)	No.	Depth (ft)	Distance (ft)	Compress.	Shear
ND-4	35	ND-1	40	200	13,300	7,680
	35		30	200	13,300	7,400
ND-11	45	ND-4	45	215	14,200	7,600
						8,000
	65	ND-17	75	175	14,000	7,600
SD-5	45	SD-1	45	160	16,000	8,000
					15,200	
	45	SD-8	45	212	13,250	7,300
ND-11	15	SD-11a	20	20	4,000	
	15		20	20	4,000	1,550
						1,800
			20	20	4,000	1,450
						1,550
	15		20	20	3,600	1,550
						1,800
	15		20	20		1,800 (1)
	15	SD-11b	20	35	4,400	1,950
	15	SD-11c	20	48	4,800	
					4,000	1,500
						1,850
	15		20	48	4,800	1,600
					4,000	1,500
SD-5	15	SD-5a	14	25	4,150	1,650
						1,550
ED-2	20	ED-2a	25	25	1,560 (1)	1,090 (1)
						835 (1)
	15		25	25	1,400	860 (1)
	25		25	25	1,190	
	25		25	25		660
	15		15	25	1,085	
	15	ED-5/2	15	80	1,950	1,100
	15		15	80	2,000	1,125
	15		25	80	1,700 (1)	1,100

02-01

NOTE:

1. Poor definition of wave arrival.

TABLE 2.5-26

RESULTS OF CROSS-HOLE SEISMIC SURVEY

Horizon	Vs (ft/sec)	Vp (ft/sec)	G (ksi)	E (ksi)	μ
Intact Rock	7650	14500	2083	5444	.307
	7600	14000	2055	5307	.291
	7600	14200	2055	5341	.299
	7400	13300	1949	4972	.276
	7680	13300	2099	5247	.250
	7300	13250	1896	4862	.282
	8000	16000	2277	6073	.333
	8000	15200	2277	5960	.308
Decomposed Rock	1550	4150	69.9	198.5	.419
	1550	4000	69.9	197.5	.412
	1850	4000	99.6	271.8	.364
	1500	4000	65.5	185.8	.418
	1600	4150	74.5	210.6	.413
	2300	4600	154.0	410.7	.333
Saprolite and Transported Soils	1100	1850	33.9	83.2	.227
	1125	2000	35.5	90.0	.263
	1100	1950	33.9	85.9	.267
	860	1400	20.7	49.6	.197
	1090	1560	33.3	68.2	.023
	835	1560	19.5	50.8	.299

Vs = Shear wave velocity

Vp = Compressional wave velocity

G = Shear modulus

E = Young's modulus

μ = Poisson's ratio

TABLE 2.5-27

PERMEABILITY TEST RESULTS

Horizon	Field Permeability: Boring No.	Field Permeability: Depth Range of tests (ft)	Field Permeability: Average Permeability (cm/sec x 10^{-5})	Laboratory Permeability: Sample No.	Laboratory Permeability: Consolidation Pressure (tsf)	Laboratory Permeability: Average Permeability (cm/sec x 10^{-5})
Colluvium / Residual Soils	SD-5b	5.0-14.5	0.18	SD-5(2')	2.0	1.5
	SD-8b	6.4-16.0	0.48		4.0	0.58
	ED-4	5.5-10.0	1.1	SD-5(6')	2.0	0.16
	SS-3	4.0-7.0	0.62	ED-2(12')	2.0	0.48
					4.0	0.79
Saprolite	ND-7	8.0-15.0	2.3	ND-4(10')	0.0	0.37
	ND-13	4.0-27.0	0.70	ED-2(27')	2.0	4.1
		27.0-30.0	7.6		3.9	1.7
		30.0-33.0	150.0+			
	ND-11a	14.0-15.5	29.0++			
	ND-20	19.0-25.5	6.4			
	ND-23	13.0-24.5	3.7			
	ND-25	9.0-25.0	0.96			
		9.0-14.0	0.18			
	SD-6	14.0-29.0	2.2			
		4.2-8.2	0.34			
	ED-4	14.6-18.0	1.2			
	SS-3	14.6-37.0	3.0			
		7.0-37.0	5.9			
Decomposed Rock	ND-7	15.0-136.0	0.94	ND-4(18')	2.0	0.20
	ND-9	4.0-20.0	0.55	ND-14(7')	2.0	1.2
	ND-9a	20.5-35.0	0.54		4.0	0.98
		35.0-45.0	1.8	ND-14(12')	0.0	0.16
		45.0-70.0	0.46			
	ND-20	25.0-38.8	0.60			
	ND-22a	4.0-30.0	0.77			
	ND-23	25.0-40.0	1.8			
		40.0-54.0	2.5			

02-01

PERMEABILITY TEST RESULTS

Horizon	Field Permeability: Boring No.	Field Permeability: Depth Range of tests (ft)	Field Permeability: Average Permeability (cm/sec x 10^{-5})	Laboratory Permeability: Sample No.	Laboratory Permeability: Consolidation Pressure (tsf)	Laboratory Permeability: Average Permeability (cm/sec x 10^{-5})
Decomposed Rock (Continued)	ND-24	4.0-29.0	0.64			
	SD-5b	14.5-18.0	0.54			
	SD-6	18.0-20.8	3.6			
	SD-8b	18.0-38.0	2.5			
	ED-4	19.2-25.0	4.1			
		37.0-40.0	1.7			
Fractured Rock	ND-13	33.0-34.0	1000.0 (est.)			
	ND-25	29.0-30.0	320.0			
	SD-5	35.5-44.0	33.0			
	SD-8	42.0-55.0	25.0			
Intact Rock	ND-1	21.0-38.5	5.6			
	ND-11a	40.0-146.5	4.5			
	ND-21	29.5-146.5	0.60			
	SD-5	44.0-146.0	4.2			
	SD-6	38.0-52.0	2.6			
	ED-4	40.0-48.5	2.4			

NOTES:

1. Influenced by fractured rock at 34 feet.
2. Influenced by very loose alluvium at 13.5 feet.
3. Additional test results are presented by Table 2.5-64.

SUMMARY OF LABORATORY TEST RESULTS
FOUNDATION SOILS

SUMMARY OF LABORATORY TEST RESULTS – COLLUVIUM

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT %	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	UNCON COMPRESS STRESS	UNCON COMPRESS STRAIN %	UNIT DRY WGT pcf	SPECIFIC GRAVITY	GRAIN SIZE SIEVE	GRAIN SIZE HYDR	OPT MOIST	CONSOLID	TRIAXIAL UU	TRIAXIAL CIU	TRIAXIAL CELL PRESSURE	TRIAXIAL BACK PRESSURE psi
SD-1	4.0- 5.5	CL		14.5														
	11.0-12.5	CL		26.8														
SD-1A	2.0- 3.5	SM		13.2														
	5.0- 6.5	ML		29.9														
SD-5	2.[illegible]- 4.5	CL	(1)	17.5	23	15			110.6	2.67				*				
			(2)	18.7														
				22.3														
				19.9														
	6.0- 8.5	ML		18.2														
			(2)	18.7	39	27			99.0	2.67				*		*		
				21.6														
				25.4														
SD-8	2.0- 3.5	CL		20.1														
	[illegible].0- 6.5	CL		23.2														
	[illegible].0- 9.5	CL		28.8														
	11.0-12.5	CL		26.5														
	14.0-15.5	CL		23.0														
	1[illegible]-18.5	SC		17.[illegible]														

* [illegible]   (1) Permeability   (2) Cyclic Triaxial Shear

TABLE 2.5-28 (Cont'd)
Sheet 2 of 21

SUMMARY OF LABORATORY TEST RESULTS – COLLUVIUM

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		UNCON COMPRESS		UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		OPT MOIST	CONSOLID	TRIAXIAL			
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (tsf)	STRAIN (%)			SIEVE	HYDR			U.U.	CIU	CELL PRESSURE (psi)	BACK PRESSURE (psi)
SD-9B	4.0- 6.5	ML		19.7 26.4	38	26			87.5						*			
	7.0- 9.5	CL-ML		22.2 20.6 22.0	26	19			106.1 99.9					*	*			
	10.0-12.5	ML		11.5 16.7 13.8					109.5 110.8					*	*			
SD-9D	4.0- 6.5	CL		24.3 19.7 26.4 22.4 24.5	31	20			98.9 95.6					*	*			
	10.0-12.2	ML			21	17												

* See Text

TABLE 2.5-28 (Cont'd)
Sheet 3 of 21

SUMMARY OF LABORATORY TEST RESULTS - RESIDUAL SOIL

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	UNCON COMPRESS STRESS (tsf)	UNCON COMPRESS STRAIN (%)	UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE SIEVE	GRAIN SIZE HYDR	OPT MOIST	CONSOLID	TRIAXIAL U.U.	TRIAXIAL $\overline{CIU}$	TRIAXIAL CELL PRESSURE (psi)	TRIAXIAL BACK PRESSURE (psi)
ND-3	2.0- 3.5	ML		22.9														
	5.0- 6.5	ML		5.6														
	8.0- 8.6	ML		16.3														
ND-15	2.0- 3.5	CH		29.2	61	29												
	5.0- 6.5	CH		17.9														
ND-16	2.0- 3.5	CL/CH		24.6 30.7														
SD-3	2.0- 3.5	CL		36.2														
	5.0- 6.5	CL		25.6														
SD-7	2.0- 3.5	CL		37.3														
ED-2	2.0- 4.4	ML		27.3 29.4	47	36	0.81	4.5	88.6									
	4.4- 5.8	ML/MH		41.4														
	7.0- 9.5	MH		50.8 46.3	60	51	0.46	1.0	78.8									
	9.5-11.0	ML/MH		43.9														
	12.0-14.5	MH		59.7 60.4	65	58			69.8					*				
	14.5-16.0	MH		45.8														

* See Test Curves

SUMMARY OF LABORATORY TEST RESULTS - RESIDUAL SOIL

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	UNCON COMPRESS STRESS (tsf)	UNCON COMPRESS STRAIN (%)	UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE SIEVE	GRAIN SIZE HYDR	OPT MOIST	CONSOLID	TRIAXIAL UU	TRIAXIAL CIU	TRIAXIAL CELL PRESSURE (psi)	TRIAXIAL BACK PRESSURE (psi)
ED-2	17.0-19.5	MH			54	48			67.5					*				
	19.5-21.0	MH		43.4														
WD-1	2.0- 3.5	CL/CH		40.3 37.4														
	5.0- 6.5	CL/CH		39.3 29.7														
WD-2	2.0- 3.5	CL		29.7 29.9														
	5.0- 6.5	CL		29.4 26.2														
	8.0- 9.5	ML		28.1 24.1														
	11.0-12.5	ML		23.8 22.6														
	14.0-15.5	ML		21.6 28.4														
WD-5	2.0- 3.5	CL		20.7														
	5.0- 6.5	ML		24.5														
WD-6	2.0- 4.2	MH		42.6 35.7	54	37	1.04	4.0	87.8									
WD-7	2.0- 3.5	CL		30.7														
	5.0- 6.5	CL		29.9														

* See Test Curves

TABLE 2.5-28 (Cont'd)
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SUMMARY OF LABORATORY TEST RESULTS - RESIDUAL SOIL

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		UNCON COMPRESS		UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		OPT MOIST	CONSOLID	TRIAXIAL			
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (tsf)	STRAIN (%)			SIEVE	HYDR			UU	$\overline{CIU}$	CELL PRESSURE (psi)	BACK PRESSURE (psi)
WD-7	8.0- 9.5	ML/MH		24.5														
	11.0-12.5	ML/MH		19.3														
WD-8	2.0- 4.5	CH		41.3 36.1	58	24	1.94	14.0	84.0 88.9	2.65				*				
	4.5- 6.5	CH		29.8 27.2														
WD-9	2.0- 3.5	CH		27.1														
WD-10	2.0- 3.5	CL/CH		21.7														
	5.0- 6.5	SC		18.3														
	8.0- 9.5	SC		19.2														
SS-1	2.0- 3.8	MH		38.5 35.9	55	43	0.92	3.0	83.5									
SS-5	10.0-12.5	MH		31.9 44.0	59	40	0.26	4.0	72.1									
C-1	2.0- 3.5	MH		31.0 42.3	56	50												
	5.0- 6.5	MH		33.1	59	43												
	8.0- 9.5	MH		26.7														
	11.0-12.5	MH		28.6	72	43												

* See Test Curves

TABLE 2.5-28 (Cont'd)
Sheet 6 of 21

SUMMARY OF LABORATORY TEST RESULTS - RESIDUAL SOIL

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		UNCON COMPRESS		UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		OPT MOIST	CONSOLID	TRIAXIAL			
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (tsf)	STRAIN (%)			SIEVE	HYDR			UU	$\overline{CIU}$	CELL PRESSURE (psi)	BACK PRESSURE (psi)
C-2	14.0-15.5	MH		30.0														
C-3	2.0- 4.0	CL		22.9 25.0 24.0	49	20	1.07	2.5	102.0									
	4.0- 5.5	MH		33.6	87	39												
	10.0-11.8	MH		48.1 34.7 34.3	59	54	1.31	1.0	84.5									
C-6	2.0- 3.5	MH		30.7 32.1 33.3 39.8														
	5.0- 6.5	MH		28.5 28.2 28.6 31.7	66	53												
	8.0- 9.5	MH		27.3 27.4														
	11.0-12.5	MH		28.4 28.7	60	46												
	14.0-15.5	MH		31.4 32.5	50	43												
C-7	2.0- 3.5	MH		32.1														
	5.0- 6.5	MH		32.9	67	47												

* See Test Curves

SUMMARY OF LABORATORY TEST RESULTS - RESIDUAL SOIL

BORING and SAMPLE No	DEPTH - feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		UNCON COMPRESS		UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		OPT MOIST	CONSOLID	TRIAXIAL			
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (tsf)	STRAIN (%)			SIEVE	HYDR			UU	$\overline{CIU}$	CELL PRESSURE (psi)	BACK PRESSURE (psi)
C-7	8.0- 9.5	MH		31.6														
	11.0-12.5			30.6														
C-8	0.0- 5.0	CH		28.2	70	32					* *	* *						
	5.0-10.0	CH		25.3	66	26					*	*						
	10.0-15.0	ML		26.7	50	30					*	*						
C-10	5.0-10.0	MH		21.2	69	46					*	*						
	10.0-15.0	MH		23.6	71	50					*	*						

* See Test Curves

TABLE 2.5-28 (Cont'd)
Sheet 8 of 21

SUMMARY OF LABORATORY TEST RESULTS - SAPROLITE

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	UNCON COMPRESS STRESS (tsf)	UNCON COMPRESS STRAIN (%)	UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE SIEVE	GRAIN SIZE HYDR	OPT MOIST	CONSOLID	TRIAXIAL UU	TRIAXIAL $\overline{CIU}$	TRIAXIAL CELL PRESSURE (psi)	TRIAXIAL BACK PRESSURE (psi)
ND-4	10.0-11.0	SM	(1)	18.6					97.9					*		*		
	11.0-11.5	SM		15.0														
ND-5	2.0- 3.5	ML		17.8														
ND-15	8.0- 9.5	CL		17.7														
	11.0-12.5	ML		12.9	31	28												
	14.0-15.5	ML		19.9														
	17.0-18.5	ML		7.6 8.3														
SD-1A	8.0- 9.5	SM/ML		11.7														
SD-3	8.0- 9.5	ML		20.5														
	11.0-12.5	ML		17.6														
	14.0-15.5	ML		23.0														
	17.0-18.5	ML		17.3														
	20.0-21.5	ML		16.3														
	23.0-24.5	ML		22.9														

* See Test Curves (1) Permeability

TABLE 2.5-28 (Cont'd)
Sheet 9 of 21

SUMMARY OF LABORATORY TEST RESULTS - SAPROLITE

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	UNCON COMPRESS. STRESS (tsf)	UNCON COMPRESS. STRAIN (%)	UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE SIEVE	GRAIN SIZE HYDR	OPT MOIST	CONSOLID	TRIAXIAL UU	TRIAXIAL CIU	TRIAXIAL CELL PRESSURE (psi)	TRIAXIAL BACK PRESSURE (psi)
SD-3	26.0-27.5	ML		13.9														
	29.0-30.5	ML		14.5														
	32.0-33.5	ML		20.3														
	35.0-36.5	ML		20.4														
SD-7	12.5-14.0	ML		18.0	43	40												
	20.5-22.0	ML		22.7	36	NP												
	27.5-29.0	ML		18.7														
	33.0-34.5	ML		14.9														
SD-8	20.0-21.5	SM		15.4														
ED-2	23.8-25.3	ML		32.1														
	27.0-28.9	ML	(1)	36.7 37.3	45 40	NP NP			69.8 87.3	2.67				*	*			
	29.0-30.5	ML		35.0														
ED-3	32.0-33.0	ML		31.2														
	42.0-42.8	ML		26.6														

* See Test Curves (1) Permeability

TABLE 2.5-28 (Cont'd)
Sheet 10 of 21

SUMMARY OF LABORATORY TEST RESULTS - SAPROLITE

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	UNCON COMPRESS STRESS (tsf)	UNCON COMPRESS STRAIN (%)	UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE SIEVE	GRAIN SIZE HYDR	OPT MOIST	CONSOLID	TRIAXIAL UU	TRIAXIAL CIU	TRIAXIAL CELL PRESSURE (psi)	TRIAXIAL BACK PRESSURE (psi)
WD-1	10.0-11.5	SM		12.4 17.0														
	15.0-16.5	SM		27.1 29.8														
	20.0-21.5	SM		11.9 17.1														
WD-2	17.0-18.5	ML		18.0 19.6														
	20.0-21.5	ML		18.7														
	23.0-24.5	ML		23.2 27.2														
	26.0-27.5	ML		29.4 27.9														
	32.0-33.5	SM/ML		20.8														
	35.0-36.5	SM/ML		9.4														
	38.0-39.5	SM/ML		17.6 8.9														
WD-5	8.0- 9.6	SM		14.9														
	11.0-12.5	SM		18.7														
	14.0-15.5	ML		20.1														
	17.0-18.5	ML		32.2														

* See Test Curves

TABLE 2.5-28 (Cont'd)
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SUMMARY OF LABORATORY TEST RESULTS - SAPROLITE

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	UNCON COMPRESS STRESS (tsf)	UNCON COMPRESS STRAIN (%)	UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE SIEVE	GRAIN SIZE HYDR	OPT MOIST	CONSOLID	TRIAXIAL UU	TRIAXIAL CIU	TRIAXIAL CELL PRESSURE (psi)	TRIAXIAL BACK PRESSURE (psi)
WD-5	20.0-21.5	ML		23.8														
	23.0-24.5	ML		15.4														
	26.0-27.5	ML		24.1														
	29.0-30.5	SM		16.5														
	32.0-33.5	SM		11.6														
	35.0-36.5	SM		10.8														
	38.0-39.5	SM		9.0														
WD-6	10.0-12.5	SM		35.4	37	NP			78.1 99.9	2.69				*	*			
	12.5-14.0	SM		17.7														
	18.0-20.2	SM		32.2	36	NP			85.9						*			
WD-7	14.0-15.5	ML		27.4														
	17.0-18.5	ML		15.7														
	20.0-21.5	ML		15.8														
	24.0-25.5	ML		30.5														

* See Test Curves

SUMMARY OF LABORATORY TEST RESULTS – SAPROLITE

BORING and SAMPLE No	DEPTH (feet)	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	UNCON COMPRESS: STRESS (tsf)	UNCON COMPRESS: STRAIN (%)	UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE: SIEVE	GRAIN SIZE: HYDR	OPT MOIST	CONSOLID	TRIAXIAL: UU	TRIAXIAL: CIU	TRIAXIAL: CELL PRESSURE (psi)	TRIAXIAL: BACK PRESSURE (psi)
WD-7	26.0-27.5	ML		24.0														
WD-8	10.0-11.8	ML		30.9	45	NP			88.9						*			
	11.8-13.3	ML		17.7 26.0														
WD-9	5.0- 6.5	SM/SC		17.8														
WD-10	11.0-12.5	ML		19.5														
	14.0-15.5	ML		17.4														
WD-14	2.0- 3.5	SM		16.7														
SS-1	14.5-16.0	ML		24.6														
	20.0-21.5	ML		22.0														
	27.4-28.8	ML		23.5														
SS-4	2.0- 3.5	ML			40	NP												
	3.5- 4.7	ML		26.5														
	10.0-12.0	ML		31.1 24.0	40	NP			80.1						*			
	12.3-13.8	ML		19.9														

* See Test Curves

TABLE 2.5-28 (Cont'd)
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SUMMARY OF LABORATORY TEST RESULTS - SAPROLITE

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		UNCON COMPRESS		UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		OPT MOIST	CONSOLID	TRIAXIAL			
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (tsf)	STRAIN (%)			SIEVE	HYDR			U.U.	$\overline{CIU}$	CELL PRESSURE (psi)	BACK PRESSURE (psi)
SS-4	18.0-20.3	ML		26.9	31	NP			93.8						*			
	20.3-21.8	ML		19.8														
SS-5	18.0-20.5	ML		24.5	42	NP	0.44	3.0	91.1									
C-1	5.0- 6.5	ML		13.8	30	NP												
	8.0- 9.5	ML		17.9														
	11.0-12.6	ML		17.3	35	NP												
	14.0-15.5	ML		18.3														
	17.0-18.5	ML		17.3	30	NP												
	20.0-21.5	ML		22.6														
	23.0-24.5	ML		14.6	29	NP												
	26.0-27.5	ML		15.5														
	29.0-30.5	ML		19.9	32	NP												
C-2	17.0-18.5	MH		29.1	57	56												
	20.0-21.5	MH/MH		33.9														

* See Test Curves

SUMMARY OF LABORATORY TEST RESULTS - SAPROLITE

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	UNCON COMPRESS. STRESS (tsf)	UNCON COMPRESS. STRAIN (%)	UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE SIEVE	GRAIN SIZE HYDR	OPT MOIST	CONSOLID	TRIAXIAL U.U.	TRIAXIAL $\overline{CIU}$	TRIAXIAL CELL PRESSURE (psi)	TRIAXIAL BACK PRESSURE (psi)
C-2	23.0-24.5	ML		30.5	46	38												
	26.0-27.5	ML/MH		24.9														
	29.0-30.5	ML		22.7	37	NP												
	32.0-33.5	ML		25.3	35	NP												
	35.0-36.5	ML/MH		30.2														
	38.0-39.5	ML		25.0	45	42												
	41.0-42.5	ML/MH		25.6														
	44.0-45.5	ML		28.6														
	47.0-48.5	ML		24.5														
	50.0-51.5	ML		21.0														
C-3	18.0-20.3	MH		44.7	53	49			81.3						*			
C-5	4.0- 5.5	SM		21.6	31	27												
	7.0- 9.5	SM		35.7 23.9	35 35	25 32			74.5						*			
	14.0-15.5	SM		25.0	35	30												

* See Test Curves

TABLE 2.5-28 (Cont'd)
Sheet 15 of 21

SUMMARY OF LABORATORY TEST RESULTS - SAPROLITE

BORING and SAMPLE No	DEPTH - feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		UNCON COMPRESS		UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		OPT MOIST	CONSOLID	TRIAXIAL			
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (tsf)	STRAIN (%)			SIEVE	HYDR			UU	CIU	CELL PRESSURE (psi)	BACK PRESSURE (psi)
C-5	17.0-19.4	SM		36.5 23.0	35	30			97.8 87.3							*		
	19.4-20.5	SM		19.4	30	NP												
C-6	20.0-21.5	MH		29.6 25.4														
	23.0-24.5	ML		32.5	45	NP												
	26.0-27.5	ML		24.4														
	29.0-30.5	ML		25.9	44	NP												
C-7	19.0-20.5	ML		25.2														
	22.0-23.5	ML		25.2	40	39												
	30.0-31.5	ML		30.3														
	33.0-34.5	ML		25.8 30.5	37	NP												
	40.0-41.5	ML		23.1														
C-8	15.0-20.0	CL		18.2	31	21					*	*						
	20.0-25.0	ML		24.3	47	32					*	*						
	25.0-30.0	MH		19.7	50	32					*	*						

* See Test Curves

TABLE 2.5-28 (Cont'd)
Sheet 16 of 21

SUMMARY OF LABORATORY TEST RESULTS - SAPROLITE

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		UNCON COMPRESS		UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		OPT MOIST	CONSOLID.	TRIAXIAL			
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (tsf)	STRAIN (%)			SIEVE	HYDR			UU	$\overline{CIU}$	CELL PRESSURE (psi)	BACK PRESSURE (psi)
C-8	30.0-35.0	MH		21.9	57	33					*	*						
C-9	15.0-20.0	ML									*	*						
	30.0-35.0	ML									*	*						
	35.0-40.0	MH			74	46												
	40.0-45.0	MH			65	43												
C-10	15.0-20.0	MH		21.7	72	46					*	*						
	20.0-25.0	MH		25.1	70	55					*	*						
	25.0-30.0	MH		21.1	53	36					*	*						
	30.0-35.0	ML		15.3	40	31					*	*						
	35.0-40.0	ML		17.9	46	29					*	*						
	40.0-45.0	ML		17.0	40	26					*	*						
C-11	5.0-10.0	ML									*	*						
	15.0-20.0	ML			41	NP												
	20.0-25.0	ML			43	NP					*	*						

* See Test Curves

TABLE 2.5-28 (Cont'd)
Sheet 17 of 21

SUMMARY OF LABORATORY TEST RESULTS - DECOMPOSED ROCK

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		UNCON COMPRESS		UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		OPT MOIST	CONSOLID.	TRIAXIAL			
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (tsf)	STRAIN (%)			SIEVE	HYDR			U.U.	CIU	CELL PRESSURE (psi)	BACK PRESSURE (psi)
ND-1	11.0-12.3	SM		11.3														
ND-2	2.0- 3.5	ML		20.6														
	5.0- 6.5	ML		18.9														
ND-4	10.0-11.0								97.7 128.8					*		*		
	18.0-20.5	SM	(1)	10.1					119.7	2.64				*				
ND-5	5.0- 5.5	SC/SM		10.0														
ND-6	2.0- 3.5	SC/SM		13.6														
	8.0- 9.5	SM		13.9														
	11.0-12.5	SM		4.5														
ND-7	4.3- 4.6	CL		21.5														
ND-14	2.0- 3.0	SM		9.0														
	7.0- 8.4	SM	(1)	7.9					126.6					*		*		
	12.0-13.8	SM	(1)	6.1					140.1	2.66				*		*		
ND-15	23.0-24.5	ML		14.1	23	NP												

* See Test Curves (1) Permeability

TABLE 2.5-28 (Cont'd)
Sheet 18 of 21

SUMMARY OF LABORATORY TEST RESULTS - DECOMPOSED ROCK

BORING and SAMPLE No.	DEPTH feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		UNCON COMPRESS		UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		OPT MOIST	CONSOLID	TRIAXIAL			
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (tsf)	STRAIN (%)			SIEVE	HYDR			UU	CIU	CELL PRESSURE (psi)	BACK PRESSURE (psi)
ND-16	5.0- 6.0	SM		13.6														
	10.0-11.0	SM		12.4														
ND-18	2.0- 3.0	ML		22.9														
	5.0- 6.5	ML		11.1														
	7.0- 7.5	ML		15.5														
ND-19	2.0- 3.1	ML		11.5														
	5.0- 5.7	ML		9.8														
	8.0- 8.3	SM		10.8														
SD-1A	11.0-12.5	SM/ML		11.5														
SD-3	38.0-39.2	SM		8.8														
SD-4	4.9- 5.5	ML		5.8														
[illegible]	12.5-14.0	SM		10.7														
SD-7	60.0-60.3	SM		11.6														
SD-8	23.0-23.2	SM		14.6														

* See Test Curves

TABLE 2.5-28 (Cont'd)
Sheet 19 of 21

SUMMARY OF LABORATORY TEST RESULTS - DECOMPOSED ROCK

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	UNCON COMPRESS. STRESS (tsf)	UNCON COMPRESS. STRAIN (%)	UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE SIEVE	GRAIN SIZE HYDR	OPT MOIST	CONSOLID	TRIAXIAL UU	TRIAXIAL CIU	TRIAXIAL CELL PRESSURE (psi)	TRIAXIAL BACK PRESSURE (psi)
SD-8	26.0-26.3	SM		16.5														
ED-2	32.0-34.0	SM		19.8														
ED-3	50.6-15.6	SM		16.0														
WD-1	25.0-26.5	SM		7.5 9.4														
WD-5	41.0-41.8	SM		9.4														
WD-8	15.0-17.0			5.7 6.3														
				6.1														
WD-9	8.0- 9.5	SM/SC		10.6														
	11.0-11.8	SM/SC		9.3														
WD-10	17.0-18.5	ML		15.4														
	20.0-20.8	ML		18.1														
	23.0-23.7	ML		15.1														
WD-14	5.0- 6.5			10.3														
	10.0-11.2			5.3														

* See Test Curves

TABLE 2.5-28 (Cont'd)
Sheet 20 of 21

SUMMARY OF LABORATORY TEST RESULTS - DECOMPOSED ROCK

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		UNCON COMPRESS.		UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		OPT MOIST	CONSOLID.	TRIAXIAL			
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (tsf)	STRAIN (%)			SIEVE	HYDR			UU	CIU	CELL PRESSURE (psi)	BACK PRESSURE (psi)
SS-4	29.0-29.2	SM		12.8														
C-1	32.0-33.5	SM		18.0														
	35.0-36.3	SM		14.7	26	NP												
C-2	56.0-56.8	ML		20.2														
C-5	24.0-25.0	SM		18.0														
	28.0-29.5	SM		16.1														

* See Test Curves

TABLE 2.5-28 (Cont'd)
Sheet 21 of 21

SUMMARY OF LABORATORY TEST RESULTS - INTACT ROCK

BORING and SAMPLE No	DEPTH - feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		UNCON COMPRESS		UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		OPT MOIST	CONSOLID.	TRIAXIAL			
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (tsf)	STRAIN (%)			SIEVE	HYDR.			U.U.	CIU	CELL PRESSURE (psi)	BACK PRESSURE (psi)
ND 7-2	169.0		(1)						150.1									
ND 7-3	169.0		(1)						176.4									
ND 7-4	169.0		(1)						179.5									
SD 1-1	32.0-37.0		(1)						185.2									
SD 1-2	32.0-37.0		(1)						185.4									
SD 1-3	32.0-37.0		(1)						175.5									
SD 1-4	32.0-37.0		(1)						176.3									

* See Test Curves (1) Sonic Velocity

TABLE 2.5-29

PHYSICAL PROPERTIES OF COLLUVIUM

Property	Range	Average	Number of Tests
Natural Water Content, %	11.5 to 29.9	21.2	31
Liquid Limit, %	21 to 39	30	6
Plasticity Index, %	4 to 12	9	6
Unit Dry Weight, pcf	87.5 to 110.8	102.0	9
Specific Gravity	2.67	2.67	2

TABLE 2.5-30

PHYSICAL PROPERTIES OF RESIDUAL SOIL

Property	Range	Average	Number of Tests
Natural Water Content, %	5.6 to 60.4	30.9	89
Liquid Limit, %	47 to 87	61	24
Plasticity Index, %	5 to 48	20	24
Unit Dry Weight, pcf	67.5 to 102.0	82.5	11
Specific Gravity	2.65	2.65	1

TABLE 2.5-31

PHYSICAL PROPERTIES OF SAPROLITE

Property	Range	Average	Number of Tests
Natural Water Content, %	7.6 to 44.7	22.0	133
Liquid Limit, %	29 to 74	42	47
Plasticity Index, %	0 to 28	6	47
Unit Dry Weight, pcf	69.8 to 99.9	86.7	14
Specific Gravity	2.67 to 2.69	2.68	2

TABLE 2.5-32

PHYSICAL PROPERTIES OF DECOMPOSED ROCK

Property	Range	Average	Number of Tests
Natural Water Content, %	4.5 to 22.9	12.5	49
Liquid Limit, %	23 to 26	24	2
Plasticity Index, %	0	0	2
Unit Dry Weight, pcf	97.7 to 128.8	122.6	5
Specific Gravity	2.64 to 2.66	2.65	2

TABLE 2.5-33

SHEAR STRENGTH PROPERTIES OF FOUNDATION SOILS

Total Stress Parameters

Stratigraphic Horizon	Undrained Shear Strength, C_u (psf) Minimum	Maximum	Average	Number of Tests
Colluvium	600	2220	1210	4
Residual Soil	260	1940	935	9
Saprolite	440	5920	2530	9

Effective Stress Parameters

Stratigraphic Horizon	Test Series	Effective Friction Angle, $\bar{\phi}$ (degrees)	Effective Cohesion, $\bar{c}$ (psf)
Colluvium	SD-5-Series 2	25	660
	SD-5-Series 3	25	1760
Saprolite	C-5-Series 1	36	0
	C-5-Series 2	36	0
Decomposed	ND-14-Series 1-2	41.5	0
Rock	ND-14-Series 3	38.5	0

TABLE 2.5-34

ONE DIMENSIONAL COMPRESSION PROPERTIES OF FOUNDATION MATERIALS

HORIZON	TEST NUMBER	WATER CONTENT (%)	INITIAL VOID RATIO	C'_r	C'_c	C'_s	P_o (tsf)	P_c (tsf)	P_c / P_o	C/P_o	
	SD- 5 (2')	18.4	0.51	0.007	0.08	0.016	0.1±	1.0±	10	-	
	SD- 5 (6')	24.3	0.68	0.015	0.10	0.023	0.23	2.0±	9	-	
Colluvium	SD-9b(7')	19.7	0.57	0.007	0.08	0.013	0.35	5.0±	14	0.9	
	SD- 9b(10')	14.3	0.50	0.007	0.084	0.015	0.42	5.0±	12	2.6	
	SD- 9d(4')	23.1	0.68	0.008	0.097	0.016	0.26	3.0±	11	2.0	
Residual	WD- 8 (2')	36.0	0.97	0.013	0.12	0.028	0.17	2.0±	12	5.7	02-01
	ED- 2 (12')	49.5	1.39	0.007	0.23	0.026	0.75	5.0±	7	-	
Saprolite	ED- 2 (27')	55.0	1.39	0.012	0.22	0.021	1.57	4.0±	2.5	0.8	02-01
	WD- 6 (10')	22.6	1.15	0.013	0.19	0.025	0.55	2.0±	3.6	5.4	
	ND- 4 (10')	28.3	0.691	0.008	0.10	0.016	0.35	2.0±	5.7		
Decomposed Rock	ND- 4 (18')	15.0	0.377		0.058	0.009	0.75	4.0±	5.3		
	ND-14 (7')	7.9	0.311	0.006	0.037	0.008	0.55	3.0±	5.5		
	ND-14 (12')	3.9	0.185	0.006	0.024	0.008	0.90	4.0±	4.5		

C'_r = Recompression index, unit strain basis

C'_c = Virgin compression index, unit strain basis

C'_s = Swell index, unit strain basis

P_o = Existing overburden pressure

P_c = Estimated maximum preconsolidation pressure

C = Cohesion as determined from undrained shear strength

TABLE 2.5-35

RESULTS OF CYCLIC TRIAXIAL TESTS ON UNDISTURBED SAMPLES OF COLLUVIUM

Boring No.	Sample No.	Moisture Content (%)	Dry Density (pcf)	Confining Pressure σ_3 (psf)	Peak Cyclic Deviator Stress,[1] $\pm\sigma_d$ (psf)	Stress Ratio[1] $\frac{\pm\sigma_d}{2\sigma_{3c}}$	No. of Cycles to Cause: Initial Lique-faction	± 5% Strain	± 10% Strain
BSD-SC	1-(Lab A)	22.2	104.2	3000	2505	0.417	4		
					2460	0.41		21.5	
					2430	0.405			30
	1-(Lab B)	20.2	109.2	3000	2820	0.47	4		
					2790	0.465		11.5	
					2700	0.45			17.5
	1-(Lab C)	20.1	110.8	6000	4800	0.40	4		
					4680	0.39		7.6	-
BSD-9C	1-(Lab A)	24.3	100.5	1500	1350	0.45	8		
					1320	0.44		39	440
	2-(Lab A)	20.8	106.7	750	705	0.47	17		
					690	0.46		560[2]	-
	3-(Lab A)	14.4	117.3	1500	1245	0.415	15	610[2]	-
	3-(Lab B)	17.2	110.1	3000	2550	0.425	8		
					2505	0.417		35	
					2460	0.41			63
BSD-9D	3-(Lab A)	17.4	112.3	750	600	0.40	30	600[2]	-
	3-(Lab A)	18.1	110.1	3000	2520	0.42	4		
					2475	0.412		14.5	
					2415	0.402			37.5
	5-(Lab B)	19.9	108.7	6000	4980	0.415	4.7	8.5	
					4890	0.407			14
	5-(Lab C)	22.5	106.1	3000	2715	0.452	4.5	10.5	
					2625	0.438			25

02-01

NOTES:

(1) Cyclic deviator stress varied slightly during tests. Values reported are the average values for the number of cycles corresponding to initial liquefaction, ± 5% strain, and ± 10% strain. 02-01

(2) Extrapolated values

TABLE 2.5-36

RESULTS OF CYCLIC TRIAXIAL TESTS ON UNDISTURBED SAMPLES OF SAPROLITE

Boring No.	Depth (ft)	Moisture Content (%)	Dry Density (pcf)	Confining Pressure σ_{3c} (psf)	Peak Cyclic Deviator Stress, $\pm\sigma_d$ (psf)	Stress Ratio $\frac{\pm\sigma_d}{2\sigma_{3c}}$	No. of Cycles to Cause		
							Initial Lique-faction	$\pm$ 5% Strain	$\pm$ 10% Strain
C-5	12-14	27.5	85.1	3,000	2,640	0.440	1.8	3.6	6.6
SS-1	18-20	20.9	91.3	3,000	2,880	0.480	2.9	14.2	22.5
ED-3	34-36	16.8	94.8	3,000	2,750	0.458	2.1	5.6	11.3
ED-3	42-44	30.8	90.2	6,000	5,200	0.434	2	7	10

02-01

TABLE 2.5-37

CYCLIC STRENGTH CHARACTERISTICS OF IN SITU SOILS

Confining Pressure σ_3 (psf)	Laboratory Stress Ratio Causing 5% Strain, $\frac{\pm \sigma d}{2\sigma_3}$		Factor Correction Cr	Field Stress Ratio Causing 5% Strain, $\frac{\pm \tau^{(1)}}{\sigma}$		02-01
	10 Cycles	20 Cycles		10 Cycles	20 Cycles	
750	0.51	0.49	0.80	0.41	0.39	
1500	0.485	0.46	0.79	0.38	0.36	
3000	0.43	0.41	0.75	0.32	0.31	
6000	0.39	0.365	0.72	0.28	0.26	

Note:

(1) τ = cyclic shear stress
σ = effective normal pressure

Reformatted Per
Amendment 02-01

TABLE 2.5-38

SHEAR WAVE VELOCITIES AND MAXIMUM SHEAR MODULI
FOR FOUNDATION MATERIALS

Horizon	Shear Wave Velocity (ft/sec)	Maximum Shear Moduli (ksi)
Intact Rock	7400 to 8000	1896 to 2277
Decomposed Rock	1500 to 2300	65.5 to 154
Saprolite and Transported Soils	835 to 1125	19.5 to 35.5

TABLE 2.5-39

SONIC VELOCITY TEST RESULTS

Sample	Vp (ft/sec)	Vs (ft/sec)	G (ksi)	μ	E (ksi)	γ (pcf)
ND 7-2	15598	8063	2104	.318	5546	150.1
ND 7-3	13066	7302	2028	.273	5163	176.4
ND 7-4	15401	8028	2494	.313	6553	179.5
SD 1-1	14795	8430	2838	.260	7151	185.2
SD 1-2	16404	8622	2971	.309	7780	185.4
SD 1-3	10555	6503	1599		3821	175.5
SD 1-4	12836	7783	2303	.209	5569	176.3

Vs = Shear wave velocity
Vp = Compressional wave velocity
G = Shear modulus
μ = Poisson's Ratio
E = Young's Modulus
γ = Unit Moist Weight

Note:

(1) All tests conducted without axial or confining stress on sound rock cores.

SUMMARY OF LABORATORY TEST RESULTS - BORROW SOURCE F

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	UNCON COMPRESS STRESS (tsf)	UNCON COMPRESS STRAIN (%)	SHRINKAGE LIMIT	SPECIFIC GRAVITY	GRAIN SIZE SIEVE	GRAIN SIZE HYDR	OPT MOIST	CONSOLID	TRIAXIAL UU	TRIAXIAL CIU	TRIAXIAL CELL PRESSURE (psi)	TRIAXIAL BACK PRESSURE (psi)
F- 1 Bag	0 -43.5	SM-ML	(1)		NP	NP			36.0	2.73	*	*	*	*	*		3 point	series
F- 3 Bag	0 -43.5	SM-ML	(1)		NP	NP			36.0	2.73	*	*	*	*	*		3 point	series
RES-1F	0 -15.0	MH-ML (Note 1)	(1)		51	46				2.65	*	*	*	*	*		3 point	series
F- 7 B-1	5.0-10.0	ML-SM	(1)	30.1	53	45			28.8	2.81	*	*	*	*	*		3 point	series
F- 7A B-1	25.0-30.0	SM	(1)	20.8					31.6	2.78	*		*	*		*	3 point	series
F-11 B-1	7.5-10.0	ML		23.6							*							
F-11 B-2	30.0-35.0	ML		26.4							*							
F-13 B-1	10.0-15.0	SM	(2)	22.0	43	41			32.8	2.74	*	*	*					
F-13 B-2	35.0-40.0	SM		23.1	50	47			37.3	2.77	*	*	*			*	3 point	series
F-15 B-1	10.0-15.0	SM		23.4	47	36			34.2		*		*					
F-15 B-2	40.0-45.0	SM		25.7					33.8	2.71	*		*		*		3 point	series

* See Test Curves (1) Permeability (2) Torsion

Note 1 - Test sample consists of combination of selected samples derived from a depth of 0 to 15 feet (13 samples) from Borings F-1 through F-4

TABLE 2.5-40 (Cont'd)
Sheet 2 of 6

SUMMARY OF LABORATORY TEST RESULTS – BORROW SOURCE G

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	Shrinkage Limit	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	UNCON COMPRESS STRESS (tsf)	UNCON COMPRESS STRAIN (%)	UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE SIEVE	GRAIN SIZE HYDR.	OPT MOIST	CONSOLID.	TRIAXIAL U.U.	TRIAXIAL CIU	TRIAXIAL CELL PRESSURE (psi)	TRIAXIAL BACK PRESSURE (psi)
TBG-2 S-3	15.0-16.5	SM									*							
S-4	20.0-21.5	SM									*							
S-6	30.0-31.5	SM									*							
S-8	40.0-41.5	SM									*							
TBG-3 S-1	5.0- 6.5	CH	28.3		51	27												
S-3	15.0-16.5	MH	28.7		60	41					*	*						
S-5	25.0-26.5	ML			50	45					*	*						
S-8	40.0-41.5	ML									*	*						
S-9	45.0-46.5	SM									*							
TBG-5 S-1	5.0- 6.5	MH		24.9	50	36												
S-2	10.0-11.5	MH	26.2		54	32												
Bag	20.0-25.0	ML								2.73	*	*						
S-5	25.0-26.5	SM									*							
Bag	35.0-40.0	ML									*	*						
Bag	45.0-50.0	ML									*	*						

* See Test Curves

SUMMARY OF LABORATORY TEST RESULTS - BORROW SOURCE G

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	Shrinkage Limit	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS		UNCON COMPRESS		UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		OPT MOIST	CONSOLID	TRIAXIAL			
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (tsf)	STRAIN (%)			SIEVE	HYDR			U.U.	CIU	CELL PRESSURE (psi)	BACK PRESSURE (psi)
TBG-7 S-3	15.0-16.5	ML			44	42					*	*						
Bag	40.0-45.0	ML									*	*						
TBG-8 S-1	5.0- 6.5	MH		28.2	65	33					*	*						
S-3	15.0-16.5	ML		27.3							*	*						
S-7A	35.0-35.5	ML		22.3	35	27					*	*						
S-7B	35.5-36.5	MH		37.1	66	54					*	*						
TBG-10 S-1	5.0- 6.5	CH		22.5	51	28												
S-3	15.0-16.5	ML	22.5	20.3	45	36												
S-7	35.0-36.5	SM		23.9	20	NP					*	*						
TBG-12 S-3	15.0-16.5	MH			66	60					*	*						
S-5	25.0-26.5	SM		22.9							*							
S-6	30.0-31.5	ML		26.3	44	NP												
Bag	30.0-35.0	ML									*	*						
Bag	40.0-45.0	ML									*	*						
TBG-14 S-2	10.0-11.5	ML			35	NP												

* See Test Curves

TABLE 2.5-40 (Cont'd)
Sheet 4 of 6

SUMMARY OF LABORATORY TEST RESULTS - BORROW SOURCE G

BORING and SAMPLE No.	DEPTH feet	CLASSIFICATION	Shrinkage Limit	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	UNCON COMPRESS. STRESS (tsf)	UNCON COMPRESS. STRAIN (%)	UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE SIEVE	GRAIN SIZE HYDR.	OPT MOIST	CONSOLID	TRIAXIAL U.U.	TRIAXIAL CIU	TRIAXIAL CELL PRESSURE (psi)	TRIAXIAL BACK PRESSURE (psi)
TBG-14 S-3	20.0-21.5	SM			52	42					*	*						
S-8	40.0-41.5	SM								2.81	*	*						
TBG-15 S-1	5.0- 6.5	MH	26.2		53	41												
S-3	15.0-16.5	ML									*	*						
S-4	20.0-21.5	ML									*	*						
Bag	20.0-25.0	ML									*	*						
S-7	35.0-36.5	SM								2.64	*	*						
Bag	35.0-40.0	ML									*	*						
TBG-16 Bag	5.0-10.0	SM									*	*						
Bag	25.0-30.0	SM									*	*						
TBG-17 S-1	5.0- 6.5	ML	24.4	25.9	48	33												
S-3	15.0-16.5	ML									*							
Bag	35.0-40.0	ML									*	*						
TBG-20 S-1	5.0- 6.5	MH		23.4	53	31												
S-2	10.0-11.5	MH		29.8	69	44												

* See Test Curves

SUMMARY OF LABORATORY TEST RESULTS – BORROW SOURCE G

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	Shrinkage Limit	NATURAL WAT. CONTENT (%)	ATTERBERG LIMITS		UNCON COMPRESS.		UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE		OPT MOIST	CONSOLID	TRIAXIAL			
					LIQUID LIMIT	PLASTIC LIMIT	STRESS (tsf)	STRAIN (%)			SIEVE	HYDR			U.U.	CIU	CELL PRESSURE (psi)	BACK PRESSURE (psi)
TBG-23																		
S-1	5.0- 6.5	CH		25.2	53	23												
S-2	10.0-11.5	MH	33.7	28.2	59	37												
S-5	25.0-26.5	MH		34.0	60	51					*	*						
S-7	35.0-36.5	SM									*							
TPG- 4	5.0-10.0	MH	28.0		56	38				2.72	*		*					
TPG- 9	9.0-10.0	MH			53	31				2.71	*		*					
TPG-11	7.0-11.0	MH			52	38				2.83	*		*					
TPG-18	8.0-12.0	MH			57	41				2.79	*		*					
TPG-21	10.0-13.0	SM			NP	NP				2.69	*		*					
TPG-22	9.0-12.0	ML			NP	NP				2.84	*		*					
TPG-24	12.0-15.0	MH			52	34				2.81	*		*					
TPG-25	12.0-[illegible].0	ML	27.5		46	33				2.77	*		*					

* See Test Curves

AMENDMENT 97-01
AUGUST 1997

TABLE 2.5-40 (Cont'd)
Sheet 6 of 6

SUMMARY OF LABORATORY TEST RESULTS — BORROW SOURCE G

BORING and SAMPLE No	DEPTH feet	CLASSIFICATION	SPECIAL TESTS	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	UNCON COMPRESS STRESS (tsf)	UNCON COMPRESS STRAIN (%)	UNIT DRY WGT (pcf)	SPECIFIC GRAVITY	GRAIN SIZE SIEVE	GRAIN SIZE HYDR	OPT MOIST	CONSOLID	TRIAXIAL U.U.	TRIAXIAL $\overline{\text{CIU}}$	TRIAXIAL CELL PRESSURE (psi)	TRIAXIAL BACK PRESSURE (psi)
TPG-4 TPG-5 TPG-24		High PI mixture	(1)		66 67 55 67 63	36 37 30 39 28										*		
TPG-11 TPG-18 TPG-25		Intermediate PI mixture	(1)		59 58 62 62	37 35 37 40										*		
Bag 1	439.2				76	43				2.71	*	*	*					
Bag 2	445.2		(2)		59 64	35 38				2.74	*	*	*	* *				
Bag 3	439.6				56	37				2.82	*	*	*					
Bag 1&2 mixture			(2)		63	36								* *				

* See Test Curves (1) Torsion (2) Permeability

TABLE 2.5-41

PHYSICAL PROPERTIES OF BORROW MATERIAL

Residual soil

Property	Range	Average	Number of Tests
Natural Water Content, %	22.5 to 29.8	26.0	8
Liquid Limit, %	46 to 69	55	18
Plasticity Index, %	12 to 32	21	18
Specific Gravity	2.77 to 2.84	2.80	2

Saprolite

Property	Range	Average	Number of Tests
Natural Water Content, %	20.8 to 37.1	25.7	15
Liquid Limit, %	35 to 66	47	15
Plasticity Index, %	0 to 12	6	15
Specific Gravity	2.64 to 2.81	2.78	10

TABLE 2.5-42

SHEAR STRENGTH PROPERTIES OF LABORATORY COMPACTED BORROW MATERIAL

Total Stress Parameters

Test Series	C_ξ (psf)	φ_u (degrees)
F-1	1,320	18.5
F-3	2,000	19.4
RES-1F	3,700	15.4
F-7	2,200	19.7
F-15	2,000	15.0

Effective Stress Parameters

Test Series	$\overline{C}$ (psf)	$\overline{\varphi}$ (degrees)
F-7A	550	24.0
F-13	700	21.0
Int. PI	230	30.0
High PI	230	28.0

TABLE 2.5-43

RESULTS OF CYCLIC TRIAXIAL TESTS ON ISOTROPICALLY CONSOLIDATED RECONSTITUTED SAMPLES

Confining Pressure, σ_3 (psf)	Sample No.	Moisture Content %	Dry Density (pcf)	Peak Cyclic Deviator Stress.[1] $\pm\sigma_d$ (psf)	Stress Ratio,[1] $\frac{\pm\sigma_d}{2\sigma_3}$	No. of Cycles to Cause: Initial Lique-faction	No. of Cycles to Cause: ± 5% Strain	No. of Cycles to Cause: 10% Strain	02-01
750	17	18.3	107.2	810	0.54	41	> 1000[2]	---	
	18	18.2	107.3	630	0.42	83	> 1000[2]	---	
1500	1	17.5	108.0	1185	0.395	46			
				1280	0.425		900[2]	---	02-01
	6	17.8	107.7	1385	0.462	5			
				1580	0.525		48	> 1000[2]	
	7	17.6	107.9	1320	0.44	9			
				1500	0.50		52	> 1000[2]	
3000	2	17.7	107.8	2460	0.41	1	6.2	70	
	3	17.8	107.7	2670	0.445	1	3.9		
				2730	0.455			15.7	
	5	18.2	107.4	2320	0.385	4.8	21.7	> 1000[2]	
6000	4	18.0	107.5	4920	0.41	1	2.1	8.1	
	8			4460	0.372	1	3.7	13	
	12	17.9	107.6	4200	0.35	3.1	9.8		
				4100	0.342			35	

NOTES

(1) Cyclic deviator stress varied slightly during tests. Values reported are the average values for the number of cycles corresponding to initial liquefaction, ± 5% strain, and ± 10% strain. 02-01

(2) Extrapolated values.

TABLE 2.5-44

RESULTS OF CYCLIC TRIAXIAL TESTS ON ANISOTROPICALLY CONSOLIDATED RECONSTITUTED SAMPLES

Confining Pressure, σ_3 (psf)	Consoli-dation Ratio $K_c = \sigma 1 / \sigma 3$	Sample No.	Moisture Content %	Dry Density (pcf)	Peak Cyclic Deviator Stress.[1] $\pm \sigma_d$ (psf)	Peak Cyclic Shear Stress on Failure Plane[1] $\pm \gamma$ (psf)	No. of Cycles to Cause $\pm$ 5% Strain	No. of Cycles to Cause 10% Strain
400	1.5	23	18.1	107.5	410	170	2000[2]	---
		24	18.1	107.6	570	240	15	> 1000[2]
	2.0	25	18.0	107.6	590	250	34	> 1000[2]
		26	18.1	107.4	675	285	9.5	> 1000[2]
750	1.5	16	18.2	107.4	755	330	60	> 1000[2]
		21	17.8	107.7	1065	445	11	
					1110	465		143
1500	1.5	11	18.1	107.4	1500	635	11	
					1510	640		170
		13			1920	810	3.3	
					1980	840		25
	2.0	14	18.1	107.4	2050	845	1.6	
					2090	865		11.5
		15	18.5	107.1	1500	630	6.6	
					1545	645		130
3000	1.5	9	17.9	107.6	2590	1080	4.2	
					2640	1120		24.8
		10	18.0	107.5	2980	1250	1.5	
					3010	1265		7.4

02-01

NOTES

(1) Cyclic deviator stress varied slightly during tests. Values reported are the average values for the number of cycles corresponding to initial liquefaction, ± 5% strain, and ± 10% strain. 02-01

(2) Extrapolated values.

TABLE 2.5-45

RESULTS OF STRESS-CONTROLLED CYCLIC TRIAXIAL TESTS ON INTERMEDIATE RESIDUAL SOILS [1]

Test No.	Initial Effective Confining Pressure σ_{3c} (psf)	K_c	Cyclic Stress Ratio $\pm\ \sigma_d/2\sigma_{3c}$	Number of Cycles Required to Cause 5% Strain
C-I12	3000	1.5	0.436	9
C-I9	6000	1.0	0.348	381
C-I10	6000	1.0	0.385	3-1/2
C-I13	6000	1.0	0.384	3-1/2
O-I1	6000	1.0	0.361	3
O-I2	6000	1.0	0.345	6
O-I3	6000	1.0	0.339	6
O-I4	6000	1.0	0.316	11-1/2

NOTE:

(1) PI approximately 19

TABLE 2.5-46

CORRECTION FACTORS

Confining Pressure, σ_3 (psf)	Correction Factor, C_r
1500 or less	0.80
3000	0.70
6000	0.65

TABLE 2.5-47

SPECIFIED GRADATIONS OF FILTER MATERIALS

Zone 1 Filter

Sieve Size US Standard Mesh	Percent Passing by Dry Weight
3/4 inch	100
No. 4	75 - 100
No. 10	50 - 85
No. 40	10 - 50
No. 200	0 - 5

Zone 2 Filter

Sieve Size US Standard Mesh	Percent Passing by Dry Weight	
6 inch	100	
3 inch	75 - 100	
1-1/2 inch	40 - 85	02-01
3/8 inch	15 - 60	
No. 10	0 - 10	

TABLE 2.5-48

SPECIFIED GRADATIONS OF RIPRAP

Zone A

Size (inches)	Percent Finer by Weight
30	100
18	40-90
12	25-60
3	0-10

Zone B

Size (inches)	Percent Finer by Weight
18	100
12	35-85
6	10-40
3	0-10

Zone C

Rock Size in Inches for a Specific Gravity Range of

	2.55 to 2.65	2.65 to 2.74	2.75 to 2.84	2.85 and Up	Percent Passing by Count
(1)	45	43	39	37	100
(2)	39	37	34	32	90-100
(3)	33	31	29	27	0-5

Zone D

Size (inches)	Percent Finer by Weight
30	100
18	40-90
15	25-60
8	0-10

TABLE 2.5-49

PROPERTIES USED FOR DEFORMATION ANALYSIS

Material	Yt (pcf)	S (%)	B	Cv (ft2/day)	C'c	C'r
Embankment	120	83	0.23	4.00	0.054 to 0.064	NA
Saprolite	105	100	1.0	NA	0.22	0.012
Decomposed Rock	139	100	1.0	NA	NA	0.007

NA = Not applicable

Yt = Total unit weight

S = Degree of saturation

B = Pore pressure parameter

Cv = Coefficient of consolidation

C'c = Virgin Compression index, unit strain basis

C'r = Recompression index, unit strain basis

TABLE 2.5-50

SELECT FILL PLACEMENT TESTING PROCEDURES AND FREQUENCIES

Placement Test	ASTM Designation	Test Frequency [(3)]
Moisture Content	D 2216 or D 1556 [(1)]	C, D, H
Gradation	D 422	F, I
Atterburg Limits	D 423, D 424	F, I
Specific Gravity	D 854	F, J
Compaction Standard	D 1557, Method A	F, G, J
In-Place Density Test	D 1556 [(2)], D 2922	A, B, C, D, E, F

NOTES:

(1) After calibration, the Speedy Moisture Tester can be used in lieu of ASTM D 2216, provided at least every tenth test is checked against ASTM D 2216.

(2) After calibration, the Troxler Nuclear Method, ASTM D 2922, can be used, provided at least every tenth test is checked against ASTM D 1556.

(3) Test frequency letter designations are as follows:

A - In areas where degree of compaction is doubtful.

B - In area where earth fill operations are concentrated.

C - At least one for each earth fill shift.

D - One for every 2,000 cubic yards of fill for control.

E - For record tests at location of any embedded items.

F - Where material identify is questionable.

G - One point test for field density tests as needed.

H - Where soil appears too wet or too dry.

I - One for every 12,000 cubic yards for record and control.

J - One for every 50,000 cubic yards for record and control.

TABLE 2.5-51

SUMMARY OF CONSTRUCTION CONTROL
PHYSICAL PROPERTY TESTS ON SELECT FILL

	MAXIMUM	MINIMUM	AVERAGE	NUMBER OF TESTS	SPECIFICATION REQUIREMENTS
NORTH DAM					
Liquid Limit (1)	61	50	54	7	≤ 70
Plastic Limit (1)	53	43	47	7	N/A
Plasticity Index (1)	11	3	7	7	≤ 25
Specific Gravity	2.88	2.67	2.74	50	N/A
SOUTH DAM					
Liquid Limit (1)	67	53	58	5	≤ 70
Plastic Limit (1)	54	44	47	5	N/A
Plasticity Index (1)	17	5	10	5	≤ 25
Specific Gravity	2.88	2.69	2.74	25	N/A
EAST DAM					
Liquid Limit (1)	57	51	53	7	≤ 70
Plastic Limit(1)	48	39	44	7	N/A
Plasticity Index (1)	18	6	10	7	≤ 25
Specific Gravity	2.85	2.72	2.76	10	N/A
WEST EMBANKMENT					
Liquid Limit (1)	68	45	55	9	≤ 70
Plastic Limit (1)	53	38	45	9	N/A
Plasticity Index (1)	15	6	9	9	≤ 25
Specific Gravity	2.86	2.59	2.70	52	N/A

TABLE 2.5-51 (Continued)

	MAXIMUM	MINIMUM	AVERAGE	NUMBER OF TESTS	SPECIFICATION REQUIREMENTS
BORROW SOURCE CONTROL TESTS					
Liquid Limit [1]	70	43	57	21	≤ 70
Plastic Limit [1]	58	28	44	21	N/A
Plasticity Index [1]	28	4	13	21	≤ 25
Specific Gravity	2.93	2.62	2.77	53	N/A

02-01

NOTE:

1. Data excludes all nonplastic test results:

    North Dam - 69 tests

    South Dam - 24 tests

    East Dam - 3 tests

    West Embankment - 47 tests

    Borrow Control - 50 tests

02-01

TABLE 2.5-52

TESTING REQUIREMENTS FOR ZONE 1 FILTER MATERIALS

Pre-Qualification Test	Placement Test	ASTM Designation	Test Frequency (1)	
Gradation	--	C 136	A, B	02-01
Specific Gravity	--	C 128	B	
--	Gradation	C 136	A, C	
--	Specific Gravity	C 128	C	02-01
--	Compaction Standard (2)	D 2049	A, D	
--	In-Place Density Test (horizontal filter only) (3)	D 1556	C	

NOTES:

(1) Test frequency:

A - Where material identify is questionable.

B - One at each quarry source prior to delivery to site.

C - One for every 8,000 square yards for record and control.

D - 8 tests in horizontal filter materials for each dam.

(2) Minimum density to be determined by ASTM D 2049. Maximum density to be determined by the Department of the Army, EM 110-2-1906, Appendix XII, “Maximum Density of Cohesionless Soils, Modified Providence Method.”

(3) Relative density to be determined from results of in-place density test and compaction standard data.

TABLE 2.5-53

ZONE 1 FILTER FOR HORIZONTAL FILTER BLANKETS
SUMMARY OF BULK SPECIFIC GRAVITY AND
IN-PLACE DENSITY TESTS [(1)]

	Bulk Specific Gravity	Relative Density
Minimum Specification Requirement	2.50	75.0 %
Minimum Test Result	2.62	75.6 % [(1)]
Maximum Test Result	2.67	106.7 % [(1)]
Average Test Result	2.65	95.6 %
Number of Tests	21	14

NOTE:

1. Data range is wide because the number of coverages by compaction equipment varied from four to nine passes and often compacted the materials to densities greater than could be achieved using the specified ASTM procedure.

TABLE 2.5-54

ZONE 2 FILTER MATERIAL TESTING PROCEDURES AND FREQUENCIES

Pre-Qualification Test	Placement Test	ASTM Designation	Test Frequency (1)	
Gradation	--	C 136	B	
Specific Gravity	--	C 127	B	
Sodium Sulfate Soundness	--	C 88	B	
LA Abrasion	--	C 535	B	02-01
--	Gradation	C 136	A, C or D	
--	Specific Gravity	C 127	E	
--	Sodium Sulfate Soundness	C 88	C	
--	In-Place Permeability (3)	By Engineer	E	

NOTES:

(1) Test frequency:

A - Where material identity is questionable.

B - One at each quarry source prior to delivery to site.

C - One for every 8,000 square yards for record and control.

D - One from the conveyor belt for every 2,000 cubic yards produced for record and control.

E - Eight tests in horizontal filter materials for each dam. 02-01

(2) Minimum density to be determined by ASTM D 2049. Maximum density to be determined by the Department of the Army, EM 1110-2-1906, Appendix XII, "Maximum Density of Cohesionless Soils, Modified Providence Method."

(3) For record and control on horizontal filters only.

(4) Relative density to be determined from results of in-place density test and compaction standard data.

TABLE 2.5-55

ZONE 2 FILTER

SUMMARY OF BULK SPECIFIC GRAVITY AND

SODIUM SULFATE SOUNDNESS TESTS

	Bulk Specific Gravity	Sodium Sulfate Loss
Specification Requirement	2.50, minimum	10%, maximum
Maximum Test Result	2.72	3.5%
Minimum Test Result	2.67	0.1%
Average Test Result	2.69	1.08%
Number of Tests	20	16

TABLE 2.5-56

SUMMARY OF IN SITU PERMEABILITY TEST ON HORIZONTAL DRAINAGE BLANKETS

North Dam		
	Specification Requirement, cm/sec	$K \leq 1.0 \times 10^{-3}$
	Maximum Recorded Value, cm/sec	$K = 198.0 \times 10^{-3}$
	Minimum Recorded Value, cm/sec	$K = 1.4 \times 10^{-3}$
	Average Value, cm/sec	$K = 71 \times 10^{-3}$
	Number of Tests	8
South Dam		
	Specification Requirements, cm/sec	$K \leq 1.0 \times 10^{-3}$
	Maximum Recorded Value	218×10^{-3}
	Minimum Recorded Value	10×10^{-3}
	Average Value	59×10^{-3}
	Number of Tests	8

TABLE 2.5-57

RIPRAP TESTING PROCEDURES AND FREQUENCIES

Pre-Qualification Test	Placement Test	ASTM Designation	Test Frequency (1)
Gradation	--	Special Procedure	B
Specific Gravity	--	C 127	B
Sodium Sulfate Soundness	--	C 88	B
LA Abrasion	--	C 535	B
--	Gradation	C 136 for < 6 in. Visual > 6 in.	A, C
--	Specific Gravity	C 127	C
--	Sodium Sulfate Soundness	C 88	C

NOTES:

(1) Test frequency:

A - Where material identify is questionable.
B - One at each quarry source prior to delivery to site.
C - One for every 12,000 cubic yards for record and control.

TABLE 2.5-58

RIPRAP SUMMARY OF
BULK SPECIFIC GRAVITY AND
SODIUM SULFATE SOUNDNESS TESTS

	Bulk Specific Gravity	Sodium Sulfate Loss	
Particle Size	--	1 1/2" to 3/4"	3/4" to 3/8"
Specification Requirement	2.50	10%, Maximum	10%, maximum
Maximum Test Result	2.75	8.1%	6.8%
Minimum Test Result	2.62	0.0%	0.6%
Average Test Result	2.70	1.9%	2.5%
Number of Tests	12	16	16

TABLE 2.5-59 (Sheet 1 of 8)

SUMMARY OF BLOCK SAMPLE TEST RESULTS FOR

[illegible] DAM

BLOCK SAMPLE NO.	COORDINATE LOCATION	ELEV. (Ft)	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS L.L.	P.L.	P.I.	S.L.	SPECIFIC GRAVITY	UNIT DRY WGT. (pcf)	COMP. STD. NO.	MAX. DRY DENSITY (pcf)	OPT. MOIST. (%)	PERCENT COMP.	GRAIN SIZE SIEVE	HYDR.	% < 200	CONSOLID.	PERMEABILITY	UU SERIES φ (deg)	c (psf)	C̄U SERIES φ̄ (deg)	c̄ (psf)	OTHER TESTS
UDS- 5	N473,035 E1,905,847	338.0	26.6	59	46	13			93.3	68	100.6	25.5	92.7	*	*	80	*						
			26.8						92.3	68	100.6	25.5	91.7										NOTE: Fill removed due to adverse weather and moisture conditions
			24.5																				
			28.8																				
			27.5						92.4	88	103.8	20.0	89.0										
			28.7						91.7	88	103.8	20.0	88.3										
			28.0						92.7	88	103.8	20.0	89.3						19.0	2800			
UDS- 6	N473,0?6 E1,905,858	336.0	SAMPLE IN STORAGE																				
UDS- 8	N473,034 E1,905,812	342.0	23.4	57	49	8																	
			22.7	55	41	14																	Resonant Column
			23.6																				
			22.4																				
			24.9																				
			23.2						88.0	68	100.6	25.5	87.4										
			25.1						92.9	68	100.6	25.5	92.3						21.5	3000			
			23.6						96.8	68	100.6	25.5	96.[illegible]										
			22.8	47	42	5		2.74	90.7	68	100.6	25.5	90.0				*						
UDS-12	N473,258 E1,905,841	330.0	25.2	59	45	14	30		82.7					*	*	59							
			24.6						83.5	88	103.8	20.0	80.4										
			26.4						95.8	88	103.8	20.0	92.3										
			24.2						96.8	88	103.8	20.0	93.3								25.6	600	
									89.3								*	*					Dispersion by SCS Procedures
																	*	*					Pinhole dispersion
UDS-14	N473,212 E1,905,751	336.0	18.4	48	44	4	30	2.81	99.0	72	106.0	18.5	93.4	*	*	63							Resonant Column
																							SCS dispersion
																							Pinhole dispersion
UDS-15	N473,031 E1,905,849	348.0	21.1	57	41	16	32	2.71	91.8	67	100.7	23.8	91.2	*	*	73							
			21.1						87.5	67	100.7	23.8	85.9						22.0	3000			Dispersion by SCS Procedure
			21.1						94.9	67	100.7	23.8	94.2										
			22.1						92.7	67	100.7	23.8	92.1				*	*					Pinhole Dispersion Test
			21.6						93.5	67	100.7	23.8	92.8				*	*					
UDS-16	N473,031 E1,905,852	348.0	SAMPLE [illegible]																				

"* SEE TEST CURVES"

SUMMARY OF BLOCK SAMPLE TEST RESULTS

NORTH DAM

BLOCK SAMPLE NO.	COORDINATE LOCATION	ELEV. (Ft.)	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS L.L.	P.L.	P.I.	S.L.	SPECIFIC GRAVITY	UNIT DRY WGT. (pcf)	COMP. STD. NO.	MAX. DRY DENSITY (pcf)	OPT. MOIST. (%)	PERCENT COMP.	GRAIN SIZE SIEVE	HYDR.	%<200	CONSOLID.	PERMEABILITY	UU SERIES φ (deg)	UU SERIES c (psf)	CTU SERIES φ̄ (deg)	CTU SERIES c̄ (psf)	OTHER TESTS
UDS-19	N473,418 E1,905,637	344.0	22.0	52	45	7		2.69	89.1	145	106.9	19.3	83.3	*	*	71							
			22.2						97.1	145	106.9	19.3	90.8				*	*					
			22.4						98.8	145	106.9	19.3	92.4				*	*					
			21.6						86.9	145	106.9	19.3	81.3										
			22.0						93.3	145	106.9	19.3	87.3								33.2	0	
			20.9						87.2	145	106.9	19.3	81.6										
UDS-21A	N473,276 E1,905,790	363.0	SAMPLE NOT TESTED							146	106.9	19.4											
UDS-26	N473,396 E1,905,594	369.0	21.5																				
			21.8																				
			20.2	47	34	13		2.69						*	*	54							
			20.2						88.9	178	105.7	20.0	84.1										
			26.9 (1)						89.0	178	105.7	20.0	84.1										Resonant Column
			25.4 (1)						91.0	178	105.7	20.0	84.1										
			22.9 (1)						89.1	178	105.7	20.0	84.1										
			21.9 (1)						90.0	178	105.7	20.0	84.1										
UDS-27	N473,018 E1,[illegible]05,8[illegible]	[illegible]61.0	21.1	NP	NP	NP																	
			22.2													69							
			21.4																				
			23.3						92.5	167	105.9	18.5	87.3										
			23.3						93.0	167	105.9	18.5	87.8								31.0	140	
			23.1						93.1	167	105.9	18.5	87.9										
UDS-30	N473,249 E1,905,715	379.0	20.1	51	44	7		2.74						*	*	53							
			21.5																				
			21.0																				
			20.1						93.7	I-39	108.2	18.2	86.6										
			21.5						92.2	I-39	108.2	18.2	85.2						35	1200			
			21.0						91.7	I-39	108.2	18.2	84.8										
UDS-31	N473,355 E1,905,670	381.0		54	41	13		2.70						*	*	56							
				NP	NP	NP																	
			21.6						95.1	221	111.8	15.5	85.1				*	*					
			19.1						98.8	221	111.8	15.5	88.4										
			18.9						98.7	221	111.8	15.5	88.3										
			19.2						97.7	221	111.8	15.5	87.4								28	230	
[illegible]32	N473,110 E1,905,890	375.0	SAMPLE NOT TESTED							222	113.4	15.3											

(1) Initial moisture contents computed after testing

TABLE 2.5-59 (Sheet 3 of 8)

SUMMARY OF BLOCK SAMPLE TEST RESULTS

NORTH DAM

BLOCK SAMPLE NO.	COORDINATE LOCATION	ELEV. (Ft.)	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS L.L.	P.L.	P.I.	S.L.	SPECIFIC GRAVITY	UNIT DRY WGT. (pcf)	COMP. STD. NO.	MAX. DRY DENSITY (pcf)	OPT. MOIST. (%)	PERCENT COMP.	GRAIN SIZE SIEVE	HYDR.	% < 200	CONSOLID.	PERMEABILITY	UU SERIES φ (deg)	c (psf)	$\overline{CIU}$ SERIES $\bar{\phi}$ (deg)	$\bar{c}$ (psf)	OTHER TESTS
UDS-35	N473,210 E1,905,701	387	SAMPLE NOT TESTED							237	108.7	17.7											
UDS-37	N473,099 E1,905,955	384	21.3 21.6 20.2 21.2 19.9	NP	NP			2.70	93.3 92.7 98.2	247 247 247	109.0 109.0 109.0	18.7 18.7 18.7	85.6 85.1 90.1	*	*	66					31	460	
UDS-38	N473,388 E1,905,967	394	20.3 20.2 21.9	52 52 52	44 44 44	8 8 8		2.73 2.74 2.74	98.1 98.7 96.0	250 250 250	110.8 110.8 110.8	16.0 16.0 16.0	88.5 89.1 86.6	*	*	59							Cyclic Testing
UDS-39	N473,110 E1,905,529	401	SAMPLE NOT TESTED																				
UDS-42	N473,150 E1,905,383	405	SAMPLE NOT TESTED							264	111.6	16.2											
UDS-43	N473,342 E1,905,905	408	SAMPLE NOT TESTED							275	112.8	14.5											
UDS-44	N473,342 E1,905,908	408	20.6 17.6 18.4 18.8	43	36	7		2.70	97.8 99.0 100.5	275 275 275	112.8 112.8 112.8	14.5 14.5 14.5	86.7 87.8 89.1	*	*	59					26	400	
UDS-45	N473,254 E1,906,088	413	SAMPLE NOT TESTED																				
UDS-50	N473,276 E1,905,989	433	SAMPLE NOT TESTED																				

SUMMARY OF BLOCK SAMPLE TEST RESULTS

SOUTH DAM

BLOCK SAMPLE NO.	COORDINATE LOCATION	ELEV. (Ft.)	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS L.L.	ATTERBERG LIMITS P.L.	ATTERBERG LIMITS P.I.	ATTERBERG LIMITS S.L.	SPECIFIC GRAVITY	UNIT DRY WGT. (pcf)	COMP. STD. NO.	MAX. DRY DENSITY (pcf)	OPT. MOIST. (%)	PERCENT COMP.	GRAIN SIZE SIEVE	GRAIN SIZE HYDR.	GRAIN SIZE % < 200	CONSOLID.	PERMEABILITY	UU SERIES φ (deg)	UU SERIES c (psf)	$\overline{CIU}$ SERIES $\bar{\phi}$ (deg)	$\overline{CIU}$ SERIES $\bar{c}$ (psf)	OTHER TESTS
USD-11	N472,049 E1,906,645	364.9	24.3 24.5 24.1 24.4 25.4 21.8	61 64 62	43 42 45	18 22 17		2.77	89.2 90.0 90.1 91.1	85 85 85 85	103.0 103.0 103.0 103.0	22.5 22.5 22.5 22.5	86.6 87.4 87.5 88.4	*	*	62	*	*			31.0	250	Resonant Column
UDS-13	N472,172 E1,906,738	375.0	18.8 18.6 18.6 20.0 18.1 18.8 18.6 18.6 19.5	60	49	11	35	2.77	85.7 89.7 91.2 85.1 86.1 85.4	72 72 72 72 72 72	106.0 106.0 106.0 106.0 106.0 106.0	18.5 18.5 18.5 18.5 18.5 13.5	80.9 84.6 86.0 81.2 81.2 80.6	*	*	63	* *	* *	20.0	2200			
UDS-17	N471,942 E1,906,758	391	19.1 19.1 18.7 19.1 18.5 16.7	NP NP NP	NP NP NP	NP NP NP		2.73 2.73 2.73	90.4 96.3 93.5 89.4 91.4 90.4	116 116 116 116 116	107.6 107.6 107.6 107.6 107.6	14.8 14.8 14.8 14.8 14.8	89.3 86.9 83 85 84	*	*	52	* *	* *			30.9	0	
UDS-18	N472,114 E1,906,727	402	22.7 19.0 23.7 22.3	68	44	24	27	2.73	95.7 94.2 100.0	115 115 115	104.6 104.6 104.6	17.7 17.7 17.7	91.5 90.0 95.6	*	*	72					30	580	SCS Dispersion
UDS-20	N472,171 E1,906,740	407	25.4 25.2 24.7	60 60	32 32	18 18		2.70 2.70	85.8	162	105.8	19.0	81.1	*	*	68	*						
UDS-24	N472,031 E1,906,547	422	22.5 avg 24.4 22.3 22.9 20.4	NP	NP	NP		2.70 2.70	91.2 91.8 83.1 87.1	178 178 178	105.7 105.7 105.7	20.0 20.0 20.0	86.8 78.6 82.4	*	*	67	* *		21.0	2000			
UDS-25	N472,034 E1,906,548	422	SAMPLE NOT TESTED																				

TABLE 2.5-59 (Sheet 5 of 8)

SUMMARY OF BLOCK SAMPLE TEST RESULTS

EAST DAM

BLOCK SAMPLE NO.	COORDINATE LOCATION	ELEV. (Ft.)	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS L.L.	P.L.	P.I.	S.L.	SPECIFIC GRAVITY	UNIT DRY WGT. (pcf)	COMP. STD. NO.	MAX. DRY DENSITY (pcf)	OPT. MOIST. (%)	PERCENT COMP.	GRAIN SIZE SIEVE	HYDR.	% < 200	CONSOLID.	PERMEABILITY	UU SERIES φ (deg)	UU SERIES c (psf)	$\bar{C}\bar{T}\bar{U}$ SERIES $\bar{\phi}$ (deg)	$\bar{C}\bar{T}\bar{U}$ SERIES $\bar{c}$ (psf)	OTHER TESTS
UDS-48	N472,960 E1,907,210	431	25.4	55	48	7		2.73	95.9	284	104.4	22.7	91.9										
			25.6						96.9	284	104.4	22.7	92.8						37	960			
			25.5						95.4	284	104.4	22.7	91.4										
			26.4						94.0	284	104.4	22.7	90.0	*	*	84	*						
UDS-49	N473,672 E1,906,930	430	24.6	57	44	13		2.74		284	104.4	22.7		*	*	74							
			24.5																				

TABLE 2.5-59 (Sheet 6 of 8)

SUMMARY OF BLOCK SAMPLE TEST RESULTS FOR
WEST EMBANKMENT

BLOCK SAMPLE NO.	COORDINATE LOCATION	ELEV. (Ft.)	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS L.L.	P.L.	P.I.	S.L.	SPECIFIC GRAVITY	UNIT DRY WGT. (pcf)	COMP. STD. NO.	MAX. DRY DENSITY (pcf)	OPT. MOIST. (%)	PERCENT COMP.	GRAIN SIZE SIEVE	HYDR.	%<200	CONSOLID.	PERMEABILITY	UU SERIES φ (deg)	c (psf)	$\overline{CIU}$ SERIES $\bar{\phi}$ (deg)	$\bar{c}$ (psf)	OTHER TESTS
UDS-1	N472,375 E1,905,400	369.0	24.0	60	38	22		2.64						*	*	58							
			24.6																				
			24.7	43	33	10																	
			29.5																				
			29.7	41	36	5																	
			29.5						87.6	15	108.3	17.5	80.9				*	*					
			29.8						91.4	15	108.3	17.5	84.4										
			24.1						91.5	15	108.3	17.5	84.5										
			23.8						93.0	15	108.3	17.5	85.9								19.7	1480	
			29.4						93.7	15	108.3	17.5	86.5										UU-Single Test $\frac{\sigma_1-\sigma_3}{2}$ = 5.6 tsf
UDS-2	N472,591 E1,905,450	383.0	23.3	43	33	10		2.65															
			23.2											*	*	58							
			22.4																				
			23.2						89.9	15	108.3	17.5	83.0										Unconfined Compression
			22.2						88.9	15	108.3	17.5	83.0				*						σ_{1max} = 1.7 tsf
UDS-3	N 472,416 E1,905,445	383.5	23.8					2.67															
			21.7	45	35	10																	
			22.8																				
			24.7	42	31	8								*	*	62							
			23.2						96.4	15	108.3	17.5	89.0				*	*					
			24.1						97.8	15	108.3	17.5	90.3				*	*					
			22.3						101.5	15	108.3	17.5	93.7										
			22.5						102.0	15	108.3	17.5	94.2										
			25.2						99.4	15	108.3	17.5	91.8								27.8	900	
UDS-4	N472,745 E1,905,425	390.0	16.0	41	37	4		2.71															
			19.7											*	*	58							
			22.0																				
			23.2																				
			21.2						93.6	25	107.6	18.0	87.0										Unconfined Compression
			20.3						93.6	25	107.6	18.0	87.0										σ_{1max} = 2.5 tsf
UDS-7	N472,380 E1,905,643	400.0	23.6	51	35	16		2.78															
			24.7	59	34	25		2.76						*	*	78							
			24.2	60	35	24		2.87						*	*	76							
			24.8											*	*	77							
			24.3																				Resonant Column
			25.3																				
			25.0																				
			25.9																				

TABLE 2.5-59 (Sheet 7 of 8)

SUMMARY OF BLOCK SAMPLE TEST RESULTS FOR

WEST EMBANKMENT

BLOCK SAMPLE NO.	COORDINATE LOCATION	ELEV. (Ft.)	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS L.L.	P.L.	P.I.	S.L.	SPECIFIC GRAVITY	UNIT DRY WGT. (pcf)	COMP. STD. NO.	MAX. DRY DENSITY (pcf)	OPT. MOIST. (%)	PERCENT COMP.	GRAIN SIZE SIEVE	HYDR.	% < 200	CONSOLID.	PERMEABILITY	UU SERIES φ (deg)	c (psf)	C̄IU SERIES φ̄ (deg)	c̄ (psf)	OTHER TESTS
UDS-7 (cont.)			24.7					2.76	86.0	67	100.7	23.8	85.4				*	*					
			23.6						82.2	67	100.7	23.8	81.6				*	*					
			20.3						82.8	67	100.7	23.8	82.2										
			28.6						80.0	67	100.7	23.8	79.4										
			29.6						92.7	67	100.7	23.8	92.0										Resonant Column
			24.4						80.1	67	100.7	23.8	79.5										
			25.6						95.7	67	100.7	23.8	95.0										
UDS-A	N472,510 E1,905,400	385.0	22.9	NP	NP	NP		2.71															
			23.0																				
			22.4																				
			22.3																				
			23.8																				
			23.8																				
			19.9						98.5	95	107.3	18.6	91.8										
			19.4						97.8				91.1								27.0	650	
			20.6						92.3				86.0										
			23.4						94.0				87.6				*						
			20.0						98.5				91.8										Resonant Column
			23.0						98.2				91.5										
			26.5						98.7				92.0										
UDS-9	N472,348 E1,905,569	421.0	24.3	69	43	26		2.74						*	*	77							
			24.2	57	39	18																	
			23.4	69	42	27																	
			24.3	69	43	26			97.3	67	100.7	23.8	96.3				*	*					
			23.3						97.2	67	100.7	23.8	96.5										
			22.5						97.2	67	100.7	23.8	96.5										
			24.3						99.6	67	100.7	23.8	98.9								29.8	576	
			22.3						96.9	67	100.7	23.8	96.2										Resonant Column
UDS-10	N472,152 E1,905,801	431.0	SAMPLE NOT TESTED																				
UDS-23	N472,525 E1,905,410	399.0	SAMPLE NOT TESTED																				
UDS-36	N472,536 E1,905,470	416.0	22.7	NP	NP	NP	36	2.73						*	*	39							SCS Dispersion
			23.1																				
			23.3						89.9	211	113.0	15.5	79.6				*	*					
			22.6						89.2	211	113.0	15.5	78.9				*	*					
UDS-41	N472,648 E1,905,377	415.0	SAMPLE NOT TESTED							262	110.8	16.0											

AMENDMENT 97-01
AUGUST 1997

SUMMARY OF BLOCK SAMPLE TEST RESULTS
WEST EMBANKMENT

BLOCK SAMPLE NO.	COORDINATE LOCATION	ELEV. (Ft.)	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS L.L.	ATTERBERG LIMITS P.L.	ATTERBERG LIMITS P.I.	ATTERBERG LIMITS S.L.	SPECIFIC GRAVITY	UNIT DRY WGT. (pcf)	COMP. STD. NO.	MAX. DRY DENSITY (pcf)	OPT. MOIST. (%)	PERCENT COMP.	GRAIN SIZE SIEVE	GRAIN SIZE HYDR.	GRAIN SIZE % < 200	CONSOLID.	PERMEABILITY	UU SERIES φ (deg)	UU SERIES c (psf)	$\overline{CIU}$ SERIES $\bar{\phi}$ (deg)	$\overline{CIU}$ SERIES $\bar{c}$ (psf)	OTHER TESTS
UDS-46	N472,781 E1,905,272	429.0	SAMPLE NOT TESTED							289	106.8	19.7											
UDS-47	N472,781 E1,905,274	429.0	SAMPLE NOT TESTED							289	106.8	19.7											

TABLE 2.5-59a

SUMMARY OF BLOCK SAMPLE TEST RESULTS
TEST FILL - BORROW G

BLOCK SAMPLE NO.	COORDINATE LOCATION	ELEV. (Ft.)	NATURAL WATER CONTENT (%)	ATTERBERG LIMITS				SPECIFIC GRAVITY	UNIT DRY WGT. (pcf)	COMP. STD. NO.	MAX. DRY DENSITY (pcf)	OPT. MOIST. (%)	PERCENT COMP.	GRAIN SIZE			CONSOLID.	PERMEABILITY	UU SERIES		$\overline{CIU}$ SERIES		OTHER TESTS
				L.L.	P.L.	P.I.	S.L.							SIEVE	HYDR.	% < 200			φ (deg)	c (psf)	$\bar{\phi}$ (deg)	$\bar{c}$ (psf)	
UDS-21	Not Applicable	N/A		49	41	8		2.75						*	*	58							
								2.73								59							
			24.6						93.8	177	106.0	19.1	88.5										
			25.6						92.5	177	106.0	19.1	87.3								32.0	350	
			25.2						92.8	177	106.0	19.1	87.5										
UDS-22	Not Applicable	N/A	24.4	44	39	5		2.63						*	*								
			23.9					2.75								59							
			24.4													63							
			23.4						93.7	165	106.8	17.8	87.7										
			23.7						93.4	165	106.8	17.8	87.5								31.7	350	
			23.4						92.5	165	106.8	17.8	86.6										
UDS-28	Not Applicable	N/A	21.4	NP	NP	NP		2.69						*	*	53							
			21.0																				
			20.7					2.69	100.2	I-37	108.8	17.0	92.1				*	*					
			21.6						99.4	I-37	108.8	17.0	91.4										
UDS-29	Not Applicable	N/A	SAMPLE NOT TESTED							I-37	108.8	17.0											

TABLE 2.5-60

PHYSICAL PROPERTIES OF BLOCK SAMPLES

Property	Range	Average	Number of Tests
Natural Water Content, %	16.0 to 29.8	22.8	170
Liquid Limit, %	41 to 69	55	38(1)
Plasticity Index, %	4 to 27	14	38(1)
Unit Dry Weight, pcf	80.0 to 102.0	92.8	108
Specific Gravity	2.64 to 2.87	2.73	35

NOTE:

(1) Does not include seven tests that were nonplastic.

TABLE 2.5-61

PINHOLE DISPERSION TEST RESULTS ON BLOCK SAMPLES

Sample Number	Head (Inches)	Flow (ml/sec)	Color (1)	Dispersion Classification (2)
UDS-12	2	0.25	D	ND1
	7	0.76	D	
	15	1.31	D	
	40	2.43	D	
UDS-12	2	0.29	D	ND1
	7	0.80	D	
	15	1.40	D	
	40	2.50	D	
UDS-15	2	0.08	D	ND1
	7	0.16	D	
	15	0.90	D	
	40	2.18	D	

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NOTES:

(1) Color code:

A = Dark
B = Slight to Medium
C = Barely Visible
D = Completely Clear

(2) Dispersion code:

D1, D2 = Dispersive and erodible.
ND1, ND2 = Non-dispersive and highly erosion-resistant.
ND3, ND4 = Non-dispersive and intermediate erosion resistant.

TABLE 2.5-61a

SUMMARY OF SCS DISPERSION TEST RESULTS

SAMPLE NO.	LOCATION	ELEVATION (ft.)	MC %	PL %	LL %	PERCENT DISPERSION
UDS-12	North Dam	330.0	25.2	59	45	0
UDS-14	North Dam	336.0	18.4	48	44	0
UDS-15	North Dam	348.0	21.1	57	41	0
UDS-18	South Dam	402.0	22.7	68	44	0
UDS-36	West Embankment	416.0	22.7	NP	NP	0

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Amendment 02-01

TABLE 2.5-62

COMPUTED MAXIMUM CREST ACCELERATION AND
MINIMUM SAFETY FACTOR FOR SAFE SHUTDOWN EARTHQUAKE

Height of Embankment (ft.)	Maximum Crest Acceleration (%g)	Minimum Factor of Safety	Elevation at Which Minimum Safety Factor Occurs (ft.)
110 (North Dam)	29	1.20	370
80	34	1.20	370
67 (South Dam)	35	1.20	375
50	35	1.35	400
30 (East Dam)	30	1.55	405

TABLE 2.5-63

CASES STUDIED FOR DYNAMIC SHEAR MODULI VARIATIONS

Designation	Section	Dynamic Shear Moduli: Embankment	Dynamic Shear Moduli: Weathered Rock [1] (K_2) max	Dynamic Shear Moduli: Colluvium [1] (K_2) max
S-MAX-I	South Dam, max section	Probable Values [2]	250	70
S-MAX-II	South Dam, max section	Probable Values [2]	200	50
S-MAX-III	South Dam, max section	Probable Values [2]	500	120
N-MAX-I	North Dam, max section	Probable Values [2]	250	--
N-MAX-II	North Dam, max section	Probable Values [2]	200	--
N-MAX-III	North Dam, max section	Probable Values [2]	500	--

NOTES:

(1) Gmax = 1000 (K_2) max $\sigma_o^{1/2}$

(2) Gmax = 35,000 $\sigma_o^{1/2}$ for $\sigma_o \leq 2100$ psf, in which σ_o is the mean effective normal pressure.
Gmax = 760 σ_o psf for $\sigma_o > 2100$ psf.

TABLE 2.5-64

RESULTS OF FIELD PERMEABILITY TESTS
CONDUCTED DURING GROUTING OF NORTH DAM

Tests in Valley

Test Hole	Test Elevation (ft)	Average Coefficient of Permeability (cm/sec x 10^{-4})	Test Hole	Test Elevation (ft)	Average coefficient of permeability (cm/sec x 10^{-4})
7+06P	370-339	4.20	9+66S	316-299	15.59
7+46P	362-331	4.06	9+67T	314-300	11.74
8+26P	338-307	7.73		316-304	7.44 (1)
8+66P	333-287	1.67	9+86P	316-300	20.26
8+86S	325-303	7.35	9+96T	316-299	12.72
8+96T	323-303	6.34	10+06S	317-302	20.68
9+06P	320-301	9.01	10+11Q	317-300	14.77
	300-265	3.59	10+16T	316-300	7.75
9+26S	318-301	7.46	10+21Q	318-300	0.96
9+41Q	314-301	14.66	10+46S	322-300	11.50
9+46P	317-298	13.12	10+48.5Q	327-300	10.41
	313-302	9.26 (1)	10+51Q	323-300	10.09
	302-264	6.66	10+53Q	326-300	6.41
9+56T	317-300	10.59			

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Tests in Abutments

Test Hole	Test Elevation (ft)	Average Coefficient of Permeability (cm/sec x 10^{-4})
5+46P	401-356	0.62
13+06P	393-349	0.39
13+46P	399-360	0.46
14+26P	407-366	0.22
15+06P	412-368	0.14
15+46P	414-470	0.39
16+26P	418-474	0.30

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NOTE:

(1) Partially grouted.

TABLE 2.5-65

SUMMARY OF DESIGN COEFFICIENTS OF PERMEABILITY

Zone	PSAR Coefficient of Permeability (cm/sec)	FSAR Coefficient of Permeability (cm/sec)
Embankment		
Horizontal	1.0×10^{-6}	2.0×10^{-5}
Vertical	1.0×10^{-7}	2.0×10^{-5}
North Dam Foundation		
Valley Upper Stratum (1)	3.2×10^{-5}	1.0×10^{-3}
Valley Lower Stratum	3.2×10^{-5}	3.2×10^{-5}
Abutements	3.2×10^{-5}	3.6×10^{-5}
South Dam Foundation		
Upper Stratum (2)	3.2×10^{-5}	2.9×10^{-4}
Lower Stratum	3.2×10^{-5}	4.2×10^{-5}

NOTES:

(1) Thickness = 52 feet

(2) Thickness = 15 feet

TABLE 2.5-66

STRATIFICATION AT SPRING AND SEEP LOCATIONS

Source	Residual Soil and Saprolite Thickness [1] (ft)		Decomposed Rock Thickness [1] (ft)		Combined Thickness of Overburden (ft)
	Range	Average	Range	Average	
Spring No. 1	0-34	9	0-18	12	21 (12) [2]
Spring No. 2	20-34	27	34	34	61 (20) [2]
Bench Cut Seeps	0-8	5	10-60	25	30 (12) [2]

NOTES:

(1) Based on a review of closest test boring data.

(2) Depths in ( ) represent the minimum possible depth of overburden that could be postulated from the adjacent borings which were terminated within the decomposed rock before penetrating the “fractured rock” zone.

TABLE 2.5-66a

PIEZOMETER LOCATIONS

Piezometer No.	North Dam Centerline Station	Offset In Feet (1)	Tip Elevation
8-1	8+00.2	148.4-M	382.8
8-2	8+05.5	114.8-M	389.4
8-3	8+04.7	14.8-S	374.4
8-4	8+03.9	202.4-S	358.4
10-1	10+00.9	280.3-M	340.7
10-2	10+02.8	220.6-M	348.0
10-3	10+04.7	14.4-S	334.2
10-4	10+06.5	200.9-S	333.8
12+50-1	12+51.4	199.3-M	373.5
12+50-2	12+51.1	140.0-M	387.4
12+50-3	12+50.6	15.0-S	390.7
12+50-4	12+57.1	120.1-S	381.7

02-01

NOTE:

1. M refers to Monticello Reservoir slope.

   S refers to service water pond slope.

Reformatted Per
Amendment 02-01

TABLE 2.5-66b
NORTH DAM SETTLEMENT MONUMENT READINGS

Date	-(0+04)	0+00	1+00	2+00	3+00	4+00	5+00	6+00	7+00	8+00	9+00	10+00	11+00	12+00	13+00	14+00	15+00	16+00
	Settlement (feet)																	
12/02/77	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/12/77	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.00	0.00	0.00	0.00	-
12/23/77	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.04	0.04	0.03	-	0.01	0.00	0.00	-
1/02/78	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01	-0.01	0.00	0.00	0.01	0.04	0.04	0.02	-	0.00	-0.01	0.00	-0.01
1/11/78	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.01	0.01	0.02	0.05	0.05	0.03	0.02	0.01	0.01	0.00	0.00
1/20/78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.05	0.05	0.04	0.02	0.01	0.00	0.00	-0.01
1/30/78	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.01	0.02	0.02	0.05	0.04	0.03	0.02	0.00	0.00	-0.01	-0.01
2/10/78	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.02	0.02	0.05	0.05	0.04	0.01	0.01	0.00	0.00	-0.01
2/20/78	0.00	0.00	-0.01	0.00	-0.01	0.00	0.02	0.01	0.02	0.03	0.05	0.06	0.04	0.01	0.00	0.00	-0.01	-0.02
3/01/78	0.01	0.01	0.00	0.00	-0.01	0.01	0.03	0.03	0.03	0.03	0.06	0.06	0.04	0.04	0.00	-0.01	-0.02	-0.03
3/09/78	0.01	0.00	0.00	0.00	0.01	0.00	0.03	0.02	0.03	0.03	0.06	0.06	0.05	0.04	0.01	-0.01	-0.01	0.00
4/04/78	-0.01	-0.01	-0.01	-0.01	-0.02	-0.01	0.01	0.01	0.01	0.02	0.05	0.22	0.05	0.03	-0.01	-0.02	-0.02	-0.04
5/01/78	0.00	0.00	-0.01	0.00	-0.02	-0.01	0.02	0.01	0.01	0.01	0.05	0.22	0.04	0.03	-0.01	-0.02	-0.03	-0.05
6/05/78	-0.02	-0.01	-0.02	-0.01	-0.03	-0.01	0.01	0.01	0.01	0.00	0.04	0.21	0.03	0.01	-0.02	-0.03	-0.03	-0.06
7/06/78	-0.02	-0.01	-0.02	-0.01	-0.03	-0.02	0.01	0.01	0.00	0.00	0.03	0.20	0.02	0.01	-0.02	-0.03	-0.04	-0.06
8/02/78	-0.02	0.00	-0.01	-0.01	-0.03	-0.02	0.01	0.01	0.00	0.00	0.02	0.20	0.02	0.01	-0.02	-0.03	-0.03	-
9/05/78	-0.02	0.00	-0.01	-0.01	-0.04	-0.02	0.01	0.01	0.00	-0.01	0.02	0.19	0.02	0.01	-0.02	-0.03	-0.04	-
10/03/78	-0.02	-0.01	-0.01	-0.01	-0.04	-0.02	0.01	0.00	-0.01	-0.02	0.01	0.17	0.01	0.00	-0.07	-0.04	-0.04	-
11/02/78	-0.02	0.00	-0.01	-0.01	-0.04	-0.01	0.02	0.01	0.00	-0.01	0.01	0.18	0.01	0.01	-0.03	-0.03	-0.04	-
12/05/78	-0.03	-0.01	-0.02	-0.02	-0.05	-0.02	0.00	0.00	-0.02	-0.02	-0.01	0.17	0.00	0.00	-0.04	-0.03	-0.04	-
1/04/79	-0.02	0.00	-0.01	-0.01	-0.03	-0.02	0.01	0.00	-0.01	-0.02	-0.01	0.17	0.00	0.00	-0.04	-0.03	-0.03	-
1/30/79	-0.03	-0.01	-0.02	-0.02	-0.05	-0.02	0.00	0.00	-0.02	-0.02	-0.01	0.17	0.00	0.01	-0.04	-0.03	-0.04	-
3/05/79	-0.04	-0.02	-0.02	-0.03	-0.05	-0.03	0.00	-0.02	-0.02	-0.04	-0.01	0.15	-0.01	-0.01	-0.05	-0.04	-0.05	-
4/02/79	-0.03	-0.01	-0.03	-0.02	-0.06	-0.02	-0.01	-0.01	-0.03	-0.03	-0.02	0.16	-0.01	0.00	-0.05	-0.04	-0.04	-
5/02/79	-0.05	-0.03	-0.04	-0.04	-0.07	-0.05	-0.01	-0.03	-0.04	-0.06	-0.03	0.16	-0.02	-0.02	-0.05	-0.05	-0.05	-
6/07/79	-0.05	-0.03	-0.03	-0.04	-0.07	-0.04	-0.01	-0.03	-0.03	-0.05	-0.03	0.14	-0.03	-0.02	-0.06	-0.05	-0.05	-
7/04/79	-0.06	-0.03	-0.04	-0.04	-0.07	-0.04	-0.02	-0.03	-0.04	-0.06	-0.04	0.13	-0.03	-0.03	-0.06	-0.06	-0.05	-
8/02/79	-0.05	-0.03	-0.04	-0.04	-0.07	-0.04	-0.02	-0.03	-0.04	-0.05	-0.04	0.14	-0.03	-0.02	-0.06	-0.05	-0.05	-
8/28/79	-0.05	-0.03	-0.04	-0.04	-0.07	-0.04	-0.02	-0.03	-0.04	-0.06	-0.04	0.13	-0.03	-0.02	-0.06	-0.05	-0.05	-
10/08/79	-0.05	-0.03	-0.04	-0.04	-0.07	-0.04	-0.02	-0.03	-0.04	-0.06	-0.04	0.13	-0.03	-0.02	-0.06	-0.05	-0.05	-
11/05/79	-0.06	-0.03	-0.04	-0.04	-0.07	-0.04	-0.02	-0.04	-0.04	-0.06	-0.04	0.13	-0.03	-0.03	-0.06	-0.06	-0.06	-
12/03/79	-0.06	-0.03	-0.04	-0.04	-0.07	-0.04	-0.02	-0.04	-0.04	-0.06	-0.04	0.13	-0.04	-0.03	-0.07	-0.06	-0.06	-
1/02/80	-0.05	-0.03	-0.04	-0.04	-0.07	-0.04	-0.02	-0.04	-0.04	-0.06	-0.05	0.13	-0.04	-0.03	-0.07	-0.06	-0.06	-
2/07/80	-0.06	-0.03	-0.04	-0.04	-0.08	-0.04	-0.03	-0.04	-0.05	-0.07	-0.05	0.12	-0.05	-0.03	-0.07	-0.06	-0.07	-
3/04/80	-0.06	-0.03	-0.04	-0.04	-0.07	-0.04	-0.03	-0.04	-0.05	-0.06	-0.05	0.12	-0.05	-0.03	-0.07	-0.06	-0.07	-
4/02/80	-0.06	-0.03	-0.04	-0.05	-0.07	-0.05	-0.03	-0.05	-0.05	-0.07	-0.06	0.11	-0.05	-0.03	-0.07	-0.06	-0.06	-

NOTE: Monument 12+00 destroyed 12/21/77 and replaced 1/4/78. Settlement of 0.01 feet which had been measured through 12/21/77 has been added to settlements measured after 1/4/78.

Monument 16+00 removed due to construction of guard tower.

Negative readings indicate uplift.

TABLE 2.5-66c
NORTH DAM ALIGNMENT MONUMENT READINGS

Date	Horizontal Movement (feet) -(0+84)	0+00	1+00	2+00	3+00	4+00	5+00	6+00	7+00	8+00	9+00	10+00	11+00	12+00	13+00	14+00	15+00	16+00
12/02/77	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/12/77	0.00	0.00	0.01N	0.00	0.00	0.00	0.00	0.00	0.00	0.03N	0.02N	0.04N	0.00	0.03N	0.00	0.01N	0.00	-
12/23/77	0.00	0.00	0.04S	0.01N	0.04S	0.00	0.00	0.00	0.00	0.02S	0.05N	0.07N	0.03N	-	0.03N	0.00	0.01N	-
1/02/78	0.00	0.00	0.00	0.00	0.02S	0.03S	0.03S	0.03S	0.01N	0.04N	0.06N	0.04N	0.03N	-	0.02N	0.03N	0.03N	0.01N
1/11/78	0.00	0.00	0.00	0.01S	0.03S	0.02S	0.01S	0.00	0.03S	0.04N	0.07N	0.04N	0.04N	0.02S	0.03N	0.02N	0.04N	0.01N
1/20/78	0.00	0.00	0.00	0.01N	0.03S	0.03S	0.02S	0.00	0.03S	0.03N	0.05N	0.07N	0.00	0.02S	0.01N	0.02N	0.01N	0.00
1/30/78	0.00	0.00	0.00	0.01N	0.03S	0.03S	0.00	0.00	0.03S	0.01N	0.05N	0.04N	0.00	0.03S	0.01N	0.01N	0.01N	0.00
2/10/78	0.00	0.00	0.01S	0.01N	0.05S	0.04S	0.29S	0.02S	0.04S	0.01N	0.05N	0.05N	0.00	0.05S	0.00	0.01N	0.01N	0.00
2/20/78	0.00	0.00	0.00	0.01N	0.02S	0.04S	0.29S	0.00	0.03S	0.01N	0.05N	0.05N	0.03S	0.08S	0.02S	0.01S	0.01N	0.00
3/01/78	0.00	0.00	0.00	0.02S	0.04S	0.04S	0.29S	0.02N	0.06S	0.02S	0.00	0.05N	0.02S	0.19S	0.03S	0.00	0.00	0.00
3/09/78	0.00	0.00	0.00	0.01N	0.04S	0.04S	0.25S	0.02N	0.06S	0.05S	0.04S	0.10S	0.04S	0.24S	0.04S	0.01S	0.01S	0.00
4/04/78	0.00	0.00	0.01S	0.00	0.04S	0.06S	0.28S	0.01N	0.08S	0.07S	0.06S	0.11S	0.08S	0.22S	0.06S	0.02S	0.02S	0.01S
5/01/78	0.00	0.00	0.00	0.02N	0.04S	0.05S	0.27S	0.02N	0.08S	0.07S	0.03S	0.11S	0.06S	0.22S	0.05S	0.02S	0.02S	0.01S
6/05/78	0.00	0.00	0.00	0.01S	0.04S	0.05S	0.25S	0.00	0.08S	0.09S	0.06S	0.12S	0.04S	0.26S	0.04S	0.01S	0.02S	0.00
7/06/78	0.00	0.00	0.00	0.00	0.05S	0.06S	0.25S	0.01N	0.06S	0.07S	0.07S	0.09S	0.05S	0.23S	0.04S	0.01S	0.03S	0.00
8/02/78	-	0.00	0.00	0.01S	0.05S	0.05S	0.24S	0.02N	0.08S	0.05S	0.07S	0.12S	0.05S	0.23S	0.05S	0.00	0.03S	-
9/05/78	-	0.00	0.00	0.00	0.05S	0.05S	0.27S	0.02N	0.07S	0.05S	0.06S	0.10S	0.05S	0.22S	0.04S	0.06S	0.02S	-
10/03/78	-	0.01S	0.00	0.00	0.05S	0.05S	0.27S	0.01N	0.07S	0.05S	0.05S	0.10S	0.05S	0.22S	0.04S	0.01S	0.02S	-
11/02/78	-	0.00	0.00	0.00	0.05S	0.05S	0.27S	0.01N	0.07S	0.06S	0.06S	0.10S	0.05S	0.22S	0.05S	0.01S	0.02S	-
12/05/78	-	0.01N	0.01N	0.00	0.05S	0.06S	0.27S	0.03N	0.07S	0.07S	0.07S	0.09S	0.05S	0.24S	0.04S	0.02S	0.03S	-
1/04/79	-	0.00	0.00	0.00	0.05S	0.05S	0.27S	0.02N	0.07S	0.05S	0.06S	0.10S	0.06S	0.22S	0.04S	0.01S	0.03S	-
1/30/79	-	0.01S	0.00	0.00	0.05S	0.06S	0.27S	0.01N	0.08S	0.05S	0.05S	0.10S	0.05S	0.22S	0.04S	0.02S	0.02S	-
3/05/79	-	0.01S	0.00	0.00	0.05S	0.05S	0.26S	0.01N	0.07S	0.05S	0.05S	0.10S	0.05S	0.22S	0.04S	0.02S	0.02S	-
4/02/79	-	0.00	0.02S	0.01S	0.08S	0.07S	0.24S	0.00	0.07S	0.08S	0.07S	0.12S	0.05S	0.22S	0.01S	0.02S	0.02S	-
5/02/79	-	0.00	0.01S	0.01S	0.07S	0.06S	0.24S	0.00	0.07S	0.08S	0.07S	0.12S	0.05S	0.22S	0.05S	0.02S	0.02S	-
6/07/79	-	0.01S	0.01S	0.00	0.07S	0.06S	0.24S	0.01N	0.07S	0.07S	0.06S	0.13S	0.05S	0.20S	0.04S	0.00	0.01S	-
7/04/79	-	0.01S	0.01S	0.00	0.07S	0.05S	0.25S	0.01N	0.06S	0.07S	0.06S	0.12S	0.05S	0.21S	0.04S	0.00	0.01S	-
8/01/79	-	0.01S	0.01S	0.00	0.07S	0.05S	0.25S	0.01N	0.07S	0.07S	0.06S	0.12S	0.05S	0.21S	0.04S	0.00	0.02S	-
8/20/79	-	0.01S	0.01S	0.01N	0.07S	0.05S	0.25S	0.01N	0.07S	0.07S	0.06S	0.13S	0.05S	0.20S	0.04S	0.00	0.02S	-
10/08/79	-	0.01S	0.01S	0.01N	0.07S	0.06S	0.26S	0.01N	0.08S	0.06S	0.06S	0.13S	0.05S	0.20S	0.04S	0.00	0.02S	-
11/05/79	-	0.01S	0.01S	0.01N	0.07S	0.06S	0.26S	0.02N	0.08S	0.06S	0.06S	0.13S	0.05S	0.20S	0.04S	0.00	0.02S	-
12/03/79	-	0.01S	0.01S	0.01N	0.07S	0.06S	0.26S	0.02N	0.08S	0.06S	0.06S	0.13S	0.05S	0.21S	0.04S	0.00	0.02S	-
1/02/80	-	0.01S	0.01S	0.01N	0.07S	0.07S	0.26S	0.02N	0.08S	0.06S	0.06S	0.13S	0.05S	0.21S	0.04S	0.00	0.02S	-
2/07/80	-	0.01S	0.02S	0.02N	0.07S	0.07S	0.26S	0.02N	0.08S	0.07S	0.05S	0.13S	0.05S	0.21S	0.04S	0.01S	0.03S	-
3/04/80	-	0.01S	0.02S	0.02N	0.07S	0.06S	0.29S	0.02N	0.07S	0.07S	0.05S	0.13S	0.05S	0.21S	0.04S	0.01S	0.03S	-
		0.02S	0.02S	0.01N	0.07S	0.06S	0.27S	0.02N	0.08S	0.07S	0.04S	0.13S	0.04S	0.22S	0.03S	0.01S	0.03S	-

NOTE: Monument 12+00 destroyed 12/21/77 and replaced 1/4/78. Alignment readings after 1/4/78 do not include previous movement.
Monument 16+00 removed due to construction of guard tower

TABLE 2.5-66d
SOUTH DAM SETTLEMENT MONUMENT READINGS

Date	Settlement (feet)										
	0+00	1+00	2+00	3+00	4+00	5+00	6+00	7+00	8+00	9+00	10+00
12/13/77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/23/77	0.02	0.02	0.00	0.02	0.00	0.01	0.00	0.02	0.00	0.00	0.00
1/02/78	0.00	0.00	-0.01	0.00	-0.01	0.00	0.00	0.01	0.00	0.00	-0.01
1/11/78	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.02	0.00	0.00	0.00
1/20/78	0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.02	-0.01	0.00	0.01
1/30/78	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01	-0.01	0.00	-0.01
2/10/78	0.01	0.01	0.01	0.01	0.00	0.00	-0.01	0.01	-0.01	0.00	-0.01
2/20/78	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.02	0.00	-0.02	-0.01	-0.01
3/01/78	0.01	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.00	-0.02	-0.02	-0.01
3/09/78	0.00	0.01	0.00	0.00	-0.01	-0.01	-0.02	0.00	-0.02	-0.01	-0.01
4/04/78	-0.01	-0.01	0.00	-0.02	-0.02	-0.04	-0.03	-0.02	-0.03	-0.03	-0.01
5/02/78	-0.02	-0.01	-0.02	-0.02	-0.04	-0.05	-0.04	-0.03	-0.04	-0.04	-0.01
6/05/78	-0.04	-0.02	-0.03	-0.03	-0.06	-0.06	-0.05	-0.04	-0.05	-0.04	-0.01
7/06/78	-0.04	-0.03	-0.02	-0.04	-0.06	-0.08	-0.06	-0.05	-0.06	-0.05	-0.01
8/02/78	-0.04	-0.02	-0.02	-0.03	-0.07	-0.08	-0.07	-0.05	-0.06	-0.05	-0.01
9/05/78	-0.04	-0.02	-0.02	-0.03	-0.07	-0.08	-0.07	-0.06	-0.07	-0.05	0.00
10/04/78	-0.05	-0.02	-0.02	-0.04	-0.08	-0.10	-0.09	-0.07	-0.08	-0.06	-0.01
11/02/78	-0.05	-0.02	-0.03	-0.04	-0.09	-0.10	-0.09	-0.07	-0.08	-0.05	-0.01
12/05/78	-0.06	-0.03	-0.03	-0.05	-0.10	-0.11	-0.11	-0.09	-0.09	-0.06	-0.01
1/04/79	-0.06	-0.03	-0.03	-0.05	-0.10	-0.12	-0.11	-0.10	-0.09	-0.07	-0.02
1/30/79	-0.06	-0.03	-0.02	-0.05	-0.10	-0.12	-0.10	-0.09	-0.09	-0.07	-0.01
3/01/79	-0.05	-0.03	-0.02	-0.05	-0.10	-0.12	-0.12	-0.10	-0.10	-0.06	-0.01
4/02/79	-0.05	-0.02	-0.02	-0.04	-0.10	-0.12	-0.13	-0.10	-0.10	-0.06	-0.02
5/02/79	-0.06	-0.02	-0.02	-0.05	-0.10	-0.13	-0.13	-0.11	-0.10	-0.06	-0.02
6/04/79	-0.06	-0.02	-0.03	-0.05	-0.11	-0.14	-0.13	-0.11	-0.10	-0.07	-0.02
7/04/79	-0.06	-0.02	-0.02	-0.05	-0.11	-0.14	-0.14	-0.11	-0.11	-0.06	-0.02
8/02/79	-0.05	-0.02	-0.02	-0.06	-0.11	-0.14	-0.14	-0.12	-0.11	-0.07	-0.02
8/28/79	-0.05	-0.02	-0.02	-0.05	-0.10	-0.13	-0.14	-0.11	-0.11	-0.05	-0.01
10/09/79	-0.05	-0.02	-0.02	-0.06	-0.11	-0.14	-0.14	-0.12	-0.11	-0.07	-0.02
11/05/79	-0.05	-0.01	-0.02	-0.05	-0.11	-0.14	-0.14	-0.12	-0.11	-0.06	-0.02
12/04/79	-0.05	-0.01	-0.02	-0.05	-0.11	-0.14	-0.14	-0.12	-0.11	-0.06	-0.01
1/02/80	-0.05	-0.01	-0.02	-0.05	-0.11	-0.14	-0.14	-0.12	-0.11	-0.06	-0.02
2/05/80	-0.05	-0.02	-0.02	-0.05	-0.12	-0.15	-0.16	-0.13	-0.11	-0.07	-0.02
3/04/80	-0.04	-0.01	-0.02	-0.04	-0.11	-0.14	-0.15	-0.11	-0.11	-0.06	-0.02
4/02/80	-0.05	-0.01	-0.02	-0.05	-0.11	.0.15	-0.16	-0.12	-0.11	-0.06	-0.03

NOTE: Negative reading indicates uplift

TABLE 2.5-66e
SOUTH DAM ALIGNMENT MONUMENT READINGS

Date	Horizontal Movement (feet)										
	0+00	1+00	2+00	3+00	4+00	5+00	6+00	7+00	8+00	9+00	10+00
12/13/77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/23/77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/02/78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/11/78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/20/78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/30/78	0.01S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2/10/78	0.01S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04S	0.00
2/20/78	0.01S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04S	0.00
3/01/78	0.02S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02S	0.00
3/09/78	0.01S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02S	0.00
4/04/78	0.01N	0.00	0.00	0.02N	0.02N	0.02N	0.02N	0.03N	0.00	0.03S	0.00
5/02/78	0.01N	0.00	0.00	0.01N	0.02N	0.02N	0.02N	0.04N	0.00	0.03N	0.00
6/05/78	0.02N	0.00	0.00	0.01N	0.02N	0.01N	0.01N	0.03N	0.00	0.02N	0.00
7/06/78	0.02N	0.00	0.00	0.01N	0.02N	0.02N	0.00	0.01N	0.00	0.01N	0.00
8/01/78	0.02N	0.00	0.00	0.01N	0.04N	0.03N	0.02N	0.02N	0.02N	0.02N	0.00
9/05/78	0.02N	0.00	0.00	0.02N	0.04N	0.03N	0.03N	0.04N	0.03N	0.02N	0.00
10/04/78	0.02N	0.00	0.00	0.02N	0.04N	0.03N	0.03N	0.04N	0.03N	0.03N	0.00
11/02/78	0.02N	0.00	0.00	0.03N	0.04N	0.03N	0.04N	0.04N	0.04N	0.03N	0.00
12/05/78	0.02N	0.01N	0.01N	0.03N	0.04N	0.03N	0.04N	0.04N	0.04N	0.03N	0.00
1/04/79	0.02N	0.01N	0.01N	0.03N	0.05N	0.03N	0.03N	0.05N	0.04N	0.02N	0.00
1/30/79	0.02N	0.01N	0.01N	0.03N	0.05N	0.03N	0.03N	0.04N	0.04N	0.03N	0.00
3/01/79	0.02N	0.00	0.01N	0.05N	0.05N	0.05N	0.03N	0.05N	0.04N	0.03N	0.00
4/02/79	0.00	0.00	0.01N	0.03N	0.04N	0.03N	0.03N	0.03N	0.03N	0.02N	0.00
5/02/79	0.00	0.00	0.01N	0.03N	0.04N	0.03N	0.03N	0.03N	0.03N	0.02N	0.00
6/04/79	0.00	0.00	0.01N	0.03N	0.04N	0.03N	0.03N	0.03N	0.03N	0.02N	0.00
7/04/79	0.00	0.00	0.01N	0.03N	0.04N	0.03N	0.03N	0.03N	0.03N	0.02N	0.00
8/02/79	0.00	0.00	0.01N	0.03N	0.04N	0.03N	0.03N	0.03N	0.03N	0.02N	0.00
8/28/79	0.00	0.00	0.05N	0.03N	0.04N	0.03N	0.04N	0.03N	0.03N	0.02N	0.00
10/09/79	0.00	0.00	0.01N	0.03N	0.04N	0.03N	0.04N	0.03N	0.03N	0.02N	0.00
11/05/79	0.00	0.00	0.01N	0.03N	0.04N	0.03N	0.04N	0.03N	0.03N	0.02N	0.00
12/04/79	0.00	0.00	0.01N	0.03N	0.04N	0.03N	0.04N	0.03N	0.03N	0.02N	0.00
1/02/80	0.00	0.00	0.01N	0.03N	0.04N	0.03N	0.04N	0.03N	0.03N	0.02N	0.00
2/05/80	0.00	0.01N	0.00	0.02N	0.03N	0.02N	0.03N	0.03N	0.03N	0.02N	0.01S
3/04/80	0.00	0.00	0.01N	0.02N	0.03N	0.02N	0.03N	0.04N	0.03N	0.02N	0.01S
4/02/80	0.00	0.00	0.01N	0.03N	0.03N	0.02N	0.02N	0.03N	0.03N	0.02N	0.01S

TABLE 2.5-67

PRINCIPAL EQUIPMENT USED TO CONSTRUCT THE SERVICE WATER POND DAMS

	No. of Pieces	Model Number	Manufacturer
Foundation Preparation			
Mucking and Cleaning	1	225 Cat Backhoe	Caterpillar Tractor Company
	4	D-9 Pushers	Caterpillar Tractor Company
	1	Model 6 Dragline	Northwest Engineering Company
	1	Model 41 Dragline	Northwest Engineering Company
	2	TS-14 Scrapers	Terex (General Motors)
	6	TS-24 Scrapers	Terex (General Motors)
Select Fill Placement			
Excavation and Hauling	8	641 Scrapers	Caterpillar Tractor Company
	16	631 Scrapers	Caterpillar Tractor Company
	1	480 Michigan Pusher	Clark Equipment Company
	4	D-9 Pushers	Caterpillar Tractor Company
Placement and Compaction	4	D-5 Dozers	Caterpillar Tractor Company
	4	D-8 Dozers	Caterpillar Tractor Company
	2	631 Water Wagons	Caterpillar Tractor Company
	4	No. 16 Motor Graders	Caterpillar Tractor Company
	2	No. 14 Motor Graders	Caterpillar Tractor Company
	2	No. 12 Motor Graders	Caterpillar Tractor Company
	3	825 Compactors	Caterpillar Tractor Company
	2	Buffalo - Springfield Rollers	Koehring Company
	1	Ferguson Roller	Ferguson Company
	2	Vibro Plus Roller	Vibro Plus Corporation
	2	Tampo Rollers	Tampo Manufacturing Company
Filters and Riprap	6	R-22 Rear Dumps	Euclid Corporation
	4	R-40 Rear Dumps	Terex (General Motors)
	4	D-5 Dozers	Caterpillar Tractor Company
	4	D-8 Dozers	Caterpillar Tractor Company
	2	Vibro Plus Roller	Vibro Plus Corporation

TABLE 2.5-67 (Continued)

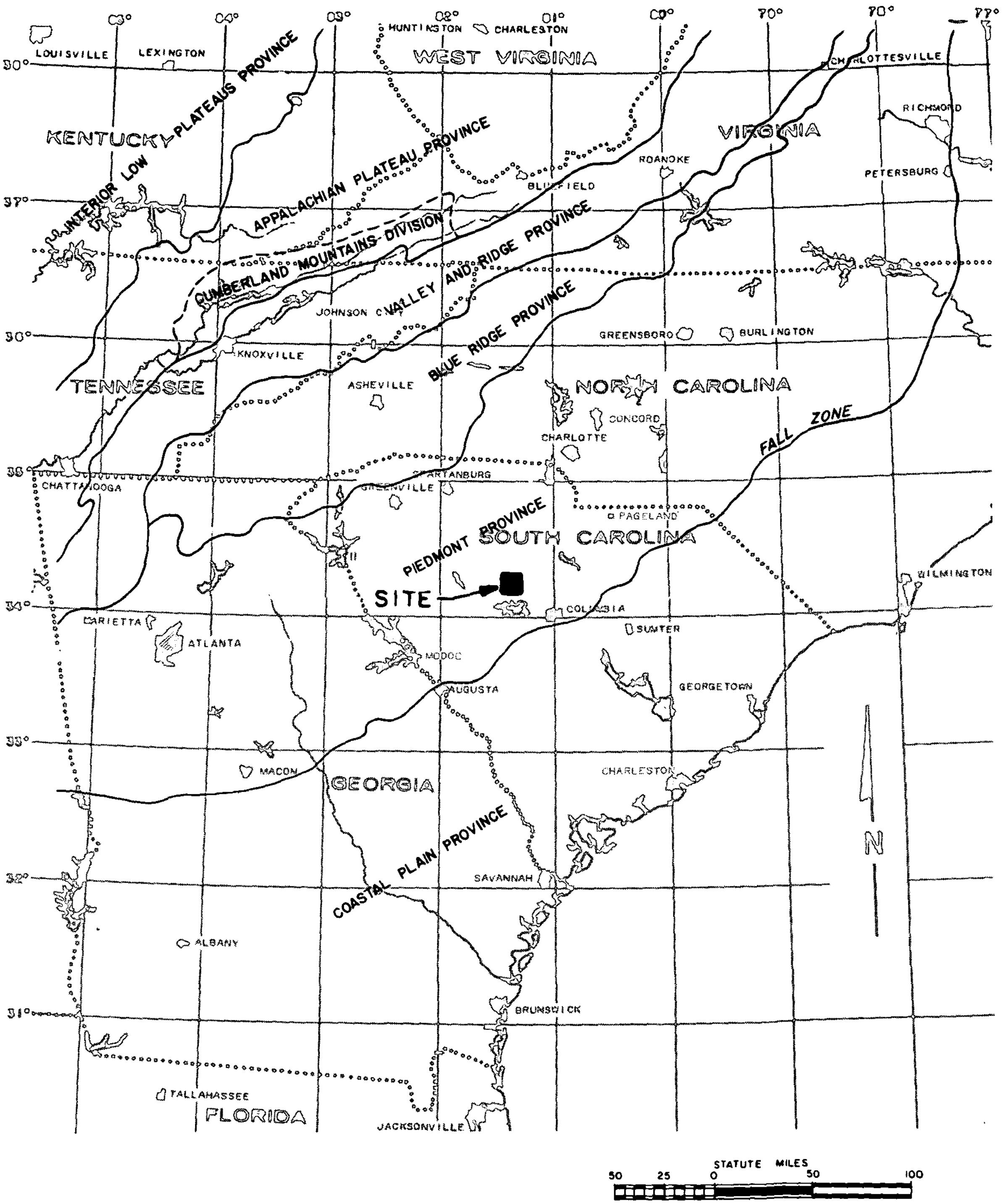
	No. of Pieces	Model Number	Manufacturer
Filters and Riprap (cont'd)	1	235 Backhoe with Grapple	Caterpillar Tractor Company
	1	225 Backhoe with Grapple	Caterpillar Tractor Company
	4	R-122 Rear Dumps	Terex (General Motors)
	1	Cruz Air 80 Backhoe with Grapple	Drott Manufacturing Div. J.I. Case, Aternnero Company
	1	60 Ton Crane with Orange Peel Grapple	Northwestern Engineering Company
	1	Hydro-Scopic 300 Grad II	Warner & Swasey Company
	11	DM600 Rear Dumps	Mack Truck, Inc.
	6	DM600 Trailer Dumps	Mack Truck, Inc.
	2	Autocar Rear Dumps	Autocar Trucks Div. White Motor Corporation

TABLE 2.5-68

SUMMARY OF LARGE RESERVOIR INDUCED EARTHQUAKES

RESERVOIR/DAM	DEPTH (M)	VOLUME (x 10^6 M^3)	SIZE (M)	FOCAL DEPTH (KM)	ACTIVE FAULTS
Benmore	96	2040	5.0	12	Yes
Eucumbene	106	4761	5.0	17	Yes
Hoover	191	36,703	5.0	16	Yes
Kariba	122	175,000	6.3	10	Not Known
Koyna	100	2780	6.5	27	Yes
Kremasta	120	4750	6.3	10	Yes
Marathon	60	41	5.8	15	Not Known
Mendocino	30	151	5.2	9.9	Yes
Oroville	204	4400	5.7	5-10	Yes
Xinfengjiang	80	13,896	6.0	5	Yes

Data Source: Woodward-Clyde Consultants, 1979



Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

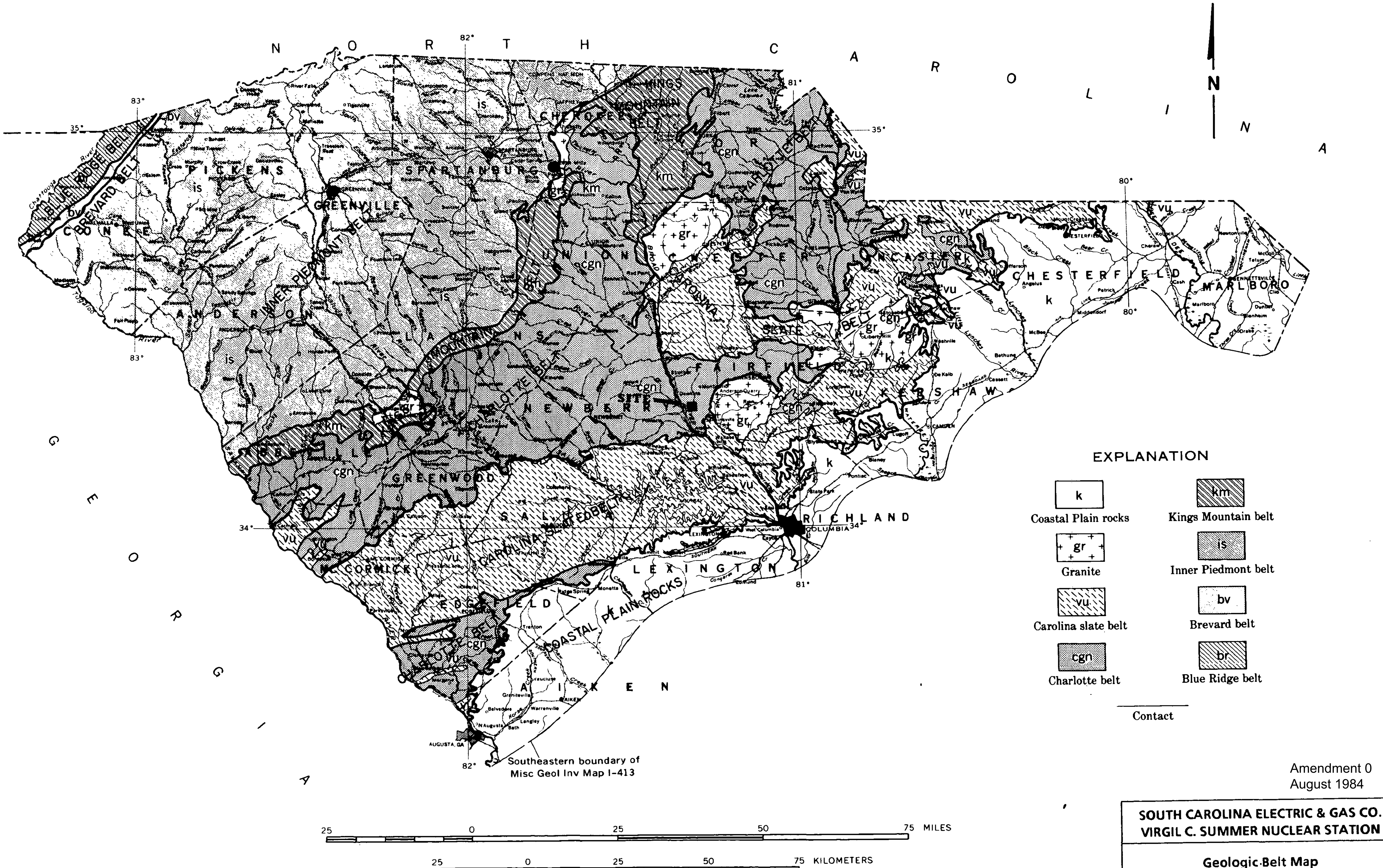
REFERENCE:

THE BASE FOR THIS MAP WAS PREPARED FROM A PORTION OF THE U.S.G.S. "IFR WALL PLANNING CHART, EAST AND WEST, 1967."

PHYSIOGRAPHIC DIVISIONS TAKEN FROM PHYSIOGRAPHY OF EASTERN UNITED STATES BY N. M. FENNEMAN, 1938.

Regional Physiography Map

Figure 2.5-1



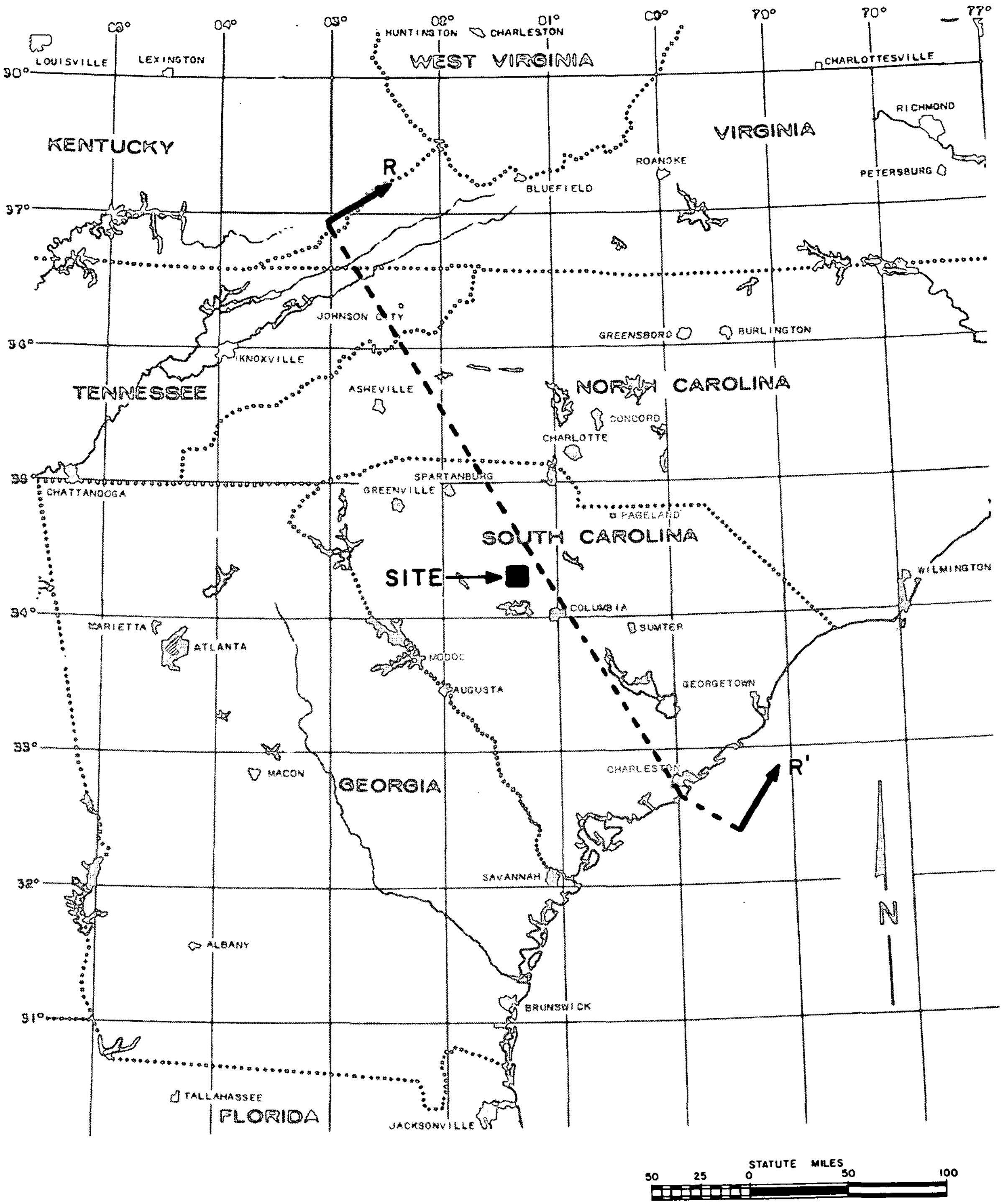
REFERENCE:
THE BASE FOR THIS MAP WAS PREPARED FROM U.S. DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY, 1965, BULLETIN 1183, PLATE 2.

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Geologic Belt Map
Of South Carolina

Figure 2.5-2



Amendment 0
August 1984

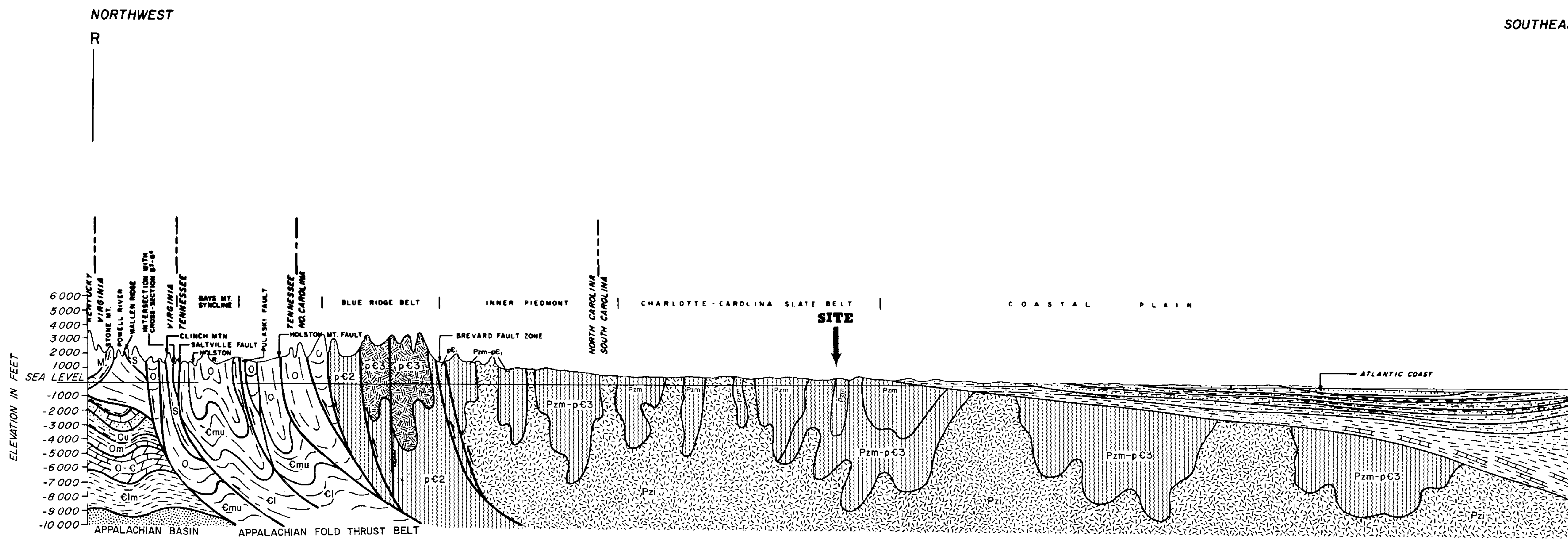
REFERENCE:

THE BASE FOR THIS MAP WAS PREPARED FROM A PORTION OF THE U.S.G.S. "IFR WALL PLANNING CHART, EAST AND WEST, 1967."

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Location Of Regional Geologic Section

Figure 2.5-4



AGE	SYMBOL	DESCRIPTION: REGIONAL	DESCRIPTION: SOUTH CAROLINA
MISSISSIPPIAN	M	LIMESTONE, SHALE, SANDSTONE & CHERT	
SILURIAN	S	SANDSTONE, SHALE & LIMESTONE	
ORDOVICIAN (UPPER)	Ou	LIMESTONE, SANDSTONE & SHALE	
(MIDDLE)	Om	LIMESTONE	
(LOWER TO UPPER)	O	LIMESTONE, DOLOMITE, SHALE & CHERT	
ORDOVICIAN-CAMBRIAN	O-€	DOLOMITE, LIMESTONE, CHERT & SANDSTONE	
CAMBRIAN (MIDDLE TO UPPER)	€MU	LIMESTONE, DOLOMITE & SHALE	
(LOWER TO MIDDLE)	€lM	SLATE, SHALE & SANDSTONE	
(LOWER)	€l	SANDSTONE, QUARTZITE & SHALE	
PRECAMBRIAN THRU PALEOZOIC	PZI	INTRUSIVES	GRANITES-UNDIVIDED
	PZM, P€2, P€3	METAMORPHICS	METASEDIMENTARY & METAVOLCANIC ROCKS OF THE CAROLINA SLATE, CHARLOTTE, KINGS MT., INNER PIEDMONT & BREVARD BELTS

REFERENCE:

THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS, ENTITLED "MID-ATLANTIC REGION, GEOLOGICAL HIGHWAY MAP, 1970".

SECTION A-A

HORIZONTAL SCALE IN MILES

10 0 10 20 30 40 50

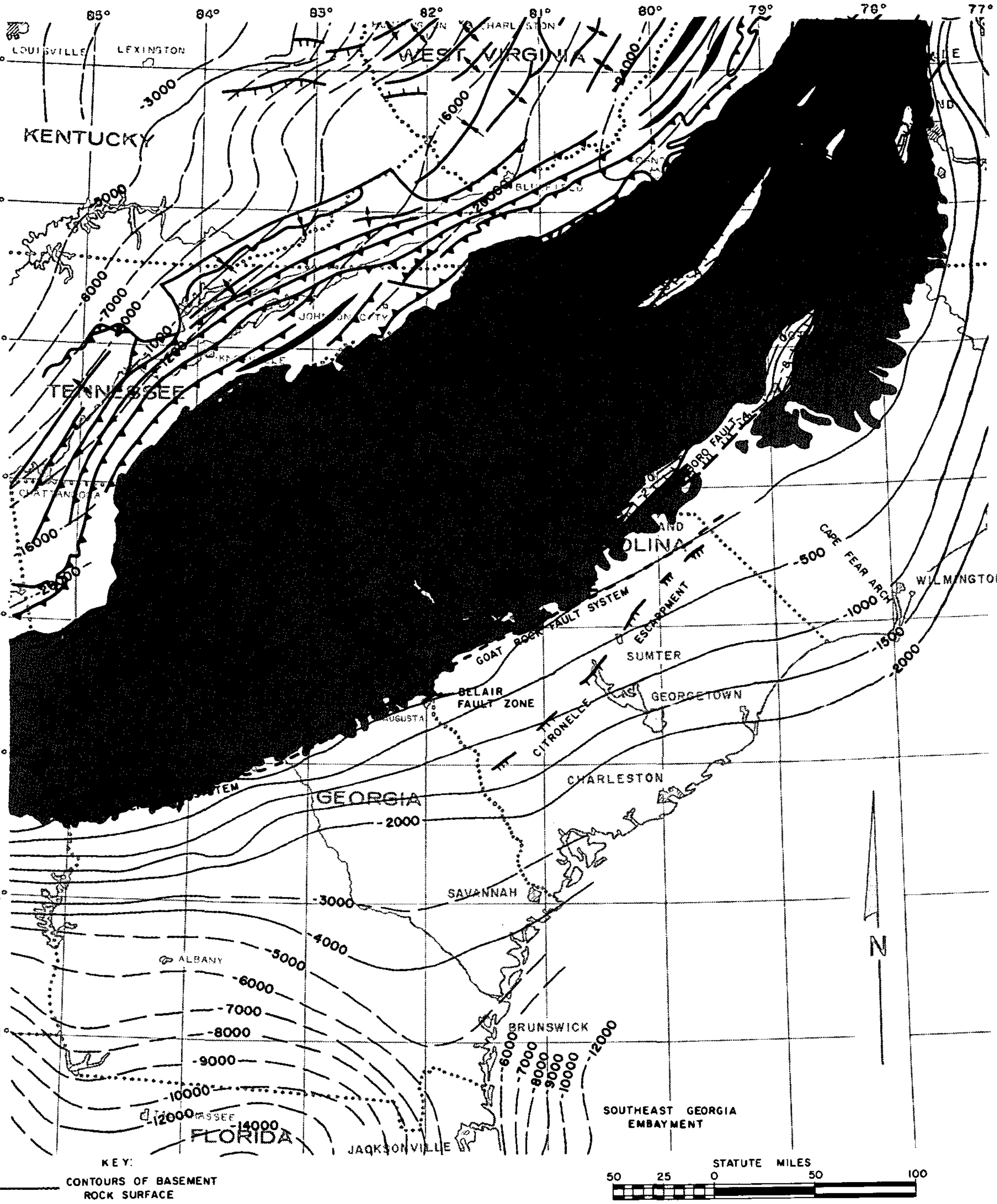
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Generalized Regional Geologic Section

Figure 2.5-5

Amendment 0
August 1984



KEY:

CONTOURS OF BASEMENT ROCK SURFACE

BASEMENT ROCK OUTCROP ENCLOSURE

SYNCLINAL AXIS

ANTICLINAL AXIS

NORMAL FAULT (HACHURES INDICATE DOWNTHROWN SIDE)

THRUST FAULT (HACHURES INDICATE OVERTHURST SIDE)

UNDIFFERENTIATED FAULT

MONOCLINAL FLEXURE

ELONGATE, CLOSELY COMPRESSED ANTICLINE

ESCARPMENT

REFERENCE:

THE BASE FOR THIS MAP WAS PREPARED FROM A PORTION OF THE U.S.G.S. "IFR WALL PLANNING CHART, EAST AND WEST, 1967."

MAJOR TECTONIC FEATURES WERE TAKEN FROM A PORTION OF THE "TECTONIC MAP OF THE U.S." BY U.S.G.S. AND A.A.P.G., 1962. (SEE TEXT FOR SEISMOLOGY REFERENCES)

EXTENSIONS OF TOWALIGA FAULT AND GOAT ROCK FAULT SYSTEM PROPOSED BY HOWELL, 1976 AND TALWANI AND HOWELL, 1976.

Amendment 0
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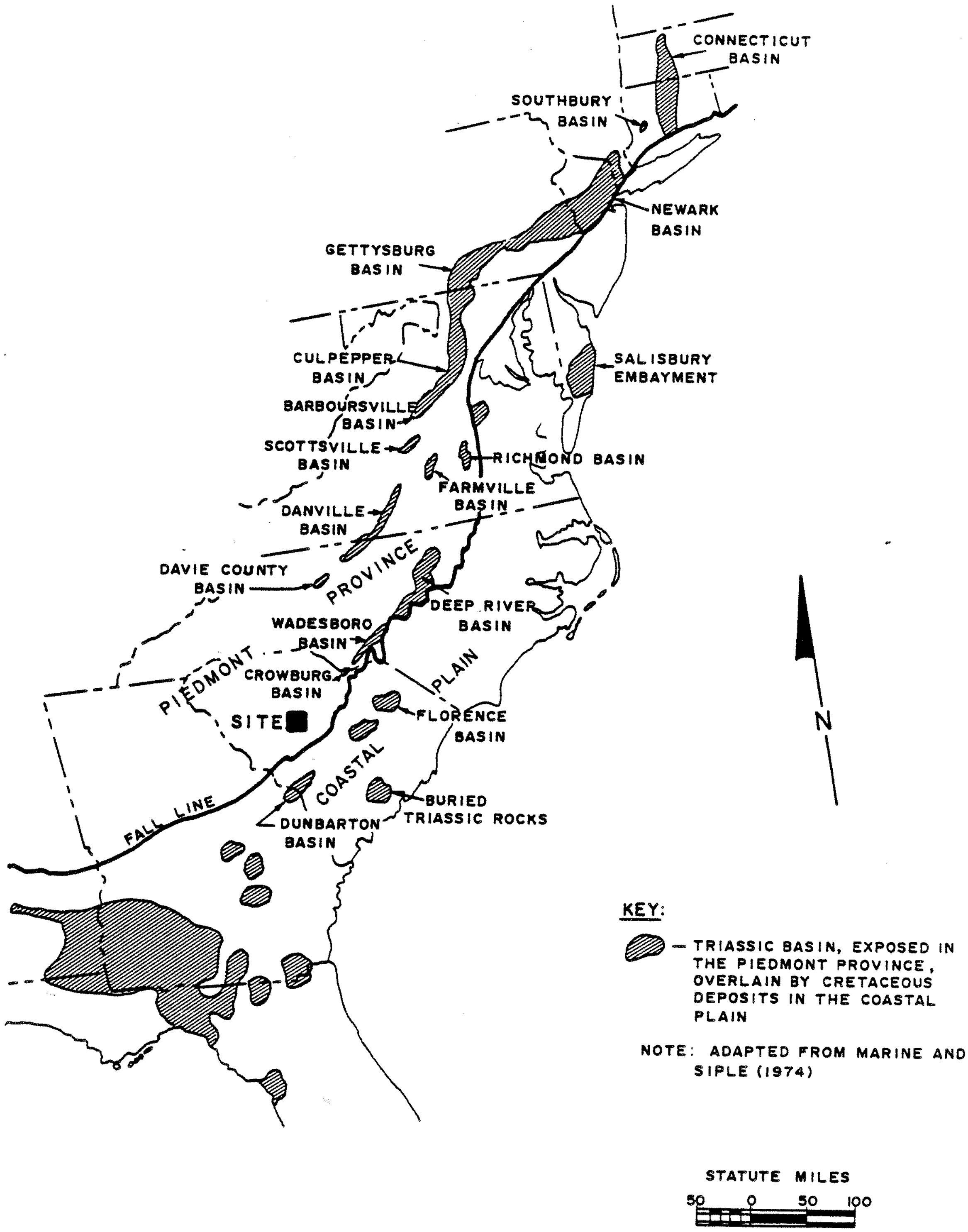
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Regional Tectonic Map

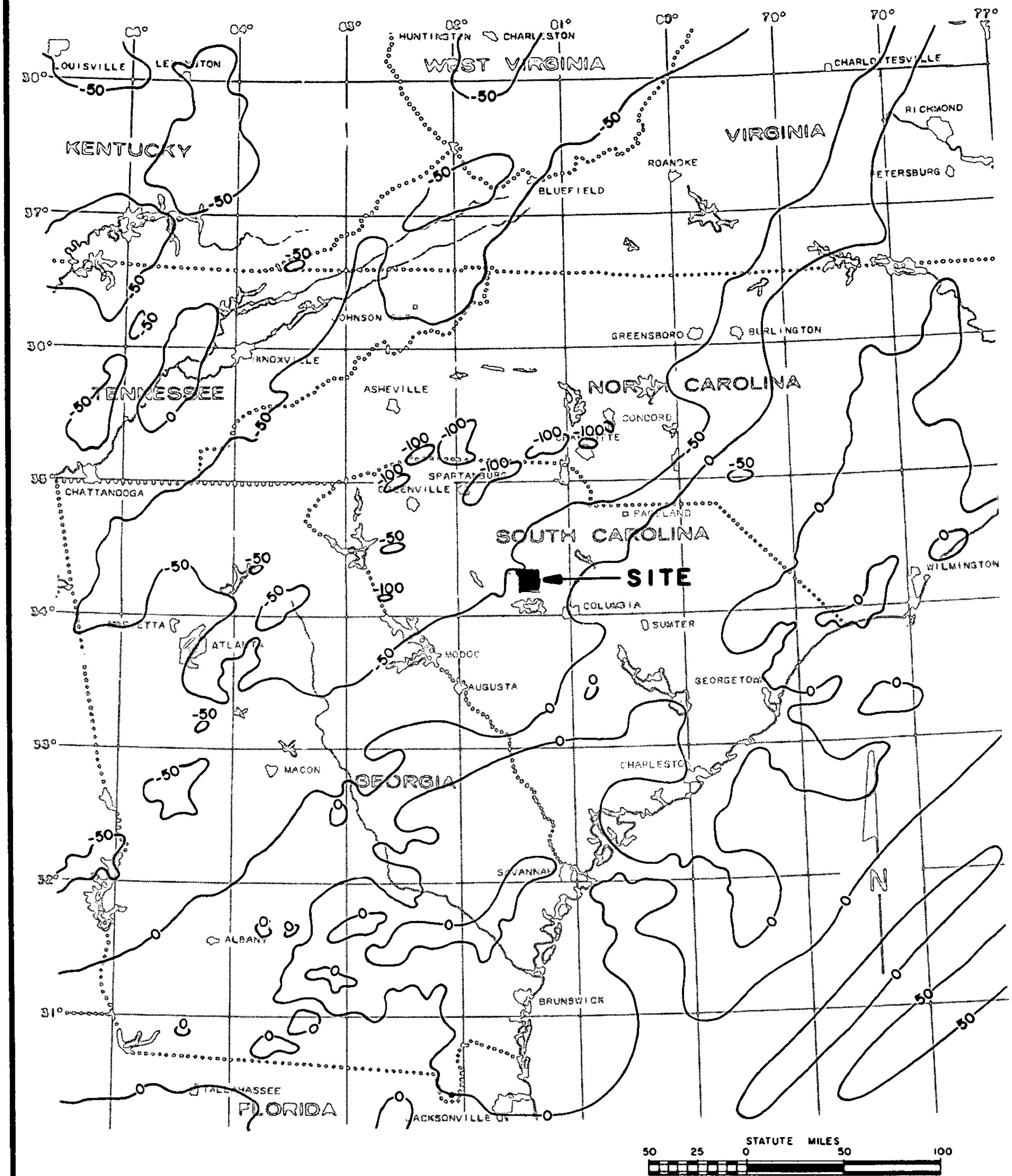
Figure 2.5-6



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Triassic Basins

Figure 2.5-7



Amendment 0
August 1984

REFERENCE:

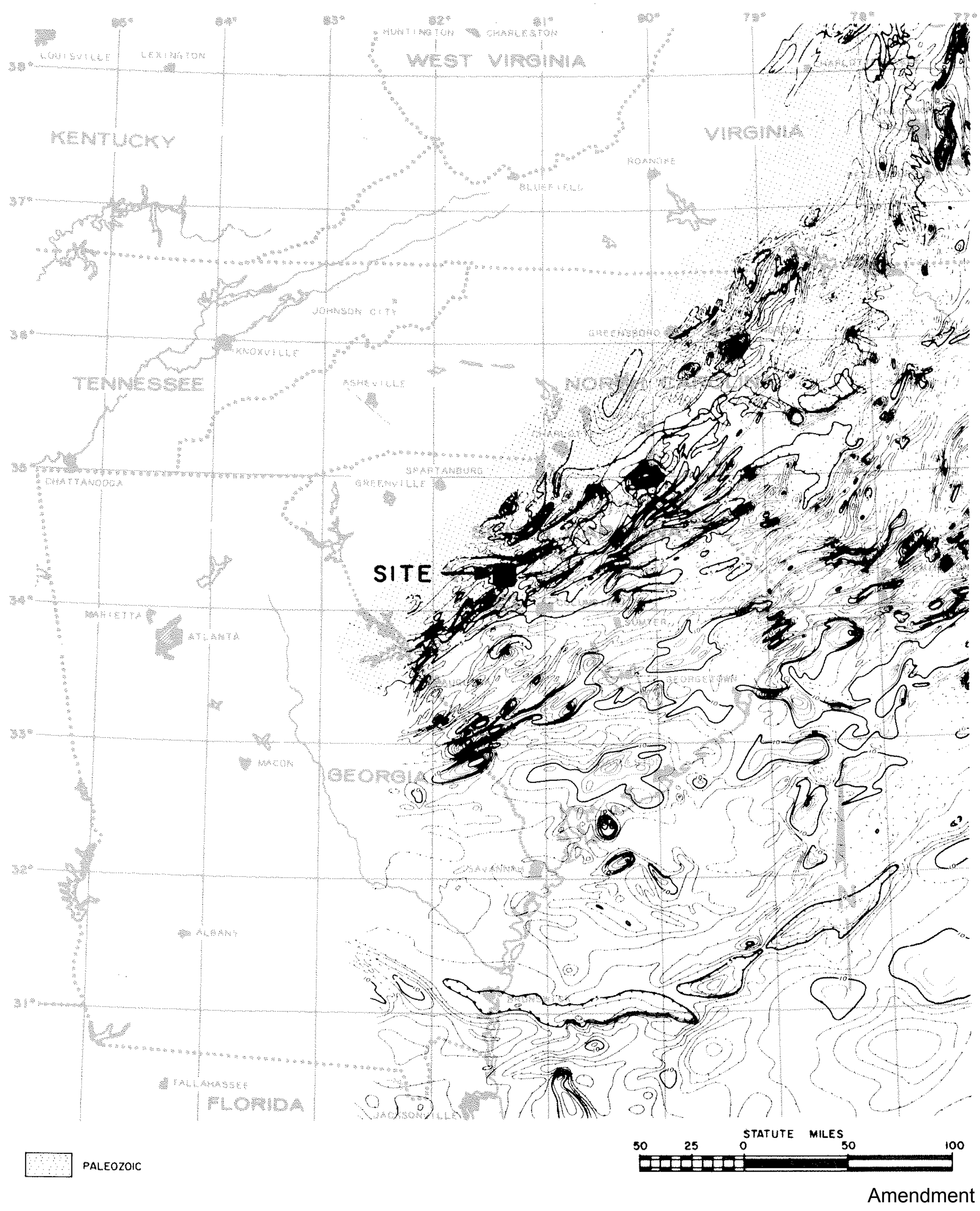
THE BASE FOR THIS MAP WAS PREPARED FROM A PORTION OF THE U.S.G.S. "IFR WALL PLANNING CHART, EAST AND WEST, 1967."

THE "BOUGUER GRAVITY ANOMALY MAP OF THE U.S." BY THE AMERICAN GEOPHYSICAL UNION AND THE U.S.G.S., 1974. CONTOUR INTERVAL = 50 MILLIGALS.

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Regional Bouguer Gravity Anomaly Map

Figure 2.5-8



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August 1984

N O T E:

NUMERICAL VALUES ARE GIVEN IN HUNDREDS OF GAMMAS RELATIVE TO AN ARBITRARY DATUM; HACHURES DENOTE AREAS OF LOWER INTENSITY. CONTOUR INTERVAL 100 GAMMAS.

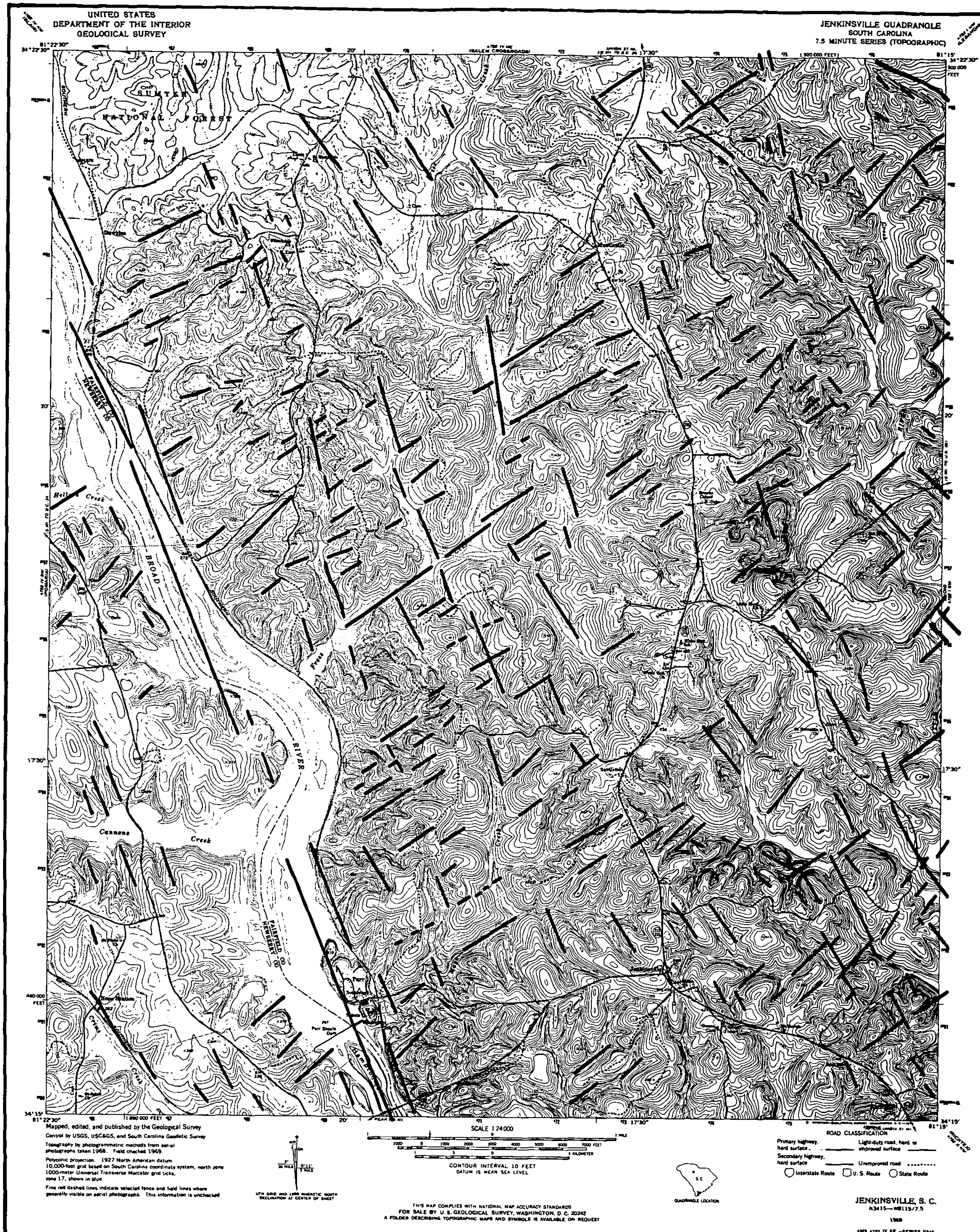
R E F E R E N C E:

THE BASE FOR THIS MAP WAS PREPARED FROM A PORTION OF THE U.S.G.S. "IFR WALL PLANNING CHART, EAST AND WEST, 1967."

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Regional Aeromagnetic Anomaly Map

Figure 2.5-9

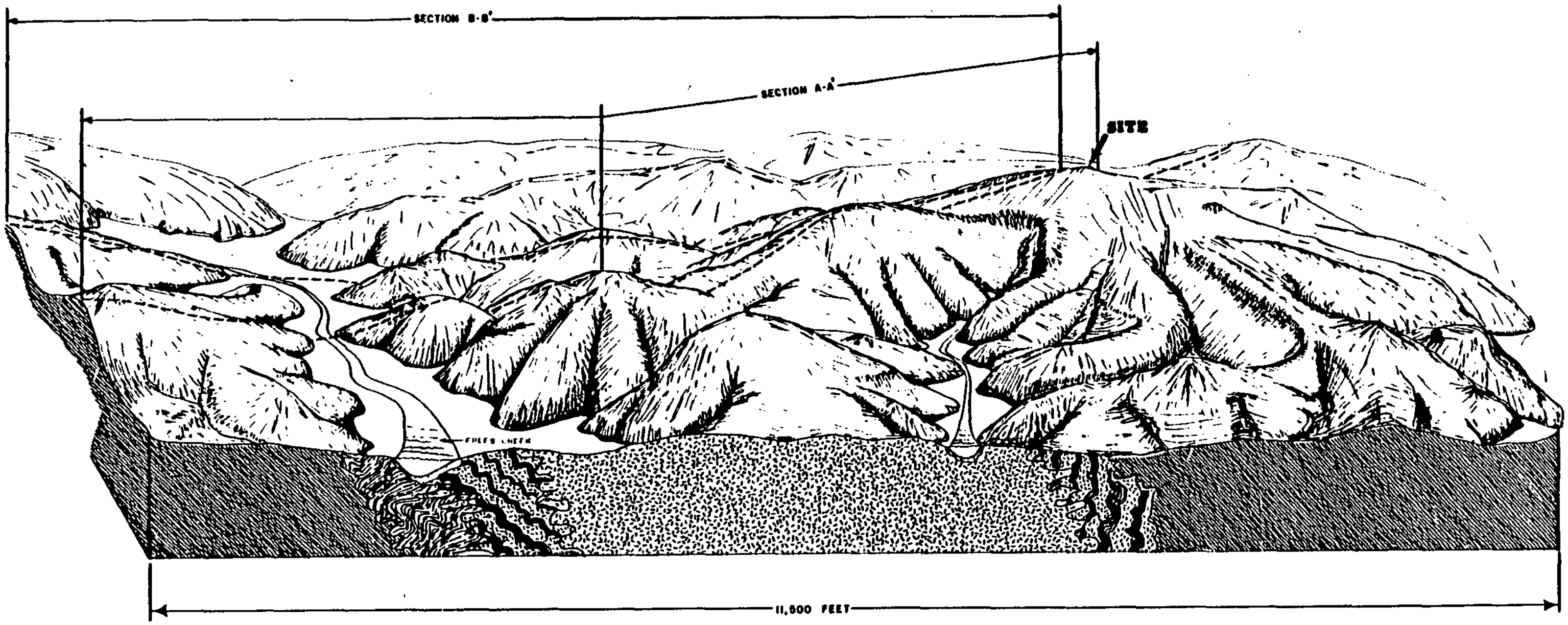


SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Linear Features
Map

Amendment 0
August 1984

Figure 2.5-11



KEY:

NO SCALE - DIAGRAMATIC ONLY

- GRANODIORITE
- MIGMATITE OF GRANODIORITE COMPOSITION
- MIGMATITE OF GNEISSIC COMPOSITION
- CHARLOTTE BELT GNEISS

NOTES: 1) THE DIAGRAMMATIC SECTIONS SHOWN REPRESENT OUR EVALUATION OF THE MOST PROBABLE CONDITIONS BASED UPON INTERPRETATION OF PRESENTLY AVAILABLE DATA. SOME VARIATIONS FROM THESE CONDITIONS MUST BE EXPECTED.

2) DIAGRAMMATIC SECTIONS A-A' AND B-B' ARE SHOWN ON FIGURE 2.5-21.

Amendment 0
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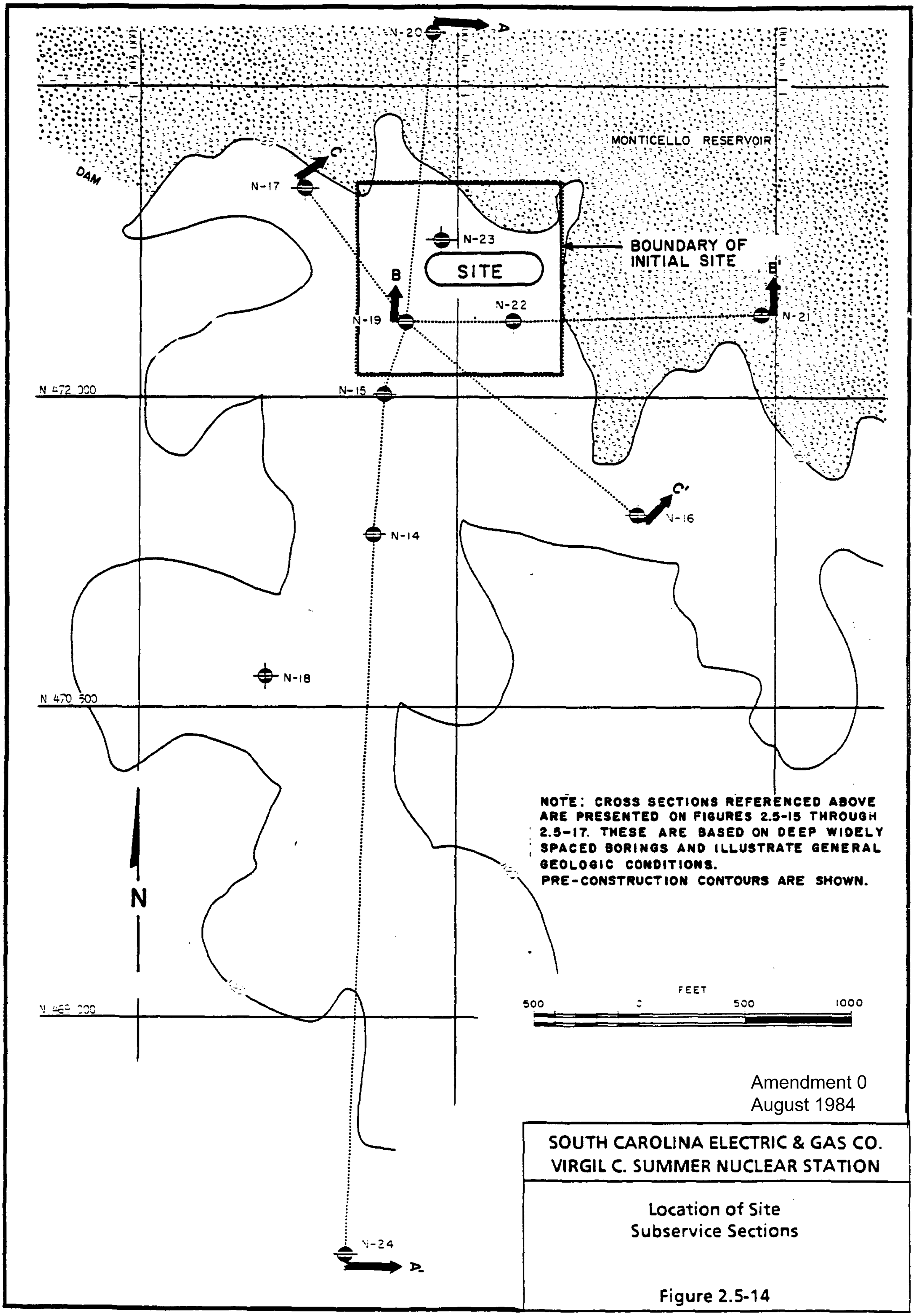
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Diagrammatic View Parallel to Broad River

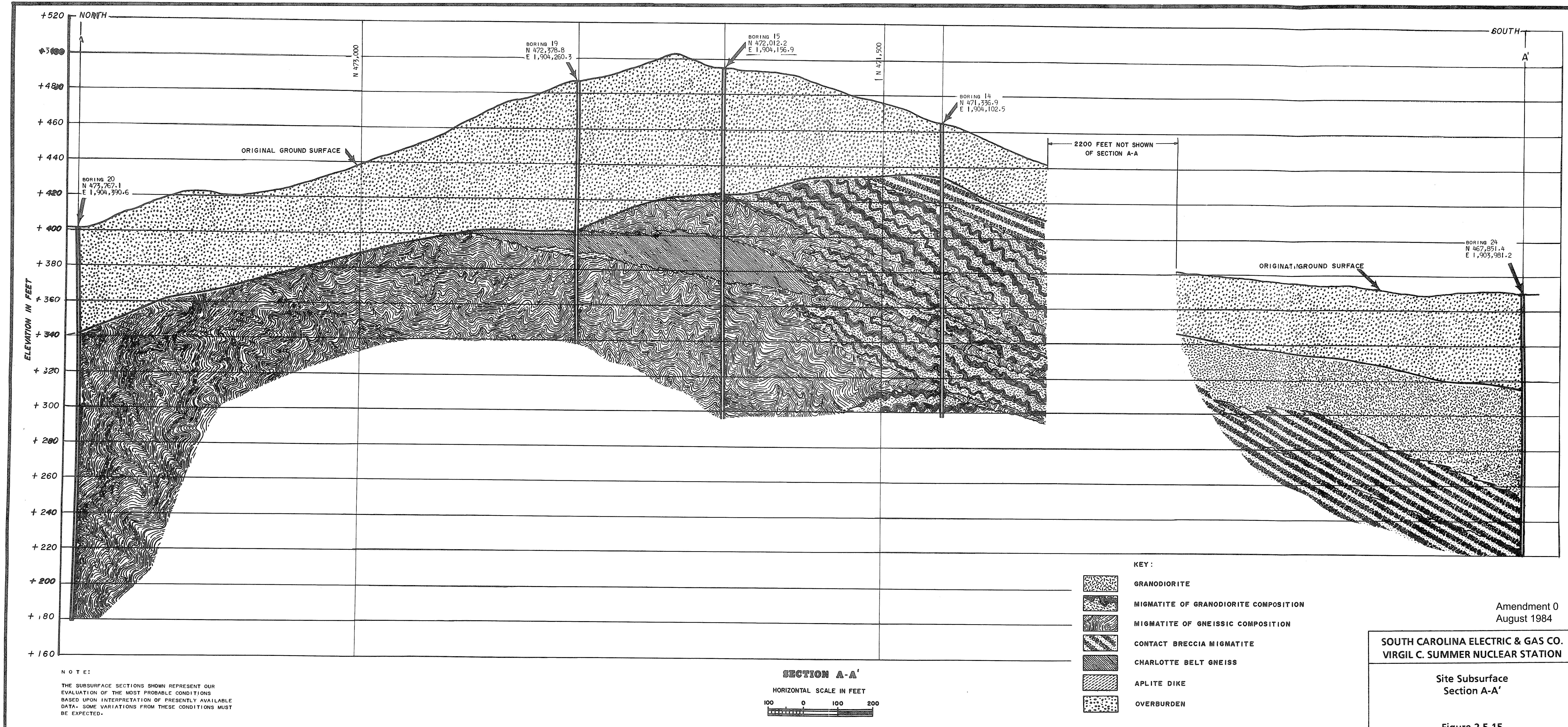
Figure 2.5-12



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Location of Site
Subservice Sections

Figure 2.5-14



NOTE:

THE SUBSURFACE SECTIONS SHOWN REPRESENT OUR EVALUATION OF THE MOST PROBABLE CONDITIONS BASED UPON INTERPRETATION OF PRESENTLY AVAILABLE DATA. SOME VARIATIONS FROM THESE CONDITIONS MUST BE EXPECTED.

SECTION A-A'

HORIZONTAL SCALE IN FEET

100 0 100 200

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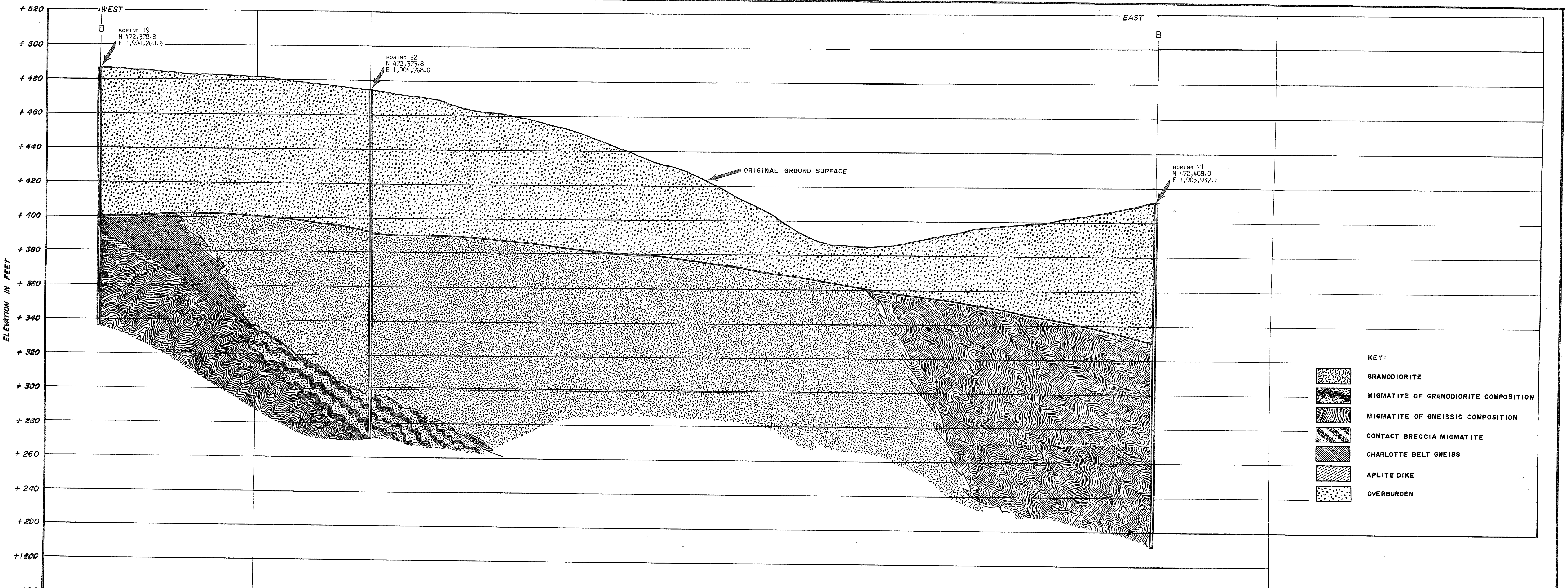
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Site Subsurface
Section A-A'

Figure 2.5-15



SECTION B-B'

HORIZONTAL SCALE IN FEET

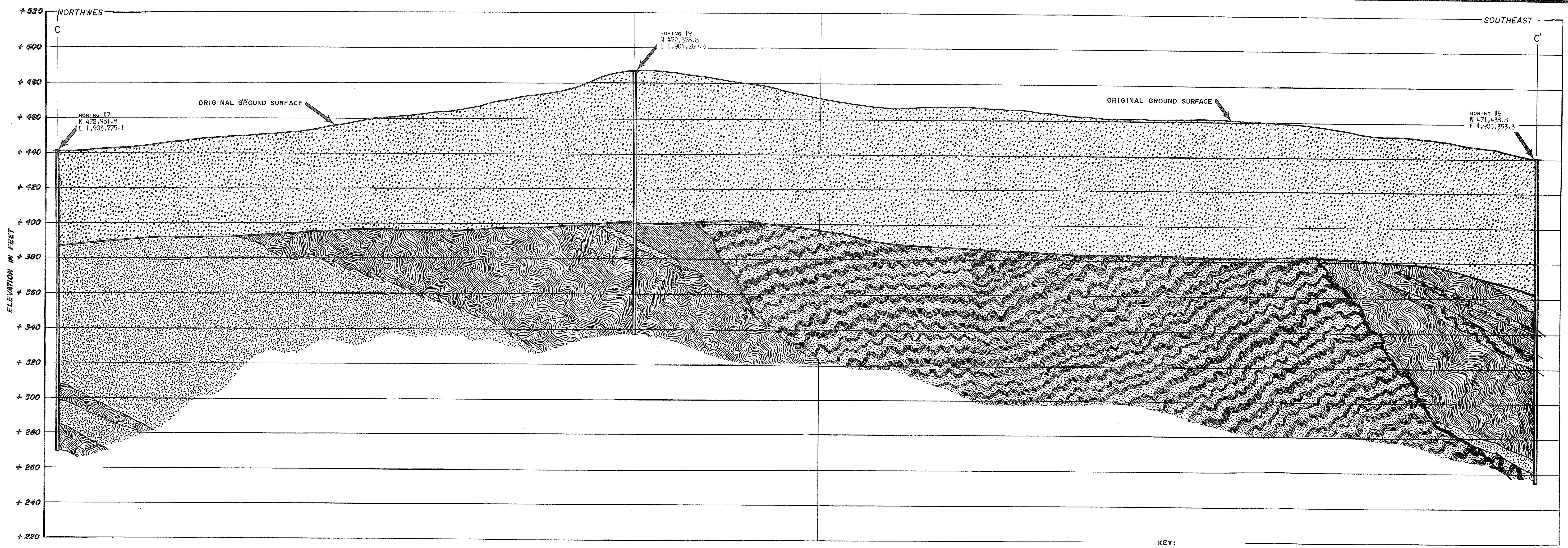
50 0 50 100

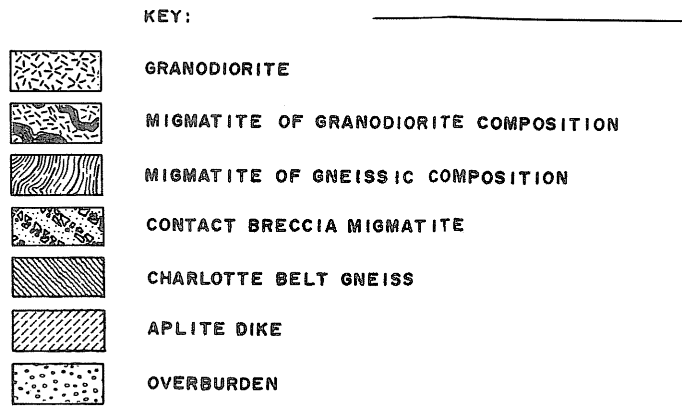
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Site Subsurface
Section B-B'

Figure 2.5-16





SECTION C-C'

HORIZONTAL SCALE IN FEET

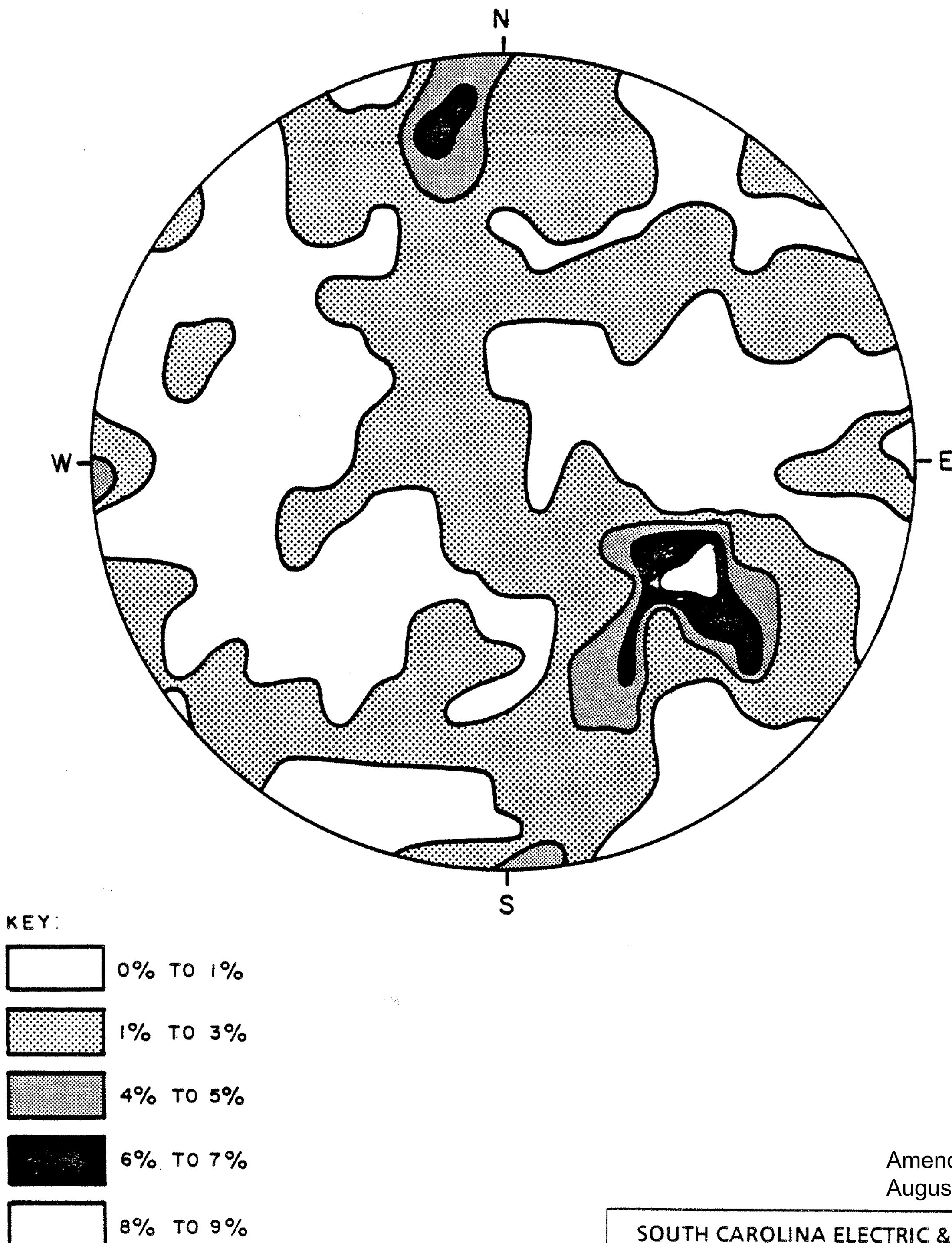
50 0 50 100

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Site Subsurface
Section C-C'

Figure 2.5-17

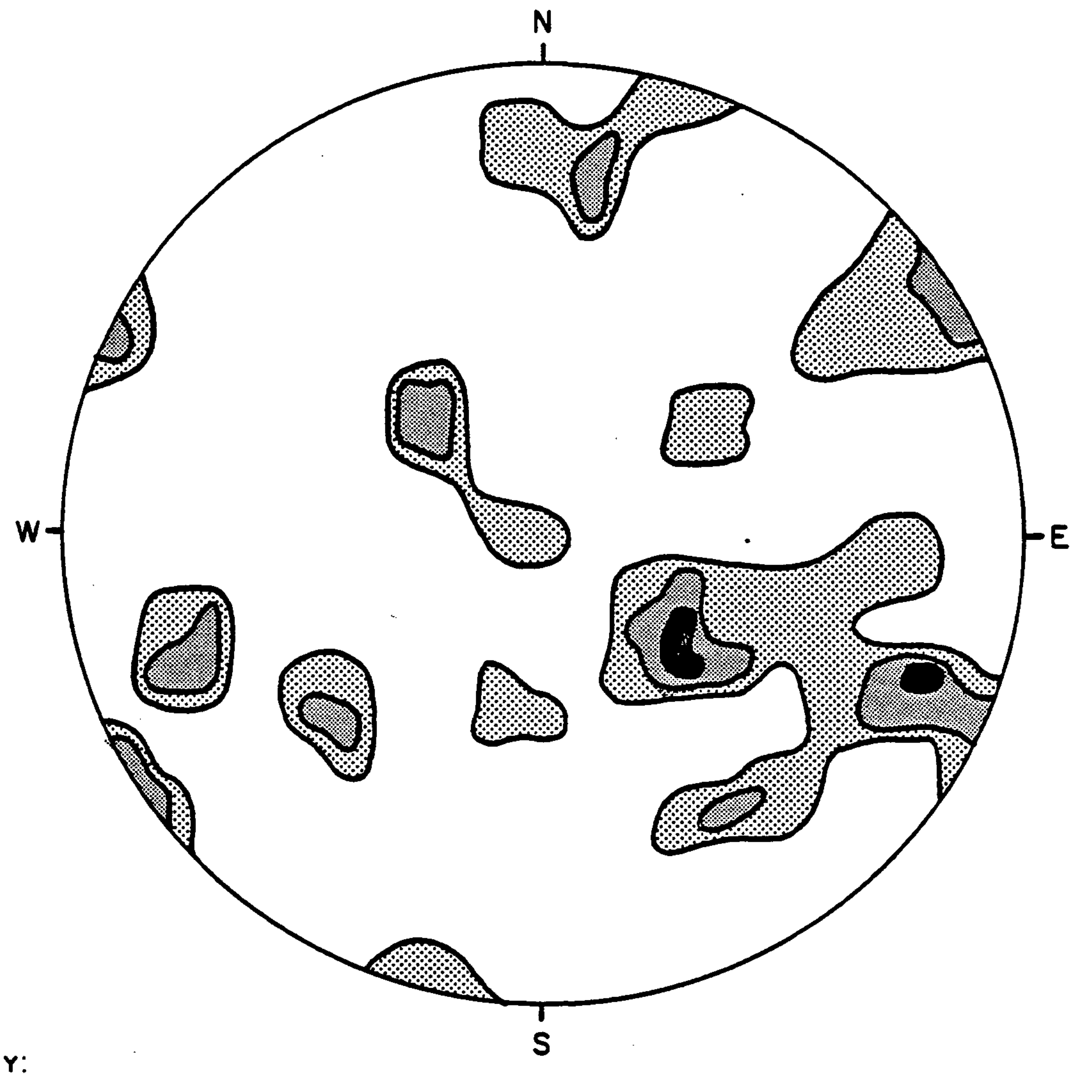


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Areal Foliation Contour Diagram

Figure 2.5-18



KEY:

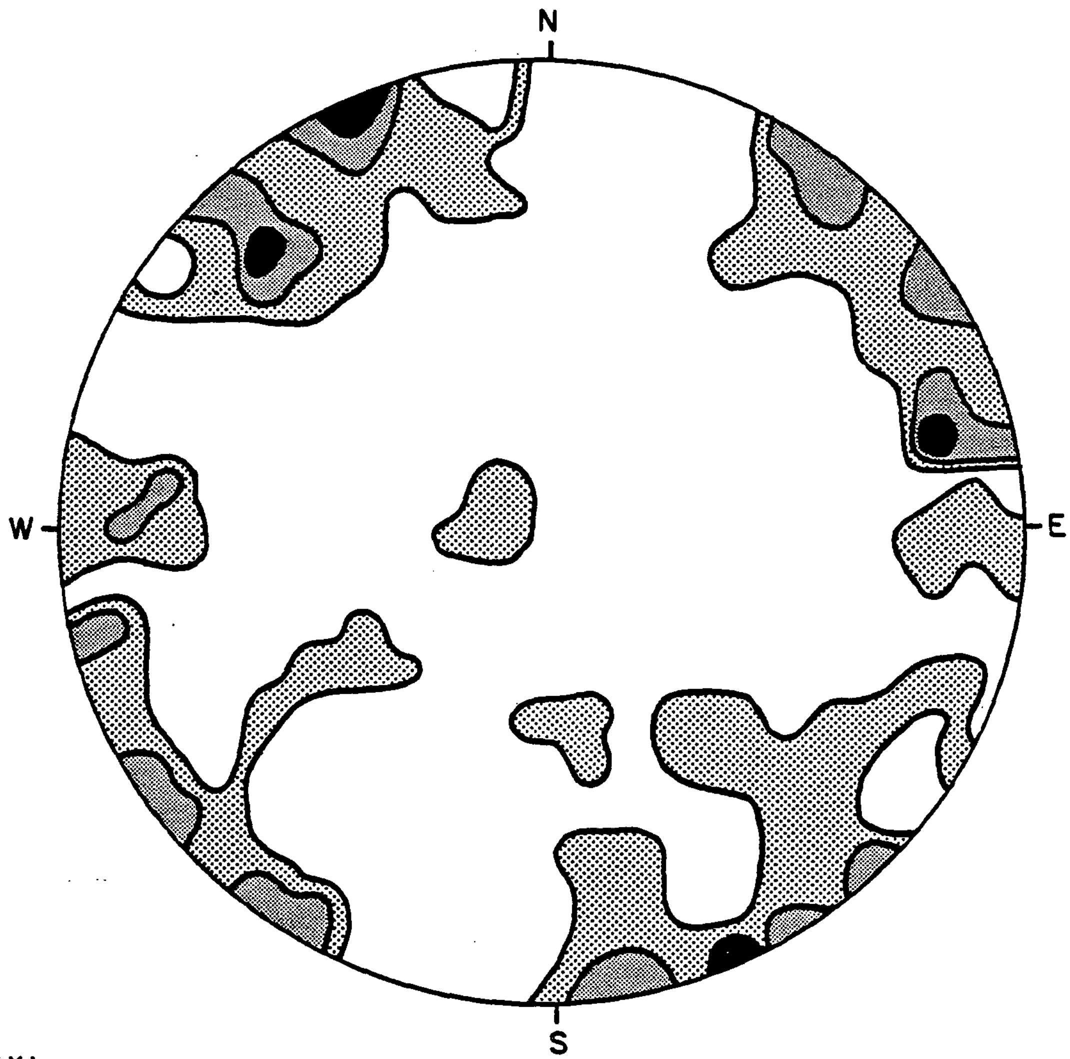
(blank)	0% TO 3%
(light stipple)	3%
(medium stipple)	4% TO 6%
(black)	7% TO 13%

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Pluton Area Foliation
Contour Diagram

Figure 2.5-19



KEY:

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(light dotted)	1% TO 2.5%
(darker dotted)	3% TO 4%
(black)	5% TO 7%

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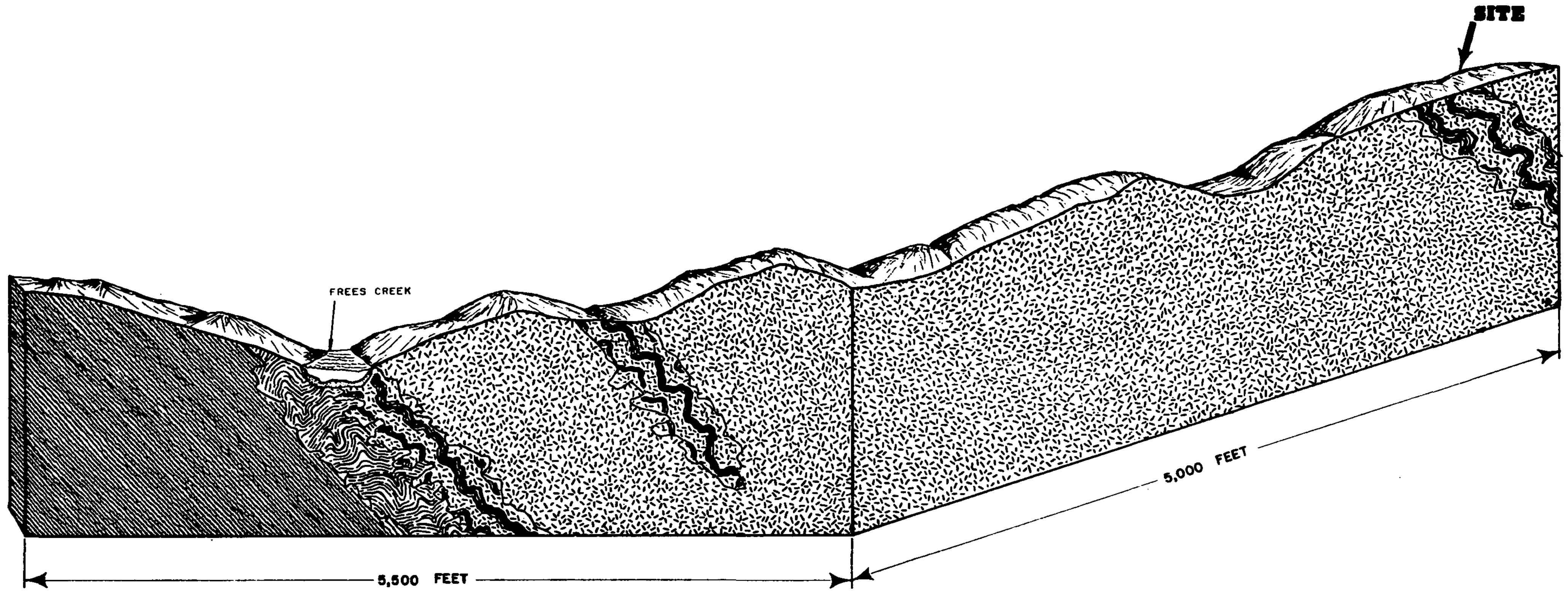
August 1984

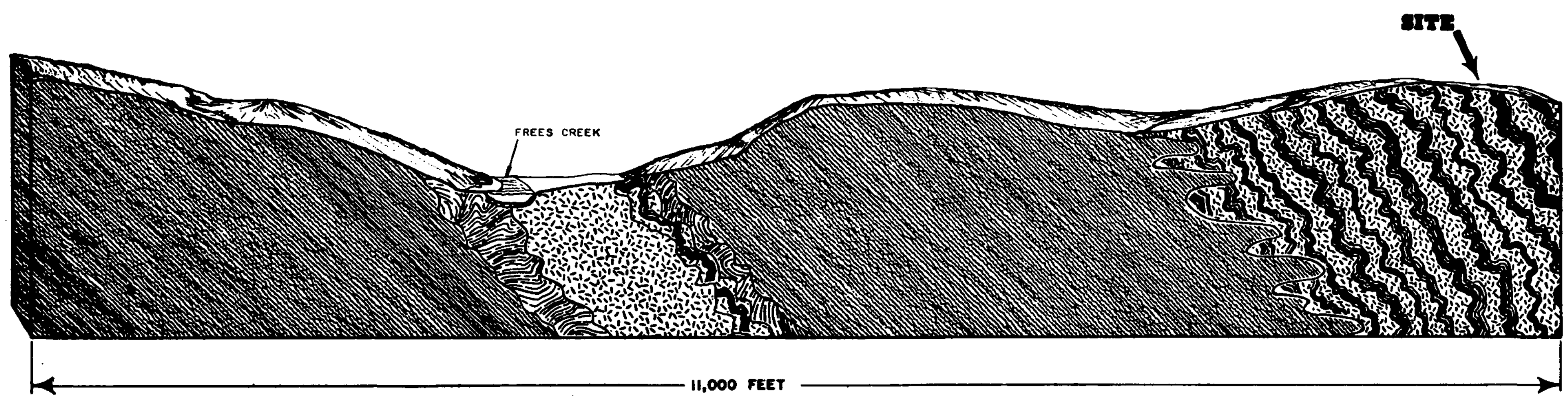
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Areal Joint Contour Diagram

Figure 2.5-20



DIAGRAMMATIC SECTION A-A' ALONG PROPOSED DAM AXIS



DIAGRAMMATIC SECTION B-B' THROUGH SITE

KEY:

- GRANODIORITE
- MIGMATITE OF GRANODIORITE COMPOSITION
- MIGMATITE OF GNEISSIC COMPOSITION
- CHARLOTTE BELT GNEISS

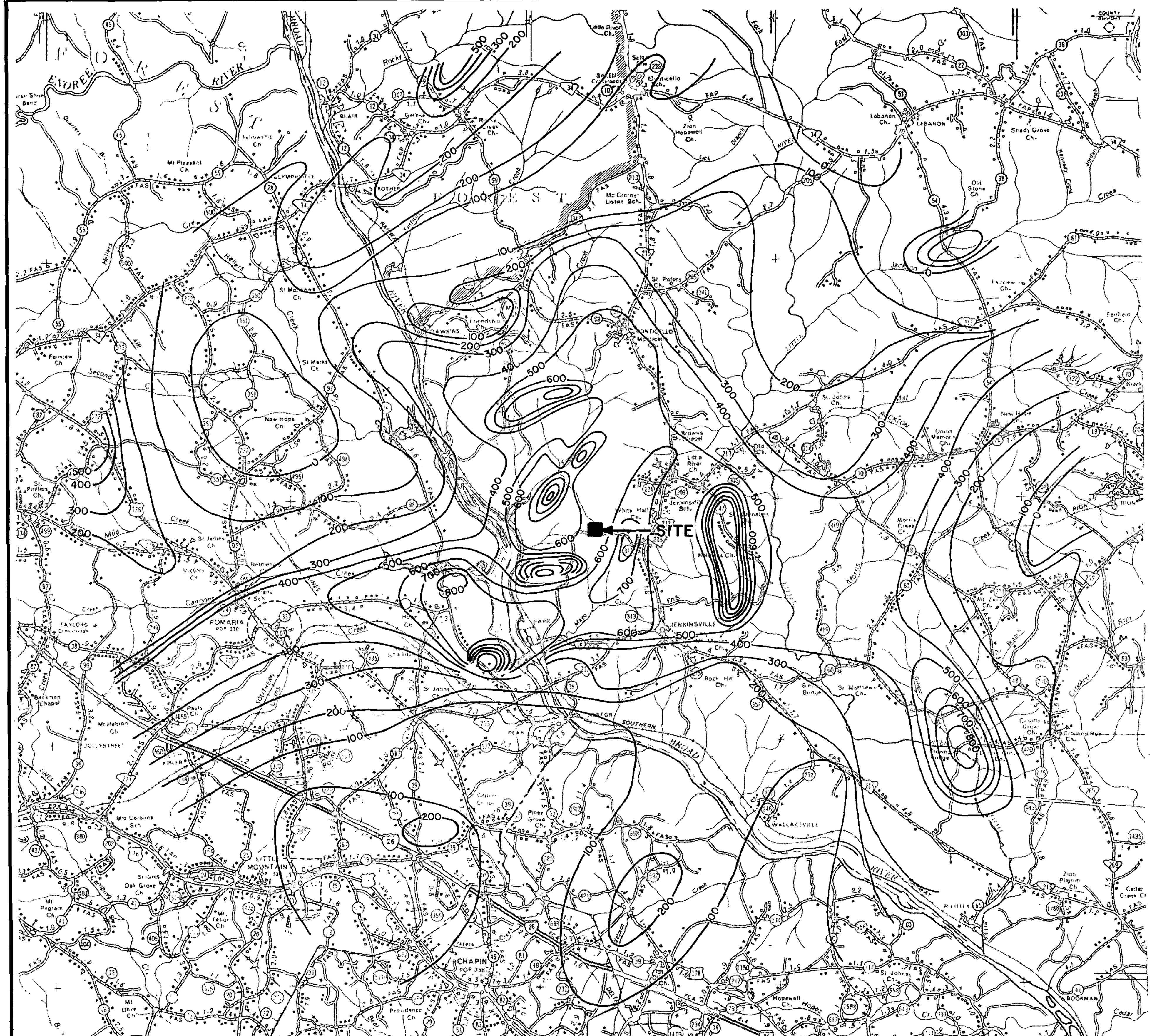
NO SCALE • DIAGRAMMATIC ONLY

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Diagrammatic Sections
A-A' and B-B'

Figure 2.5-21



N

REFERENCE:

THE BASE FOR THIS MAP WAS PREPARED FROM ENLARGED PORTIONS OF THE FOLLOWING SOUTH CAROLINA STATE HIGHWAY DEPARTMENT, GENERAL HIGHWAY MAPS: LEXINGTON CO., 1958, REVISED 1970, NEWBERRY CO., 1961, REVISED 1970, FAIRFIELD CO., 1962, REVISED 1970, AND RICHLAND CO., 1963, REVISED 1969.

STATUTE MILES

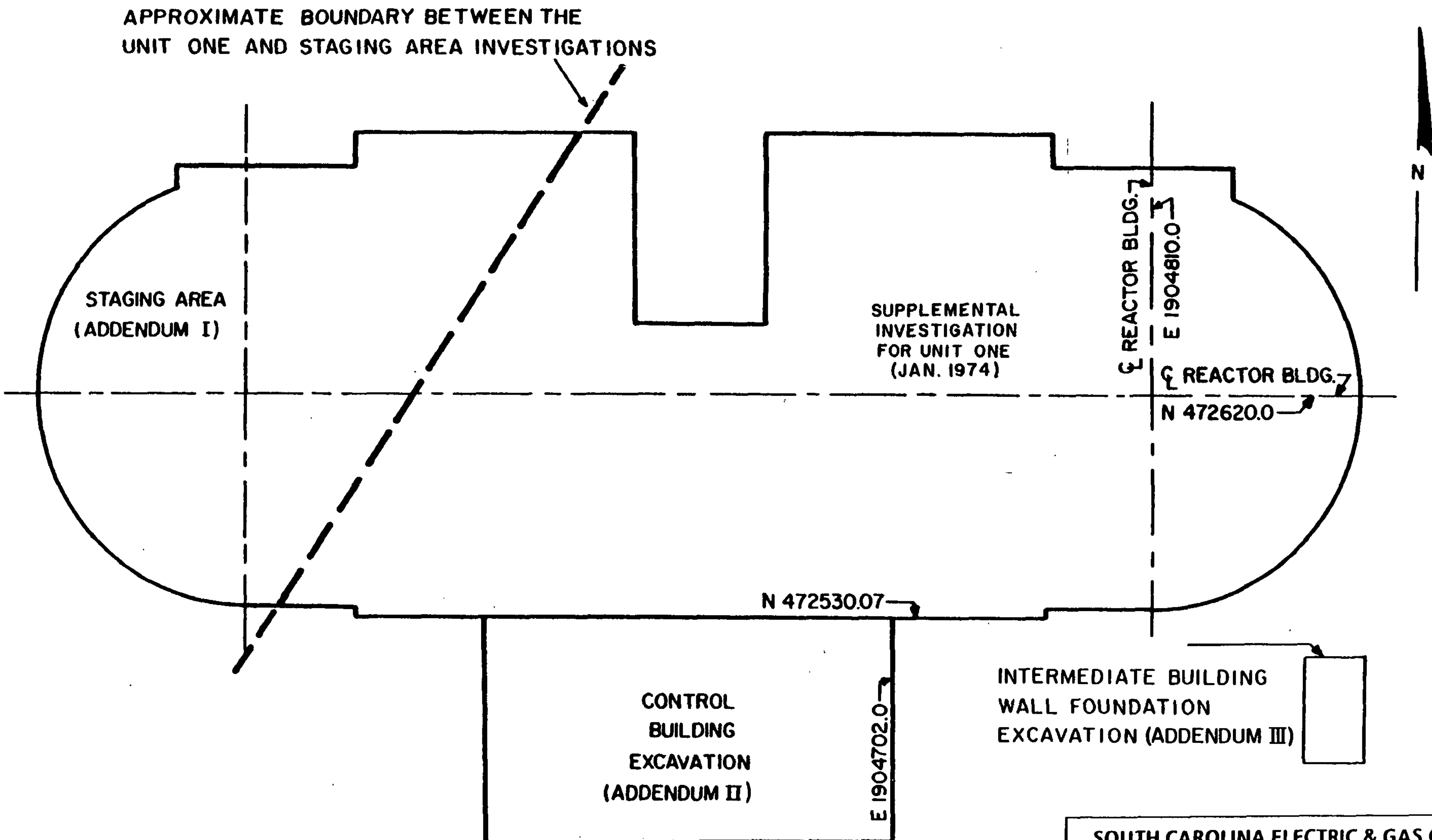
0 1 2 3

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Areal Magnetic Anomaly Map

Figure 2.5-22



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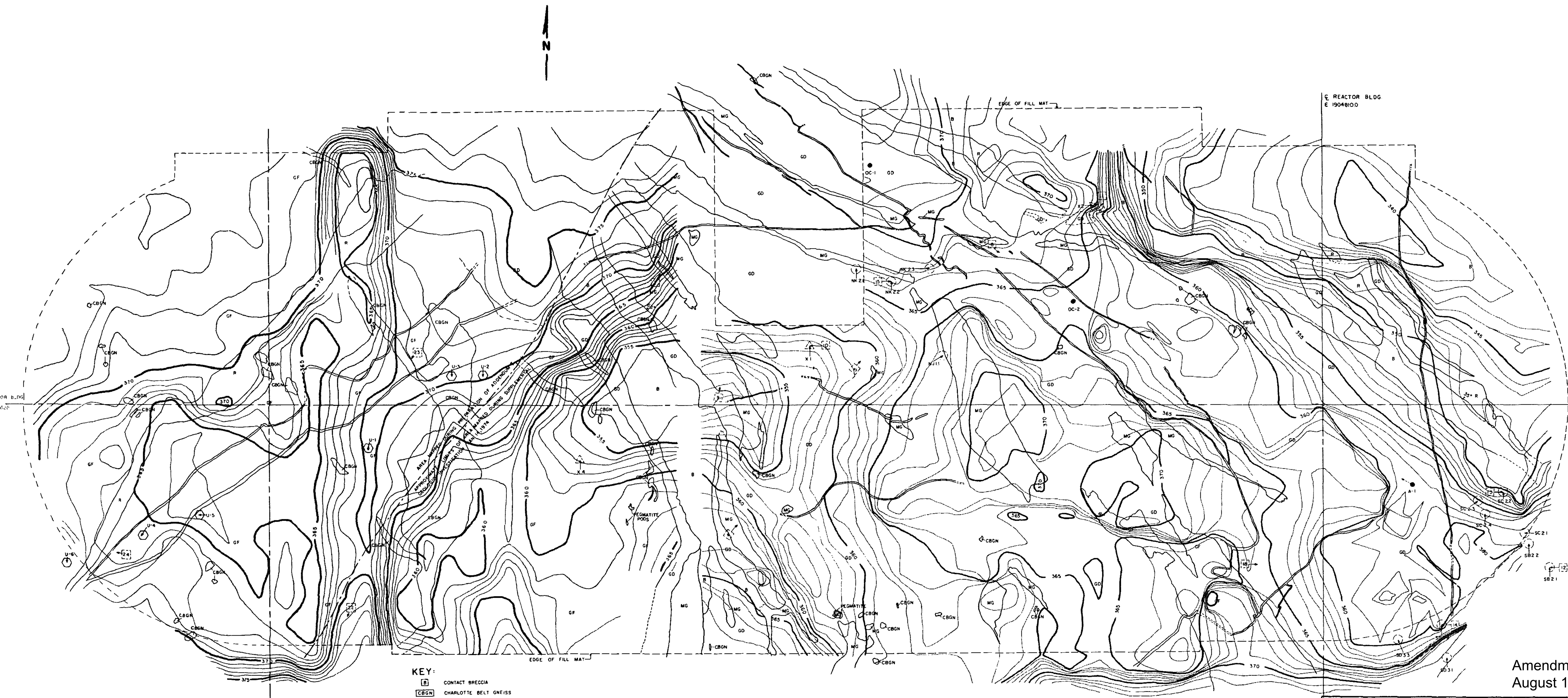
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Areas of Detailed Investigation

Figure 2.5-23



KEY:

B	CONTACT BRECCIA
CBGN	CHARLOTTE BELT GNEISS
MG	MIGMATITE OF GNEISSIC COMPOSITION
GF	GRANOFELS
GD	MEDIUM-GRAINED GRANODIORITE
R	FINE-GRAINED GRANODIORITE
	APLITE AND/OR PEGMATITE DIKE
	CONTACT SHOWING DIRECTION OF DIP, DASHED WHERE APPROXIMATE
SC 21	LOCATION OF DATING AND THIN SECTION SPECIMENS
X1	LOCATION OF SAMPLES FOR X-RAY DIFFRACTION ANALYSIS
10	LOCATION OF PHOTOGRAPHS
	ANGLE BORING
	OVERCORE BORING
U-1	LOCATION OF STAGING AREA SAMPLES

SCALE IN FEET

0 10 20 30

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Geologic Map Of Reactor Building And Staging Area Excavations

Figure 2.5-24

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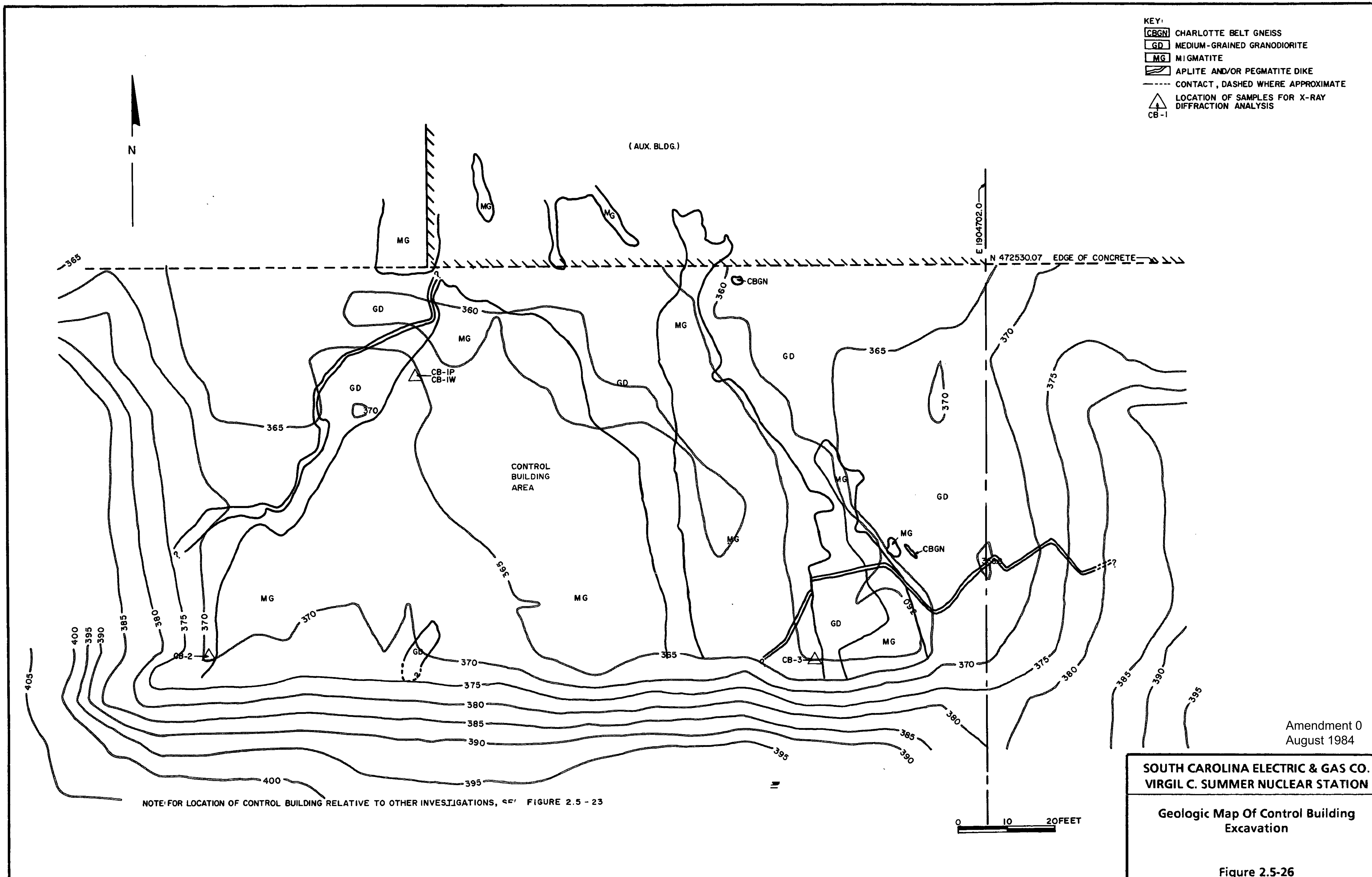
August 1984

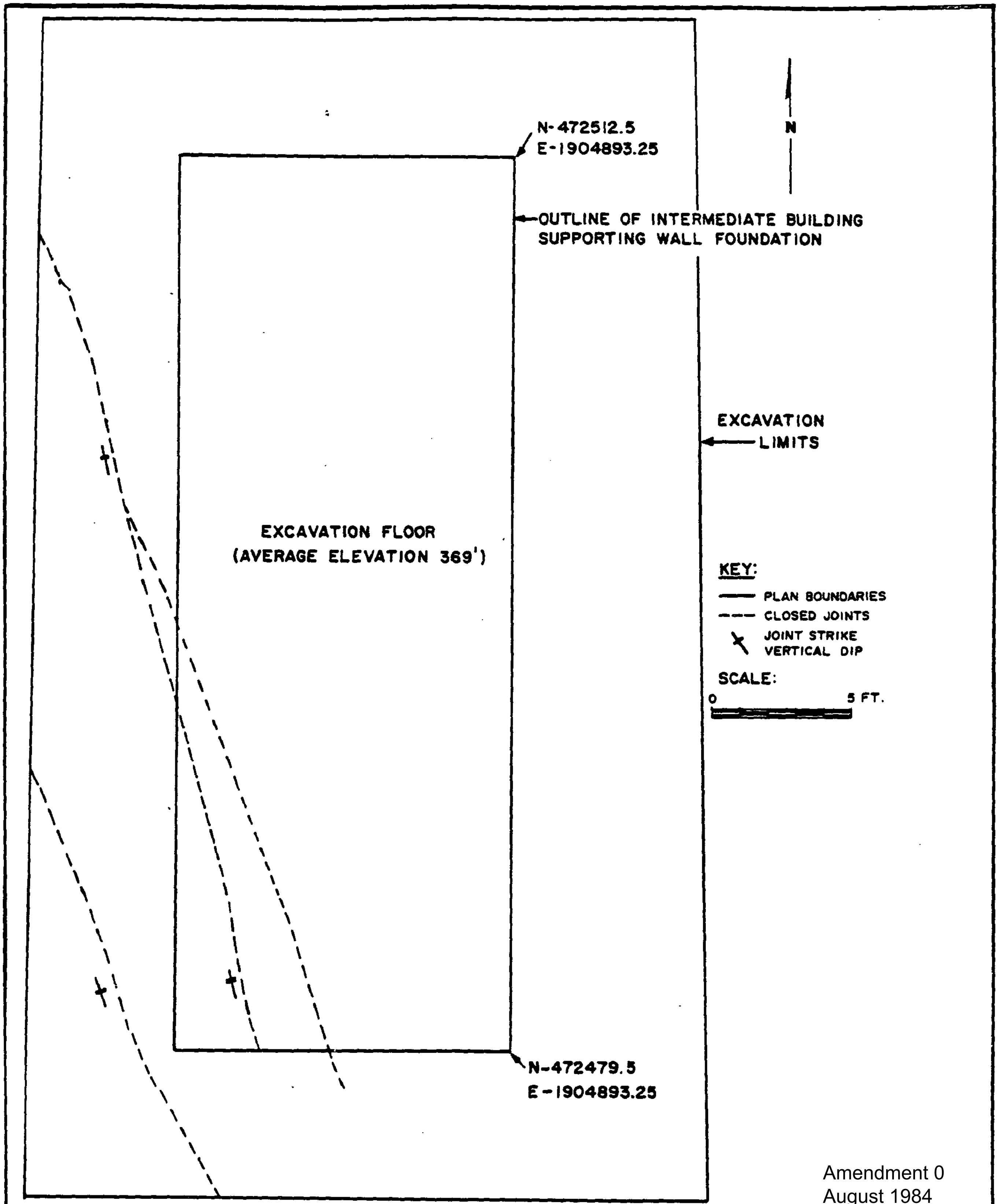


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Geologic Map Of Control Building Excavation

Figure 2.5-26



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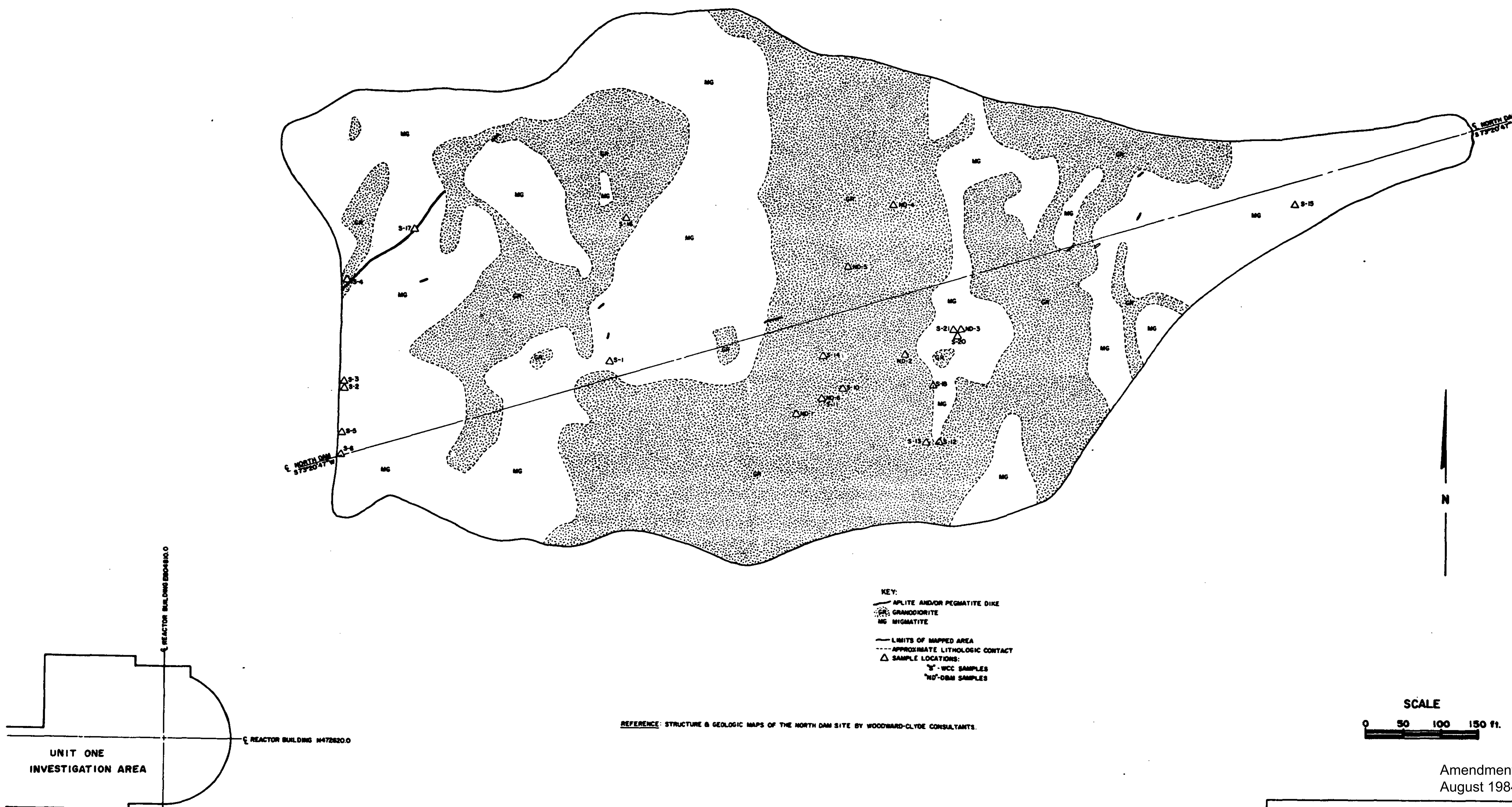
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Structure Map of Intermediate Building Wall Excavation

Figure 2.5-28

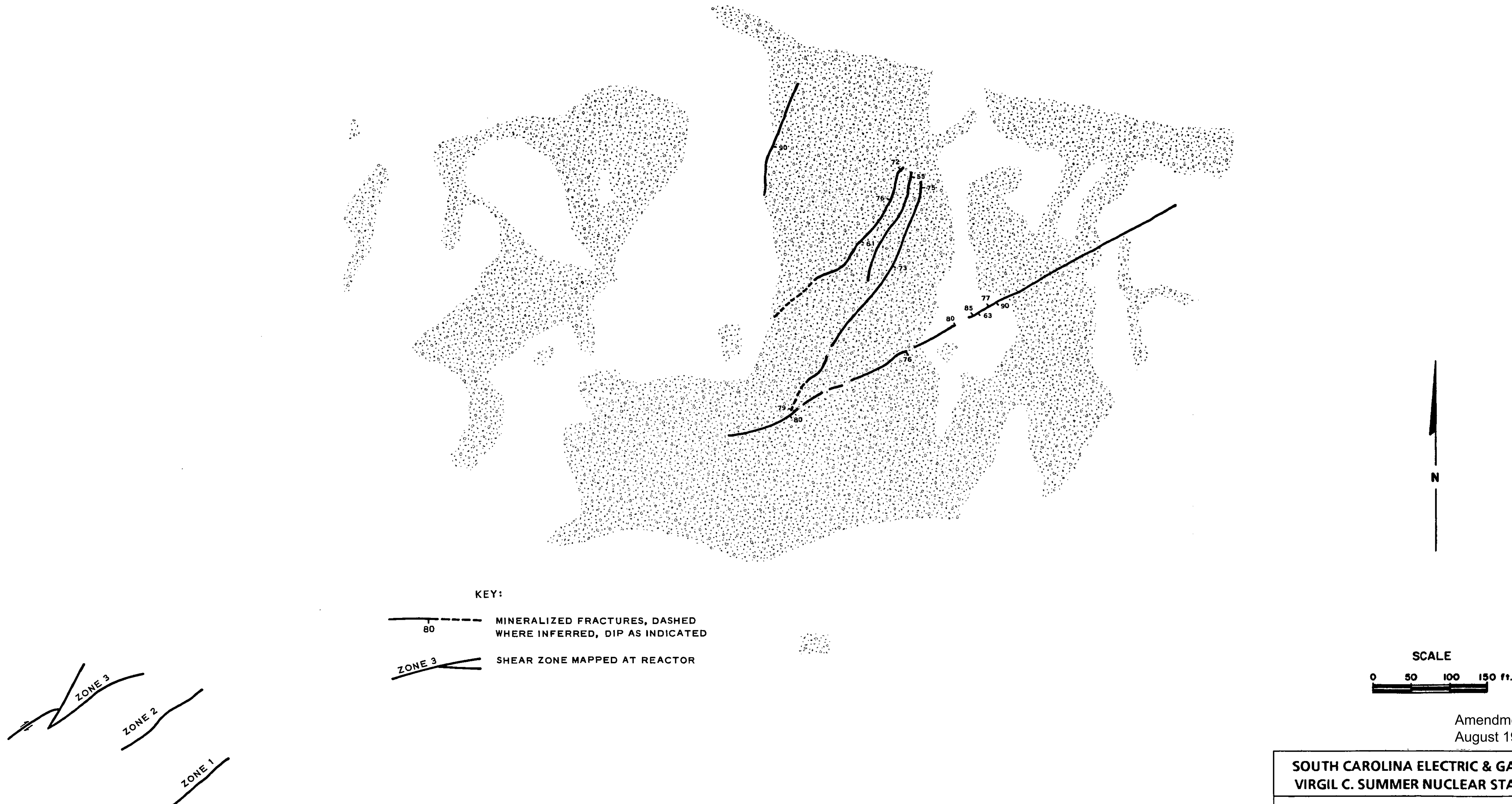


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Geologic Map of
North Dam Excavation

Figure 2.5-29



Amendment 0
August 1984

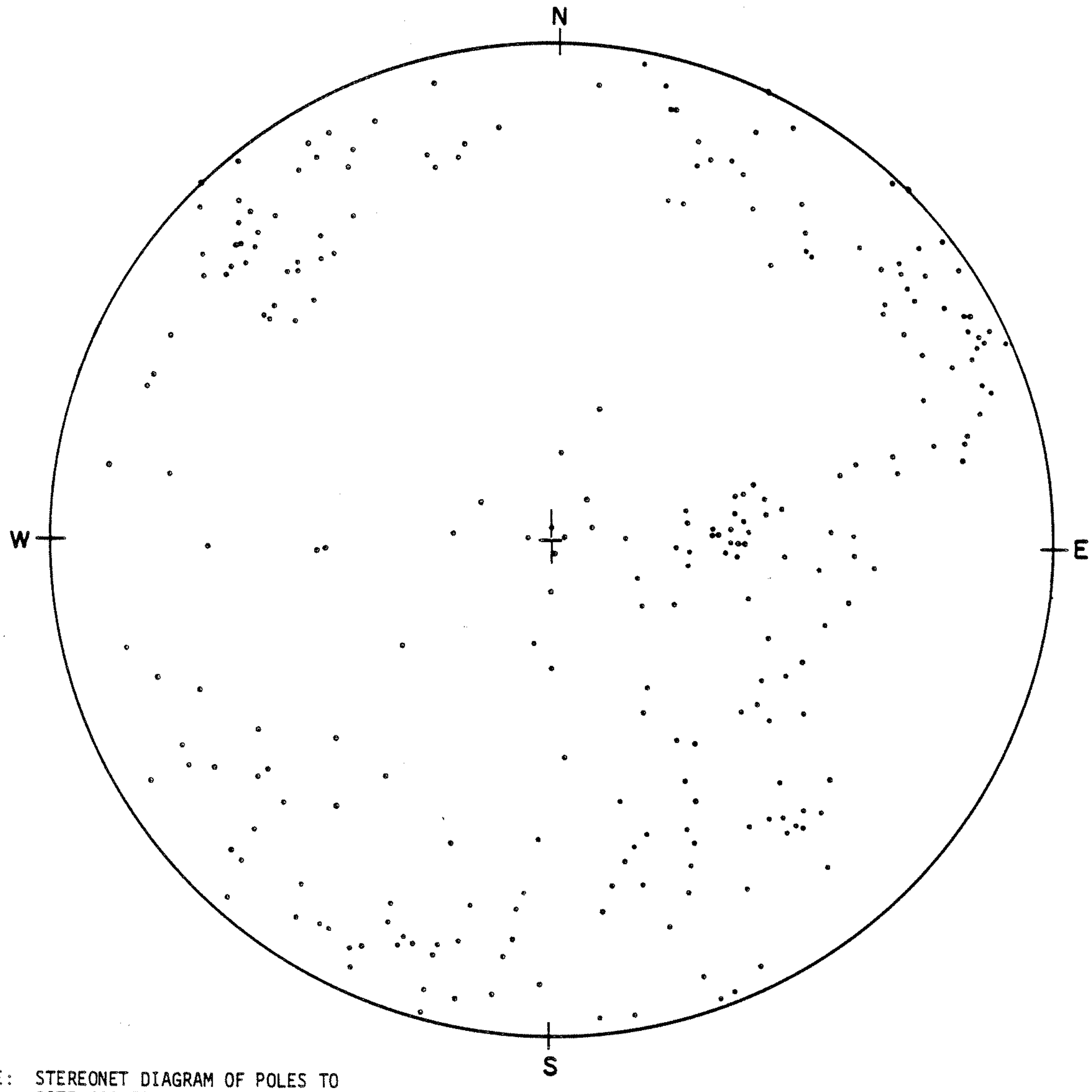
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Structure Map Of North Dam Excavation

Figure 2.5-30

FRACTURES SHOWING NO DISPLACEMENT

TOTAL=247 POLES



NOTE: STEREONET DIAGRAM OF POLES TO SITE JOINTS WHICH SHOW NO DISPLACEMENT (EQUAL AREA, LOWER HEMISPHERE PROJECTION).

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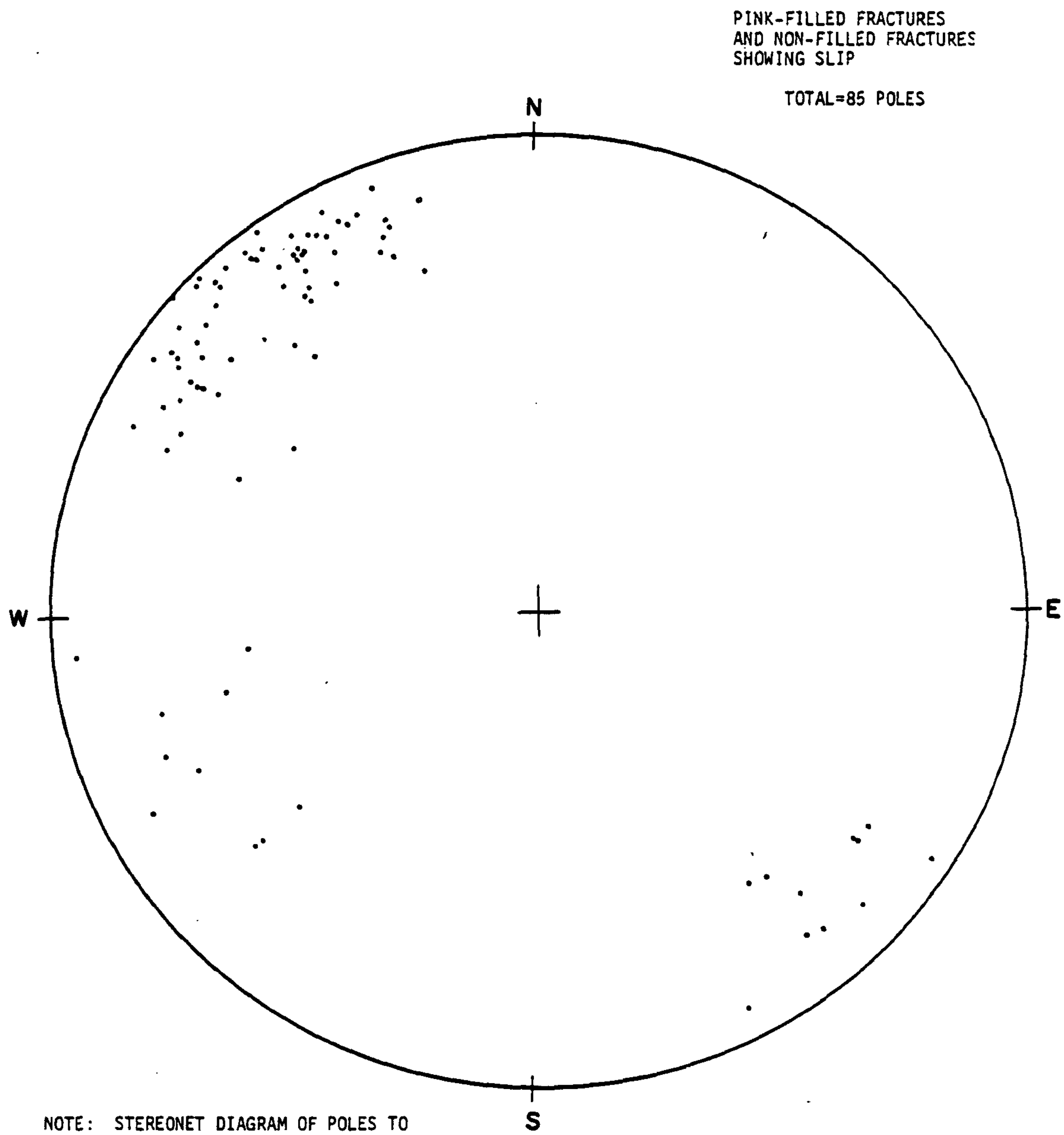
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Stereonet Diagram Non-Displaced Fractures

Figure 2.5-31



NOTE: STEREONET DIAGRAM OF POLES TO SITE JOINTS WHICH CONTAIN HYDROTHERMAL MINERALS AND/OR SHOW DISPLACEMENT (EQUAL AREA, LOWER HEMISPHERE PROJECTION).

Amendment 0
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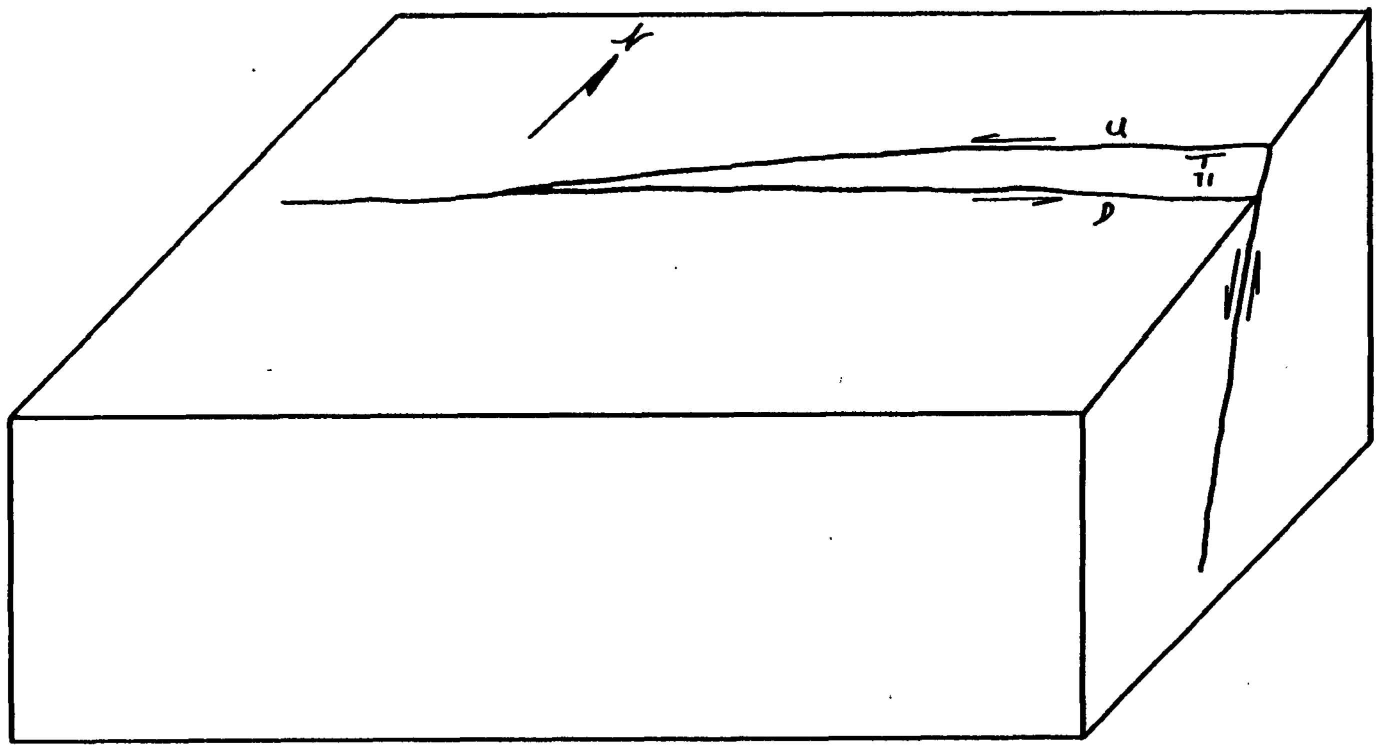
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Stereonet Diagram Hydrothermal Mineralized and/or Displaced Fractures

Figure 2.5-32



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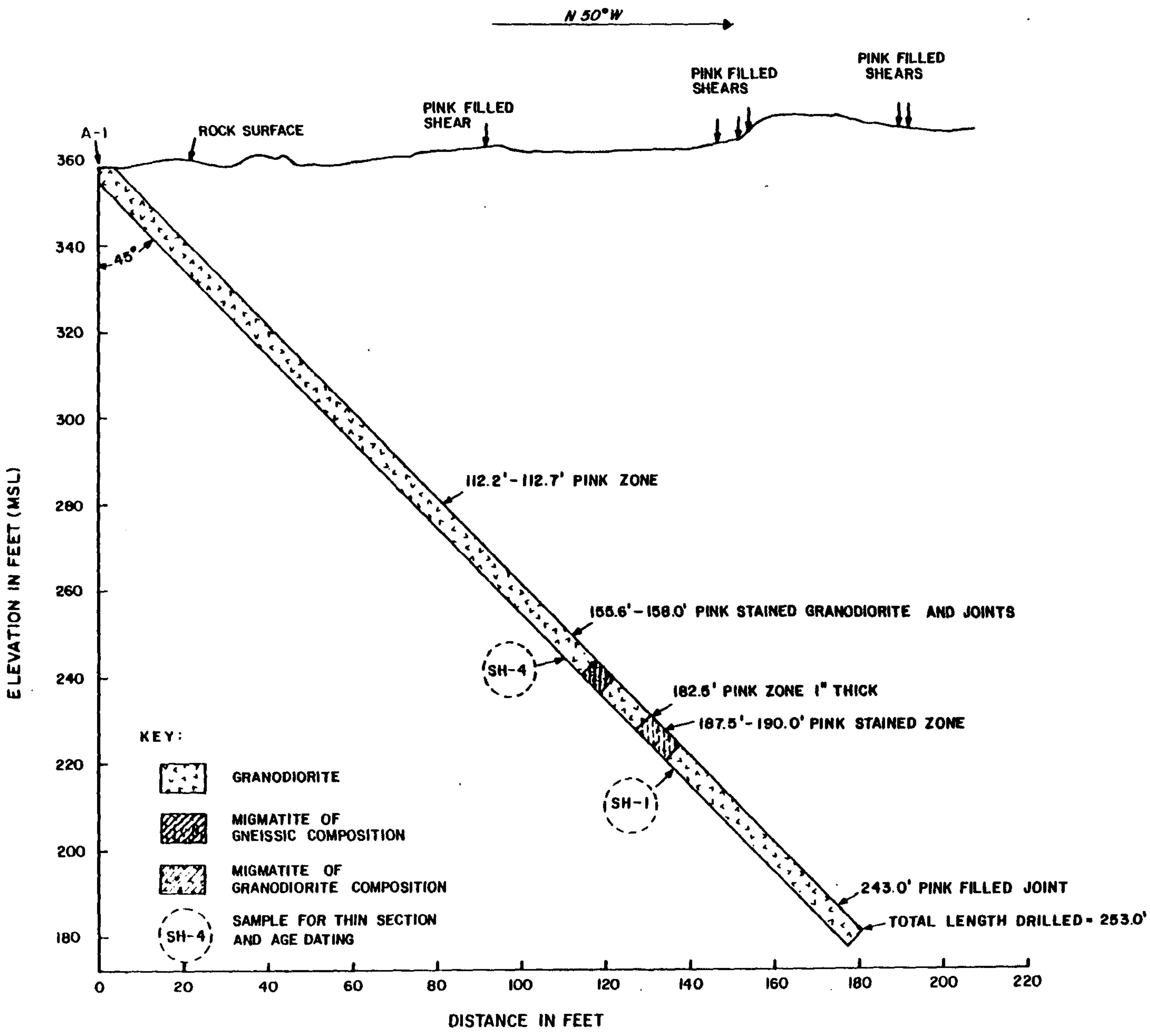
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Block Diagram
of Shear

Figure 2.5-33

NOTE: SKETCH OF THE N60E SEGMENT OF SHEAR ZONE 3 ILLUSTRATING THE THREE-DIMENSIONAL GEOMETRY OF THE DISPLACEMENT AS DETERMINED IN THIS STUDY. NOTE THAT DISPLACEMENT ALONG THE SHEAR DECREASES TO THE SOUTHWEST. (NOT TO SCALE)



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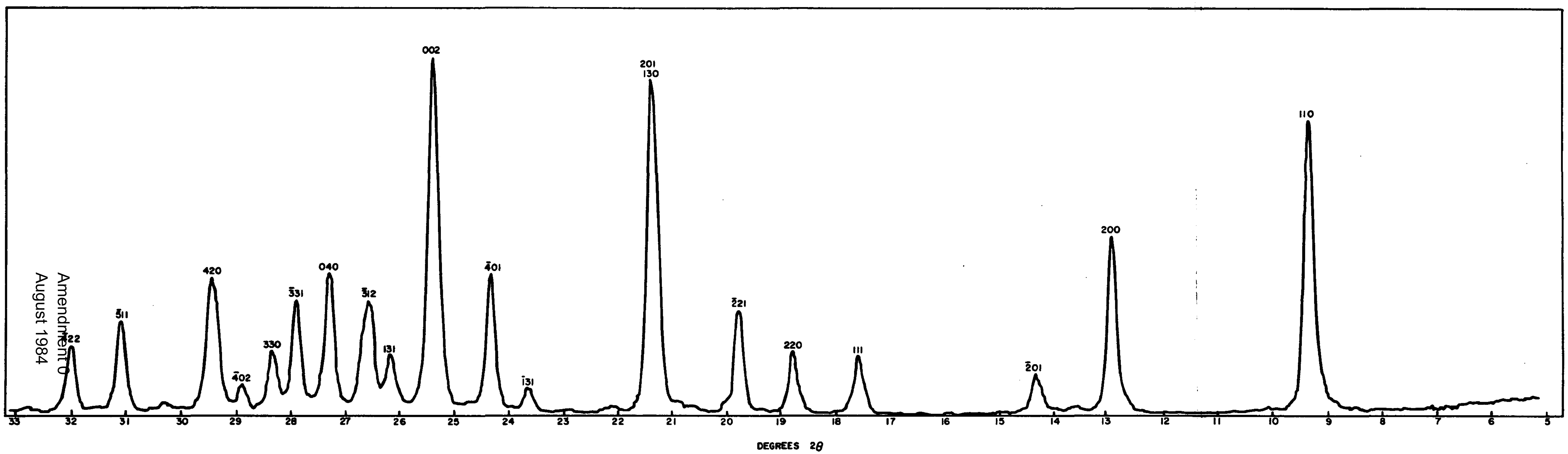
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Profile Along Angle Boring A-1

Figure 2.5-34



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

X-Ray Diffraction Pattern
Of Laumontite

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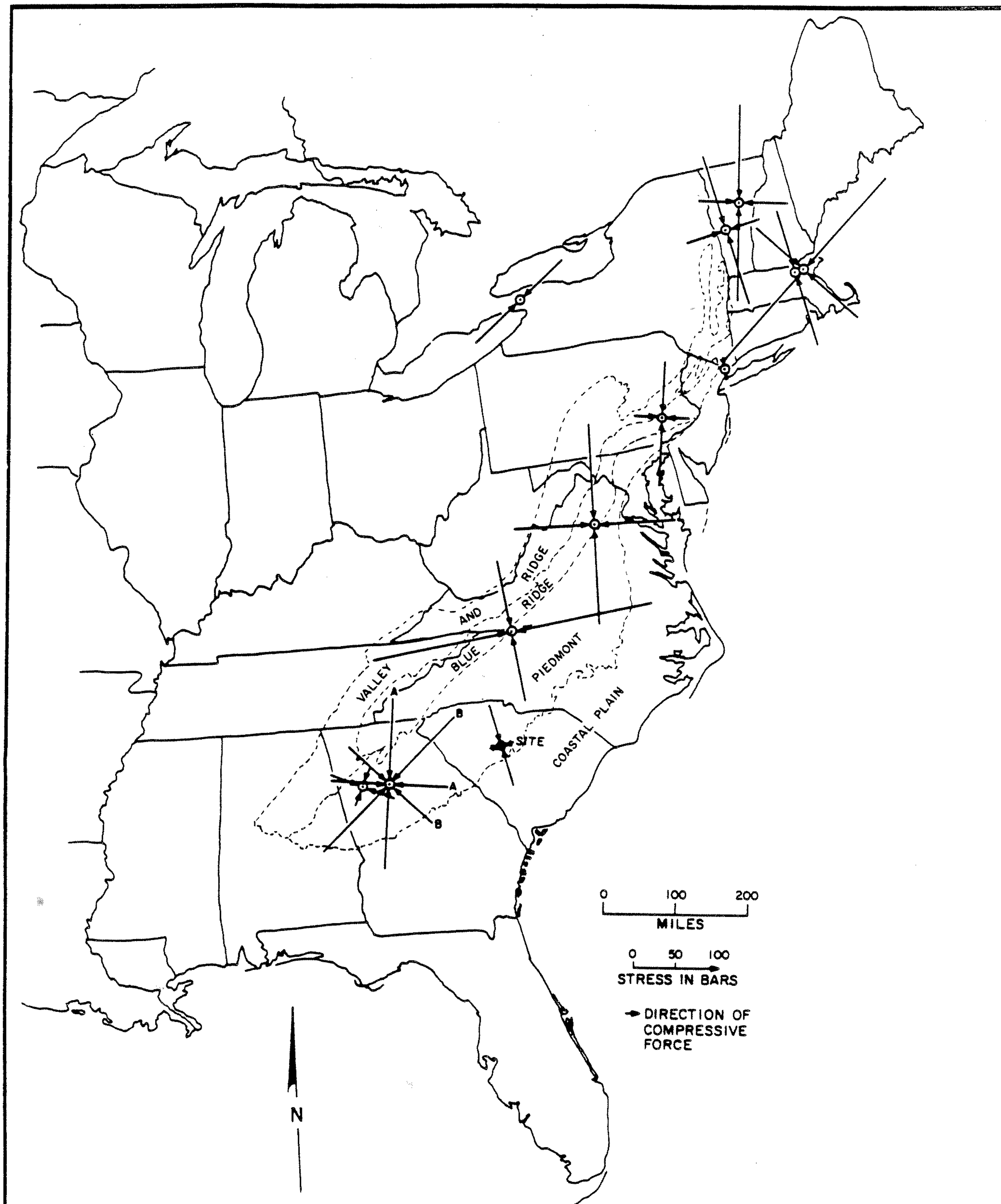
Figure 2.5-35



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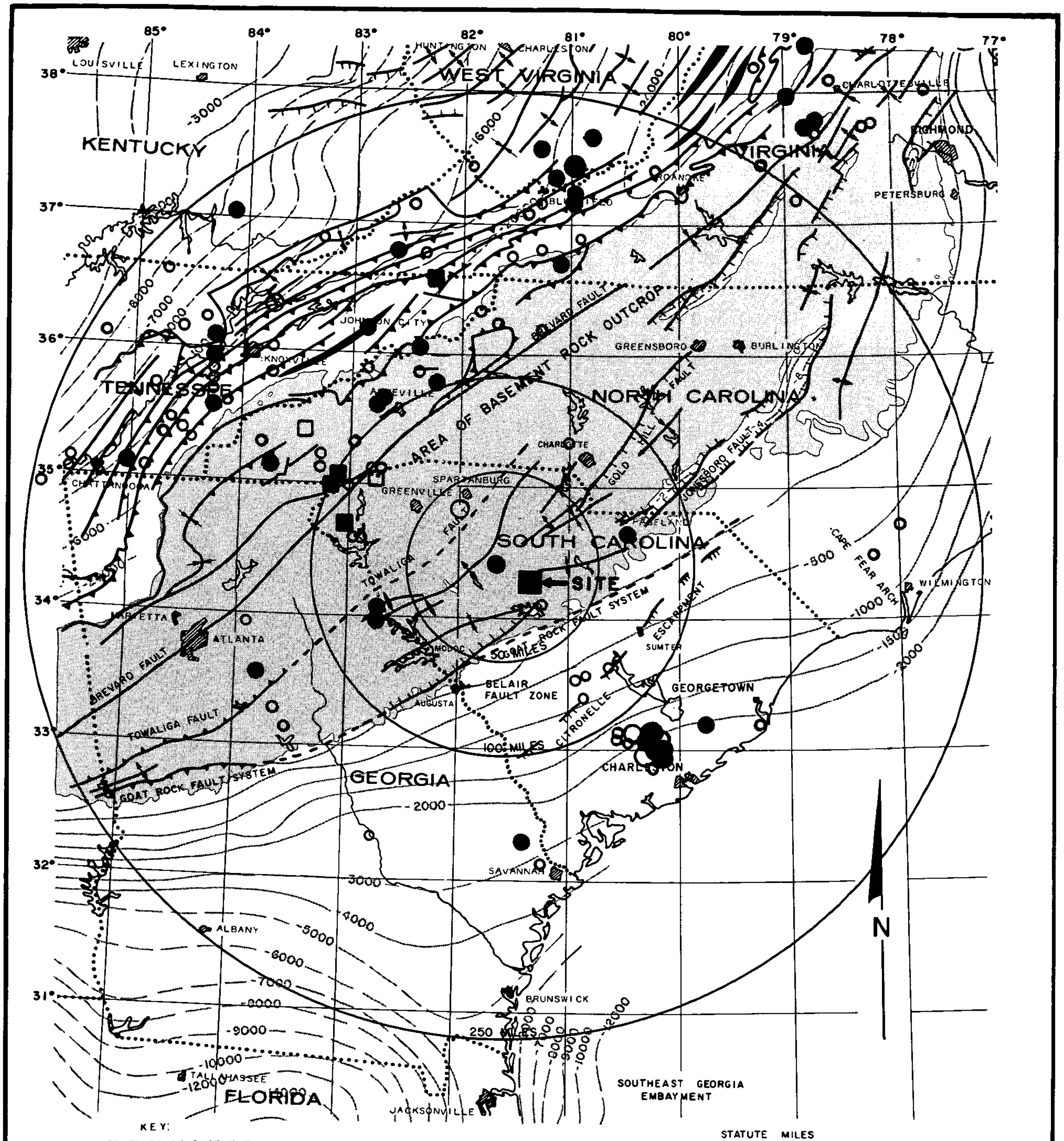
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Map of Insitu Stresses in the Piedmont Area of the United States

Figure 2.5-36



KEY:

- CONTOURS OF BASEMENT ROCK SURFACE
- BASEMENT ROCK OUTCROP ENCLOSURE
- SYNCLINAL AXIS
- ANTICLINAL AXIS
- NORMAL FAULT (HACHURES INDICATE DOWNTHROWN SIDE)
- THRUST FAULT (HACHURES INDICATE OVERTHRUST SIDE)
- UNDIFFERENTIATED FAULT
- MONOCLINAL FLEXURE
- ELONGATE, CLOSELY COMPRESSED ANTICLINE
- ESCARPMENT

REFERENCE:

THE BASE FOR THIS MAP WAS PREPARED FROM A PORTION OF THE U.S.G.S. "IFR WALL PLANNING CHART, EAST AND WEST, 1967."

MAJOR TECTONIC FEATURES WERE TAKEN FROM A PORTION OF THE "TECTONIC MAP OF THE U.S." BY U.S.G.S. AND AAPG, 1962. (SEE TEXT FOR SEISMOLOGY REFERENCES)

EXTENSIONS OF TOWALIGA FAULT AND GOAT ROCK FAULT SYSTEM PROPOSED BY HOWELL, 1976 AND TALWANI AND HOWELL, 1976.

LEGEND:

- INTENSITY V
- INTENSITY VI
- INTENSITY VII
- INTENSITY VIII
- INTENSITY IX
- MAG. 3.0-3.3
- MAG. 3.3-3.7

STATUTE MILES

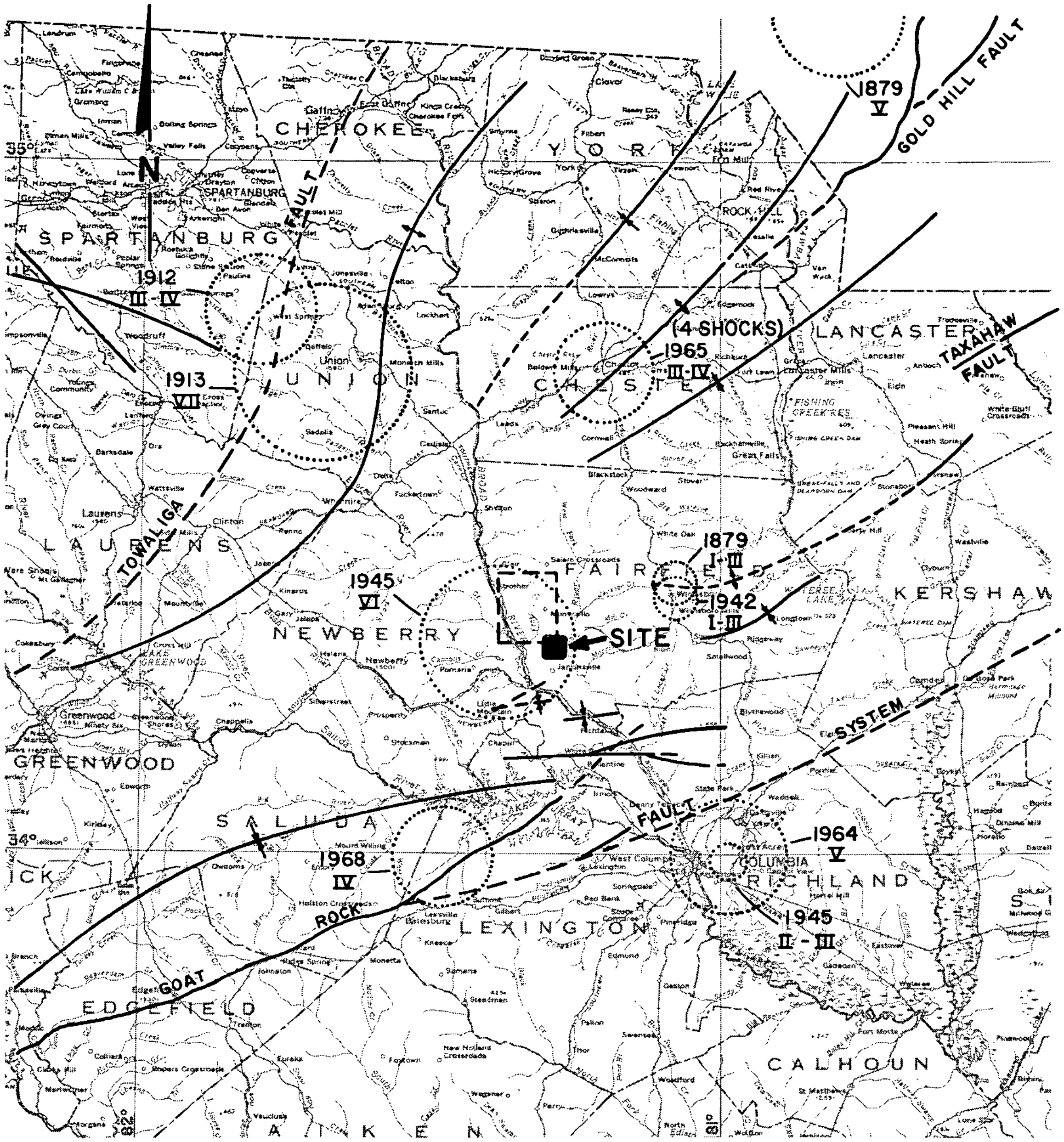
50 25 0 50 100

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Regional Epicenter Map

Figure 2.5-37



KEY:

THESE SYMBOLS REPRESENT THE RELATIVE SIZES OF THE EARTHQUAKES AND THEIR APPROXIMATE EPICENTERS. THEY DO NOT DEFINE THE LIMITS OF THE EPICENTRAL AREAS OR FELT AREAS OF THE SHOCKS. SEE TEXT OF REPORT FOR DISCUSSION.

FAULT (DASHED WHERE INFERRED)

ANTICLINAL AXIS

SYNCLINAL AXIS

CONCENTRATED RESERVOIR MICROSEISMICITY

REFERENCE:
THE BASE FOR THIS MAP WAS PREPARED FROM PORTIONS OF THE FOLLOWING USGS STATE BASE MAPS: SOUTH & NORTH CAROLINA, 1970.

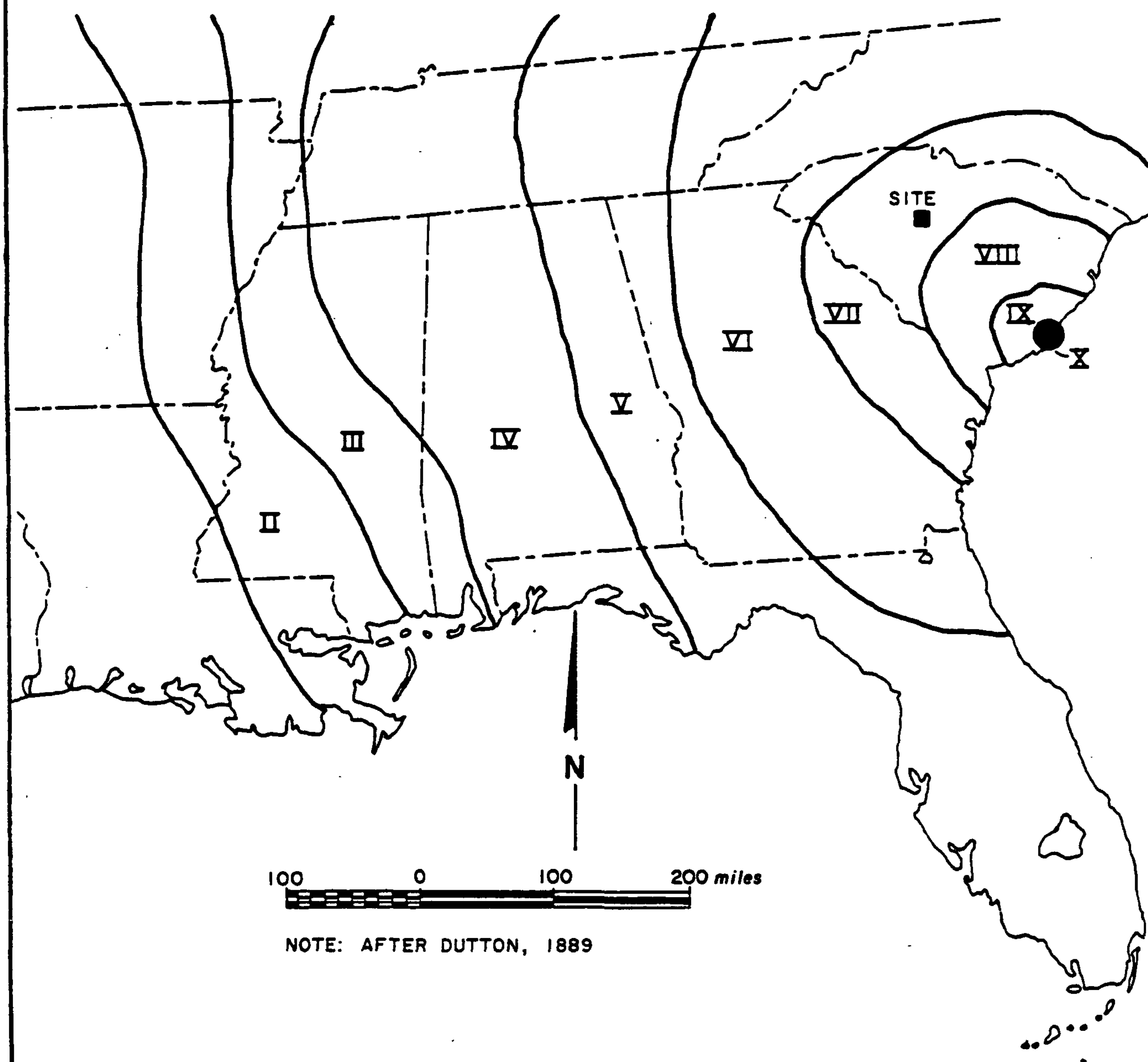
STATUTE MILES
10 0 10 20

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Local Epicenter Map

Figure 2.5-38



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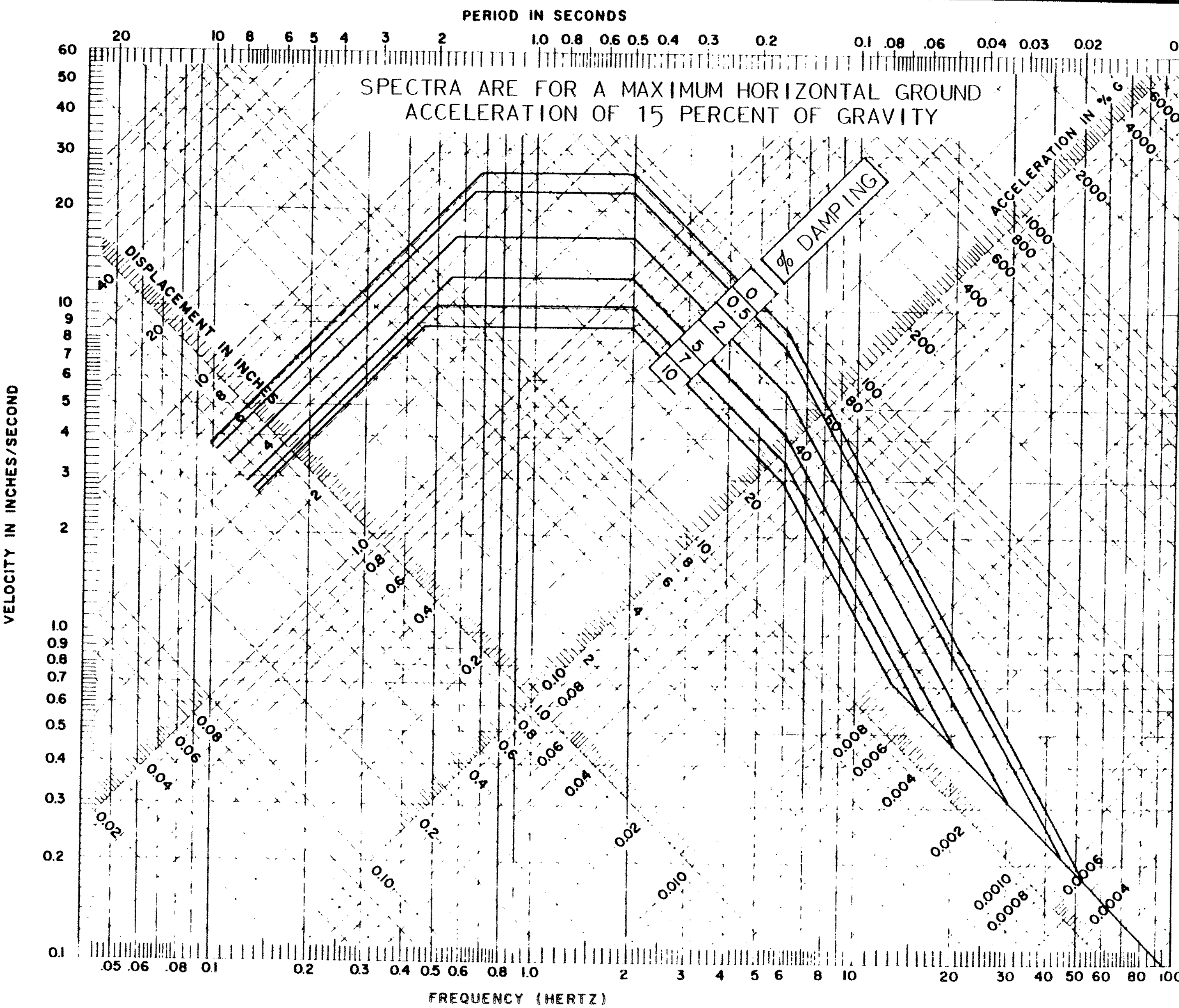
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Charleston, S. C., Earthquake
August 31, 1886, Isoseismal Map - Modified Mercalli Intensity Scale

Figure 2.5-39



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

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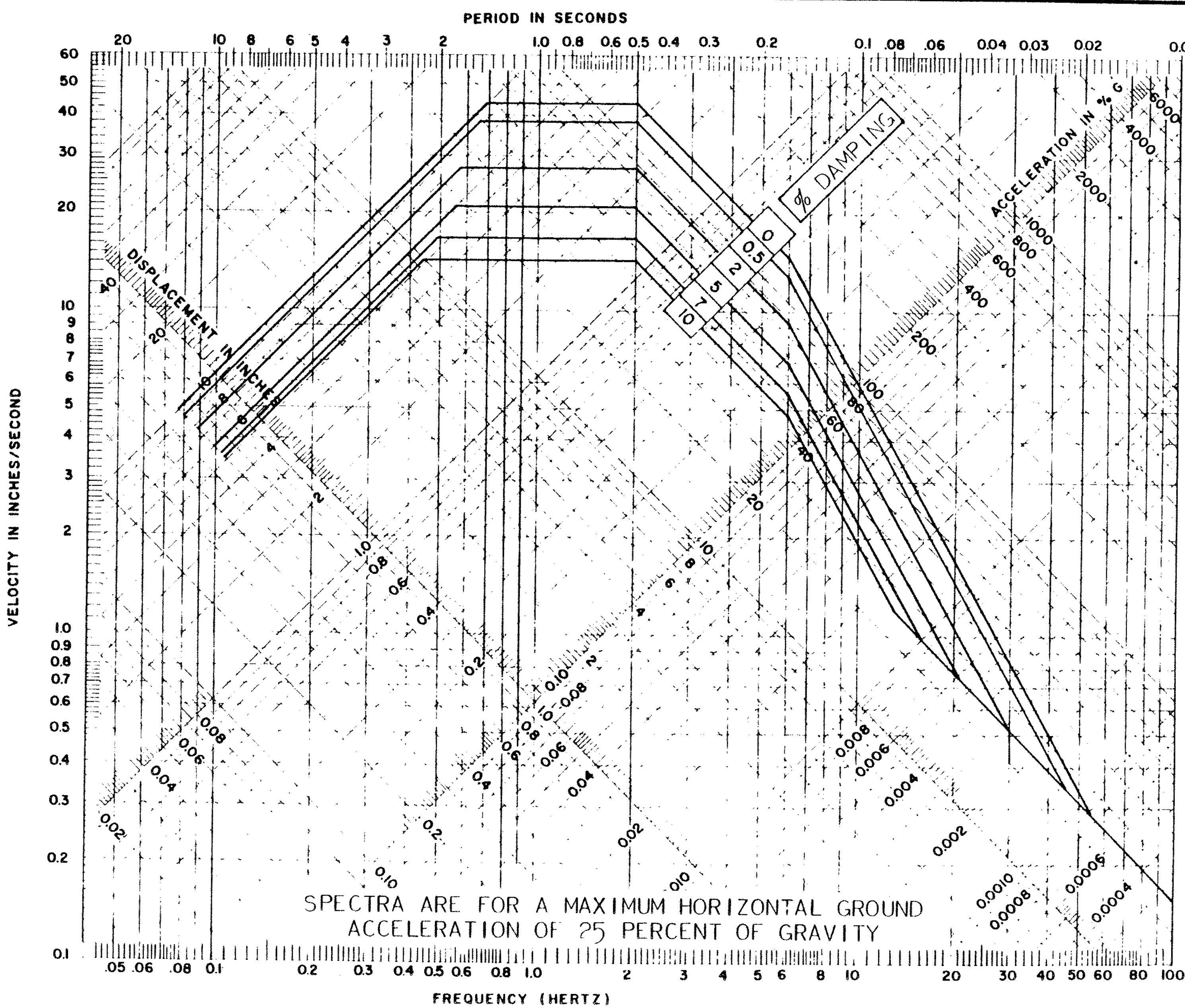
August 1984

Horizontal Design Response Spectra - SSE - Structures Founded on Rock

Figure 2.5-40



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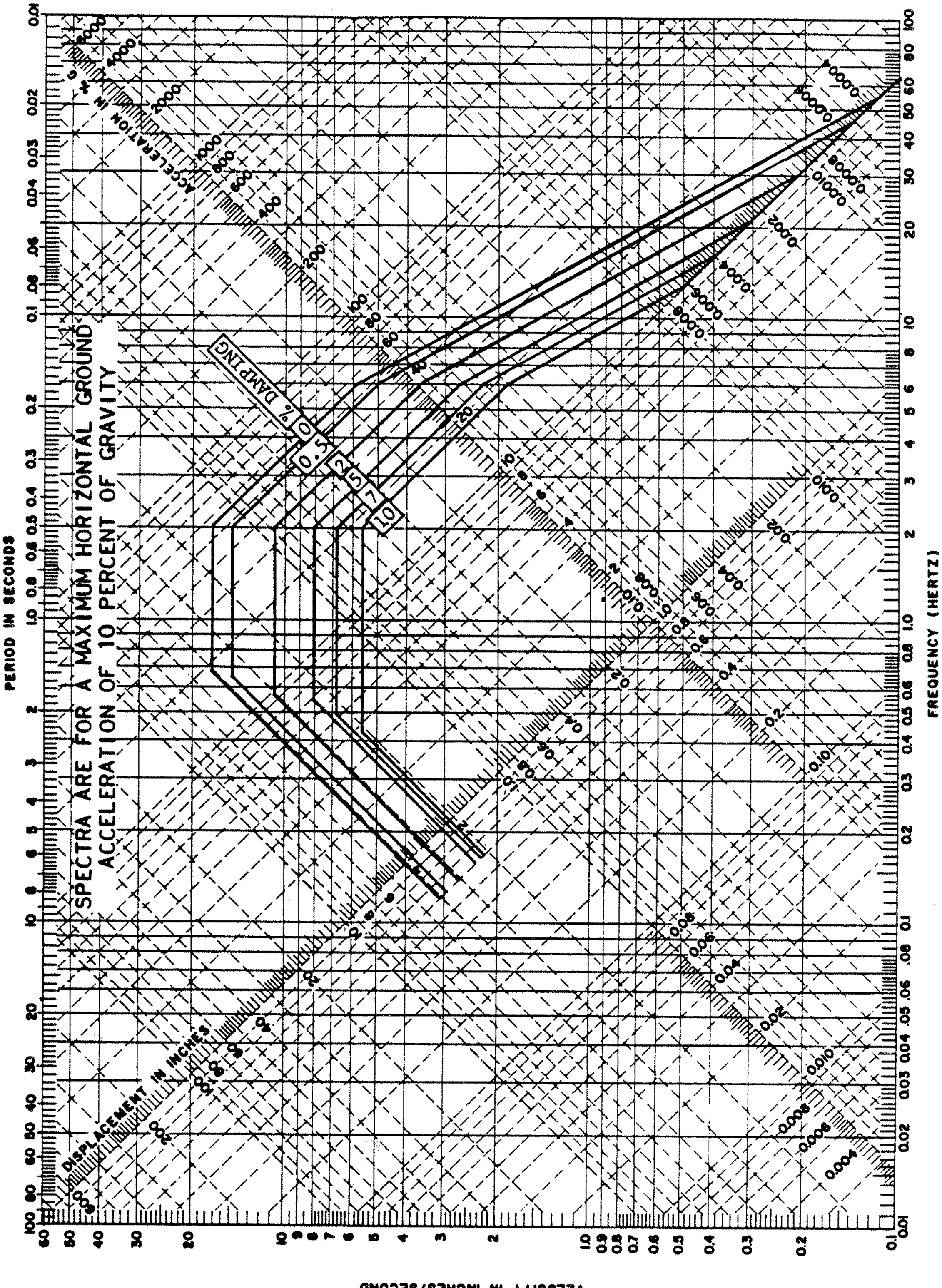
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Horizontal Design Response
Spectra - SSE - Structures
Founded on Soil

Figure 2.5-41

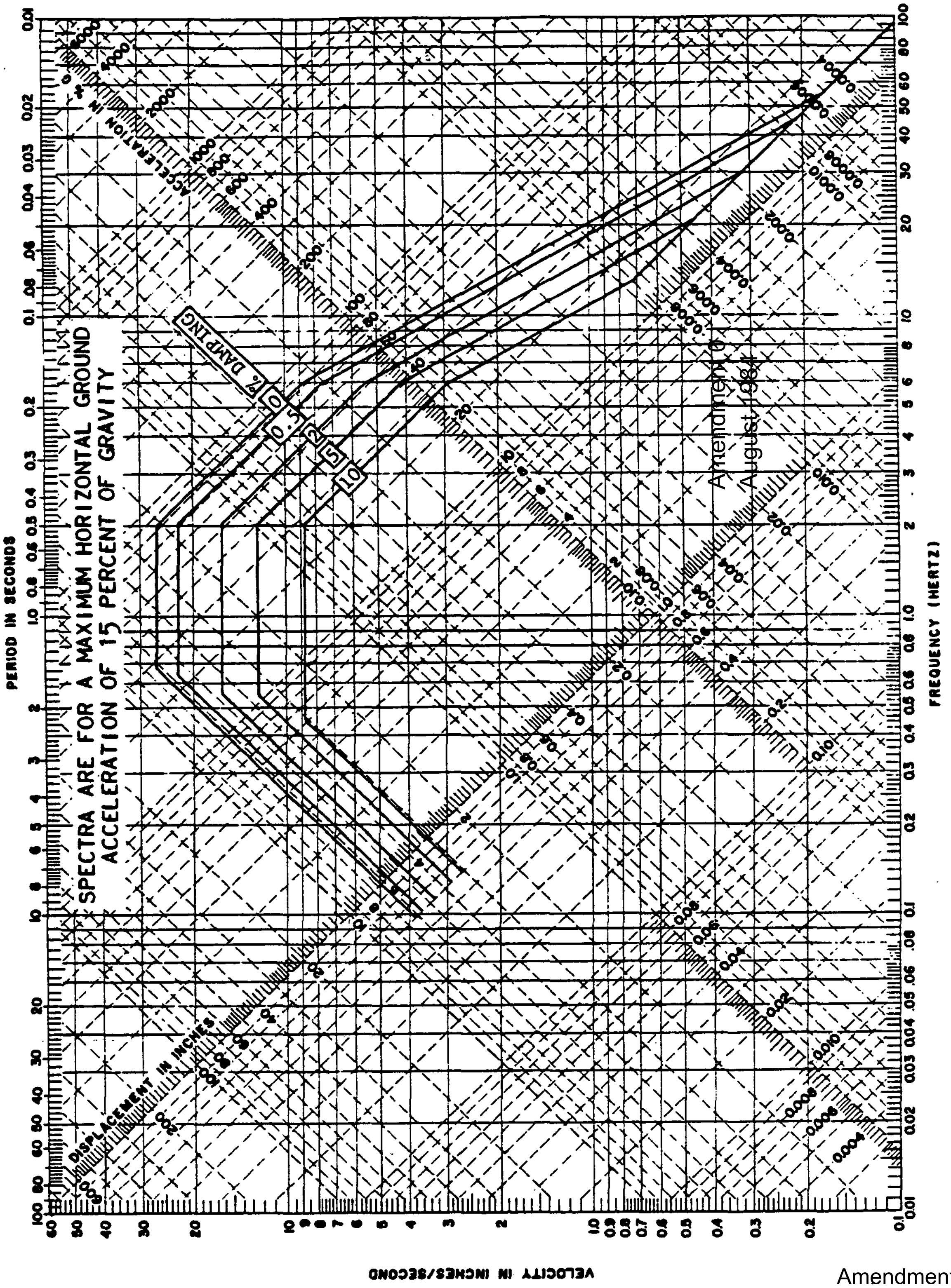


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Horizontal Design Response
Spectra - OBE - Structures
Founded on Rock

Figure 2.5-42

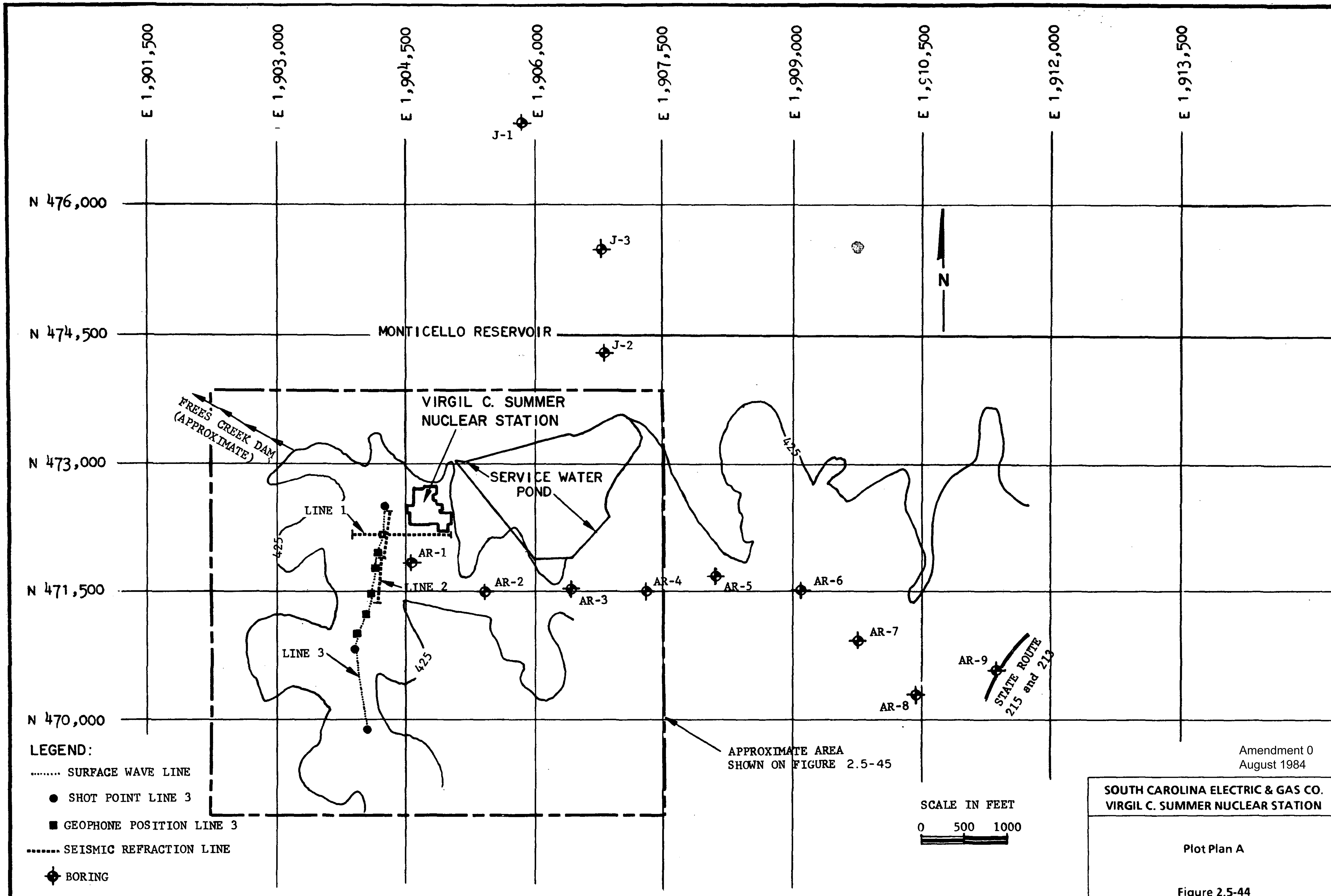


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Horizontal Design Response
Spectra - OBE - Structures
Founded on Soil

Figure 2.5-43



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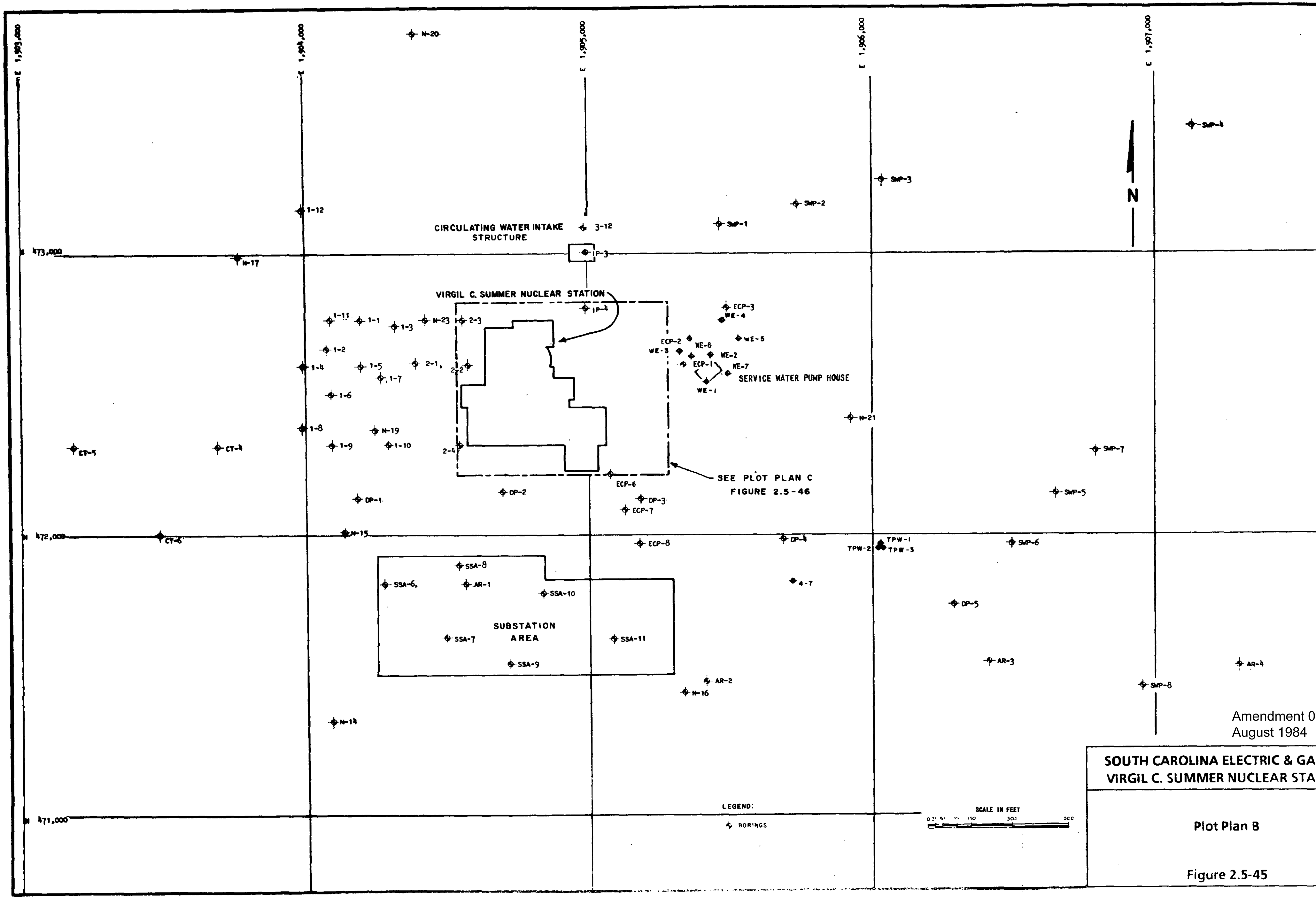
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Plot Plan A

Figure 2.5-44



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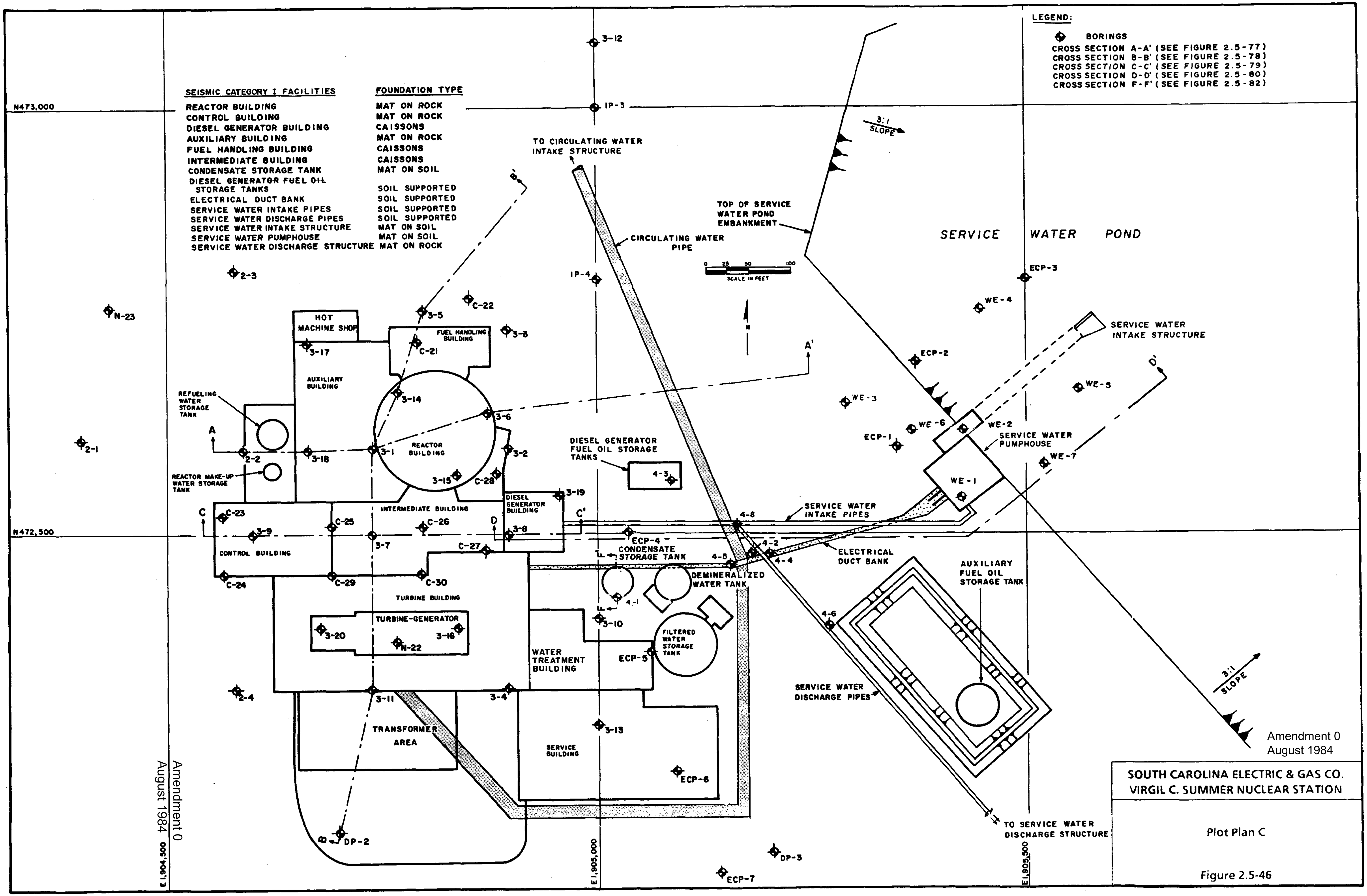
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Plot Plan B

Figure 2.5-45



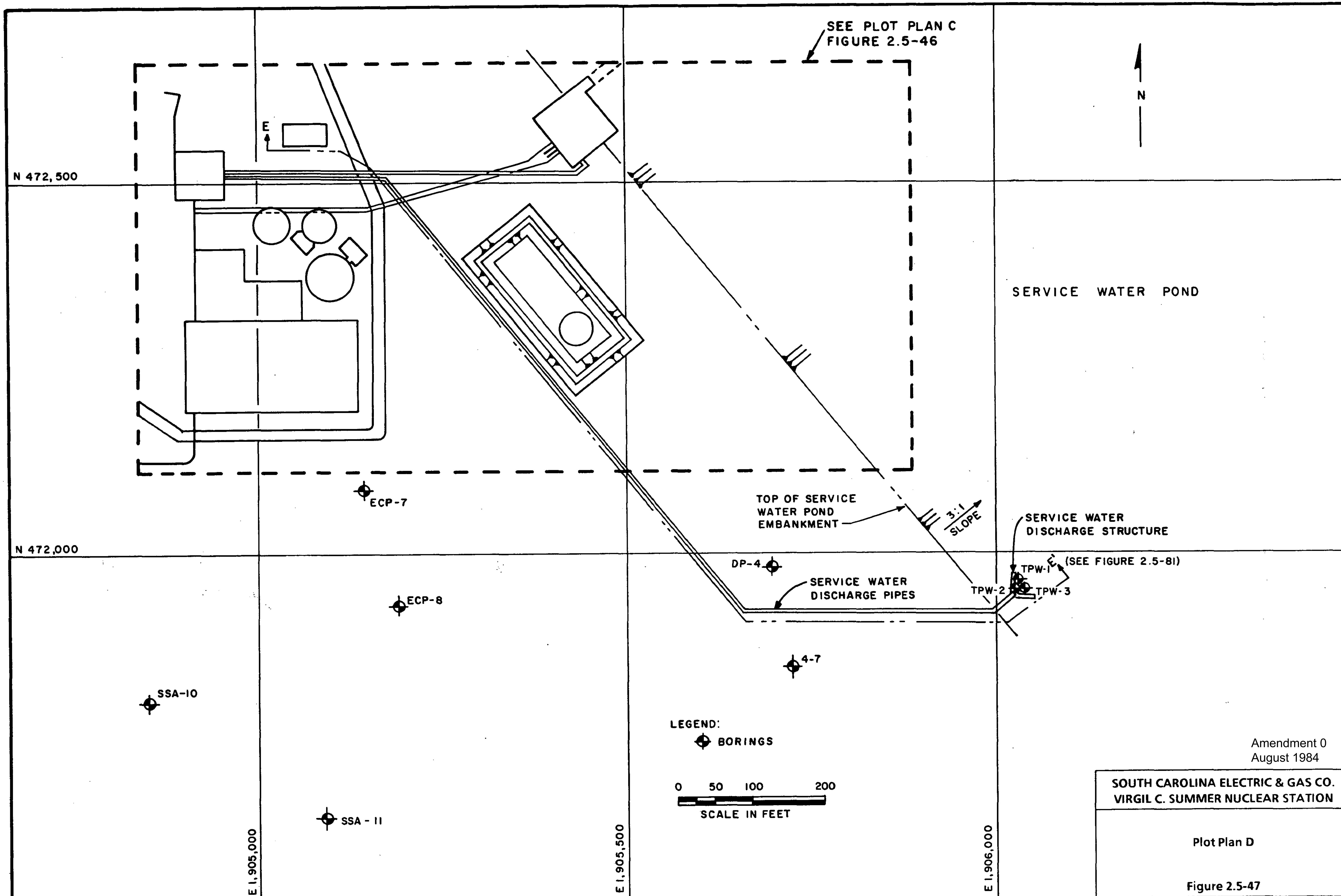
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Plot Plan C

Figure 2.5-46

Amendment 0
August 1984

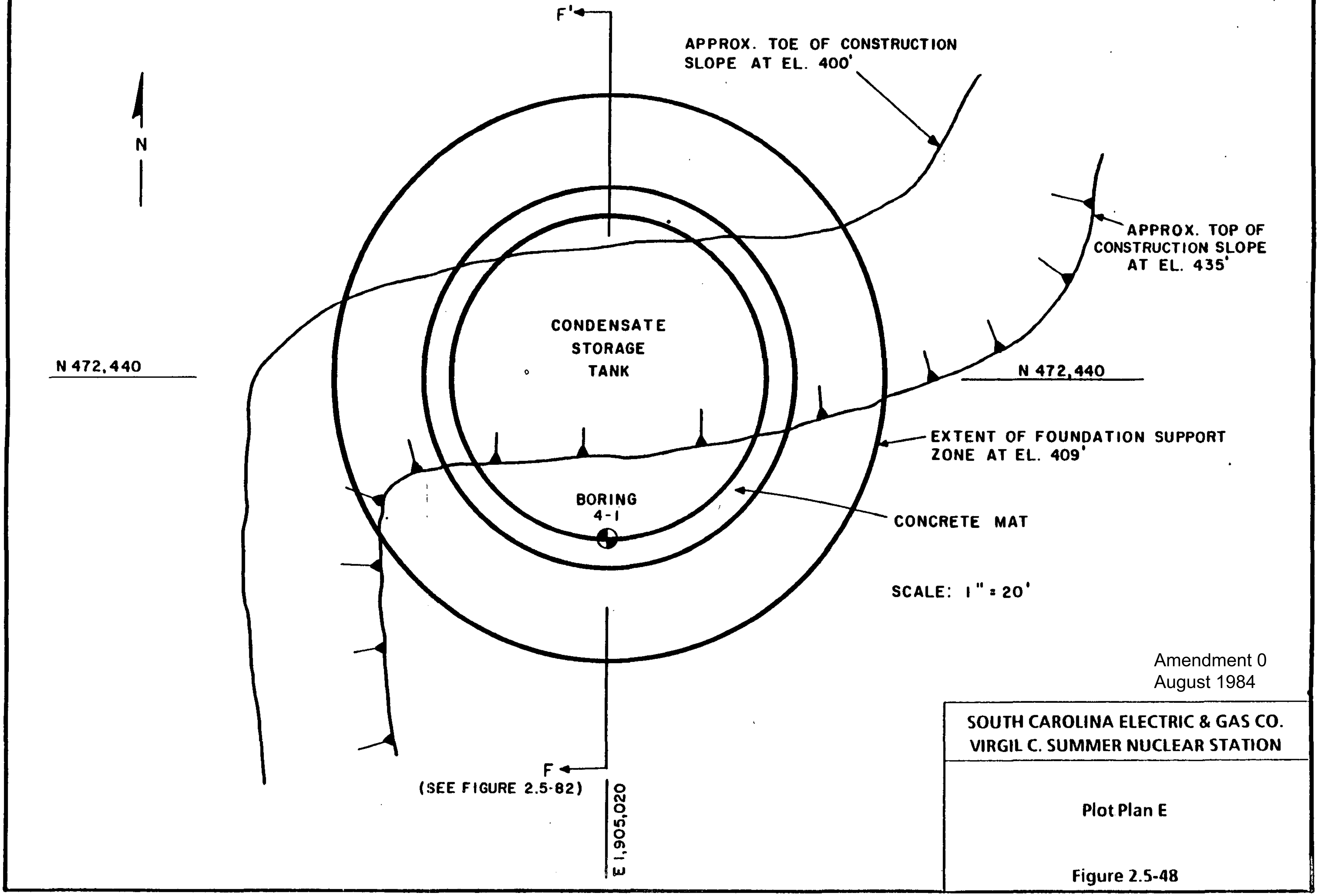


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Plot Plan D

Figure 2.5-47

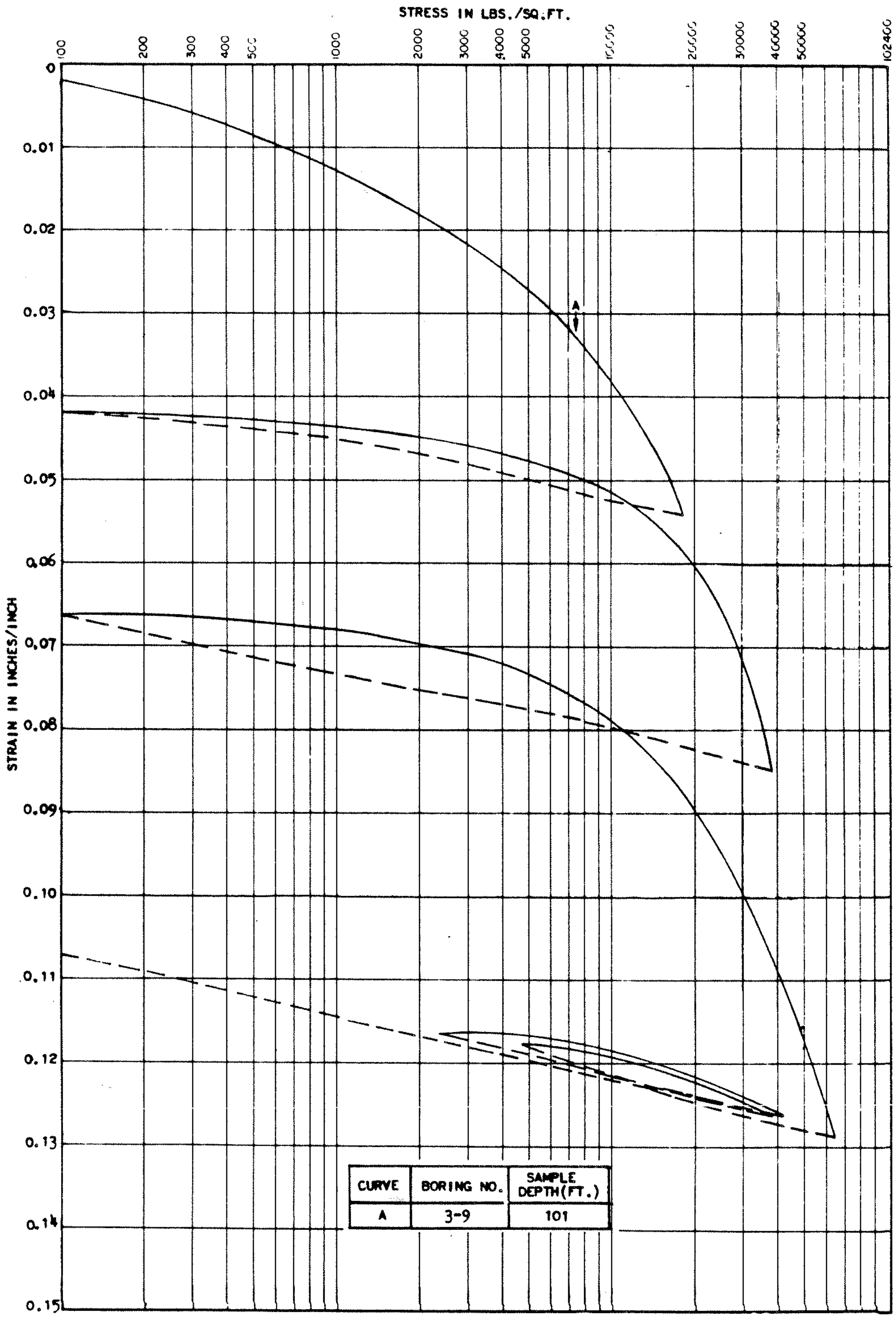


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Plot Plan E

Figure 2.5-48

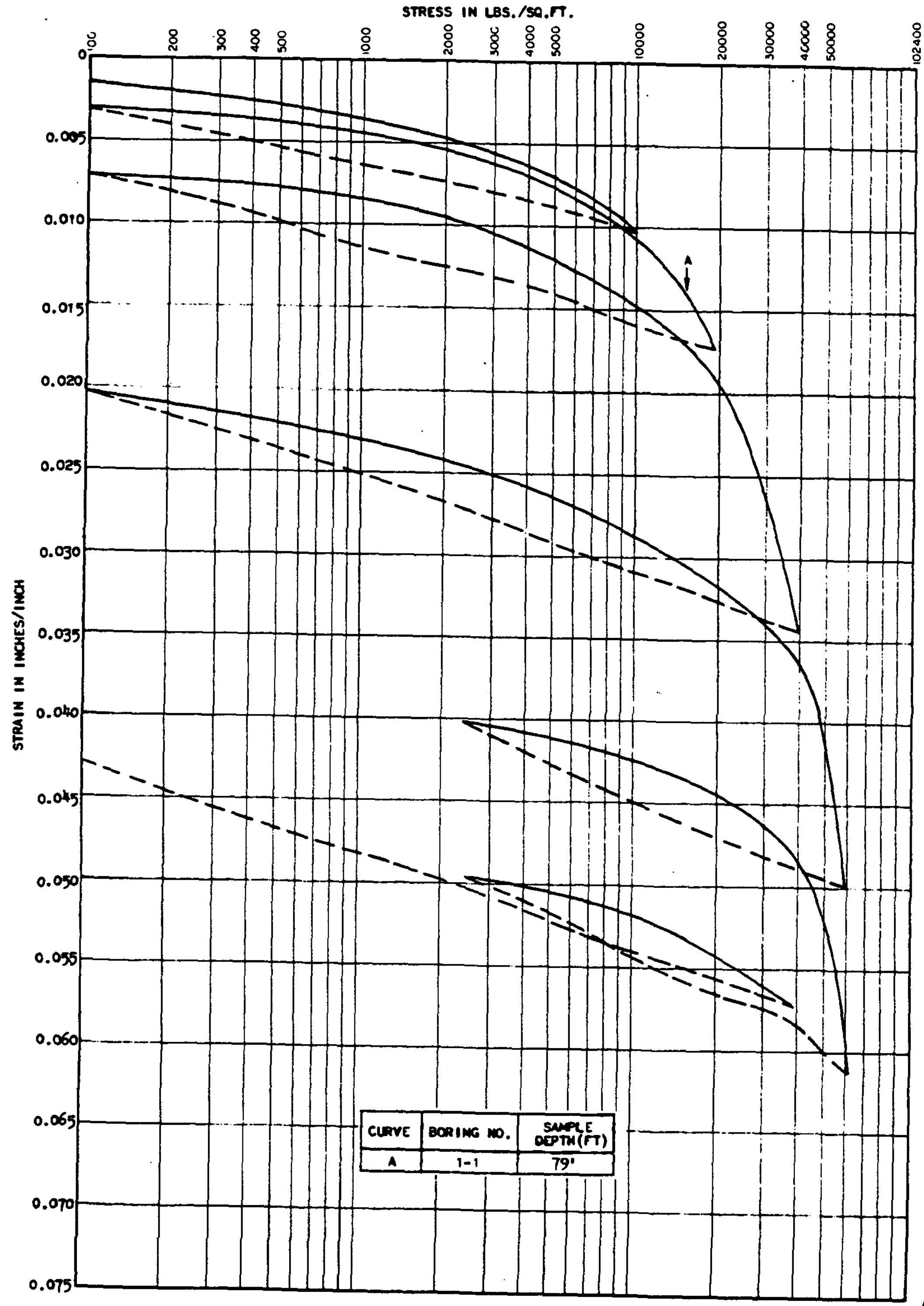


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Stress Strain Data
(Highly Weathered Rock)

Figure 2.5-49



CURVE	BORING NO.	SAMPLE DEPTH (FT)
A	1-1	79'

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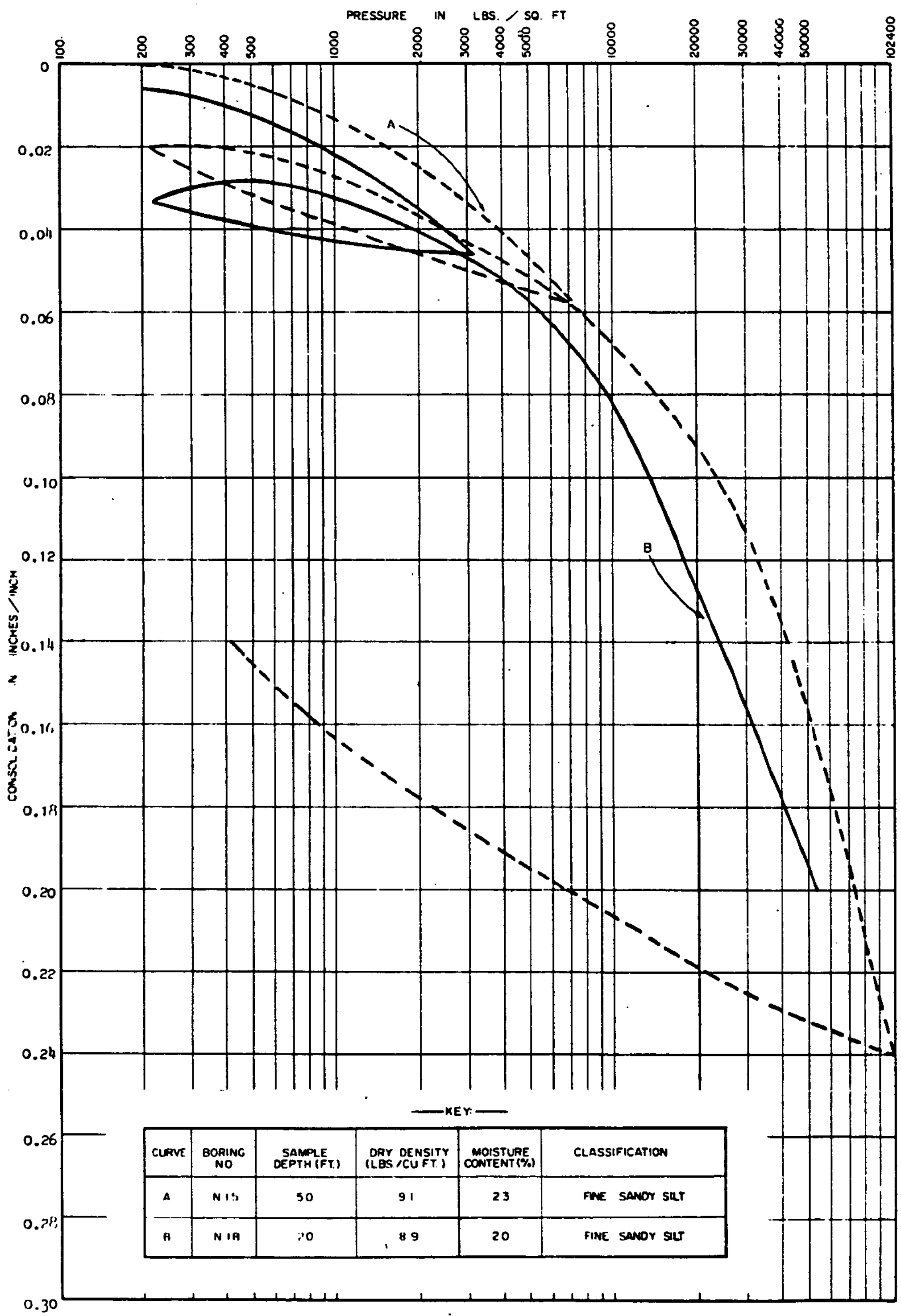
South Carolina Electric & Gas Co.
Virgil C. Summer Nuclear Station

Stress Strain Data
(Highly Weathered Rock)

Figure 2.5-50



KEY

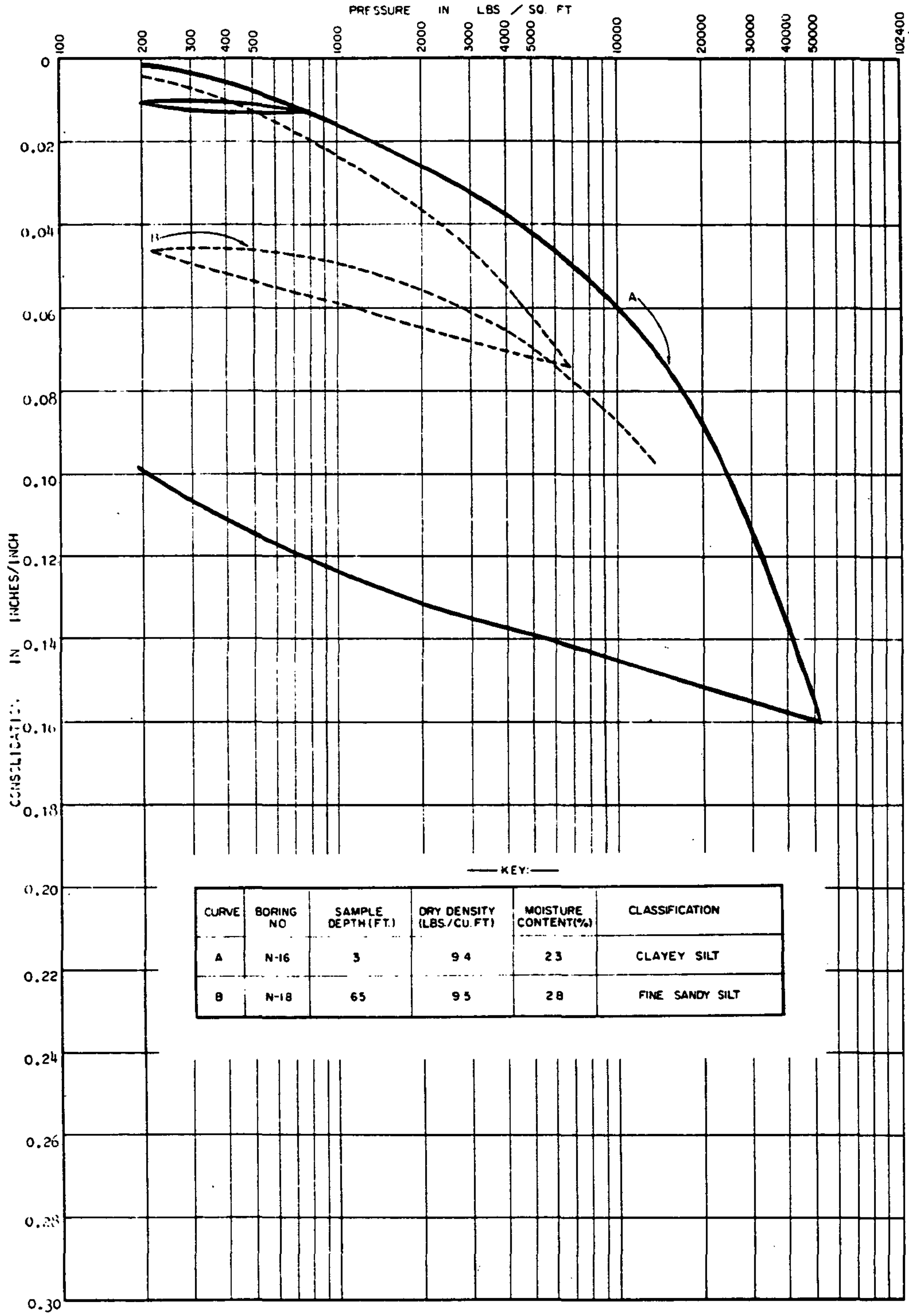
CURVE	BORING NO	SAMPLE DEPTH (FT.)	DRY DENSITY (LBS./CU FT.)	MOISTURE CONTENT (%)	CLASSIFICATION
A	N 15	50	91	23	FINE SANDY SILT
B	N 18	20	89	20	FINE SANDY SILT

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test
Data

Figure 2.5-51



KEY:

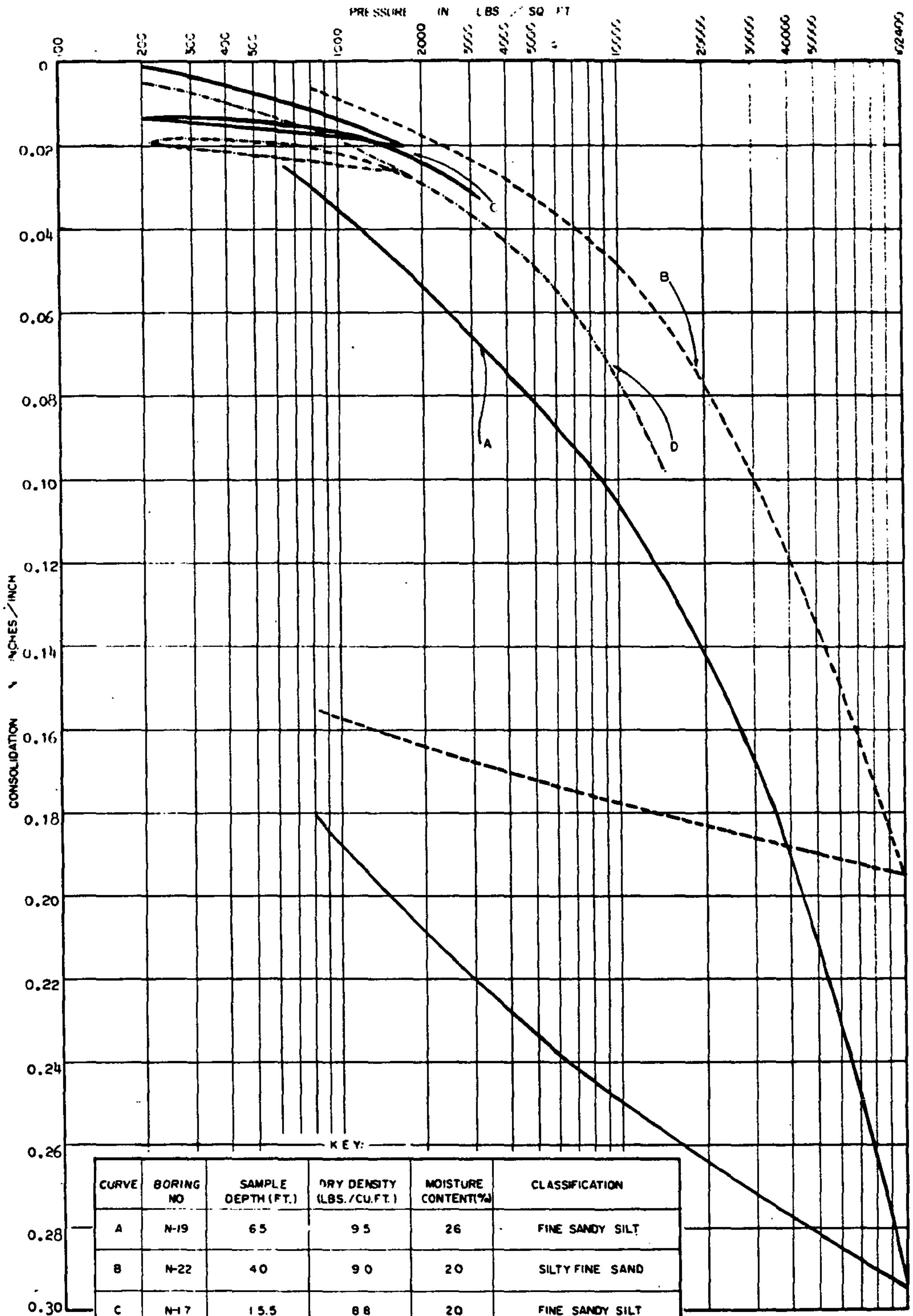
CURVE	BORING NO	SAMPLE DEPTH (FT.)	DRY DENSITY (LBS/CU.FT)	MOISTURE CONTENT(%)	CLASSIFICATION
A	N-16	3	94	23	CLAYEY SILT
B	N-18	65	95	28	FINE SANDY SILT

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test Data

Figure 2.5-52



CURVE	BORING NO	SAMPLE DEPTH (FT.)	DRY DENSITY (LBS./CU.FT.)	MOISTURE CONTENT(%)	CLASSIFICATION
A	N-19	6.5	95	26	FINE SANDY SILT
B	N-22	4.0	90	20	SILTY FINE SAND
C	N-17	15.5	88	20	FINE SANDY SILT
D	N-14	11.5	85	29	FINE SANDY SILT

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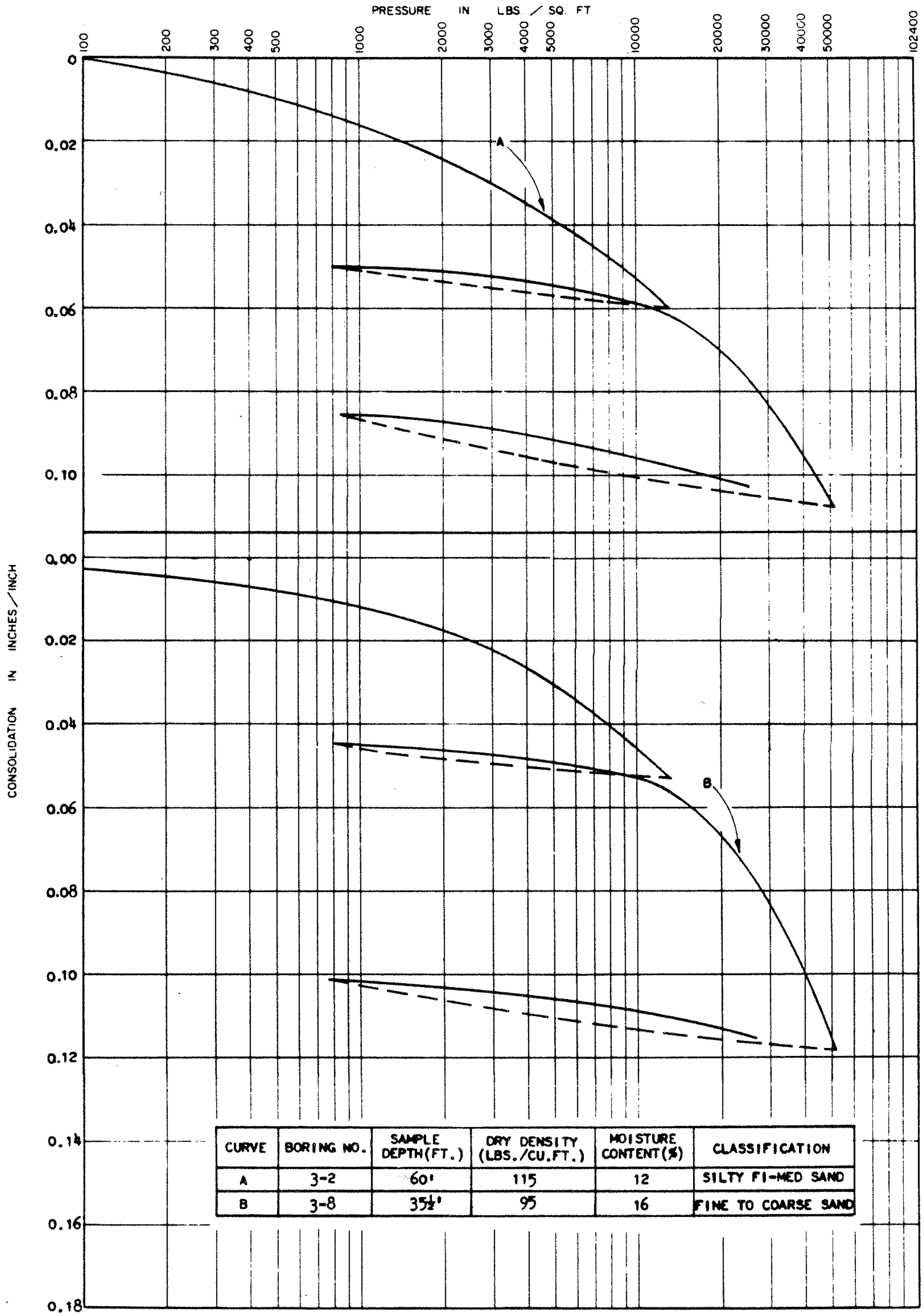
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test Data

Figure 2.5-53

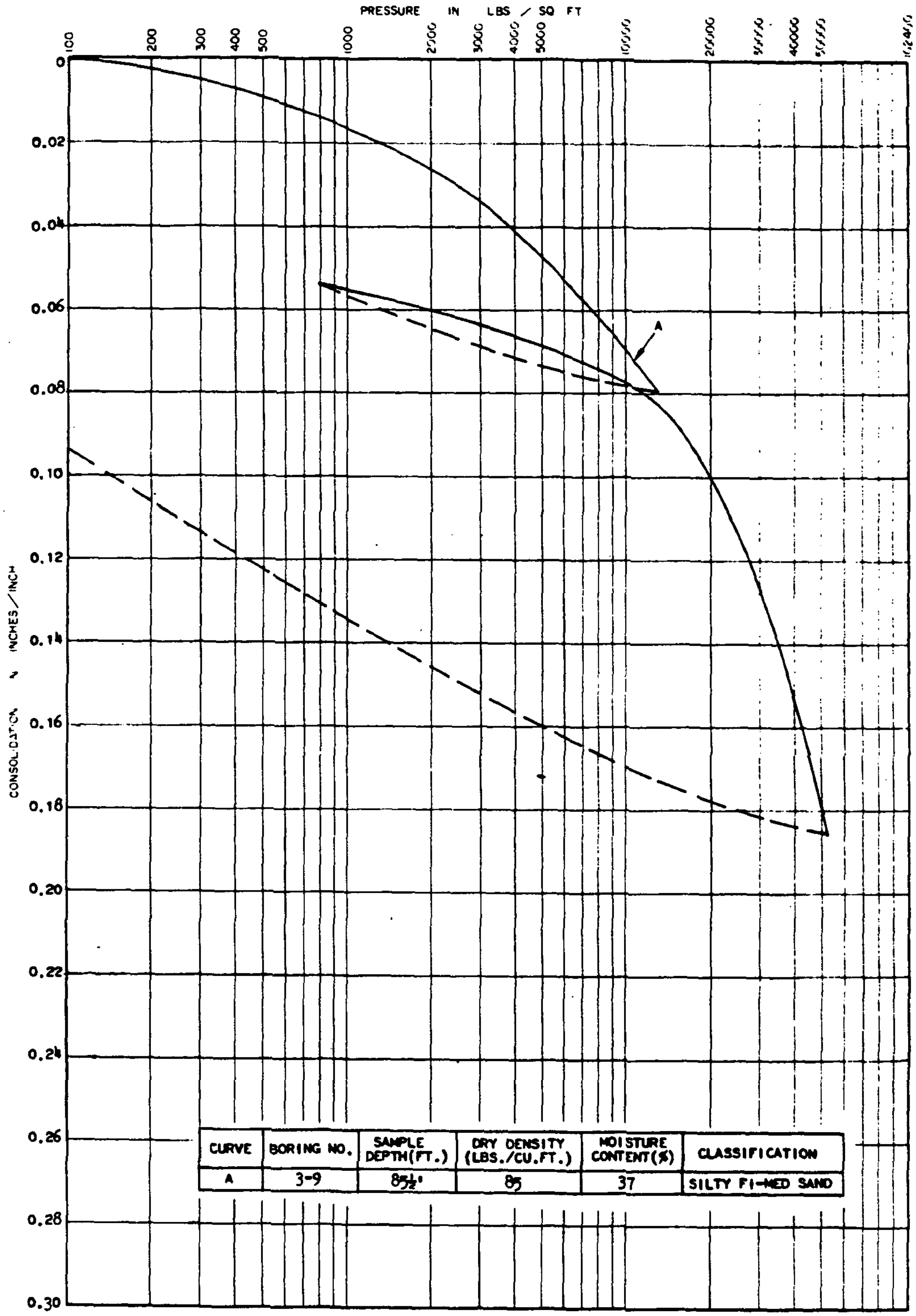


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test
Data

Figure 2.5-54



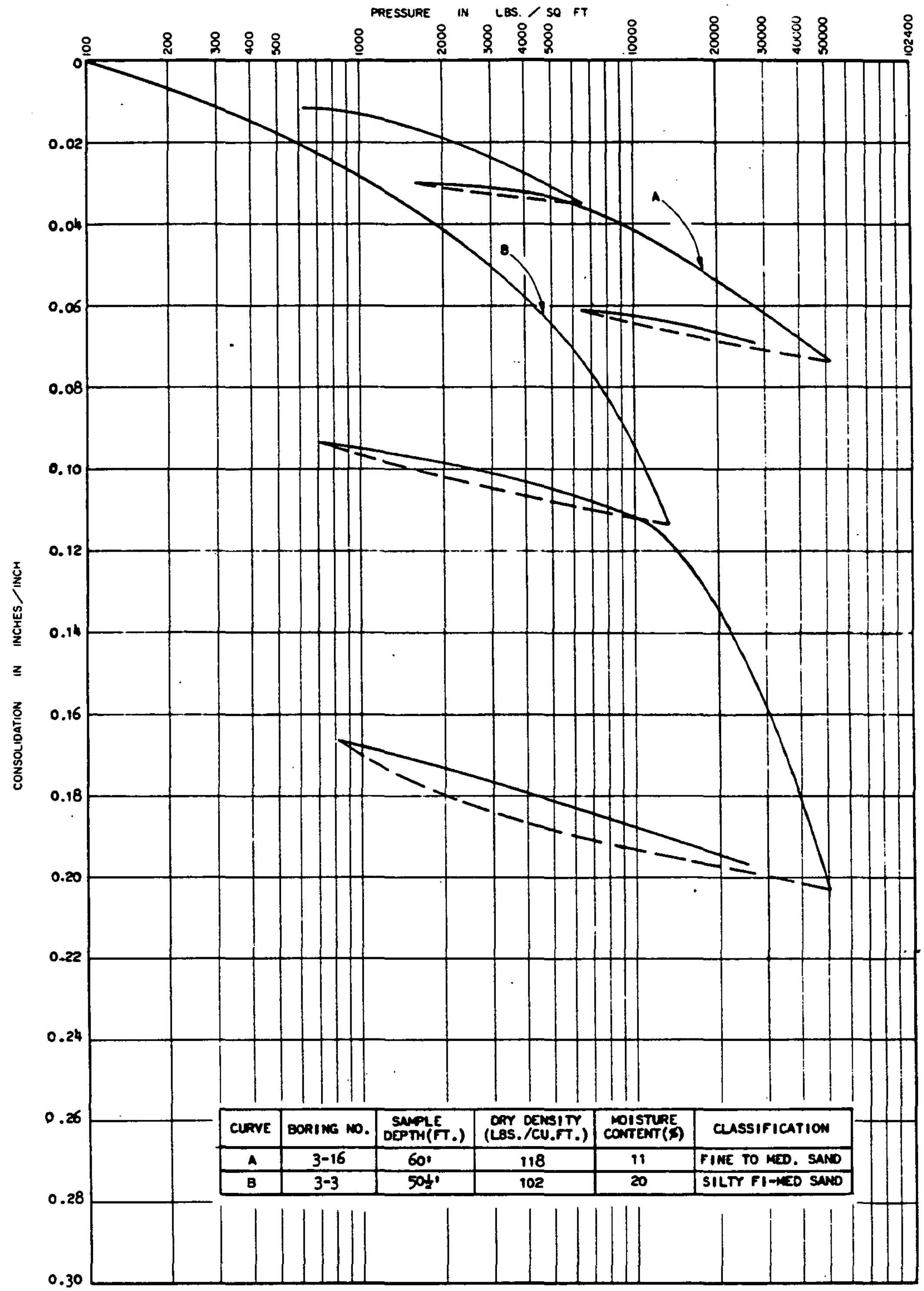
CURVE	BORING NO.	SAMPLE DEPTH(FT.)	DRY DENSITY (LBS./CU.FT.)	MOISTURE CONTENT(%)	CLASSIFICATION
A	3-9	8½'	85	37	SILTY FI-MED SAND

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test Data

Figure 2.5-55



CURVE	BORING NO.	SAMPLE DEPTH (FT.)	DRY DENSITY (LBS./CU.FT.)	MOISTURE CONTENT (%)	CLASSIFICATION
A	3-16	60'	118	11	FINE TO MED. SAND
B	3-3	50½'	102	20	SILTY FI-MED SAND

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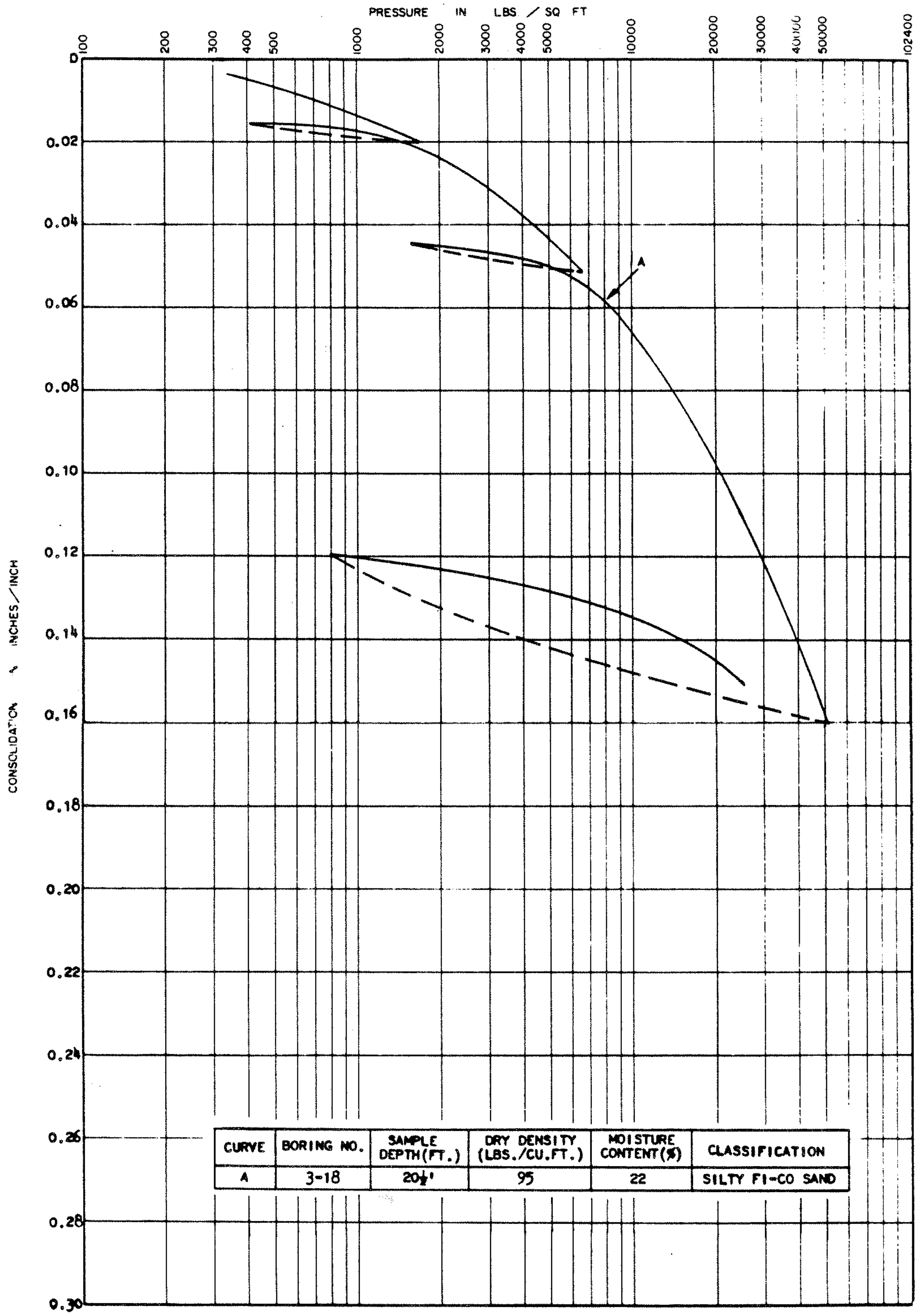
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test
Data

Figure 2.5-56



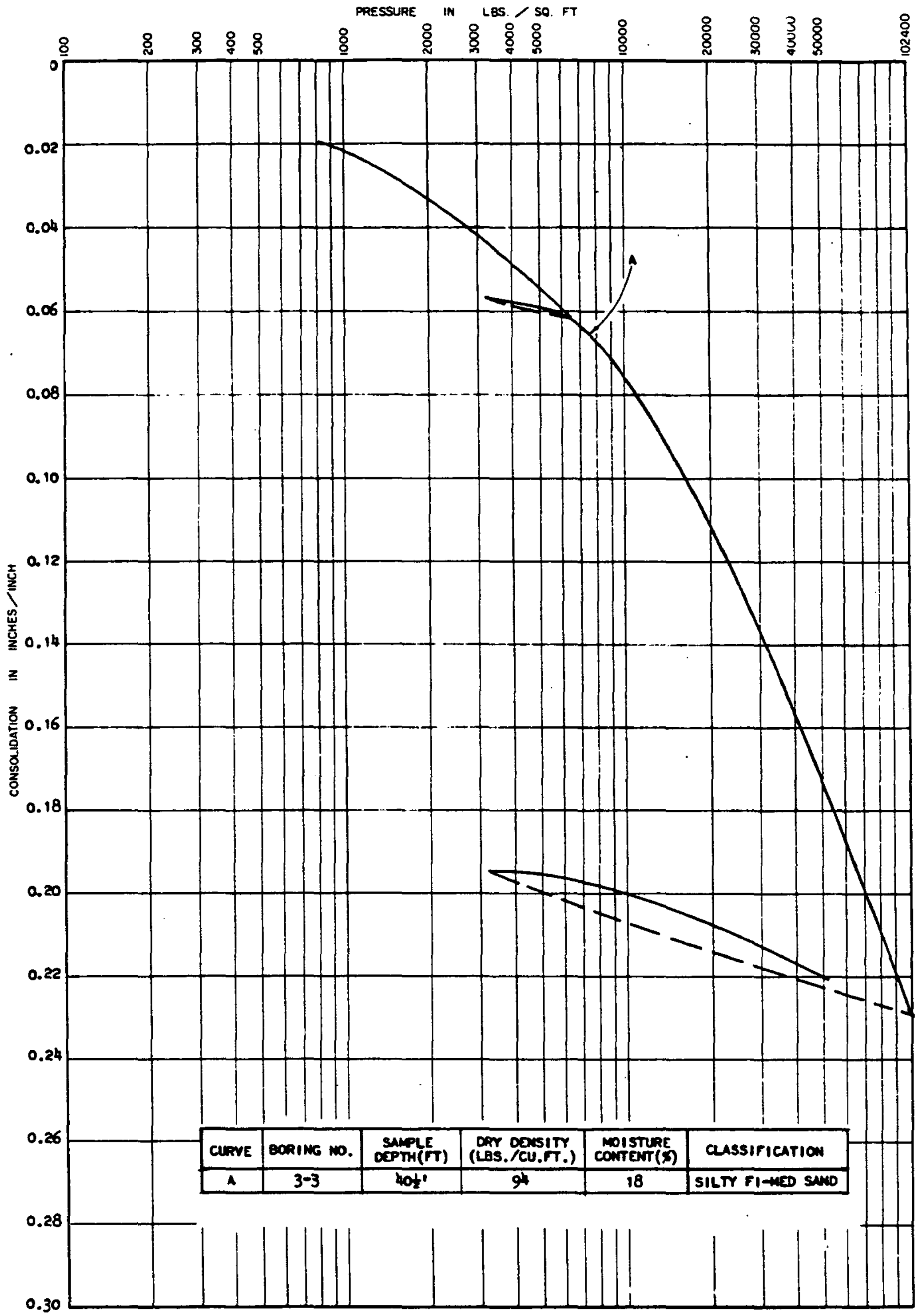
CURVE	BORING NO.	SAMPLE DEPTH(FT.)	DRY DENSITY (LBS./CU.FT.)	MOISTURE CONTENT(%)	CLASSIFICATION
A	3-18	20½'	95	22	SILTY FI-CO SAND

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test
Data

Figure 2.5-57



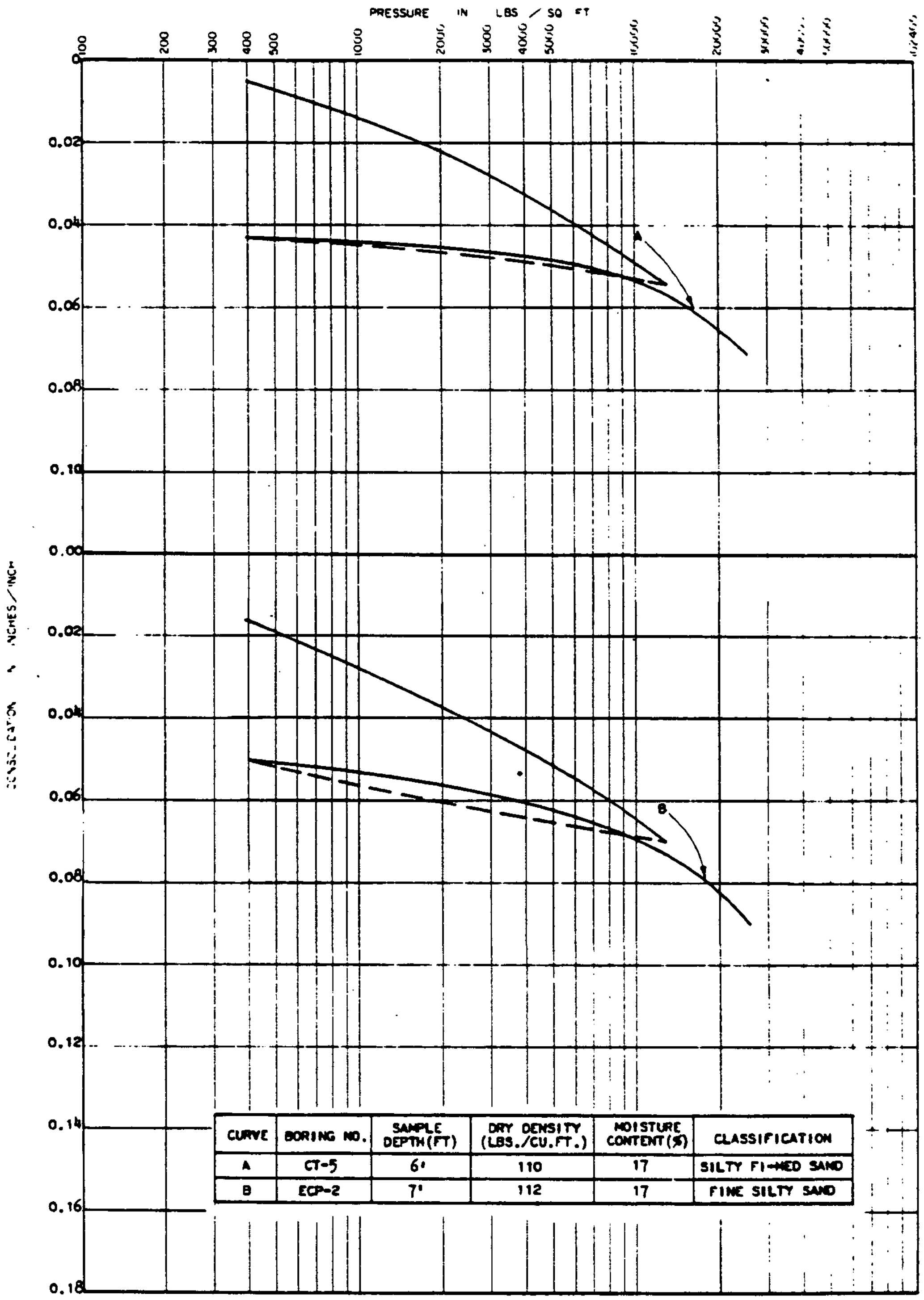
CURVE	BORING NO.	SAMPLE DEPTH(FT)	DRY DENSITY (LBS./CU.FT.)	MOISTURE CONTENT(%)	CLASSIFICATION
A	3-3	40½'	94	18	SILTY FI-MED SAND

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test Data

Figure 2.5-58



CURVE	BORING NO.	SAMPLE DEPTH (FT)	DRY DENSITY (LBS./CU.FT.)	MOISTURE CONTENT (%)	CLASSIFICATION
A	CT-5	6'	110	17	SILTY FI-MED SAND
B	ECP-2	7'	112	17	FINE SILTY SAND

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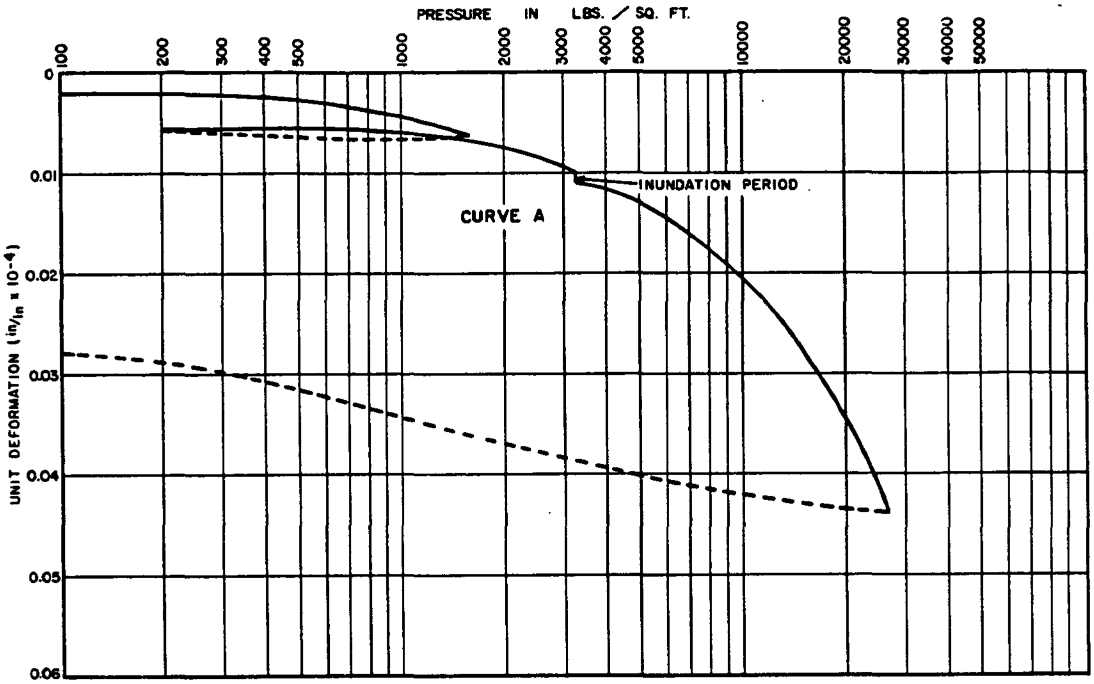
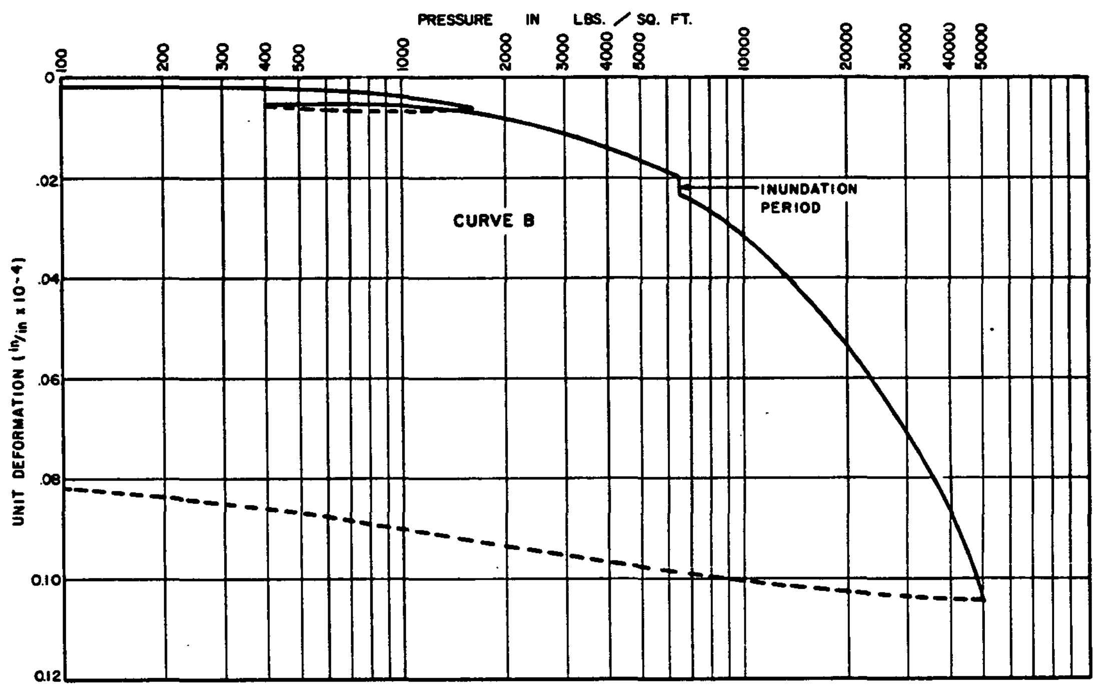
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test
Data

Figure 2.5-59





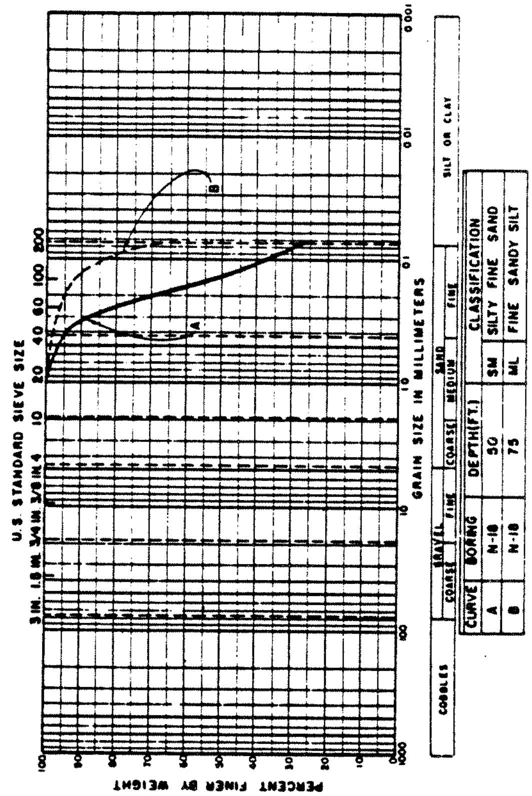
CURVE	BORING	SAMPLE DEPTH (FT.)
A	4-1	21
B	4-1	46

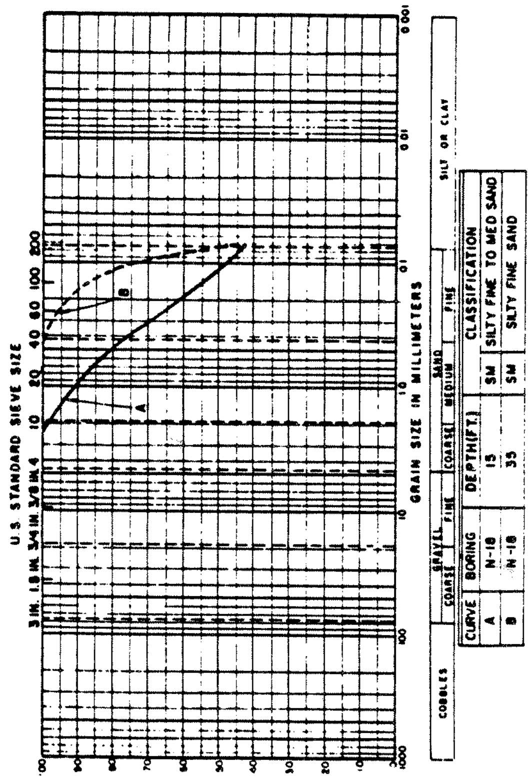
Amendment 0
August 1984

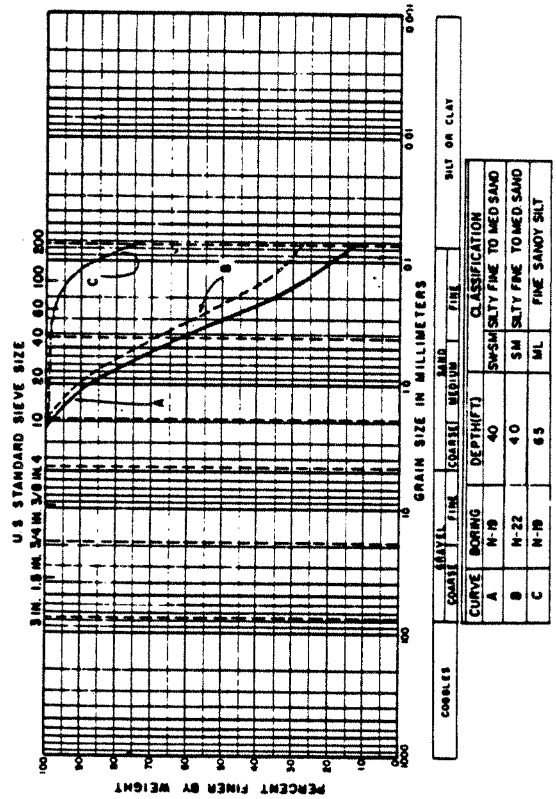
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test
Data

Figure 2.5-60







Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
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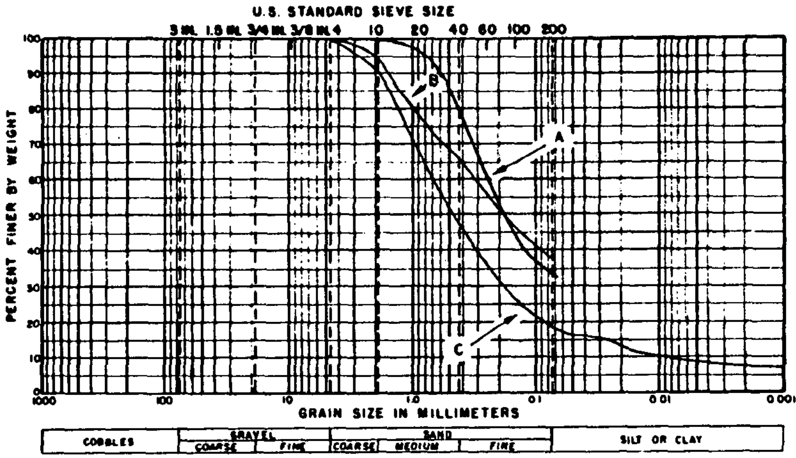
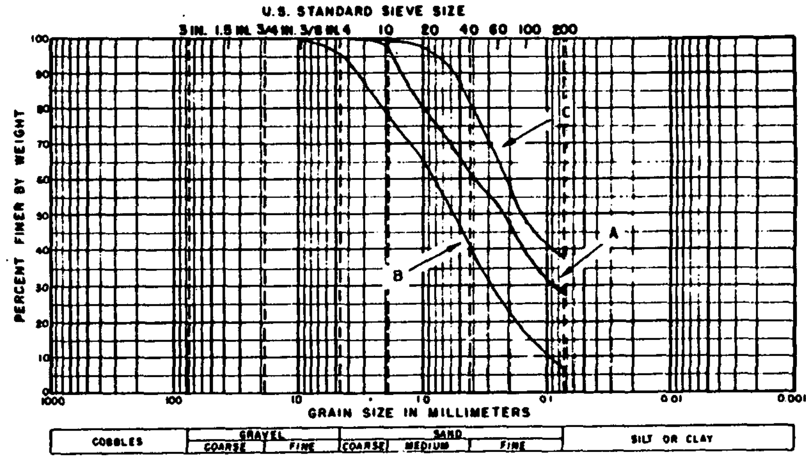
Gradation Curves

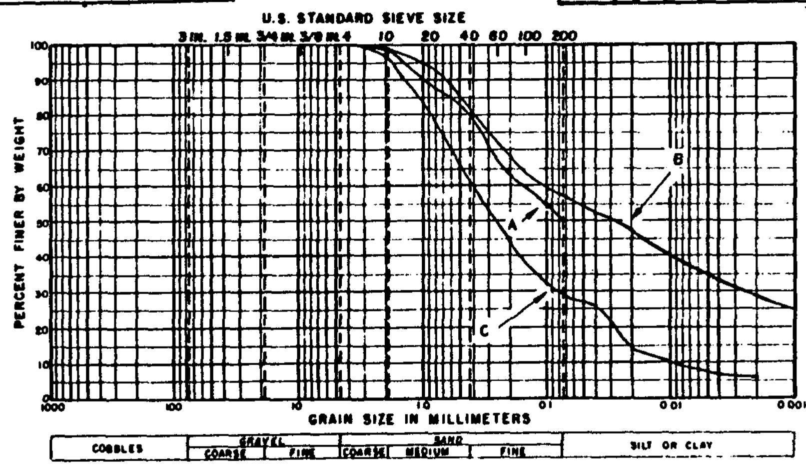
Figure 2.5-61



CURVE	BORING	DEPTH(FT.)	CLASSIFICATION	
A	3-17	25'	SM	SILTY FINE TO MED. SAND
B	3-20	30'	SM	SILTY FINE TO MED. SAND
C	AR-2	5'	ML/MH	SANDY CLAYEY SILT



CURVE	BORING	DEPTH(FT.)	CLASSIFICATION	
A	SSA-10	10½'	SM	SILTY FINE TO MED. SAND
B	3-13	45½'	SP/SW	SILTY FINE TO COARSE SAND
C	3-17	10'	SM	SILTY FINE TO COARSE SAND



CURVE	BORING	DEPTH(FT.)	CLASSIFICATION	
A	3-20	10'	ML	CLAYEY SANDY SILT
B	AR-2	1'	CL/ML	SANDY SILTY CLAY
C	AR-3	5'	SM	SILTY FINE TO MED. SAND

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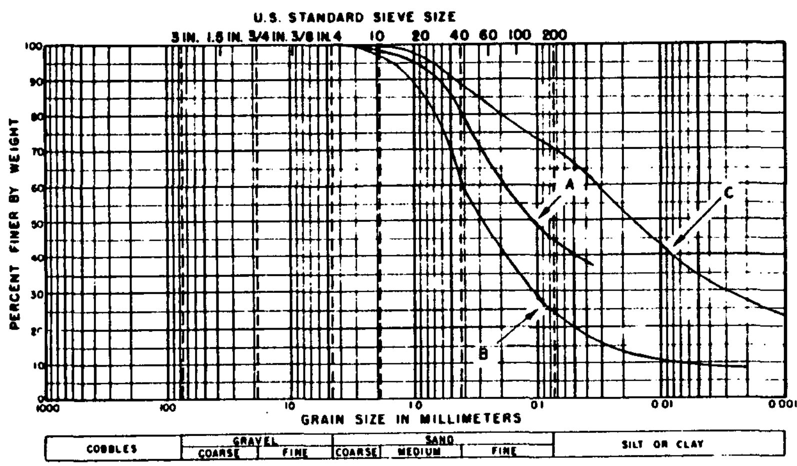
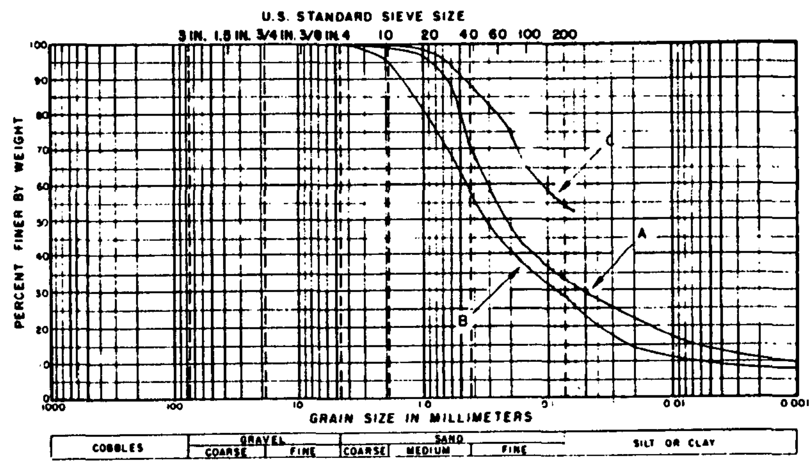
Gradation Curves

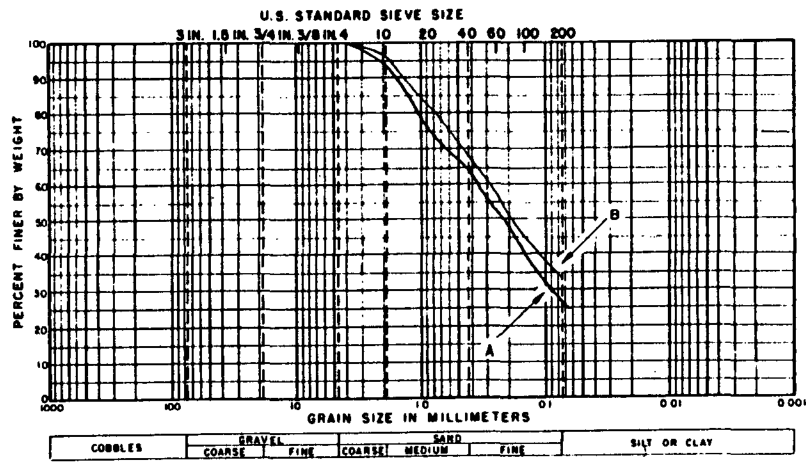
Figure 2.5-62



CURVE	BORING	DEPTH(FT.)	CLASSIFICATION	
A	3-17	30'	SM	SILTY FINE TO MED. SAND
B	AR-6	1'	SM	SILTY SAND
C	AR-6	5'	SM/CH	SANDY CLAYEY SILT



CURVE	BORING	DEPTH(FT.)	CLASSIFICATION	
A	AR-9	1½'	SM/ML	CLAYEY SILTY SAND
B	AR-7	1½'	SC/SM	SANDY CLAY
C	SSA-8	10½'	ML	SANDY CLAYEY SILT



CURVE	BORING	DEPTH(FT.)	CLASSIFICATION	
A	SSA-10	30½'	SM	SILTY FINE TO MED. SAND
B	SSA-6	10½'	SC	CLAYEY SAND

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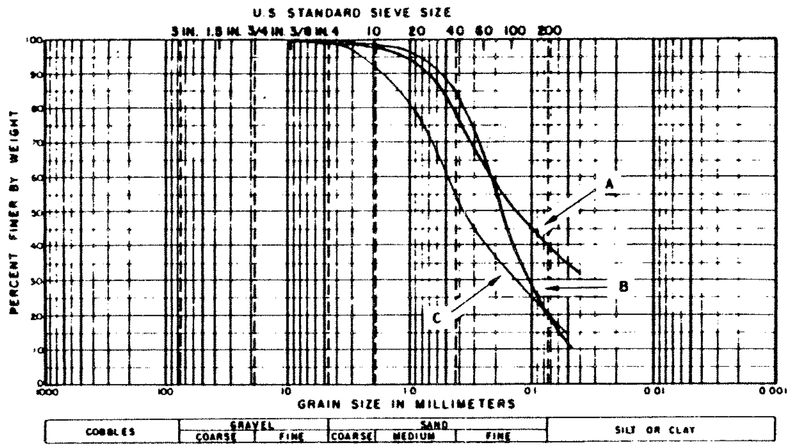
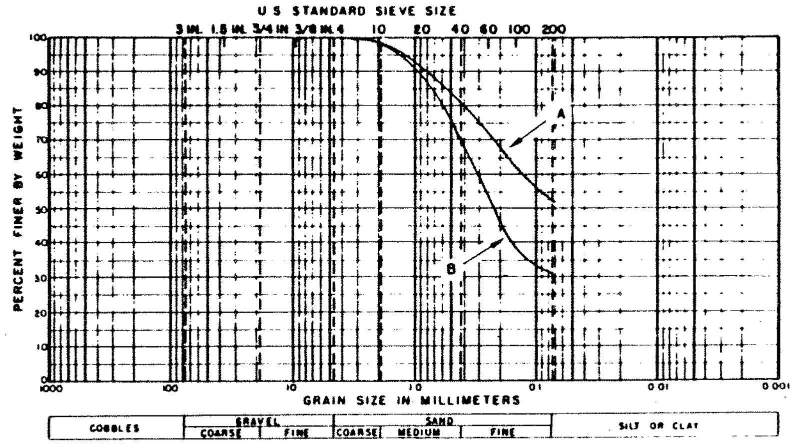
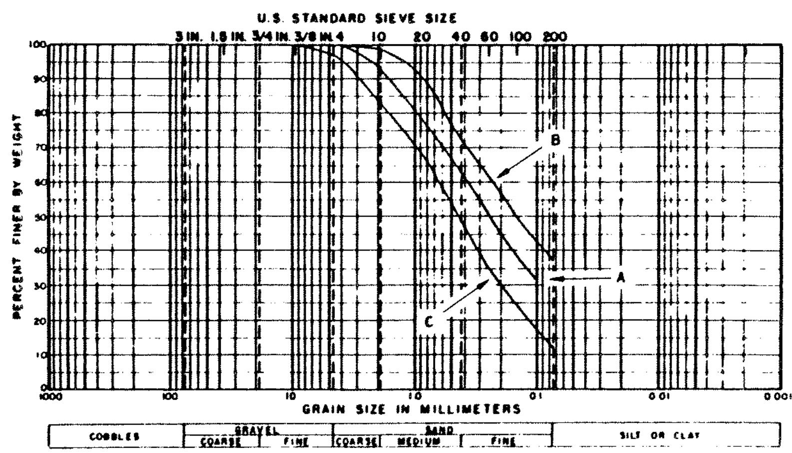
Figure 2.5-63



CURVE	BORING	DEPTH(FT)	CLASSIFICATION	
A	3-2	40'	SM	SILTY FINE TO MED. SAND
B	3-3	60½'	SM	SILTY FINE TO MED. SAND
C	3-9	75½'	SM	SILTY FINE TO MED. SAND



CURVE	BORING	DEPTH(FT.)	CLASSIFICATION	
A	3-9	10½'	SM/ML	SANDY SILT
B	3-9	½'	SC	SILTY CLAYEY SAND



CURVE	BORING	DEPTH(FT)	CLASSIFICATION	
A	3-9	40½'	SM	SILTY FINE SAND
B	3-10	½'	SC	SILTY CLAYEY SAND
C	3-13	40½'	SP/SM	SILTY FINE TO COARSE SAND

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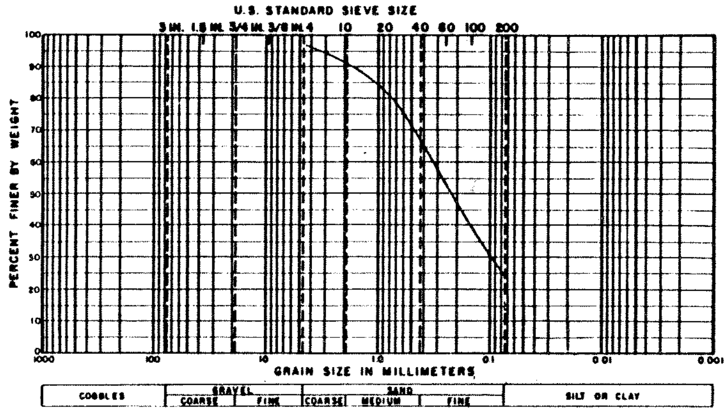
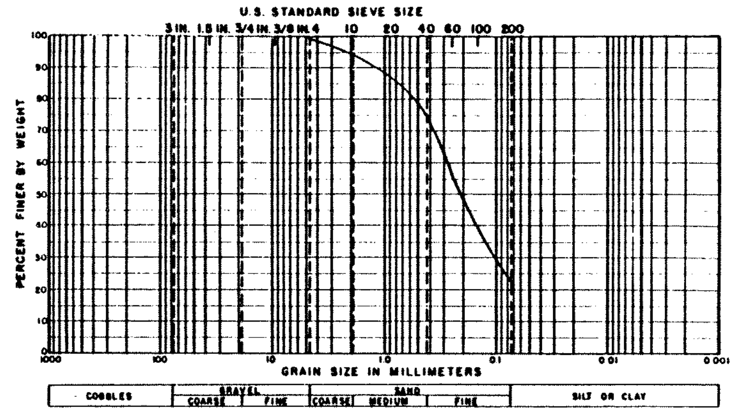
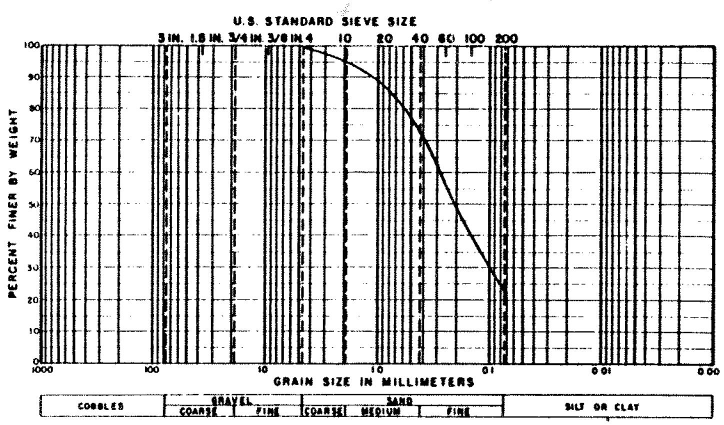
Figure 2.5-64



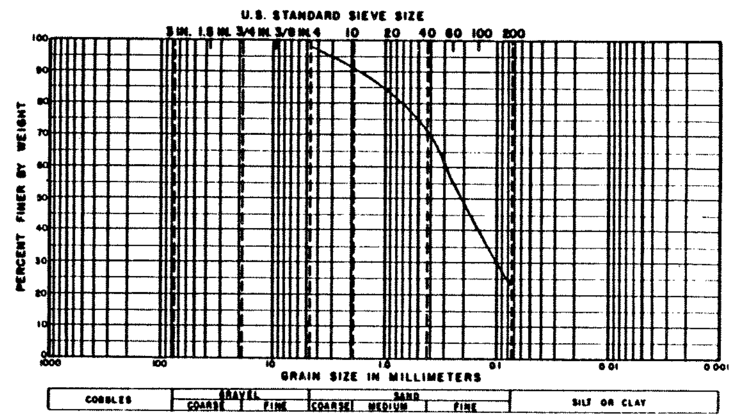
BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-1	8'	2	N.P.	SM	MOTTLED BROWN SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-1	15'	5A		SM	BROWN MICACEOUS SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-1	15'	5B		SM	BROWN MICACEOUS SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-1	18'-6"	6	N.P.	SM	MOTTLED-BROWN SILTY SAND

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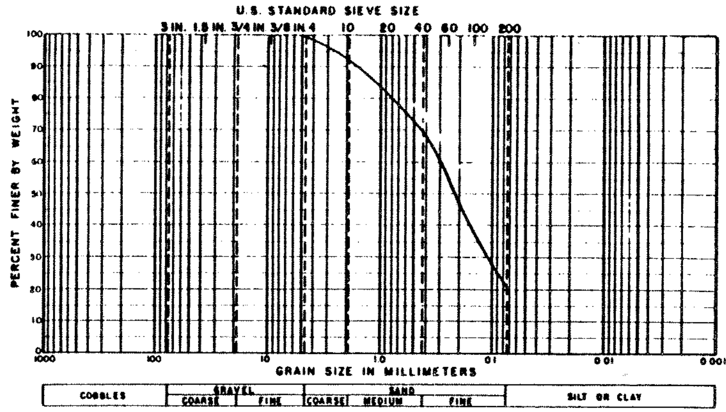
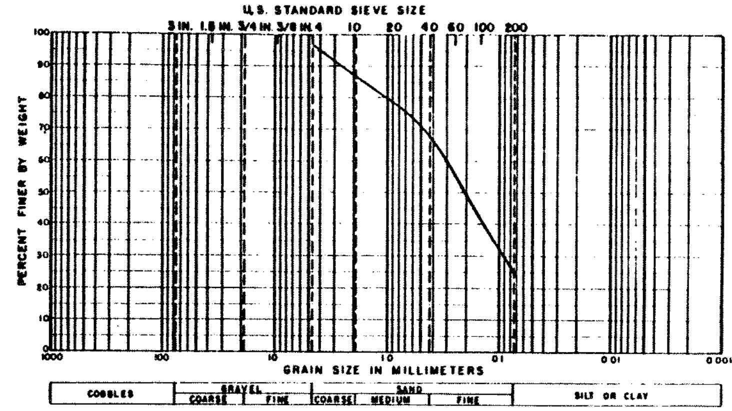
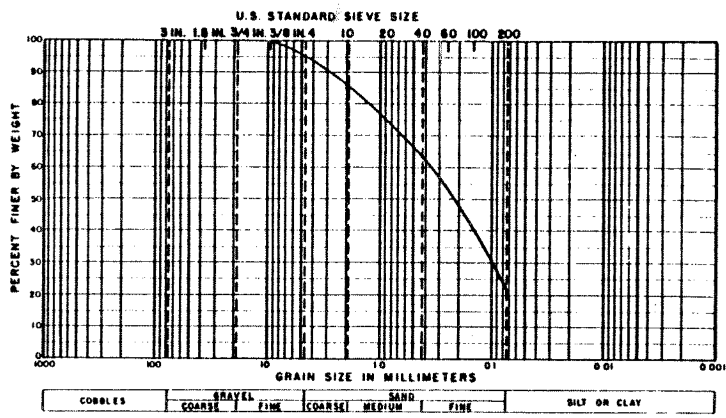
Figure 2.5-65



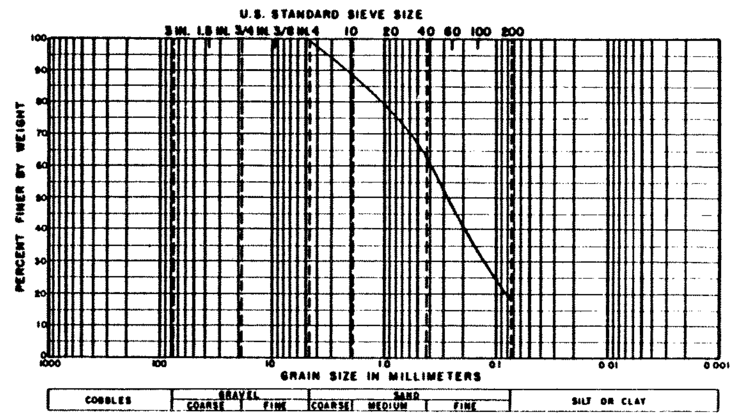
BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4 - 1	25'	9A		SM	BROWN MICACEOUS SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4 - 1	25'	9B		SM	BROWN MICACEOUS SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4 - 1	25'	9C		SM	BROWN MICACEOUS SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4 - 1	28'-6"	10	NP	SM	BROWN SILTY SAND

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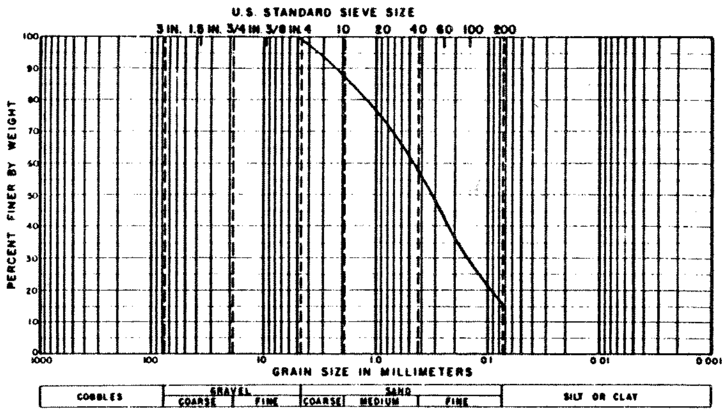
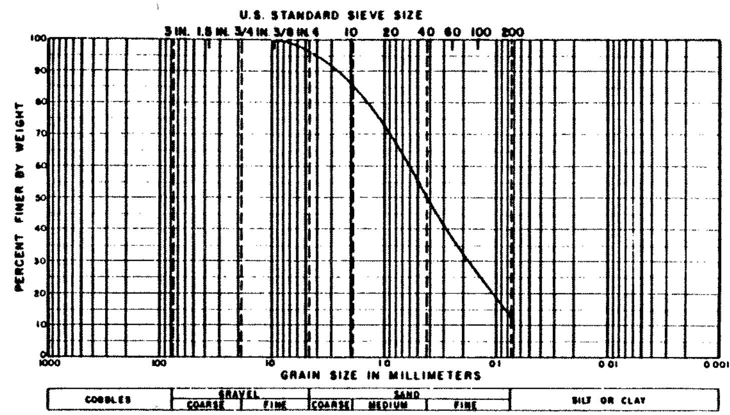
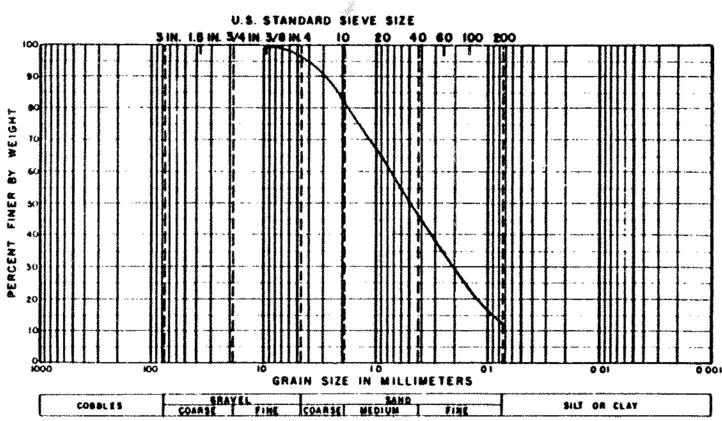
Figure 2.5-66



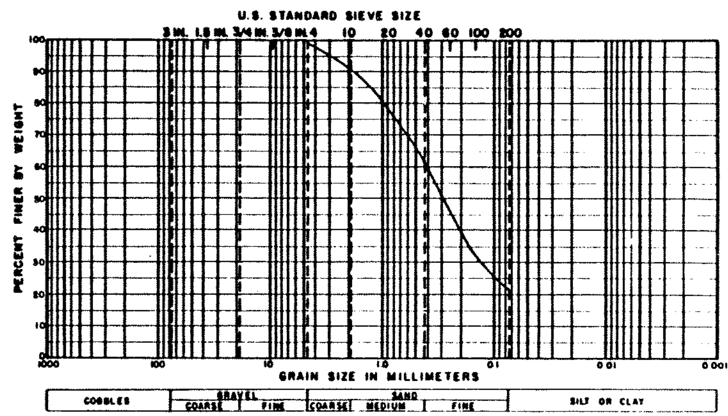
BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4 - 1	30 5'	11		SM	BROWN MICACEOUS SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4 - 1	35'	13A		SM	BROWN MICACEOUS SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4 - 1	35'	13B		SM	BROWN MICACEOUS SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4 - 1	37'-3"	14	NP	SM	BROWN SILTY SAND

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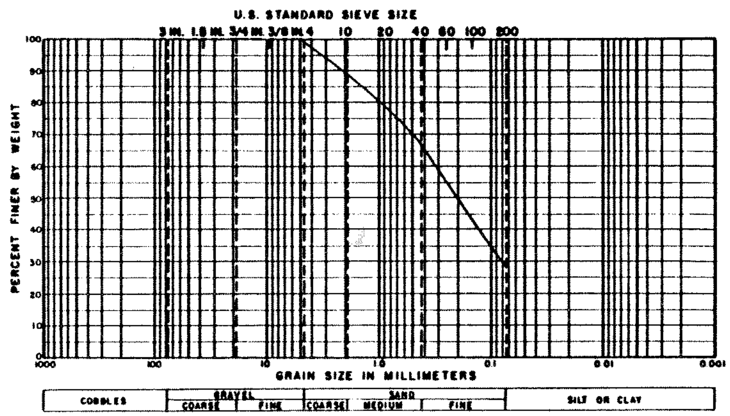
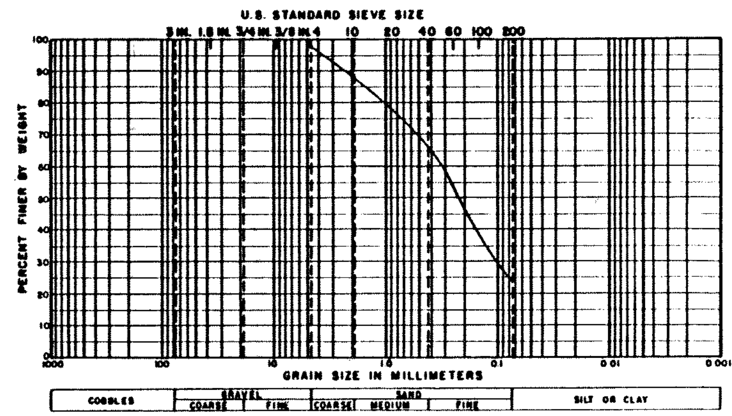
Figure 2.5-67



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4 - 1	47'-10"	18	N.P.	SM	MOTTLED-BROWN SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4 - 1	52'-6"	20	N.P.	SM	MOTTLED BROWN SILTY SAND

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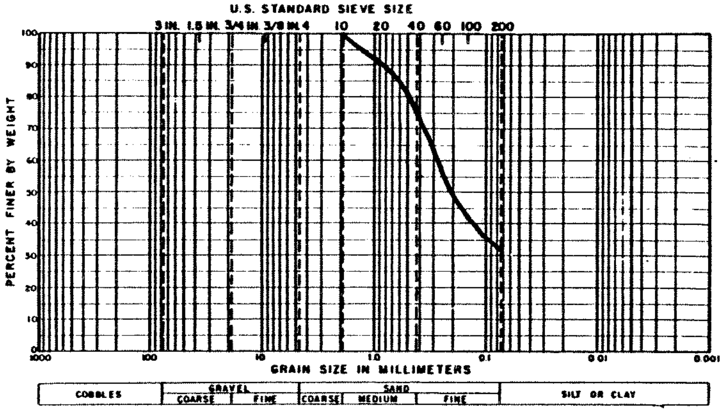
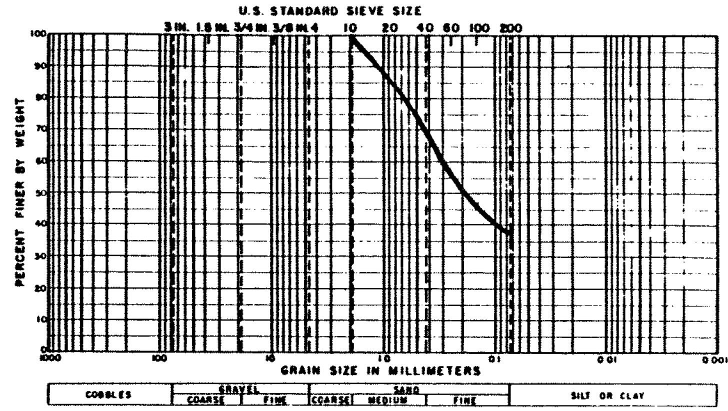
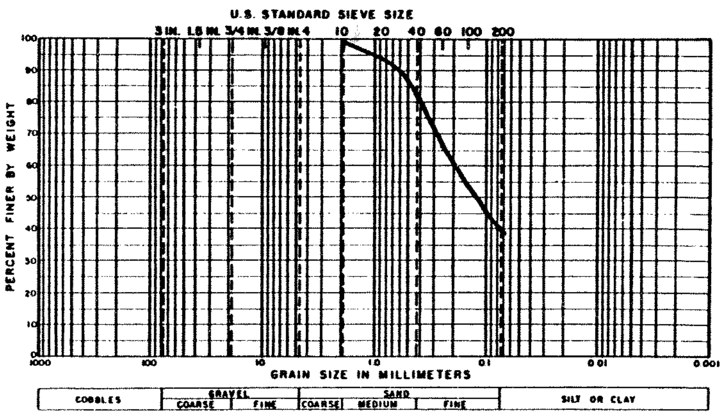
Figure 2.5-68



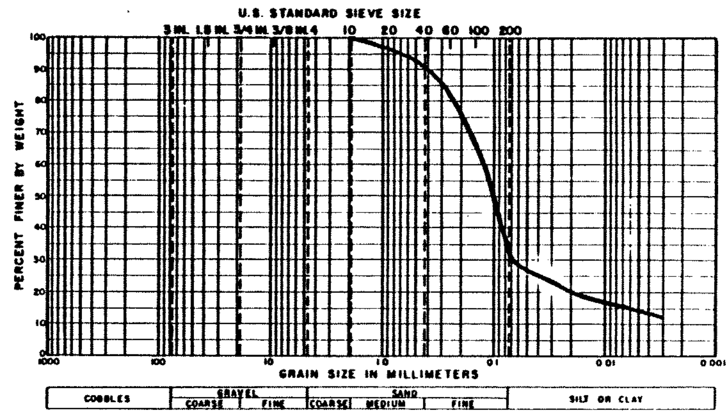
BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-2	17	6		SM	SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-2	32	12		SM	SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-2	37	14		SM	SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-2	52	20		SM	SILTY SAND

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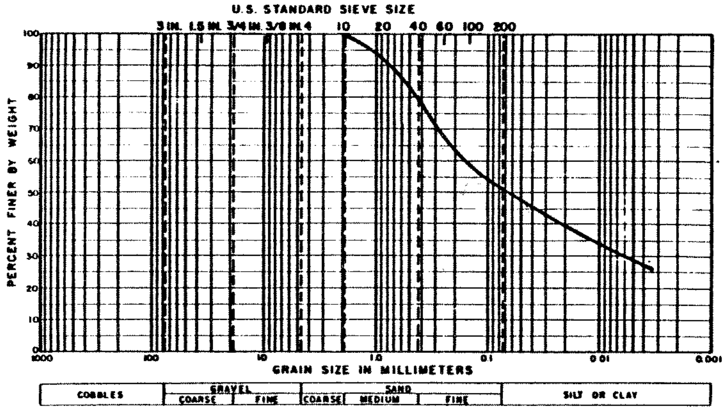
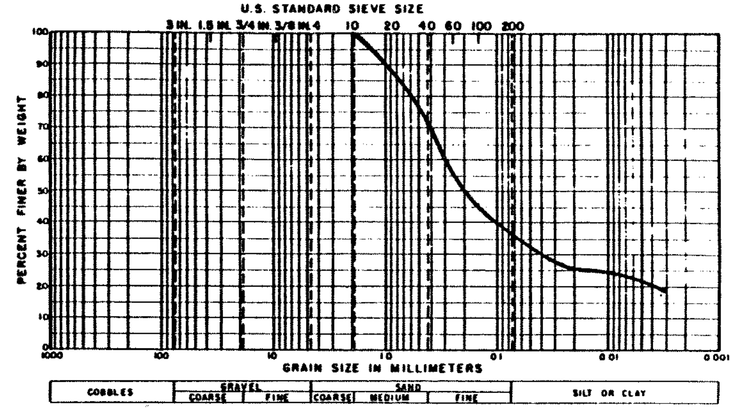
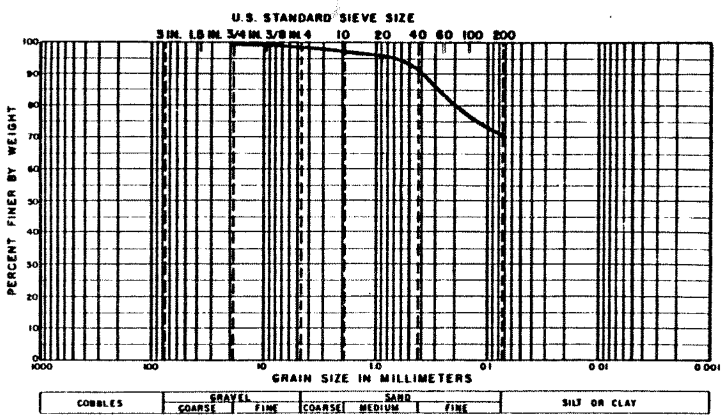
Figure 2.5-69



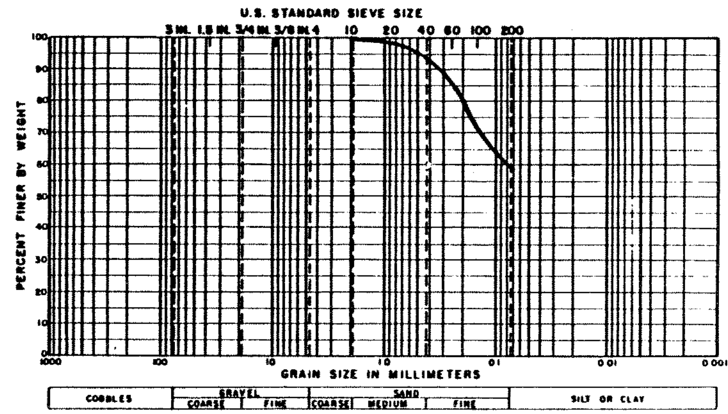
BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-2	54.5	21		CL	SILTY CLAY



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-2	57.5	22		SM	SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-3	12.5	3		CL	SILTY CLAY



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-3	17.5	4		ML	CLAYEY SILT

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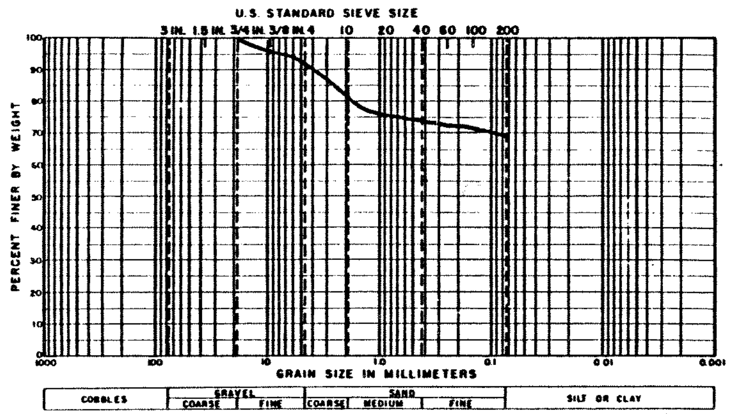
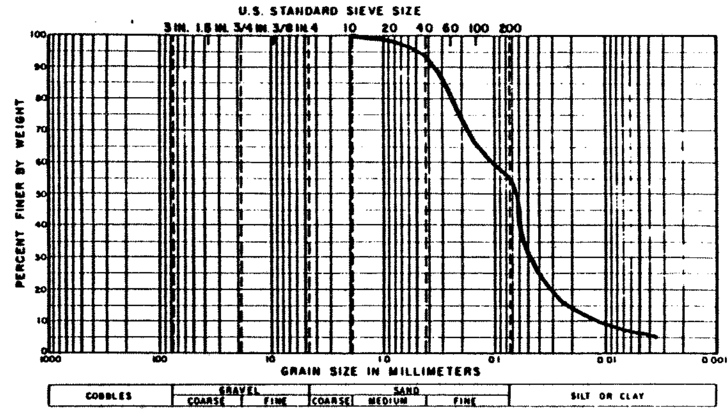
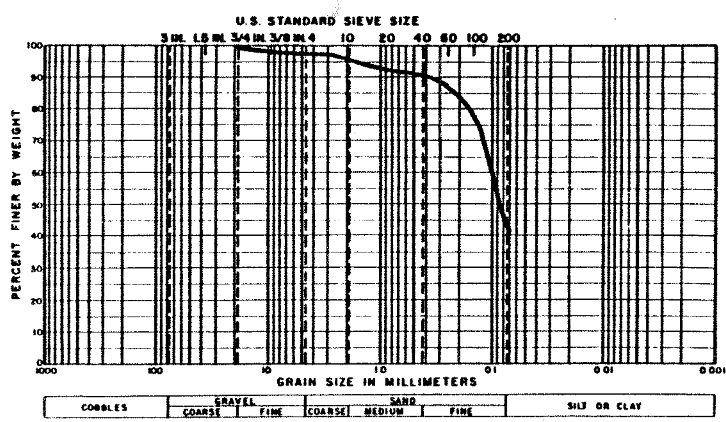
Figure 2.5-70



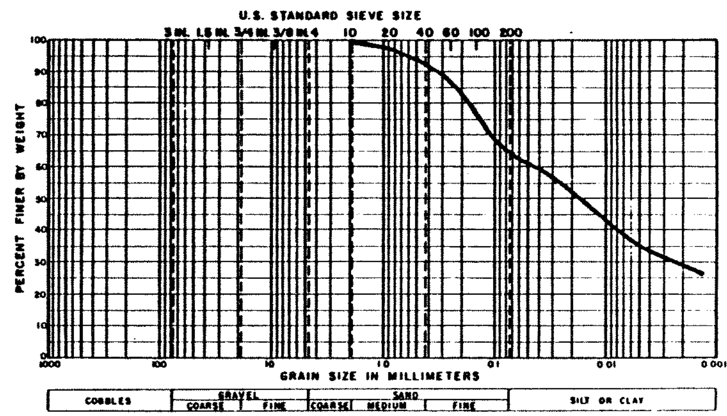
BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-3	22.5	5		CL	SILTY CLAY



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-3	37.5	8		SM	SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-3	52.5	11		SM	SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-4	4.5	1		CL	SILTY CLAY

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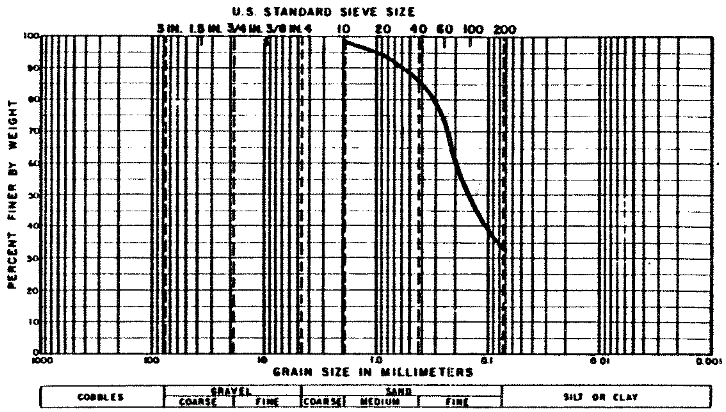
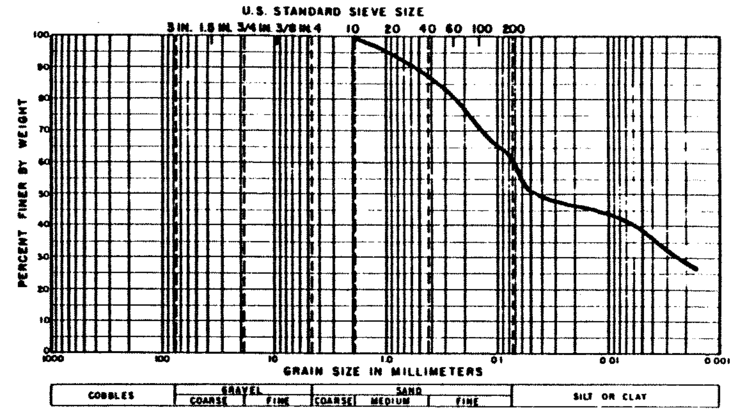
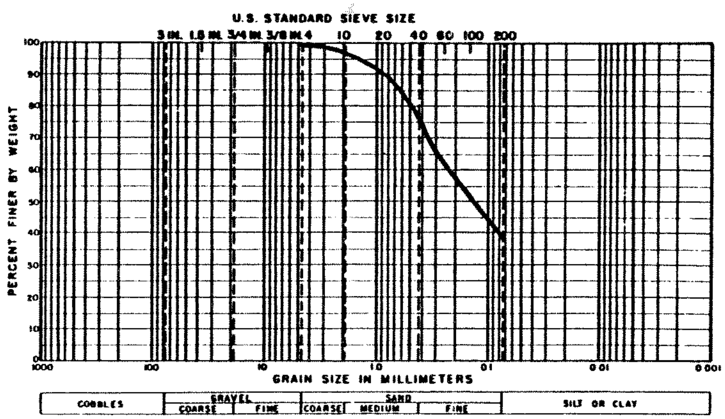
Figure 2.5-71



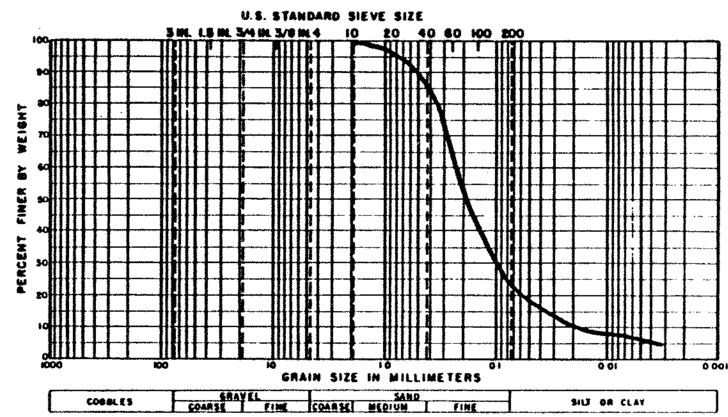
BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-4	9.5	2		SM	SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-4	19.5	6		CL	SILTY CLAY



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-4	27	8		SM	SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-4	62	18		SM	SILTY SAND

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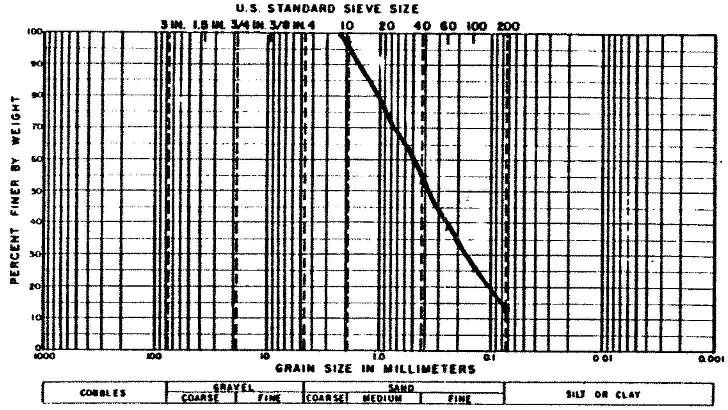
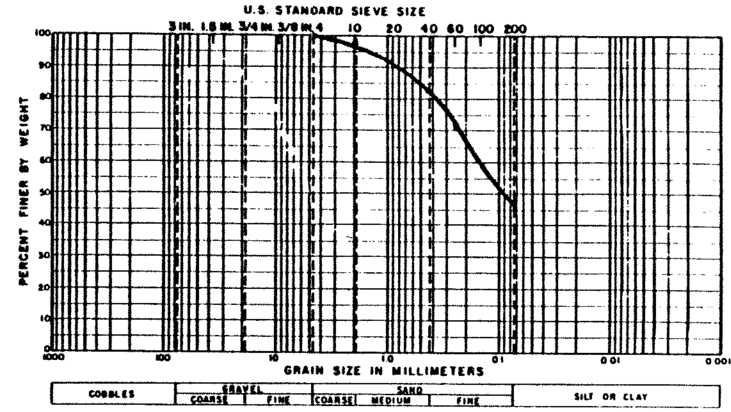
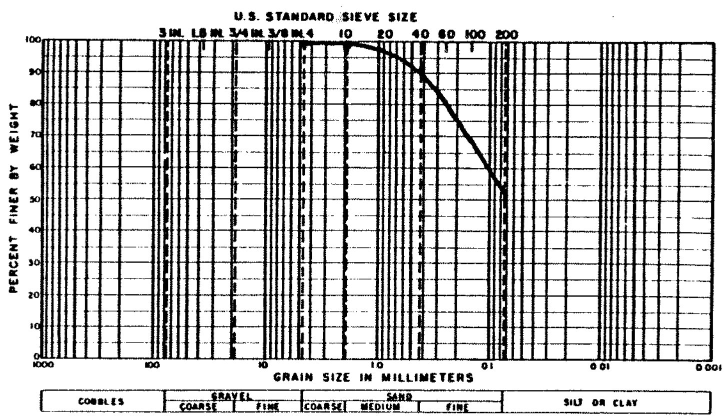
Figure 2.5-72



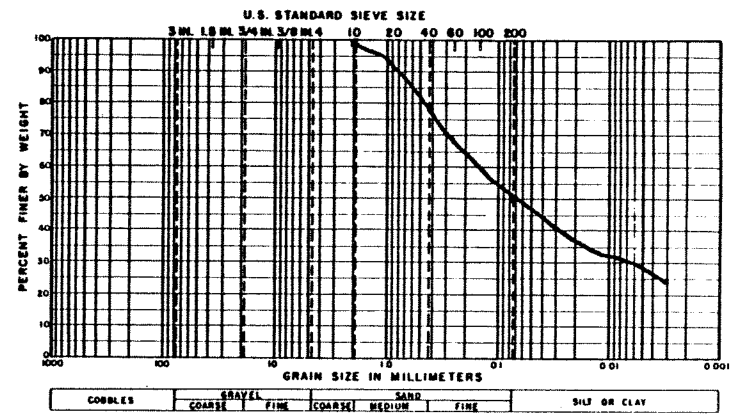
BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-5	14.5	5		SM	SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-6	24.5	6		SM	SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-6	39.5	11		ML	CLAYEY SILT



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-6	44.5	12		CL	SILTY CLAY

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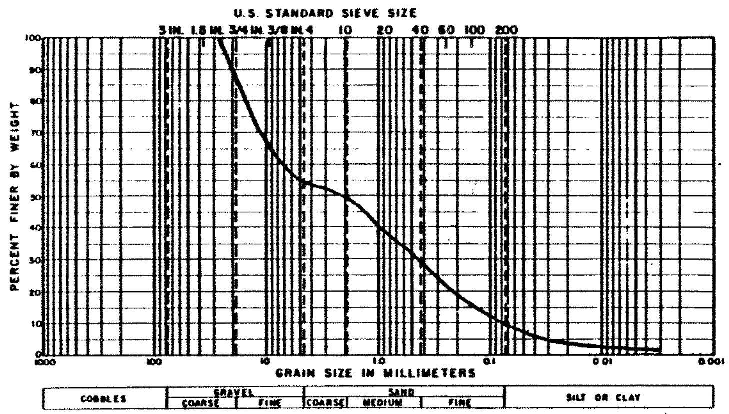
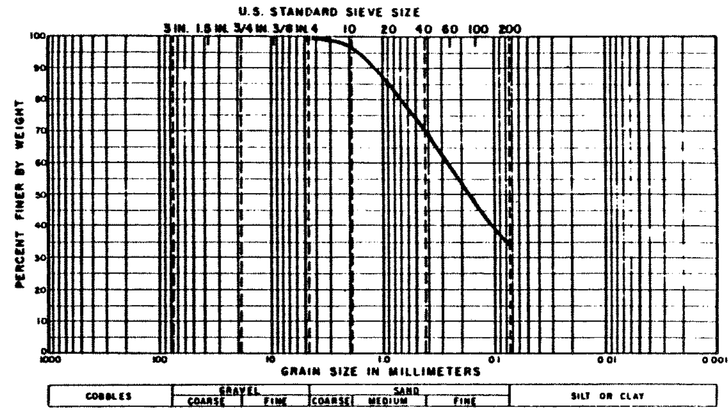
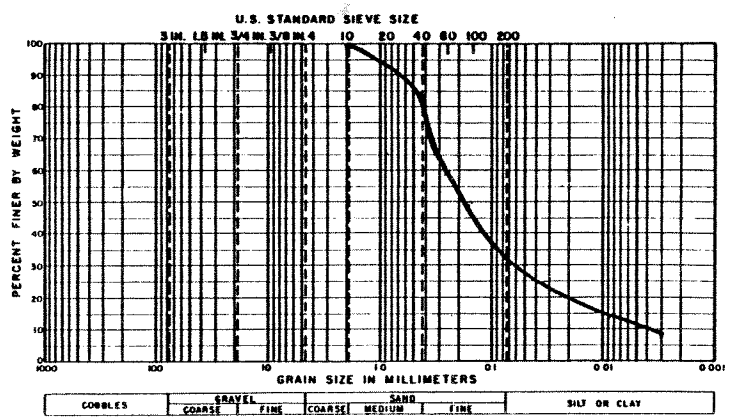
Figure 2.5-73



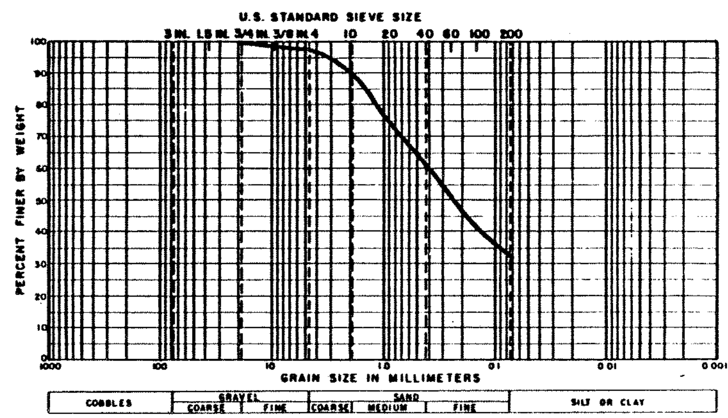
BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4.6	64.5	20		GP	SANDY GRAVEL



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-7	4.5	1		SM	SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-7	14.5	4		SM	SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-7	19.5	6		SM	SILTY SAND

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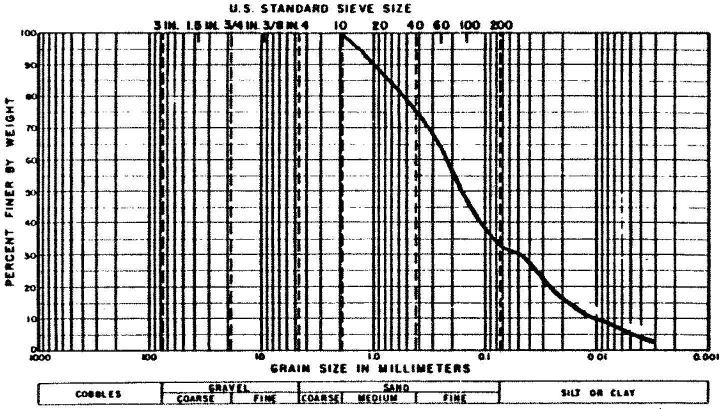
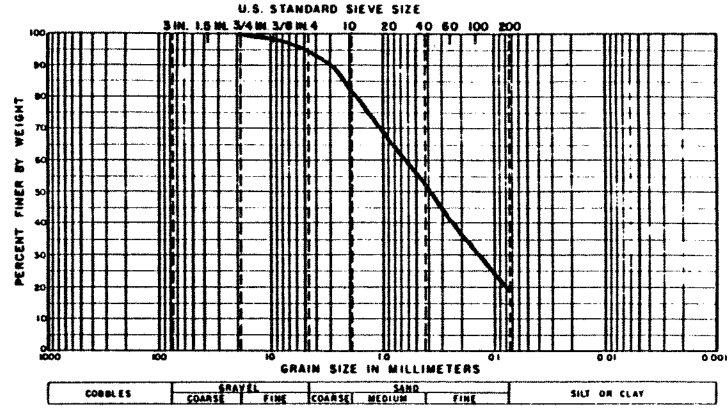
Gradation Curves

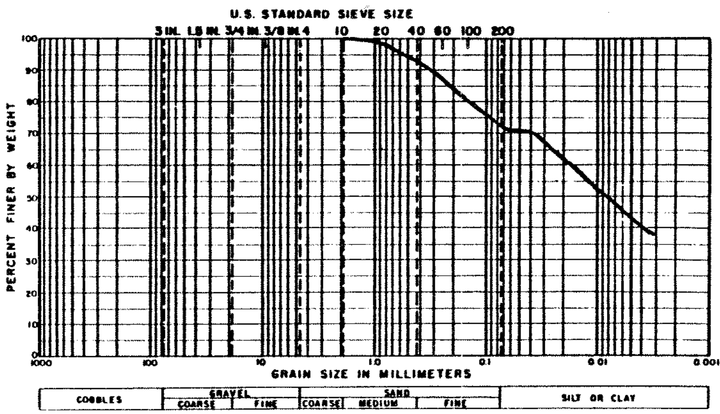
Figure 2.5-74



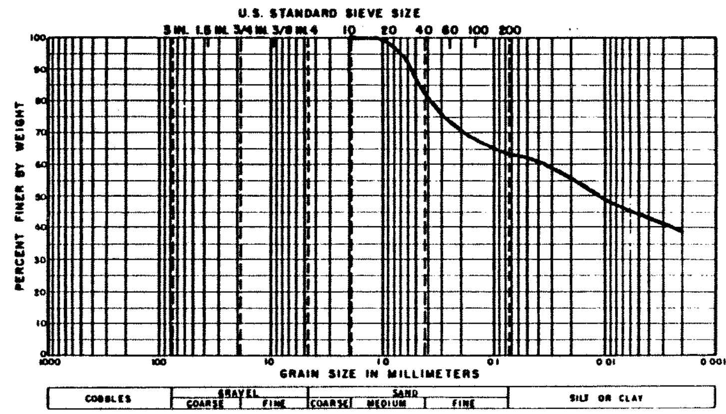
BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-7	34.5	11		SM	SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-7	42	13		SM	SILTY SAND



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-8	14.5	5		CL	SILTY CLAY



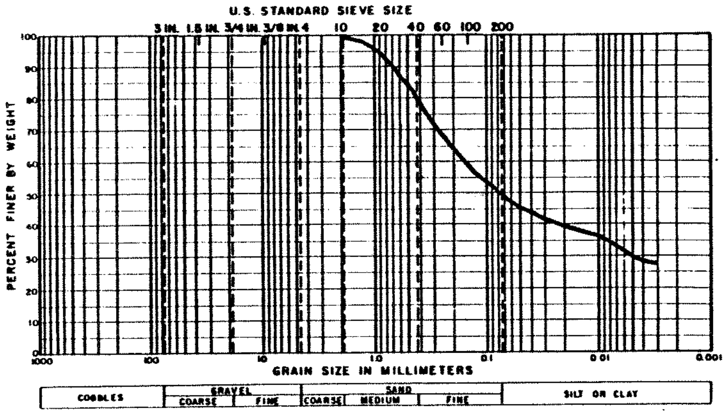
BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-8	44.5	16		CL	SILTY CLAY

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

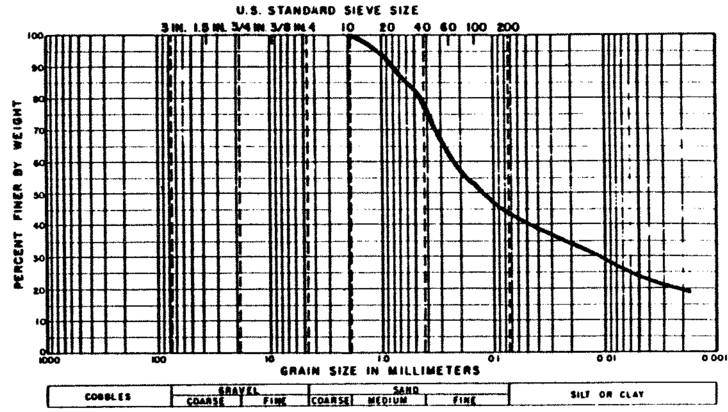
Gradation Curves

Amendment 0
August 1984

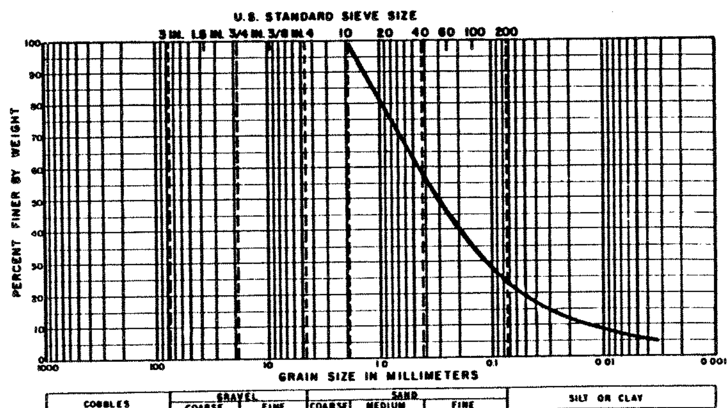
Figure 2.5-75



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-8	49.5	18		CL	SILTY CLAY



BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-8	54.5	20		SC	CLAYEY SAND



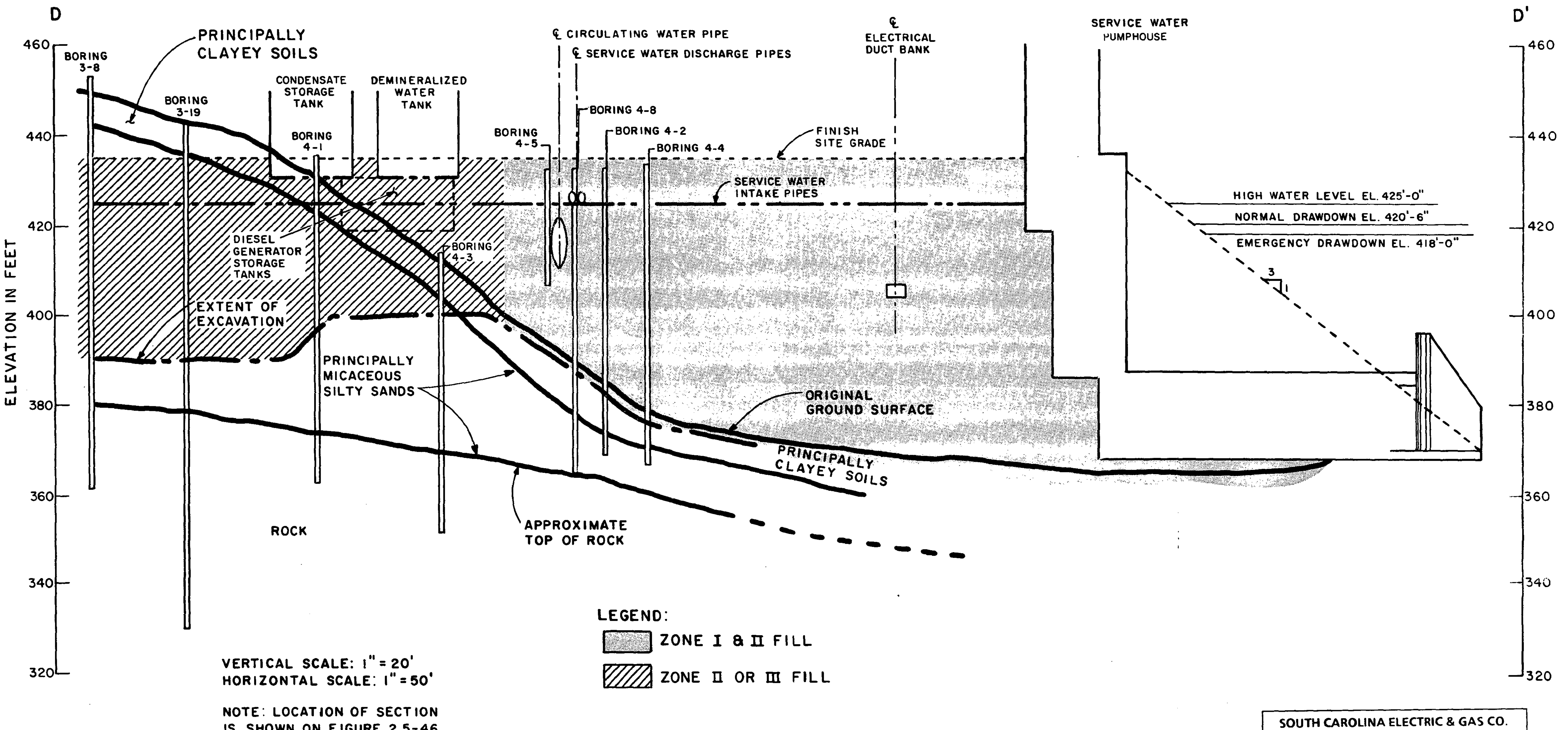
BORING	DEPTH	SAMPLE	LIQUID LIMIT	SYMBOL	SOIL CLASSIFICATION
4-8	59.5	21		SM	SILITY SAND

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Gradation Curves

Figure 2.5-76



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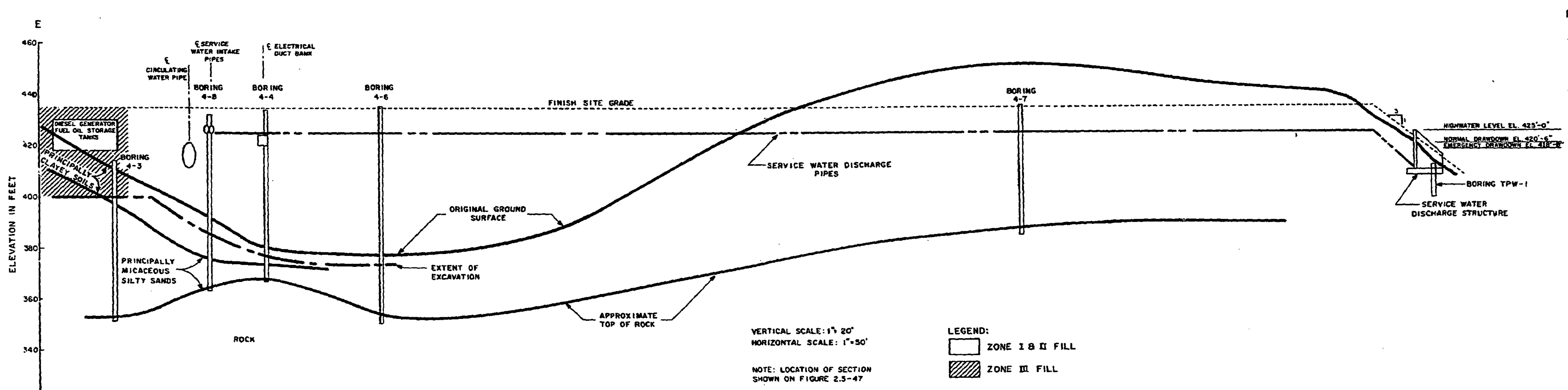
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Cross Section D - D'

Figure 2.5-80

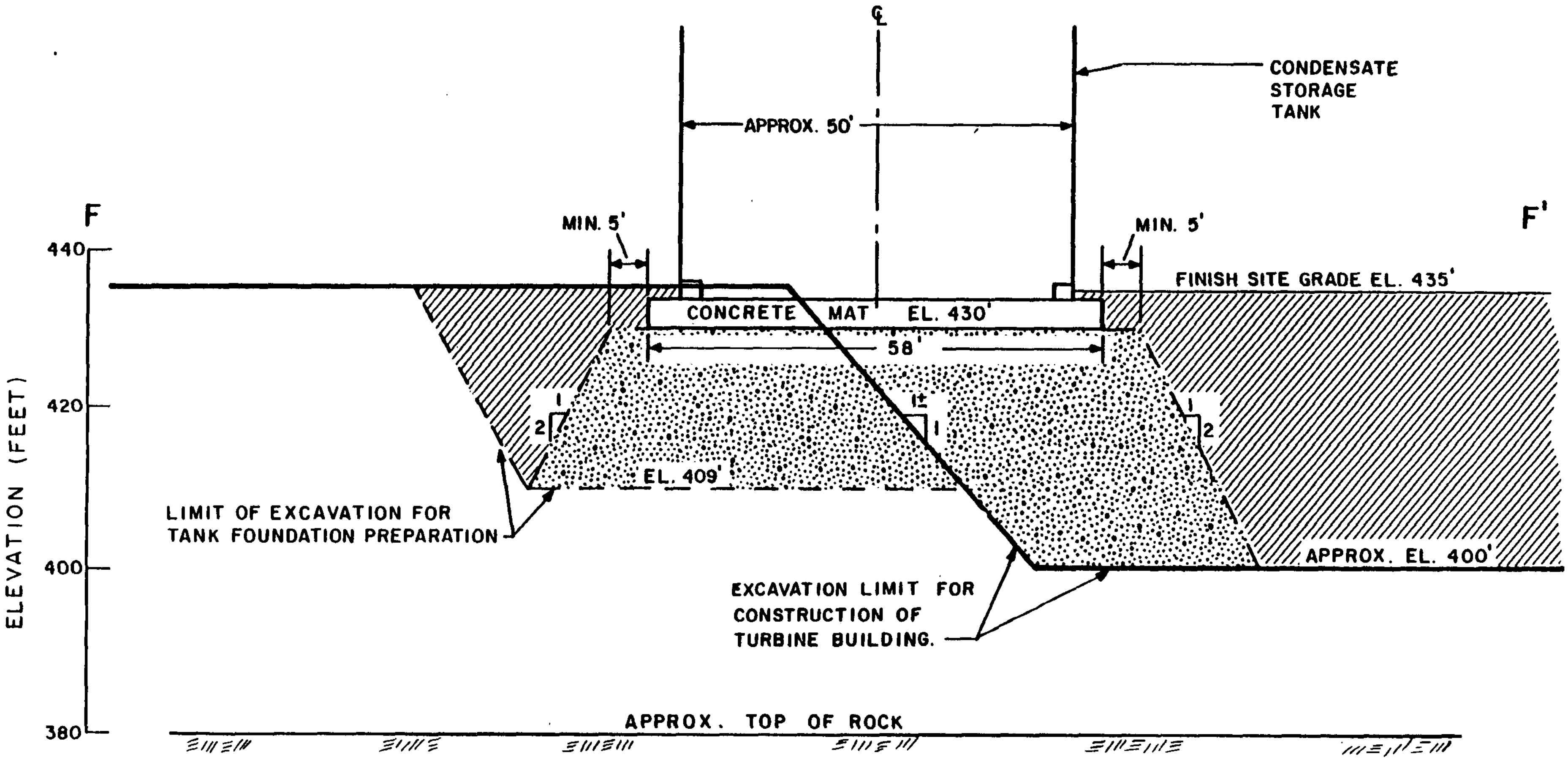


Amendment 98-01
April 1998

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Cross Section "E-E"

Rev. 1
Figure 2.5-81



SCALE: 1" = 20' HORIZONTAL AND VERTICAL

LEGEND:

- COMPACTED ZONE III MATERIAL (FOUNDATION SUPPORT ZONE)
- COMPACTED ZONE I, II, OR III MATERIAL IN ACCORDANCE WITH CONSTRUCTION PLANS AND SPECIFICATIONS

NOTE: LOCATION OF SECTION IS SHOWN ON FIGURE 2.5-46

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Cross Section F - F'

Figure 2.5-82

P■ INDICATES UNDISTURBED SAMPLE WITH 3 INCH O.D. SHELBY TUBE HYDRAULICALLY PUSHED

P☒ INDICATES DISTURBED SAMPLE WITH 3 INCH O.D. SHELBY TUBE HYDRAULICALLY PUSHED

■ INDICATES UNDISTURBED SAMPLE WITH DAMES & MOORE TYPE U SAMPLER (3.25 INCHES O.D., 2.42 INCHES I.D. SPLIT SPOON SAMPLER)

☒ INDICATES DISTURBED SAMPLE WITH DAMES & MOORE TYPE U SAMPLER

*◪ INDICATES DISTURBED SAMPLE WITH 2 INCH O.D. SAMPLER (STANDARD PENETRATION TEST)

◪ INDICATES DISTURBED SAMPLE WITH 2 INCH O.D. SAMPLER (NOT STANDARD PENETRATION TEST)

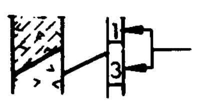
☐ INDICATES SAMPLE ATTEMPT WITH NO RECOVERY

27■ INDICATES NUMBER OF BLOWS REQUIRED TO DRIVE DAMES & MOORE OR STANDARD PENETRATION SAMPLER 1 FOOT. SAMPLER DRIVING ENERGY IS DESCRIBED ON EACH BORING LOG.

TW■ INDICATES UNDISTURBED SAMPLE WITH DAMES & MOORE TYPE U SAMPLER AND THIN-WALLED SAMPLING TUBE ATTACHMENT HYDRAULICALLY PUSHED

TW☒ INDICATES DISTURBED SAMPLE WITH DAMES & MOORE TYPE U SAMPLER AND THIN-WALLED SAMPLING TUBE ATTACHMENT HYDRAULICALLY PUSHED

TW☐ INDICATES NO RECOVERY WITH DAMES & MOORE TYPE U SAMPLER AND THIN-WALLED SAMPLING TUBE ATTACHMENT HYDRAULICALLY PUSHED



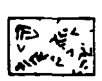
INDICATES GENERALIZED ROCK PROPERTY INDICATOR (DETAILED DESCRIPTION PRESENTED IN SECTION 2.5.4.4.1)

1. RELATIVELY MASSIVE FRESH ROCK
2. RELATIVELY MODERATELY WEATHERED AND/OR MODERATELY JOINTED
3. RELATIVELY HIGHLY WEATHERED AND/OR HIGHLY JOINTED

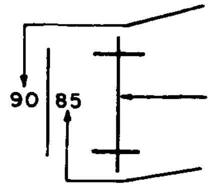
-ROCK IDENTIFICATION-

 GRANODIORITE

 MIGMATITE OF GRANODIORITE COMPOSITION

 CONTACT BRECCIA MIGMATITE

 MIGMATITE OF GNEISSIC COMPOSITION



INDICATES PER CENT CORE RECOVERY = $\frac{\text{LENGTH OF CORE}}{\text{LENGTH OF RUN}} \times 100$

INDICATES LENGTH OF CORE RUN

INDICATES ROCK QUALITY DESIGNATION (RQD)

$$(\text{RQD}) = \frac{\text{SUM OF CORE SEGMENTS} \geq 4 \text{ INCHES LONG}}{\text{LEGNTH OF RUN}} \times 100$$

MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO 200 SIEVE SIZE				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING NO 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICTY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

SOIL CLASSIFICATION CHART

NOTES:

1. DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE CLASSIFICATIONS.
2. WHEN SHOWN ON THE BORING LOGS, THE FOLLOWING TERMS ARE USED TO DESCRIBE THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE COMPACTNESS OF COHESIONLESS SOILS.

COHESIVE SOILS	(APPROXIMATE SHEARING STRENGTH IN KSF)
VERY SOFT	LESS THAN .25
SOFT	0.25 TO 0.5
MEDIUM STIFF	0.5 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	GREATER THAN 4.0

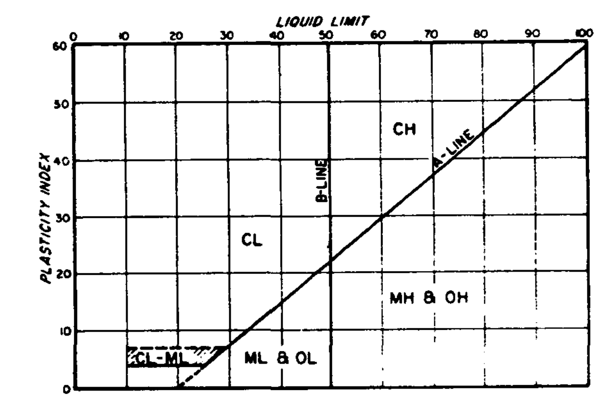
COHESIONLESS SOILS	
VERY LOOSE	THESE ARE USUALLY BASED ON AN EXAMINATION OF SOIL SAMPLES, PENETRATION RESISTANCE, AND SOIL DENSITY DATA.
LOOSE	
MEDIUM DENSE	
DENSE	
VERY DENSE	

GRADATION CHART

MATERIAL SIZE	PARTICLE SIZE			
	LOWER LIMIT		UPPER LIMIT	
	MILLIMETERS	SIEVE SIZE●	MILLIMETERS	SIEVE SIZE●
CLAY SIZE			.005	
SILT SIZE	.005		.074	#200●
SAND FINE	.074	#200●	0.42	#40●
SAND MEDIUM	0.42	#40●	2.00	#10●
SAND COARSE	2.00	#10●	4.76	#4●
GRAVEL FINE	4.76	#4●	19.1	3/4"•
GRAVEL COARSE	19.1	3/4"•	76.2	3"•
COBBLES	76.2	3"•	304.8	12"•
BOULDERS	304.8	12"•	914.4	36"

● U.S. STANDARD • CLEAR SQUARE OPENINGS

PLASTICITY CHART



Amendment 0
August 1984

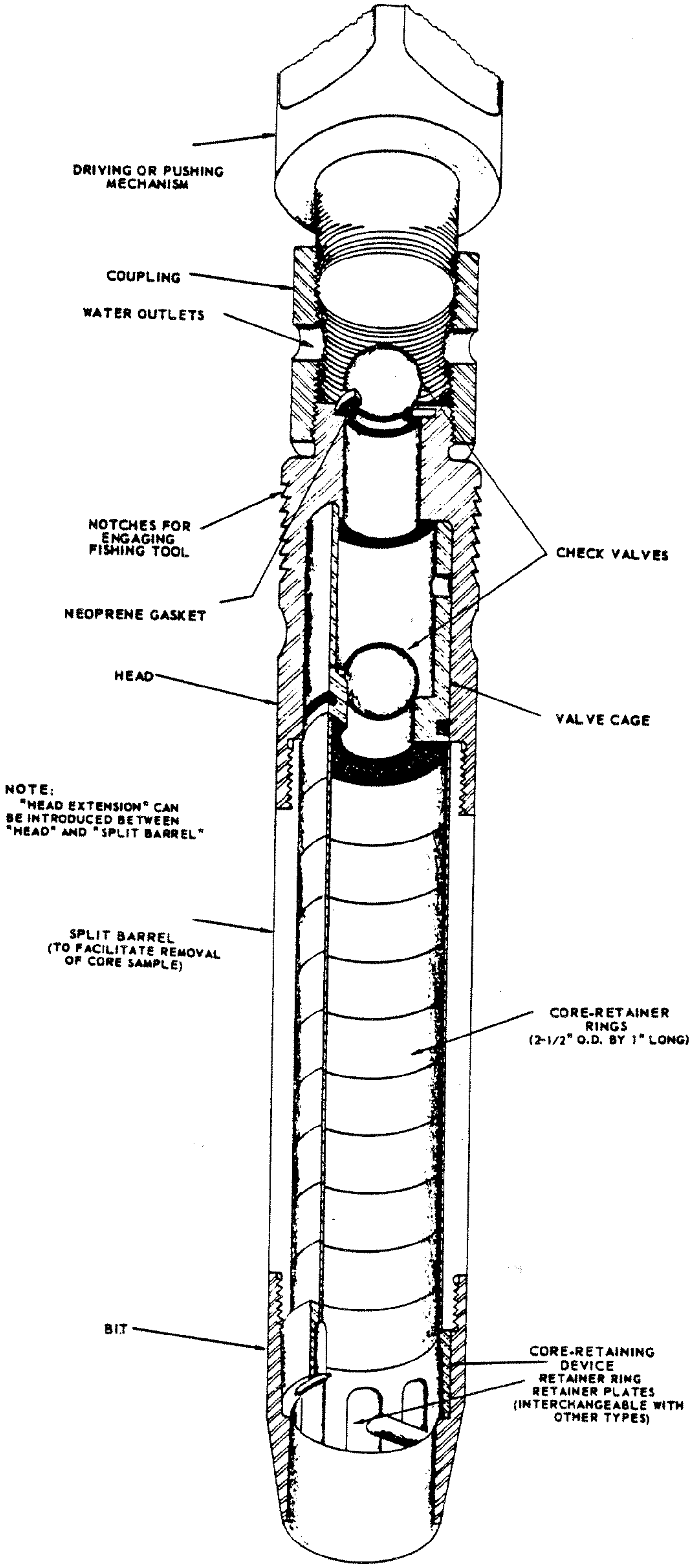
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unified Soil Classification System and Key to Sample Test Data

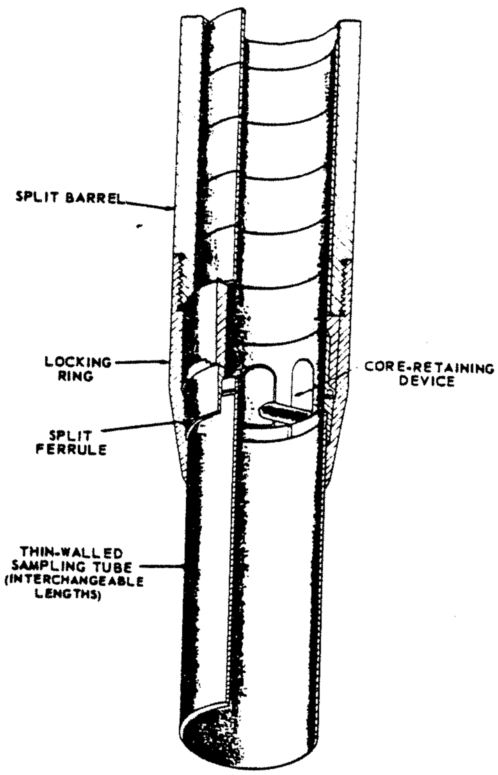
Figure 2.5-83

SOIL SAMPLER TYPE U

FOR SOILS DIFFICULT TO RETAIN IN SAMPLER



ALTERNATE ATTACHMENTS



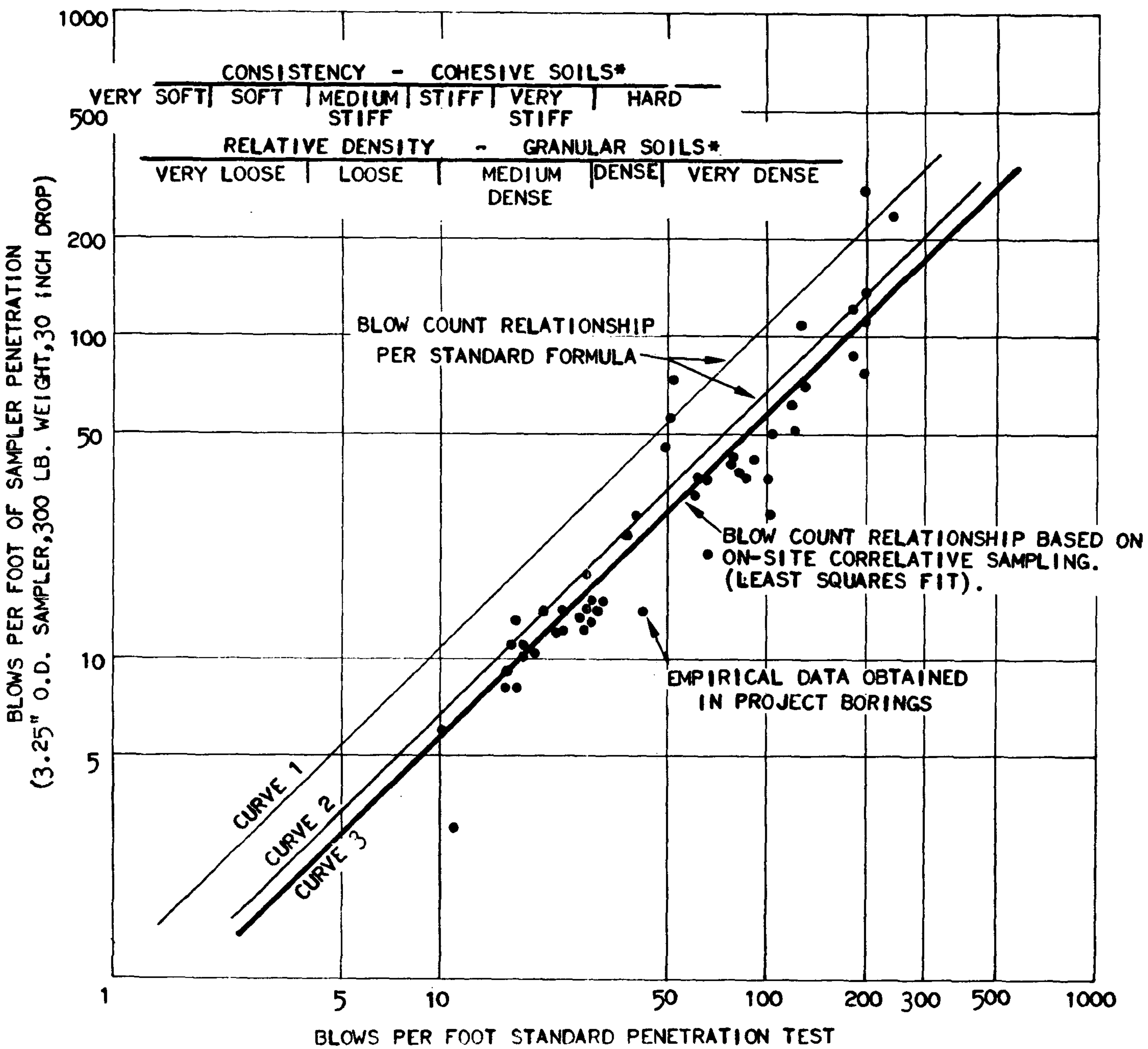
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Soil Sampler Type U

Figure 2.5-84

*CONSISTENCY AND RELATIVE DENSITY SOMETIMES INFERRED FROM STANDARD PENETRATION TESTS



NOTE: DATA ILLUSTRATES INFERRED CORRELATION BETWEEN BLOW COUNT FOR STANDARD PENETRATION SAMPLER (DISTURBED SAMPLES) AND THE LARGER DIAMETER 3.25" O.D.-2.4" I.D., TYPE U SAMPLER, (RELATIVELY UNDISTURBED SAMPLES) USED FOR MOST OF THE SAMPLING FOR PROJECT STUDIES. CURVES 1 AND 2 ARE BASED ON STANDARD ANALYTICAL EQUATIONS WHICH CONSIDER INFLUENCES OF DRIVING ENERGY AND SAMPLER GEOMETRY. CURVE 3 AND DATA POINTS ARE BASED UPON CORRELATIVE SAMPLING ON SITE AT 5 LOCATIONS USING BOTH SAMPLERS.

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Empirical Correlation - Blow Count and Soil Characteristics

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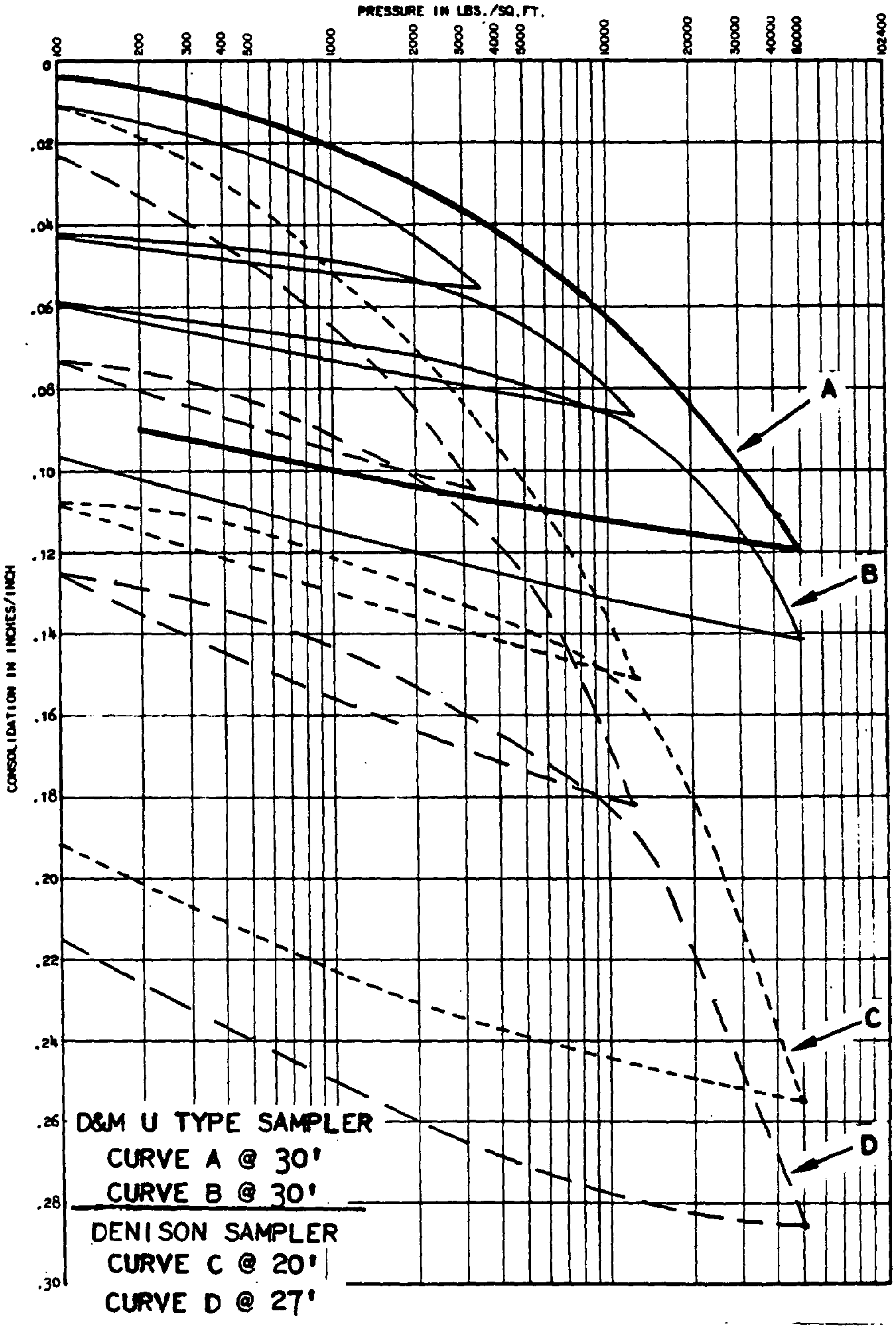
Figure 2.5-85

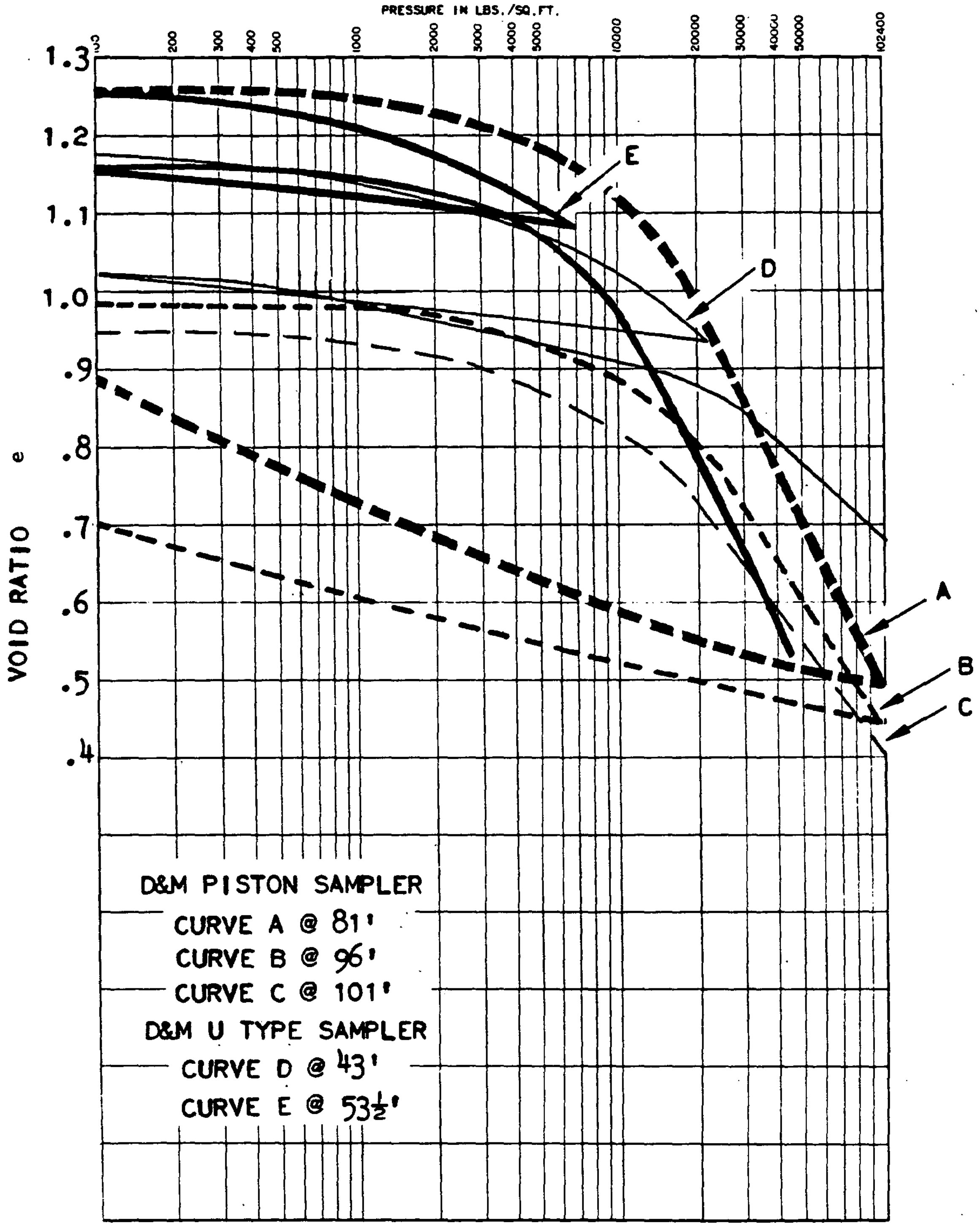


SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Comparative Consolidation Test Data - Virginia Site

Amendment 0
August 1984

Figure 2.5-86

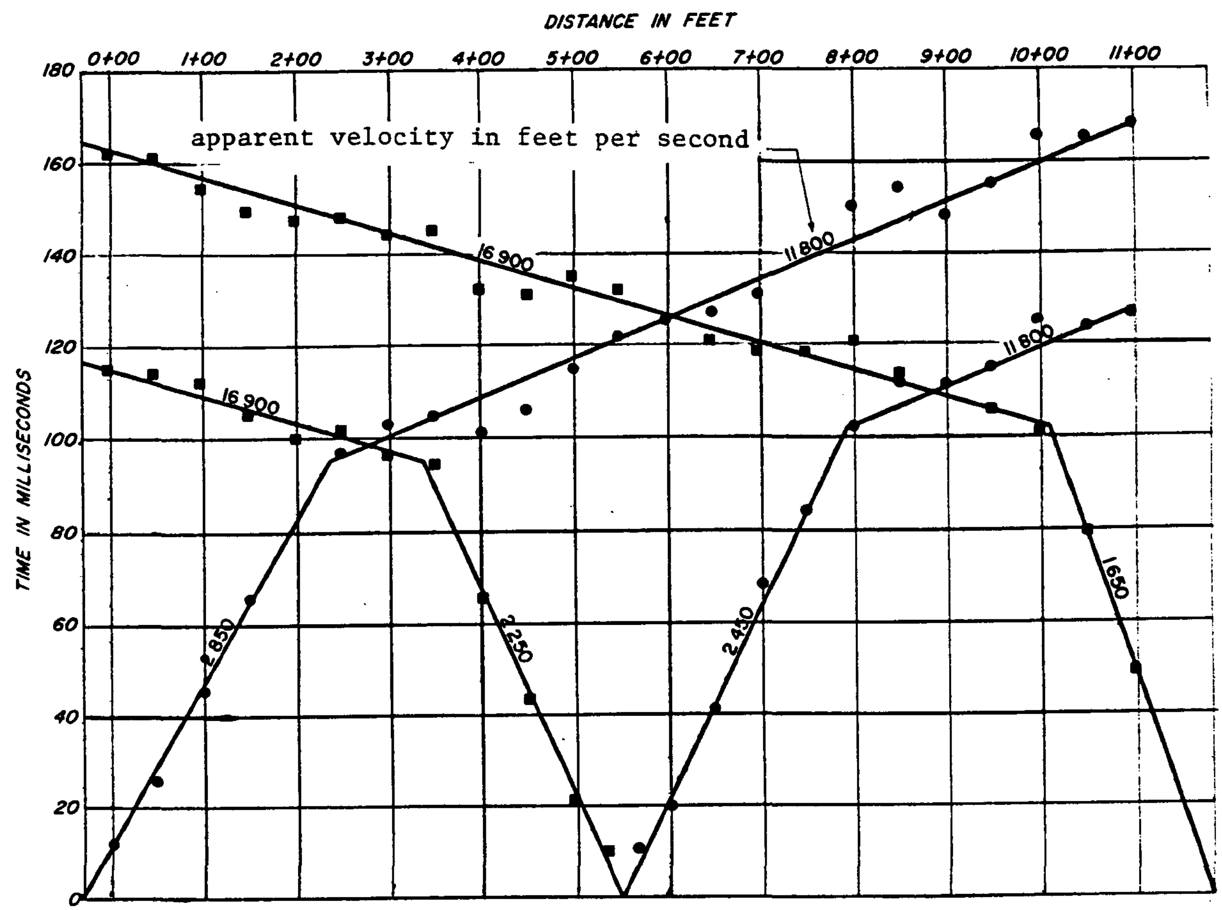


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Comparative Consolidation Test Data - Virginia Site

Figure 2.5-87



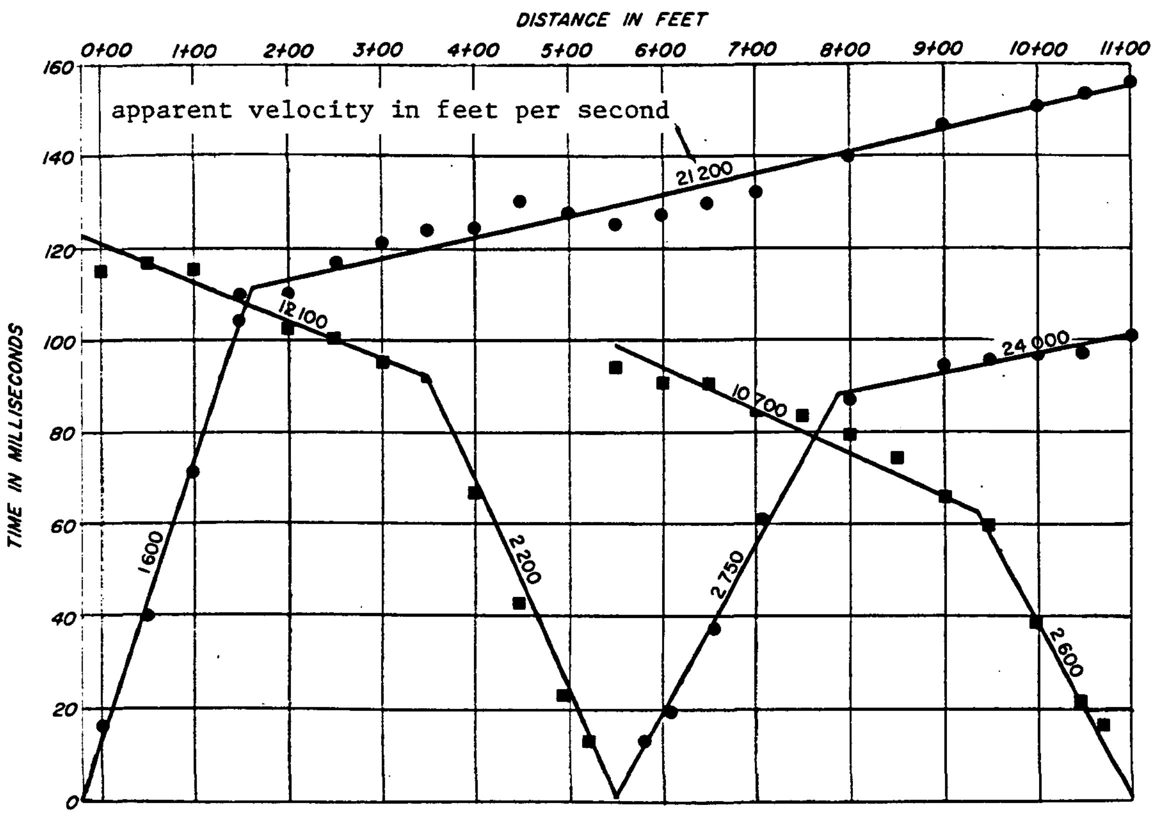
Note: times corrected to assumed horizontal grade, elevation 482 feet

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Seismic Infraction Line 1

Figure 2.5-88



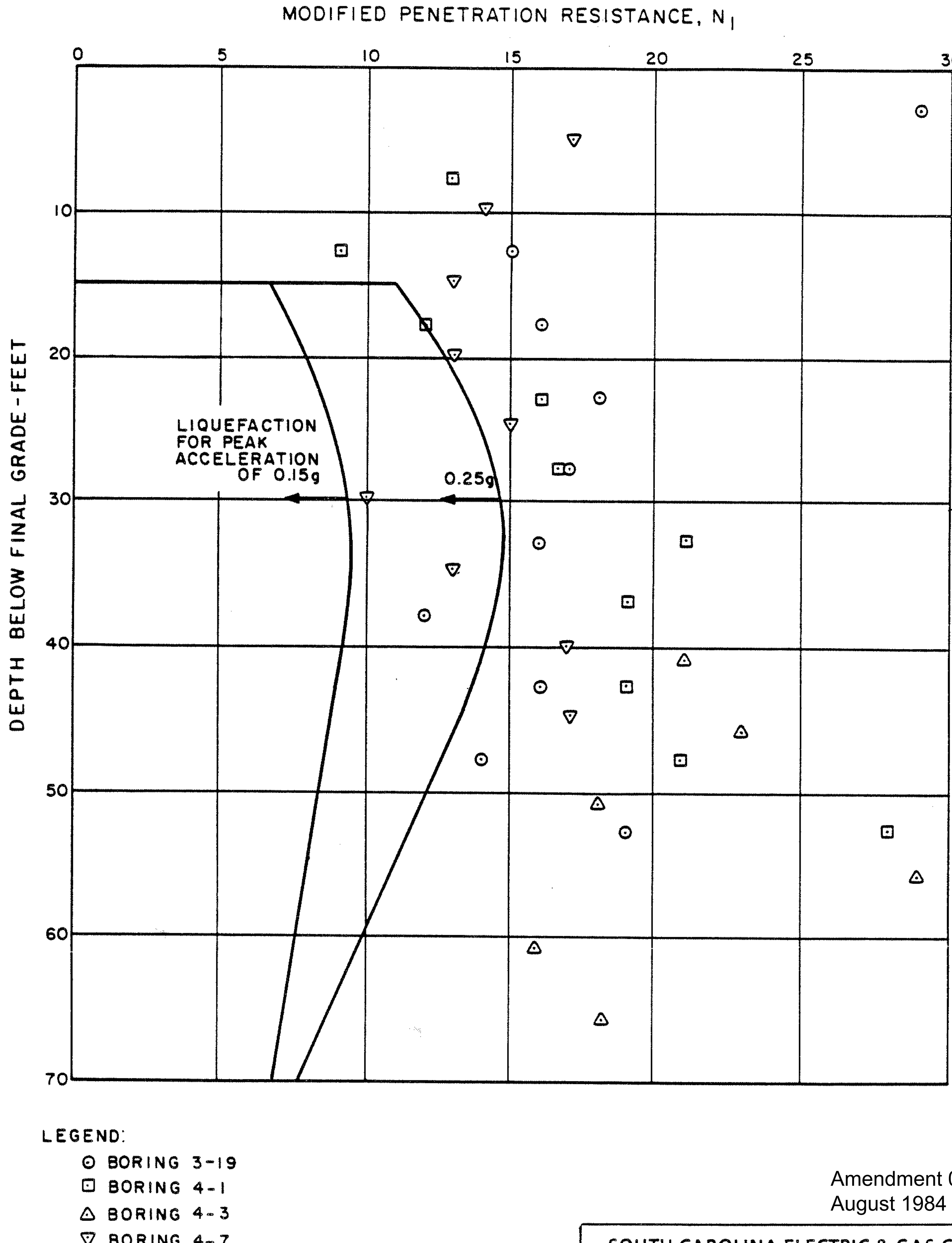
Note: times corrected to assumed
horizontal grade, elevation 482 feet

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Seismic Infraction Line 2

Figure 2.5-89

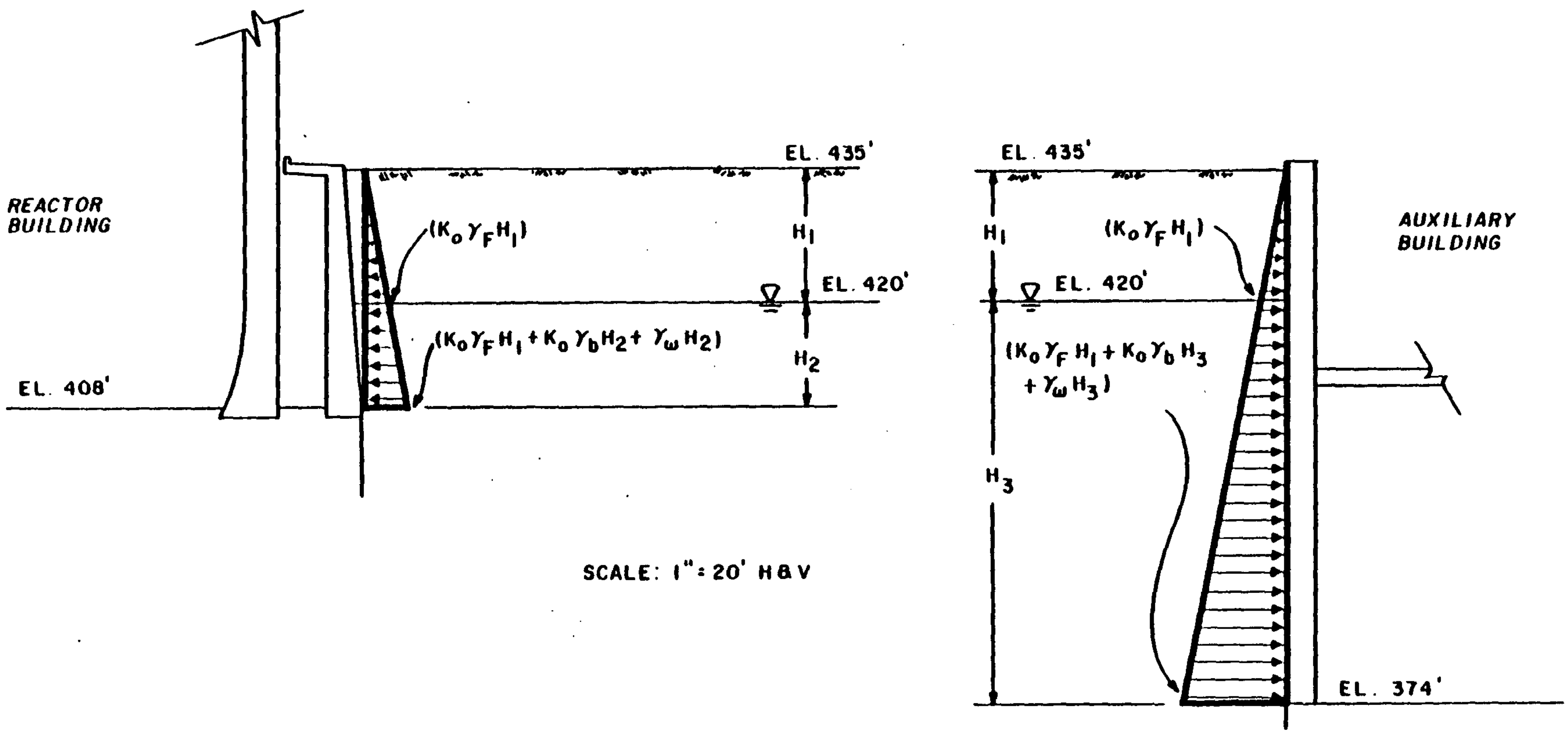


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Evaluation of Potential for Liquefaction of Saprolite

Figure 2.5-90



LEGEND:

- K_o = COEFFICIENT OF EARTH PRESSURE AT REST
- γ_F = UNIT WEIGHT OF BACKFILL
- γ_b = BUOYANT UNIT WEIGHT OF BACKFILL
- γ_ω = UNIT WEIGHT OF WATER

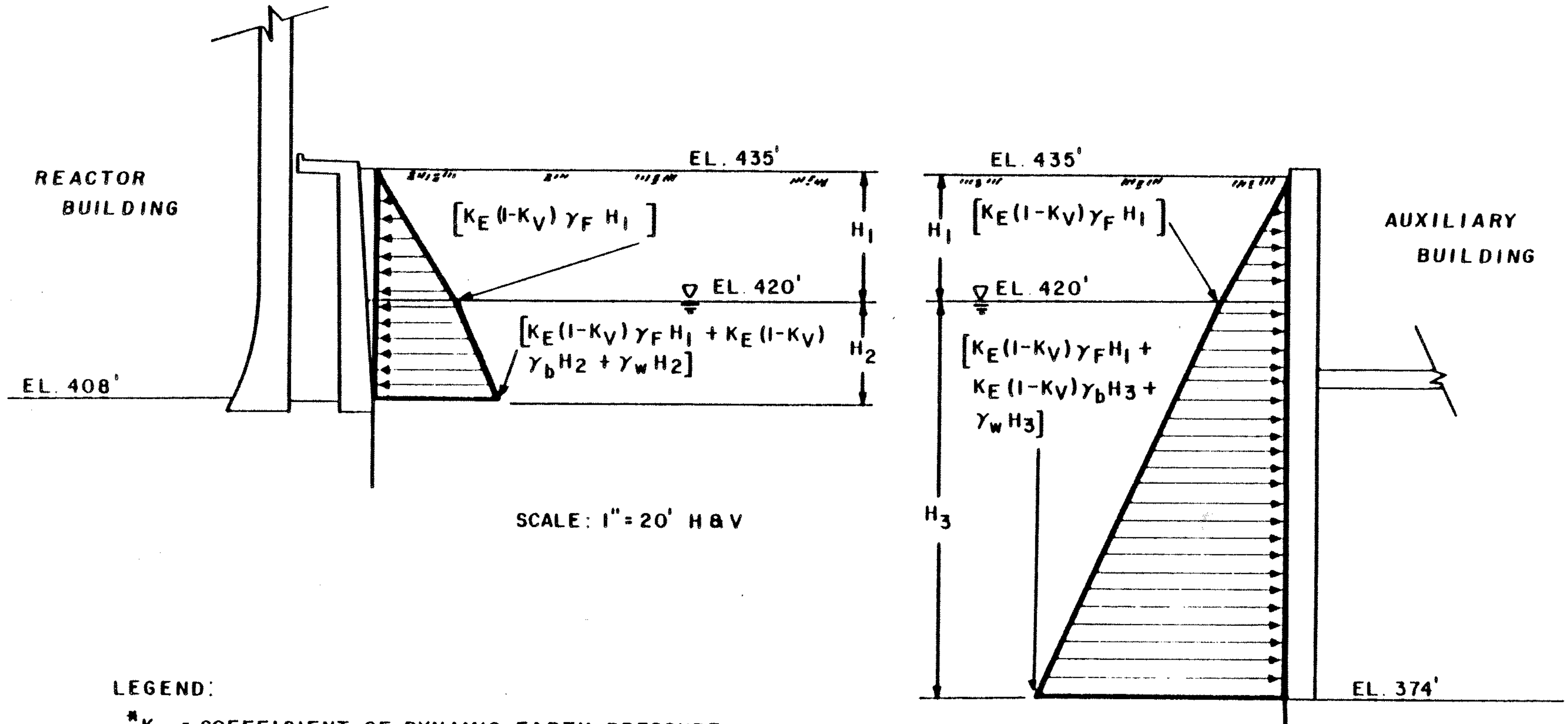
REFERENCE FSAR FIGURE 3.8-68 (NO SCALE)

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Static Lateral Earth Pressure Distribution Diagram for Typical Rigid Walls

Figure 2.5-90a



REF: FSAR FIGURE 3.8-68 (NO SCALE)

LEGEND:

*K_E = COEFFICIENT OF DYNAMIC EARTH PRESSURE

K_V = VERTICAL GROUND ACCELERATION/g

γ_F = UNIT WEIGHT OF BACKFILL

γ_b = BUOYANT UNIT WEIGHT OF BACKFILL

γ_w = UNIT WEIGHT OF WATER

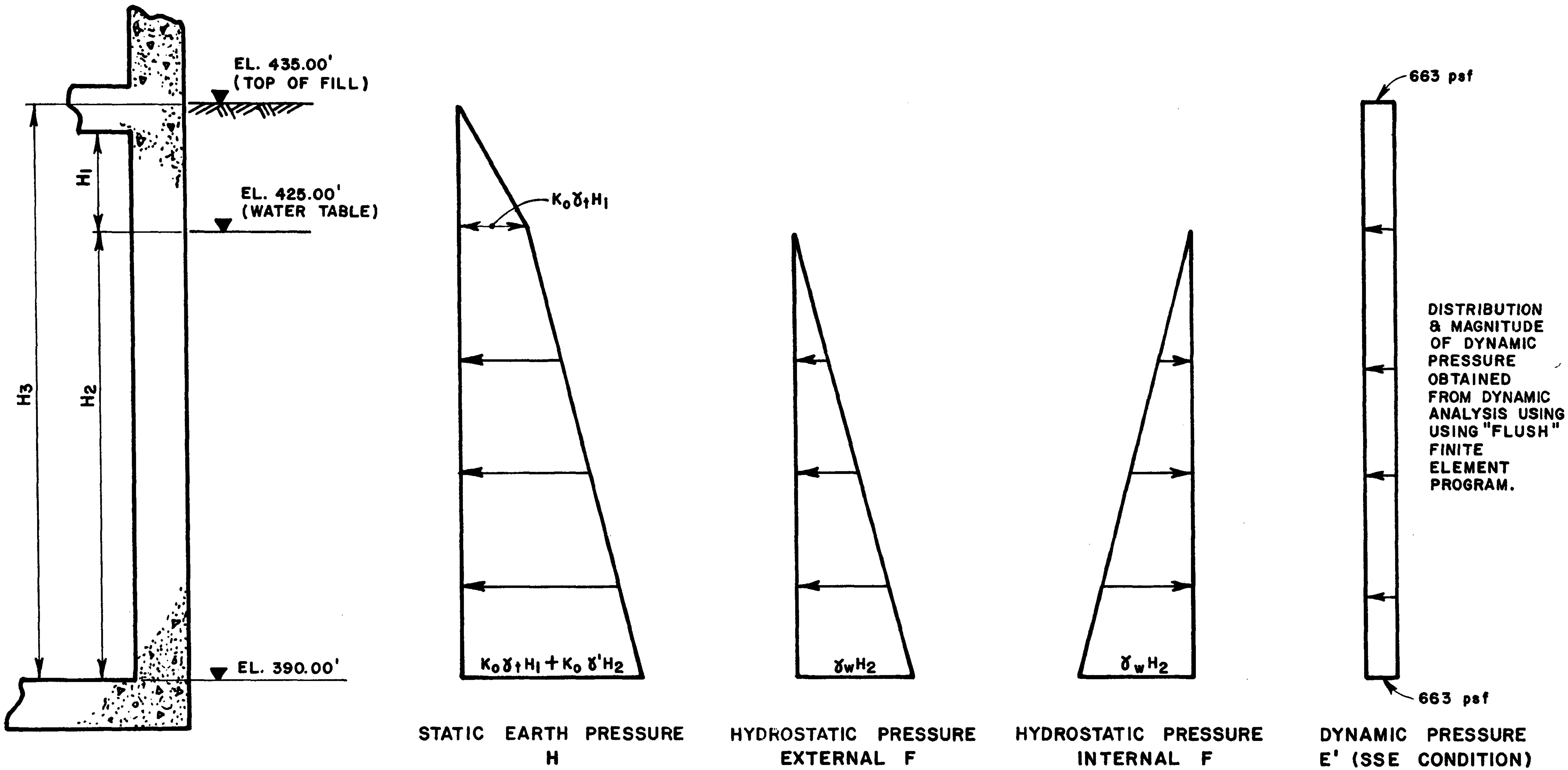
* EVALUATED BASED ON MONONOBE-OKABE APPROACH AS MODIFIED BY KAPILA (FSAR, 2.5.4.10.5)

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Dynamic Lateral Earth Pressure Distribution Diagrams for Typical Rigid Walls

Figure 2.5-90b



K_o = STATIC EARTH PRESSURE COEFFICIENT (AT REST CONDITION)

γ_t = SATURATED UNIT WEIGHT OF SOIL

γ' = SUBMERGED UNIT WEIGHT OF SOIL

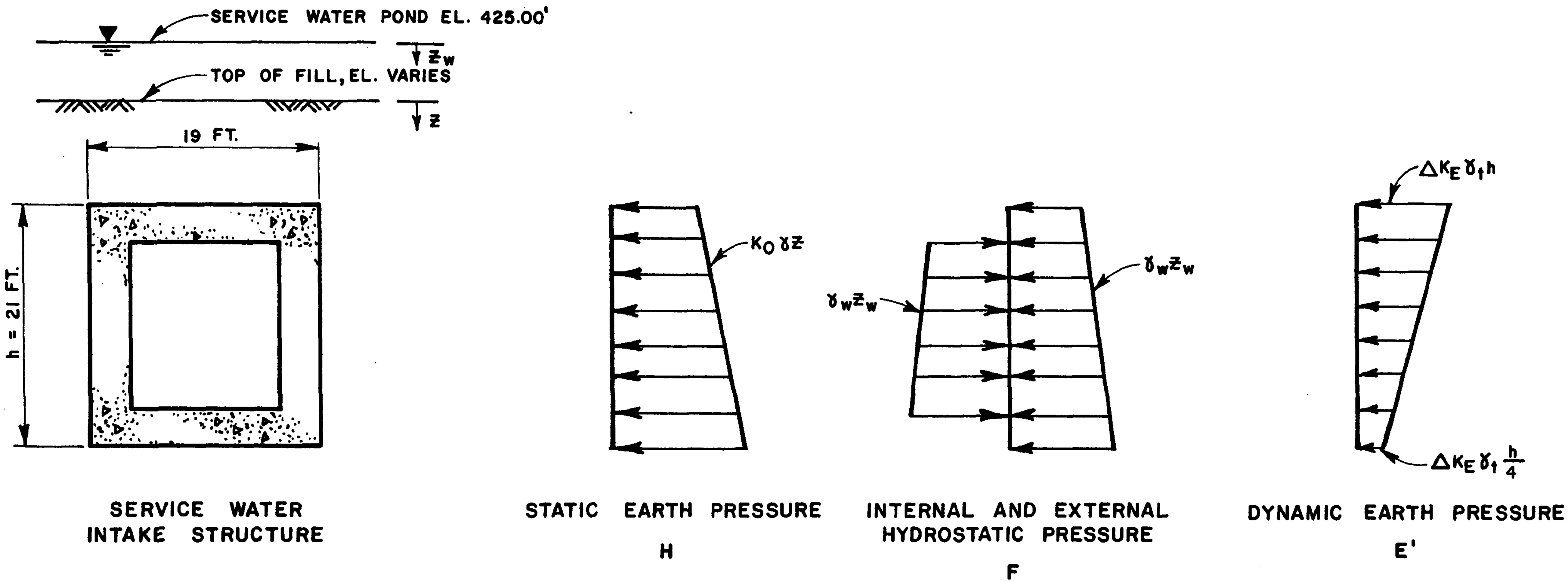
γ_w = UNIT WEIGHT OF WATER

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Service Water Pumphouse Lateral Earth Pressure Distribution

Figure 2.5-90c



K_O = STATIC EARTH PRESSURE COEFFICIENT FOR AT - REST CONDITIONS

ΔK_E = DYNAMIC PRESSURE COEFFICIENT (EVALUATED USING SEED-WHITMAN METHOD)

γ_m = MOIST UNIT WEIGHT OF SOIL

γ_t = SATURATED UNIT WEIGHT OF SOIL

γ_b = SUBMERGED UNIT WEIGHT OF SOIL

γ_w = UNIT WEIGHT OF WATER

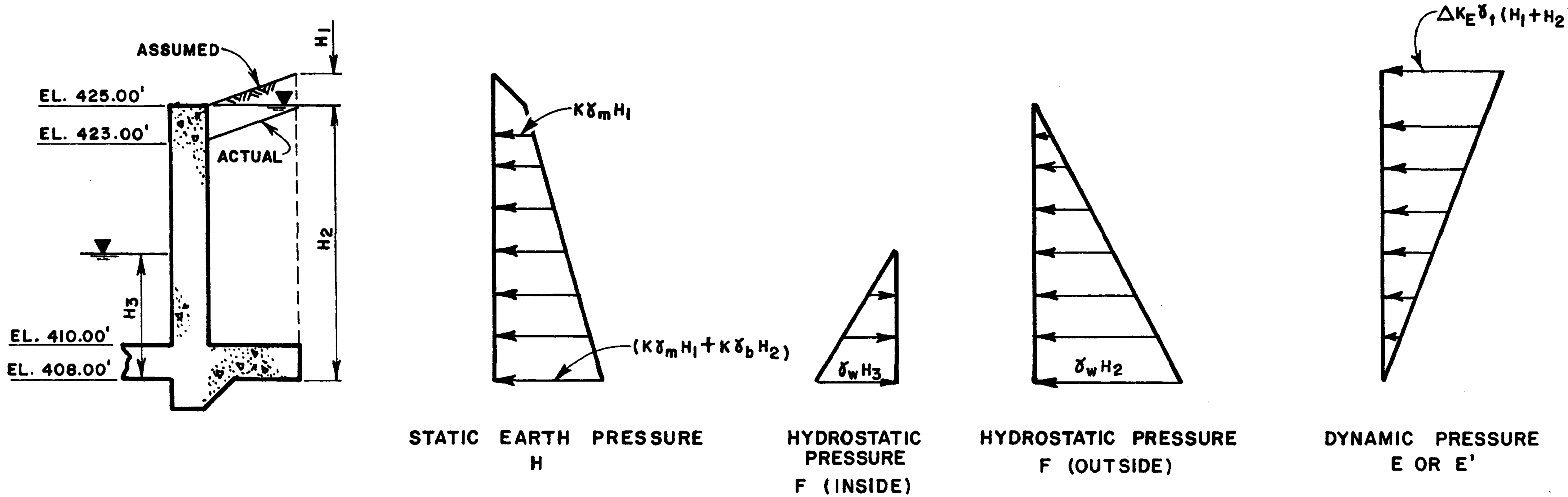
γ = γ_m FOR END OF CONSTRUCTION CONDITION & γ_b FOR OPERATING CONDITIONS

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Service Water Intake Structure Lateral Earth Pressure Distribution

Figure 2.5-90d



K = STATIC EARTH PRESSURE COEFFICIENT = K_O FOR AT-REST CONDITION AND K_A FOR ACTIVE CONDITION

ΔK_E = DYNAMIC PRESSURE COEFFICIENT = $(K^{*}_{OE} - K_O)$ AT REST CONDITION AND $(K^{*}_{AE} - K_E)$ ACTIVE CONDITION

γ_m = MOIST UNIT WEIGHT OF SOIL

γ_t = SATURATED UNIT WEIGHT OF SOIL

γ_w = UNIT WEIGHT OF WATER

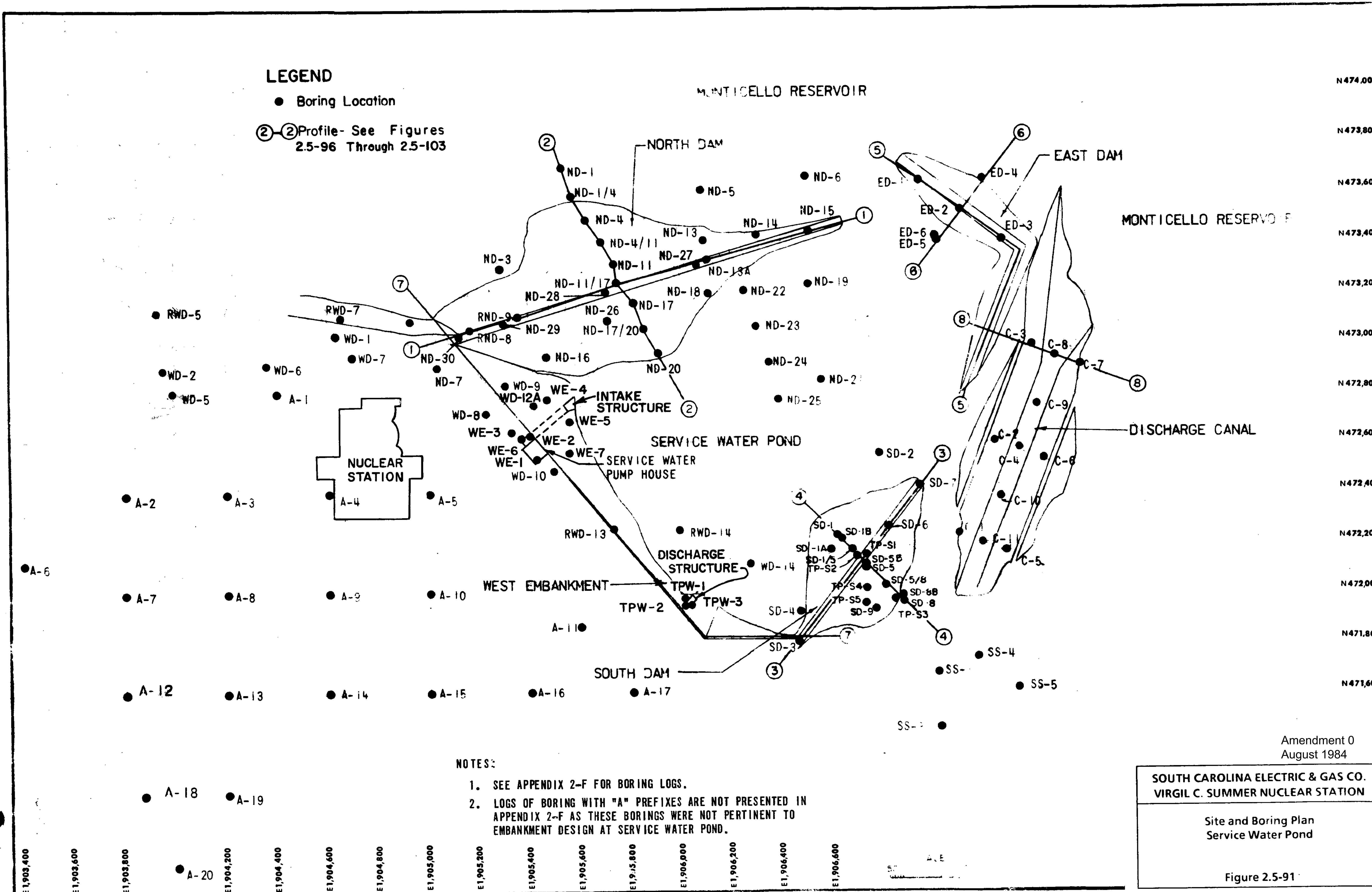
* EVALUATION BASED ON MONONOBE – OKABE APPROACH.

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Service Water Discharge Structure
Lateral Earth Pressure
Distribution

Figure 2.5-90e



NOTES:

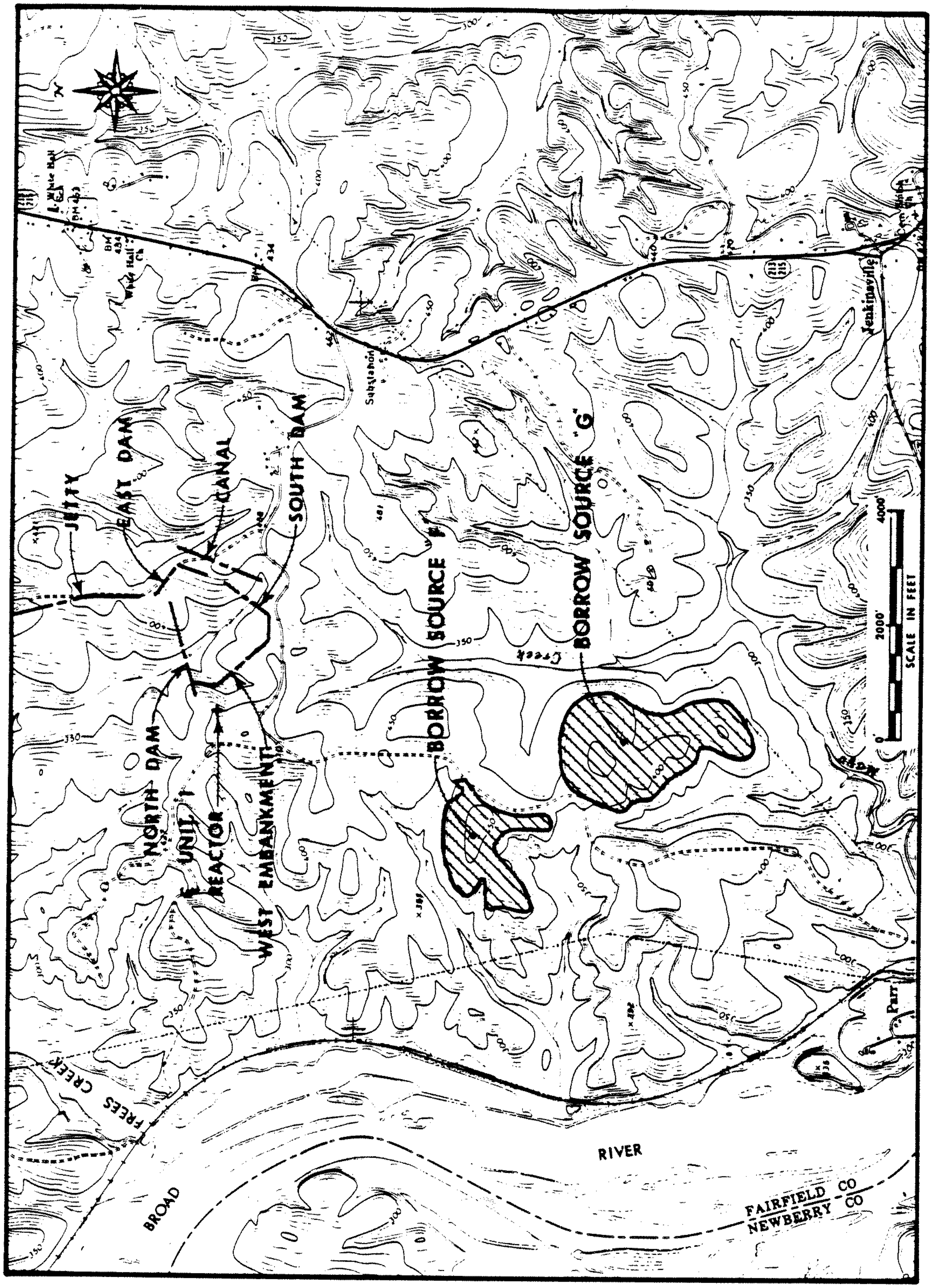
1. SEE APPENDIX 2-F FOR BORING LOGS.
2. LOGS OF BORING WITH "A" PREFIXES ARE NOT PRESENTED IN APPENDIX 2-F AS THESE BORINGS WERE NOT PERTINENT TO EMBANKMENT DESIGN AT SERVICE WATER POND.

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Site and Boring Plan
Service Water Pond

Figure 2.5-91



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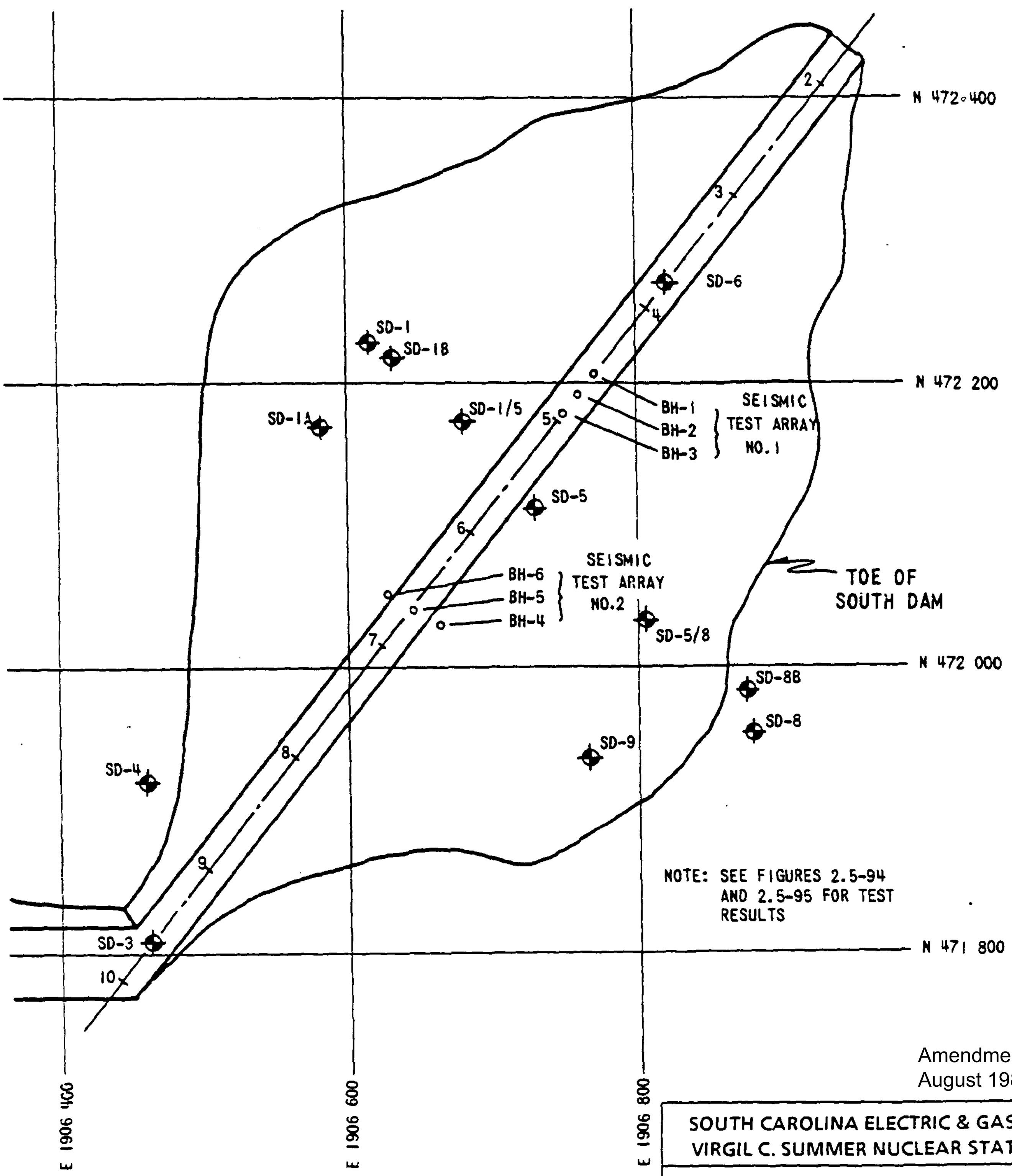
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Location Plan Borrow
Sources F and G

Figure 2.5-92

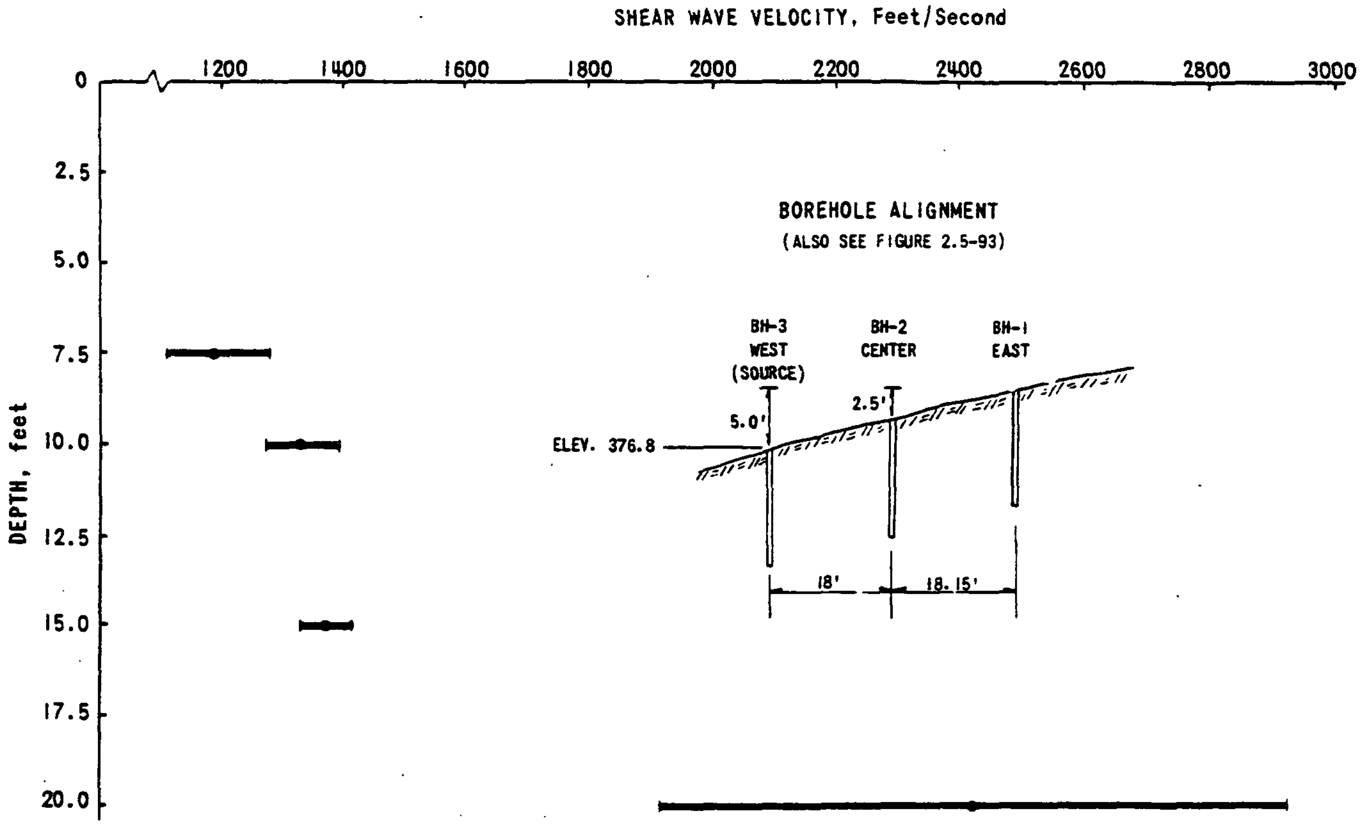


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Cross Hole, Seismic Location Plan, South Dam

Figure 2.5-93



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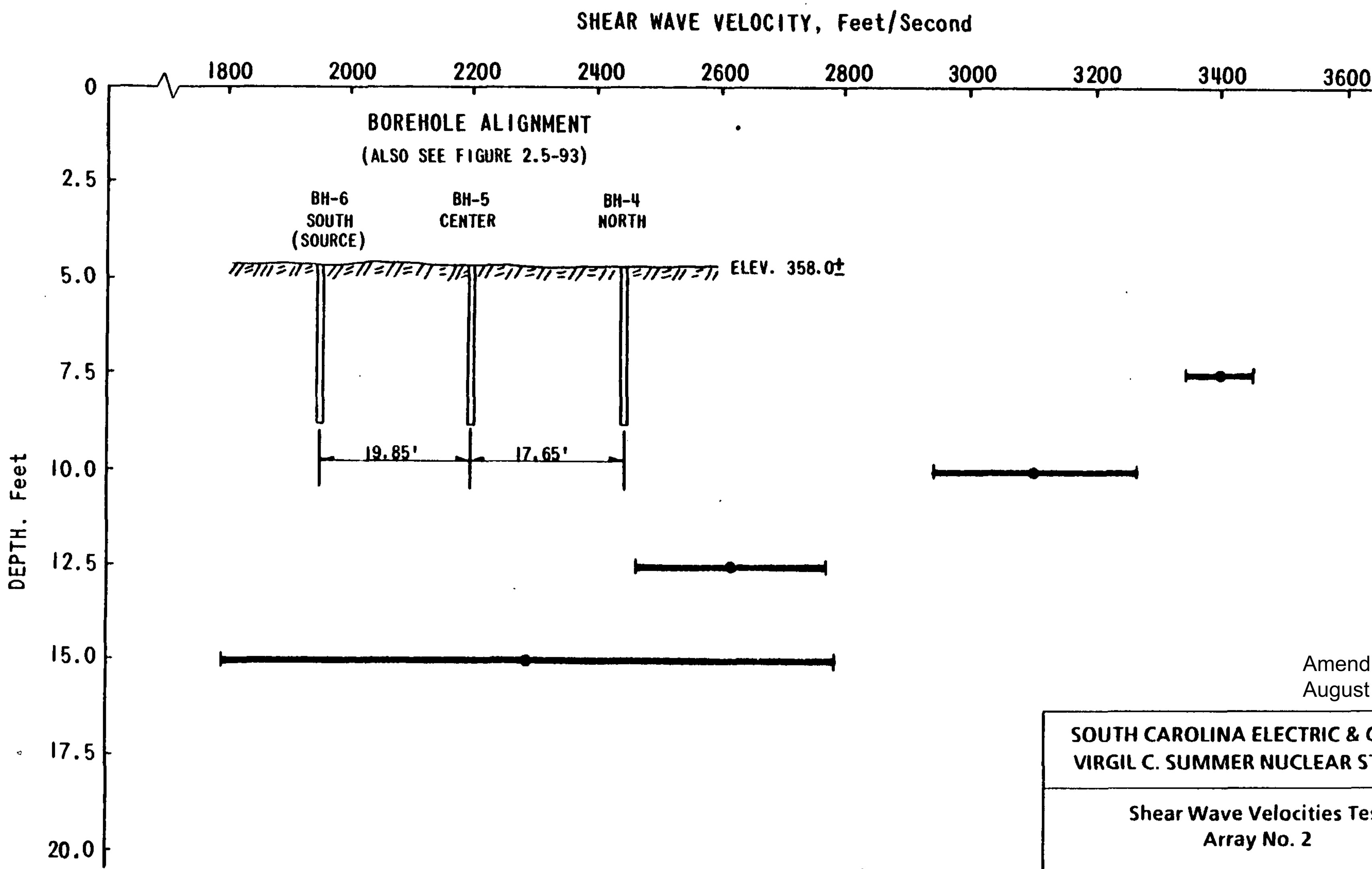
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Shear Wave Velocities Test
Array No. 1

Figure 2.5-94

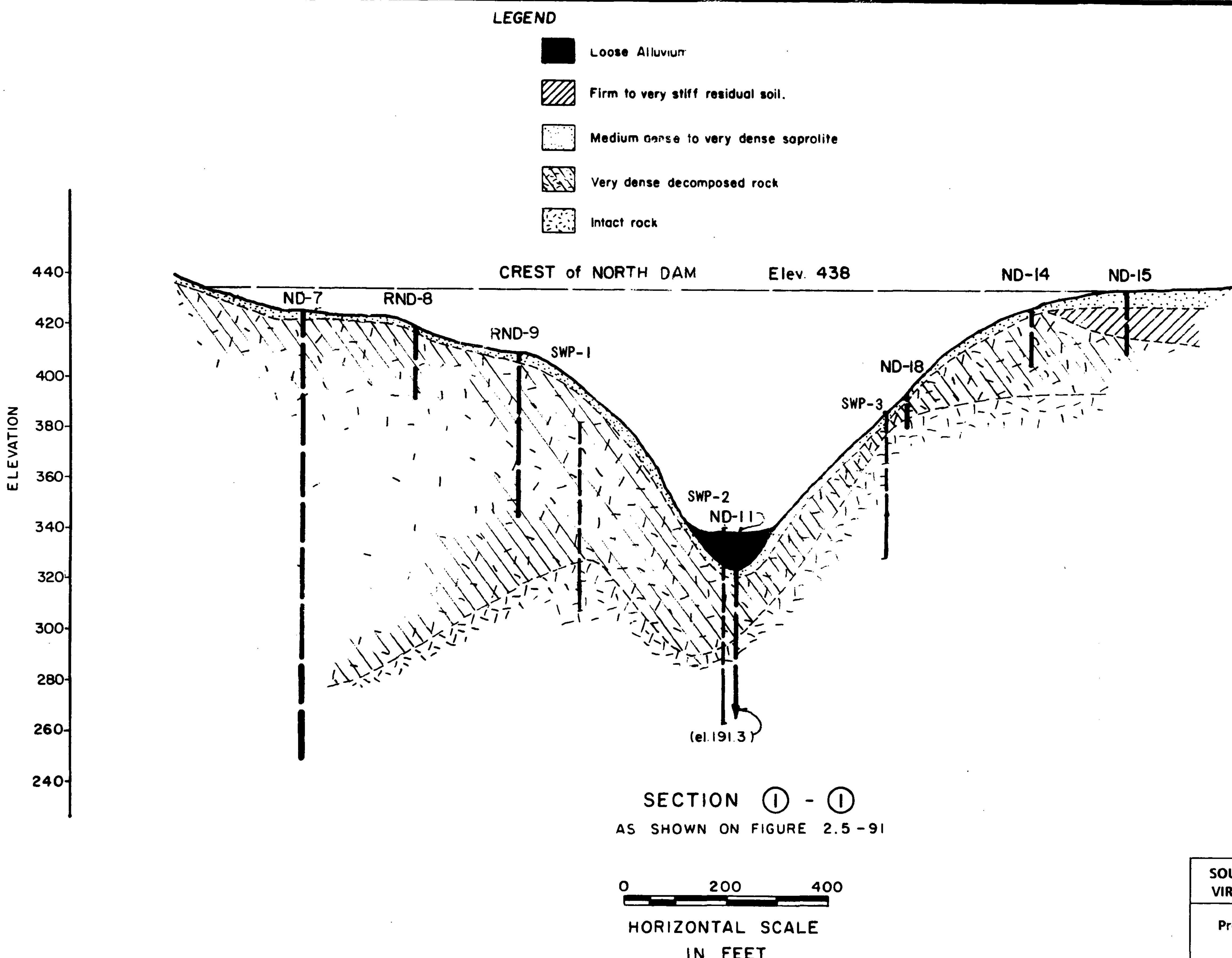


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Shear Wave Velocities Test
Array No. 2

Figure 2.5-95

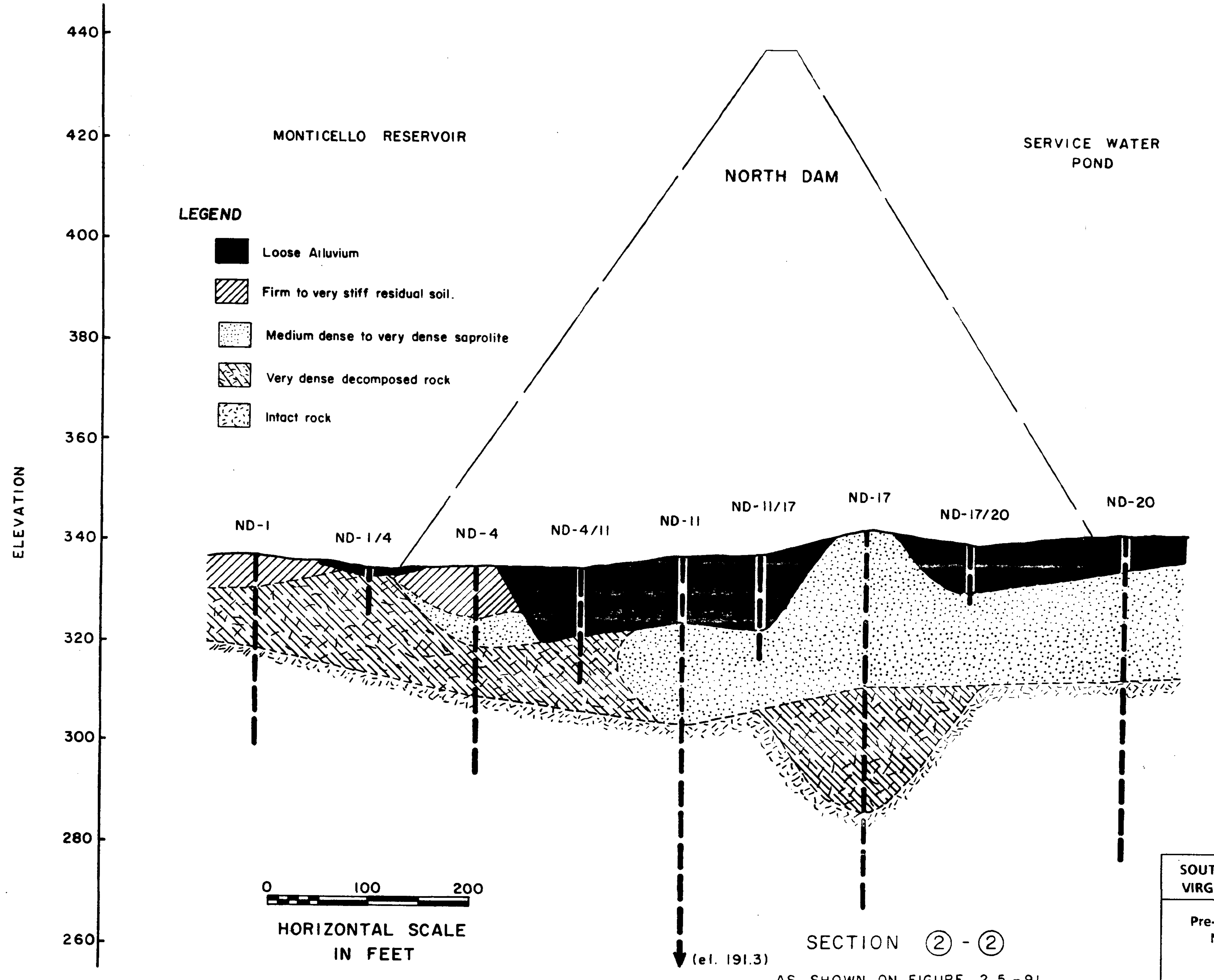


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Pre-Construction Subsurface Profile, North Dam Axis

Figure 2.5-96

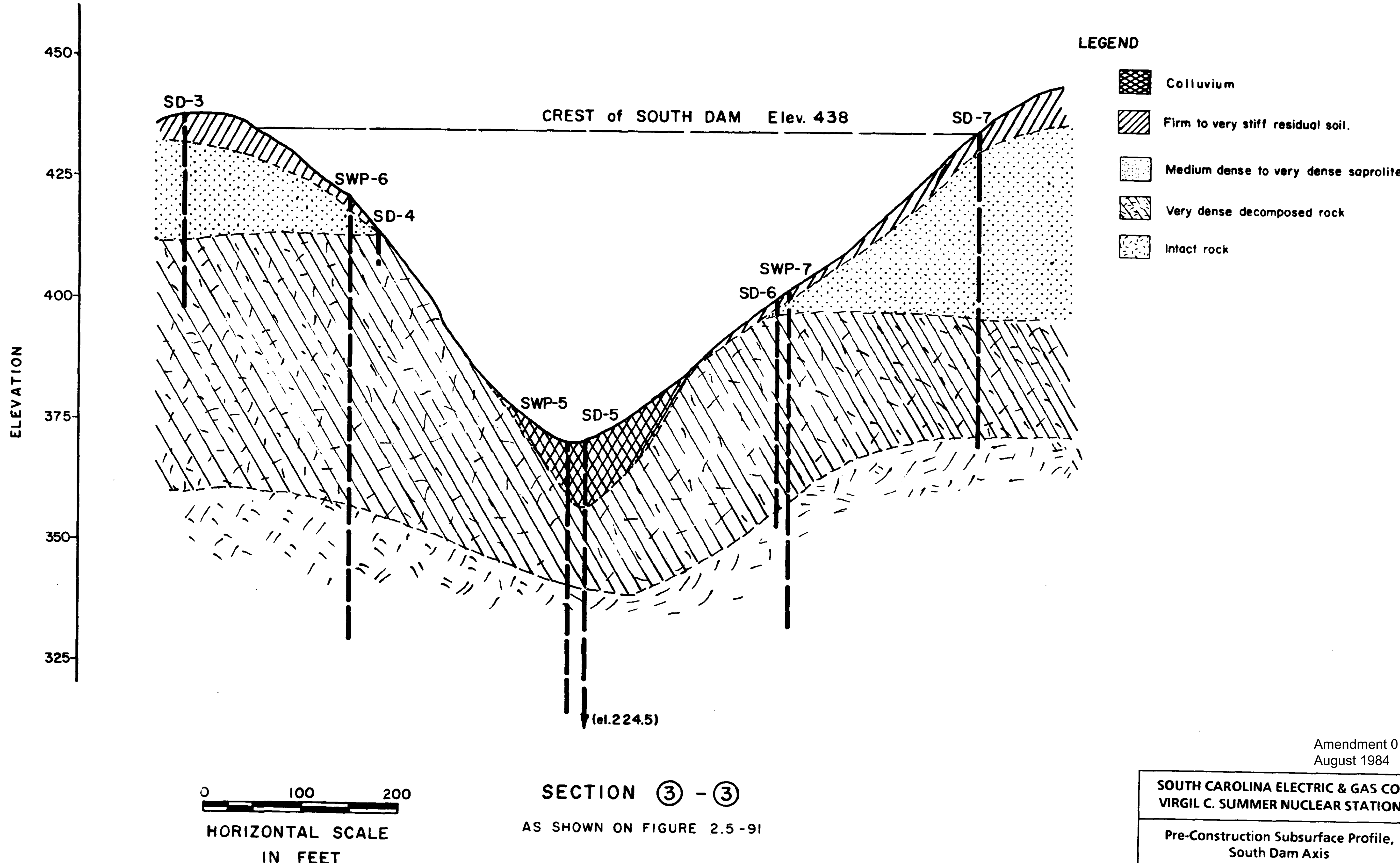


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Pre-Construction Subsurface Profile
North Dam Maximum Section

Figure 2.5-97



SECTION 3 - 3

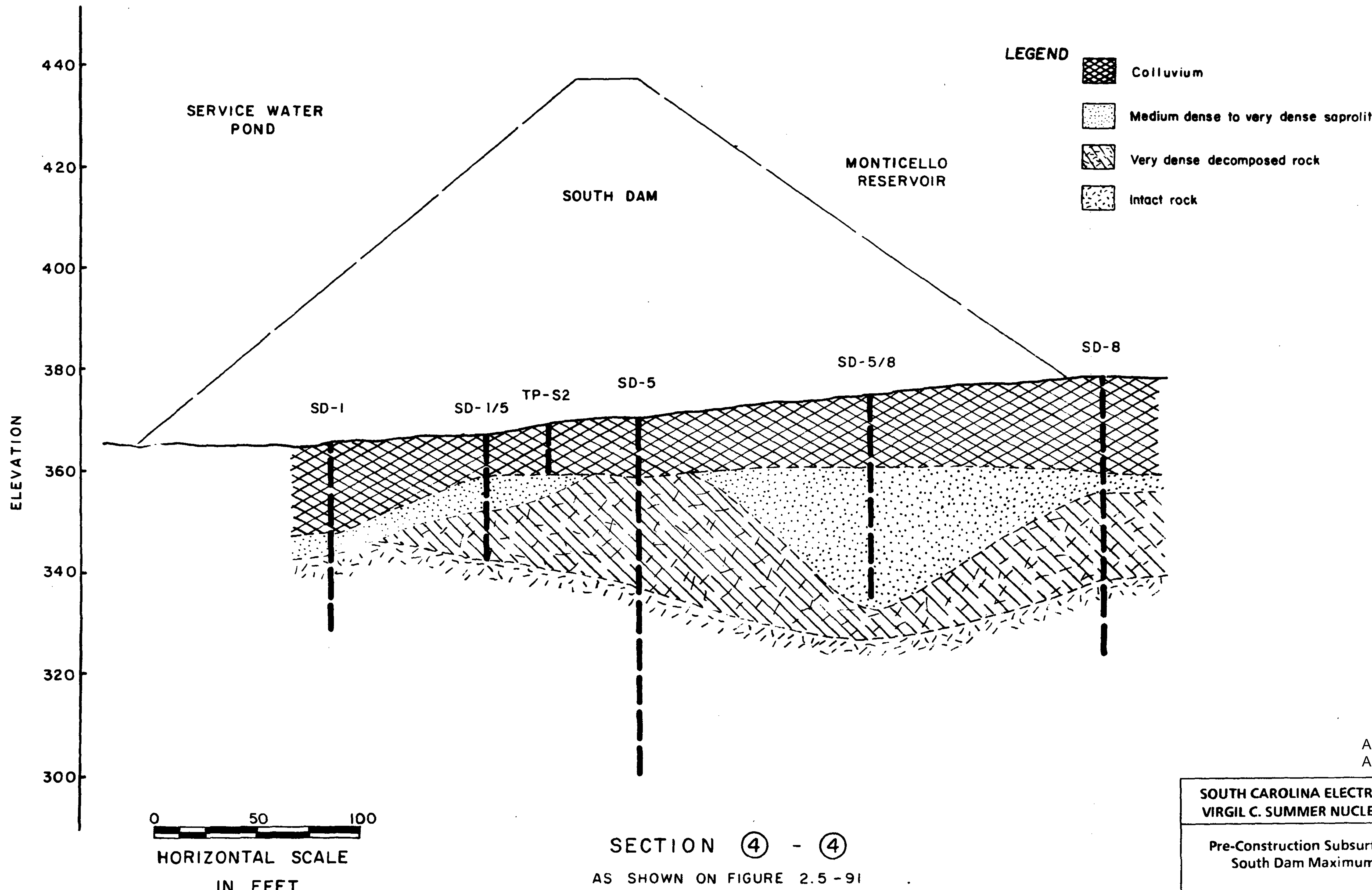
AS SHOWN ON FIGURE 2.5-91

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Pre-Construction Subsurface Profile, South Dam Axis

Figure 2.5-98



SECTION (4) - (4)

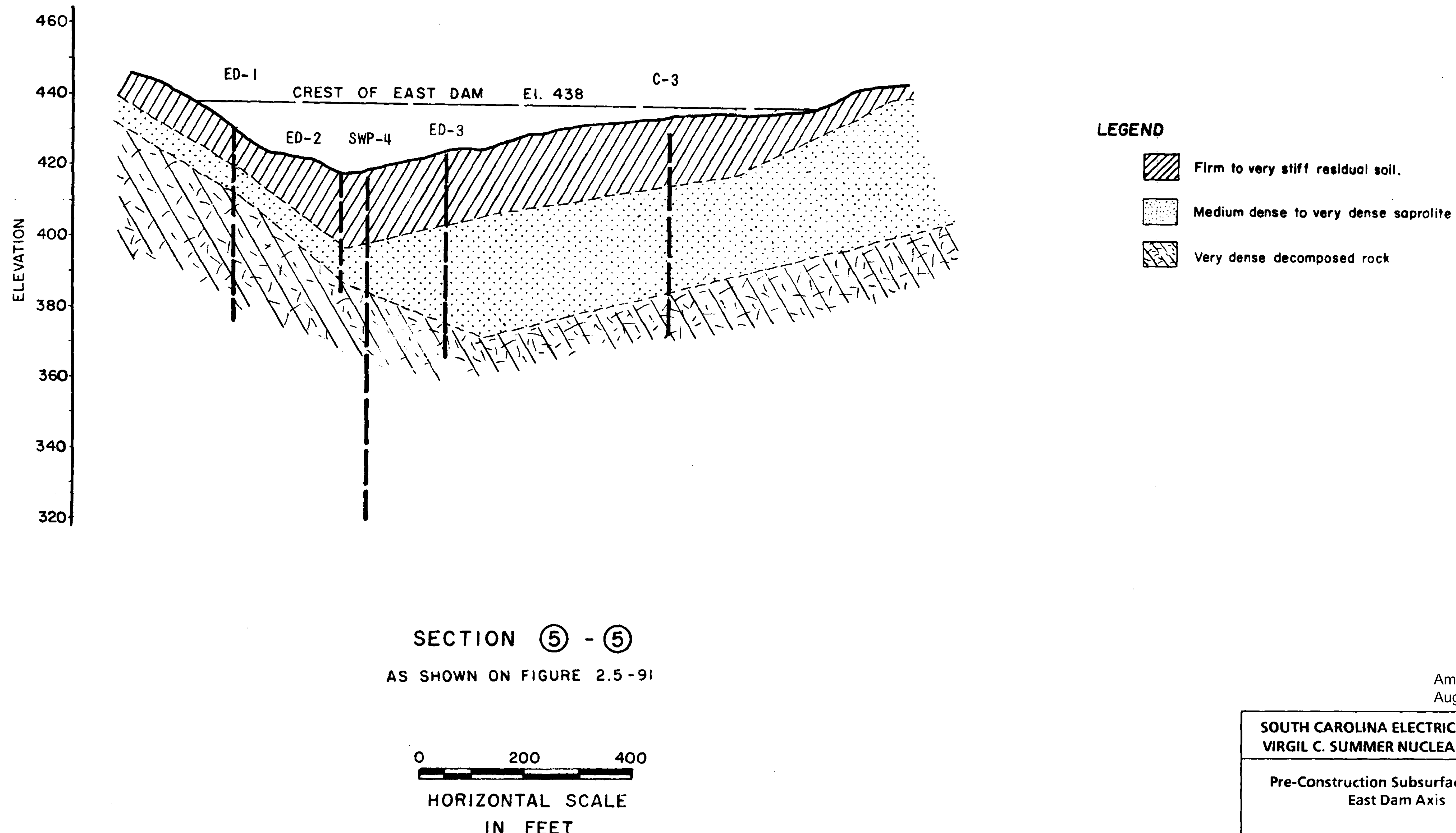
AS SHOWN ON FIGURE 2.5-91

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Pre-Construction Subsurface Profile, South Dam Maximum Section

Figure 2.5-99

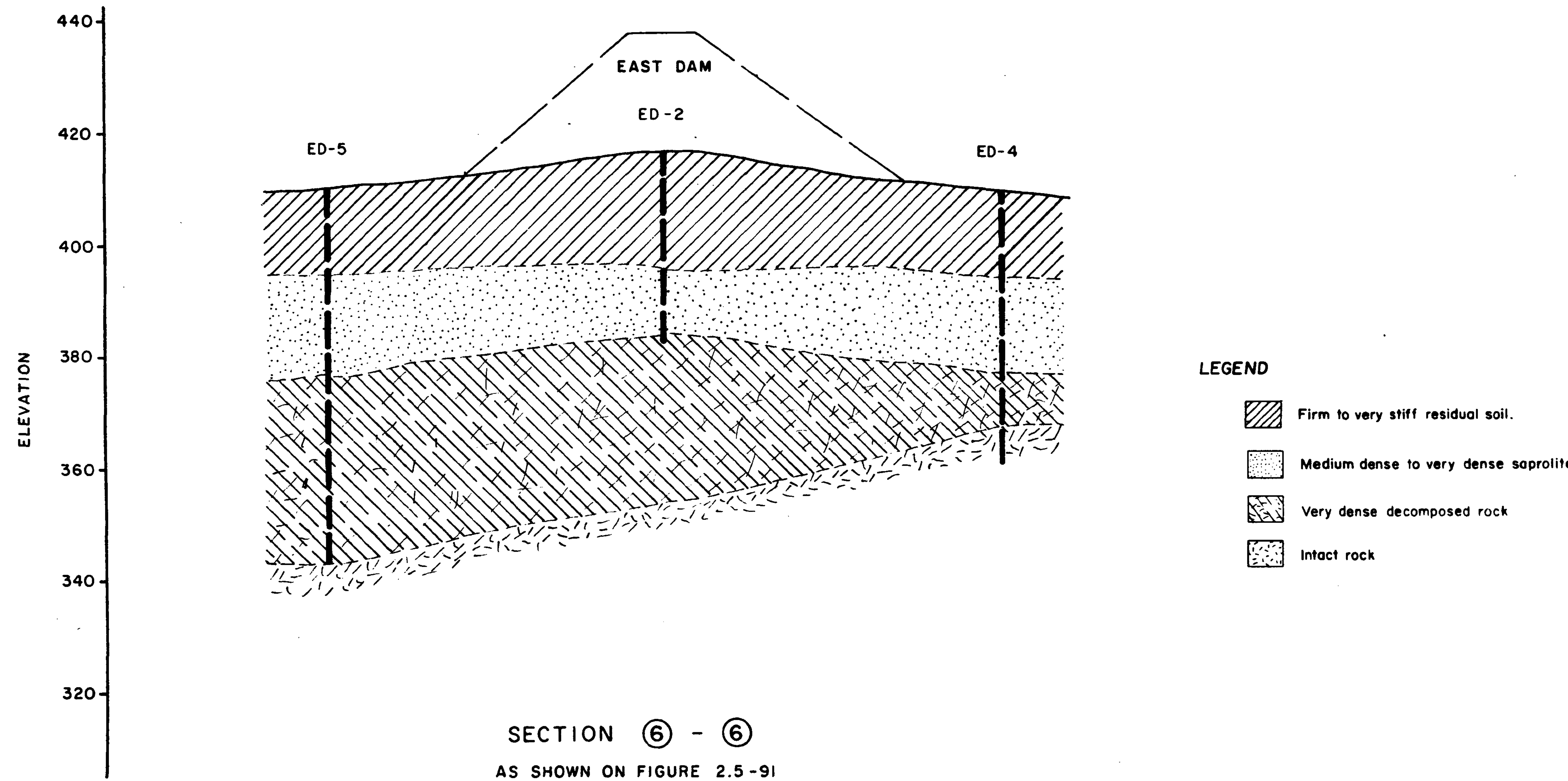


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Pre-Construction Subsurface Profile, East Dam Axis

Figure 2.5-100



SECTION ⑥ - ⑥

AS SHOWN ON FIGURE 2.5-91

0 50 100

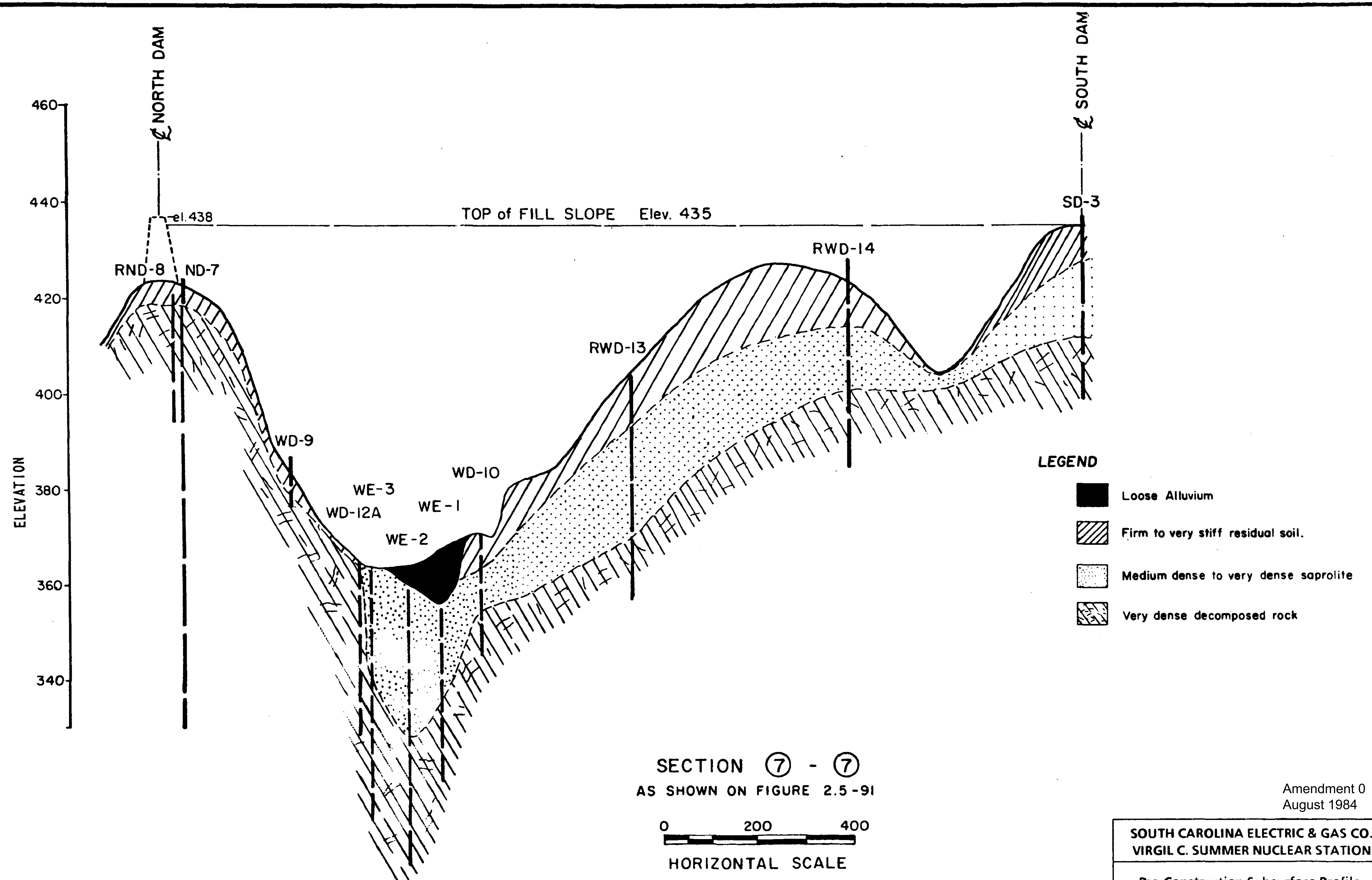
HORIZONTAL SCALE
IN FEET

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Pre-Construction Subsurface Profile,
East Dam Maximum Section

Figure 2.5-101

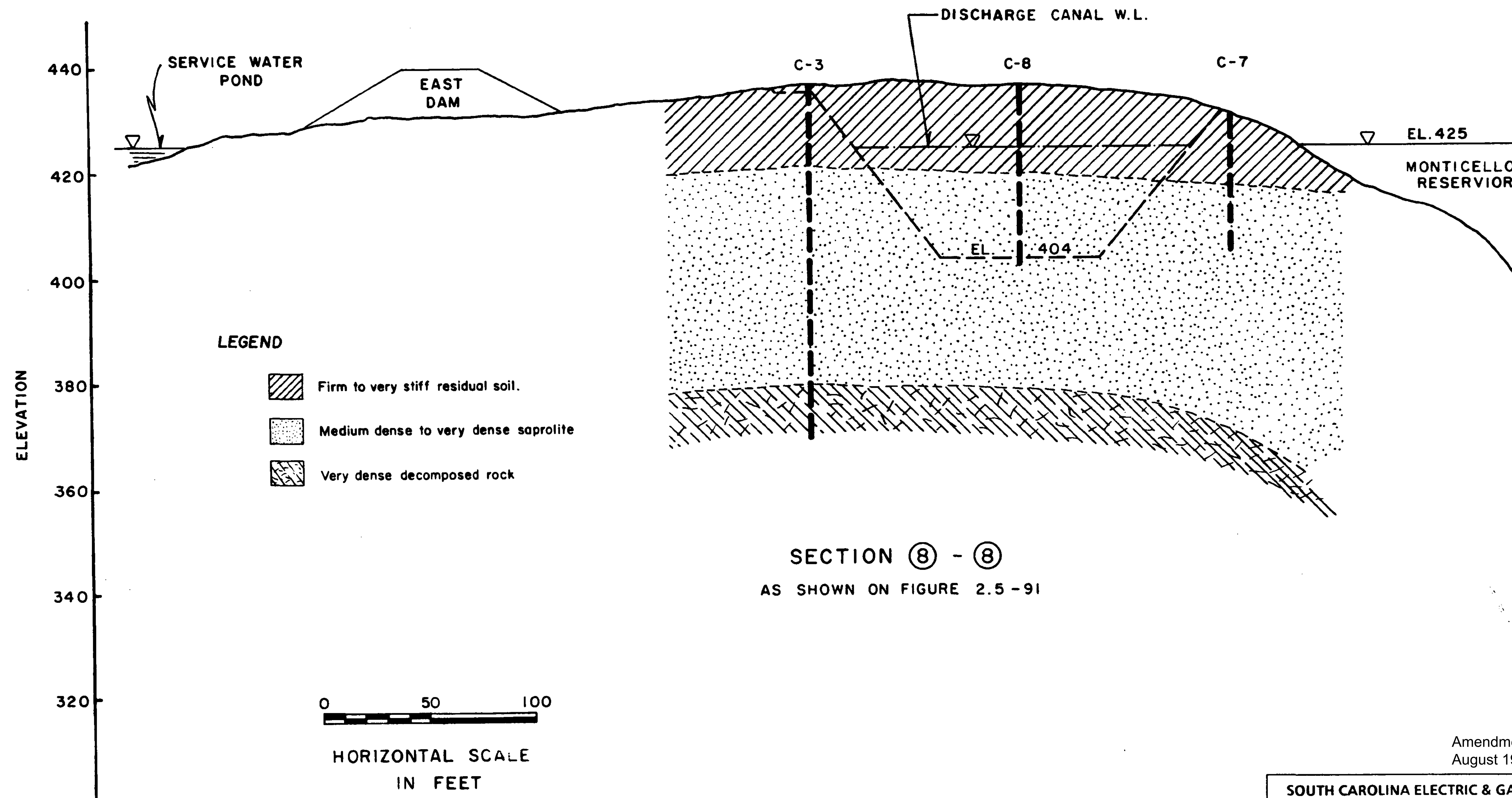


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Pre-Construction Subsurface Profile,
West Embankment at
Top of Slope

Figure 2.5-102

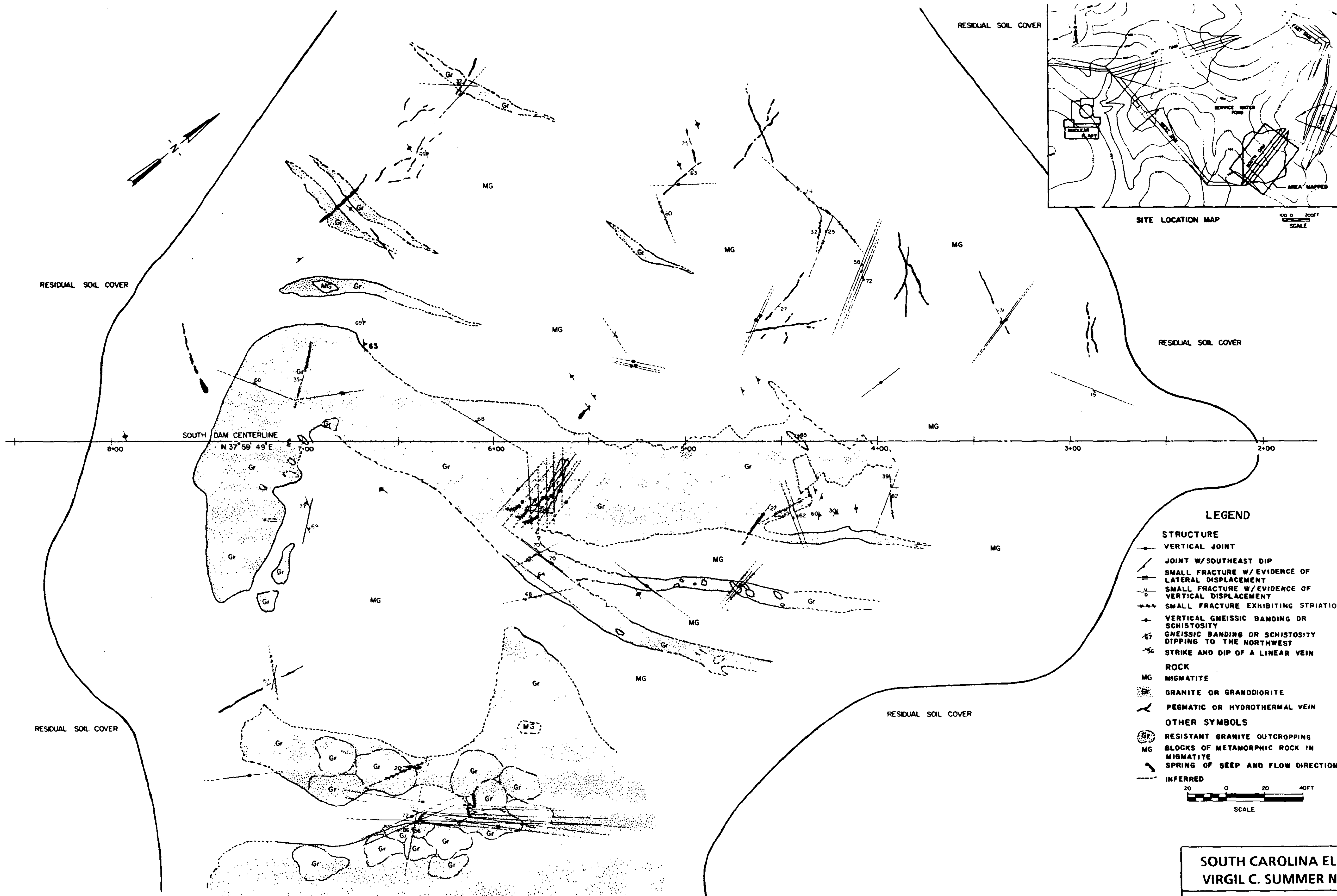


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Pre-Construction Subsurface Profile, Discharge Canal

Figure 2.5-103

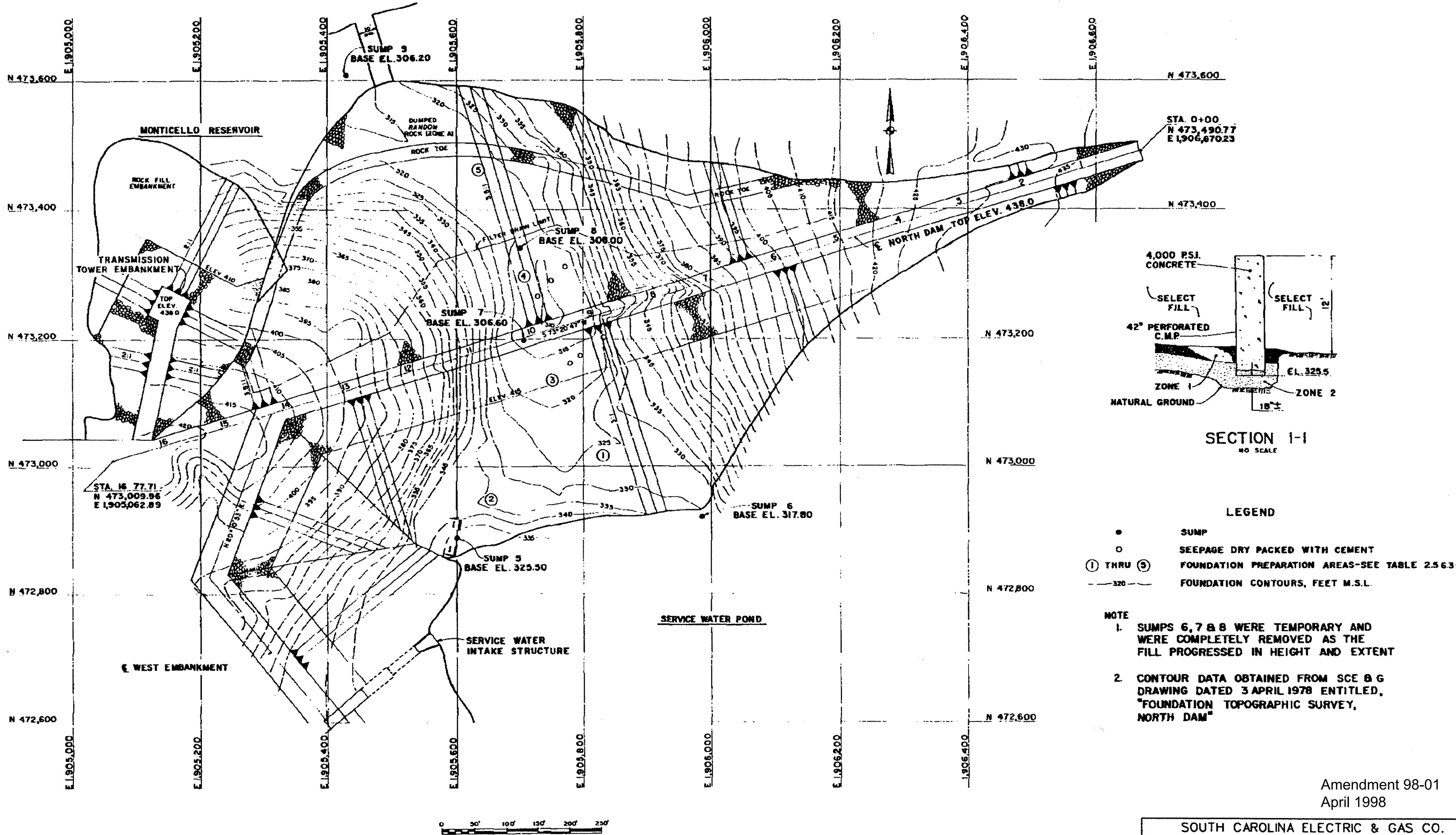


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Geologic and Structure Map of the South Dam Foundation

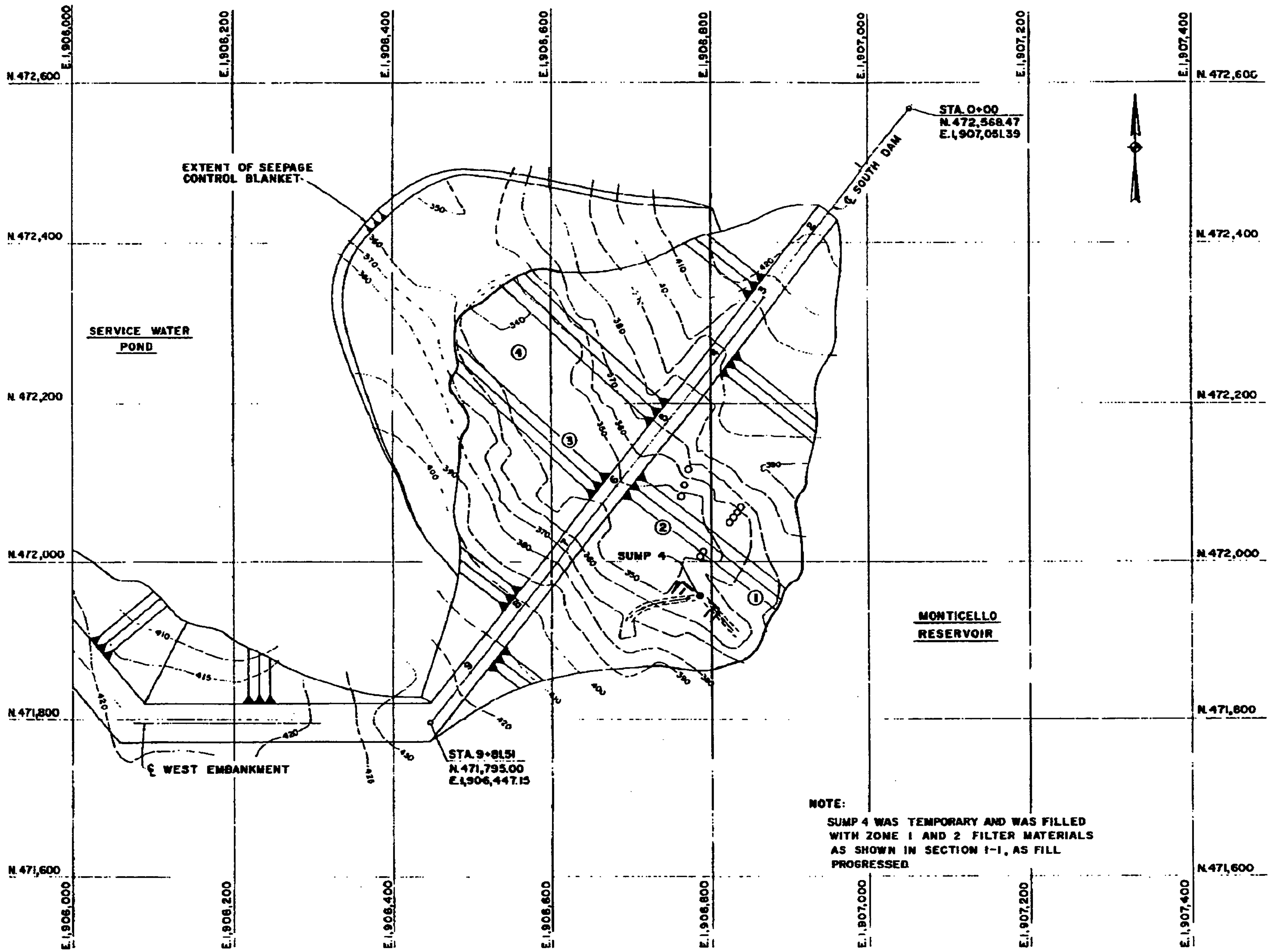
Figure 2.5-104

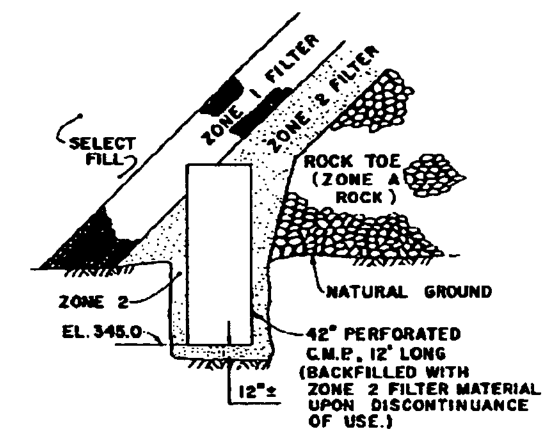


Amendment 98-01
April 1998

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

North Dam Foundation
As-Built Plan
Associated with Dwg. No. E-726-411
Rev. 1
Figure 2.5-105





SECTION 1-1

NO SCALE

LEGEND

●	SUMP
	DRAINAGE DITCH TO SUMP
o	SEEPAGE DRY PACKED WITH CEMENT
① THRU ④	FOUNDATION PREPARATION AREAS SEE TABLE 2.5.6.3-1
--- 340 ---	FOUNDATION CONTOURS, FEET M.S.L.

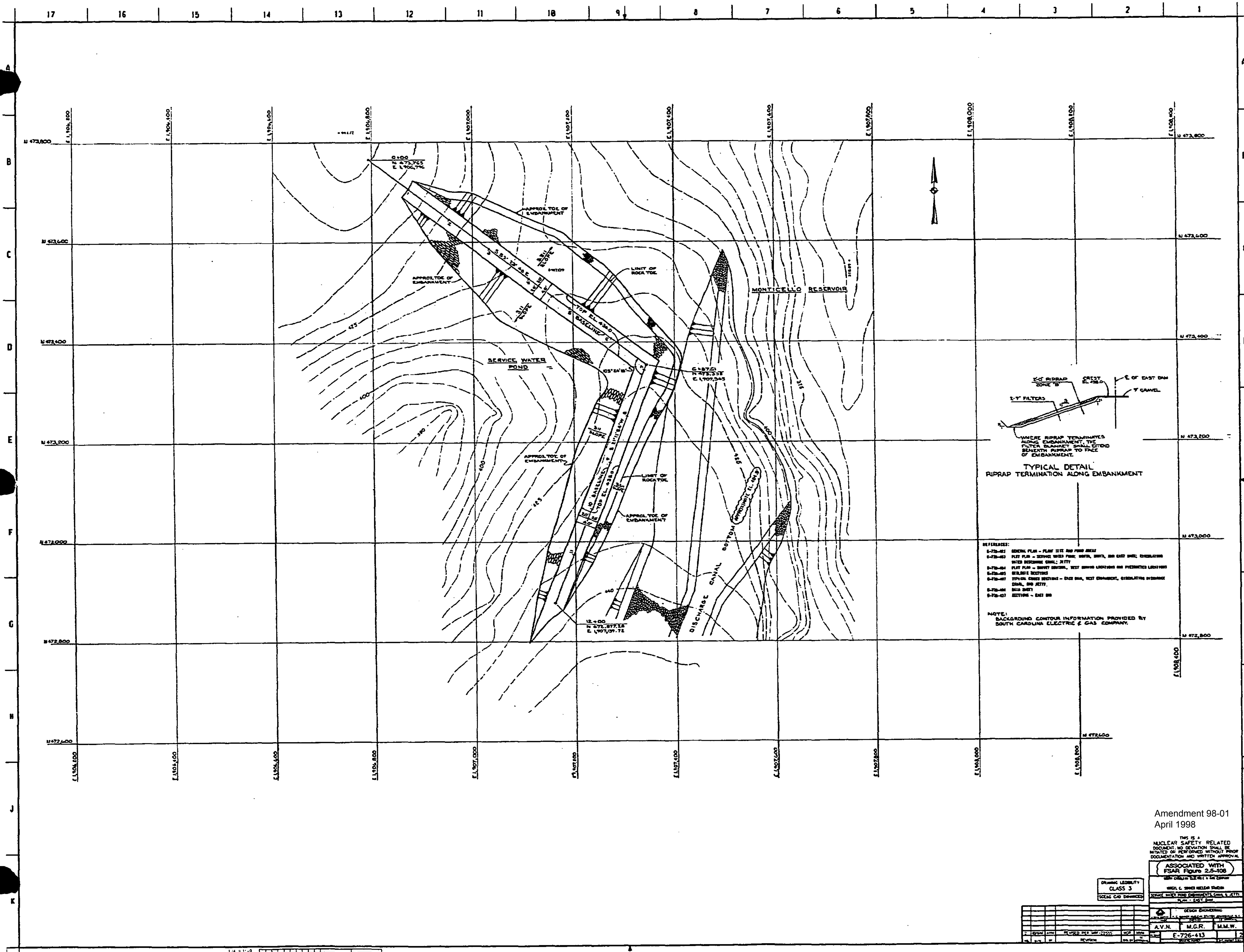
NOTE:

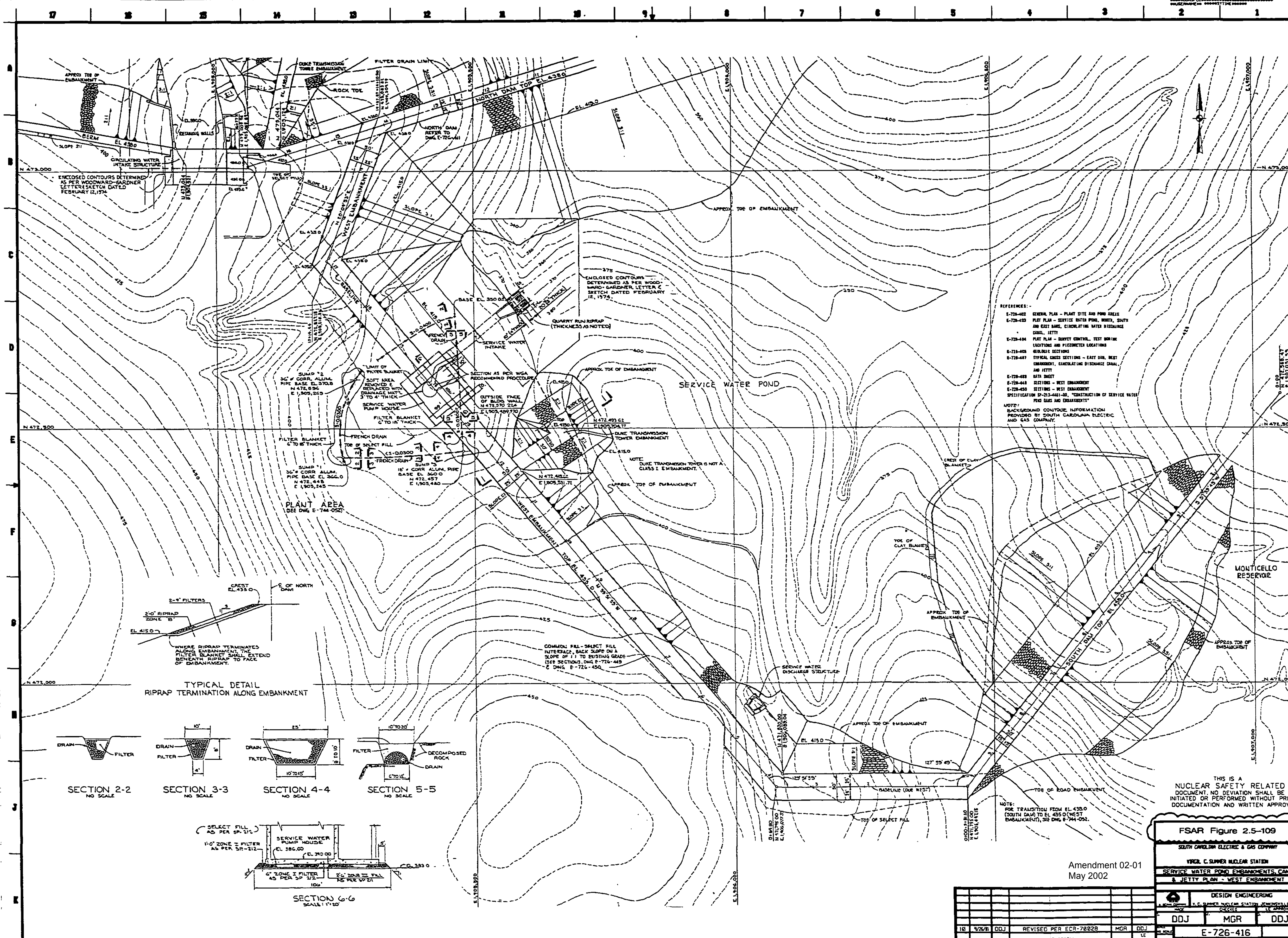
SUMP 4 WAS TEMPORARY AND WAS FILLED WITH ZONE 1 AND 2 FILTER MATERIALS AS SHOWN IN SECTION 1-1, AS FILL PROGRESSED.

Amendment 98-01
April 1998

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

South Dam Foundation
As-Built Plan
Associated with Dwg. No. E-726-412
Rev. 1
Figure 2.5-107

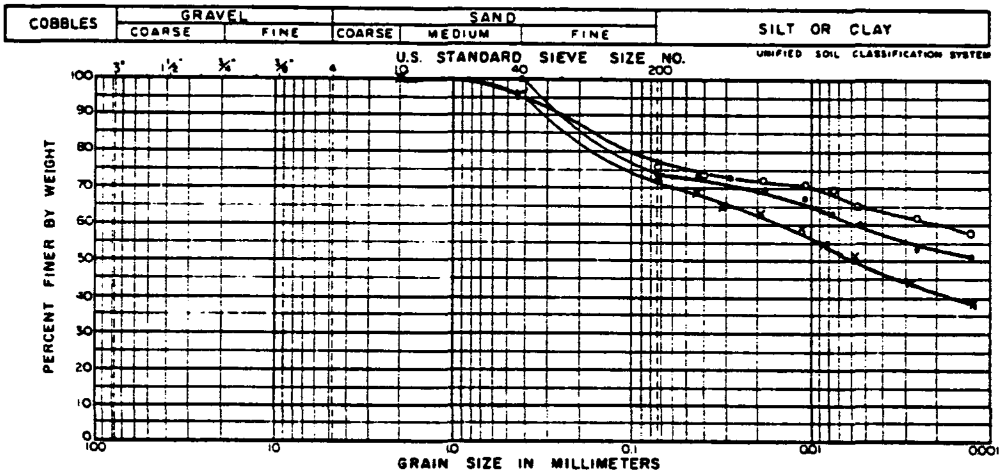

MONTICELLO RESERVOIR
SERVICE WATER POND
DISCHARGE CANAL BOTTOM
APPROX. TOE OF EMBANKMENT
LIMIT OF ROCK TOE
TOP EL. 438.0
3:1 SLOPE
0+00
N. 473,765
E. 1,906,776
12+00
N. 472,877.28
E. 1,907,139.72
2-0" RIPRAP ZONE 'B'
CREST EL. 438.0
℄ OF EAST DAM
9" GRAVEL
2-9" FILTERS
WHERE RIPRAP TERMINATES ALONG EMBANKMENT, THE FILTER BLANKET SHALL EXTEND BENEATH RIPRAP TO FACE OF EMBANKMENT.
TYPICAL DETAIL
RIPRAP TERMINATION ALONG EMBANKMENT
REFERENCES:
NOTE:
BACKGROUND CONTOUR INFORMATION PROVIDED BY SOUTH CAROLINA ELECTRIC & GAS COMPANY.
Amendment 98-01
April 1998
THIS IS A NUCLEAR SAFETY RELATED DOCUMENT. NO DEVIATION SHALL BE INITIATED OR PERFORMED WITHOUT PRIOR DOCUMENTATION AND WRITTEN APPROVAL
ASSOCIATED WITH FSAR Figure 2.5-108
DRAWING LEGIBILITY CLASS 3
A.V.N.
M.G.R.
M.M.W.
E-726-413
REVISION



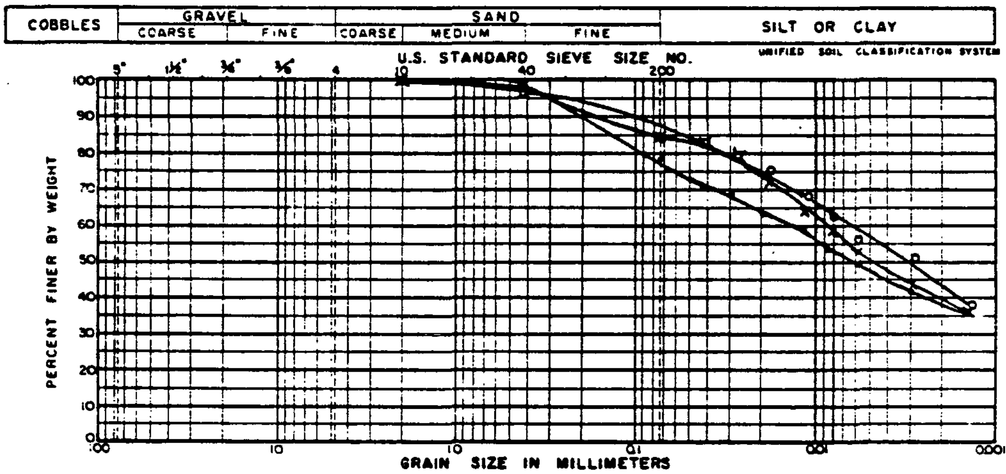
AMENDMENT 02-01
MAY 2002

RN 01-095

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
C-8		0.0-5.0	•	CH	28.2	70	32
		0.0-5.0	o	CH	28.2	70	32
C-8		5.0-10.0	x	CH	25.3	66	26



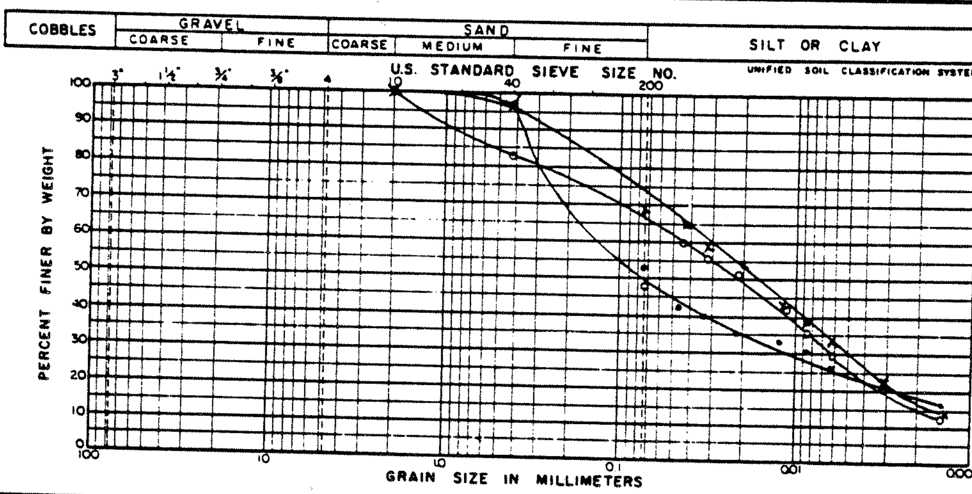
BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
C-8		10.0-15.0	•	ML-MH	26.7	50	30
C-10		5.0-10.0	o	MH	21.2	69	46
C-10		10.0-15.0	x	MH	23.6	71	50

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

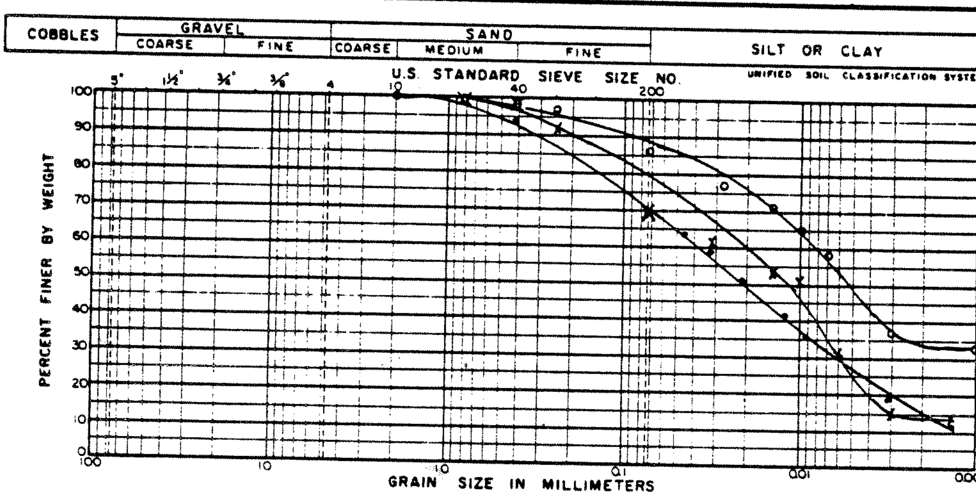
Grain Size Distribution Curves
of Foundation Soils
(Sheet 1 of 4)

Figure 2.5-110

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
C-8		15'-20'	•	CL	18.2	31	21
C-8		20'-25'	o	ML	24.3	47	32
C-8		25'-30'	x	ML-MH	19.7	50	32



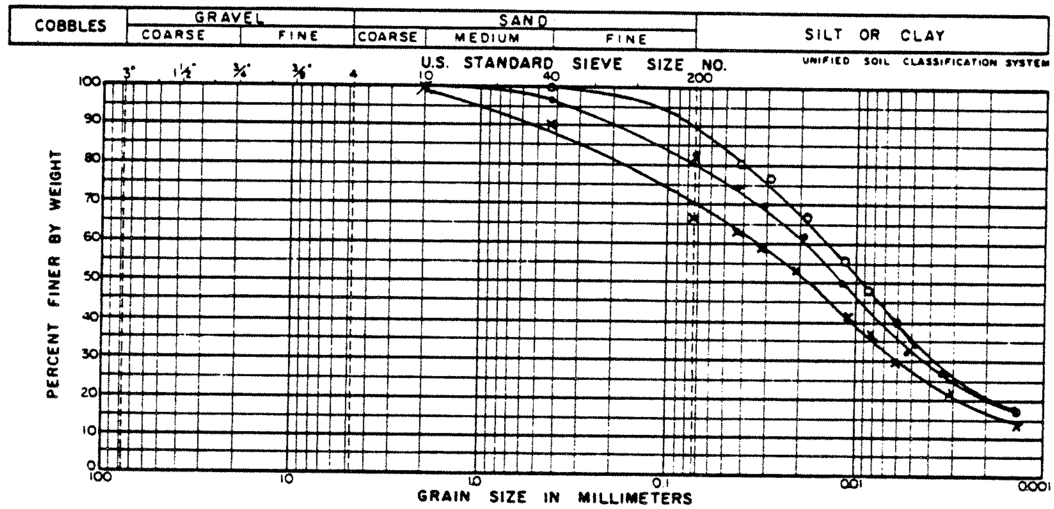
BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
C-8		30'-35'	•	MH	21.9	57	33
C-9		15'-20'	o	ML			
C-9		30'-35'	x	ML			

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

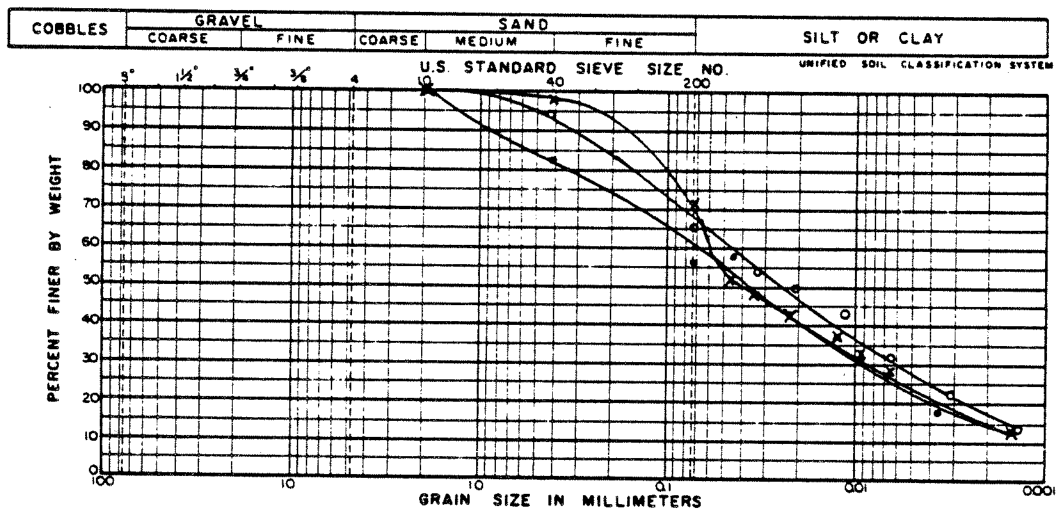
Grain Size Distribution Curves of Foundation Soils (Sheet 2 of 4)

Figure 2.5-110

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
C-10		15'-20'	•	MH	21.7	72	46
C-10		20'-25'	o	MH	25.1	70	55
C-10		25'-30'	x	MH	21.1	53	36



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
C-10		30'-35	•	ML	15.3	40	31
C-10		35'-40'	o	ML	17.9	46	29
C-10		40'-45'	x	CL-ML	17.0	40	26

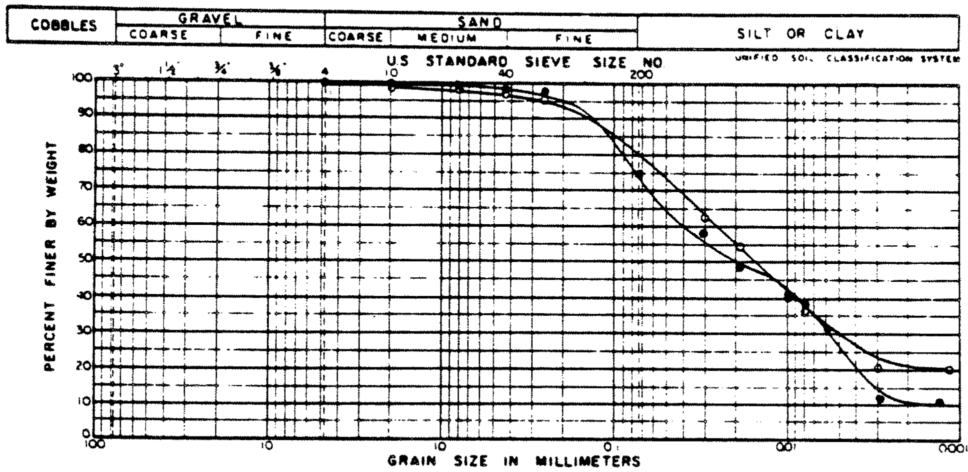
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Grain Size Distribution Curves of Foundation Soils (Sheet 3 of 4)

Figure 2.5-110

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
C-11		5'-10'	●	ML			
C-11		20'-25'	o	ML			

Amendment 0
August 1984

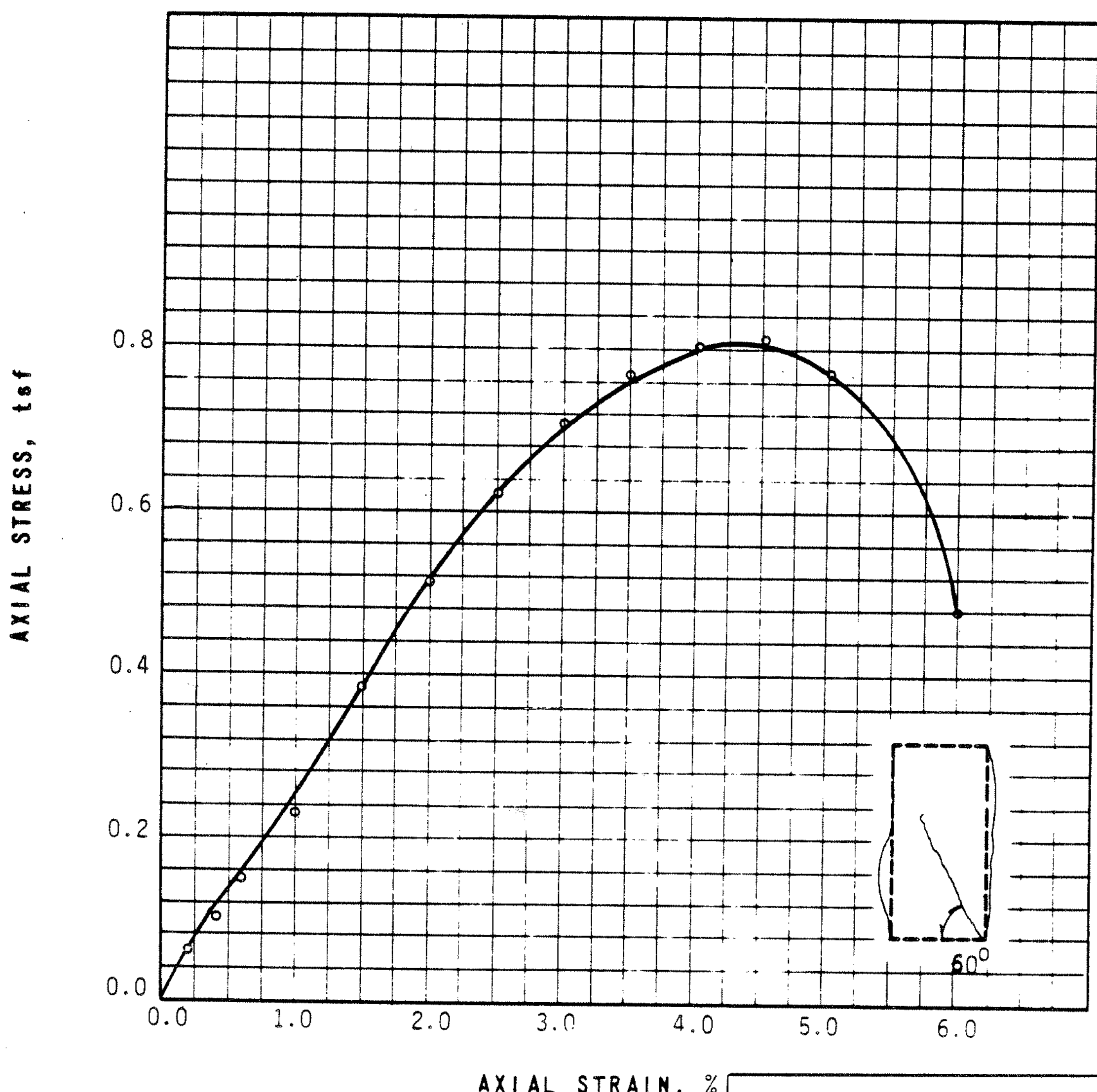
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Grain Size Distribution Curves of Foundation Soils
(Sheet 4 of 4)

Figure 2.5-110

UNCONFINED COMPRESSION TEST

Project	Virgil C. Summer Nuclear Station
Boring No. ED-2	Sample No. S-1 Depth 2.0 - 4.0 Ft.
Description	Red brown clayey silt (ML)
Moisture Content 27.3 %	Dry Density 88.6 pcf
Liquid Limit 47 %	Plastic Limit 36 %
Maximum Axial Stress 0.812 tsf @ 4.5 % Strain	



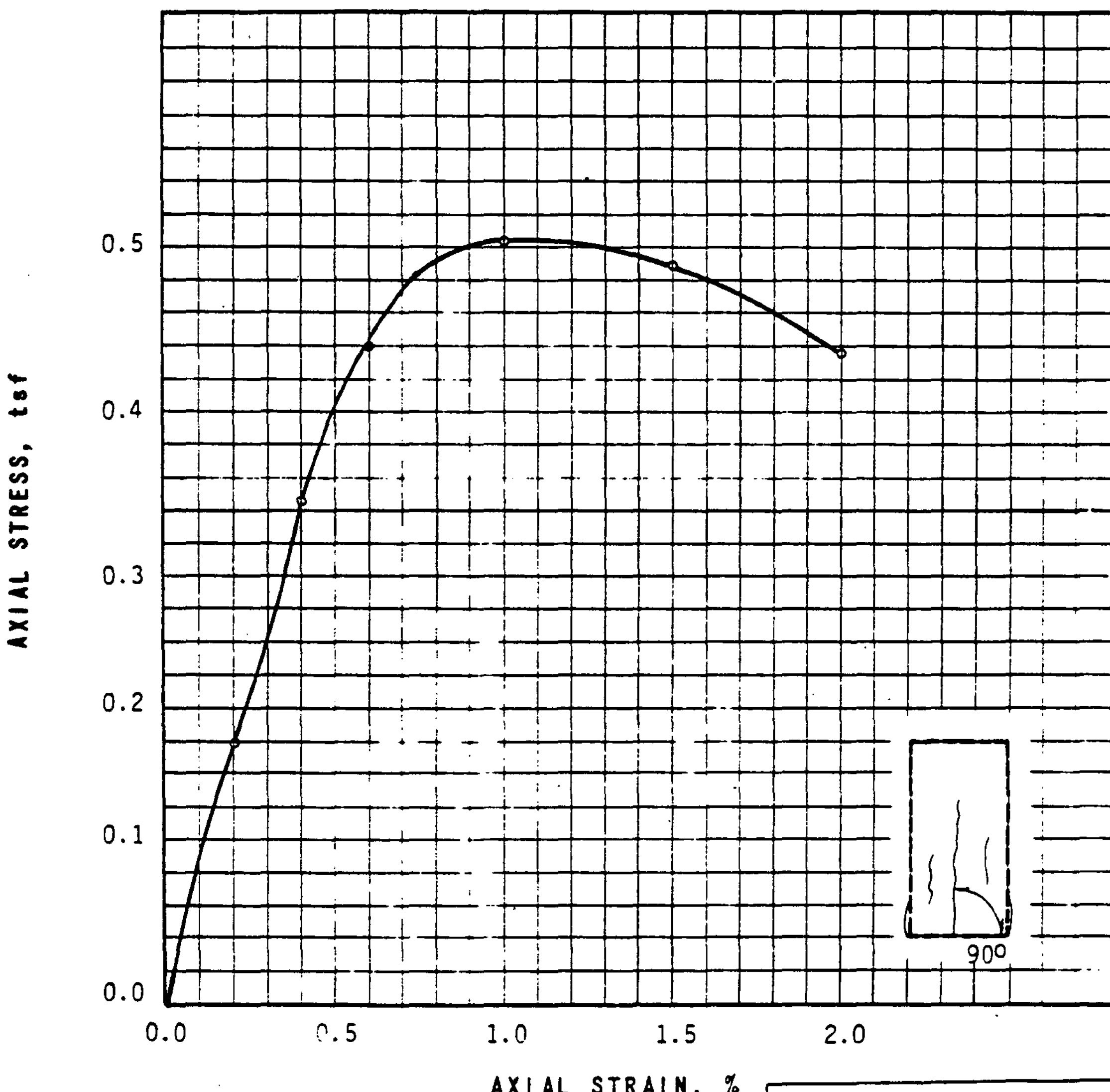
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconfined Compression Test Results
On Foundation Soils
(Sheet 1 of 9)

Figure 2.5-111

UNCONFINED COMPRESSION TEST

Project	Virgil C. Summer Nuclear Station
Boring No. ED-2	Sample No. S-3 Depth 7.0 - 9.5 Ft.
Description	Red clayey silt (MH)
Moisture Content 42.9 %	Dry Density 78.83 pcf
Liquid Limit 60 %	Plastic Limit 51 %
Maximum Axial Stress 0.464 tsf @ 1.0 % Strain	



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconfined Compression Test Results On Foundation Soils (Sheet 2 of 9)

Figure 2.5-111

UNCONFINED COMPRESSION TEST

Project Virgil C. Summer Nuclear Station

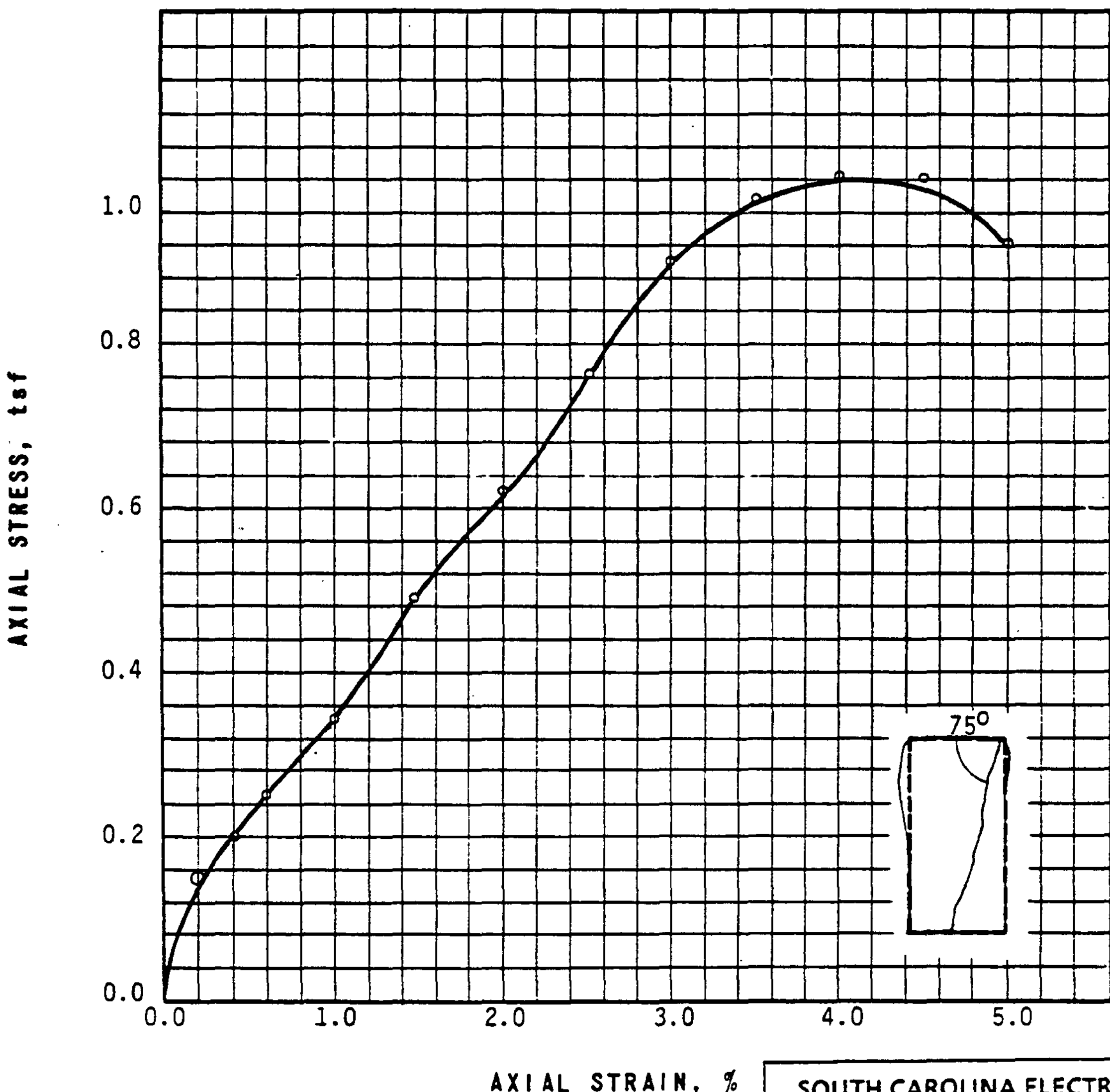
Boring No. WD-6 Sample No. S-1 Depth 2.0 - 4.2 Ft.

Description Red micaceous rooty fine sandy clayey silt (MH)

Moisture Content 32.1 % Dry Density 87.8 pcf

Liquid Limit 54 % Plastic Limit 37 %

Maximum Axial Stress 1.038 tsf @ 4.0 % Strain



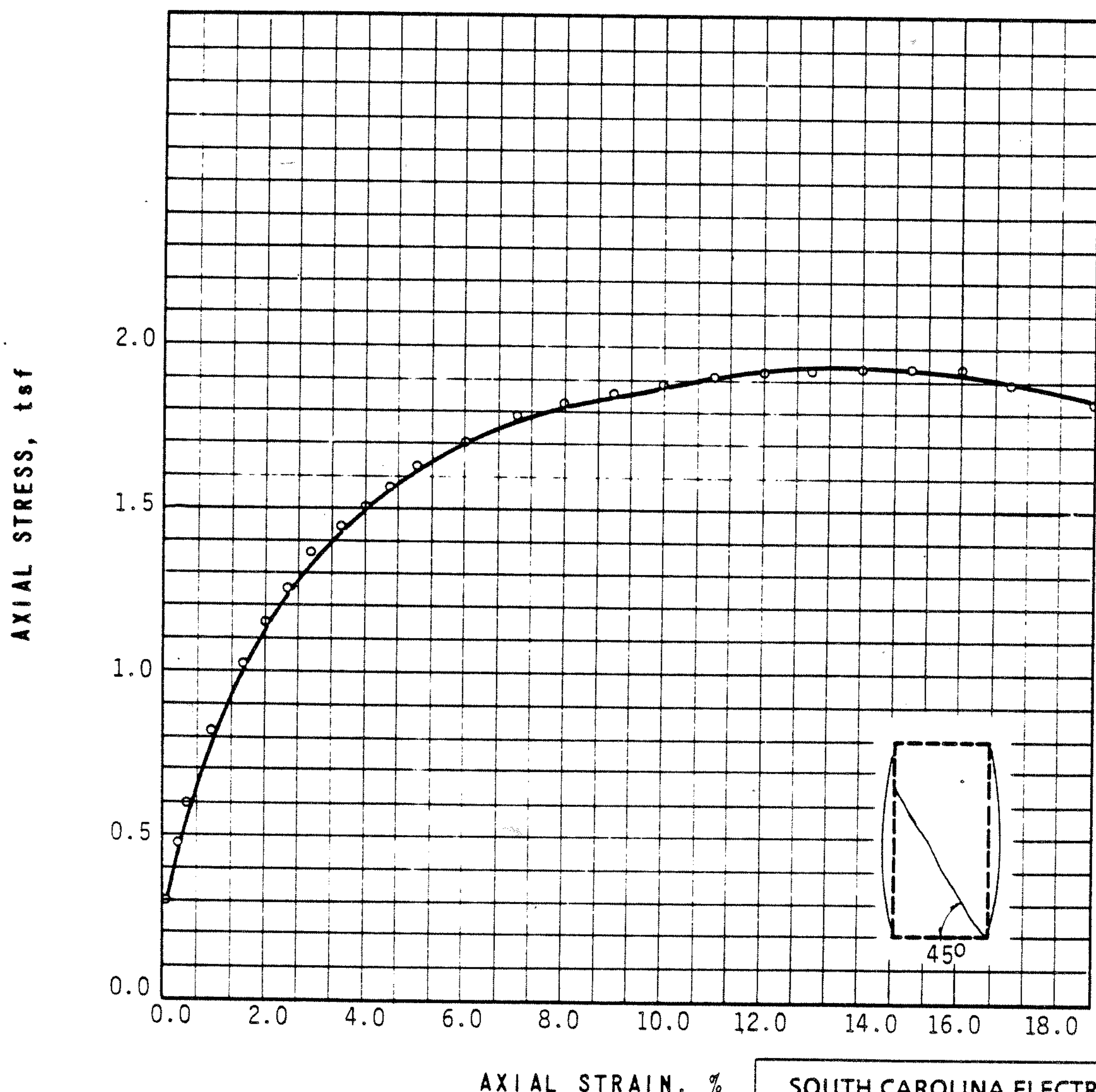
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconfined Compression Test Results
On Foundation Soils
(Sheet 3 of 9)

Figure 2.5-111

UNCONFINED COMPRESSION TEST

Project	Virgil C. Summer Nuclear Station
Boring No. WD-8	Sample No. S-1 Depth 2.0 - 4.8 Ft.
Description	Red-brown micaceous sandy silty clay (some roots) (CH)
Moisture Content 32.7 %	Dry Density 88.9 pcf
Liquid Limit 58 %	Plastic Limit 24 %
Maximum Axial Stress 1.94 tsf @ 14.0 % Strain	



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

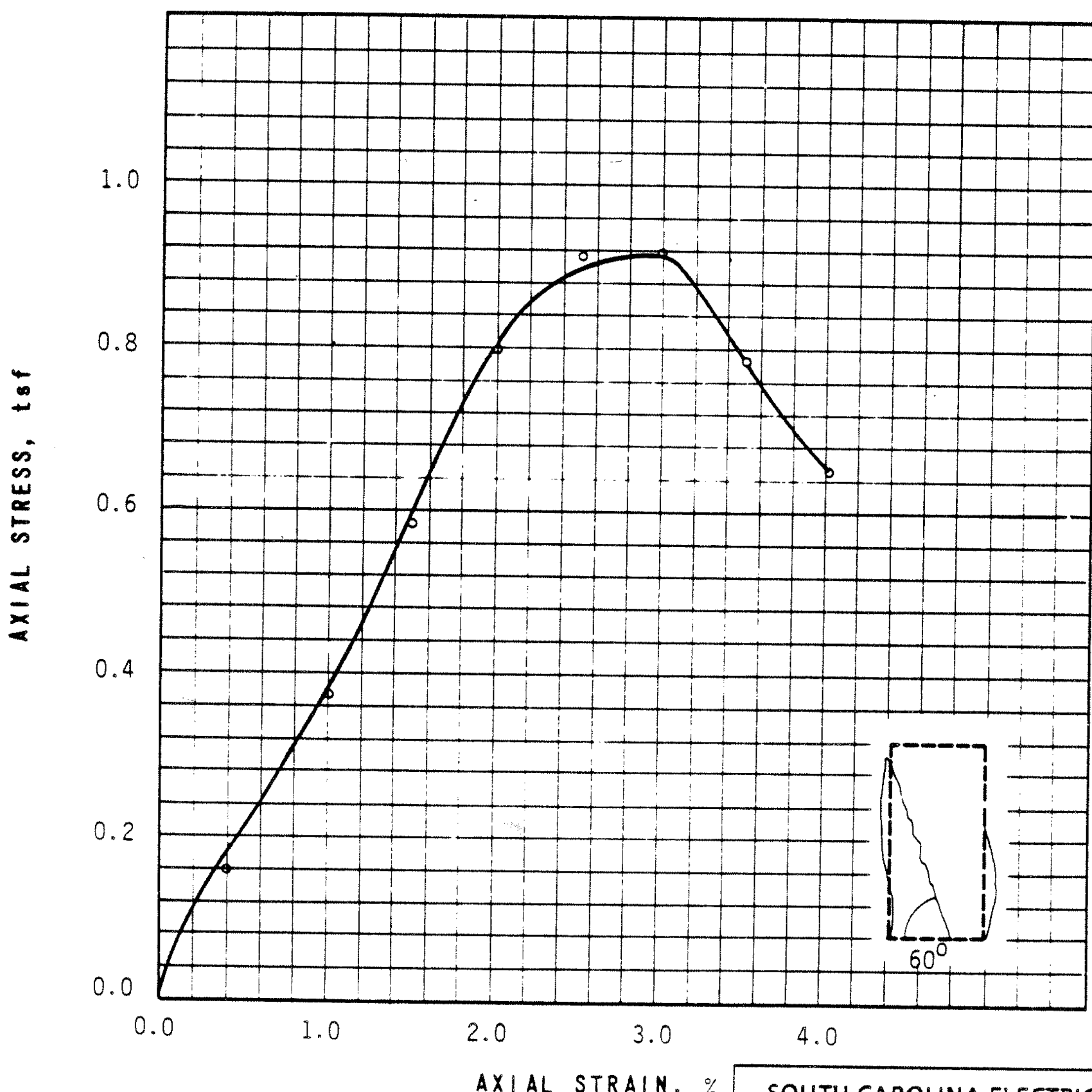
Unconfined Compression Test Results
On Foundation Soils
(Sheet 4 of 9)

Figure 2.5-111

Amendment 0
August 1984

UNCONFINED COMPRESSION TEST

Project	Virgil C. Summer Nuclear Station
Boring No. SS-1	Sample No. S-1 Depth 2.0 - 3.9 Ft.
Description	Red clayey silt with root inclusions (MH)
Moisture Content 36.1 %	Dry Density 83.5 pcf
Liquid Limit 55 %	Plastic Limit 43 %
Maximum Axial Stress 0.917 tsf @ 3.0 % Strain	



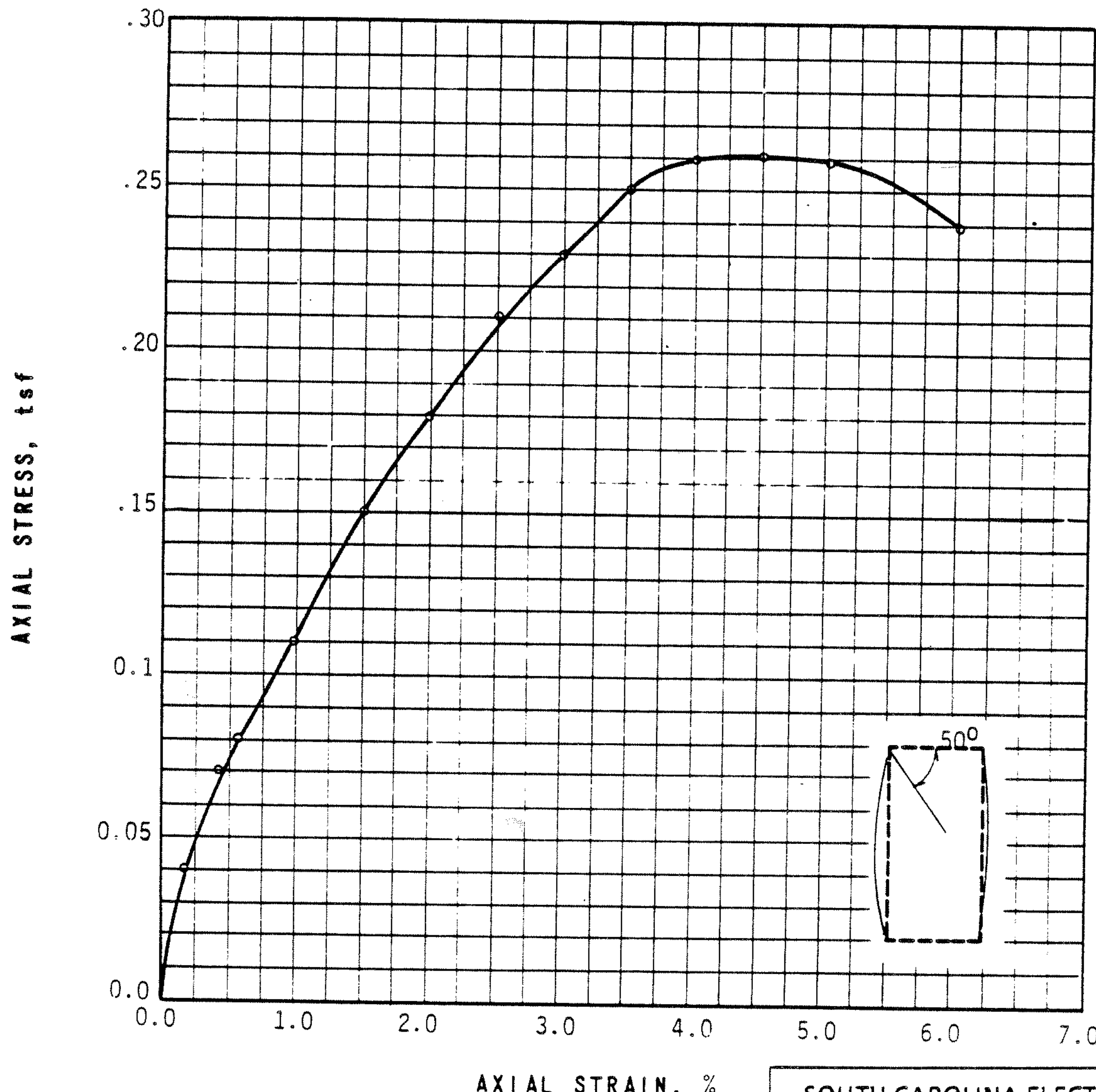
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconfined Compression Test Results
On Foundation Soils
(Sheet 5 of 9)

Figure 2.5-111

Amendment 0
August 1984

UNCONFINED COMPRESSION TEST			
Project Virgil C. Summer Nuclear Station			
Boring No. SS-5	Sample No. S-2	Depth 10.0- 12.5 Ft.	
Description Red-brown micaceous fine sandy clayey silt (MH)			
Moisture Content 44.0 %		Dry Density 72.1 pcf	
Liquid Limit 59 %	Plastic Limit 40 %		
Maximum Axial Stress 0.26 tsf @ 4.0 % Strain			



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconfined Compression Test Results
On Foundation Soils
(Sheet 6 of 9)

Figure 2.5-111

Amendment 0
August 1984

UNCONFINED COMPRESSION TEST

Project Virgil C. Summer Nuclear Station

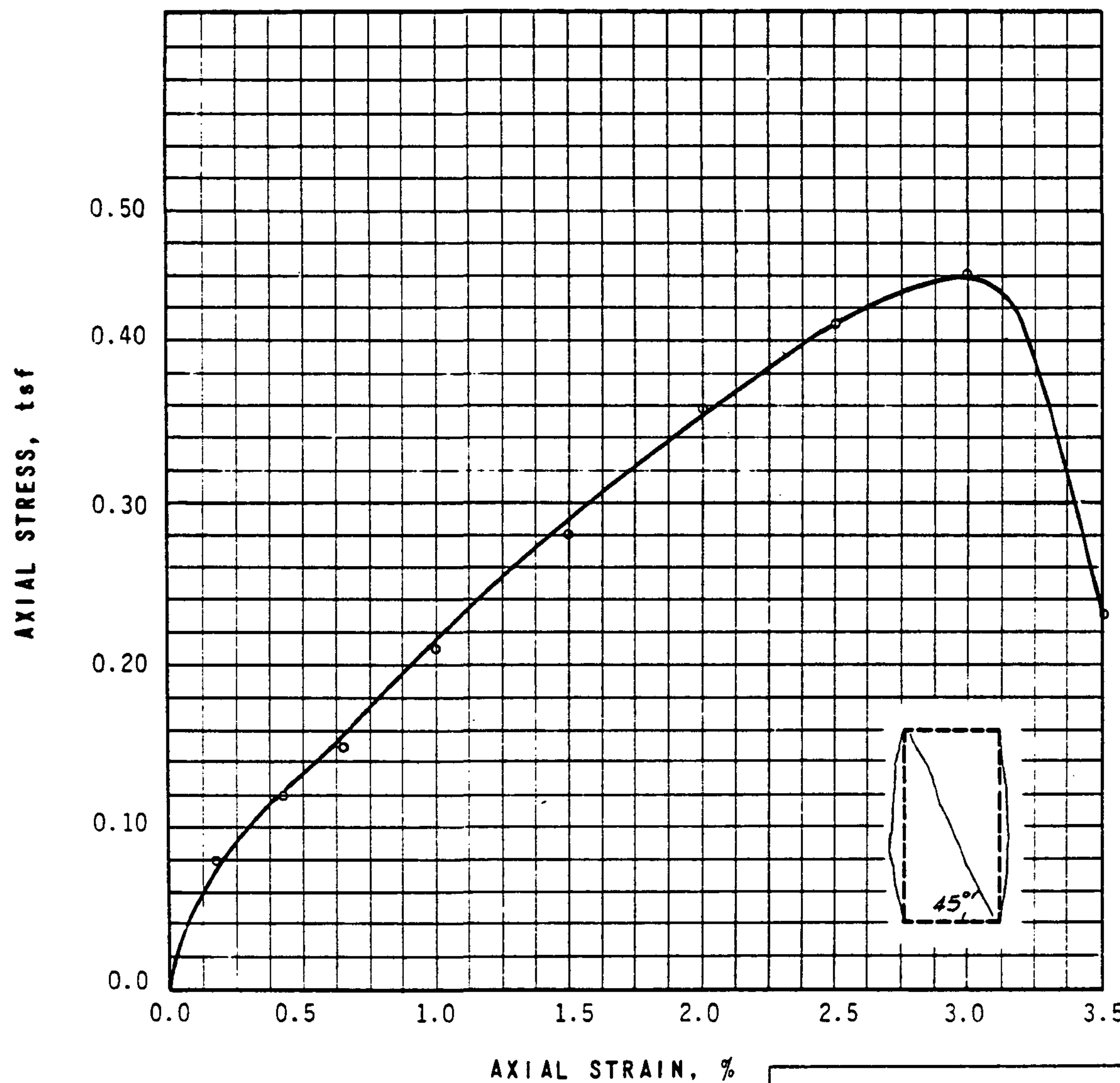
Boring No. SS-5 Sample No. S-3 Depth 18.0 - 20.6 Ft.

Description Light red-brown highly micaceous clayey sandy silt (ML)

Moisture Content 24.5 % Dry Density 91.1 pcf

Liquid Limit 42 % Plastic Limit 42 %

Maximum Axial Stress 0.44 tsf @ 3.0 % Strain



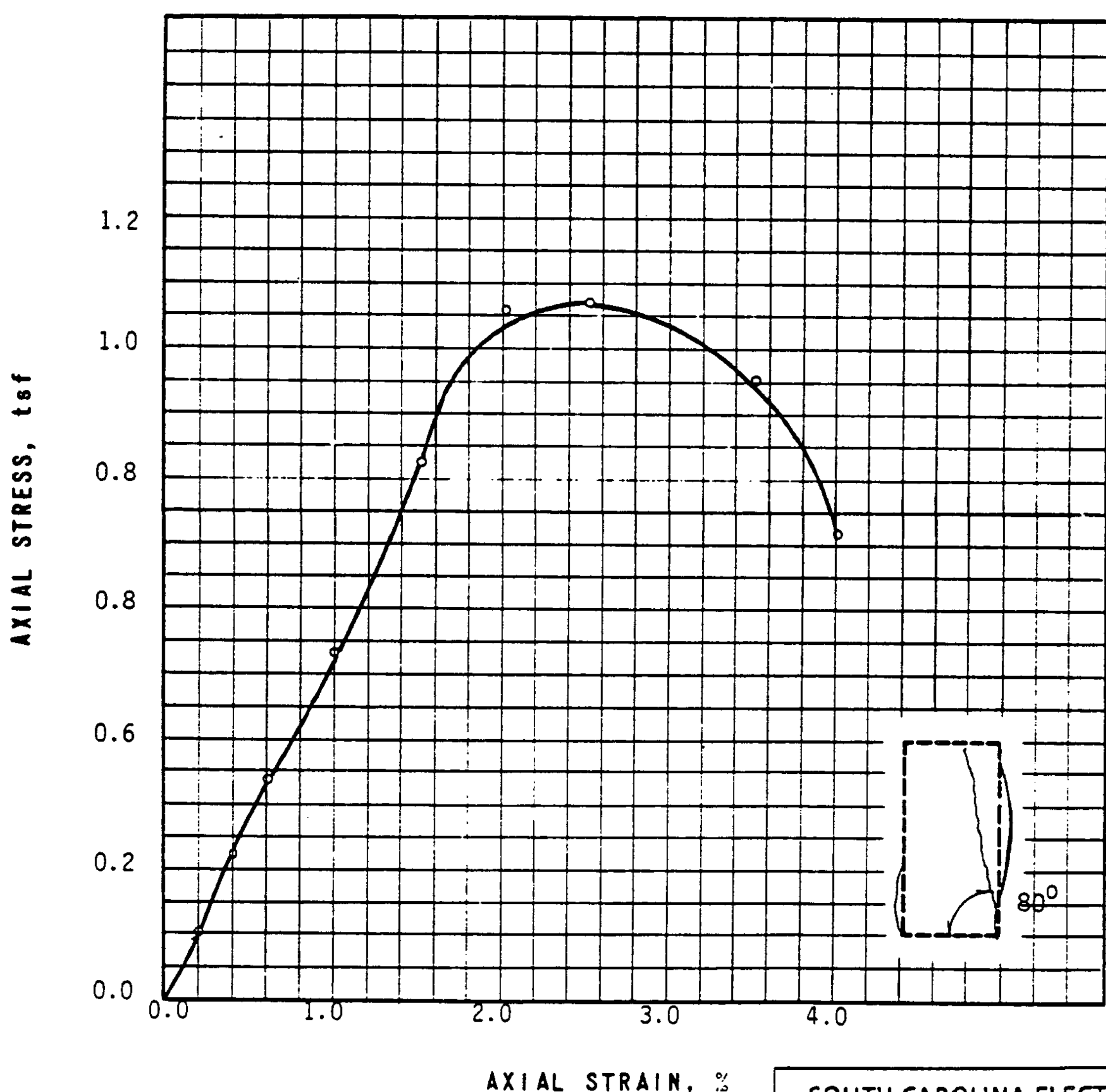
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconfined Compression Test Results
On Foundation Soils
(Sheet 7 of 9)

Figure 2.5-111

UNCONFINED COMPRESSION TEST

Project	Virgil C. Summer Nuclear Station
Boring No. C-3	Sample No. S-1 — Depth 2.0 - 4.0 Ft.
Description	Red silty clay (CL)
Moisture Content 22.9 %	Dry Density 102.0 pcf
Liquid Limit 49 %	Plastic Limit 20 %
Maximum Axial Stress 1.067 tsf @ 2.5 % Strain	



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconfined Compression Test Results
On Foundation Soils
(Sheet 8 of 9)

Figure 2.5-111

Amendment 0
August 1984

UNCONFINED COMPRESSION TEST

Project Virgil C. Summer Nuclear Station

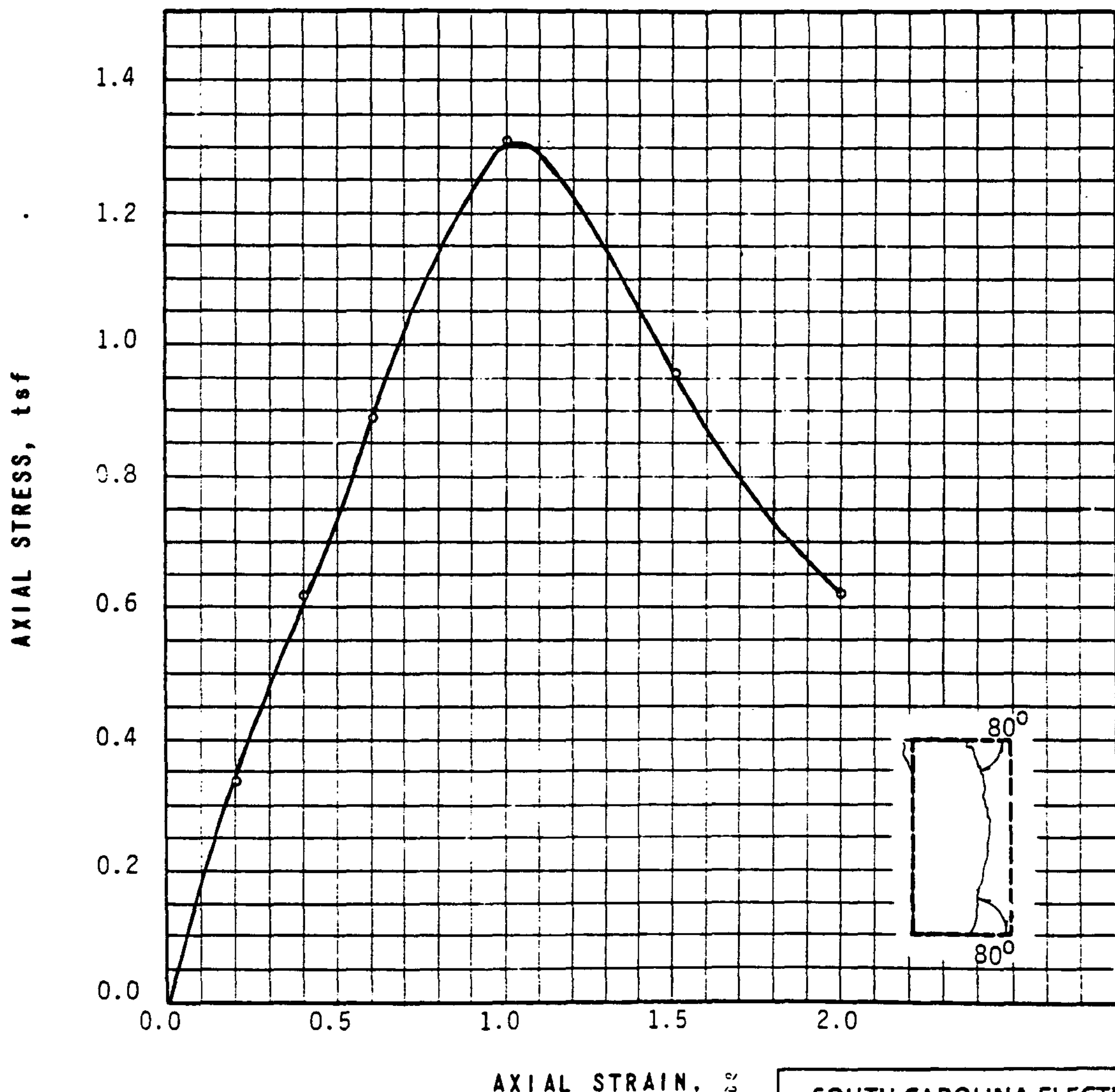
Boring No. C-3 Sample No. S-3 Depth 10.0 - 11.9 Ft.

Description Red brown micaceous clayey silt (MH)

Moisture Content 34.3 % Dry Density 84.5 pcf

Liquid Limit 59 % Plastic Limit 54 %

Maximum Axial Stress 1.307 tsf @ 1.0 % Strain



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconfined Compression Test Results
On Foundation Soils
(Sheet 9 of 9)

Figure 2.5-111

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

Project Virgil C. Summer Nuclear Station

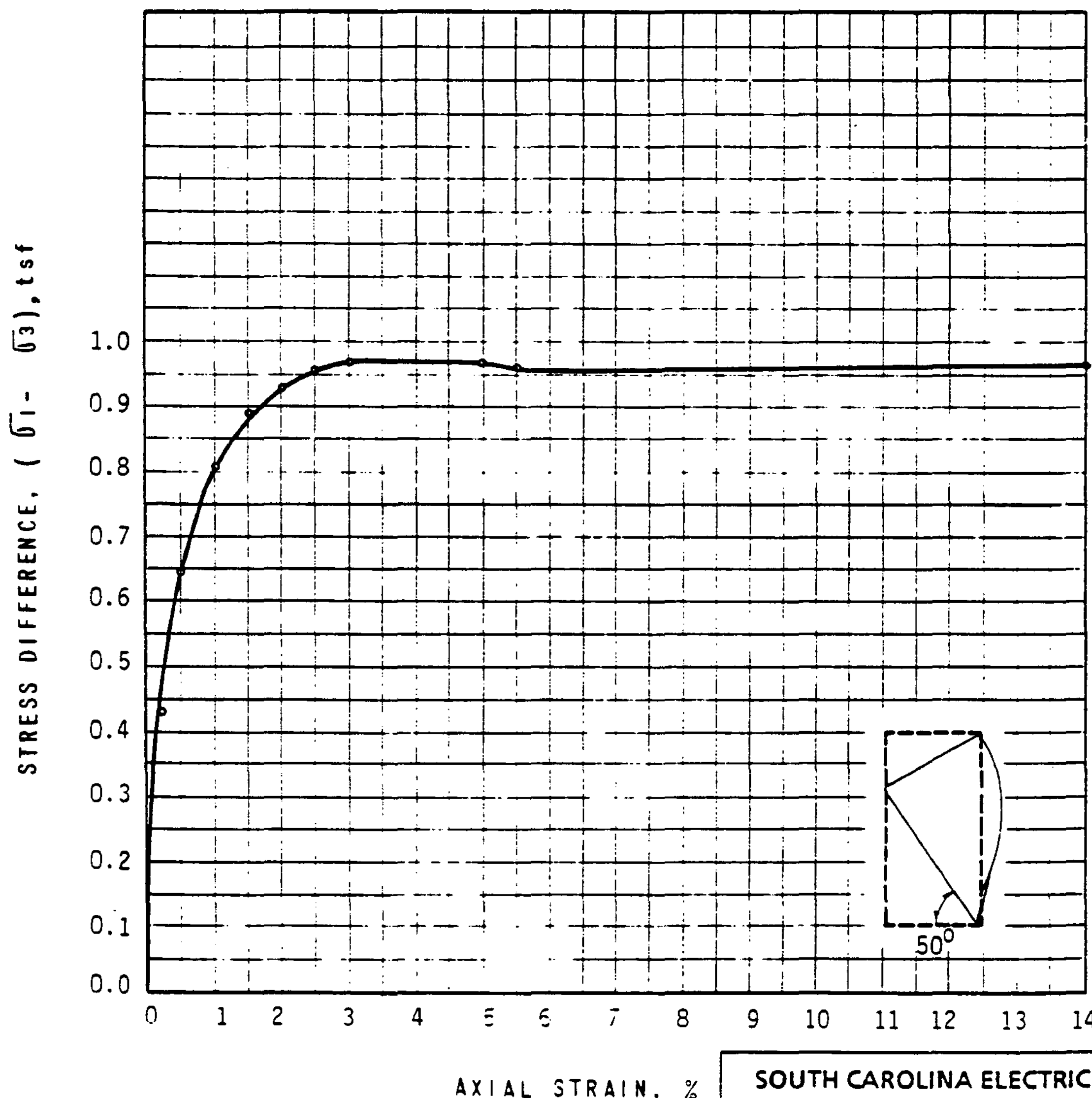
Boring No. SD-9B | Sample No. ST-1 | Depth 4.0 - 6.5 Ft

Description Red-brown fine sandy clayey silt (ML)

Moisture Content 29.0 % (after saturation) Dry Density 87.5 pcf

Liquid Limit 38 % Plastic Limit 26 % Relative Density - %

$(\sigma_1 - \sigma_3)$ max.= 0.97 tsf at 3.0 % Strain Chamber Pressure, σ_c = 17 psi



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconsolidated-Undrained Triaxial Compression Test Results On Foundation Soils (Sheet 1 of 13)

Figure 2.5-112

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

Project Virgil C. Summer Nuclear Station

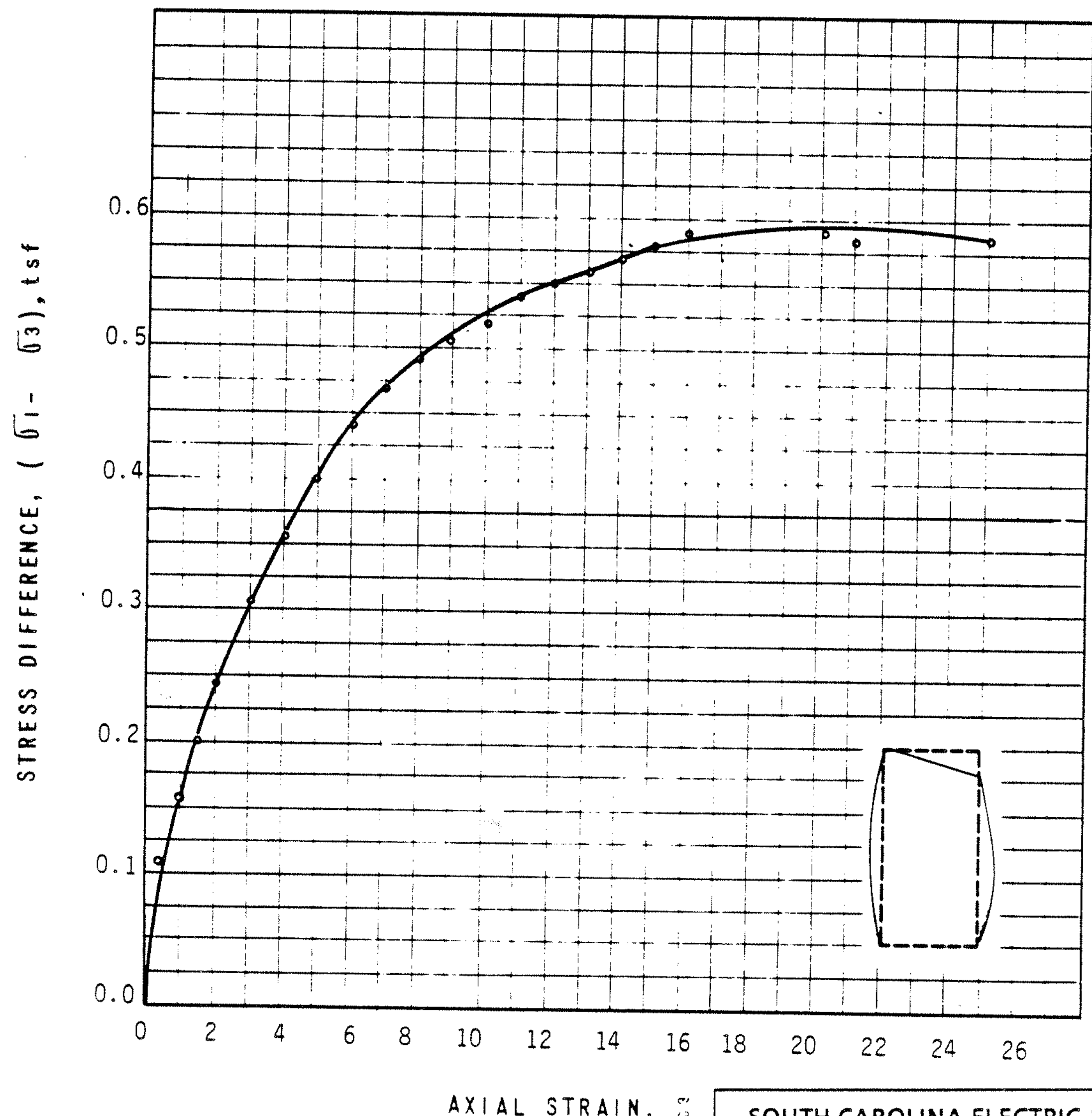
Boring No. SD-9B Sample No. ST-2 Depth 7.0 - 9.5 Ft

Description Red brown clayey silty medium to fine sand, trace coarse sand (SM-SC)

Moisture Content 24.1 % (after saturation) Dry Density 99.9 pcf

Liquid Limit 26 % Plastic Limit 19 % Relative Density - %

$(\sigma_1 - \sigma_3)$ max.= 0.59 tsf at 16.0 % Strain Chamber Pressure, σ_c = 17 psi



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconsolidated-Undrained Triaxial Compression Test Results On Foundation Soils (Sheet 2 of 13)

Figure 2.5-112

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

Project Virgil C. Summer Nuclear Station

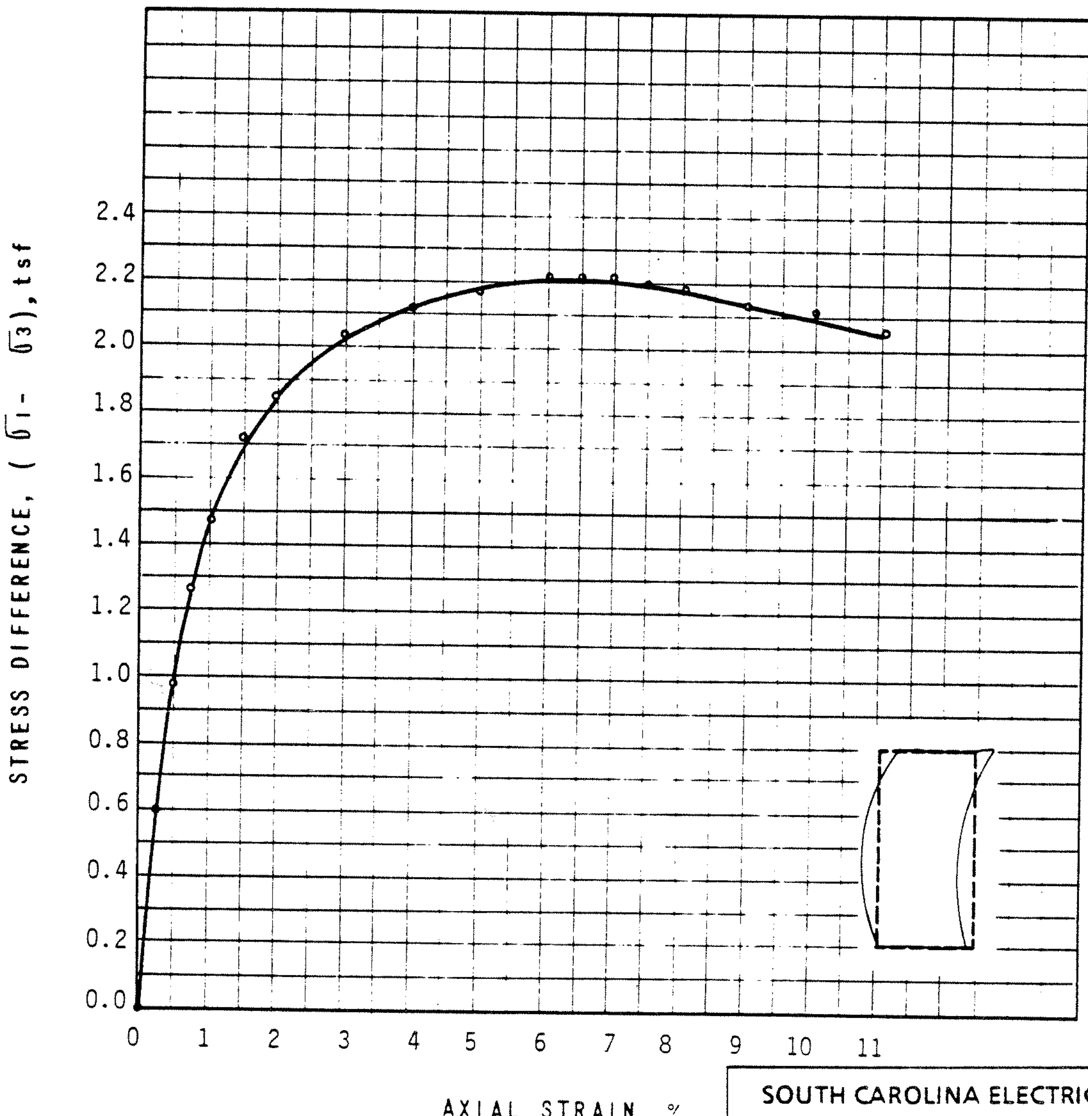
Boring No. SD-9B Sample No. ST-3 Depth 10.0-12.5 Ft

Description Mottled gray and brown clayey silty medium to fine sand (SM)

Moisture Content 14.8 % (after saturation) Dry Density 110.8 pcf

Liquid Limit 21 % Plastic Limit 17 % Relative Density - %

$(\sigma_1 - \sigma_3)$ max.= 2.21 tsf at 6.0 % Strain Chamber Pressure, σ_c = 17 psi



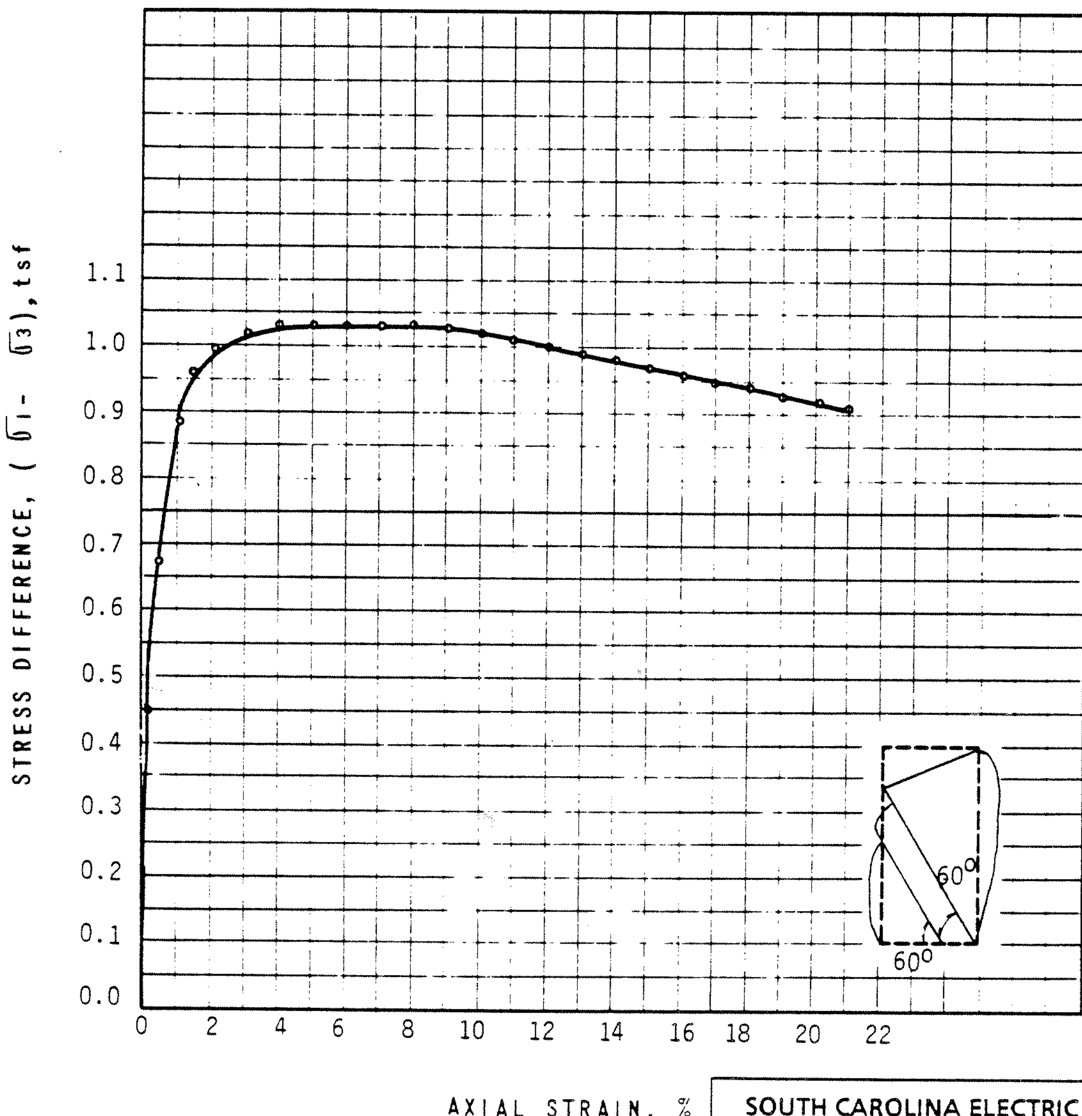
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconsolidated-Undrained Triaxial Compression Test Results On Foundation Soils (Sheet 3 of 13)

Figure 2.5-112

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

Project Virgil C. Summer Nuclear Station	
Boring No. SD-9D	Sample No. ST-1	Depth 4.0 - 6.5 Ft
Description Dark brown sandy silty clay, trace roots (CL)	
Moisture Content 23.8 % (after saturation)	Dry Density 95.6 pcf
Liquid Limit 31 % Plastic Limit 20 -	Relative Density - %
$(\sigma_1 - \sigma_3)$ max.= 1.03 tsf at 4.0 % Strain	Chamber Pressure, σ_c = 17 psi



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconsolidated-Undrained Triaxial Compression Test Results On Foundation Soils (Sheet 4 of 13)

Figure 2.5-112

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

Project Virgil C. Summer Nuclear Station

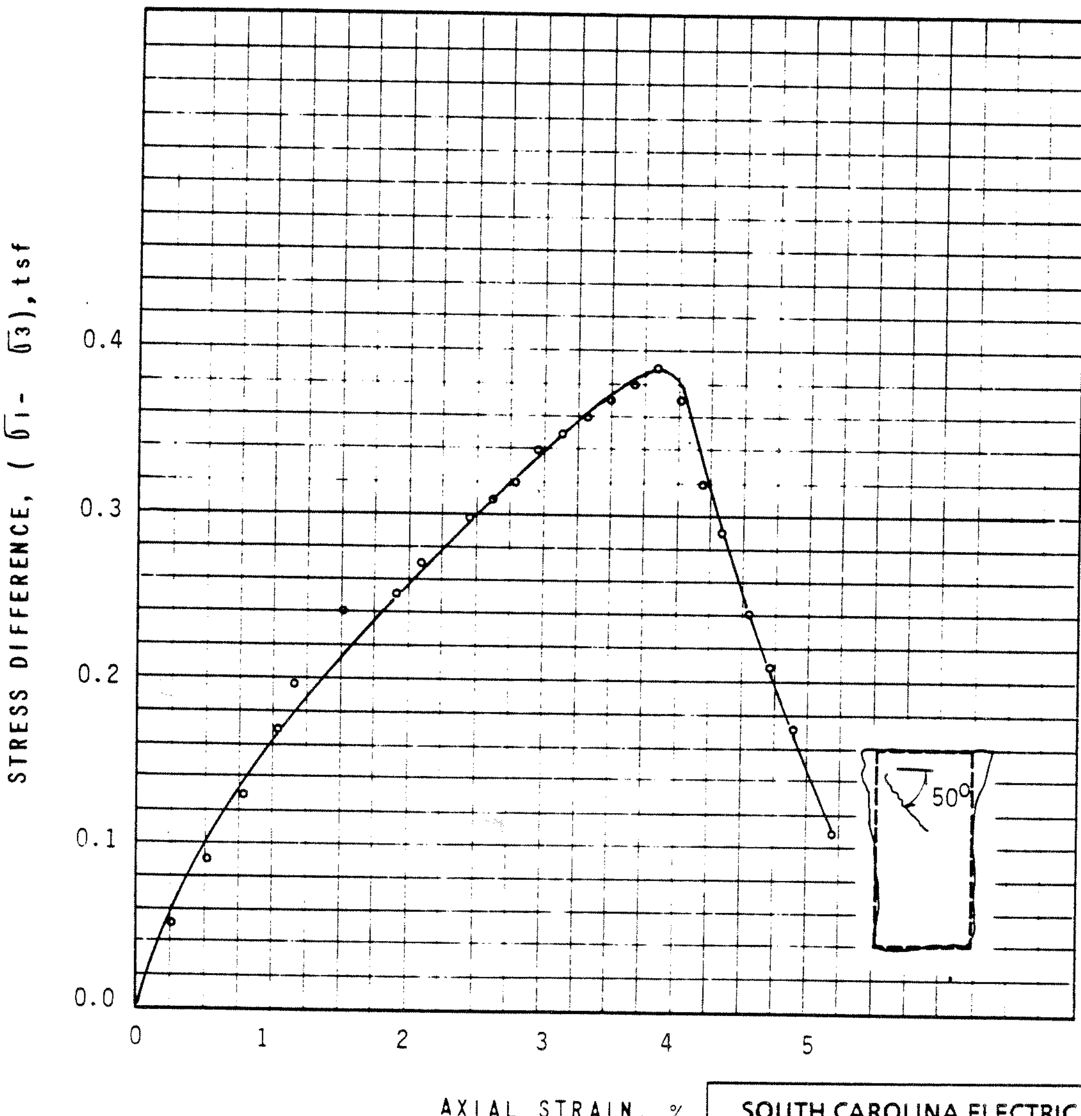
Boring No. ED-2 Sample No. S-7 Depth 17.0 - 19.5 Ft

Description Red-brown micaceous clayey silt, trace fine sand (MH)

Moisture Content 56.0 % (after saturation) Dry Density 67.5 pcf

Liquid Limit 54 % Plastic Limit 48 % Relative Density - %

$(\sigma_1 - \sigma_3)$ max.= 0.39 tsf at 3.85 % Strain Chamber Pressure, σ_c = 1.35 tsf



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

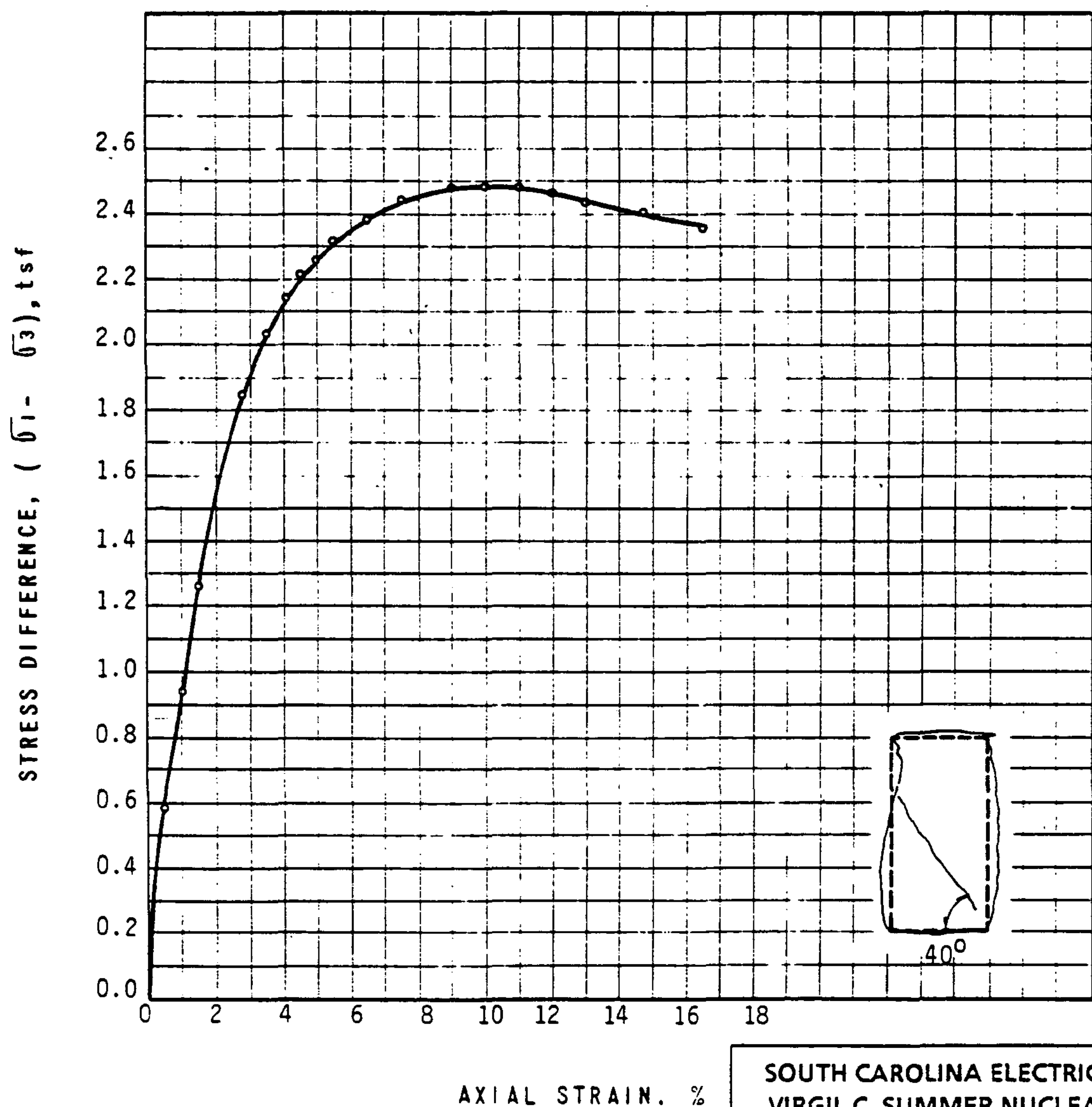
Unconsolidated-Undrained Triaxial Compression Test Results On Foundation Soils (Sheet 5 of 13)

Figure 2.5-112

Amendment 0
August 1984

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

Project	Virgil C. Summer Nuclear Station
Boring No. ED-2	Sample No. S-11 · Depth 27.0 - 29.1 Ft
Description	Brown micaceous clayey sandy silt (ML-MH)
Moisture Content 33.8 % (after saturation)	Dry Density 87.3 pcf
Liquid Limit 40 % · Plastic Limit 40 %	Relative Density - %
$(\sigma_1 - \sigma_3)$ max.= 2.49 tsf at 10.5 % Strain	Chamber Pressure, σ_c = 1.65 tsf



Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconsolidated-Undrained Triaxial Compression Test Results On Foundation Soils (Sheet 6 of 13)

Figure 2.5-112

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

Project Virgil C. Summer Nuclear Station

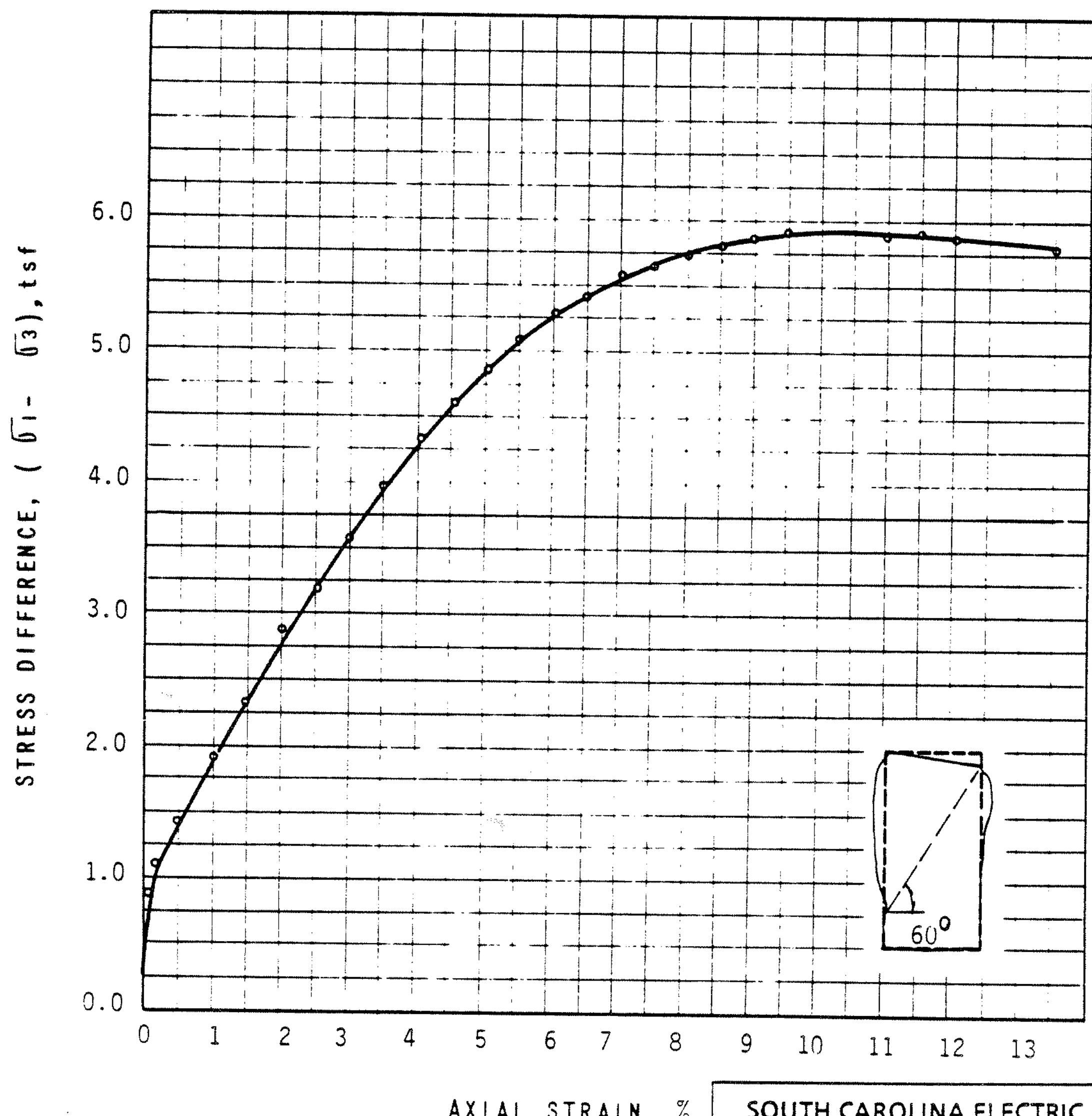
Boring No. WD-6 Sample No. S-3 Depth 10.0-12.5 Ft

Description Red-brown micaceous clayey silty sand (SM)

Moisture Content 23.0 % (after saturation) Dry Density 99.9 pcf

Liquid Limit 37 % Plastic Limit NP % Relative Density - %

$(\sigma_1 - \sigma_3)$ max.= 5.92 tsf at 10.5 % Strain Chamber Pressure, σ_c = 0.6 tsf



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VIRGIL C. SUMMER NUCLEAR STATION

Unconsolidated-Undrained Triaxial Compression Test Results On Foundation Soils (Sheet 7 of 13)

Figure 2.5-112

Amendment 0
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UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

Project	Virgil C. Summer Nuclear Station

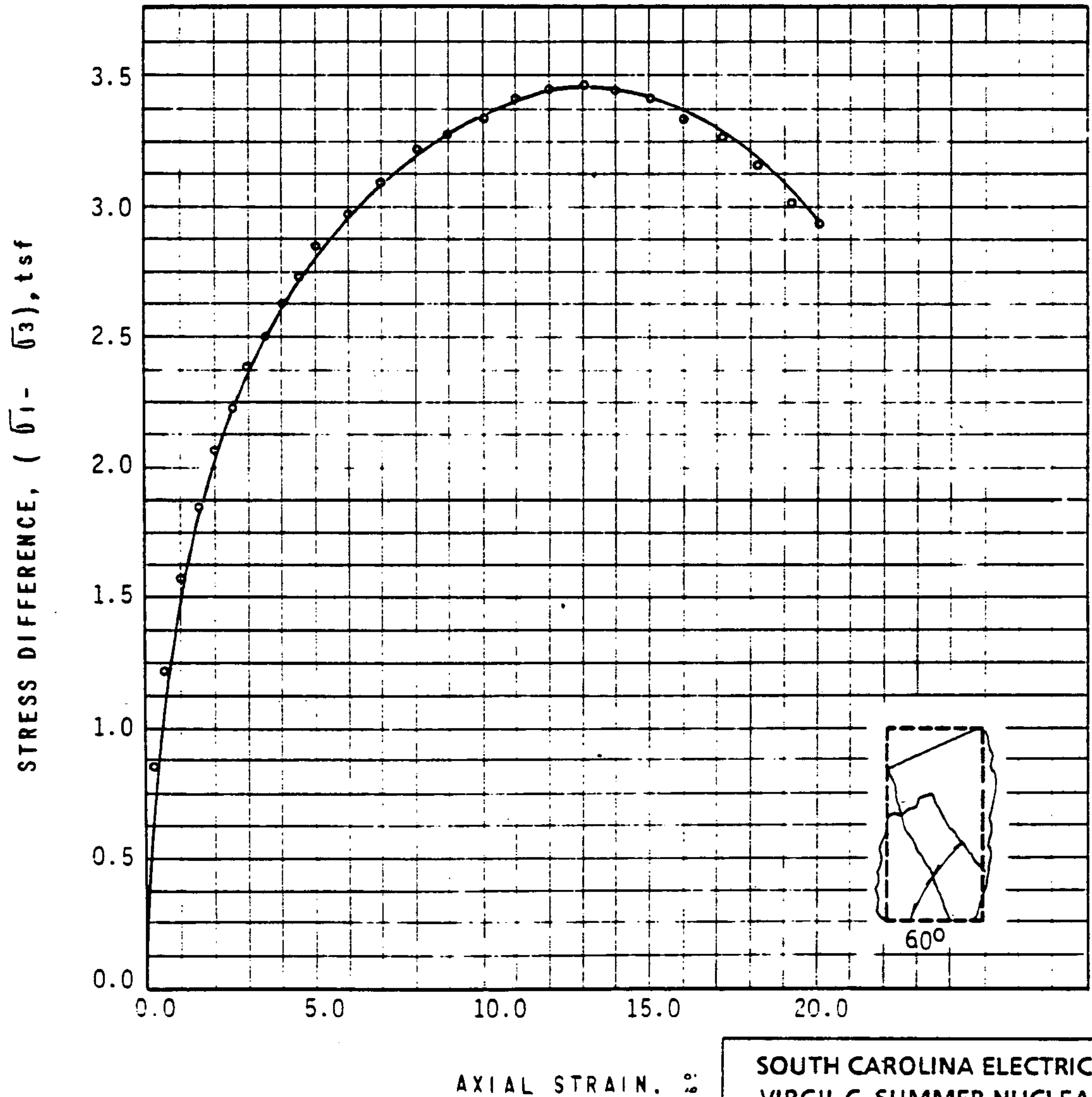
Boring No.	WD-6	Sample No.	S-5	Depth	18.0-20.2 Ft

Description Gray brown micaceous very fine sandy silt (ML)

Moisture Content 32.3 % (after saturation) Dry Density 85.9 pcf

Liquid Limit 36 % Plastic Limit NP % Relative Density - %

$(\sigma_1 - \sigma_3)$ max.= 3.45 tsf at 13.0 % Strain Chamber Pressure, σ_c = 1.10 tsf



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconsolidated-Undrained Triaxial Compression Test Results On Foundation Soils (Sheet 8 of 13)

Figure 2.5-112

Amendment 0
August 1984

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

Project Virgil C. Summer Nuclear Station

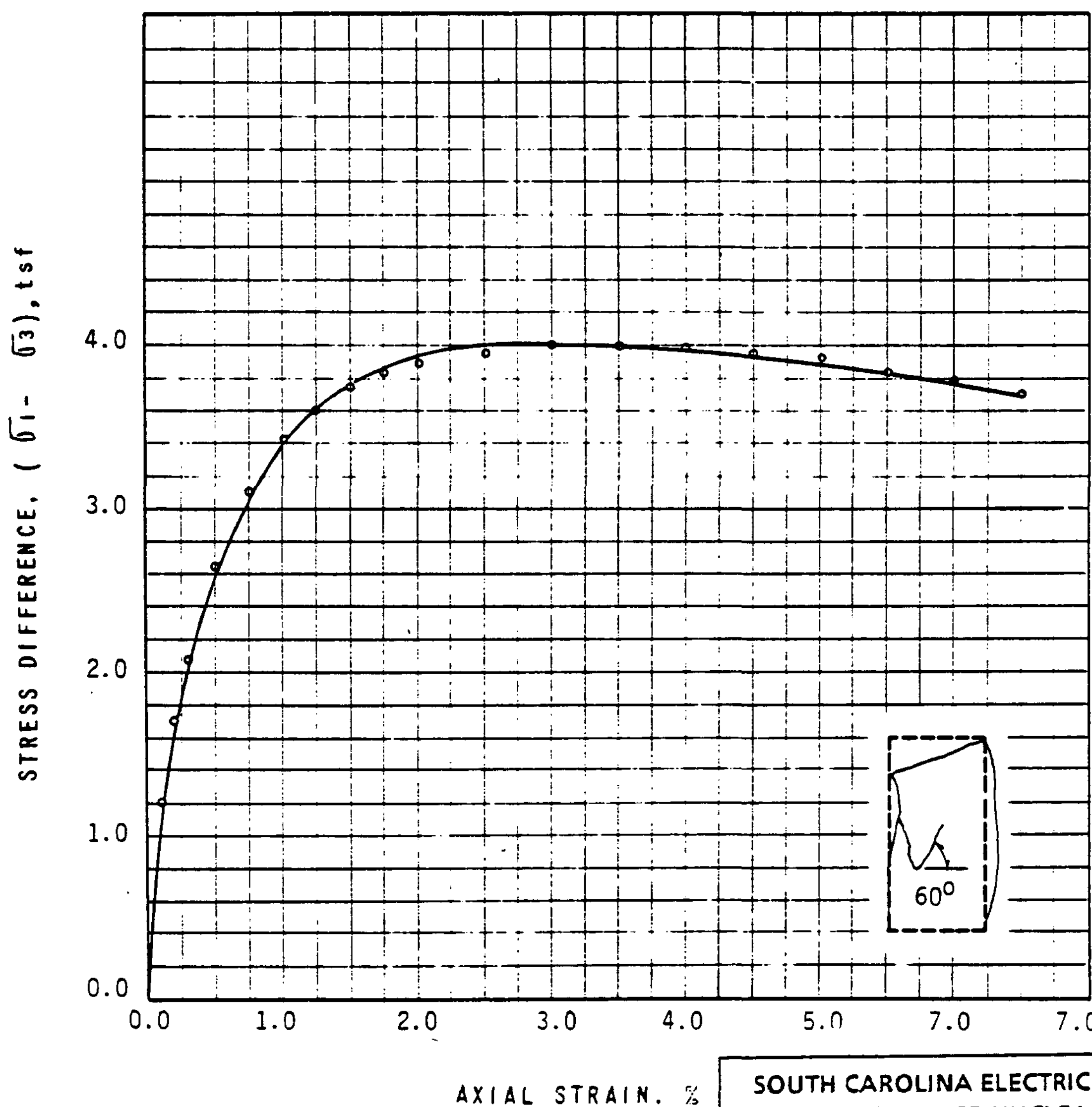
Boring No. WD-8 Sample No. S-3 Depth $10.0 - 11.8^{Ft}$

Description Red brown micaceous sandy clayey silt (ML)

Moisture Content 30.9 % (after saturation) Dry Density 88.9 pcf

Liquid Limit 45 % Plastic Limit NP % Relative Density - %

$(\sigma_1 - \sigma_3)$ max.= 4.0 tsf at 3.0 % Strain Chamber Pressure, σ_c= 2.85 tsf



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconsolidated-Undrained Triaxial Compression Test Results On Foundation Soils (Sheet 9 of 13)

Figure 2.5-112

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

Project Virgil C. Summer Nuclear Station

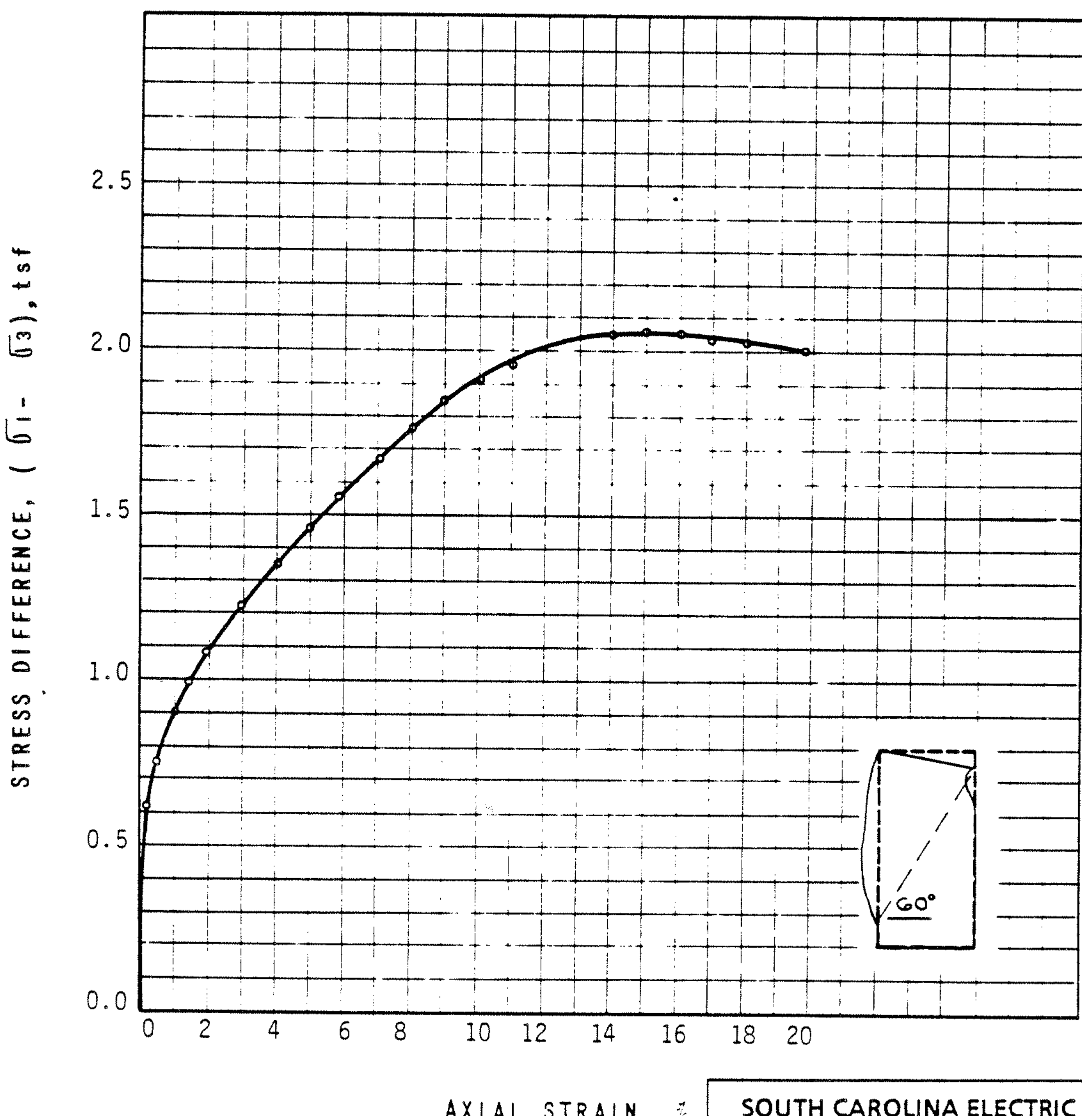
Boring No. SS-4 Sample No. S-3 Depth 10.0 - 12.0 Ft

Description Light brown fine sandy silt (ML)

Moisture Content 31.1 % (after saturation) Dry Density 80.1 pcf

Liquid Limit 40 % Plastic Limit NP % Relative Density - %

$(\sigma_1 - \sigma_3)$ max.= 2.08 tsf at 15.0 % Strain Chamber Pressure, σ_c = 0.94 tsf



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VIRGIL C. SUMMER NUCLEAR STATION

Unconsolidated-Undrained Triaxial Compression Test Results On Foundation Soils (Sheet 10 of 13)

Figure 2.5-112

Amendment 0
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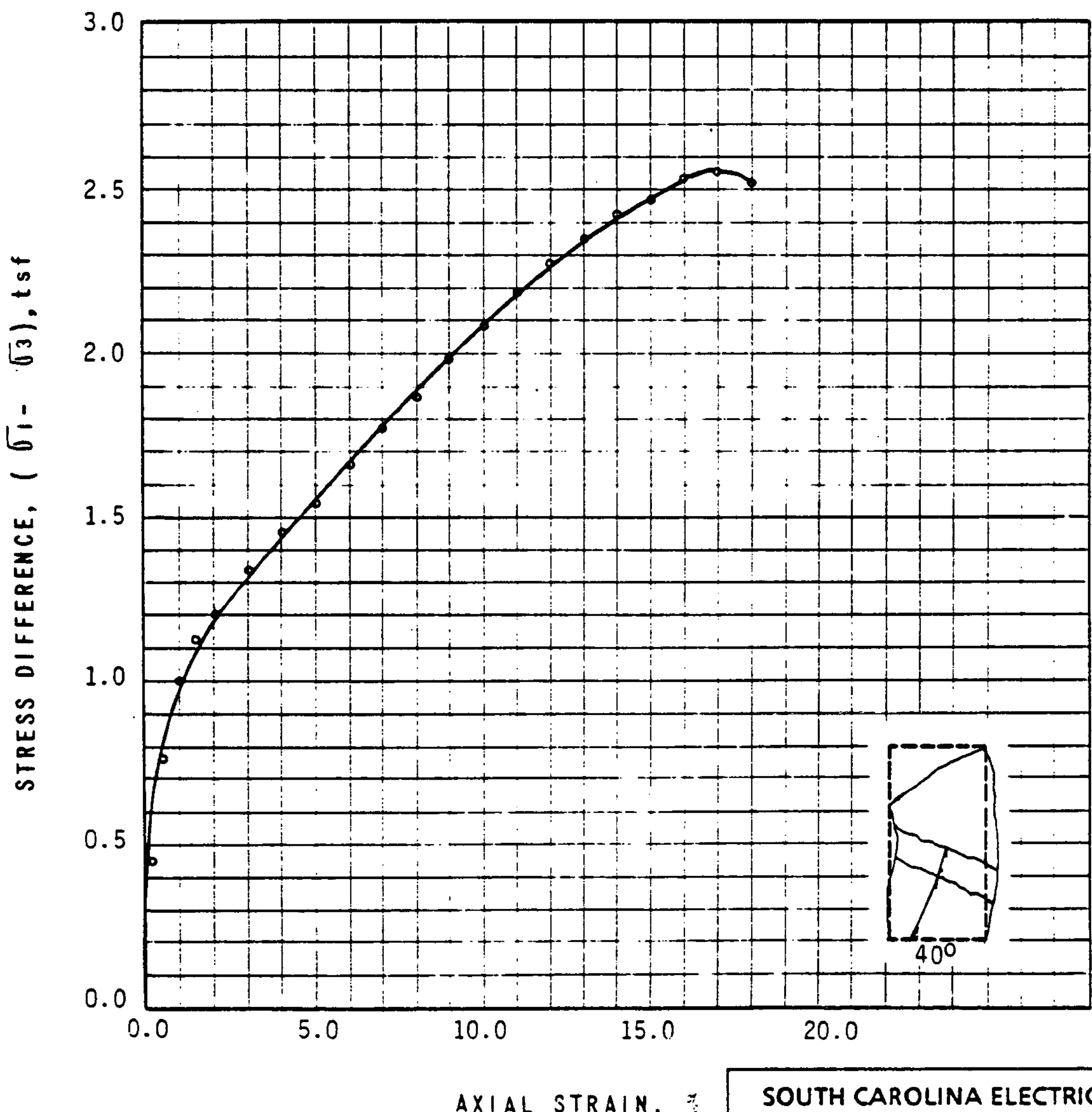
UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

Project	Virgil C. Summer Nuclear Station				
Boring No.	SS-4	Sample No.	S-5	Depth	18.0 - 20.3 Ft
Description	Gray and brown micaceous very fine sandy silt (ML)				
Moisture Content	26.9 % (after saturation)	Dry Density	93.8 pcf		
Liquid Limit	31 %	Plastic Limit	NP %	Relative Density	- %
$(\sigma_1 - \sigma_3)$ max.=	2.54 tsf at 16.5 % Strain	Chamber Pressure,	σ_c = 1.29 tsf		



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconsolidated-Undrained Triaxial Compression Test Results On Foundation Soils (Sheet 11 of 13)

Figure 2.5-112

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

Project	Virgil C. Summer Nuclear Station

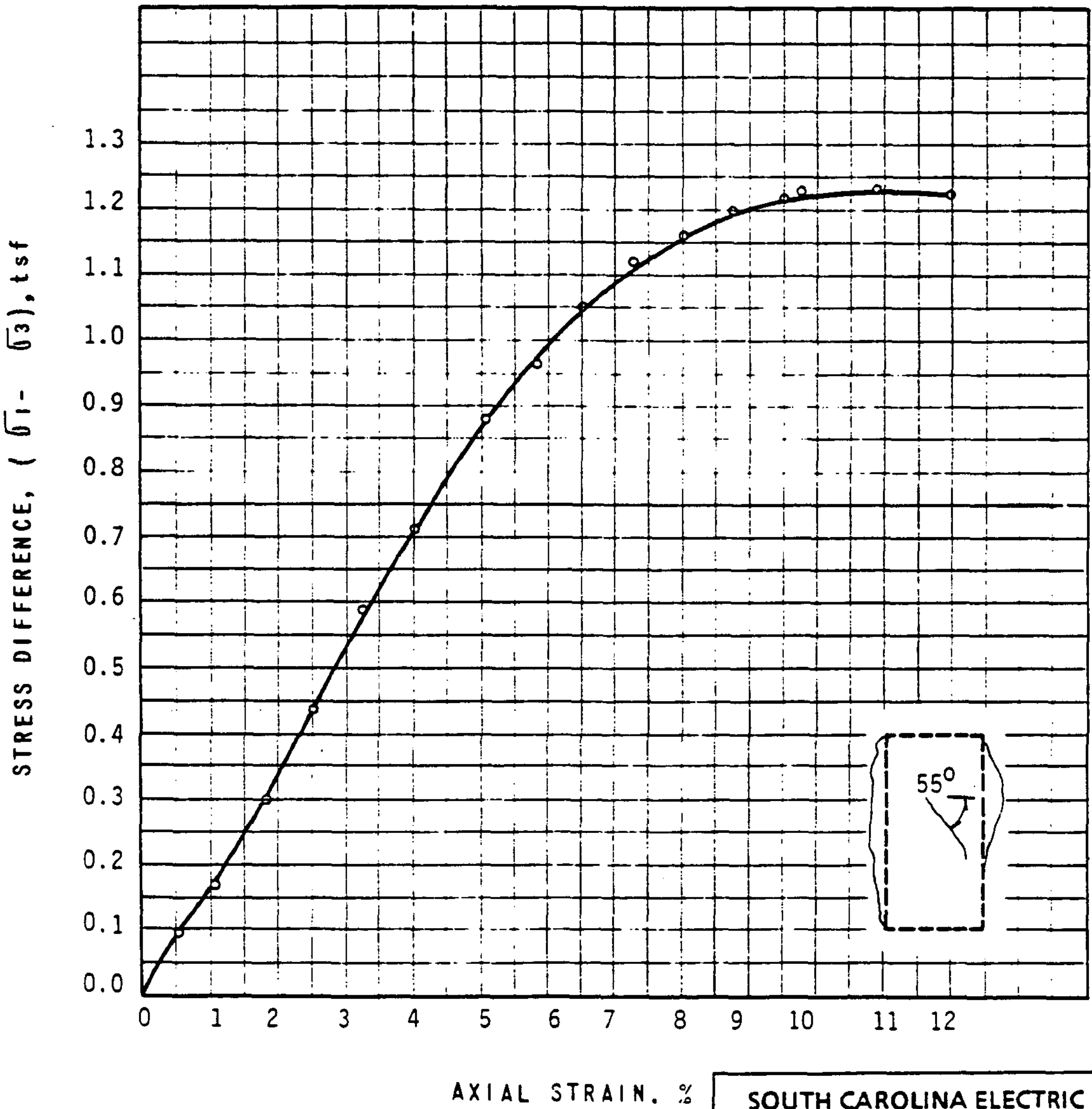
Boring No. C-3 Sample No: S-5 Depth 18.0 - 20.4 Ft

Description Red-brown micaceous clayey silt, trace fine sand (MH)

Moisture Content 44.7 % (after saturation) Dry Density 81.3 pcf

Liquid Limit 53 % Plastic Limit 19 % Relative Density %

$(\sigma_1 - \sigma_3)$ max.= 1.24 tsf at 10.9 % Strain Chamber Pressure, σ_c= 0.6 tsf



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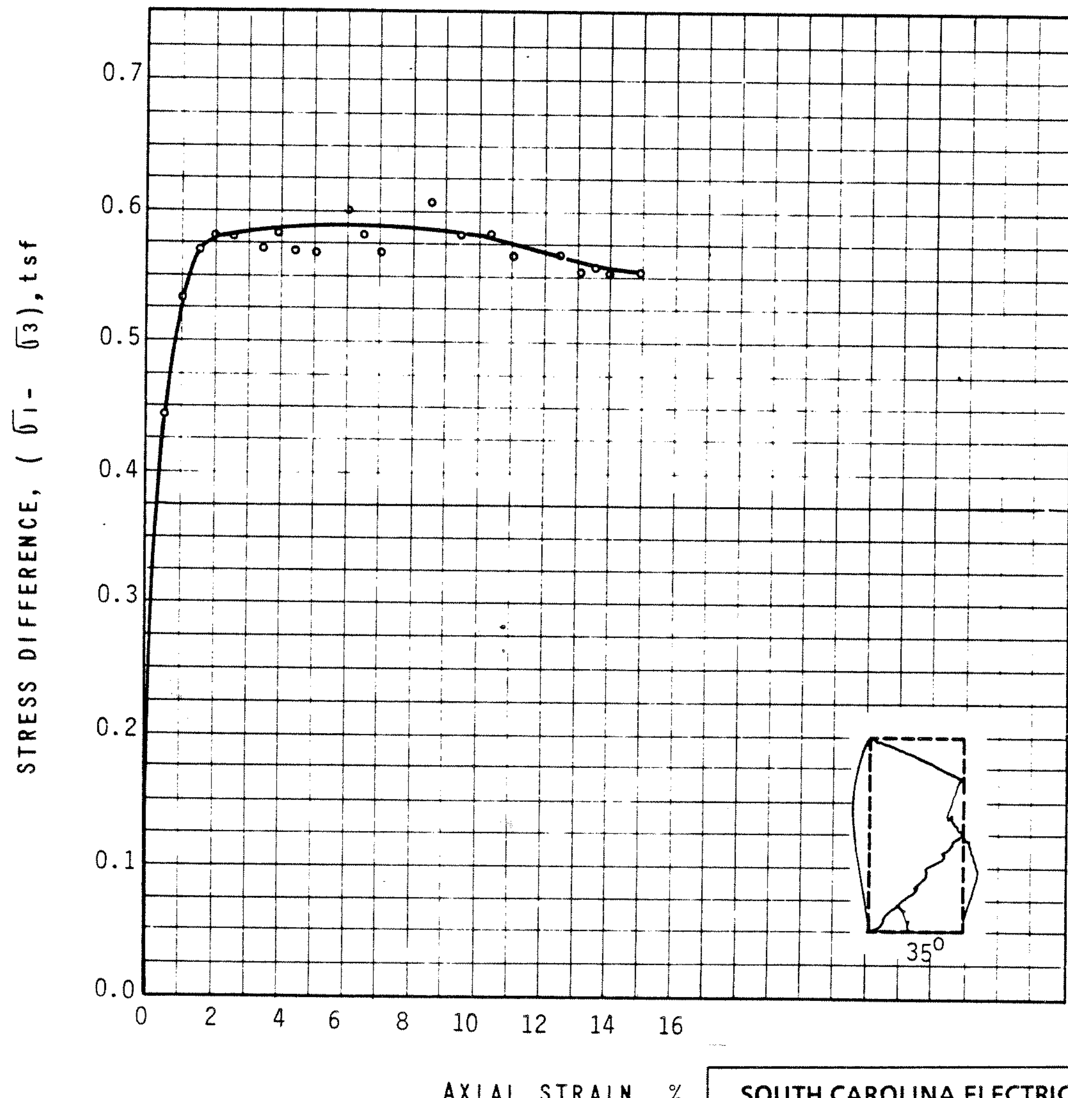
VIRGIL C. SUMMER NUCLEAR STATION

Unconsolidated-Undrained Triaxial Compression Test Results On Foundation Soils (Sheet 12 of 13)

Figure 2.5-112

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

Project	Virgil C. Summer Nuclear Station				
Boring No.	C-5	Sample No.	S-3	Depth	7.0 - 9.5 Ft
Description	Red-brown silty clayey sand and sandy clayey silt (SM-ML)				
Moisture Content	34.9 % (after saturation)	Dry Density	74.5 pcf		
Liquid Limit	32 %	Plastic Limit	25 %	Relative Density	- %
$(\sigma_1 - \sigma_3)$ max.=	0.58 tsf at 7.0 % Strain	Chamber Pressure, σ_c=	0.6 tsf		



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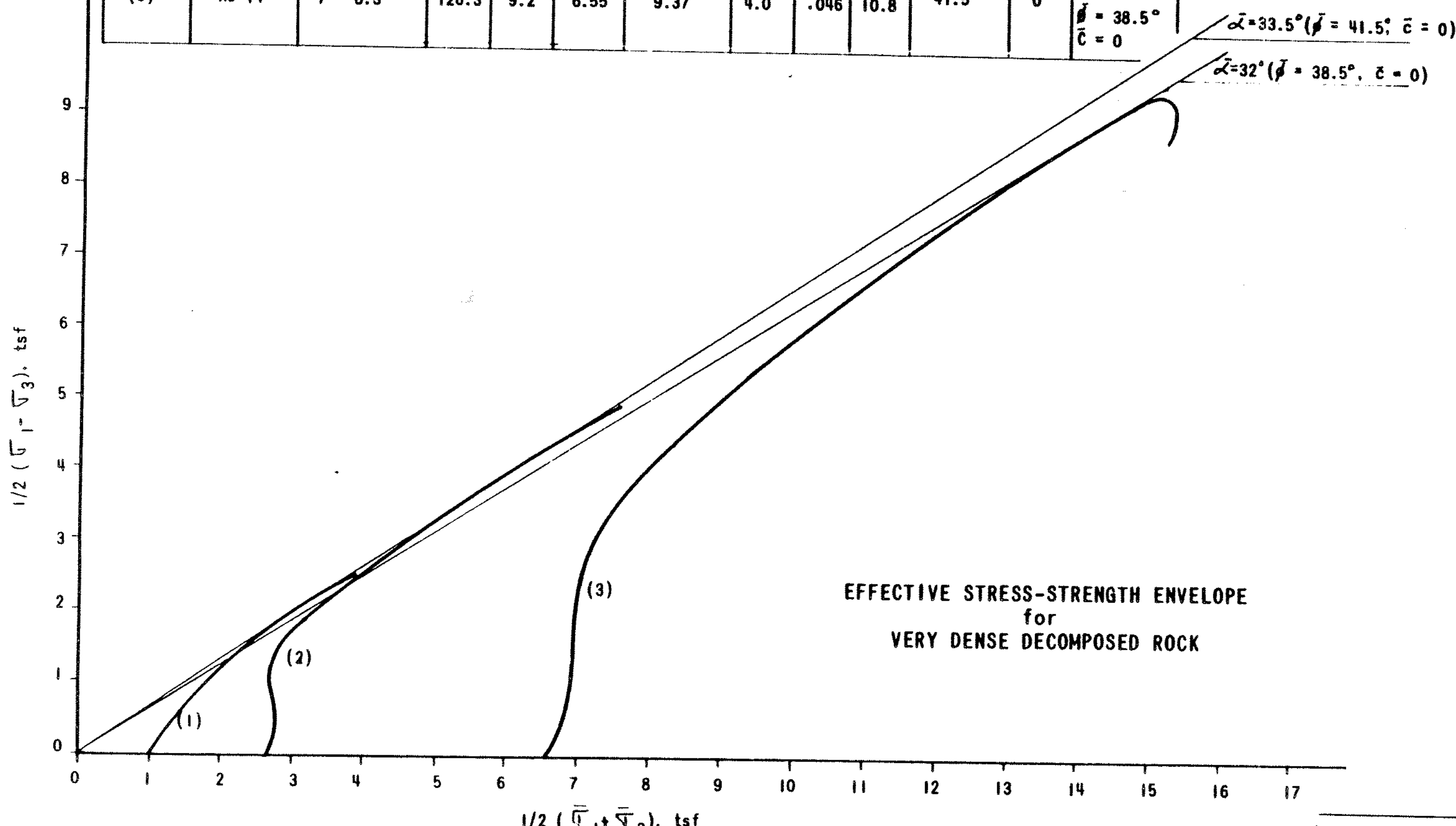
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconsolidated-Undrained Triaxial Compression Test Results On Foundation Soils (Sheet 13 of 13)

Figure 2.5-112

TEST No.	BORING No.	SAMPLE DEPTH (Ft.)	γ_d (pcf)	W_n (%)	$\bar{\sigma}_c$ (tsf)	Su $\frac{(\bar{\sigma}_1-\bar{\sigma}_3)_{max}}{2}$ (tsf)	ϵ_f (%)	A_f	W_f (%)	$\bar{\phi}$ (degrees)	$\bar{c}$ (psf)	REMARKS
(1)	ND-14	12' 13.7'	125.2	6.7	1.00	4.25	6.4	-.136	7.5	38.5	0	For Design Use $\bar{\phi}$ = 38.5° $\bar{c}$ = 0
(2)	ND- 4	10' 11'	128.8	12.8	2.65	4.94	9.1	.005	12.6			
(3)	ND-14	7' 8.3'	126.3	9.2	6.55	9.37	4.0	.046	10.8	41.5	0	



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August 1984

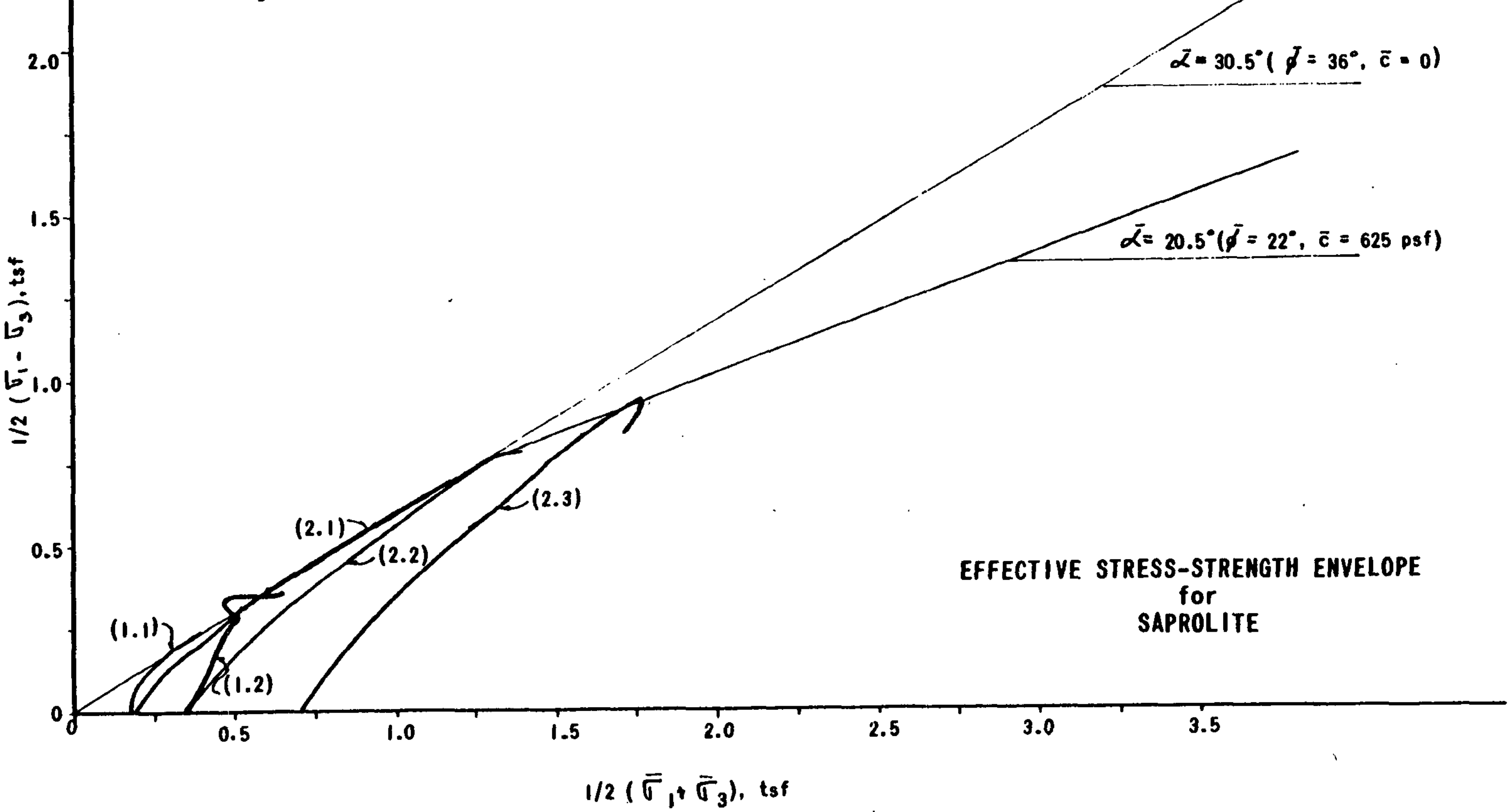
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Isotropically Consolidated, Undrained Triaxial Compression Test Results On Foundation Soils (Sheet 1 of 3)

Figure 2.5-113

TEST No.	BORING No.	SAMPLE DEPTH (Ft.)	γ_d (pcf)	W_n (%)	$\bar{\sigma}_c$ (tsf)	Su $\frac{(\bar{\sigma}_1-\bar{\sigma}_3)_{max}}{2}$ (tsf)	ϵ_f (%)	A_f	W_f (%)	$\bar{\phi}$ (degrees)	$\bar{c}$ (psf)	REMARKS
(1.1)~					0.18	0.21	4.2	.074				For Design
(1.2) *	C-5	17'~19.3'	87.3	36.5	0.36	0.37	6.4	.091	32.0	36	0	Use
					0.18	0.67	8.1	-.203				$\bar{\phi}$ = 36°
(2.1)~	C-5	17'~19.3'	97.8	23.0	0.36	0.79	5.3	-.130	25.4	36	0	$\bar{c}$ = 0
(2.3) *					0.72	0.94	4.8	-.057		22	625	

* Multi-staged test



Amendment 0
August 1984

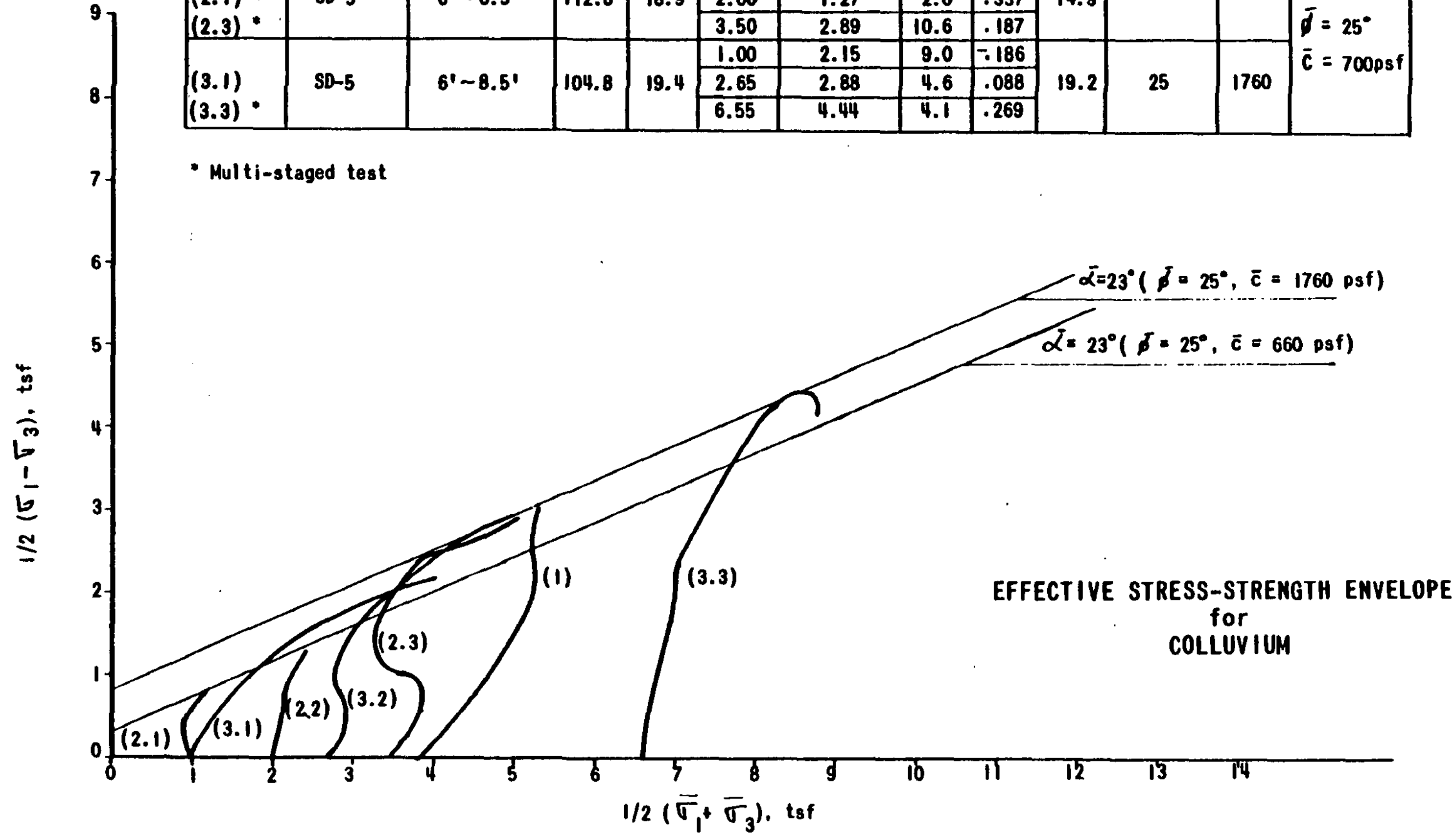
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Isotropically Consolidated, Undrained Triaxial Compression Test Results On Foundation Soils (Sheet 2 of 3)

Figure 2.5-113

TEST No.	BORING No.	SAMPLE DEPTH (Ft.)	γ_d (pcf)	W_n (%)	$\bar{\sigma}_c$ (tsf)	Su $\frac{(\bar{\sigma}_1-\bar{\sigma}_3)_{max}}{2}$ (tsf)	ϵ_f (%)	A_f	W_f (%)	$\bar{\phi}$ (degrees)	$\bar{c}$ (psf)	REMARKS
(1)	SD-5	6'~8.5'	109.3	20.9	3.88	3.03	5.4	.263	24.2	25	660	For Design Use $\bar{\phi}$ = 25° $\bar{c}$ = 700psf
(2.1)~(2.3) *	SD-5	6'~8.5'	112.8	18.9	1.00	0.80	2.1	.390	14.9			
					2.00	1.27	2.0	.337				
					3.50	2.89	10.6	.187				
(3.1)~(3.3) *	SD-5	6'~8.5'	104.8	19.4	1.00	2.15	9.0	.186	19.2	25	1760	
					2.65	2.88	4.6	.088				
					6.55	4.44	4.1	.269				

* Multi-staged test



EFFECTIVE STRESS-STRENGTH ENVELOPE
for
COLLUVIUM

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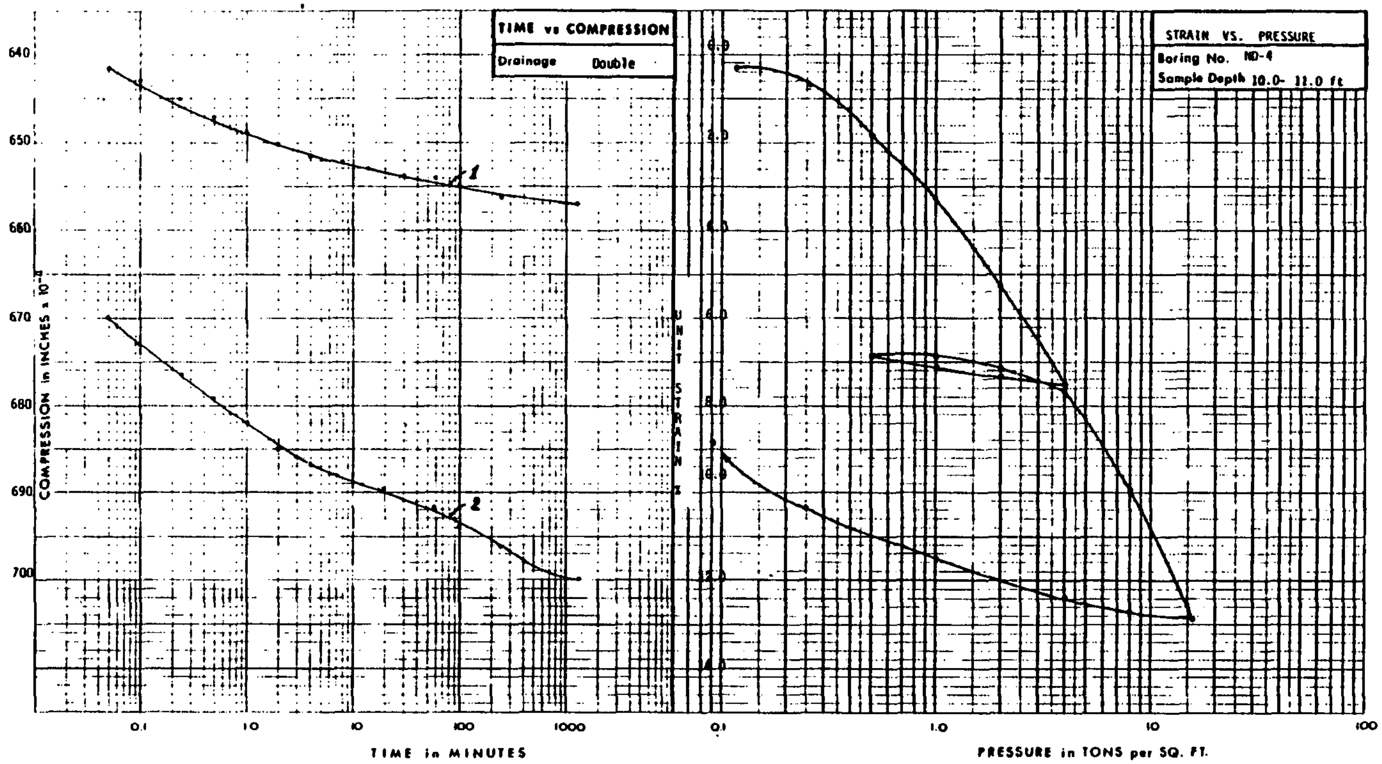
VIRGIL C. SUMMER NUCLEAR STATION

Isotropically Consolidated, Undrained Triaxial Compression Test Results On Foundation Soils (Sheet 3 of 3)

Figure 2.5-113



PRESSURE INCREMENTS OF TIME-COMPRESSION CURVES:

CURVE NUMBER	PRESSURE INCREMENT FROM(tsf.)	TO(tsf)	COEFFICIENT OF CONS (FT^2/DAY)
1	1.0 RE	2.0 RE	
2	2.0 RE	4.0 RE	

DESCRIPTION OF SPECIMEN: Dark brown micaceous clayey coarse to fine sand (decomposed rock) (Sample appears to be somewhat disturbed)

LIQUID LIMIT (%)		FINAL VOID RATIO (e_f)	0.529
PLASTIC LIMIT (%)		UNIT DRY WEIGHT (pcf)	97.9
PLASTICITY INDEX(%)		**CONSOLIDATION PROPERTIES**	
NATURAL WATER CONTENT (%)	19.0	COMPRESSION INDEX (C_c)	0.102
SPECIFIC GRAVITY		RECOMPRESSION (C_r)	0.008
TEST SPECIMEN PROPERTIES		SWELLING INDEX (C_s)	0.016
DIAMETER OF SPECIMEN(in)	2.495	PRECONSOLIDATION STRESS (P_c) tsf	2.0±
INITIAL THICKNESS OF SPECIMEN(in)	0.916	EXISTING OVERBURDEN STRESS (P_o) tsf	0.35
INITIAL WATER CONTENT (%)	28.1		
INITIAL VOID RATIO (e_o)	0.691		

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test Results On Foundation Soil (Sheet 1 of 13)

Figure 2.5-114

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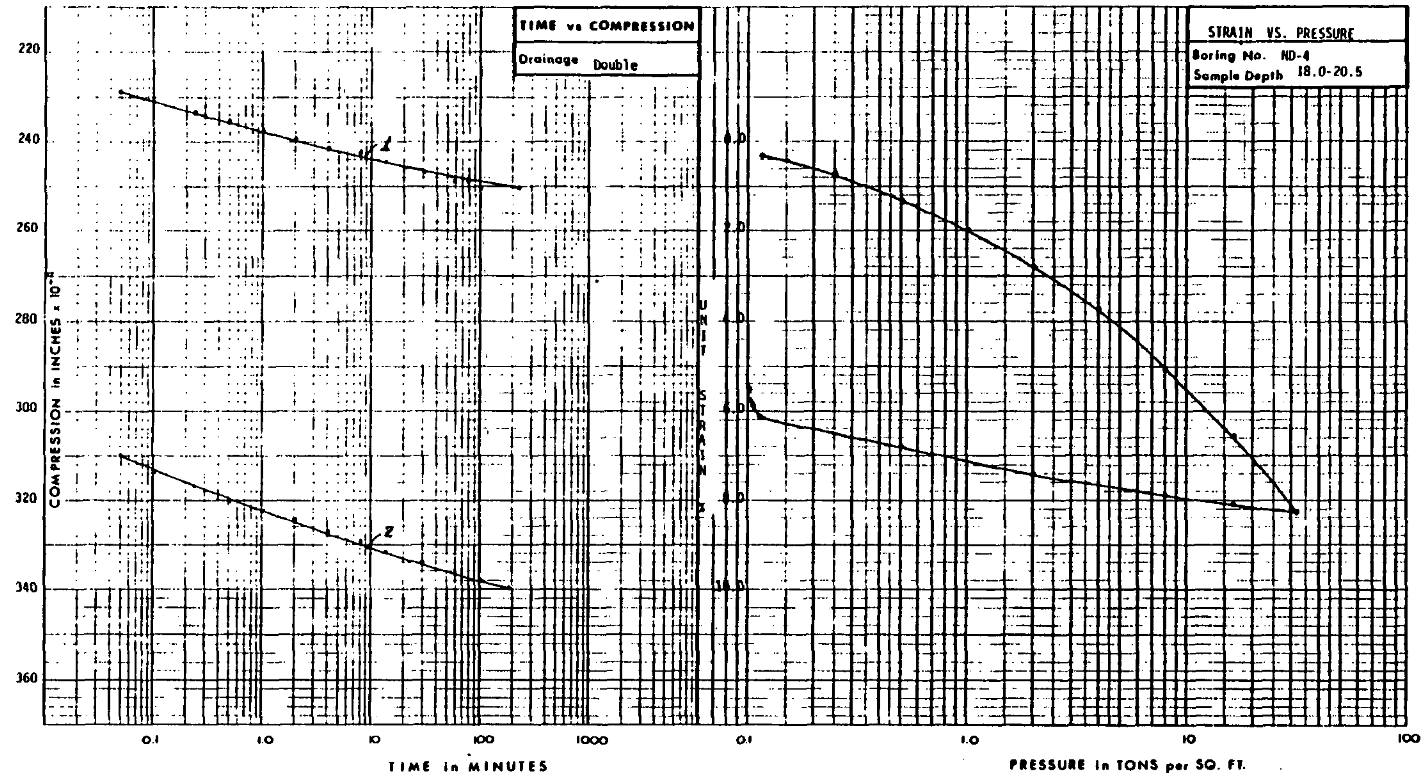

PRESSURE INCREMENTS OF TIME-COMPRESSION CURVES

CURVE NUMBER	PRESSURE INCREMENT FROM(tsf)	PRESSURE INCREMENT TO(tsf)	COEFFICIENT OF CONS. (FT²/DAY)
1	1.0	2.0	
2	2.0	4.0	

DESCRIPTION OF SPECIMEN: Dark brown micaceous clayey coarse fo fine sand (decomposed rock)

LIQUID LIMIT (%)		FINAL VOID RATIO (e_f)	0.293
PLASTIC LIMIT (%)		UNIT DRY WEIGHT (pcf)	119.7
PLASTICITY INDEX (%)		CONSOLIDATION PROPERTIES	
NATURAL WATER CONTENT (%)	15.4	COMPRESSION INDEX (C_c) (Unit strain basis)	0.058
SPECIFIC GRAVITY	2.64	RECOMPRESSION (C_q) " " "	
TEST SPECIMEN PROPERTIES		SWELLING INDEX (C_s) " " "	0.009
DIAMETER OF SPECIMEN (in.)	2.495	PRECONSOLIDATION STRESS (P_c) tsf	4.0±
INITIAL THICKNESS OF SPECIMEN (in.)	0.926	EXISTING OVERBURDEN STRESS (P_o) tsf	0.75
INITIAL WATER CONTENT (%)	15.0		
INITIAL VOID RATIO (e_o)	0.377		

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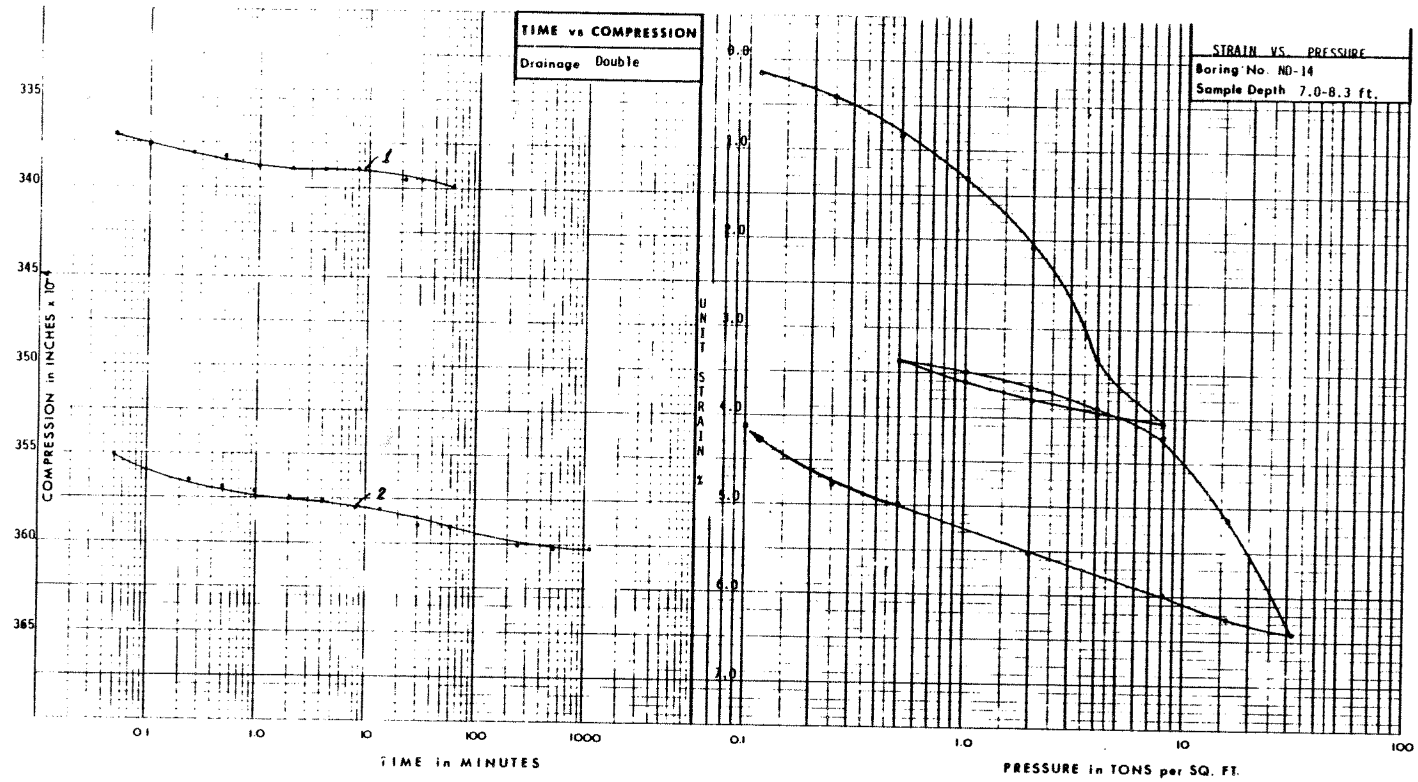
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test Results On Foundation Soil (Sheet 2 of 13)

Figure 2.5-114



PRESSURE INCREMENTS OF TIME-COMPRESSION CURVES

CURVE NUMBER	PRESSURE INCREMENT FROM(tsf)	TO(tsf)	COEFFICIENT OF CONS (FT^2/DAY)
1	1.0 RE	2.0 RE	
2	2.0 RE	4.0 RE	

DESCRIPTION OF SPECIMEN: Brown micaceous sandy clay (decomposed rock)

LIQUID LIMIT (%)	
PLASTIC LIMIT (%)	
PLASTICITY INDEX (%)	
NATURAL WATER CONTENT (%)	8.8
SPECIFIC GRAVITY	
TEST SPECIMEN PROPERTIES	
DIAMETER OF SPECIMEN (In.)	2.495
INITIAL THICKNESS OF SPECIMEN (In.)	0.931
INITIAL WATER CONTENT (%)	7.9
INITIAL VOID RATIO (e_o)	0.311

FINAL VOID RATIO (e_f)	0.270
UNIT DRY WEIGHT (pcf)	126.6
CONSOLIDATION PROPERTIES	
COMPRESSION INDEX (C_c) (Unit strain basis)	0.037
RECOMPRESSION (C_R) " " "	0.006
SWELLING INDEX (C_s) " " "	0.008
PRECONSOLIDATION STRESS (P_c) tsf	3.0±
EXISTING OVERBURDEN STRESS (P_o) tsf	0.55

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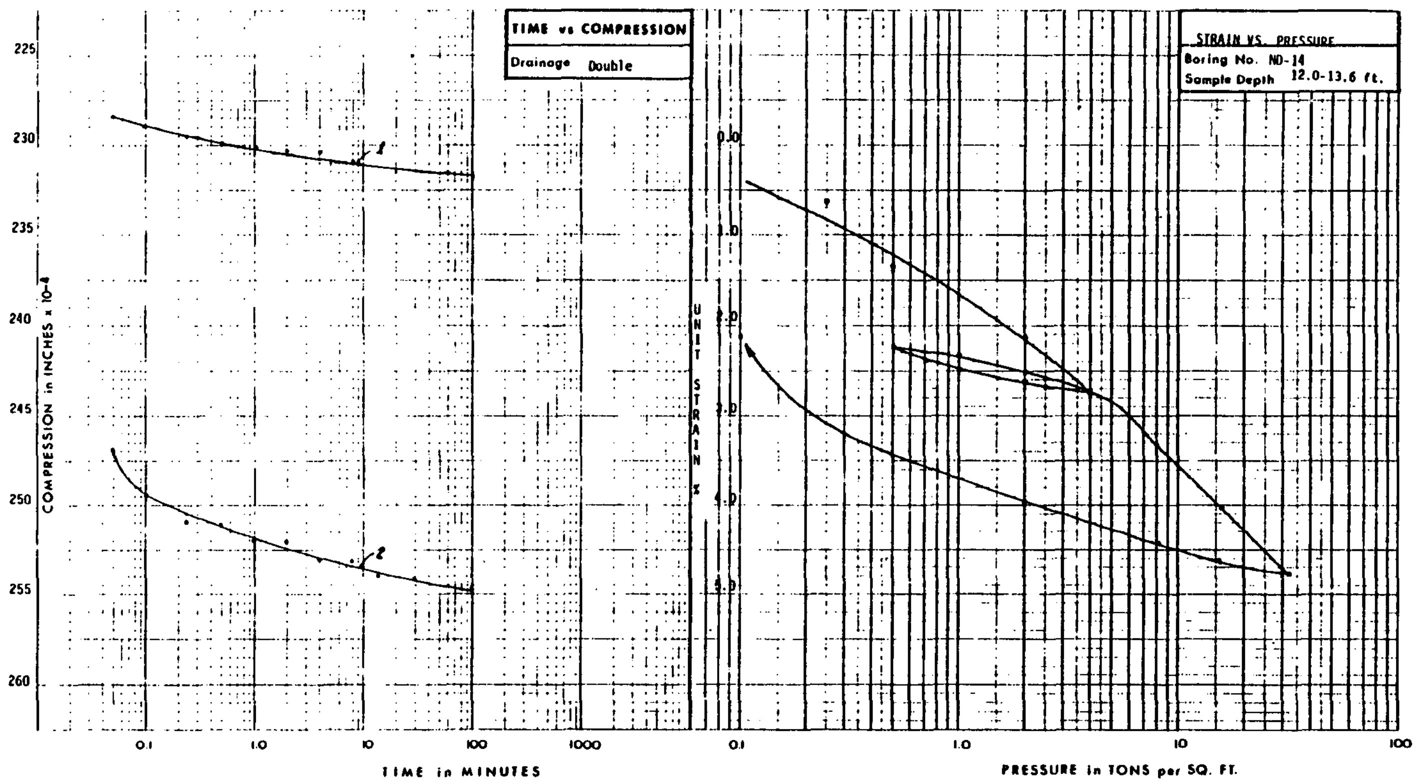
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test Results On Foundation Soil (Sheet 3 of 13)

Figure 2.5-114



PRESSURE INCREMENTS OF TIME-COMPRESSION CURVES								
CURVE NUMBER	PRESSURE INCREMENT FROM(tsf)	PRESSURE INCREMENT TO(tsf)	COEFFICIENT OF CONS. (FT²/DAY)	DESCRIPTION OF SPECIMEN: Light brown micaceous decomposed rock				
1	1.0 RE	2.0 RE		LIQUID LIMIT (%)		FINAL VOID RATIO (e_f)	0.042
2	2.0 RE	4.0 RE		PLASTIC LIMIT (%)		UNIT DRY WEIGHT (pcf)	140.1
				PLASTICITY INDEX (%)		CONSOLIDATION PROPERTIES	
				NATURAL WATER CONTENT (%)	5.4	COMPRESSION INDEX (C_c) (Unit strain basis)	0.024
				SPECIFIC GRAVITY	2.66	RECOMPRESSION (C_R)	0.006
				TEST SPECIMEN PROPERTIES		SWELLING INDEX (C_s)	0.008
				DIAMETER OF SPECIMEN (in.)	2.495	PRECONSOLIDATION STRESS (P_c) tsf	4.0±
				INITIAL THICKNESS OF SPECIMEN (in)	0.930	EXISTING OVERBURDEN STRESS (P_o) tsf	0.9
				INITIAL WATER CONTENT (%)	3.9		
				INITIAL VOID RATIO (e_o)	0.185		

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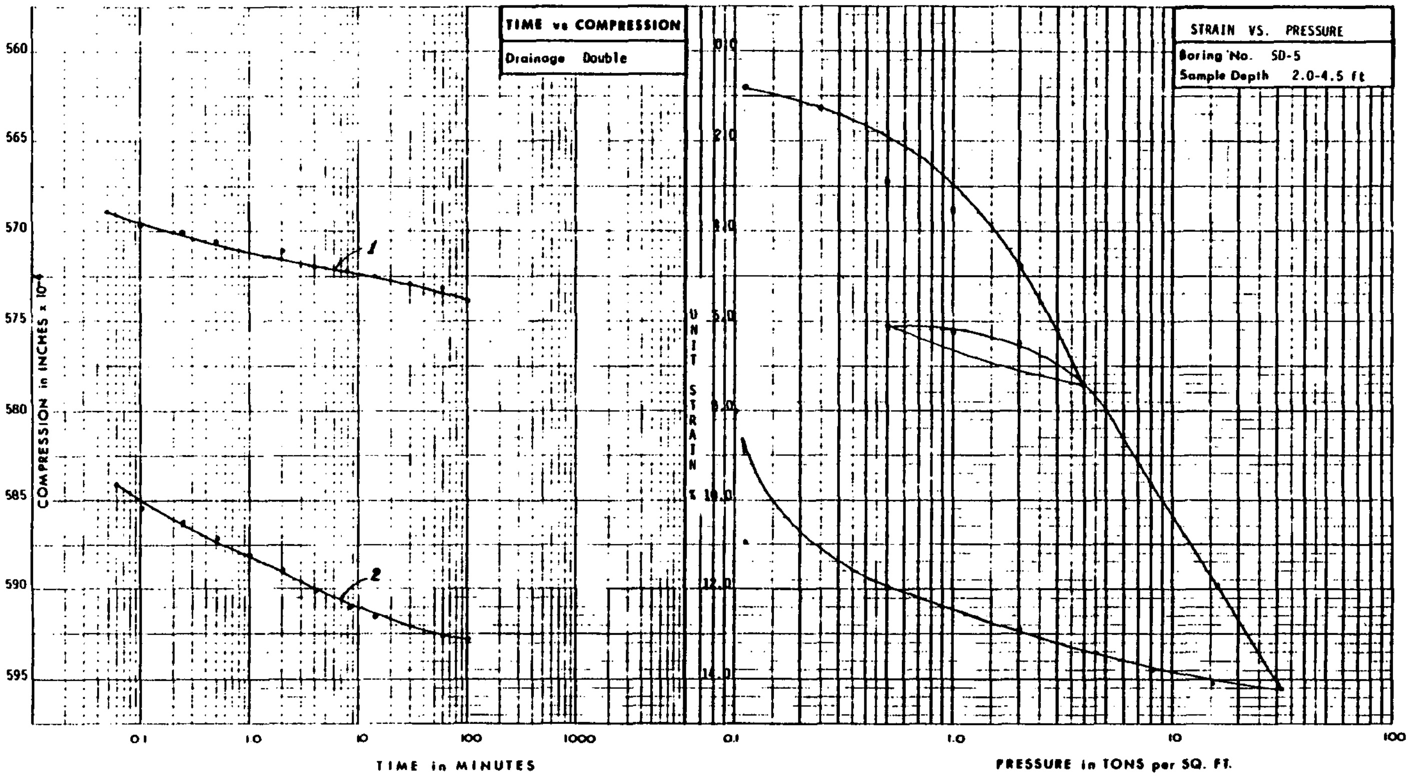
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test Results On Foundation Soil (Sheet 4 of 13)

Figure 2.5-114



PRESSURE INCREMENTS OF TIME-COMPRESSION CURVES

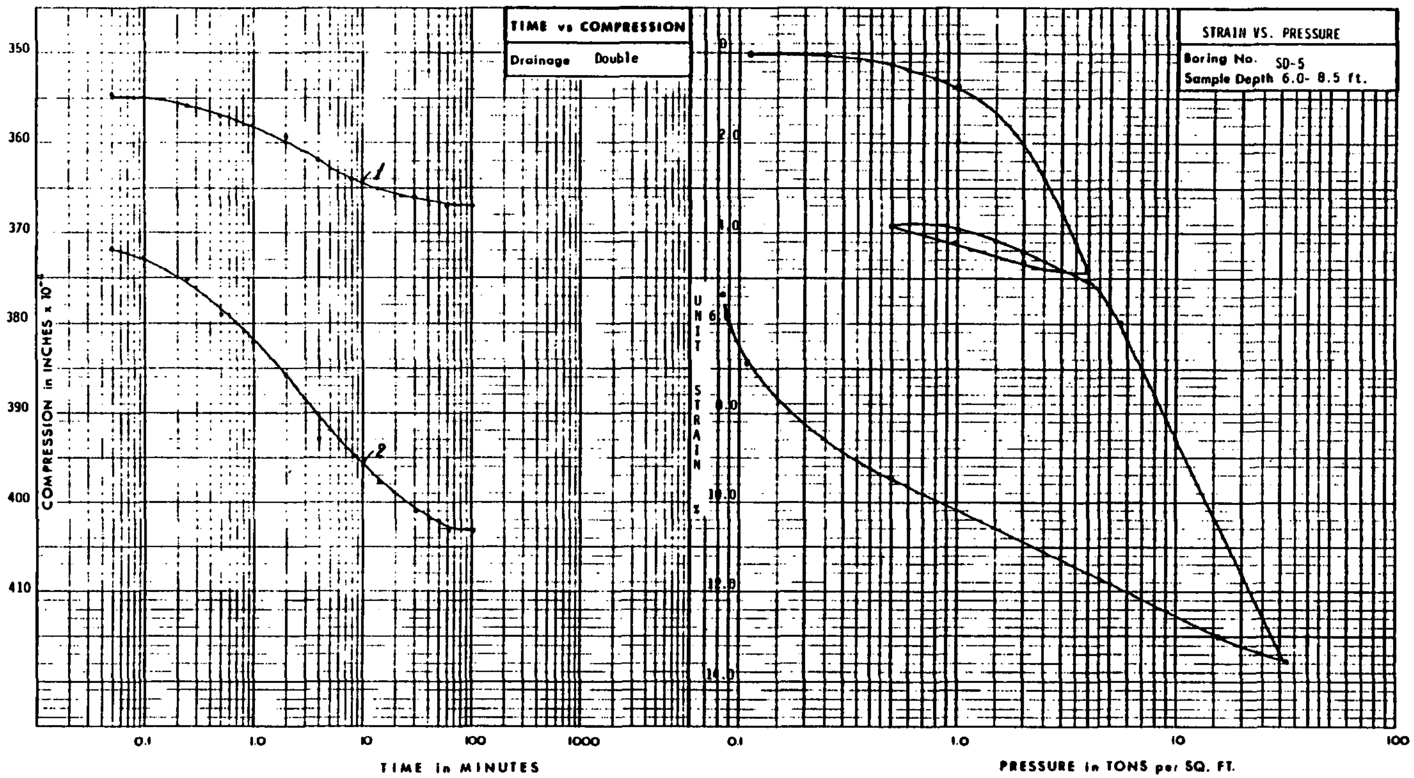
CURVE NUMBER	PRESSURE INCREMENT FROM (tsf)	PRESSURE INCREMENT TO (tsf)	COEFFICIENT OF CONS (FT^2/DAY)	DESCRIPTION OF SPECIMEN: Red brown micaceous sandy silty clay, trace organic matter (CL-ML)			
1	0.5 u	1.0 RE		LIQUID LIMIT (%)	23.0	FINAL VOID RATIO (e_f)	0.398
2	1.0 RE	2.0 RE		PLASTIC LIMIT (%)	15.0	UNIT DRY WEIGHT (pcf)	110.6
				PLASTICITY INDEX (%)	8.0	CONSOLIDATION PROPERTIES	
				NATURAL WATER CONTENT (%)	17.2	COMPRESSION INDEX (C_c)(Unit strain basis)	0.080
				SPECIFIC GRAVITY	2.67	RECOMPRESSION (C_r) " " "	0.007
				TEST SPECIMEN PROPERTIES		SWELLING INDEX (C_s) " " "	0.016
				DIAMETER OF SPECIMEN (in.)	2.495	PRECONSOLIDATION STRESS (P_c) tsf	1.0±
				INITIAL THICKNESS OF SPECIMEN (in.)	0.915	EXISTING OVERBURDEN STRESS (P_o) tsf	0.1±
				INITIAL WATER CONTENT (%)	18.4		
				INITIAL VOID RATIO (e_o)	0.507		

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test Results On Foundation Soil
(Sheet 5 of 13)

Figure 2.5-114



PRESSURE INCREMENTS OF TIME-COMPRESSION CURVES: CURVE NUMBER	PRESSURE INCREMENT FROM(tsf.)	PRESSURE INCREMENT TO(tsf)	COEFFICIENT OF CONS. (FT²/DAY)
1	1.5 UN	1.0 RE	
2	1.0 RE	2.0 RE	

DESCRIPTION OF SPECIMEN: Dark gray micaceous sandy clay			
LIQUID LIMIT (%)		FINAL VOID RATIO (e_f)	0.638
PLASTIC LIMIT (%)		UNIT DRY WEIGHT (pcf)	99.0
PLASTICITY INDEX (%)		CONSOLIDATION PROPERTIES	
NATURAL WATER CONTENT (%)	21.6	COMPRESSION INDEX (C_c) (Unit strain basis)	0.100
SPECIFIC GRAVITY	2.67	RECOMPRESSION (C_r) " " "	0.015
TEST SPECIMEN PROPERTIES		SWELLING INDEX (C_s) " " "	0.023
DIAMETER OF SPECIMEN (in.)	2.495	PRECONSOLIDATION STRESS (P_c) tsf	2.0±
INITIAL THICKNESS OF SPECIMEN (in.)	0.919	EXISTING OVERBURDEN STRESS (P_o) tsf	0.23
INITIAL WATER CONTENT (%)	24.3		
INITIAL VOID RATIO (e_o)	0.683		

Amendment 0
August 1984

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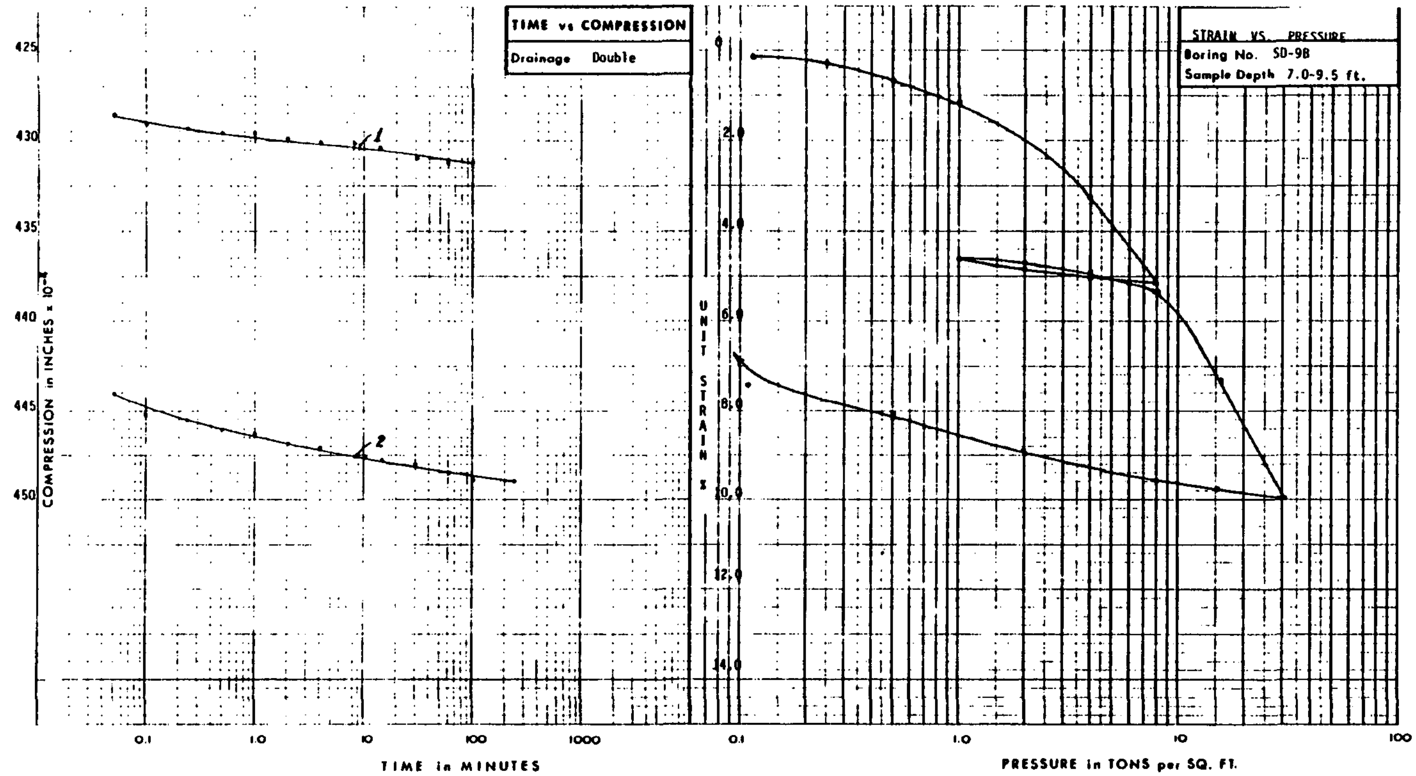
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test Results On Foundation Soil (Sheet 6 of 13)

Figure 2.5-114



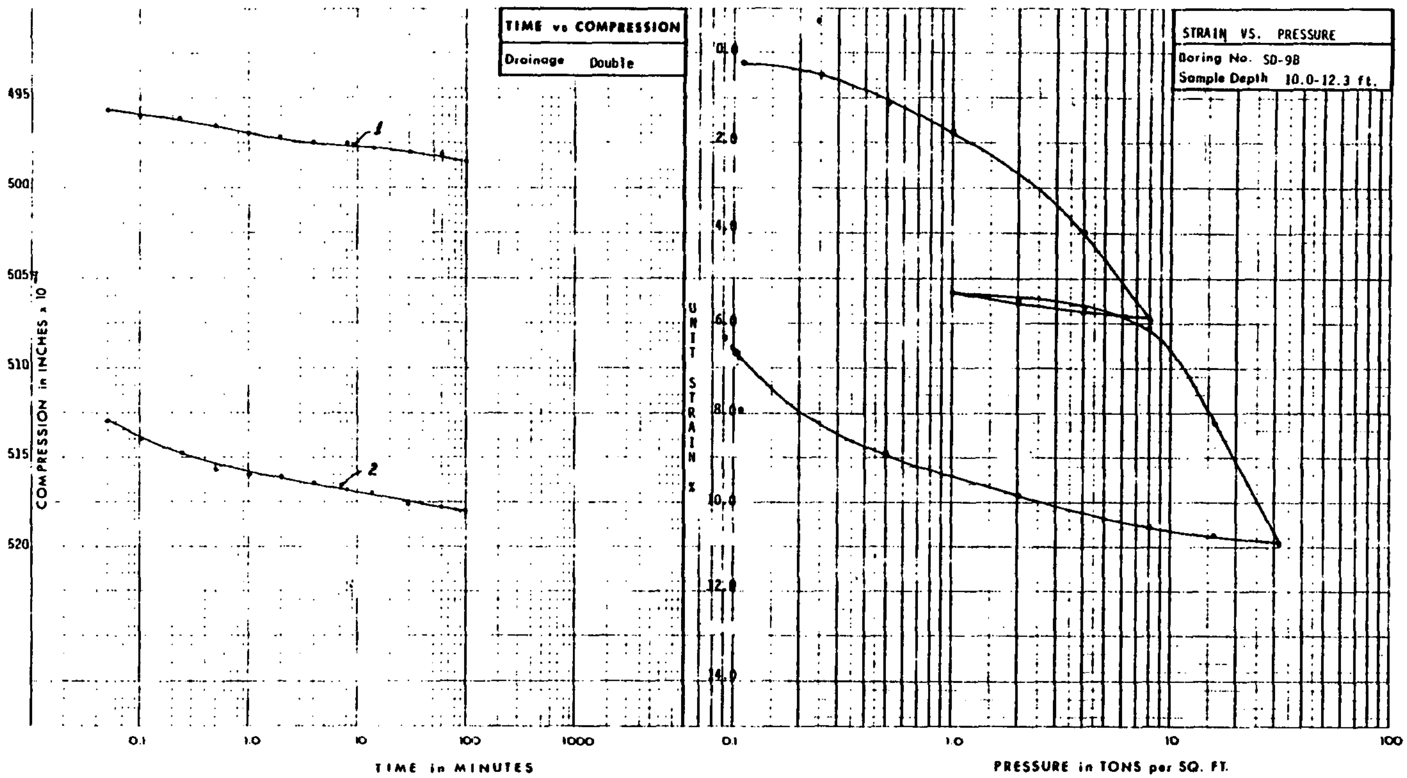
PRESSURE INCREMENTS OF TIME-COMPRESSION CURVES	CURVE NUMBER	PRESSURE INCREMENT FROM(tsf)	PRESSURE INCREMENT TO(tsf)	COEFFICIENT OF CONS. (FT²/DAY)	DESCRIPTION OF SPECIMEN: Red-brown clayey silty sand, trace coarse sand and roots (ML)			
	1	1.0 u	2.0 RE		LIQUID LIMIT (%)	26.0	FINAL VOID RATIO (e_f)	0.46
	2	2.0 RE	4.0 RE		PLASTIC LIMIT (%)	19.0	UNIT DRY WEIGHT (pcf)	106.1
					PLASTICITY INDEX (%)	7.0	CONSOLIDATION PROPERTIES	
					NATURAL WATER CONTENT (%)	19.7	COMPRESSION INDEX (C_c) (Unit strain basis)	0.080
					SPECIFIC GRAVITY		RECOMPRESSION (C_r) " " "	0.007
					TEST SPECIMEN PROPERTIES		SWELLING INDEX (C_s) " " "	0.013
					DIAMETER OF SPECIMEN (in.)	2.495	PRECONSOLIDATION STRESS (P_c) tsf	5.0±
					INITIAL THICKNESS OF SPECIMEN (in.)	.915	EXISTING OVERBURDEN STRESS (P_o) tsf	0.29
					INITIAL WATER CONTENT (%)	19.7		
					INITIAL VOID RATIO (e_o)	0.57		

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test Results On Foundation Soil
(Sheet 7 of 13)

Figure 2.5-114



PRESSURE INCREMENTS OF TIME-COMPRESSION CURVES

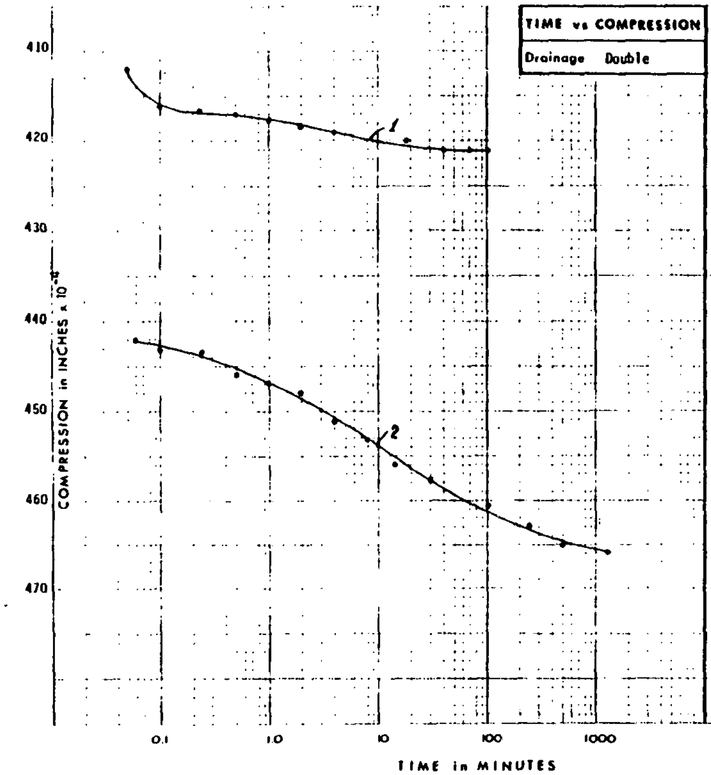
CURVE NUMBER	PRESSURE INCREMENT FROM(tsf)	PRESSURE INCREMENT TO(tsf)	COEFFICIENT OF CONS (FT^2/DAY)	DESCRIPTION OF SPECIMEN: Brownish gray clayey silty sand, trace roots (ML)			
1	1.0 u	2.0 RE		LIQUID LIMIT (%)	21.0	FINAL VOID RATIO (e_f)	.40
2	2.0 RE	4.0 RE		PLASTIC LIMIT (%)	17.0	UNIT DRY WEIGHT (pcf)	109.5
				PLASTICITY INDEX (%)	4.0	CONSOLIDATION PROPERTIES	
				NATURAL WATER CONTENT (%)	14.3	COMPRESSION INDEX (C_c) (Unit strain basis)	0.084
				SPECIFIC GRAVITY		RECOMPRESSION (C_r) " " "	0.007
				TEST SPECIMEN PROPERTIES		SWELLING INDEX (C_s)	0.015
				DIAMETER OF SPECIMEN (in.)	2.495	PRECONSOLIDATION STRESS (P_c) tsf	5.0±
				INITIAL THICKNESS OF SPECIMEN (in.)	.915	EXISTING OVERBURDEN STRESS (P_o) tsf	0.42
				INITIAL WATER CONTENT (%)	14.3		
				INITIAL VOID RATIO (e_o)	.50		

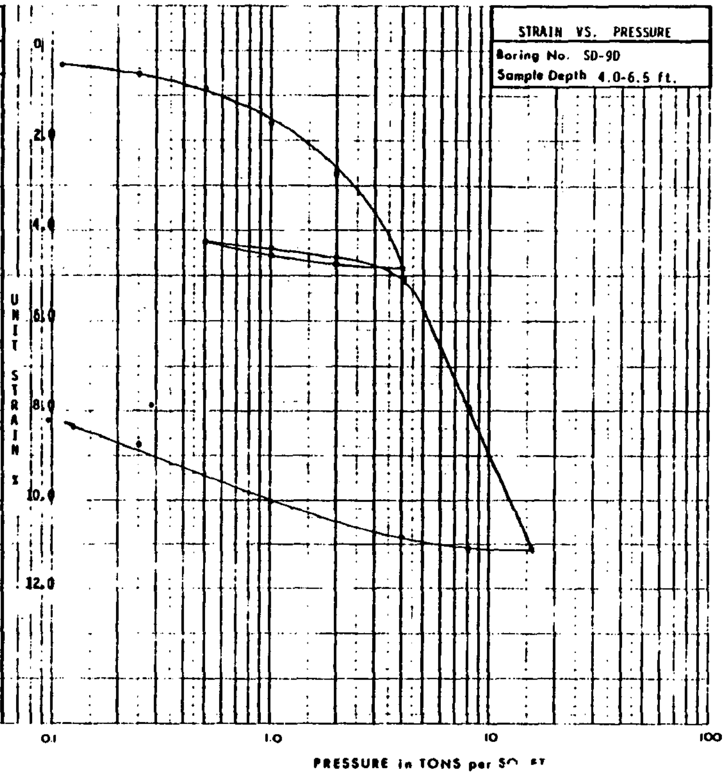
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test Results On Foundation Soil (Sheet 8 of 13)

Figure 2.5-114





PRESSURE INCREMENTS OF TIME-COMPRESSION CURVES: CURVE NUMBER	PRESSURE INCREMENT FROM (tsf)	PRESSURE INCREMENT TO (tsf)	COEFFICIENT OF CONS (FT^2/DAY)
1	1.0 RE	2.0 RE	
2	2.0 RE	4.0 RE	

DESCRIPTION OF SPECIMEN: Dark brown sandy silty clay, trace roots (CL)

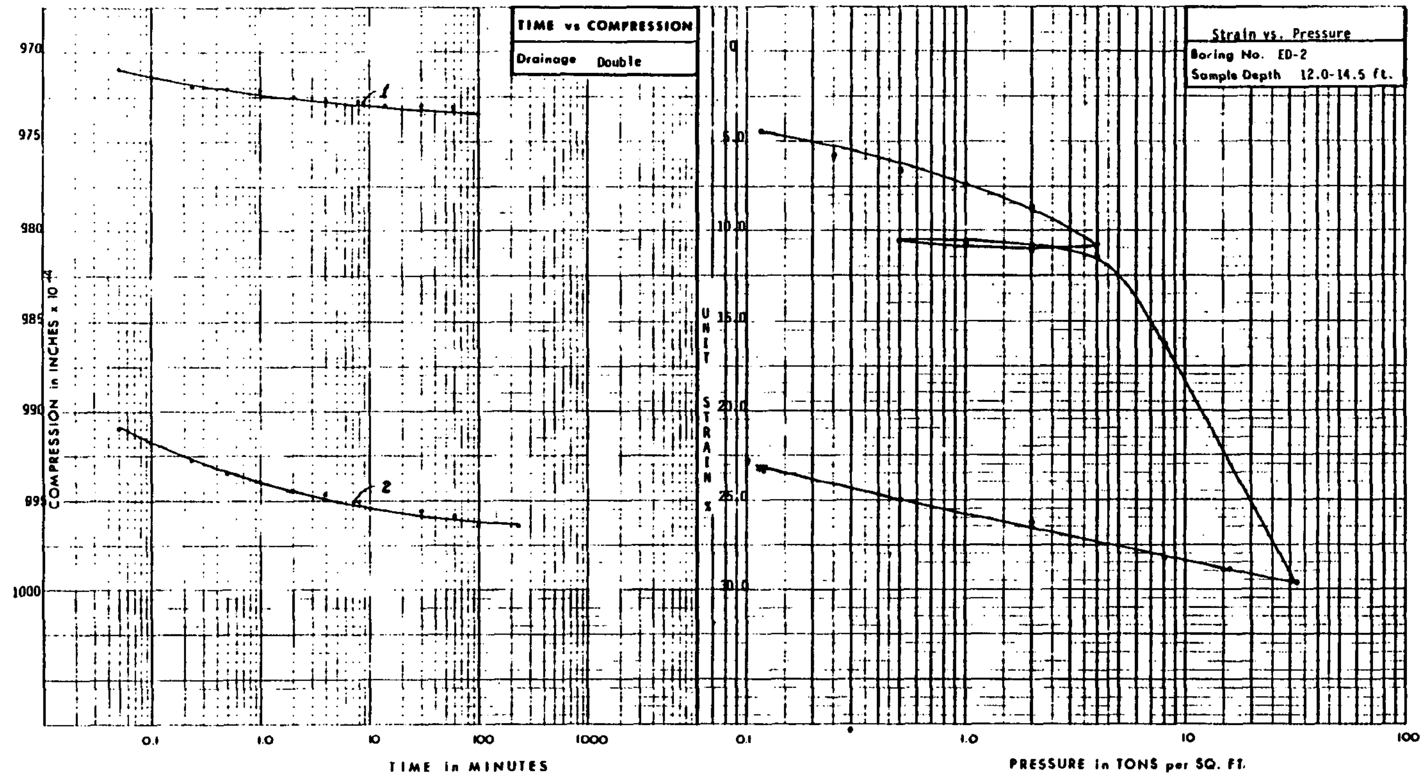
LIQUID LIMIT (%)	31.0	FINAL VOID RATIO (e_f)	0.54
PLASTIC LIMIT (%)	20.0	UNIT DRY WEIGHT (pcf)	98.9
PLASTICITY INDEX (%)	11.0	**CONSOLIDATION PROPERTIES**	
NATURAL WATER CONTENT (%)	23.1	COMPRESSION INDEX (C_c) (Unit strain basis)	0.009
SPECIFIC GRAVITY	2.66	RECOMPRESSION (C_r)	0.008
TEST SPECIMEN PROPERTIES		SWELLING INDEX (C_s)	0.016
DIAMETER OF SPECIMEN (in.)	2.495	PRECONSOLIDATION STRESS (P_c) tsf	[illegible].0±
INITIAL THICKNESS OF SPECIMEN (in.)	.916	EXISTING OVERBURDEN STRESS (P_o) tsf	0.26
INITIAL WATER CONTENT (%)	23.1		
INITIAL VOID RATIO (e_o)	.68		

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test Results On Foundation Soil (Sheet 9 of 13)

Figure 2.5-114



PRESSURE INCREMENTS OF TIME-COMPRESSION CURVES

CURVE NUMBER	PRESSURE INCREMENT FROM(tsf)	TO(tsf)	COEFFICIENT OF CONS (FT²/DAY)	DESCRIPTION OF SPECIMEN:	Red-brown micaceous sandy silty clay becoming sandy clayey silt (MH)		
1	0.5 u	1.0 RE		LIQUID LIMIT (%)	65.0	FINAL VOID RATIO (e_f)	0.982
2	1.0 RE	2.0 RE		PLASTIC LIMIT (%)	58.0	UNIT DRY WEIGHT (pcf)	69.8
				PLASTICITY INDEX (%)	7.0	CONSOLIDATION PROPERTIES	
				NATURAL WATER CONTENT (%)	51.0	COMPRESSION INDEX (C_c) (Unit strain basis)	0.23
				SPECIFIC GRAVITY	- -	RECOMPRESSION (C_R) " " "	0.007
				TEST SPECIMEN PROPERTIES		SWELLING INDEX (C_s) " " "	0.026
				DIAMETER OF SPECIMEN (in.)	2.495	PRECONSOLIDATION STRESS (P_c) tsf	5.0±
				INITIAL THICKNESS OF SPECIMEN (in)	0.915	EXISTING OVERBURDEN STRESS (P_o) tsf	0.75
				INITIAL WATER CONTENT (%)	49.5		
				INITIAL VOID RATIO (e_o)	1.390		

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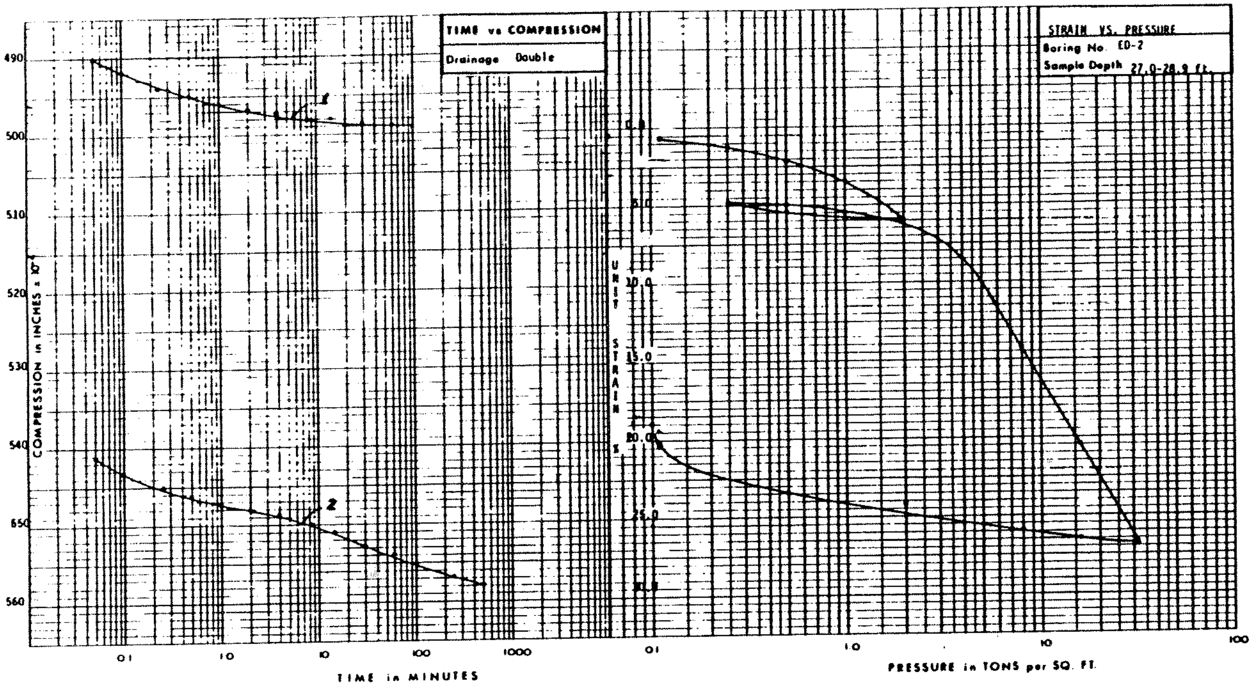
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test Results On Foundation Soil
(Sheet 10 of 13)

Figure 2.5-114



PRESSURE INCREMENTS OF TIME-COMPRESSION CURVES

CURVE NUMBER	PRESSURE INCREMENT FROM (tsf)	PRESSURE INCREMENT TO (tsf)	COEFFICIENT OF CONS (FT^2/DAY)
1	½ RE	1.0 RE	
2	1.0 RE	2.0 RE	

DESCRIPTION OF SPECIMEN: Brown gray micaceous clayey silty fine sand (ML-MH)

LIQUID LIMIT (%)	45.0	FINAL VOID RATIO (e_f)	0.725
PLASTIC LIMIT (%)	45.0	UNIT DRY WEIGHT (pcf)	78.3
PLASTICITY INDEX (%)	NP	**CONSOLIDATION PROPERTIES**	
NATURAL WATER CONTENT (%)	36.9	COMPRESSION INDEX (Cc) (Unit strain basis)	0.215
SPECIFIC GRAVITY	2.67	RECOMPRESSION (Cr) " " "	0.012
TEST SPECIMEN PROPERTIES		SWELLING INDEX (Cs)	0.021
DIAMETER OF SPECIMEN (in.)	2.495	PRECONSOLIDATION STRESS (Pc) tsf	4.0±
INITIAL THICKNESS OF SPECIMEN (in.)	0.915	EXISTING OVERBURDEN STRESS (Po) tsf	1.57
INITIAL WATER CONTENT (%)	38.1		
INITIAL VOID RATIO (e_o)	1.13		

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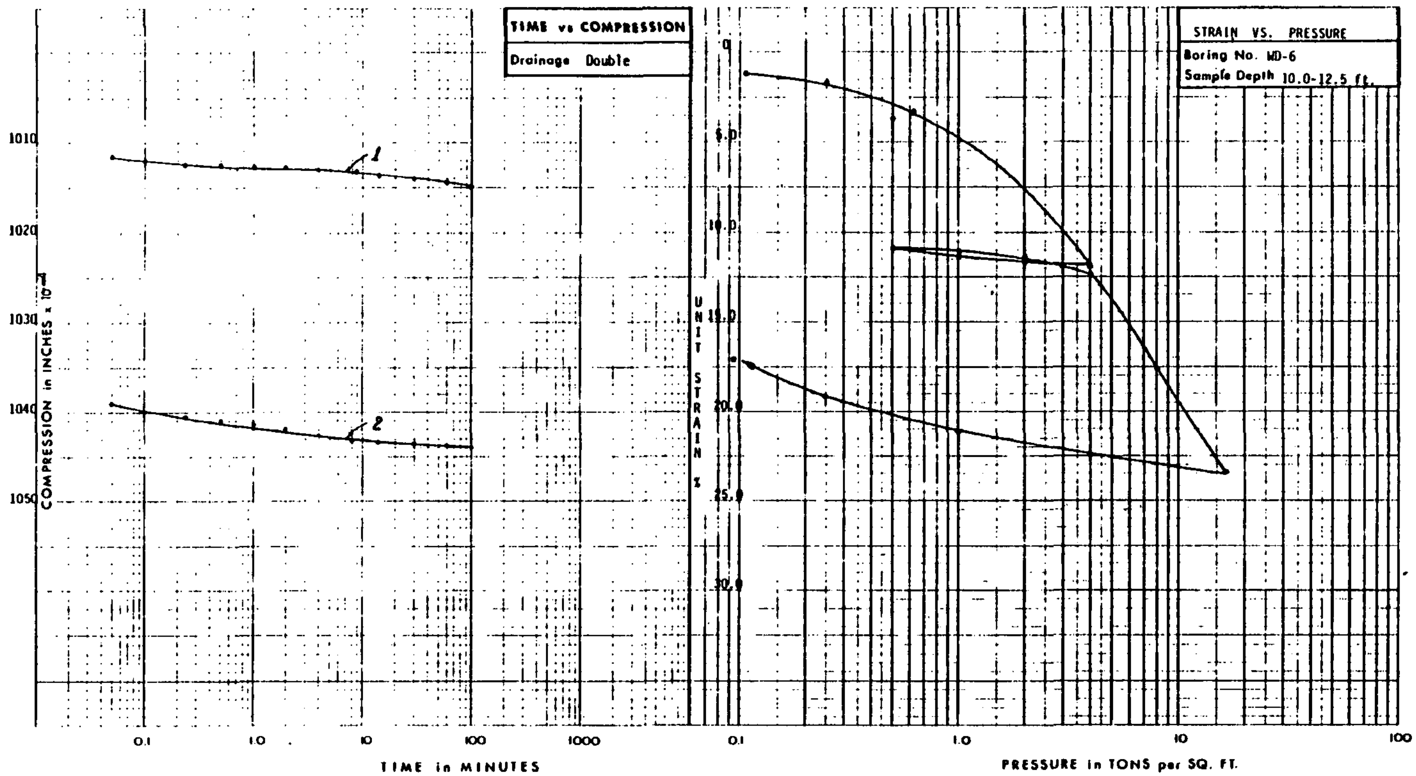
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test Results On Foundation Soil (Sheet 11 of 13)

Figure 2.5-114



PRESSURE INCREMENTS OF TIME-COMPRESSION CURVES

CURVE NUMBER	PRESSURE INCREMENT FROM(tsf)	PRESSURE INCREMENT TO(tsf)	COEFFICIENT OF CONS (FT²/DAY)
1	0.5 u	1.0 RE	
2	1.0 RE	2.0 RE	

DESCRIPTION OF SPECIMEN: Red-brown micaceous fine sandy clayey silt changing to clayey silty sand with more mica (ML-MH)

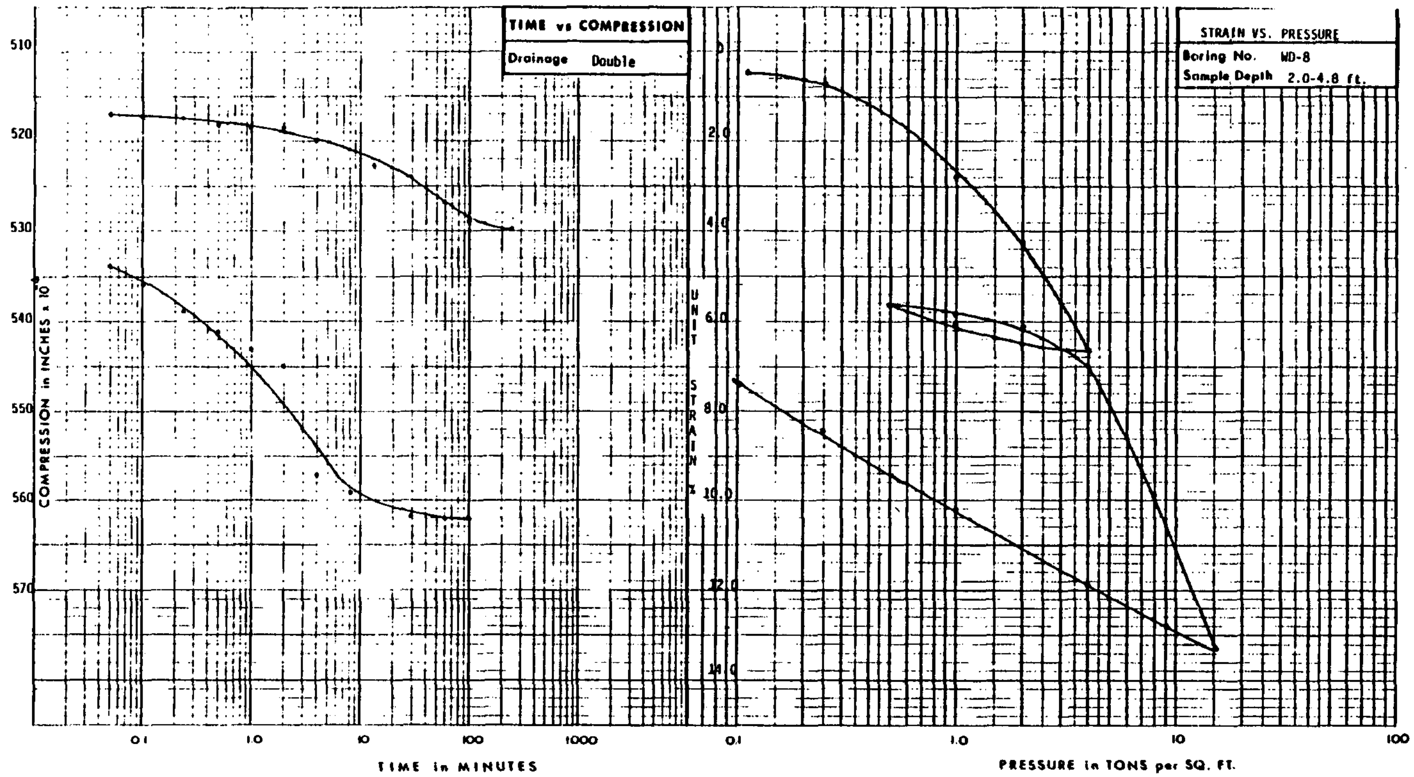
LIQUID LIMIT (%)	37.0	FINAL VOID RATIO (e_f)	.55
PLASTIC LIMIT (%)	37.0	UNIT DRY WEIGHT (pcf)	78.1
PLASTICITY INDEX (%)	NP	**CONSOLIDATION PROPERTIES**	
NATURAL WATER CONTENT (%)	22.6	COMPRESSION INDEX (Cc) (Unit strain basis)	0.19
SPECIFIC GRAVITY	2.69	RECOMPRESSION (Cq) " " "	0.013
TEST SPECIMEN PROPERTIES		SWELLING INDEX (Cs) " " "	0.025
DIAMETER OF SPECIMEN (in.)	2.495	PRECONSOLIDATION STRESS (Pc) tsf	2.0±
INITIAL THICKNESS OF SPECIMEN (in)	.916	EXISTING OVERBURDEN STRESS (Po) tsf	0.55
INITIAL WATER CONTENT (%)	22.6		
INITIAL VOID RATIO (e_o)	1.15		

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test Results On Foundation Soil (Sheet 12 of 13)

Figure 2.5-114



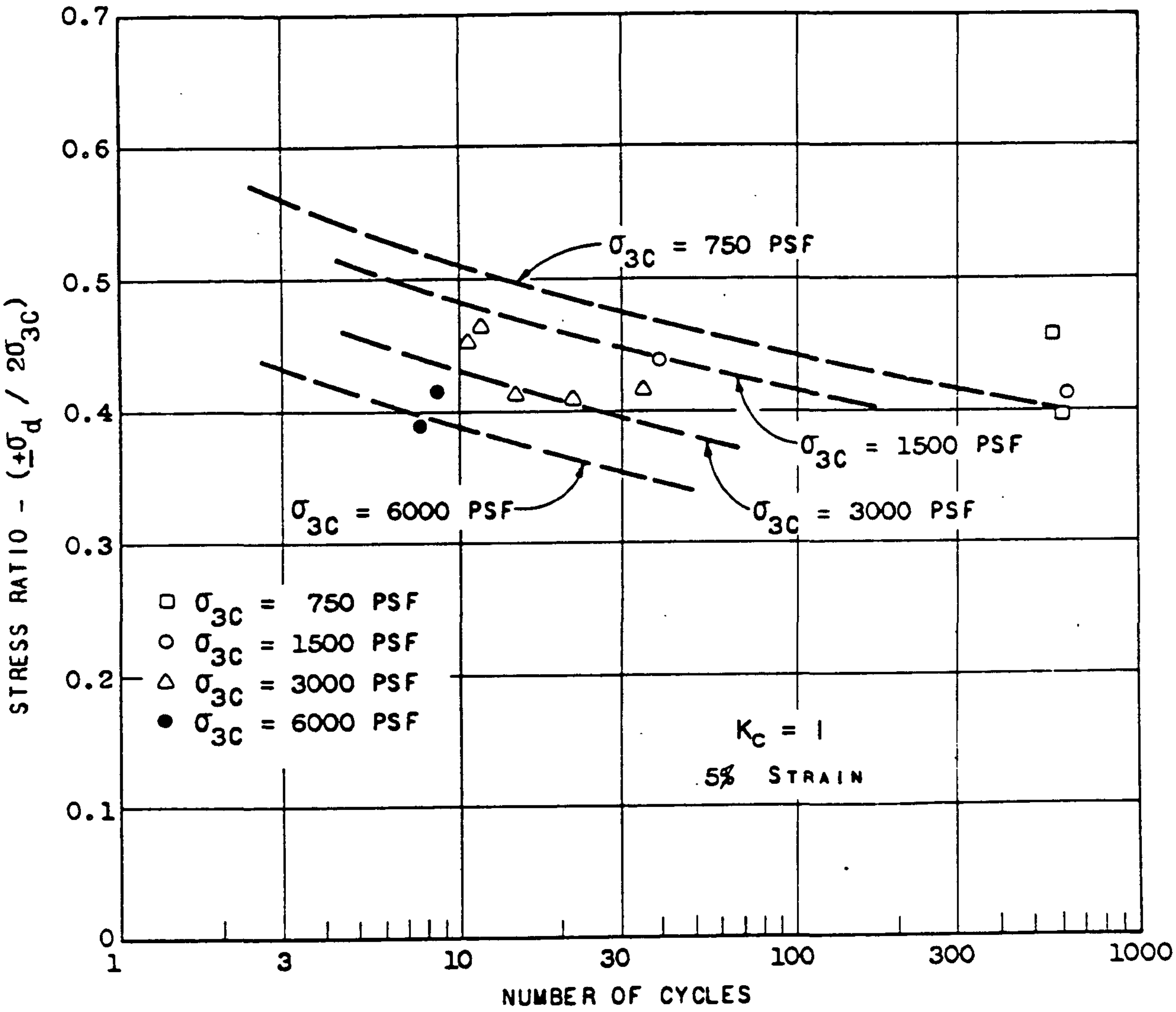
PRESSURE INCREMENTS OF TIME-COMPRESSION CURVES: CURVE NUMBER	PRESSURE INCREMENT FROM (tsf)	PRESSURE INCREMENT TO (tsf)	COEFFICIENT OF CONS (FT^2/DAY)	DESCRIPTION OF SPECIMEN: Red-brown micaceous sandy silty clay			
1	0.5 u	1.0 RE		LIQUID LIMIT (%)	.	FINAL VOID RATIO (e_f)	.86
2	1.0 RE	2.0 RE		PLASTIC LIMIT (%)	.	UNIT DRY WEIGHT (pcf)	84.0
				PLASTICITY INDEX (%)		CONSOLIDATION PROPERTIES	
				NATURAL WATER CONTENT (%)	36	COMPRESSION INDEX (C_c) (Unit strain basis)	0.12
				SPECIFIC GRAVITY	2.6	RECOMPRESSION (C_r) " " "	0.013
				TEST SPECIMEN PROPERTIES		SWELLING INDEX (C_s) " " "	0.028
				DIAMETER OF SPECIMEN (in.)	2.495	PRECONSOLIDATION STRESS (P_c) tsf	2.0±
				INITIAL THICKNESS OF SPECIMEN (in.)	.916	EXISTING OVERBURDEN STRESS (P_o) tsf	0.17
				INITIAL WATER CONTENT (%)	36		
				INITIAL VOID RATIO (e_o)	.9[illegible]		

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test Results On Foundation Soil (Sheet 13 of 13)

Figure 2.5-114



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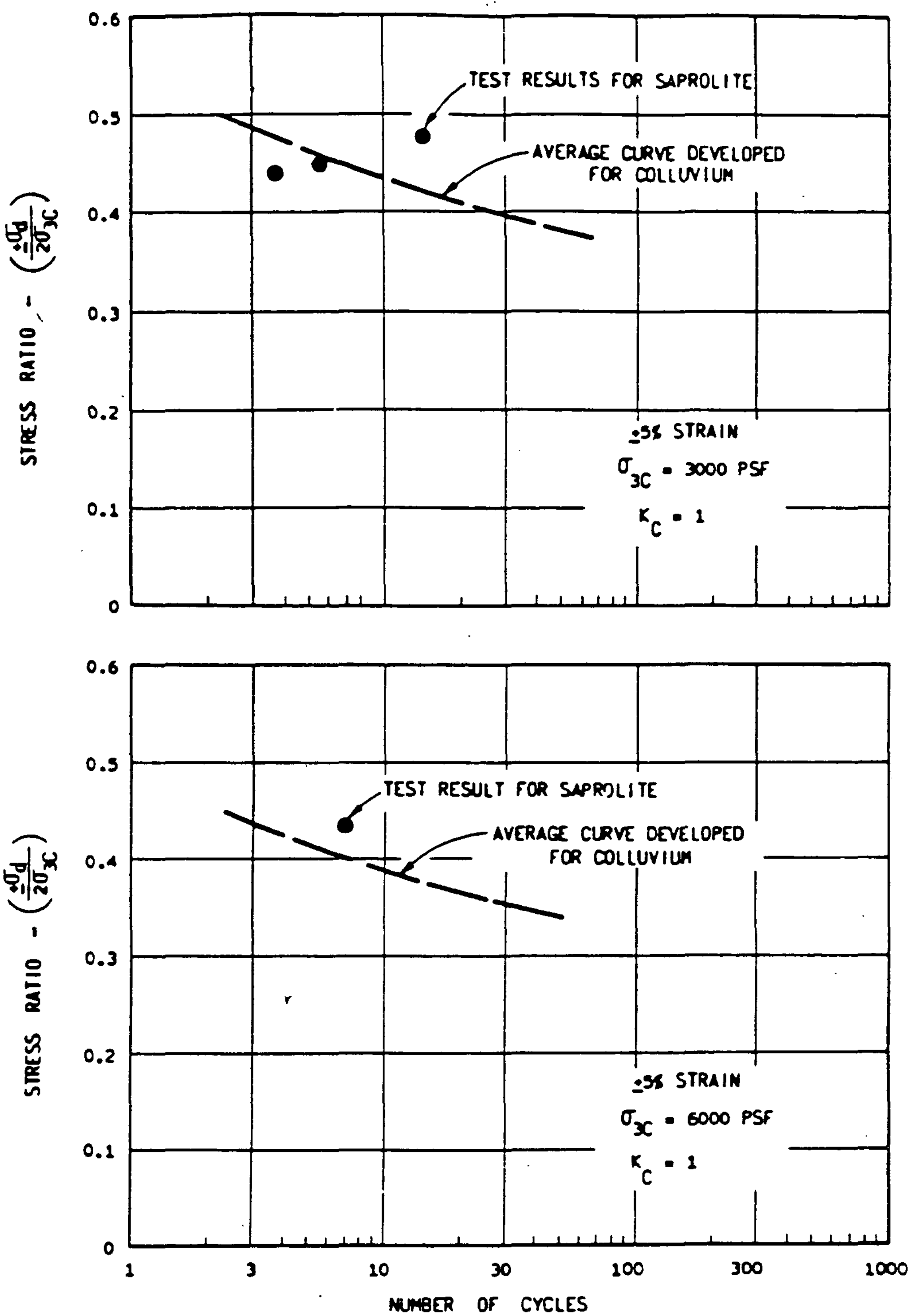
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Cyclic Triaxial Test Results for Undisturbed Samples of Colluvium

Figure 2.5-115



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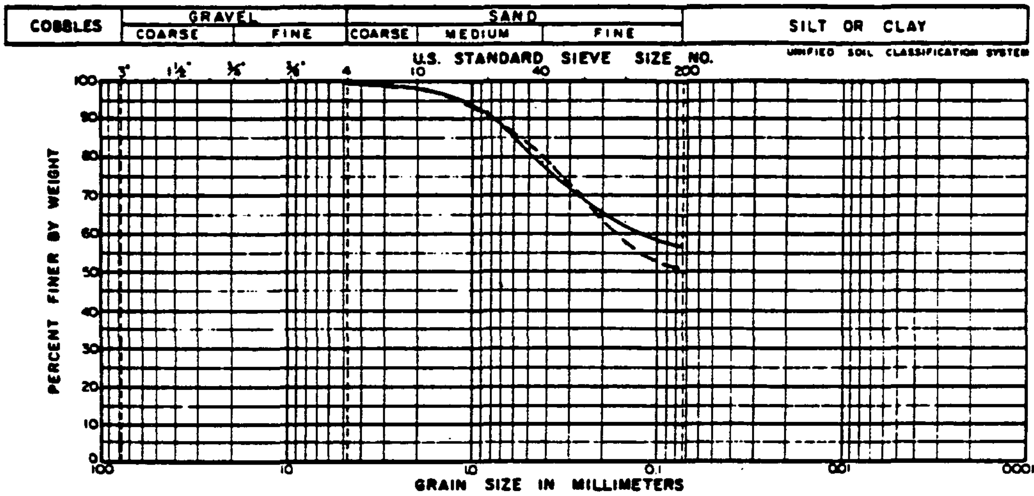
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

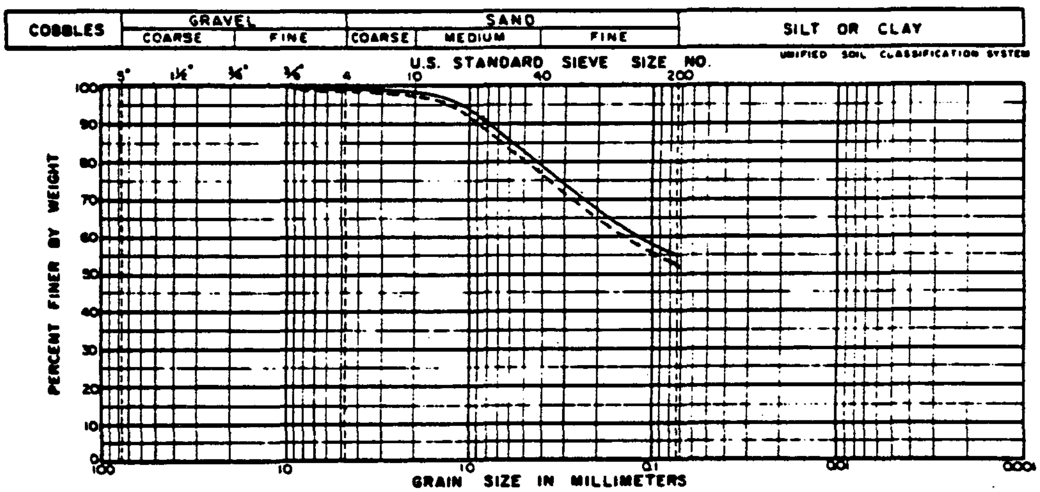
Cyclic Triaxial Test Results for Undisturbed Samples of Saprolite

Figure 2.5-116

MECHANICAL ANALYSIS



SAMPLE	SYMBOL	CLASSIFICATION	MC	LL	PL
BSD-5C Sample #1	———	CL		31	21
Lab. #A					
BSD-5C Sample #1	- - -	SC		26	17
Lab. #B					



SAMPLE	SYMBOL	CLASSIFICATION	MC	LL	PL
BSD-5C Sample #1	———	CL		32	18
Lab. #C					
BSD-9C Sample #2	- - -	CL		37	20
Lab. #A					

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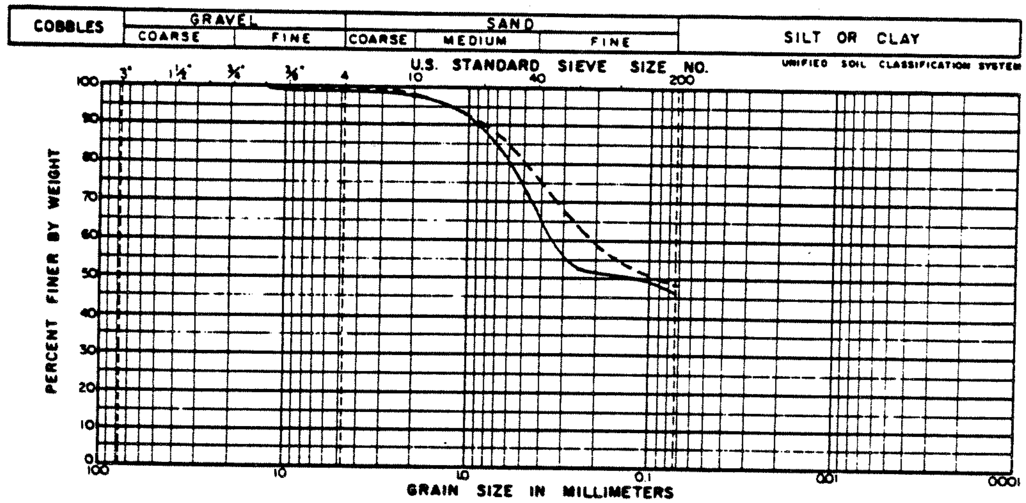
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

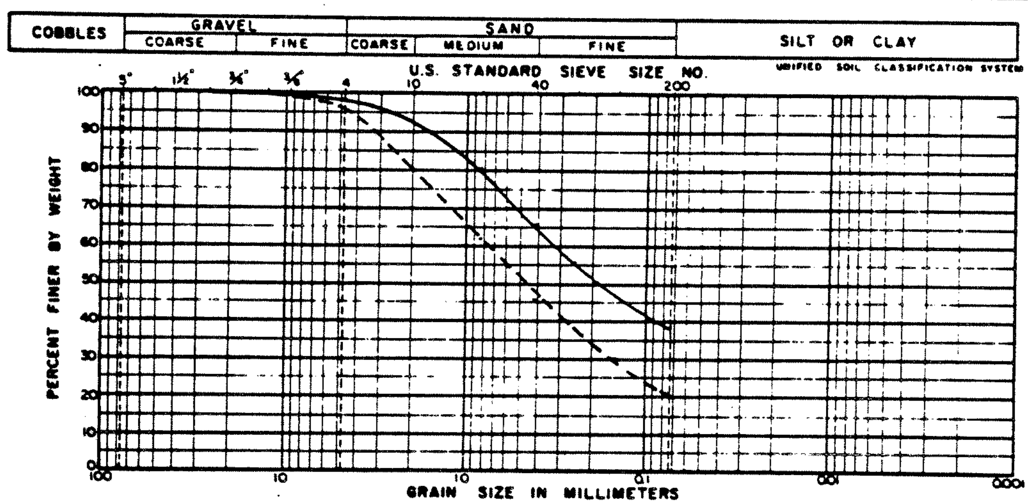
Physical Properties Of Colluvial
Cyclic Triaxial Test Samples
(Sheet 1 of 3)

Figure 2.5-117

MECHANICAL ANALYSIS



SAMPLE	SYMBOL	CLASSIFICATION	MC	LL	PL
BSD-9C Sample #3 Lab. #A	———	SC		27	17
BSD-9C Sample #3 Lab. #B	– – –	SC		29	16



SAMPLE	SYMBOL	CLASSIFICATION	MC	LL	PL
BSD-9D Sample #3 Lab. #A	———	SC		36	15
BSD-9D Sample #5 Lab. #A	– – –	SC		42	26

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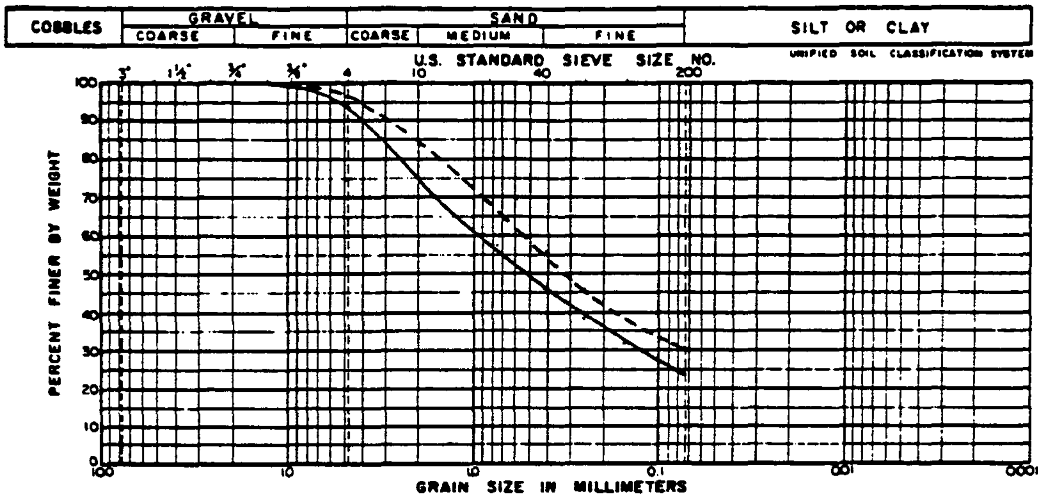
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

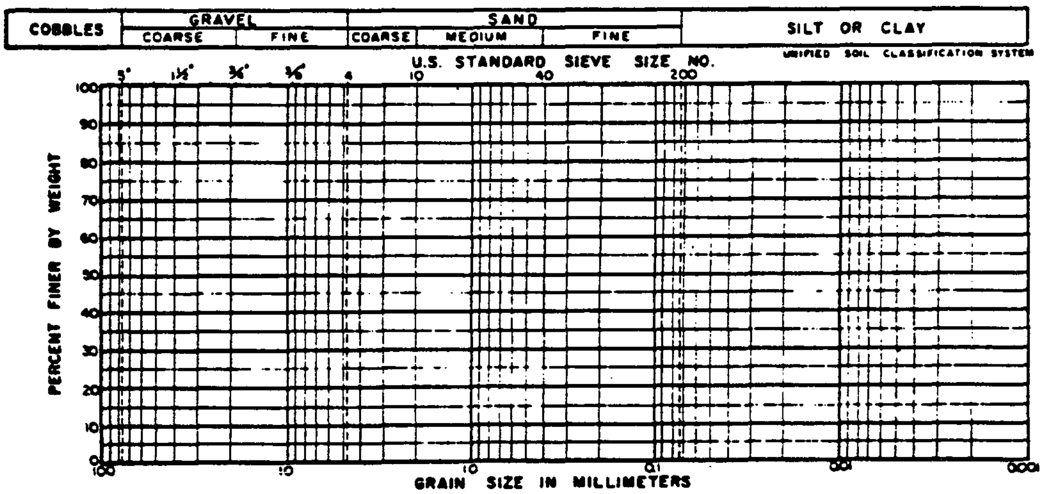
Physical Properties Of Colluvial Cyclic Triaxial Test Samples (Sheet 2 of 3)

Figure 2.5-117

MECHANICAL ANALYSIS



SAMPLE	SYMBOL	CLASSIFICATION	MC	LL	PL
BSD-9D Sample #5	———				
Lab. #B					
BSD-9D Sample #5	- - -	SC		52	26
Lab. #C					



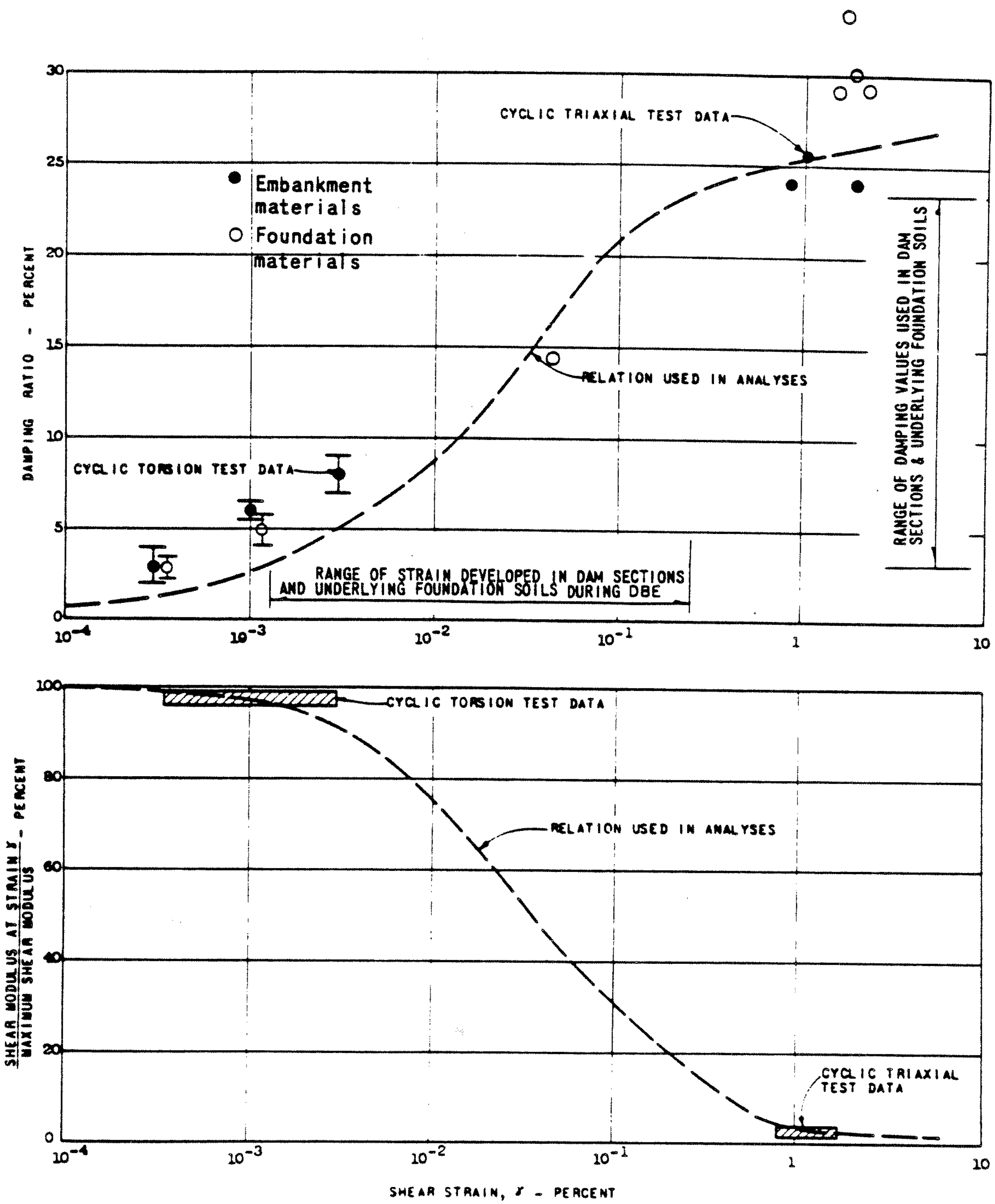
SAMPLE	SYMBOL	CLASSIFICATION	MC	LL	PL

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Physical Properties Of Colluvial
Cyclic Triaxial Test Samples
(Sheet 3 of 3)

Figure 2.5-117

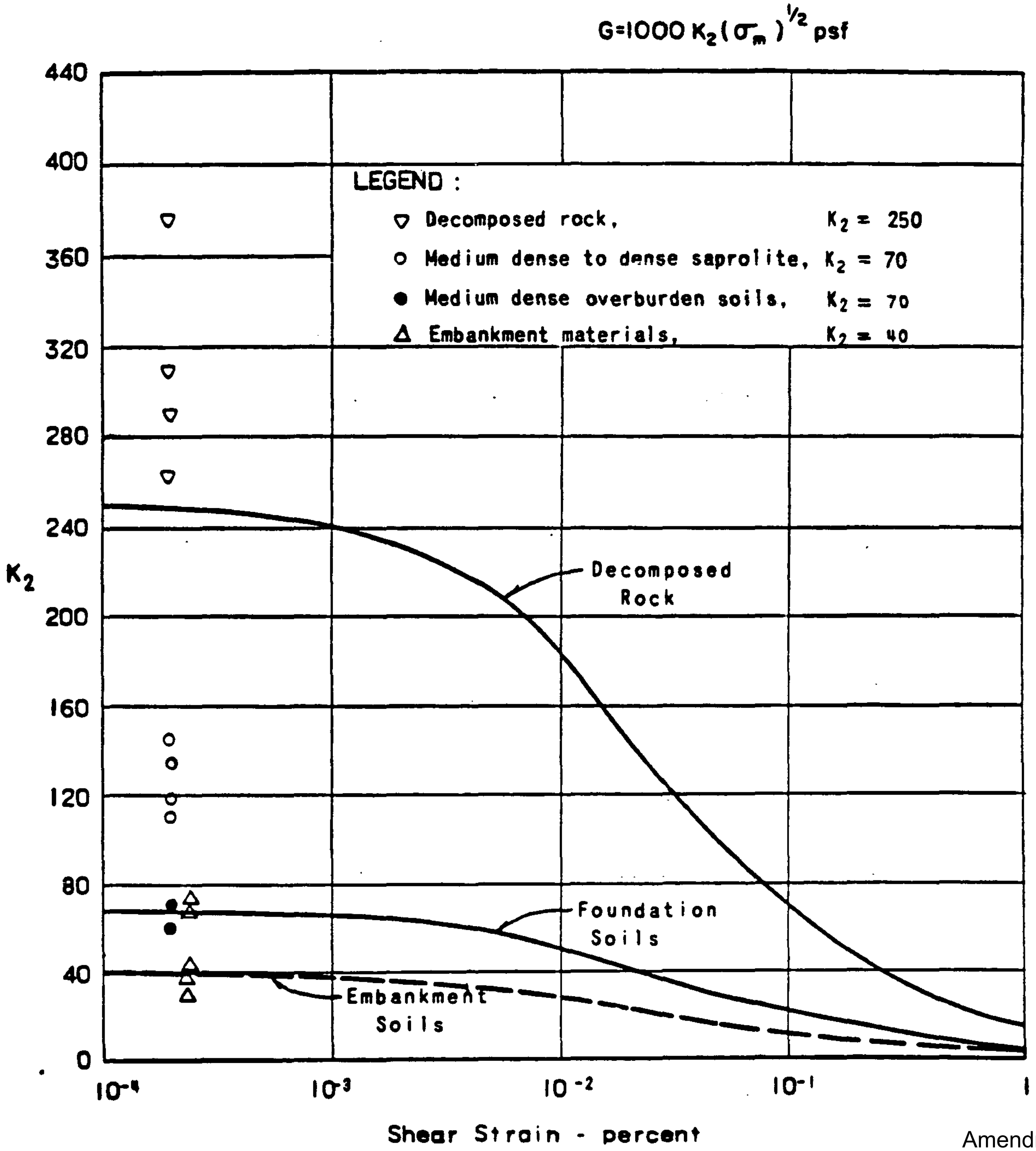


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Variations of Damping and Shear Moduli Used in Desgn

Figure 2.5-118



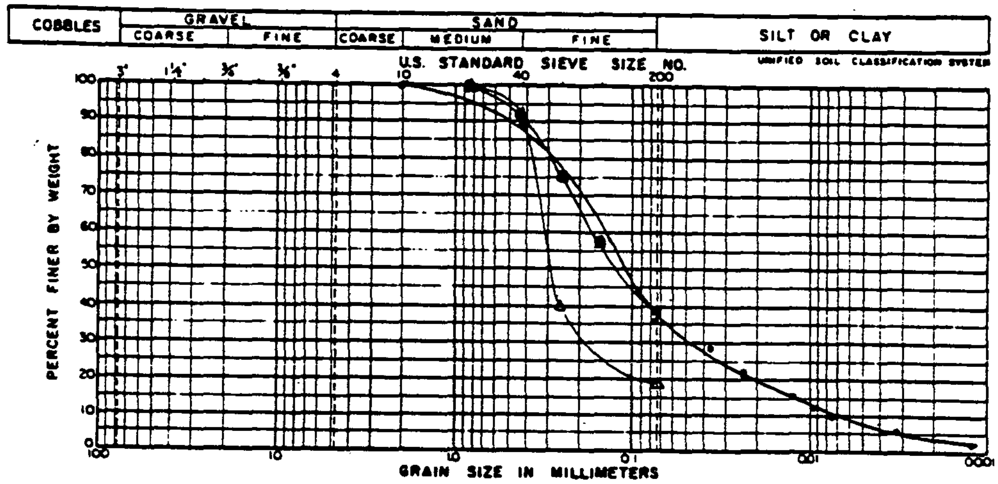
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

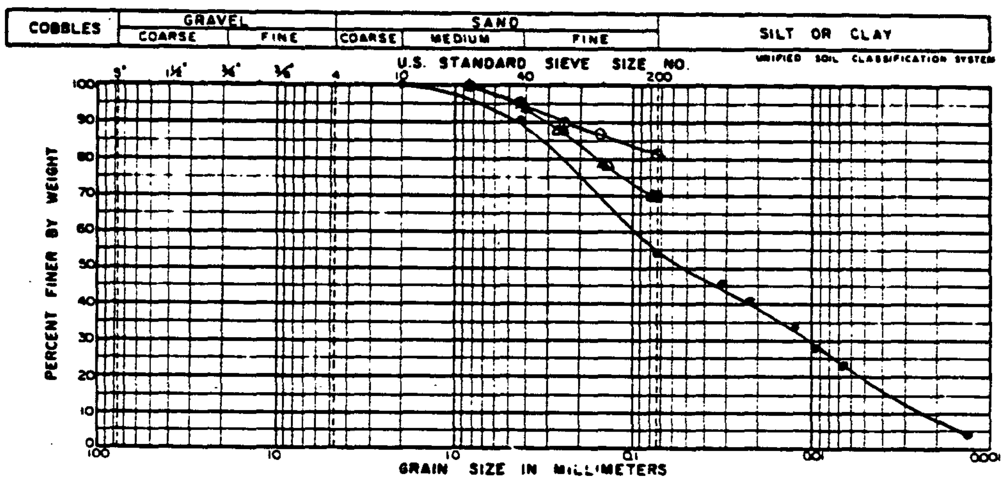
Shear Modulus K_2 Parameter
Vs. Shear Strain

Figure 2.5-119

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
F-1	BAG	0-43.5	●	SM	-	NP	-
F-1	TEST 1	0-43.5	○	SM } Tests performed after completion			
F-1	TEST 2	0-43.5	▲	SM } of UU Triaxial Test Series			
F-1	TEST 3	0-43.5	△	SM }			



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
F-3	BAG	0-43.5	●	ML	-	NP	-
F-3	TEST 1	0-43.5	○	ML } Tests performed after completion			
F-3	TEST 2	0-43.5	▲	ML } of UU Triaxial Test Series			
F-3	TEST 3	0-43.5	△	ML }			

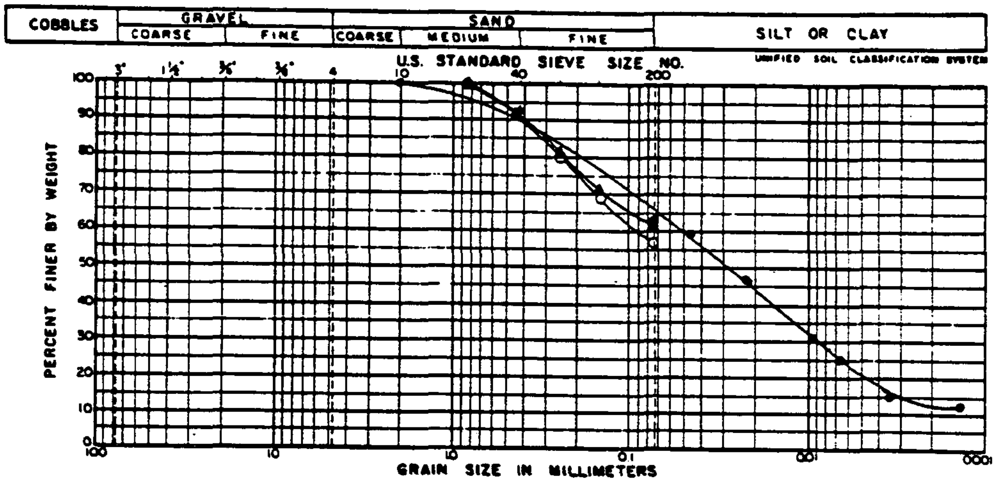
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

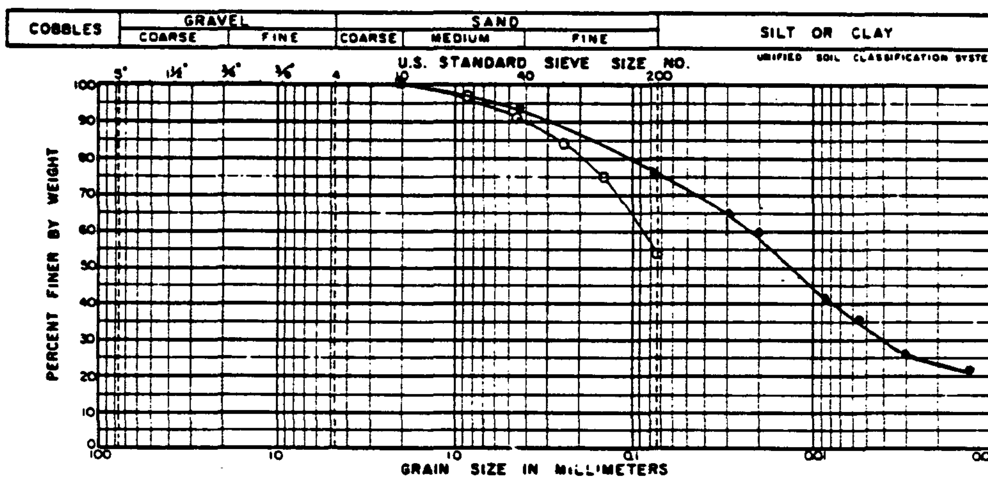
Grain Size Distribution Curves
Of Borrow Soil
(Sheet 1 of 17)

Figure 2.5-120

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
RES	1F	0-15	●	MH-ML	-	51	46
RES	TEST 1	0-15	○	MH-ML } Tests Performed after completion of UU Triaxial Test Series			
RES	TEST 2	0-15	▲	MH-ML			



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
F-7	B-1	5-10	●	MH-ML	30.1	53	45
F-7A	B-1	25-30	○	ML-SM	20.8	-	-

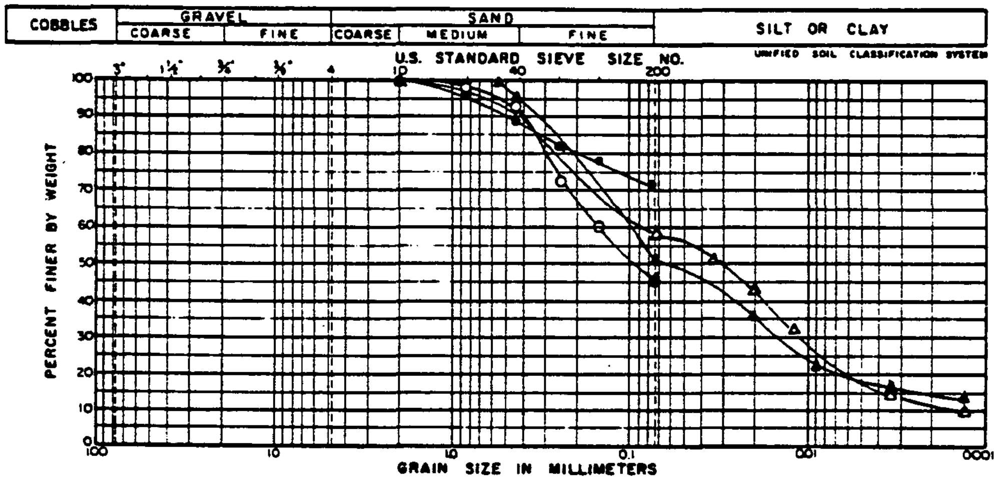
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

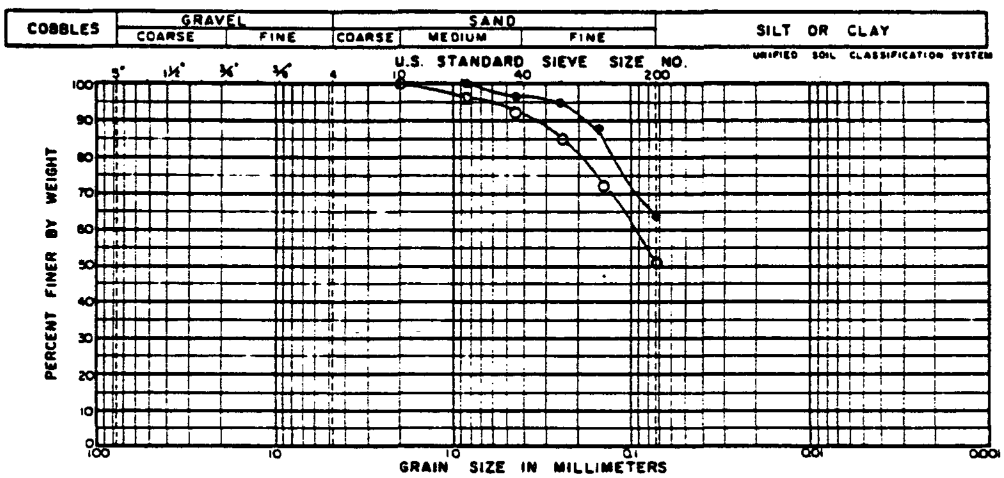
Grain Size Distribution Curves
Of Borrow Soil
(Sheet 2 of 17)

Figure 2.5-120

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
F-11	B-1	7.5-10	●	ML	23.6	-	-
F-11	B-2	30.0-35	○	SM-ML	26.4	-	-
F-13	B-1	10.0-15	▲	ML-SM	22.0	43	41
F-13	B-2	35.0-40	△	ML	23.1	50	47



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
F-15	B-1	10-15	●	ML	23.4	47	36
F-15	B-2	40-45	○	ML	25.7		

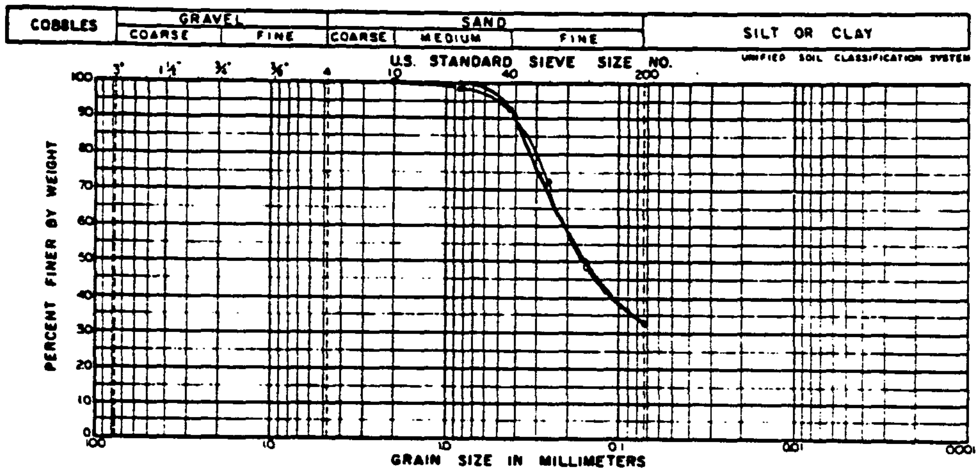
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

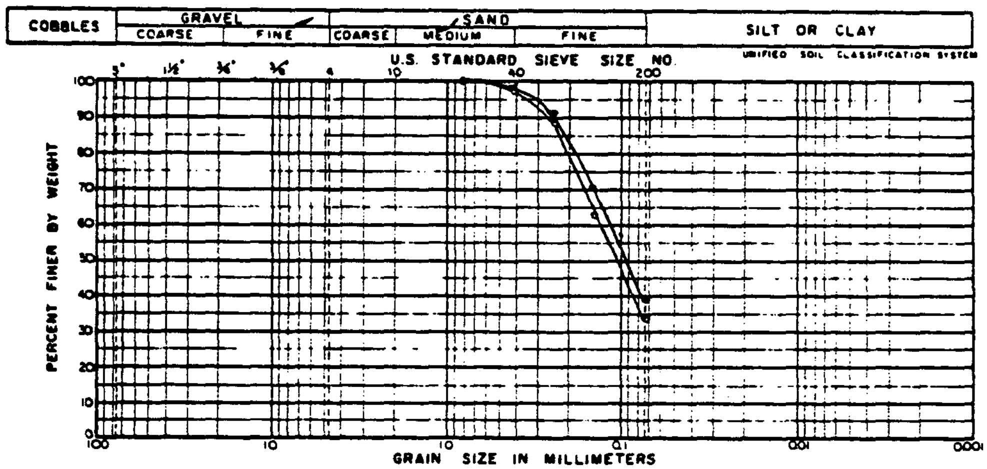
Grain Size Distribution Curves
Of Borrow Soil
(Sheet 3 of 17)

Figure 2.5-120

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-2	S-3	15.0-16.5	•	RED AND TAN MICACEOUS SILTY MEDIUM TO FINE SAND (SM)			
TBG-2	S-4	20.0-21.5	∘	GRAY AND TAN MICACEOUS SILTY MEDIUM TO FINE SAND (SM)			



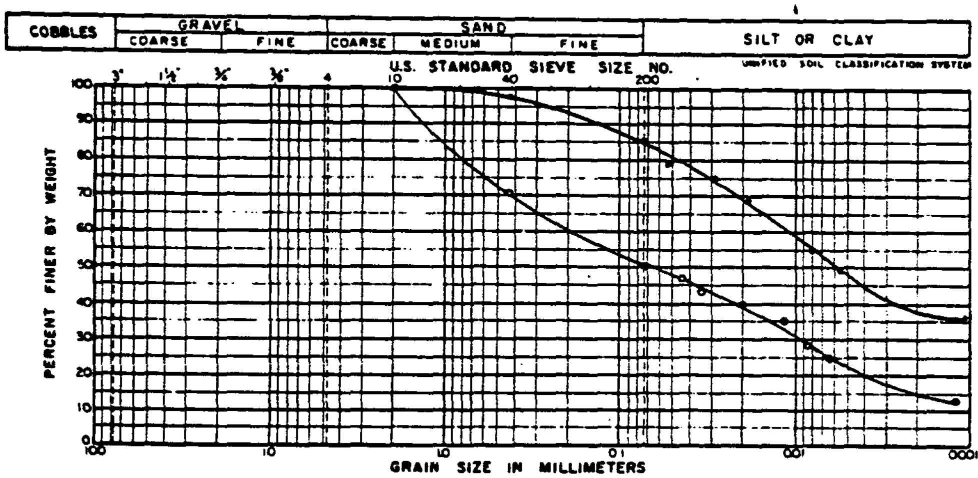
BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-2	S-6	30.0-31.5	•	MOTTLED PURPLE, TAN AND GRAY MICACEOUS SILTY FINE SAND(SM)			
TBG-2	S-8	40.0-41.5	∘	GRAY, TAN, YELLOW AND BLACK SILTY FINE SAND (SM)			

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

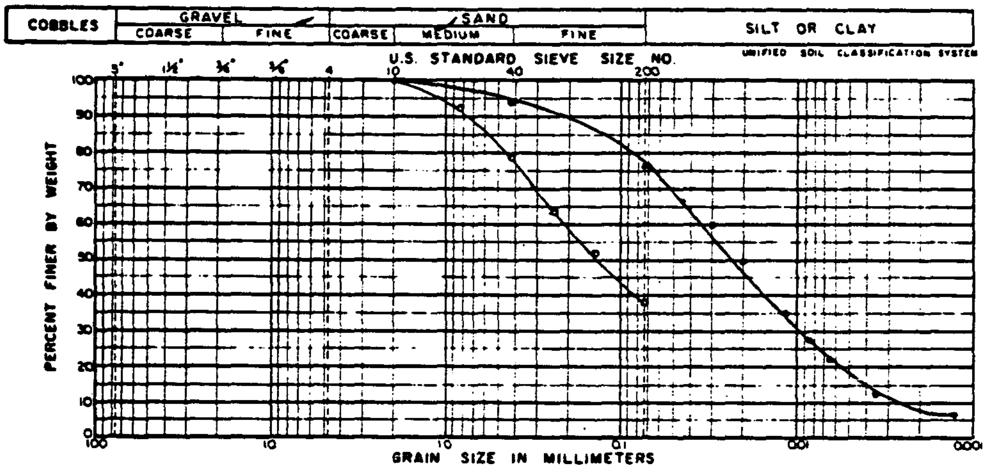
Grain Size Distribution Curves
Of Borrow Soil
(Sheet 4 of 17)

Figure 2.5-120

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-3	S-3	15.0-16.5	•	BROWN SILTY CLAY, LITTLE FINE SAND(MH)	28.7	60	41
TBG-3	S-5	25.0-26.5	∘	TAN MEDIUM TO FINE SANDY CLAYEY SILT (MH)		50	45



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-3	S-8	40.0-41.5	•	TAN AND BROWN CLAYEY SILT, SOME MEDIUM TO FINE SAND (ML)			
			∘				
TBG-3	S-9	45.0-46.5		MOTTLED GRAY, YELLOW, TAN AND BLACK MICACEOUS SILTY MEDIUM TO FINE SAND(SM)			

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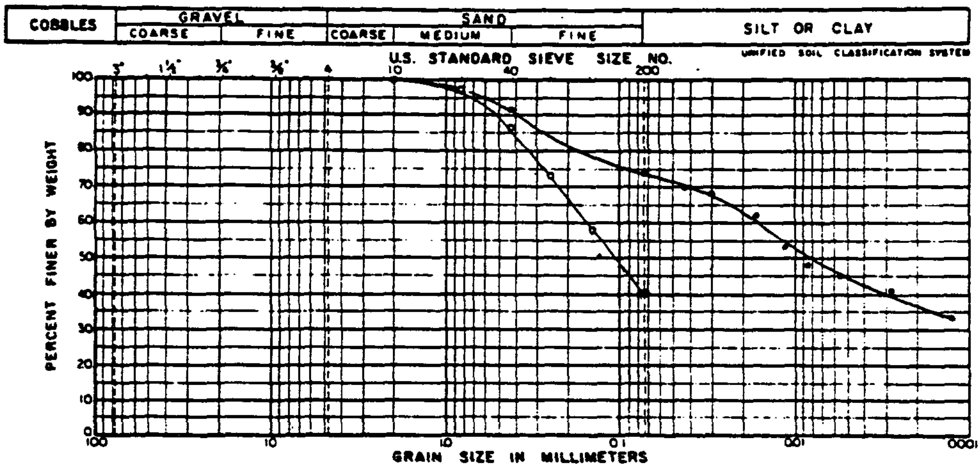
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

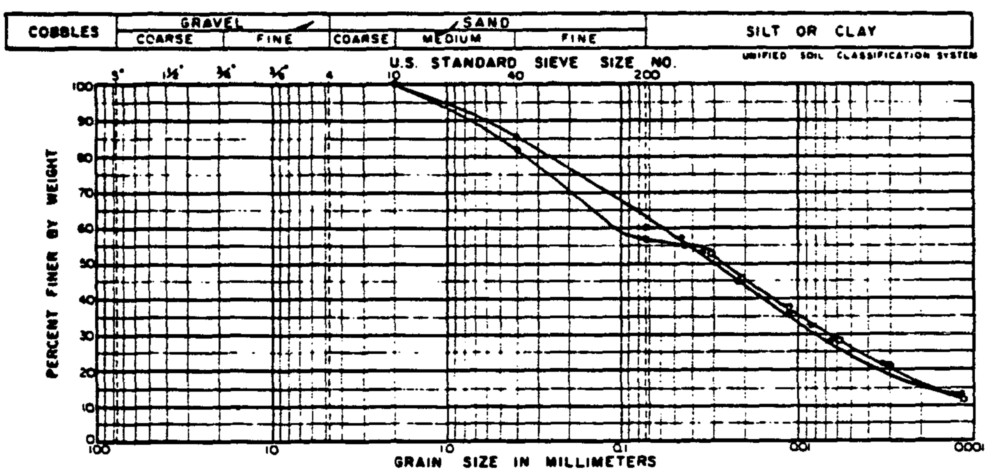
Grain Size Distribution Curves
Of Borrow Soil
(Sheet 5 of 17)

Figure 2.5-120

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-5	Bag	20.0-25.0	•	RED-BROWN MICACEOUS CLAYEY SILT, SOME MEDIUM TO FINE SAND (ML)			
TBG-5	S-5	25.0-26.5	○	RED AND TAN MICACEOUS CLAYEY SILTY MEDIUM TO FINE SAND (SM)			



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-5	Bag	35.0-40.0	•	RED-BROWN MEDIUM TO FINE SANDY CLAYEY SILT (ML)			
TBG-5	Bag	45.0-50.0	○	TAN MICACEOUS MEDIUM TO FINE SANDY CLAYEY SILT (ML)			

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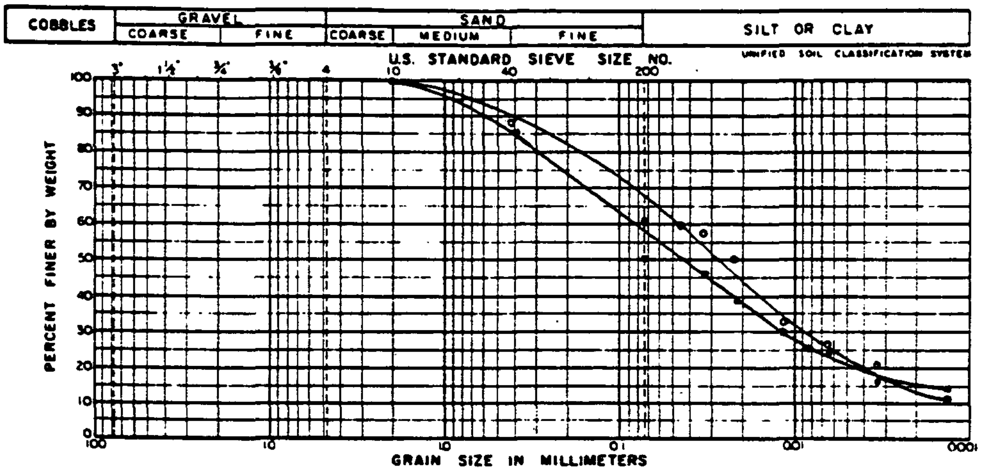
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

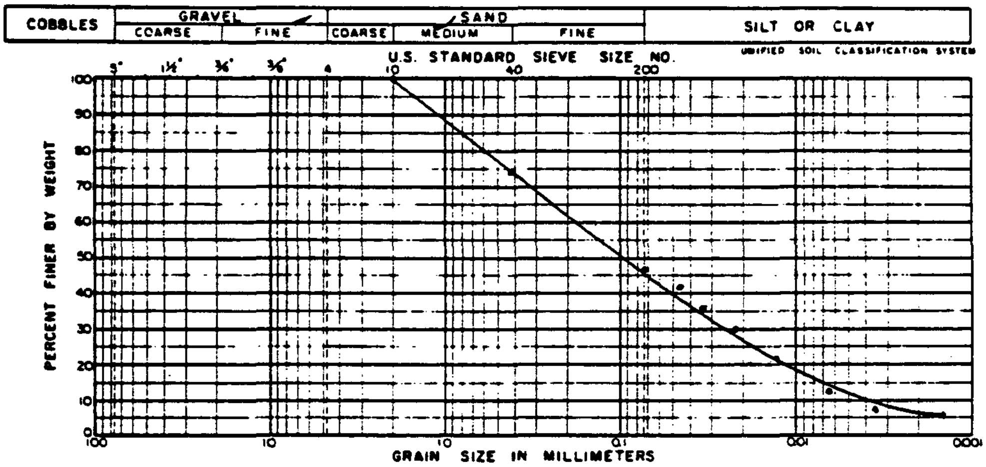
Grain Size Distribution Curves
Of Borrow Soil
(Sheet 6 of 17)

Figure 2.5-120

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-7	S-3	15.0-16.5	•	RED-BROWN MICACEOUS MEDIUM TO FINE SANDY CLAYEY SILT (ML)		44	42
TBG-7	Bag	40.0-45.0	o	LIGHT BROWN MICACEOUS MEDIUM TO FINE SANDY CLAYEY SILT (ML)			



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-10	S-7	35.0-36.5	•	TAN MICACEOUS SILTY COARSE TO FINE SAND (SM)	23.9	20	NP

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Grain Size Distribution Curves
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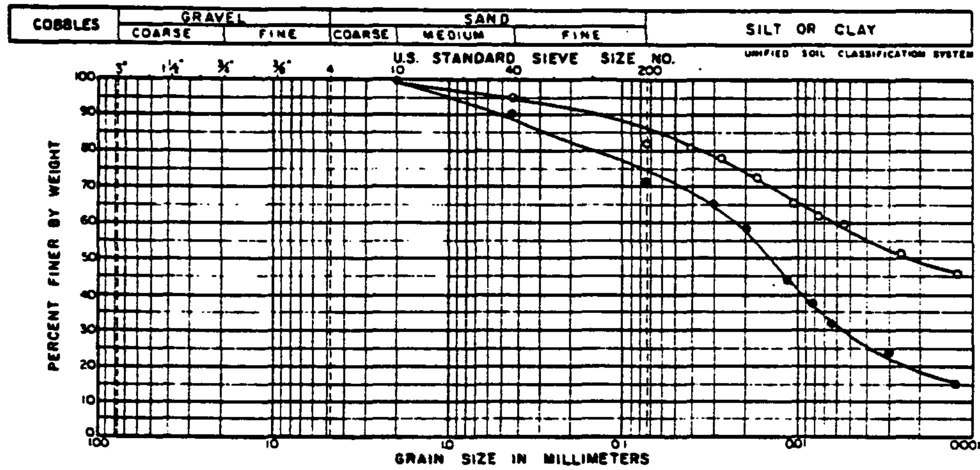
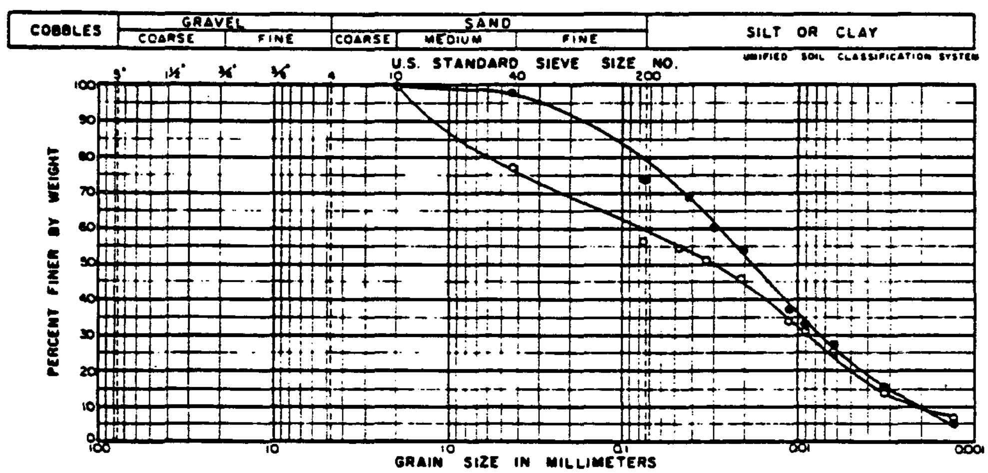
Figure 2.5-120

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-8	S-1	5.0- 6.5	○	BROWN CLAYEY SILT, LITTLE MEDIUM TO FINE SAND (MH)	28.2	65	33
TBG-8	S-3	15.0-16.5	●	BROWN MEDIUM TO FINE SANDY CLAYEY SILT (ML)	27.3		



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-8	S-7A	35.0-35.5	○	GRAY MICACEOUS MEDIUM TO FINE SANDY CLAYEY SILT (ML)	22.3	35	27
TBG-8	S-7B	35.5-36.5	●	TAN FINE SANDY CLAYEY SILT	37.1	66	54

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VIRGIL C. SUMMER NUCLEAR STATION

Grain Size Distribution Curves
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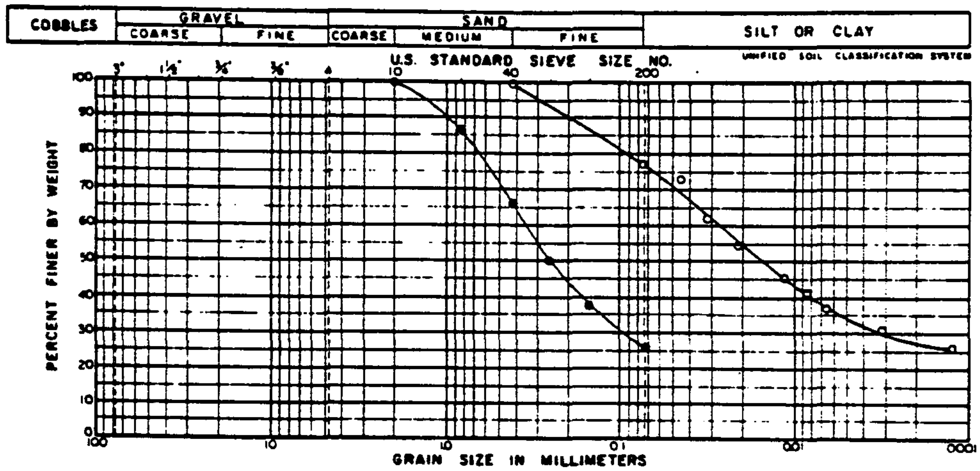
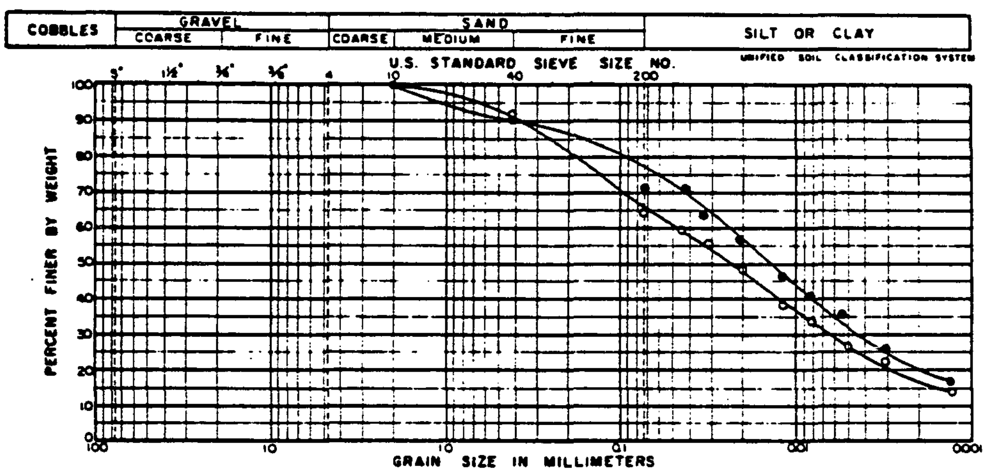
Figure 2.5-120

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-12	S-3	15.0-16.5	o	LIGHT BROWN, YELLOW AND WHITE MICACEOUS FINE SANDY CLAYEY SILT (MH)		66	60
TBG-12	S-5	25.0-26.5	•	MOTTLED RED, YELLOW AND GRAY MICACEOUS SILTY MEDIUM FINE SAND (SM)	27.9		



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-12	Bag	30.0-35.0	o	TAN MICACEOUS MEDIUM TO FINE SANDY CLAYEY SILT (ML)			
TBG-12	Bag	40.0-45.0	•	TAN MICACEOUS MEDIUM TO FINE SANDY CLAYEY SILT (ML)			

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VIRGIL C. SUMMER NUCLEAR STATION

Grain Size Distribution Curves
Of Borrow Soil
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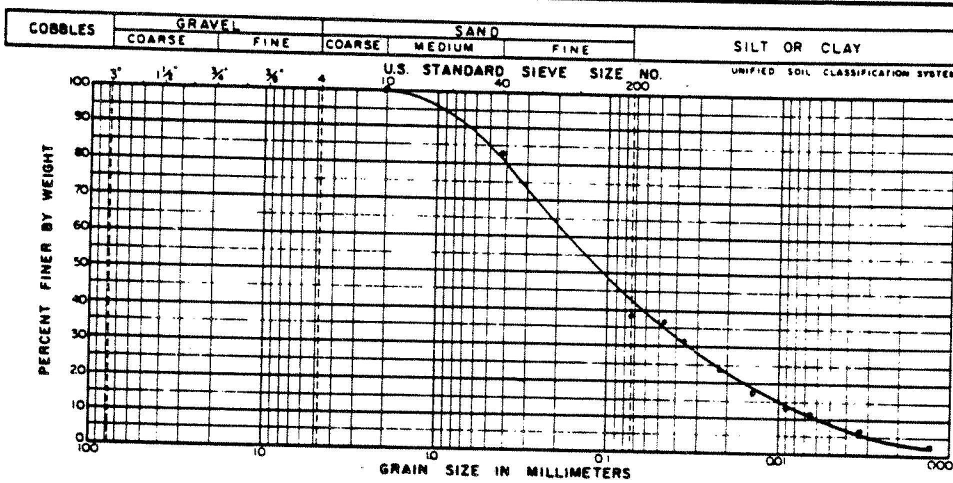
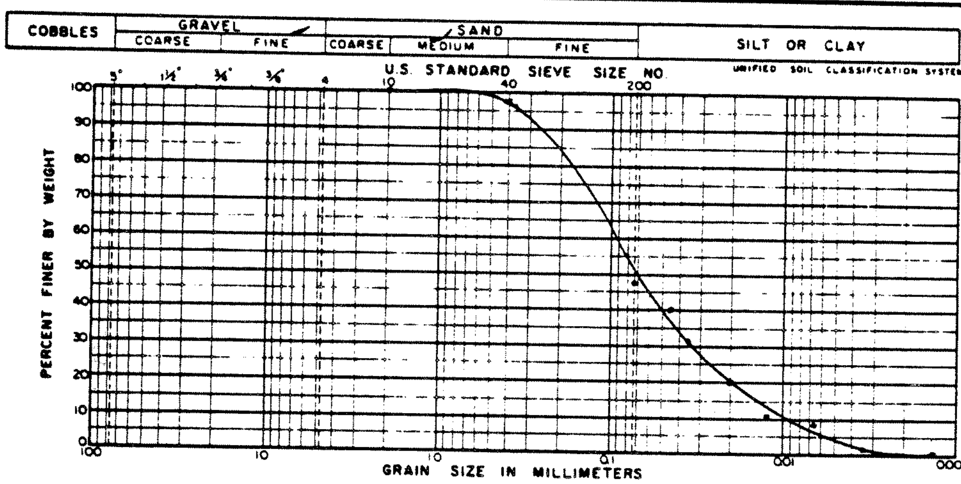
Figure 2.5-120

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-14	S-3	20.0-21.5	•	RED, TAN AND YELLOW MICACEOUS SILTY MEDIUM TO FINE SAND (SM)		52	42



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-14	S-8	40.0-41.5	•	GREEN-BROWN AND DARK BROWN MICACEOUS SILTY FINE SAND			

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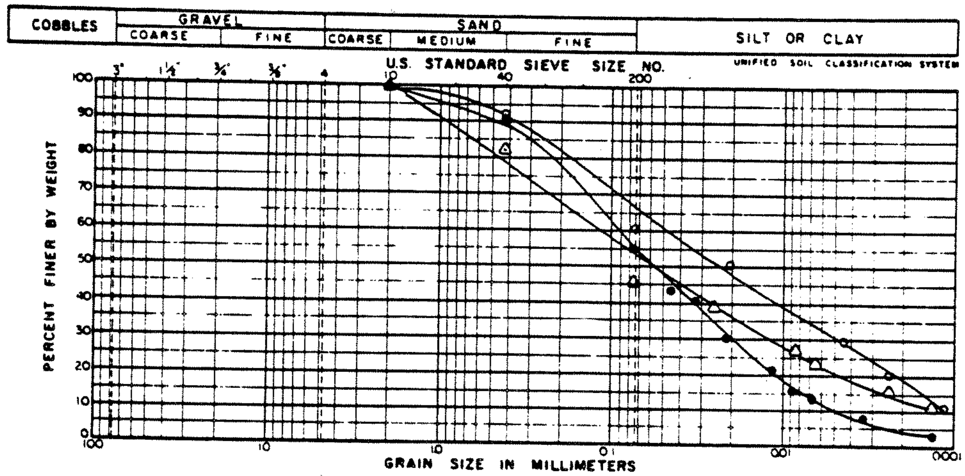
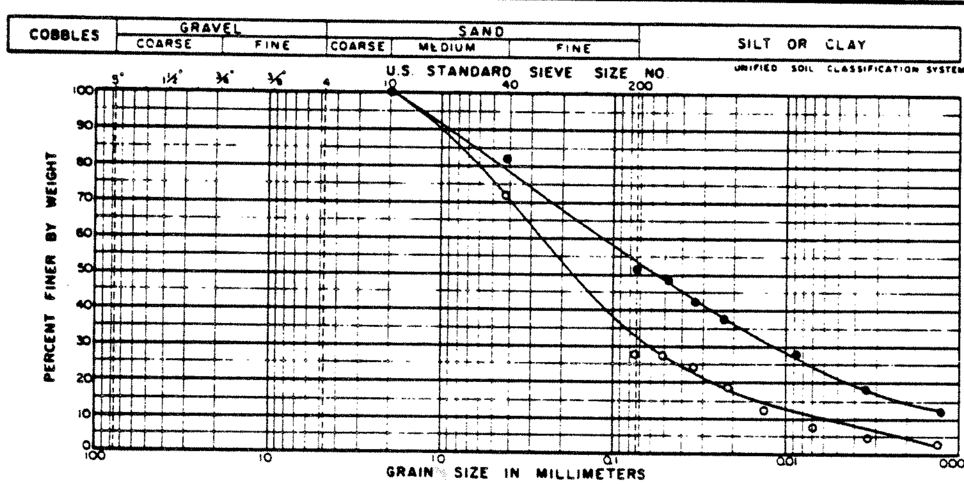
Figure 2.5-120

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-15	S-3	15.0-16.5	○	RED-BROWN MICACEOUS MEDIUM TO FINE SANDY CLAYEY SILT (ML)			
TBG-15	S-4	20.0-21.5	●	MULTICOLORED MEDIUM TO FINE SANDY CLAYEY SILT (ML)			
TBG-15	Bag	20.0-25.0	△	RED-BROWN MEDIUM TO FINE SANDY CLAYEY SILT (ML)			



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-15	S-7	35.0-36.5	○	WHITE MICACEOUS SILTY MEDIUM TO FINE SAND (SM)			
TBG-15	Bag	35.0-40.0	●	BROWN MEDIUM TO FINE SANDY CLAYEY SILT (ML)			

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Grain Size Distribution Curves
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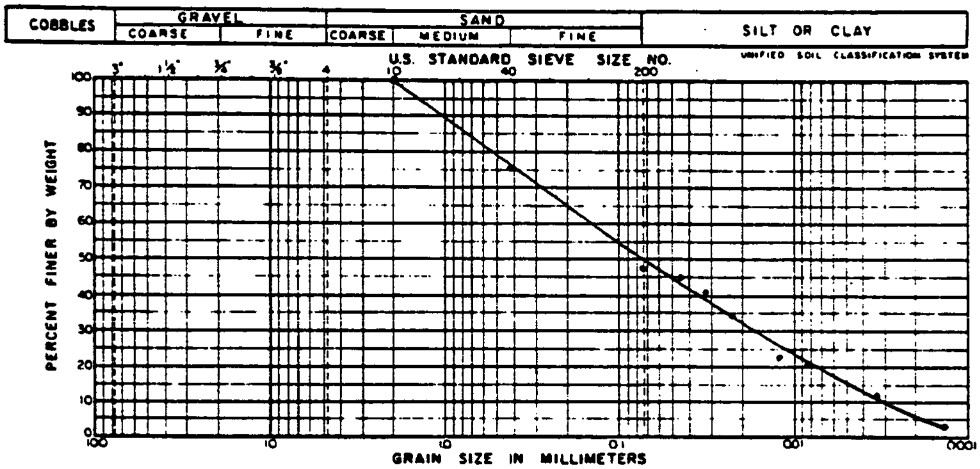
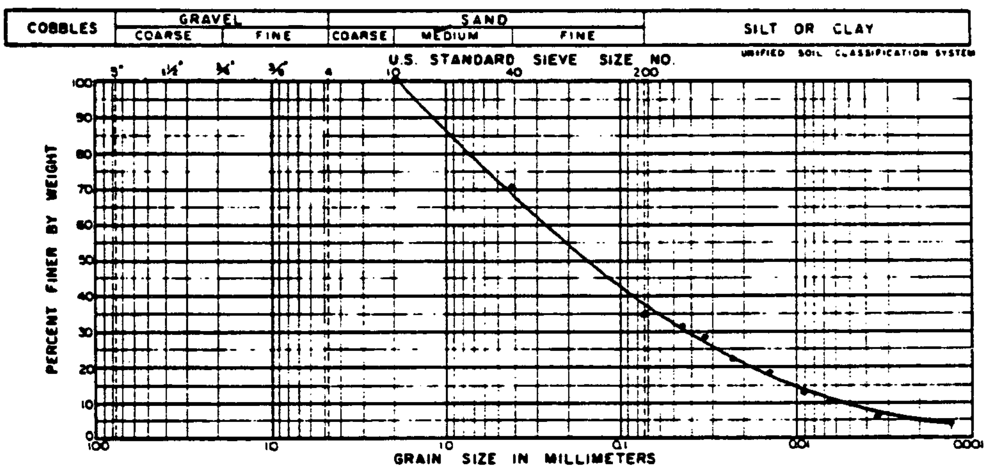
Figure 2.5-120

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-16	Bag	5.0-10.0	•	BROWN SILTY MEDIUM TO FINE SAND (SM)			



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-16	Bag	25.0-30.0	•	GRAY-BROWN, YELLOW AND WHITE SILTY MEDIUM TO FINE SAND (SM)			

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Grain Size Distribution Curves
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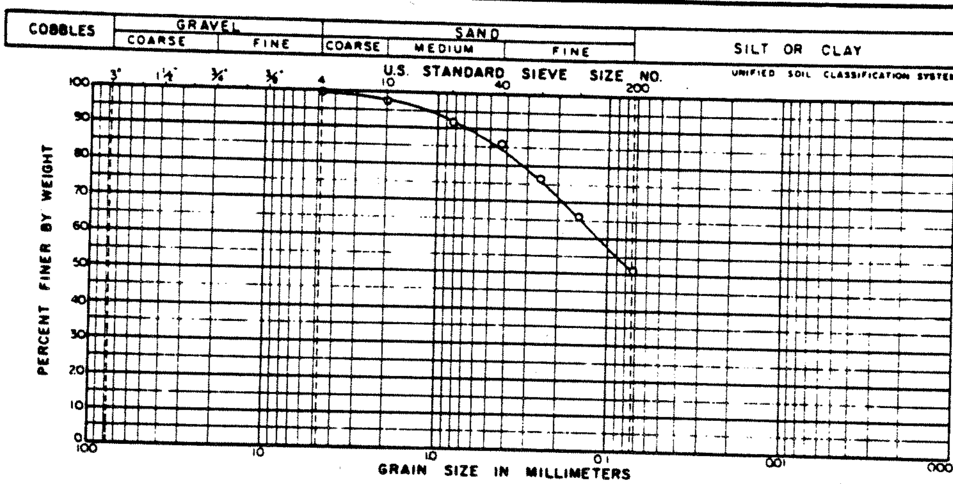
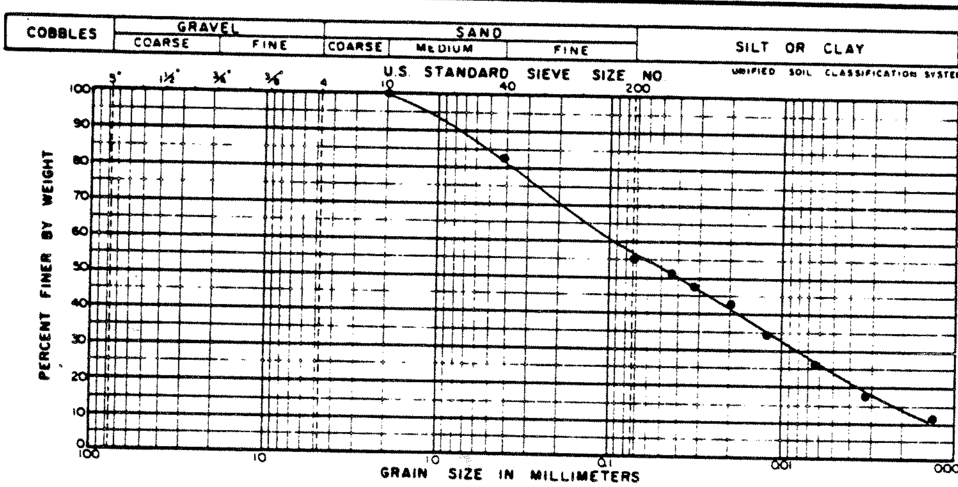
Figure 2.5-120

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-17	S-3	15.0-16.5	o	LIGHT TAN, RED, YELLOW AND WHITE MICACEOUS COARSE TO FINE SANDY CLAYEY SILT (ML)			



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-17	Bag	35.0-40.0	•	GRAY AND BROWN MEDIUM TO FINE SANDY CLAYEY SILT (ML)			

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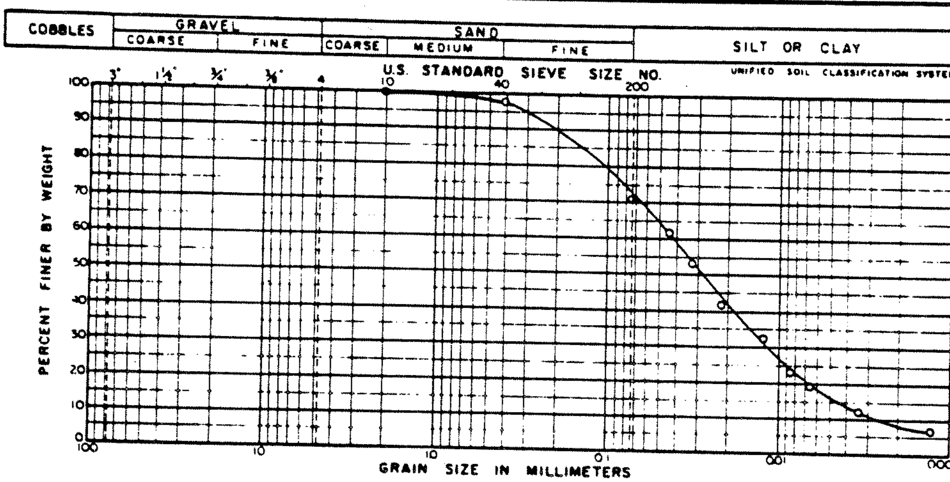
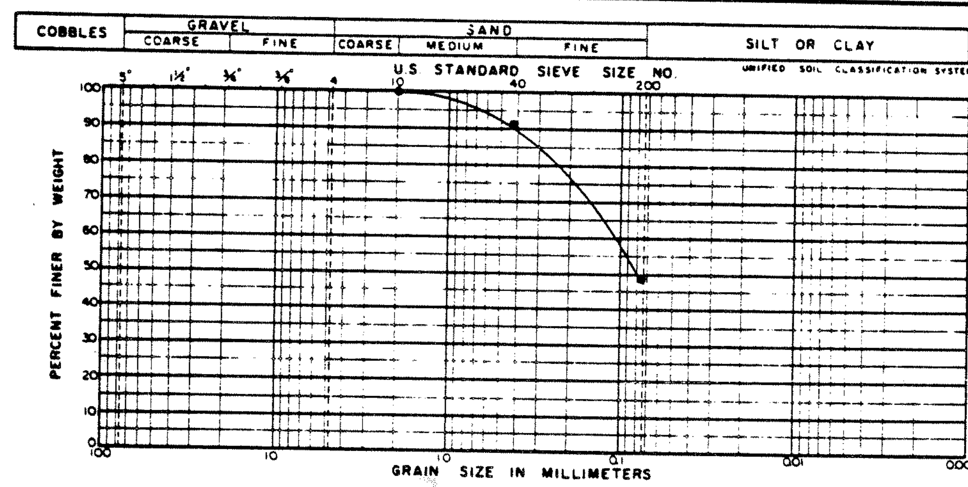
Figure 2.5-120

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-23	S-5	25.0-26.5	o	TAN, YELLOW AND RED MICACEOUS FINE SANDY CLAYEY SILT (MH)	34.0	60	51



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TBG-23	S-7	35.0-36.5	•	PURPLE, WHITE, BLACK AND BROWN MICACEOUS SILTY MEDIUM TO FINE SAND (SM)			

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Grain Size Distribution Curves
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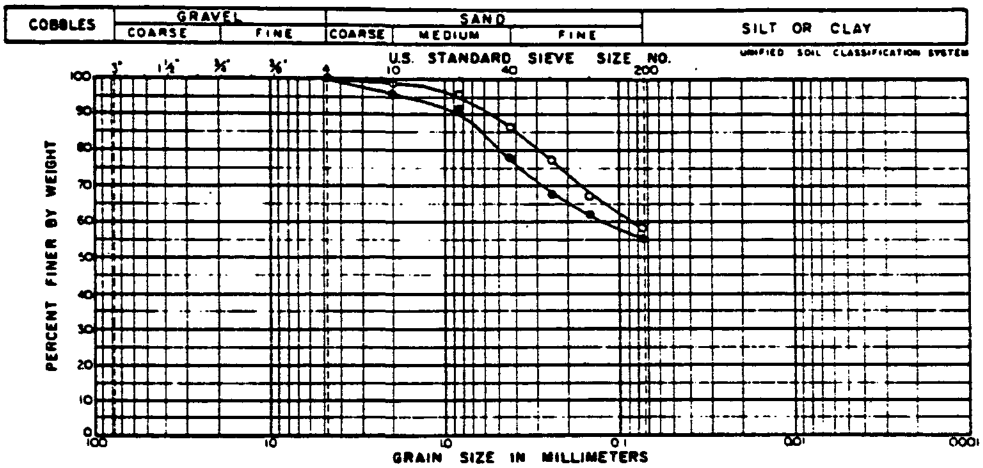
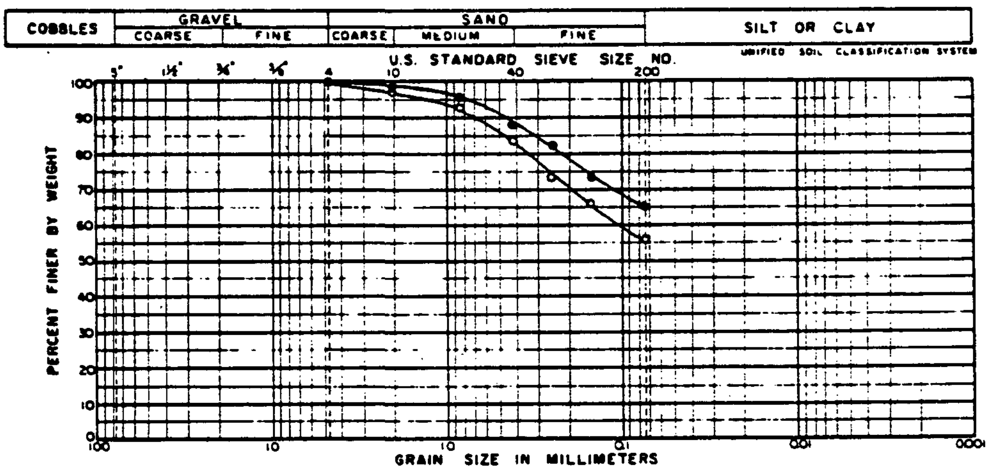
Figure 2.5-120

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TPG-4	-	5.0-10.0	○	RED-BROWN MICACEOUS MEDIUM TO FINE SANDY CLAYEY SILT (MH)		56	38
TPG-9	-	9.0-10.0	●	RED-BROWN MEDIUM TO FINE SANDY CLAYEY SILT (MH)		53	31



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TPG-11	-	7.0-11.0	○	RED-BROWN MICACEOUS MEDIUM TO FINE SANDY CLAYEY SILT (MH)		52	38
TPG-18	-	8.0-12.0	●	TAN MICACEOUS MEDIUM TO FINE SANDY CLAYEY SILT (MH)		57	41

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VIRGIL C. SUMMER NUCLEAR STATION

Grain Size Distribution Curves
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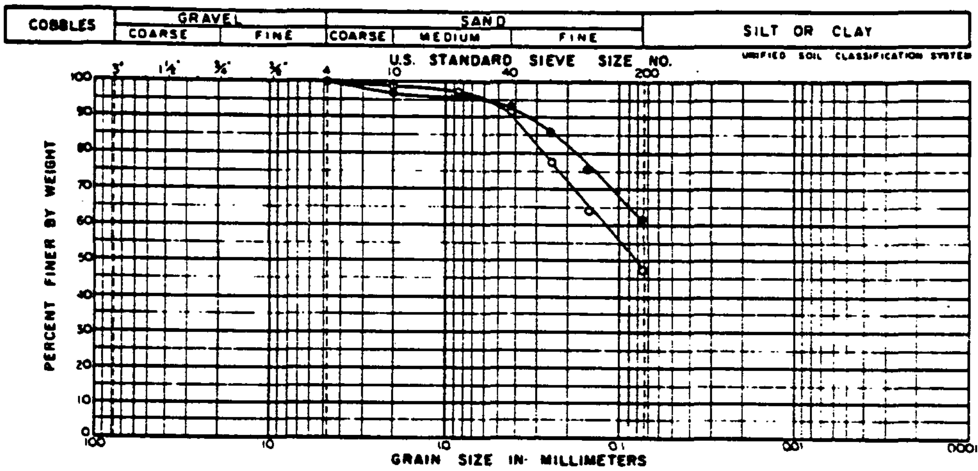
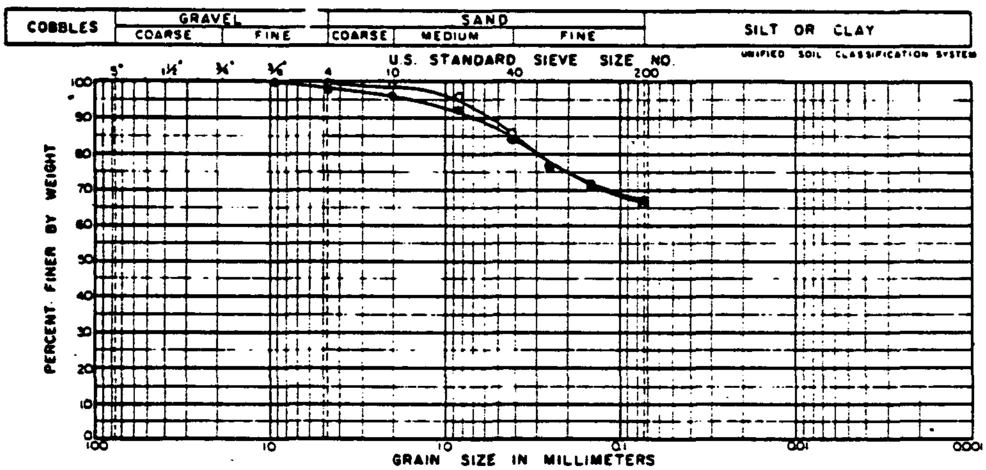
Figure 2.5-120

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TPG-21	-	10.0-13.0	○	GRAY AND BROWN MICACEOUS SILTY MEDIUM TO FINE SAND (SM)		NP	NP
TPG-21	-	9.0-12.0	●	RED-BROWN MEDIUM TO FINE SANDY CLAYEY SILT (ML)		NP	NP



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
TPG-24	-	12.0-15.0	○	RED-BROWN MICACEOUS MEDIUM TO FINE SANDY CLAYEY SILT (MH)		52	34
TPG-25	-	12.0-15.0	●	RED-BROWN, YELLOW AND WHITE COARSE TO FINE SANDY CLAYEY SILT (ML)		46	33

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VIRGIL C. SUMMER NUCLEAR STATION

Grain Size Distribution Curves
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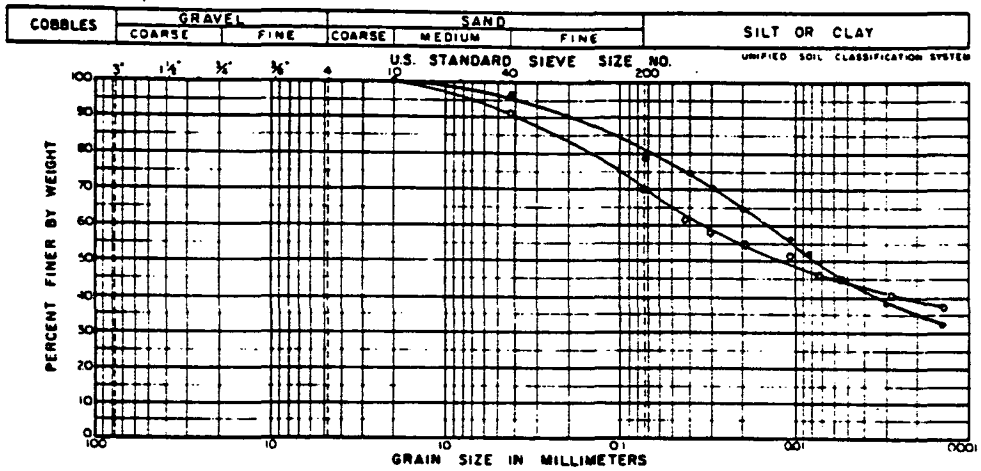
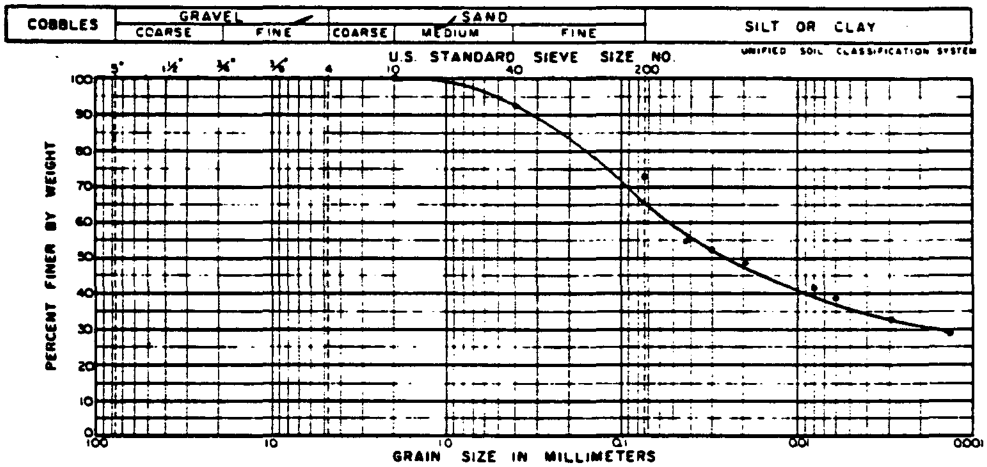
Figure 2.5-120

MECHANICAL ANALYSIS



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
BAG-1		2.0- 5.0	•	RED-BROWN AND WHITE MICACEOUS MEDIUM TO FINE SANDY SILTY CLAY (CH)		76	33
BAG-2		2.0- 5.0	∘	RED-BROWN MICACEOUS MEDIUM TO FINE SANDY SILTY CLAY (CH)		59	24



BORING	SAMPLE	DEPTH	SYMBOL	CLASSIFICATION	MC	LL	PL
BAG-3		2.0- 5.0	•	RED-BROWN MICACEOUS MEDIUM TO FINE SANDY SILTY CLAY (CH)		56	19

Amendment 0
August 1984

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Grain Size Distribution Curves
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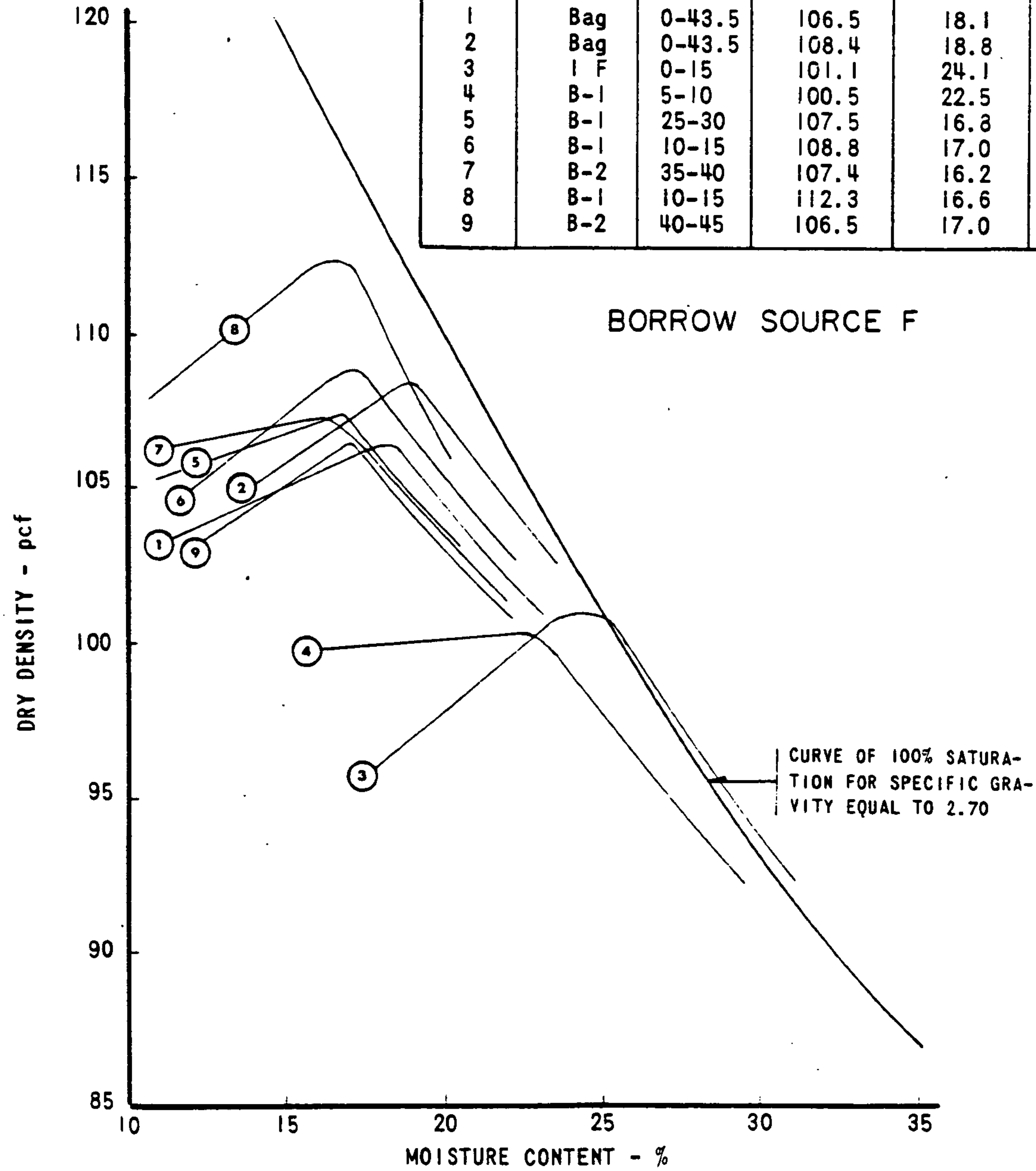
Figure 2.5-120

CURVE NO.	SAMPLE NO.	DEPTH (Ft)	MAX. DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)	LL (%)	PI (%)
1	Bag	0-43.5	106.5	18.1	NP	NP
2	Bag	0-43.5	108.4	18.8	NP	NP
3	1 F	0-15	101.1	24.1	51	5
4	B-1	5-10	100.5	22.5	53	8
5	B-1	25-30	107.5	16.8	-	-
6	B-1	10-15	108.8	17.0	43	2
7	B-2	35-40	107.4	16.2	50	3
8	B-1	10-15	112.3	16.6	47	13
9	B-2	40-45	106.5	17.0	-	-

BORROW SOURCE F



Amendment 0
August 1984

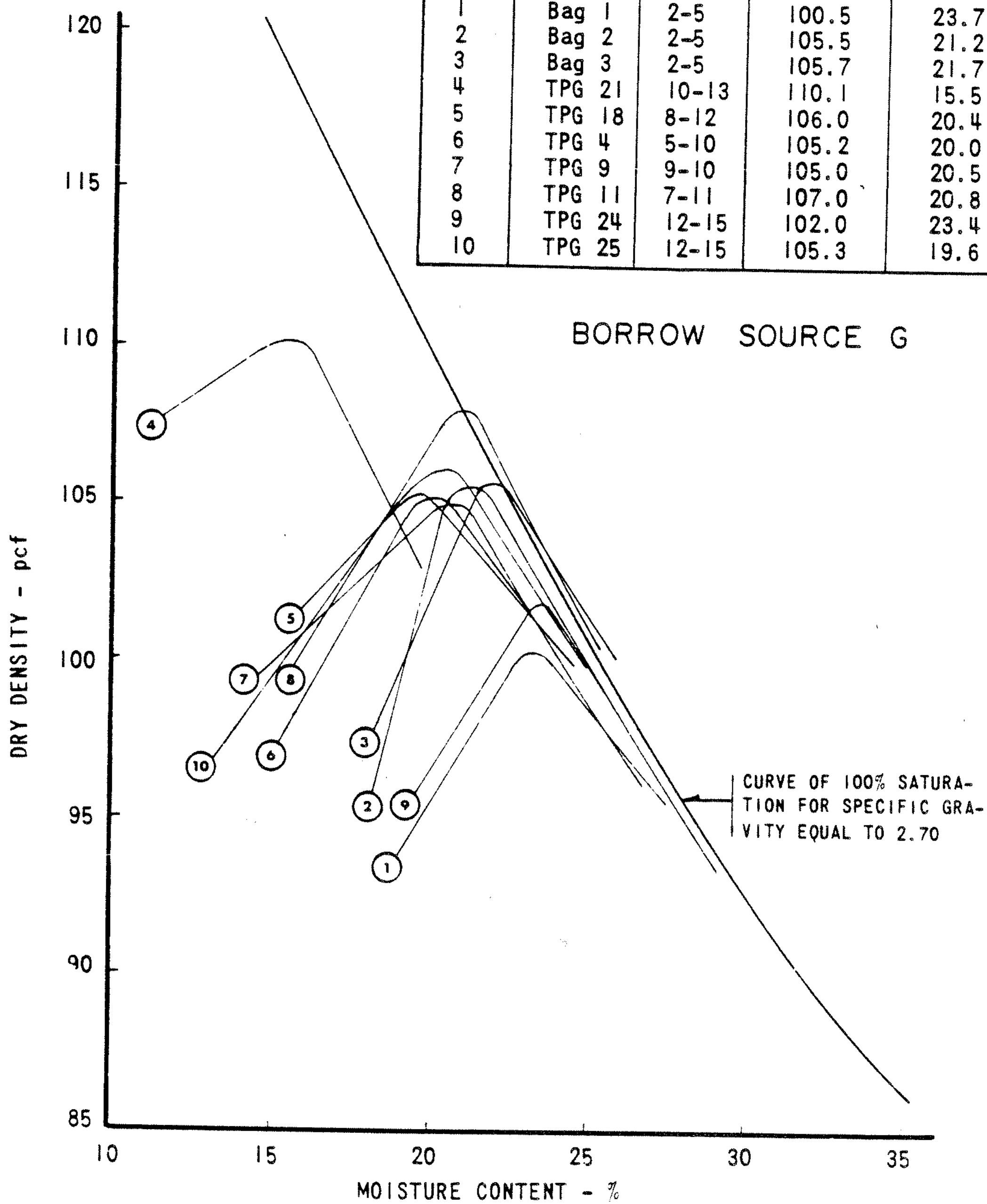
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Compaction Test Results for
Borrow Source F

Figure 2.5-121

CURVE NO.	SAMPLE NO.	DEPTH (Ft)	MAX. DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)	LL (%)	PI (%)
1	Bag 1	2-5	100.5	23.7	76	33
2	Bag 2	2-5	105.5	21.2	59	24
3	Bag 3	2-5	105.7	21.7	56	19
4	TPG 21	10-13	110.1	15.5	66	17
5	TPG 18	8-12	106.0	20.4	57	26
6	TPG 4	5-10	105.2	20.0	66	17
7	TPG 9	9-10	105.0	20.5	73	35
8	TPG 11	7-11	107.0	20.8	60	18
9	TPG 24	12-15	102.0	23.4	75	30
10	TPG 25	12-15	105.3	19.6	58	23

BORROW SOURCE G

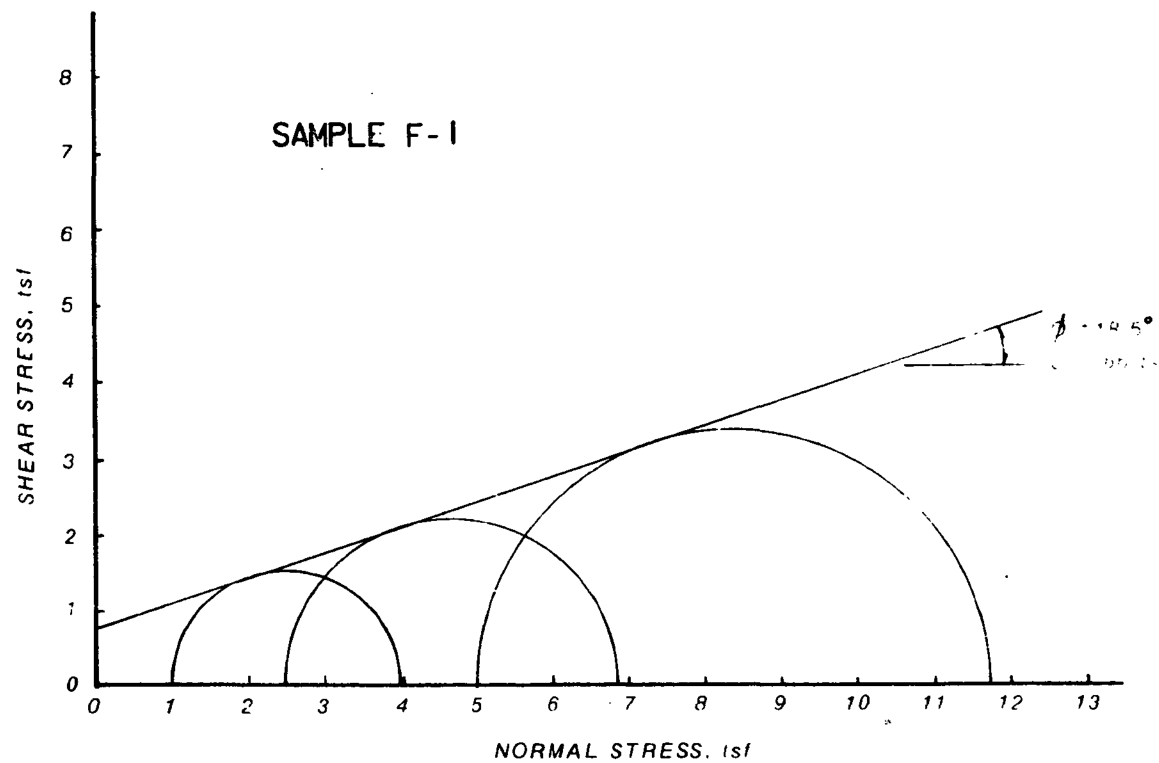


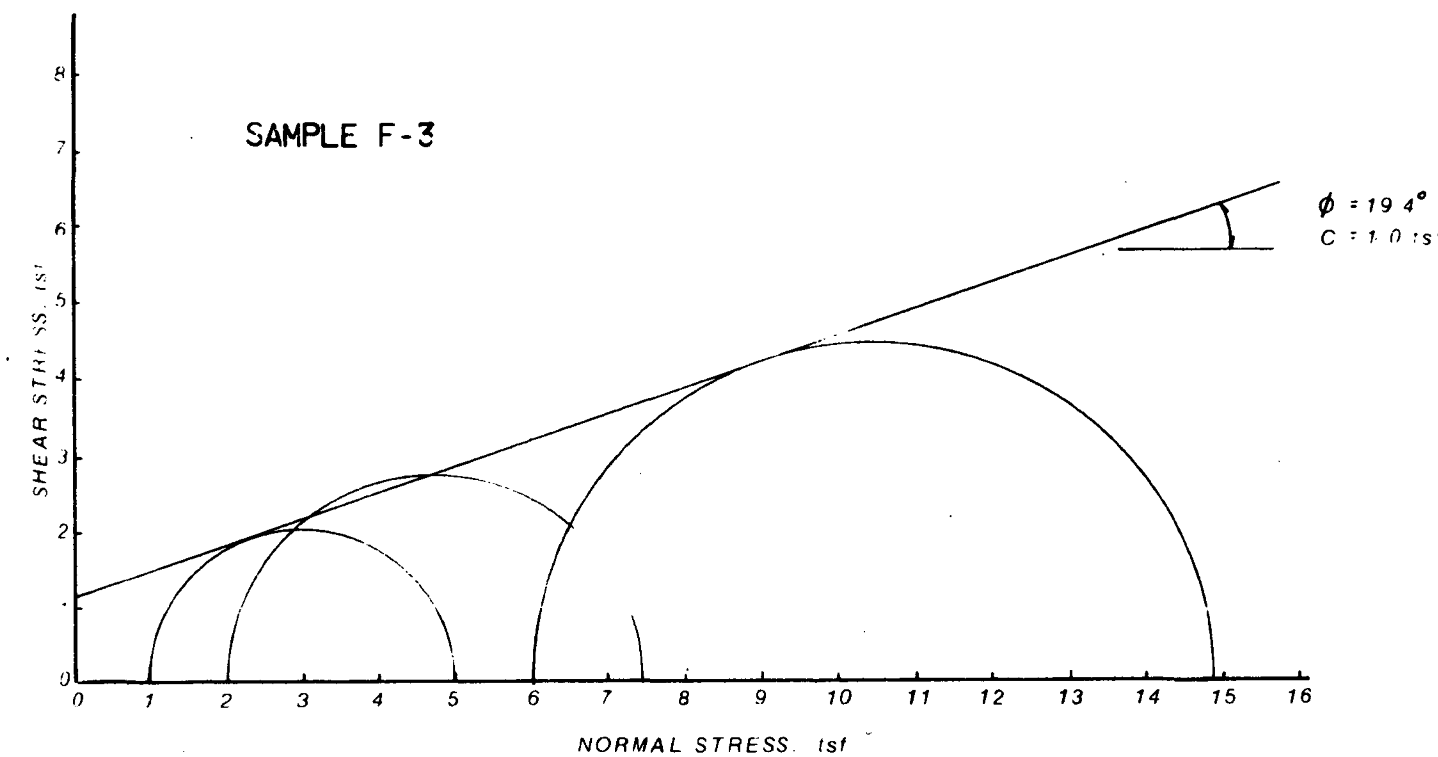
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Compaction Test Results for
Borrow Source G

Figure 2.5-122





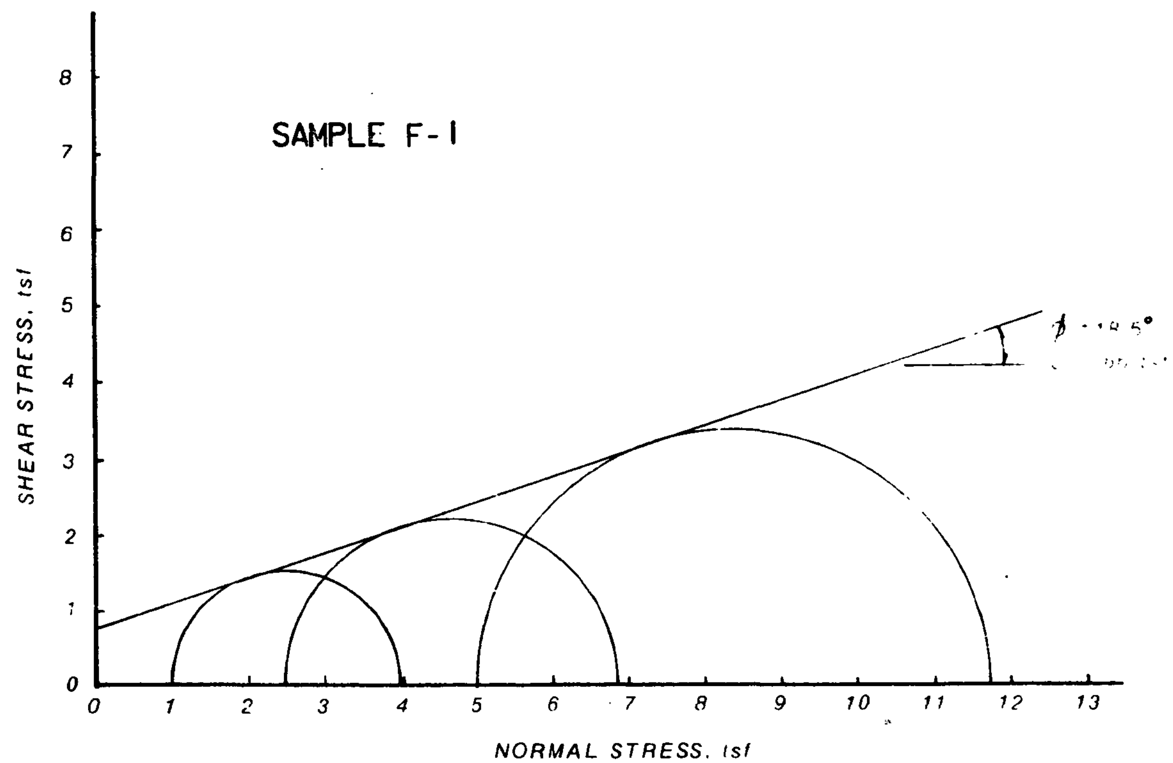
TEST No.	BORING No.	DEPTH Feet	DRY DEN. pcf	MOISTURE %	PERCENT COMPACTION	CONFINING PRES. tsf	STRAIN %
1	F-1	Auger	95.5	21.9	89.7	1.08	4.6
2	-"-	Bag	95.5	22.2	89.7	2.52	4.7
3	-"-	Sample	96.0	22.5	90.1	5.04	4.6
4	F-3	0 -43.5'	98.1	21.5	90.4	1.00	3.3
5	-"-	—"—	97.5	22.3	89.8	2.00	3.8
6	-"-	—"—	97.5	22.3	89.8	6.00	4.0

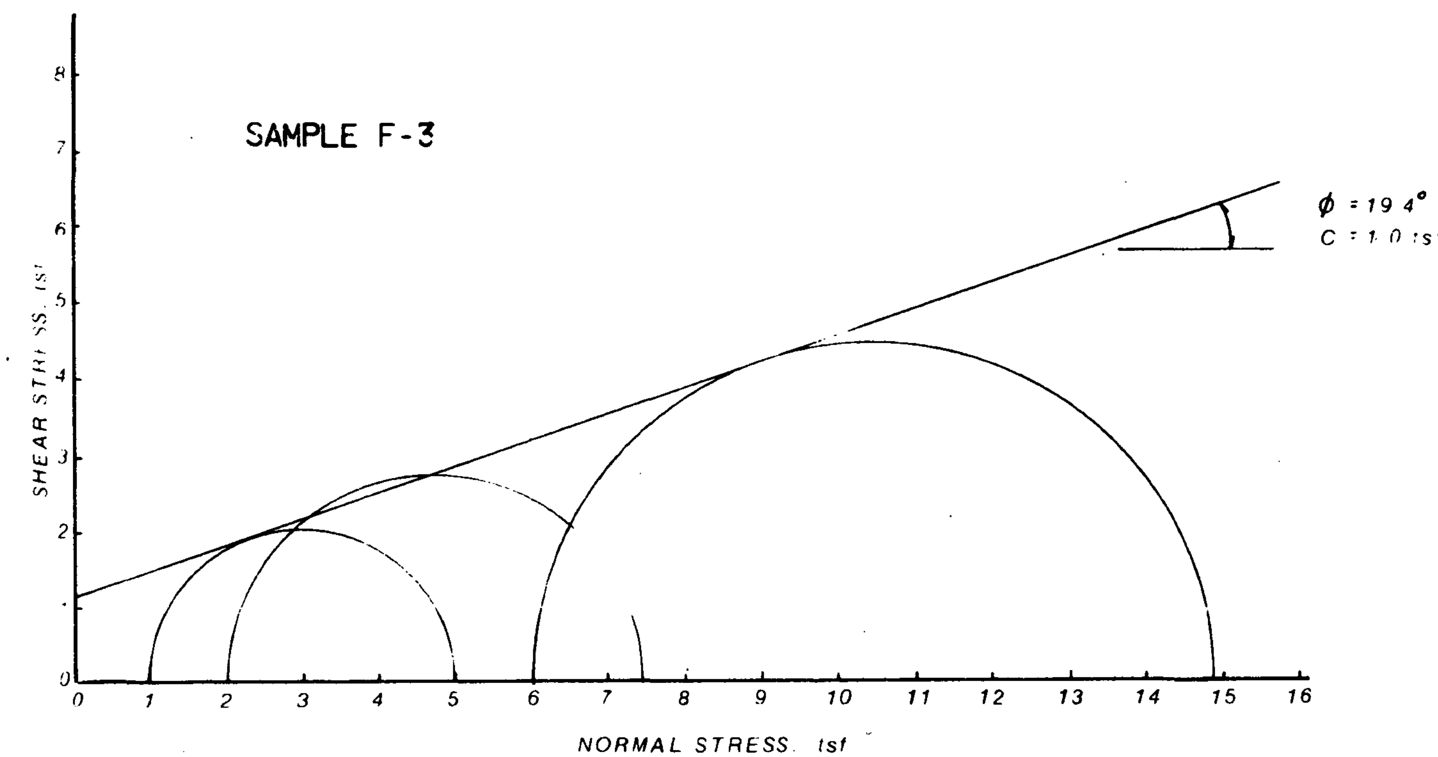
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconsolidated Undrained Triaxial Compression Test Results On Borrow Soil (Sheet 1 of 2)

Figure 2.5-123



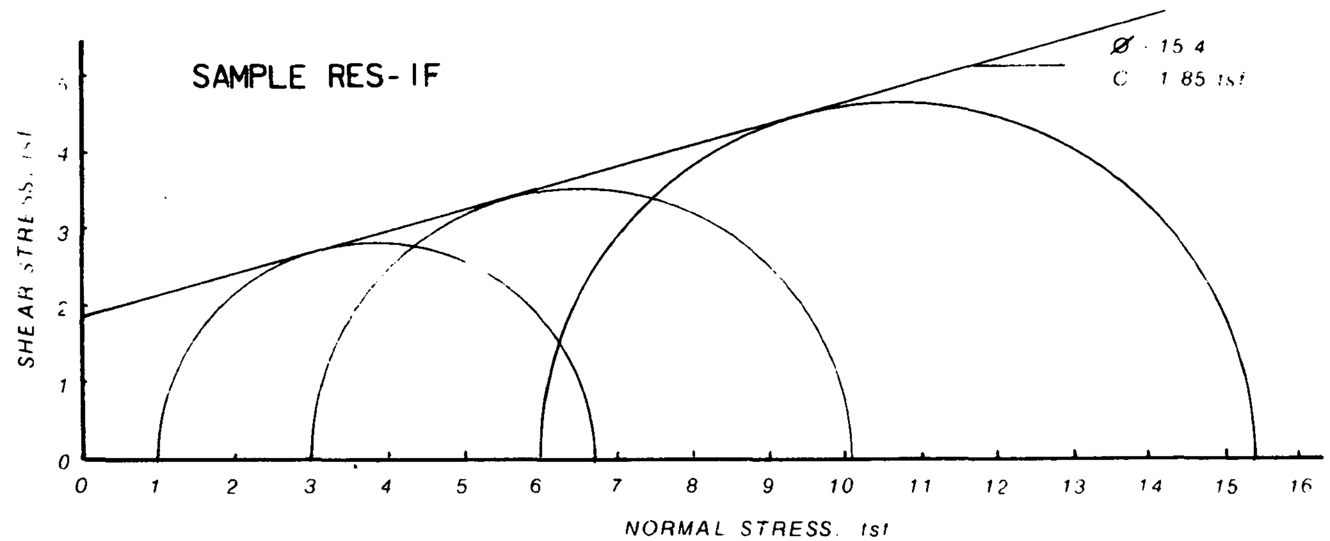


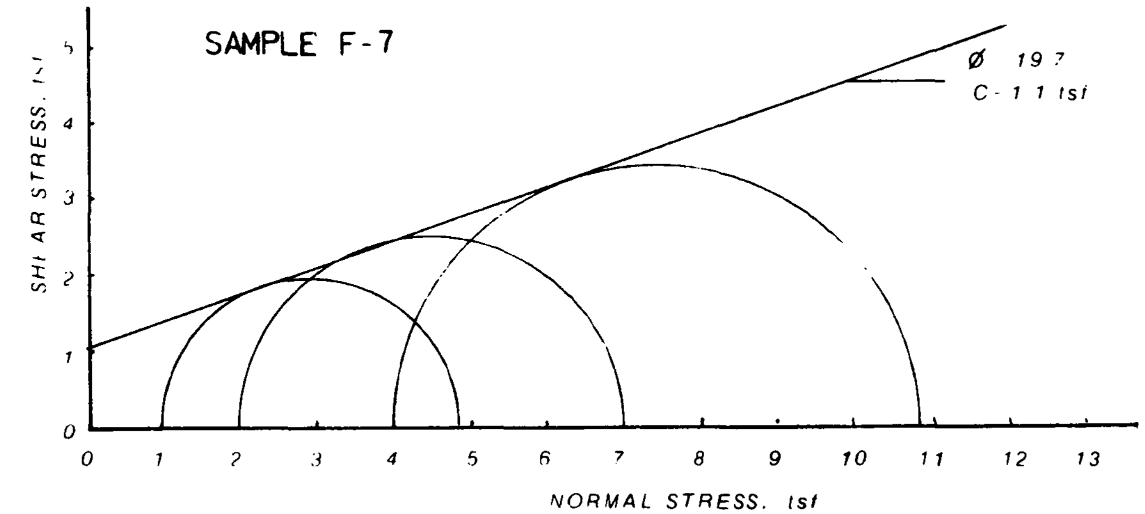
TEST No.	BORING No.	DEPTH Feet	DRY DEN. pcf	MOISTURE %	PERCENT COMPACTION	CONFINING PRES. tsf	STRAIN %
1	F-1	Auger	95.5	21.9	89.7	1.08	4.6
2	-"-	Bag	95.5	22.2	89.7	2.52	4.7
3	-"-	Sample	96.0	22.5	90.1	5.04	4.6
4	F-3	0 -43.5'	98.1	21.5	90.4	1.00	3.3
5	-"-	—"—	97.5	22.3	89.8	2.00	3.8
6	-"-	—"—	97.5	22.3	89.8	6.00	4.0

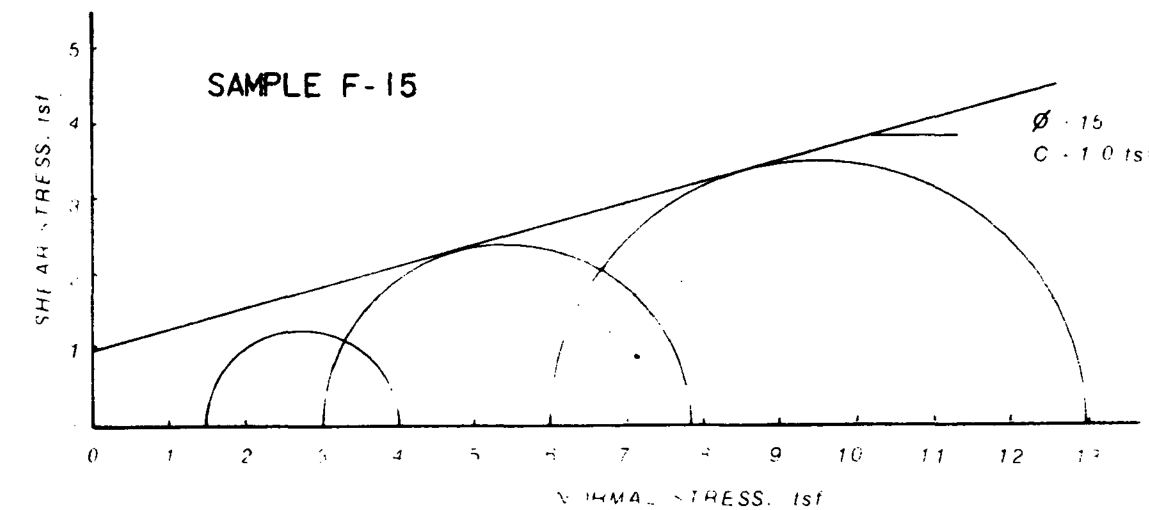
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconsolidated Undrained Triaxial Compression Test Results On Borrow Soil (Sheet 1 of 2)

Figure 2.5-123







TEST No.	BORING No.	DEPTH Feet	DRY DENS. pcf	MOISTURE %	PERCENT COMPACTION	CONFINING PRES. tsf	STRAIN %
7	Residual	0-15'	91.8	27.4	90.4	1.0	2.5
8	—"—	—"—	93.0	25.7	93.0	3.0	2.6
9	—"—	—"—	92.8	26.8	91.4	6.0	3.2
10	F-7	5'-10'	91.2	26.1	90.6	1.0	2.8
11	—"—	—"—	91.2	26.1	90.6	2.0	3.2
12	—"—	—"—	89.9	27.9	89.3	4.0	3.2
13	F-15	40'-45'	94.6	22.1	88.8	1.5	3.8
14	—"—	—"—	95.1	21.5	89.2	3.0	3.1
15	—"—	—"—	94.8	21.6	89.0	6.0	3.6

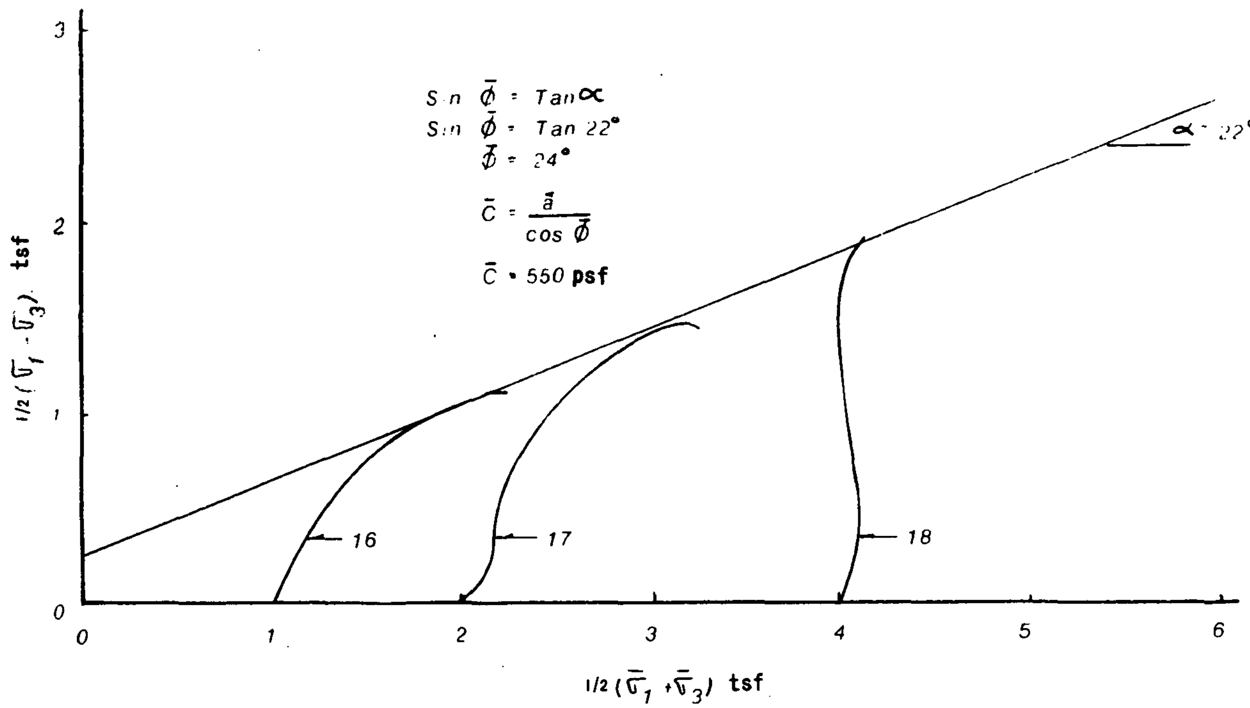
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

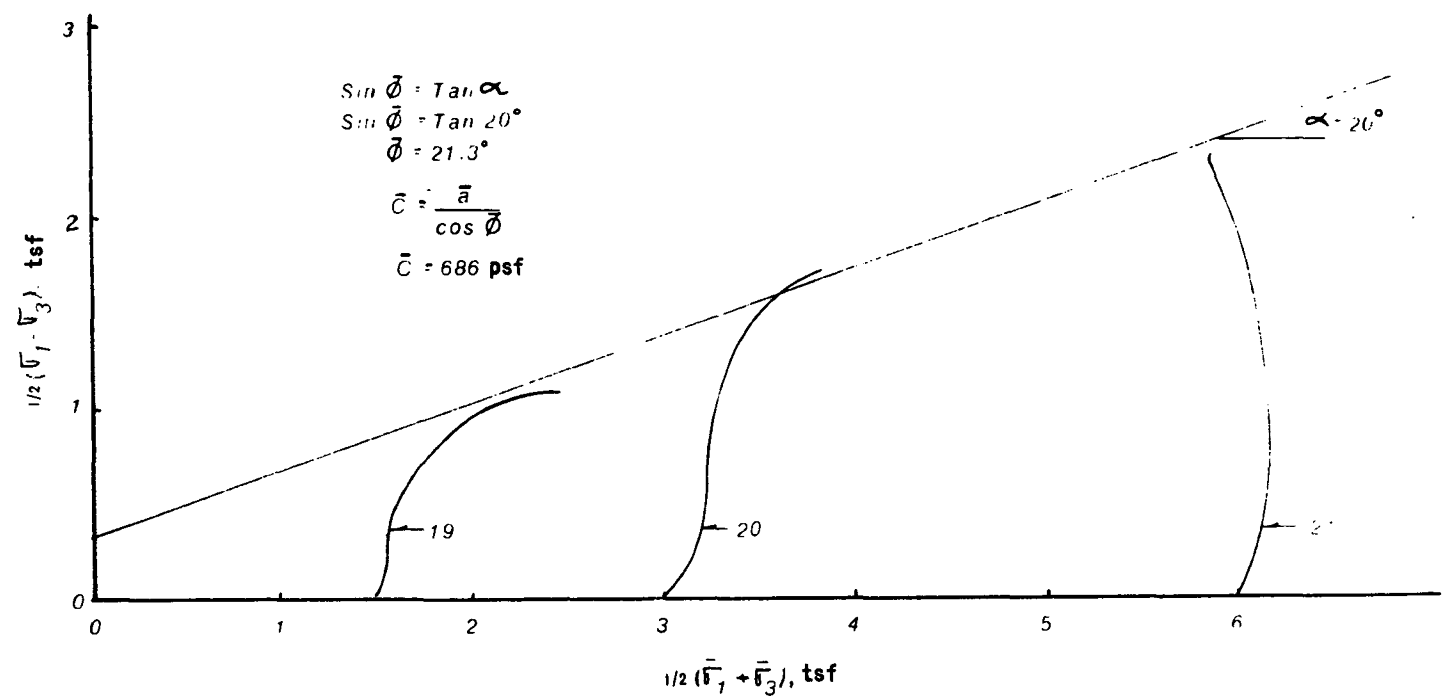
Unconsolidated Undrained Triaxial Compression Test Results On Borrow Soil (Sheet 2 of 2)

Figure 2.5-123

SAMPLE F-7A



SAMPLE F-15



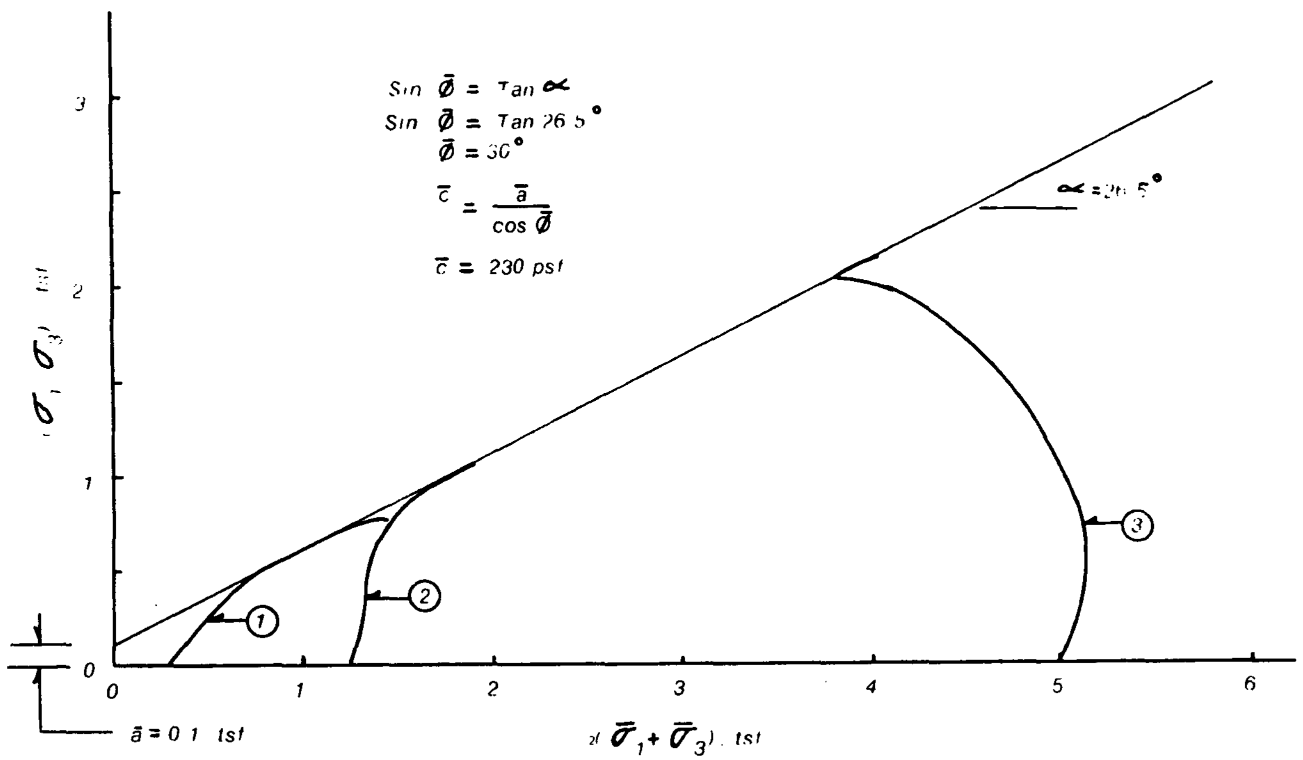
TEST No.	BORE No.	SAMPLE No.	DEPTH Feet	MOISTURE %	DRY DENS. pcf	COMPACTION %	$(\bar{\sigma}_1 - \bar{\sigma}_3)$ Max. tsf	ϵ_f %	Δ_f	$\bar{\phi}$	$\bar{C}$ psf
16	F-7A	B-1	25'-30'	20.6	96.0	89.4	2.20	7.0	-.02	24°	550
17	—"—	—"—	—"—	20.6	96.9	90.2	2.89	9.0	.08		
18	—"—	—"—	—"—	20.5	97.1	90.3	3.81	7.0	.46		
19	F-13	B-2	35'-40'	18.7	97.0	90.2	2.22	11.0	.06	21°	700
20	—"—	—"—	—"—	19.0	97.3	90.5	3.46	8.0	.26		
21	—"—	—"—	—"—	18.6	97.8	91.0	4.60	8.0	.54		

Amendment 0
August 1984

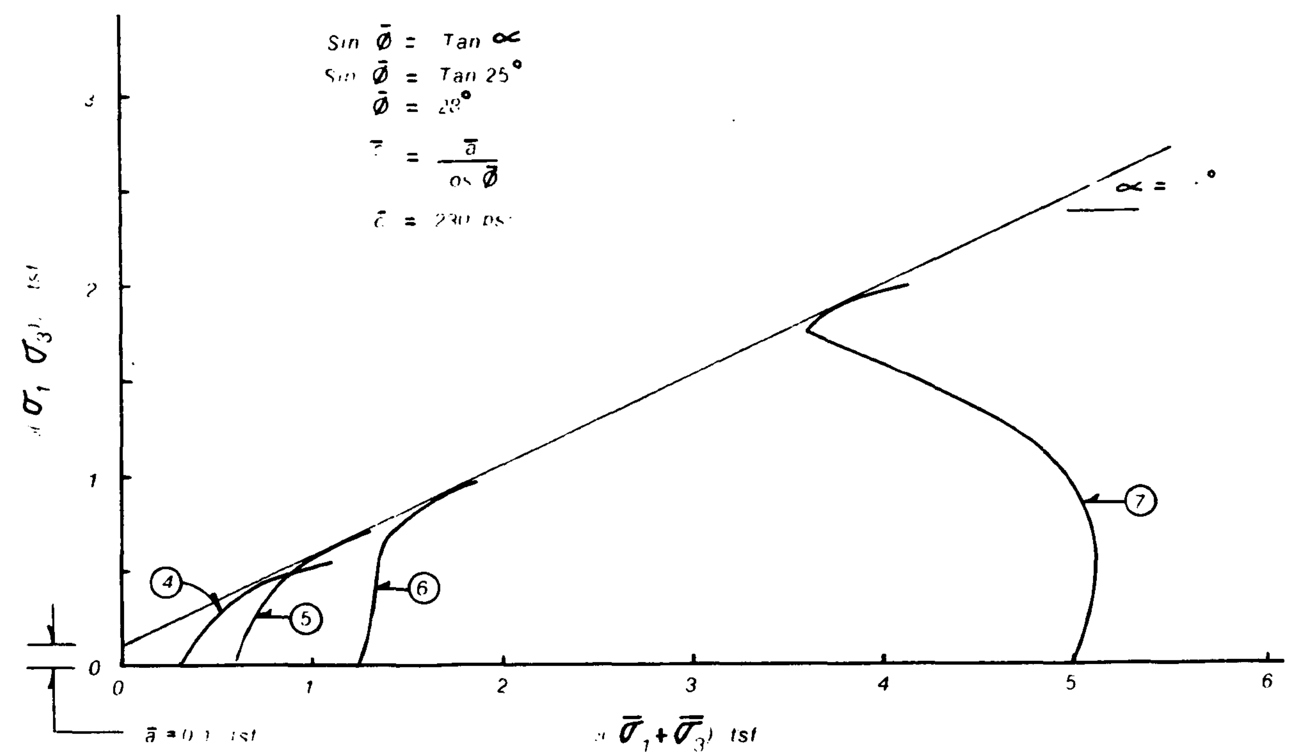
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Isotropically Consolidated, Undrained Triaxial Compression Test Results On Borrow Soils
(Sheet 1 of 2)
Figure 2.5-124

INTERMEDIATE PI MIXTURE



HIGH PI MIXTURE

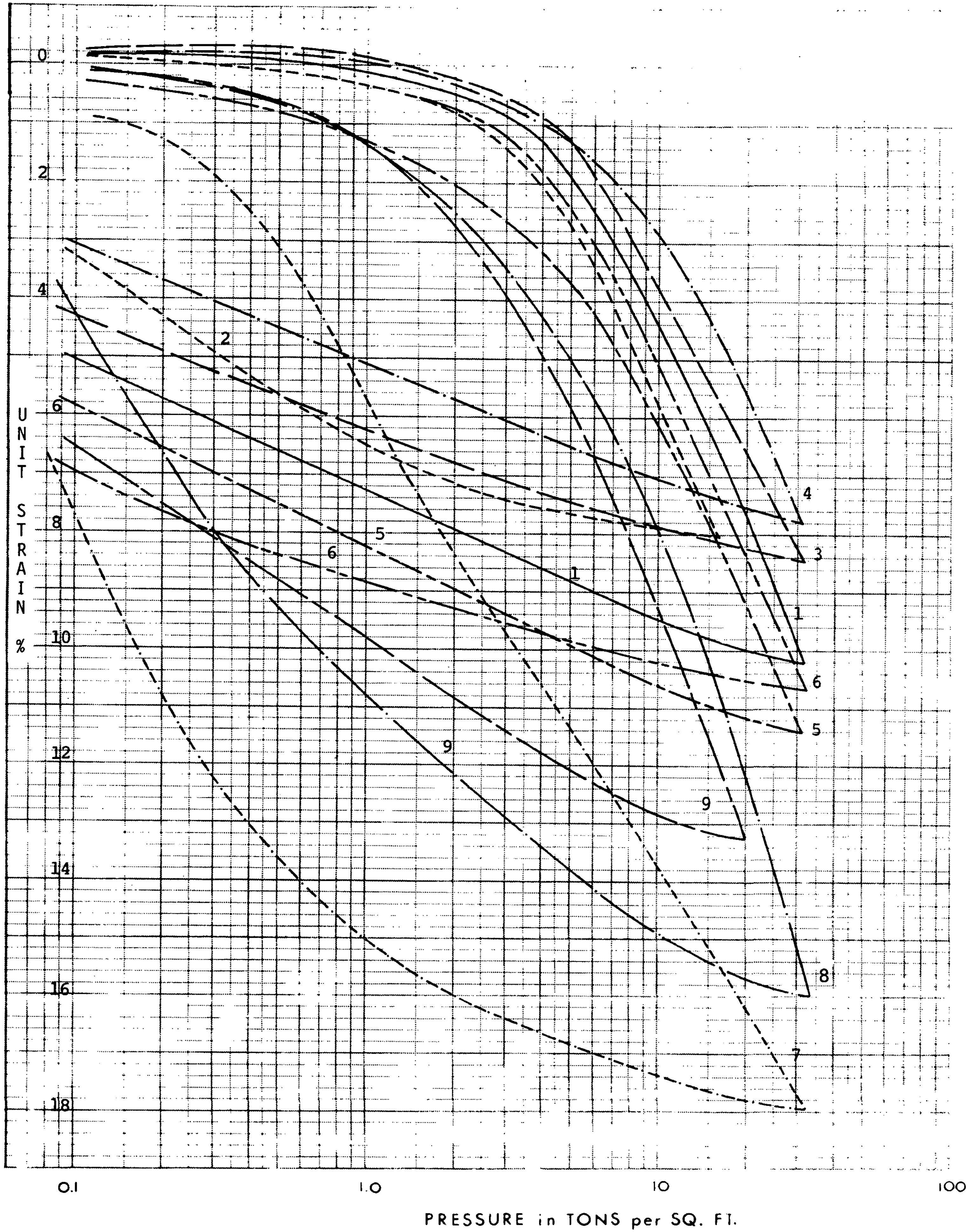


TEST NO.	LL	PL	PI	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	COMPACTION (%)	$\bar{\sigma}_c$ (tsf)	$\frac{1}{2}(\sigma_1 - \sigma_3)$ Max. (tsf)	ϵ_f (%)	$\bar{\phi}$ (deg)	$\bar{c}$ (psf)
1	62	40	22	21.8	95.1	90.0	600	0.78	14.0	30	230
2	58	35	23	22.0	94.5	89.8	2500	1.08	20.0		
3	62	37	25	21.3	95.0	90.0	10000	2.13	17.0		
4	67	39	28	25.3	91.6	89.8	600	0.58	15.0		230
5	66	36	30	25.1	91.9	90.1	1200	0.84	18.7		
6	67	37	30	24.8	93.4	91.6	2500	0.96	17.0		
7	55	30	25	25.9	92.6	90.8	10000	1.99	19.0		

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Isotropically Consolidated, Undrained Triaxial Compression Test Results On Borrow Soils
(Sheet 2 of 2)
Figure 2.5-124



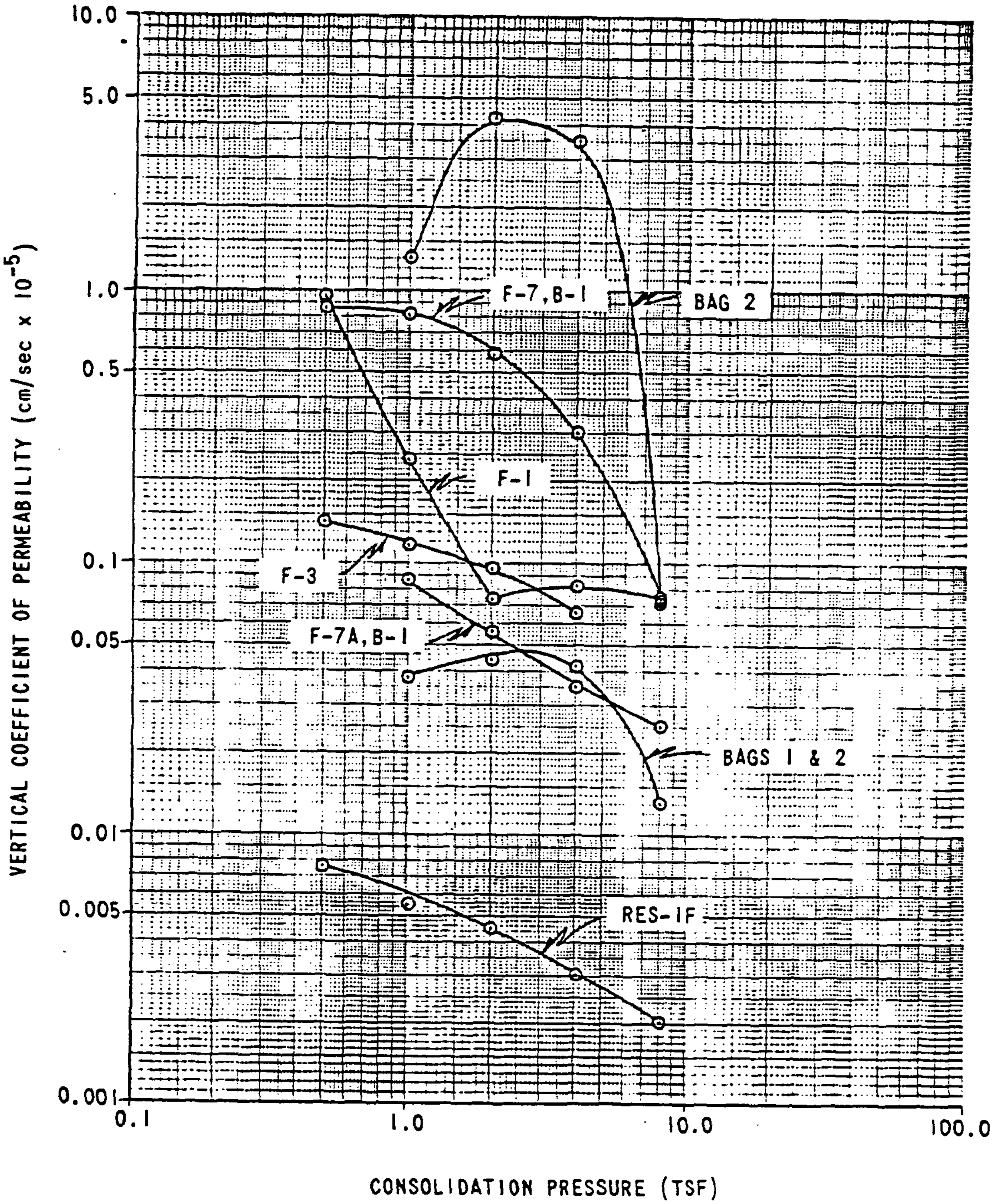
Symbol	Test No.	Borrow Source	Sample Identification	Dry Density (%)	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
———————	1	G	Bags 1 & 2	94.5	25.0	63	36	27
- - - - - - -	2	G	Bag 2	96.6	22.2	64	38	26
—— —— ——	3	G	Bag 2	97.9	21.6	64	38	26
—·—·—	4	G	Bags 1 & 2	96.5	24.8	63	36	27
—-—-—	5	F	Res - 1F	93.4	27.3	51	46	[illegible]
—--—--—	6	F	F-7, B-1	90.7	25.0	53	45	8
--·-- -- --	7	F	F-1	96.1	21.4	NP	-	-
———·———	8	F	F-3	96.5	21.7	NP	-	-
———— ——	9	F	B-7A, B-1	95.3	20.8	-	-	-

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Consolidation Test Results on Borrow Soils

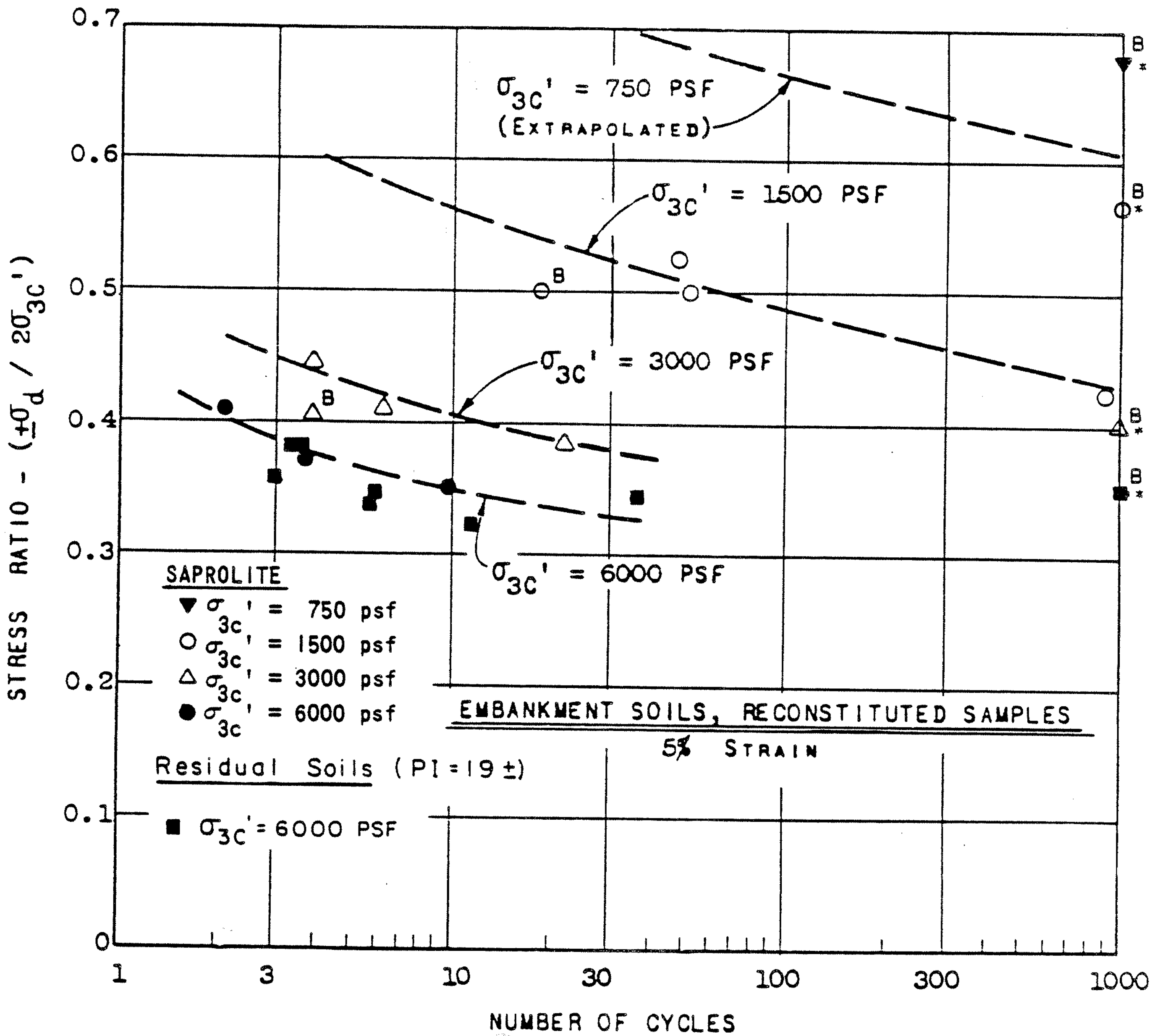
Figure 2.5-125



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Permeability Test Results on Borrow Soils

Figure 2.5-126



NOTES: B INDICATES BLOCK SAMPLE

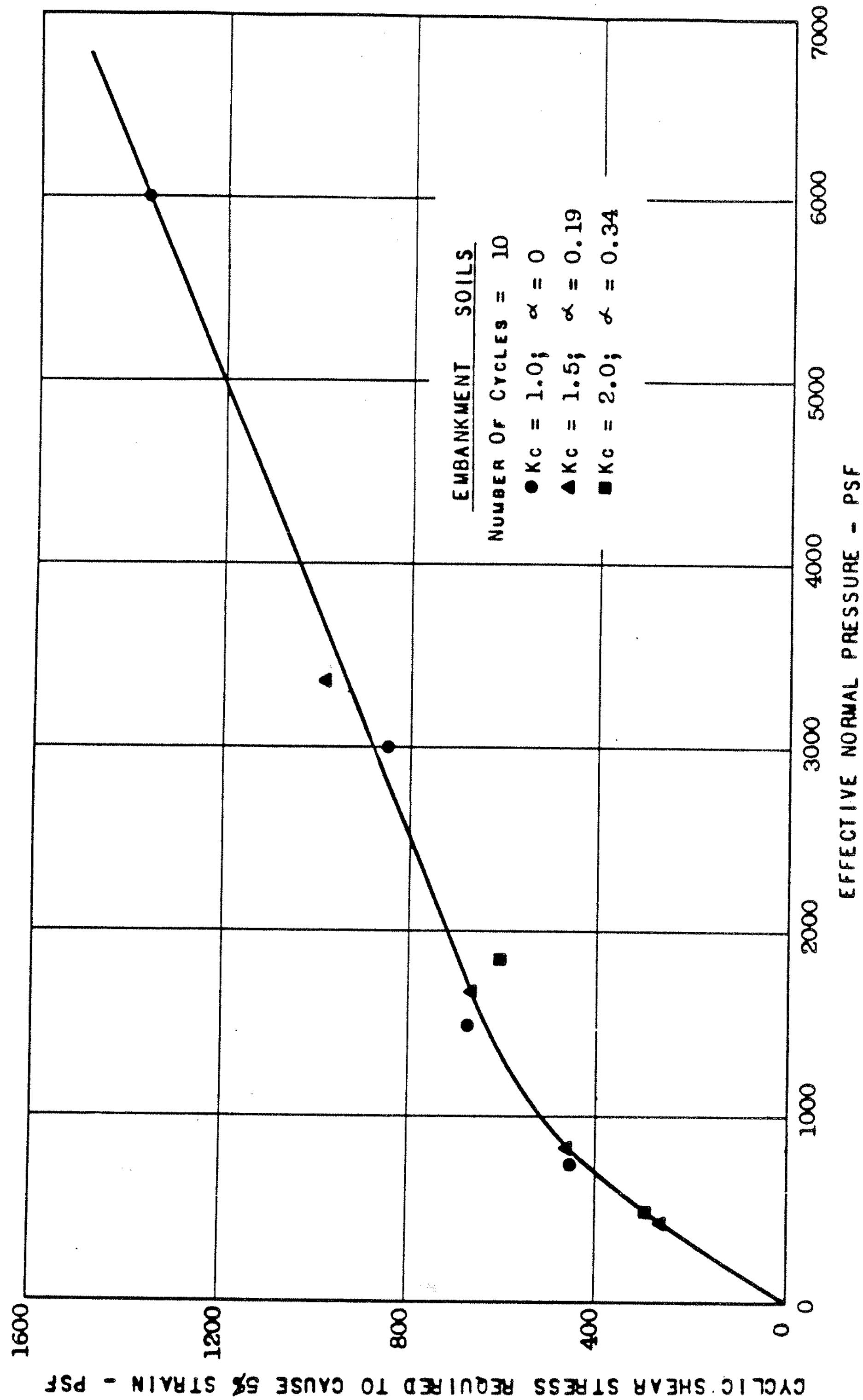
* INDICATES SAMPLE DID NOT FAIL AFTER 1000 CYCLES

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Cycle Triaxial Test Results for Embankment Soils (K_c = 1)

Figure 2.5-127

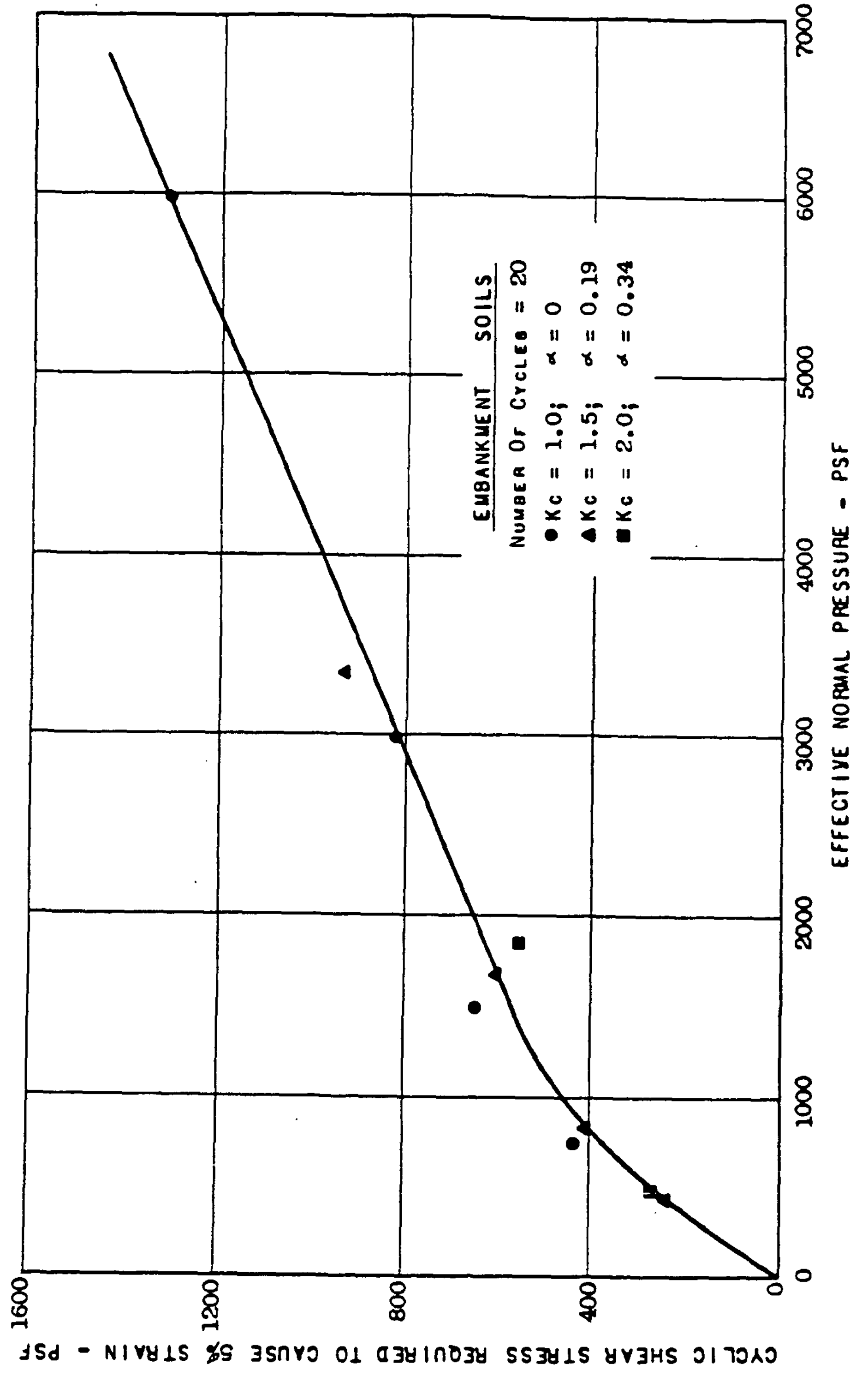


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Stresses Required to Cause 5% Strain in 10 Cycles for Embankment Soils

Figure 2.5-128

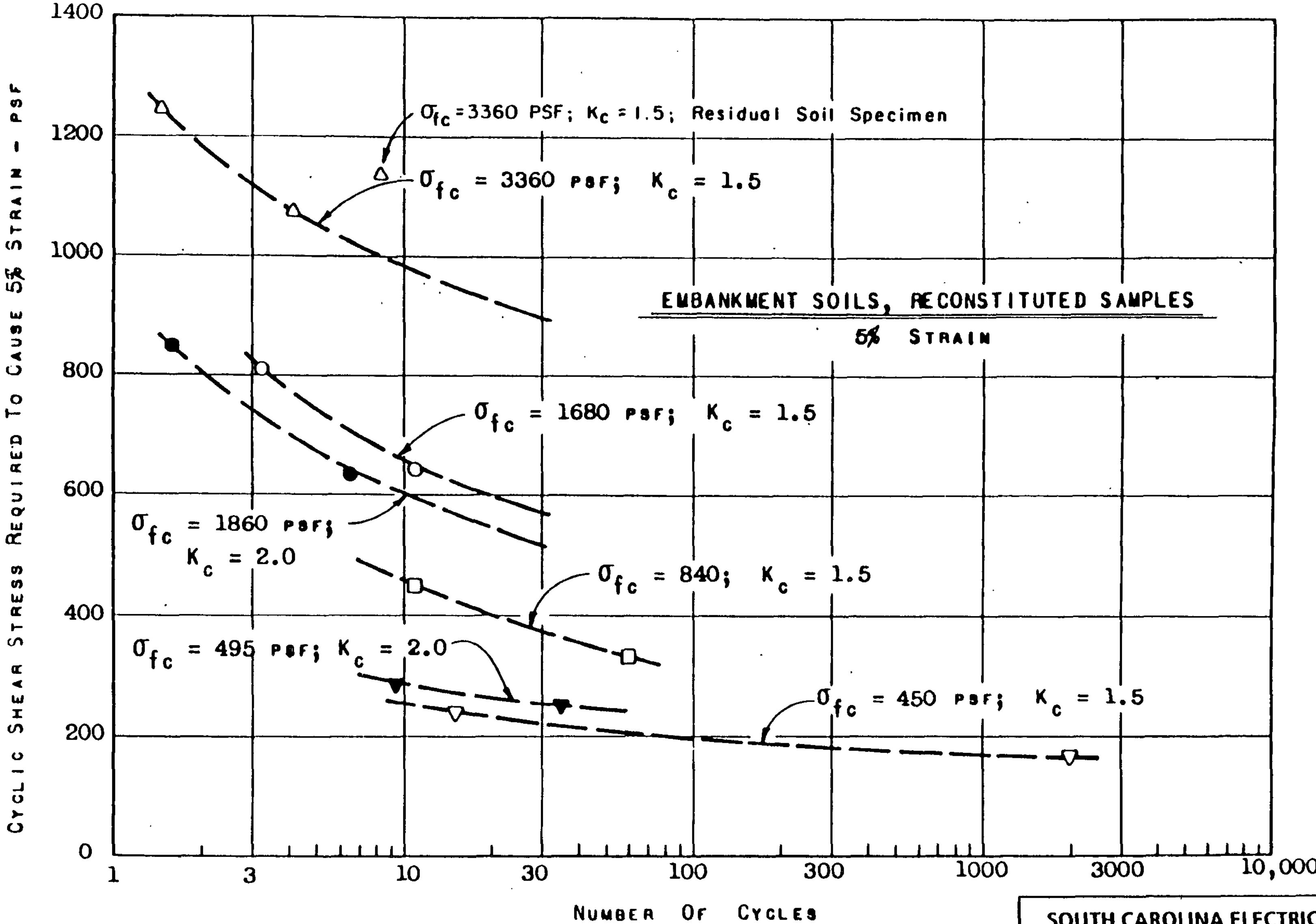


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Stresses Required to Cause 5% Strain in 20 Cycles for Embankment Soils

Figure 2.5-129

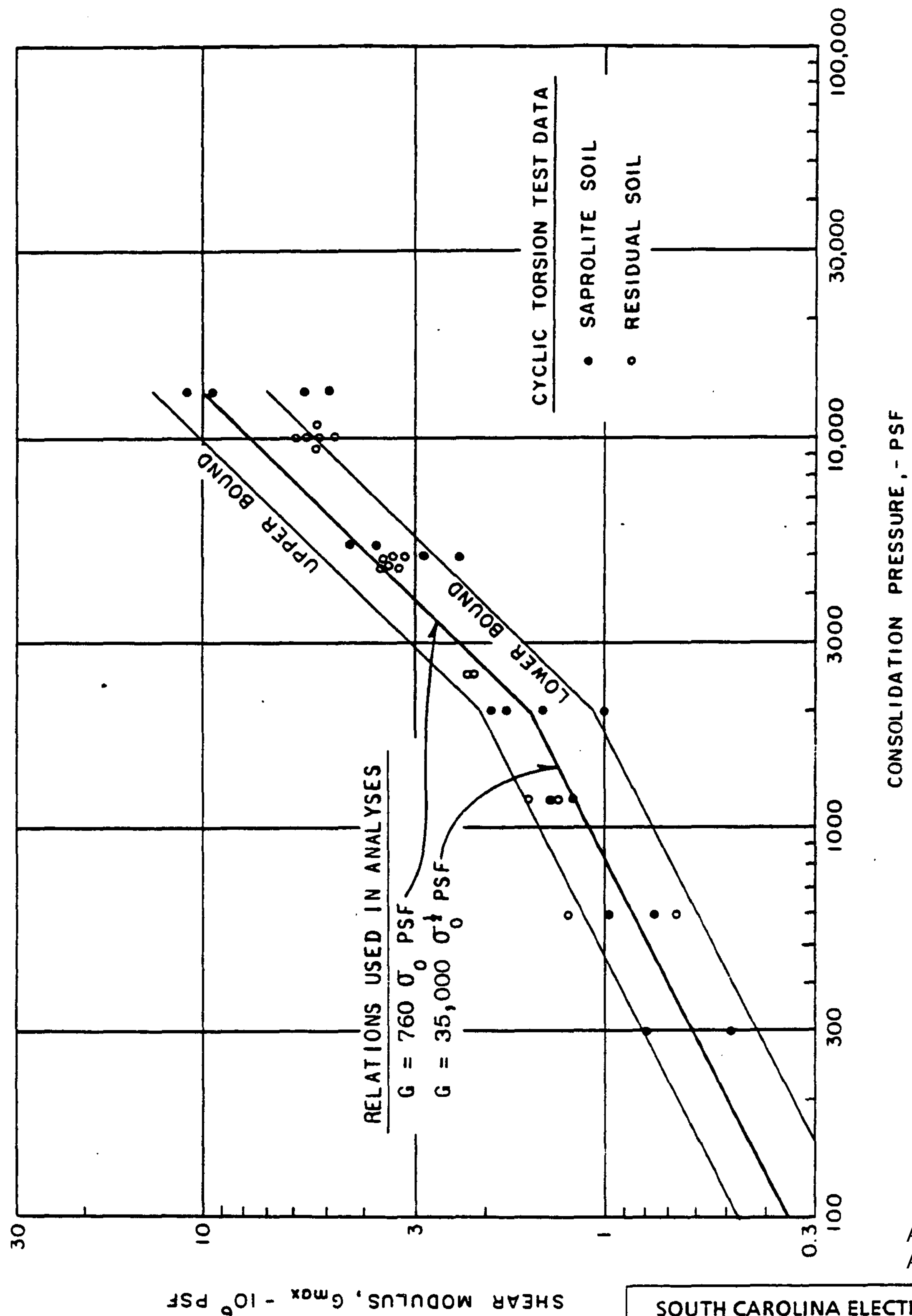


SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Cyclic Triaxial Test Results For Embankment Soils ($k_c > 1$)

Figure 2.5-130

Amendment 0
August 1984

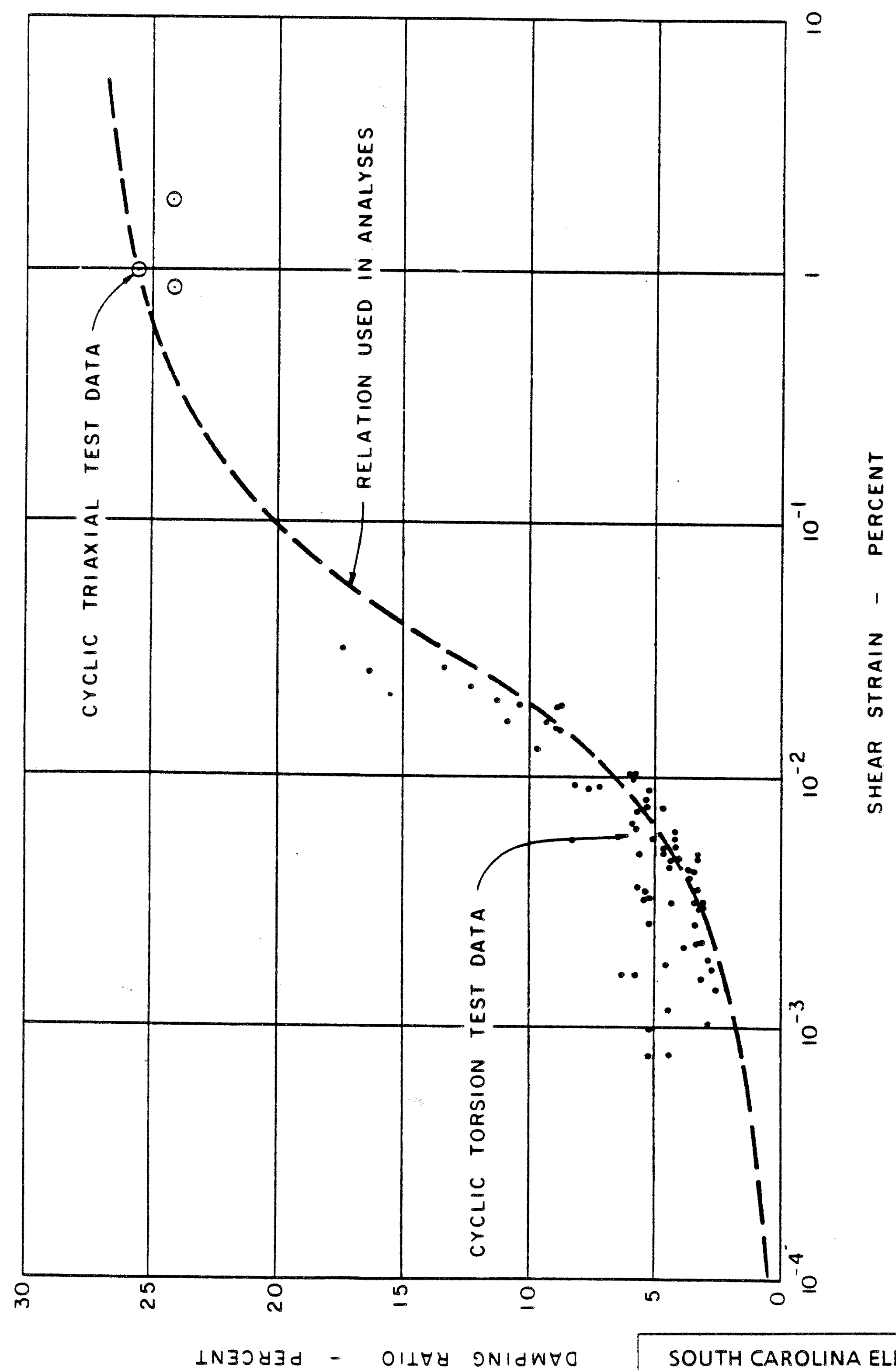


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Shear Modulus Values at Very Low Strain Levels for Embankment Soils

Figure 2.5-131

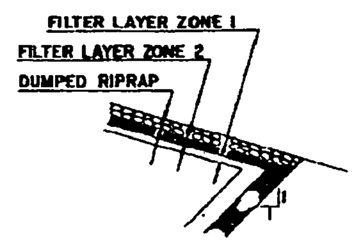


Amendment 0
August 1984

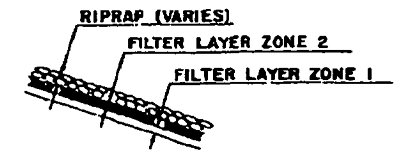
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Variation or Damping Values as a Function of Strain for Embankment Soils

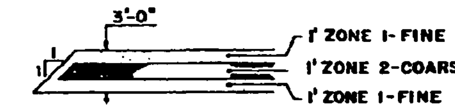
Figure 2.5-132



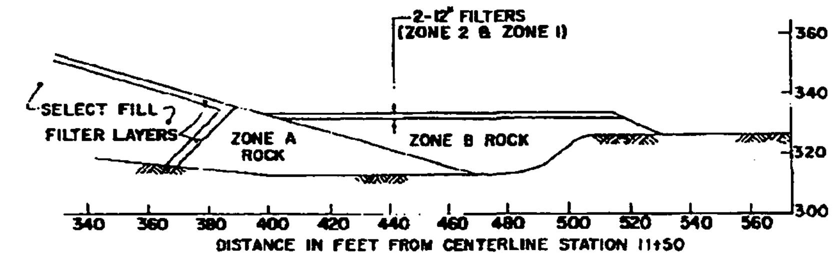
TYPICAL TRANSITION DETAIL
NO SCALE



TYPICAL FILTER DETAIL
NO SCALE

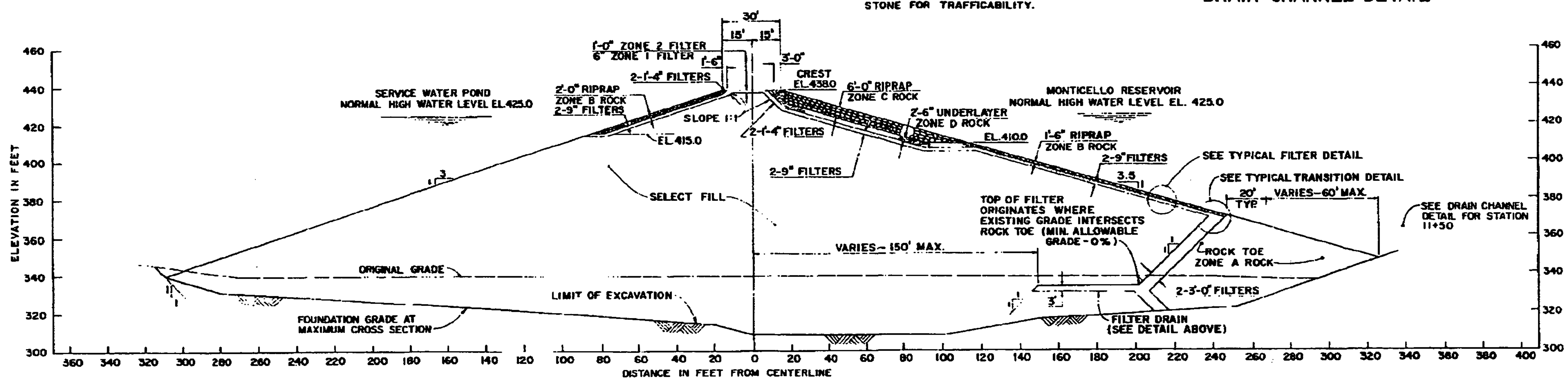


TYPICAL FILTER DRAIN DETAIL
NO SCALE



DRAIN CHANNEL DETAIL

NOTE:
CREST COVERED WITH CRUSHED STONE FOR TRAFFICABILITY.

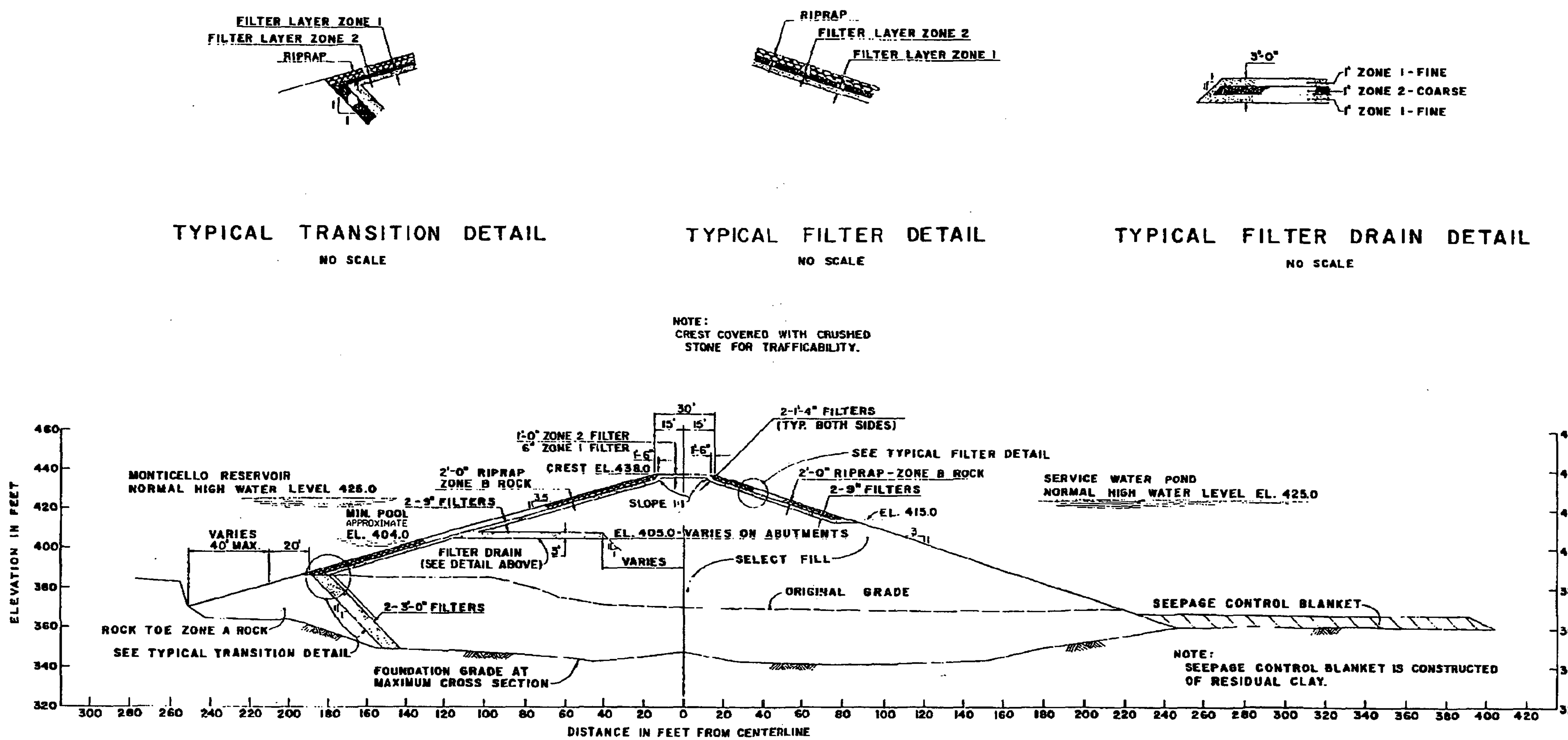


TYPICAL SECTION – NORTH DAM

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Typical Section
North Dam
Associated with Dwg. No. E-726-406
Rev. 1
Figure 2.5-133

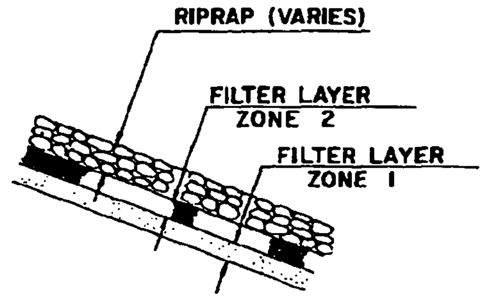


TYPICAL SECTION - SOUTH DAM

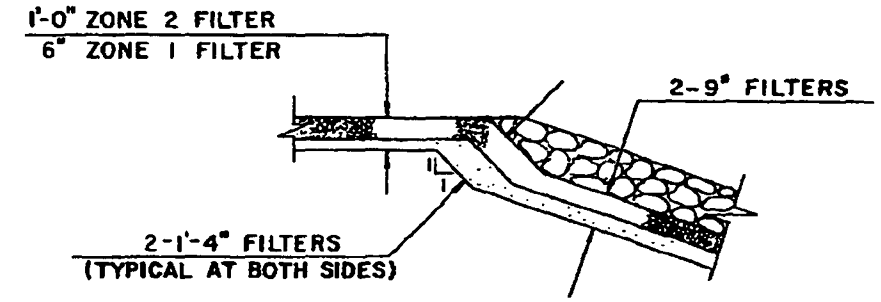
Amendment 98-01
April 1998

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

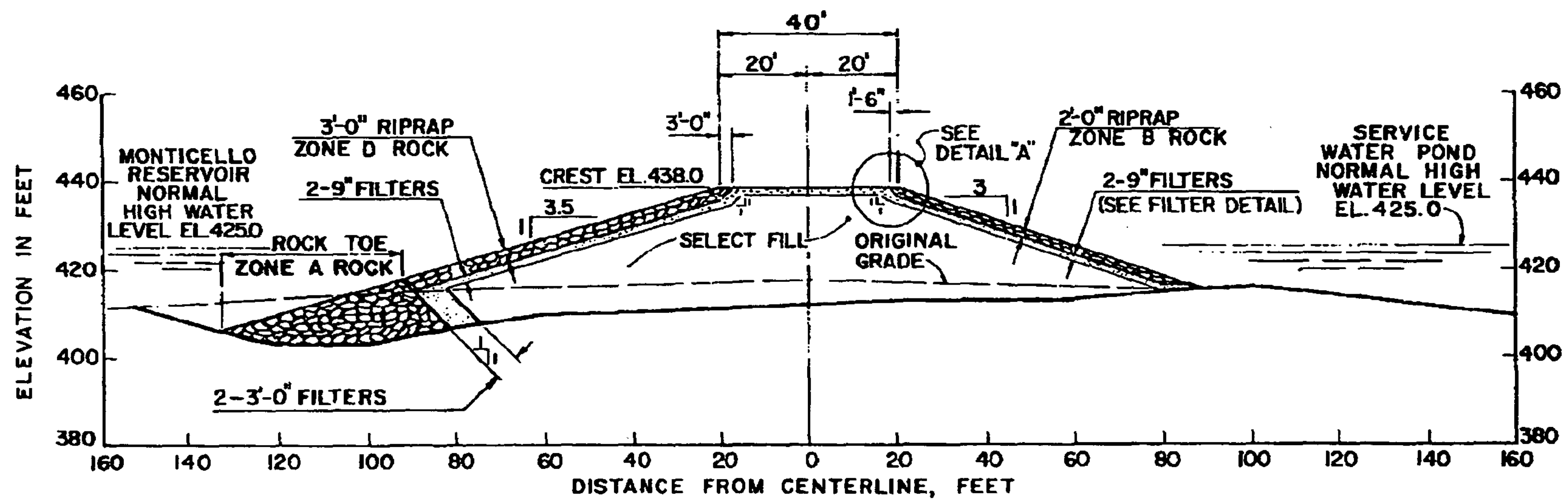
Typical Section
South Dam
Associated with Dwg. No. E-726-406
Rev. 1
Figure 2.5-134



TYPICAL FILTER DETAIL
NO SCALE



DETAIL "A"
NO SCALE



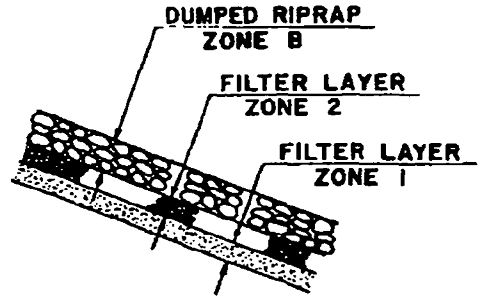
TYPICAL SECTION-EAST DAM

Amendment 98-01
April 1998

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

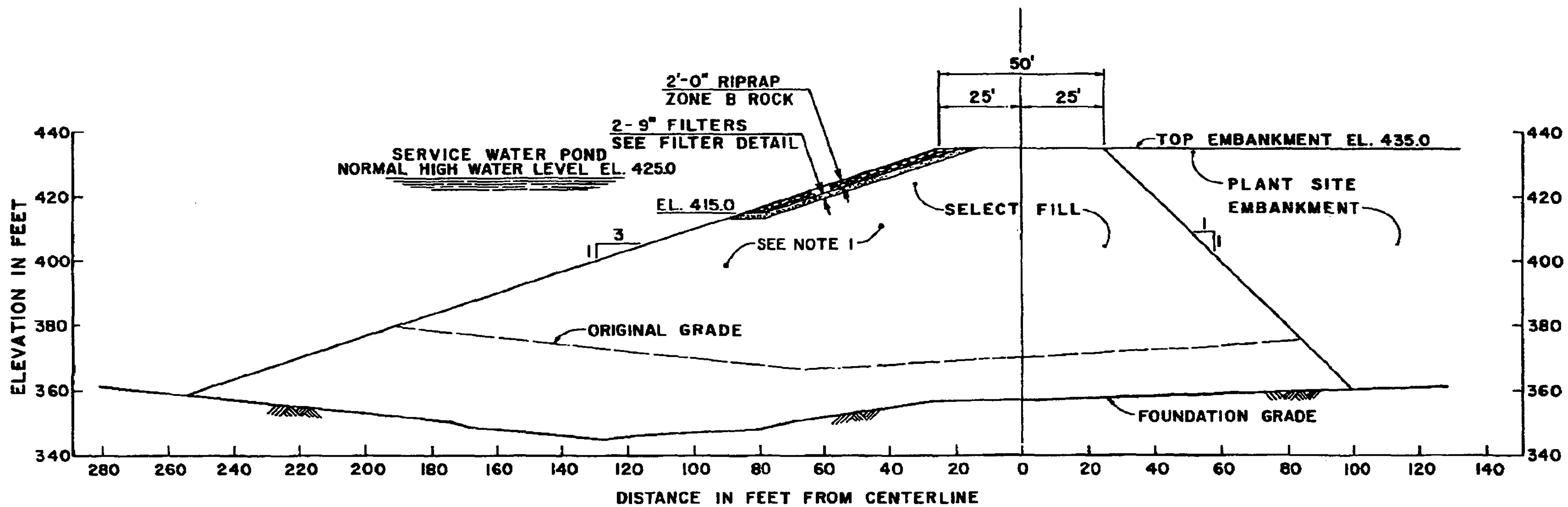
Typical Section
East Dam
Associated with Dwg. No. E-726-407
Rev. 1
Figure 2.5-135

Amendment 98-01
April 1998



TYPICAL FILTER DETAIL

NO SCALE



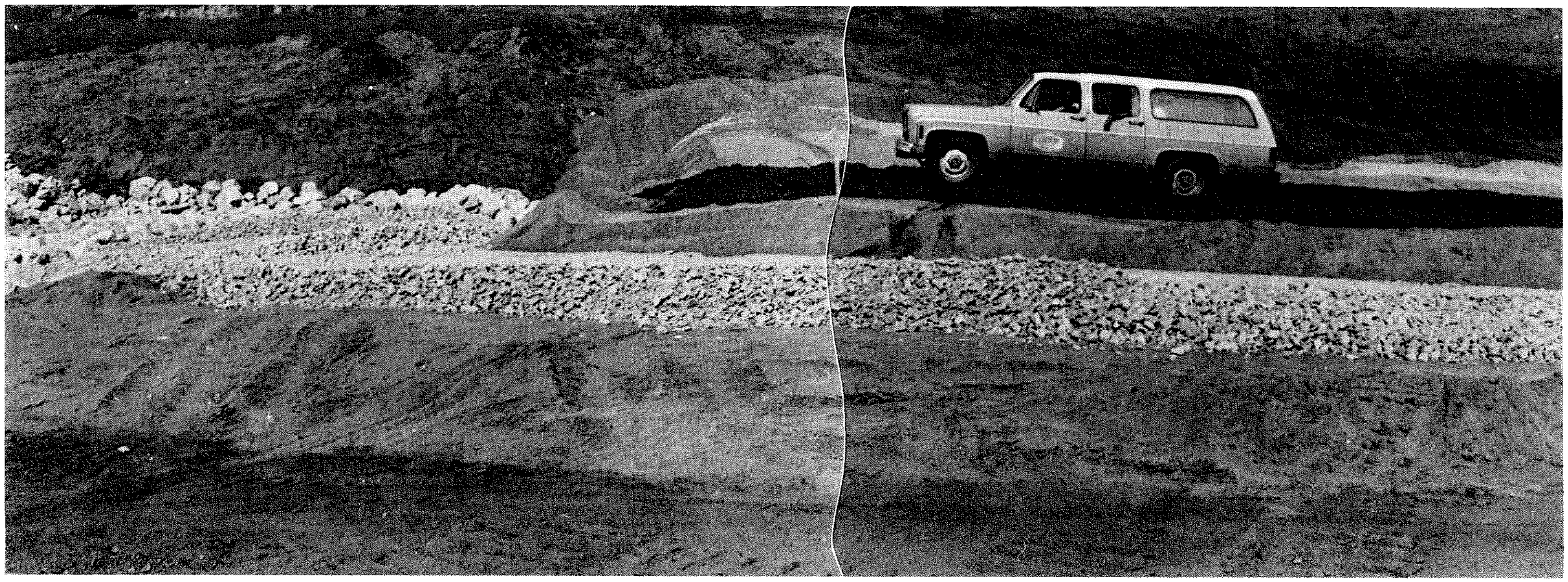
TYPICAL SECTION - WEST EMBANKMENT

Amendment 98-01
April 1998

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Typical Section
West Embankment
Associated with Dwg. No. E-726-407
Rev. 1
Figure 2.5-136

Amendment 98-01
April 1998

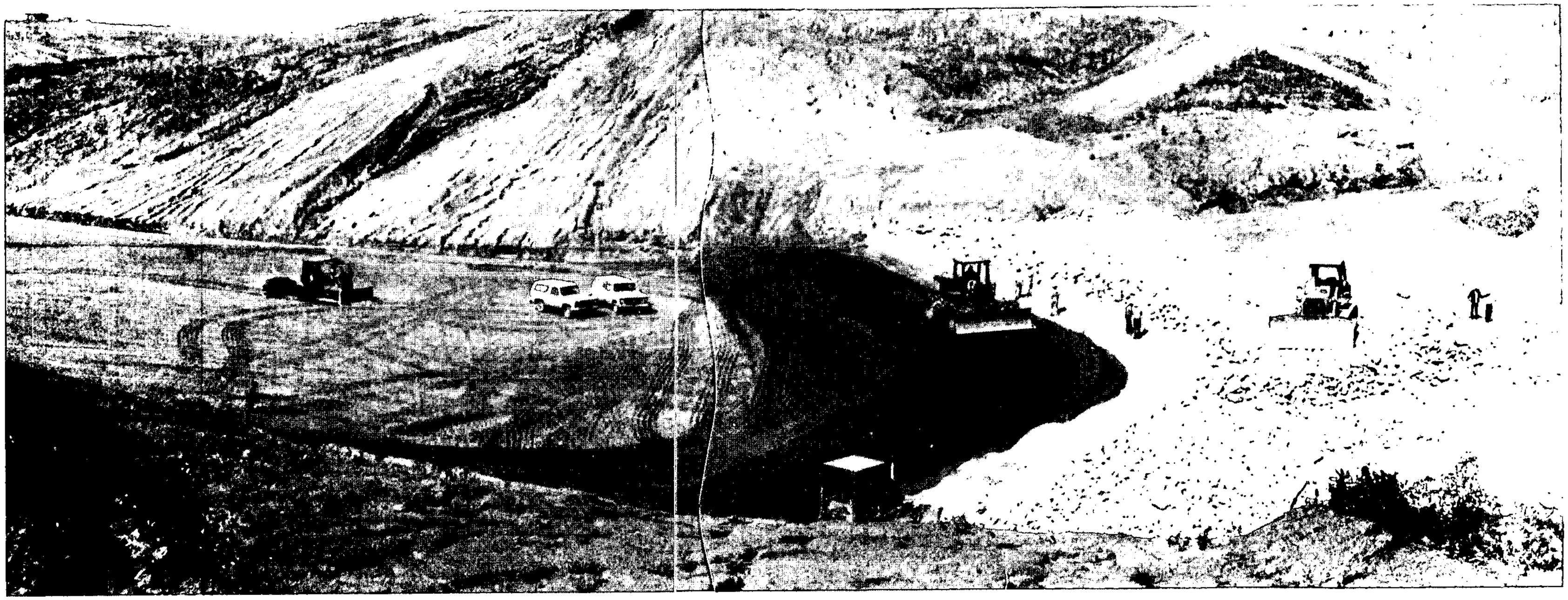


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Photograph Of Drainage
Blanket - North Dam

Figure 2.5-137

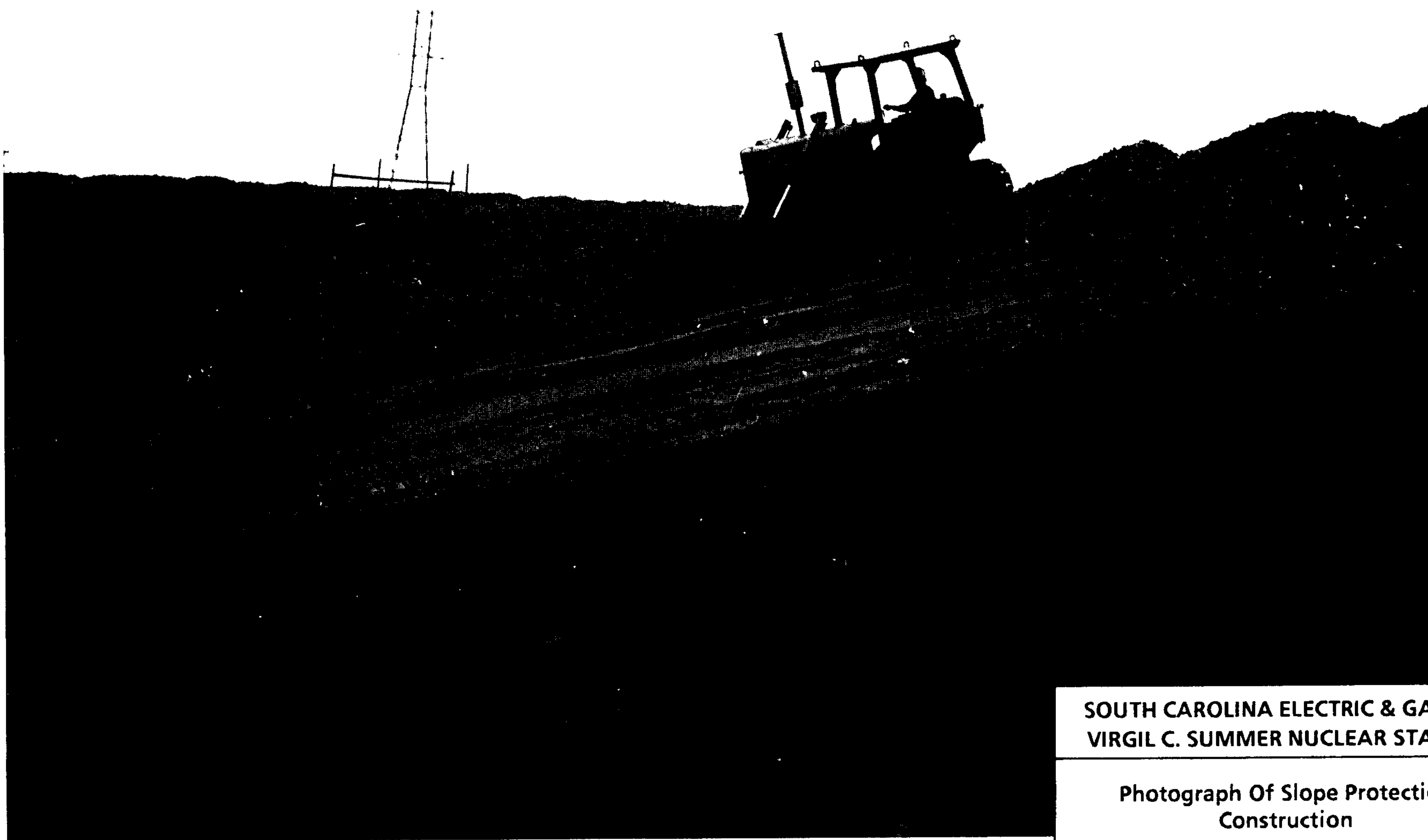


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Photograph Of Rock Toe
Construction - South Dam

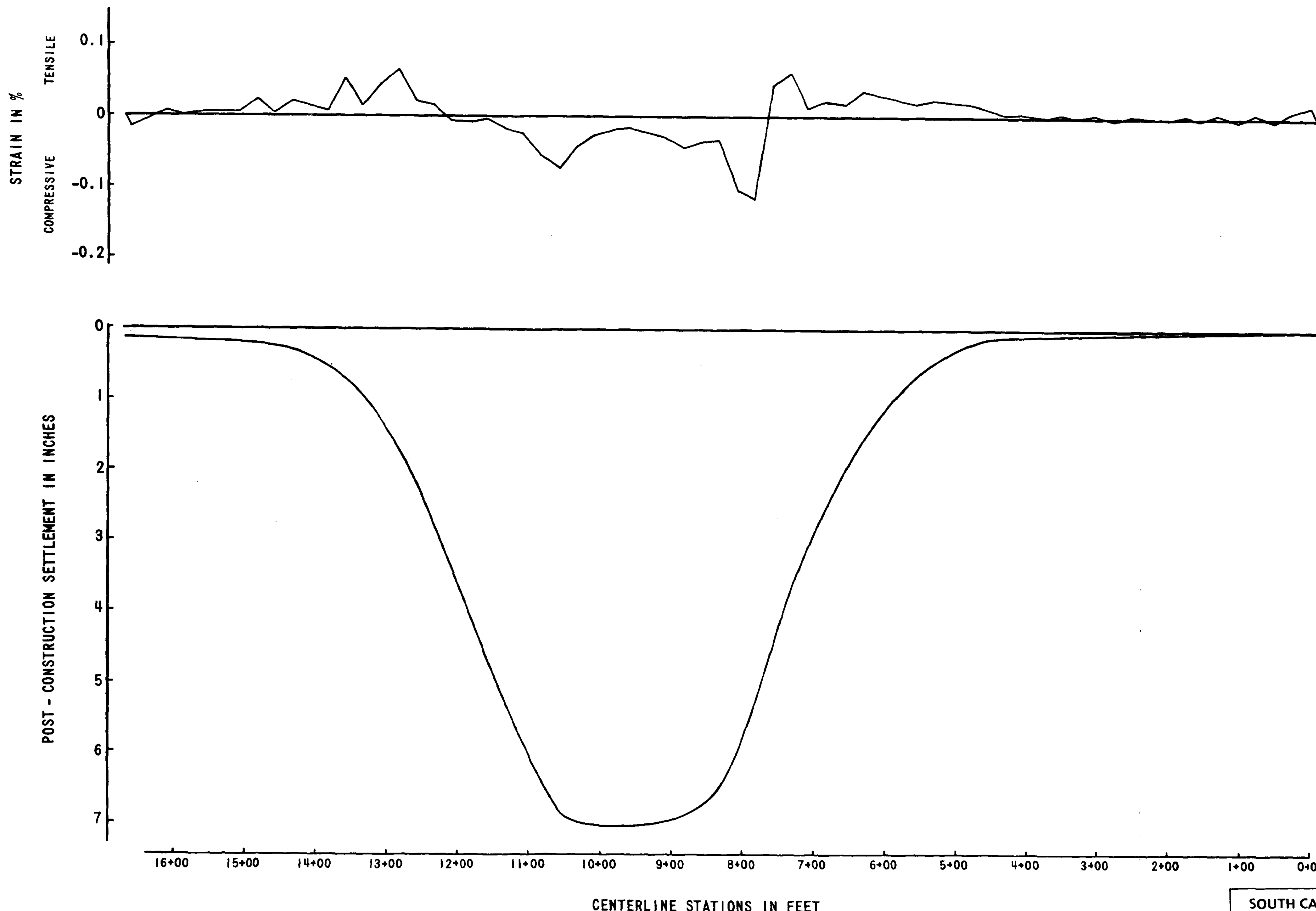
Figure 2.5-138



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Photograph Of Slope Protection Construction

Figure 2.5-139

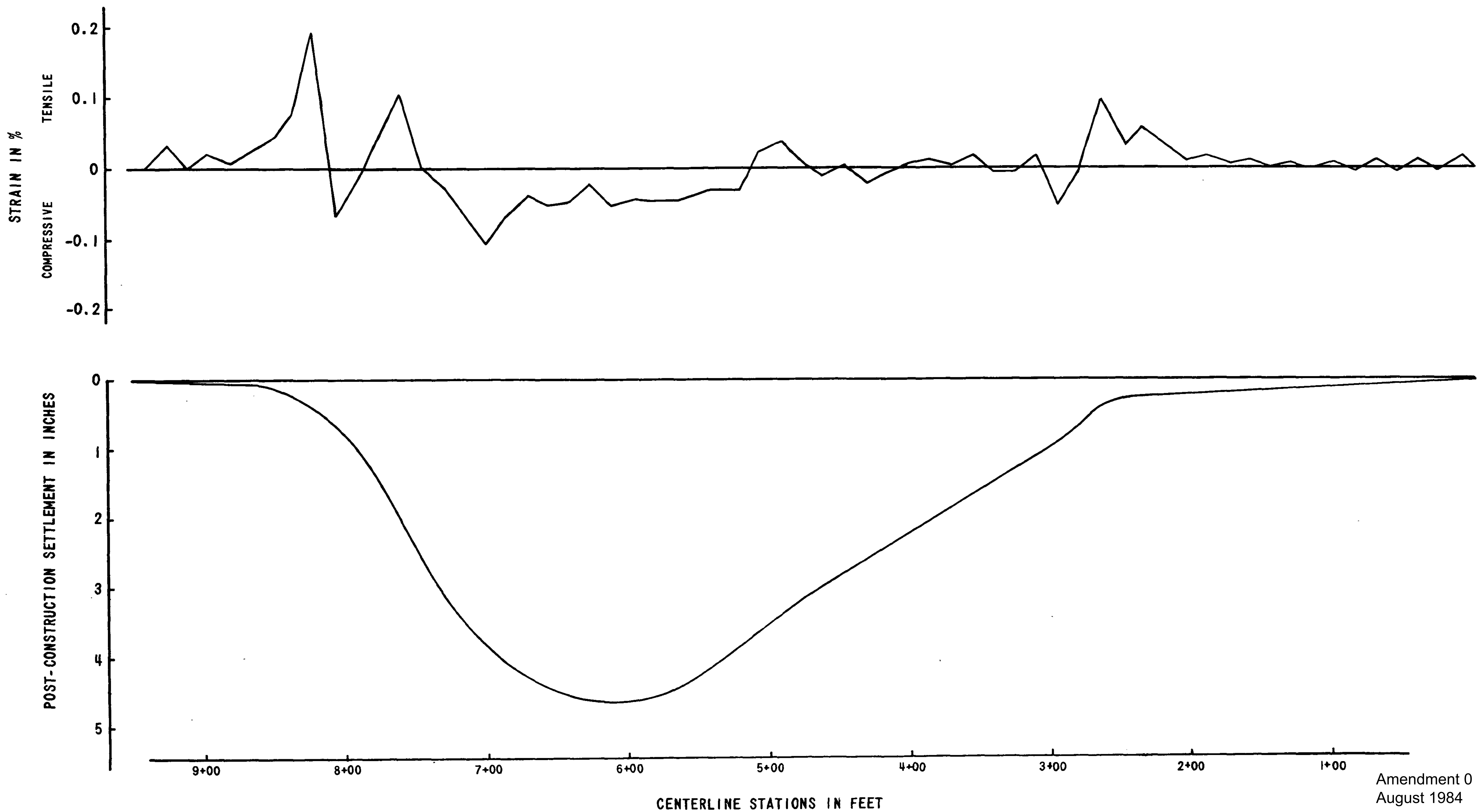


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Calculated Post-Construction Settlement and Tensile Strain North Dam

Figure 2.5-140

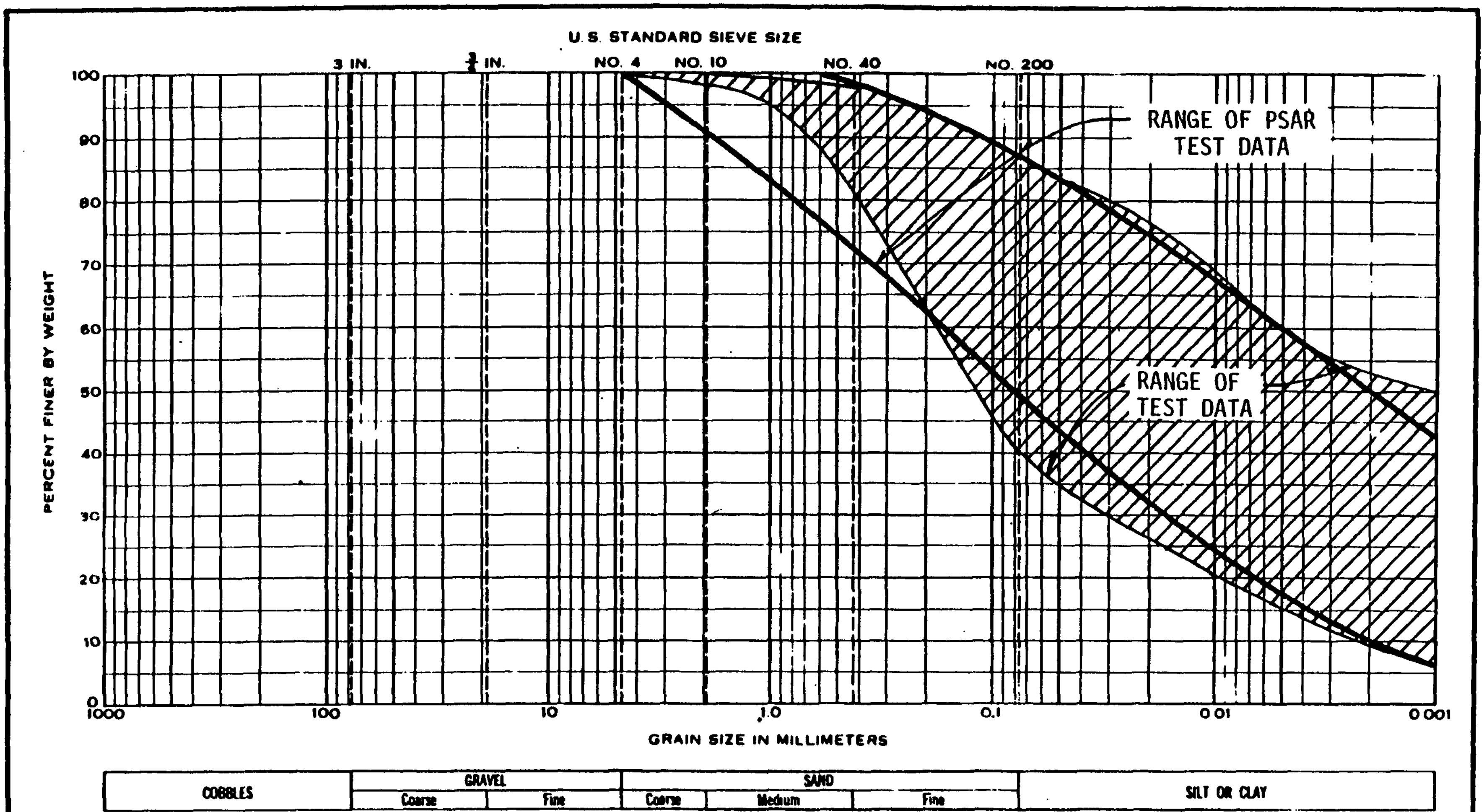


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Calculation Post-Construction Settlementr and Tensile Strain - South Dam

Figure 2.5-141



SELECT FILL MATERIALS

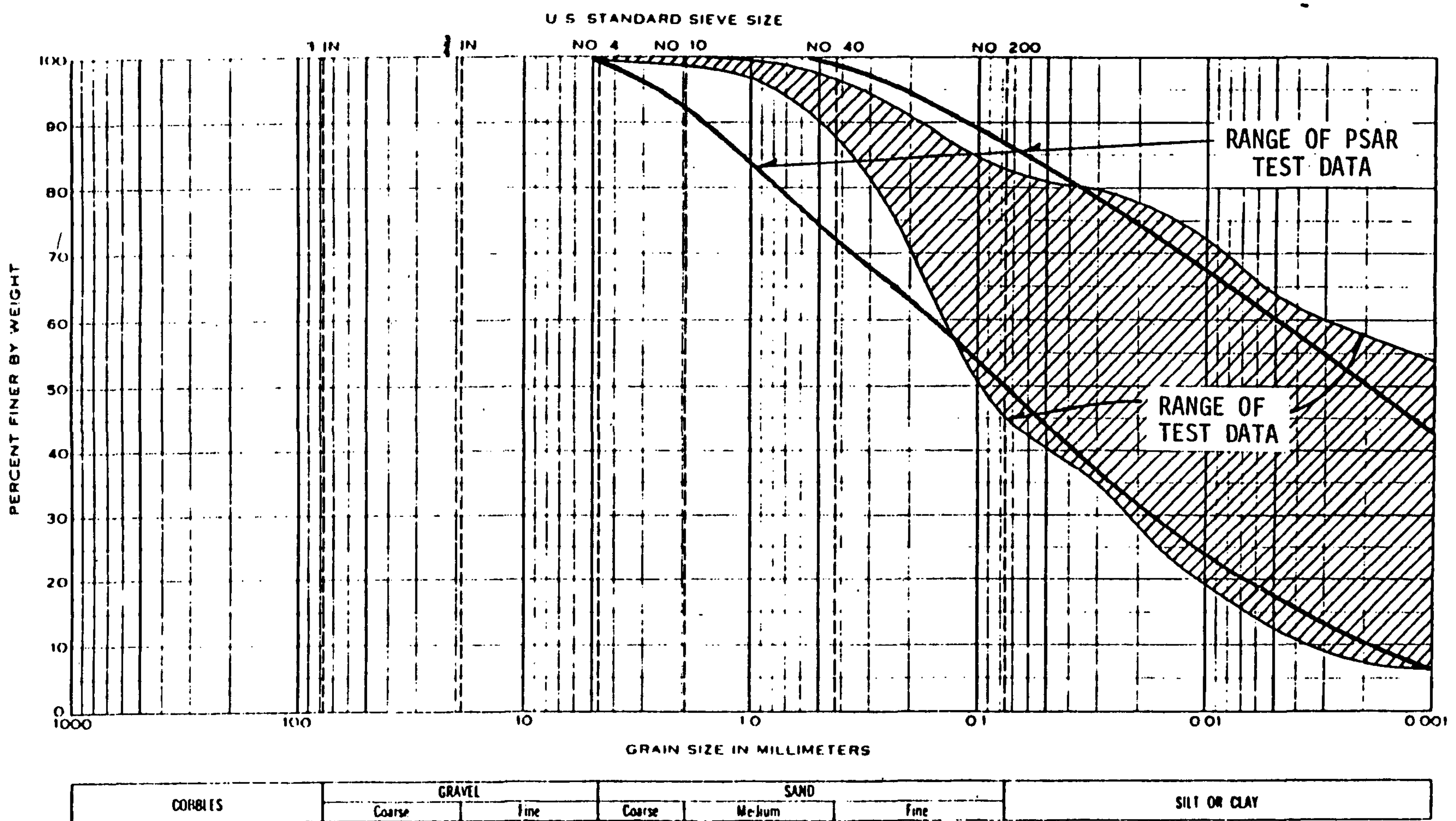
SUMMARY OF 45 GRADATION TESTS
FROM THE NORTH DAM

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary Of Construction Control
Gradation Tests - Select Fill
(Sheet 1 of 4)

Figure 2.5-142



SELECT FILL MATERIALS

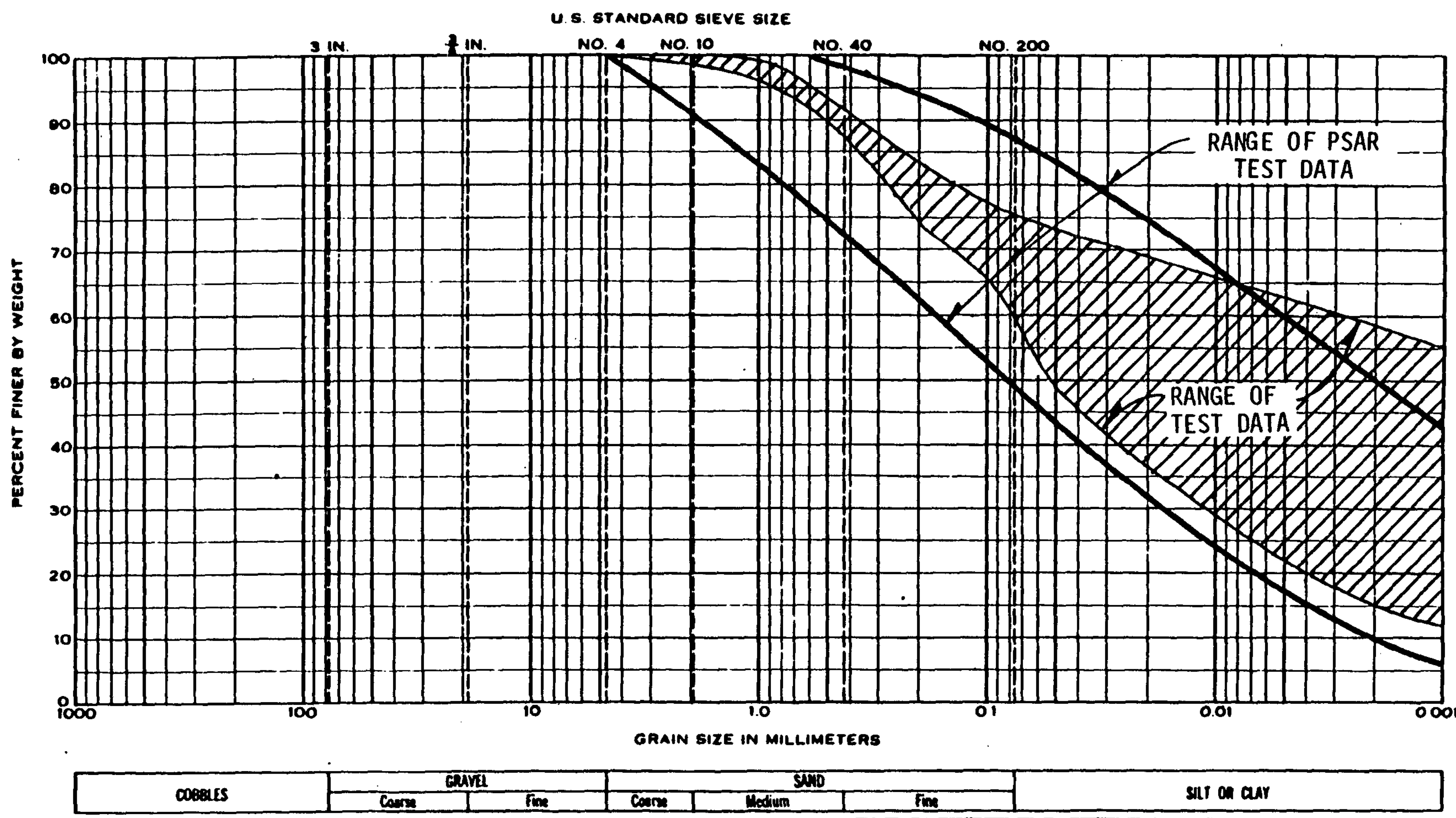
SUMMARY OF 24 GRADATION TESTS
FROM THE SOUTH DAM

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary Of Construction Control Gradation Tests - Select Fill (Sheet 2 of 4)

Figure 2.5-142



SELECT FILL MATERIALS

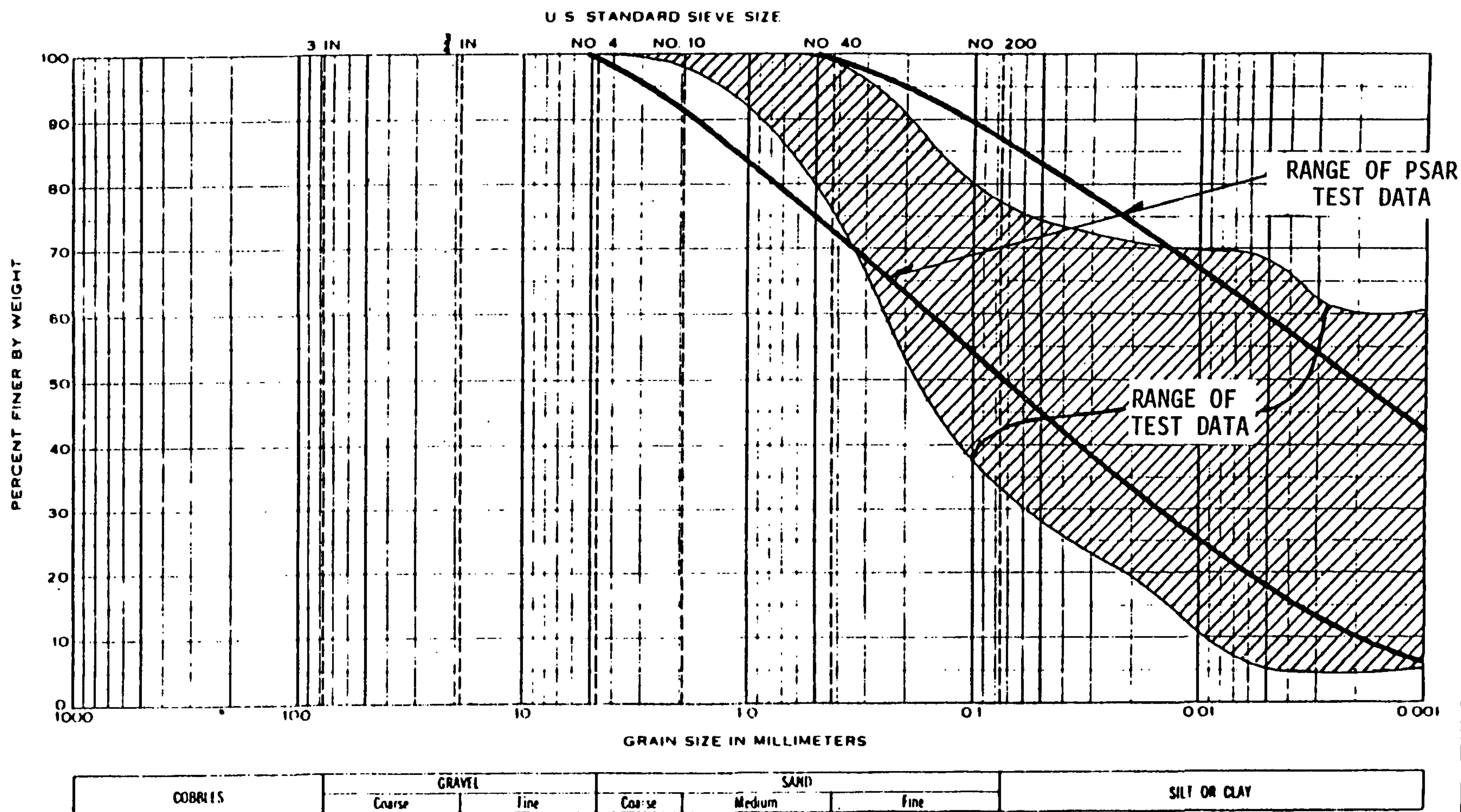
SUMMARY OF 8 GRADATION TESTS
FROM THE EAST DAM

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary Of Construction Control
Gradation Tests - Select Fill
(Sheet 3 of 4)

Figure 2.5-142



SELECT FILL MATERIALS

SUMMARY OF 43 GRADATION TESTS
FROM THE WEST EMBANKMENT

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary Of Construction Control
Gradation Tests - Select Fill
(Sheet 4 of 4)

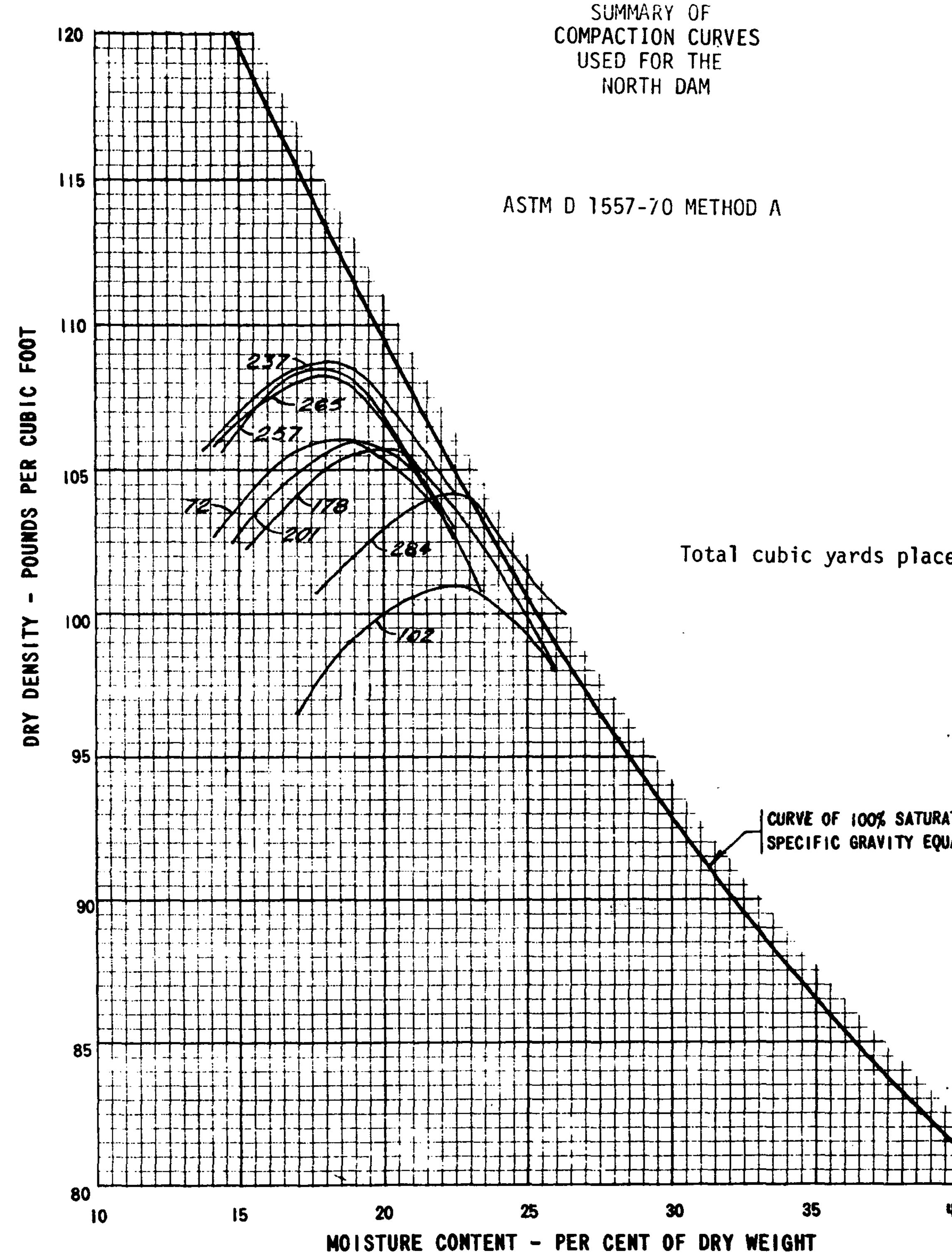
Figure 2.5-142

Curve No.	γ_{dmax} (pcf)	Opt. m/c %	No. of samples compared	% of total cu. yds. placed
51	108.0	17.4	1	<1
57	102.5	19.3	10	2
66	97.1	26.1	1	<1
67	100.7	23.8	3	<1
68	100.6	25.5	15	3
72	106.0	18.5	73	13
85	103.0	22.5	1	<1
91	104.2	22.1	14	3
94	113.2	17.5	2	<1
96	100.5	24.5	1	<1
98	101.5	23.0	4	1
102	101.0	23.0	29	5
104	104.4	22.4	3	<1
105	105.5	21.3	23	4
114	98.9	20.7	1	<1
123	107.2	18.2	2	<1
145	106.9	19.3	3	<1
146	106.7	19.4	10	2
162	105.7	19.0	6	1
167	105.9	18.5	19	3
178	105.7	20.0	25	5
192	104.5	20.0	8	1
193	105.5	19.5	18	3
198	106.1	17.0	17	3
201	106.0	19.0	94	17
237	108.7	17.7	31	6
257	108.5	17.9	30	6
265	108.3	18.0	51	9
279	109.5	15.8	10	2
284	104.4	22.7	28	5
293	107.9	19.4	11	2

NOTE: Only compaction curves representing 5% or more of total fill volume are shown.

SUMMARY OF COMPACTION CURVES USED FOR THE NORTH DAM

ASTM D 1557-70 METHOD A



Total cubic yards placed = 784,455

CURVE OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO 2.70

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary Of Construction Control Compaction Curves - Select Fill
(Sheet 1 of 4)

Figure 2.5-143

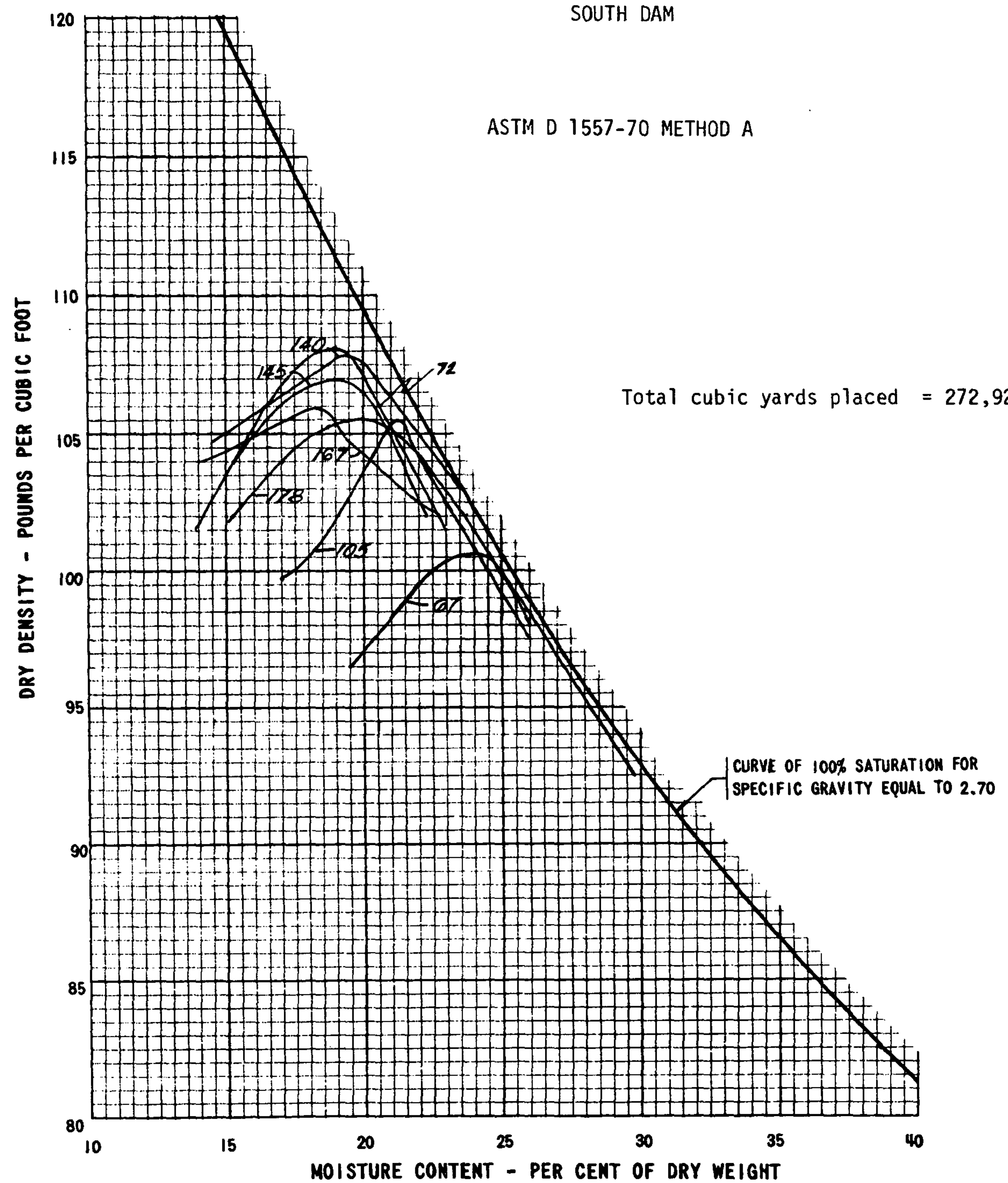
Curve No.	γ_{dmax} (pcf)	Opt. m/c %	No. of samples compared	% of total cu. yds. placed
67	100.7	23.8	10	5
68	100.6	25.5	1	<1
69	101.0	24.2	4	2
72	106.0	18.5	46	22
74	99.0	27.0	9	4
82	102.1	23.3	2	1
85	103.0	22.5	4	2
91	104.2	22.1	5	2
98	101.5	23.0	7	3
102	101.0	23.0	9	4
104	104.4	22.4	4	2
105	105.5	21.3	30	15
115	104.6	17.7	1	<1
140	107.9	19.3	10	5
145	106.9	19.3	20	10
146	106.7	19.4	9	4
162	105.8	19.0	5	2
167	105.9	18.5	13	6
178	105.7	20.0	13	6
179	109.5	17.0	1	<1
193	105.5	19.5	1	<1

NOTE: Only compaction curves representing 5% or more of total fill volume are shown.

SUMMARY OF
COMPACTION CURVES
USED FOR THE
SOUTH DAM

ASTM D 1557-70 METHOD A

Total cubic yards placed = 272,920



Amendment 0
August 1984

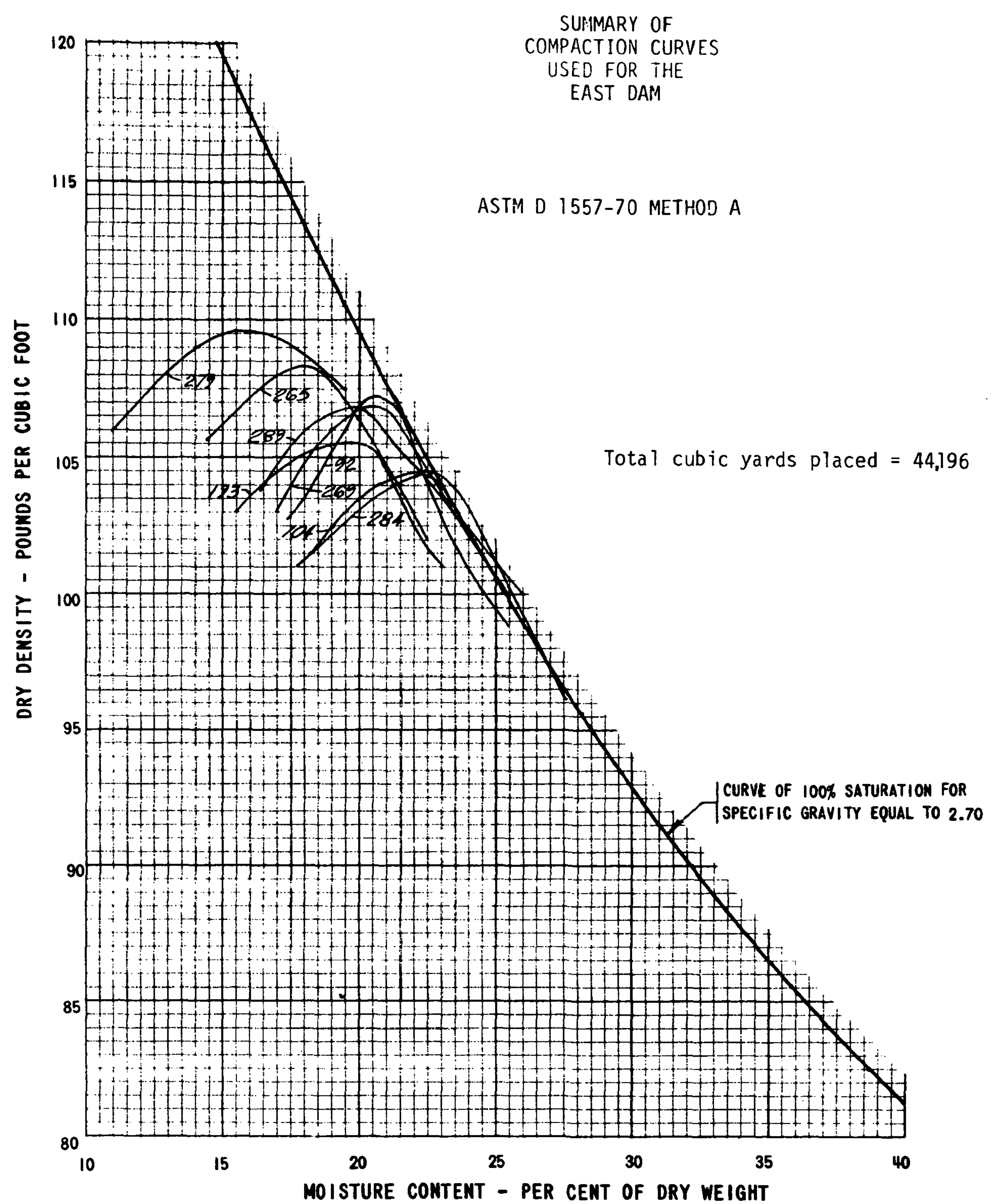
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary Of Construction Control Compaction Curves - Select Fill
(Sheet 2 of 4)

Figure 2.5-143

Curve No.	γ_{dmax} (pcf)	opt. m/c %	No. of samples compared	% of total cu. yds. placed
92	107.2	20.5	3	8
104	104.4	22.4	5	13
193	105.5	19.5	3	8
252	109.2	17.5	2	5
265	108.3	18.0	4	10
269	106.8	20.3	2	5
279	109.5	15.8	4	10
284	104.4	22.7	13	33
289	106.8	19.7	3	8

NOTE: Only compaction curves representing 5% or more of total fill volume are shown.



Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary Of Construction Control Compaction Curves - Select Fill (Sheet 3 of 4)

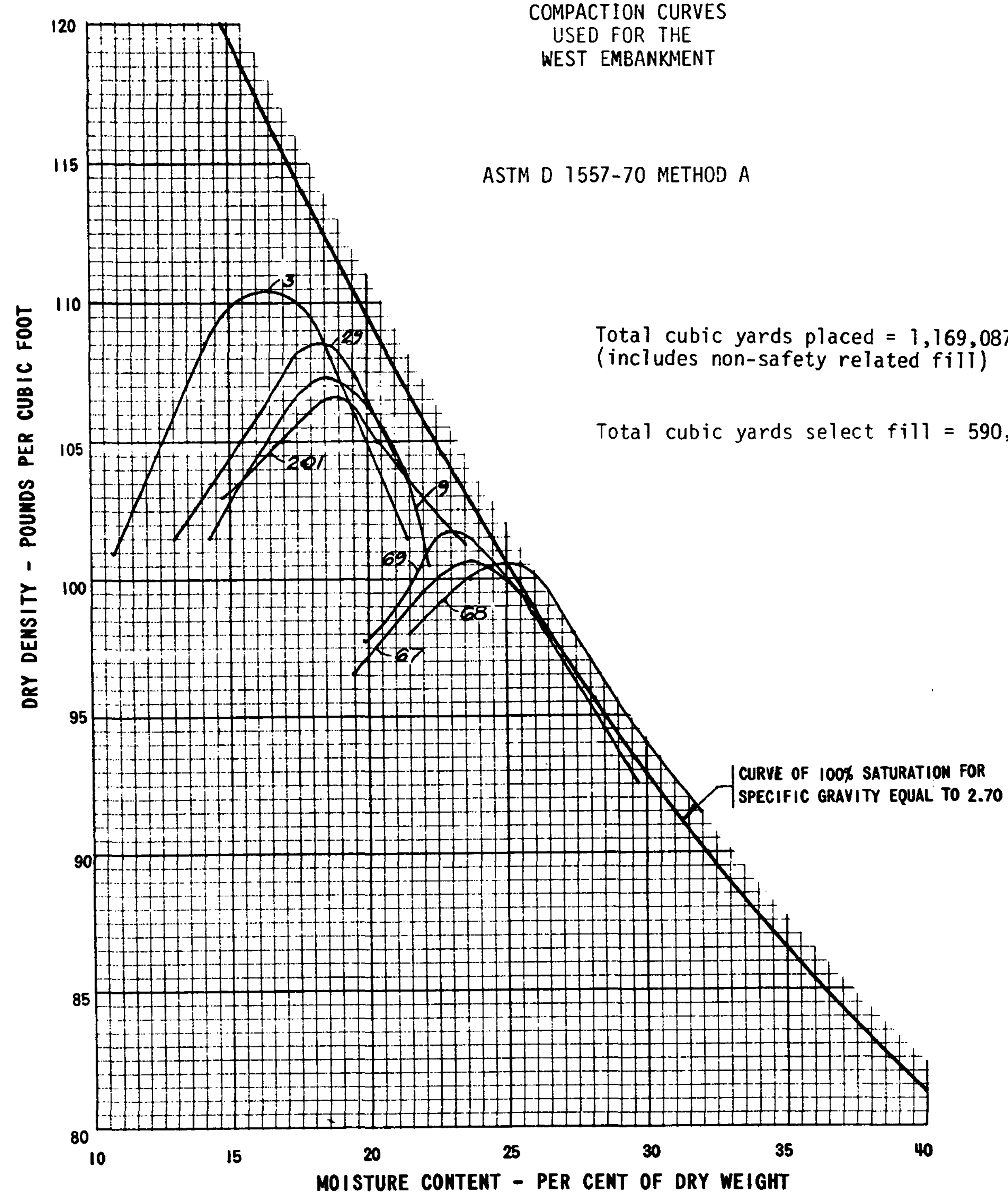
Figure 2.5-143

Curve No.	γ_{dmax} (pcf)	Opt. m/c %	No. of samples compared	% of total cu. yds. placed
A	107.0	17.2	3	1
1	116.3	12.5	1	<1
2	117.1	12.5	1	<1
3	110.4	16.8	52	13
4	114.6	13.6	1	<1
6	114.4	13.5	1	<1
7	108.9	17.4	2	<1
9	107.3	18.6	22	6
10	106.4	17.0	10	3
11	108.5	15.0	2	<1
28	109.9	14.1	4	1
29	108.6	18.5	19	5
67	100.7	23.8	58	15
68	100.6	25.5	28	7
69	101.0	24.2	25	6
72	106.0	18.5	2	<1
74	99.0	27.0	1	<1
85	103.0	22.5	1	<1
91	104.2	22.1	7	2
92	107.2	20.5	4	1
96	100.5	24.5	3	1
102	101.0	23.0	1	<1
104	104.4	22.4	3	1
178	105.7	20.0	17	4
193	105.5	19.5	4	1
200	107.7	17.0	3	1
201	106.6	19.0	45	12
237	108.7	17.7	6	2
257	108.5	17.9	14	4
262	110.8	16.8	4	1
265	108.3	18.0	14	4
279	109.5	15.8	5	2
282	112.4	16.2	1	<1
283	107.8	19.5	3	1
284	104.4	22.7	9	2
289	106.9	19.7	7	2
293	107.9	19.4	3	1

NOTE: Only compaction curves representing 5% or more of total fill volume are shown.

SUMMARY OF COMPACTION CURVES USED FOR THE WEST EMBANKMENT

ASTM D 1557-70 METHOD A



Total cubic yards placed = 1,169,087
(includes non-safety related fill)

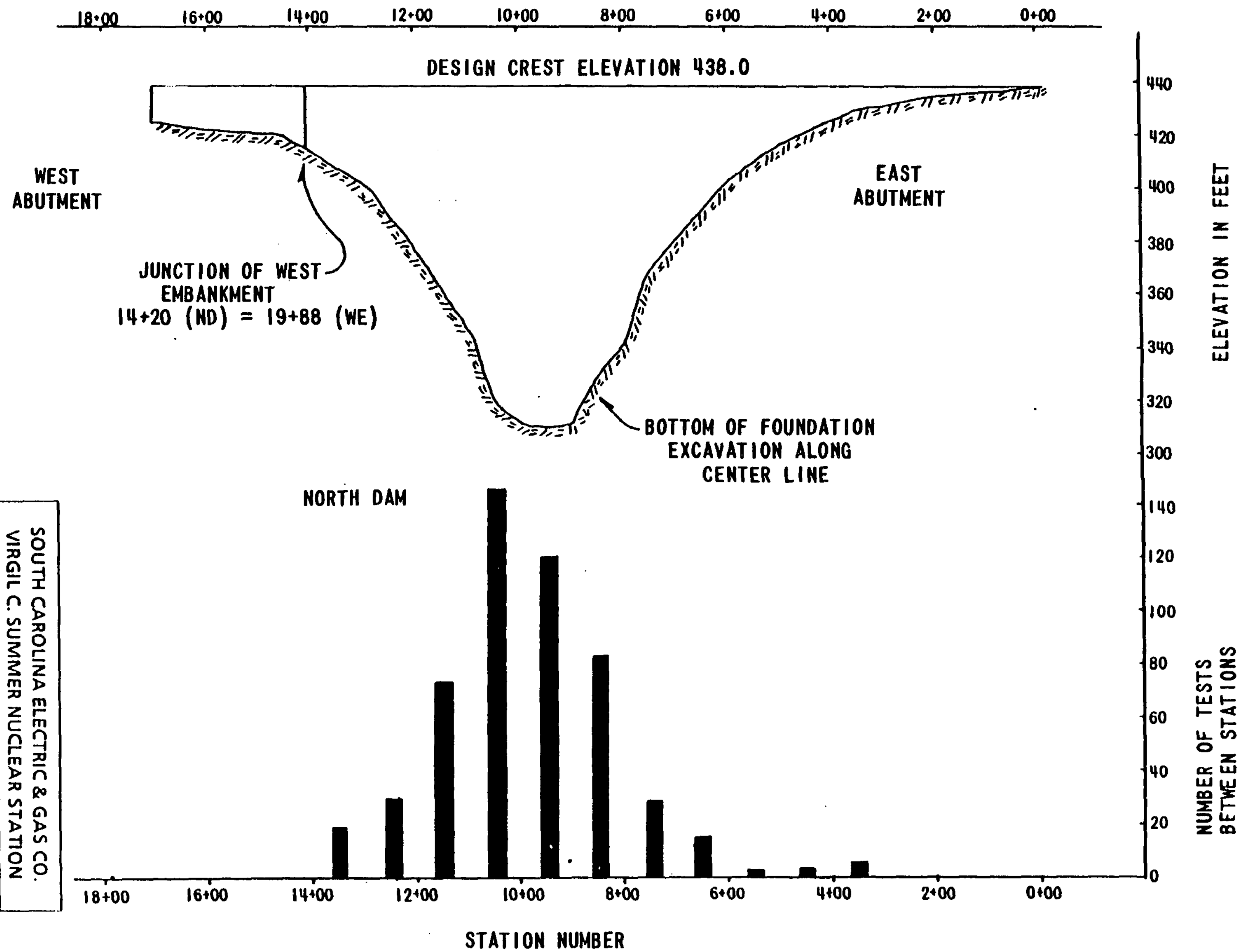
Total cubic yards select fill = 590,000

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary Of Construction Control Compaction Curves - Select Fill
(Sheet 4 of 4)

Figure 2.5-143

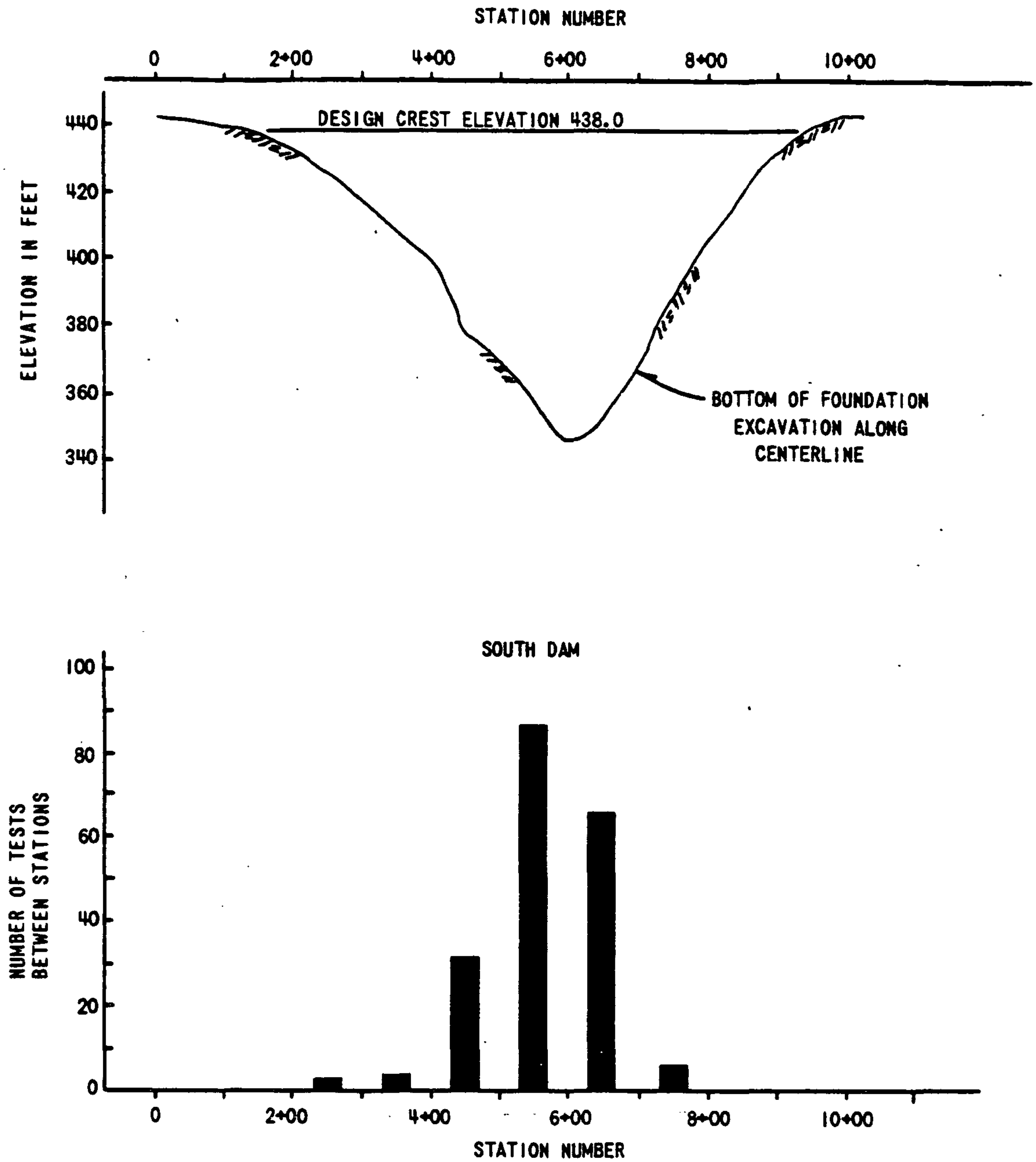


Amendment 0
August 1948

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary Of Construction Control
Compaction Test Results - Select Fill
(Sheet 1 of 4)

Figure 2.5-144

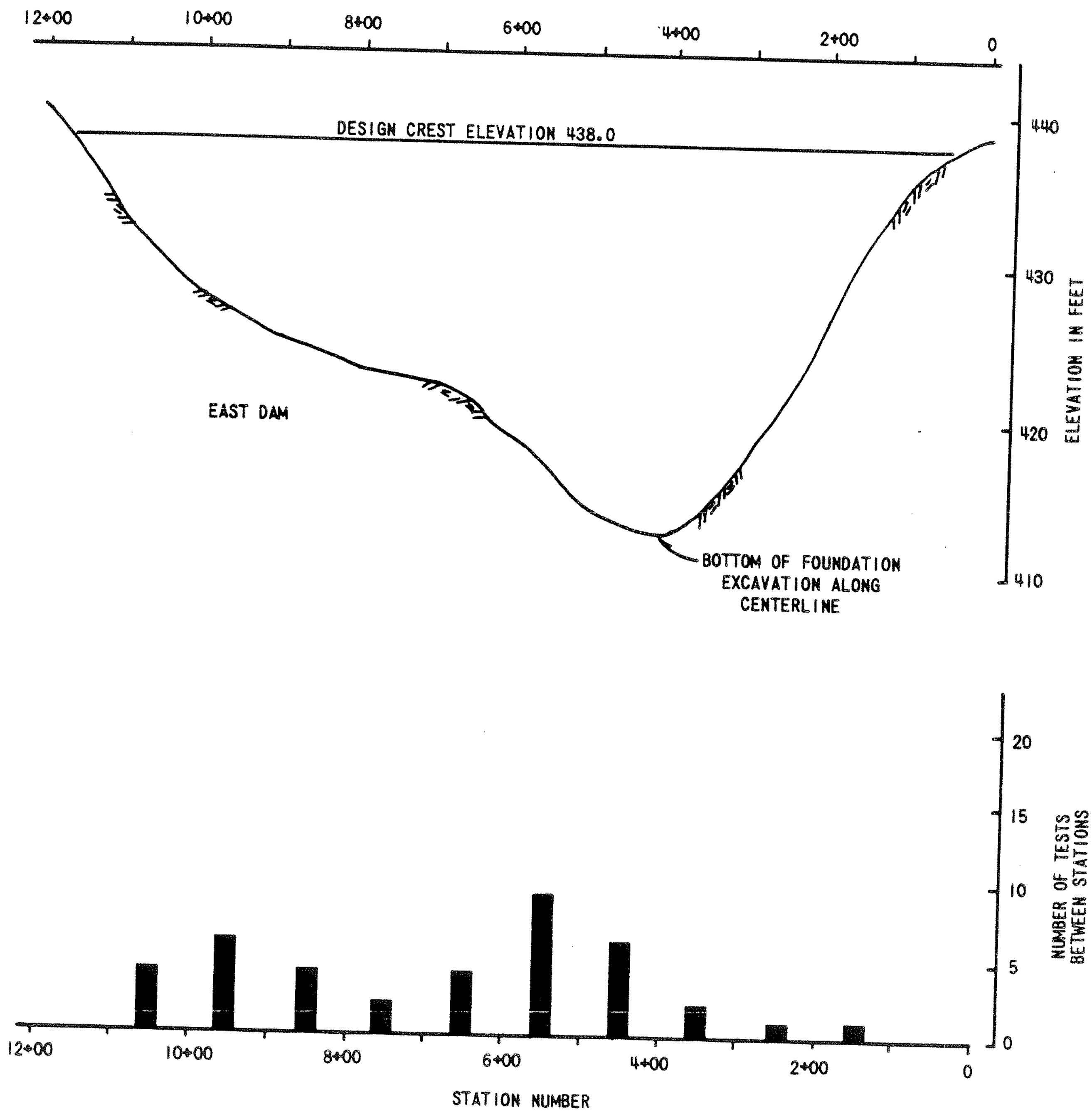


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary Of Construction Control Compaction Test Results - Select Fill (Sheet 2 of 4)

Figure 2.5-144

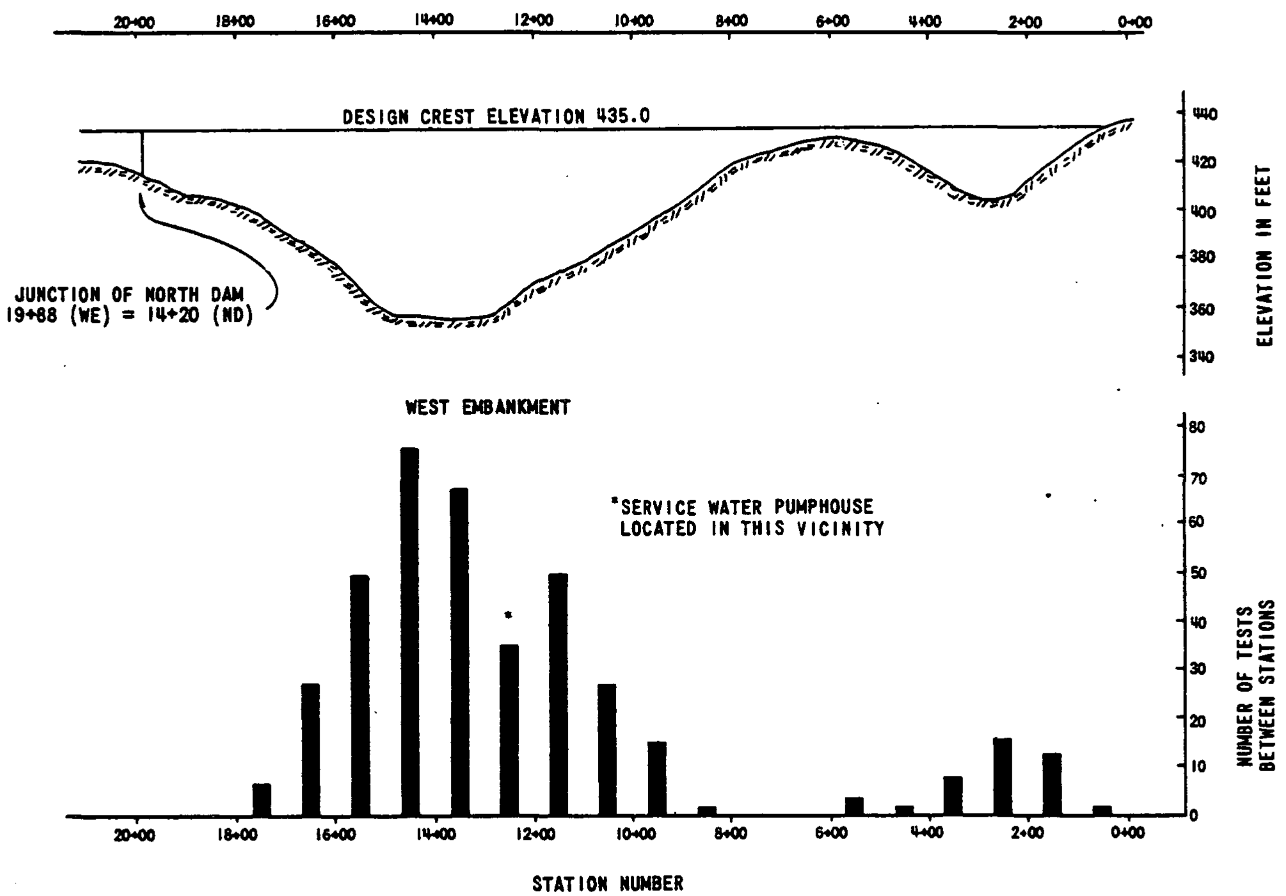


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary Of Construction Control Compaction Test Results - Select Fill (Sheet 3 of 4)

Figure 2.5-144



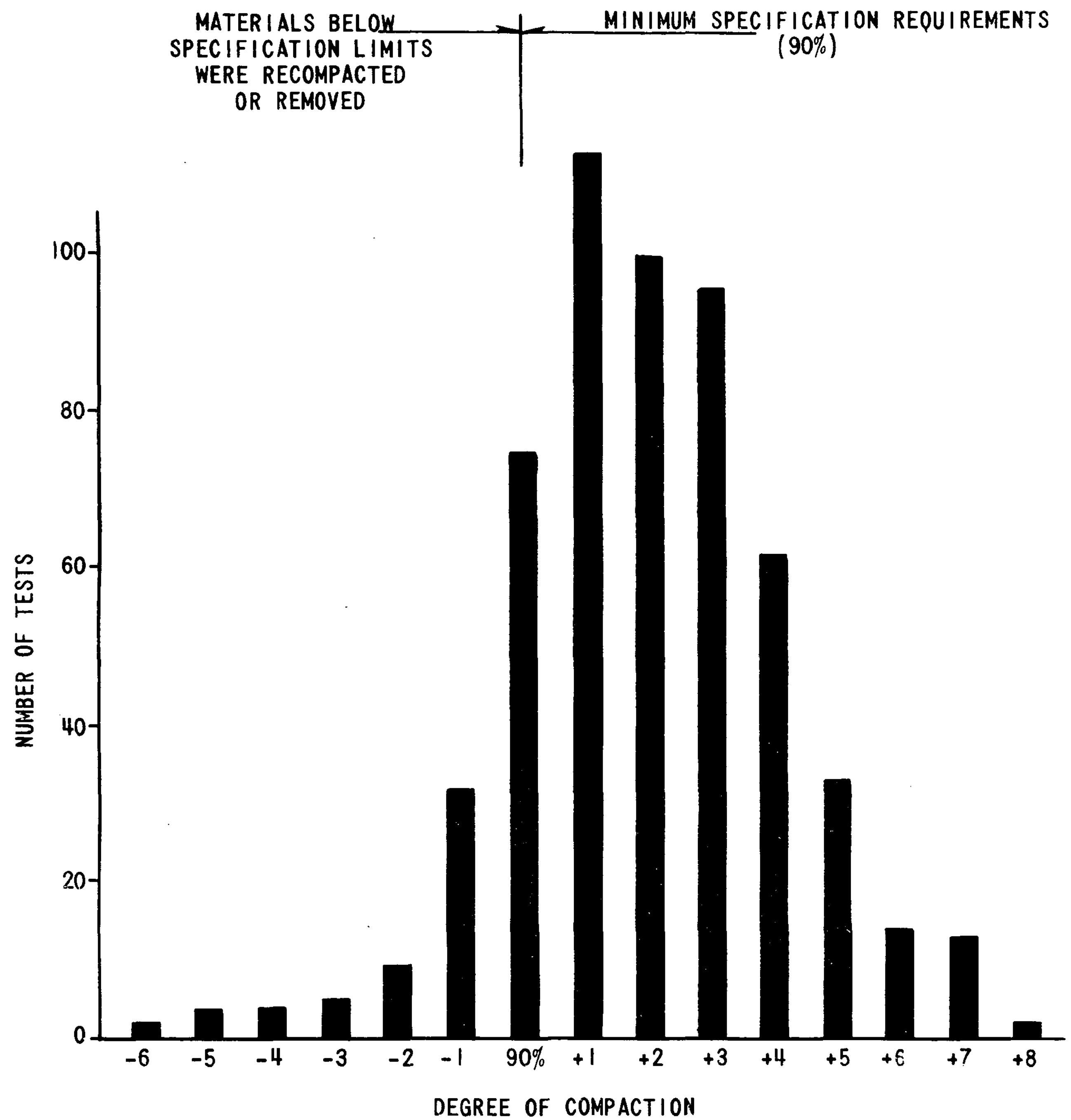
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

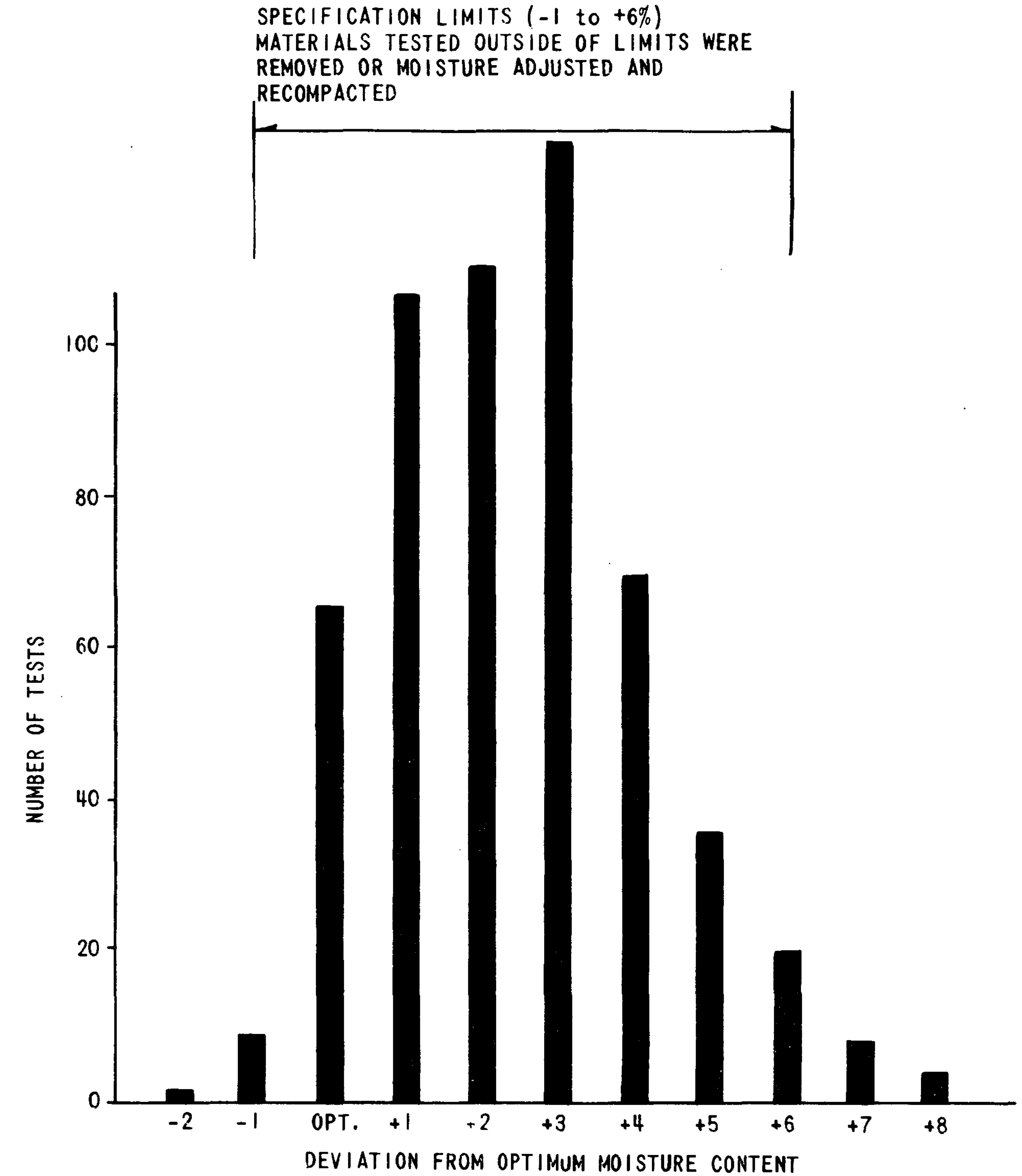
Summary Of Construction Control
Compaction Test Results - Select Fill
(Sheet 4 of 4)

Figure 2.5-144

SUMMARY OF COMPACTION TESTS
FOR NORTH DAM



NUMBER OF TESTS
vs
DEGREE OF COMPACTION

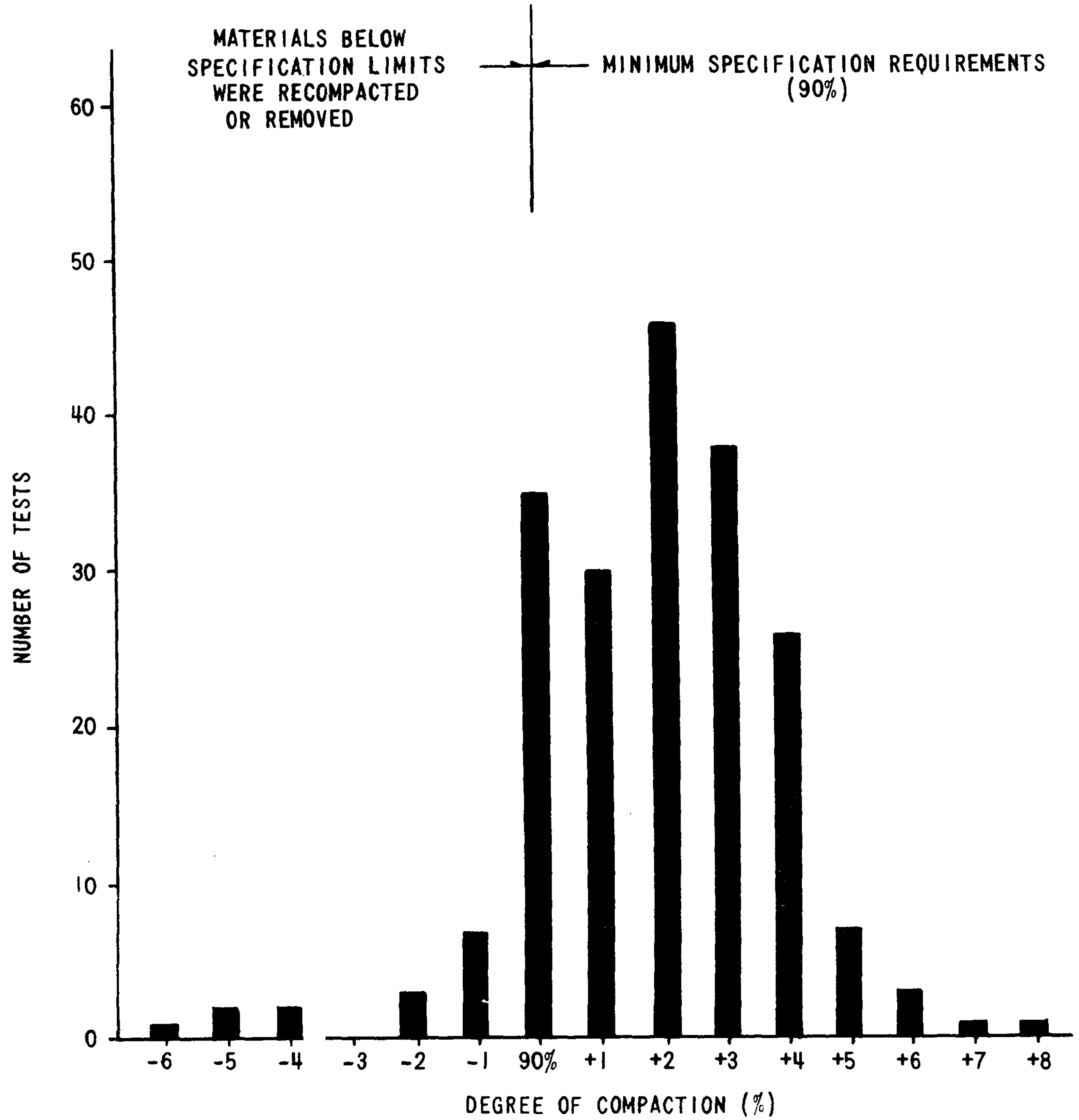


NUMBER OF TESTS
vs
DEGREE OF MOISTURE

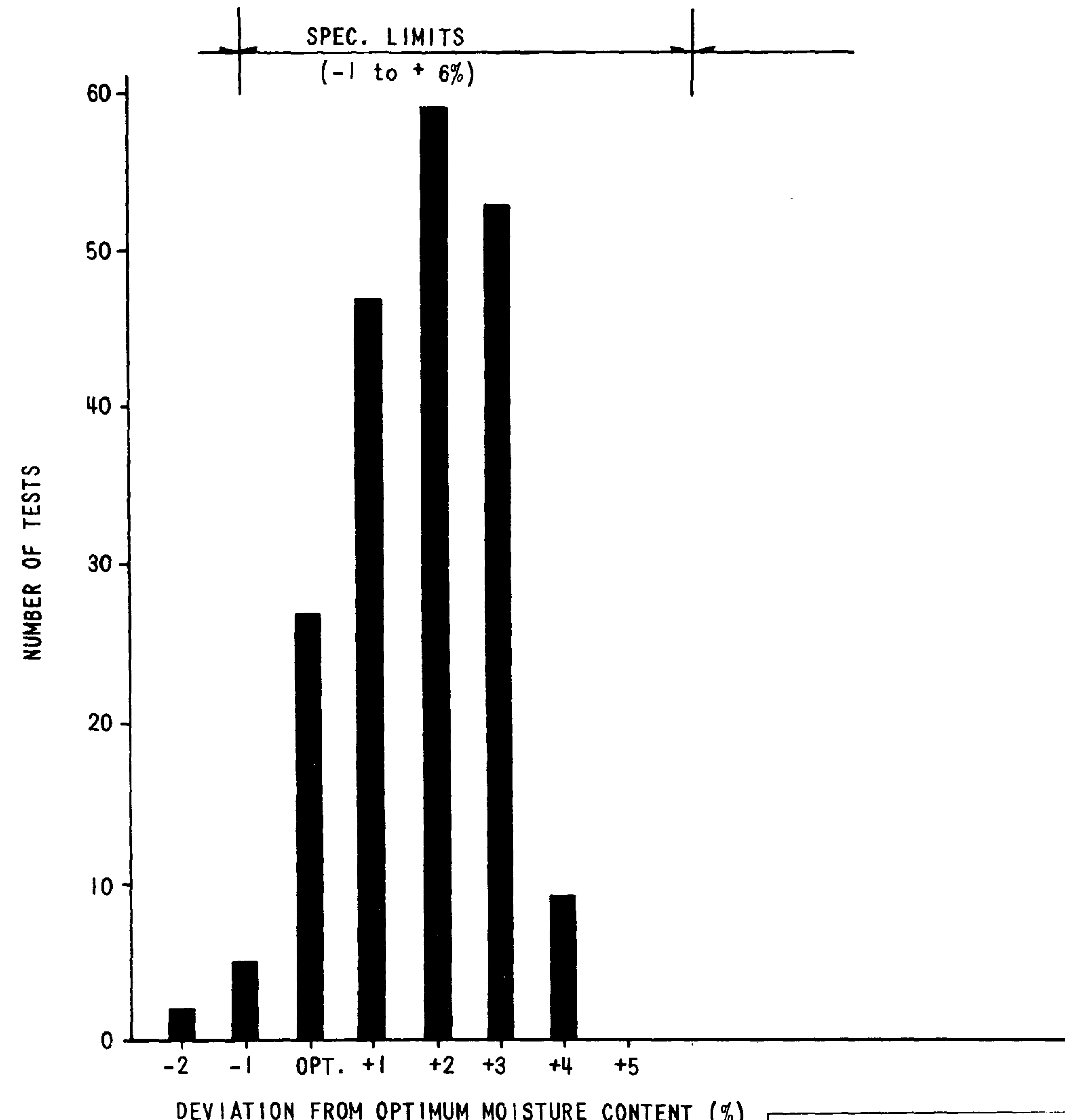
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO. VIRGIL C. SUMMER NUCLEAR STATION
Distribution of In-Place Density Test Locations - Select Fill (Sheet 1 of 4) Figure 2.5-145

SUMMARY OF COMPACTION TESTS
FOR SOUTH DAM



NUMBER OF TESTS
vs
DEGREE OF COMPACTION



NUMBER OF TESTS
vs
DEGREE OF MOISTURE

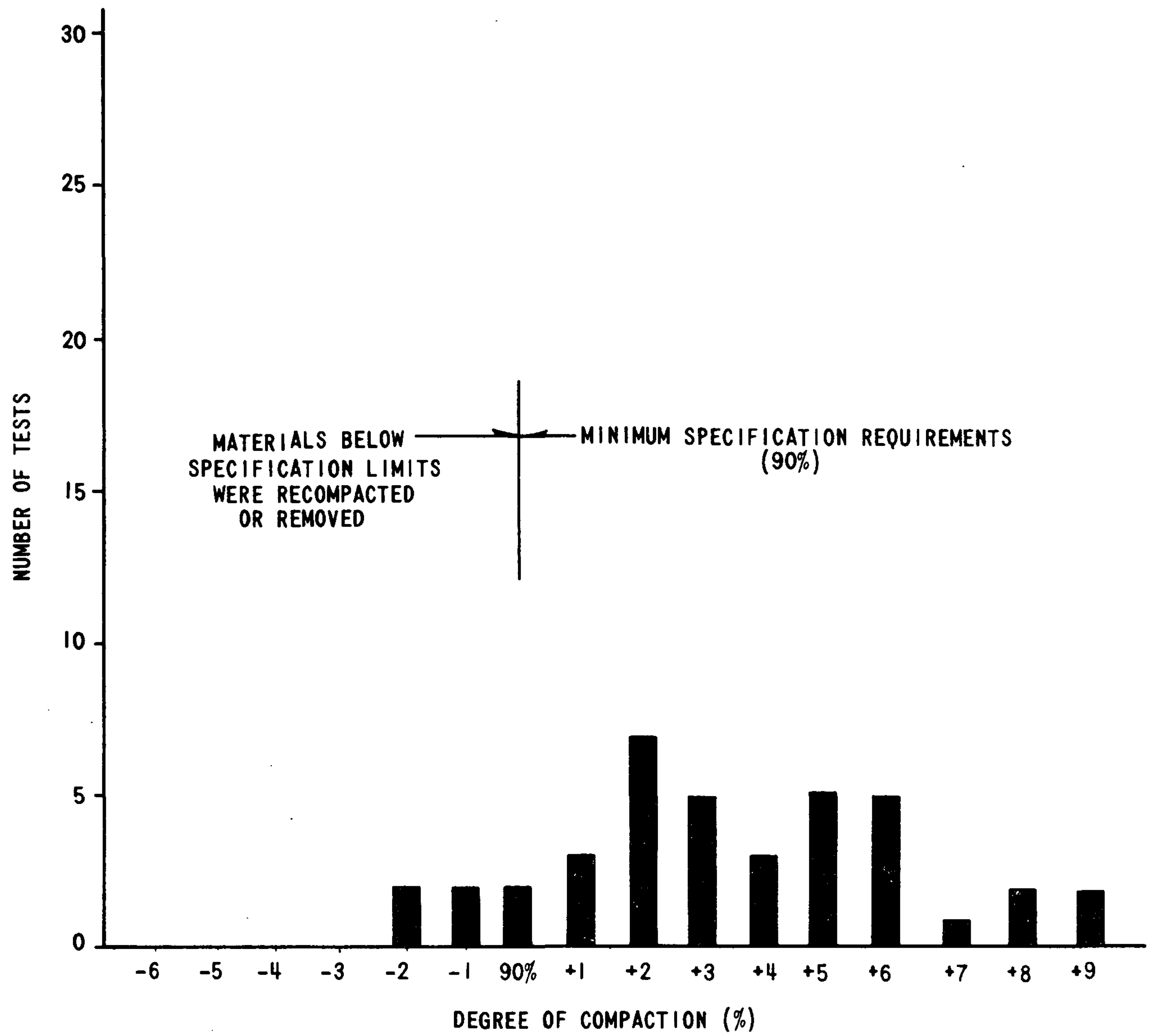
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

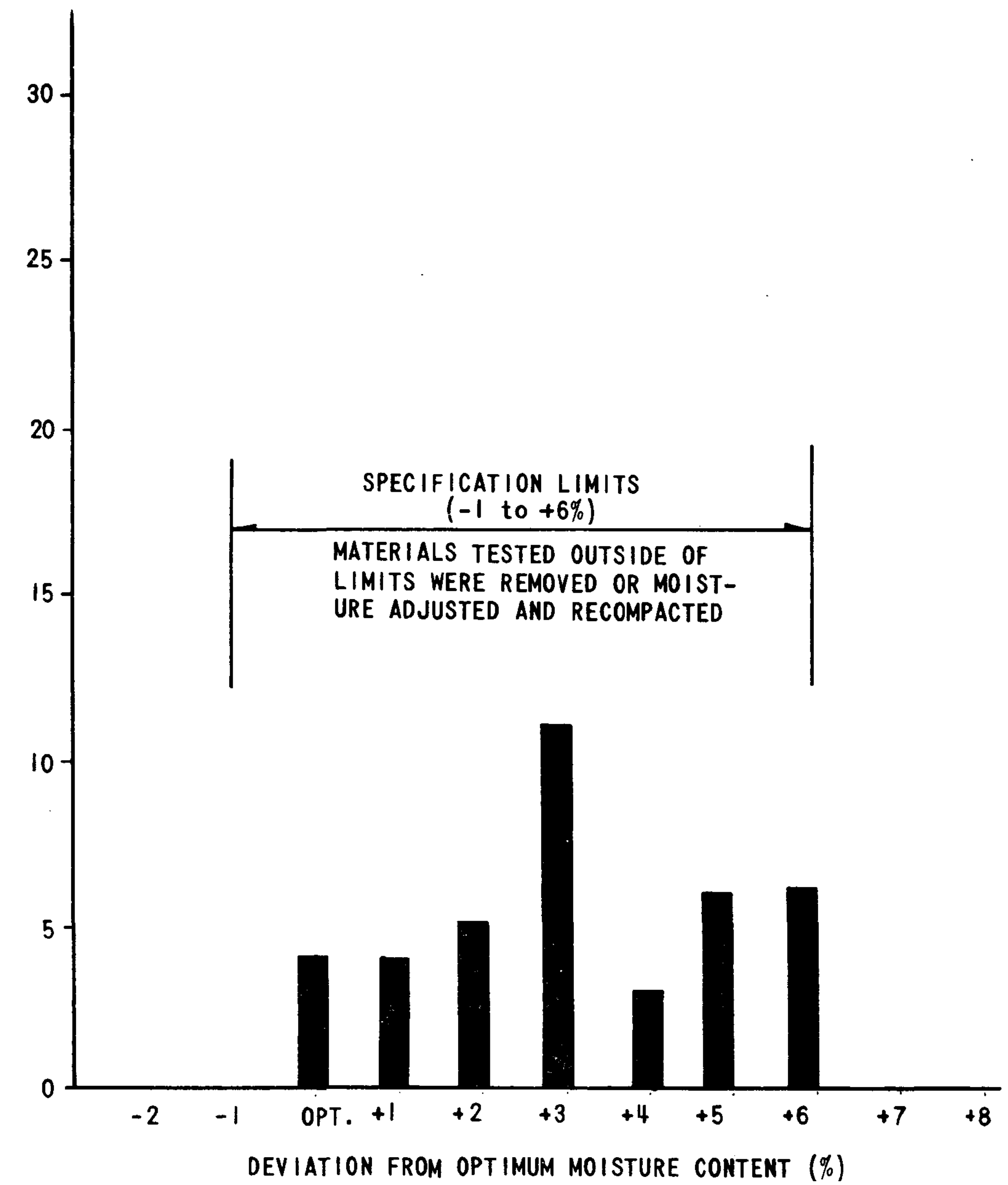
Distribution of In-Place Density Test Locations - Select Fill
(Sheet 2 of 4)

Figure 2.5-145

SUMMARY OF COMPACTION TESTS
FOR EAST DAM



NUMBER OF TESTS
vs
DEGREE OF COMPACTION



NUMBER OF TESTS
vs
DEGREE OF COMPACTION

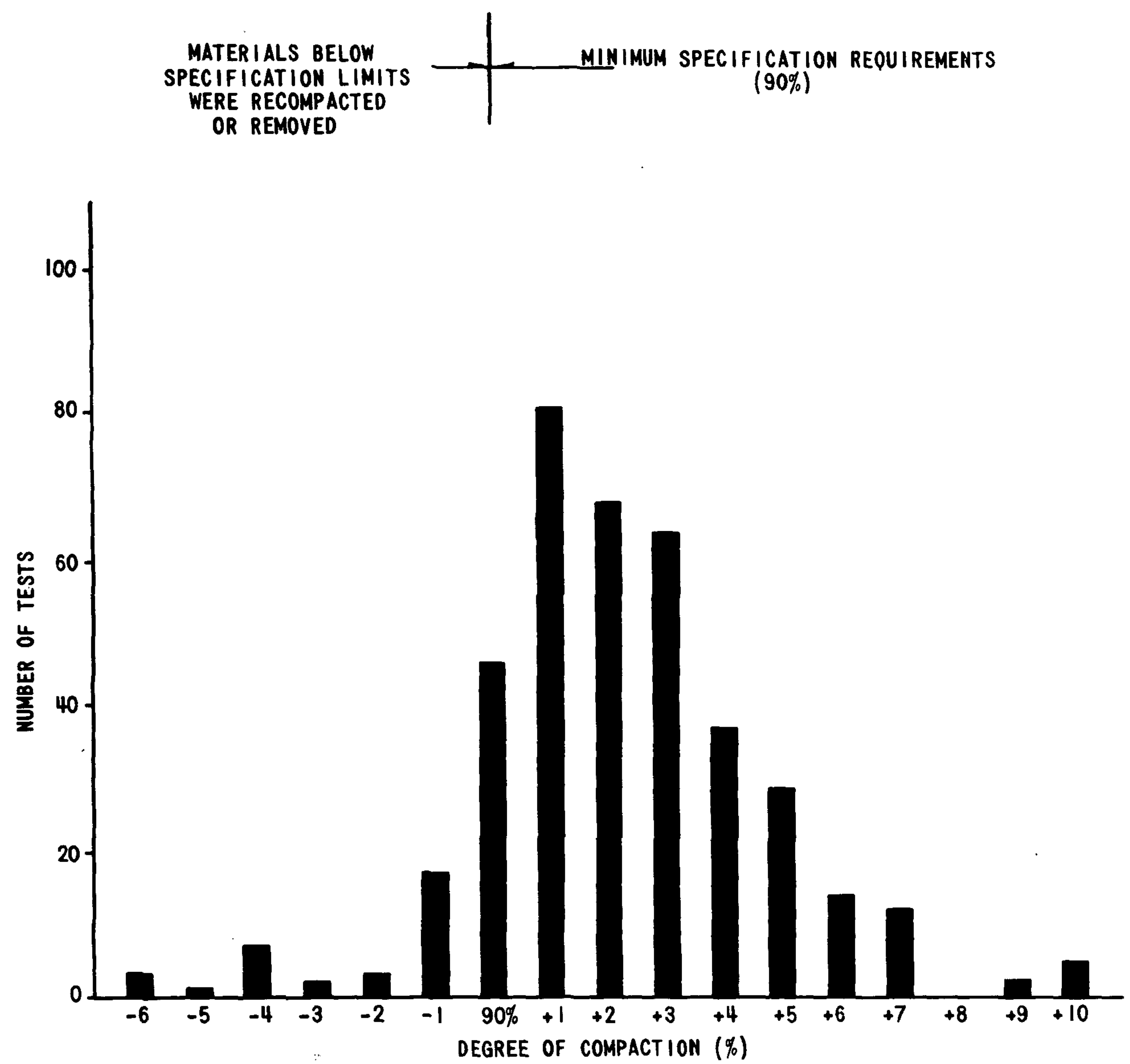
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

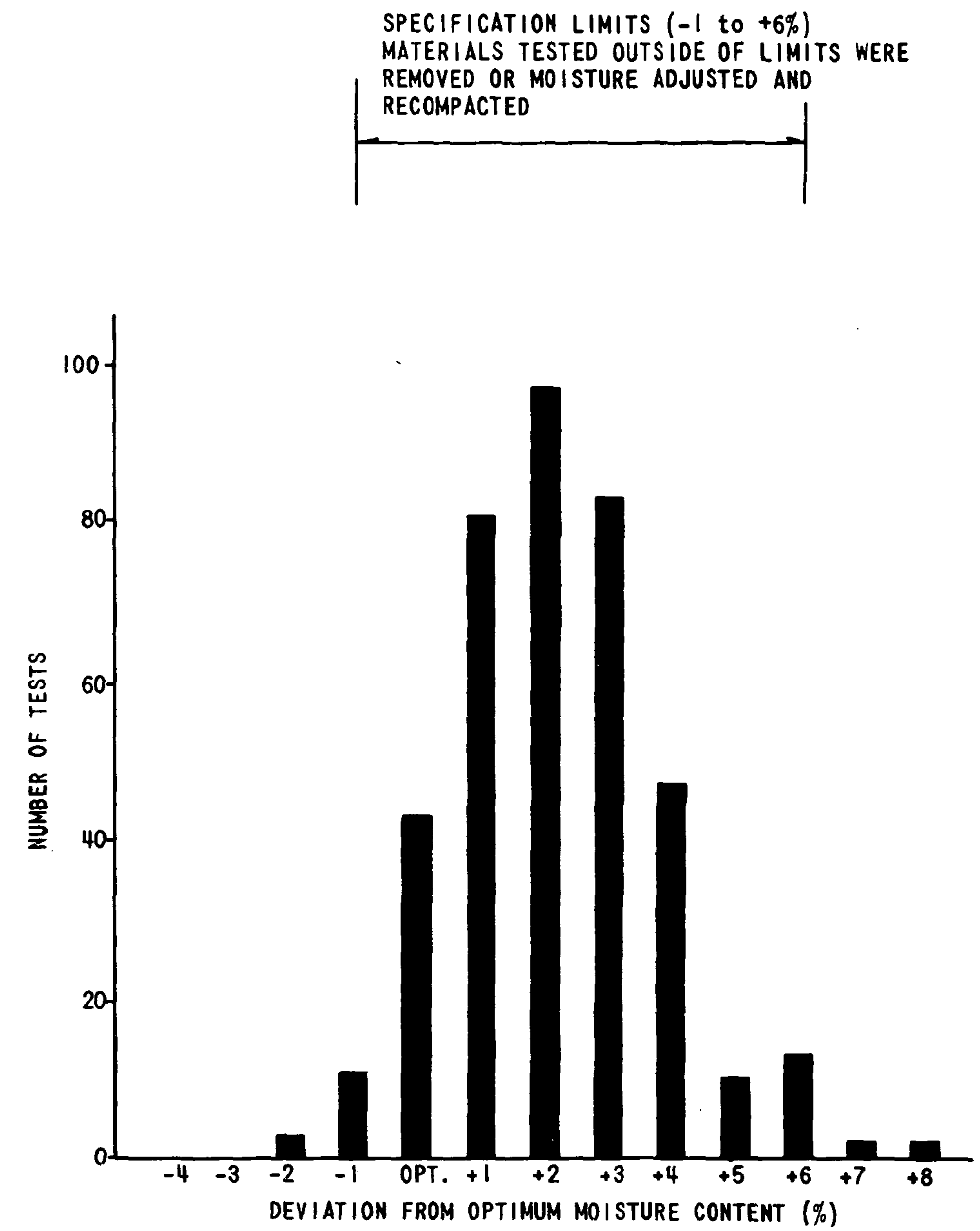
Distribution of In-Place Density Test Locations - Select Fill
(Sheet 3 of 4)

Figure 2.5-145

SUMMARY OF COMPACTION TESTS
FOR WEST EMBANKMENT



NUMBER OF TESTS
vs
DEGREE OF COMPACTION



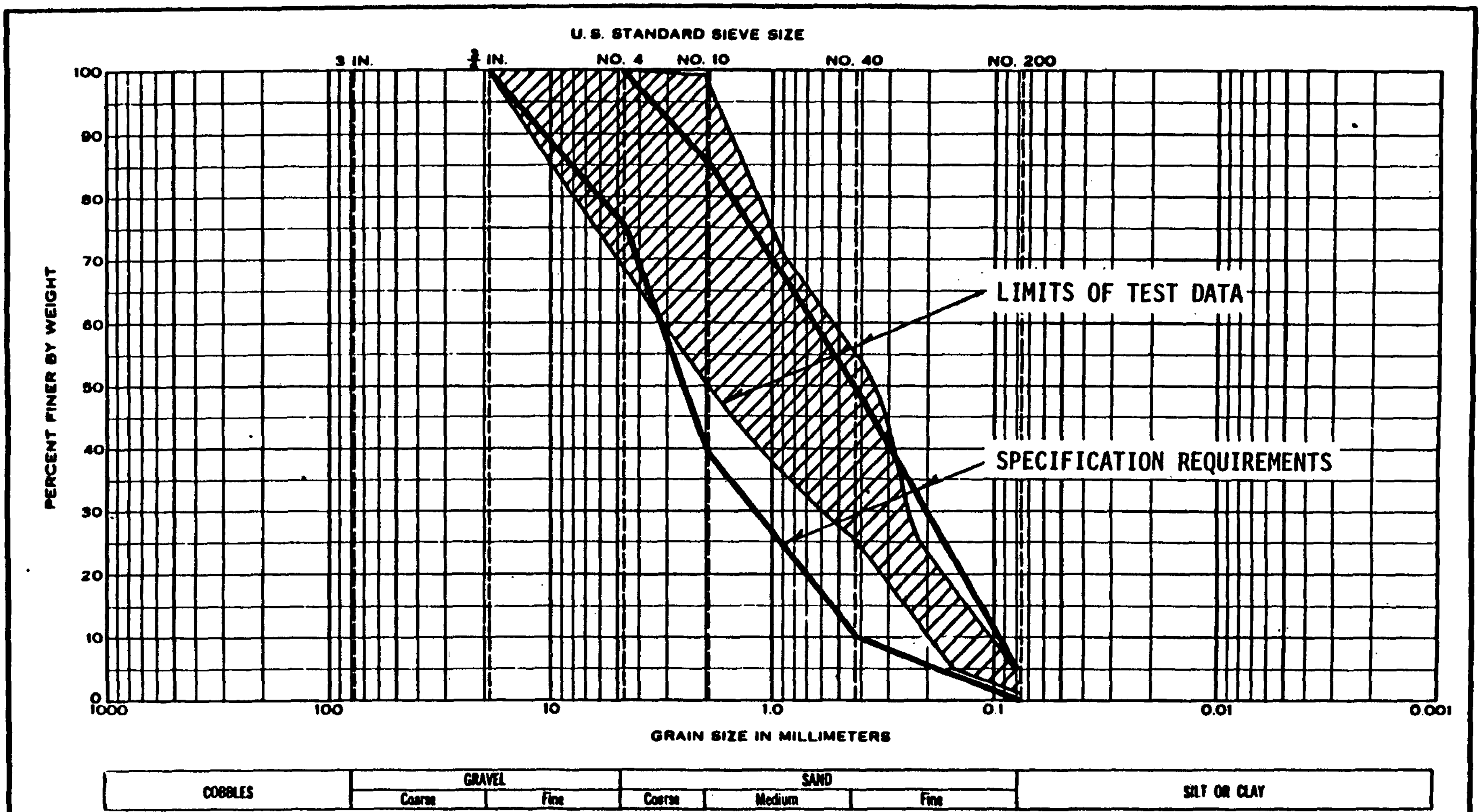
NUMBER OF TESTS
vs
DEGREE OF MOISTURE

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Distribution of In-Place Density Test Locations - Select Fill
(Sheet 4 of 4)

Figure 2.5-145



ZONE 1 FILTER

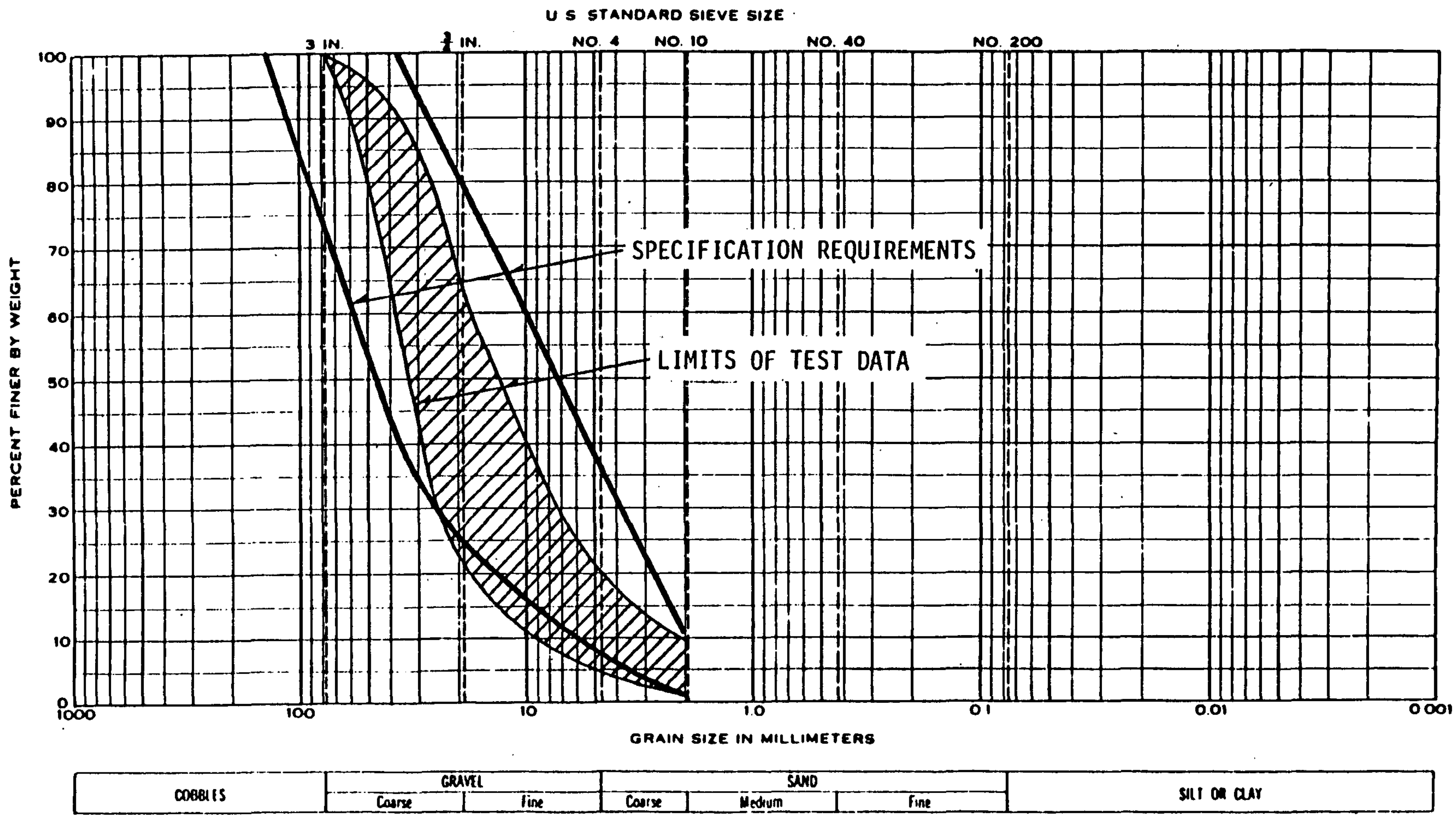
SUMMARY OF EIGHTY-THREE GRADATION TESTS
REPRESENTING 32,151 CUBIC YARDS OF MATERIAL

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary of Construction Control Gradation Tests - Zone 1 Filter Material

Figure 2.5-146



ZONE 2 FILTER

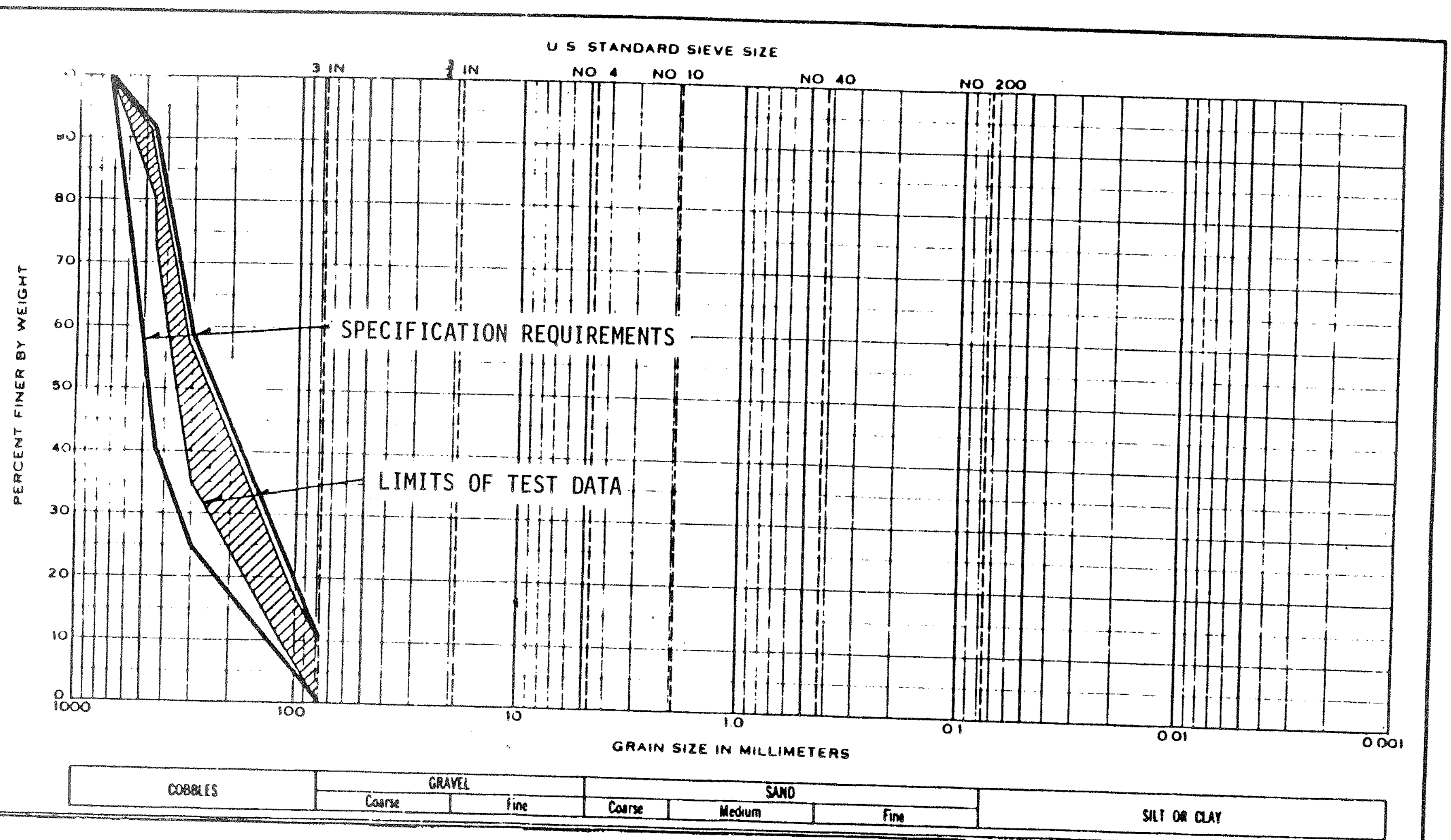
SUMMARY OF 150 GRADATION TESTS REPRESENTING
35,858 CUBIC YARDS OF MATERIAL

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary of Construction Control
Gradation Tests - Zone 2
Filter Material

Figure 2.5-147



ZONE A RIPRAP

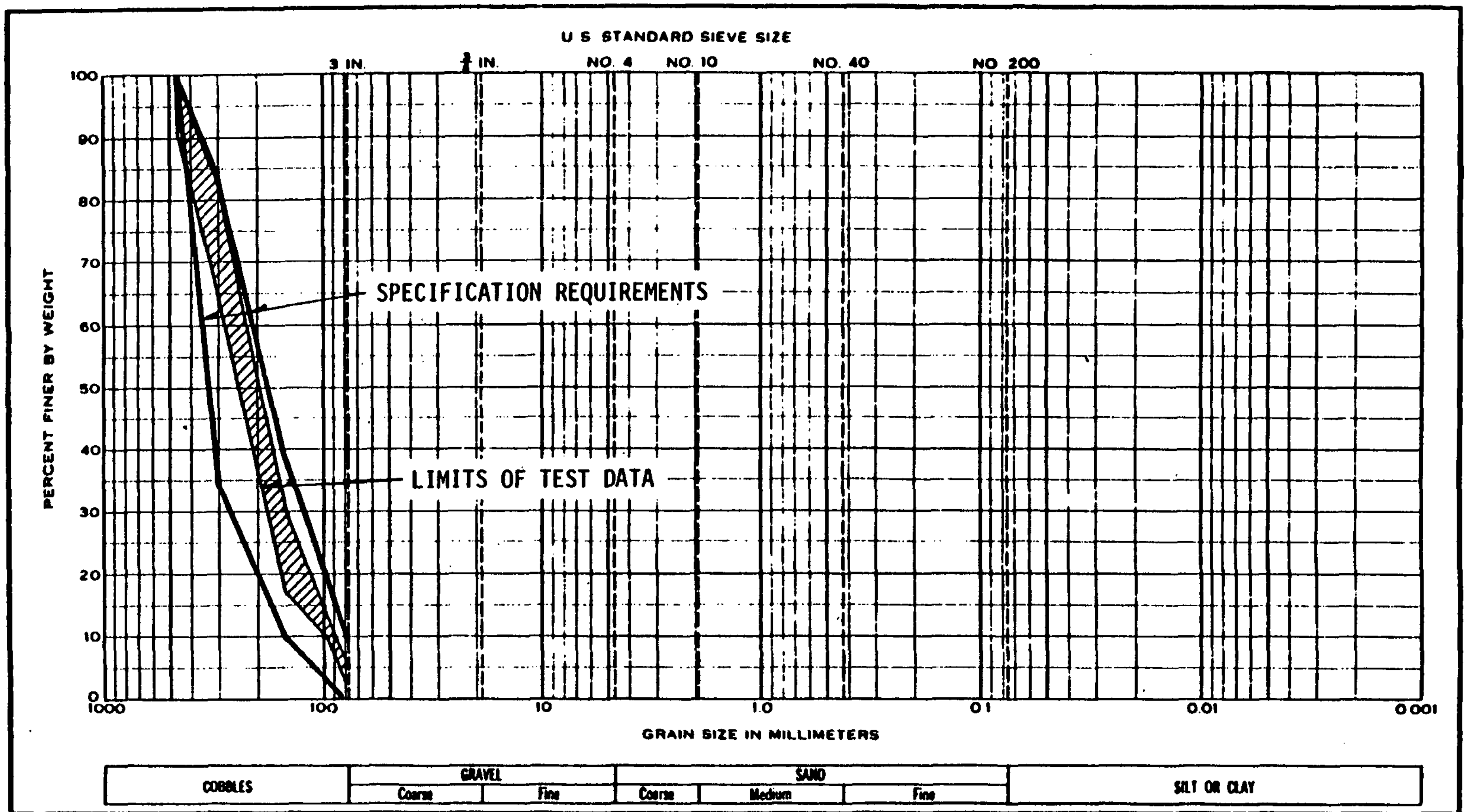
SUMMARY OF NINE GRADATION TESTS REPRESENTING
42,636 CUBIC YARDS OF MATERIAL

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary of Construction Control
Gradation Tests - Zone A Rock

Figure 2.5-148



ZONE B RIPRAP

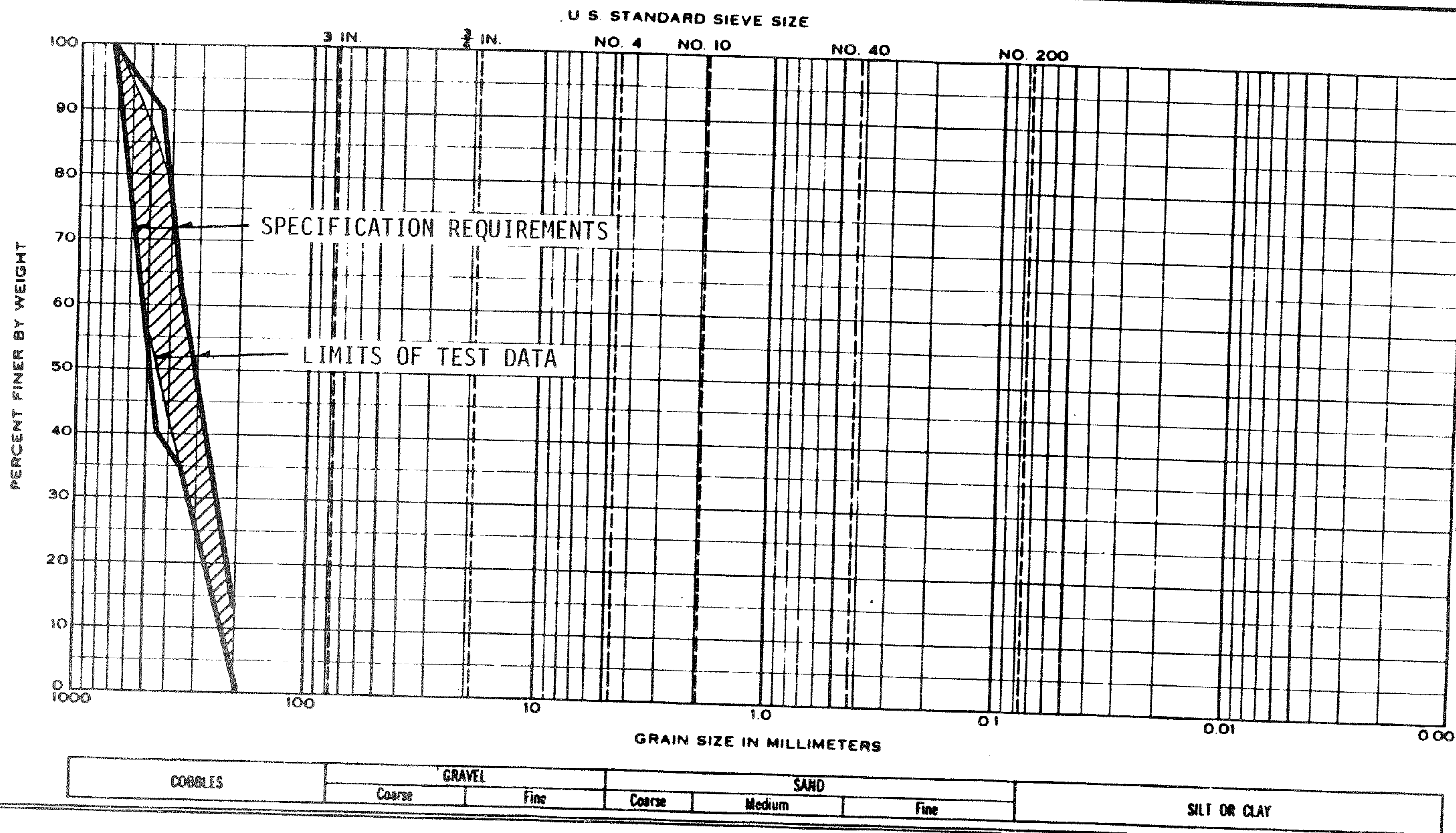
SUMMARY OF THREE GRADATION TESTS REPRESENTING
36,000 CUBIC YARDS OF MATERIAL
(INCLUDES DATA THROUGH JUNE, 1976)

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary Of Construction Control
Gradation Tests - Zone B Rock
(Sheet 1 of 3)

Figure 2.5-149



ZONE D RIPRAP

Summary of 5 Gradation Tests
Representing 20186 Cubic Yards

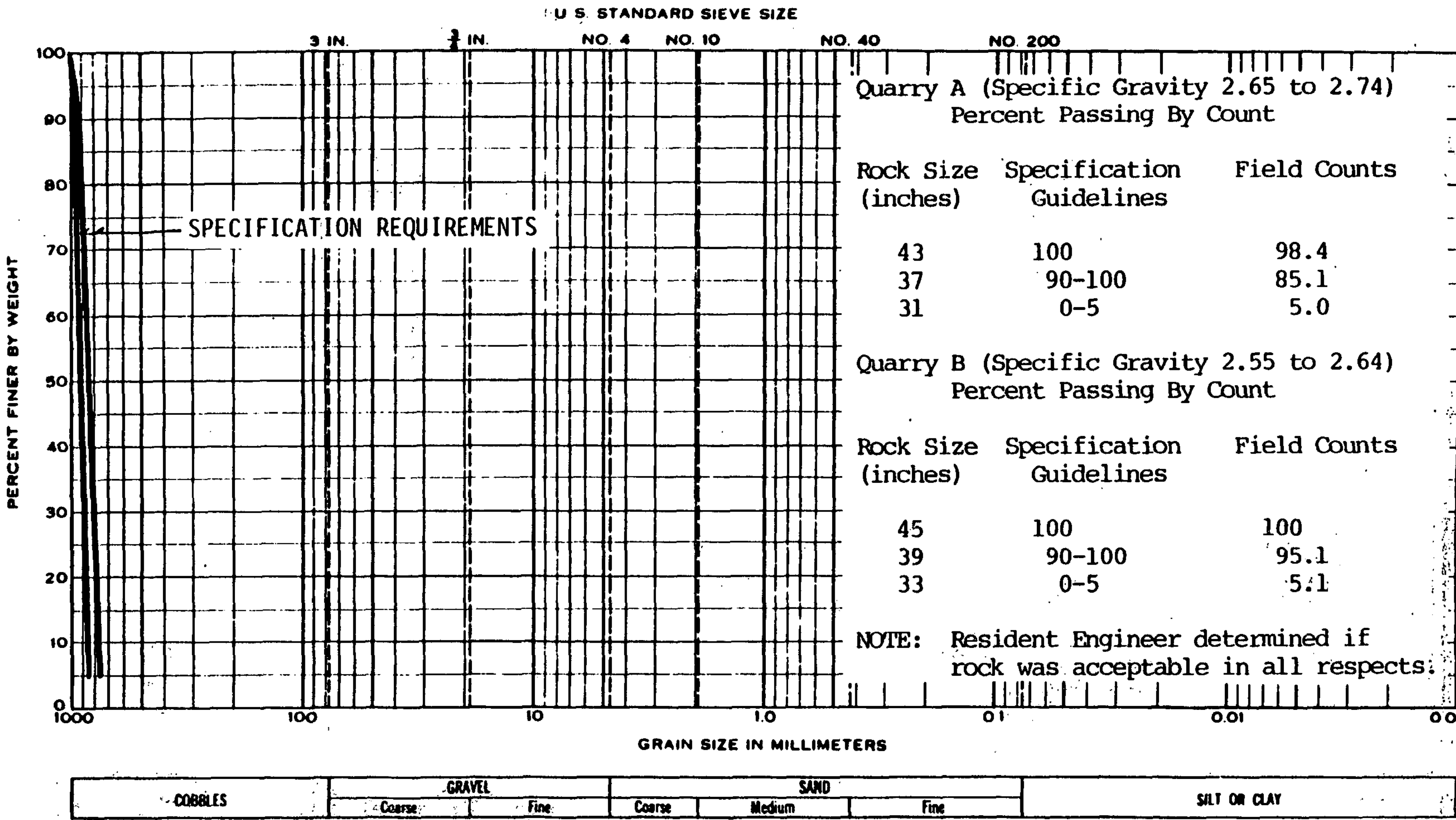
GRADATION CURVES

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary Of Construction Control
Gradation Tests - Zone D Rock
(Sheet 2 of 3)

Figure 2.5-149

Amendment 0
August 1984



Quarry A (Specific Gravity 2.65 to 2.74)
Percent Passing By Count

Rock Size (inches)	Specification Guidelines	Field Counts
43	100	98.4
37	90-100	85.1
31	0-5	5.0

Quarry B (Specific Gravity 2.55 to 2.64)
Percent Passing By Count

Rock Size (inches)	Specification Guidelines	Field Counts
45	100	100
39	90-100	95.1
33	0-5	5.1

NOTE: Resident Engineer determined if rock was acceptable in all respects.

ZONE C RIPRAP
Summary of 102 Gradation Tests
Representing 25710 Cubic Yards

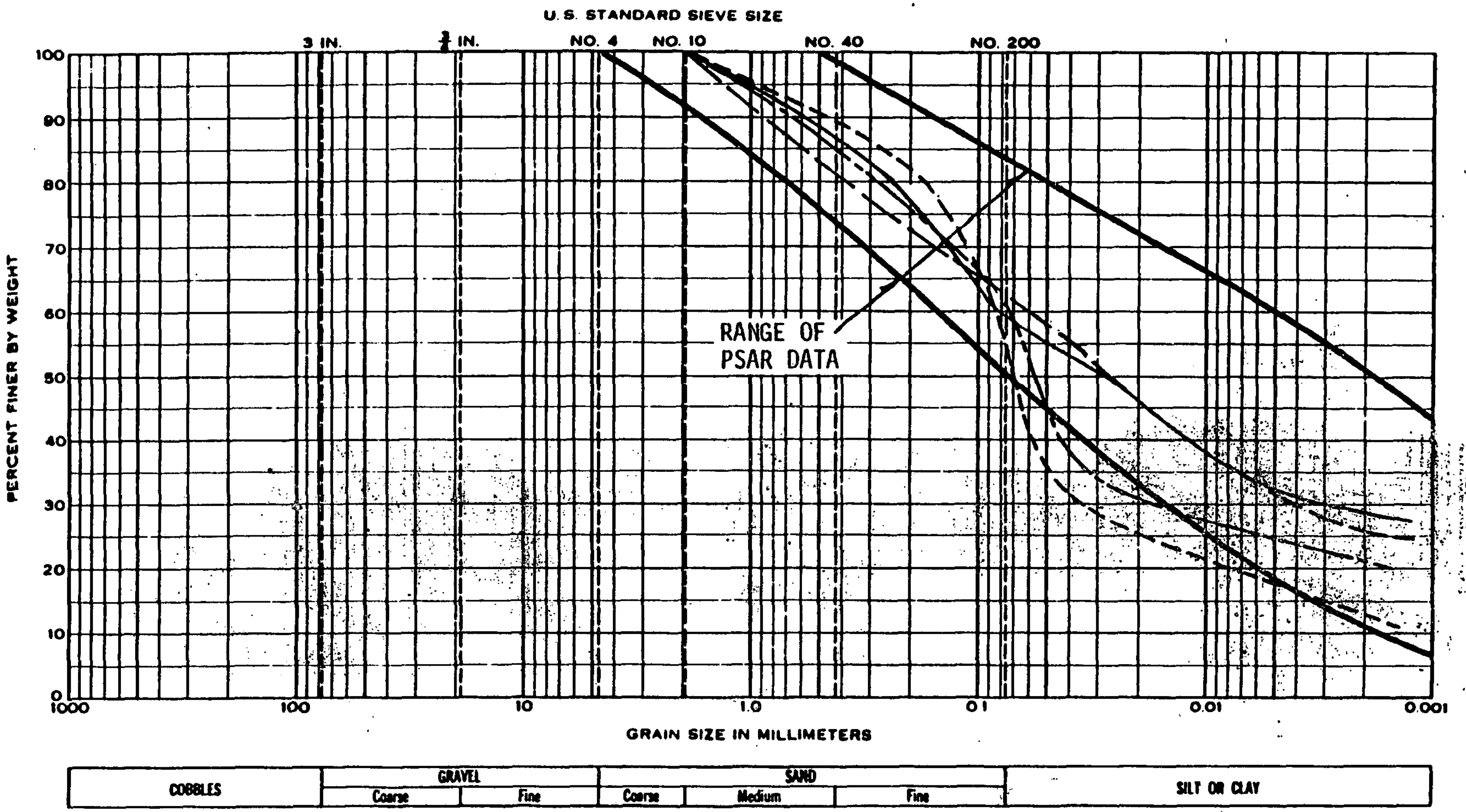
Amendment 0
August 1984

GRADATION CURVES

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary Of Construction Control
Gradation Tests - Zone C Rock
(Sheet 3 of 3)

Figure 2.5-149



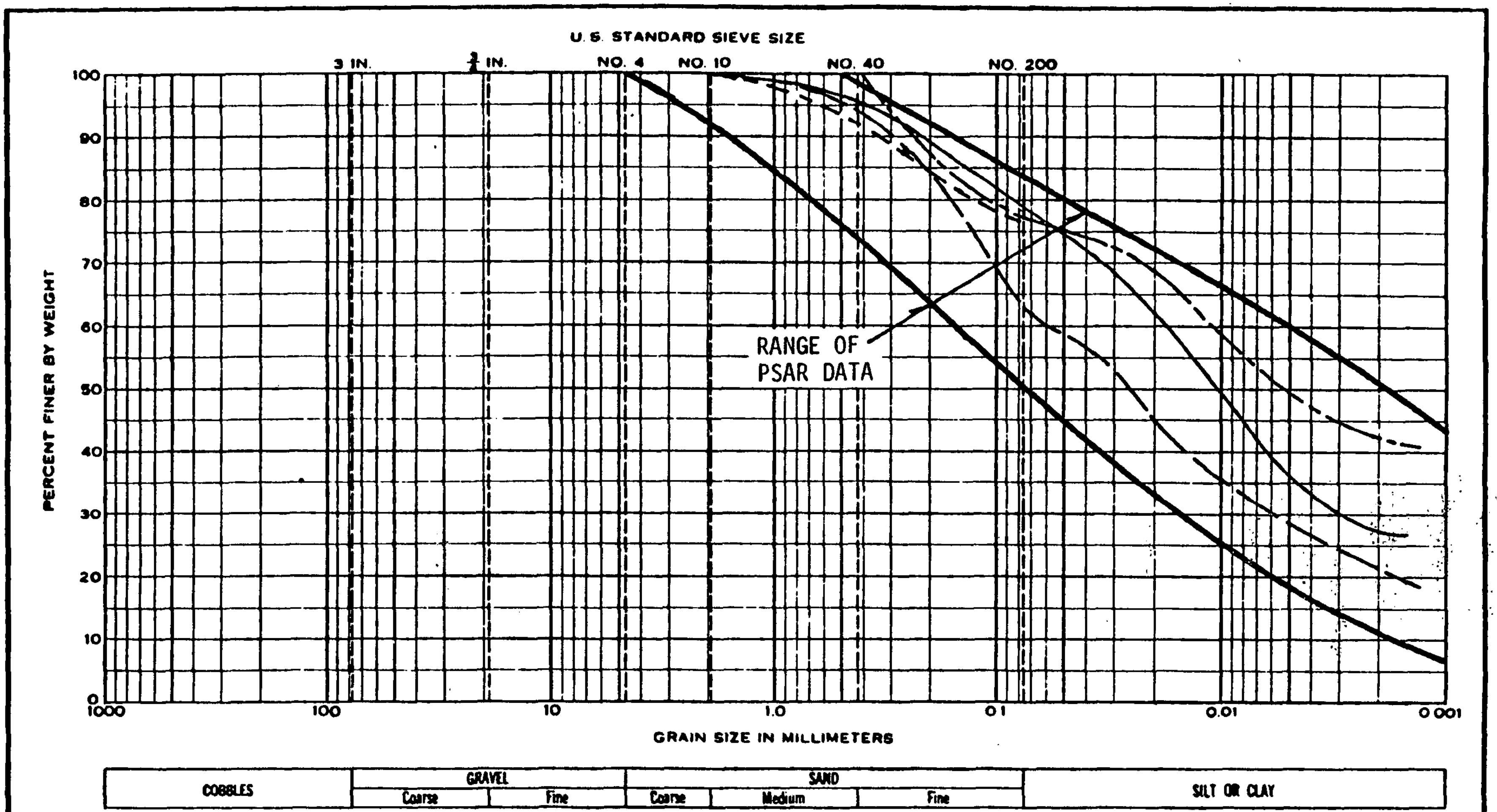
Sample No.	Elev or Depth	Classification	NatWC	LL	PL	PI	SYMBOL
UDS- 1	-	ML	29.5	43	33	10	————
UDS- 2	-	ML	22.2	43	33	10	— — —
UDS- 3	-	ML	23.2	42	34	8	—·—·—
UDS- 4	-	ML-SM	20.3	41	37	4	- - - - -

GRADATION CURVES

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Grain Size Distribution Curves - Block Samples (Sheet 1 of 8)

Figure 2.5-150



Sample No.	Elev or Depth	Classification	NatWC	LL	PL	PI	SYMBOL
UDS- 5	-	MH	27.0	59	46	13	————————
UDS- 7	-	MH	24.7	59	34	25	– – – – – – – –
UDS- 9	-	MH	24.3	69	43	26	——– –——– – ——
UDS-11	-	MH	24.3	61	43	18	—— —— —— ——

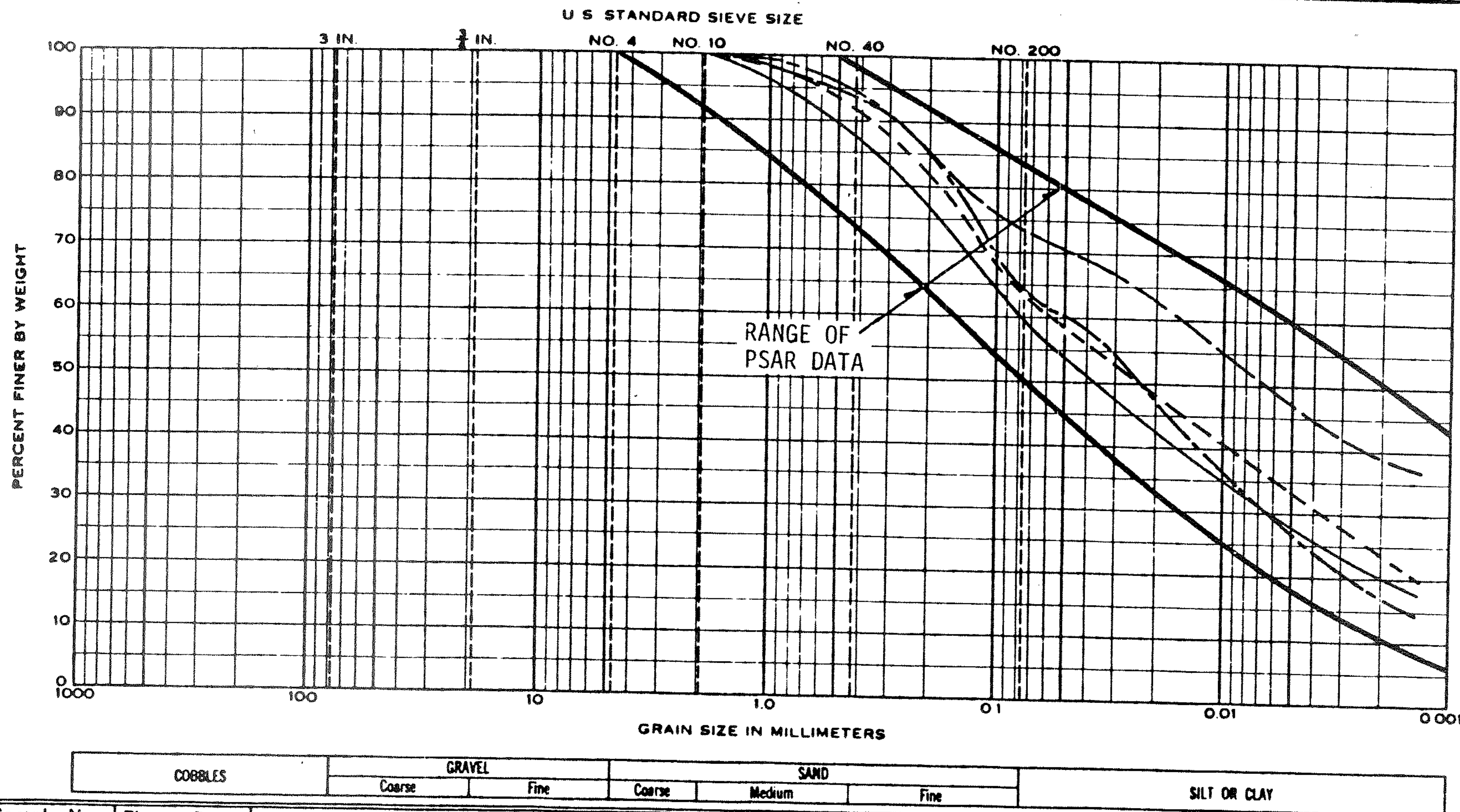
GRADATION CURVES

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Grain Size Distribution
Curves - Block Samples
(Sheet 2 of 8)

Figure 2.5-150

Amendment 0
August 1984



Sample No.	Elev or Depth	Classification	NatWC	LL	PL	PI	SYMBOL
UDS-12	330.0	MH	25.2	59	45	14	————
UDS-13	375.0	MH	18.6	60	49	11	- - - -
UDS-14	336.0	ML	18.4	48	44	4	—-—-—
UDS-15	348.0	MH	21.1	57	41	16	— — —

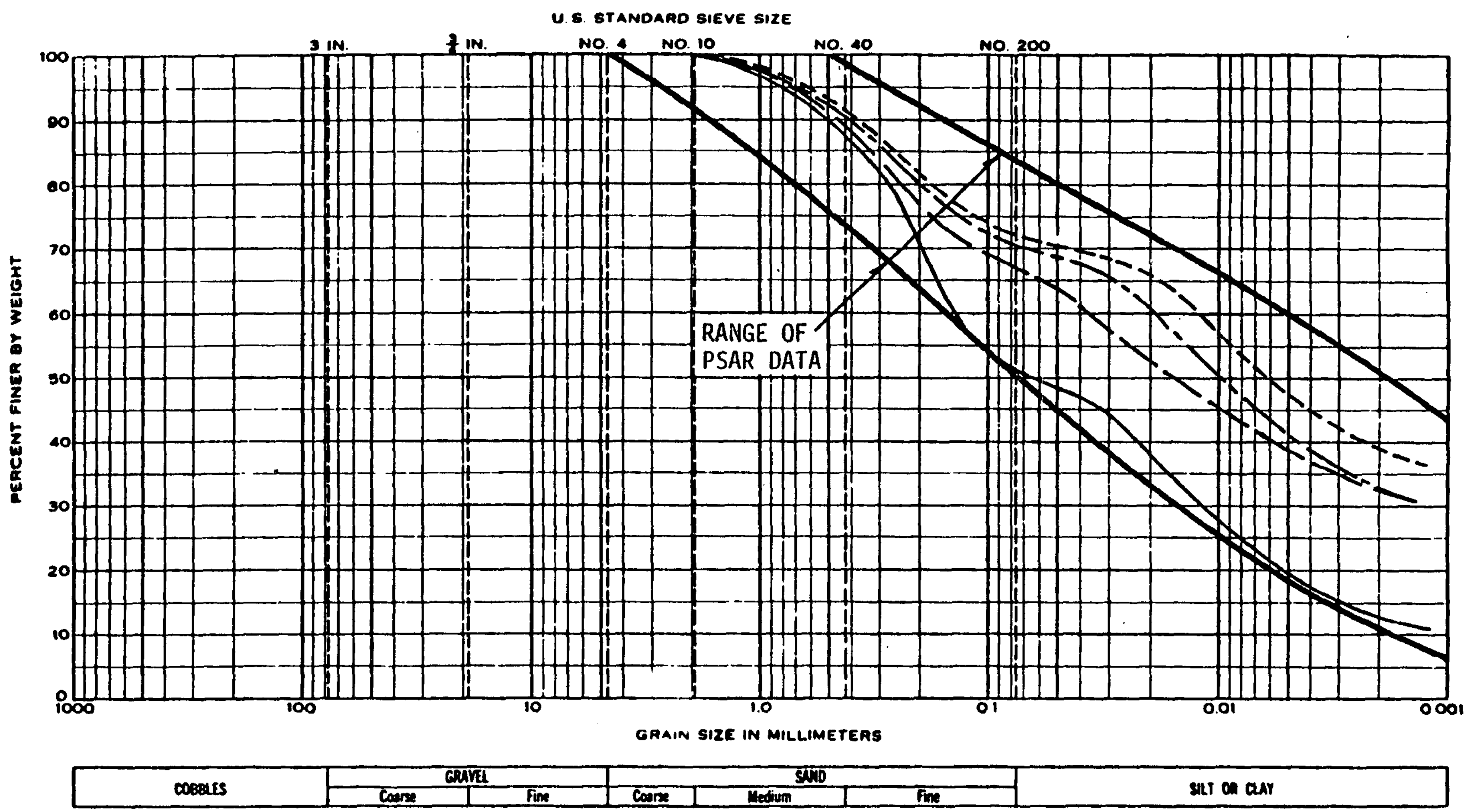
GRADATION CURVES

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Grain Size Distribution
Curves - Block Samples
(Sheet 3 of 8)

Figure 2.5-150

Amendment 0
August 1984



Sample No.	Elev or Depth	Classification	Nat WC	LL	PL	PI	SYMBOL
UDS-17	391	ML-SM	19.1	NP	NP	-	
UDS-18	402	MH	22.7	68	44	24	
UDS-19	344	MH	22.0	52	45	7	
UDS-20	407	MH-CH	25.2	60	32	28	

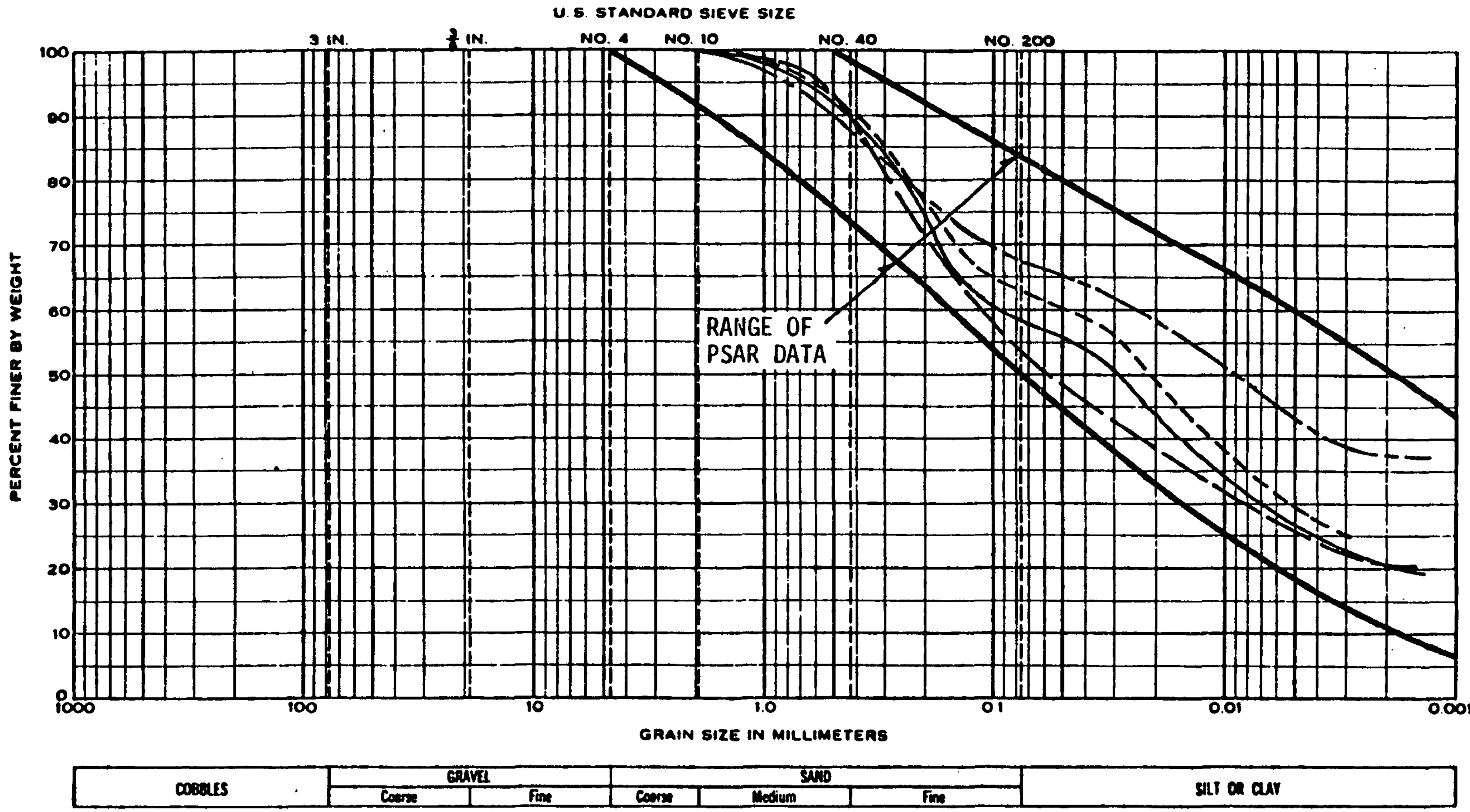
GRADATION CURVES

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Grain Size Distribution
Curves - Block Samples
(Sheet 4 of 8)

Figure 2.5-150



Sample No.	Elev or Depth	Classification	NatWC	LL	PL	PI	SYMBOL
UDS-21	363	ML	-	49	41	8	————————
UDS-22	N/A	ML	24	44	39	5	- - - - - - - - -
UDS-24	422	ML	22	NP	NP	-	————- - —-
UDS-26	369	ML-SM	20	47	34	13	—— —— ——

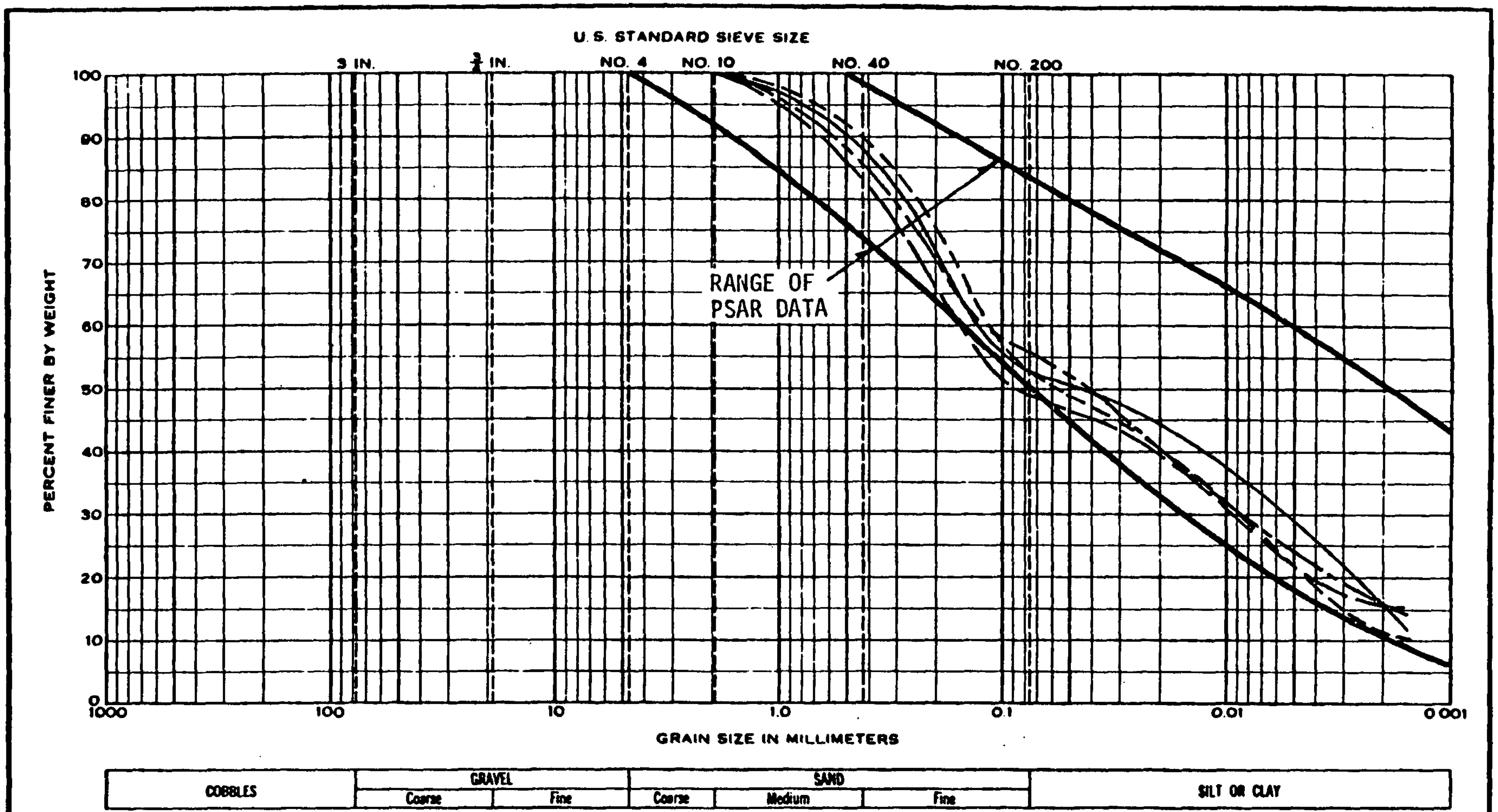
GRADATION CURVES

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Grain Size Distribution
Curves - Block Samples
(Sheet 5 of 8)

Figure 2.5-150



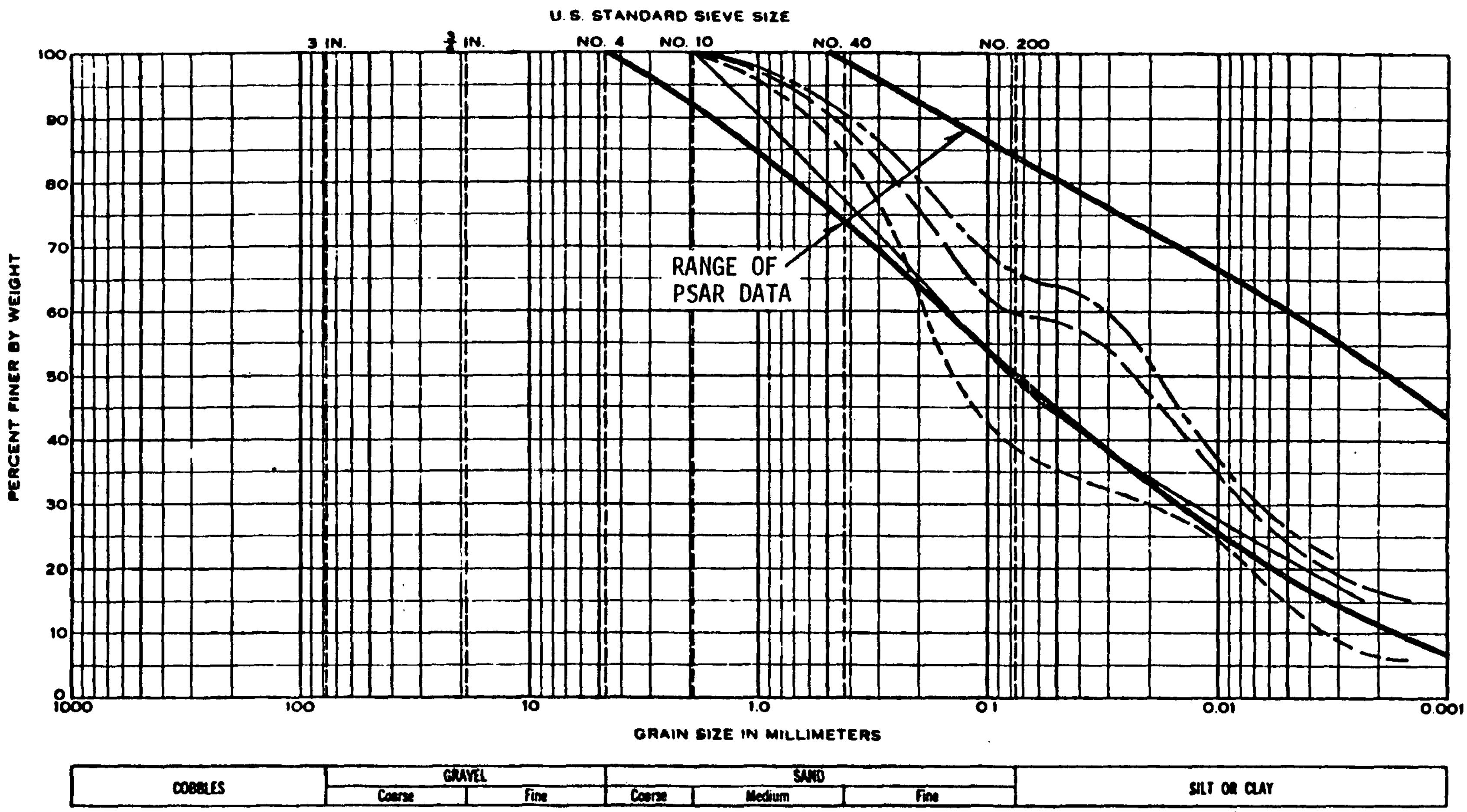
Sample No.	Elev or Depth	Classification	NatWC	LL	PL	PI	SYMBOL
UDS-28	N/A	ML-SM	21	NP	NP	-	————
UDS-30	379	ML-MH	21	51	44	7	– – – – –
UDS-31	381	ML-MH	-	54	41	13	—– — –—
UDS-33	N/A	ML	19	NP	NP	-	—— —— ——

GRADATION CURVES

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Grain Size Distribution Curves - Block Samples (Sheet 6 of 8)

Figure 2.5-150



Sample No.	Elev or Depth	Classification	NatWC	LL	PL	PI	SYMBOL
UDS-34	N/A	SM	20	NP	NP	-	———
UDS-36	416	SM-ML	23	NP	NP	-	- - - -
UDS-37	384	ML	21	NP	NP	-	—-—-—
UDS-44	408	ML	19	43	36	7	— — —

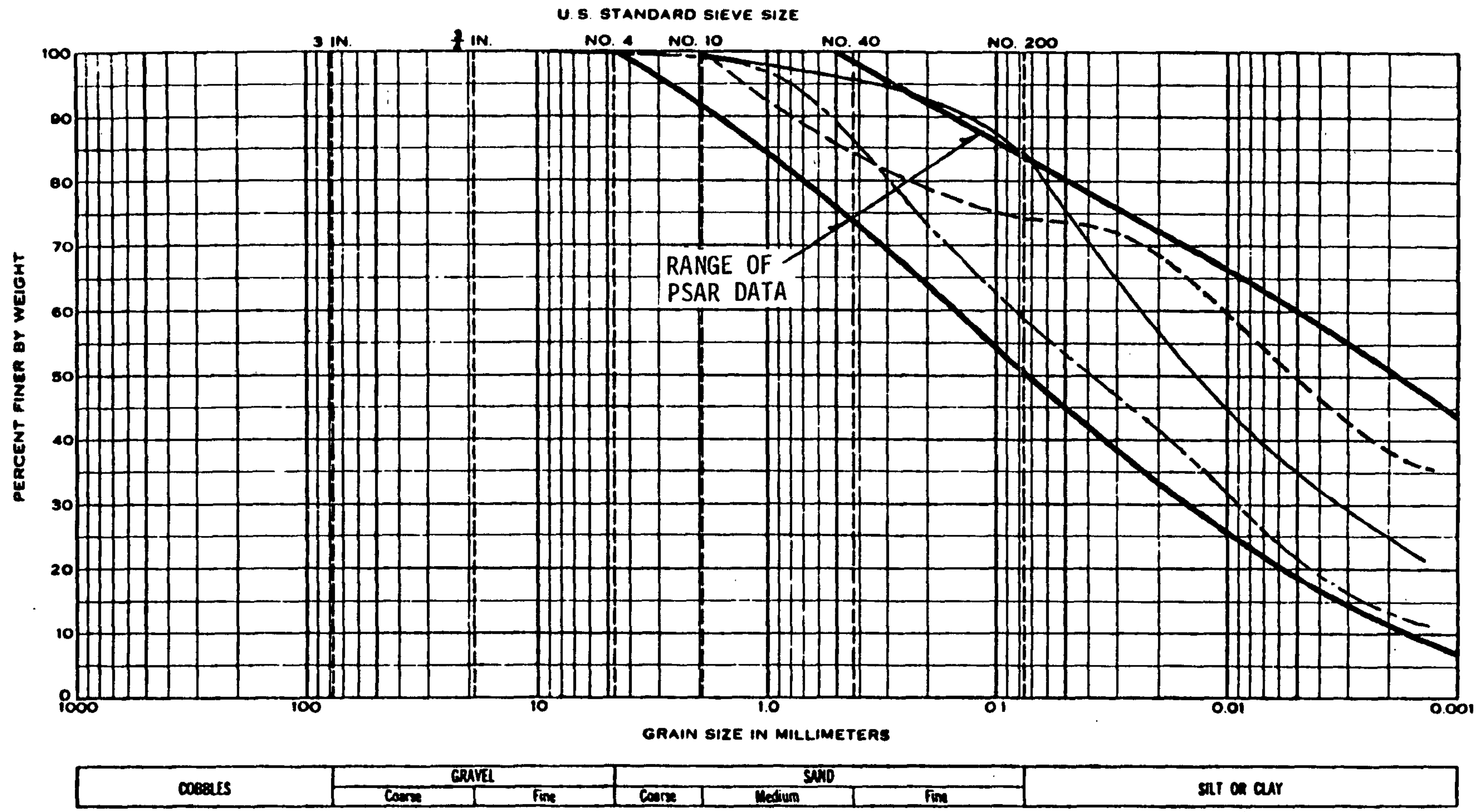
GRADATION CURVES

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Grain Size Distribution
Curves - Block Samples
(Sheet 7 of 8)

Figure 2.5-150



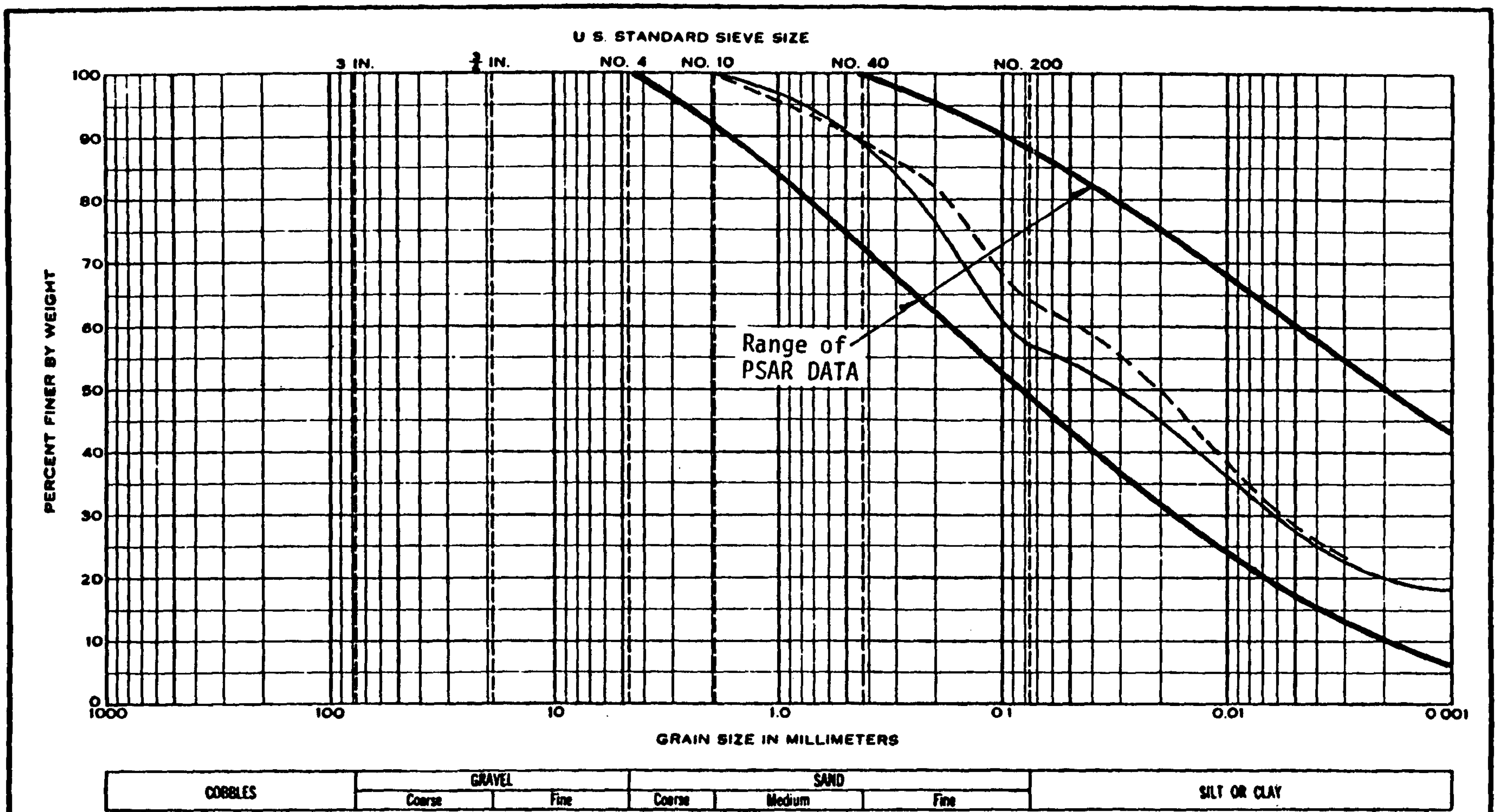
Sample No.	Elev or Depth	Classification	Nat WC	LL	PL	PI	SYMBOL
UDS-48	431	MH	27	55	48	7	———————
UDS-49	430	MH	24	57	44	13	– – – – – – –
UDS-38	394	MH	20	52	44	8	—— – —— – ——

GRADATION CURVES

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Grain Size Distribution
Curves - Block Samples
(Sheet 8 of 8)

Figure 2.5-150



Sample No.	Elev or Depth	Classification	NatWC	LL	PL	PI	
UDS-21	N/A	ML	25.1	49	41	8	————————
UDS-22	N/A	ML	23.5	44	39	5	— — — — — —

GRADATION CURVES

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Grain Size Distribution
Curves - Borrow Source G

Figure 2.5-150a

UNCONFINED COMPRESSION TEST

Project Virgil C. Summer Nuclear Station

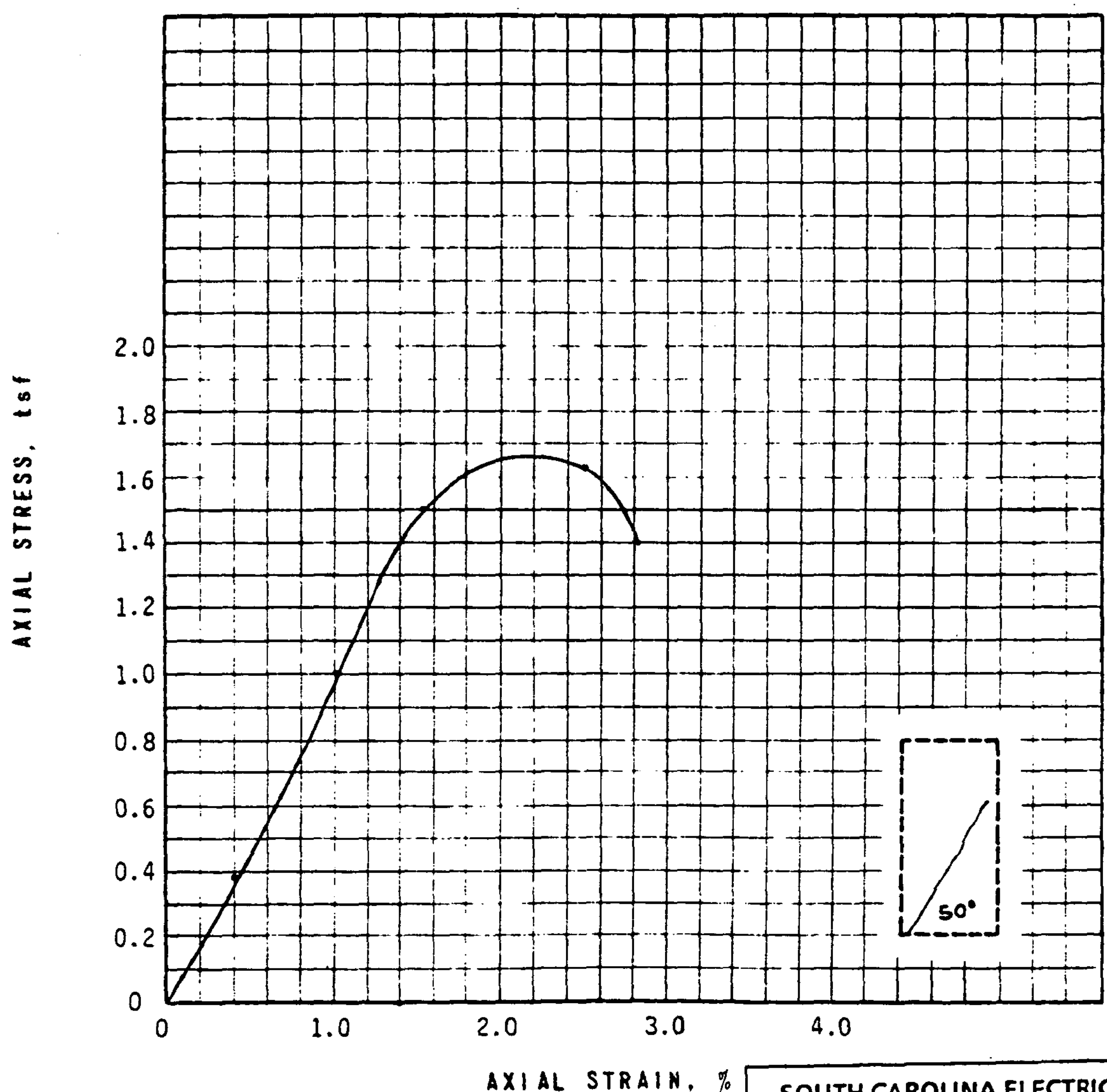
Block No. UDS-2 Coord. N 472,591 E 1,905,450 Elev. 383

Description Red-brown micaceous decomposed sandy silt (ML)

Moisture Content 23.2 % Dry Density 89.9 pcf

Liquid Limit 43 % Plastic Limit 33 %

Maximum Axial Stress 1.695 tsf @ 2.0 % Strain



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconfined Compression Test Results On Block Samples (Sheet 1 of 2)

Figure 2.5-151

UNCONFINED COMPRESSION TEST

Project Virgil C. Summer Nuclear Station

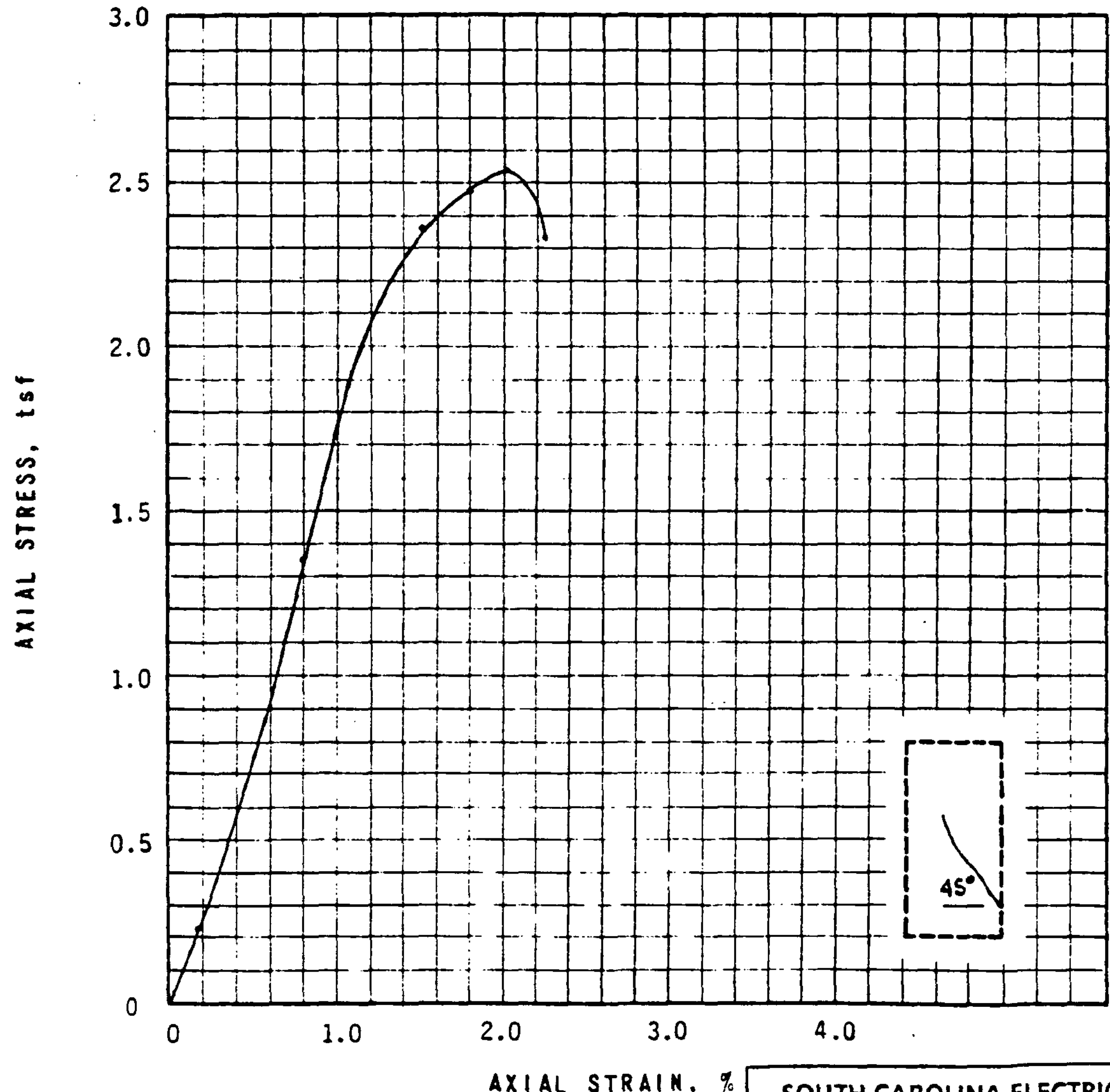
Block No. UDS-4 Coord. N 472,745 E 1,905,425 Elev. 390

Description Red-brown micaceous decomposed sandy silt (ML)

Moisture Content 21.2 % Dry Density 93.6 pcf

Liquid Limit 41 % Plastic Limit 37 %

Maximum Axial Stress 2.5 tsf @ 2.0 % Strain

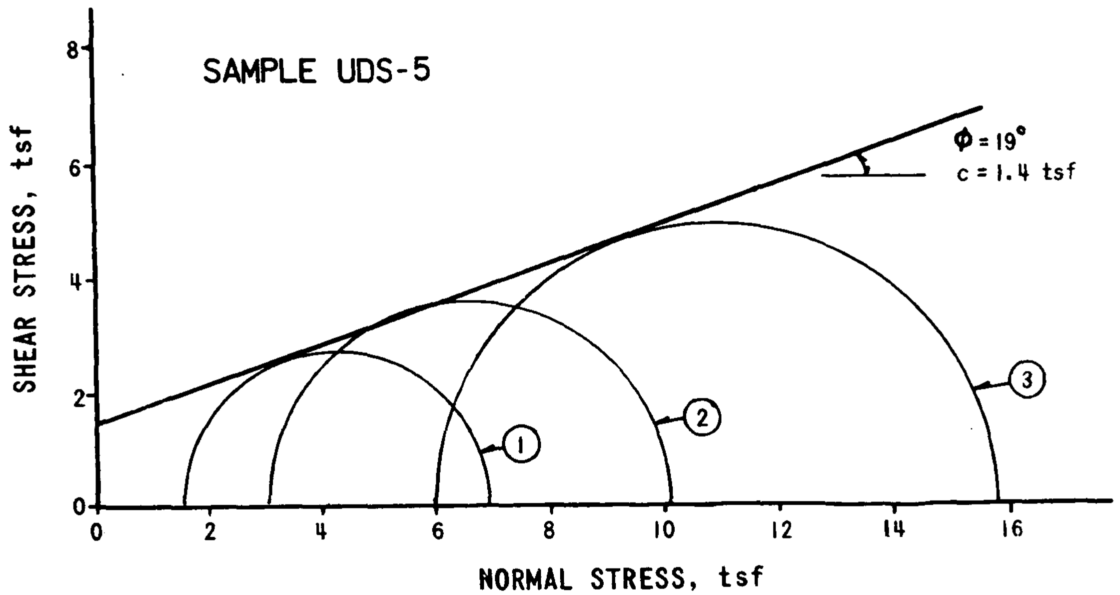


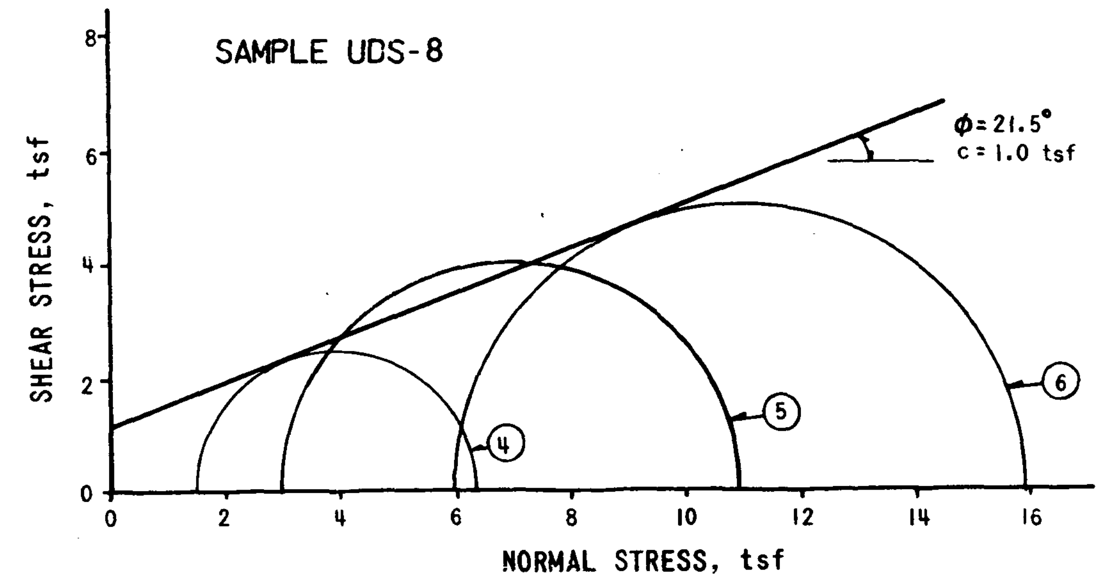
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconfined Compression Test Results
On Block Samples
(Sheet 2 of 2)

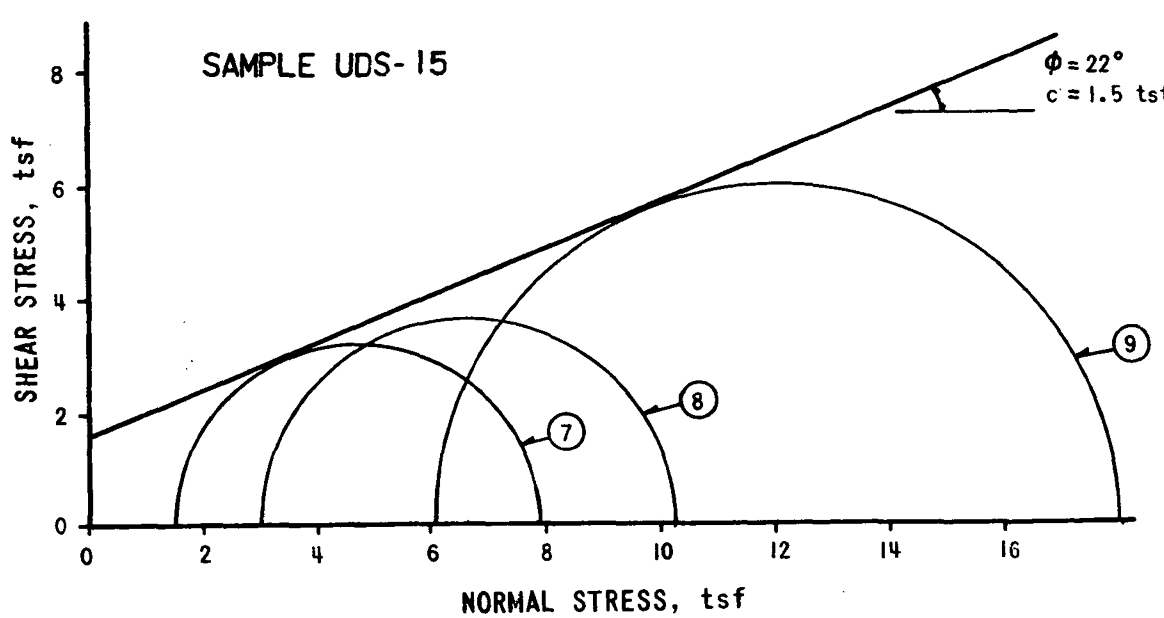
Figure 2.5-151

Amendment 0
August 1984





TEST NO.	SAMPLE NO.	LOCATION	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	PERCENT COMP.	CONFINING PRESSURE (tsf)	STRAIN (%)
1	UDS-5	NORTH DAM	92.4	27.5	89.0	1.50	16.0
2	UDS-5	NORTH DAM	91.7	28.7	88.3	3.00	15.0
3	UDS-5	NORTH DAM	92.7	28.0	89.3	6.00	18.0
4	UDS-8	NORTH DAM	88.0	23.2	87.4	1.50	5.0
5	UDS-8	NORTH DAM	92.9	25.1	92.3	3.00	5.0
6	UDS-8	NORTH DAM	96.8	23.6	96.2	6.00	5.0
7	UDS-15	NORTH DAM	91.8	21.1	91.2	2.00	15.0
8	UDS-15	NORTH DAM	86.5	21.1	85.9	3.00	17.0
9	UDS-15	NORTH DAM	94.9	21.1	94.2	6.00	15.0

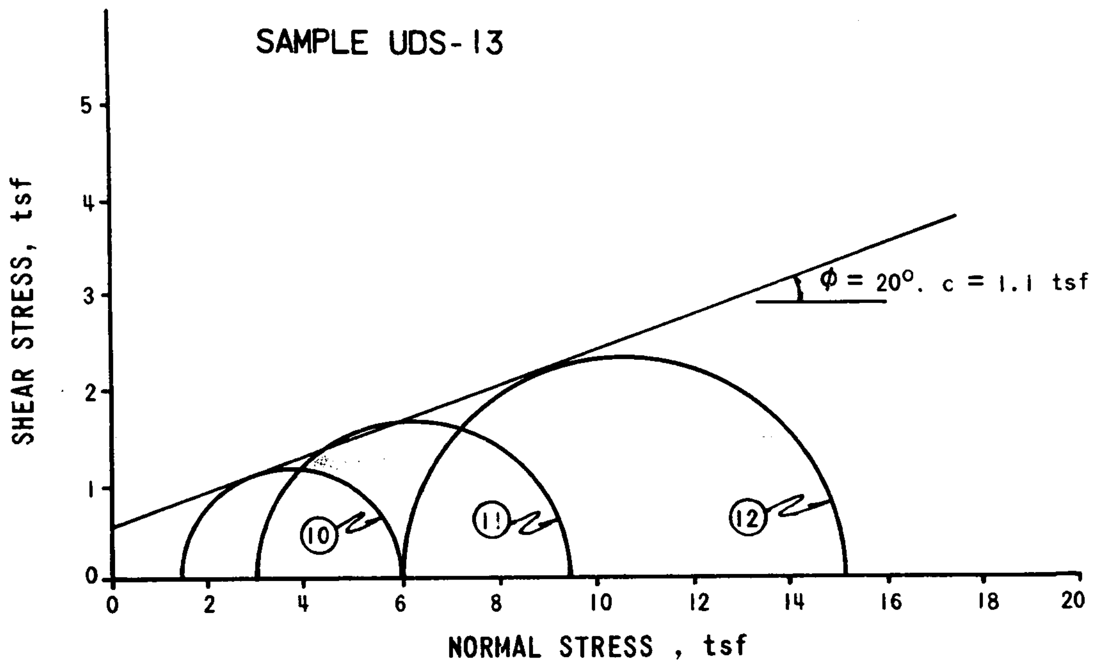


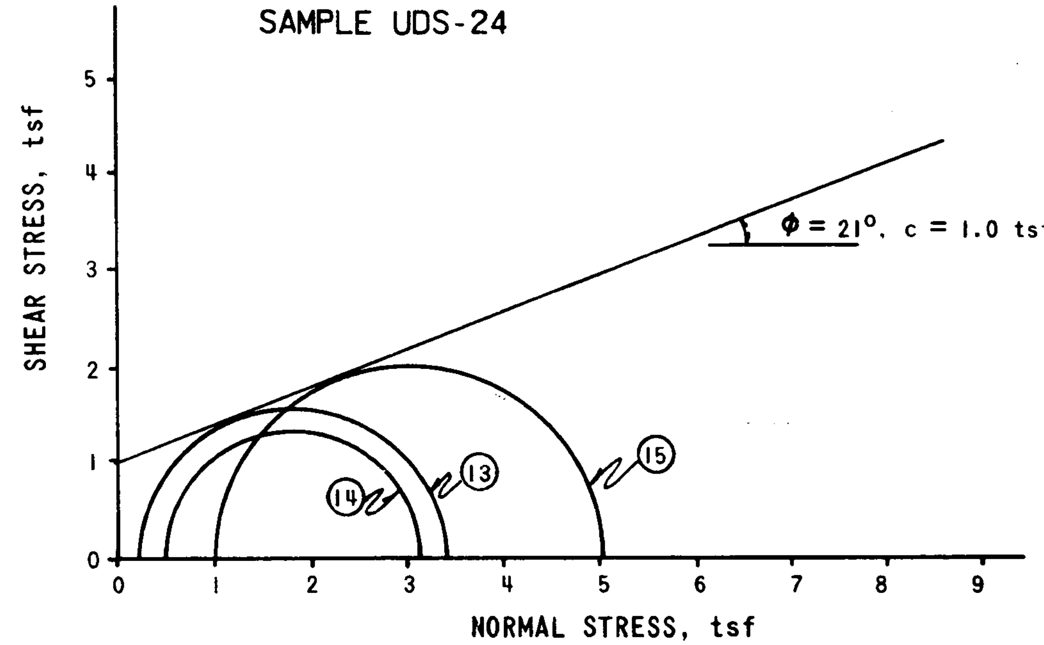
Amendment 0
August 1984

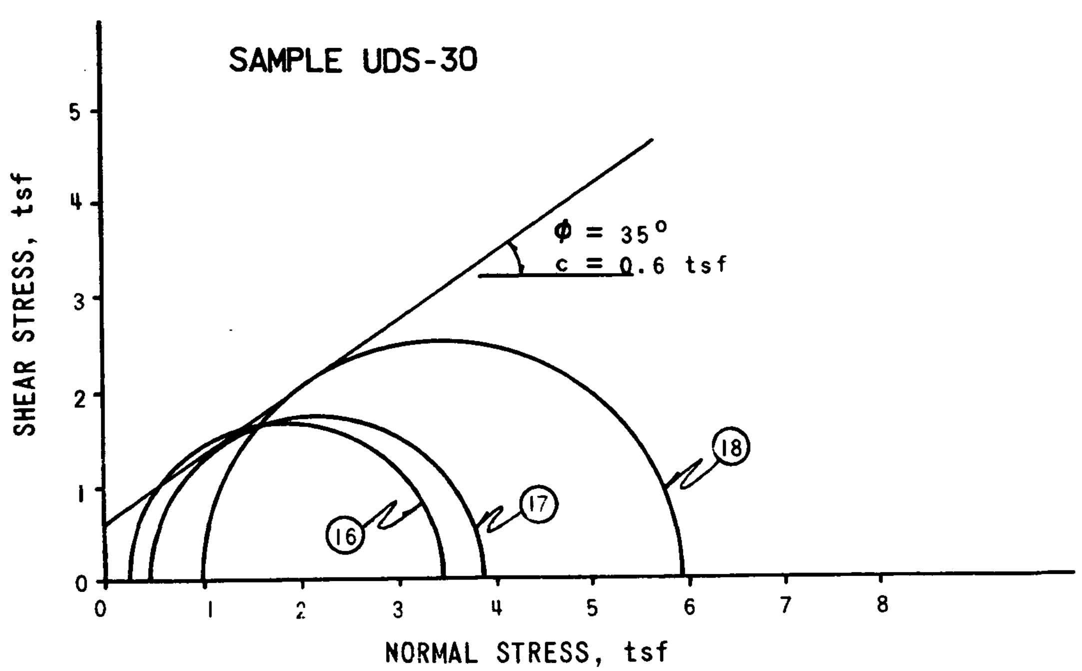
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconsolidated-Undrained Triaxial Compression Test On Block Samples (Sheet 1 of 4)

Figure 2.5-152







TEST NO.	SAMPLE NO.	LOCATION	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	PERCENT COMP.	CONFINING PRESSURE (tsf)	STRAIN (%)
10	UDS-13	SOUTH DAM	91.2	18.8	86.0	1.5	16.5
11	UDS-13		86.1	18.6	81.2	3.0	22.0
12	UDS-13		86.1	18.6	81.2	6.0	19.0
13	UDS-24	SOUTH DAM	91.8	22.3	86.8	0.25	1.78
14	UDS-24		83.1	22.9	78.6	0.50	8.05
15	UDS-24		87.1	20.4	82.4	1.00	6.03
16	UDS-30	NORTH DAM	93.7	20.1	86.6	0.25	4.5
17	UDS-30		92.2	21.5	85.2	0.50	3.5
18	UDS-30		91.7	21.0	84.8	1.00	5.0

Amendment 0
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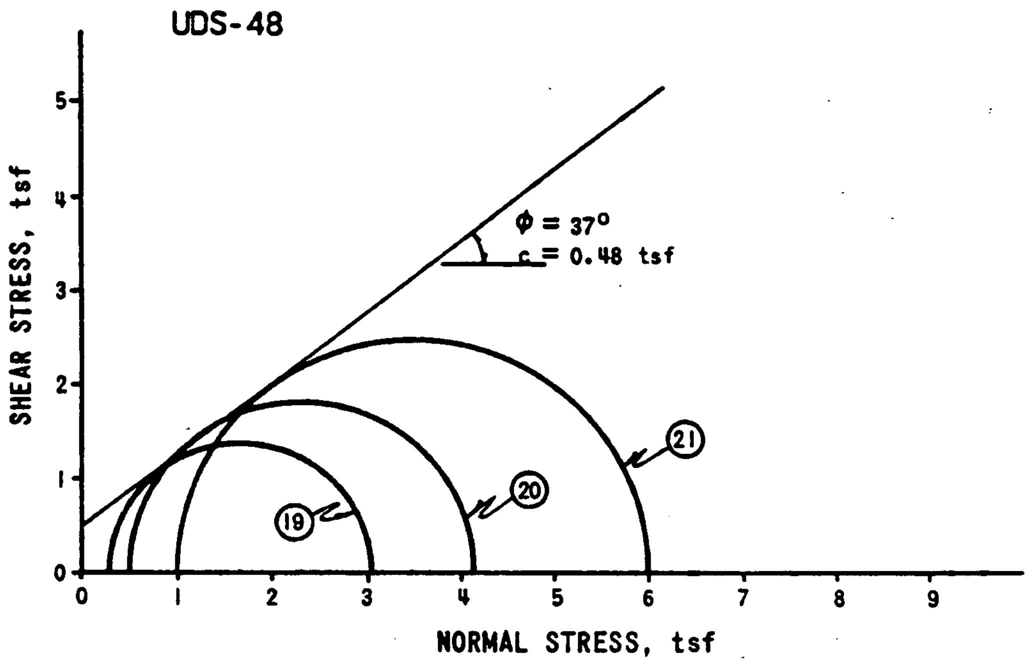
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconsolidated-Undrained Triaxial Compression Test On Block Samples
(Sheet 2 of 4)

Figure 2.5-152



TEST NO.	SAMPLE NO.	LOCATION	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	PERCENT COMP.	CONFINING PRESSURE (tsf)	STRAIN (%)
19	UDS-48		95.9	25.4	91.9	0.25	3.57
20	UDS-48	EAST DAM	96.9	25.6	92.8	0.50	3.93
21	UDS-48		95.4	25.5	91.4	1.00	8.75

Amendment 0
August 1984

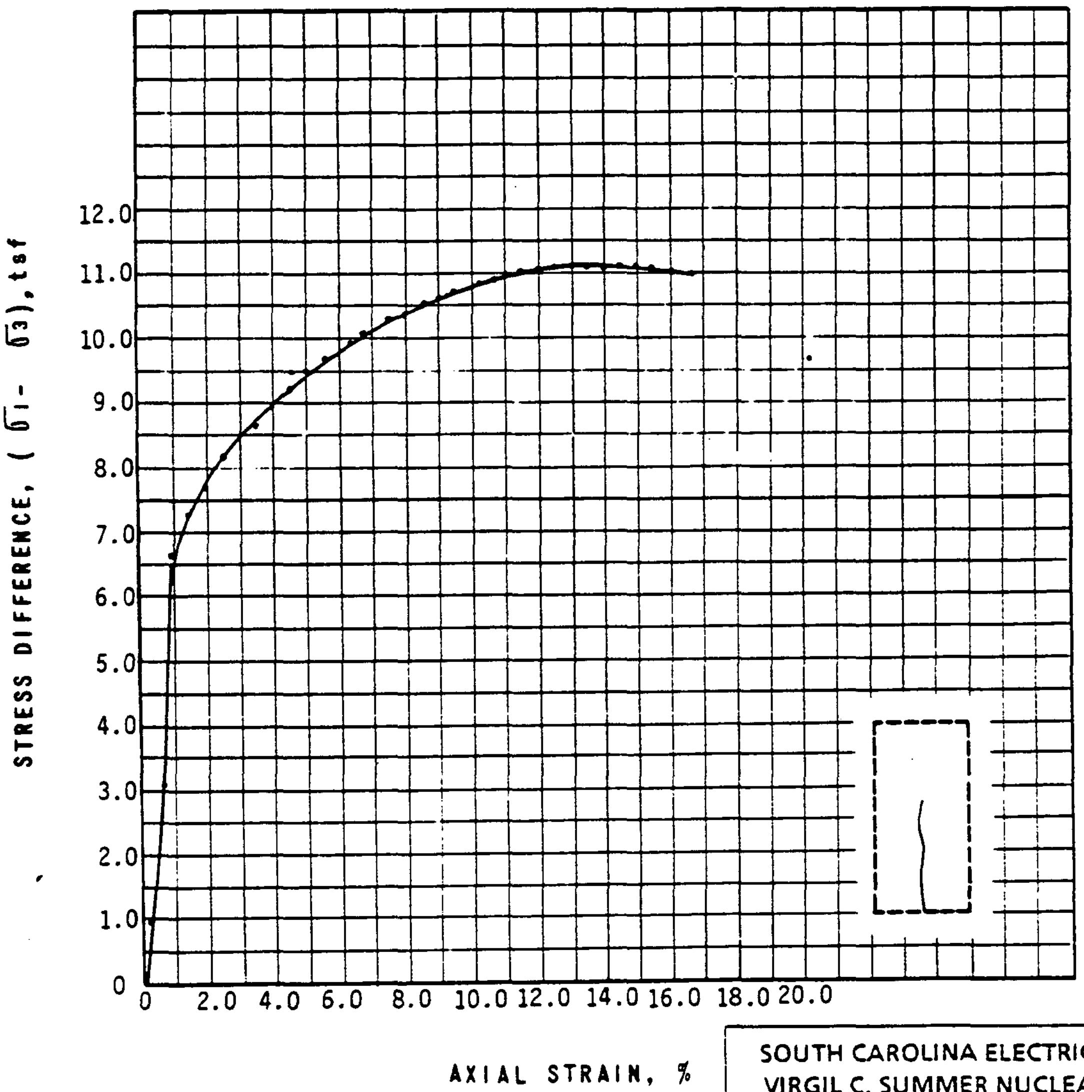
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconsolidated-Undrained Triaxial Compression Test On Block Samples
(Sheet 3 of 4)

Figure 2.5-152

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

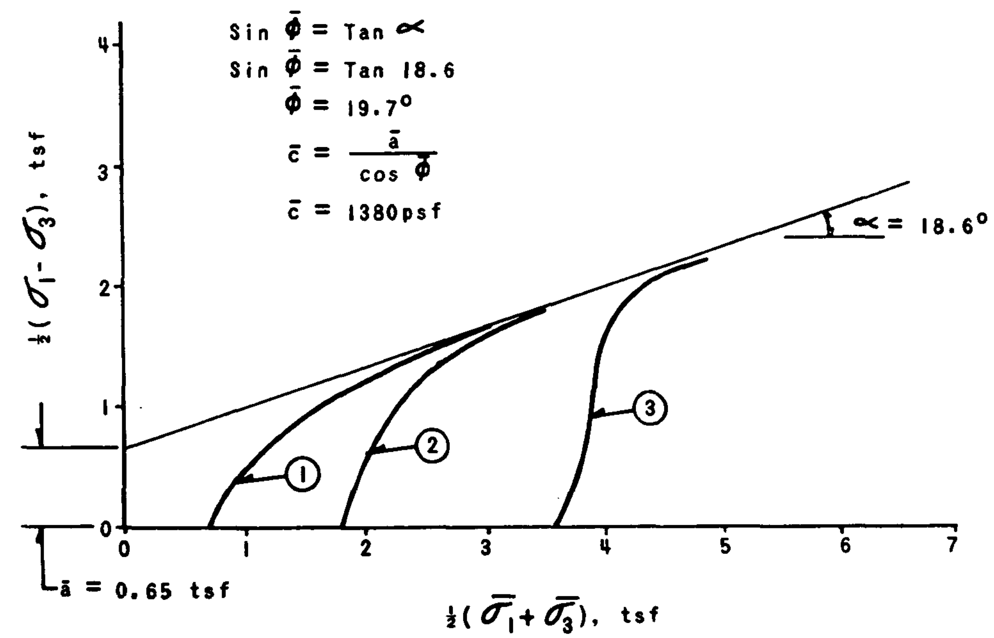
Project Virgil C. Summer Nuclear Station	
Block No. UDS-1 Coord. N 472,375 E 1,905,400	Elev. 369
Description Red-brown micaceous decomposed sandy silt (MH)	
Moisture Content 29.4 %	Dry Density 93.7 pcf
Liquid Limit 60 % Plastic Limit 38 %	Relative Density %
$(\sigma_1 - \sigma_3)$ max.= 11.25 tsf at 15.0 % Strain	Chamber Pressure, σ_c = 3.66 tsf

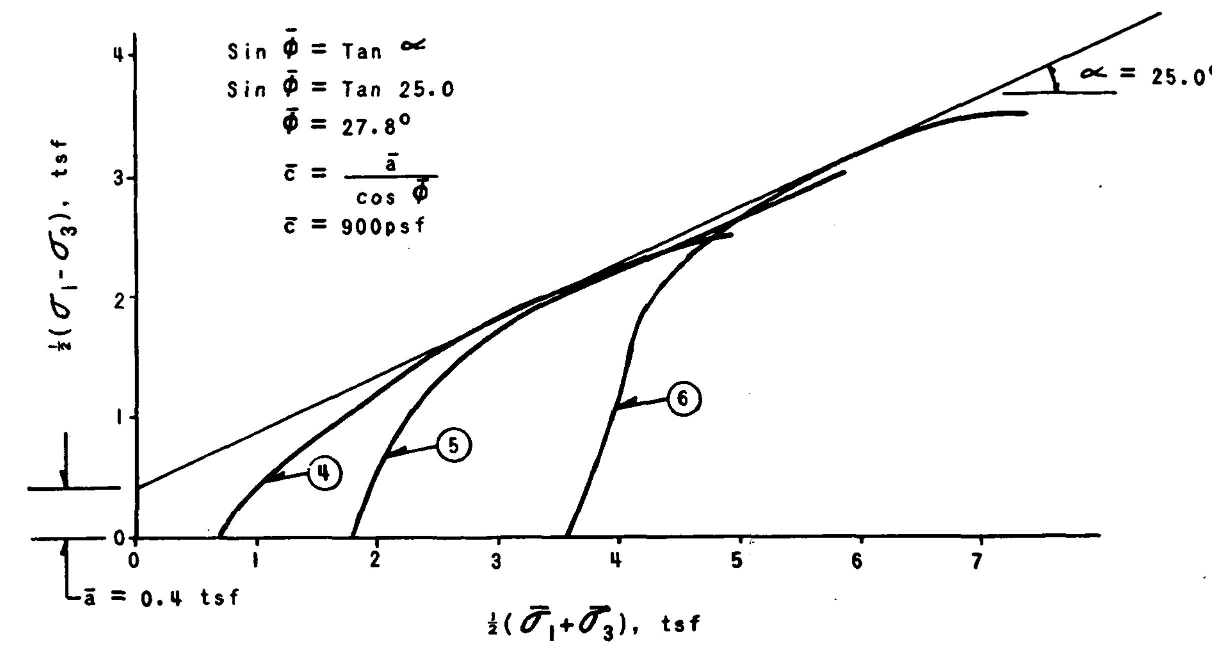


SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Unconsolidated-Undrained Triaxial Compression Test On Block Samples (Sheet 4 of 4)

Figure 2.5-152





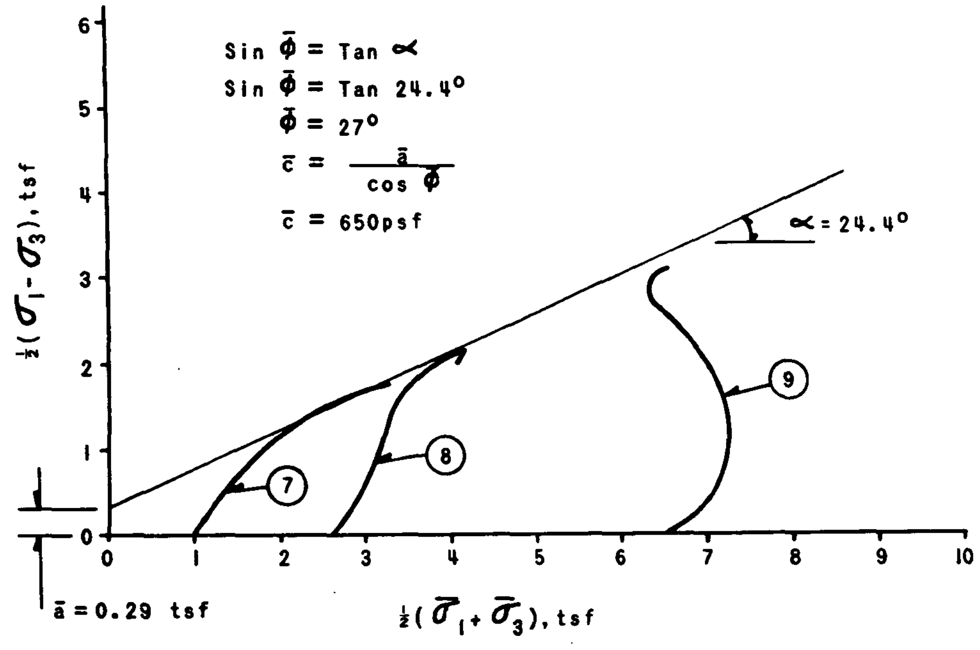
TEST NO.	BLOCK NO.	LOCATION	LL	PL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	$\bar{\sigma}_c$ (tsf)	$\frac{1}{2}(\sigma_1 - \sigma_3)_{max}$ (tsf)	ϵ_f (%)	$\bar{\phi}$ (deg)	$\bar{c}$ (psf)
1	UDS-1	WEST EMBANK	60	38	29.8	91.4	0.72	1.62	13.0	18.8	1520
2	UDS-1				24.1	91.5	1.80	1.78	12.5		
3	UDS-1				23.8	93.0	3.60	2.21	13.6		
4	UDS-3	WEST EMBANK	45	35	22.3	101.5	0.72	2.56	14.2	25.2	1104
5	UDS-3				22.5	102.0	1.80	3.00	15.4		
6	UDS-3				22.6	101.5	3.60	3.58	17.5		

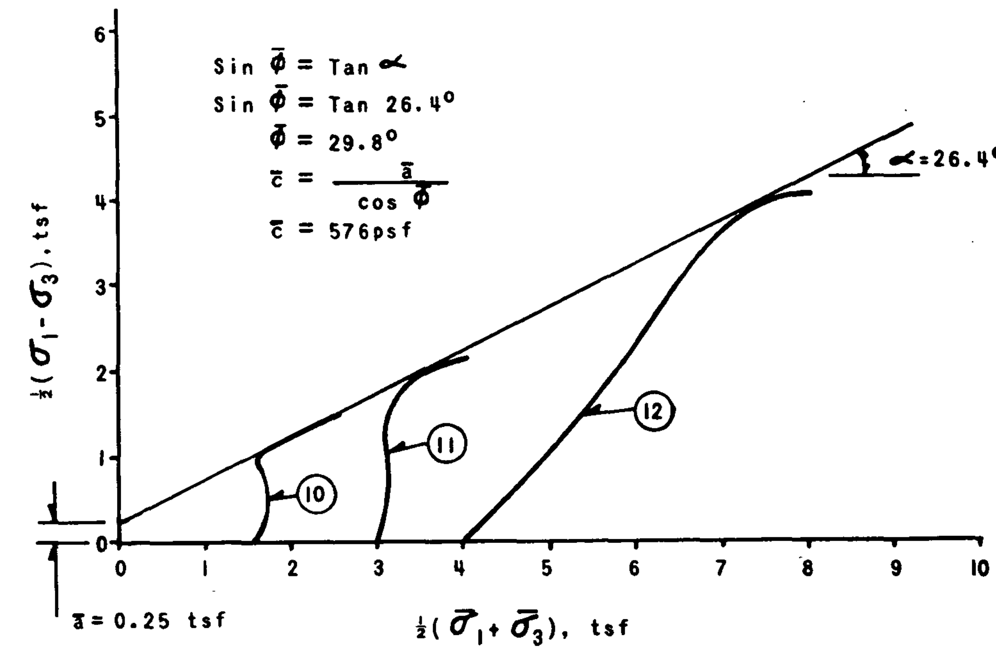
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Isotropically Consolidated, Undrained Triaxial Compression Tests On Block Samples (Sheet 1 of 7)

Figure 2.5-153





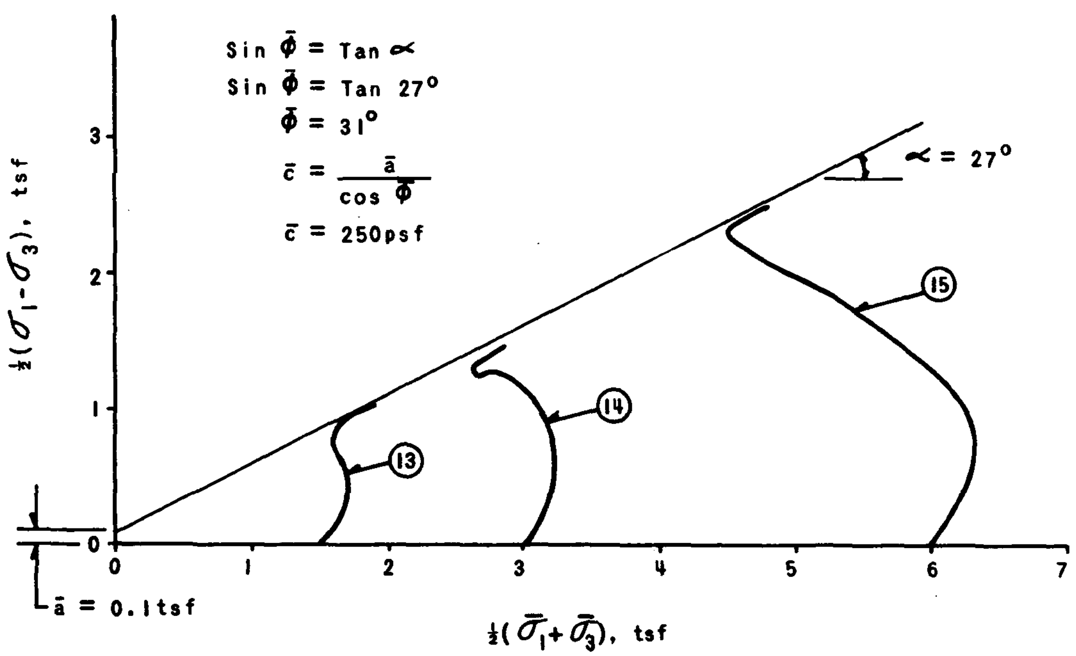
TEST NO.	BLOCK NO.	LOCATION	LL	PL	MOISTURE CONTENT (%)	DRY DENSITY (%)	$\bar{\sigma}_c$ (tsf)	$\frac{1}{2}(\sigma_1 - \sigma_3)_{max}$ (tsf)	ϵ_f (%)	$\bar{\Phi}$ (deg)	$\bar{c}$ (psf)
7	UDS-A	WEST EMBANK	NP	NP	19.9	98.5	1.0	1.82	23.0	26.4	670
8	UDS-A				19.4	97.8	2.65	2.21	12.5		
9	UDS-A				22.3	92.3	6.55	3.15	13.0		
10	UDS-9	WEST EMBANK	69	43	23.3	97.2	1.5	1.52	20.0	31	600
11	UDS-9				22.5	97.2	3.0	2.20	20.0		
12	UDS-9				24.3	99.6	4.0	4.15	7.0		

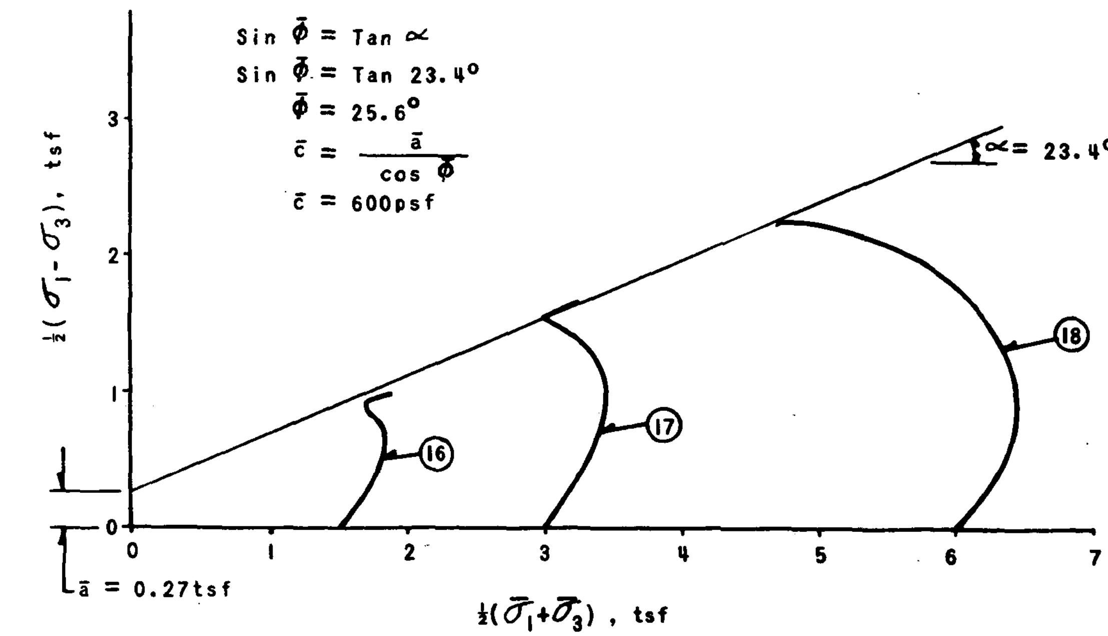
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Isotropically Consolidated, Undrained Triaxial Compression Tests On Block Samples (Sheet 2 of 7)

Figure 2.5-153





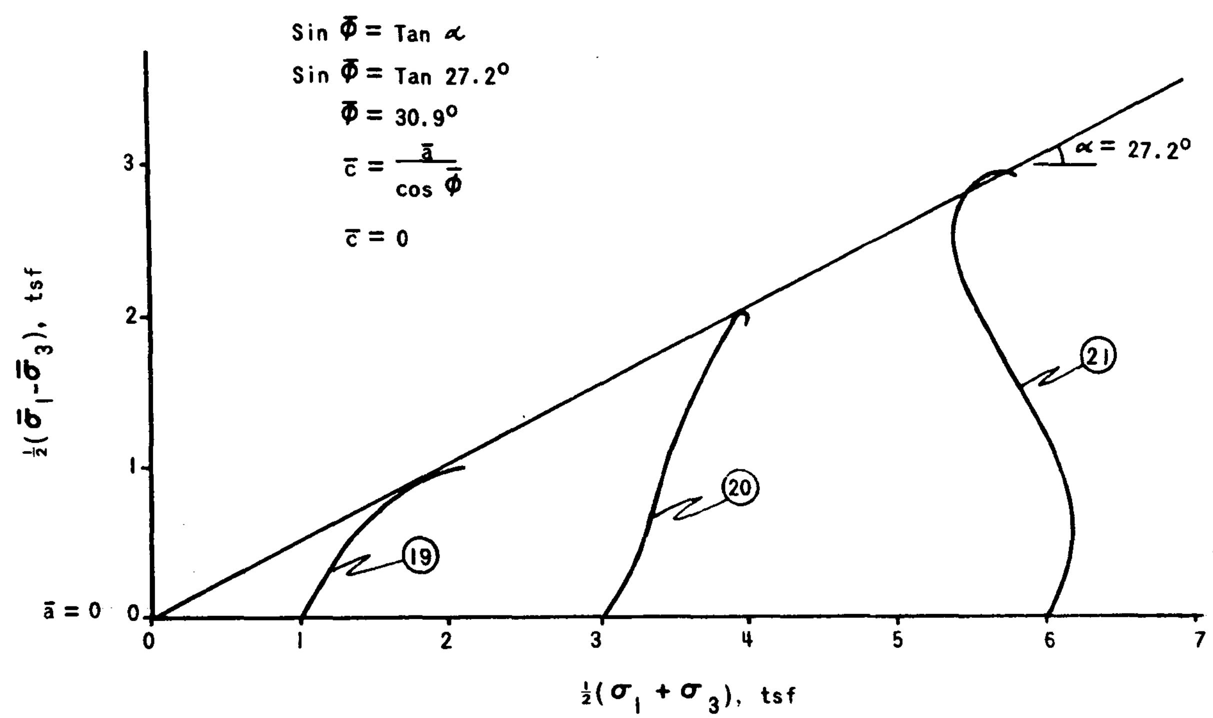
TEST NO.	BLOCK NO.	LOCATION	LL	PL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	$\bar{\sigma}_c$ (tsf)	$\frac{1}{2}(\bar{\sigma}_1 - \bar{\sigma}_3)_{max}$ (tsf)	ϵ_f (%)	$\bar{\Phi}$ (deg)	$\bar{c}$ (psf)
13	UDS-11	SOUTH DAM	61	43	24.1	89.2	1.5	1.04	12.8	31	250
14	UDS-11				24.4	90.0	3.0	1.28	8.0		
15	UDS-11				25.4	90.1	6.0	2.48	14.0		
16	UDS-12	NORTH DAM	59	45	24.6	83.5	1.5	0.98	17.0	25.6	600
17	UDS-12				26.4	95.8	3.0	1.67	17.0		
18	UDS-12				24.2	96.8	6.0	2.28	8.0		

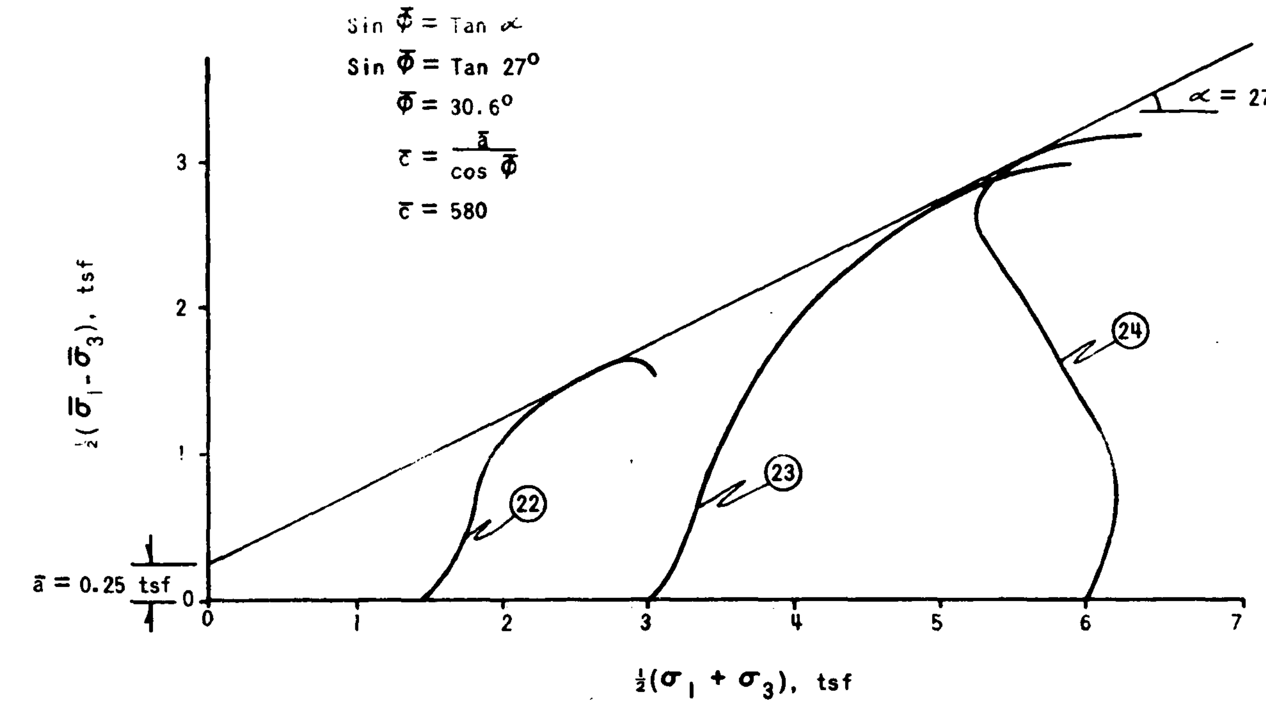
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Isotropically Consolidated, Undrained Triaxial Compression Tests On Block Samples (Sheet 3 of 7)

Figure 2.5-153





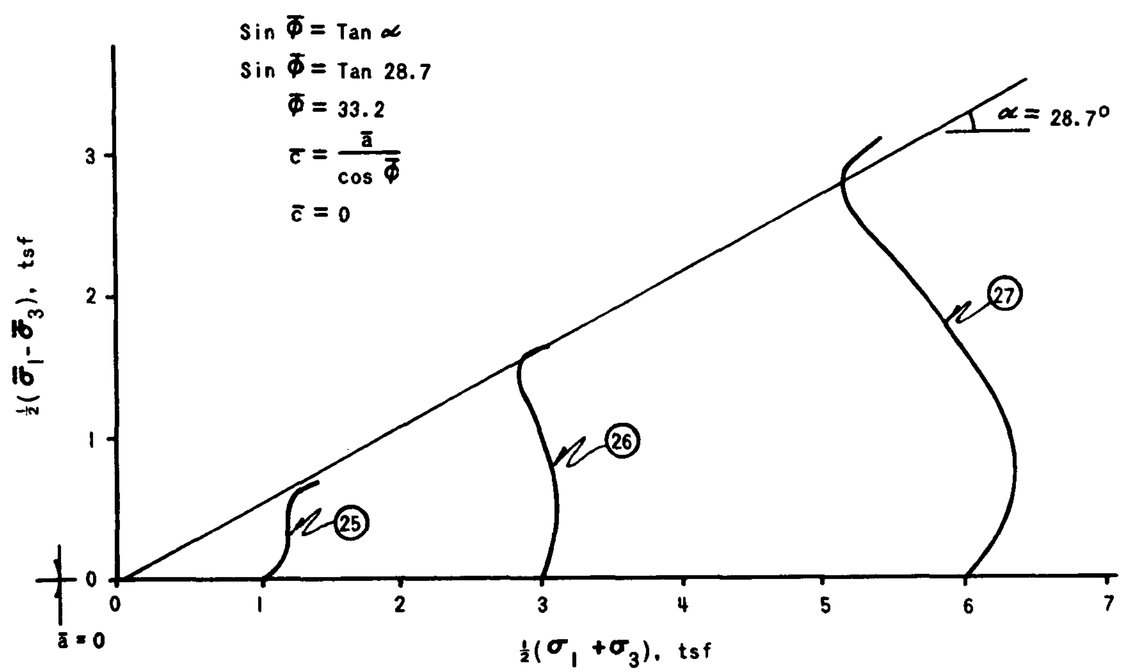
TEST NO.	BLOCK NO.	LOCATION	LL	PL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	$\bar{\sigma}_c$ (tsf)	$\frac{1}{2}(\bar{\sigma}_1-\bar{\sigma}_3)_{max}$ (tsf)	ϵ_f (%)	$\bar{\phi}$ (deg)	$\bar{c}$ (psf)
19	UDS-17				19.1	89.4	1.0	1.01	8.00		
20	UDS-17	SOUTH DAM	NP	NP	18.5	91.4	3.0	2.03	7.00	30.9	0
21	UDS-17				16.7	90.4	6.0	2.96	15.00		
22	UDS-18				19.0	95.7	1.5	1.64	11.45		
23	UDS-18	SOUTH DAM	68	44	23.7	94.2	3.0	2.99	9.53	30.0	580
24	UDS-18				22.3	100.0	6.0	3.20	23.40		

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Isotropically Consolidated, Undrained Triaxial Compression Tests On Block Samples (Sheet 4 of 7)

Figure 2.5-153



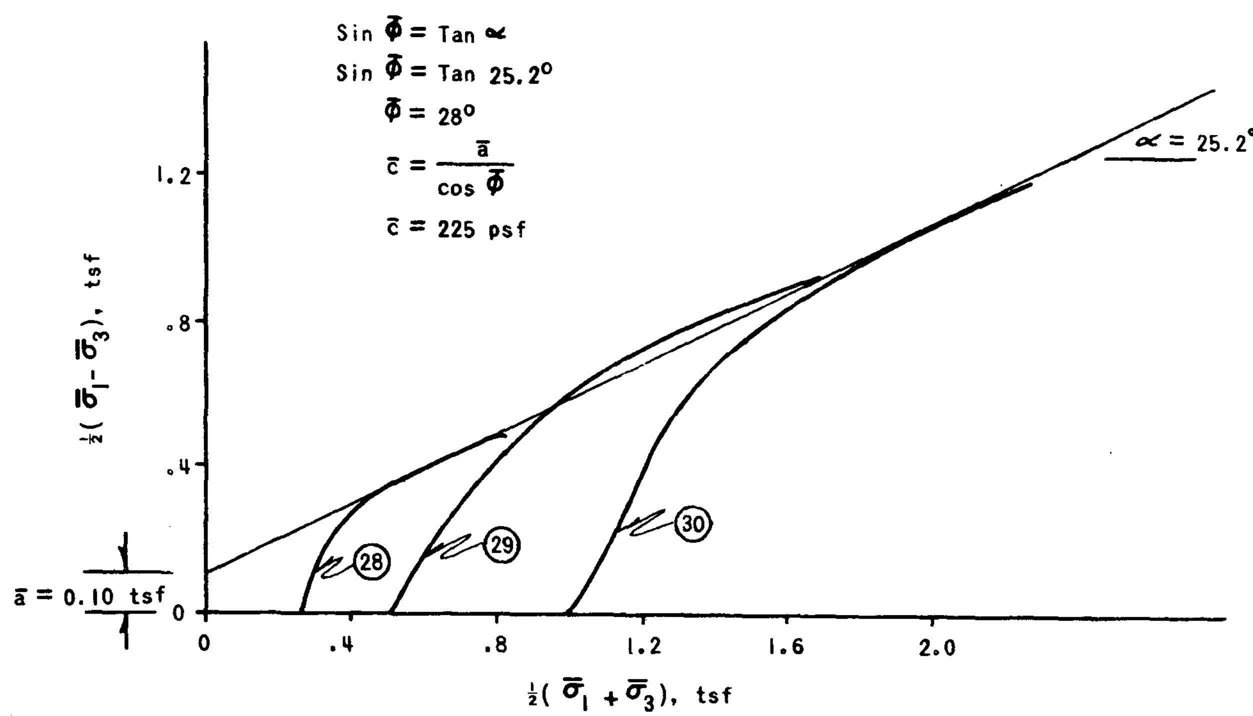
TEST NO.	BLOCK NO.	LOCATION	LL	PL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	$\bar{\sigma}_c$ (tsf)	$\frac{1}{2}(\bar{\sigma}_1 - \bar{\sigma}_3)_{max}$ (tsf)	ϵ_f (%)	$\bar{\Phi}$ (deg)	$\bar{c}$ (psf)
25	UDS-19				22.0	86.9	1.00	0.71	12.00		
26	UDS-19	NORTH DAM	52	45	22.0	93.3	3.00	1.62	10.00	33.2	0
27	UDS-19				22.2	87.2	6.00	3.11	15.00		

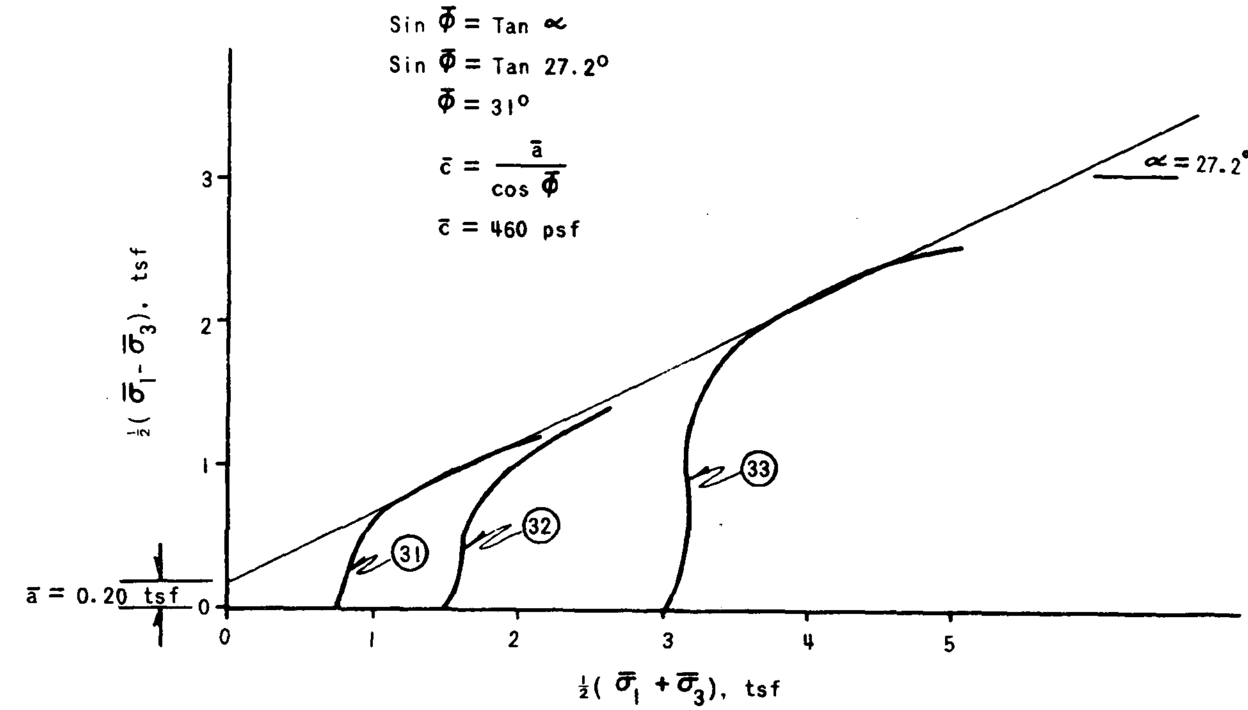
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Isotropically Consolidated, Undrained Triaxial Compression Tests On Block Samples (Sheet 5 of 7)

Figure 2.5-153





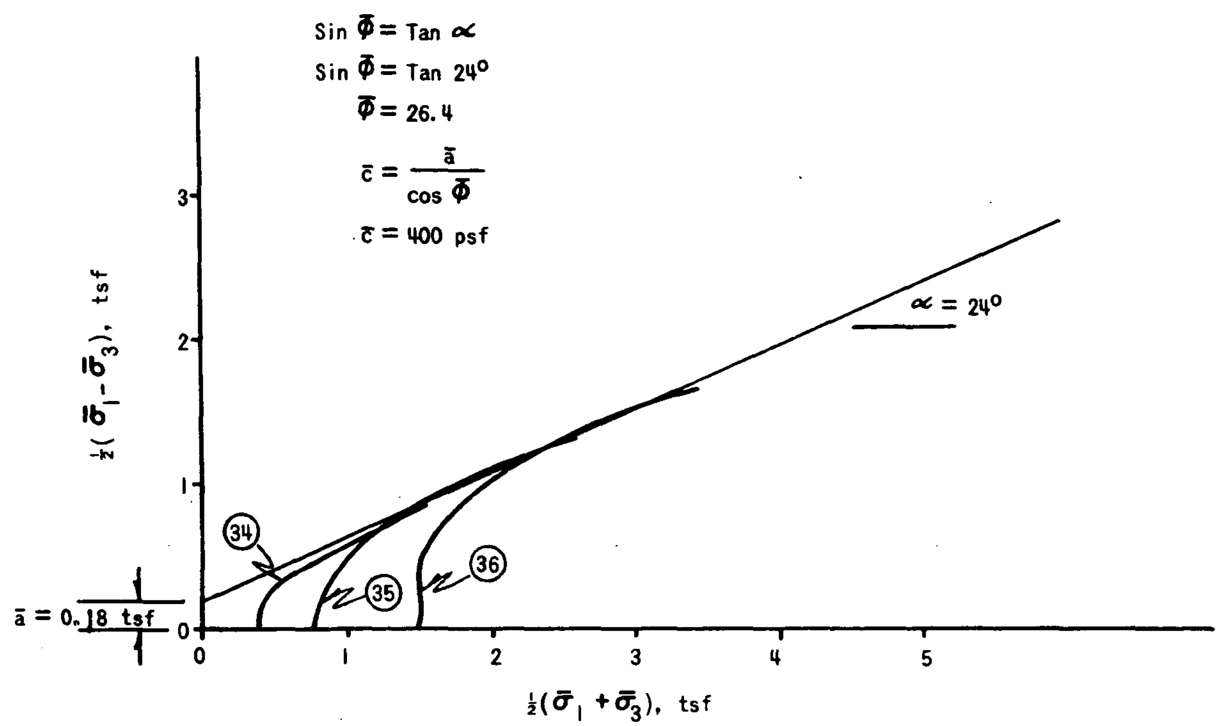
TEST NO.	BLOCK NO.	LOCATION	LL	PL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	$\bar{\sigma}_c$ (tsf)	$\frac{1}{2}(\bar{\sigma}_1 - \bar{\sigma}_3)_{max}$ (tsf)	ϵ_f (%)	$\bar{\Phi}$ (deg)	$\bar{c}$ (psf)
28	UDS-31	NORTH DAM	54	41	19.1	98.8	0.25	.497	7.57	28	225
29	UDS-31				18.9	98.7	0.50	.960	13.30		
30	UDS-31				19.2	97.7	1.00	1.183	15.88		
31	UDS-37	NORTH DAM	NP	NP	20.2	93.3	0.75	1.22	14.52	31	460
32	UDS-37				21.2	92.7	1.50	1.30	11.40		
33	UDS-37				19.9	98.2	3.00	2.56	14.85		

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Isotropically Consolidated, Undrained Triaxial Compression Tests On Block Samples (Sheet 6 of 7)

Figure 2.5-153



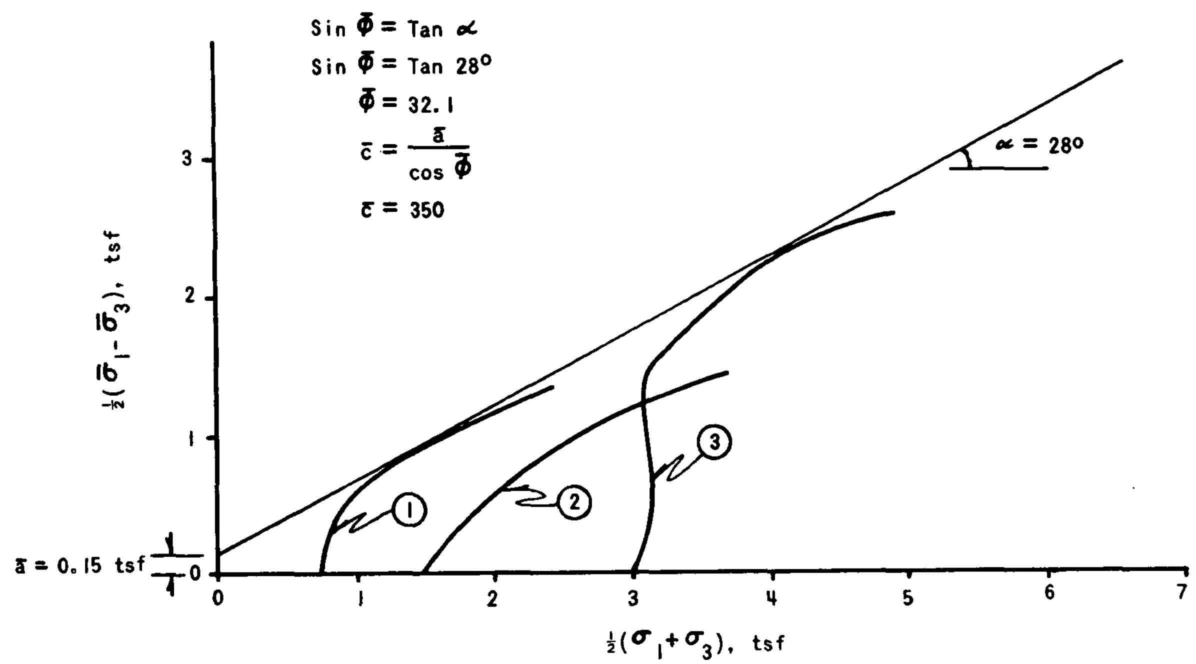
TEST NO.	BLOCK NO.	LOCATION	LL	PL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	$\bar{\sigma}_c$ (tsf)	$\frac{1}{2}(\bar{\sigma}_1 - \bar{\sigma}_3)_{max}$ (tsf)	ϵ_f (%)	$\bar{\Phi}$ (deg)	$\bar{c}$ (psf)
34	UDS-44	NORTH DAM	43	36	17.6	97.8	0.37	0.84	11.10	26.4	400
35	UDS-44				18.4	99.0	0.75	1.32	16.51		
36	UDS-44				18.8	100.5	1.50	1.67	13.86		

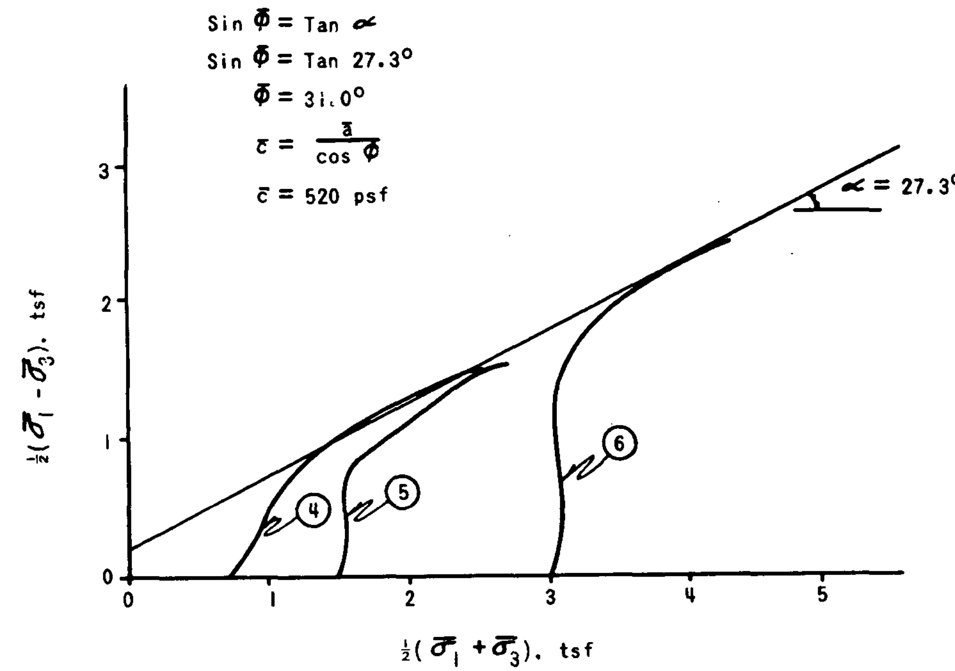
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Isotropically Consolidated, Undrained Triaxial Compression Tests On Block Samples (Sheet 7 of 7)

Figure 2.5-153





TEST NO.	BLOCK NO.	LOCATION	LL	PL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	$\bar{\sigma}_c$ (tsf)	$\frac{1}{2}(\bar{\sigma}_1 - \bar{\sigma}_3)_{max}$ (tsf)	ϵ_f (%)	$\bar{\Phi}$ (deg)	$\bar{c}$ (psf)
1	UDS-21	TEST FILL	49	41	24.6	93.8	0.75	1.35	14.40	32.1	350
2	UDS-21				25.6	92.5	1.50	1.47	14.68		
3	UDS-21				25.2	92.8	3.00	2.65	13.50		
4	UDS-22	TEST FILL	44	39	23.4	93.7	0.75	1.63	16.29	31	520
5	UDS-22				23.7	93.4	1.50	1.51	9.04		
6	UDS-22				23.4	92.5	3.00	2.39	9.59		

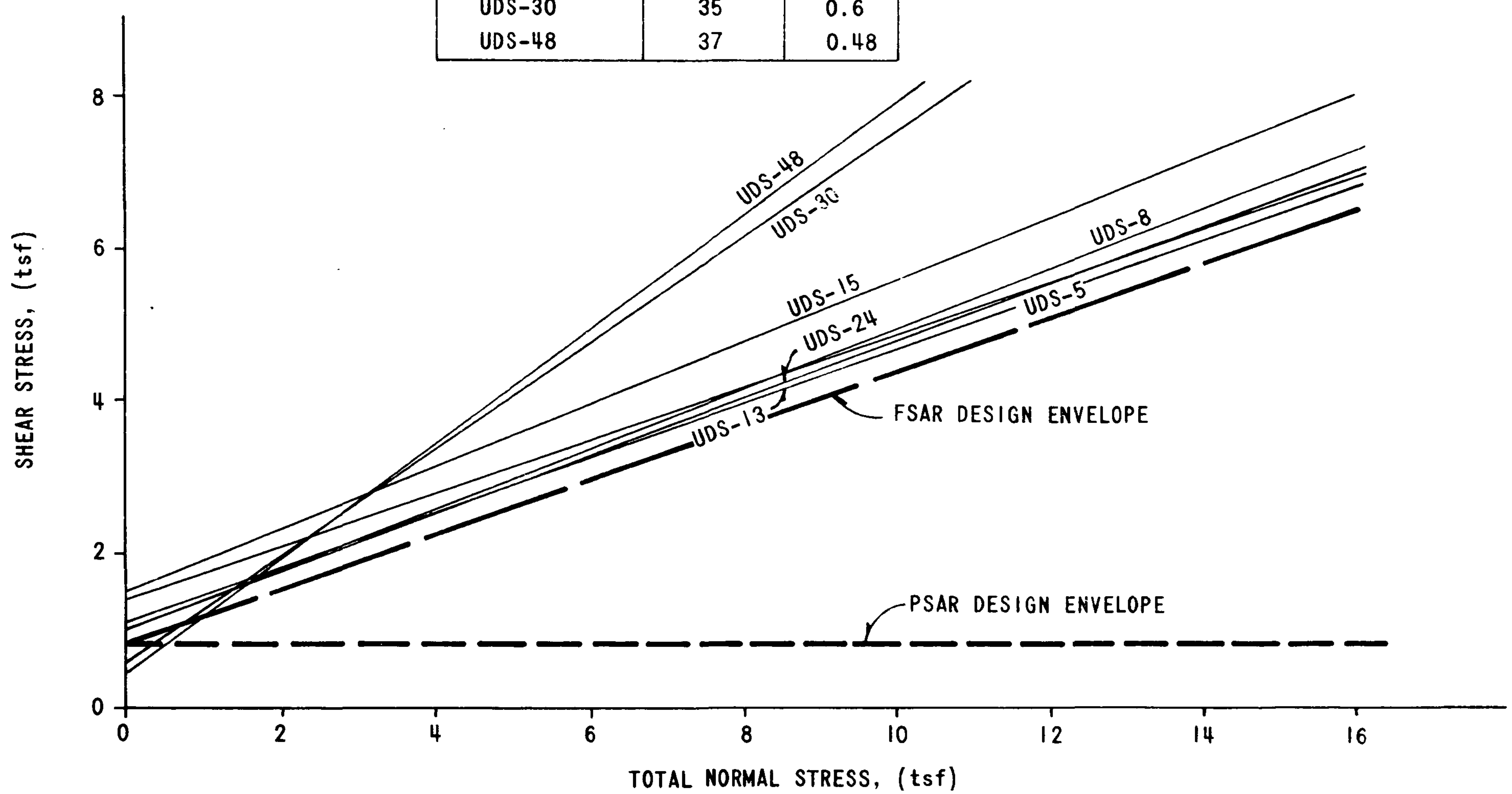
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

$\overline{\text{CIU}}$ Tests on Block Samples at High Moisture Content

Figure 2.5-153a

SAMPLE NO.	φ (deg)	c (tsf)
FSAR DESIGN ENVELOPE	20	0.8
PSAR DESIGN ENVELOPE	0	0.8
UDS-5	19	1.4
UDS-8	21.5	1.0
UDS-13	20	1.1
UDS-15	22	1.5
UDS-24	21	1.0
UDS-30	35	0.6
UDS-48	37	0.48

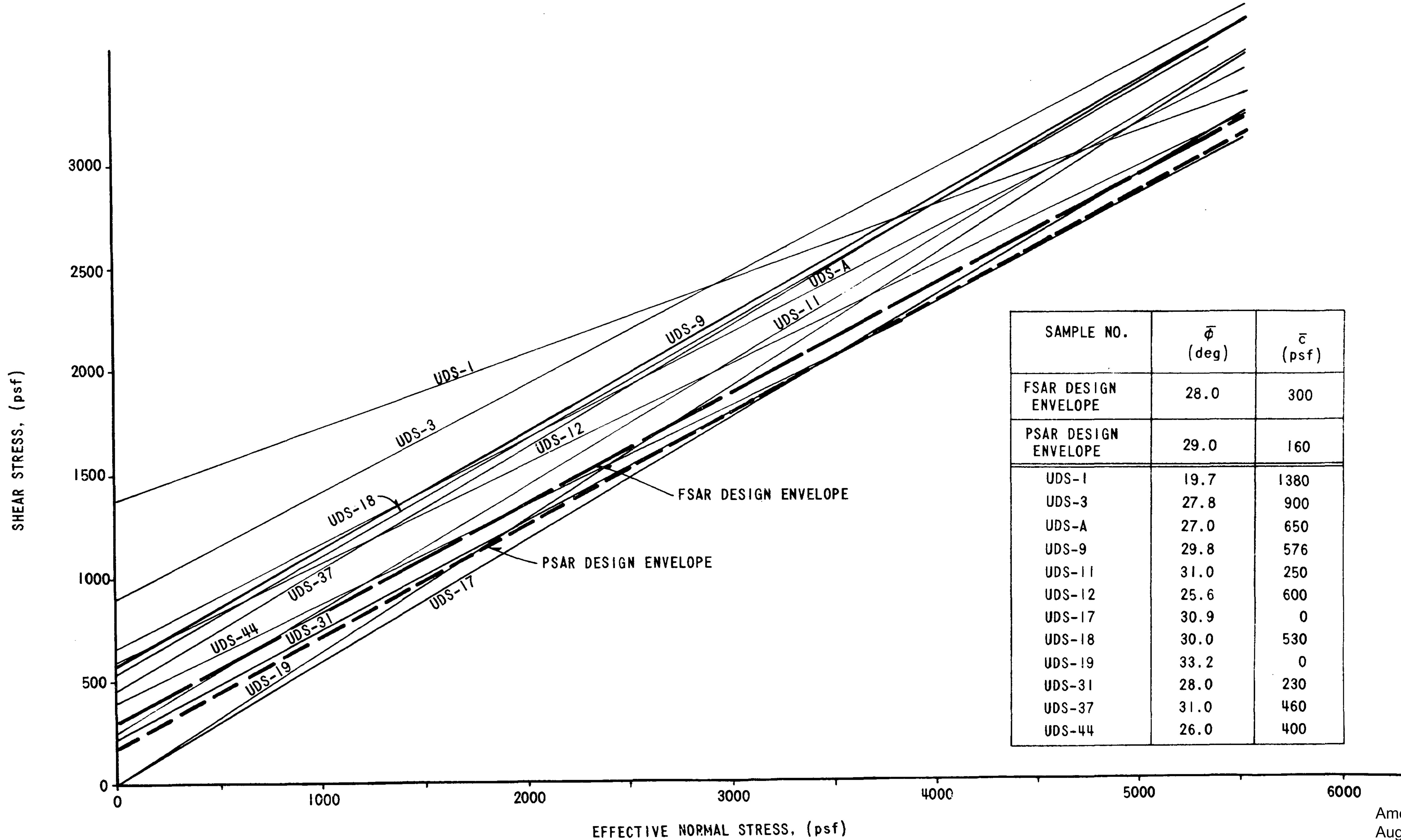


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary of Unconsolidated-Undrained Triaxial Compression Tests on Block Samples

Figure 2.5-154



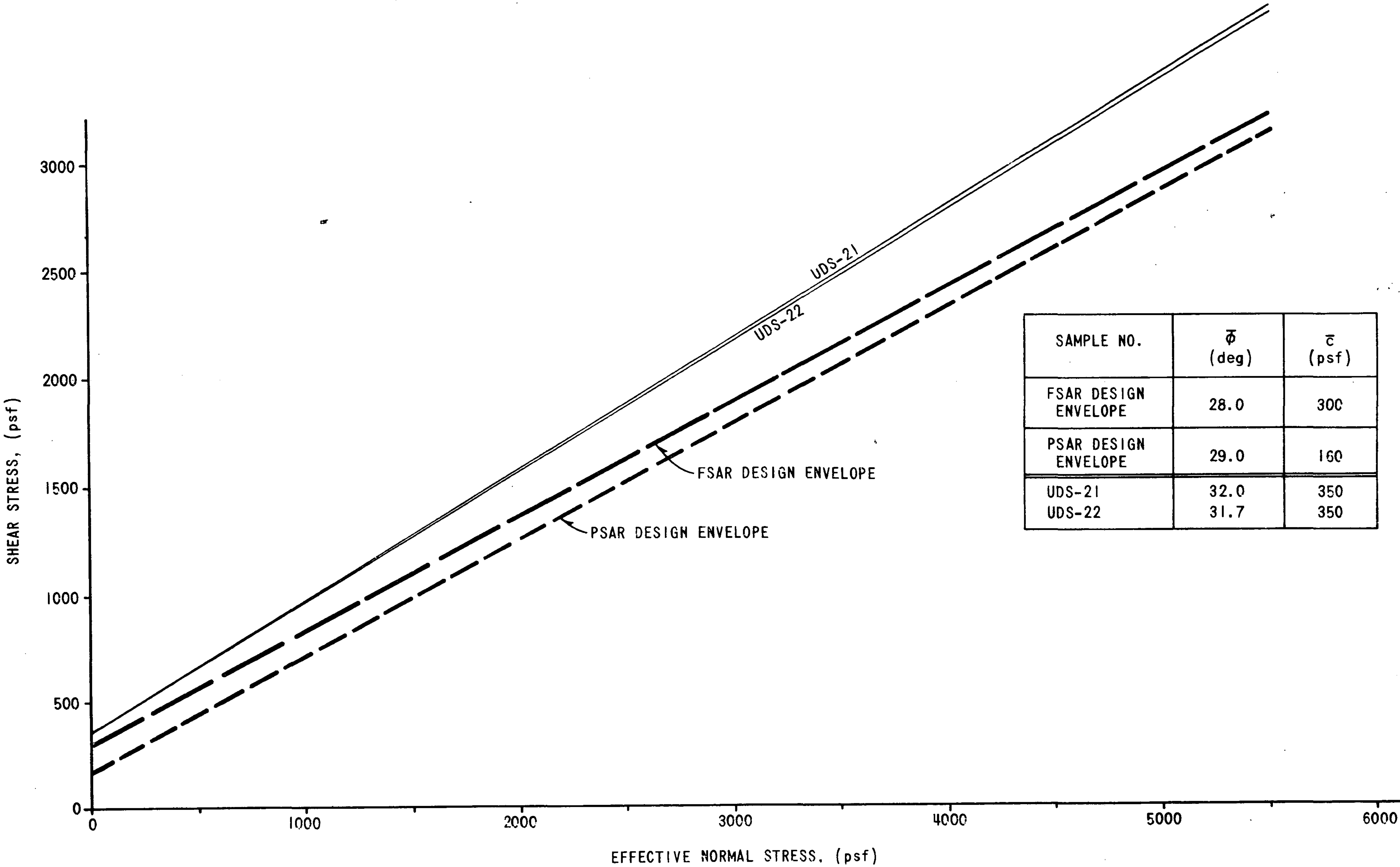
SAMPLE NO.	$\bar{\phi}$ (deg)	$\bar{c}$ (psf)
FSAR DESIGN ENVELOPE	28.0	300
PSAR DESIGN ENVELOPE	29.0	160
UDS-1	19.7	1380
UDS-3	27.8	900
UDS-A	27.0	650
UDS-9	29.8	576
UDS-11	31.0	250
UDS-12	25.6	600
UDS-17	30.9	0
UDS-18	30.0	530
UDS-19	33.2	0
UDS-31	28.0	230
UDS-37	31.0	460
UDS-44	26.0	400

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary of Isotopically Consolidated, Undrained Triaxial Compression Tests on Block Samples

Figure 2.5-155



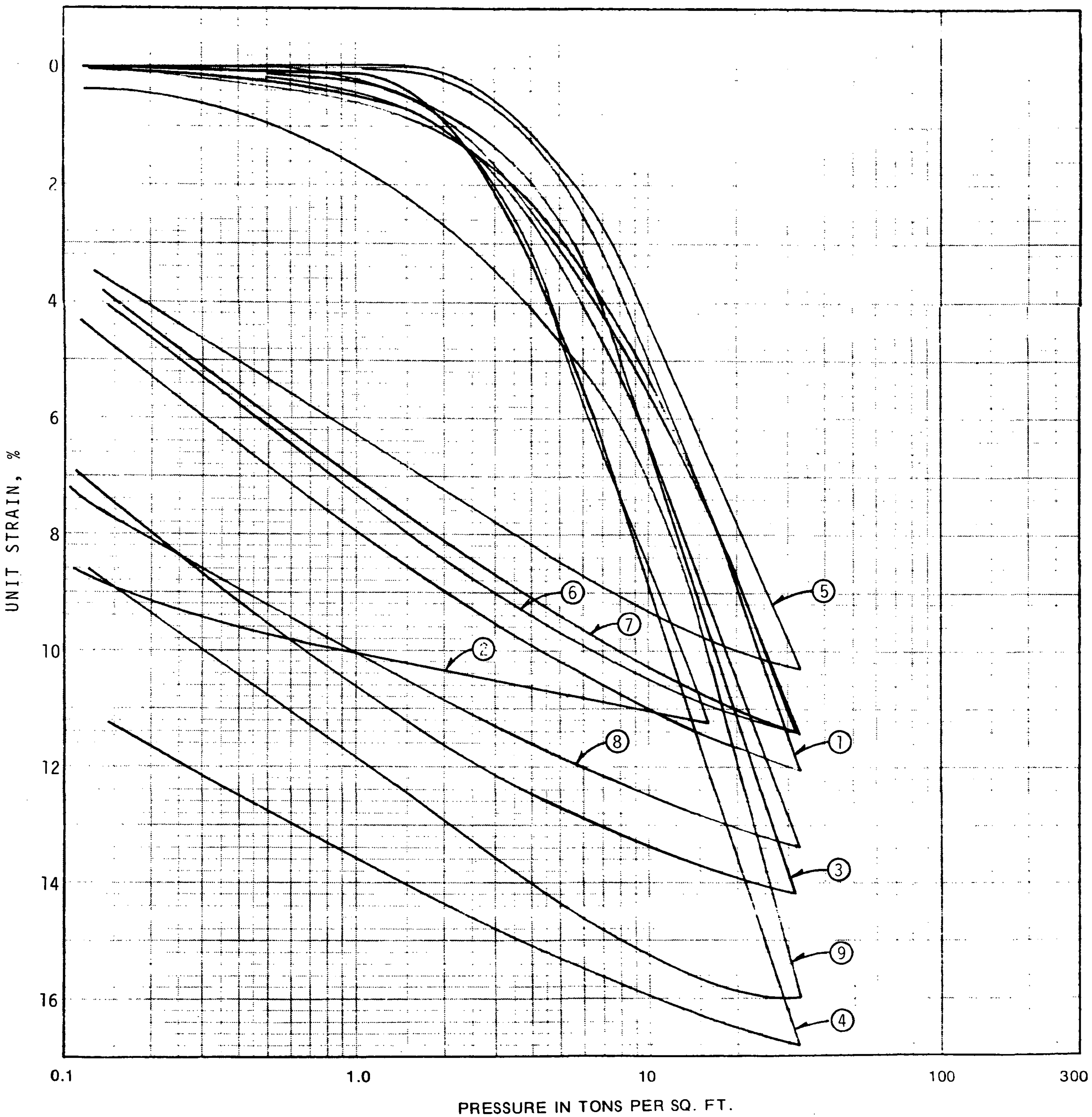
SAMPLE NO.	$\bar{\phi}$ (deg)	$\bar{c}$ (psf)
FSAR DESIGN ENVELOPE	28.0	300
PSAR DESIGN ENVELOPE	29.0	160
UDS-21	32.0	350
UDS-22	31.7	350

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary of $\overline{\text{CIU}}$ Tests on Block Samples at High Moisture Content

Figure 2.5-155a



CURVE NUMBER	BLOCK SAMPLE NUMBER	ELEVATION	INITIAL DRY DENSITY (pcf)	INITIAL M/C %	LIQUID LIMIT %	PLASTIC LIMIT %	INITIAL VOID RATIO
1	UDS-5V	338	93.3	27.0	59	46	0.890
2	UDS-8V	342	110.3	22.8	47	42	0.887
3	UDS-12V	330	89.3	25.2	59	45	0.930
4	UDS-12H	330	82.7	25.2	59	45	1.085
5	UDS-15V	348	92.7	22.1	57	41	0.828
6	UDS-15H	348	93.5	21.6	57	41	0.824
7	UDS-19V	344	98.8	22.4	52	45	0.760
8	UDS-19H	344	97.1	22.2	52	45	0.782
9	UDS-31V	331	95.1	21.6	54	41	0.771

(1) V = Sample cut horizontally through the block.

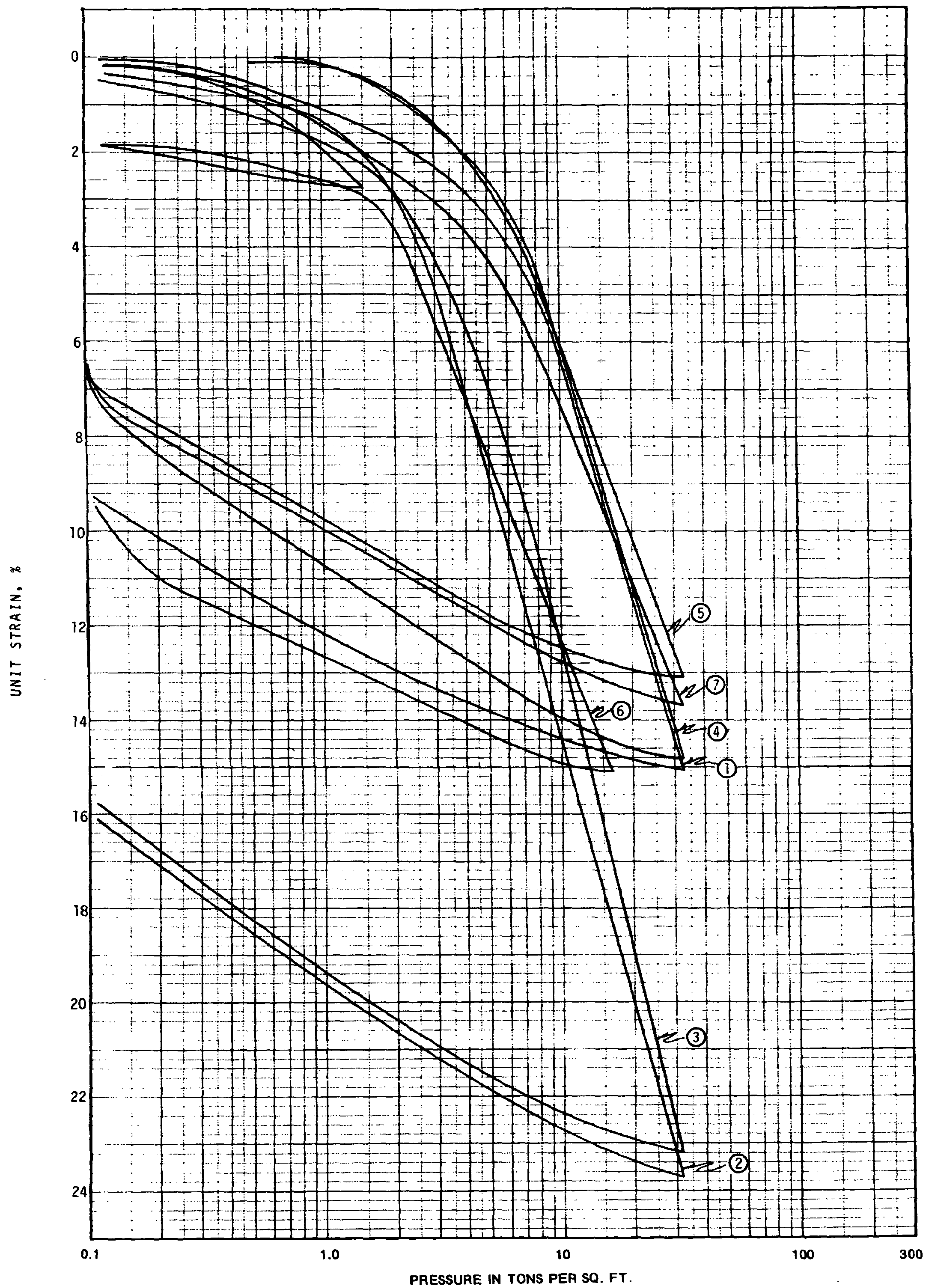
H = Sample cut vertically through the block.

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary Of Consolidation Test Results - North Dam
(Sheet 1 of 4)

Figure 2.5-156



CURVE NUMBER	BLOCK SAMPLE NUMBER (1)	ELEVATION	INITIAL DRY DENSITY (pcf)	INITIAL M/C %	LIQUID LIMIT %	PLASTIC LIMIT %	INITIAL VOID RATIO
①	UDS-11V	365	91.1	21.8	61	18	0.901
②	UDS-13V	375	85.7	17.7	66	49	1.025
③	UDS-13H	375	89.7	17.1	60	49	0.993
④	UDS-17V	391	93.5	18.7	NP	NP	0.822
⑤	UDS-17H	391	96.3	19.1	NP	NP	0.769
⑥	UDS-20V	407	85.8	24.7	60	32	0.967
⑦	UDS-24V	422	91.2	24.4	NP	NP	0.849

(1) V = Sample cut horizontally through the block with loads applied vertically.

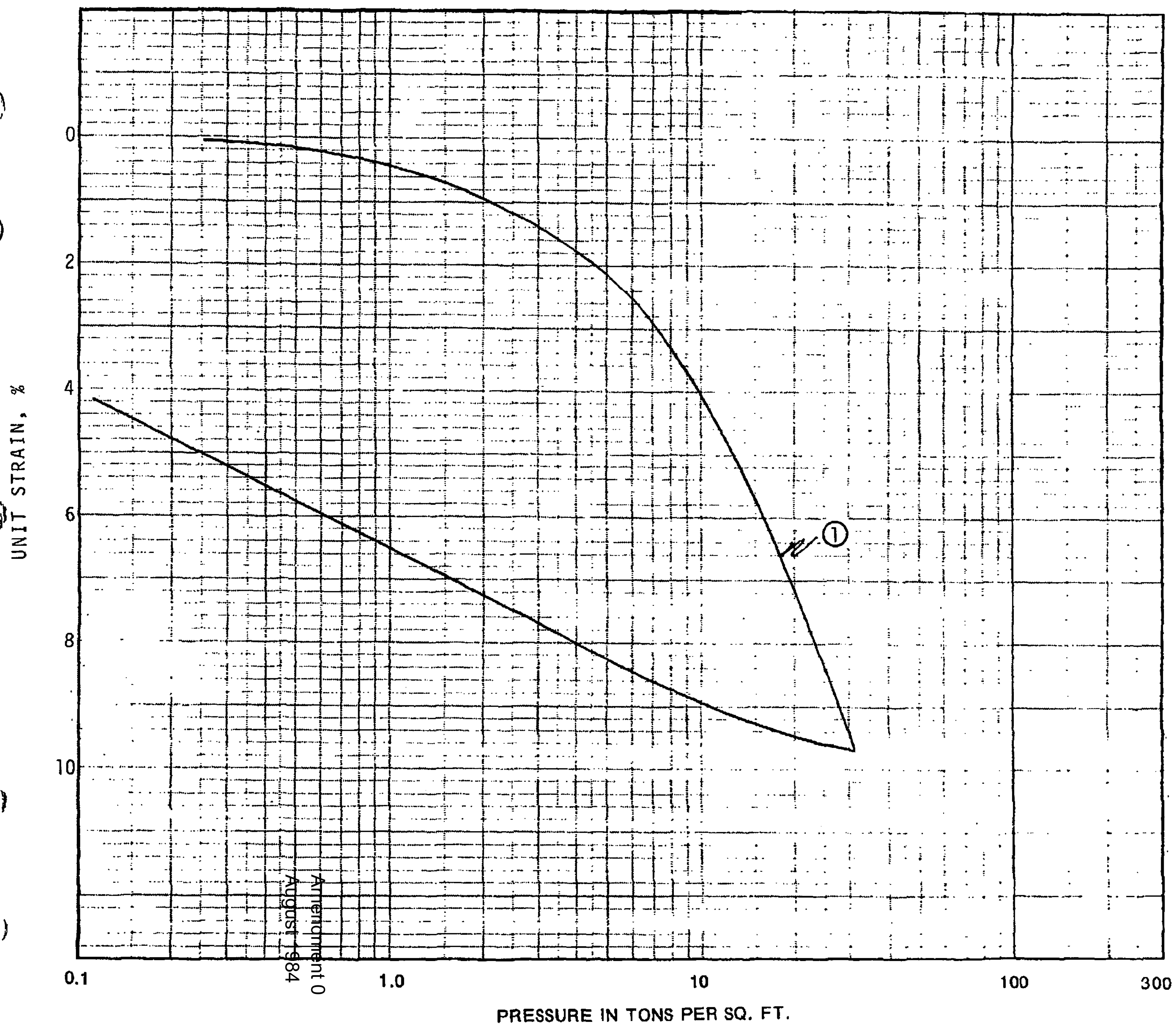
H = Sample cut vertically through the block with loads applied horizontally.

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary Of Consolidation Test Results - South Dam
(Sheet 2 of 4)

Figure 2.5-156



CURVE NUMBER	BLOCK SAMPLE NUMBER	ELEVATION	INITIAL DRY DENSITY (pcf)	INITIAL M/C	LIQUID LIMIT	PLASTIC LIMIT	INITIAL VOID RATIO
①	UDS-48 V	431	94.0	26.4	55	48	0.818

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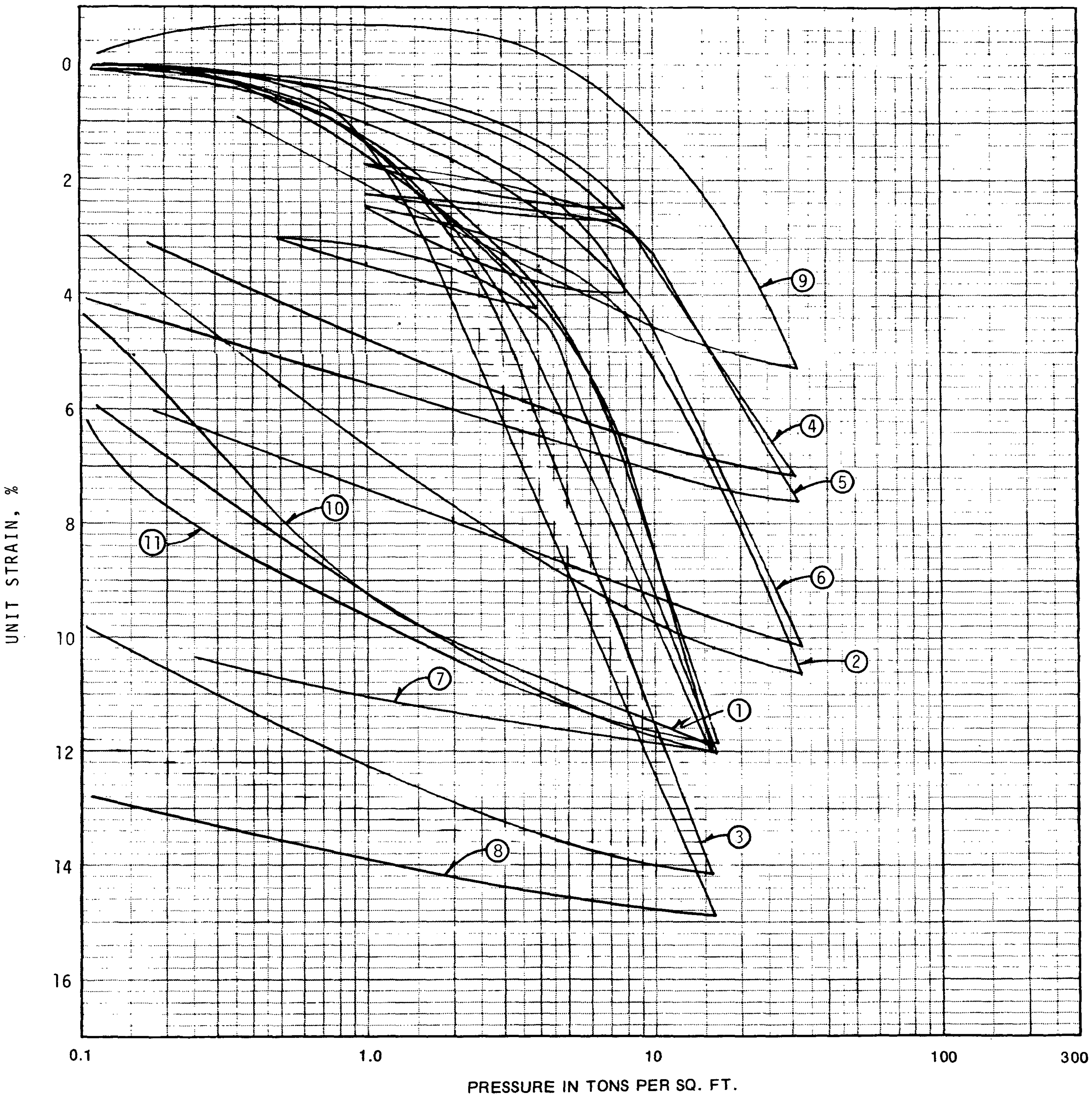
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary Of Consolidation
Test Results - East Dam
(Sheet 3 of 4)

Figure 2.5-156



CURVE NUMBER	BLOCK SAMPLE NUMBER	ELEVATION	INITIAL DRY DENSITY (pcf)	INITIAL M/C %	LIQUID LIMIT %	PLASTIC LIMIT %	INITIAL VOID RATIO
1	UDS-AV	385	94.0	23.4	NP	NP	0.797
2	UDS-1V	369	87.6	29.5	60	38	0.882
3	UDS-2V	383	89.9	22.2	43	33	0.863
4	UDS-3V	384	96.4	23.2	42	34	0.729
5	UDS-3H	384	97.8	24.1	45	35	0.704
6	UDS-4V	390	93.6	20.3	41	37	0.733
7	UDS-7V	400	86.0	24.7	59	34	0.958
8	UDS-7H	400	82.2	23.6	51	35	1.056
9	UDS-9V	421	97.3	24.3	69	43	0.843
10	UDS-36V	416	89.9	23.3	NP	NP	0.895
11	UDS-36H	416	89.2	22.6	NP	NP	0.905

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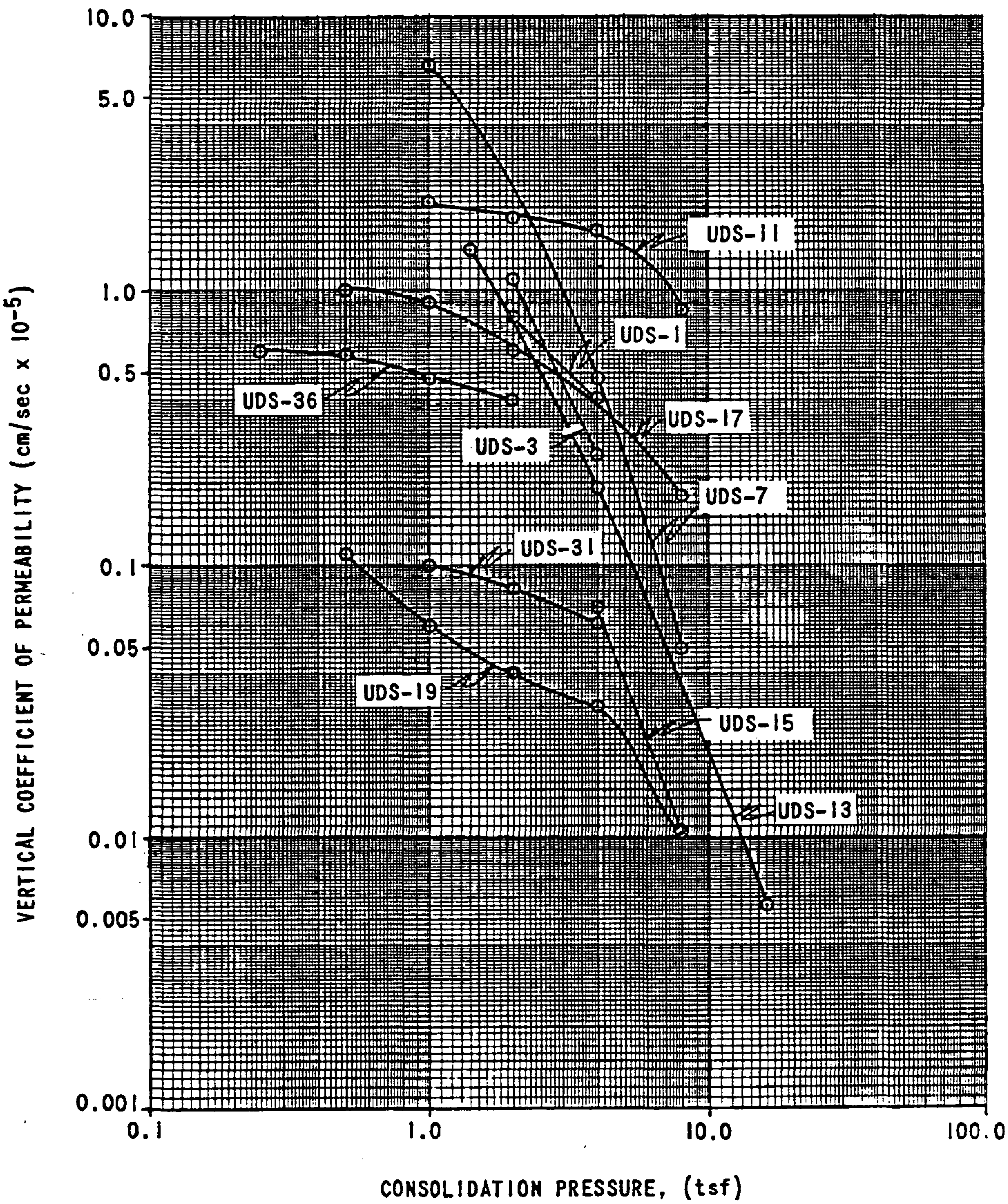
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Summary Of Consolidation
Test Results - West Embankment
(Sheet 4 of 4)

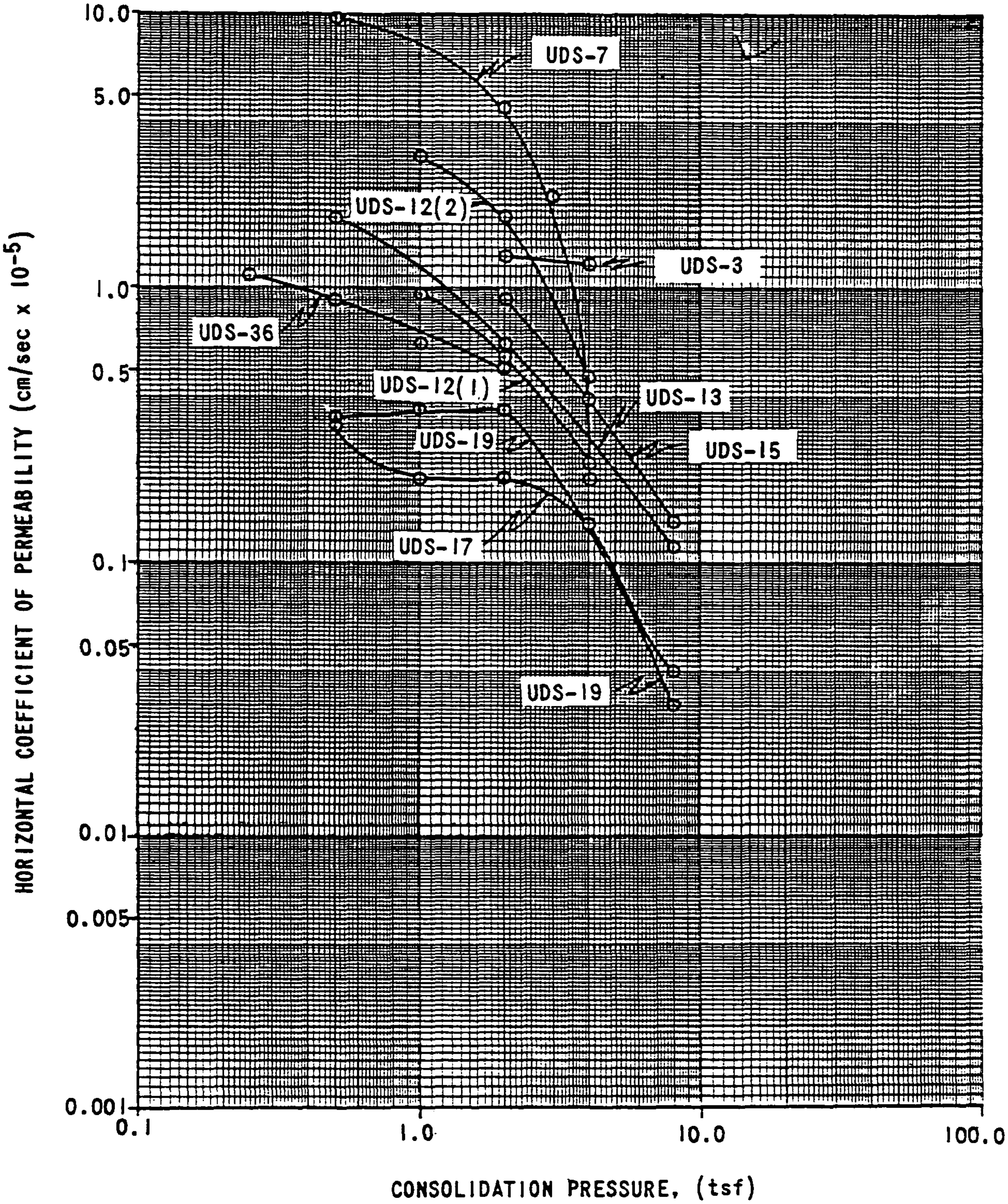
Figure 2.5-156



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Vertical Permeability Test Results on Block Samples

Figure 2.5-157



SOUTH CAROLINA ELECTRIC & GAS CO. VIRGIL C. SUMMER NUCLEAR STATION
Horizontal Permeability Test Results on Block Samples
Figure 2.5-158

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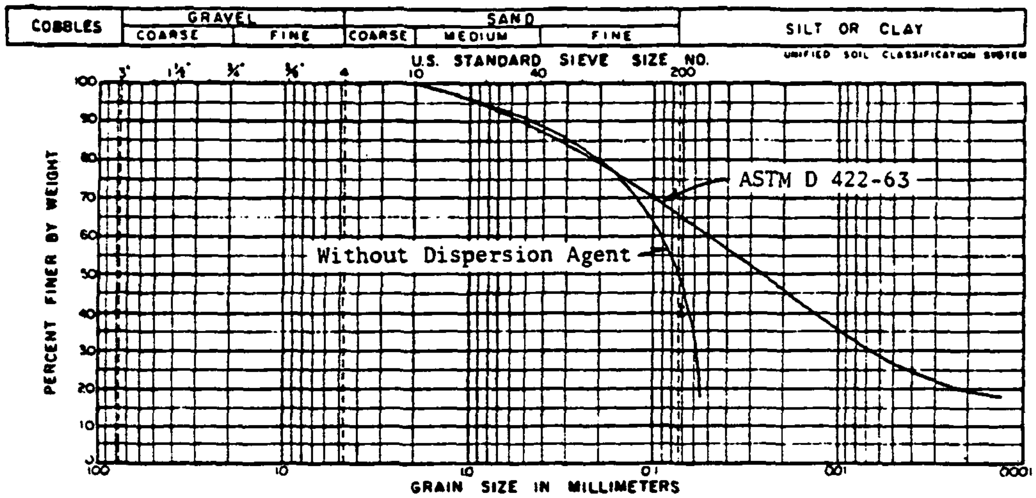
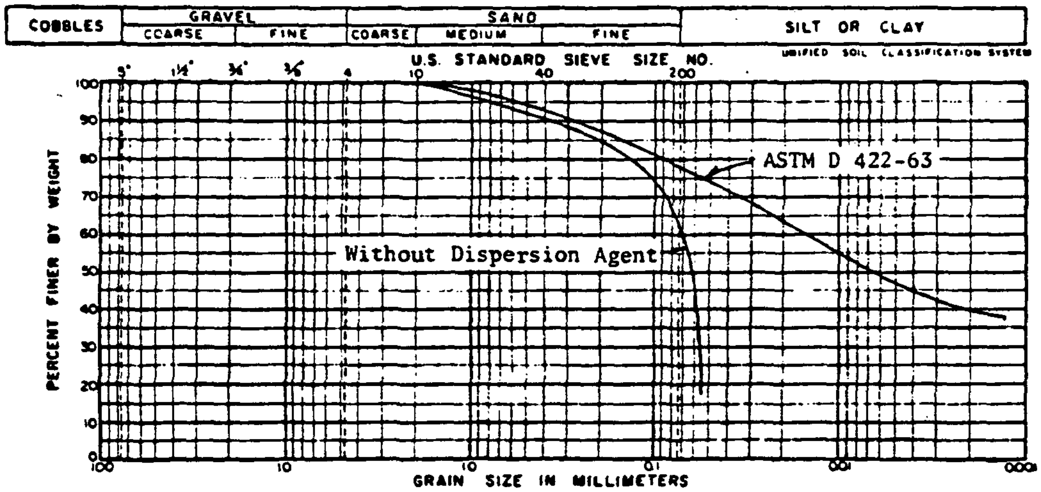
MECHANICAL ANALYSIS



Sample	Elev.	Coordinates			MC	LL	PL
		North	East				
UDS-12	330.0	473,258	1,905,841	Percent Dispersion = $\frac{0}{27}$ = 0%	25.2	59	45

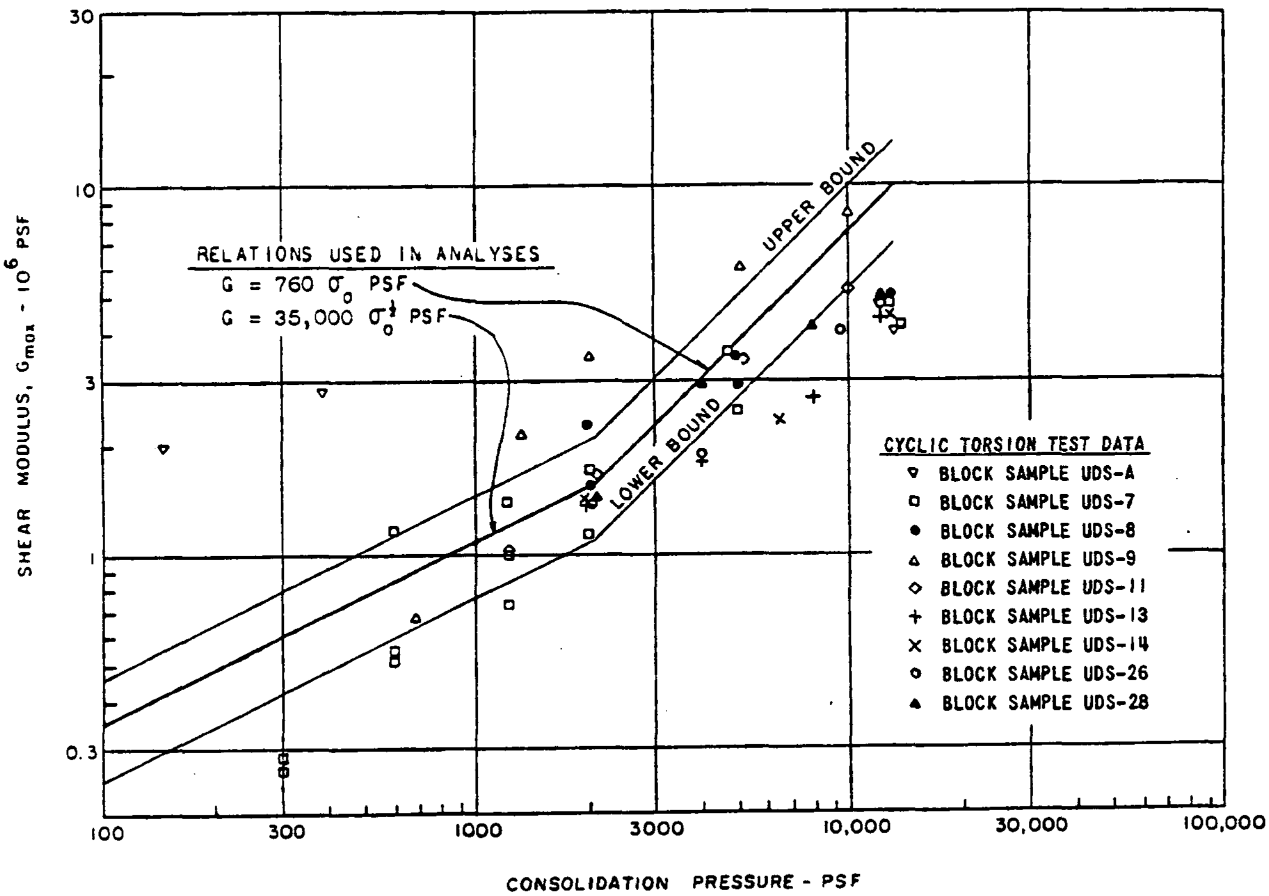


Sample	Elev.	Coordinates			MC	LL	PL
		North	East				
UDS-15	348.0	473,031	1,905,852	Percent Dispersion = $\frac{0}{47}$ = 0%	21.1	57	41

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Typical Soil Conservation Service Dispersion Test Results on Block Samples

Figure 2.5-159



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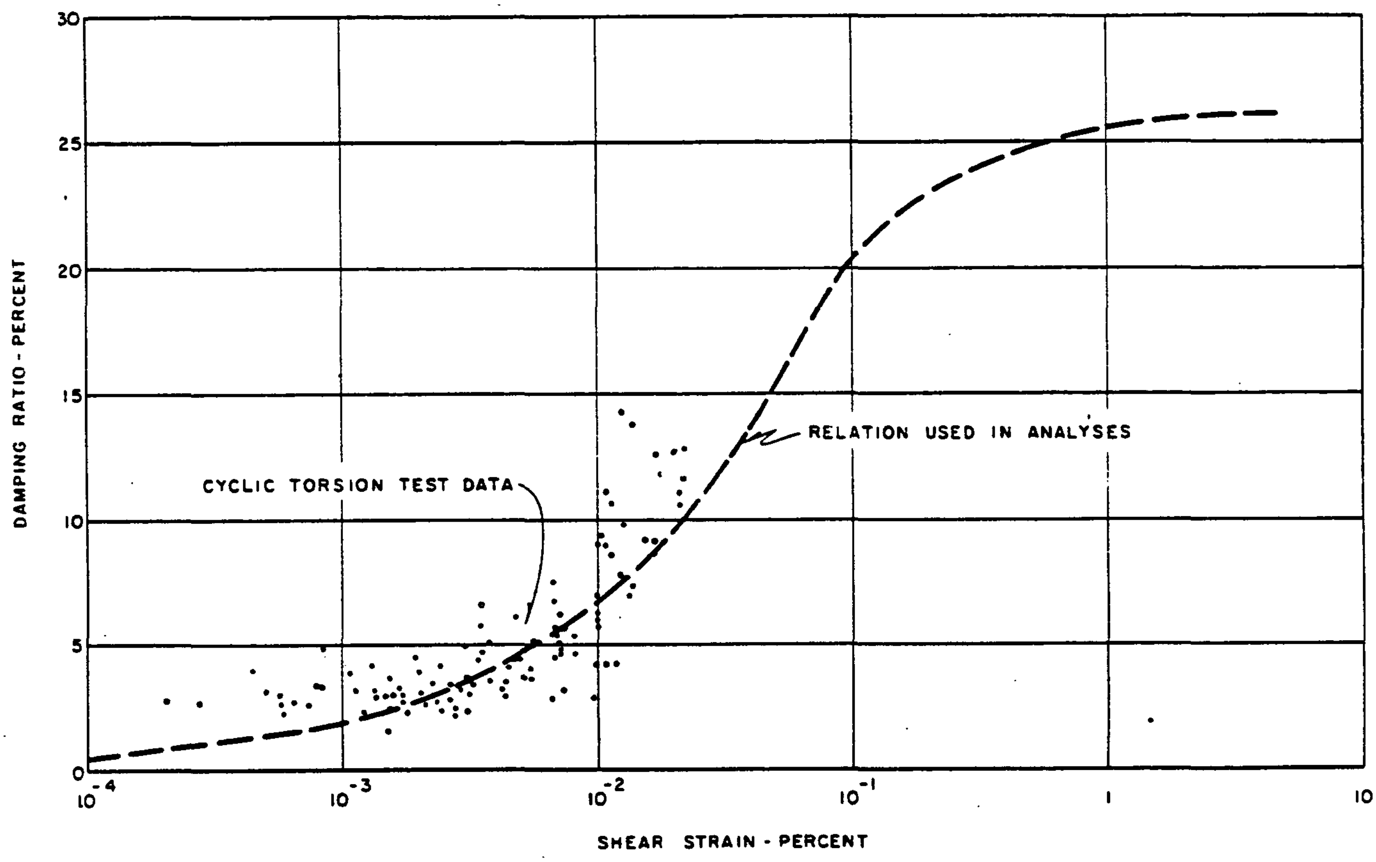
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Shear Modulus Values at Very Low Strain Levels for Block Samples

Figure 2.5-160



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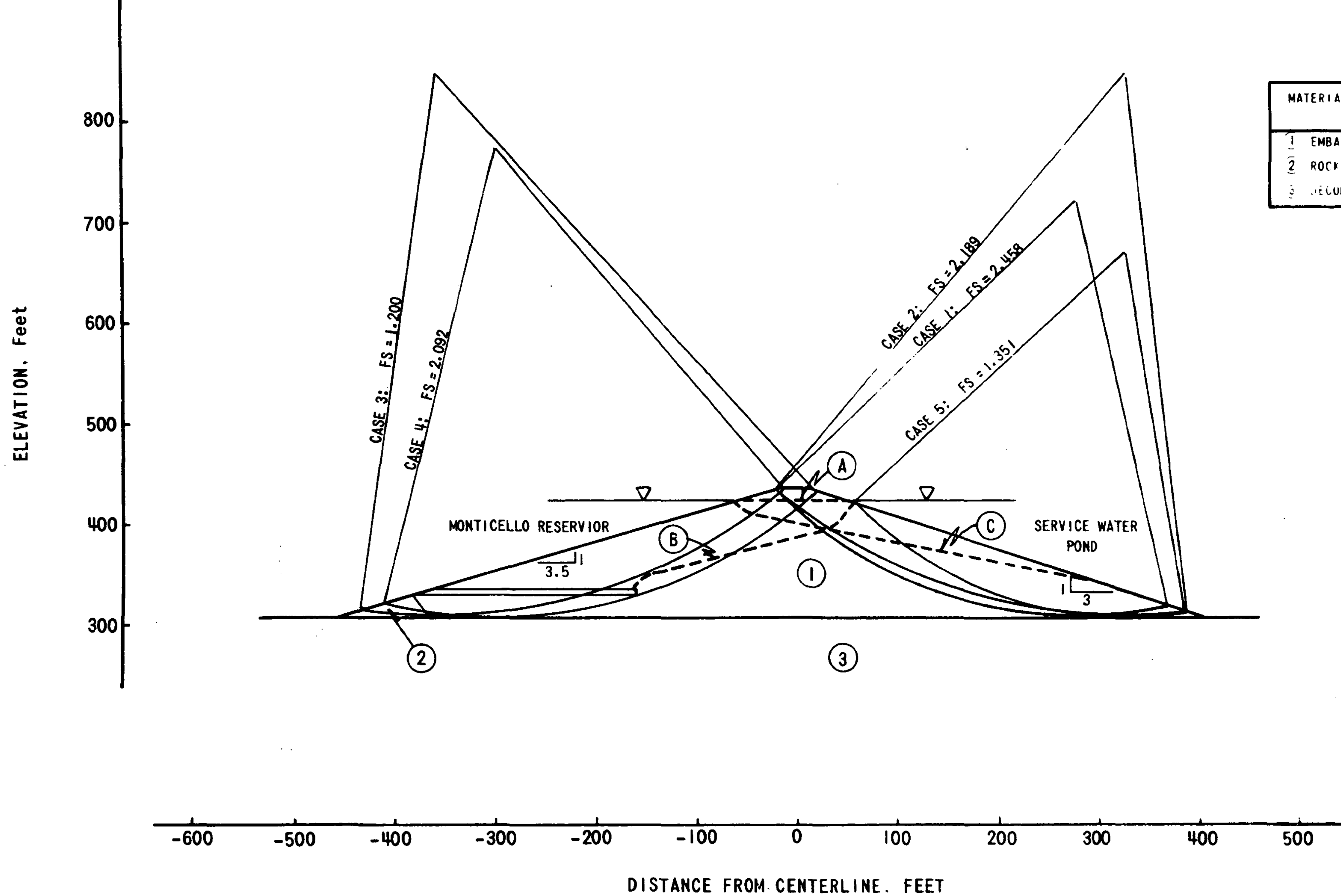
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Variation of Damping Values as a Function of Strain for Block Samples

Figure 2.5-160a

CASE	SLOPE	PHREATIC LINE	X	Y	R	FACTOR OF SAFETY
1. END OF CONSTRUCTION	SWP	--	275.0	725.0	416.0	2.458
2. SUBMERGED	SWP	A	325.0	850.0	541.0	2.189
3. SUDDEN DRAWDOWN	MR	A	-350.0	850.0	541.0	1.200
4. STEADY SEEPAGE	MR	B	-300.0	775.0	466.0	2.092
5. REVERSE SEEPAGE	SWP	C	-325.0	675.0	366.0	1.351

MATERIAL	γ_t (pcf)	Cu (psf)	ϕ_u (deg)	$\bar{c}$ (psf)	$\bar{\phi}$ (deg)
1 EMBANKMENT	119	1600	20	300	28
2 ROCK TOE	135	0	35	0	35
3 DECOMPOSED/INTACT ROCK	138	3000	0	0	38.5



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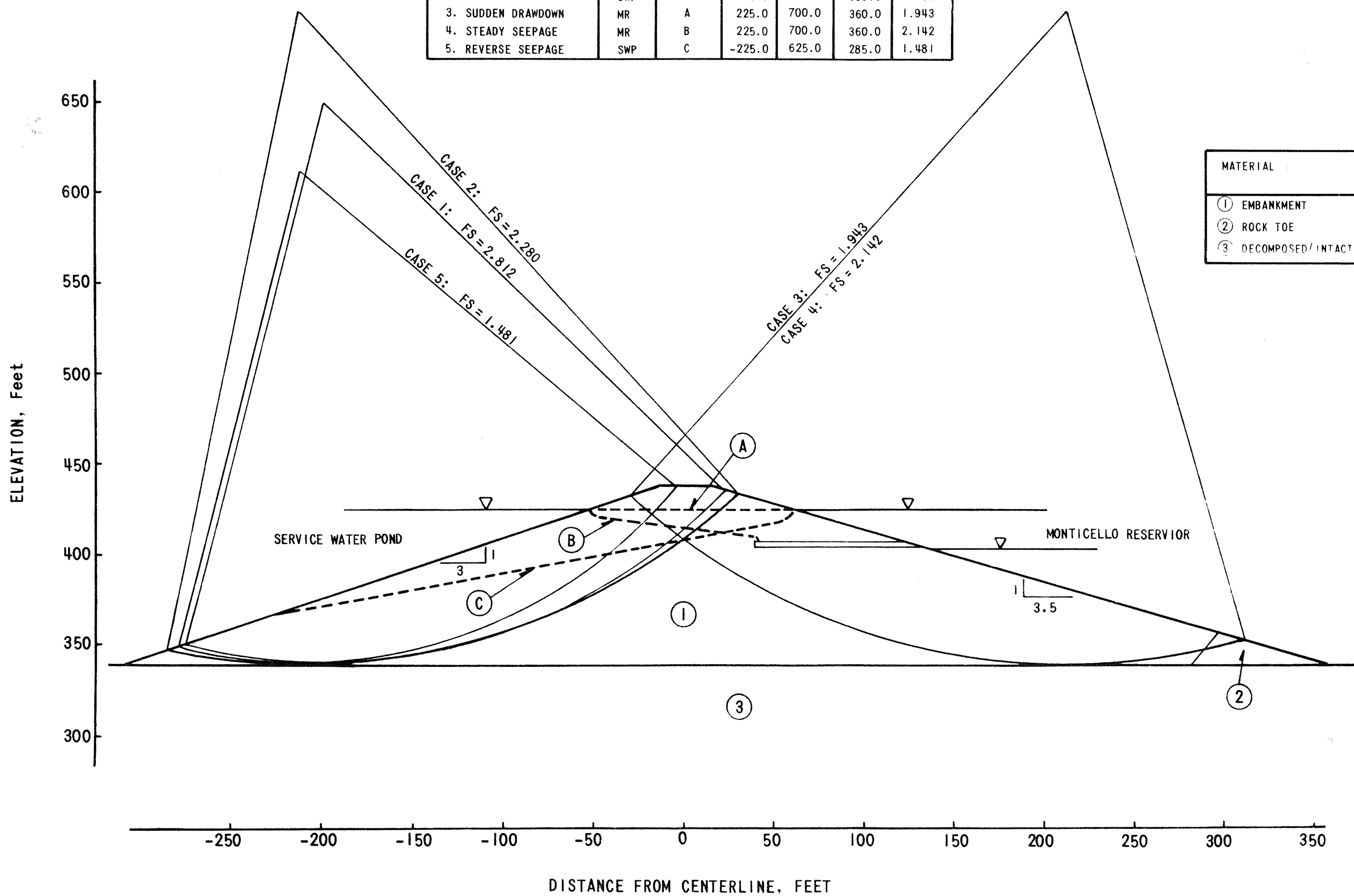
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Static Stability Analysis
North Dam

Figure 2.5-161

CASE	SLOPE	PHREATIC LINE	X	Y	R	FACTOR OF SAFETY
1. END OF CONSTRUCTION	SWP	--	-200.0	650.0	310.0	2.812
2. SUBMERGED	SWP	A	-225.0	700.0	360.0	2.280
3. SUDDEN DRAWDOWN	MR	A	225.0	700.0	360.0	1.943
4. STEADY SEEPAGE	MR	B	225.0	700.0	360.0	2.142
5. REVERSE SEEPAGE	SWP	C	-225.0	625.0	285.0	1.481

MATERIAL	γ_t (pcf)	Cu (psf)	ϕ_u (deg)	$\bar{c}$ (psf)	$\bar{\phi}$ (deg)
1 EMBANKMENT	119	1600	20	300	28
2 ROCK TOE	135	0	35	0	35
3 DECOMPOSED/INTACT ROCK	138	3000	0	[illegible]	[illegible]



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SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

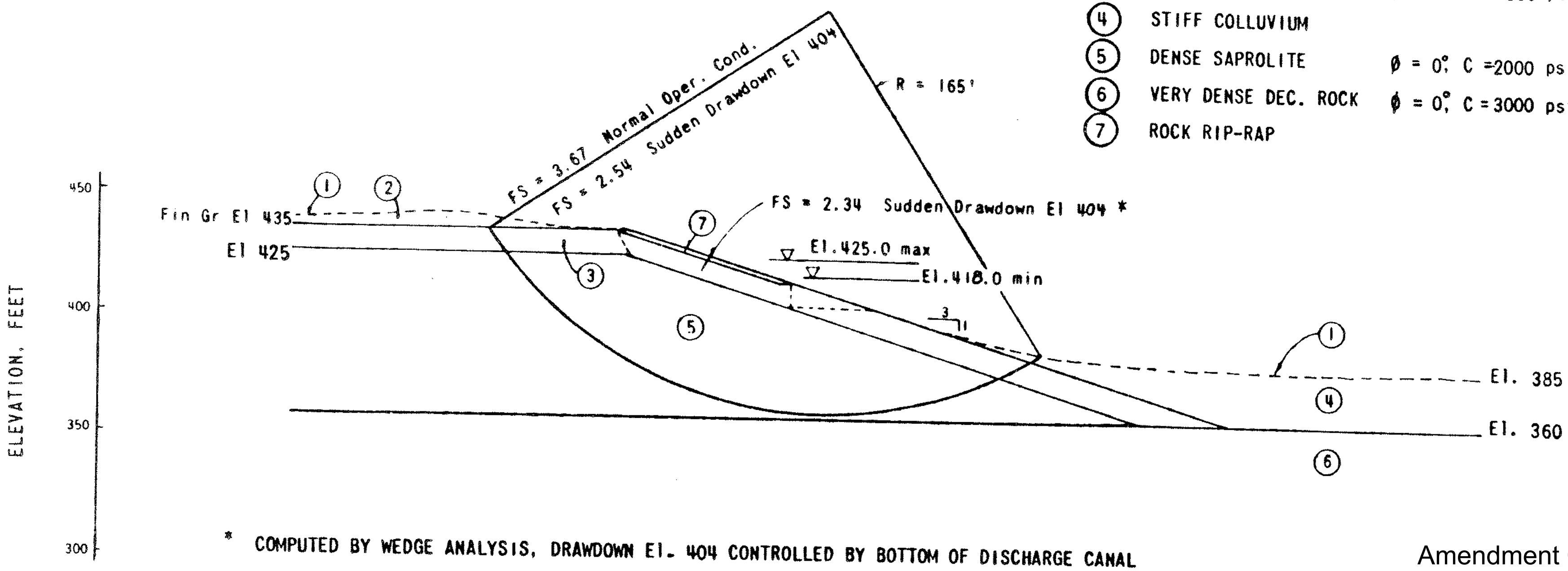
Static Stability Analysis
South Dam

Figure 2.5-162

NOTE: FS = 1.22 for SSE CONDITION (0.15g)

LEGEND:

1. EXISTING GROUND SURFACE
2. PROPOSED CUT TO FINISHED GRADE 435.0
3. STIFF RESIDUAL CLAY $\phi = 0°$, C = 800 psf
4. STIFF COLLUVIUM
5. DENSE SAPROLITE $\phi = 0°$, C = 2000 psf
6. VERY DENSE DEC. ROCK $\phi = 0°$, C = 3000 psf
7. ROCK RIP-RAP



* COMPUTED BY WEDGE ANALYSIS, DRAWDOWN El. 404 CONTROLLED BY BOTTOM OF DISCHARGE CANAL

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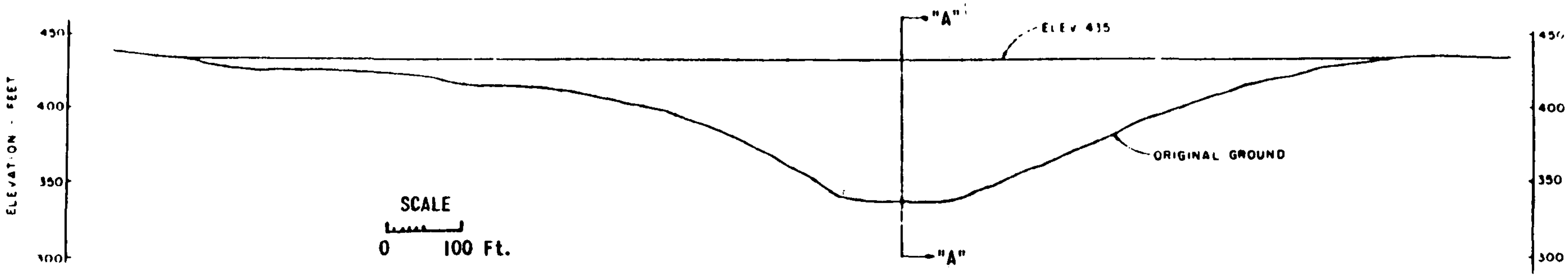
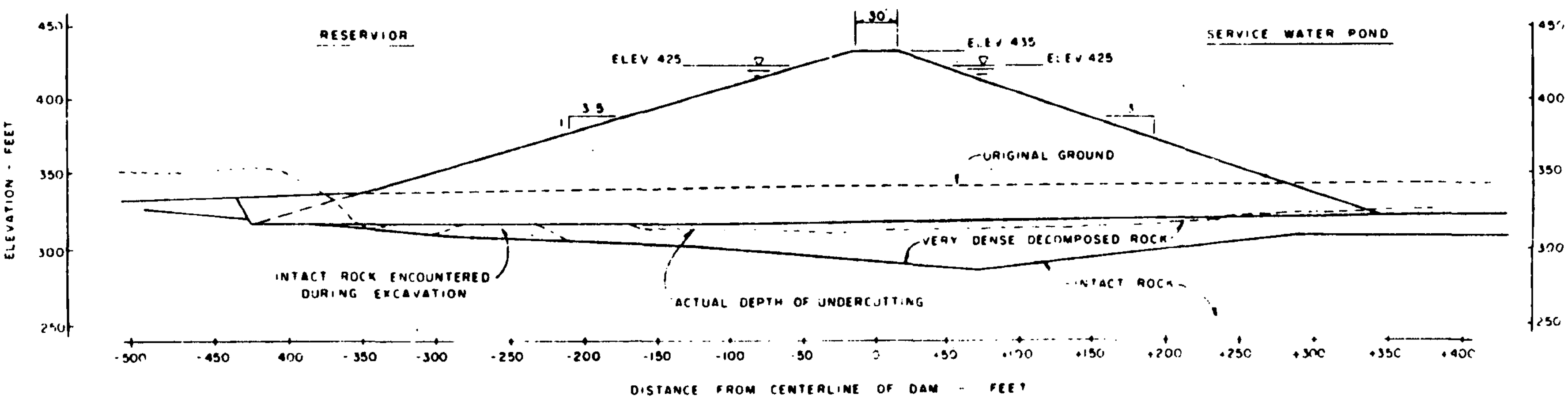
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Stability Analysis Natural Slope Near South Dam Abutment

Figure 2.5-163



PROFILE ACROSS VALLEY



SECTION "A-A" MAXIMUM SECTION (STATION 9+50 ±)

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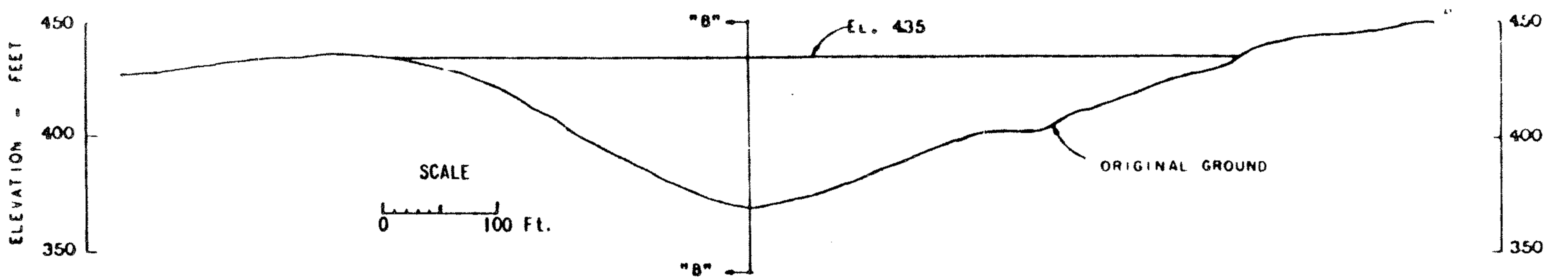
August 1984

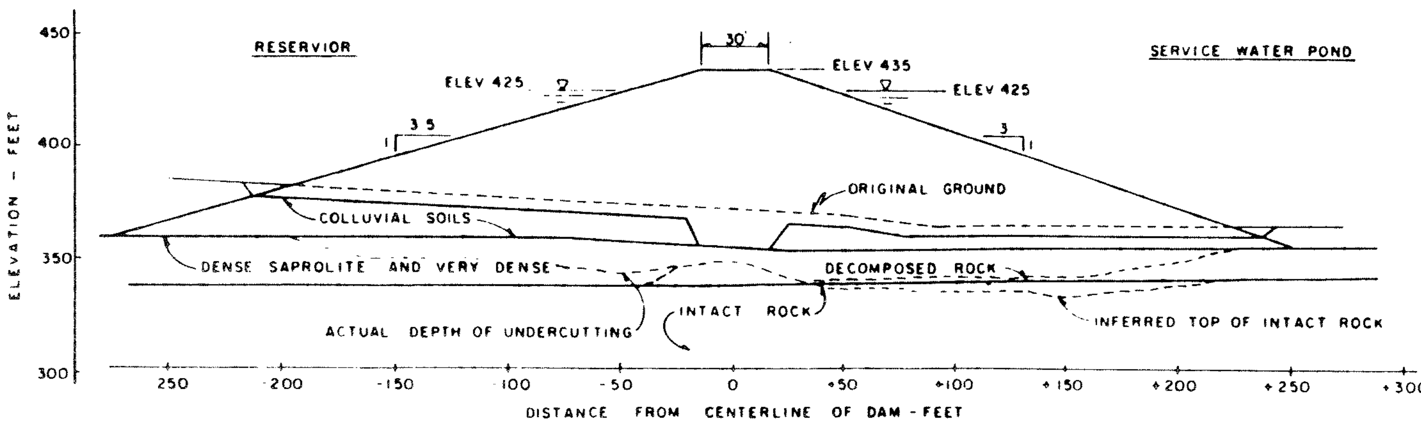
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Profile Across Valley and Maximum Section Analyzed for Seizmic Stability- North Dam

Figure 2.5-164



PROFILE ACROSS VALLEY



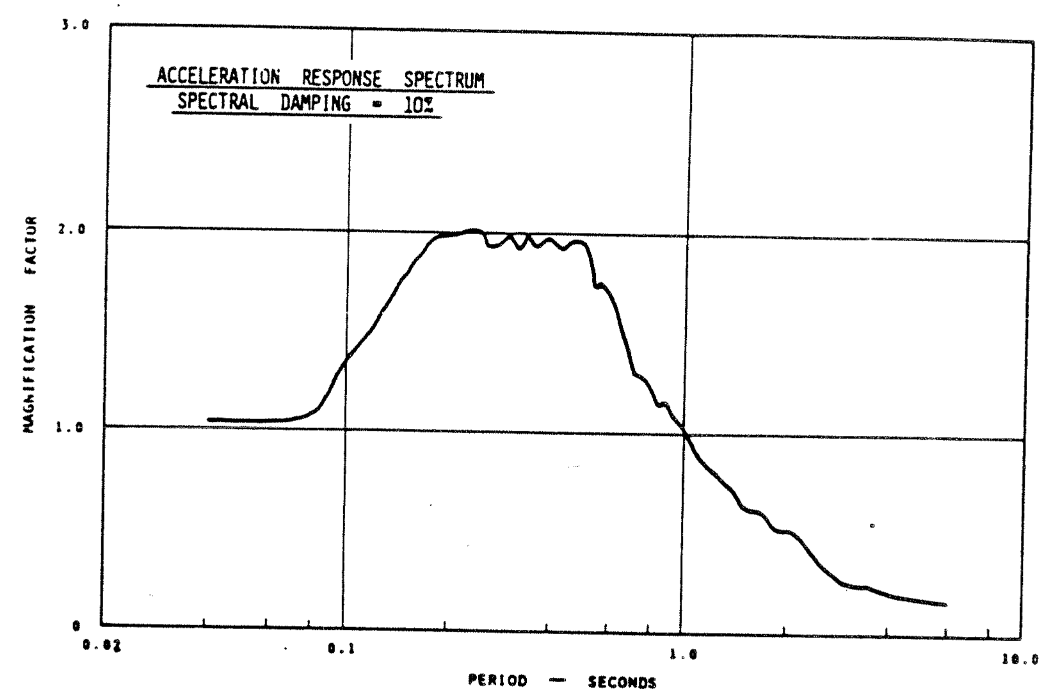
SECTION "B-B" — MAXIMUM SECTION (STATION 6+10±)

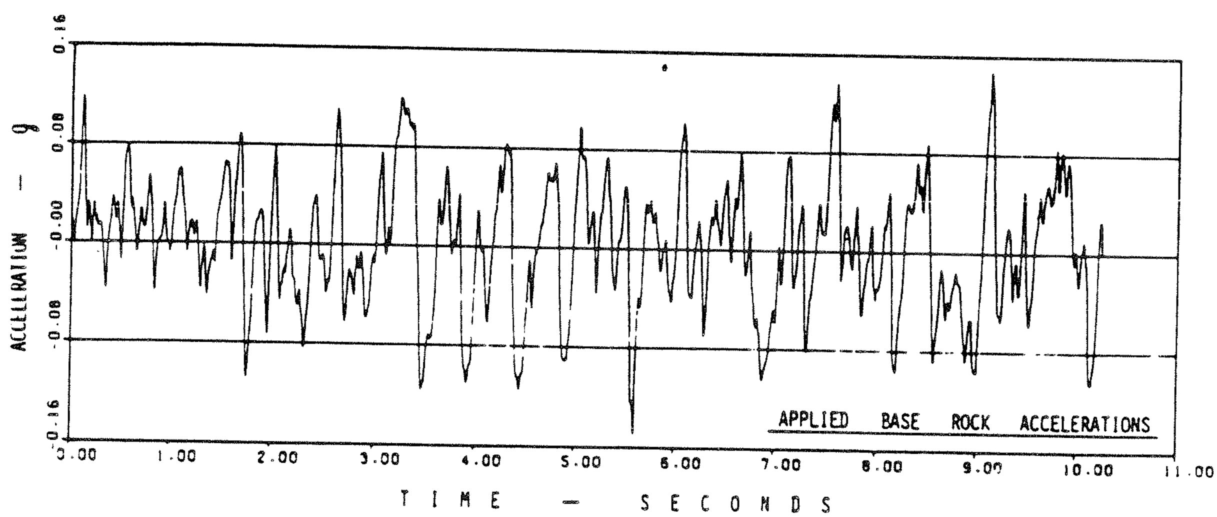
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Profile Across Valley and Maximum Section Analyzed for Seizmic Stability- South Dam

Figure 2.5-165





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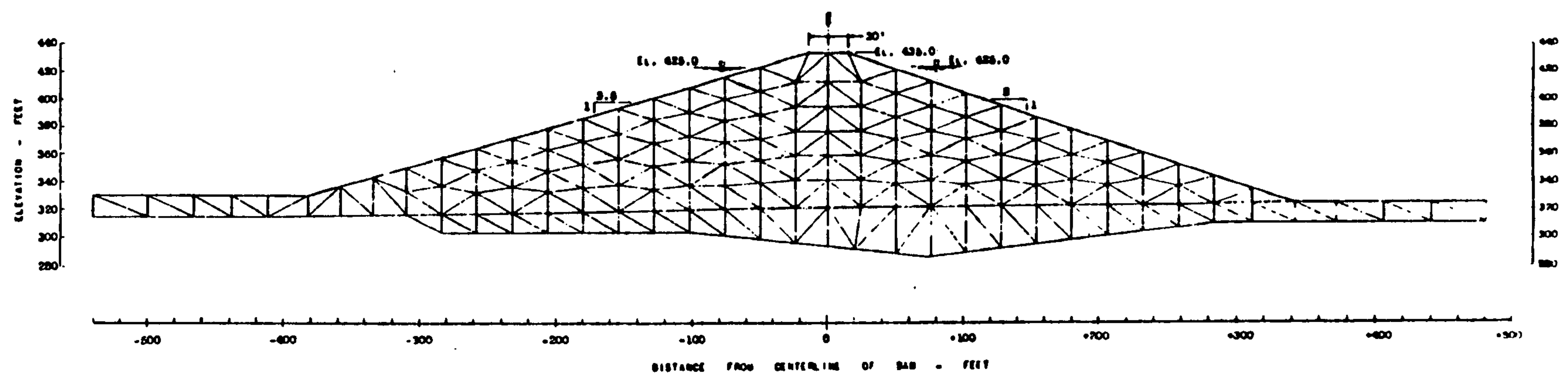
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Time History and Response Spectrum for Applied Base Rock Motion

Figure 2.5-166



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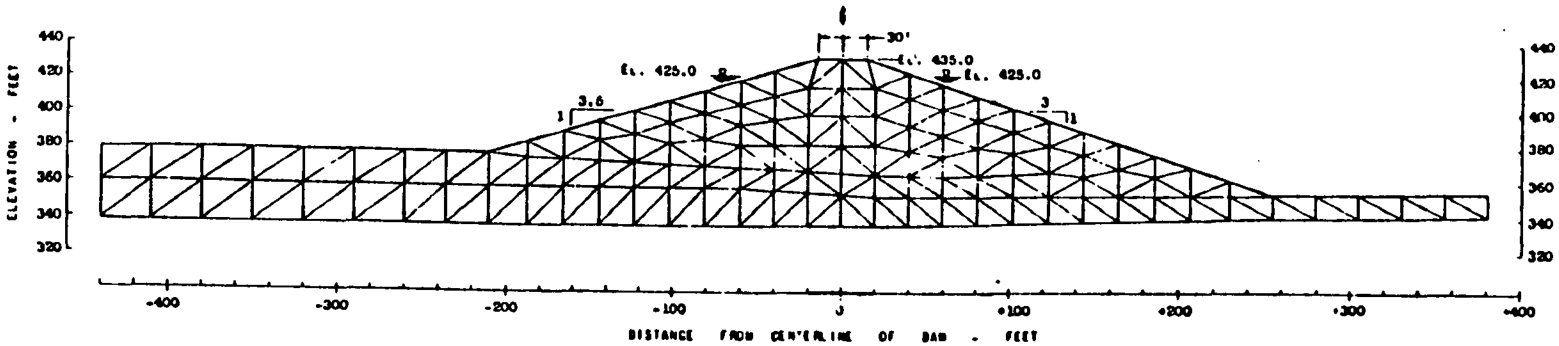
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Finite Element Representation - Maximum Section North Dam

Figure 2.5-167



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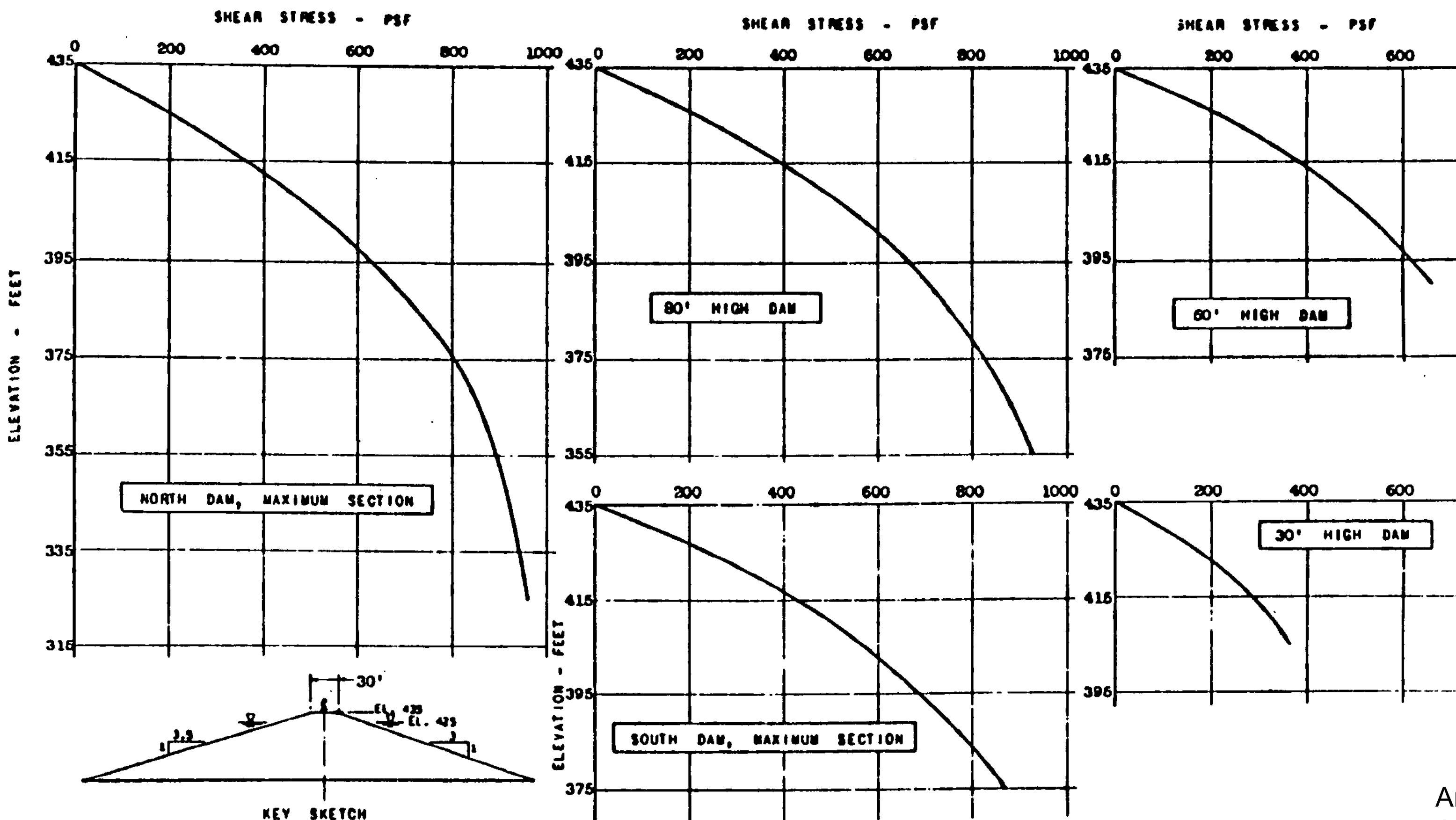
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Finite Element Representation - Maximum Section South Dam

Figure 2.5-168



NOTE:
SHEAR STRESS IS THE EQUIVALENT UNIFORM HORIZONTAL SHEAR STRESS DEVELOPED IN 20 CYCLES DURING GROUND MOTIONS.

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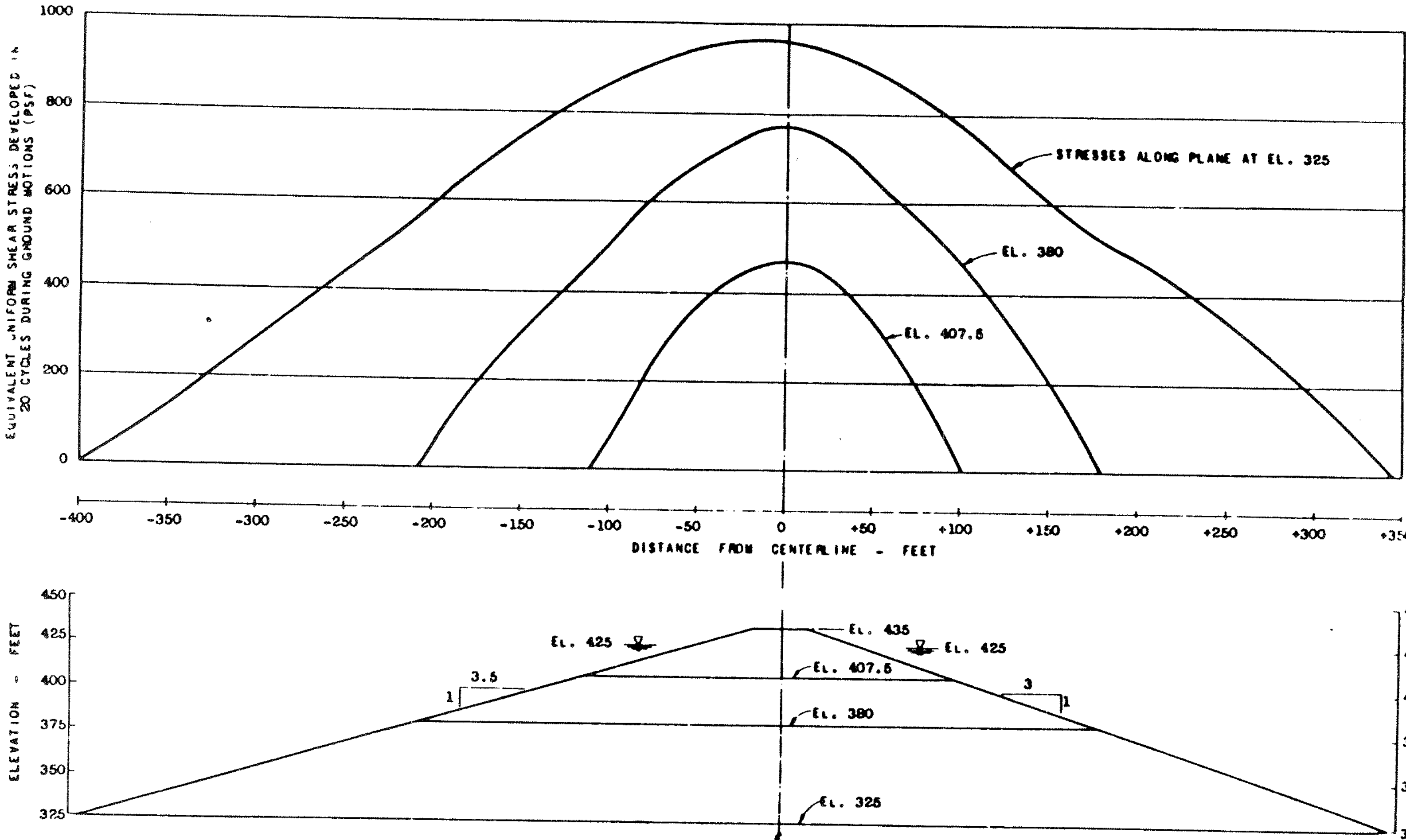
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Shear Stress Variation Along Centerline During SSE

Figure 2.5-169



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Shear Stresses Developed Along Typical Horizontal Planes During SSE - Maximum Section Analyzed - North Dam

Figure 2.5-170

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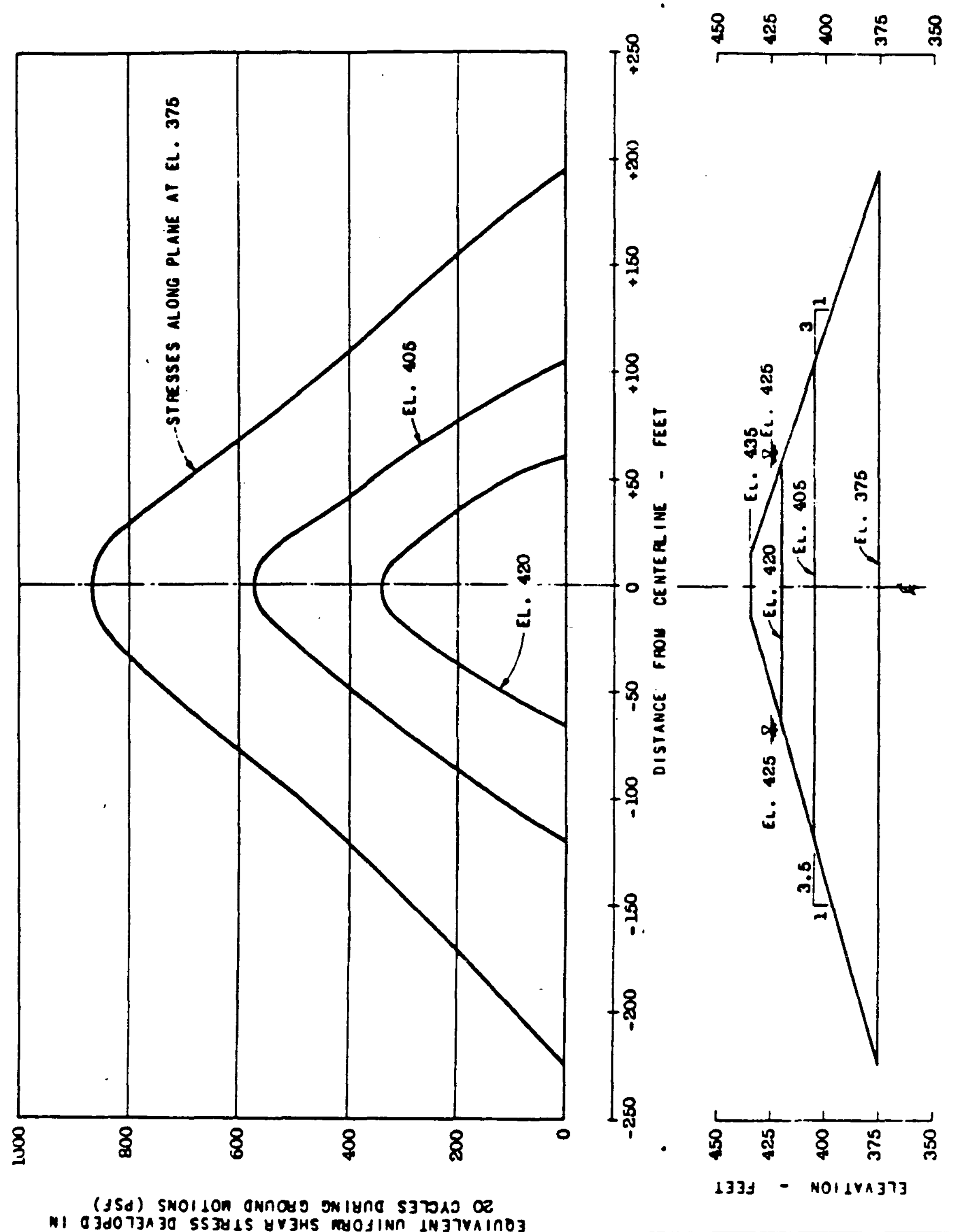

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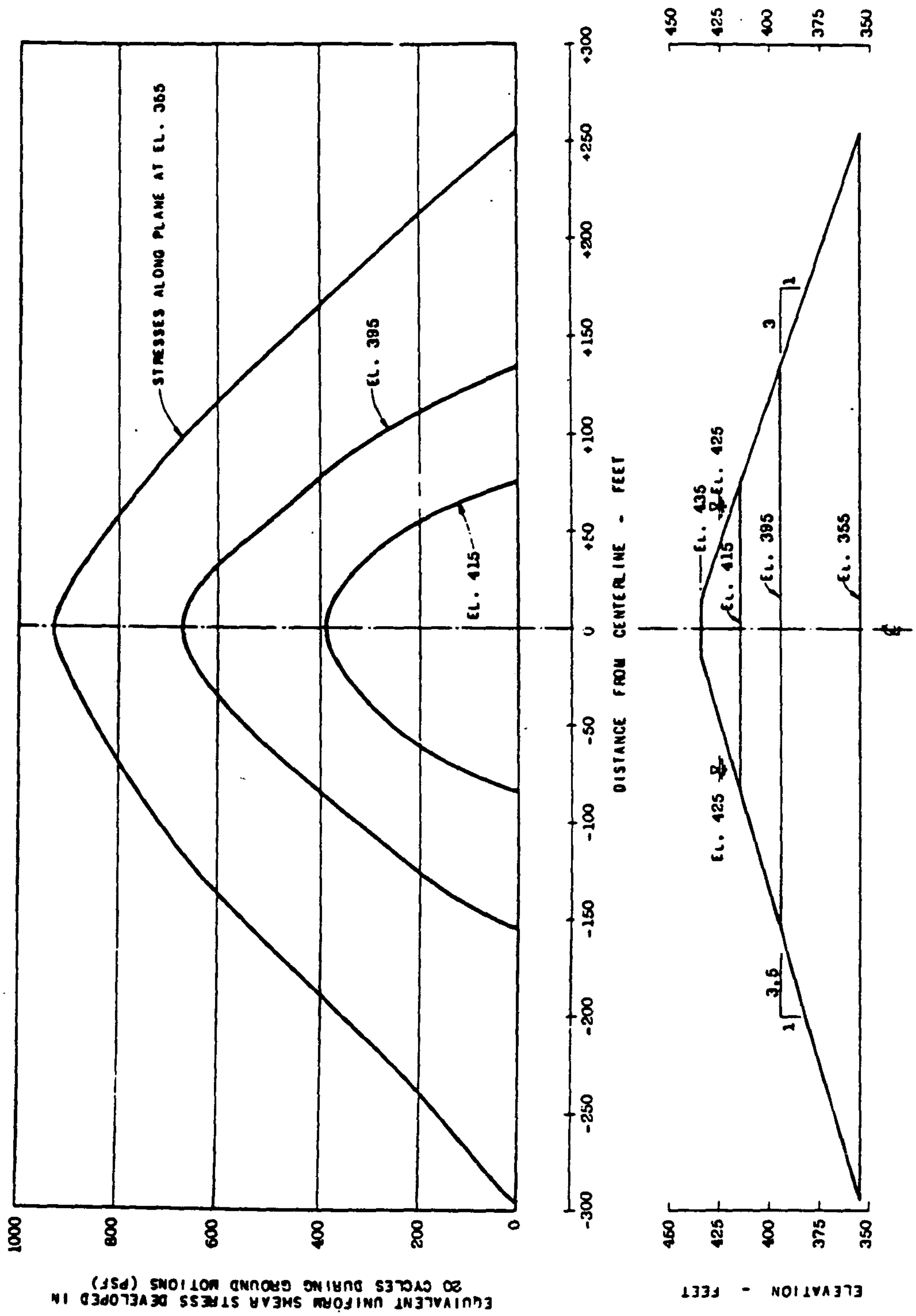
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Shear Stresses Developed Along Typical Horizontal Planes During SSE - Maximum Section Analyzed South Dam

Figure 2.5-171



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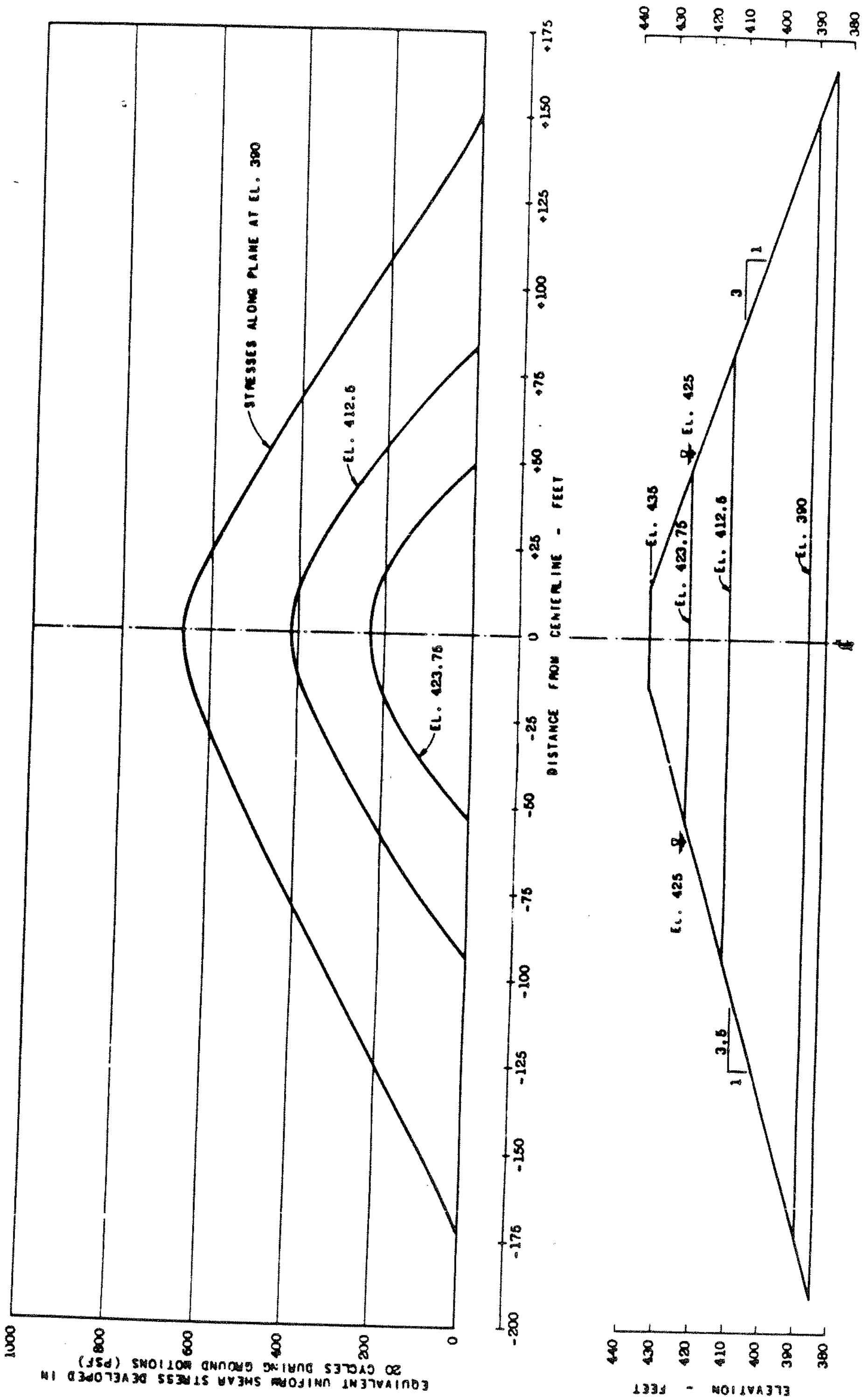
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Shear Stresses Developed Along Typical Horizontal Planes During SSE - 80 Foot High Dam

Figure 2.5-172



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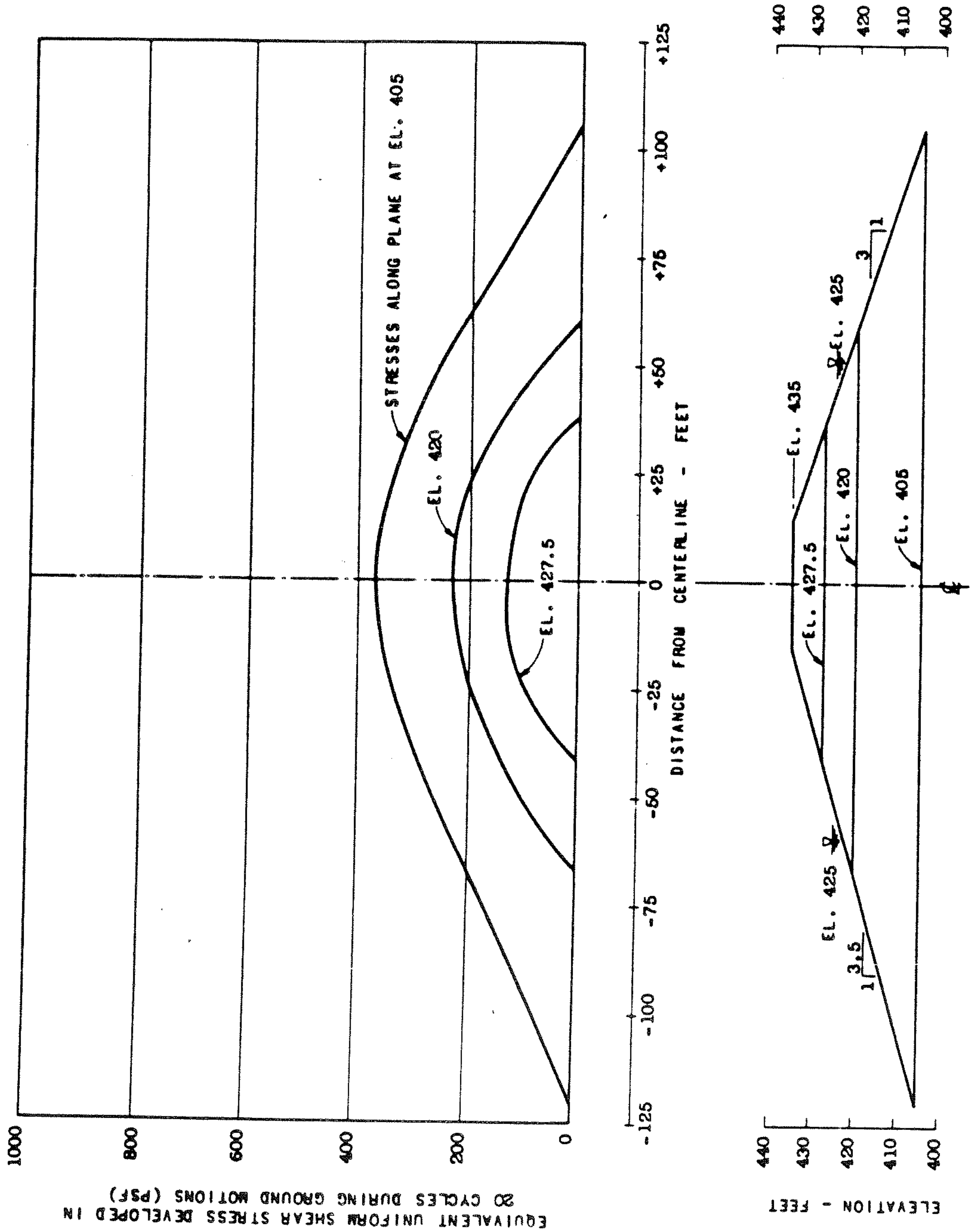
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Shear Stresses Developed Along Typical Horizontal Planes During SSE - 50 Foot High Dam

Figure 2.5-173



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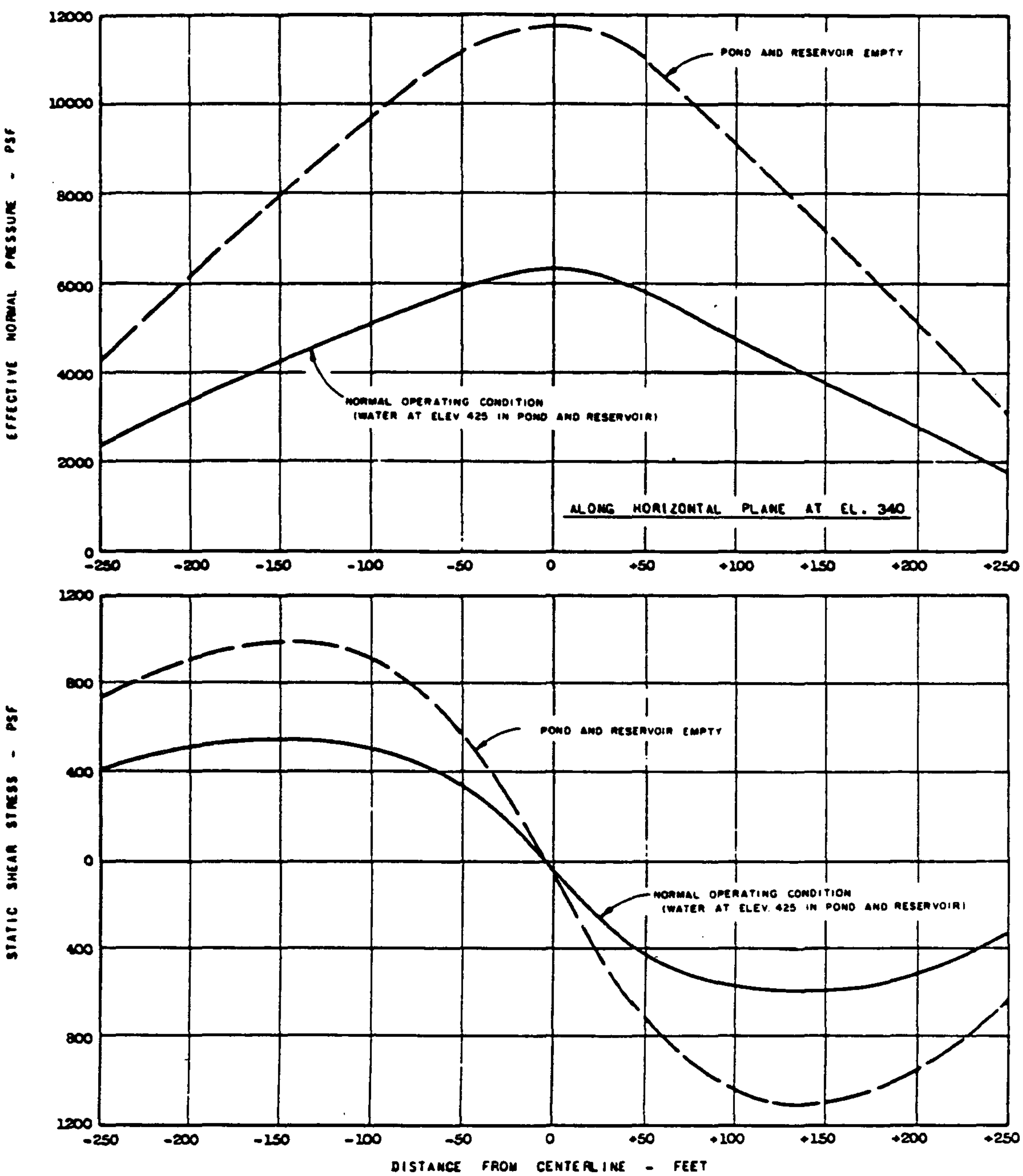
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Shear Stresses Developed Along Typical Horizontal Planes During SSE - 30 Foot High Dam

Figure 2.5-174



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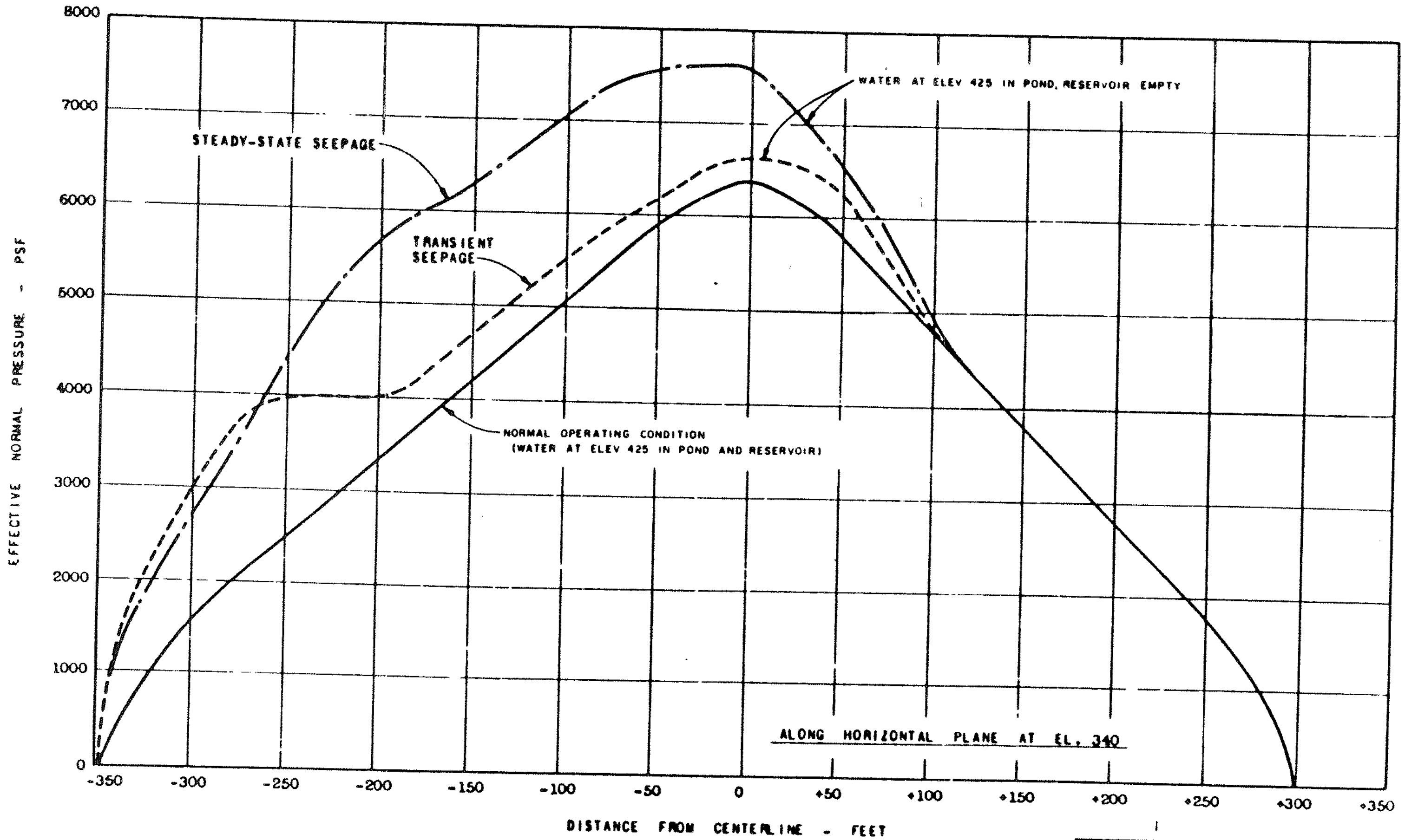
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Typical Static Stresses for Normal Operating Condition and for Pond and Reservoir Empty - Maximum Section Analyzed, North Dam
Figure 2.5-175



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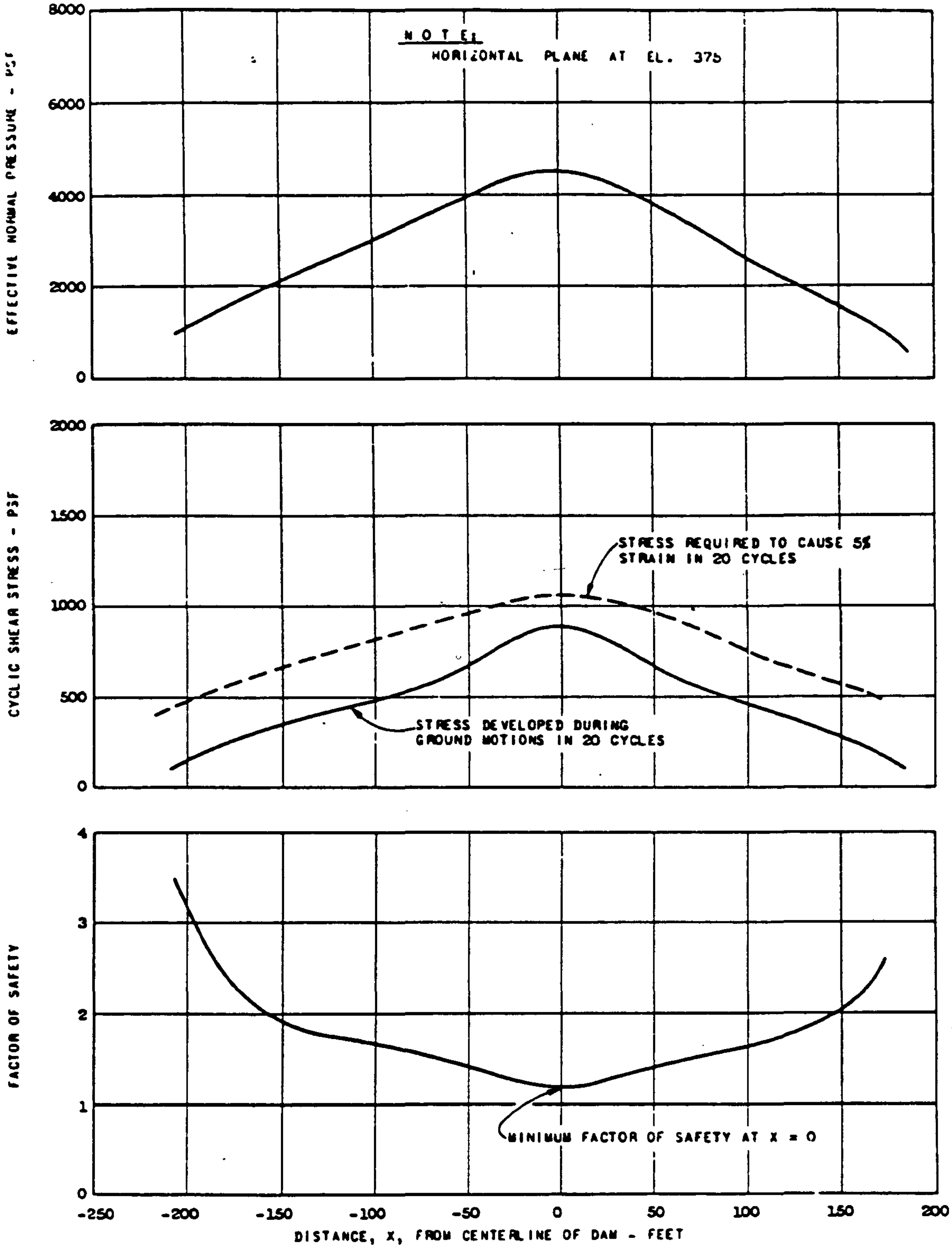
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Typical Static Stresses from Normal Operating Conditions and for Water at Elev. 425.0 in Pond with Reservoir Empty - Max. Section Analyzed, North Dam
Figure 2.5-176



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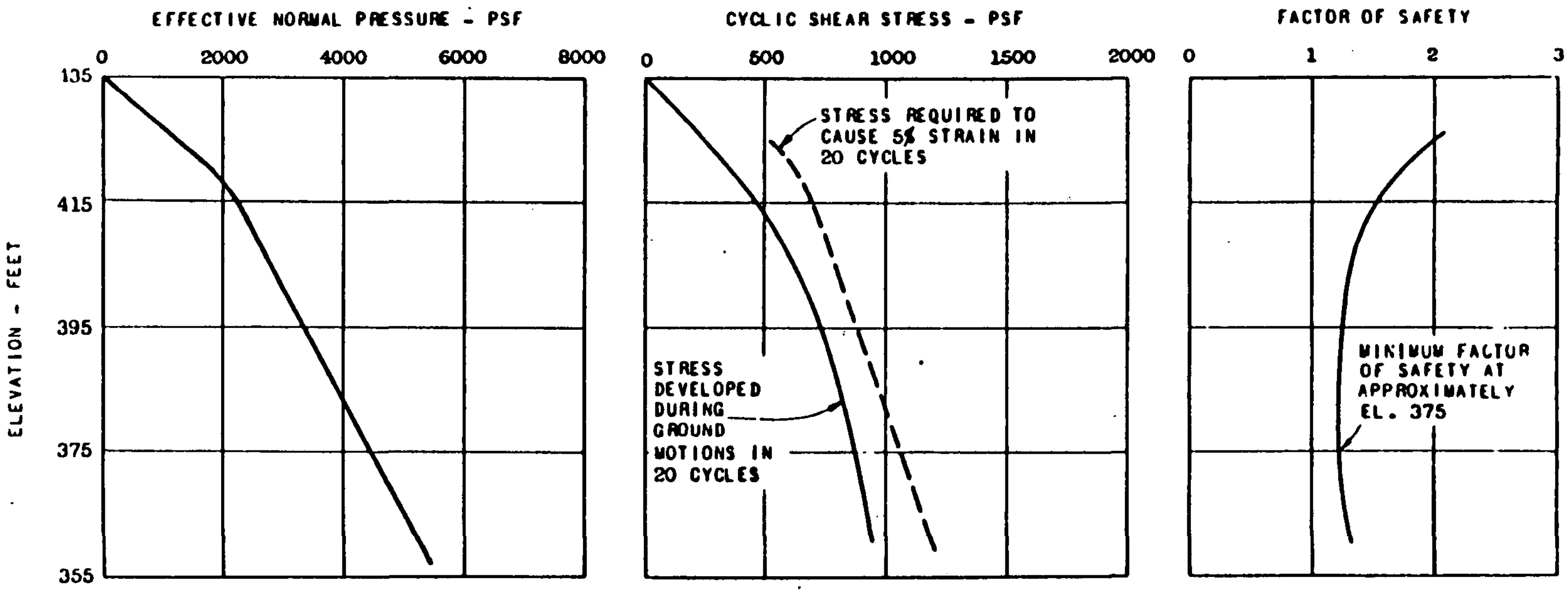
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Failure Potential Along Typical Horizontal Plane - Maximum Section Analyzed, South Dam

Figure 2.5-177



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SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Failure Potential Along Centerline -
Maximum Section Analyzed, South Dam

Figure 2.5-178

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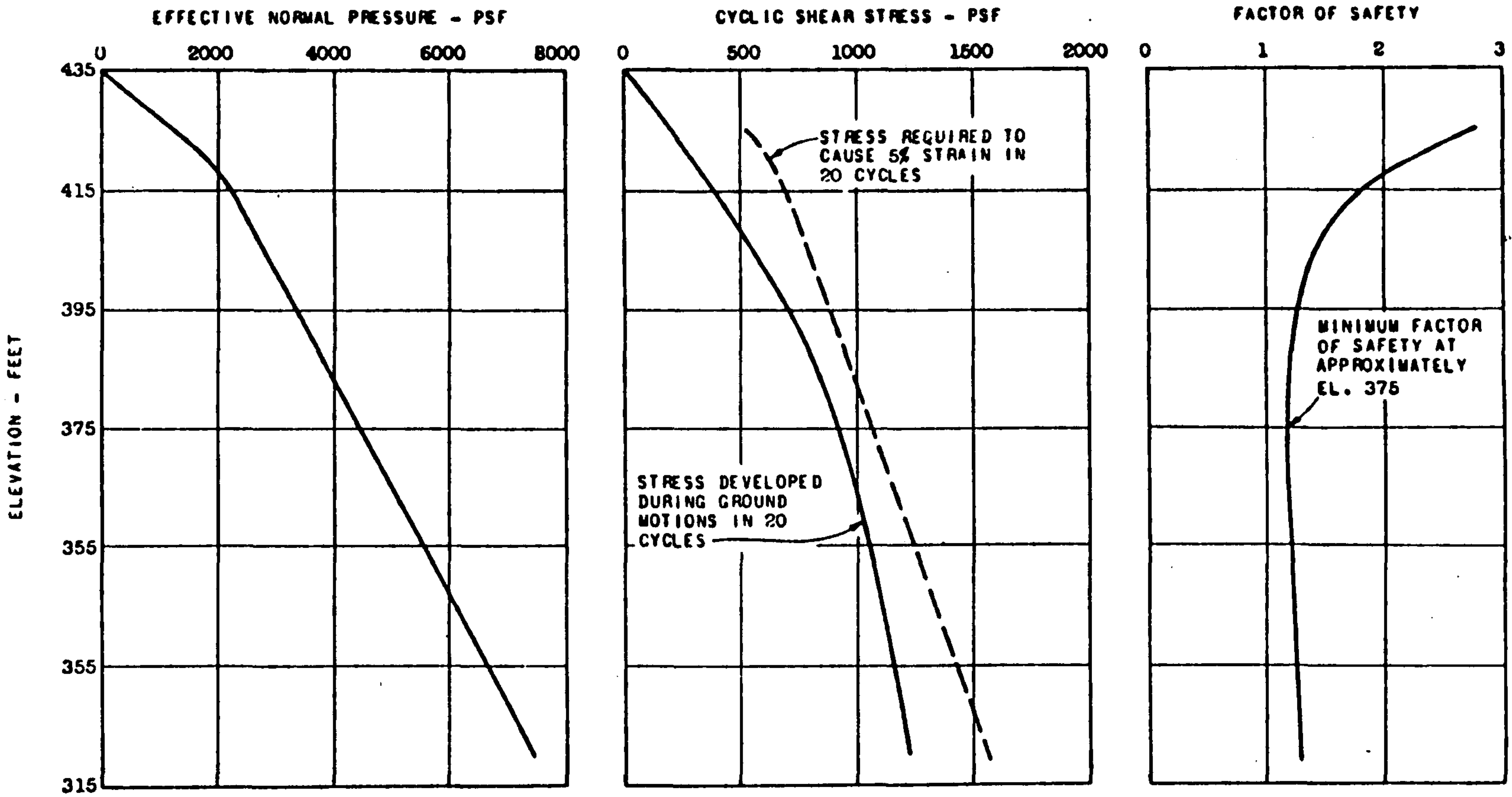
August 1984



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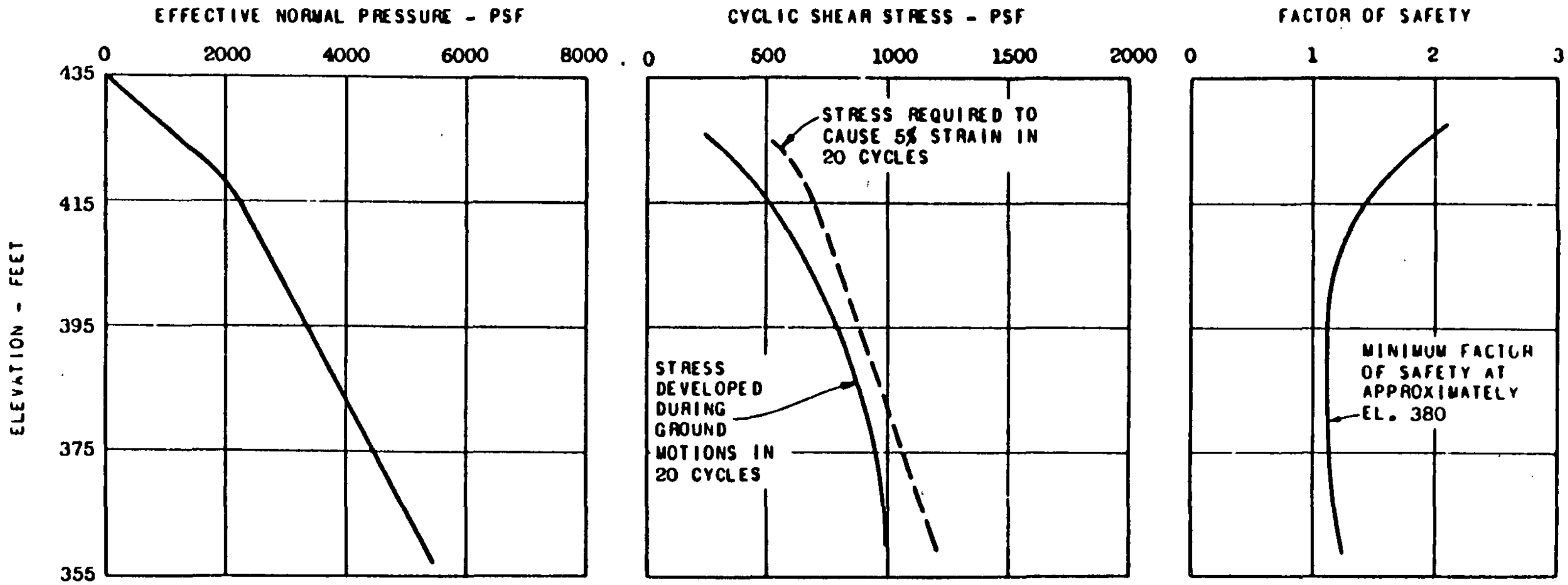
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Failure Potential Along Centerline - Maximum Section Analyzed, North Dam

Figure 2.5-179



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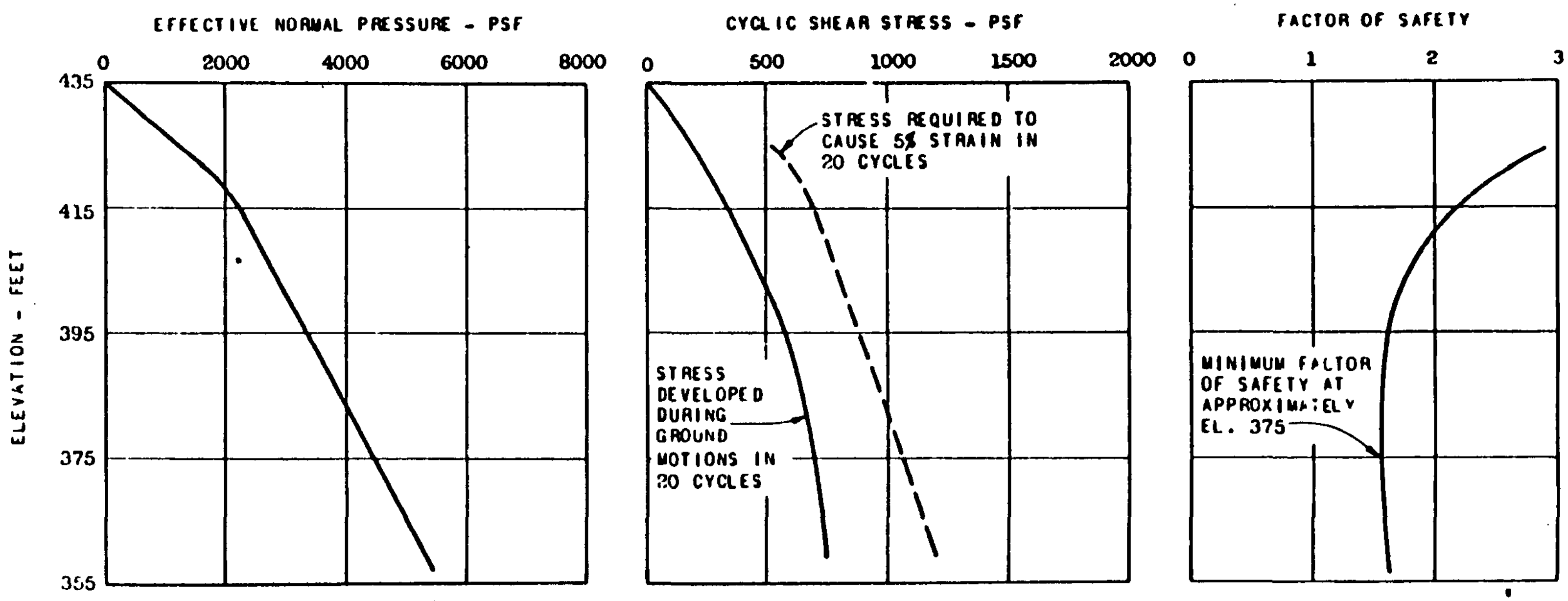
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Failure Potential Along Centerline Using Upper Bound on Probable Modulus Values - Maximum Section Analyzed, South Dam

Figure 2.5-180



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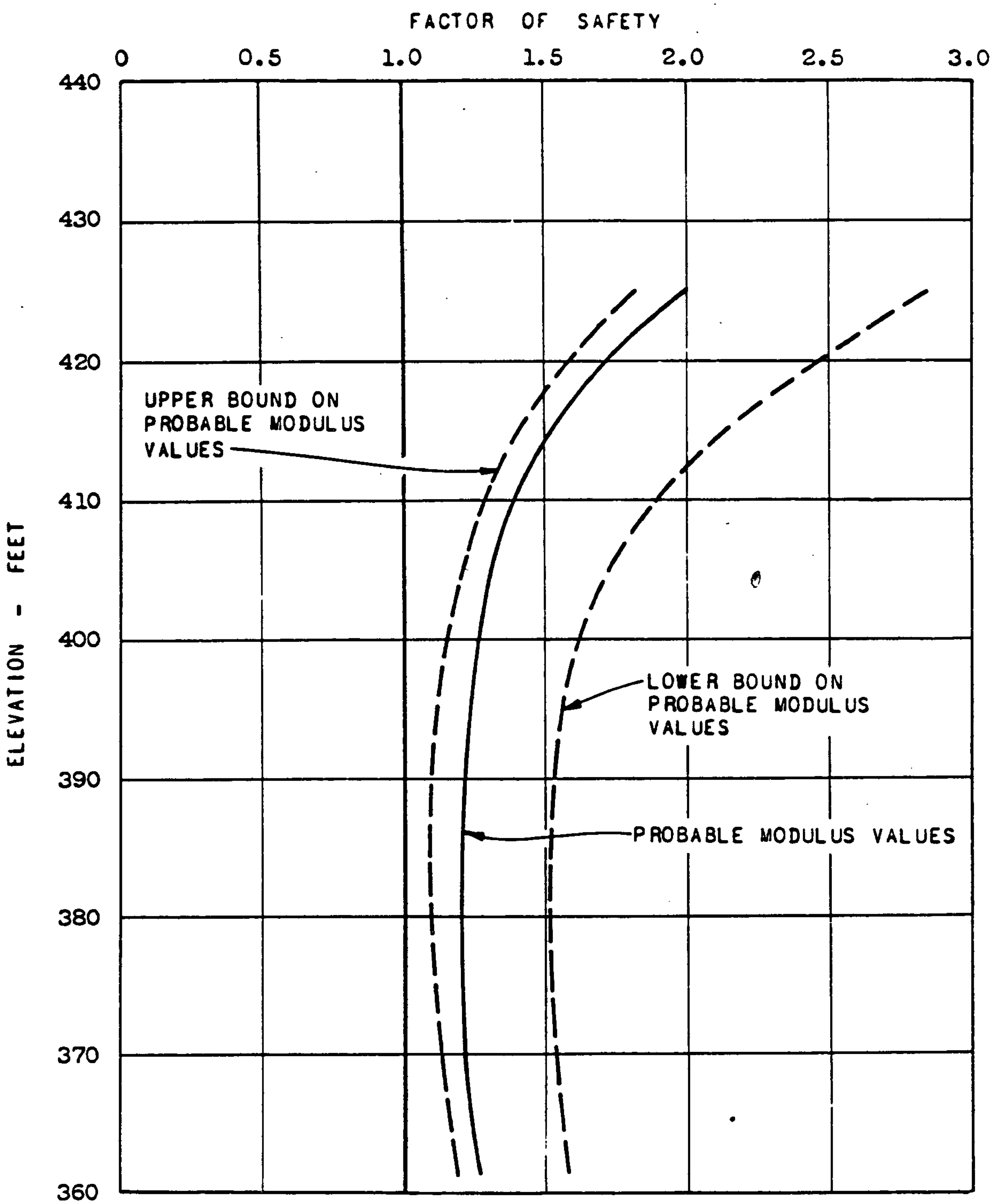
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Failure Potential Along Centerline Using Lower Bound on Probable Modulus Values - Maximum Section Analyzed, South Dam

Figure 2.5-181



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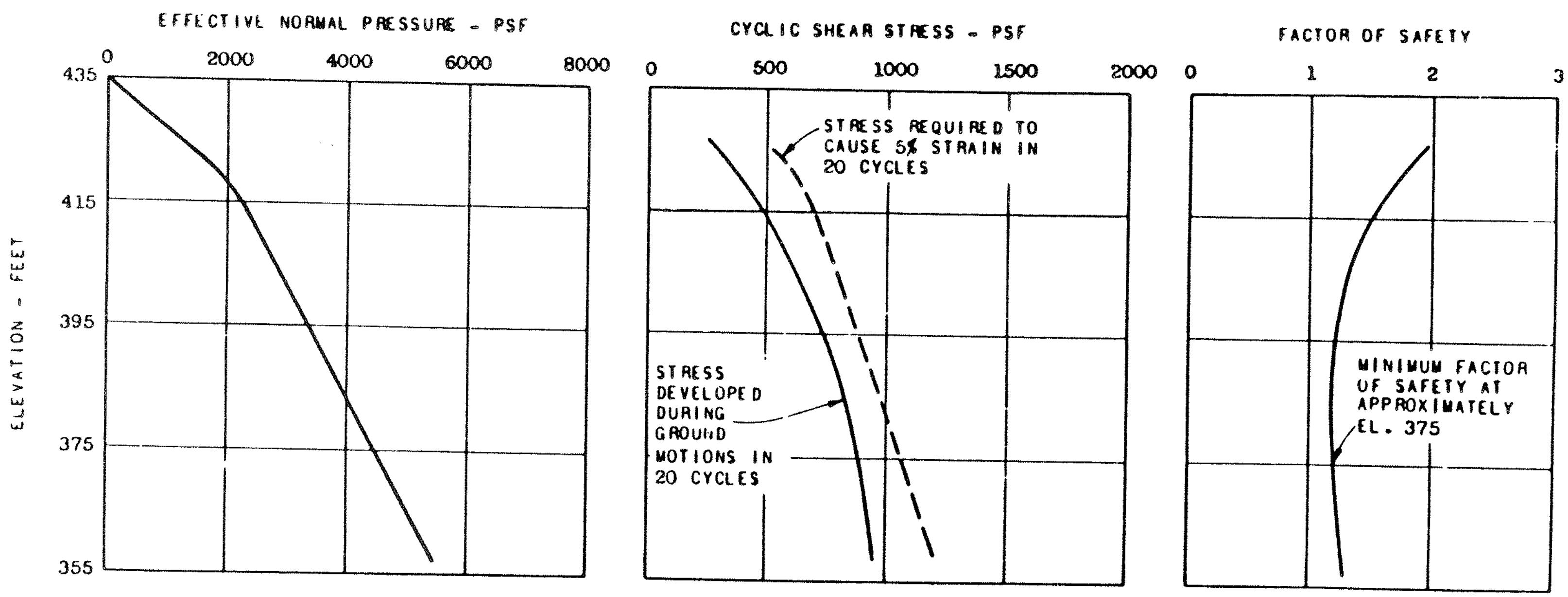
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Effects of Variation in Modulus Values on Failure Potential - Maximum Section Analyzed, South Dam

Figure 2.5-182



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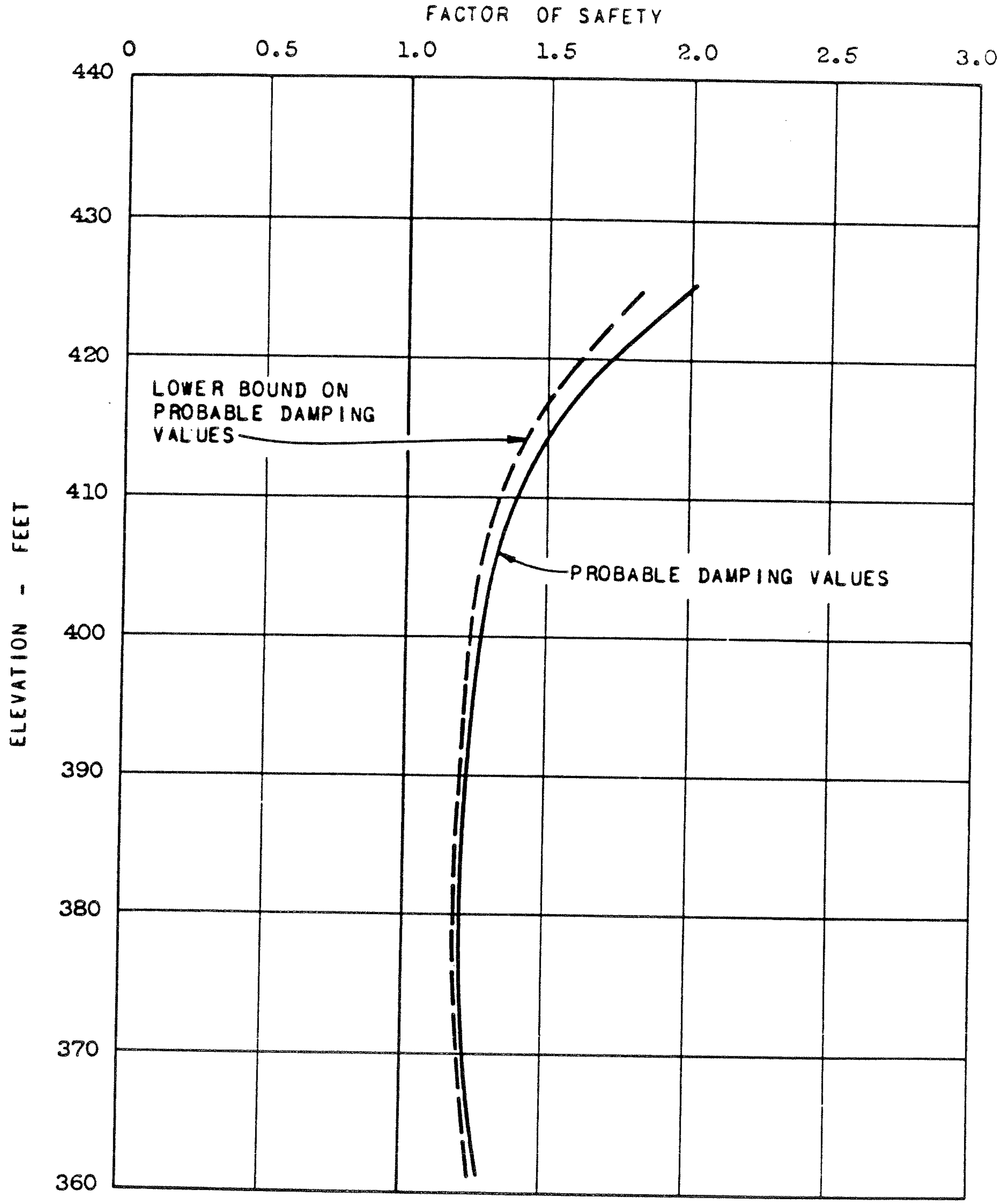
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Failure Potential Along Centerline Using Lower Bound on Damping Values - Maximum Section Analyzed, South Dam

Figure 2.5-183



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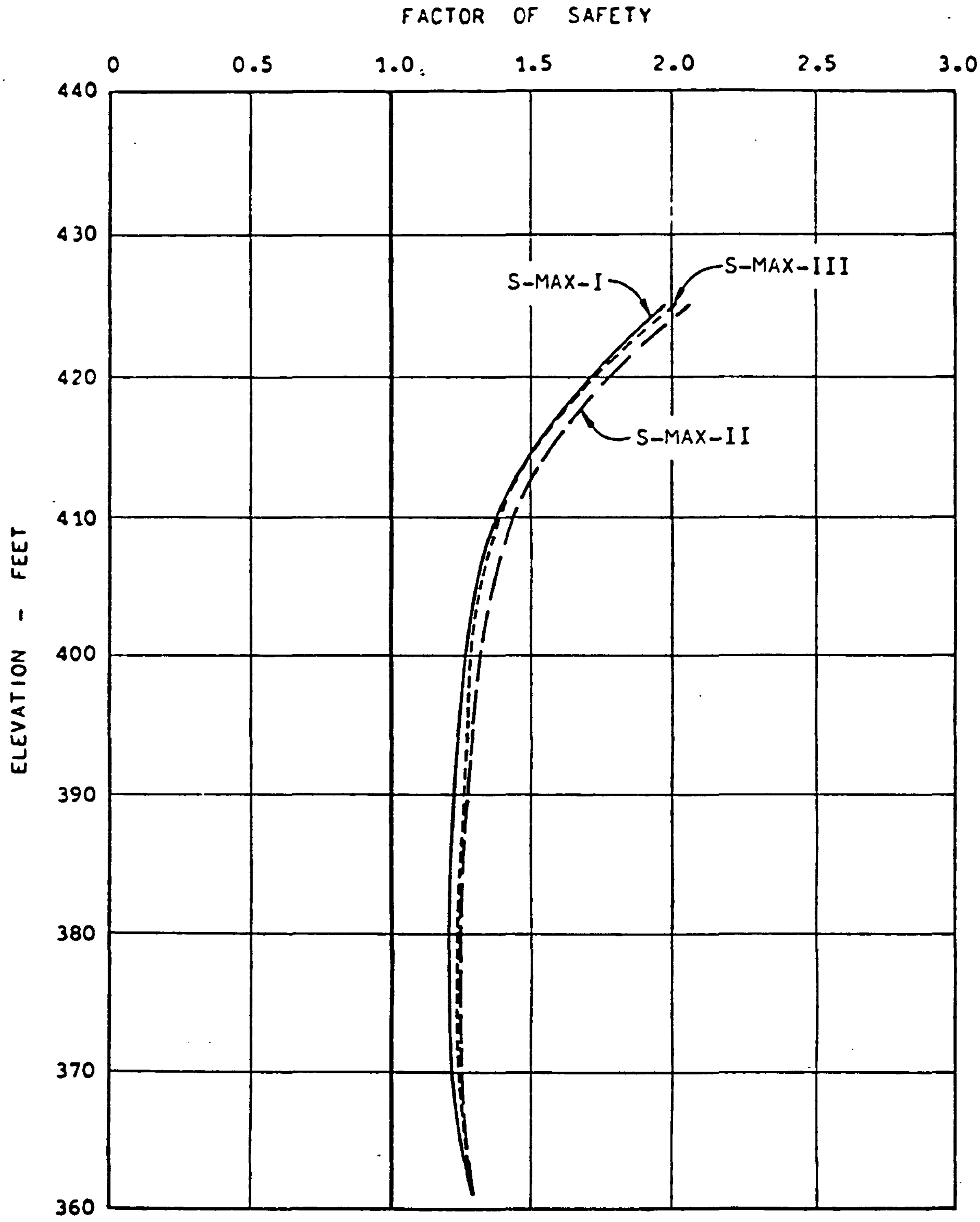
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Effects of Variation in Damping Values on Failure Potential - Maximum Section Analyzed, South Dam

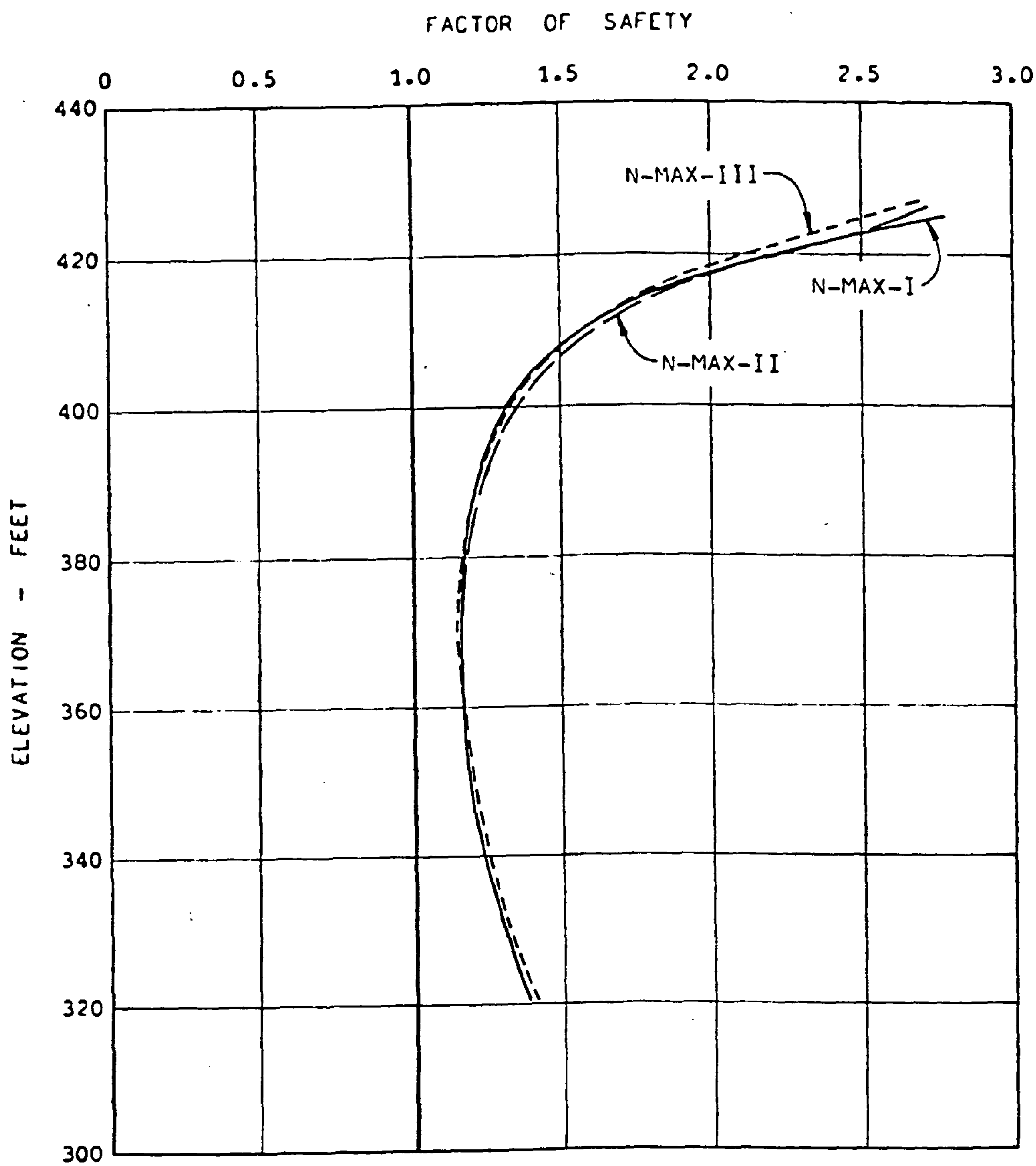
Figure 2.5-184



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Effects of Variation in Modulus Values of the Foundation Strata on Failure Potential - Maximum Section Analyzed, South Dam

Figure 2.5-185



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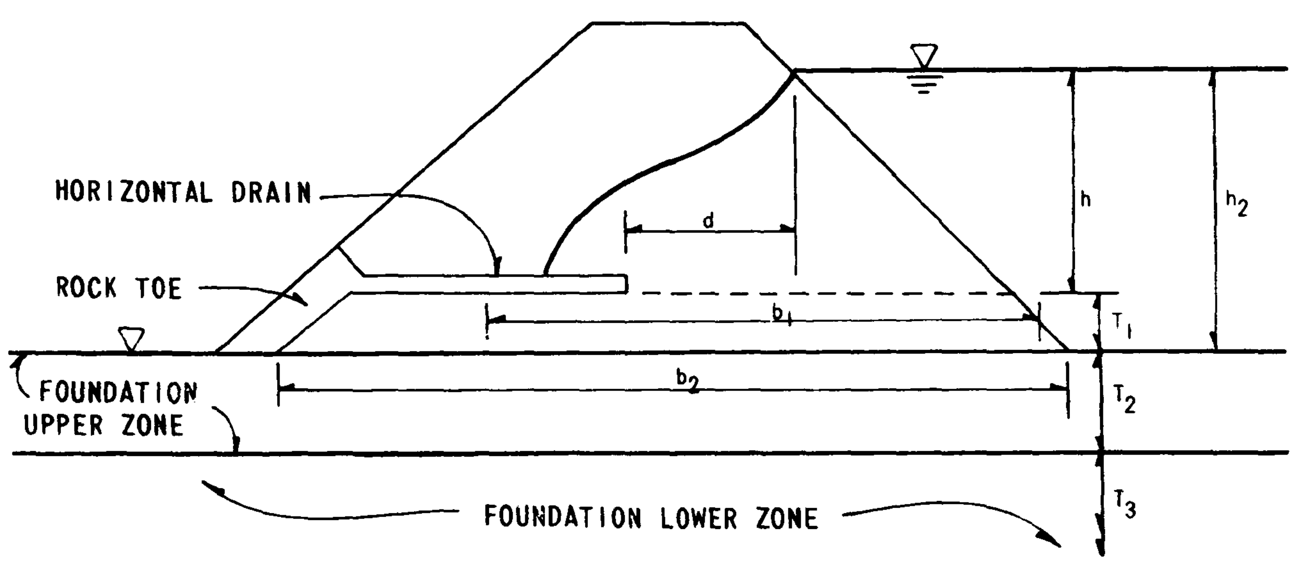
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

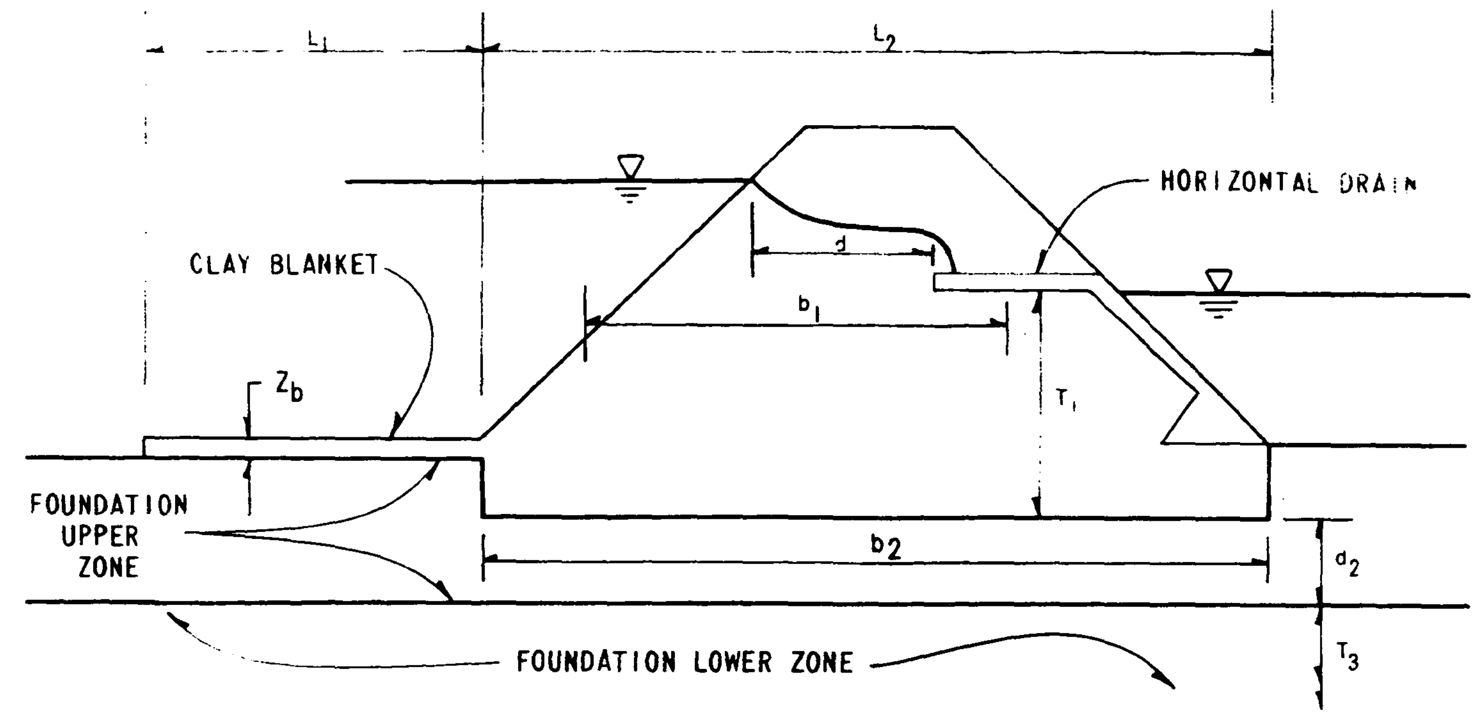
Effects of Variation in Modulus Values of the Weathered Rock on Failure Potential - Maximum Section Analyzed , North Dam

Figure 2.5-186



NOTE: IN SECTION 2.5.6.6.3, USE:

1) h and d with Eq (1) for seepage through embankment above drain
2) h, T_1 and b_1 with Eq (2) for seepage through embankment below drain
3) h_2, T_2 and b_2 with Eq (2) for seepage through foundation upper zone
4) h_2, T_3 and b_2 with Eq (4) for seepage through foundation lower zone



NOTE: IN SECTION 2.5.6.6.3, USE:

1) h and d with Eq (1) for seepage through embankment above drain
2) h, T_1 and b, with Eq (2) for seepage through embankment below drain
3) h, d_2, L_1 and L_2 with Eq (5) for seepage through foundation upper zone protected with clay blanket
4) h, T_3 and b_2 with Eq (4) for seepage through foundation lower zone

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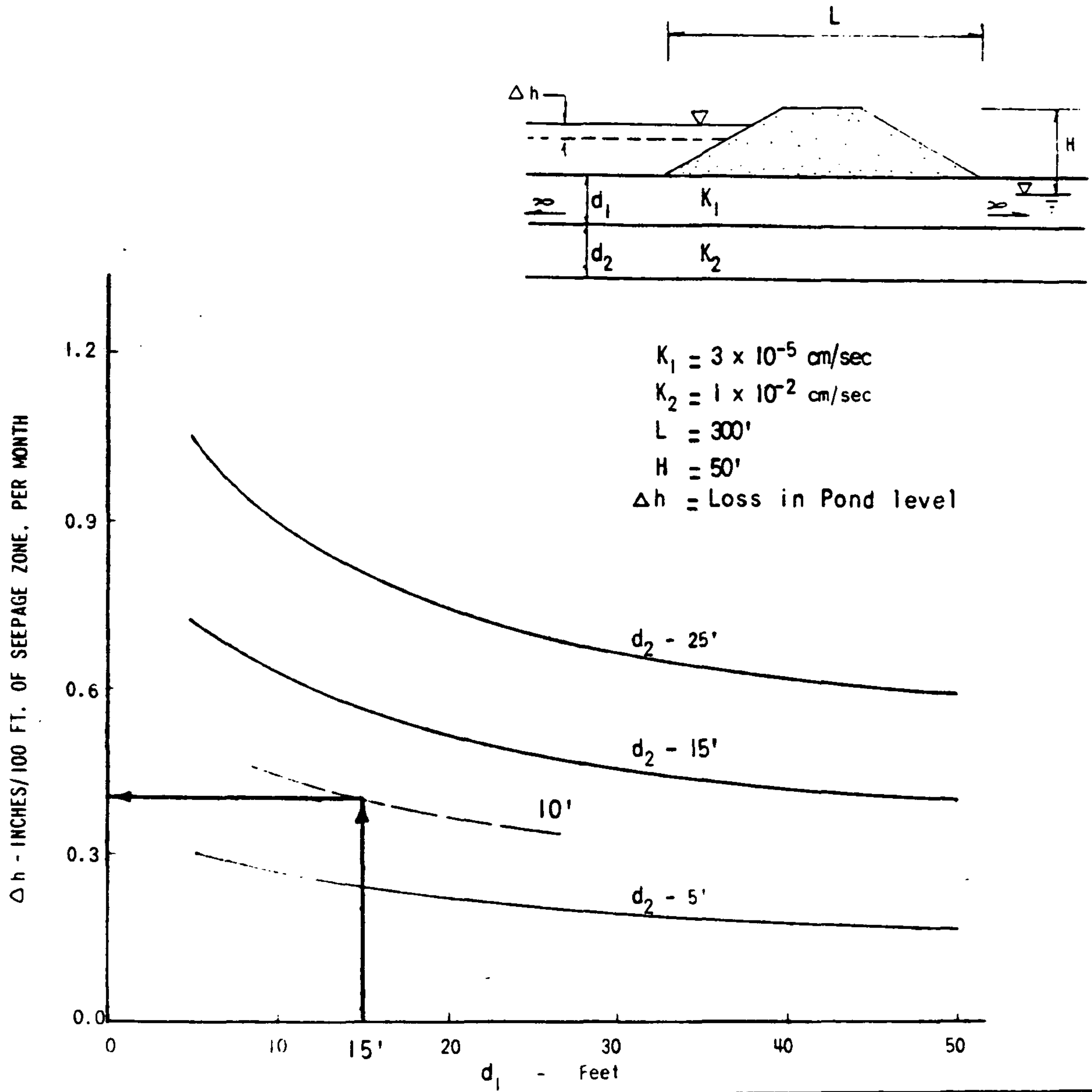
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Schematic Definition of Geometrical Parameters Used in Seepage Analysis

Figure 2.5-187

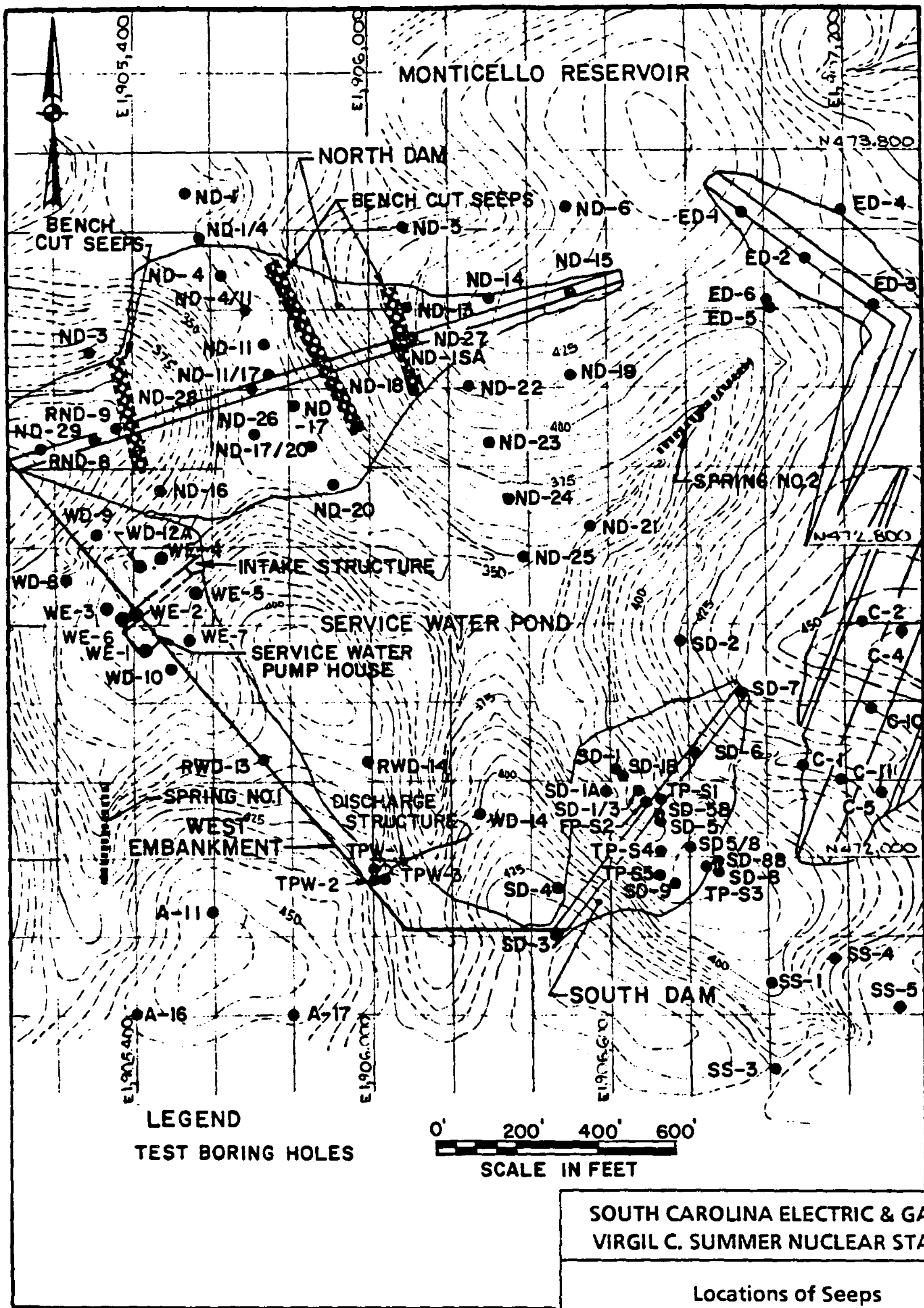


SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Estmated Loss in Pond Level Due to High Permeability Foundation Zone

Figure 2.5-188

Amendment 0
August1984

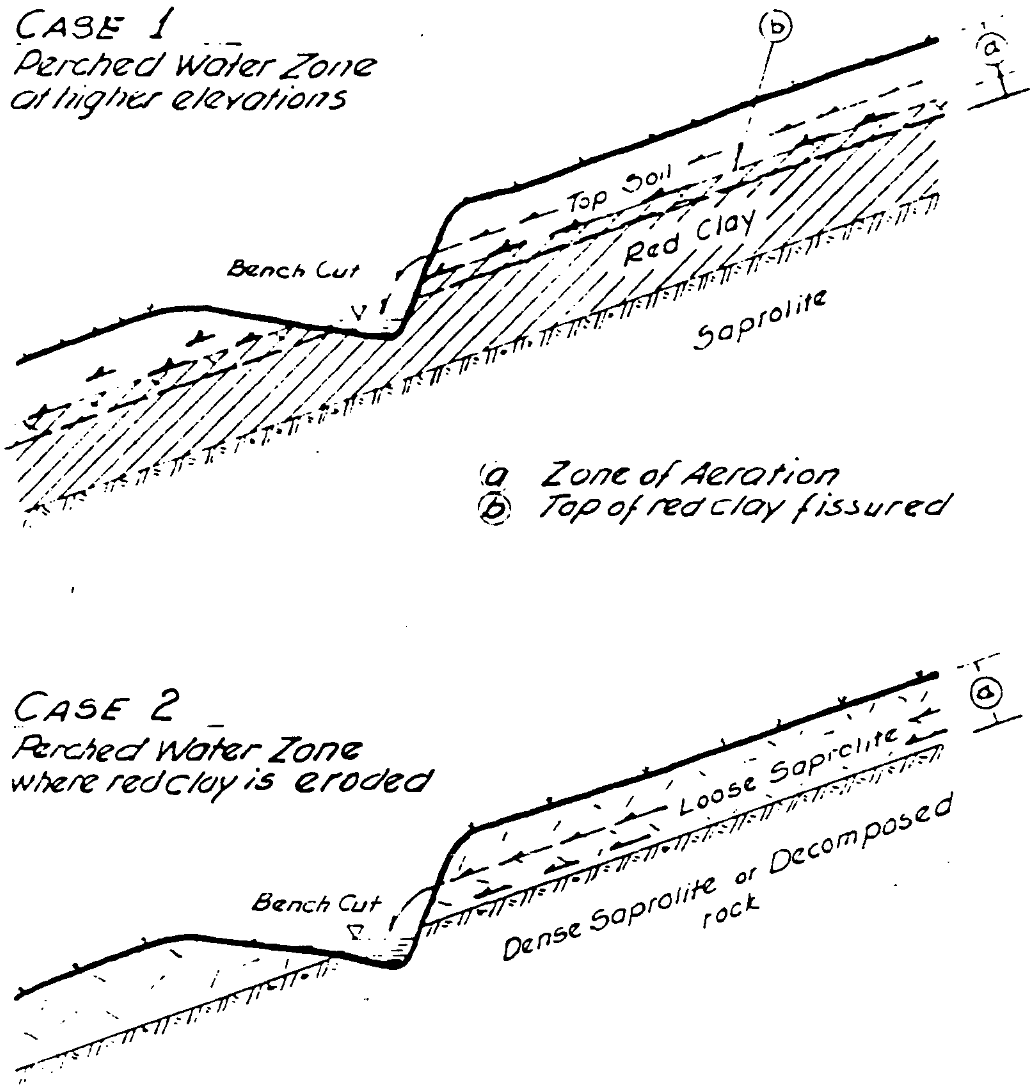


SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Locations of Seeps and Springs

Figure 2.5-189

Amendment 0
August1984



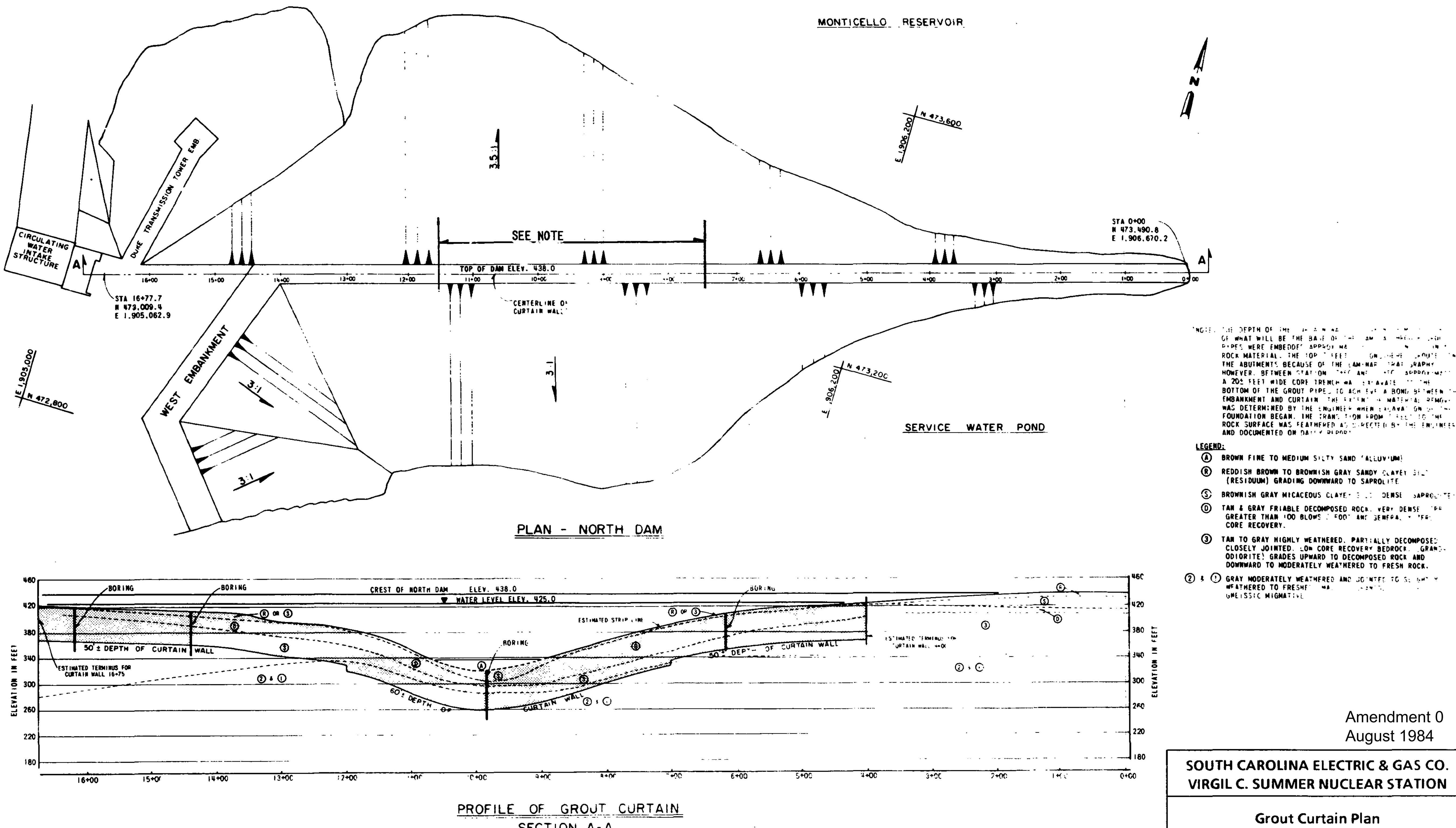
(Case 2 is the most common case at lower elevations)

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Seepage at Bench Cuts

Figure 2.5-190

Amendment 0
August1984

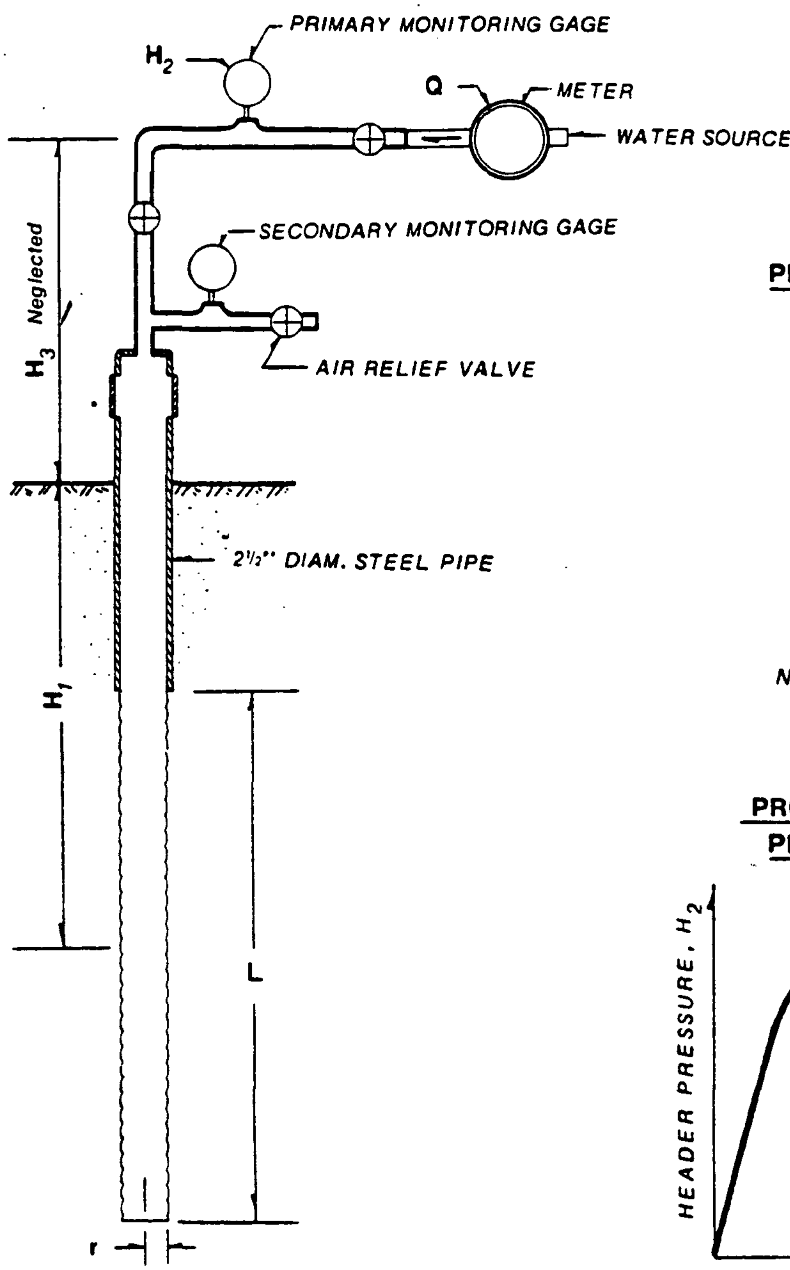


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Grout Curtain Plan and Profile

Figure 2.5-191



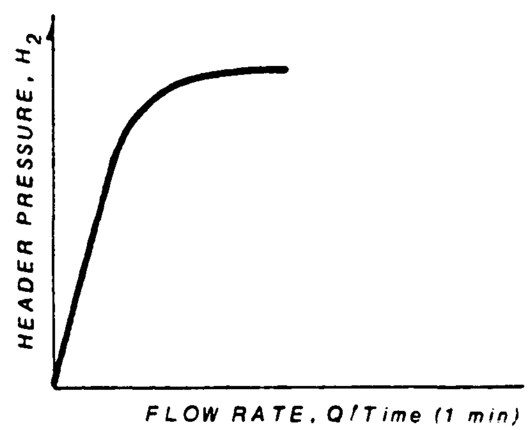
PERMEABILITY COMPUTATION

$K = 0.0108 \frac{Q}{LH} \times Log_e \frac{L}{r}$

- **K** = *Permeability (cm/sec)*
- **Q** = *Inflow rate (GPM)*
- **L** = *Length of Test Section (ft)*
- **H** = *Pressure Head (ft)*
- **r** = *Radius of Hole (ft)*

NOTE: Total Head, $H = H_1 + H_2$

PROCEDURE USED TO PLOT PRESSURE vs FLOW RATE

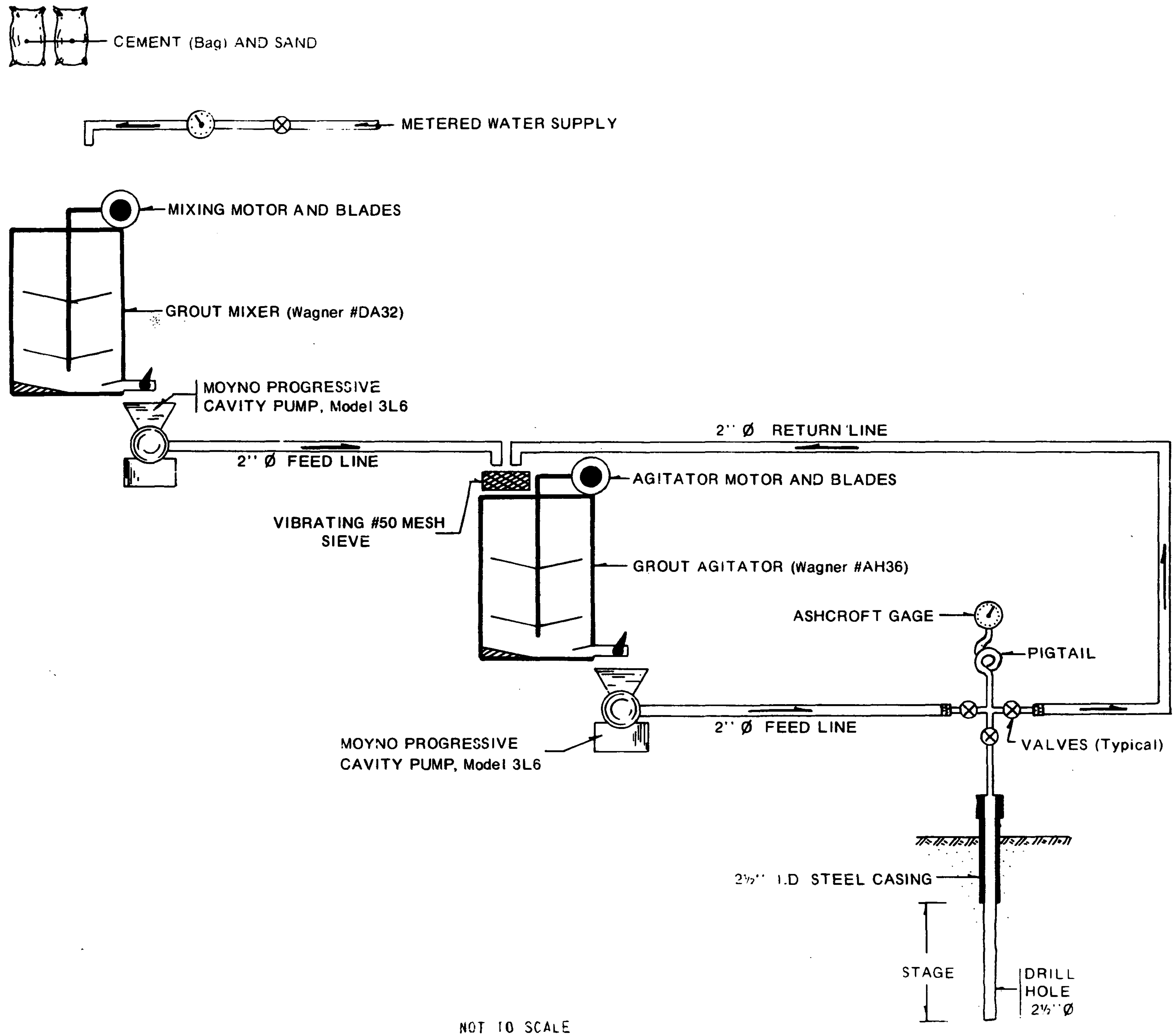


NOT TO SCALE

SCHEMATIC
of
WATER PRESSURE TESTING
APPARATUS

SOUTH CAROLINA ELECTRIC & GAS CO. VIRGIL C. SUMMER NUCLEAR STATION
Water Pressure Testing Apparatus Figure 2.5-192

Amendment 0
August1984

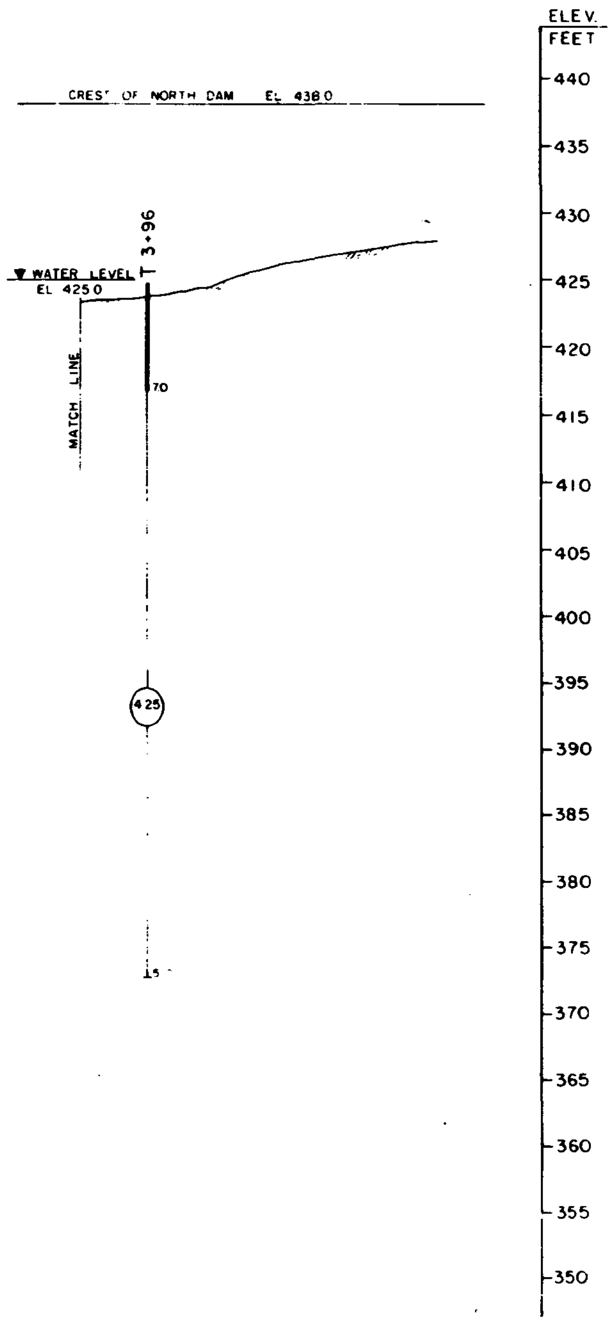


Amendment 0
August 1984

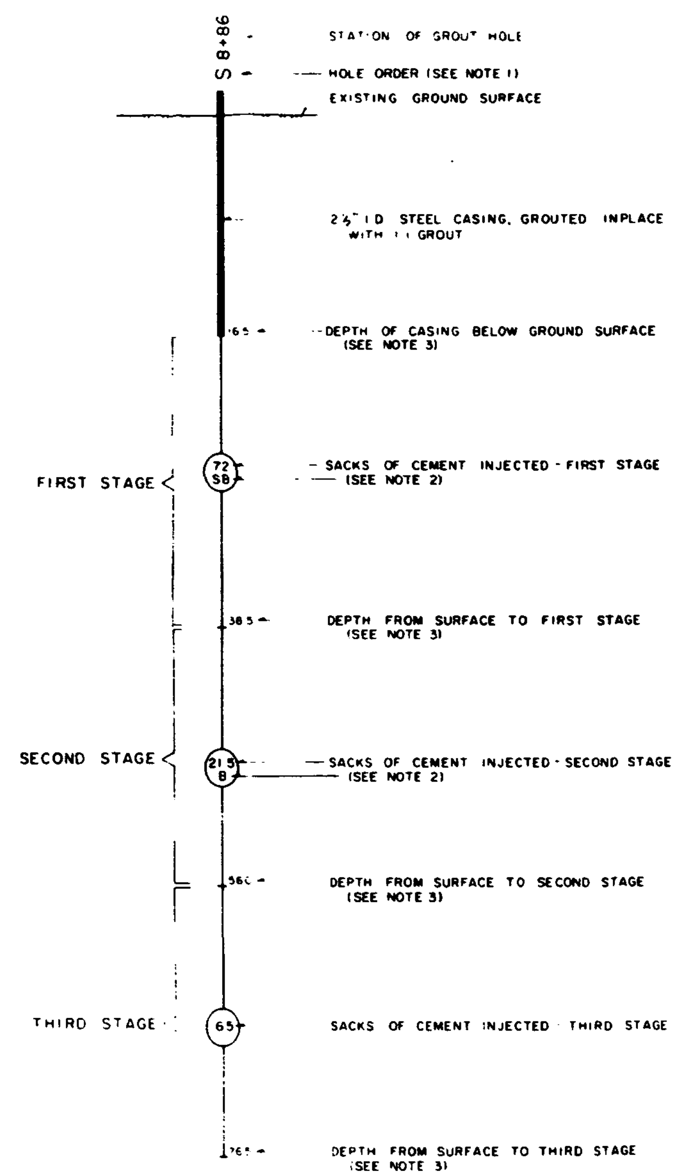
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Circulating Grout
System

Figure 2.5-193



LEGEND



NOTES

1. SYMBOLS FOR HOLE ORDER - MODIFIED SPLIT-SPACING PROCEDURE

   P = PRIMARY - INITIAL FIRST ORDER HOLES

   S = SECONDARY - SECOND ORDER HOLES WHICH SPLIT THE SPACE BETWEEN PRIMARY HOLES

   T = TERTIARY - THIRD ORDER HOLES WHICH SPLIT THE SPACE BETWEEN A PRIMARY AND A SECONDARY

   Q QUATERNARY - FOURTH ORDER HOLES LOCATED ON EITHER SIDE OF TERTIARY HOLES

   Qu - QUINARY FIFTH ORDER HOLES

2. GROUT TAKE RESPONSE SYMBOLS

   B - BREAKOUT - DENOTES THAT GROUT SURFACED DURING THE INJECTION PROCESS OR COMMUNICATED TO A HIGHER HOLE

   SB SUSPECTED BREAKOUT.- DENOTES THAT GROUT TAKE AND PRESSURE CHANGES INDICATED POSSIBLE BREAKOUT OF GROUT INTO EARTHEN CONSTRUCTION PAD LOCATED IN VALLEY BOTTOM

   SI = STAGE INCOMPLETE.- GROUTING WAS SUSPENDED IN STAGE BEFORE TERMINATION OR ACCEPTANCE CRITERIA WAS MET. EXPLANATION FOR SUSPENSION IS DOCUMENTED ON AS-BUILT DAILY GROUT LOGS LOCATED IN NUCLEAR SITE DOCUMENTION VAULT

3. FOR ANGLE HOLES THE DEPTH IS MEASURED ALONG THE LENGTH OF THE HOLE

SCALE IN FEET

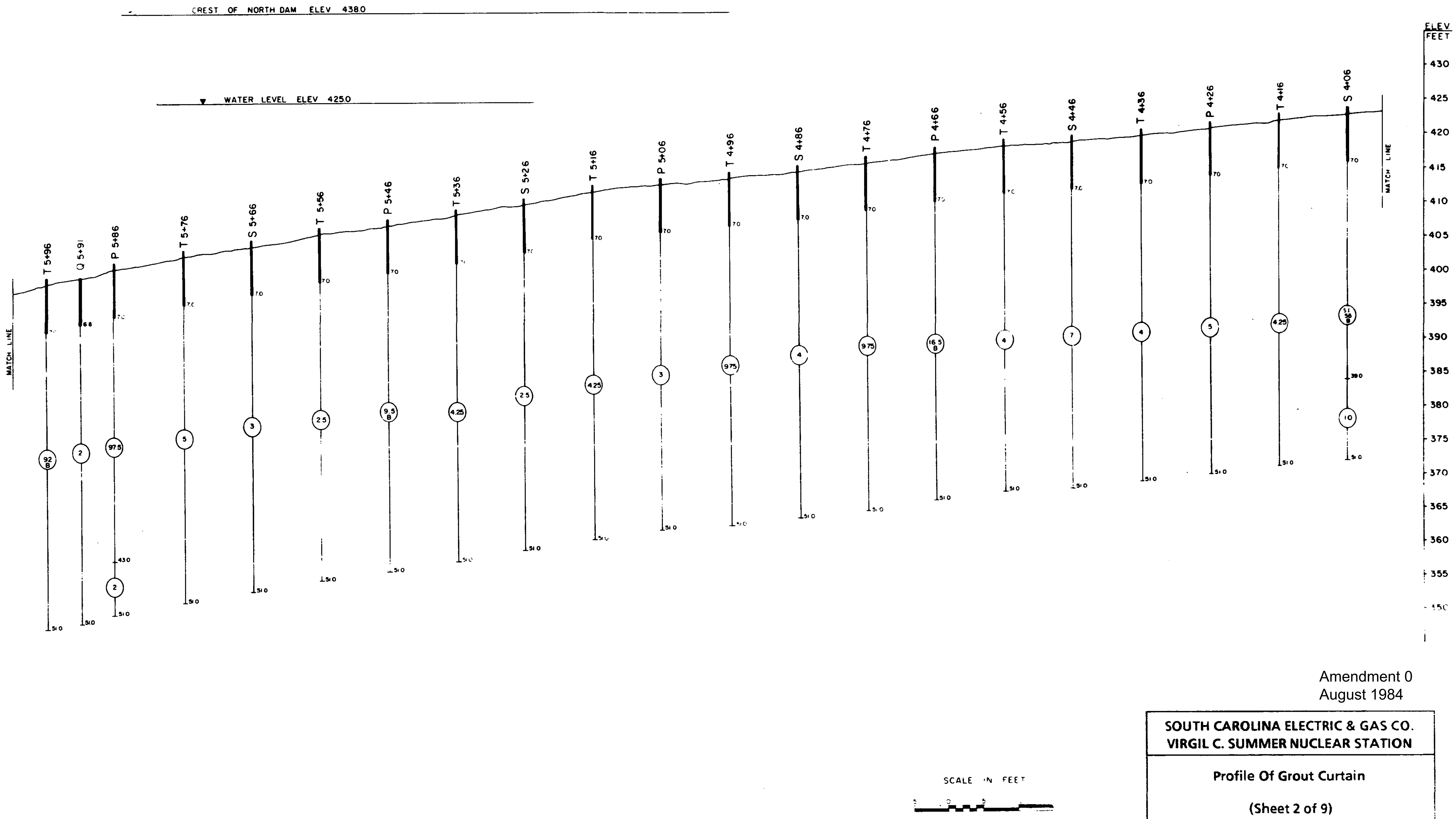
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Profile Of Grout Curtain

(Sheet 1 of 9)

Figure 2.5-194



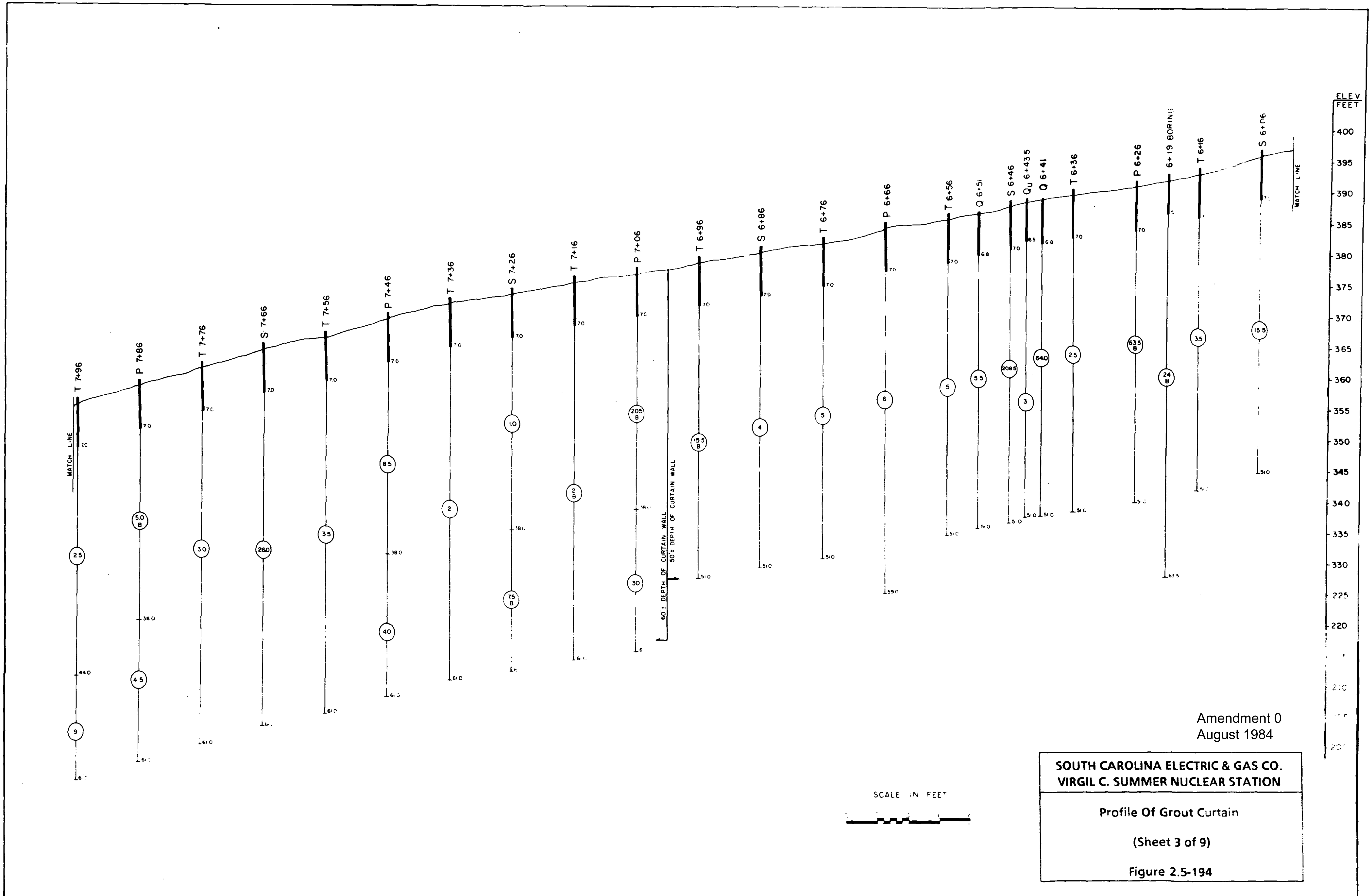
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Profile Of Grout Curtain

(Sheet 2 of 9)

Figure 2.5-194



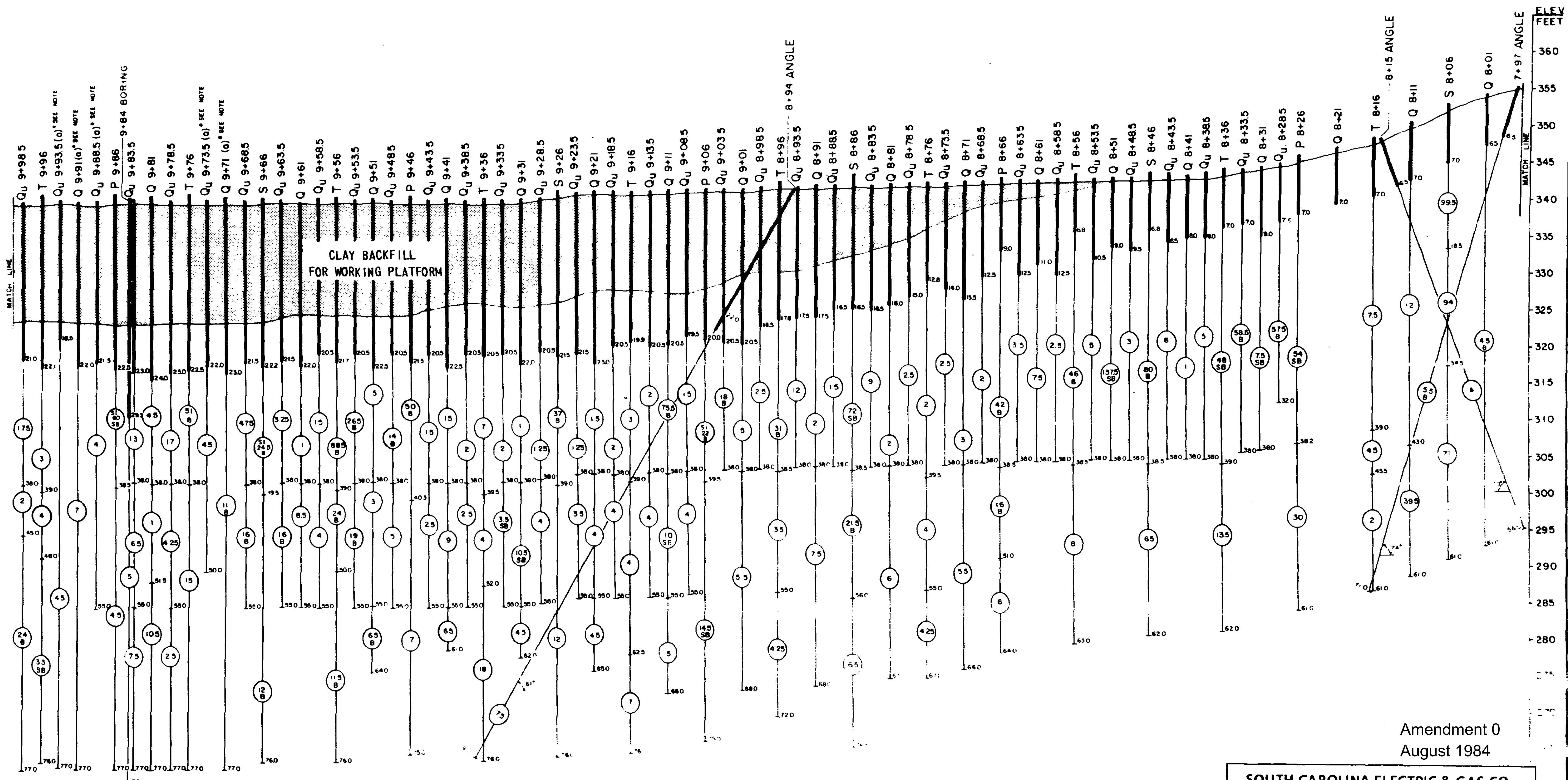
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Profile Of Grout Curtain

(Sheet 3 of 9)

Figure 2.5-194



*NOTE (a) DESIGNATION INDICATES ORIGINAL HOLE WAS ABANDONED. THIS REPLACEMENT HOLE WAS LOCATED EITHER 1' ± NORTH OR SOUTH OF ORIGINAL HOLE DEPENDING ON EXISTING FIELD CONDITIONS. EXACT LOCATIONS CAN BE FOUND IN THE DAILY GROUTING LOG LOCATED IN THE NUCLEAR SITE DOCUMENTATION VAULT.

CLAY BACKFILL WAS REMOVED PRIOR TO EMBANKMENT CONSTRUCTION.

SCALE IN FEET

5 0 5 10 15

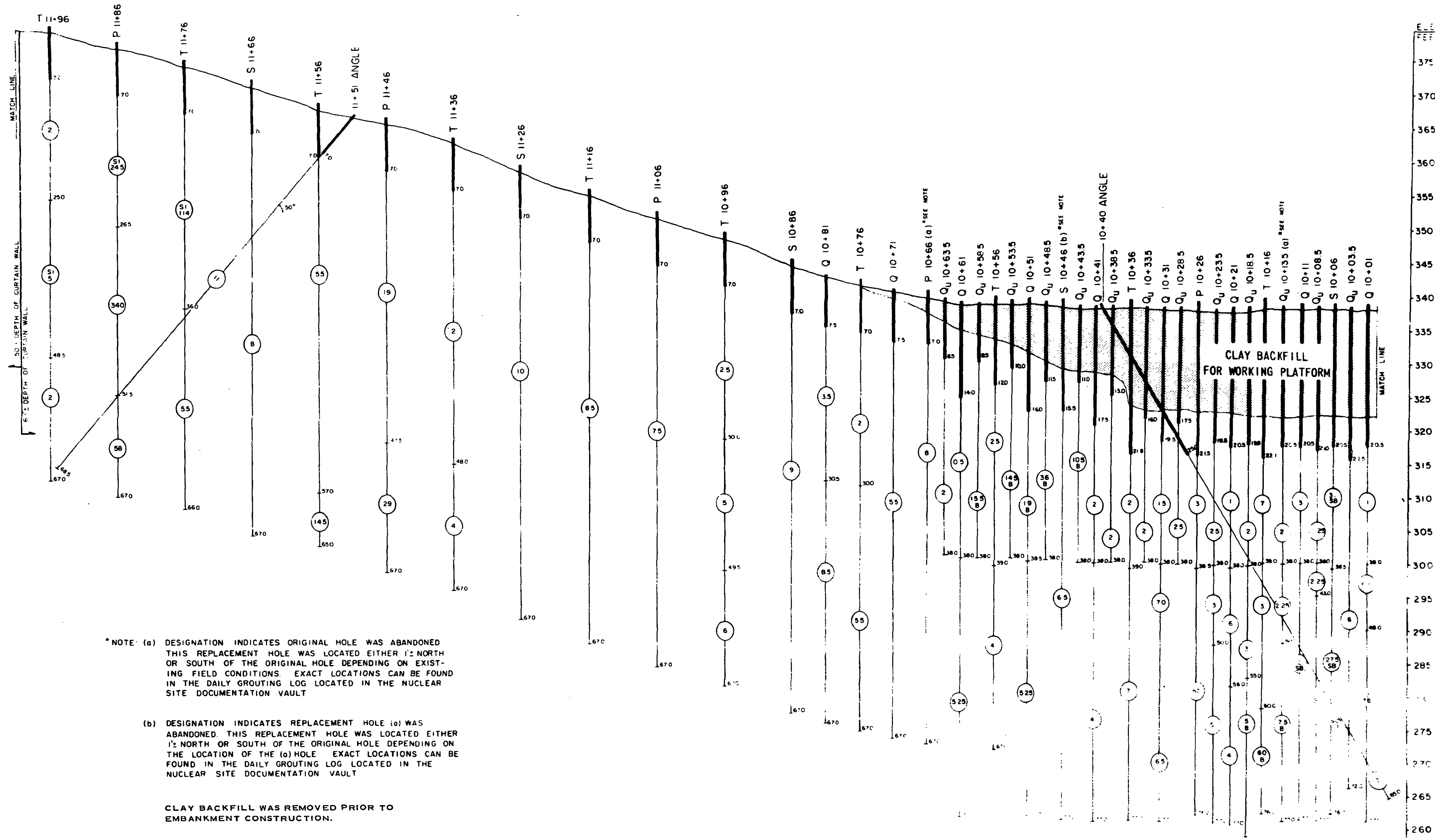
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Profile Of Grout Curtain

(Sheet 4 of 9)

Figure 2.5-194



*NOTE: (a) DESIGNATION INDICATES ORIGINAL HOLE WAS ABANDONED. THIS REPLACEMENT HOLE WAS LOCATED EITHER 1'± NORTH OR SOUTH OF THE ORIGINAL HOLE DEPENDING ON EXISTING FIELD CONDITIONS. EXACT LOCATIONS CAN BE FOUND IN THE DAILY GROUTING LOG LOCATED IN THE NUCLEAR SITE DOCUMENTATION VAULT

(b) DESIGNATION INDICATES REPLACEMENT HOLE (a) WAS ABANDONED. THIS REPLACEMENT HOLE WAS LOCATED EITHER 1'± NORTH OR SOUTH OF THE ORIGINAL HOLE DEPENDING ON THE LOCATION OF THE (a) HOLE. EXACT LOCATIONS CAN BE FOUND IN THE DAILY GROUTING LOG LOCATED IN THE NUCLEAR SITE DOCUMENTATION VAULT

CLAY BACKFILL WAS REMOVED PRIOR TO EMBANKMENT CONSTRUCTION.

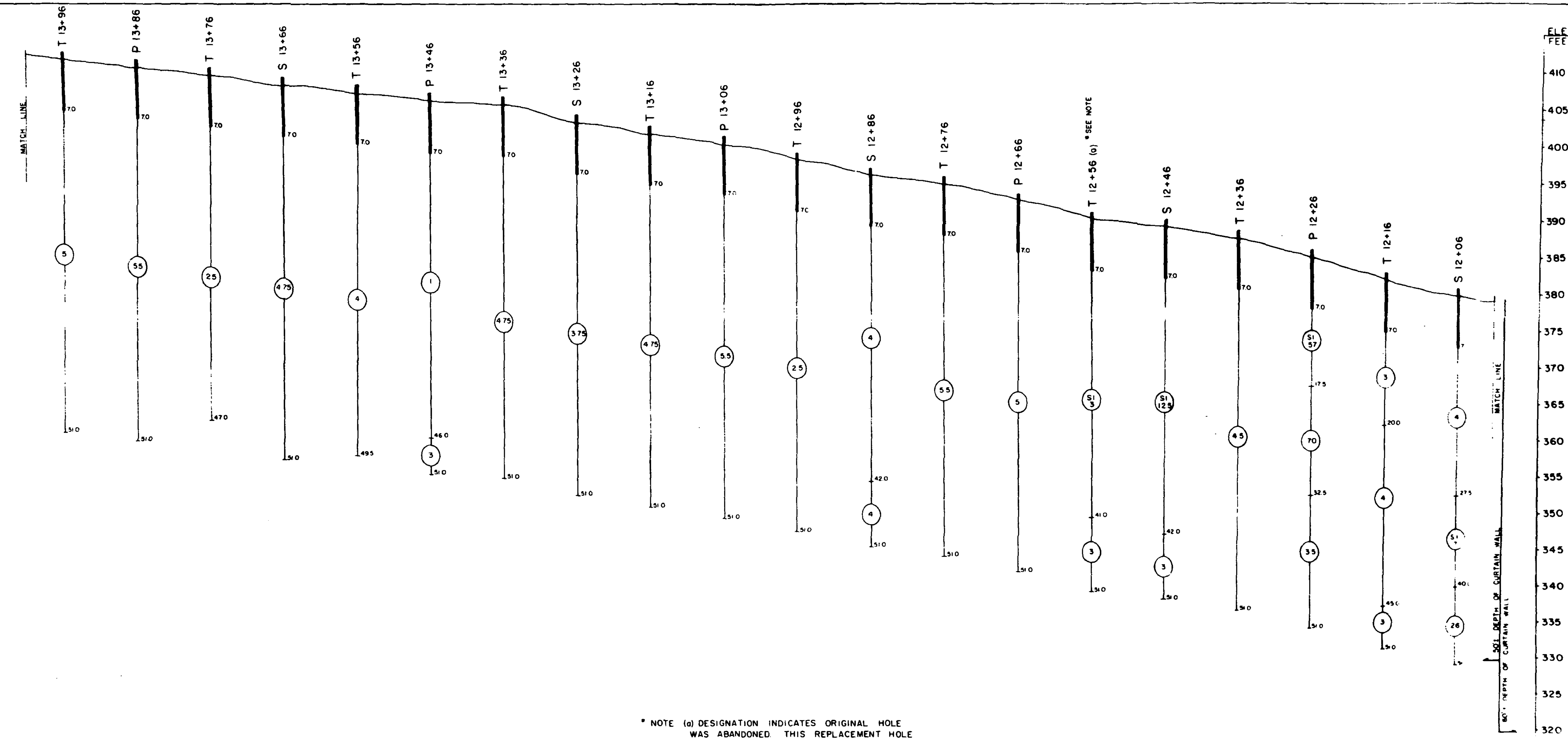
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Profile Of Grout Curtain

(Sheet 5 of 9)

Figure 2.5-194



* NOTE (a) DESIGNATION INDICATES ORIGINAL HOLE WAS ABANDONED. THIS REPLACEMENT HOLE WAS LOCATED EITHER 1'± NORTH OR SOUTH OF THE ORIGINAL HOLE DEPENDING ON EXISTING FIELD CONDITIONS. EXACT LOCATIONS CAN BE FOUND IN THE DAILY GROUTING LOG LOCATED IN THE NUCLEAR SITE DOCUMENTATION VAULT

SCALE IN FEET

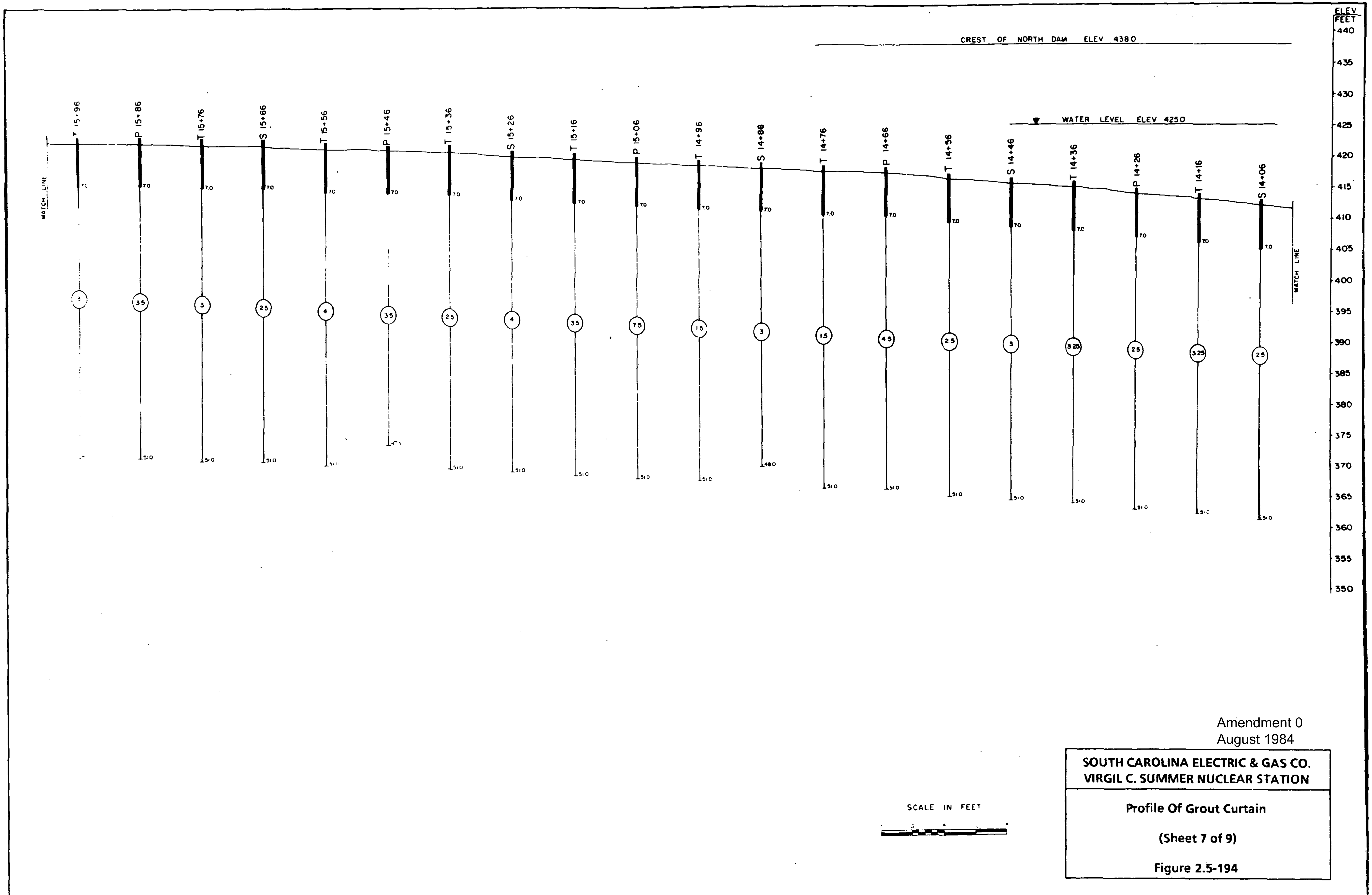
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Profile Of Grout Curtain

(Sheet 6 of 9)

Figure 2.5-194



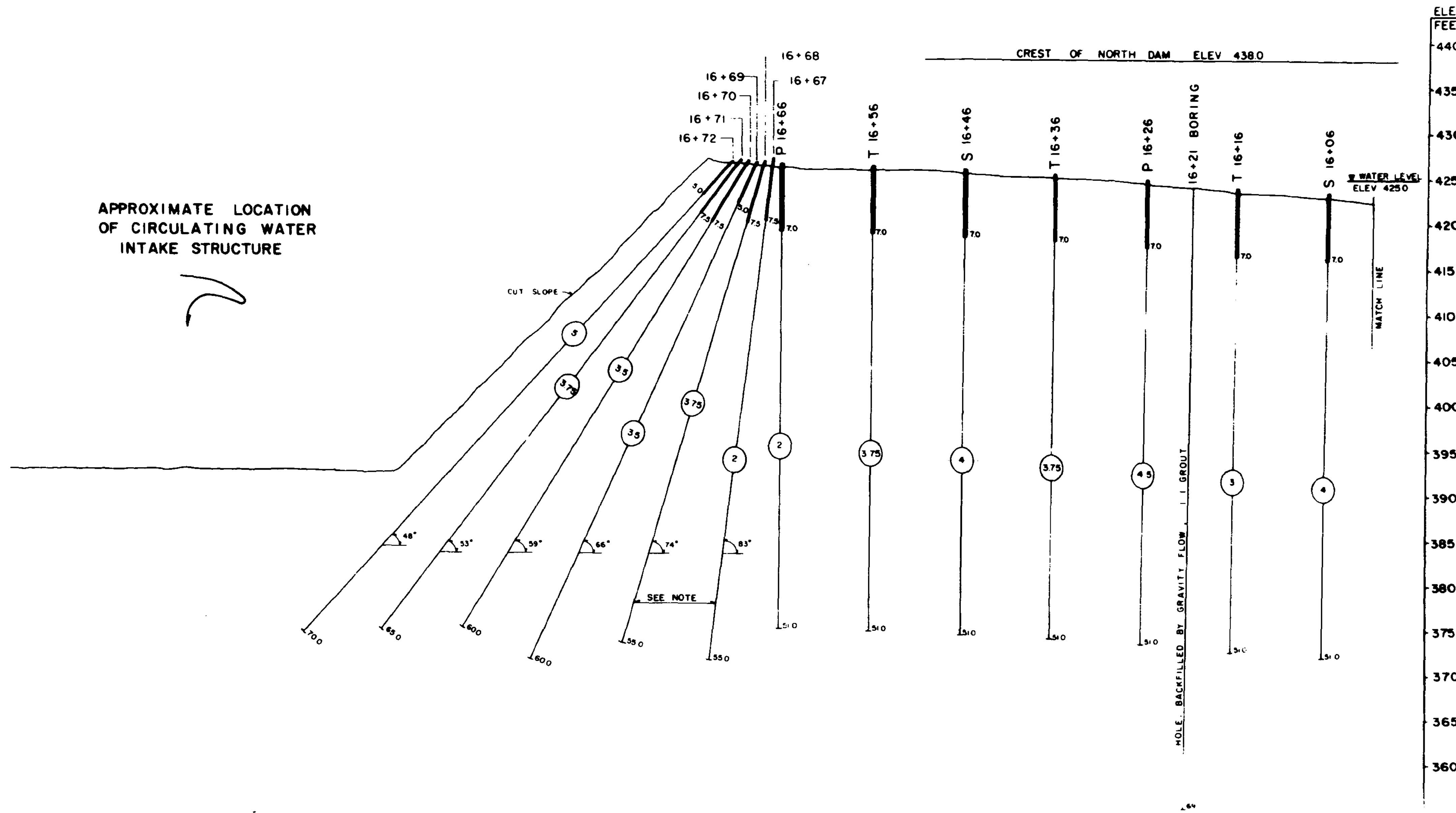
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Profile Of Grout Curtain

(Sheet 7 of 9)

Figure 2.5-194



NOTE ANGLE HOLES 16+67 THROUGH 16+72, MAXIMUM SPACING AT A DEPTH OF 50' BELOW SURFACE DOES NOT EXCEED 10 FEET

SCALE IN FEET

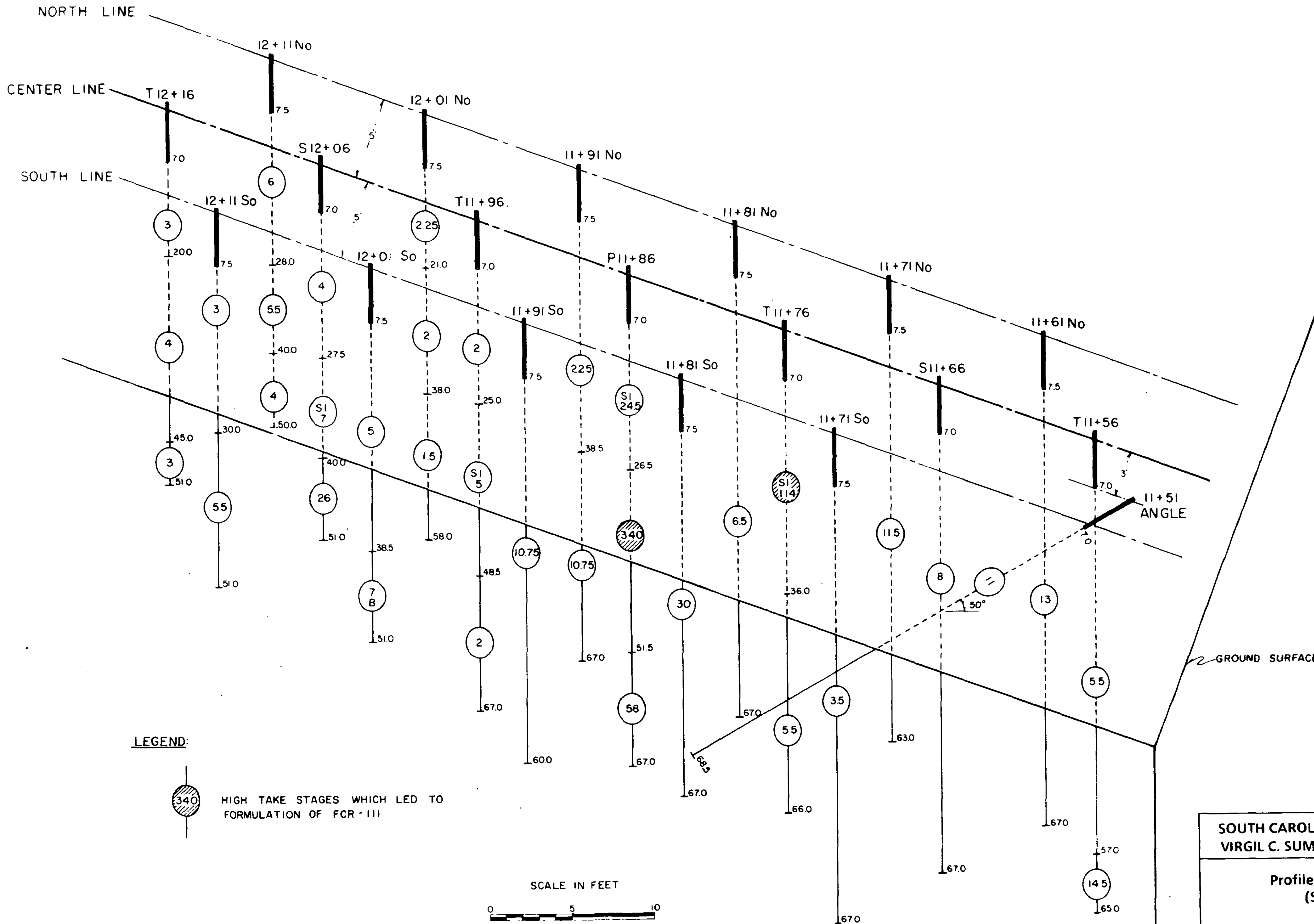
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Profile Of Grout Curtain

(Sheet 8 of 9)

Figure 2.5-194

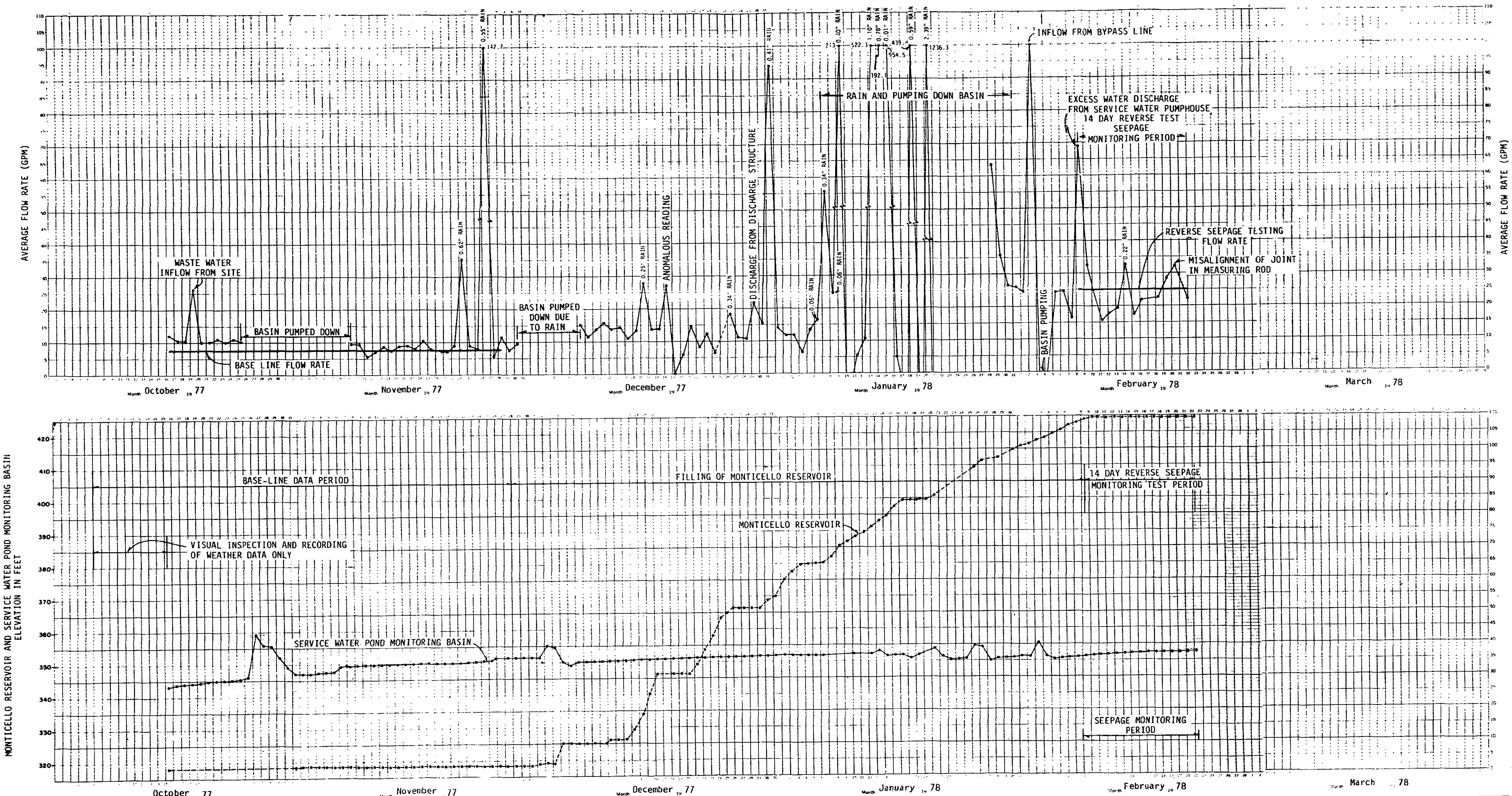


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Profile of Grout Curtain
(Sheet 9 of 9)

Figure 2.5-194

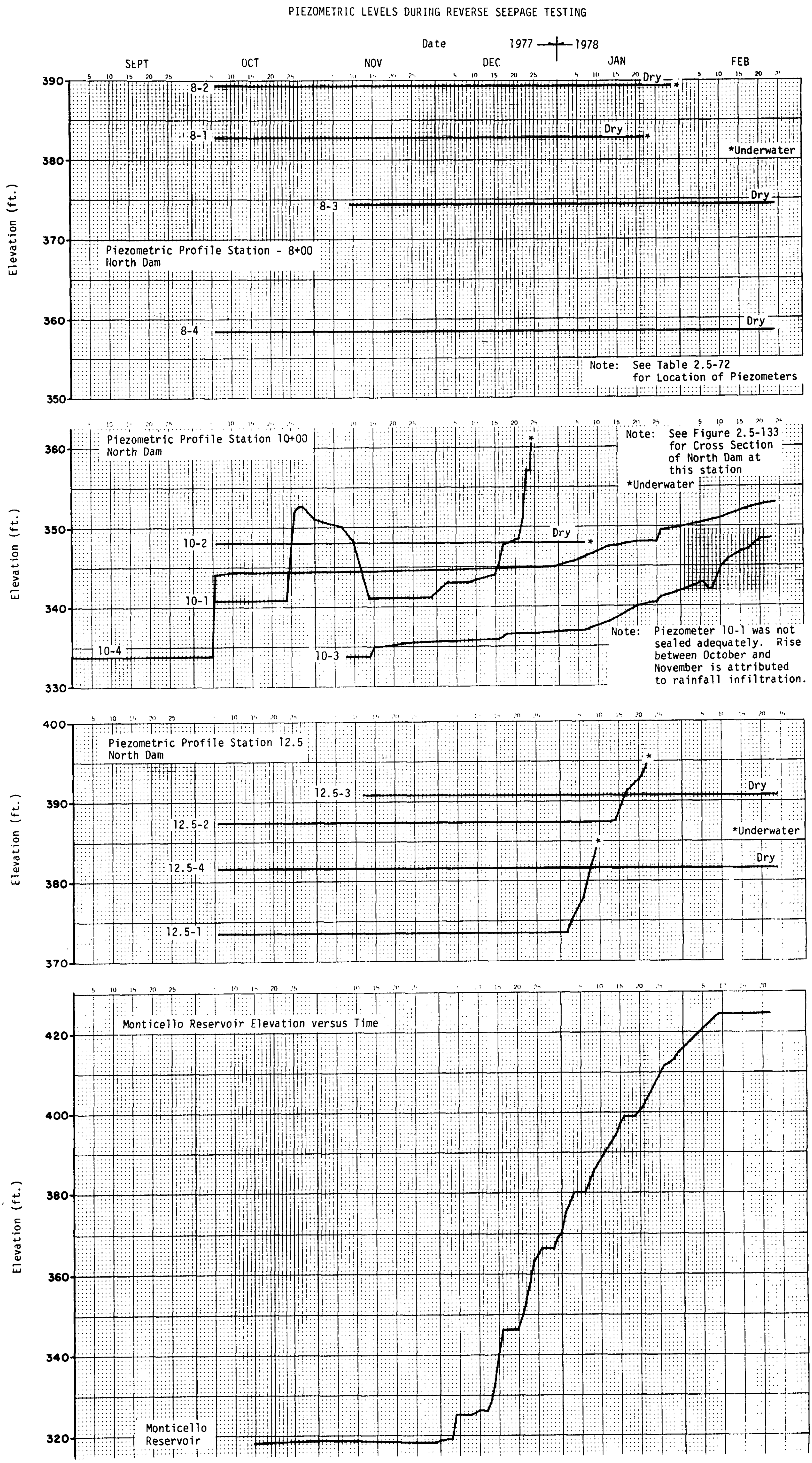


SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Reverse Seepage Testing
Flow Rates

Figure 2.5-194a

Amendment 0
August 1984

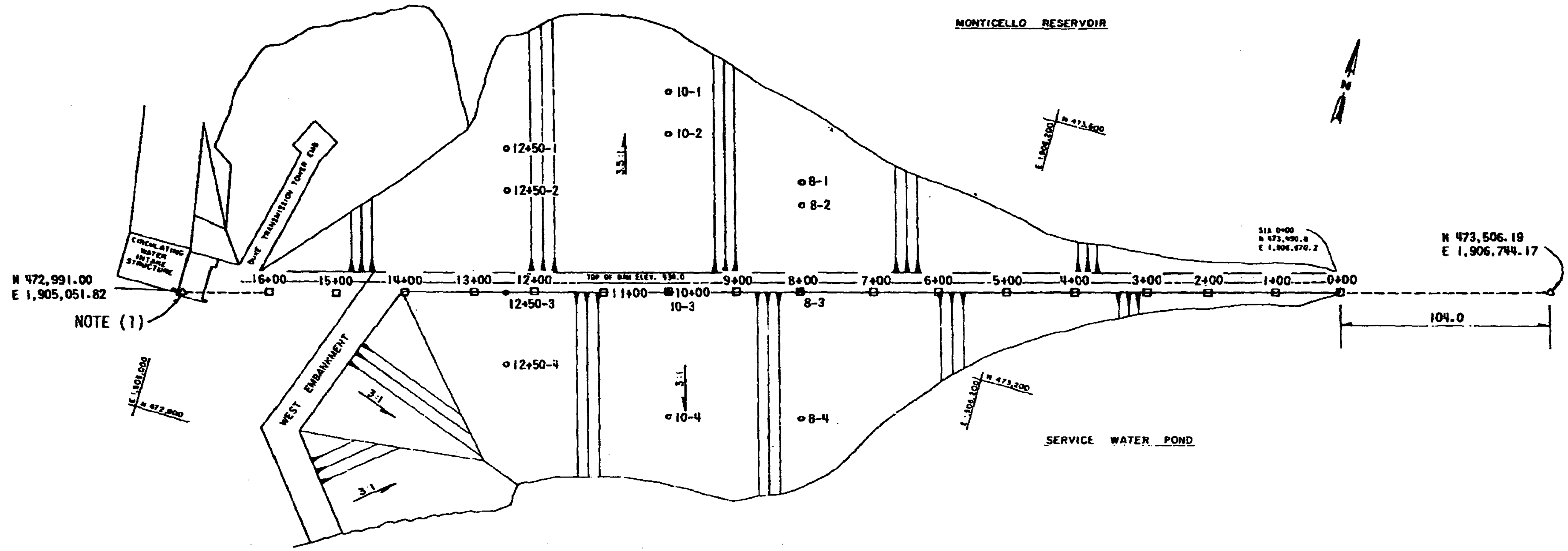


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Piezometric Levels During Reverse Seepage Testing

Figure 2.5-194b



NOTE (1) Reference point is located on Circulation Water Intake Structure which is founded on rock

(2) Monument 16+00 removed due to construction of guard tower

LEGEND:

- ∘ PIEZOMETER
- ◻ ELEVATION AND ALIGNMENT MONUMENT
- △ REFERENCE ALIGNMENT MONUMENT

Amendment 98-01
April 1998

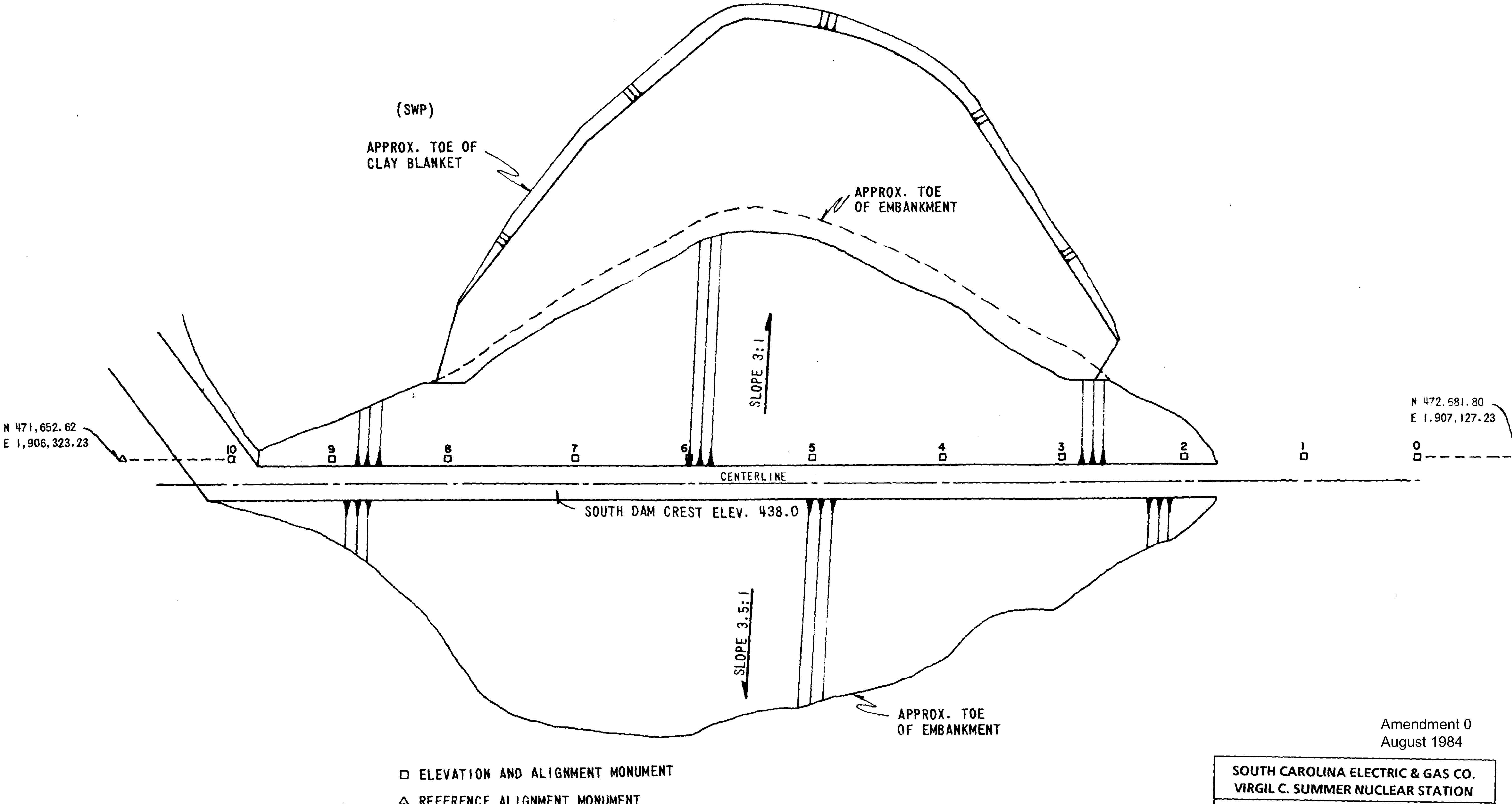
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Instrumentation Location Plan for North Dam

Rev. 1

Figure 2.5-195

Amendment 98-01
April 1998

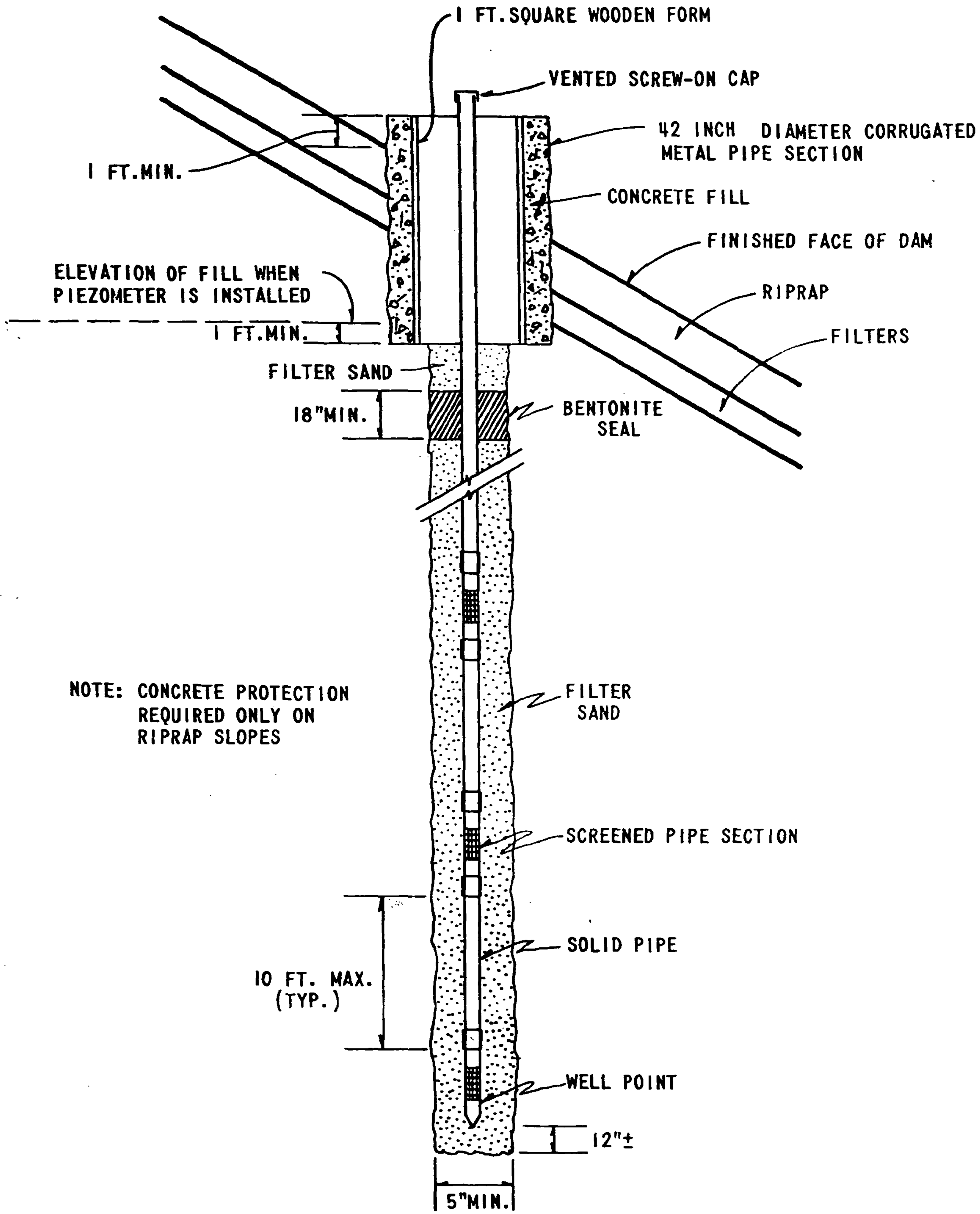


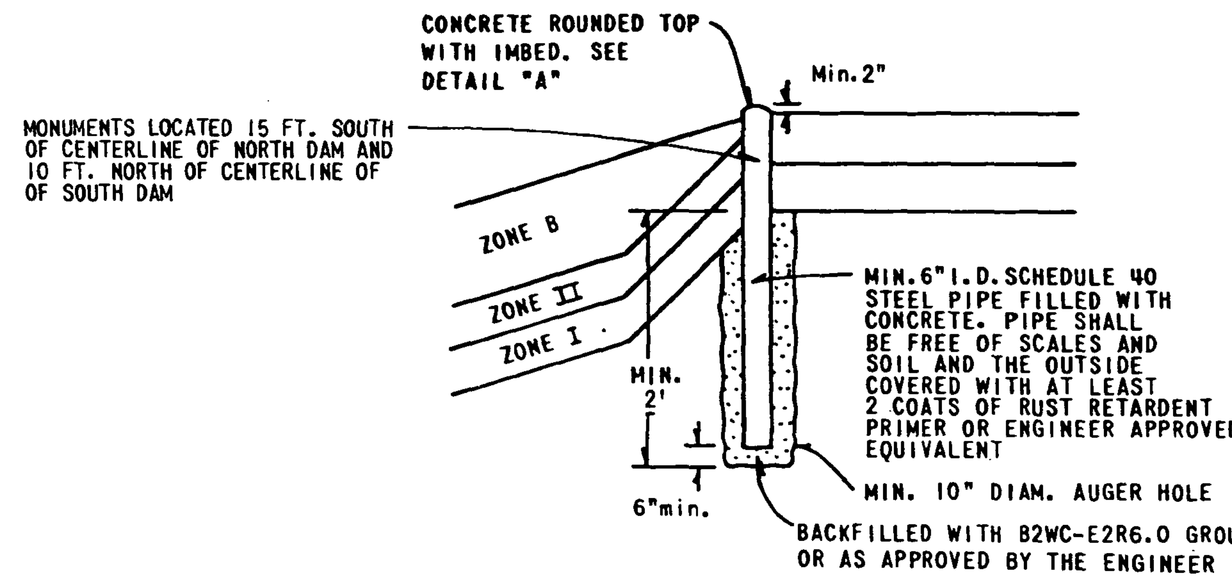
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

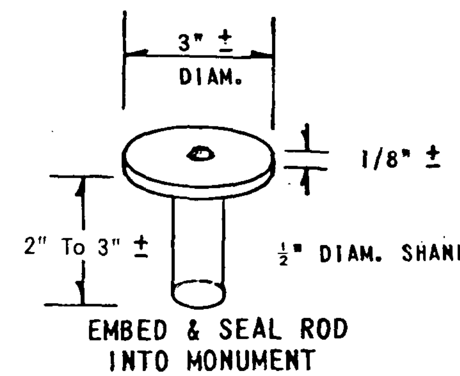
Instrumentation Location Plan
for South Dam

Figure 2.5-195a





CONSTRUCTION DETAIL
NORTH DAM & SOUTH DAMS
(Not to Scale)



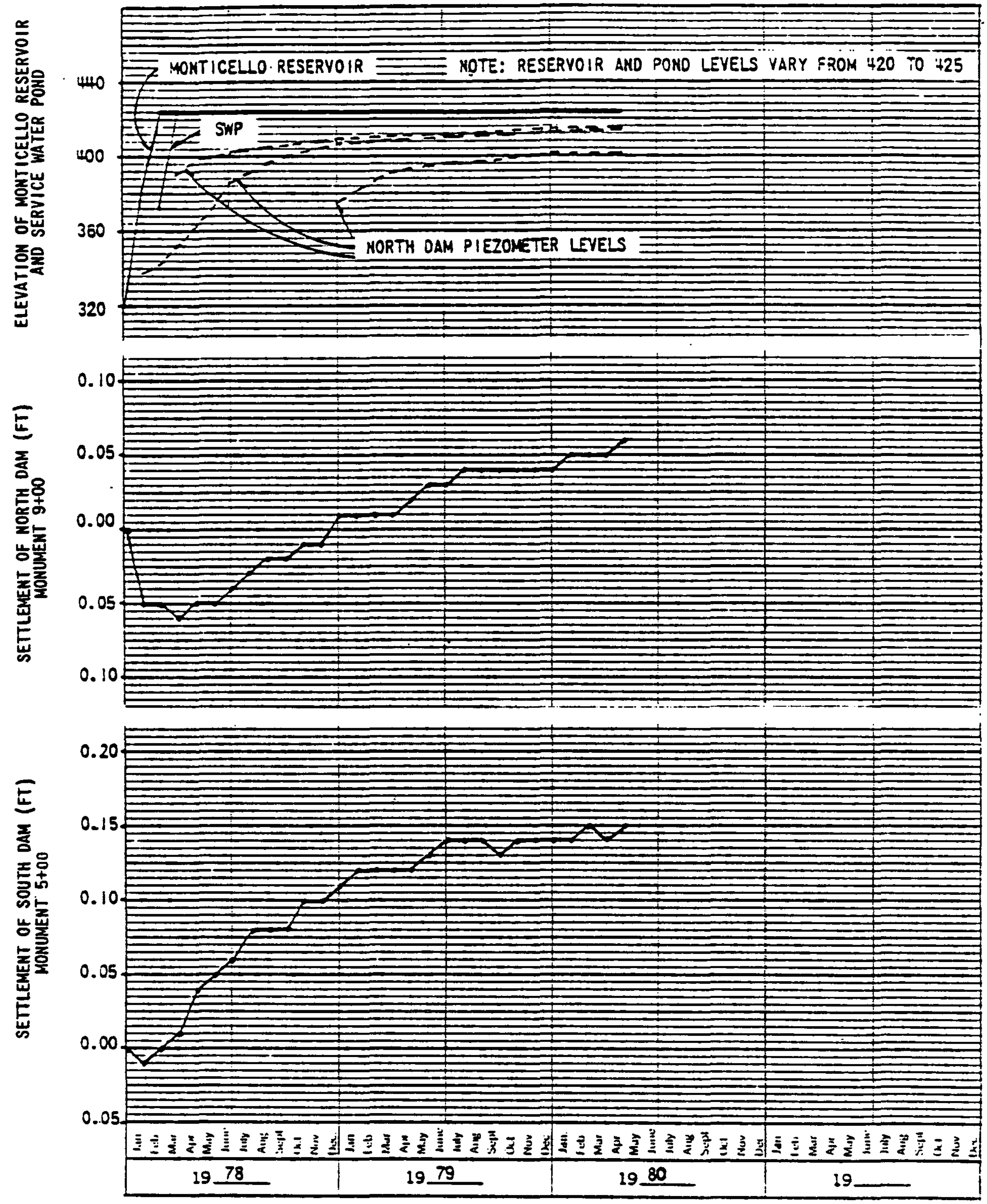
DETAIL A
(Not to Scale)

Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Instrumentation Details

Figure 2.5-196

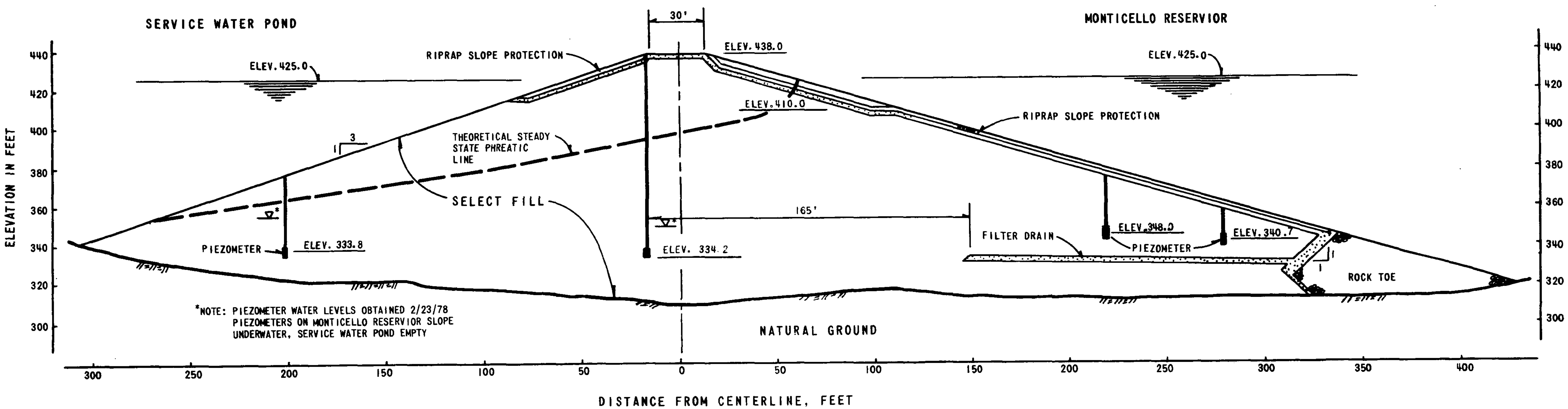


SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Post-Contruction Crest Settlement
- Maximum Cross Section -
North and South Dams

Figure 2.5-196a

Amendment 0
August 1984

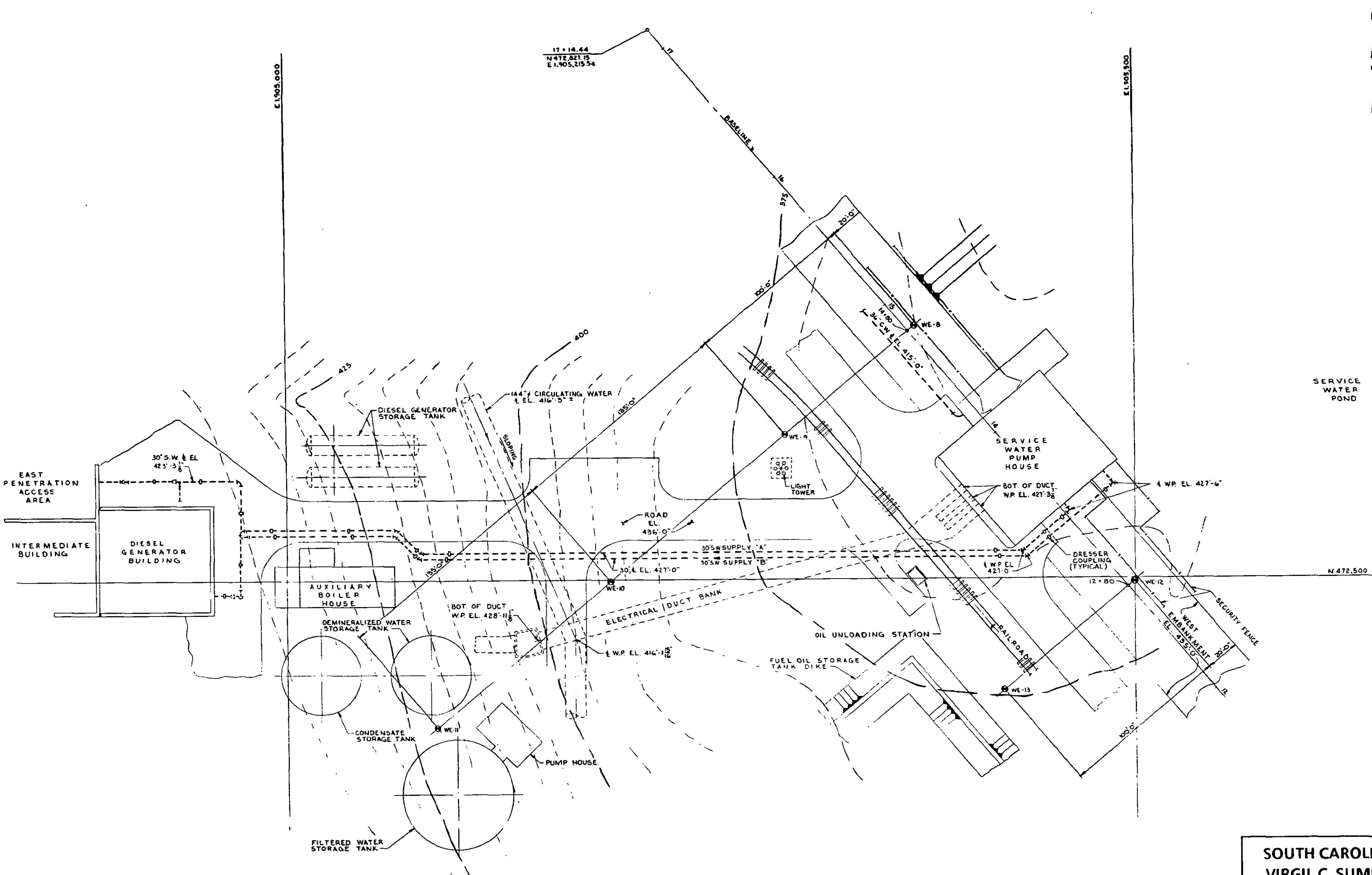


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Typical Cross Section for Piezometer Locations Station 10 + 00

Figure 2.5-197

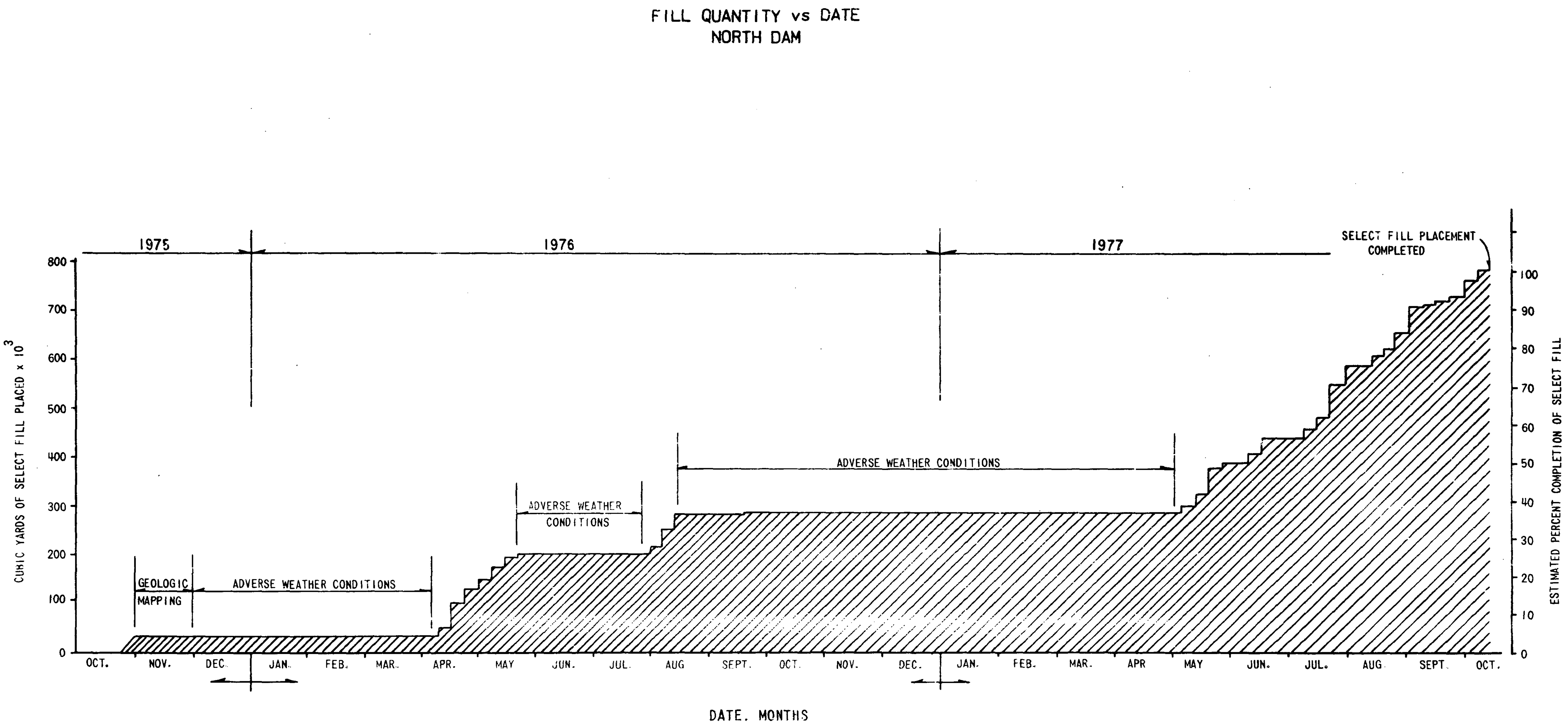


Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Piezometer Locations in Vicintity of the Service Water Pumphouse

Figure 2.5-197a



Amendment 0
August 1984

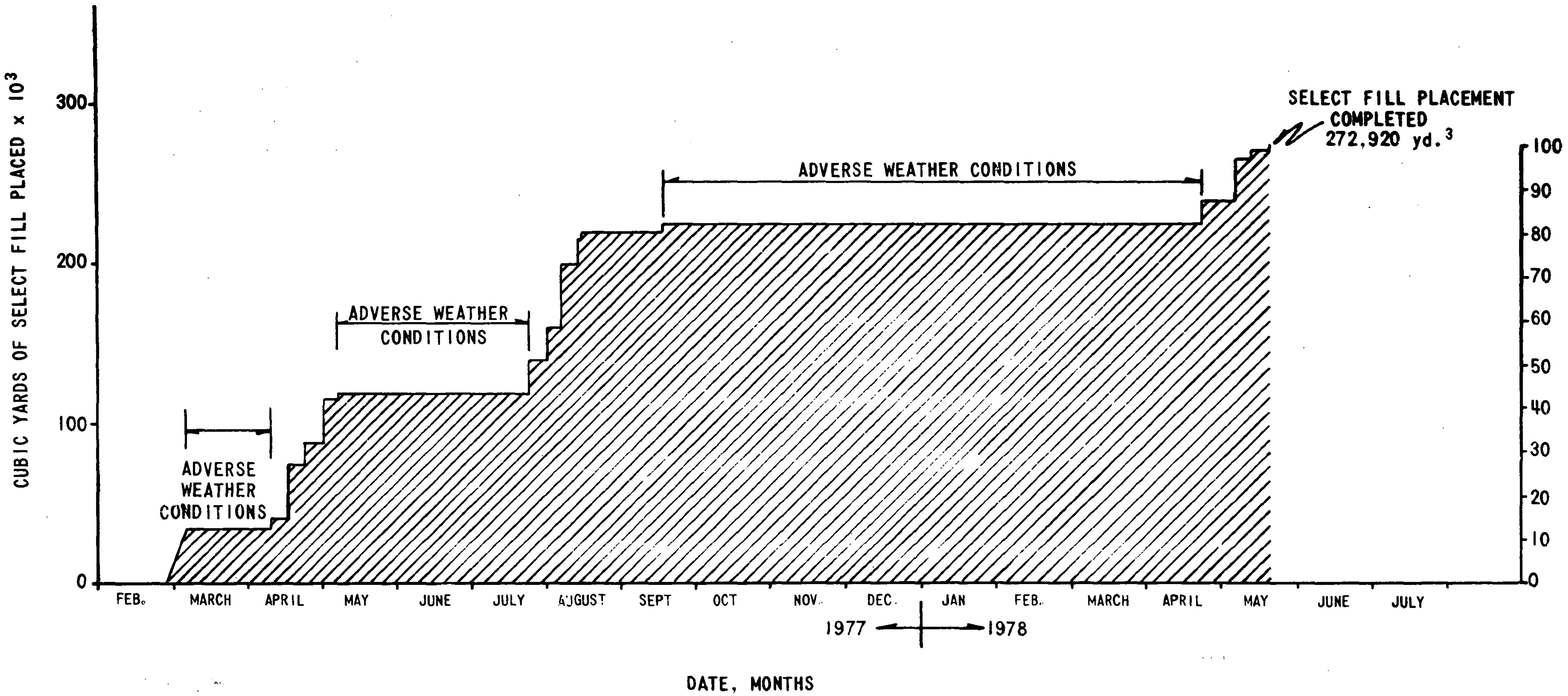
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Fill Quantity Vs. Date

(Sheet 1 of 4)

Figure 2.5-198

SOUTH DAM
Select Fill Placement



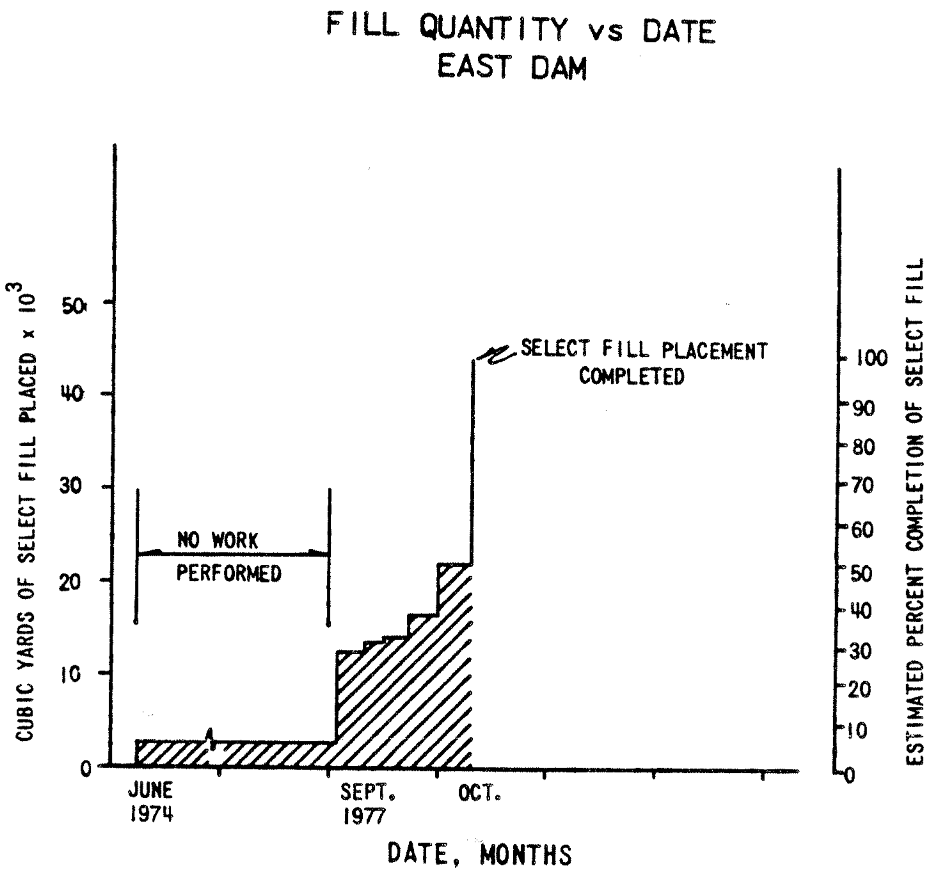
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Fill Quantity Vs. Date

(Sheet 2 of 4)

Figure 2.5-198



Amendment 0
August 1984

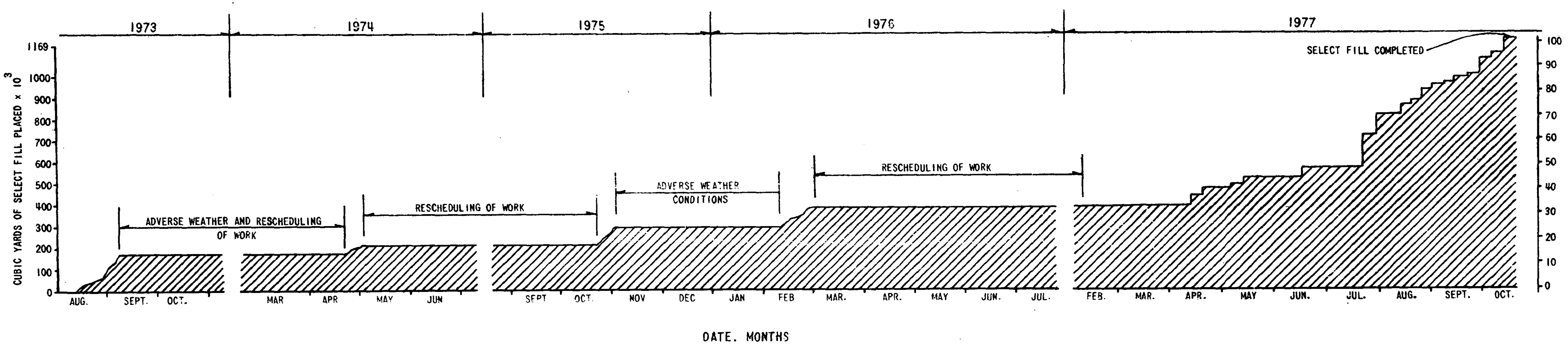
SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Fill Quantity Vs. Date

(Sheet 3 of 4)

Figure 2.5-198

FILL QUANTITY vs DATE
WEST EMBANKMENT



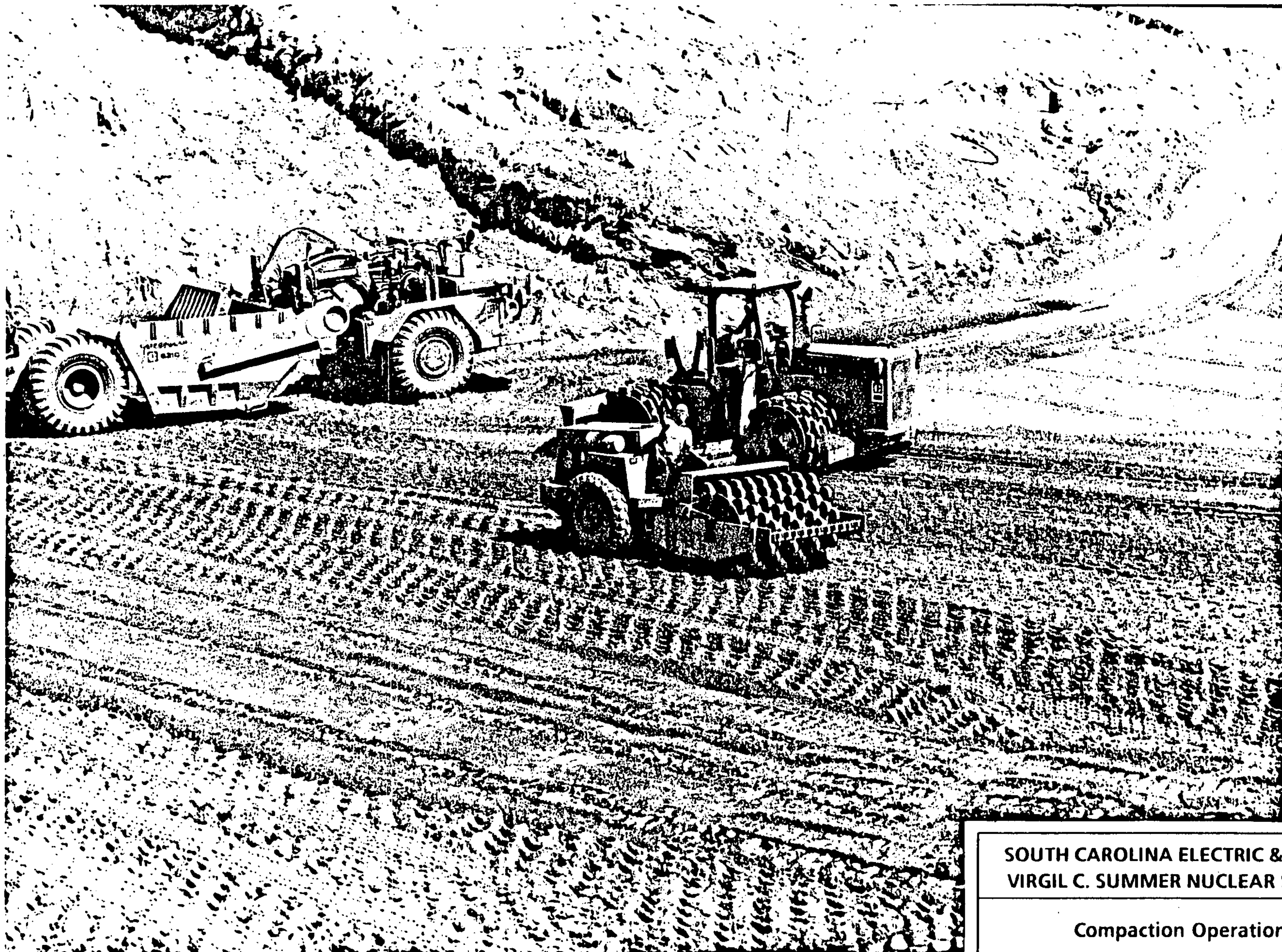
Amendment 0
August 1984

SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Fill Quantity Vs. Date

(Sheet 4 of 4)

Figure 2.5-198



SOUTH CAROLINA ELECTRIC & GAS CO.
VIRGIL C. SUMMER NUCLEAR STATION

Compaction Operations

Figure 2.5-199

Amendment 0
August 1984

Appendices 2A through 2F

APPENDIX 2A

X-RAY DIFFRACTION ANALYSIS

X-RAY DIFFRACTION ANALYSIS

Paul C. Ragland
University of North Carolina

RESULTS

<u>Sample No. 1</u>:

Crystal concentrate collected from drusy lining of vug.

Result: Laumontite (a zeolite).

<u>Sample No. 1-B</u>:

Siliceous (?) lining and fill material from same vug.

Result: alpha-quartz; in addition, three very small peaks that probably belong to a small quantity of montmorillonitic clay.

<u>Sample No. 2</u>:

Crystals scraped from thoroughly weathered vug lining.

Result: laumontite.

<u>Sample No. 4</u>:

Black vein deposit, probably wad.

Results: poorly crystallized kaolinite (as indicated by very broad teeth); alpha-quartz; one small peak in the region of the strongest feldspar piece; amorphous material, which is probably an iron-magnesium oxide (presence of amorphous material is indicated by very high background).

<u>Sample No. 5</u>:

White clay ridge (?) vein deposit.

Results: moderately well crystallized kaolinite; minor alpha-quartz.

PROCEDURES

1. Crush each sample for 10 minutes in SPEX mixer mill.

2. Grind each sample for 10 minutes in a Fischer automatic mortar and pestle.

3. Scan each sample from 2 degrees to 50 degrees to theta on a Phillips X-ray difractometer at the following settings: Copper tube nickel filter, 35 kv, 19 milliamps: PAD: Window 15 volts, base level 3 volts, Scintillation counter at 900 volts; Scan speed: one degree a minute; time constant: 2; Rate meter: either 1×10^3 or 2×10^3 full scale.

4. Each sample was run in duplicate to verify all peak positions.

5. Identifications were made by referring to the standard ASTM powder diffraction data file and to the verification references given above. Positive identification of at least 10 peaks was considered necessary for definite mineral identification.

VERIFICATION REFERENCES

Laumontite:

Bartl, H. and Fischer, K. F., 1967, Unterschung der Kristallsturktur des Zeilithes Laumontit: Nus, Jarb. Mineral. Monatshefte, pp. 33-42.

Alpha-Quartz:

Zachariasen, W. H., Tlettineger, H. A., 1965, Extension in Quartz: Acta Cryst., Vol. 18, pp. 710-714.

Kaolinite:

Drits, V. A., and Kashaez, A. A., 1960, an X-ray Study of a Single Crystal of Kaolinite: Soviet Physics - Crystaliography, Vol. 5, No. 2, pp. 207-210.

APPENDIX B

APPENDIX BRADIOMETRIC ANALYSIS,
RUBIDIUM-STRONTIUM AGE DETERMINATION

RADIOMETRIC ANALYSIS, RUBIDIUM-STRONTIUM AGE DETERMINATION

Paul D. Fullagar
University of North Carolina

Method

Samples were analyzed to determine rubidium-strontium (Rb-Sr) radiometric ages using standard methods of sample preparation and analytical procedures. Naturally-occurring Rb and Sr are composed of the following isotopes:

Rb	Sr
Rb^{85}	Sr^{84}
Rb^{87}	Sr^{86}
	Sr^{87}
	Sr^{88}

Rb^{87} decays to Sr^{87} at a fixed and known rate. This Sr^{87} is called radiogenic Sr. The time (age) since crystallization or metamorphism of a mineral or rock can be determined by measuring the present concentrations of Rb^{87} and Sr^{87} and calculating or estimating the amounts of these isotopes initially present in the mineral.

The following equation is used for the age calculations:

$$(Sr^{87}/Sr^{86})_N = (Sr^{87}/Sr^{86})_0 + Rb^{87}/Sr^{86}\ (e^{\lambda t} - 1)$$

Where

$(Sr^{87}/Sr^{86})_N$ is the measured isotopic ratio,
$(Sr^{87}/Sr^{86})_O$ is the ratio at the time of crystallization (initial ratio) and is estimated for model ages or calculated when multiple samples are analyzed from the same rock unit (the age that results is called an isochron age),
Rb^{87}/Sr^{86} is measured,
e is the natural logarithm,
λ (lambda) is the Rb^{87} decay constant (1.39×10^{-11}/year) and t is time or the age of the system. 02-01

An age is obtained by solving the equation for t. Each quantity in the age equation is expressed as a ratio to Sr^{86} since this is the form in which data is obtained from a mass spectrometer. 02-01

An age for a sample of igneous or metamorphic rock is normally interpreted as indicating the time of crystallization or formation of the rock. Biotite separated from the rock normally gives a minimum age because the radiometric clock for biotites is not set until the temperature of the mineral drops below approximately 200°C.

The isotopic and concentration analyses were made with a thermal ionization source mass spectrometer in the geochronology laboratories at the Geology Department of the University of North Carolina, Chapel Hill.

Sample Preparation

All samples were washed with distilled water to remove extraneous matter. A chip was cut from each sample and analyzed by X-ray fluorescence to obtain approximate Rb/Sr ratios. These ratios were used to

1. Select samples suitable for age determinations

2. Establish proper weight of sample to be dissolved for mass spectrometric analysis

3. Determine amount of Sr^{84} and Rb^{87} spike to be added to each sample for the purpose of measuring Sr and Rb concentrations.

Based on the approximate Rb/Sr ratio, sample NK 2.3 was not analyzed. The Rb/Sr 02-01
ratio of about 0.4 was too low to permit calculation of a model age as an insignificant amount of radiogenic Sr would have accumulated in the rock. In general, Rb/Sr ratios must be at least 1.0 in order to calculate a meaningful model age.

Samples for age determinations were crushed in a jaw crusher and a split of the total or whole rock sample was taken for samples SC 2.2, SC 2.4 and NK 2.1. These whole rock samples were then processed for mass spectrometric analysis. The remaining rock samples were crushed further in a disk mill and sieved. The 20 to 40 mesh or 40 to 60 mesh fraction was passed through a magnetic separator to obtain a biotite (or biotite-chlorite) concentrate. With repeated pass-throughs, mineral separates of 98+% purity were obtained for all samples except NK 2.2 and SD 3.2; these samples are estimated to be 95% biotite-chlorite. A heavy liquid (methylene iodide) was used to help clean up the separate from NK 2.2. The impurities in the mineral separates are grains of feldspar and quartz. Their presence almost certainly has no effect on the ages obtained.

Spikes of Sr^{84} and Rb^{87} were added to each sample; the samples then were dissolved with hydrofluoric and sulfuric acids. Solutions were passed through cation exchange columns to concentrate Rb and Sr. The next step was analysis of the samples in the mass spectrometer.

Calculations

Model Ages. Model ages are obtained by using the previously given age equation and assuming a value for $(Sr^{87}/Sr^{86})_O$. The assumed value for these model age calculations is 0.7050. This value is the average of the values calculated (see below) 02-01
for SC 2.4 (0.7045) and NK 2.1 (0.7055); since these samples are very similar to the other samples analyzed it is reasonable to use 0.705 except where noted under Results. Following is an example of model age calculation:

SC 2.1 Biotite

$$(Sr^{87}/Sr^{86})_N = (Sr^{87}/Sr^{86})_O + Rb^{87}/Sr^{86}\left(e^{\lambda t} - 1\right)$$

$$0.8617 = 0.7050 + 38.18\left(e^{\left(1.39 \times 10^{-11}/\text{year}\right)t} - 1\right)$$ 02-01

$$t = 295 \pm 15 \text{ million years (m.y.)}$$

The age uncertainty ($\pm$ 15 m.y.) is an estimate based on our analytical precision.

Isochron Ages, There are two unknowns in the age equation, $(Sr^{87}/Sr^{86})_O$ and t. By analyzing two (or more) samples from the same rock unit it is possible to solve for both unknowns as they will be the same for each sample. This solving of simultaneous equations is tedious if done by hand and we use a standard computer program that is used by virtually all geochronology laboratories. This program was used for the two SC 2.4 samples and the two NK 2.1 samples. 02-01

Results

Location SC. Two biotites from unweathered samples (SC 2.1 Biotite, SC 2.3 Biotite) have model ages of 295 $\pm$15 m.y. and 315 $\pm$ m.y., respectively (see data table). A biotite-chlorite sample and whole rock sample of hydrothermally altered SC 2.4 yield an isochron age of 299 $\pm$ 10 m.y. The close agreement between the ages of the unweathered and altered samples suggests one of two possibilities:

1). The alteration occurred about 300 m.y. ago, or
2). The alteration occurred more recently but did not affect the Rb-Sr chemistry and isotopic composition of the sample.

If petrographic study indicates a significant alteration and recrystallization, the alteration probably occurred about 300 m.y. ago. Whole rock sample SC 2.2, a microbreccia from a shear zone, has a model age of 345 $\pm$ 70 m.y. The large error reflects the low radiogenic Sr content, or low $(Sr^{87}/Sr^{86})_N$ ratio for the sample. The ratio is 0.7164 which is quite closed to the assumed initial ratio of 0.7050. A small error in the $(Sr^{87}/Sr^{86})_N$ ratio produces a relatively large error in the age. The initial ratio could be greater than 0.7050 as a thermal or recrystallization event more recent than 345 m.y ago would be 02-01
expected to raise the initial ratio; thus, the 345 m.y age for the microbreccia should be considered a maximum age.

<u>Location SD.</u> SD 3.3 Biotite is unweathered and has a 314 ± 15 m.y. age. Slightly altered biotite from weathered granodiorite (SD 3.1 Biotite) has an identical age of 02-01
317 ± 15 m.y. Thus, the degree of alteration exhibited by SD 3.1 Biotite was not sufficient to change the Rb- Sr age of biotite from this location. SD 3.2 Biotite-Chlorite has a model age of 358 ± 40 m.y. This age is probably best interpreted as a maximum age as the initial ratio could be higher that 0.705.

<u>Location NJ.</u> Biotite from unweathered granodiorite (NJ 1.1 Biotite) has a model age of 299 ± 15 m.y. which is essentially identical to the ages for the other unaltered samples (locations SC, SD and NK). These ages are best interpreted as minimum ages for the formation of the granodiorite.

<u>Location NK.</u> Samples of whole rock and biotite from unweathered granodiorite 02-01
(NK 2.1 and NK 2.1 Biotite) have an isochron age of 292 ± 10 m.y. NK 2.2 Biotite-Chlorite has a model age of 521 ± 70 m.y. Again, because of the low $(Sr^{87}/SR^{86})_N$ ratio the error is large. Because the sample is altered, there is no assurance that the initial ratio is 0.7050; indeed, the fact that this model age is much greater than any age for unaltered samples indicates that this should be regarded as a maximum age.

<u>Qualifications of Investigators</u>

The analyses were performed by dr. Paul D. Fullagar with the assistance of Dr. Michael L. Bottino. We each have over ten years experience in Rb-Sr geochronology. During 02-01
this time we have authored or co-authored about 20 papers on geochronology which have been published in major scientific journals. In addition we have each presented over 20 geochronology papers at national and international meetings. All of our geochronology research has received financial support from the National Science Foundation. Virtually all of Fullagar's research for the last seven years has involved geochronology problems in the southeastern United States.

The laboratories in which the analyses were done are in the Geology Department at the University of North Carolina, Chapel Hill. These facilities were developed by and are supervised by Dr. Fullagar. The laboratories have been full operation for over three years, and during this time 600 rock and mineral samples have been analyzed to determine Rb-Sr ages.

ANALYTICAL DATA

SAMPLE	Sr^{86}/Sr^{88}	$(Sr^{87}/Sr^{86})N$	Rb ppm	Sr ppm	Rb/Sr	$Rb^{87}Sr^{86}$	Age, m.y	
SC 2.1 Biotite	0.11960	0.8617	483.1	37.19	12.99	38.18	295 ± 15*	
SC 2.2	0.11977	0.7164	133.5	163.1	0.818	2.37	345 ± 70*	
SC 2.3 Biotite	0.11961	0.8502	518.0	45.96	11.27	33.08	315 ± 15*	02-01
SC 2.4	0.11995	0.7079	89.39	316.3	0.283	0.818	299 ± 10	
SC 2.4 Biotite-Chlorite	0.11928	0.7509	161.2	42.02	3.84	11.15	299 ± 10	
SD 3.1 Biotite	0.11949	0.8457	450.8	41.49	10.86	31.88	317 ± 15*	
SD 3.2 Biotite-Chlorite	0.11984	0.7254	94.12	66.67	1.41	4.09	358 ± 40*	
SD 3.3 Biotite	0.11940	0.8691	502.8	39.41	12.76	37.52	314 ± 15*	
NJ 1.1 Biotite	0.11963	0.9644	507.7	24.21	20.97	62.24	299 ± 15*	
NK 2.1	0.12027	0.7088	108.2	388.4	0.279	0.807	292 ± 10	
NK 2.1 Biotite	0.11978	1.3093	540.6	11.16	48.42	148.5	292 ± 10	
NK 2.2 Biotite-Chlorite	0.11996	0.7218	73.24	91.91	0.797	2.31	521 ± 70*	02-01

* Model age, $(Sr^{87}/Sr^{86})_0$ assumed = 0.7050

Rb^{87} decay constant = 1.39 x 10^{-11}/year

APPENDIX 2C

RADIOMETRIC ANALYSIS, POTASSIUM-ARGON AGE DETERMINATION

RADIOMETRIC ANALYSIS, POTASSIUM-ARGON AGE DETERMINATION

TELEDYNE ISOTOPES

WESTWOOD LABORATORIES
50 VAN BUREN AVENUE
WESTWOOD, NEW JERSEY 07675
(201) 664-7070 TELESX 134475

Todd M. Gates
Teledyne Isotopes

7 January 1974

Dames & Moore
Suite 200
455 East Paces Ferry Road
Atlanta, Georgia 30305 02-01

Gentlemen:

Subject: W. O. No. 3-9268-212 02-01

We have completed the analysis of your samples submitted for K/Ar age determination. The results are as follows:

Isotopes Sample #	Your Sample #	Isotopic Age (m.y.)	scc $Ar^{40\ Rad}$/gm $x10^{-5}$	% Ar^{40} Rad	% K
KA73-383	SC 2.2		3.04	86	3.75
			3.31	95	3.85
		196±18	3.18		3.83
KA73-384	SC 2.4		2.00	84	3.05
			2.22	92	3.13
		163±16	2.11		3.09
KA73-385	SB 2.1		2.93	47	3.35
			2.95	49	3.31
		209±13	2.94		3.33
KA73-386	SB 2.2		4.49	98	4.65
			4.50	98	4.70
		227 ± 14	4.50		4.67
KA73-387	NK 2.2		2.89	91	2.54
			2.88	90	2.55
		264±16	2.89		2.55
KA73-388	NK 2.3		3.52	95	2.95
			3.54	96	3.04
		273±16	3.53		3.00
KA73-389	SC 2.1		8.91	93	7.10
Biotite			8.95	93	7.05
		291±15	8.93		7.08

02-01

Isotopes Sample #	Your Sample #	Isotopic Age (m.y.)	scc $Ar^{40\ Rad}$/gm x10^{-5}	% Ar^{40} Rad	% K
KA73-390	SC 2.3		8.48	91	6.78
Biotite			8.56	91	6.88
		288±14	8.52		6.83
KA73-391	SD 3.1		6.97	79	6.37
			6.91	80	5.85
		264±16	6.94		6.11
KA73-392	SD 3.2		1.33	61	1.25
			1.36	65	1.18
		256±15	1.34		1.22
KA73-393	SD 3.3		7.87	87	6.13
Biotite			7.95	87	6.15
		297±18	7.91		6.14
KA73-394	NJ 1.1		9.07	94	7.26
Biotite			9.10	94	7.23
		290±17	9.09		7.25
KA73-395	NK 2.1		9.46	79	7.54
Biotite			9.53	79	7.50
		292±17	9.50		7.52

02-01

The constants used for the age calculations are: $\lambda_\beta = 4.72 \times 10^{-10}\,yr^{-1}$ λ_e = 0.585 x 10^{-10} yr^{-1} and K^{40} = 1.19 x 10^{-4} atom percent of natural potassium. 02-01

The error indicated for the reported ages consists of a summation of all analytical errors. Through past experience these errors generally amount to 1-3 percent. Therefore, we have selected the upper limit of our analytical error (3 percent) and use this number in calculating the analytical error in the isotopic ages for samples with sufficient radiogenic argon. As the volume of radiogenic argon or the potassium content decreases to 10^{-8} scc and less than 0.1% respectively, the size of the analytical error naturally increases. This is due to the inherent limitation of the instrumentation. In these cases errors are calculated in a manner similar to that of Cox and Dalrmple (J. Geophys. Res 72 (10) p. 2603-14).

02-01

If you have any questions concerning these results or I can be of any further assistance to you, please do not hesitate to contact me. We look forward to being of continued service to you.

Very truly yours,

Todd M. Gates

TMG:11

TELEDYNE ISOTOPES

WESTWOOD LABORATORIES
50 VAN BUREN AVENUE
WESTWOOD, NEW JERSEY 07675
(201) 664-7070 TELESX 134475

10 January 1974

Mr. William Smith
Dames & Moore
Suite 200
455 East Paces Ferry Road
Atlanta, Georgia 30305

Dear Mr. Smith:

Subject: W. O. No. 3-9308-212

We have completed the analysis of your sample submitted for K/Ar age determination. The results are as follows:

Isotopes Sample #	Your Sample #	Isotopic Age (m.y.)	scc $Ar^{40\ Rad}$/gm $x10^{-5}$	% Ar^{40} Rad	% K
KA74-108	X-1		0.064	27	0.33
			0.059	25	0.34
		45±5	0.062		0.34
KA74-109	SH4		1.09	87	1.85
			1.11	88	1.89
		141±8	1.10		1.87
KA74-110	-		8.09	90	6.50
			8.14	90	6.50
		289±17	8.12		6.50

02-01

The constants used for the age calculations are $\lambda_\beta = 4.72 \times 10^{-10}\ yr^{-1}$ $\lambda_e = 0.585 \times 10^{-10}\ yr^{-1}$ and $K^{40} = 1.19 \times 10^{-4}$ atom percent of natural potassium. 02-01

The error indicated for the reported ages consists of a summation of all analytical errors. Through past experience these errors generally amount to 1-3 percent. Therefore, we have selected the upper limit of our analytical error (3 percent) and use this number in calculating the analytical error in the isotopic ages for samples with sufficient radiogenic argon. As the volume of radiogenic argon or the potassium content decreases to 10^{-8} scc and less than 0.1% respectively, the size of the analytical error naturally increases. This is due to the inherent limitation of the instrumentation. In these cases errors are calculated in a manner similar to that of Cox and Dalrymple (J.Geophys. Res 72 (10) p. 2603-14).

If you have any questions concerning these results or I can be of any further assistance to you, please do not hesitate to contact me. We look forward to being of continued service to you. 02-01

Very truly yours,

TMG:11

Todd M. Gates

APPENDIX 2D

IN SITU STRESS MEASUREMENTS BY THE OVERCORING TECHNIQUE

IN SITU STRESS MEASUREMENTS BY THE OVERCORING TECHNIQUE

Dale Stephenson

Dames & Moore

There are several methods available for measuring in situ stresses in rock, many of which are described in ASTM STP 429 Determination of Stress in Rock, A State-Of-the-Art Report, some of which involve the overcoring method. The one used in this investigation of the in situ rock stresses at the Virgil C. Summer Nuclear Station involved overcoring and was done using a borehole deformation gage similar to the one developed by the U. S. Bureau of Mines. A detailed description of the gage and theory involved can be found in reports by Obert (1962) or Merrill (1967). Where the measurements are made near the earth surface in vertical drill holes one stress direction is assumed vertical and due to gravity loading. The other two components of stress (termed secondary principal stresses) can be determined from a single overcoring observation. If three non-parallel holes are drilled and measurements made in them, the complete state of stress in the rock mass can be determined. Only a summary of the theory and method is presented here.

Using elastic theory, the solution of stresses and strains associated with a hole in an infinite plate subjected to a biaxial stress field can be determined. Therefore, if the strain or deformation of the hole in the plate can be measured the biaxial stresses (P', Q') can be calculated. For the condition of plane stress the diametral deformation U is

$$U = \frac{d}{E}(P' + Q') + 2(P' - Q')\cos 2\theta \qquad (1)$$

and if the plate is in plane strain

$$U = \frac{d(1 - \nu^2)}{E}(P' + Q') + 2(P' - Q')\cos 2\theta \qquad (2)$$

where d is the diameter of the hole and E and ν are elastic constants.

If the diametral deformations in three specified directions are measured at a point in a borehole in the rock, P', Q' and θ can be determined assuming the elastic constants are known. If the measurements of diametral deformation (U_1, U_2, U_3) are made at 60-degree intervals (angular deformation rosette) the magnitude and direction of the applied field can be determined from: 02-01

$$P' = \frac{E}{6d}\{(U_1 + U_2 + U_3) + (\sqrt{2}/2)[(U_1 - U_2)^2 + (U_2 - U_3)^2 + (U_3 - U_1)^2]^{1/2}\} \quad (3)$$

$$Q' = \frac{E}{6d}\{(U_1 + U_2 + U_3) - (\sqrt{2}/2)[(U_1 - U_2)^2 + (U_2 - U_3)^2 + (U_3 - U_1)^2]^{1/2}\} \quad (4)$$

$$\theta = 1/2 \tan^{-1} \frac{\sqrt{3}(U_2 - U_3)}{2U_1 - U_2 - U_3} \quad (5)$$

where θ is measured from U_1 to P' in a counterclockwise direction. To use this mathematical procedure to determine the absolute stress in the rock an overcoring technique must be used.

The procedure as developed by the U. S. Bureau of Mines and used at the site is to first drill a small diameter (1 1/2 inch) hole into the bottom surface of a 6 inch diameter borehole. The borehole deformation gage is then placed in this hole, oriented to measure one of the deformations in a given direction such as north and an initial strain indicator reading made, S_1 (S_1, S_2, S_3). Next the section of rock is concentrically overcored using the 6 inch diameter diamond bit, thereby stress relieving the section of the rock containing the gage. Strain indicator readings are taken during the overcoring and after the rock core containing the gage as been completely stress relieved (there is no further drop in readings) a final value of readings S_2 $\left(S_1', S_2', S_3'\right)$ is taken. The difference between the initial and final strain indicator readings can be related by a calibration factor to the deformation of the borehole. This procedure is illustrated in Figure 2D-1 where (a) is the overcoring technique and (b) is the response of the strain indicator. 02-01 02-01

The modulus of deformation of the rock is calculated using the scope of the pressure/deformation plot by means of the relationship

$$E = -\frac{4ab^2}{(b^2 - a^2)} \frac{\Delta P}{U} \qquad (6)$$ 02-01

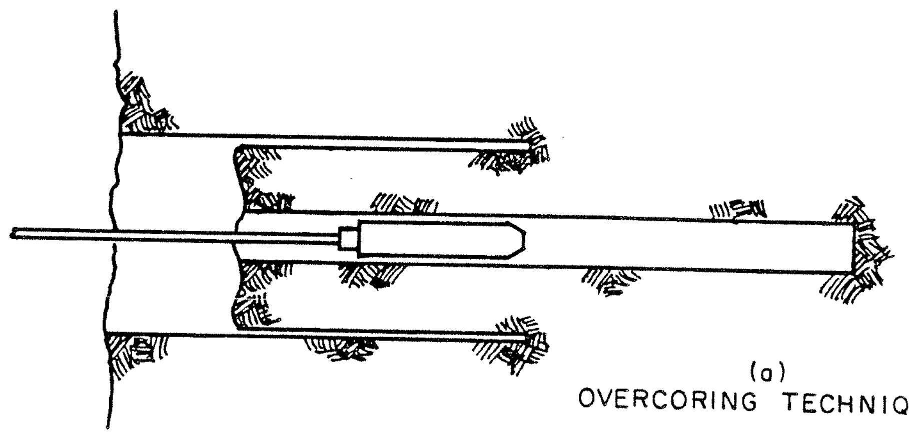
where E is the modulus, a is the inner radius of the specimen, b is the outer radius, ΔP is the change in applied pressure, and U is the measured deformation of the inner hole. This is similar to the thick walled cylinder problem and the complete derivation is given in Obert and Duvall (1967).

Each laboratory test of the specimen enables three separate directional moduli to be calculated, 60 degrees apart. To provide more data to examine the validity of assuming an isotropic modulus, laboratory tests are repeated with the borehole deformation gage rotated counterclockwise through 30 degrees with respect to field locations. If the rock is anisotropic, this can be taken into consideration in the calculation of the in situ stresses. 02-01

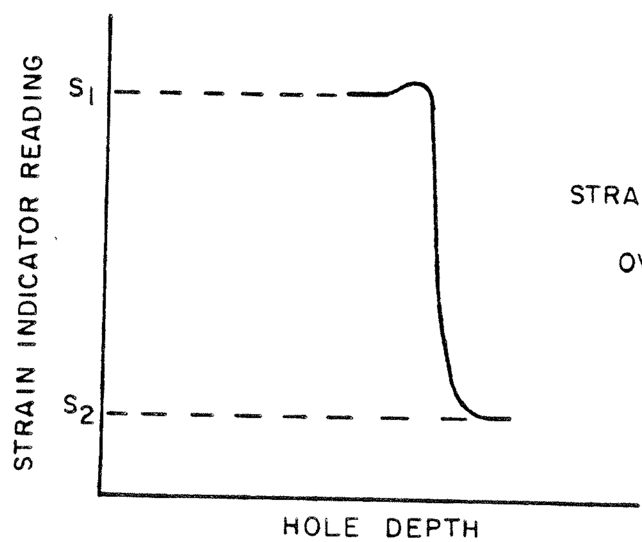
The results of the field test showing plots of deformation versus depth are given in Figures 2D-1 through 2D-6. 02-01

Dale Stephenson

Dames & Moore



(a)
OVERCORING TECHNIQUE

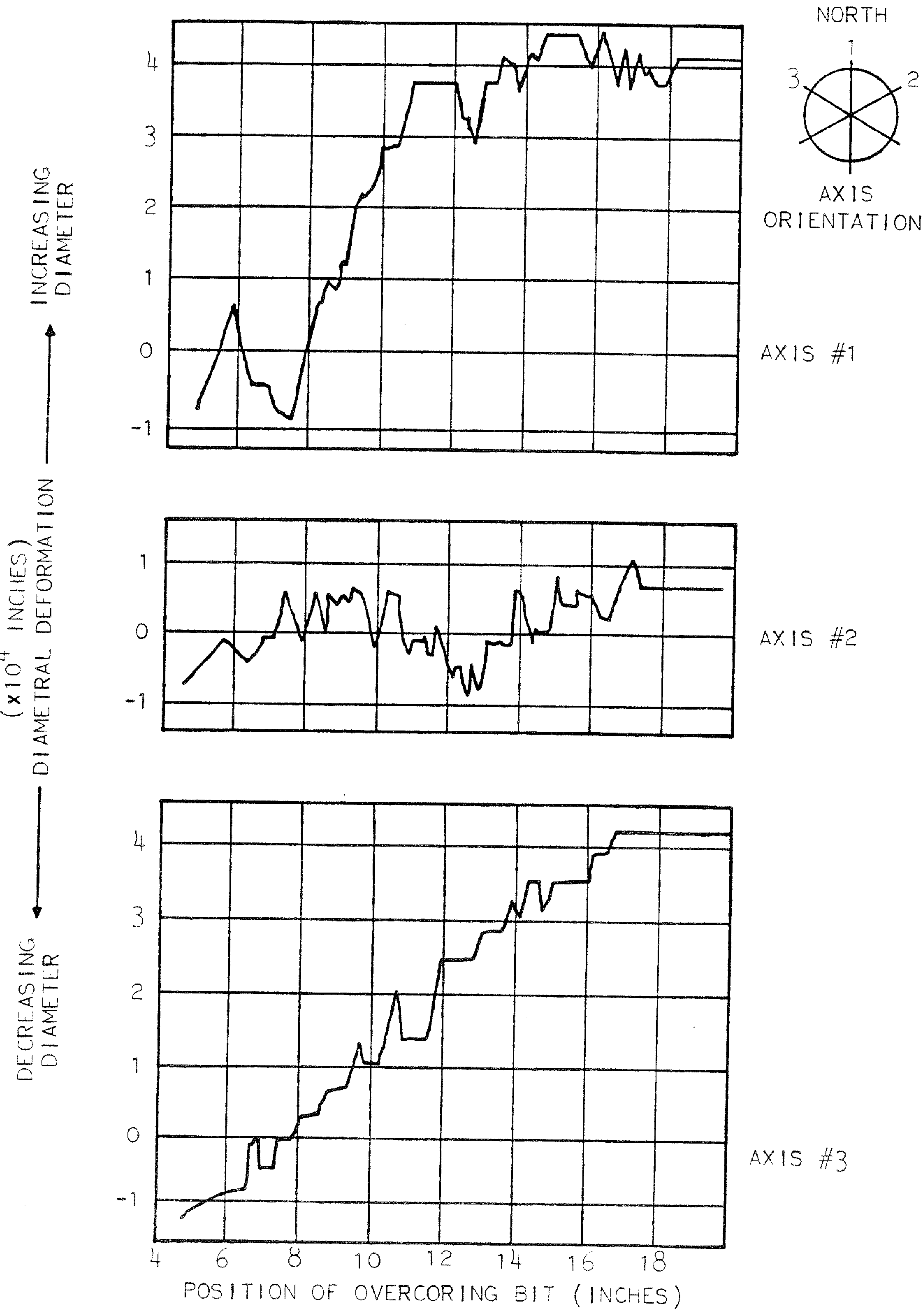


(b)
STRAIN INDICATOR RESPONSE
VERSUS
OVERCORING DEPTH

Amendment 0
August 1984

Borehole Deformation-
Overcoring procedure

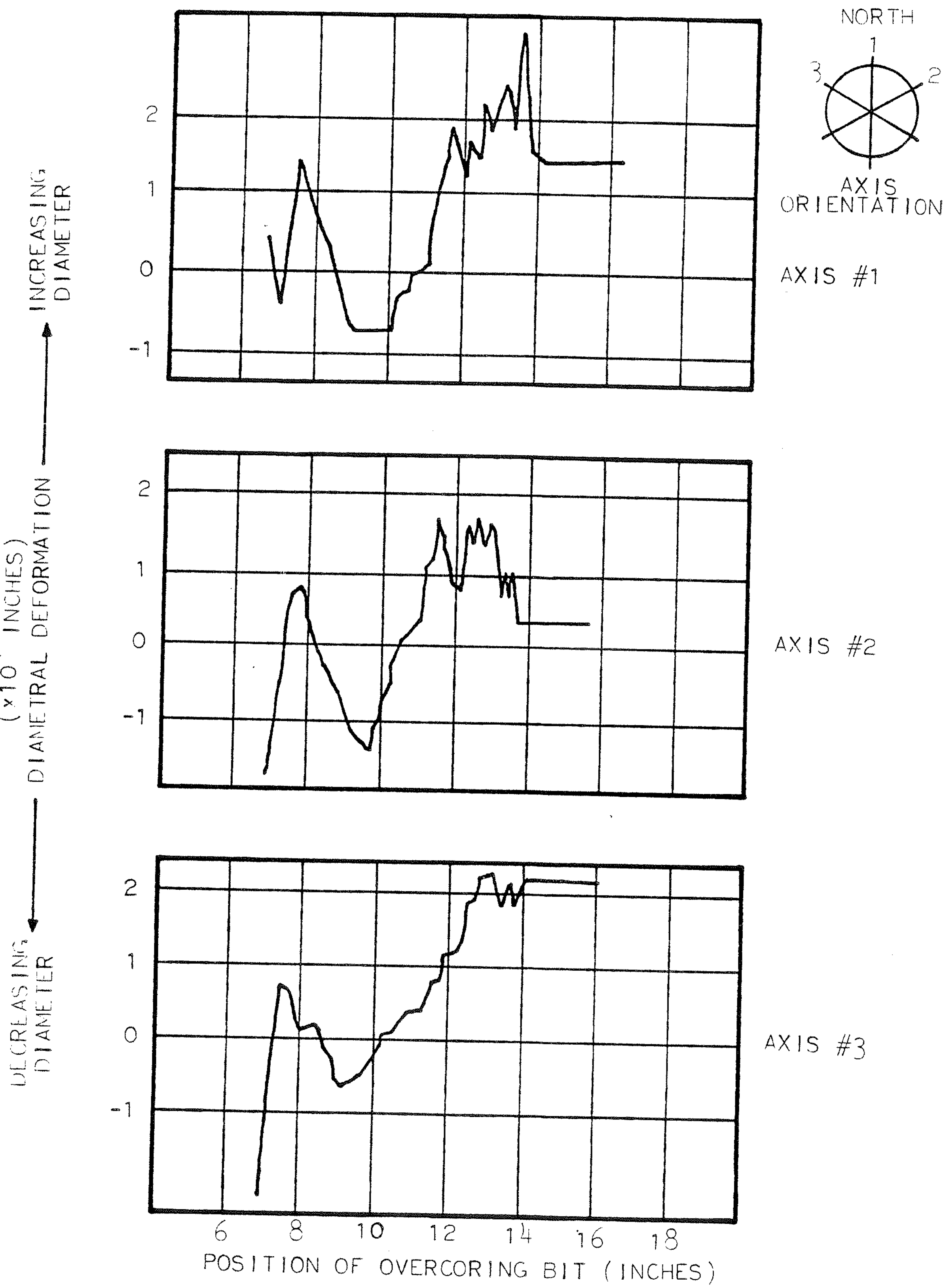
Figure 2D - 1



In Situ Stress Test
Boring OC - 1
Test 2

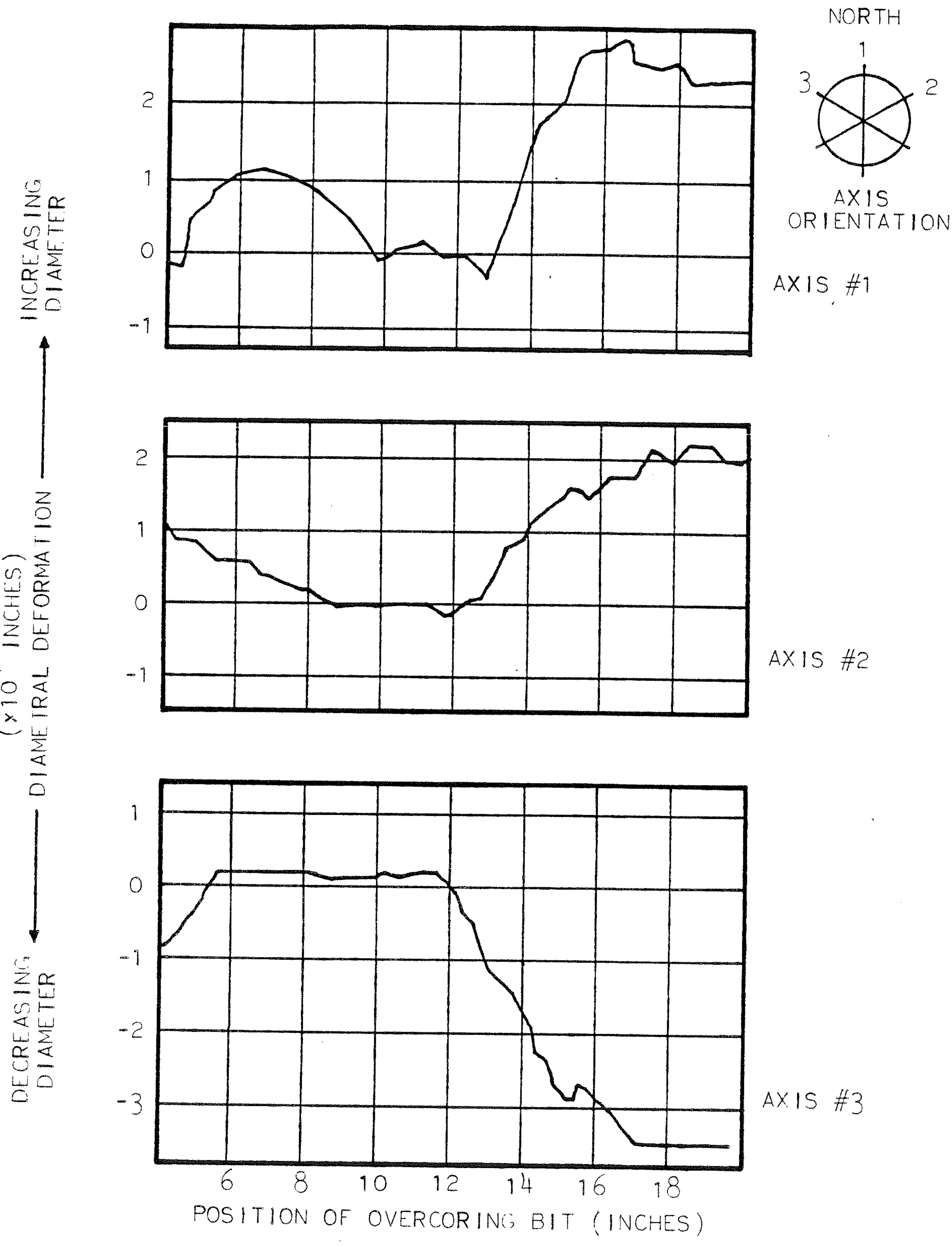
Amendment 0
August 1984

Figure 2D - 2



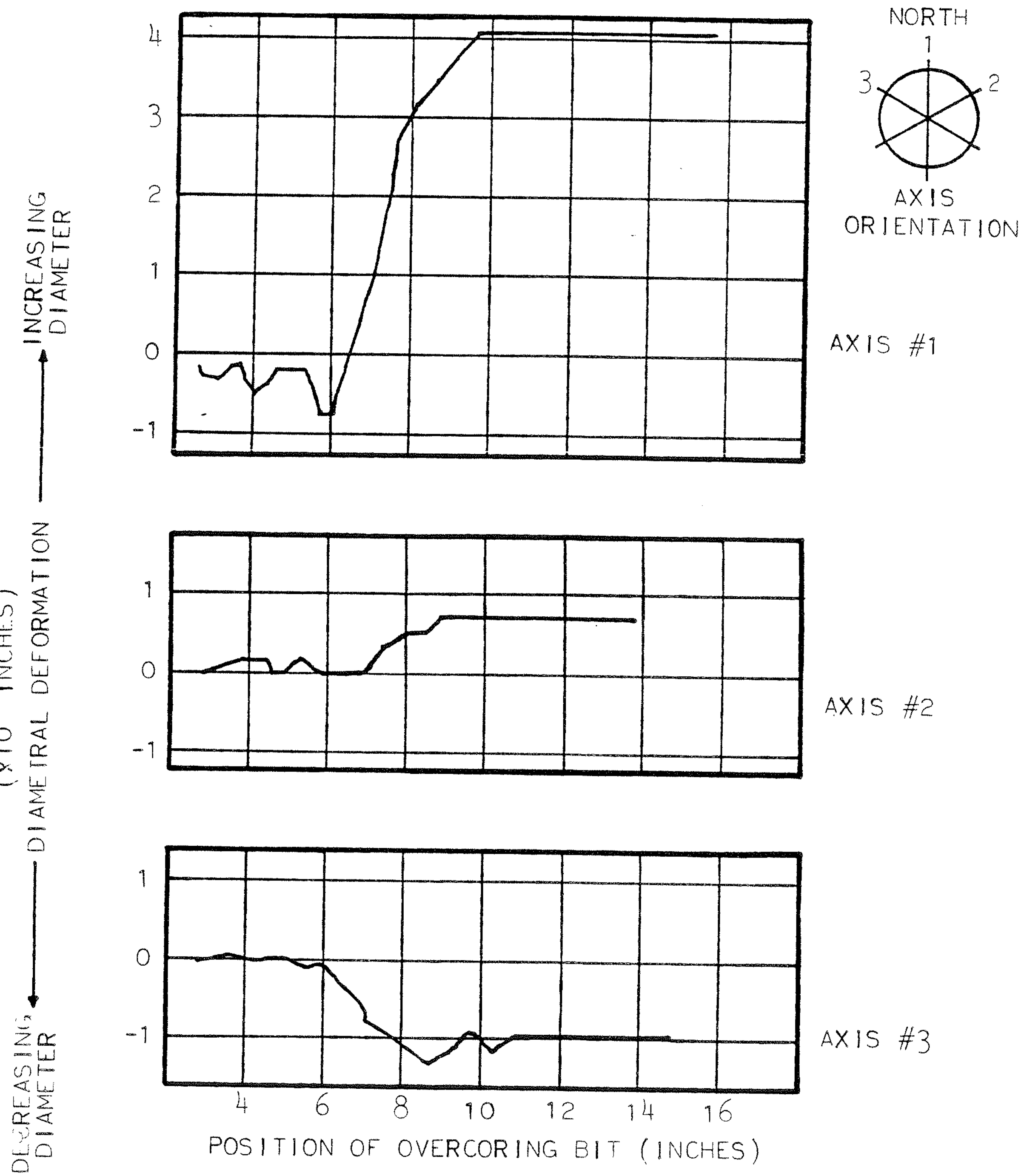
In Situ Stress Test
Boring OC - 1
Test 3

Figure 2D - 3



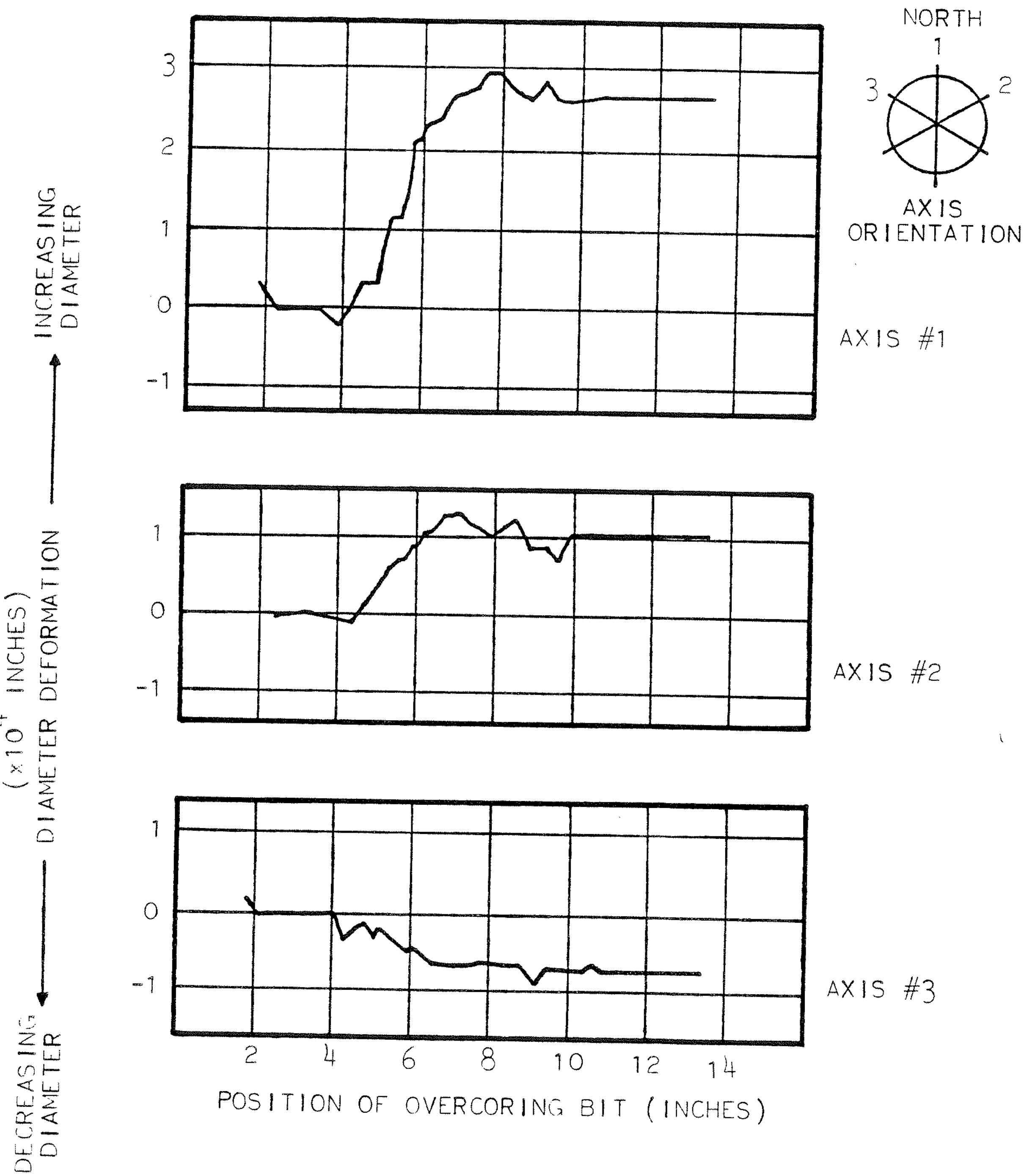
In Situ Stress Test
Boring OC - 2
Test 1

Figure 2D - 4



In Situ Stress Test
Boring OC - 2
Test 2

Figure 2D - 5



In Situ Stress Test
Boring OC - 2
Test 3

Figure 2D - 6

APPENDIX 2E

LOGS OF BORINGS

NUCLEAR PLANT SITE AND GENERAL AREA

APPENDIX 2F

LOGS OF BORING AND TEST PITS FOR SERVICE WATER POND EMBANKMENTS

APPENDIX 2F

LOGS OF BORING AND TEST PITS FOR
SERVICE WATER POND EMBANKMENTS
INDEX SHEET