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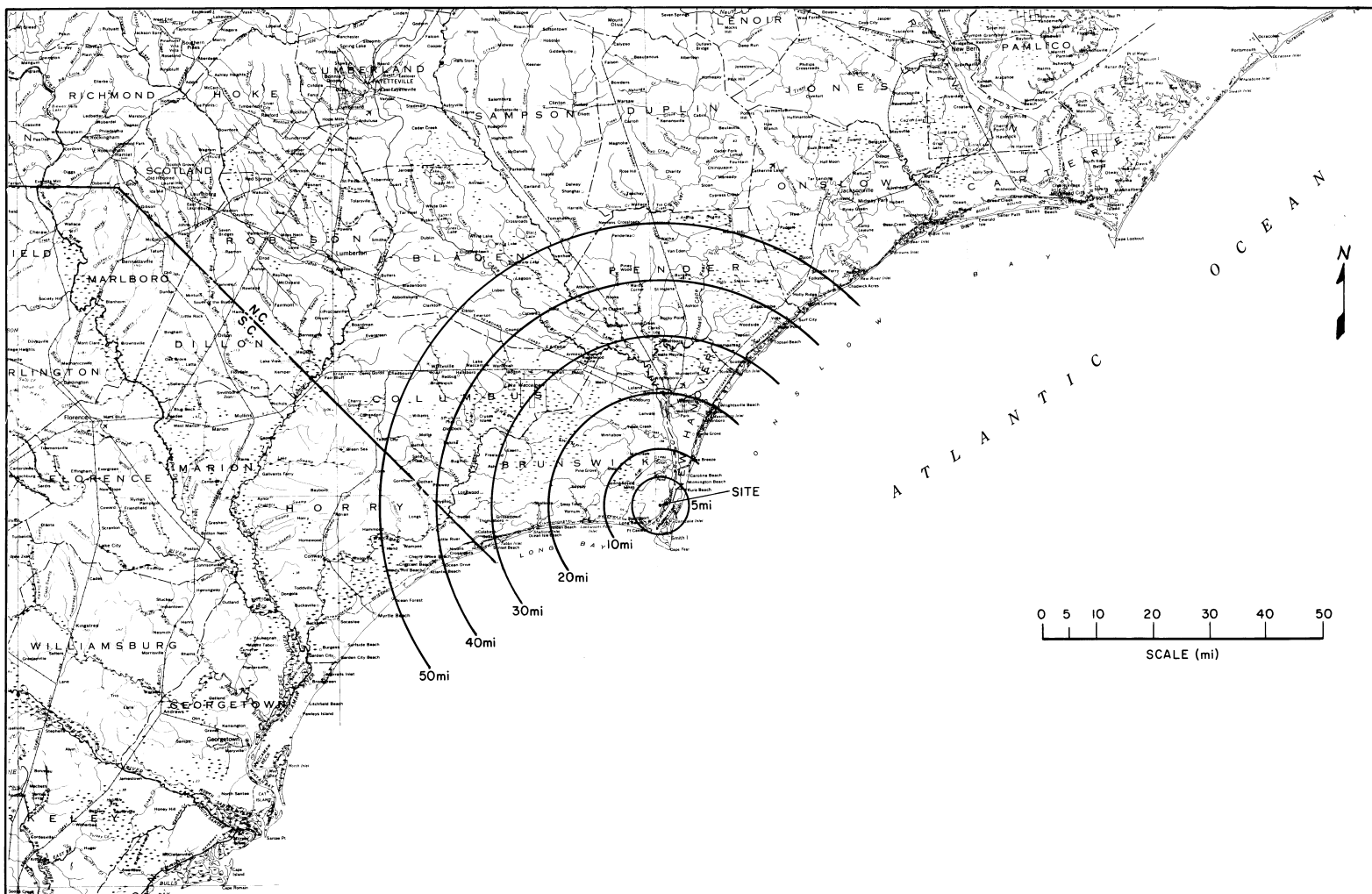
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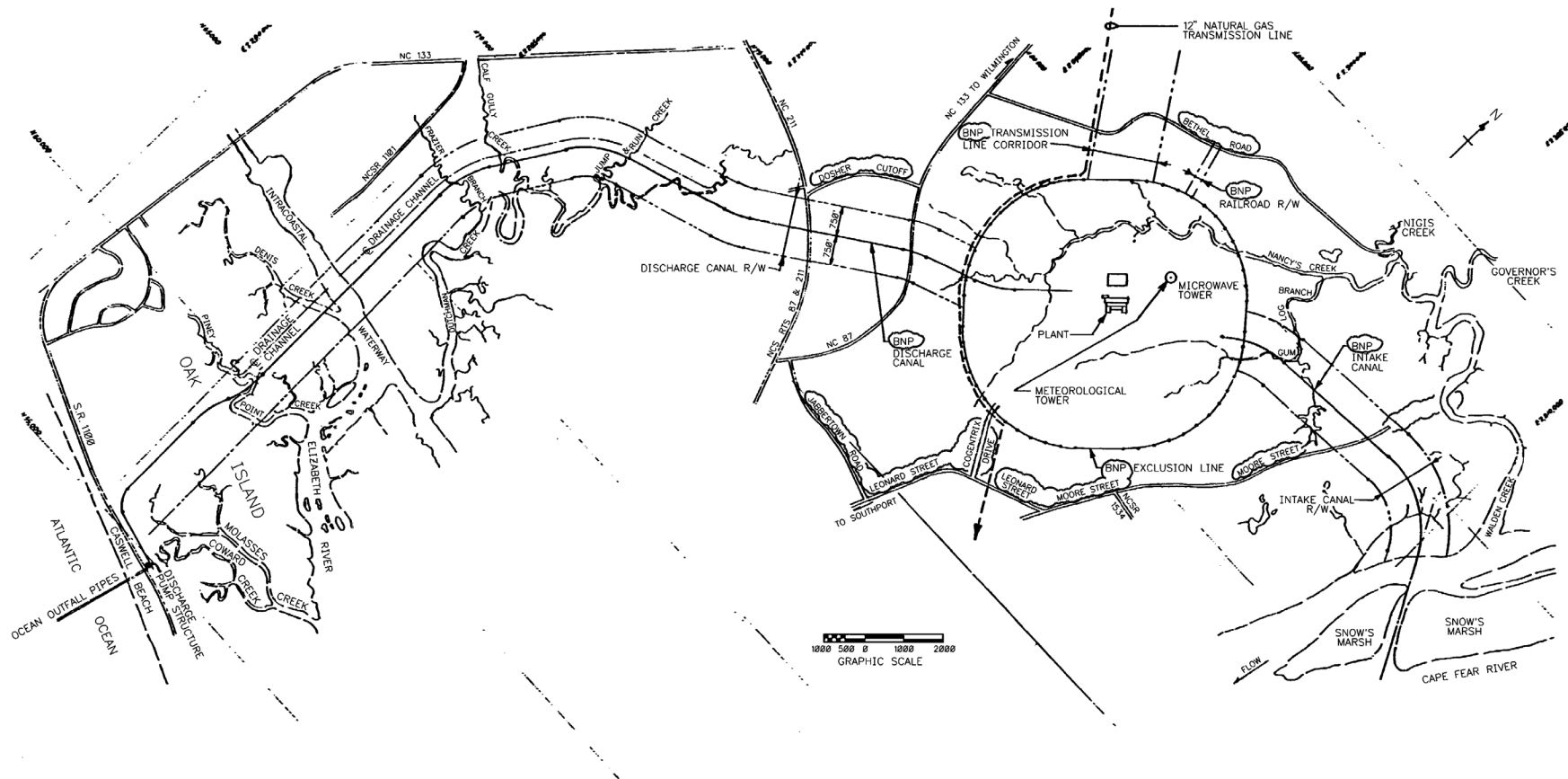
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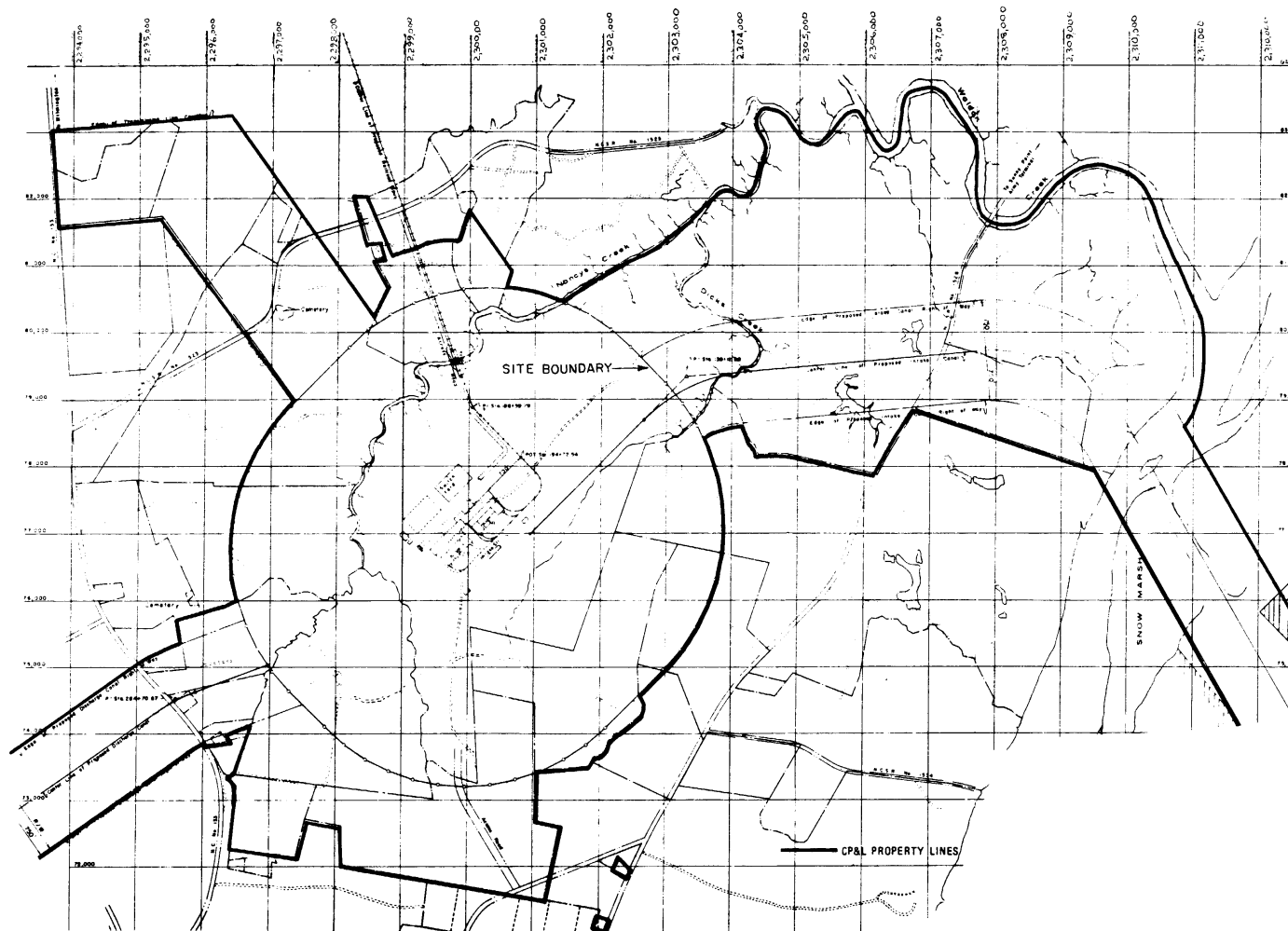
General Site Location Map



Site Plan



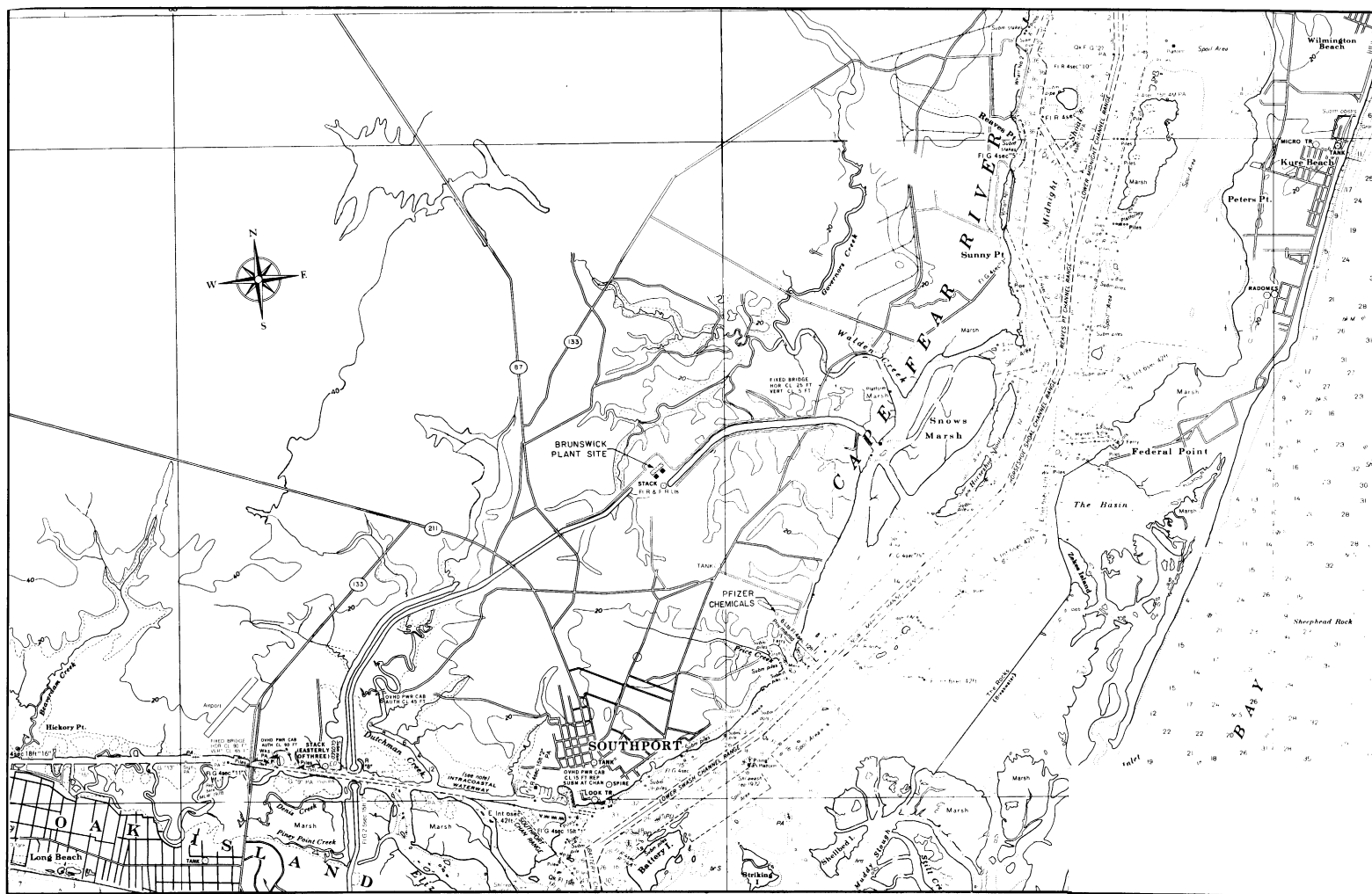
Site Map



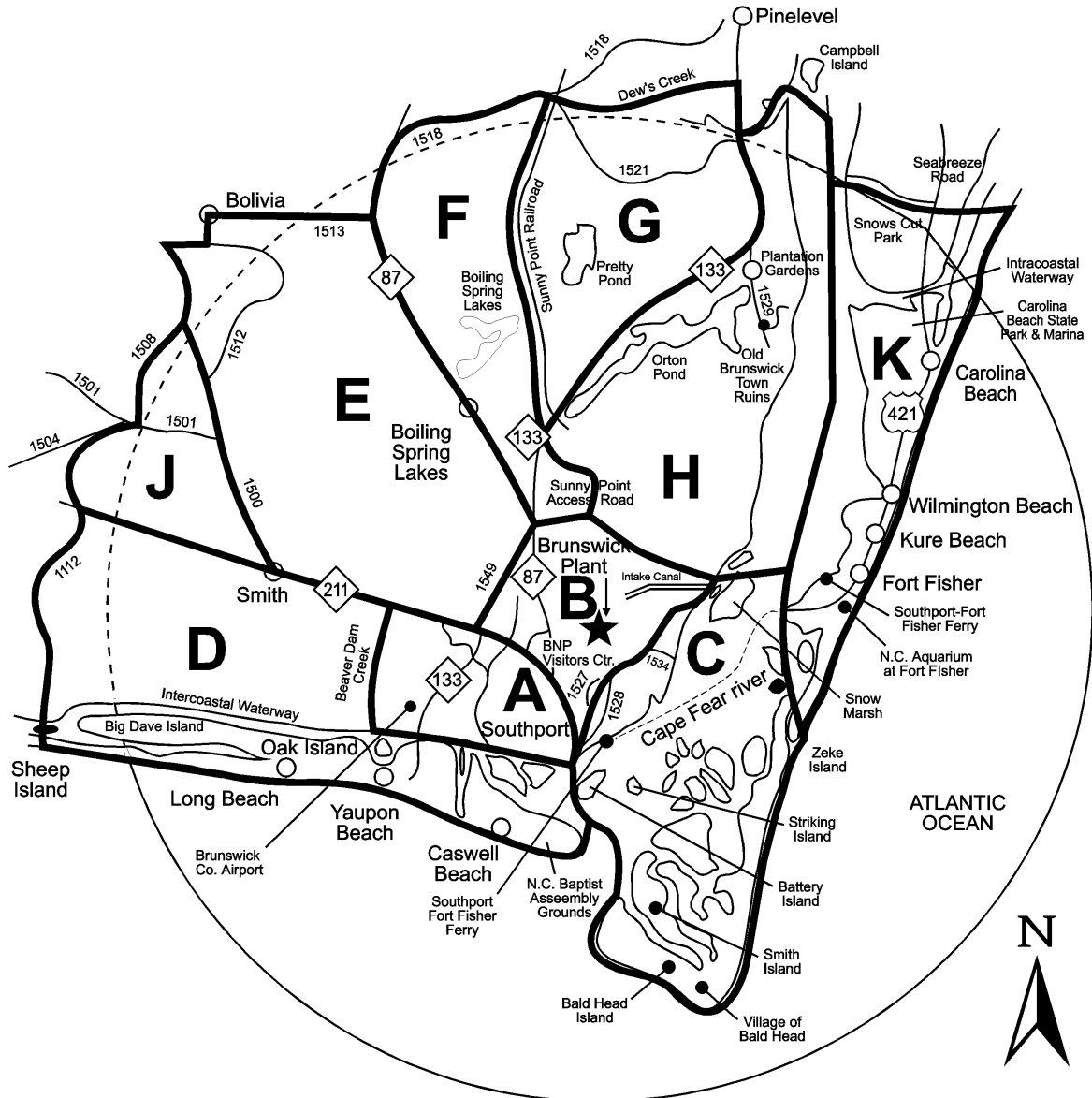
Aerial Photograph Of Site (1981)



General Site Topography



Evacuation Zones (10 Mile EPZ)



Evacuation Zones (10 Mile EPZ)

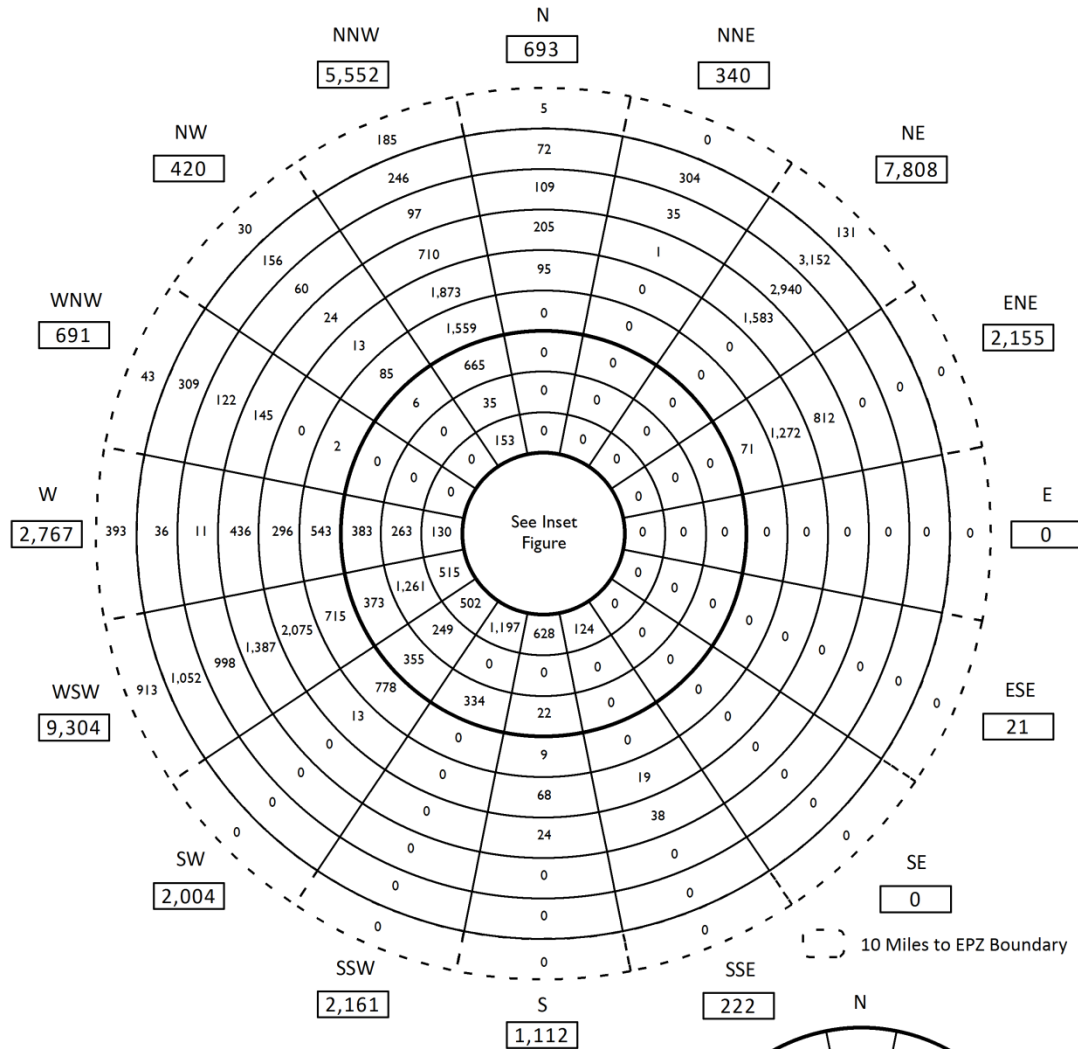




UPDATED FSAR
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CHAPTER 2 FIGURES

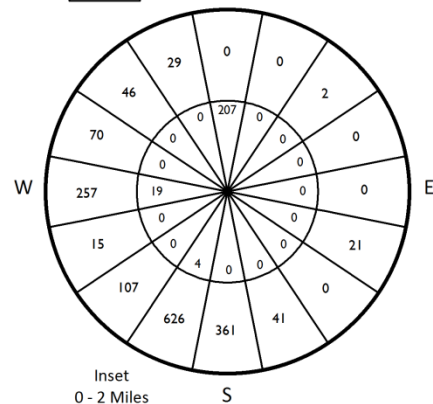
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Permanent Resident Population by Sector

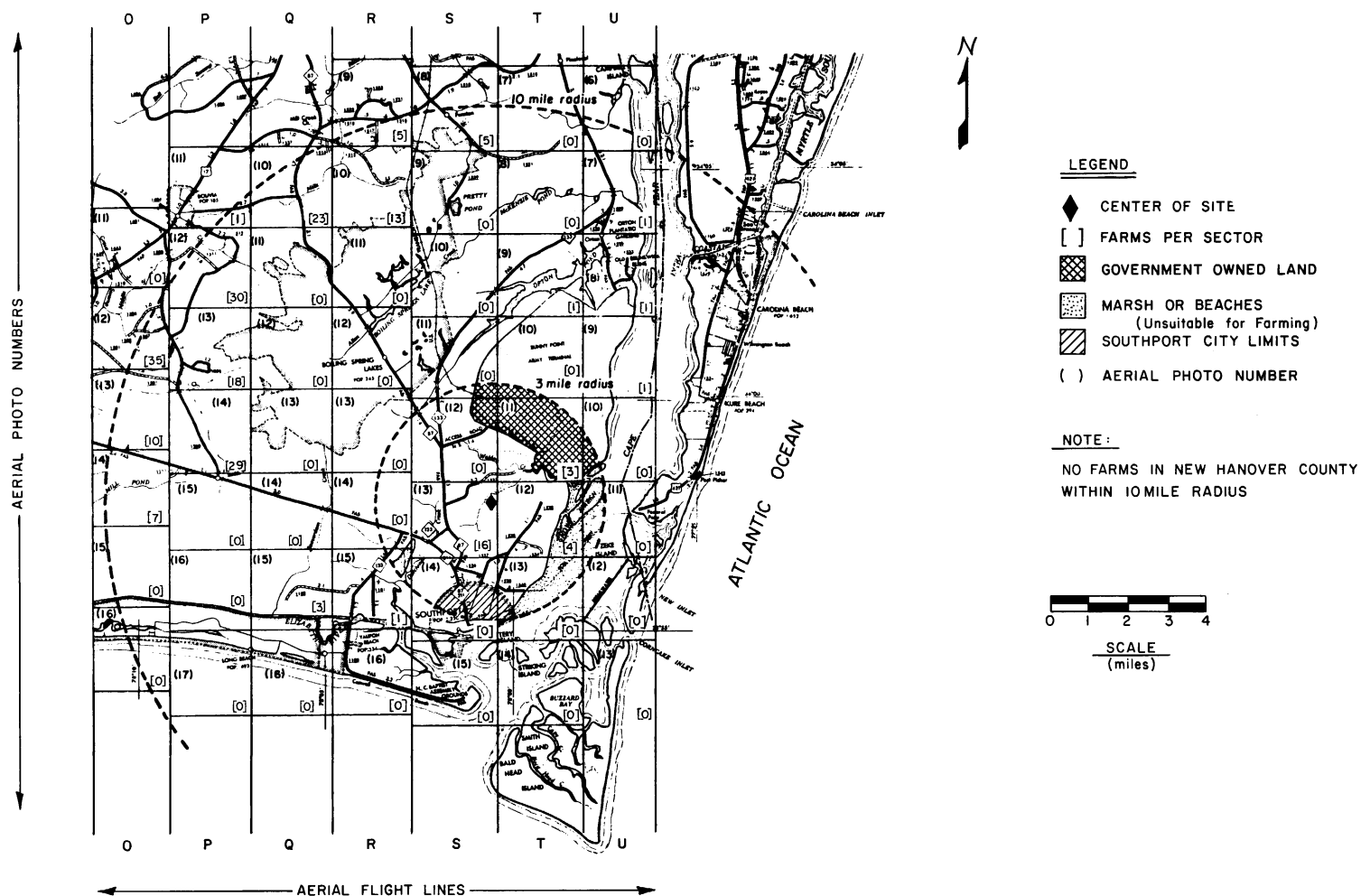


Resident Population

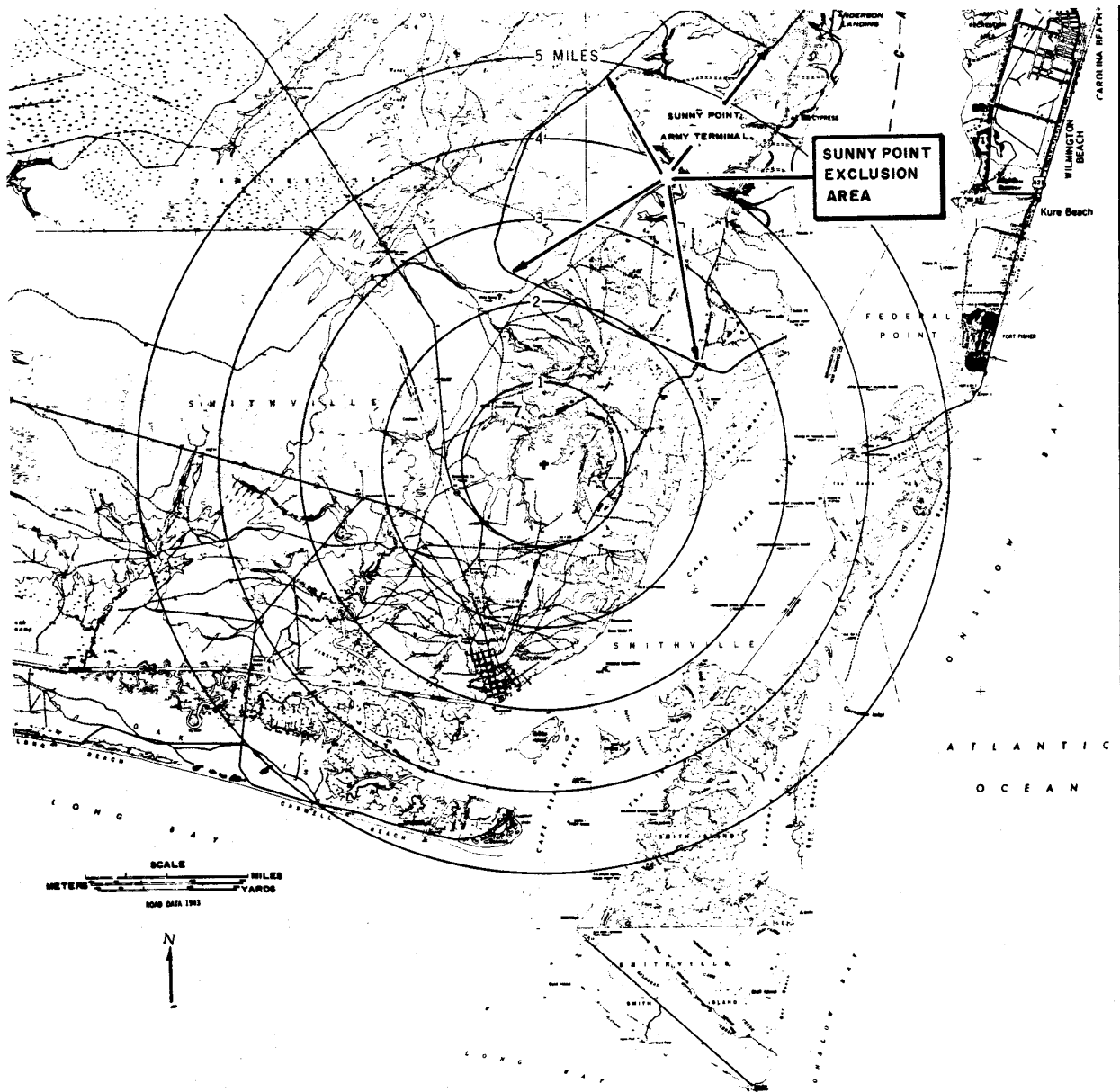
Miles	Subtotal by Ring	Cumulative Total
0 - 1	230	230
1 - 2	1,575	1,805
2 - 3	3,249	5,054
3 - 4	1,808	6,862
4 - 5	2,138	9,000
5 - 6	3,762	12,762
6 - 7	5,724	18,486
7 - 8	5,365	23,851
8 - 9	4,372	28,223
9 - 10	5,327	33,550
10 - EPZ	1,700	35,250
Total:		35,250



Location of Farms Within 10 Miles of the Site



Local Site Topography

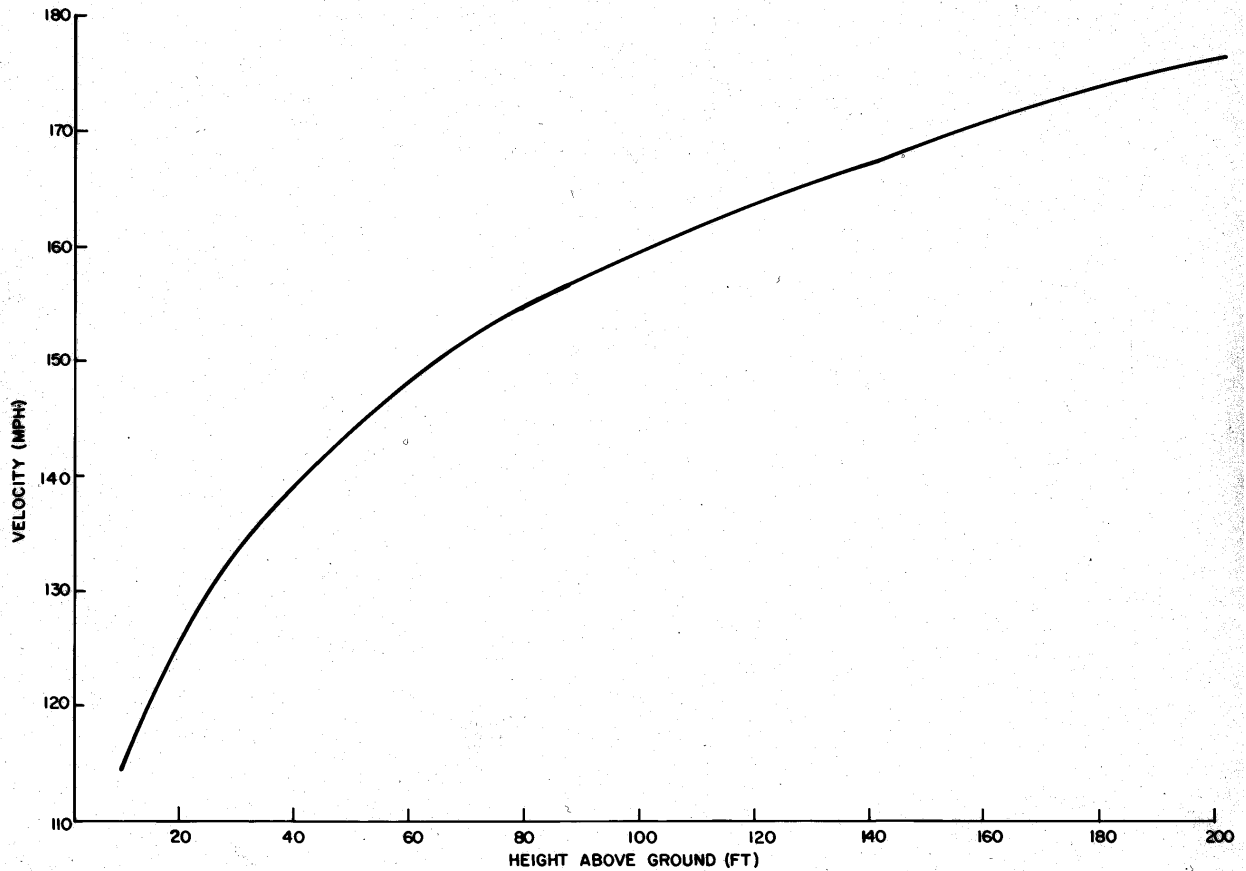




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Vertical Profile At The Extreme Mile Wind

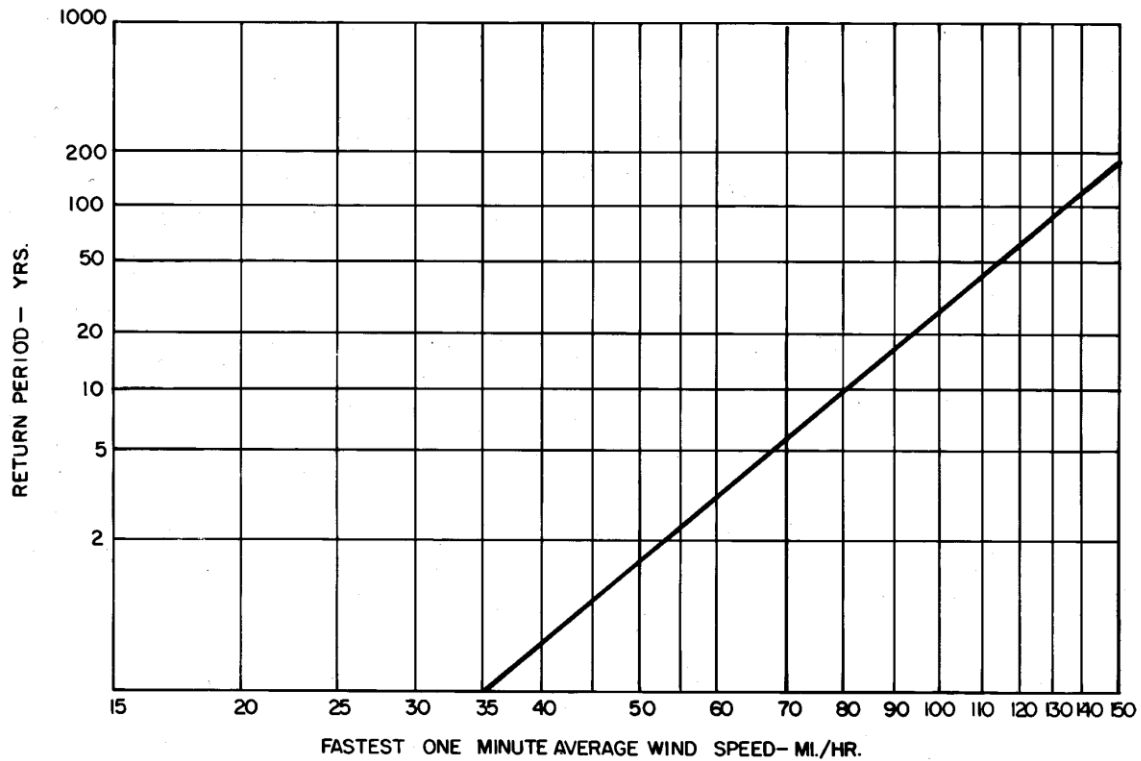




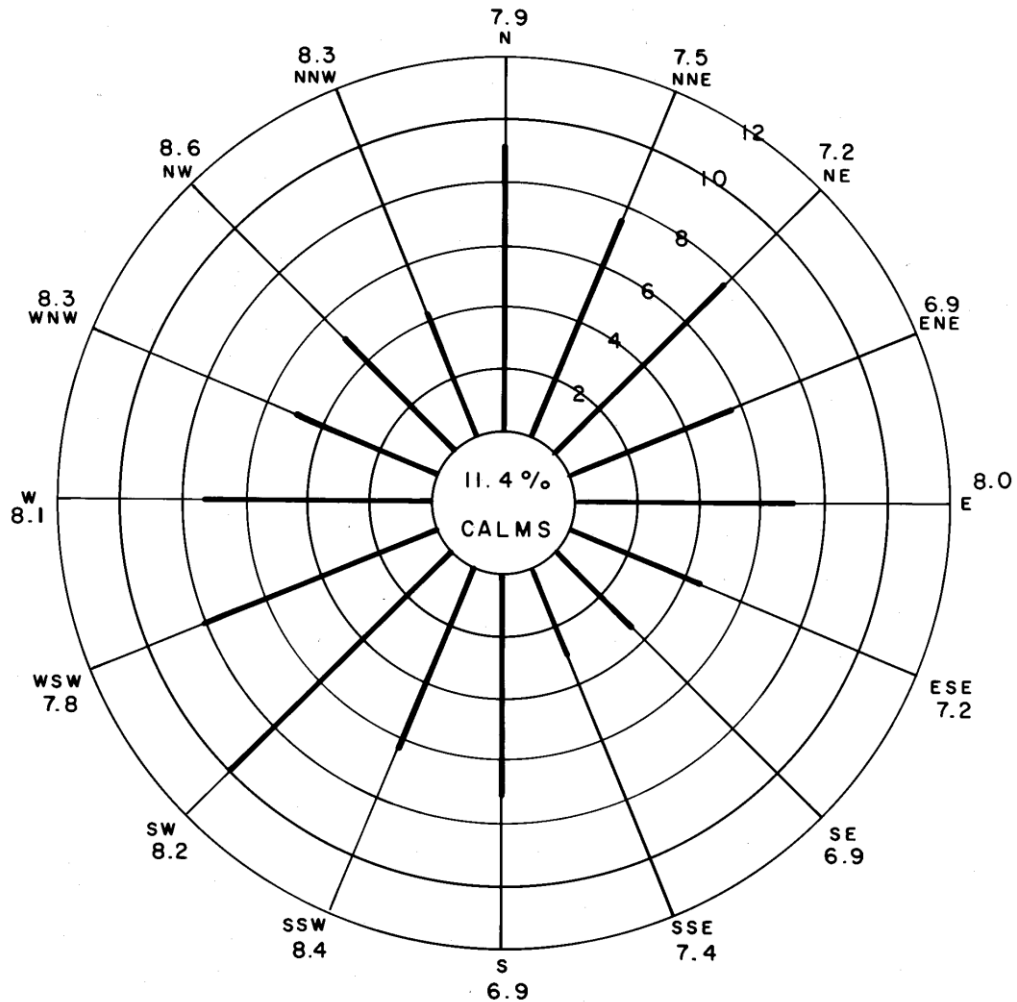
UPDATED FSAR
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**Recurrence Period of
Fastest 1 Minute Extreme Wind
for Site**



Wilmington, N.C. Weather Service Wind Rose



\bar{u} = 6.9 MPH

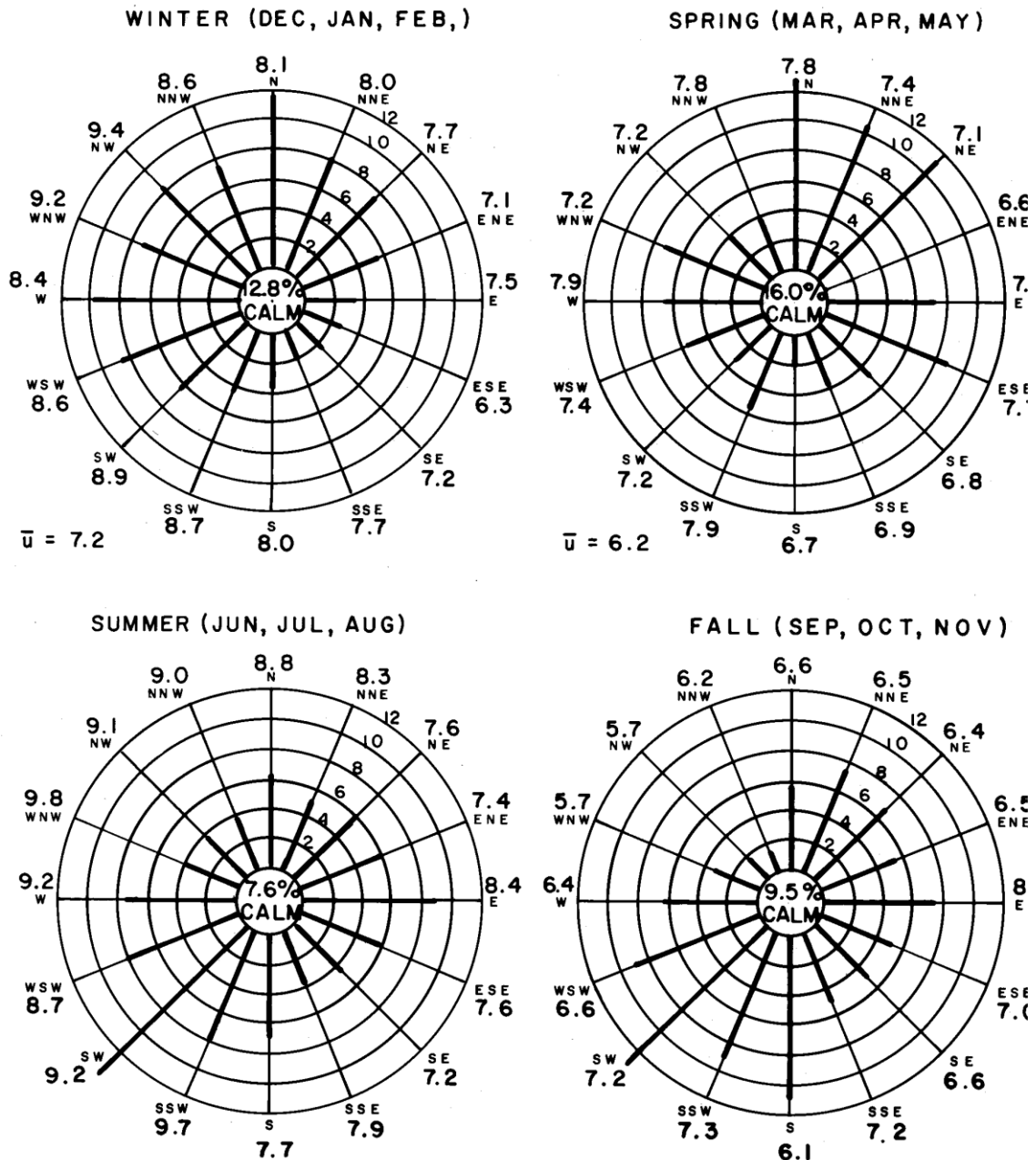
\bar{u} = ALL DIRECTION AVERAGE WIND SPEED

NOTE: DIRECTIONAL AVERAGE WIND SPEEDS (MPH)
 ARE DISPLAYED RADIALY

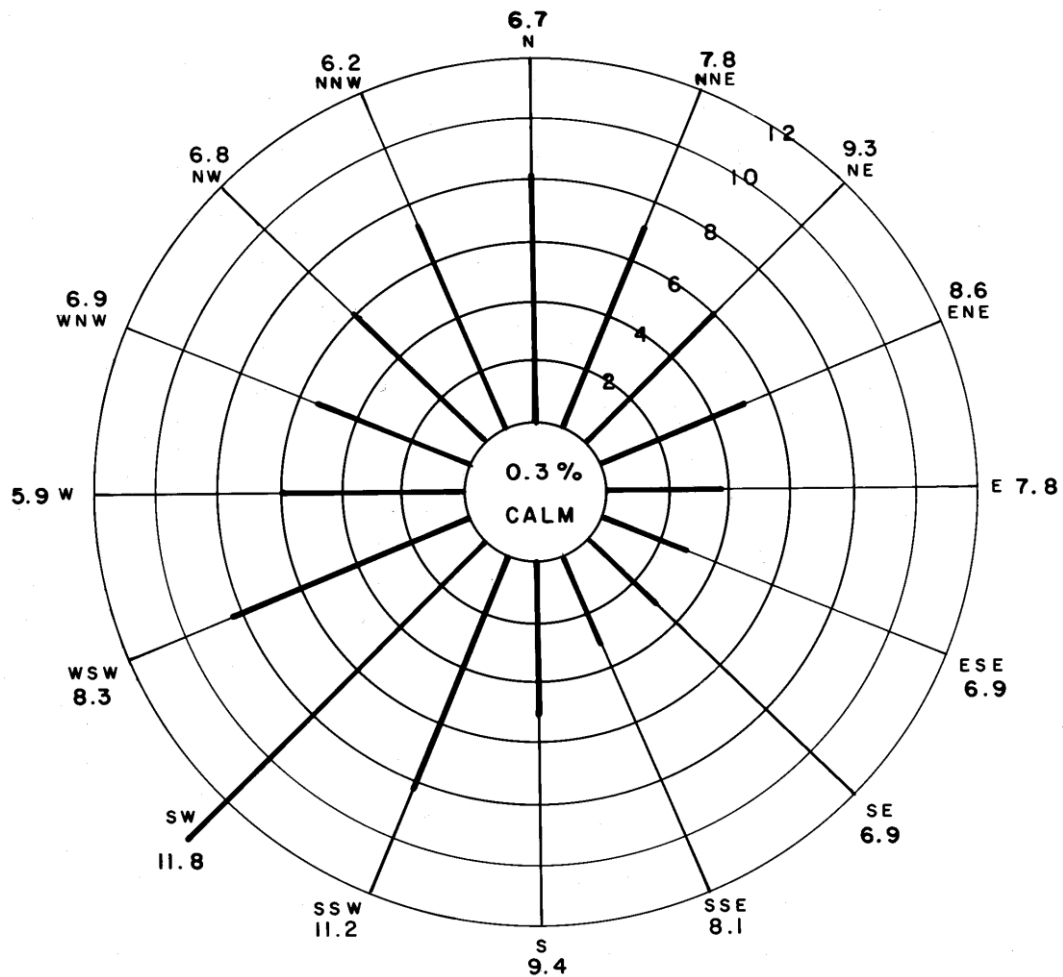
— WIND DIRECTION (%)

1966-1970

Wilmington, N.C. Weather Service Seasonal Wind Rose



BSEP On-Site Lower Level Wind Rose



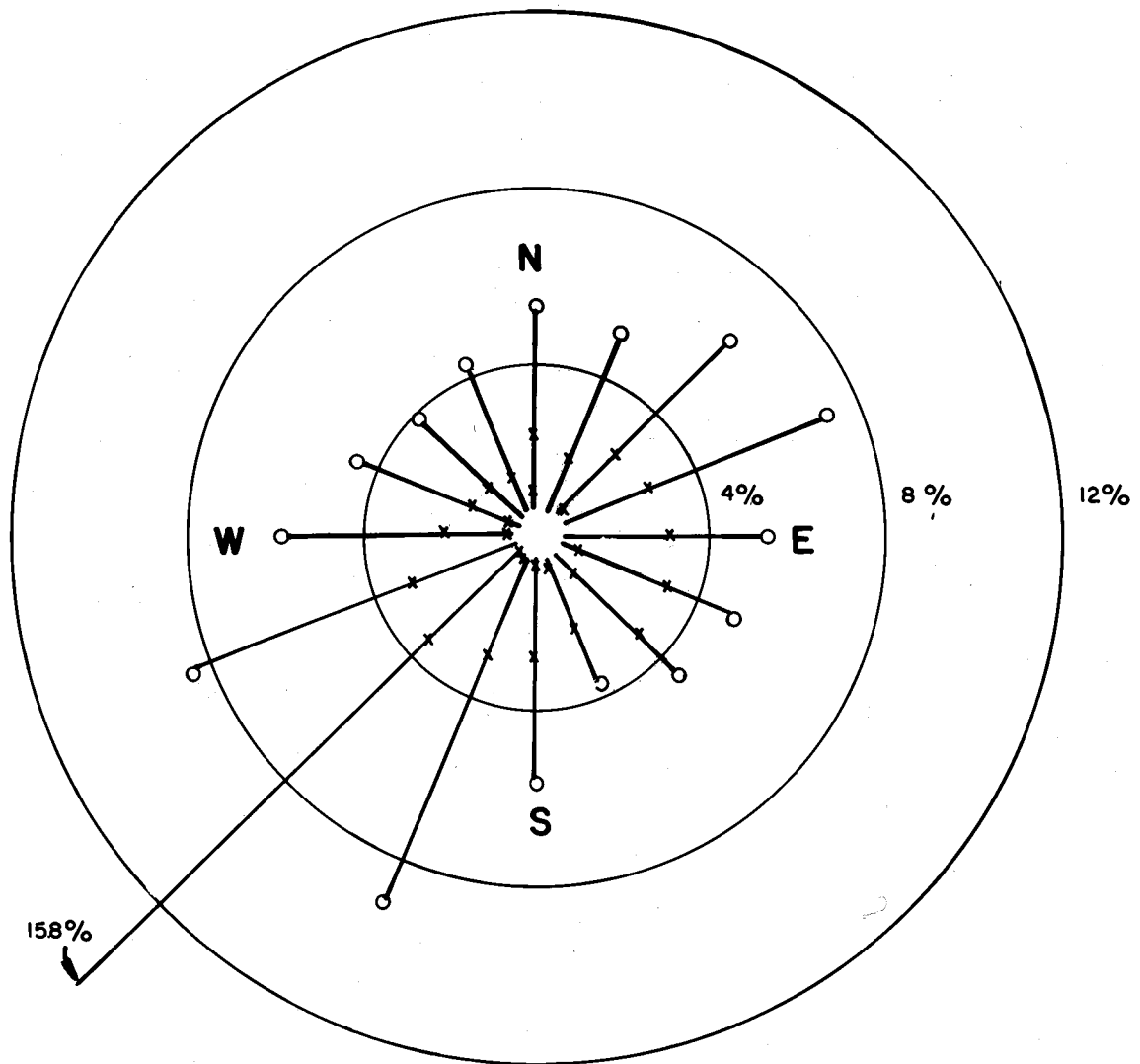
u = 8.5 MPH

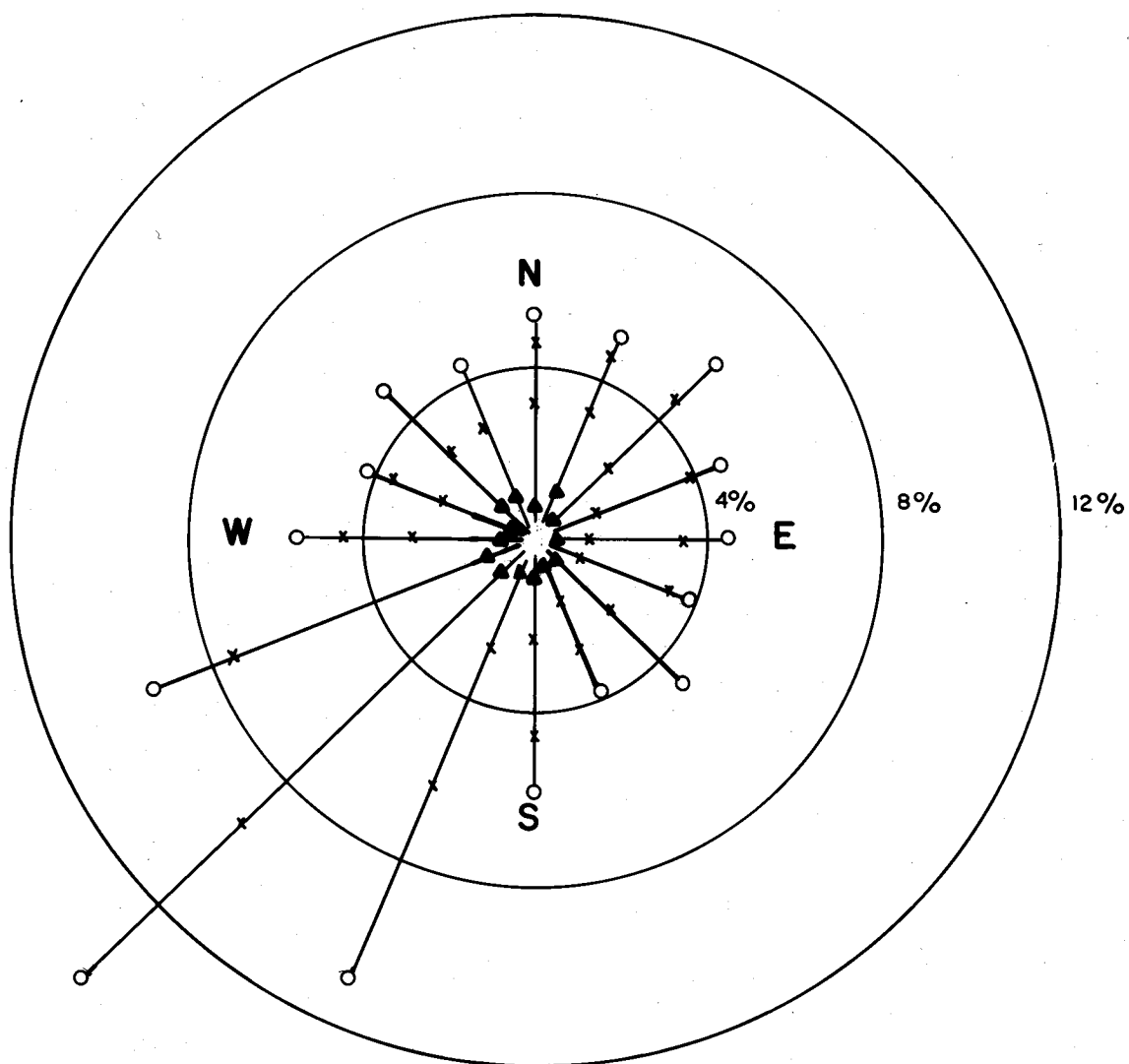
u = ALL DIRECTION AVERAGE WIND SPEED

NOTE: DIRECTIONAL AVERAGE WIND SPEEDS (MPH)
ARE DISPLAYED RADially

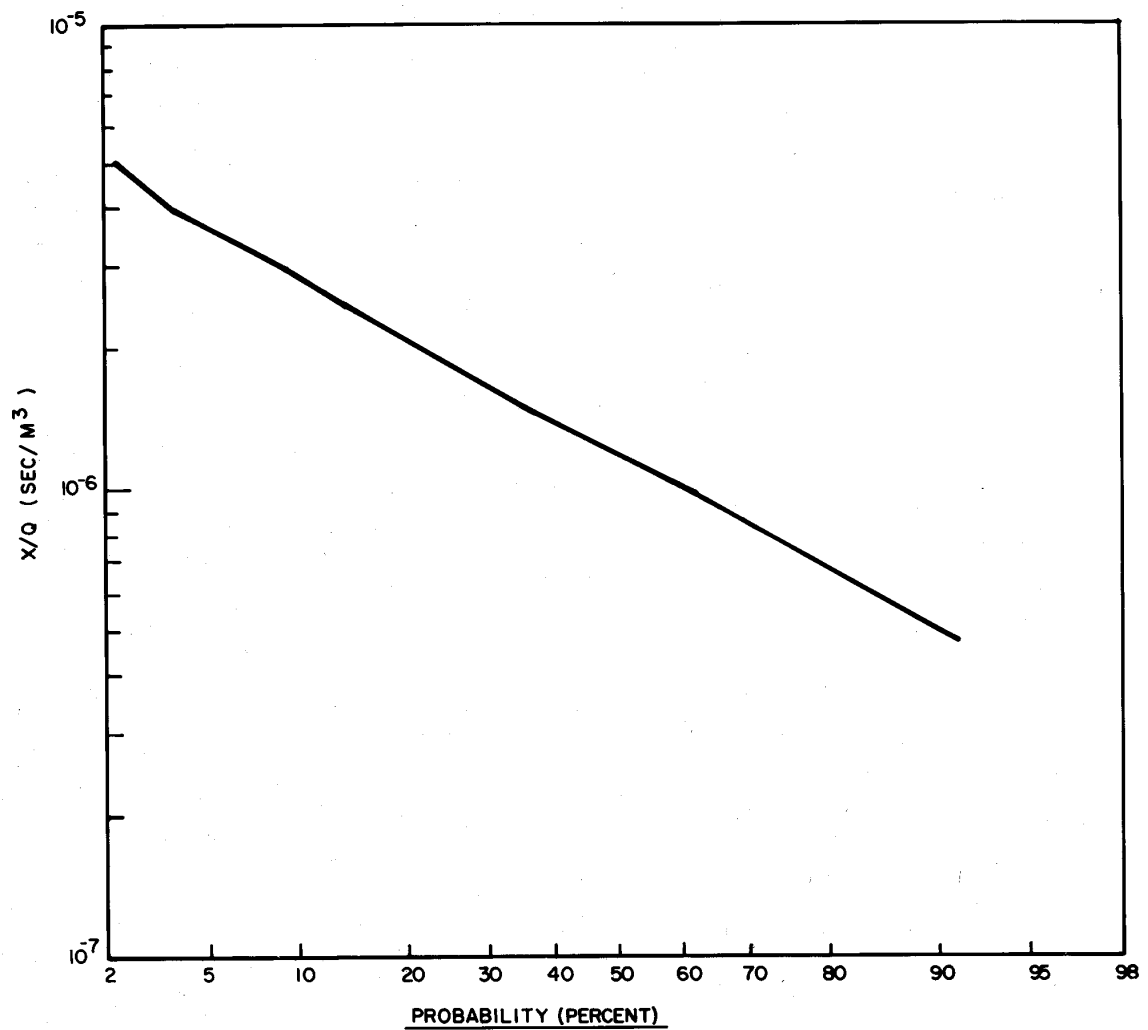
— WIND DIRECTION (%)

350 Foot Wind Rose

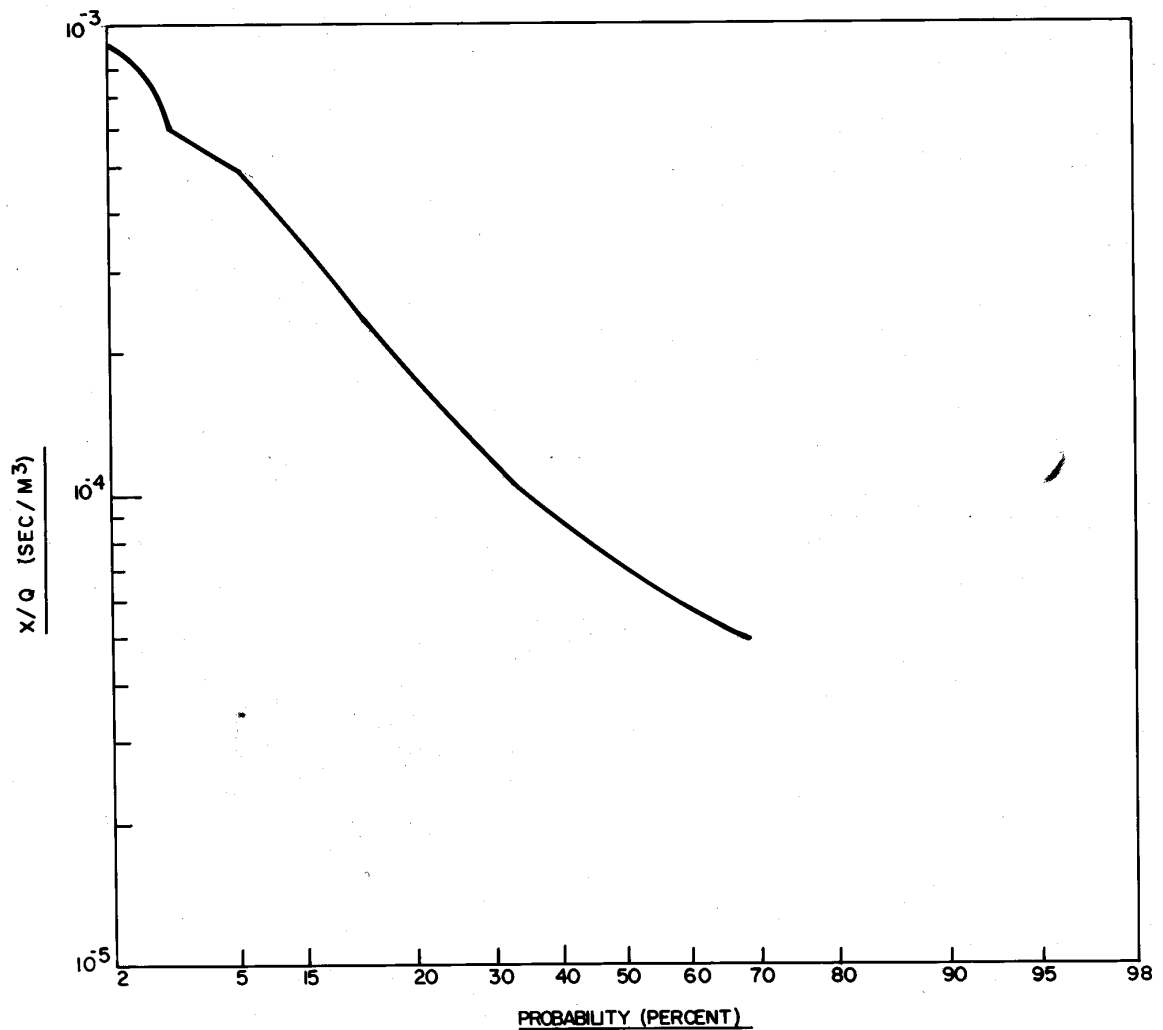




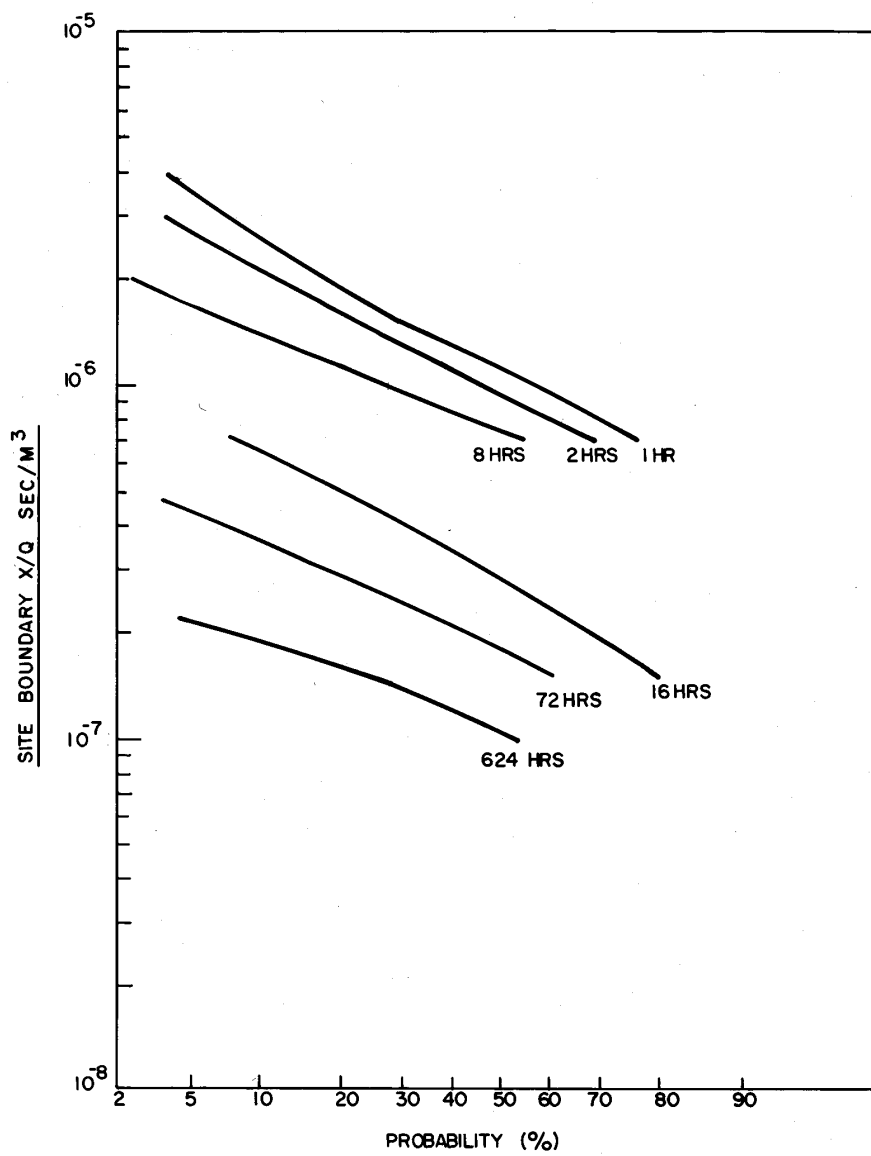
Brunswick Tower 350 Foot Cumulative Probability of X/Q Values from Ground Release



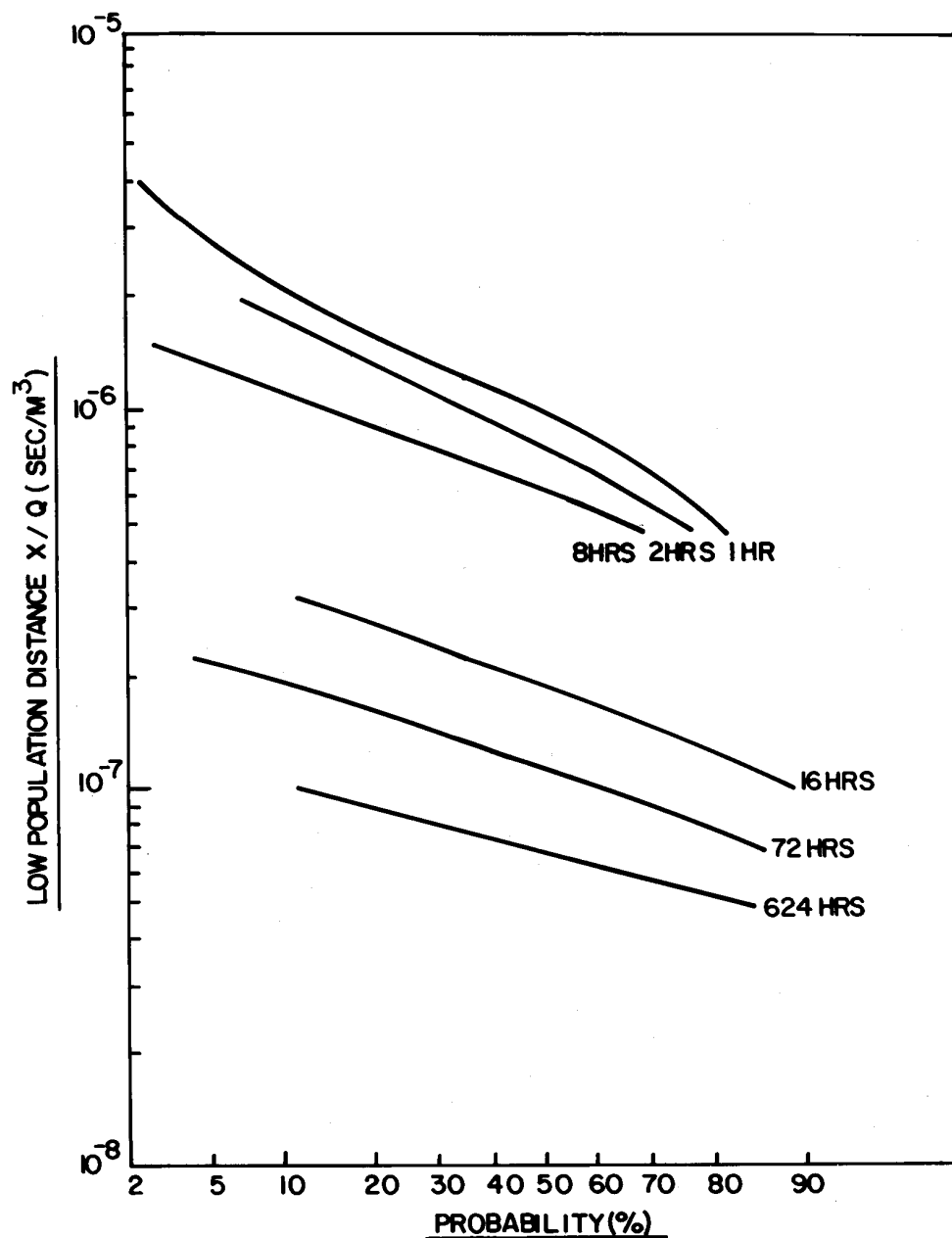
Brunswick Tower 44 Foot Cumulative Probability of X/Q Values from Ground Release



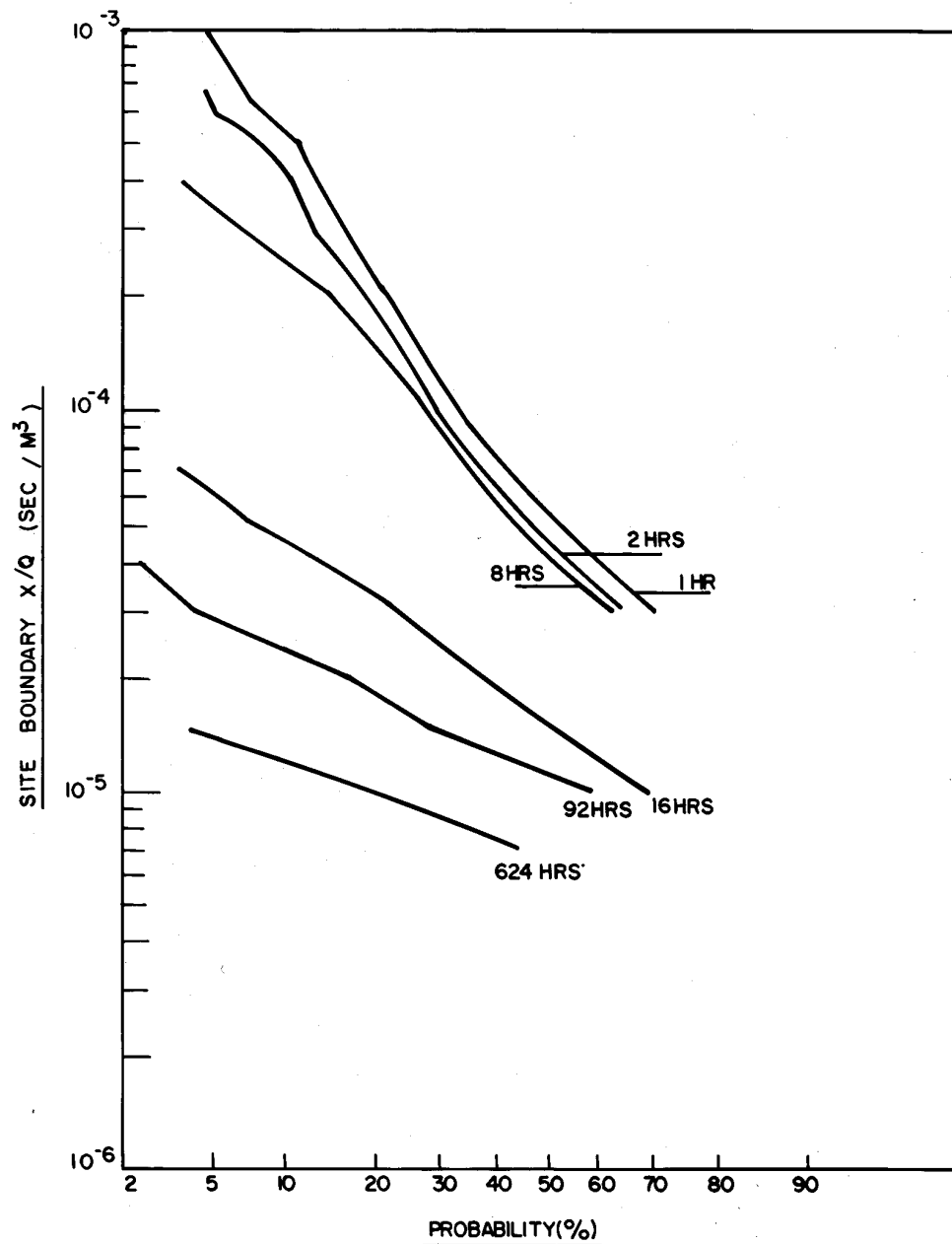
Cumulative Probability of Average X/Q Values for Stack Releases Based on 350 Foot Level Composite Year of Brunswick Data (Site Boundary)



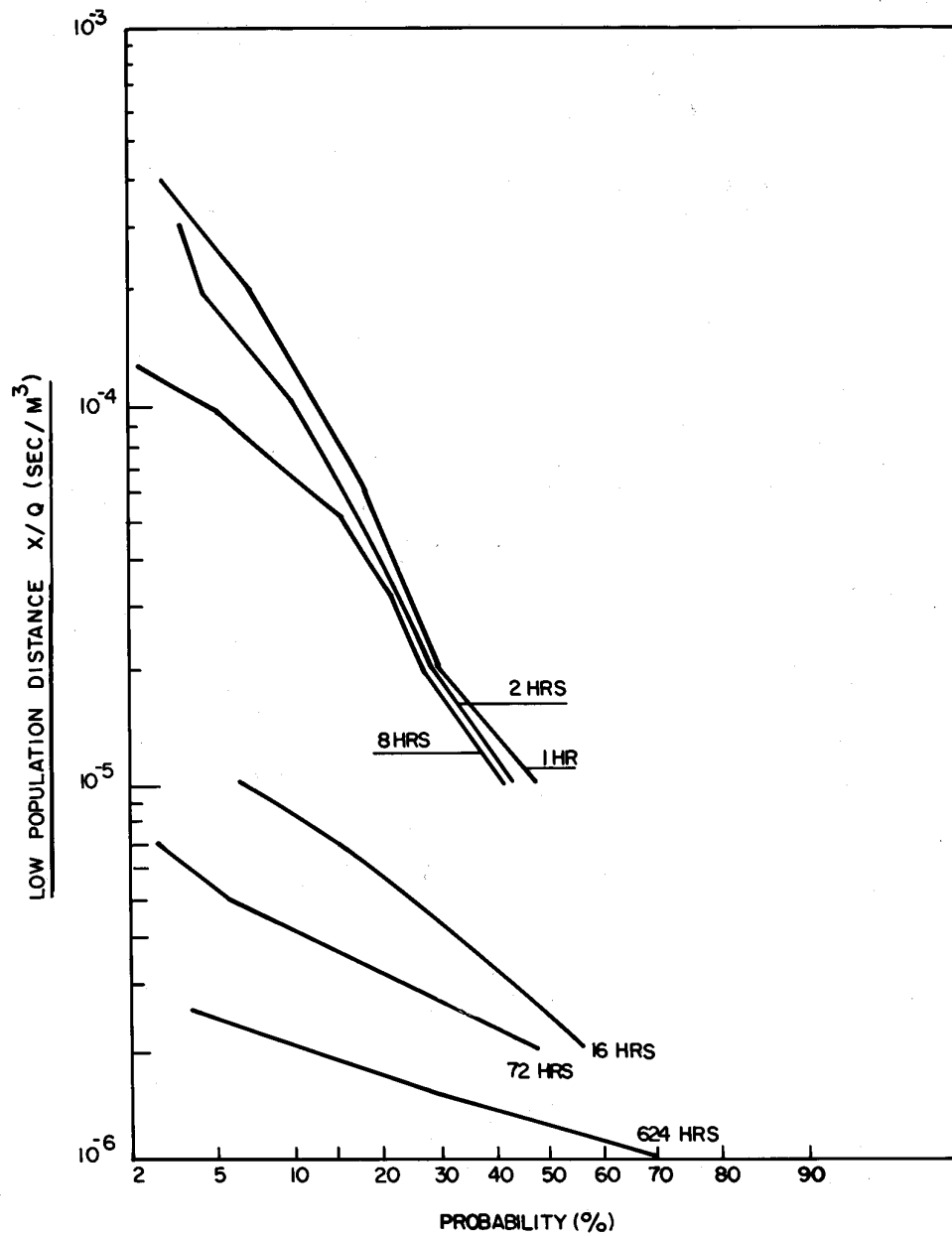
Cumulative Probability of Average X/Q Values for Stack Releases Based on 350 Foot Level Composite Year of Brunswick Data (Low Population Distance)



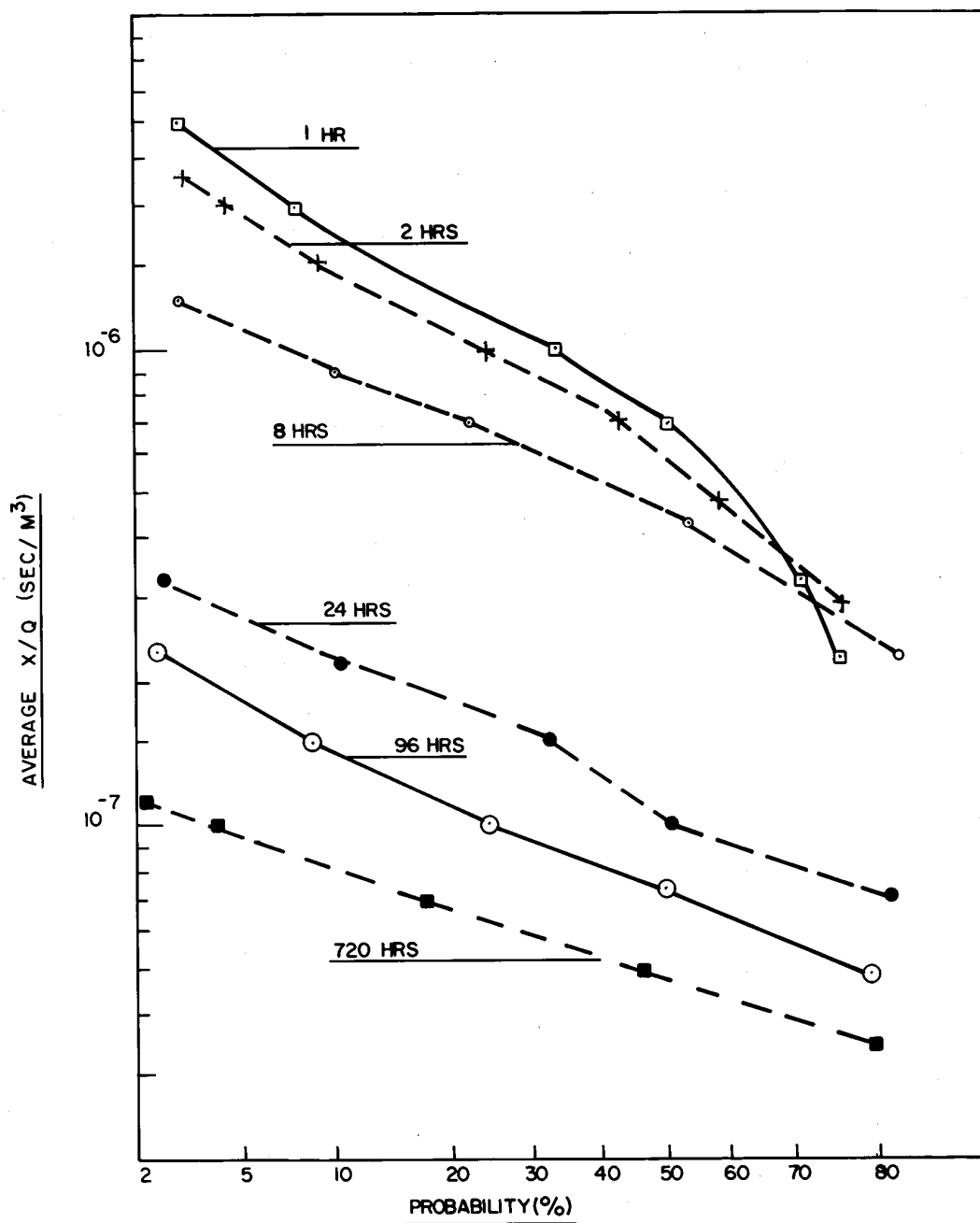
Cumulative Probability of Average X/Q Values for Stack Releases Based on 44 Foot Level Composite Year of Brunswick Data (Site Boundary)



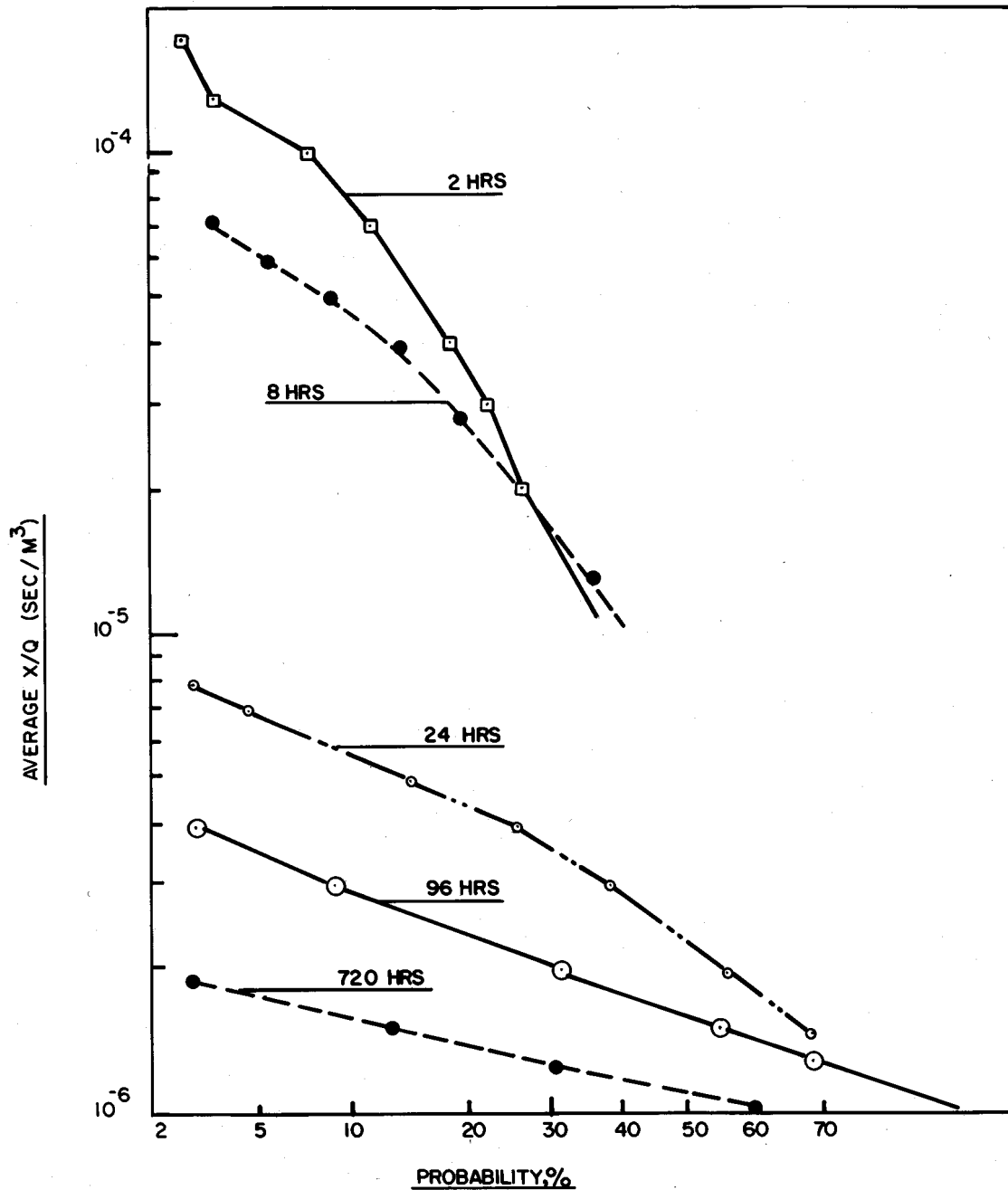
Cumulative Probability of Average X/Q Values for Ground Level Releases Based on 44 Foot Level Composite Year of Brunswick Data (Low Population Distance)



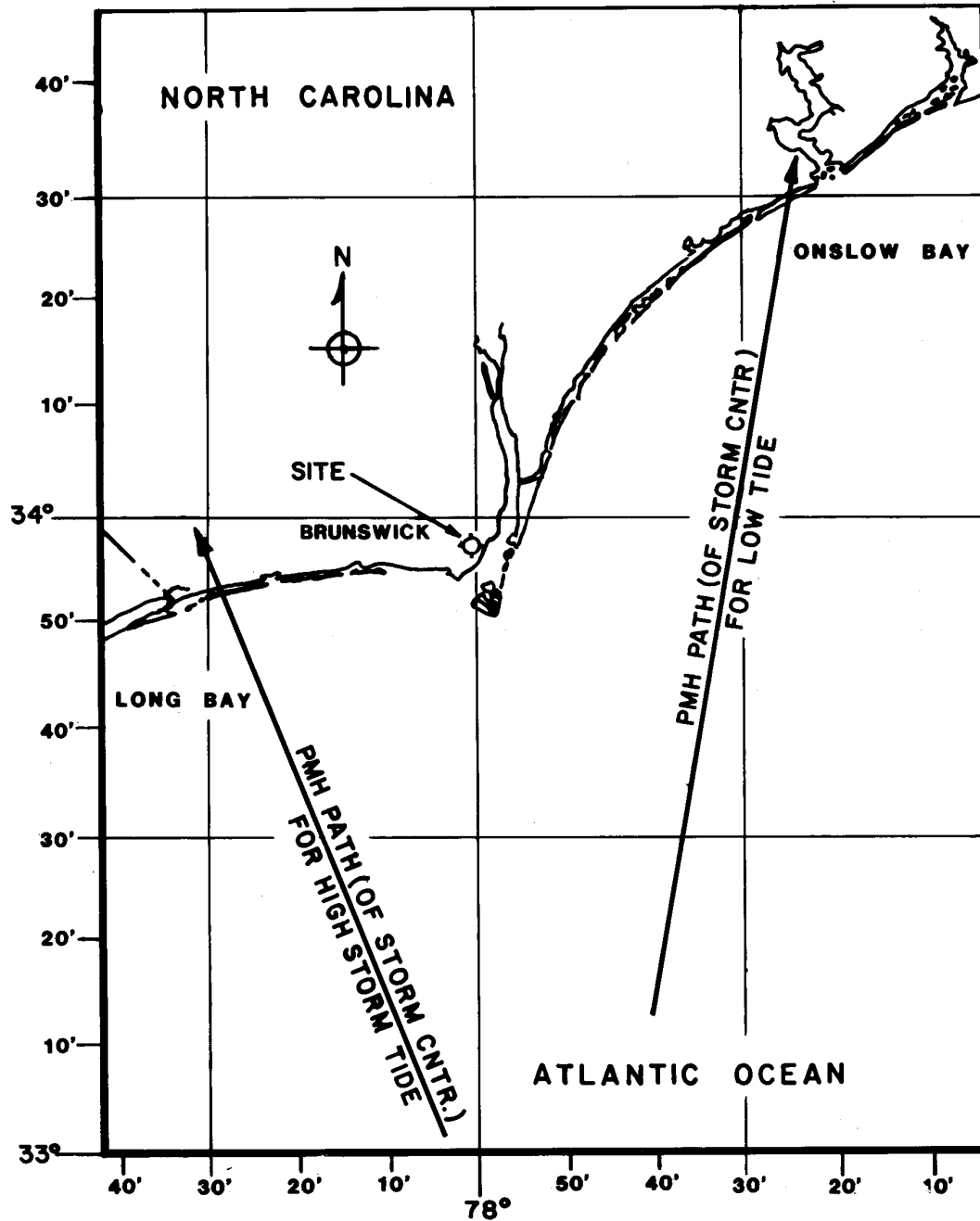
Cumulative Probability of Average X/Q Values (1970 – 1971 Brunswick Site Data – Stack Release)



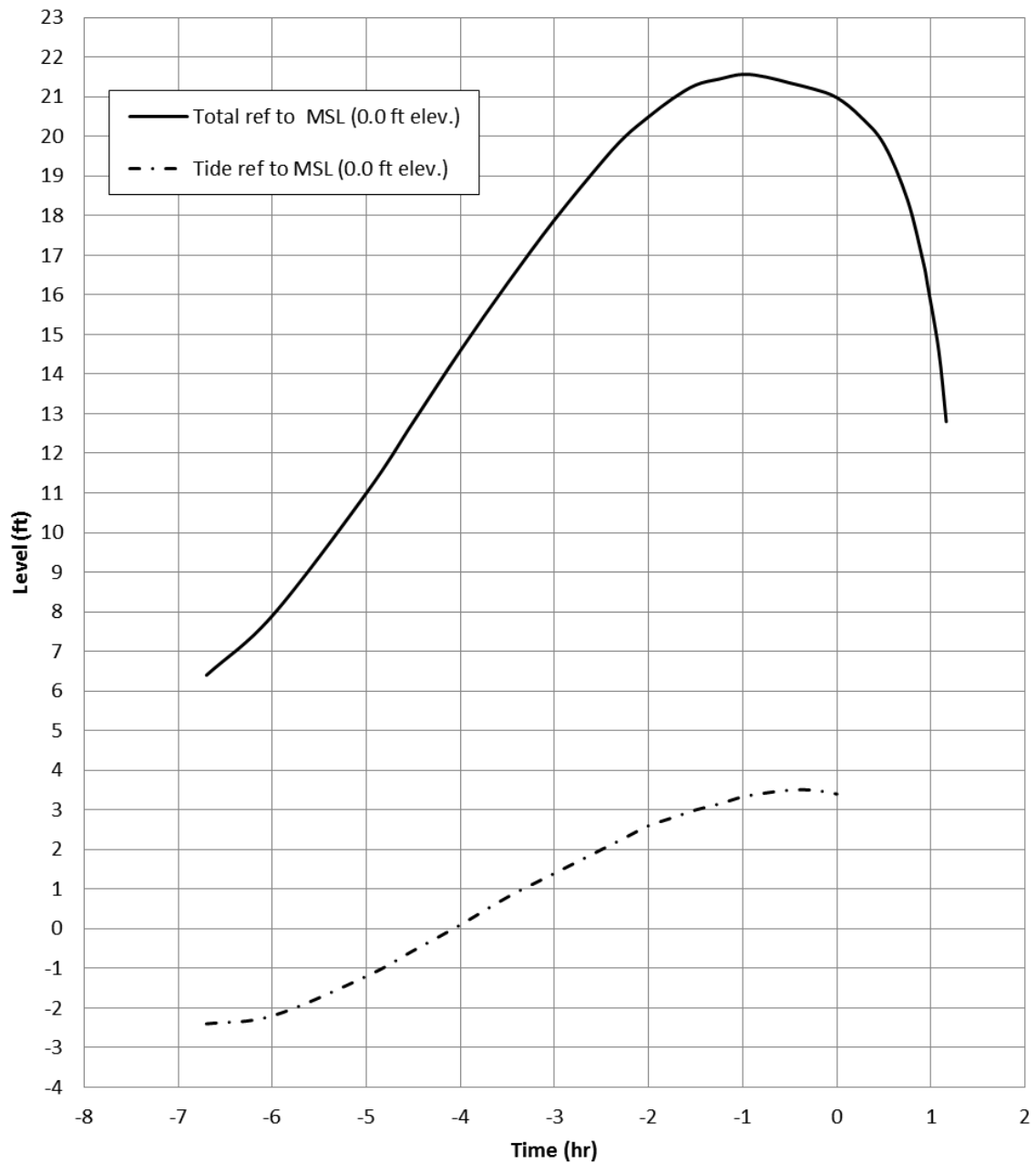
Cumulative Probability of Average X/Q Values (1970 – 1971 Brunswick Site Data – Ground Release)



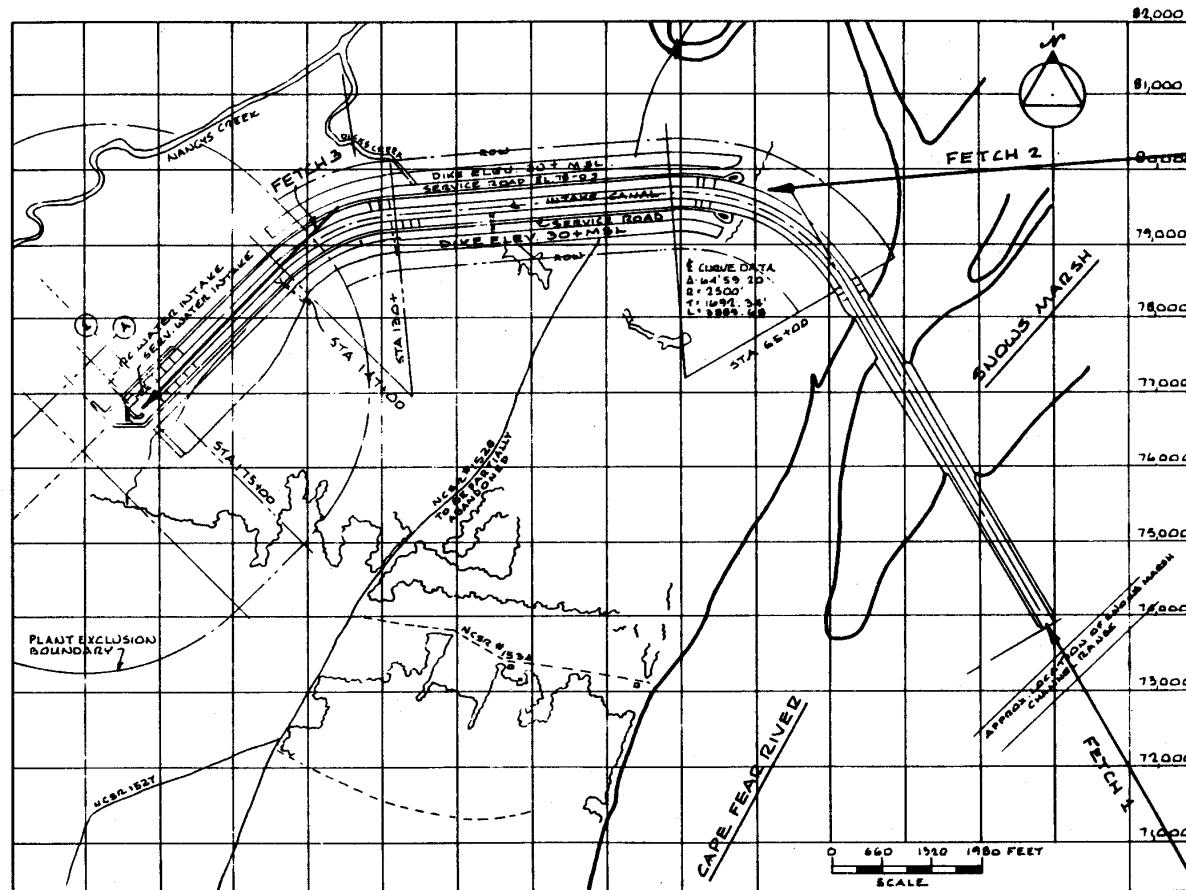
Storm Paths for High and Low Storm Tides



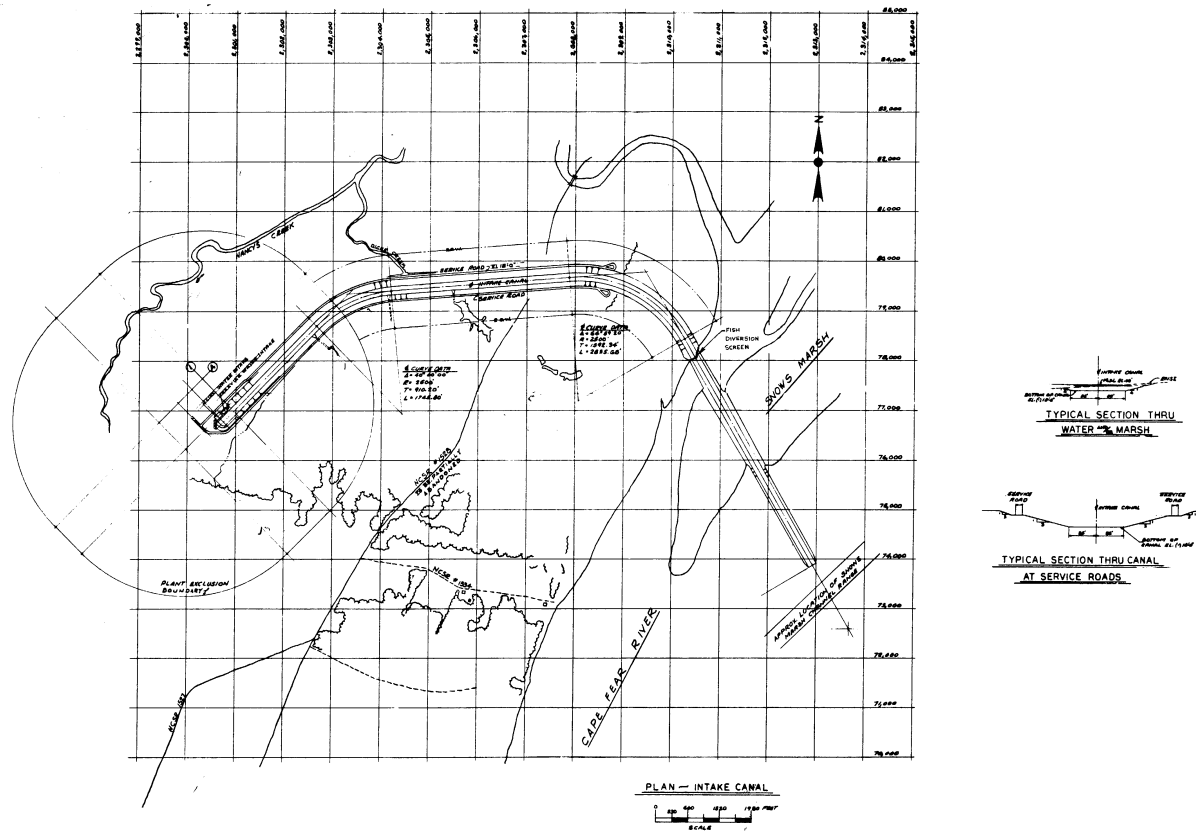
Time History of PMH at the Open Coast



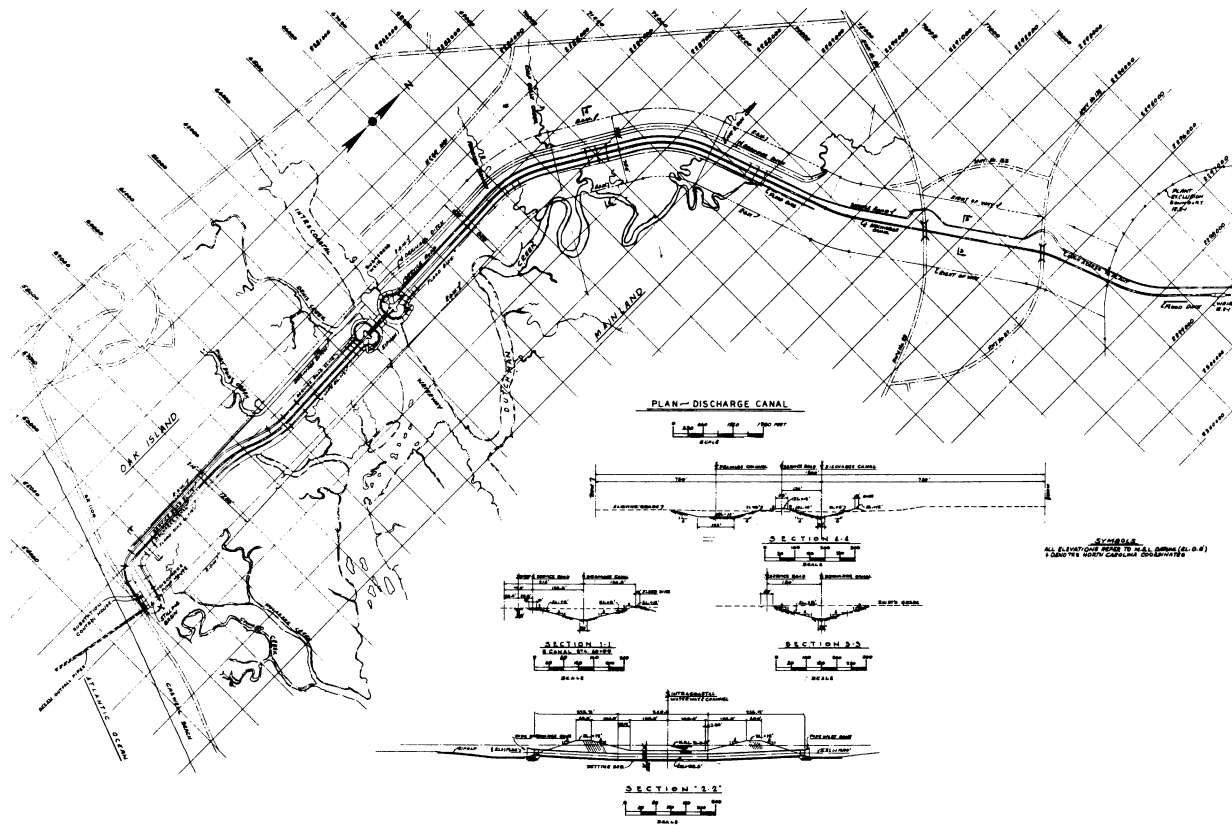
Storm Fetches for Maximum and Minimum Water Levels



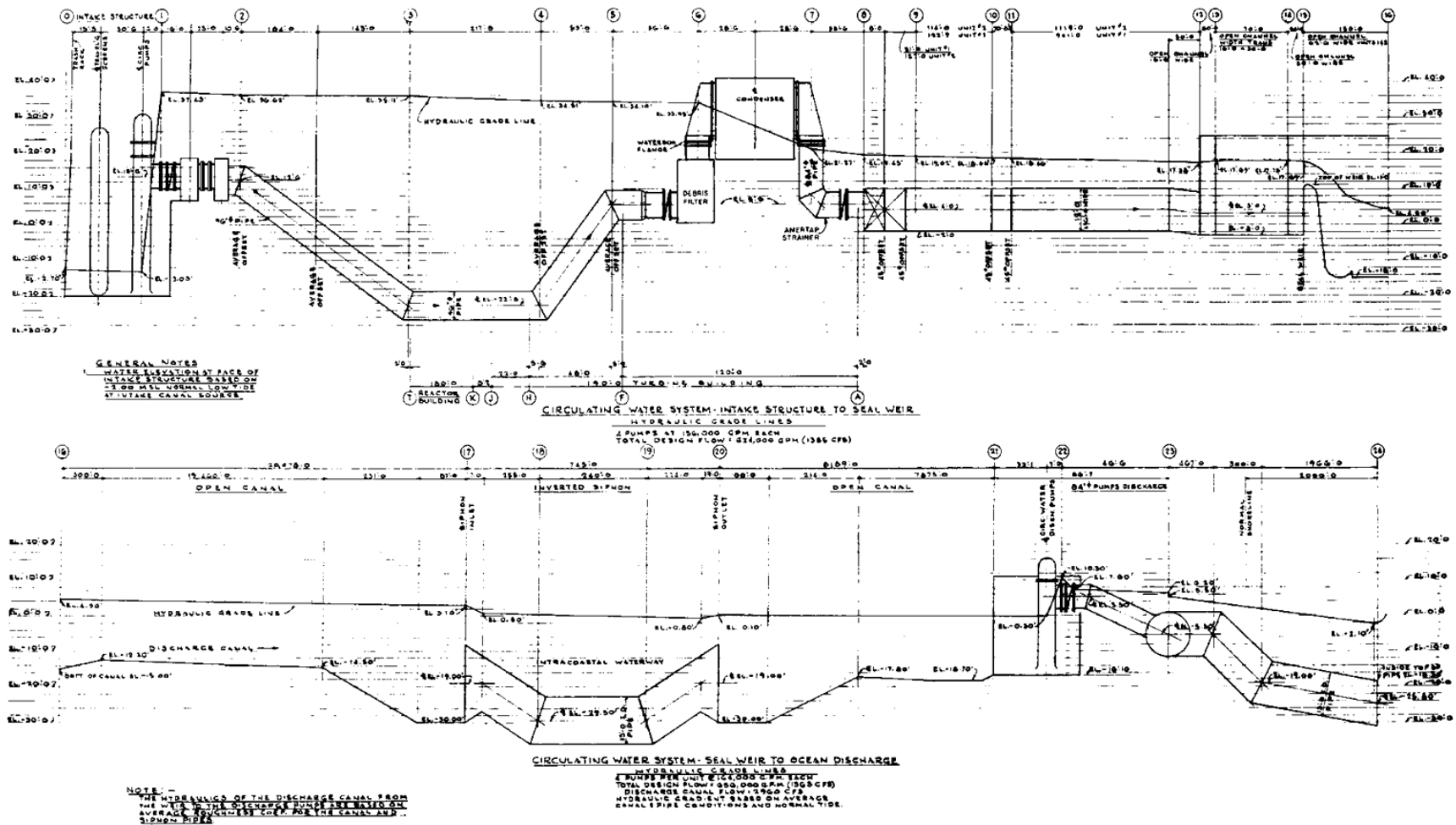
General Arrangement – Intake Canal



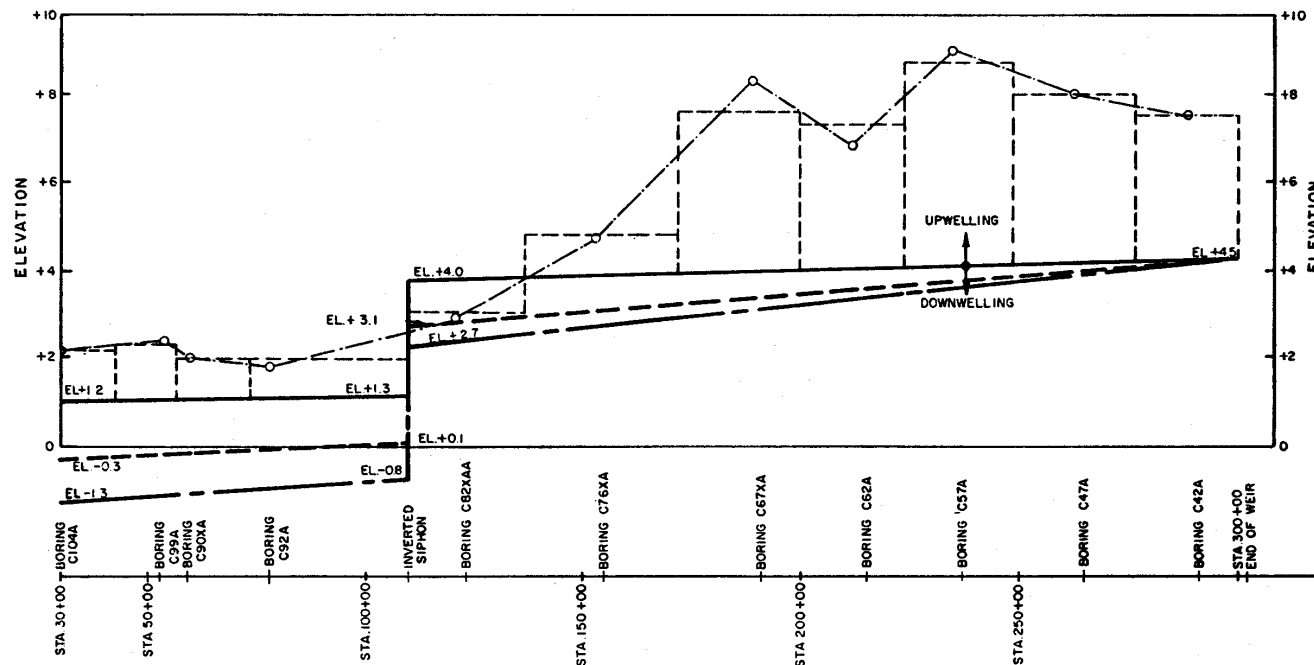
General Arrangement – Discharge Canal



Circulating Water System Hydraulic Gradient



Artesian Head and Water Surface Along the Discharge Canal Route

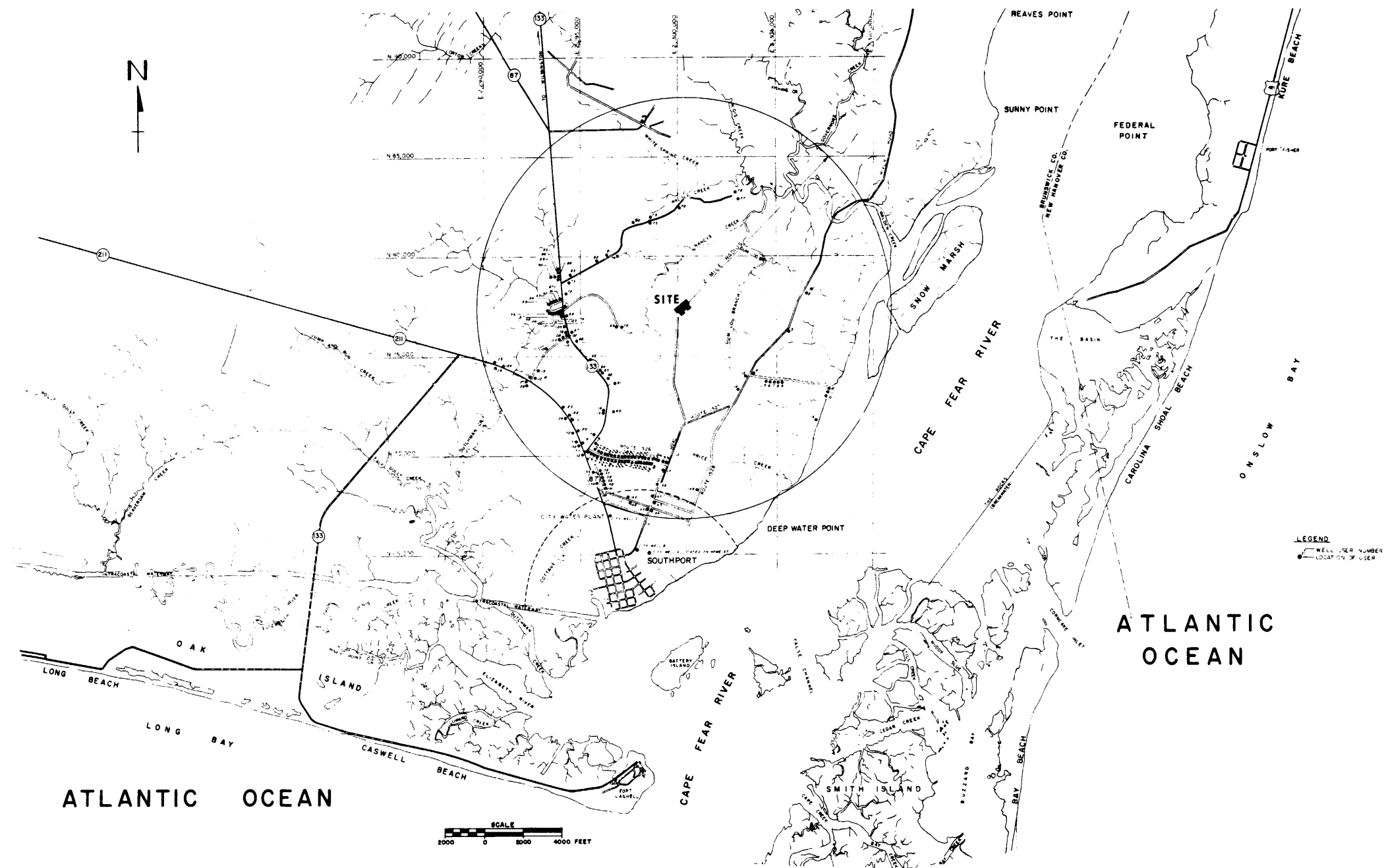


NOTE:
 THE CANAL WATER SURFACES WERE ADJUSTED TO ACCOUNT FOR THE DIFFERENCE IN THE SPECIFIC GRAVITIES OF FRESH WATER AND SALT WATER IN COMPUTING THE QUANTITIES OF UPWELLING AND DOWNWELLING.

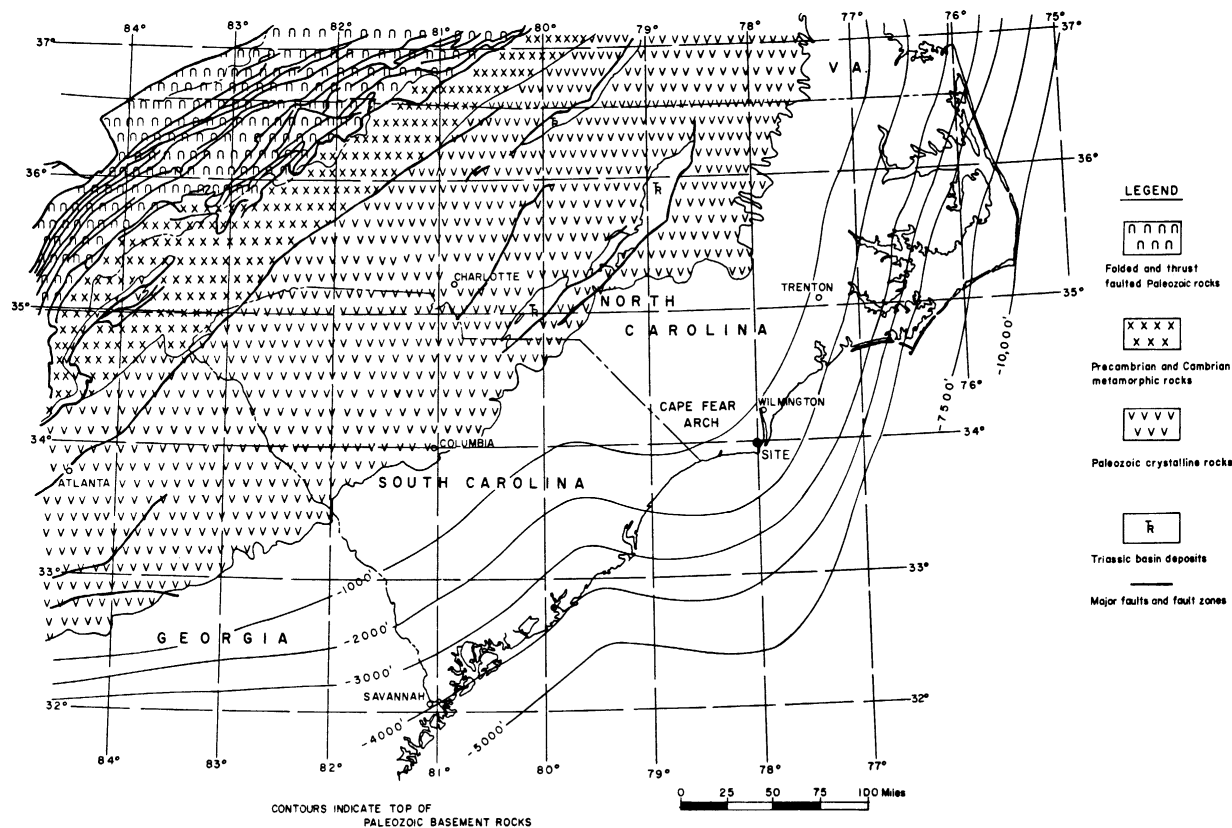
LEGEND

- ARTESIAN HEAD ALONG CANAL
- AVERAGE ARTESIAN HEAD OVER A REACH
- PIEZOMETRIC DATA POINT
- CANAL LEVEL AT BEGINNING OF TWO UNIT OPERATION
- CANAL LEVEL AT AVERAGE, OR MIDDLE AGE, CONDITION
- CANAL LEVEL AT EXPECTED PLANT LIFE

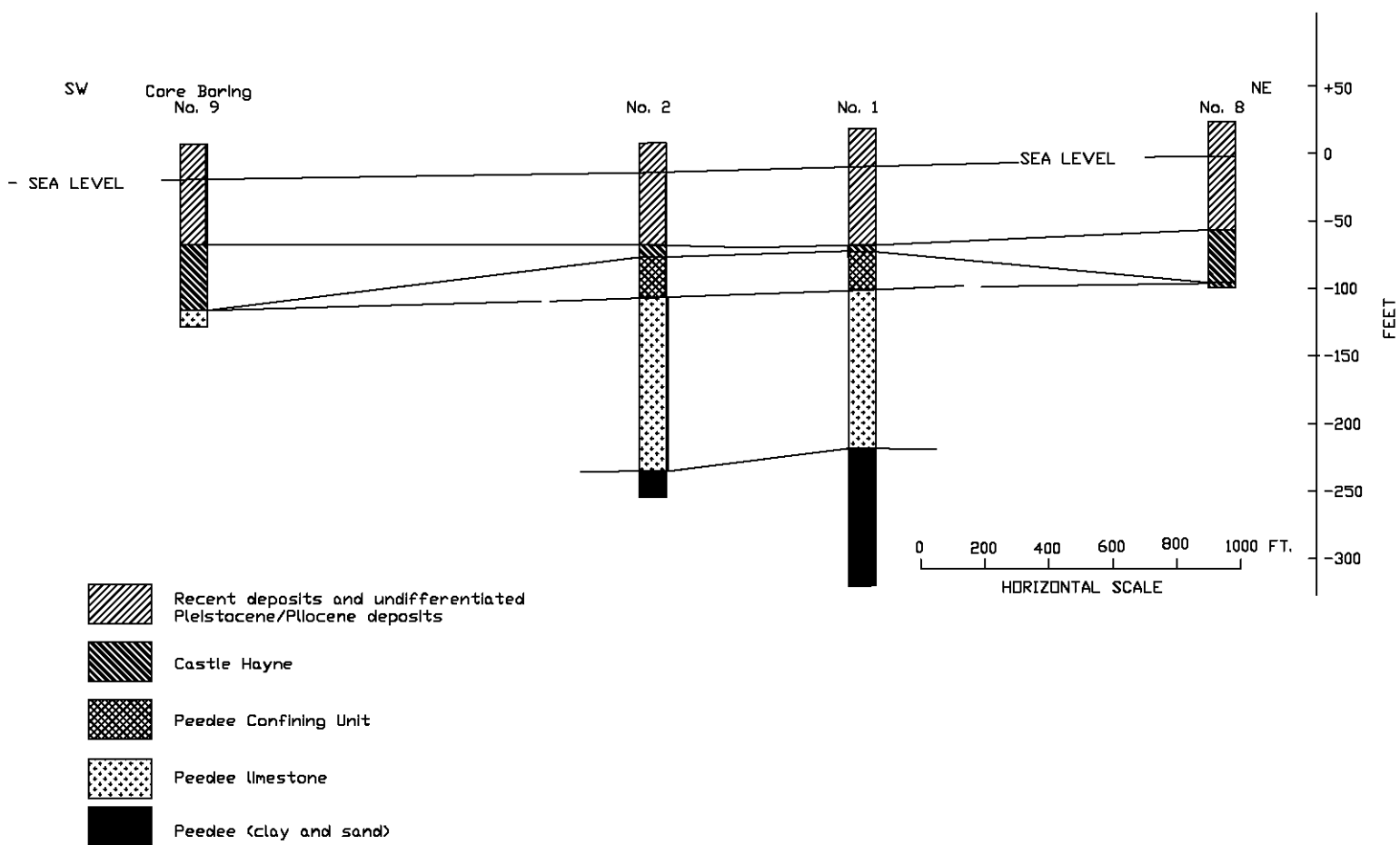
Location of Existing Wells Within a Two-Mile Radius of Plant Site [Historical Information]



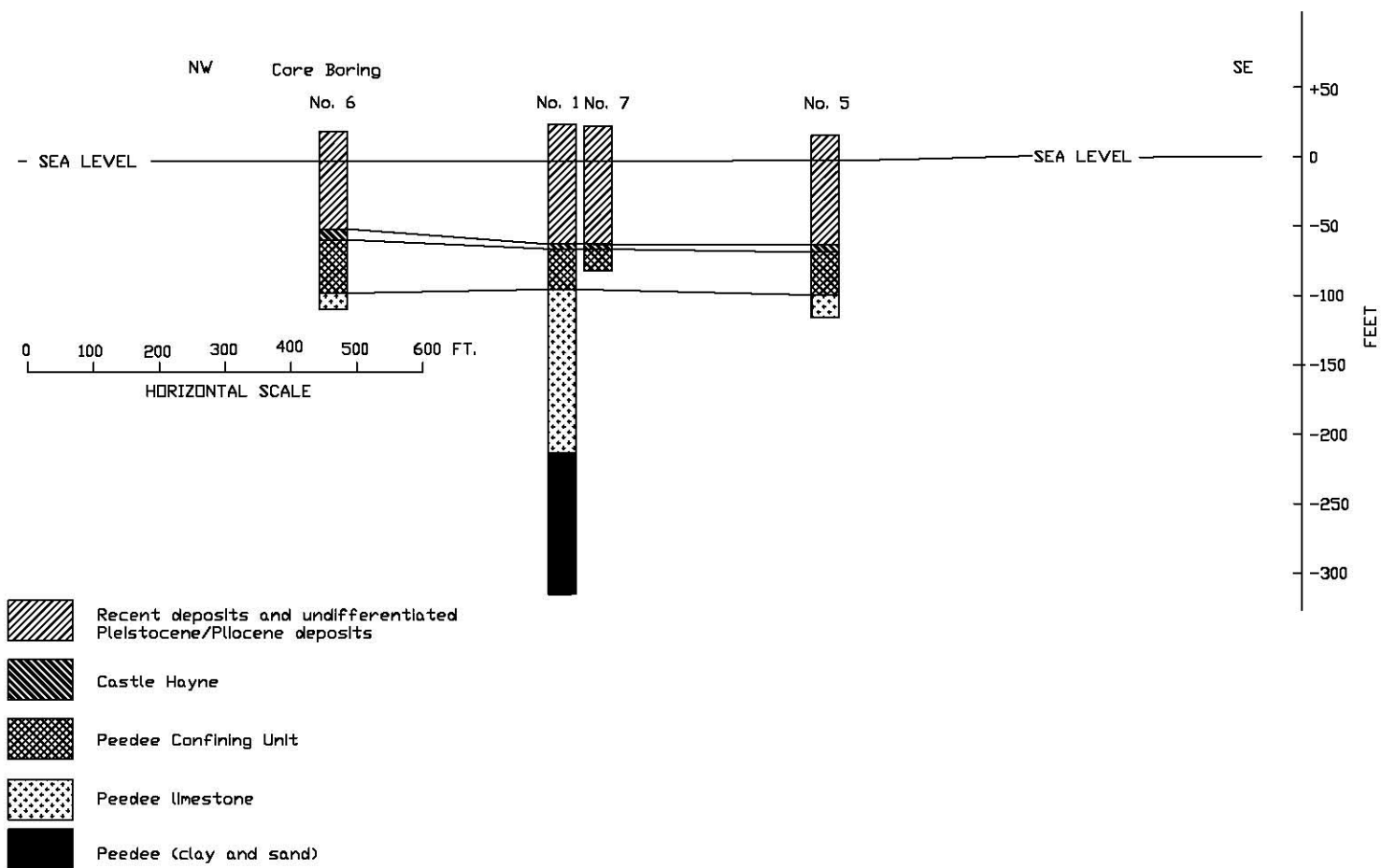
Tectonic Map North and South Carolina



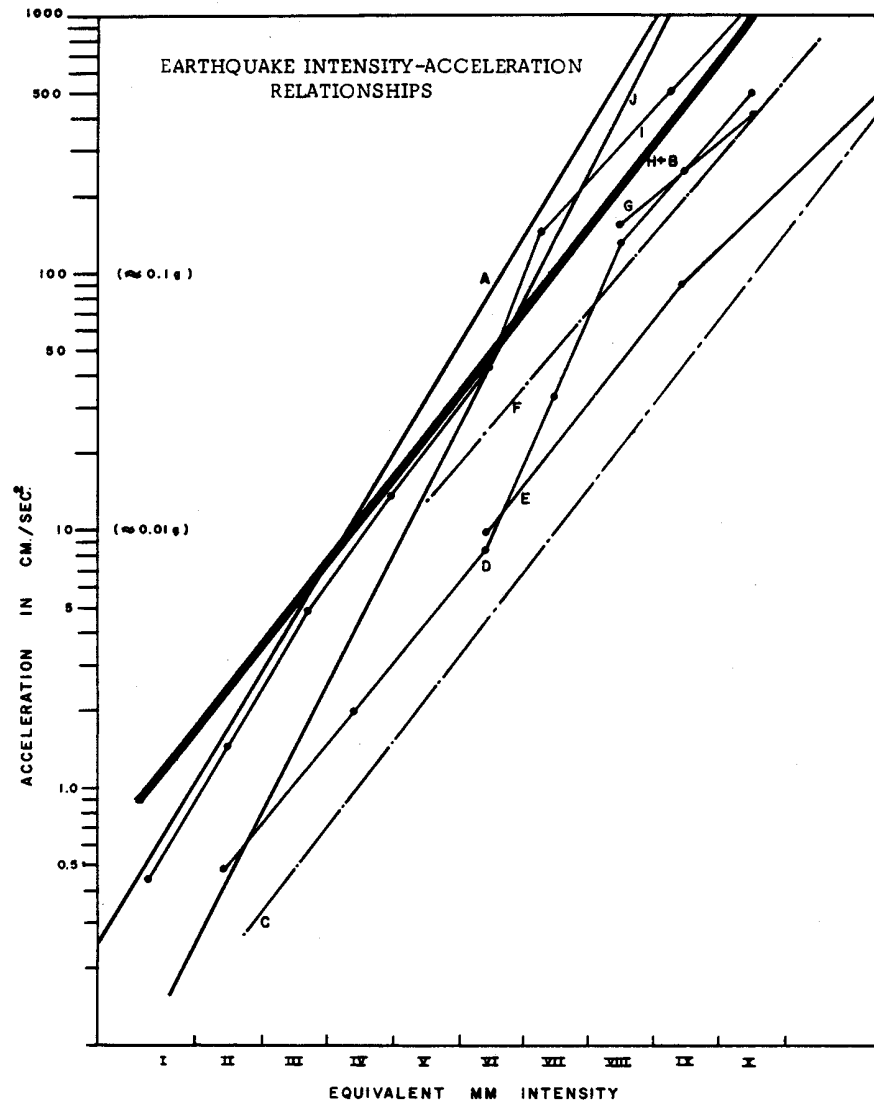
**Geological Cross Section
At Brunswick Site
(Part 1)**



**Geological Cross Section
 At Brunswick Site
 (Part 2)**



Earthquake Intensity - Acceleration Relationships



A - HERSHBERGER (1956)
B - GUTENBERG & RICHTER (1942)
* C - CANCANI (1904)
* D - ISHIMOTO (1932)
* E - SAVARENSKY & KIRNOS (1955)

* F - MEDVEDEV ET AL. (1963)
* G - N.Z. DRAFT BY-LAW
H - TID-7024 (1963)
* I - KAWASUMI (1951)
* J - PETERSCHMITT (1951)

* DATA FROM G.A. EIBY (1965)

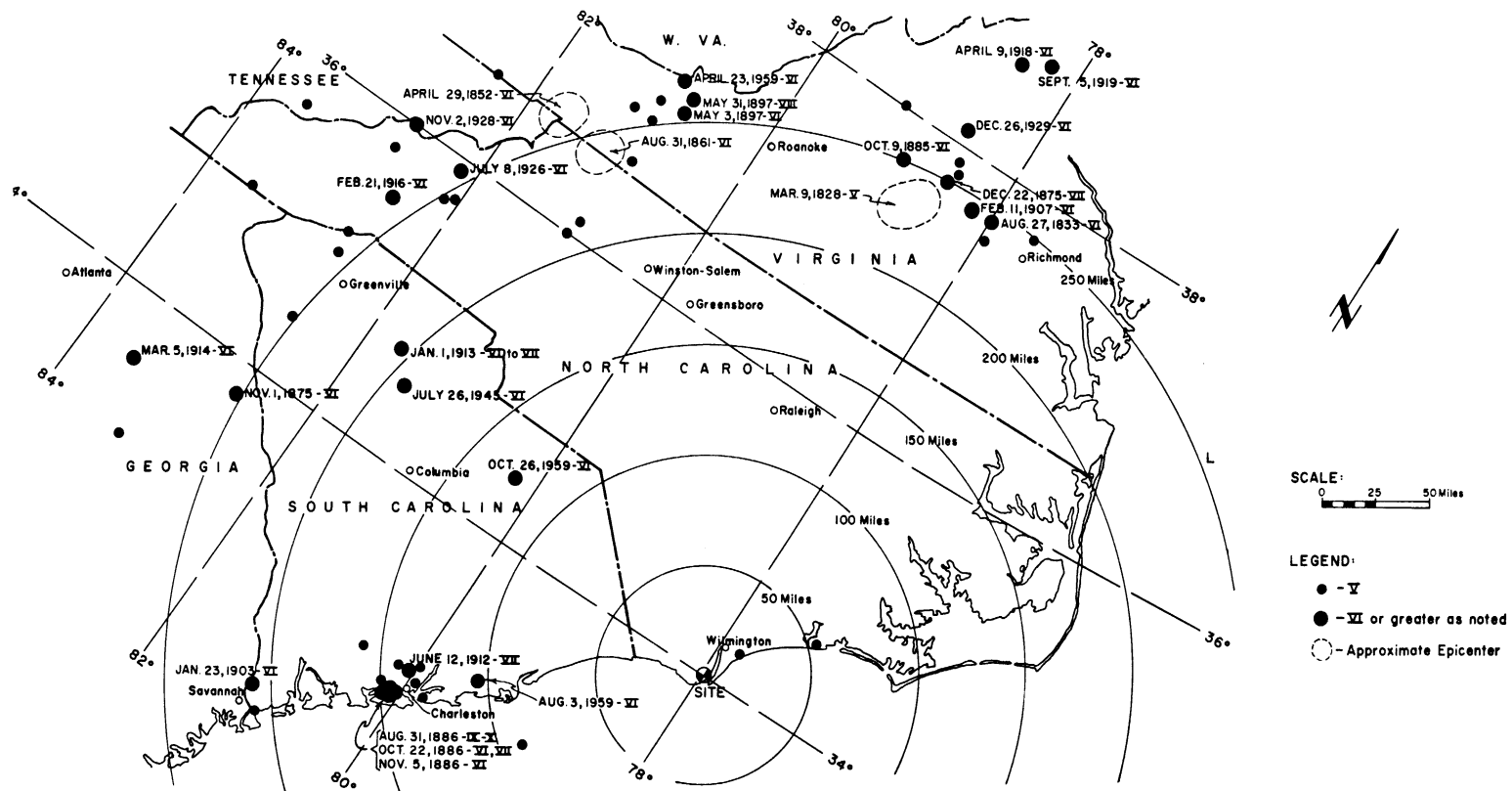
Modified Mercalli Intensity Scale Approximate Relationship with Magnitude, Ground Acceleration and Rossi-Forel Intensity Scale

ROSSI - FOREL INTENSITY SCALE	ABRIDGED MODIFIED MERCALLI INTENSITY SCALE		MAGNITUDE (RICHTER SCALE) GROUND ACCELERATION IN g's
I	I	Not felt except by a very few under especially favourable circumstances.	
II	II	Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.	3
III	III	Felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration like passing of truck. Duration estimated.	0.005
IV	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 motor cars rocked noticeably.	4
V	V	Felt by nearly everyone; many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbance of trees, poles and other tall objects sometimes noticed. Pendulum clocks may stop.	
VI	VI		5
VII	VII	Felt by all; many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.	0.05
VIII	VIII	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 motor cars.	6
IX	IX	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 motor cars disturbed.	
	X	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.	7
	XI	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.	8

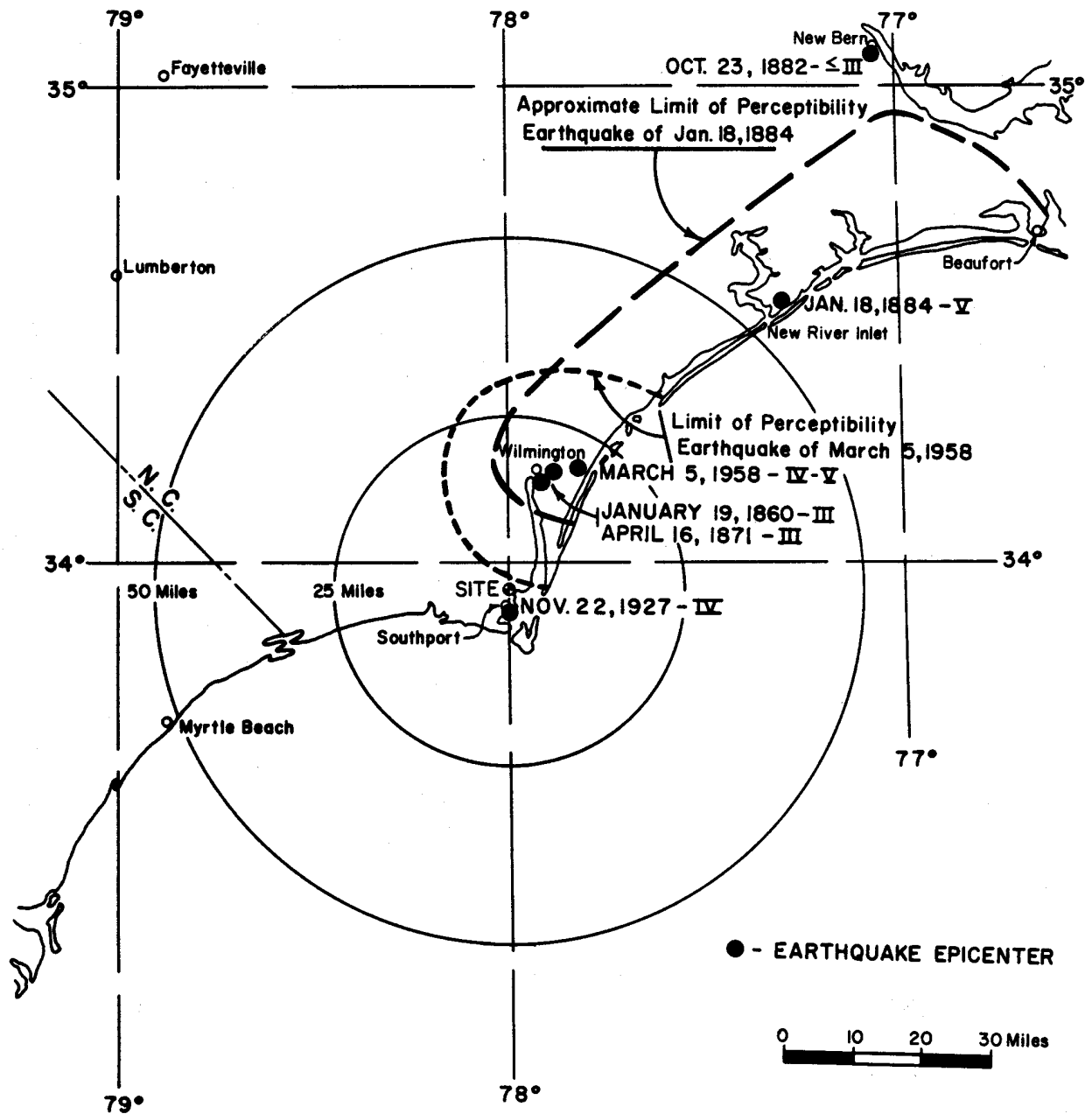
Modified Mercalli Intensity Scale and relationship with Rossi-Forel Scale after Wood and Neumann, 1931 (Modified Mercalli Intensities XI and XII not included).

Magnitude and acceleration values taken from Nuclear Reactors and Earthquakes, TID-7024, United States Atomic Energy Commission.

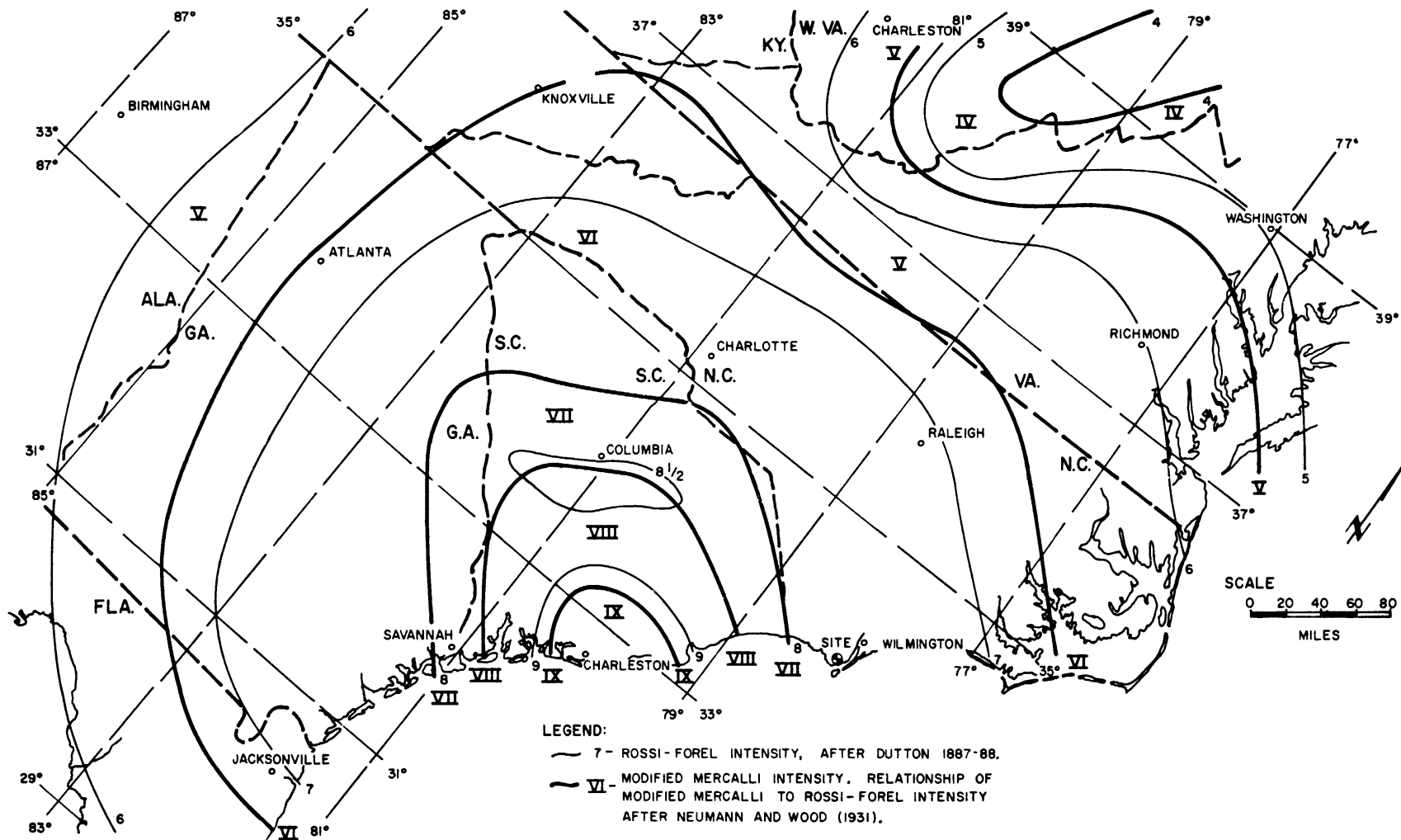
Compilation of Earthquakes Virginia and the Carolinas



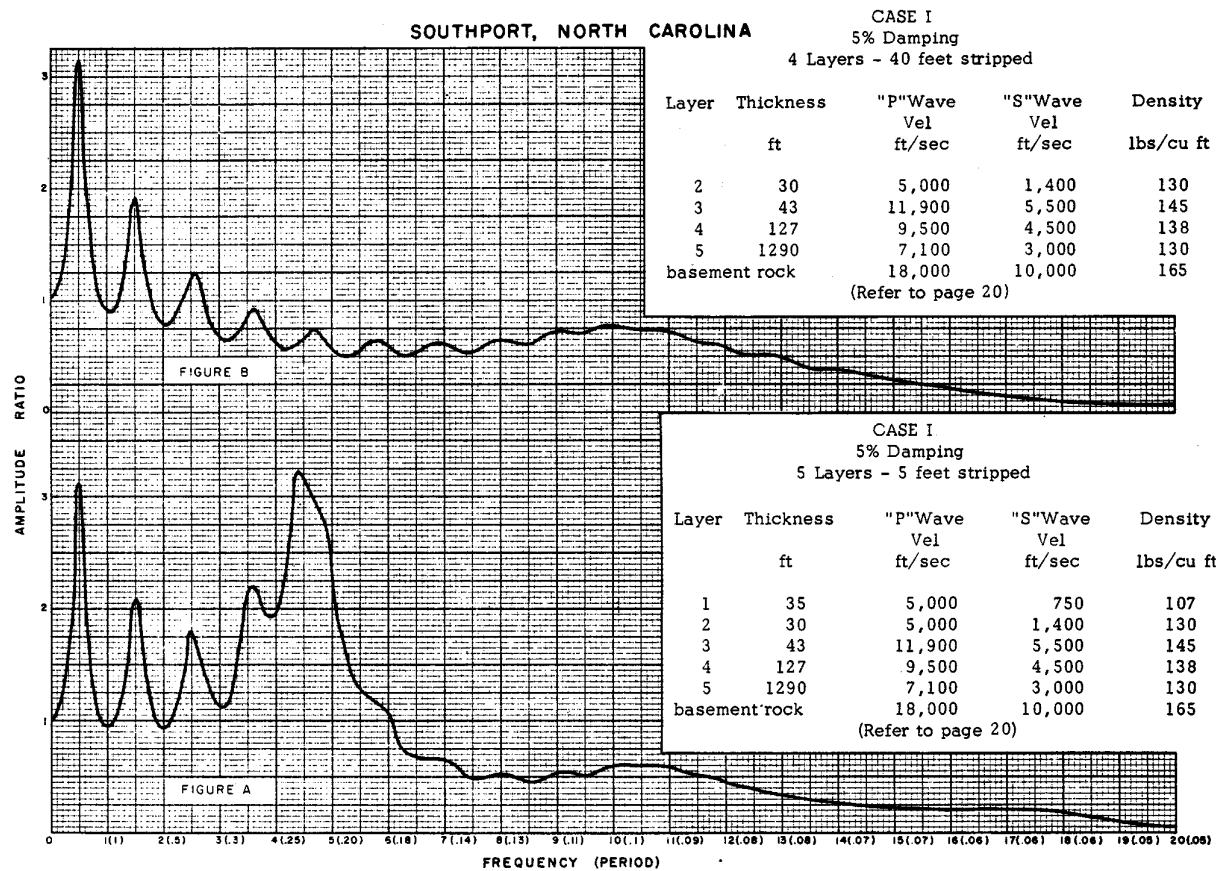
Compilation of Earthquakes Southeastern North Carolina



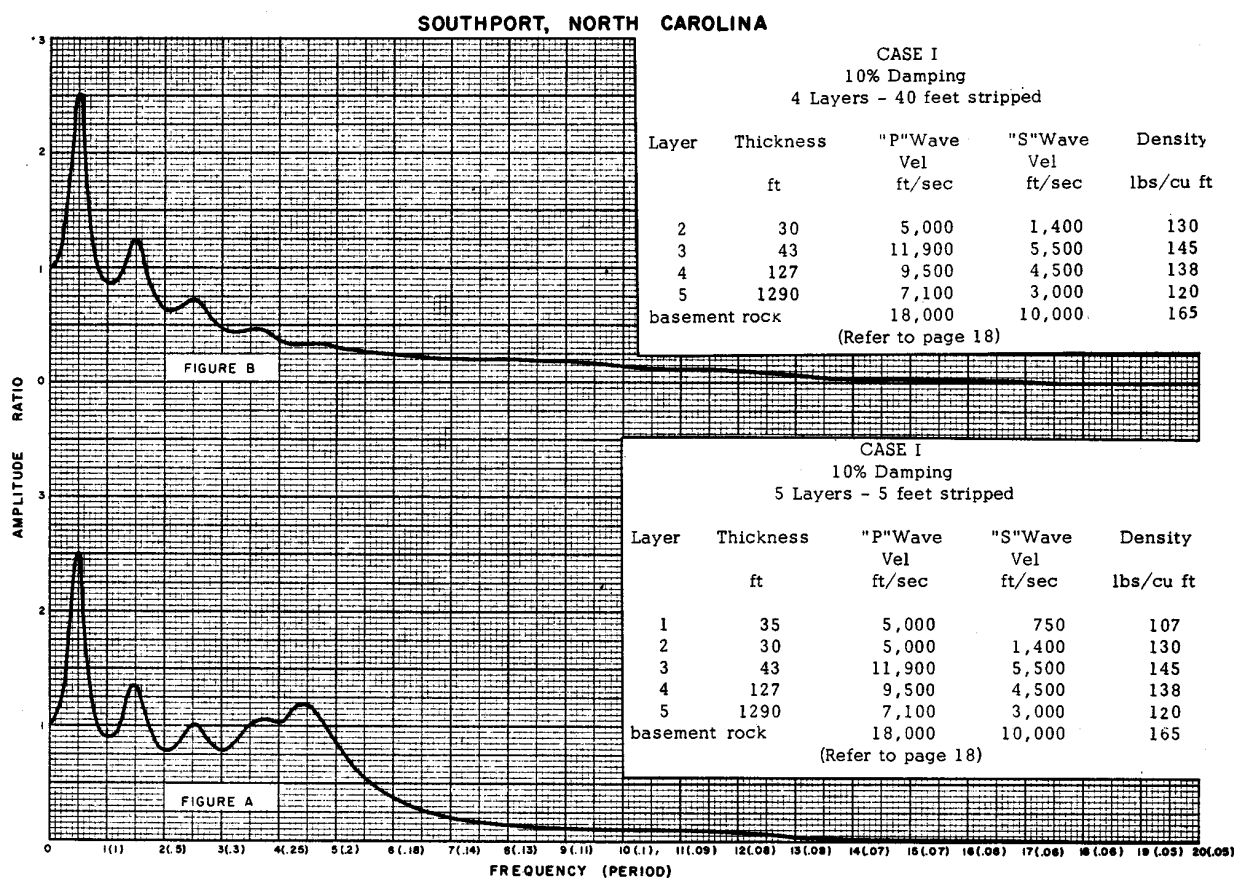
Isoseismal Map Charleston Earthquake of August 31, 1886



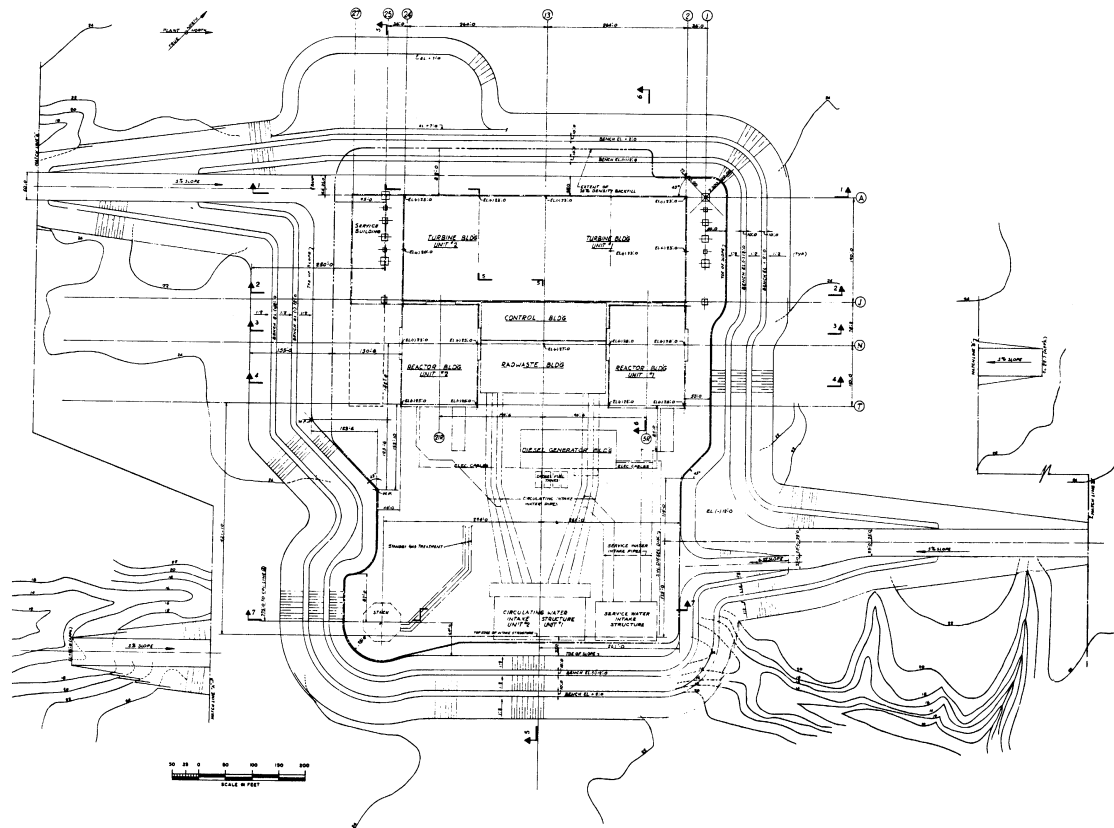
Seismic Amplification Curves 5 Percent Damping



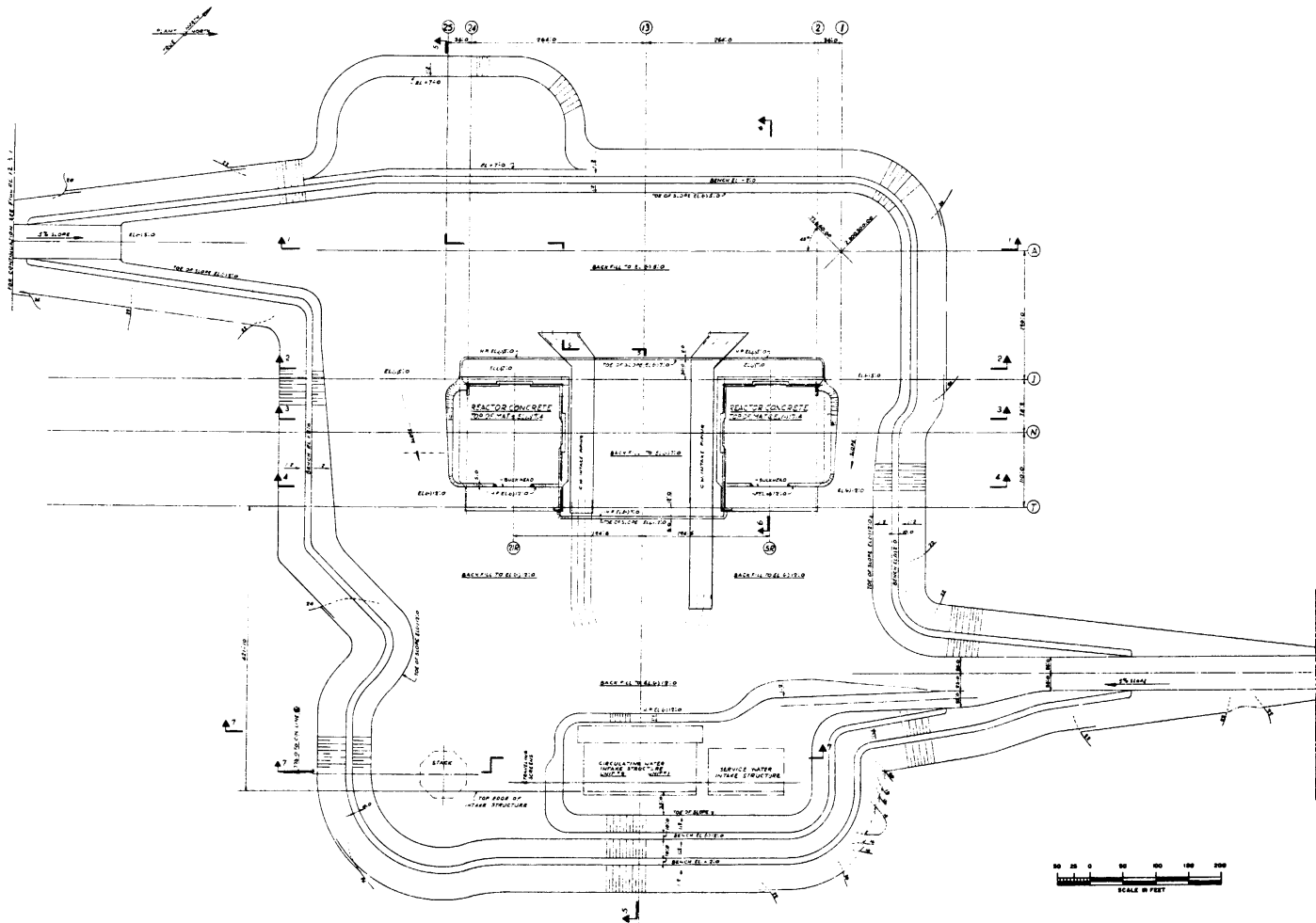
Seismic Amplification Curves 10 Percent Damping

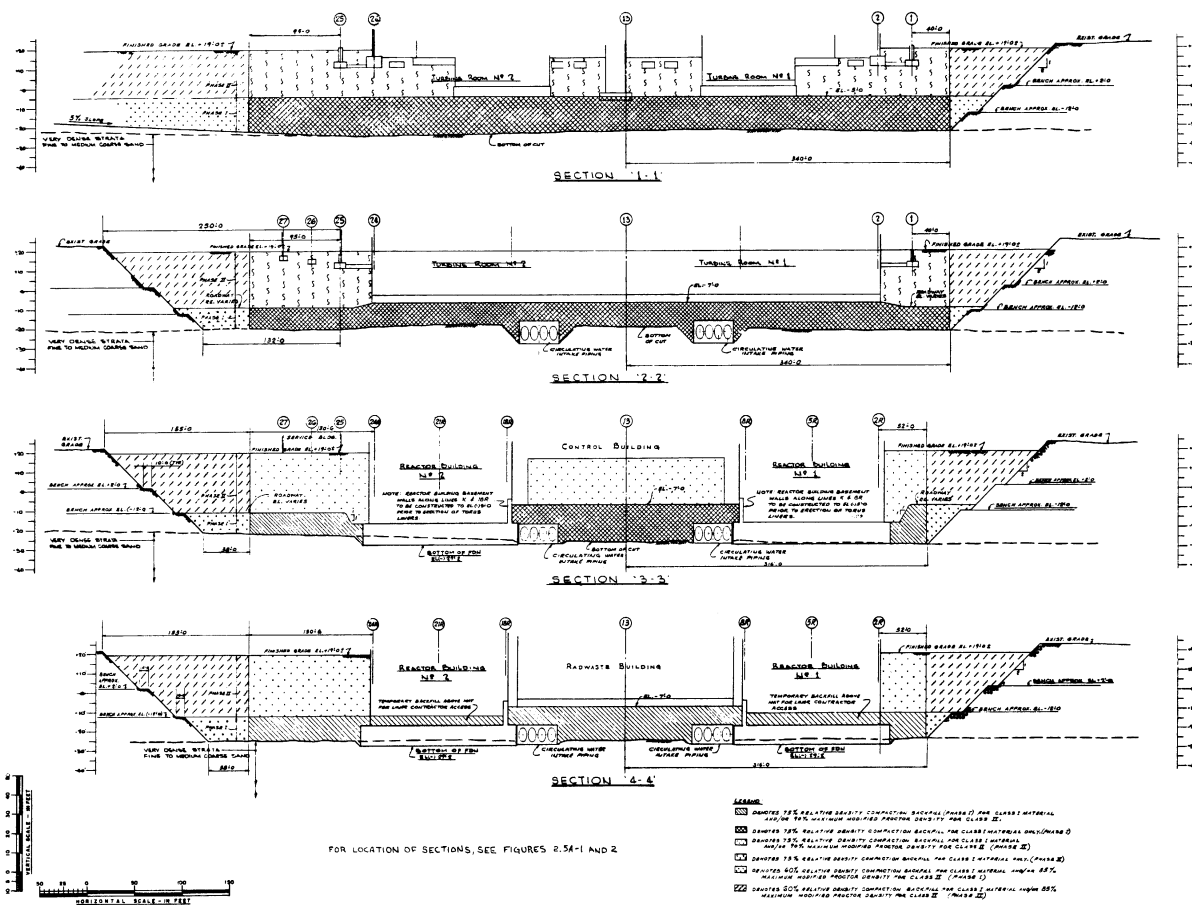


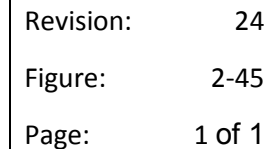
General Plant Excavation - Plan



General Plant Backfill – Plan Phase I







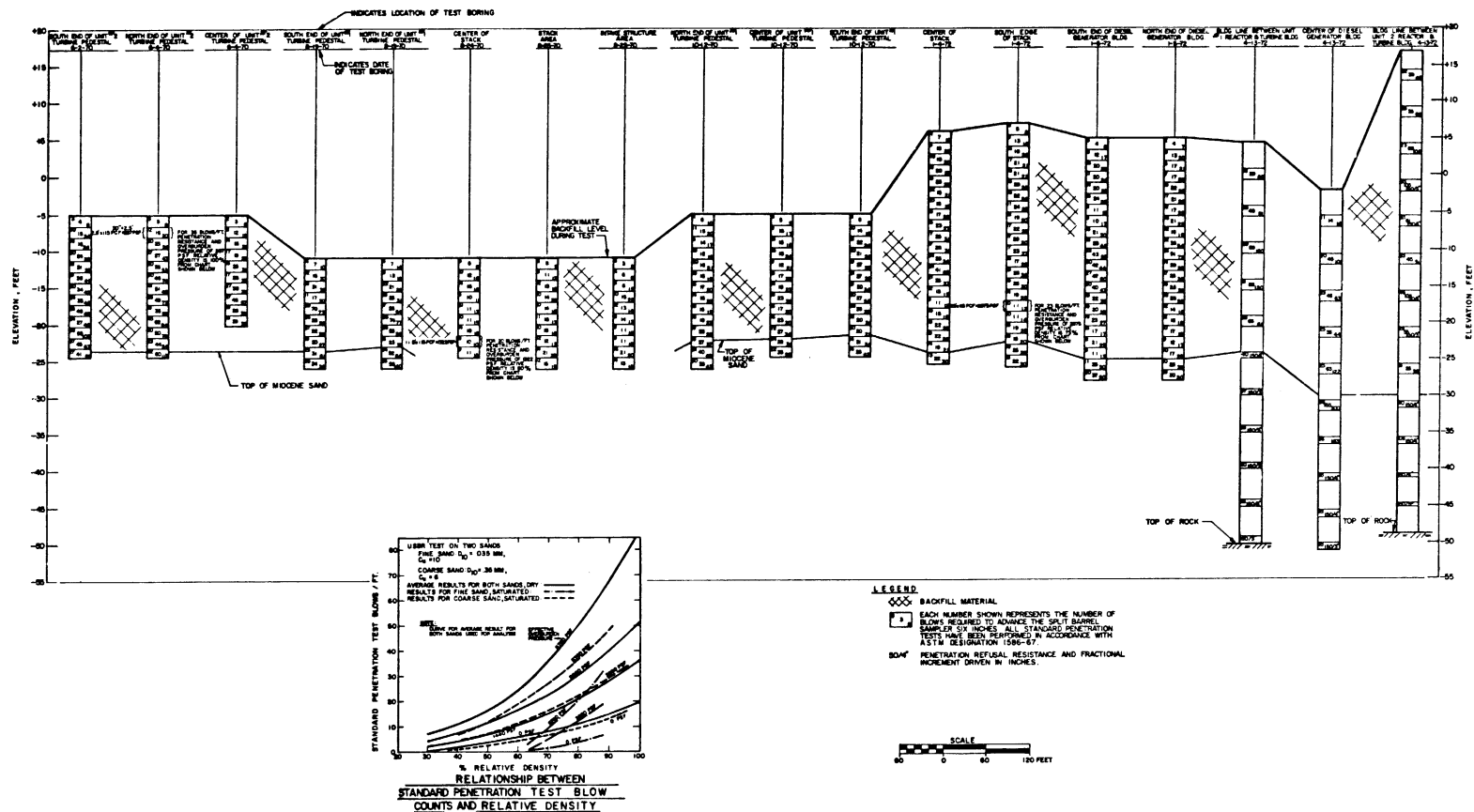
SECTION 5-5

SECTION 6-6

SECTION 7-7

FOR LOCATION OF SECTIONS, SEE FIGURES 2.5-1 AND 2

Test Data for All Standard Penetration Tests Performed at BSEP Site as Part of Quality Assurance Program



Permeability Test In Insitu Soil

A) FALLING HEAD METHOD

$$K = \frac{r^2}{2L(t_2 - t_1)} \ln\left(\frac{H_1}{H_2}\right)$$

WHERE

K = PERMEABILITY

r = RADIUS OF STANDPIPE

L = LENGTH OF TEST POCKET

R = RADIUS OF TEST POCKET = RADIUS OF CASING

H₁ AND H₂ = WATER HEADS AT
TIME T₁ AND T₂

ln = NATURAL LOGARITHM

B) CONSTANT HEAD METHOD

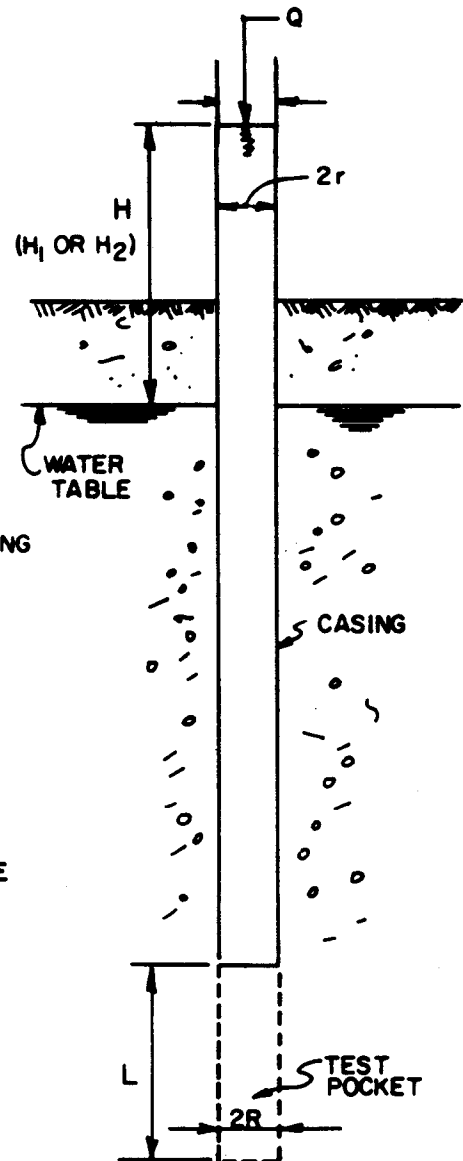
$$K = \frac{Q}{CH}$$

WHERE

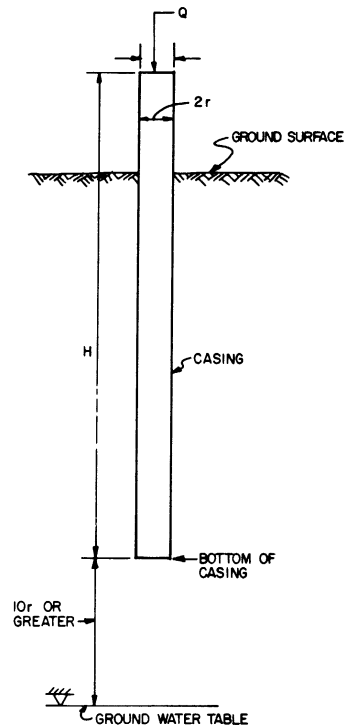
Q = FLOW OF WATER TO KEEP H CONSTANT

H = HEAD DIFFERENCE BETWEEN WATER INSIDE
CASING AND GROUNDWATER LEVEL (TEST
ZONE BELOW GROUNDWATER LEVEL).

C = TEST FACTOR, DEPENDING ON L AND R

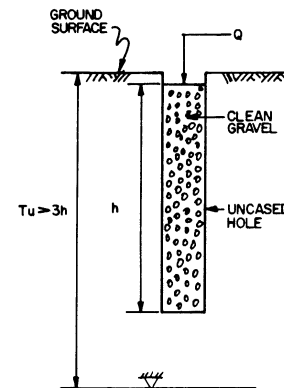


Permeability Test in Soil



A) CONSTANT HEAD METHOD
 $K = \frac{Q}{5.5rH}$

WHERE
 Q = FLOW OF WATER TO KEEP H CONSTANT
 H = DIFFERENTIAL HEAD OF WATER (DISTANCE BETWEEN WATER LEVEL IN CASING AND BOTTOM OF CASING).
 r = INTERNAL RADIUS OF CASING

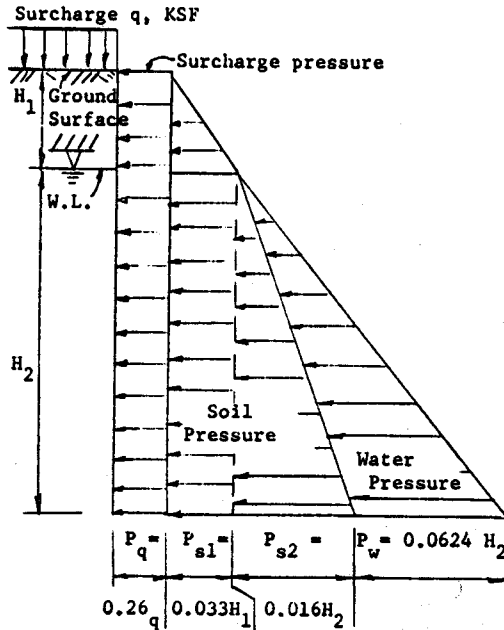


B) CONSTANT HEAD METHOD

WHERE
 K_{20} = COEFFICIENT OF PERMEABILITY, FEET PER YEAR
 h = HEIGHT OF WATER IN THE WELL, FEET
 r = RADIUS OF WELL, FEET
 Q = DISCHARGE RATE OF WATER FROM THE WELL FOR STEADY STATE CONDITION, CUBIC FEET PER MINUTE
 μ_T = VISCOSITY OF WATER AT TEMPERATURE T
 μ_{20} = VISCOSITY OF WATER AT 20°C
 $\frac{\mu_T}{\mu_{20}}$ = UNSATURATED DISTANCE BETWEEN THE WATER SURFACE IN THE WELL AND THE WATER TABLE, FEET

Soil Pressure Diagrams for Foundation Design – Cases I and II

CASE I ACTIVE PRESSURE WITH SURCHARGE, q , ABOVE GROUNDWATER LEVEL



$$P_q = \text{Surcharge pressure} = K_a q$$

$$= 0.26q$$

$$P_{s1} = \text{Soil pressure} = K_a \gamma_t H_1 = 0.033H_1$$

$$P_{s2} = \text{Soil pressure} = K_a \gamma_{\text{subm.}} H_2 = 0.016H_2$$

$$P_w = \text{Water pressure} = \gamma_w H_2 = 0.0624H_2$$

Sand submerged fill:

$$\text{Wet Unit Weight} = \gamma_t = 0.125 \text{ KCF}$$

$$\text{Saturated Unit Weight} = \gamma_t = 0.125 \text{ KCF}$$

$$\text{Submerged Unit Weight} = \gamma_{\text{subm.}}$$

$$= 0.063 \text{ KCF}$$

$$\bar{\phi} = 36^\circ, K_a = \frac{1 - \sin \bar{\phi}}{1 + \sin \bar{\phi}} = 0.26$$

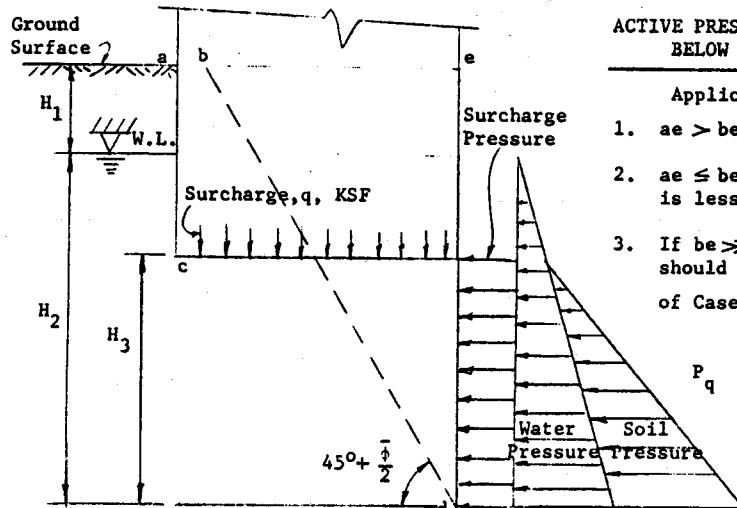
For 0.08g earthquake, increase K_a to 1.17 K_a

For 0.16g earthquake, increase K_a to 1.36 K_a

CASE II ACTIVE PRESSURE WITH SURCHARGE, q , BELOW GROUNDWATER LEVEL

Applicable Conditions:

1. $ae > be$
2. $ae \leq be$ but the weight of soil ac is less than q .
3. If $be \gg ae$, the pressure diagram should be the sum of $P_{s1} + P_{s2} + P_w$ of Case I and P_q of Case II



$$P_q = \text{Surcharge pressure} = K_a q'$$

$$= 0.26q'$$

where $q' = q - (H_2 - H_3)\gamma_w$

$$P_s = \text{Soil pressure} = K_a \gamma_{\text{subm.}} H_3$$

$$= 0.016H_3$$

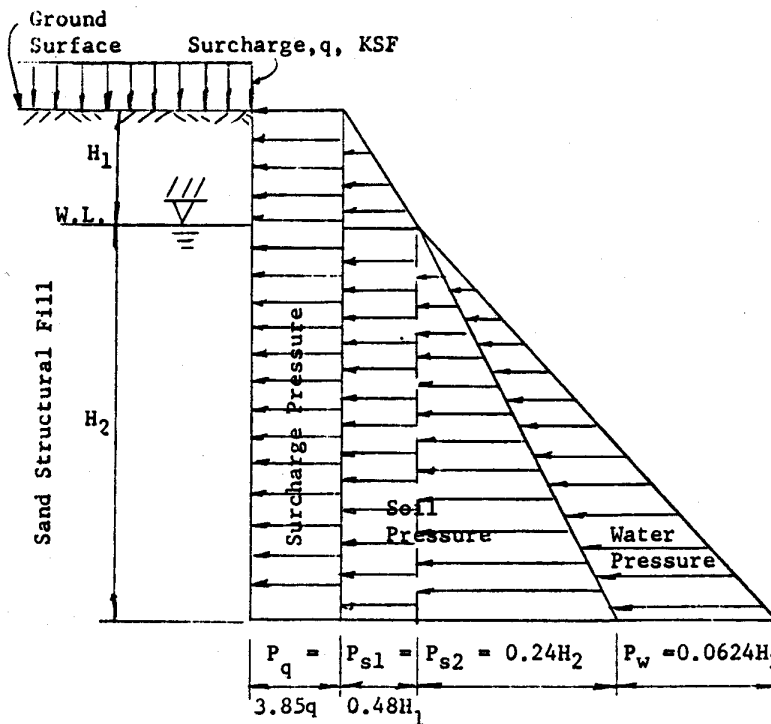
$$P_w = \text{Water pressure} = \gamma_w H_2$$

$$= 0.0624H_2$$

NOTE: The units for these pressures are in KSF.

Soil Pressure Diagrams for Foundation Design – Case III

CASE III
PASSIVE PRESSURE WITH SURCHARGE, q , AT GROUND SURFACE



For Soil Properties, See
Fig. 12.3-5

$$K_p = \frac{1 + \sin \bar{\phi}}{1 - \sin \bar{\phi}} = 3.85$$

$$P_q = \text{Surcharge pressure} \\ = K_p q = 3.85q$$

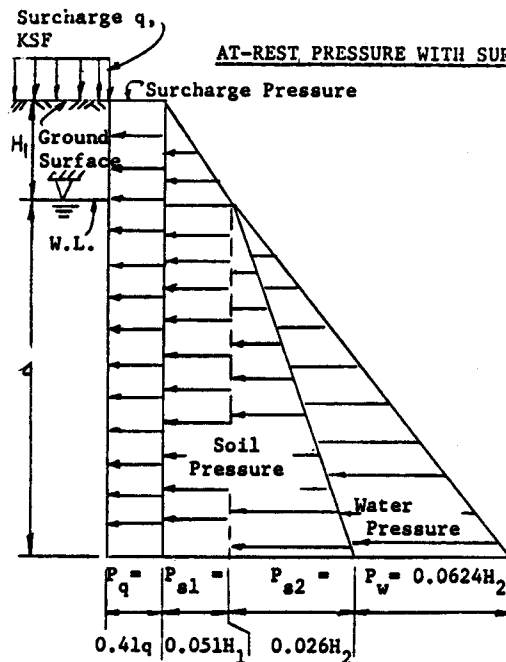
$$P_{s1} = \text{Soil pressure} = K_p \gamma_t H_1 \\ = 0.48H_1$$

$$P_{s2} = \text{Soil pressure} = K_p \gamma_{\text{subm.}} H_2 \\ = 0.24H_2$$

$$P_w = \text{Water pressure} = \gamma_w H_2 \\ = 0.0624H_2$$

NOTE: The units for these pressures are in KSF.

Soil Pressure Diagrams for Foundation Design – Cases IV and V



For Soil Properties, See Fig. 12.3-5

$$\bar{\phi} = 36^\circ, K_o = 1 - \sin \bar{\phi} = 0.41$$

$$P_q = \text{Surcharge pressure} = K_o q = 0.41q$$

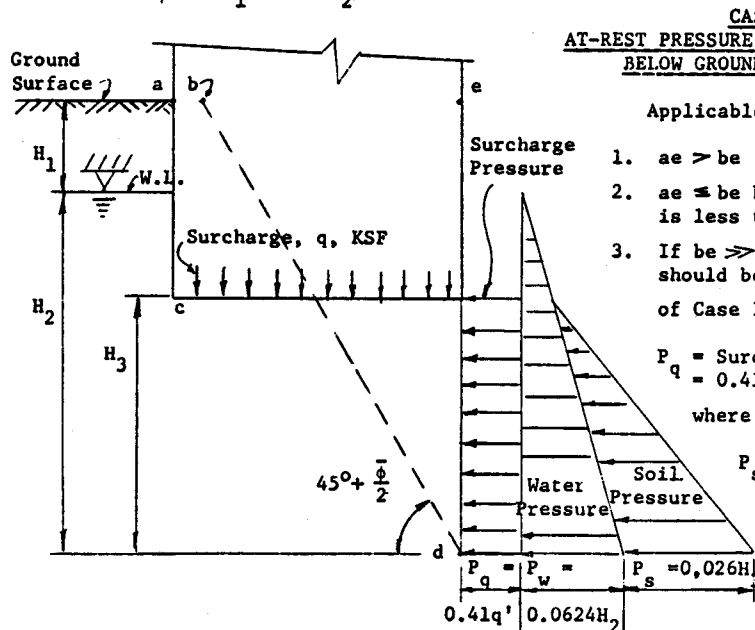
$$P_{s1} = \text{Soil pressure} = K_o \gamma_t H_1 = 0.051H_1$$

$$P_{s2} = \text{Soil pressure} = K_o \gamma_{\text{subm}} H_2 = 0.026H_2$$

$$P_w = \text{Water pressure} = \gamma_w H_2 = 0.0624H_2$$

For 0.08g earthquake, increase K_o to 1.17 K_o

For 0.16g earthquake, increase K_o to 1.36 K_o



Applicable Conditions:

1. $ae > be$
2. $ae \leq be$ but the weight of soil ac is less than q .
3. If $be \gg ae$, the pressure diagram should be the sum of $P_{s1} + P_{s2} + P_w$ of Case IV and P_q of Case V

$$P_q = \text{Surcharge pressure} = K_o q'$$

$$P_q = 0.41q'$$

$$\text{where } q' = q - (H_2 - H_3)\gamma_w$$

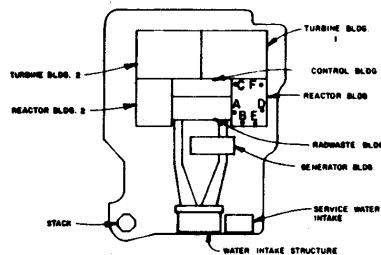
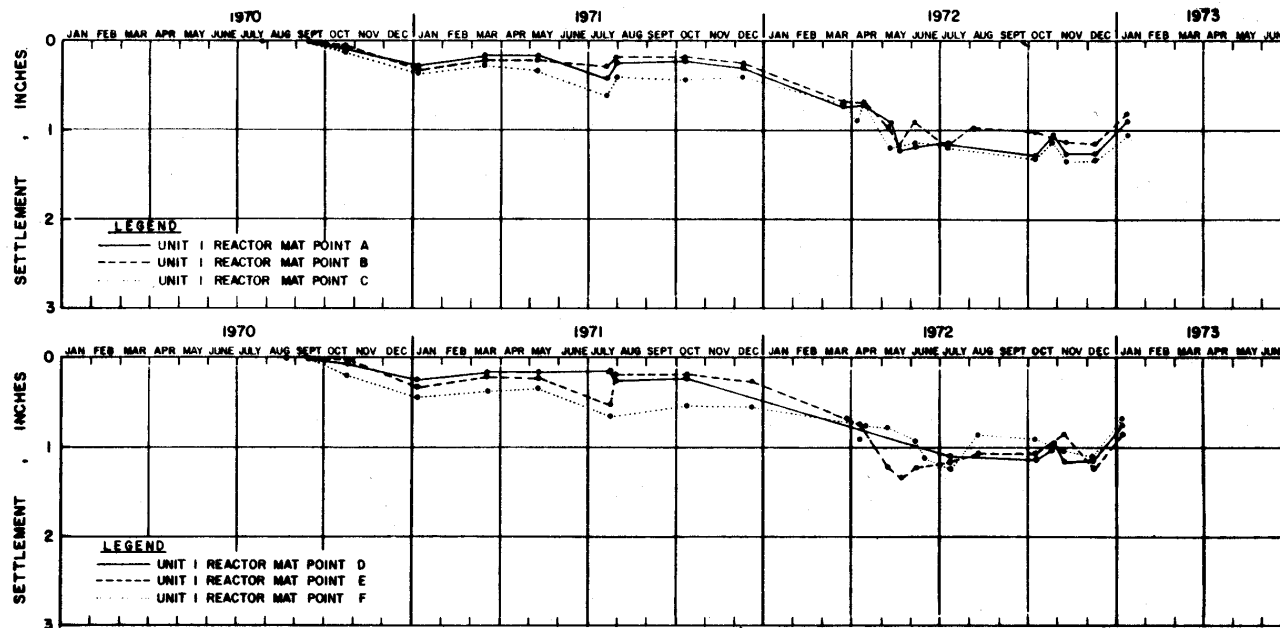
$$P_s = \text{Soil pressure} = K_o \gamma_{\text{subm}} H_3$$

$$P_s = 0.026H_2$$

$$P_w = \text{Water pressure} = \gamma_w H_2$$

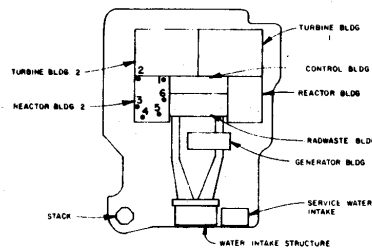
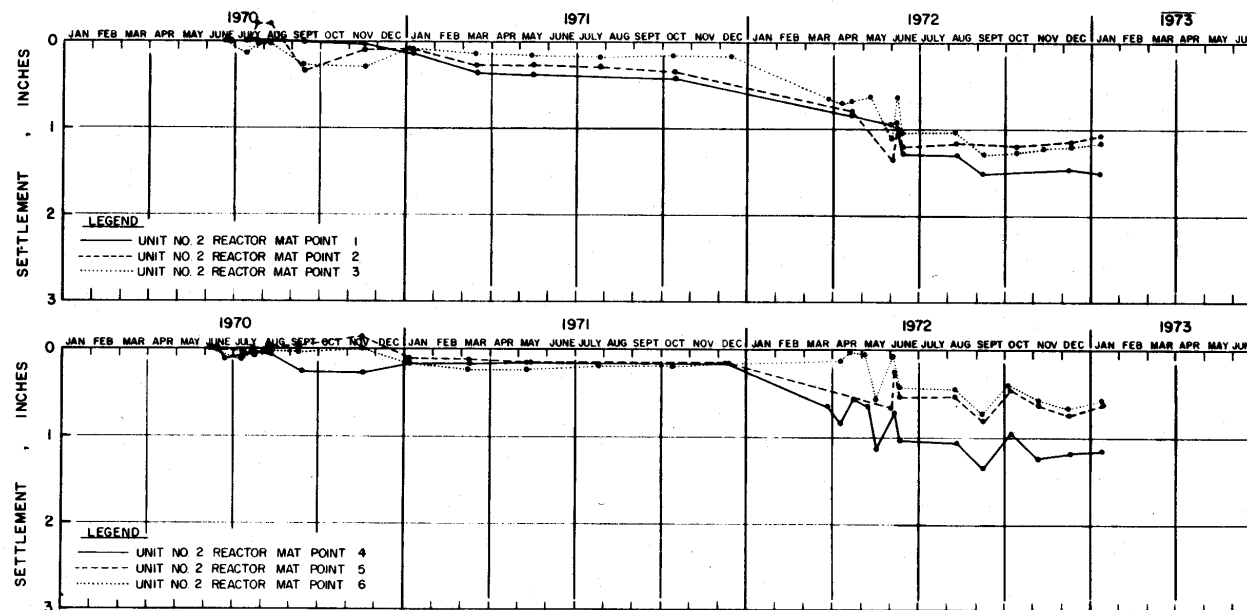
$$P_w = 0.0624H_2$$

Settlement of Unit 1 Reactor Mat



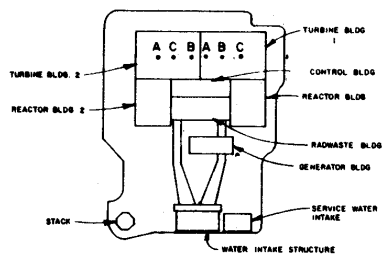
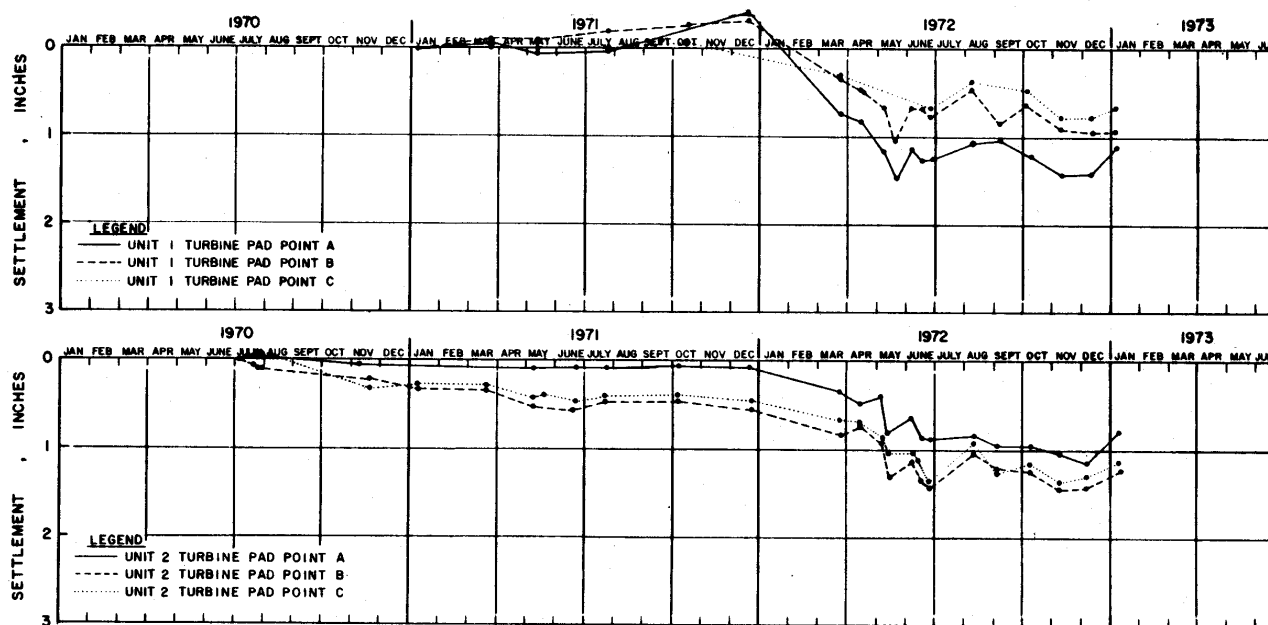
NOTE:
 PERMANENT BENCH MARK FOR THIS SURVEY
 IS DEEP WELL CASING NO. 10. ALL DATA SHOWN
 IS RAW SURVEY DATA REFERENCED FROM AND
 TIED-IN TO WELL CASING NO. 10.

Settlement of Unit 2 Reactor Mat



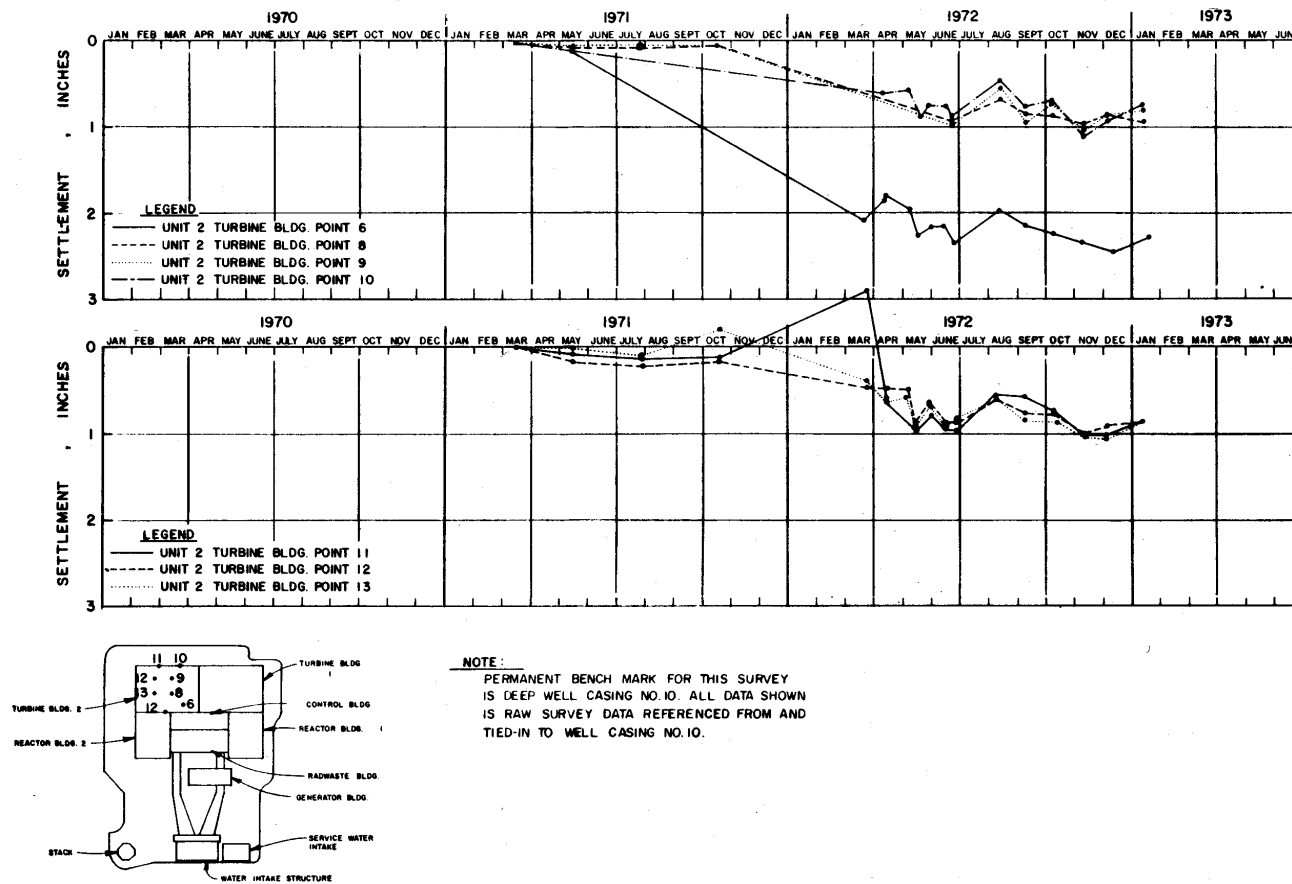
NOTE
 PERMANENT BENCH MARK FOR THIS SURVEY
 IS DEEP WELL CASING NO. 10. ALL DATA SHOWN
 IS RAW SURVEY DATA REFERENCED FROM AND
 TIED-IN TO WELL CASING NO. 10.

Settlement of Unit 1 & Unit 2 Turbine Pads

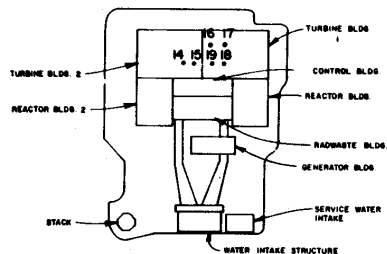
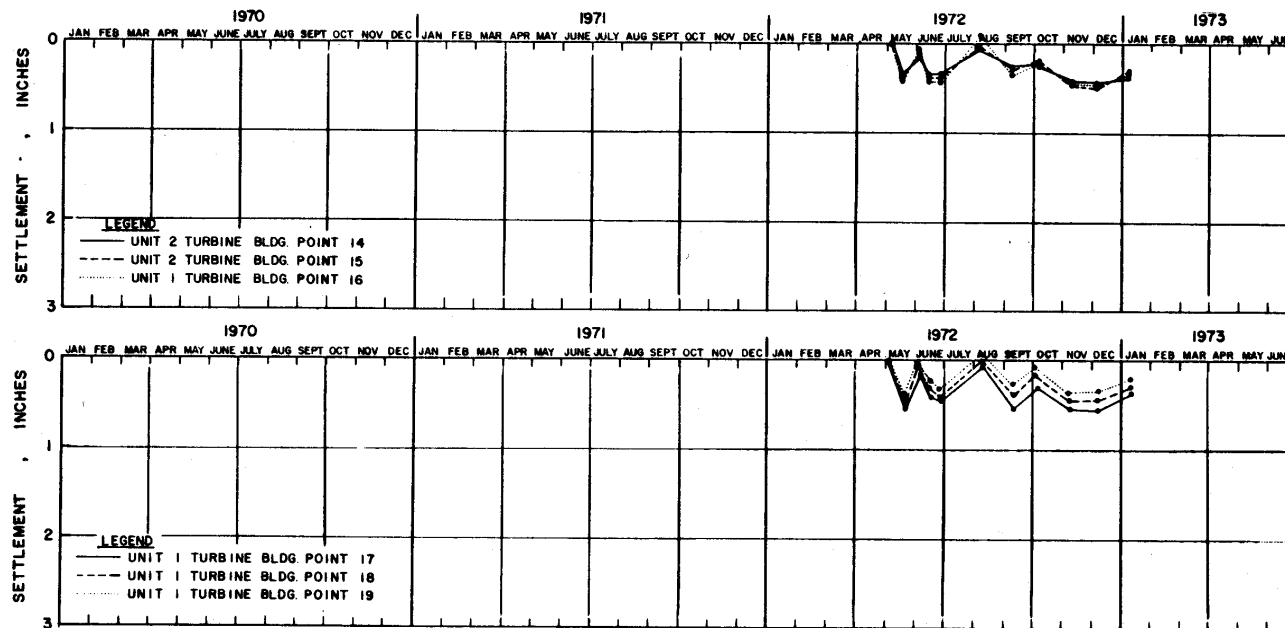


NOTE:
 PERMANENT BENCH MARK FOR THIS SURVEY
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 IS RAW SURVEY DATA REFERENCED FROM AND
 TIED-IN TO WELL CASING NO. 10.

Settlement of Unit 2 Turbine Building

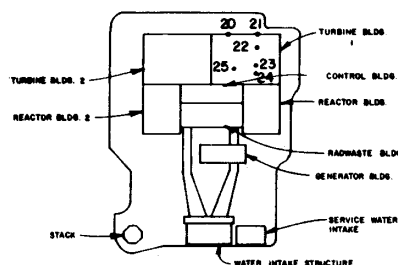
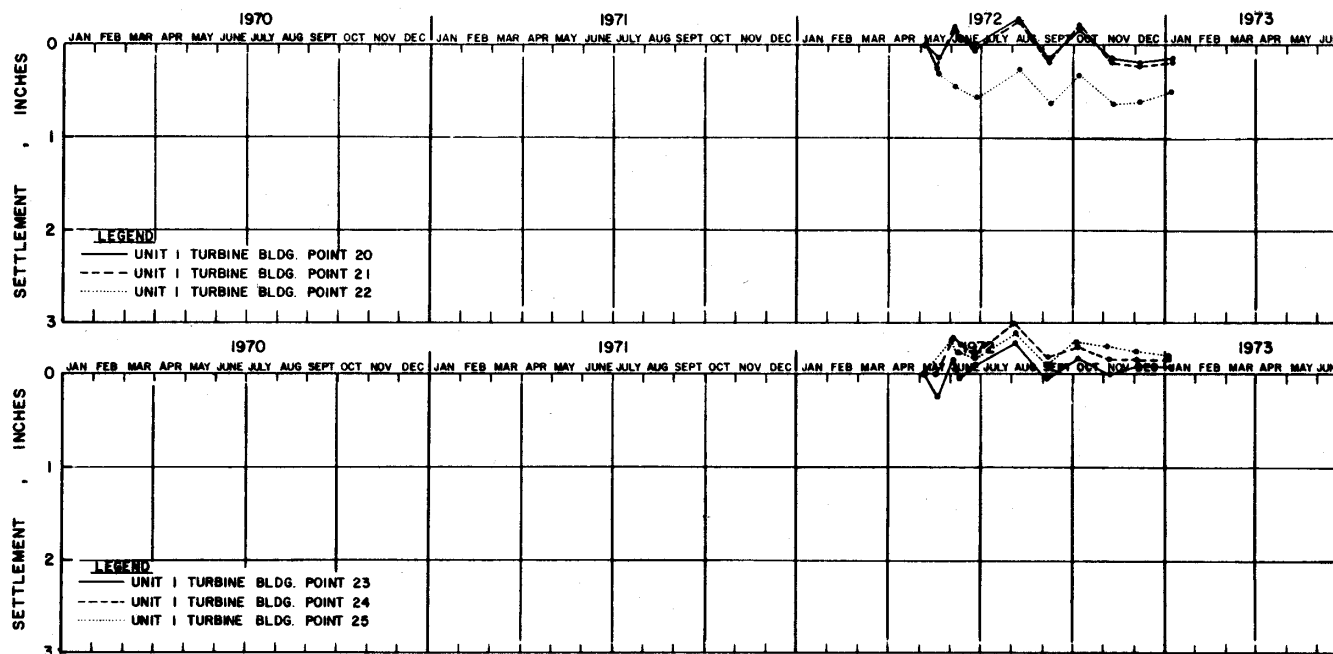


Settlement of Unit 1 & Unit 2 Turbine Buildings



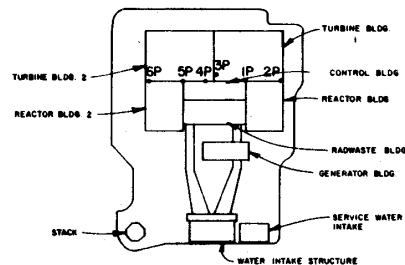
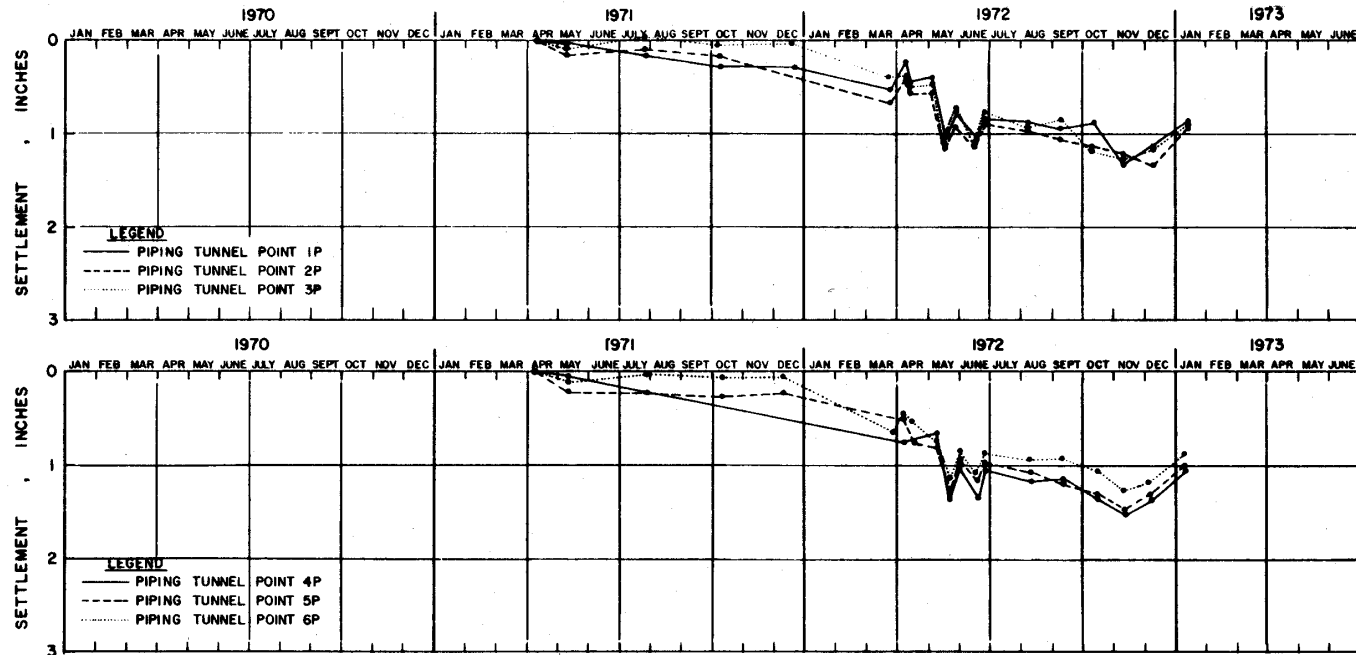
NOTE:
 PERMANENT BENCH MARK FOR THIS SURVEY
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 TIED-IN TO WELL CASING NO.10.

Settlement of Unit 1 Turbine Building



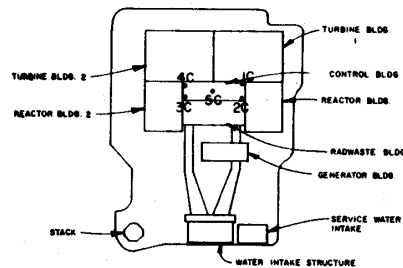
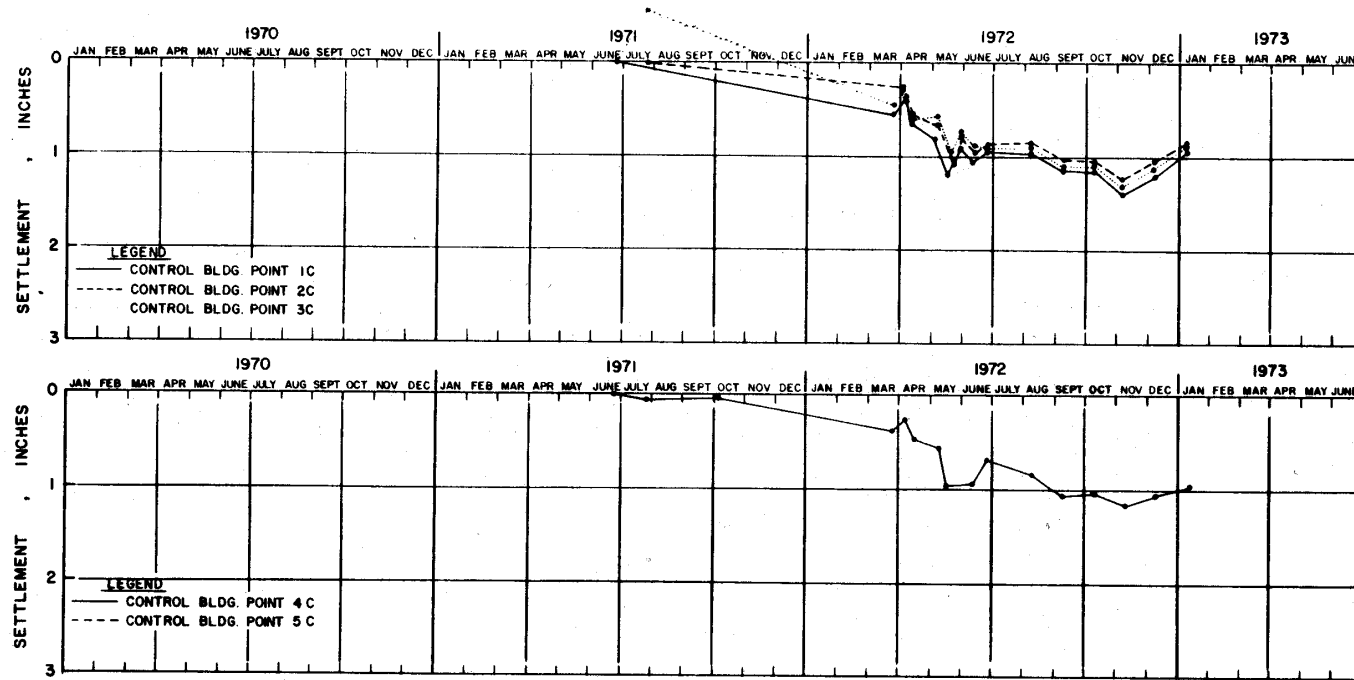
NOTE:
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 TIED-IN TO WELL CASING NO. 10.

Settlement of Piping Tunnel



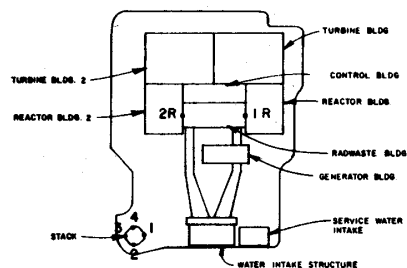
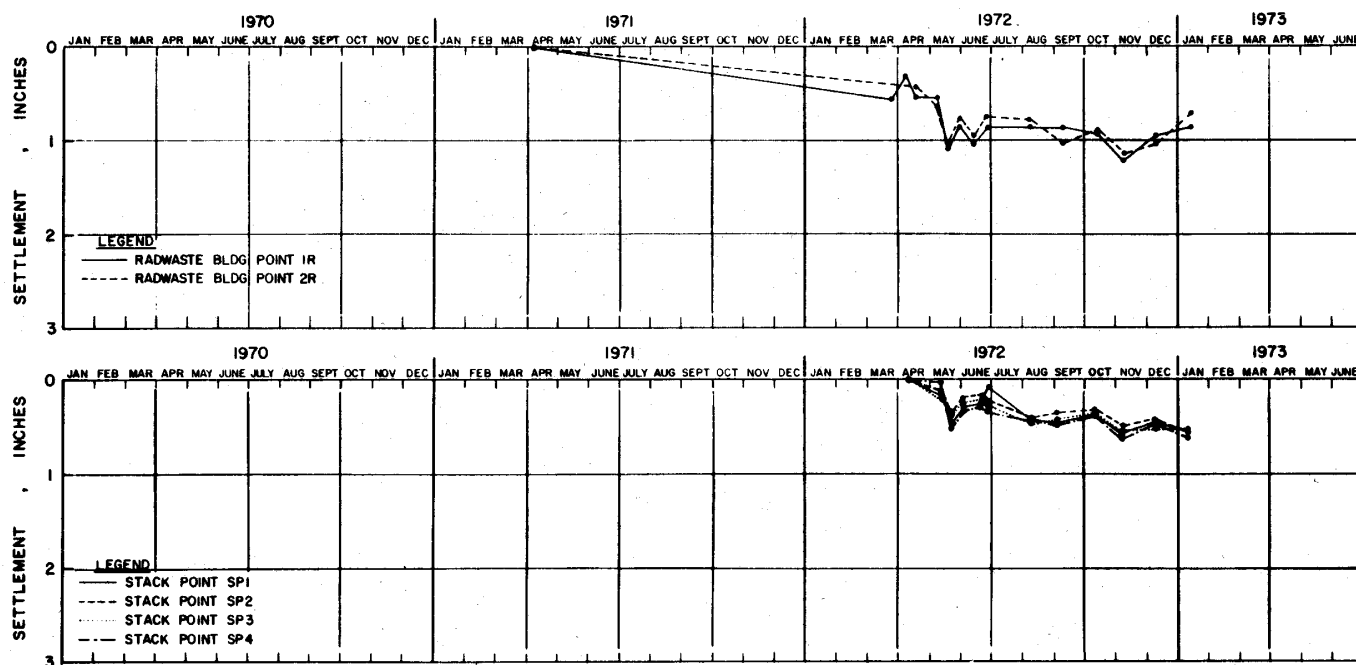
NOTE:
 PERMANENT BENCH MARK FOR THIS SURVEY
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 IS RAW SURVEY DATA REFERENCED FROM AND
 TIED-IN TO WELL CASING NO. 10.

Settlement of Control Building



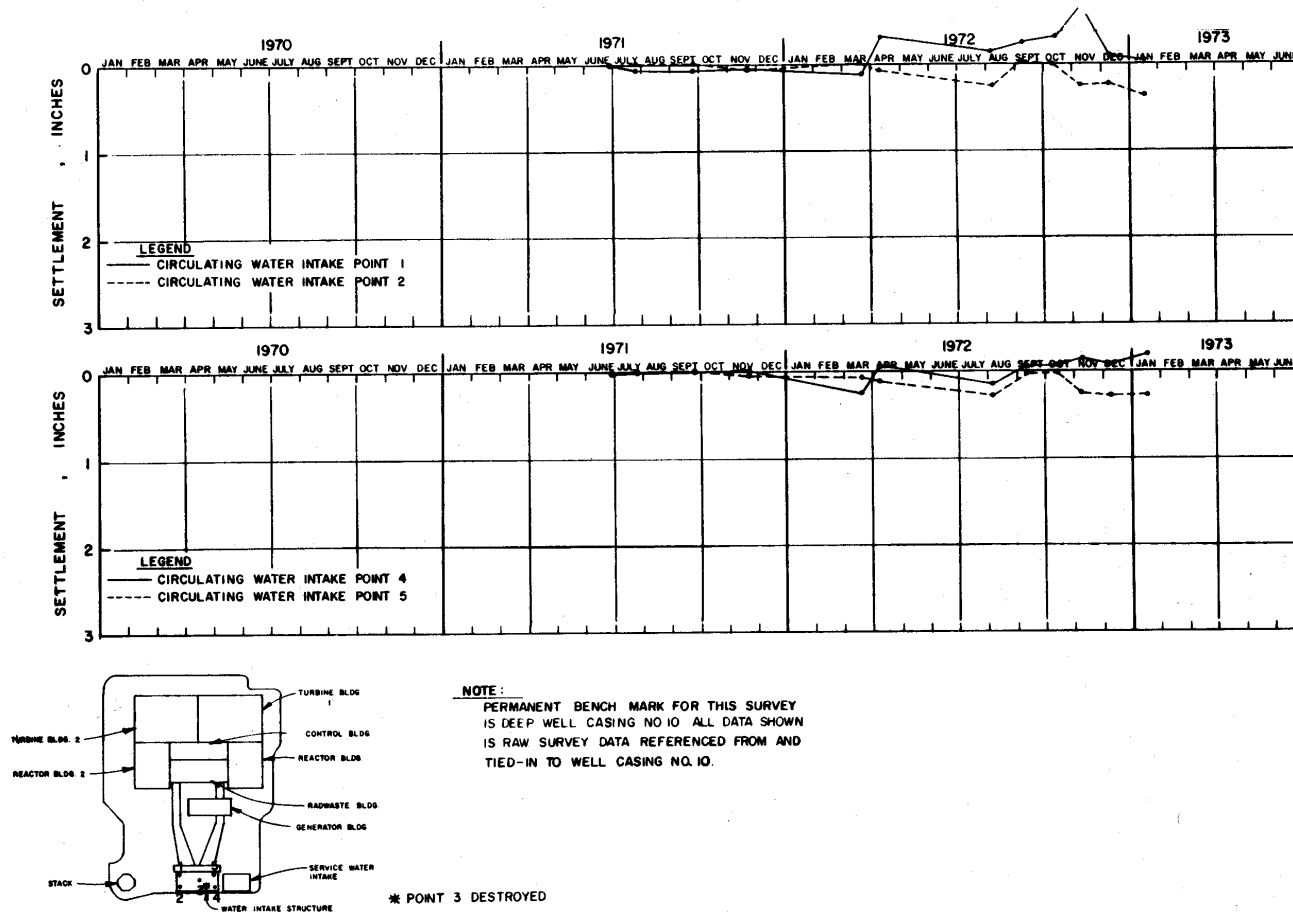
NOTE:
 PERMANENT BENCH MARK FOR THIS SURVEY
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Settlement of Radwaste Building and Stack

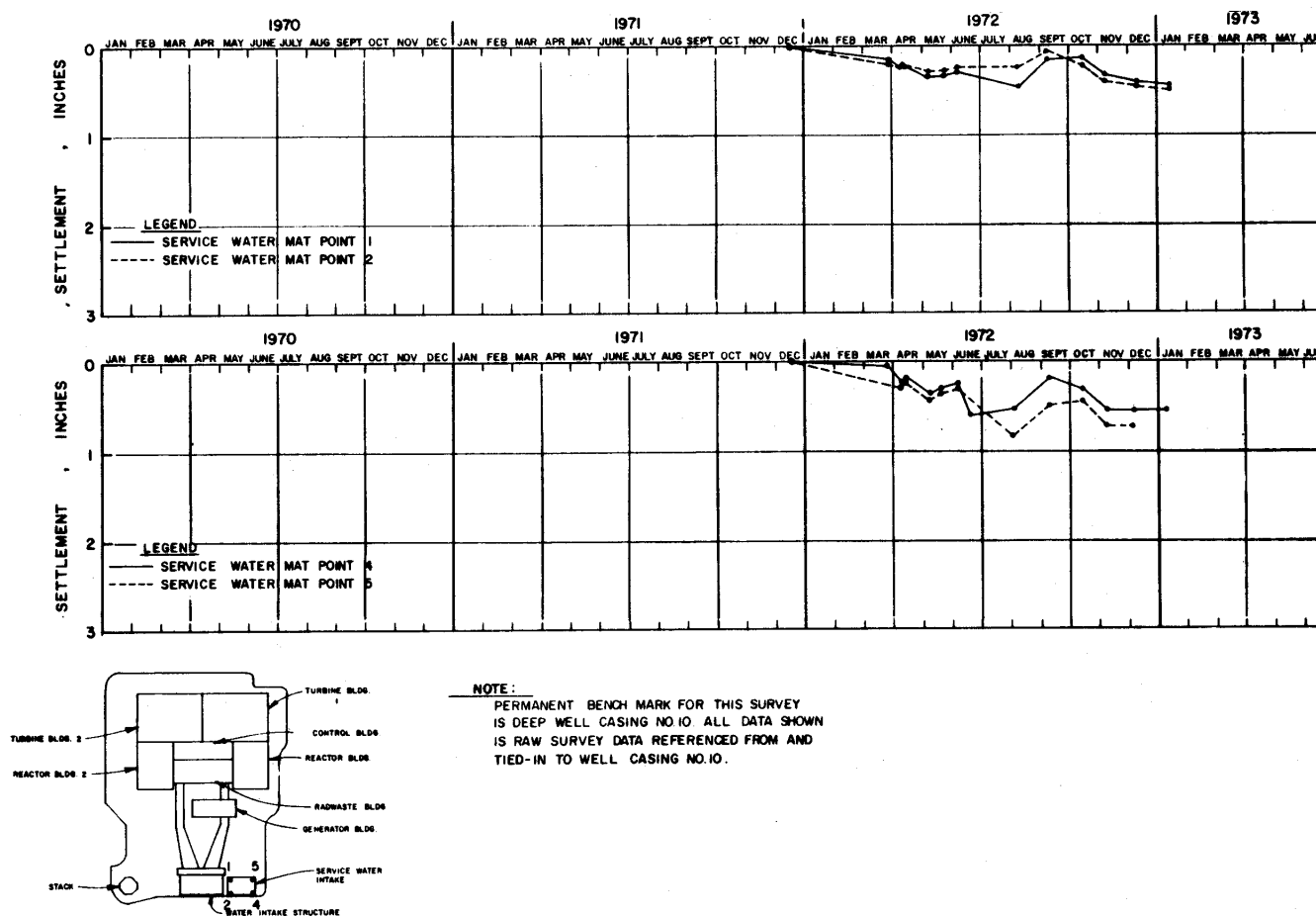


NOTE:
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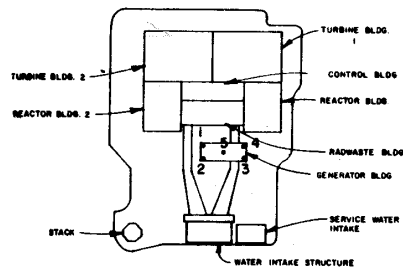
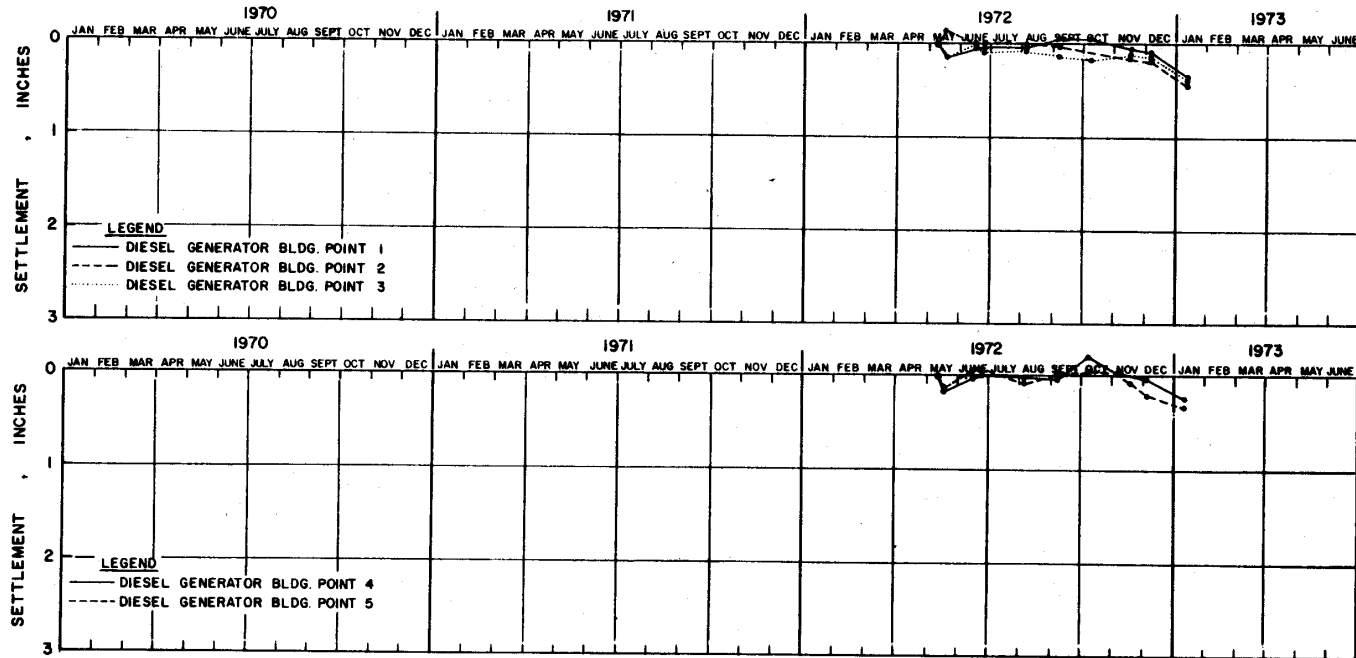
Settlement of Circulating Water Intake



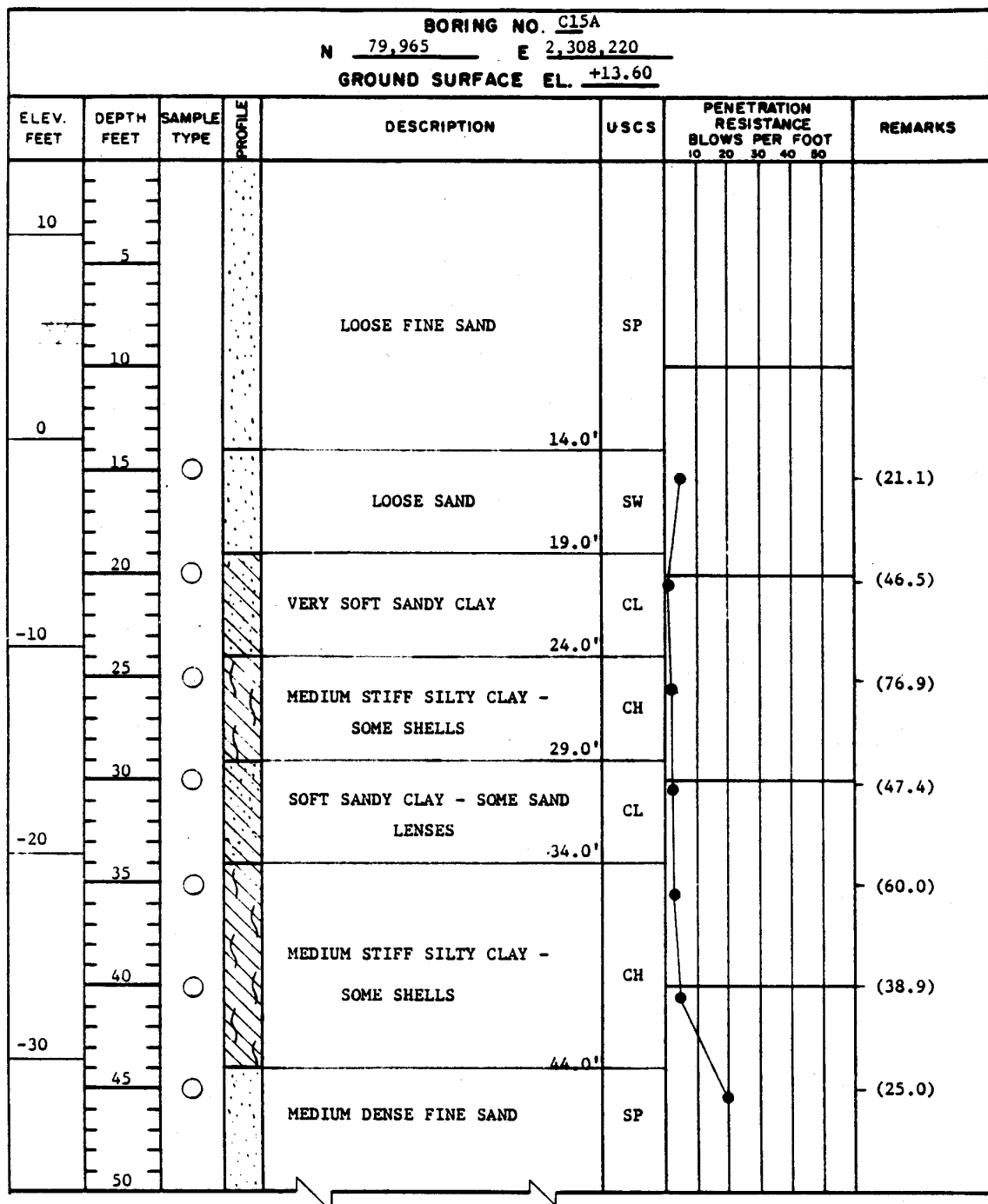
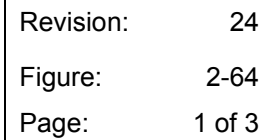
Settlement of Service Water Intake



Settlement of Diesel Generator Building



NOTE:
 PERMANENT BENCH MARK FOR THIS SURVEY
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 IS RAW SURVEY DATA REFERENCED FROM AND
 TIED-IN TO WELL CASING NO. 10.







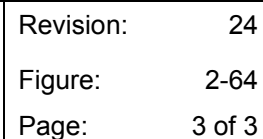


UPDATED FSAR
SITE CHARACTERISTICS
CHAPTER 2 FIGURES

Revision: 24
 Figure: 2-64
 Page: 2 of 3

Intake Canal Boring Log C15A – Sheet 2 of 3

BORING NO. <u>C15A</u>							
N <u>79,965</u> E <u>2,308,220</u>							
GROUND SURFACE EL. <u>+13.60</u>							
ELEV. FEET	DEPTH FEET	SAMPLE TYPE	PROFILE	DESCRIPTION	USCS	PENETRATION RESISTANCE BLOWS PER FOOT 10 20 30 40 50	REMARKS
-40				CLAYEY FINE SAND AND SHELLS			TOP OF ROCK
	55			VERY HARD SHELL LIMESTONE - SOME VUGS			
	60	15					USED BX CORE 1-5/8" DIA.
-50	65	28		SOFT SANDY SHELL LIMESTONE (DENSE)			
	70	7					
-60	75	8		SOFT TO MEDIUM HARD SANDY SHELL LIMESTONE			
	80	5		SOFT TO HARD SANDY SHELL LIMESTONE - SOME VUGS			
-70	85	12					
	90	30		HARD CONGLOMERATIC SHELL LIMESTONE (LIMESTONE AGGREGATE, VUGS)			NO RECOVERY WASH SAMPLE CONTAINS BROKEN SHELLS
-80	95	0					
	100	63					



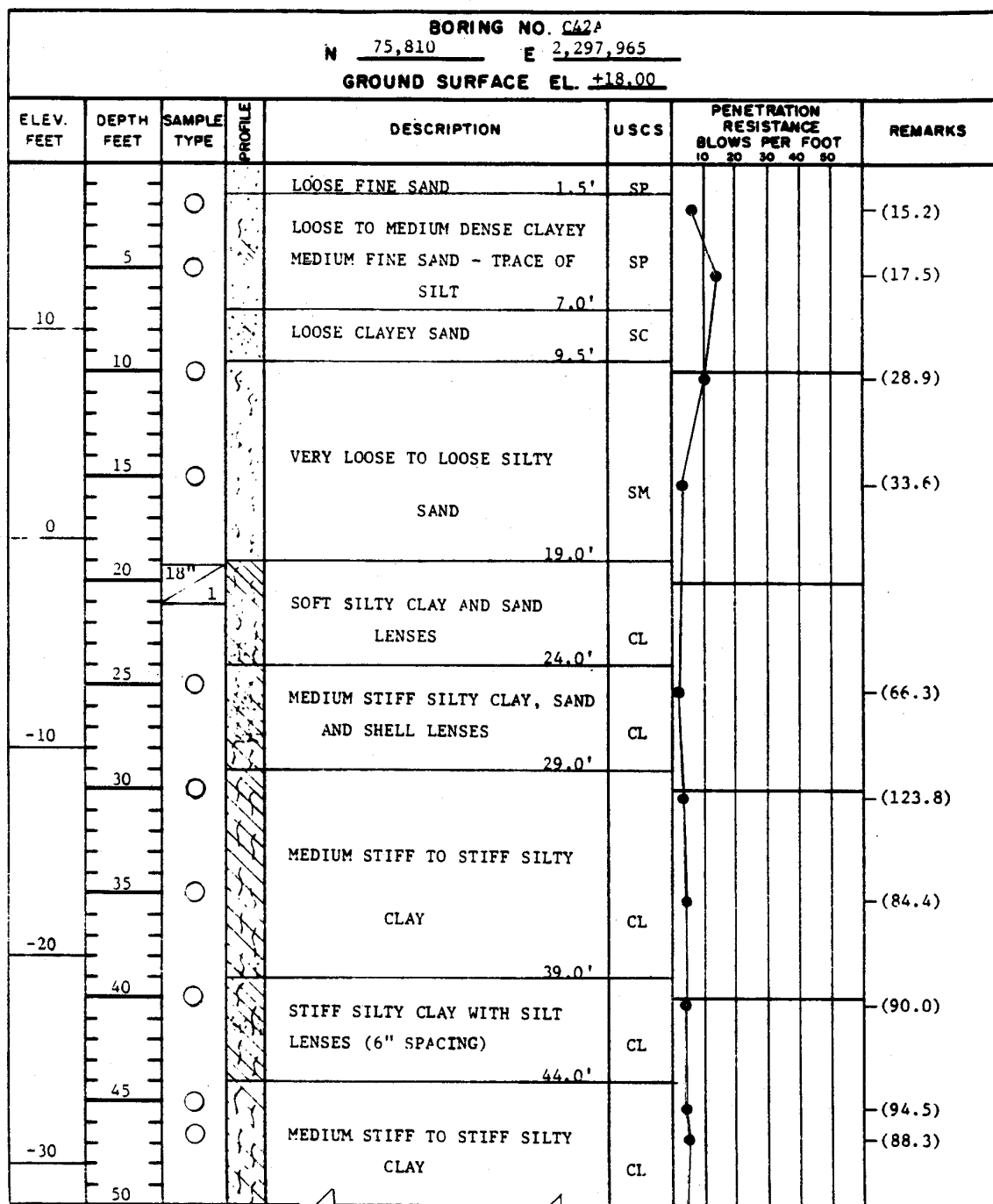
BORING NO. C15A											
N 79,965 E 2,308,220											
GROUND SURFACE EL. +13.60											
ELEV. FEET	DEPTH FEET	SAMPLE TYPE	PROFILE	DESCRIPTION	USCS	PENETRATION RESISTANCE BLOWS PER FOOT					REMARKS
						10	20	30	40	50	
-90		18		HARD CONGLOMERATIC SHELL LIMESTONE AND SHELL LIMESTONE (DENSE WITH VUGS)							TOP OF CASTLE HAYNE
	105										
		23									
	110										
-100		30									
	115										
				VERY SOFT DRILLING NO RECOVERY							
	120	0									
-110		(3.0)									
		37									
	125			MEDIUM HARD TO HARD SHELL LIMESTONE (MEDIUM DENSE TO VERY POROUS - VUGS)							
		(2.6)									
		22									
	130			SOFT TO MEDIUM HARD SANDY SHELL LIMESTONE (POROUS WITH VUGS)							
		(1.4)									
-120		10									
	135			SOFT TO MEDIUM HARD SANDY SHELL LIMESTONE							
		(0.8)									
-125.4	139.0	14									
				BOTTOM OF BORING 139.0'							PIEZOMETER INSTALLED

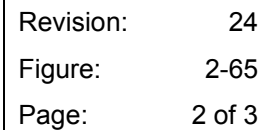


UPDATED FSAR
SITE CHARACTERISTICS
CHAPTER 2 FIGURES

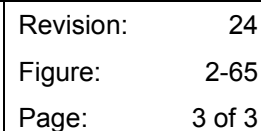
Revision: 24
 Figure: 2-65
 Page: 1 of 3

Discharge Canal Boring Log C42A – Sheet 1 of 3





ELEV. FEET		DEPTH FEET		SAMPLE TYPE		PROFILE		DESCRIPTION		USCS		PENETRATION RESISTANCE BLOWS PER FOOT		REMARKS	
												10 20 30 40 50			
								MEDIUM STIFF SILTY CLAY - SOME FINE SAND						(47.3)	
		55						54.0'							
-40								LOOSE MEDIUM FINE SAND - TRACE OF SILT AND SHELLS						(36.8)	
		60						VERY DENSE FINE SAND							
								SOFT TO MEDIUM HARD MEDIUM DENSE SHELL LIMESTONE						(33.0)	
		65		100				HARD MASSIVE TO SLIGHTLY BROKEN DENSE SHELL LIMESTONE (VUGGIE)						STARTED NX CORING (2-1/8" DIA. CORE)	
-50								67.6'							
		70		100				MEDIUM HARD SLIGHTLY BROKEN SHELL LIMESTONE - VERY POROUS							
								70.6'							
		75		60				SOFT TO MEDIUM HARD BROKEN SHELL LIMESTONE (VUGGIE)							
								75.8'							
-60								HARD MASSIVE SHELL LIMESTONE - DENSE							
		80		96				78.3'							
								SOFT TO MEDIUM HARD BROKEN TO SLIGHTLY BROKEN SHELL LIMESTONE - POROUS							
		85		100				85.0'							
-70								HARD BROKEN TO SLIGHTLY BROKEN CONGLOMERATIC SHELL LIMESTONE (VUGGIE)							
		90		100				88.2'							
								SOFT BROKEN SHELL LIMESTONE - POROUS, FRIABLE							
		95		100				93.7'							
-80								VERY BROKEN TO BROKEN CONGLOMERATIC MEDIUM HARD TO SHELL LIMESTONE							
		100		76											



BORING NO. C42A							
N 75.810 E 2.297.965							
GROUND SURFACE EL. +18.00							
ELEV. FEET	DEPTH FEET	SAMPLE TYPE	PROFILE	DESCRIPTION	USCS	PENETRATION RESISTANCE BLOWS PER FOOT 10 20 30 40 50	REMARKS
				SAME AS ABOVE 101.1'			
	105	76		HARD SLIGHTLY BROKEN TO MASSIVE CONGLOMERATIC SHELL LIMESTONE 105.0'			
				SOFT TO MEDIUM HARD SHELL LIMESTONE - SLIGHTLY POROUS 107.8'			TOP OF CASTLE HAYNE
-90	110	82		MEDIUM HARD BROKEN SHELL LIMESTONE - POROUS 110.0'			
		(3.0)		MEDIUM HARD VEPY BROKEN SHELL LIMESTONE - POPOUS 113.6'			
	115	46		SOFT TO MEDIUM HARD MASSIVE TO BROKEN MEDIUM DENSE SHELL LIMESTONE - SLIGHTLY POROUS 118.3'			
-100	120	(0.8)		MEDIUM HARD SLIGHTLY BROKEN MEDIUM DENSE SHELL LIMESTONE 120.8'			
		(0.4)		SOFT TO MEDIUM HARD SLIGHTLY BROKEN SANDY TEXTURED SHELL LIMESTONE - POROUS, FRIABLE			
-109.8	127.8	(0.6)		BOTTOM OF BORING 127.8'			PIEZOMETER INSTALLED AT COMPLETION OF BORING
					</		