North Atlantic

North Atlantic Energy Service Corporation
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The Northeast Utilities System

April 27, 2000

Docket No. 54-443
NYN-00037

AR#97010035

U.S. Nuclear Regulatory Commission
Attn.: Document Control Desk
Washington, DC 20555-0001

Seabrook Station
Annual Radioactive Effluent Release Report

North Atlantic Energy Service Corporation (North Atlantic) has enclosed the Annual Radioactive Effluent Release Report for 1999. This report is submitted pursuant to Technical Specification 6.8.1.4.

The following information is provided in the enclosures:

Enclosure 1   Effluent release data as required by Regulatory Guide 1.21

Enclosure 2   Joint frequency distributions of wind speed, wind direction and atmospheric stability

Enclosure 3   Radiation dose assessment

Should you have any questions regarding this letter, please contact James M. Peschel, Manager - Regulatory Programs, at (603) 773-7194.

Very truly yours,

NORTH ATLANTIC ENERGY SERVICE CORP.

William A. DiProfio
Station Director

cc:

H. J. Miller, NRC Region I Administrator
R. M. Pulsifer, NRC Project Manager, Project Directorate 1-2
R. K. Lorson, NRC Senior Resident Inspector

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

(*with enclosure)

Cuoco, L. M.	e-mail
Kacich, R. M.	e-mail
Leland, W. B.*	49-SS
Litman, R.	e-mail
Letter Distribution	e-mail
Licensing File 0001*	01-48
RMD	02-06

Effluent Release Data as Required by Regulatory Guide 1.21

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT

Supplemental Information 1999

Facility: Seabrook Station Unit 1   Licensee: North Atlantic Energy
                                                             Service Corporation

1. Regulatory Limits

    A. Gaseous Effluents

        a. 5.0 mrad per quarter gamma air dose.
        b. 10.0 mrad per quarter beta air dose.
        c. 7.5 mrem per quarter to any organ.

    B. Liquid Effluents

        a. 1.5 mrem per quarter total body.
        b. 5.0 mrem per quarter any organ.
        c. 2.0E-04 µCi/ml dissolved or entrained gas.

2. Maximum Permissible Concentrations

    Provide the MPC's used in determining allowable release rates or concentrations.

        a. Fission and activation gases: 1 MPC
        b. Iodines: 1 MPC
        c. Particulates, half-lives >8 days: 1 MPC
        d. Liquid Effluents: 1 MPC

3. Average Energy

    Not applicable

4. Measurements and Approximations of Total Radioactivity

    Provide the methods used to measure or approximate the total radioactivity in effluents and the methods used to determine radionuclide composition.

    A. Fission and activation gases: Determined by gamma spectroscopy. Total error is based on stack flow error, analytical error, and calculated sampling error.

    B. Iodines: Determined by collection on charcoal with subsequent gamma spectroscopy analysis. Total error is based on stack flow error, analytical error, and calculated sampling error.

    C. Particulates: Determined by collection on fixed filter with subsequent gamma spectroscopy analysis. Strontium is determined by composite analysis of filters by liquid scintillation, gross alpha by proportional counter and iron 55 by liquid scintillation. Total error is based on stack flow error, analytical error, and calculated sampling error.

    D. Liquid Effluents: Determined by gamma spectroscopy. A composite sample is analyzed for strontium by liquid scintillation, tritium by liquid scintillation, gross alpha by proportional counter and iron 55 by liquid scintillation. Total error is based on the volume discharge error and analytical error.

E.   ND: None Detected or No Detectable Activity

5.   <u>Batch Releases</u>

Provide the following information relating to batch releases of radioactive materials in liquid and gaseous effluents.

A.   Liquid

      a.   Number of batch releases: 148
      b.   Total time for batch releases: 35837 minutes
      c.   Maximum time period for batch release: 2110 minutes
      d.   Average time period for batch release: 242 minutes
      e.   Minimum time period for batch release: 21 minutes
      f.   Average stream flow during periods of release of effluents into a flowing stream: 1.60E+06 liters per minute

B.   Gaseous

      a.   Number of batch releases: 68
      b.   Total time for batch releases: 100170 minutes
      c.   Maximum time period for batch release: 40320 minutes
      d.   Average time period for batch release: 1357 minutes
      e.   Minimum time period for batch release: 1 minute

6.   <u>Abnormal Releases</u>

A.   Liquid

      a.   Number of releases: 0
      b.   Total activity released: N/A

B.   Gaseous

      a.   Number of releases: 0
      b.   Total activity released: N/A

TABLE 1A

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT (1999)

GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est. Total Error, %
A. Fission and activation gases						
1. Total releases	Ci	1.32E-01	2.62E-01	2.15E-01	1.51E-01	1.70E+01
2. Average release rate for period	μCi/sec	1.70E-02	3.37E-02	2.70E-02	1.90E-02	
3. Percent of applicable Technical Specification Limit	%	8.78E-04	1.05E-03	8.88E-04	1.23E-03	

B. Iodines	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est. Total Error, %
1. Total release	Ci	ND	9.81E-07	ND	ND	1.50E+01
2. Average release rate for period	μCi/sec	NA	1.26E-07	NA	NA	
3. Percent of applicable Technical Specification limit	%	3.04E-01	6.65E-01	3.09E-01	2.96E-01	

C. Particulates	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est. Total Error, %
1. Total release	Ci	2.24E-06	1.05E-04	ND	ND	1.80E+01
2. Average release rate for period	μCi/sec	2.88E-07	1.35E-05	NA	NA	
3. Percent of applicable Technical Specification Limit	%	3.04E-01	6.65E-01	3.09E-01	2.96E-01	
4. Total alpha radioactivity	Ci	ND	ND	ND	ND	

D. Tritium	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est. Total Error, %
1. Total release	Ci	2.26E+01	2.52E+01	2.31E+01	2.22E+01	1.60E+01
2. Average release rate for period	μCi/sec	2.90E+00	3.24E+00	2.91E+00	2.79E+00	
3. Percent of applicable Technical Specification limit	%	3.04E-01	6.65E-01	3.09E-01	2.96E-01	

TABLE 1B
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT (1999)
GASEOUS EFFLUENTS-ELEVATED RELEASES

CONTINUOUS MODE

Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4

1. Fission and activation gases

Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
argon-41	Ci	ND	ND	ND	ND
krypton-85	Ci	ND	ND	ND	ND
krypton-85m	Ci	ND	ND	ND	ND
krypton-87	Ci	ND	ND	ND	ND
krypton-88	Ci	ND	ND	ND	ND
xenon-131m	Ci	ND	ND	ND	ND
xenon-133	Ci	ND	ND	ND	ND
xenon-133m	Ci	ND	ND	ND	ND
xenon-135	Ci	ND	ND	ND	ND
xenon-135m	Ci	ND	ND	ND	ND
xenon-138	Ci	ND	ND	ND	ND
unidentified	Ci	ND	ND	ND	ND
Total for period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00

2. Iodines

Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
iodine-131	Ci	ND	ND	ND	ND
iodine-133	Ci	ND	ND	ND	ND
iodine-135	Ci	ND	ND	ND	ND
Total for period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00

3. Particulate

Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
strontium-89	Ci	ND	ND	ND	ND
strontium-90	Ci	ND	ND	ND	ND
cesium-134	Ci	ND	ND	ND	ND
cesium-137	Ci	ND	ND	ND	ND
barium-lanthanum-140	Ci	ND	ND	ND	ND
cobalt-58	Ci	ND	ND	ND	ND
cobalt-60	Ci	ND	ND	ND	ND
chromium-51	Ci	ND	ND	ND	ND
manganese-54	Ci	ND	ND	ND	ND
niobium-95	Ci	ND	ND	ND	ND
iron-59	Ci	ND	ND	ND	ND
unidentified	Ci	ND	ND	ND	ND
Total for period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE 1B
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT (1999)
GASEOUS EFFLUENTS-ELEVATED RELEASES

BATCH MODE

Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4

1. Fission and activation gases

Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
argon-41	Ci	3.84E-02	1.99E-02	4.08E-02	4.89E-02
krypton-85	Ci	ND	ND	ND	ND
krypton-85m	Ci	ND	ND	ND	ND
krypton-87	Ci	ND	ND	ND	ND
krypton-88	Ci	ND	ND	ND	ND
xenon-131m	Ci	ND	ND	ND	ND
xenon-133	Ci	3.12E-02	2.30E-02	4.40E-02	1.68E-02
xenon-133m	Ci	ND	ND	ND	ND
xenon-135	Ci	1.94E-05	2.75E-03	3.52E-04	ND
xenon-135m	Ci	ND	ND	ND	ND
xenon-138	Ci	ND	ND	ND	ND
unidentified	Ci	ND	ND	ND	ND
Total for period	Ci	6.96E-02	4.57E-02	8.52E-02	6.57E-02

2. Iodines

Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
iodine-131	Ci	ND	ND	ND	ND
iodine-133	Ci	ND	ND	ND	ND
Iodine-135	Ci	ND	ND	ND	ND
Total for period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00

3. Particulates

Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
strontium-89	Ci	ND	ND	ND	ND
strontium-90	Ci	ND	ND	ND	ND
cesium-134	Ci	ND	ND	ND	ND
cesium-137	Ci	ND	ND	ND	ND
barium-lanthanum-140	Ci	ND	ND	ND	ND
unidentified	Ci	ND	ND	ND	ND
Total for period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE 1C
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT (1999)
GASEOUS EFFLUENTS-GROUND LEVEL RELEASES

CONTINUOUS MODE

Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4

1. Fission and activation gases

Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
argon-41	Ci	ND	ND	ND	ND
krypton-85	Ci	ND	ND	ND	ND
krypton-85m	Ci	ND	ND	ND	ND
krypton-87	Ci	ND	ND	ND	ND
krypton-88	Ci	ND	ND	ND	ND
xenon-133	Ci	6.30E-02	6.40E-02	ND	ND
xenon-135	Ci	ND	ND	ND	ND
xenon-135m	Ci	ND	ND	ND	ND
xenon-138	Ci	ND	ND	ND	ND
Unidentified	Ci	ND	ND	ND	ND
Total for period	Ci	6.30E-02	6.40E-02	0.00E+00	0.00E+00

2. Iodines

Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
iodine-131	Ci	ND	ND	ND	ND
iodine-133	Ci	ND	ND	ND	ND
Total for period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00

3. Particulates

Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
strontium-89	Ci	ND	ND	ND	ND
strontium-90	Ci	ND	ND	ND	ND
cesium-134	Ci	ND	ND	ND	ND
cesium-136	Ci	ND	ND	ND	ND
cesium-137	Ci	ND	ND	ND	ND
barium-lanthanum-140	Ci	ND	ND	ND	ND
cobalt-58	Ci	ND	1.39E-06	ND	ND
Cobalt-60	Ci	ND	ND	ND	ND
Unidentified	Ci	ND	ND	ND	ND
Total for period	Ci	0.00E+00	1.39E-06	0.00E+00	0.00E+00

TABLE 1C
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT (1999)
GASEOUS EFFLUENTS-GROUND LEVEL RELEASES

BATCH MODE

Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1. Fission and activation gases					
argon-41	Ci	ND	ND	ND	ND
krypton-85	Ci	ND	ND	ND	ND
krypton-85m	Ci	ND	ND	ND	ND
krypton-87	Ci	ND	ND	ND	ND
krypton-88	Ci	ND	ND	ND	ND
xenon-131m	Ci	ND	ND	ND	ND
xenon-133m	Ci	ND	ND	ND	ND
xenon-133	Ci	ND	2.01E-02	ND	ND
xenon-135	Ci	ND	ND	ND	ND
xenon-135m	Ci	ND	ND	ND	ND
xenon-138	Ci	ND	ND	ND	ND
unidentified	Ci	ND	ND	ND	ND
Total for period	Ci	0.00E+00	2.01E-02	0.00E+00	0.00E+00
2. Iodines					
iodine-131	Ci	ND	9.81E-07	ND	ND
iodine-132	Ci	ND	9.31E-05	ND	ND
iodine-133	Ci	ND	ND	ND	ND
iodine-135	Ci	ND	ND	ND	ND
Total for period	Ci	0.00E+00	9.41E-05	0.00E+00	0.00E+00
3. Particulates					
strontium-89	Ci	ND	ND	ND	ND
strontium-90	Ci	ND	ND	ND	ND
cesium-134	Ci	ND	ND	ND	ND
cesium-136	Ci	ND ·	ND	ND	ND
cesium-137	Ci	ND	3.66E-09	ND	ND
barium-lanthanum-140	Ci	ND	ND	ND	ND
cobalt-57	Ci	ND	ND	ND	ND
cobalt-58	Ci	ND	6.62E-06	ND	ND
cobalt-60	Ci	1.07E-07	6.70E-07	ND	ND
manganese-54	Ci	1.78E-06	2.45E-07	ND	ND
iron-59	Ci	ND	ND	ND	ND
niobium/zirconium-95	Ci	ND	4.83E-07	ND	ND
chromium-51	Ci	ND	2.60E-06	ND	ND
technetium-99m	Ci	ND	ND	ND	ND
bromine-82	Ci	3.57E-07	ND	ND	ND
unidentified	Ci	ND	ND	ND	ND
Total for period	Ci	2.24E-06	1.06E-05	0.00E+00	0.00E+00

TABLE 2A

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT (1999)

LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est. Total Error, %
A. Fission and activation products						
1. Total releases	Ci	1.11E-02	1.55E-02	1.10E-02	8.76E-03	6.00E+00
2. Average diluted concentration during period	μCi/ml	5.66E-11	9.69E-11	5.07E-11	3.89E-11	
3. Percent of applicable limit	%	3.12E-02	8.27E-02	7.06E-03	5.59E-03	
B. Tritium						
1. Total release	Ci	7.79E+02	1.93E+02	4.03E+01	2.75E+01	8.00E+00
2. Average diluted concentration during period	μCi/ml	3.97E-06	1.21E-06	1.86E-07	1.22E-07	
3. Percent of applicable limit	%	3.12E-02	8.27E-02	7.06E-03	5.59E-03	
C. Dissolved and entrained gases						
1. Total release	Ci	4.82E-05	ND	ND	ND	1.90E+01
2. Average diluted concentration during period	μCi/ml	2.46E-13	NA	NA	NA	
3. Percent of applicable limit	%	1.23E-07	NA	NA	NA	
D. Gross alpha radioactivity						
1. Total release	Ci	ND	ND	ND	ND	1.00E+01
E. Volume of waste released (prior to dilution)	liters	1.65E+07	1.68E+07	1.49E+07	1.47E+07	1.30E+00
F. Volume of dilution water used during period	liters	1.96E+11	1.60E+11	2.17E+11	2.25E+11	9.00E+00

TABLE 2B

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT (1999)

LIQUID EFFLUENTS

CONTINUOUS MODE

Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
strontium-89	Ci	ND	ND	ND	ND
strontium-90	Ci	ND	ND	ND	ND
cesium-134	Ci	ND	1.13E-06	ND	ND
cesium-137	Ci	1.77E-05	3.19E-06	ND	ND
iodine-131	Ci	ND	ND	ND	ND
iodine-133	Ci	ND	ND	ND	ND
cobalt-58	Ci	ND	5.38E-06	ND	6.98E-05
cobalt-60	Ci	ND	2.98E-04	2.65E-04	1.64E-04
iron-59	Ci	ND	ND	ND	ND
zinc-65	Ci	ND	ND	ND	ND
manganese-54	Ci	ND	ND	ND	ND
chromium-51	Ci	ND	ND	ND	ND
zirconium-niobium-95	Ci	ND	ND	ND	ND
molybdenum-99	Ci	ND	ND	ND	ND
technetium-99m	Ci	ND	ND	ND	ND
barium-lanthanum-140	Ci	ND	ND	ND	ND
cerium-141	Ci	ND	ND	ND	ND
unidentified	Ci	ND	ND	ND	ND

| Total for period(above) | Ci | 1.77E-05 | 3.08E-04 | 2.65E-04 | 2.34E-04 |

xenon-131m	Ci	ND	ND	ND	ND
xenon-133m	Ci	ND	ND	ND	ND
xenon-133	Ci	ND	ND	ND	ND
xenon-135	Ci	ND	ND	ND	ND

TABLE 2B
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT (1999)
LIQUID EFFLUENTS

BATCH MODE

Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
strontium-89	Ci	ND	ND	ND	ND
strontium-90	Ci	ND	ND	ND	ND
cesium-134	Ci	ND	ND	ND	ND
cesium-137	Ci	ND	ND	2.43E-05	ND
iodine-131	Ci	3.58E-04	ND	3.34E-06	ND
iodine-133	Ci	1.24E-05	ND	ND	ND
cobalt-57	Ci	6.79E-06	ND	3.58E-06	ND
cobalt-58	Ci	7.79E-04	6.30E-03	4.56E-03	3.58E-04
cobalt-60	Ci	2.42E-03	8.19E-04	3.25E-04	1.34E-04
chromium-51	Ci	ND	ND	ND	ND
iron-55	Ci	3.62E-03	2.92E-03	3.19E-03	1.28E-03
iron-59	Ci	ND	1.67E-05	ND	ND
zinc-65	Ci	ND	ND	ND	ND
manganese-54	Ci	5.96E-05	1.18E-05	2.34E-06	ND
zirconium-niobium-95	Ci	ND	7.84E-06	ND	ND
molybdenum-99	Ci	ND	ND	ND	ND
technetium-99m	Ci	ND	ND	ND	ND
barium-lanthanum-140	Ci	ND	ND	ND	ND
cerium-141	Ci	ND	ND	ND	ND
antimony-124	Ci	ND	8.51E-05	1.54E-05	ND
antimony-125	Ci	3.87E-03	4.99E-03	2.61E-03	6.76E-03
niobium-97	Ci	ND	ND	ND	ND
tin-117m	Ci	ND	ND	ND	ND
sodium-24	Ci	ND	ND	ND	ND
unidentified	Ci	ND	ND	ND	ND

| Total for period(above) | Ci | 1.11E-02 | 1.52E-02 | 1.07E-02 | 8.53E-03 |

| xenon-133 | Ci | 4.82E-05 | ND | ND | ND |
| xenon-135 | Ci | ND | ND | ND | ND |

TABLE 3
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT 1999
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not Irradiated Fuel)

1. Type of waste (no shipment made)	Unit	Est. total error %
a. Spent resins, filter sludges, evaporator bottoms, etc.	23.3 m³ 82.1 Ci	2.00 E+01
b. Dry compressible waste, contaminated equip., etc.	0 m³ 0 Ci	NA
c. Irradiated components, control rods, etc.	0 m³ 0 Ci	NA
d. Other (describe) Dewatered Cartridge Filters	4.72 m³ 65.3 Ci	2.88 E+01

2. Estimate of major nuclide composition (by type of waste)

a.

Nuclide	%	Ci
H-3	0.84	6.93E-01
Mn-54	0.10	8.28E-02
Fe-55	6.00	4.93E+00
Co-57	0.04	3.64E-02
Co-58	4.95E-03	4.06E-03
Co-60	5.76	4.73E+00
Ni-63	86.84	7.13E+01
Sb-125	0.09	7.34E-02
Cs-134	0.12	9.89E-02
Cs-137	0.19	1.59E-01
Zr-95	6.54E-07	5.37E-07
Nb-95	1.89E-08	1.55E-08

	Nuclide	%	Ci
b.			
	NA	NA	NA
c.	NA	NA	NA
d	H-3	0.01	4.19E-03
	Cr-51	0.07	4.73E-02
	Mn-54	0.62	4.04E-01
	Fe-55	64.76	4.23E+01
	Fe-59	2.77E-03	1.81E-03
	Co-57	0.05	3.54E-02
	Co-58	1.01	6.57E-01
	Co-60	12.77	8.34E+00
	Ni-63	18.29	1.20E+01
	Zr-95	0.05	3.13E-02
	Nb-95	0.03	1.68E-02
	Ag-110m	1.86E-03	1.21E-03
	Sn-113	0.01	9.14E-03
	Sb-125	0.01	6.54E-03
	Cs-134	0.02	1.43E-02
	Cs-137	2.30	1.50E+00

3. Solid Waste Disposition

Number of shipments	Mode of Transportation	Destination
6	Flatbed Truck	Chem Nuclear – Barnwell, S.C.

B. IRRADIATED FUEL SHIPMENTS (Disposition)

Number of Shipments	Mode of Transportation	Destination
0	NA	NA

LIST OF APPENDICES

Appendix A

Offsite Dose Calculation Manual

Requirement:

Technical Specification 6.13.2.b requires that licensee initiated changes to the Off-Site Dose Calculation Manual (ODCM) be submitted to the Commission in the Annual Radioactive Effluent Release Report for the period in which the changes were made effective. Included in these changes are changes to the Radiological Environmental Monitoring Program (REMP) in accordance with Technical Specifications 3.12.1 and 3.12.2.

Response:

On December 15, 1999, Amendment 66 to the Seabrook Station's Operating License authorized the relocation of the Radiological Effluent Technical Specifications (RETS) to the ODCM. The relocation was implemented on April 12, 2000. These changes to the ODCM will be described and a copy provided in the 2000 Radioactive Effluent Release Report.

In 1999, the ODCM was revised to correct two minor errors. First, the Table of Contents was revised to accurately reflect the pages of the Manual. Second, a footnote was added to Table B.4-1, "Radiological Environment Monitoring Stations," monitoring location TM-15 to designate that this is an informational location that is not required by the monitoring program as defined in Part A of the ODCM. These changes, which were reviewed and approved by the SORC, did not reduce the accuracy or reliability of dose calculations or setpoint determinations.

The Kierstad Farm (TM-08) went out of business and dropped out of the Program during 1999. As a result of this farm being removed from the Program, the ODCM was revised in early 2000 to reflect the removal of milk sample location (TM-08) from Table B.4-1 (Radiological Environmental Monitoring Stations). This change was revised and found to be acceptable by the SORC. Again, like the above minor changes, removal of this milk sample location did not reduce the accuracy or reliability of dose calculations or setpoint determinations. Since this happened in 1999, the affected page is included as part of this submittal. There were no other effective changes made to the REMP in 1999.

For this period, the REMP was conducted as specified in the ODCM. The Land Use Census for 1999 reflects the continued use of Global Positioning technology that more accurately locates and verifies residences and gardens as to distance and sector from containment. Air sampler (AP/CF-01) was relocated within the same sector due to power availability and security. There was no impact to the Program from this change.

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TOC 1 - 7	19	B.1-20	17	B.4-8	16
		B.1-21	17	B.4-9	16
LOEP 1 & 2	19	B.1-22	17	B.4-10	16
		B.1-23	16		
A.1-1	16	B.1-24	16	B.5-1	17
		B.1-25	16	B.5-2	17
A.2-1	16	B.1-26	16	B.5-3	17
		B.1-27	16	B.5-4	17
A.3-1	16	B.1-28	16	B.5-5	17
A.3-2	16			B.5-6	17
A.3-3	16	B.2-1	16	B.5-7	17
A.3-4	16	B.2-2	16	B.5-8	17
A.3-5	16	B.2-3	16	B.5-9	17
A.3-6	16			B.5-10	17
A.3-7	16	B.3-1	16	B.5-11	17
		B.3-2	16	B.5-12	17
A.4-1	16	B.3-3	16		
A.4-2	16	B.3-4	16	B.6-1	17
A.4-3	16	B.3-5	16	B.6-2	17
A.4-4	16	B.3-6	16	B.6-3	16
A.4-5	16	B.3-7	16		
		B.3-8	16	B.7-1	16
A.5-1	16	B.3-9	16	B.7-2	16
A.5-2	16	B.3-10	16	B.7-3	16
A.5-3	16	B.3-11	16	B.7-4	16
A.5-4	16	B.3-12	16	B.7-5	16
A.5-5	16	B.3-13	16	B.7-6	16
A.5-6	16	B.3-14	16	B.7-7	16
A.5-7	16	B.3-15	16	B.7-8	16
A.5-8	16	B.3-16	16	B.7-9	16
A.5-9	16	B.3-17	16	B.7-10	16
A.5-10	16	B.3-18	16	B.7-11	16
		B.3-19	16	B.7-12	16
B.1-0	16	B.3-20	16	B.7-13	16
B.1-1	17	B.3-21	16	B.7-14	16
B.1-2	17	B.3-22	16	B.7-15	16
B.1-3	16	B.3-23	16	B.7-16	16
B.1-4	16	B.3-24	16	B.7-17	16
B.1-5	16	B.3-25	16	B.7-18	16
B.1-6	16	B.3-26	16	B.7-19	16
B.1-7	16	B.3-27	16	B.7-20	16
B.1-8	16	B.3-28	16	B.7-21	16
B.1-9	16	B.3-29	16	B.7-22	16
B.1-10	16	B.3-30	16	B.7-23	16
B.1-11	16	B.3-31	16	B.7-24	16
B.1-12	16			B.7-25	16
B.1-13	17	B.4-1	19	B.7-26	16
B.1-14	17	B.4-2	19	B.7-27	16
B.1-15	17	B.4-3	16	B.7-28	16

TABLE B.4-1
RADIOLOGICAL ENVIRONMENTAL MONITORING STATIONS[a]

Exposure Pathway and/or Sample	Sample Location and Designated Code		Distance From Unit 1 Containment (km)	Direction From the Plant
1. AIRBORNE (Particulate and Radioiodine)				
	AP/CF-01	PSNH Barge Landing Area	2.7	ESE
	AP/CF-02	Harbor Road	2.7	E
	AP/CF-03	SW Boundary	0.8	SW
	AP/CF-04	W. Boundary	1.0	W
	AP/CF-05	Winnacunnet H.S.[b]	4.0	NNE
	AP/CF-06	Georgetown Substation (Control)	24.0	SSW
	AP/CF-07	PSNH Substation[b]	5.7	NNW
	AP/CF-08	E&H Substation[b]	3.4	SSE
2. WATERBORNE				
a. Surface	WS-01	Hampton-Discharge Area	5.3	E
	WS-51	Ipswich Bay (Control)	16.9	SSE
b. Sediment	SE-02	Hampton-Discharge Area[b]	5.3	E
	SE-07	Hampton Beach[b]	3.1	E
	SE-08	Seabrook Beach	3.2	ESE
	SE-52	Ipswich Bay (Control)[b]	16.9	SSE
	SE-57	Plum Island Beach (Control)[b]	15.9	SSE
3. INGESTION				
a. Milk	TM-04	Salisbury, MA	5.2	SW
	TM-08	Hampton Falls, NH	4.3	NNW
	TM-09	Hampton, NH	5.5	NNW
	TM-15	Hampton Falls, NH[b]	7.0	NW
	TM-16	Kensington, NH[b]	7.7	WNW
	TM-20	Rowley, MA (Control)	16.3	S
	TM-21	North Andover, MA[b]	29.0	SW
b. Fish and Invertebrates[c]	FH-03	Hampton - Discharge Area	4.5	ESE
	FH-53	Ipswich Bay (Control)	16.4	SSE
	HA-04	Hampton - Discharge Area	5.5	E
	HA-54	Ipswich Bay (Control)	17.2	SSE
	MU-06	Hampton - Discharge Area	5.2	E
	MU-09	Hampton Harbor[b]	2.6	E
	MU-56	Ipswich Bay (Control)	17.4	SSE
	MU-59	Plum Island[b]	15.8	SSE

4.0   RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

The radiological environmental monitoring stations are listed in Table B.4-1. The locations of the stations with respect to the Seabrook Station are shown on the maps in Figures B.4-1 to B.4-6.

Direct radiation measurements are analyzed at the station. All other radiological analyses for environmental samples are performed at the Yankee Environmental Laboratory. The Yankee Environmental Laboratory participates in the U.S. Environmental Protection Agency's Environmental Intercomparison Studies Program for all relevant species in an aqueous (water) matrix. An independent vendor (Analytics) supplies the remaining cross check samples. These samples are presented on an air filter and in milk and water matrices.

Pursuant to Specification 4.12.2, the land use census will be conducted "during the growing season" at least once per 12 months. The growing season is defined, for the purposes of the land use census, as the period from June 1 to October 1. The method to be used for conducting the census will consist of one or more of the following, as appropriate: door-to-door survey, visual inspection from roadside, aerial survey, or consulting with local agricultural authorities.

Technical Specification 6.8.1.3 requires that the results of the Radiological Environmental Monitoring Program be summarized in the Annual Radiological Environmental Operating Report "in the format of the table in the Radiological Assessment Branch Technical Position, Revision 1, 1979." The general table format will be used with one exception and one clarification, as follows. The mean and range values will be based not upon detectable measurements only, as specified in the NRC Branch Technical Position, but upon all measurements. This will prevent the positive bias associated with the calculation of the mean and range based upon detectable measurements only. Secondly, the Lower Limit of Detection column will specify the LLD required by ODCM Table A.5-2 for that radionuclide and sample medium.

Exposure Pathway and/or Sample	Sample Location and Designated Code	Distance From Unit 1 Containment (km)	Direction From the Plant
TL-27	Highland St., S. Hampton	7.6	W
TL-28	Route 150, Kensington	7.9	WNW
TL-29	Frying Pan Lane, Hampton Falls	7.4	NW
TL-30	Route 27, Hampton	7.9	NNW
TL-31	Alumni Drive, Hampton	4.0	NNE
TL-32	Seabrook Elementary School	1.9	S
TL-33	Dock Area, Newburyport	9.7	S
TL-34	Bow St., Exeter	12.1	NW
TL-35	Lincoln Ackerman School	2.4	NNW
TL-36	Route 97, Georgetown (Control)	22.0	SSW
TL-37	Plaistow, NH (Control)	26.0	WSW
TL-38	Hampstead, NH (Control)	29.0	W
TL-39	Fremont, NH (Control)	27.0	WNW
TL-40	Newmarket, NH (Control)	24.0	NNW
TL-41	Portsmouth, NH (Control)[b]	21.0	NNE
TL-42	Ipswich, MA (Control)[b]	27.0	SSE

(a)   Sample locations are shown on Figures B.4-1 to B.4-6.

(b)   This sample location is not required by monitoring program defined in Part A of ODCM; program requirements specified in Part A do not apply to samples taken at this location.

(c)   Samples will be collected pursuant to ODCM Table A.5-1. Samples are not required from all stations listed during any sampling interval (FH = Fish; HA = Lobsters; MU = Mussels). Table A.5-1 specifies that "one sample of three commercially and recreationally important species" be collected in the vicinity of the plant discharge area, with similar species being collected at a control location. (This wording is consistent with the NRC Final Environmental Statement for Seabrook Station.) Since the discharge area is off-shore, there is a great number of fish species that could be considered commercially or recreationally important. Some are migratory (such as striped bass), making them less desirable as an indicator of plant-related radioactivity. Some pelagic species (such as herring and mackerel) tend to school and wander throughout a large area, sometimes making catches of significant size difficult to obtain. Since the collection of all species would be difficult or impossible, and would provide unnecessary redundancy in terms of monitoring important pathways to man, three fish and invertebrate species have been specified as a minimum requirement. Samples may include marine fauna such as lobsters, clams, mussels, and bottom-dwelling fish, such as flounder or hake. Several similar species may be grouped together into one sample if sufficient sample mass for a single species is not available after a reasonable effort has been made (e.g., yellowtail flounder and winter flounder).

Appendix B

Process Control Program

Requirement:

Technical Specification 6.12.2.a requires that licensee initiated changes to the Process Control Program (PCP) be submitted to the Commission in the Annual Radioactive Effluent Release Report for the period in which the changes were made.

Response:

During 1999, there were no changes to the PCP.

Appendix C

Radioactive Liquid Effluent Monitoring Instrumentation

Requirement: Radioactive Liquid Effluent Monitoring Instrumentation channels are required to be operable in accordance with Technical Specification 3.3.3.9.b. With less than the minimum number of channels operable for 30 days, Technical Specification 3.3.3.9.b requires an explanation for the delay in correcting the inoperability in the next Annual Radiological Effluent Release Report in accordance with Technical Specification 6.8.1.4.

Response:

A review of the Action Statement Status tracking system for the period from January 1, 1999 to December 31, 1999 indicated Technical Specification 3.3.3.9 was not entered for more than 30 consecutive days.

Appendix D

Radioactive Gaseous Effluent Monitoring Instrumentation

Requirement: Radioactive Gaseous Effluent Monitoring Instrumentation Channels are required to be operable in accordance with Technical Specification 3.3.3.10.b. With less than the minimum number of channels operable for 30 days, Technical Specification 3.3.3.10.b requires an explanation for the delay in correcting the inoperability in the next Annual Radioactive Effluent Release Report in accordance with Technical Specification 6.8.1.4.

Response:

A review of the Action Statement Status tracking system for the period from January 1, 1999 to December 31, 1999 indicated Technical Specification 3.3.3.10 was not entered for more than 30 consecutive days.

Appendix E

Liquid Holdup Tanks

Requirement: Technical Specification 3.11.1.4 limits the quantity of radioactive material contained in any outside temporary tank. With the quantity of radioactive material in any outside temporary tank exceeding the limits of Technical Specification 3.11.1.4, a description of the events leading to this condition is required in the next Annual Radiological Effluent Release Report in accordance with Technical Specification 3.11.1.4.

Response: From January 1, 1999 to December 31, 1999, there was no radioactive material stored in any temporary outdoor tank that exceeded the limits of TS 3.11.1.4.

Appendix F

Radwaste Treatment Systems

Requirement: Technical Specification 6.14.1.a requires that licensee initiated changes to the Radwaste Treatment Systems (liquid, gaseous and solid) be submitted to the Commission in the Annual Radioactive Effluent Release Report for the period in which the change was made.

Response: During 1999, there were no changes to the Radwaste Treatment Systems (liquid, gaseous and solid).

Appendix G

Unplanned Releases

Requirement: Technical Specification 6.8.1.4 requires a list and description of unplanned releases from the site to UNRESTRICTED AREAS of radioactive materials in gaseous and liquid effluents made during the reporting period.

Response: A review of the January 1, 1999 to December 31, 1999 time period indicated there were no unplanned, unanticipated or abnormal releases from the site to unrestricted areas of radioactive materials of gaseous or liquid effluents.

Joint Frequency Distributions of Wind Speed, Wind Direction and Atmospheric Stability

SEABROOK JAN99-DEC99 MET DATA JOINT FREQUENCY DISTRIBUTION (210-FOOT TOWER)

43.0 FT WIND DATA   STABILITY CLASS A   CLASS FREQUENCY (PERCENT) = 2.30

WIND DIRECTION FROM

SPEED MPH	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2
(1)	.00	.00	.50	.50	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	1.01
(2)	.00	.00	.01	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.02
4-7	0	1	0	0	5	1	10	3	0	2	1	0	0	0	0	0	0	23
(1)	.00	.50	.00	.00	2.51	.50	5.03	1.51	.00	1.01	.50	.00	.00	.00	.00	.00	.00	11.56
(2)	.00	.01	.00	.00	.06	.01	.12	.03	.00	.02	.01	.00	.00	.00	.00	.00	.00	.27
8-12	0	1	0	0	24	14	67	7	1	7	4	3	5	5	0	1	0	139
(1)	.00	.50	.00	.00	12.06	7.04	33.67	3.52	.50	3.52	2.01	1.51	2.51	2.51	.00	.50	.00	69.85
(2)	.00	.01	.00	.00	.28	.16	.77	.08	.01	.08	.05	.03	.06	.06	.00	.01	.00	1.61
13-18	0	0	0	2	3	1	1	3	0	2	9	6	1	3	4	0	0	35
(1)	.00	.00	.00	1.01	1.51	.50	.50	1.51	.00	1.01	4.52	3.02	.50	1.51	2.01	.00	.00	17.59
(2)	.00	.00	.00	.02	.03	.01	.01	.03	.00	.02	.10	.07	.01	.03	.05	.00	.00	.40
19-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	0	2	1	3	32	16	78	13	1	11	14	9	6	8	4	1	0	199
(1)	.00	1.01	.50	1.51	16.08	8.04	39.20	6.53	.50	5.53	7.04	4.52	3.02	4.02	2.01	.50	.00	100.00
(2)	.00	.02	.01	.03	.37	.18	.90	.15	.01	.13	.16	.10	.07	.09	.05	.01	.00	2.30

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
 C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

SEABROOK JAN99-DEC99 MET DATA JOINT FREQUENCY DISTRIBUTION (210-FOOT TOWER)

43.0 FT WIND DATA   STABILITY CLASS B   CLASS FREQUENCY (PERCENT) =   2.50

WIND DIRECTION FROM

SPEED MPH	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
(1)	.00	.00	.00	.00	.00	.00	.00	.93	.00	.00	.00	.00	.00	.00	.00	.00	.00	.93
(2)	.00	.00	.00	.00	.00	.00	.00	.02	.00	.00	.00	.00	.00	.00	.00	.00	.00	.02
4-7	1	0	0	0	5	3	10	2	0	5	2	2	5	0	0	0	0	35
(1)	.46	.00	.00	.00	2.31	1.39	4.63	.93	.00	2.31	.93	.93	2.31	.00	.00	.00	.00	16.20
(2)	.01	.00	.00	.00	.06	.03	.12	.02	.00	.06	.02	.02	.06	.00	.00	.00	.00	.40
8-12	4	2	0	10	18	7	30	6	2	2	6	9	5	16	9	2	0	128
(1)	1.85	.93	.00	4.63	8.33	3.24	13.89	2.78	.93	.93	2.78	4.17	2.31	7.41	4.17	.93	.00	59.26
(2)	.05	.02	.00	.12	.21	.08	.35	.07	.02	.02	.07	.10	.06	.18	.10	.02	.00	1.48
13-18	0	0	3	2	0	0	1	0	2	1	5	0	4	11	14	1	0	44
(1)	.00	.00	1.39	.93	.00	.00	.46	.00	.93	.46	2.31	.00	1.85	5.09	6.48	.46	.00	20.37
(2)	.00	.00	.03	.02	.00	.00	.01	.00	.02	.01	.06	.00	.05	.13	.16	.01	.00	.51
19-24	0	0	1	0	0	0	0	0	0	1	0	0	1	1	2	1	0	7
(1)	.00	.00	.46	.00	.00	.00	.00	.00	.00	.46	.00	.00	.46	.46	.93	.46	.00	3.24
(2)	.00	.00	.01	.00	.00	.00	.00	.00	.00	.01	.00	.00	.01	.01	.02	.01	.00	.08
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	5	2	4	12	23	10	41	10	4	9	13	11	15	28	25	4	0	216
(1)	2.31	.93	1.85	5.56	10.65	4.63	18.98	4.63	1.85	4.17	6.02	5.09	6.94	12.96	11.57	1.85	.00	100.00
(2)	.06	.02	.05	.14	.27	.12	.47	.12	.05	.10	.15	.13	.17	.32	.29	.05	.00	2.50

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
 C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

SEABROOK JAN99-DEC99 MET DATA JOINT FREQUENCY DISTRIBUTION (210-FOOT TOWER)

43.0 FT WIND DATA   STABILITY CLASS C   CLASS FREQUENCY (PERCENT) =   5.43

WIND DIRECTION FROM

SPEED MPH	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	0	0	2	0	1	0	2	0	0	0	0	0	1	0	0	0	0	6
(1)	.00	.00	.43	.00	.21	.00	.43	.00	.00	.00	.00	.00	.21	.00	.00	.00	.00	1.28
(2)	.00	.00	.02	.00	.01	.00	.02	.00	.00	.00	.00	.00	.01	.00	.00	.00	.00	.07
4-7	2	4	3	2	12	7	25	7	1	5	5	11	6	13	8	8	0	119
(1)	.43	.85	.64	.43	2.55	1.49	5.32	1.49	.21	1.06	1.06	2.34	1.28	2.77	1.70	1.70	.00	25.32
(2)	.02	.05	.03	.02	.14	.08	.29	.08	.01	.06	.06	.13	.07	.15	.09	.09	.00	1.38
8-12	13	0	6	18	24	20	29	6	2	14	20	18	22	43	17	11	0	263
(1)	2.77	.00	1.28	3.83	5.11	4.26	6.17	1.28	.43	2.98	4.26	3.83	4.68	9.15	3.62	2.34	.00	55.96
(2)	.15	.00	.07	.21	.28	.23	.34	.07	.02	.16	.23	.21	.25	.50	.20	.13	.00	3.04
13-18	1	1	5	0	2	2	0	0	0	1	4	6	13	16	26	1	0	78
(1)	.21	.21	1.06	.00	.43	.43	.00	.00	.00	.21	.85	1.28	2.77	3.40	5.53	.21	.00	16.60
(2)	.01	.01	.06	.00	.02	.02	.00	.00	.00	.01	.05	.07	.15	.18	.30	.01	.00	.90
19-24	0	0	0	0	0	0	0	0	1	0	0	0	0	1	2	0	0	4
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.21	.00	.00	.00	.00	.21	.43	.00	.00	.85
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.01	.00	.00	.00	.00	.01	.02	.00	.00	.05
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	16	5	16	20	39	29	56	13	4	20	29	35	42	73	53	20	0	470
(1)	3.40	1.06	3.40	4.26	8.30	6.17	11.91	2.77	.85	4.26	6.17	7.45	8.94	15.53	11.28	4.26	.00	100.00
(2)	.18	.06	.18	.23	.45	.34	.65	.15	.05	.23	.34	.40	.49	.84	.61	.23	.00	5.43

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
 C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

SEABROOK JAN99-DEC99 MET DATA JOINT FREQUENCY DISTRIBUTION (210-FOOT TOWER)

43.0 FT WIND DATA   STABILITY CLASS D   CLASS FREQUENCY (PERCENT) = 42.34

WIND DIRECTION FROM

SPEED MPH	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
(1)	.00	.00	.03	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.03
(2)	.00	.00	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
C-3	15	11	17	30	14	2	12	10	13	14	6	8	27	28	15	11	0	233
(1)	.41	.30	.46	.82	.38	.05	.33	.27	.35	.38	.16	.22	.74	.76	.41	.30	.00	6.36
(2)	.17	.13	.20	.35	.16	.02	.14	.12	.15	.16	.07	.09	.31	.32	.17	.13	.00	2.69
4-7	80	32	42	86	120	59	103	84	71	59	43	73	115	115	110	62	0	1254
(1)	2.18	.87	1.15	2.35	3.28	1.61	2.81	2.29	1.94	1.61	1.17	1.99	3.14	3.14	3.00	1.69	.00	34.22
(2)	.92	.37	.49	.99	1.39	.68	1.19	.97	.82	.68	.50	.84	1.33	1.33	1.27	.72	.00	14.49
8-12	111	51	72	62	108	54	39	55	45	78	97	107	144	254	203	59	0	1539
(1)	3.03	1.39	1.97	1.69	2.95	1.47	1.06	1.50	1.23	2.13	2.65	2.92	3.93	6.93	5.54	1.61	.00	42.00
(2)	1.28	.59	.83	.72	1.25	.62	.45	.64	.52	.90	1.12	1.24	1.66	2.94	2.35	.68	.00	17.79
13-18	6	0	56	17	18	2	1	3	1	21	49	32	44	151	134	16	0	551
(1)	.16	.00	1.53	.46	.49	.05	.03	.08	.03	.57	1.34	.87	1.20	4.12	3.66	.44	.00	15.04
(2)	.07	.00	.65	.20	.21	.02	.01	.03	.01	.24	.57	.37	.51	1.75	1.55	.18	.00	6.37
19-24	0	0	5	2	2	6	3	0	3	4	1	0	3	32	16	0	0	77
(1)	.00	.00	.14	.05	.05	.16	.08	.00	.08	.11	.03	.00	.08	.87	.44	.00	.00	2.10
(2)	.00	.00	.06	.02	.02	.07	.03	.00	.03	.05	.01	.00	.03	.37	.18	.00	.00	.89
GT 24	0	0	5	0	0	1	0	0	0	0	0	0	0	.2	1	0	0	9
(1)	.00	.00	.14	.00	.00	.03	.00	.00	.00	.00	.00	.00	.00	.05	.03	.00	.00	.25
(2)	.00	.00	.06	.00	.00	.01	.00	.00	.00	.00	.00	.00	.00	.02	.01	.00	.00	.10
ALL SPEEDS	212	94	198	197	262	124	158	152	133	176	196	220	333	582	479	148	0	3664
(1)	5.79	2.57	5.40	5.38	7.15	3.38	4.31	4.15	3.63	4.80	5.35	6.00	9.09	15.88	13.07	4.04	.00	100.00
(2)	2.45	1.09	2.29	2.28	3.03	1.43	1.83	1.76	1.54	2.03	2.27	2.54	3.85	6.73	5.54	1.71	.00	42.34

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
 C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

SEABROOK JAN99-DEC99 MET DATA JOINT FREQUENCY DISTRIBUTION (210-FOOT TOWER)

43.0 FT WIND DATA   STABILITY CLASS E   CLASS FREQUENCY (PERCENT) = 31.18

WIND DIRECTION FROM

SPEED MPH	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	2	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	5
(1)	.00	.07	.00	.00	.00	.00	.04	.04	.00	.00	.00	.04	.00	.00	.00	.00	.00	.19
(2)	.00	.02	.00	.00	.00	.00	.01	.01	.00	.00	.00	.01	.00	.00	.00	.00	.00	.06
C-3	19	20	26	39	25	13	17	17	26	38	44	35	48	59	49	31	0	506
(1)	.70	.74	.96	1.45	.93	.48	.63	.63	.96	1.41	1.63	1.30	1.78	2.19	1.82	1.15	.00	18.75
(2)	.22	.23	.30	.45	.29	.15	.20	.20	.30	.44	.51	.40	.55	.68	.57	.36	.00	5.85
4-7	34	17	25	27	44	27	54	59	84	111	127	253	174	204	141	48	0	1429
(1)	1.26	.63	.93	1.00	1.63	1.00	2.00	2.19	3.11	4.11	4.71	9.38	6.45	7.56	5.23	1.78	.00	52.97
(2)	.39	.20	.29	.31	.51	.31	.62	.68	.97	1.28	1.47	2.92	2.01	2.36	1.63	.55	.00	16.51
8-12	5	5	6	11	21	17	22	22	9	49	113	146	58	115	46	6	0	651
(1)	.19	.19	.22	.41	.78	.63	.82	.82	.33	1.82	4.19	5.41	2.15	4.26	1.70	.22	.00	24.13
(2)	.06	.06	.07	.13	.24	.20	.25	.25	.10	.57	1.31	1.69	.67	1.33	.53	.07	.00	7.52
13-18	1	1	2	6	5	2	4	8	1	6	9	7	1	27	4	7	0	91
(1)	.04	.04	.07	.22	.19	.07	.15	.30	.04	.22	.33	.26	.04	1.00	.15	.26	.00	3.37
(2)	.01	.01	.02	.07	.06	.02	.05	.09	.01	.07	.10	.08	.01	.31	.05	.08	.00	1.05
19-24	0	0	2	6	2	3	0	0	0	0	0	0	0	0	1	0	0	14
(1)	.00	.00	.07	.22	.07	.11	.00	.00	.00	.00	.00	.00	.00	.00	.04	.00	.00	.52
(2)	.00	.00	.02	.07	.02	.03	.00	.00	.00	.00	.00	.00	.00	.00	.01	.00	.00	.16
GT 24	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
(1)	.00	.00	.04	.00	.00	.04	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.07
(2)	.00	.00	.01	.00	.00	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.02
ALL SPEEDS	59	45	62	89	97	63	98	107	120	204	293	442	281	405	241	92	0	2698
(1)	2.19	1.67	2.30	3.30	3.60	2.34	3.63	3.97	4.45	7.56	10.86	16.38	10.42	15.01	8.93	3.41	.00	100.00
(2)	.68	.52	.72	1.03	1.12	.73	1.13	1.24	1.39	2.36	3.39	5.11	3.25	4.68	2.79	1.06	.00	31.18

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
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 C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

SEABROOK JAN99-DEC99 MET DATA JOINT FREQUENCY DISTRIBUTION (210-FOOT TOWER)

43.0 FT WIND DATA   STABILITY CLASS F   CLASS FREQUENCY (PERCENT) = 8.49

WIND DIRECTION FROM

SPEED MPH	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	4
(1)	.14	.00	.00	.00	.00	.00	.00	.00	.00	.00	.14	.00	.00	.14	.00	.14	.00	.54
(2)	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.00	.00	.01	.00	.01	.00	.05
C-3	20	8	7	18	13	5	9	6	14	27	52	55	75	64	52	18	0	443
(1)	2.72	1.09	.95	2.45	1.77	.68	1.22	.82	1.90	3.67	7.07	7.48	10.20	8.71	7.07	2.45	.00	60.27
(2)	.23	.09	.08	.21	.15	.06	.10	.07	.16	.31	.60	.64	.87	.74	.60	.21	.00	5.12
4-7	2	2	2	7	5	3	3	3	6	20	23	44	38	58	59	7	0	282
(1)	.27	.27	.27	.95	.68	.41	.41	.41	.82	2.72	3.13	5.99	5.17	7.89	8.03	.95	.00	38.37
(2)	.02	.02	.02	.08	.06	.03	.03	.03	.07	.23	.27	.51	.44	.67	.68	.08	.00	3.26
8-12	0	0	0	2	0	0	0	0	1	0	0	2	1	0	0	0	0	6
(1)	.00	.00	.00	.27	.00	.00	.00	.00	.14	.00	.00	.27	.14	.00	.00	.00	.00	.82
(2)	.00	.00	.00	.02	.00	.00	.00	.00	.01	.00	.00	.02	.01	.00	.00	.00	.00	.07
13-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
19-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	23	10	9	27	18	8	12	9	21	47	76	101	114	123	111	26	0	735
(1)	3.13	1.36	1.22	3.67	2.45	1.09	1.63	1.22	2.86	6.39	10.34	13.74	15.51	16.73	15.10	3.54	.00	100.00
(2)	.27	.12	.10	.31	.21	.09	.14	.10	.24	.54	.88	1.17	1.32	1.42	1.28	.30	.00	8.49

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SEABROOK JAN99-DEC99 MET DATA JOINT FREQUENCY DISTRIBUTION (210-FOOT TOWER)

43.0 FT WIND DATA   STABILITY CLASS G   CLASS FREQUENCY (PERCENT) =   7.75

WIND DIRECTION FROM

SPEED MPH	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	1	0	1	0	0	0	0	0	1	1	0	3	1	2	0	3	0	13
(1)	.15	.00	.15	.00	.00	.00	.00	.00	.15	.15	.00	.45	.15	.30	.00	.45	.00	1.94
(2)	.01	.00	.01	.00	.00	.00	.00	.00	.01	.01	.00	.03	.01	.02	.00	.03	.00	.15
C-3	7	10	7	8	5	1	5	1	5	7	50	70	157	152	43	18	0	546
(1)	1.04	1.49	1.04	1.19	.75	.15	.75	.15	.75	1.04	7.45	10.43	23.40	22.65	6.41	2.68	.00	81.37
(2)	.08	.12	.08	.09	.06	.01	.06	.01	.06	.08	.58	.81	1.81	1.76	.50	.21	.00	6.31
4-7	1	0	0	0	1	0	0	0	0	0	8	15	20	44	23	0	0	112
(1)	.15	.00	.00	.00	.15	.00	.00	.00	.00	.00	1.19	2.24	2.98	6.56	3.43	.00	.00	16.69
(2)	.01	.00	.00	.00	.01	.00	.00	.00	.00	.00	.09	.17	.23	.51	.27	.00	.00	1.29
8-12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
13-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
19-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	9	10	8	8	6	1	5	1	6	8	58	88	178	198	66	21	0	671
(1)	1.34	1.49	1.19	1.19	.89	.15	.75	.15	.89	1.19	8.64	13.11	26.53	29.51	9.84	3.13	.00	100.00
(2)	.10	.12	.09	.09	.07	.01	.06	.01	.07	.09	.67	1.02	2.06	2.29	.76	.24	.00	7.75

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
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 C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

SEABROOK JAN99-DEC99 MET DATA JOINT FREQUENCY DISTRIBUTION (210-FOOT TOWER)

43.0 FT WIND DATA   STABILITY CLASS ALL   CLASS FREQUENCY (PERCENT) = 100.00

WIND DIRECTION FROM

SPEED MPH	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	2	2	2	0	0	0	1	1	1	1	1	4	1	3	0	4	0	23
(1)	.02	.02	.02	.00	.00	.00	.01	.01	.01	.01	.01	.05	.01	.03	.00	.05	.00	.27
(2)	.02	.02	.02	.00	.00	.00	.01	.01	.01	.01	.01	.05	.01	.03	.00	.05	.00	.27
C-3	61	49	60	96	58	21	45	36	58	86	152	168	308	303	159	78	0	1738
(1)	.70	.57	.69	1.11	.67	.24	.52	.42	.67	.99	1.76	1.94	3.56	3.50	1.84	.90	.00	20.09
(2)	.70	.57	.69	1.11	.67	.24	.52	.42	.67	.99	1.76	1.94	3.56	3.50	1.84	.90	.00	20.09
4-7	120	56	72	122	192	100	205	158	162	202	209	398	358	434	341	125	0	3254
(1)	1.39	.65	.83	1.41	2.22	1.16	2.37	1.83	1.87	2.33	2.42	4.60	4.14	5.02	3.94	1.44	.00	37.61
(2)	1.39	.65	.83	1.41	2.22	1.16	2.37	1.83	1.87	2.33	2.42	4.60	4.14	5.02	3.94	1.44	.00	37.61
8-12	133	59	84	103	195	112	187	96	60	150	240	285	235	433	275	79	0	2726
(1)	1.54	.68	.97	1.19	2.25	1.29	2.16	1.11	.69	1.73	2.77	3.29	2.72	5.00	3.18	.91	.00	31.50
(2)	1.54	.68	.97	1.19	2.25	1.29	2.16	1.11	.69	1.73	2.77	3.29	2.72	5.00	3.18	.91	.00	31.50
13-18	8	2	66	27	28	7	7	14	4	31	76	51	63	208	182	25	0	799
(1)	.09	.02	.76	.31	.32	.08	.08	.16	.05	.36	.88	.59	.73	2.40	2.10	.29	.00	9.23
(2)	.09	.02	.76	.31	.32	.08	.08	.16	.05	.36	.88	.59	.73	2.40	2.10	.29	.00	9.23
19-24	0	0	8	8	4	9	3	0	4	5	1	0	4	34	21	1	0	102
(1)	.00	.00	.09	.09	.05	.10	.03	.00	.05	.06	.01	.00	.05	.39	.24	.01	.00	1.18
(2)	.00	.00	.09	.09	.05	.10	.03	.00	.05	.06	.01	.00	.05	.39	.24	.01	.00	1.18
GT 24	0	0	6	0	0	2	0	0	0	0	0	0	0	2	1	0	0	11
(1)	.00	.00	.07	.00	.00	.02	.00	.00	.00	.00	.00	.00	.00	.02	.01	.00	.00	.13
(2)	.00	.00	.07	.00	.00	.02	.00	.00	.00	.00	.00	.00	.00	.02	.01	.00	.00	.13
ALL SPEEDS	324	168	298	356	477	251	448	305	289	475	679	906	969	1417	979	312	0	8653
(1)	3.74	1.94	3.44	4.11	5.51	2.90	5.18	3.52	3.34	5.49	7.85	10.47	11.20	16.38	11.31	3.61	.00	100.00
(2)	3.74	1.94	3.44	4.11	5.51	2.90	5.18	3.52	3.34	5.49	7.85	10.47	11.20	16.38	11.31	3.61	.00	100.00

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
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C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

SEABROOK JAN99-DEC99 MET DATA JOINT FREQUENCY DISTRIBUTION (210-FOOT TOWER)

209.0 FT WIND DATA   STABILITY CLASS A   CLASS FREQUENCY (PERCENT) = 2.31

WIND DIRECTION FROM

SPEED MPH	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	0	0	1	0 •	0	1	0	0	0	0	0	0	0	0	0	0	0	2
(1)	.00	.00	.50	.00	.00	.50	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	1.01
(2)	.00	.00	.01	.00	.00	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.02
4-7	0	0	0	0	2	2	0	1	0	1	2	0	0	0	0	0	0	8
(1)	.00	.00	.00	.00	1.01	1.01	.00	.50	.00	.50	1.01	.00	.00	.00	.00	.00	.00	4.02
(2)	.00	.00	.00	.00	.02	.02	.00	.01	.00	.01	.02	.00	.00	.00	.00	.00	.00	.09
8-12	0	1	0	0	12	14	38	8	0	4	1	2	2	3	0	0	0	85
(1)	.00	.50	.00	.00	6.03	7.04	19.10	4.02	.00	2.01	.50	1.01	1.01	1.51	.00	.00	.00	42.71
(2)	.00	.01	.00	.00	.14	.16	.44	.09	.00	.05	.01	.02	.02	.03	.00	.00	.00	.99
13-18	0	1	0	2	3	3	29	22	2	3	7	2	3	3	0	2	0	82
(1)	.00	.50	.00	1.01	1.51	1.51	14.57	11.06	1.01	1.51	3.52	1.01	1.51	1.51	.00	1.01	.00	41.21
(2)	.00	.01	.00	.02	.03	.03	.34	.26	.02	.03	.08	.02	.03	.03	.00	.02	.00	.95
19-24	0	0	0	0	0	0	1	2	0	1	8	3	1	2	3	0	0	21
(1)	.00	.00	.00	.00	.00	.00	.50	1.01	.00	.50	4.02	1.51	.50	1.01	1.51	.00	.00	10.55
(2)	.00	.00	.00	.00	.00	.00	.01	.02	.00	.01	.09	.03	.01	.02	.03	.00	.00	.24
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.50	.00	.00	.00	.50
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.00	.00	.00	.01
ALL SPEEDS	0	2	1	2	17	20	68	33	2	9	18	7	6	9	3	2	0	199
(1)	.00	1.01	.50	1.01	8.54	10.05	34.17	16.58	1.01	4.52	9.05	3.52	3.02	4.52	1.51	1.01	.00	100.00
(2)	.00	.02	.01	.02	.20	.23	.79	.38	.02	.10	.21	.08	.07	.10	.03	.02	.00	2.31

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

SEABROOK JAN99-DEC99 MET DATA JOINT FREQUENCY DISTRIBUTION (210-FOOT TOWER)

209.0 FT WIND DATA   STABILITY CLASS B   CLASS FREQUENCY (PERCENT) =   2.51

WIND DIRECTION FROM

SPEED MPH	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00.	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4-7	0	0	0	1	2	2	2	3	2	0	2	0	0	0	1	0	0	0	13
(1)	.00	.00	.00	.46	.93	.93	1.39	.93	.00	.93	.00	.00	.00	.46	.00	.00	.00	6.02
(2)	.00	.00	.00	.01	.02	.02	.03	.02	.00	.02	.00	.00	.00	.01	.00	.00	.00	.15
8-12	1	1	0	6	16	9	24	6	0	2	4	4	4	9	1	1	0	88
(1)	.46	.46	.00	2.78	7.41	4.17	11.11	2.78	.00	.93	1.85	1.85	1.85	4.17	.46	.46	.00	40.74
(2)	.01	.01	.00	.07	.19	.10	.28	.07	.00	.02	.05	.05	.05	.10	.01	.01	.00	1.02
13-18	4	2	1	2	0	0	8	14	2	2	3	9	6	12	12	2	0	79
(1)	1.85	.93	.46	.93	.00	.00	3.70	6.48	.93	.93	1.39	4.17	2.78	5.56	5.56	.93	.00	36.57
(2)	.05	.02	.01	.02	.00	.00	.09	.16	.02	.02	.03	.10	.07	.14	.14	.02	.00	.92
19-24	0	0	2	2	0	0	0	0	2	1	2	0	3	2	11	1	0	26
(1)	.00	.00	.93	.93	.00	.00	.00	.00	.93	.46	.93	.00	1.39	.93	5.09	.46	.00	12.04
(2)	.00	.00	.02	.02	.00	.00	.00	.00	.02	.01	.02	.00	.03	.02	.13	.01	.00	.30
GT 24	0	0	0	0	0	0	0	0	0	0	1	0	1	5	2	1	0	10
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.46	.00	.46	2.31	.93	.46	.00	4.63
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.00	.01	.06	.02	.01	.00	.12
ALL SPEEDS	5	3	3	11	18	11	35	22	4	7	10	13	14	29	26	5	0	216
(1)	2.31	1.39	1.39	5.09	8.33	5.09	16.20	10.19	1.85	3.24	4.63	6.02	6.48	13.43	12.04	2.31	.00	100.00
(2)	.06	.03	.03	.13	.21	.13	.41	.26	.05	.08	.12	.15	.16	.34	.30	.06	.00	2.51

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
 C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

SEABROOK JAN99-DEC99 MET DATA JOINT FREQUENCY DISTRIBUTION (210-FOOT TOWER)

209.0 FT WIND DATA   STABILITY CLASS C   CLASS FREQUENCY (PERCENT) =   5.42

WIND DIRECTION FROM

SPEED MPH	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	0	0	1	0	1	2	1	0	0	0	1	0	0	0	1	0	0	7
(1)	.00	.00	.21	.00	.21	.43	.21	.00	.00	.00	.21	.00	.00	.00	.21	.00	.00	1.50
(2)	.00	.00	.01	.00	.01	.02	.01	.00	.00	.00	.01	.00	.00	.00	.01	.00	.00	.08
4-7	5	1	5	2	4	5	7	2	2	0	4	1	1	2	8	3	0	52
(1)	1.07	.21	1.07	.43	.86	1.07	1.50	.43	.43	.00	.86	.21	.21	.43	1.71	.64	.00	11.13
(2)	.06	.01	.06	.02	.05	.06	.08	.02	.02	.00	.05	.01	.01	.02	.09	.03	.00	.60
8-12	5	1	1	13	18	19	32	20	1	8	15	11	14	26	7	8	0	199
(1)	1.07	.21	.21	2.78	3.85	4.07	6.85	4.28	.21	1.71	3.21	2.36	3.00	5.57	1.50	1.71	.00	42.61
(2)	.06	.01	.01	.15	.21	.22	.37	.23	.01	.09	.17	.13	.16	.30	.08	.09	.00	2.31
13-18	12	2	6	3	5	6	8	11	0	4	12	14	14	35	28	1	0	161
(1)	2.57	.43	1.28	.64	1.07	1.28	1.71	2.36	.00	.86	2.57	3.00	3.00	7.49	6.00	.21	.00	34.48
(2)	.14	.02	.07	.03	.06	.07	.09	.13	.00	.05	.14	.16	.16	.41	.33	.01	.00	1.87
19-24	1	1	1	0	0	0	0	1	0	0	2	1	8	9	14	4	0	42
(1)	.21	.21	.21	.00	.00	.00	.00	.21	.00	.00	.43	.21	1.71	1.93	3.00	.86	.00	8.99
(2)	.01	.01	.01	.00	.00	.00	.00	.01	.00	.00	.02	.01	.09	.10	.16	.05	.00	.49
GT 24	0	0	0	0	0	0	0	0	1	0	0	1	2	1	1	0	0	6
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.21	.00	.00	.21	.43	.21	.21	.00	.00	1.28
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.01	.00	.00	.01	.02	.01	.01	.00	.00	.07
ALL SPEEDS	23	5	14	18	28	32	48	34	4	12	34	28	39	73	59	16	0	467
(1)	4.93	1.07	3.00	3.85	6.00	6.85	10.28	7.28	.86	2.57	7.28	6.00	8.35	15.63	12.63	3.43	.00	100.00
(2)	.27	.06	.16	.21	.33	.37	.56	.39	.05	.14	.39	.33	.45	.85	.69	.19	.00	5.42

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 C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

SEABROOK JAN99-DEC99 MET DATA JOINT FREQUENCY DISTRIBUTION (210-FOOT TOWER)

209.0 FT WIND DATA   STABILITY CLASS D   CLASS FREQUENCY (PERCENT) = 42.32

WIND DIRECTION FROM

SPEED MPH	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	3
(1)	.00	.00	.00	.03	.05	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.08
(2)	.00	.00	.00	.01	.02	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.03
C-3	2	9	11	16	12	9	6	4	12	4	1	4	3	8	4	11	0	116
(1)	.05	.25	.30	.44	.33	.25	.16	.11	.33	.11	.03	.11	.08	.22	.11	.30	.00	3.18
(2)	.02	.10	.13	.19	.14	.10	.07	.05	.14	.05	.01	.05	.03	.09	.05	.13	.00	1.35
4-7	31	20	26	49	65	51	61	43	33	21	22	25	44	35	39	44	0	609
(1)	.85	.55	.71	1.35	1.78	1.40	1.67	1.18	.91	.58	.60	.69	1.21	.96	1.07	1.21	.00	16.72
(2)	.36	.23	.30	.57	.76	.59	.71	.50	.38	.24	.26	.29	.51	.41	.45	.51	.00	7.07
8-12	88	33	44	57	75	70	88	72	72	75	59	59	92	146	131	55	0	1216
(1)	2.42	.91	1.21	1.56	2.06	1.92	2.42	1.98	1.98	2.06	1.62	1.62	2.53	4.01	3.60	1.51	.00	33.38
(2)	1.02	.38	.51	.66	.87	.81	1.02	.84	.84	.87	.69	.69	1.07	1.70	1.52	.64	.00	14.12
13-18	107	59	68	20	24	11	14	44	35	49	99	84	121	178	206	42	0	1161
(1)	2.94	1.62	1.87	.66	.66	.30	.38	1.21	.96	1.35	2.72	2.31	3.32	4.89	5.65	1.15	.00	31.87
(2)	1.24	.69	.79	.23	.28	.13	.16	.51	.41	.57	1.15	.98	1.41	2.07	2.39	.49	.00	13.49
19-24	14	9	31	8	9	2	4	8	1	13	33	18	52	91	110	18	0	421
(1)	.38	.25	.85	.22	.25	.05	.11	.22	.03	.36	.91	.49	1.43	2.50	3.02	.49	.00	11.56
(2)	.16	.10	.36	.09	.10	.02	.05	.09	.01	.15	.38	.21	.60	1.06	1.28	.21	.00	4.89
GT 24	0	0	7	3	3	7	3	3	3	4	5	1	9	49	20	0	0	117
(1)	.00	.00	.19	.08	.08	.19	.08	.08	.08	.11	.14	.03	.25	1.35	.55	.00	.00	3.21
(2)	.00	.00	.08	.03	.03	.08	.03	.03	.03	.05	.06	.01	.10	.57	.23	.00	.00	1.36
ALL SPEEDS	242	130	187	154	190	150	176	174	156	166	219	191	321	507	510	170	0	3643
(1)	6.64	3.57	5.13	4.23	5.22	4.12	4.83	4.78	4.28	4.56	6.01	5.24	8.81	13.92	14.00	4.67	.00	100.00
(2)	2.81	1.51	2.17	1.79	2.21	1.74	2.04	2.02	1.81	1.93	2.54	2.22	3.73	5.89	5.92	1.97	.00	42.32

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SEABROOK JAN99-DEC99 MET DATA JOINT FREQUENCY DISTRIBUTION (210-FOOT TOWER)

209.0 FT WIND DATA   STABILITY CLASS E   CLASS FREQUENCY (PERCENT) = 31.25

WIND DIRECTION FROM

SPEED MPH	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	2	3	1	0	0	0	0	0	0	0	1	0	0	7
(1)	.00	.00	.00	.00	.07	.11	.04	.00	.00	.00	.00	.00	.00	.00	.04	.00	.00	.26
(2)	.00	.00	.00	.00	.02	.03	.01	.00	.00	.00	.00	.00	.00	.00	.01	.00	.00	.08
C-3	5	4	5	16	13	11	6	9	3	5	6	4	5	4	4	2	0	102
(1)	.19	.15	.19	.59	.48	.41	.22	.33	.11	.19	.22	.15	.19	.15	.15	.07	.00	3.79
(2)	.06	.05	.06	.19	.15	.13	.07	.10	.03	.06	.07	.05	.06	.05	.05	.02	.00	1.18
4-7	17	18	22	21	16	31	42	24	26	28	22	14	22	24	29	18	0	374
(1)	.63	.67	.82	.78	.59	1.15	1.56	.89	.97	1.04	.82	.52	.82	.89	1.08	.67	.00	13.90
(2)	.20	.21	.26	.24	.19	.36	.49	.28	.30	.33	.26	.16	.26	.28	.34	.21	.00	4.34
8-12	49	37	9	18	19	11	25	67	81	119	133	119	97	146	131	70	0	1131
(1)	1.82	1.38	.33	.67	.71	.41	.93	2.49	3.01	4.42	4.94	4.42	3.61	5.43	4.87	2.60	.00	42.04
(2)	.57	.43	.10	.21	.22	.13	.29	.78	.94	1.38	1.54	1.38	1.13	1.70	1.52	.81	.00	13.14
13-18	18	8	10	2	10	10	14	25	24	68	136	209	114	166	91	21	0	926
(1)	.67	.30	.37	.07	.37	.37	.52	.93	.89	2.53	5.06	7.77	4.24	6.17	3.38	.78	.00	34.42
(2)	.21	.09	.12	.02	.12	.12	.16	.29	.28	.79	1.58	2.43	1.32	1.93	1.06	.24	.00	10.76
19-24	1	2	0	3	6	3	7	14	0	7	11	9	8	28	9	6	0	114
(1)	.04	.07	.00	.11	.22	.11	.26	.52	.00	.26	.41	.33	.30	1.04	.33	;22	.00	4.24
(2)	.01	.02	.00	.03	.07	.03	.08	.16	.00	.08	.13	.10	.09	.33	.10	.07	.00	1.32
GT 24	0	0	3	7	5	5	2	7	0	0	0	0	0	6	1	0	0	36
(1)	.00	.00	.11	.26	.19	.19	.07	.26	.00	.00	.00	.00	.00	.22	.04	.00	.00	1.34
(2)	.00	.00	.03	.08	.06	.06	.02	.08	.00	.00	.00	.00	.00	.07	.01	.00	.00	.42
ALL SPEEDS	90	69	49	67	71	74	97	146	134	227	308	355	246	374	266	117	0	2690
(1)	3.35	2.57	1.82	2.49	2.64	2.75	3.61	5.43	4.98	8.44	11.45	13.20	9.14	13.90	9.89	4.35	.00	100.00
(2)	1.05	.80	.57	.78	.82	.86	1.13	1.70	1.56	2.64	3.58	4.12	2.86	4.34	3.09	1.36	.00	31.25

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 C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

SEABROOK JAN99-DEC99 MET DATA JOINT FREQUENCY DISTRIBUTION (210-FOOT TOWER)

209.0 FT WIND DATA   STABILITY CLASS ALL   CLASS FREQUENCY (PERCENT) = 100.00

WIND DIRECTION FROM

SPEED MPH	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	1	0	1	3	4	4	1	1	0	0	1	0	0	0	1	2	0	19
(1)	.01	.00	.01	.03	.05	.05	.01	.01	.00	.00	.01	.00	.00	.00	.01	.02	.00	.22
(2)	.01	.00	.01	.03	.05	.05	.01	.01	.00	.00	.01	.00	.00	.00	.01	.02	.00	.22
C-3	14	20	23	37	35	35	30	24	24	17	16	13	11	18	13	22	0	352
(1)	.16	.23	.27	.43	.41	.41	.35	.28	.28	.20	.19	.15	.13	.21	.15	.26	.00	4.09
(2)	.16	.23	.27	.43	.41	.41	.35	.28	.28	.20	.19	.15	.13	.21	.15	.26	.00	4.09
4-7	74	48	68	83	99	102	130	104	99	92	104	80	104	84	98	91	0	1460
(1)	.86	.56	.79	.96	1.15	1.18	1.51	1.21	1.15	1.07	1.21	.93	1.21	.98	1.14	1.06	.00	16.96
(2)	.86	.56	.79	.96	1.15	1.18	1.51	1.21	1.15	1.07	1.21	.93	1.21	.98	1.14	1.06	.00	16.96
8-12	186	101	67	98	151	124	209	187	211	269	289	251	279	399	355	199	0	3375
(1)	2.16	1.17	.78	1.14	1.75	1.44	2.43	2.17	2.45	3.12	3.36	2.92	3.24	4.63	4.12	2.31	.00	39.20
(2)	2.16	1.17	.78	1.14	1.75	1.44	2.43	2.17	2.45	3.12	3.36	2.92	3.24	4.63	4.12	2.31	.00	39.20
13-18	146	74	85	30	44	31	73	121	68	139	274	347	277	427	373	96	0	2605
(1)	1.70	.86	.99	.35	.51	.36	.85	1.41	.79	1.61	3.18	4.03	3.22	4.96	4.33	1.12	.00	30.26
(2)	1.70	.86	.99	.35	.51	.36	.85	1.41	.79	1.61	3.18	4.03	3.22	4.96	4.33	1.12	.00	30.26
19-24	16	12	34	13	15	5	12	25	3	23	56	31	75	132	147	29	0	628
(1)	.19	.14	.39	.15	.17	.06	.14	.29	.03	.27	.65	.36	.87	1.53	1.71	.34	.00	7.29
(2)	.19	.14	.39	.15	.17	.06	.14	.29	.03	.27	.65	.36	.87	1.53	1.71	.34	.00	7.29
GT 24	0	0	10	10	8	12	5	10	4	4	6	2	12	62	24	1	0	170
(1)	.00	.00	.12	.12	.09	.14	.06	.12	.05	.05	.07	.02	.14	.72	.28	.01	.00	1.97
(2)	.00	.00	.12	.12	.09	.14	.06	.12	.05	.05	.07	.02	.14	.72	.28	.01	.00	1.97
ALL SPEEDS	437	255	288	274	356	313	460	472	409	544	746	724	758	1122	1011	440	0	8609
(1)	5.08	2.96	3.35	3.18	4.14	3.64	5.34	5.48	4.75	6.32	8.67	8.41	8.80	13.03	11.74	5.11	.00	100.00
(2)	5.08	2.96	3.35	3.18	4.14	3.64	5.34	5.48	4.75	6.32	8.67	8.41	8.80	13.03	11.74	5.11	.00	100.00

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
 C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

SEABROOK JAN99-DEC99 MET DATA JOINT FREQUENCY DISTRIBUTION (210-FOOT TOWER)

209.0 FT WIND DATA   STABILITY CLASS G   CLASS FREQUENCY (PERCENT) =   7.65

WIND DIRECTION FROM

SPEED MPH	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	1	0	0	1	0	1	0	0	0	0	1	0	0	0	0	2	0	6
(1)	.15	.00	.00	.15	.00	.15	.00	.00	.00	.00	.15	.00	.00	.00	.00	.30	.00	.91
(2)	.01	.00	.00	.01	.00	.01	.00	.00	.00	.00	.01	.00	.00	.00	.00	.02	.00	.07
C-3	4	4	0	2	6	8	11	5	4	5	6	4	2	1	2	7	0	71
(1)	.61	.61	.00	.30	.91	1.21	1.67	.76	.61	.76	.91	.61	.30	.15	.30	1.06	.00	10.77
(2)	.05	.05	.00	.02	.07	.09	.13	.06	.05	.06	.07	.05	.02	.01	.02	.08	.00	.82
4-7	14	5	9	8	2	2	8	14	17	23	30	27	29	15	14	12	0	229
(1)	2.12	.76	1.37	1.21	.30	.30	1.21	2.12	2.58	3.49	4.55	4.10	4.40	2.28	2.12	1.82	.00	34.75
(2)	.16	.06	.10	.09	.02	.02	.09	.16	.20	.27	.35	.31	.34	.17	.16	.14	.00	2.66
8-12	20	13	8	2	2	0	1	7	21	24	28	31	40	25	38	27	0	287
(1)	3.03	1.97	1.21	.30	.30	.00	.15	1.06	3.19	3.64	4.25	4.70	6.07	3.79	5.77	4.10	.00	43.55
(2)	.23	.15	.09	.02	.02	.00	.01	.08	.24	.28	.33	.36	.46	.29	.44	.31	.00	3.33
13-18	0	1	0	0	0	0	0	2	3	2	6	10	7	11	14	10	0	66
(1)	.00	.15	.00	.00	.00	.00	.00	.30	.46	.30	.91	1.52	1.06	1.67	2.12	1.52	.00	10.02
(2)	.00	.01	.00	.00	.00	.00	.00	.02	.03	.02	.07	.12	.08	.13	.16	.12	.00	.77
19-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	39	23	17	13	10	11	20	28	45	54	71	72	78	52	68	58	0	659
(1)	5.92	3.49	2.58	1.97	1.52	1.67	3.03	4.25	6.83	8.19	10.77	10.93	11.84	7.89	10.32	8.80	.00	100.00
(2)	.45	.27	.20	.15	.12	.13	.23	.33	.52	.63	.82	.84	.91	.60	.79	.67	.00	7.65

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
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 C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

SEABROOK JAN99-DEC99 MET DATA JOINT FREQUENCY DISTRIBUTION (210-FOOT TOWER)

209.0 FT WIND DATA   STABILITY CLASS F   CLASS FREQUENCY (PERCENT) =   8.54

WIND DIRECTION FROM

SPEED MPH	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	3
(1)	.00	.00	.14	.14	.00	.00	.00	.14	.00	.00	.00	.00	.00	.00	.00	.00	.00	.41
(2)	.00	.00	.01	.01	.00	.00	.00	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.03
C-3	3	3	5	3	3	4	6	6	5	3	2	1	1	5	2	2	0	54
(1)	.41	.41	.68	.41	.41	.54	.82	.82	.68	.41	.27	.14	.14	.68	.27	.27	.00	7.35
(2)	.03	.03	.06	.03	.03	.05	.07	.07	.06	.03	.02	.01	.01	.06	.02	.02	.00	.63
4-7	7	4	6	2	8	9	9	18	21	17	24	13	8	7	8	14	0	175
(1)	.95	.54	.82	.27	1.09	1.22	1.22	2.45	2.86	2.31	3.27	1.77	1.09	.95	1.09	1.90	.00	23.81
(2)	.08	.05	.07	.02	.09	.10	.10	.21	.24	.20	.28	.15	.09	.08	.09	.16	.00	2.03
8-12	23	15	5	2	9	1	1	7	36	37	49	25	30	44	47	38	0	369
(1)	3.13	2.04	.68	.27	1.22	.14	.14	.95	4.90	5.03	6.67	3.40	4.08	5.99	6.39	5.17	.00	50.20
(2)	.27	.17	.06	.02	.10	.01	.01	.08	.42	.43	.57	.29	.35	.51	.55	.44	.00	4.29
13-18	5	1	0	1	2	1	0	3	2	11	11	19	12	22	22	18	0	130
(1)	.68	.14	.00	.14	.27	.14	.00	.41	.27	1.50	1.50	2.59	1.63	2.99	2.99	2.45	.00	17.69
(2)	.06	.01	.00	.01	.02	.01	.00	.03	.02	.13	.13	.22	.14	.26	.26	.21	.00	1.51
19-24	0	0	0	0	0	0	0	0	0	1	0	0	3	0	0	0	0	4
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.14	.00	.00	.41	.00	.00	.00	.00	.54
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.00	.00	.03	.00	.00	.00	.00	.05
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	38	23	17	9	22	15	16	35	64	69	86	58	54	78	79	72	0	735
(1)	5.17	3.13	2.31	1.22	2.99	2.04	2.18	4.76	8.71	9.39	11.70	7.89	7.35	10.61	10.75	9.80	.00	100.00
(2)	.44	.27	.20	.10	.26	.17	.19	.41	.74	.80	1.00	.67	.63	.91	.92	.84	.00	8.54

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
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C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

Radiation Dose Assessment

Seabrook Station
Radiological Effluent Impact Assessment For 1999
(Annual Radioactive Effluent Release Report)

I.   <u>Summary</u>

Doses resulting from liquid and gaseous effluents from Seabrook Station during 1999 were calculated in accordance with Method II as defined in the Station Offsite Dose Calculation Manual (ODCM). The calculational methods used follow the models in Regulatory Guide 1.109. The calculations included maximum whole body doses and organ doses from all liquid releases, maximum offsite organ doses resulting from airborne iodines, tritium and particulate radionuclides, and maximum offsite beta air and gamma air doses from airborne noble gases. Doses were also calculated for the special receptor locations inside the site boundary: the Science and Nature Center and the "Rocks". In addition, the potential direct dose from plant operation was evaluated. Doses from effluent releases and direct shine during 1999 are summarized in Table A.

The calculated maximum annual total body dose and the maximum organ dose from liquid effluents each represent 0.03% of the annual dose limits established by Technical Specification 3.11.1.2 (3 mrem total body and 10 mrem organ). The calculated annual maximum dose from airborne iodine, tritium and particulate radionuclides for offsite receptor locations represents 0.09% of the dose limit established by Technical Specification 3.11.2.3 (15 mrem organ), whereas the calculated maximum annual beta air and gamma air doses from airborne noble gases for offsite receptor locations represent 0.0003% and 0.0006% of the dose limits established by Technical Specification 3.11.2.2 (20 mrad beta air and 10 mrad gamma air). For onsite special receptors, the calculated annual doses from airborne effluents for both the Science and Nature Center and the "Rocks" were also well below all Technical Specification dose limits.

The sum of the maximum whole body doses from all exposure pathways for the liquid and gaseous effluents, plus the direct whole body dose from station operation, was 1.50E-02 mrem to a hypothetical individual at or beyond the site boundary. This whole body dose

represents 0.06% of the annual whole body dose limit (25 mrem) for a member of the public as set forth in 40CFR190, and demonstrates compliance with that code. The maximum organ dose from all exposure pathways including direct dose was 1.71E-02 mrem. This represents 0.07% of the annual organ dose limit of 25 mrem to other organs, as set forth in EPA's environmental radiation standard for the uranium fuel cycle, 40CFR190.

II. Method for Calculating the Total Body and Maximum Organ Doses Resulting from Liquid Releases

The computer code IDLE, which is consistent with the models in Regulatory Guide 1.109 (Reference 1), was used to calculate the total body and organ doses resulting from liquid effluents from Seabrook Station. The general equations A-3, A-4, A-5, A-6 and A-7 from Regulatory Guide 1.109 are applied in IDLE. The total body doses and the organ doses are evaluated for each of the four age groups (i.e., infant, child, teen and adult) to determine the maximum total body dose and maximum organ dose via all existing exposure pathways (i.e., fish and aquatic invertebrate ingestion, and shoreline exposure) to an age-dependent individual. The values for the various factors considered in equations A-3 through A-7 have been taken from Regulatory Guide 1.109 and the Station Offsite Dose Calculation Manual (ODCM) (Reference 2). The specific values used for the usage factor (U_{ap}), mixing ratio (M_p), bioaccumulation factor (B_{ip}), dose factors (D_{aipj}), transit time (t_p), transfer constant from water to sediment (K_c), exposure time for sediment or soil (t_b), and shore width factor (W) are provided by the reference sources as summarized in Table B. The flow rate of the liquid effluent (F) and the radionuclide activities (Q_i) are measured specifically prior to each liquid release. The values for half lives for radionuclides (T_i) and their radioactive decay constants (λ_i) have been taken from Kocher (Reference 3).

The exposure pathways considered in the calculations of total body and maximum organ doses resulting from liquid discharges from Seabrook Station have been limited to ingestion of aquatic foods and exposure to shoreline deposits. The dose calculations do not include the ingestion of potable water and irrigated vegetation as potential exposure pathways because the liquid effluents from the plant are discharged into salt water.

Table A presents the calculated liquid pathway doses for each calendar quarter and also the total for the year.

III.   Method for Calculating the Gamma and Beta Air Doses from Noble Gases

The computer codes AIRAD and AEOLUS 2 were used for the calculation of both the gamma and beta air doses resulting from noble gases present in gaseous effluents released from Seabrook Station. The features and use of AEOLUS 2 for the calculation of atmospheric dispersion factors (i.e., Chi/Q factors) from recorded meteorological data (i.e., meteorological data measurements taken during the time of the release) are described in section B.7.3.2 of Seabrook's ODCM. Meteorological dispersion factors concurrent with periods of gas releases are calculated by AEOLUS 2 and used in the gamma and beta air dose calculations performed by AIRAD. AIRAD is consistent with the models presented in Regulatory Guide 1.109, general equations B-4 and B-5. The values for the dose factors, DF_i^γ and DF_i^β, have been taken from Table B-1 in Regulatory Guide 1.109.

Table A lists the calculated air doses for each calendar quarter, and the total for the year.

IV. Method for Calculating the Critical Organ Dose Resulting from Iodines, Tritium and Particulates with $T_{1/2}$ Greater than 8 Days in Gaseous Releases

The computer codes AEOLUS 2 and ATMODOS were used for the calculation of the organ doses resulting from iodines, tritium and particulates with half-lives greater than 8 days present in gaseous effluents released from Seabrook Station. The features and use of AEOLUS 2 for the calculation of atmospheric dispersion factors (i.e., Chi/Q factors) from recorded meteorological data (i.e., meteorological data measurements taken during the time of the release) are described in section B.7.3.2 of Seabrook's ODCM. Meteorological dispersion factors concurrent with periods of gas releases were calculated by AEOLUS 2 and used in the dose calculations by ATMODOS. ATMODOS calculates the organ doses (i.e., dose to bone, liver, kidney, lung, lower large intestine, total body, and skin) due to the presence of radionuclides other than noble gases in gaseous effluents, and is consistent with the models presented in Appendix C of Regulatory Guide 1.109. The pathways considered in the dose calculations are the ground plane, inhalation, and ingestion of stored vegetables, fresh garden vegetables, and milk. The critical organ dose is determined for the offsite location (e.g., site boundary, nearest resident or farm) of receptor pathways as identified in the most recent annual land use census. The total body dose contributions via the ground plane and inhalation pathways as calculated by ATMODOS have also been included in the total body dose estimates for the special receptor locations inside the site boundary. Regulatory Guide 1.109 equations C-1 through C-13 are applied in the ATMODOS calculation of the critical organ doses. The input data and assumptions are those provided in Appendix C of the Regulatory Guide, except where site-specific data and assumptions have been identified in Tables B.7-2 and B.7-3 of Seabrook's ODCM. These two ODCM tables provide the options for special conditions, depending on the type of receptor being evaluated at a specific location, that can be applied in Method II calculations. The receptor type controls the exposure pathways for calculational purposes. The receptor types used in the dose calculations were a resident receptor (which considered the ground plane, inhalation and vegetable ingestion exposure pathways), a milk receptor (which considered the ground plane, inhalation, vegetable and milk ingestion exposure pathways) and a boundary and radius receptor (both of which considered the ground plane and inhalation

exposure pathways). The resident and milk receptor locations for the various sector were based on the 1999 land use census data for Seabrook Station (Table D). The radius receptor locations were applied at several distances in the prevalent downwind sectors to insure that the location of the maximum doses were not overlooked.

Depletion of the plume during transport is considered by AEOLUS 2 in the calculations of atmospheric dispersion factors (e.g., calculation of $[X/Q]^D$). A shielding factor (S_F) of 0.7 is applied for residential structures. The source for the values of the various factors used in Regulatory Guide 1.109 dose equations C-1 through C-13 are summarized in Table C.

V.   References

1.   Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the
     Purposes of Evaluating Compliance with 10CFR Part 50, Appendix I, Reg. Guide 1.109,
     Rev 1, Oct. 1977.

2.   Station Offsite Dose Calculation Manual, Rev 19.

3.   Kocher, D.C., Dose-Rate Conversion Factors for Exposure to Photons and Electrons,
     Health Physics, Vol. 45, No. 3, Sept. 1983.

TABLE A
(Sheet 1)

Seabrook Station
1999 Annual Radioactive Effluent Release Report

Maximum[a] Off-Site Doses and Dose Commitments to Members of the Public

		Dose (mrem)[b]			
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Year[c]
Liquid Effluents:						
Total Body Dose		2.95E-04 (1)	4.03E-04 (1)	5.12E-05 (2)	2.25E-05 (1)	7.72E-04
Organ Dose		4.41E-04 (3)	2.07E-03 (3)	2.15E-04 (4)	9.21E-05 (4)	2.82E-03
Airborne Effluents:						
Organ Dose from Iodines, Tritium, and Particulates		3.28E-03 (5)	4.47E-03 (6)	3.43E-03 (7)	3.06E-03 (8)	1.42E-02
Noble Gases	Beta Air (mrad)	8.58E-06 (9)	3.27E-05 (10)	5.37E-06 (11)	1.07E-05 (9)	5.74E-05
	Gamma Air (mrad)	1.29E-05 (12)	1.79E-05 (13)	1.14E-05 (11)	1.81E-05 (9)	6.03E-05

Doses (mrem) at Receptor Locations Inside Site Boundary[d]:

Science and Nature Center (SW, 488m):

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Year
Beta Air Dose (mrad)	2.86E-09	1.83E-07	3.91E-09	1.50E-18	1.90E-07
Gamma Air Dose (mrad)	2.87E-09	3.53E-08	2.00E-08	5.25E-09	6.34E-08
Organ Dose (mrem)	1.11E-06 (15)	3.98E-06 (15)	1.44E-06 (16)	1.06E-06 (16)	7.59E-06

The "Rocks" (NE/ENE, 244m):

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Year
Beta Air Dose (mrad)	3.16E-06	1.09E-07	7.45E-08	1.46E-07	3.49E-06
Gamma Air Dose (mrad)	2.34E-06	1.66E-08	1.96E-07	1.15E-07	2.67E-06
Organ Dose (mrem)	1.32E-04 (16)	1.10E-04 (16)	1.21E-04 (16)	1.57E-04 (16)	5.20E-04

Direct Dose From Plant Operation[e]					0

TABLE A
(Sheet 2)

Seabrook Station
1999 Annual Radioactive Effluent Release Report

NOTES:

(a)   "Maximum means the largest fraction of corresponding 10CFR50, Appendix I, dose design objective.

(b)   The numbered footnotes indicate the age group, organ, and location (compass sector and distance from stack in meters) of the dose receptor, where appropriate.

        (1)   Adult
        (2)   Child
        (3)   GI-LLI of an adult
        (4)   Bone of a child
        (5)   Liver, kidney, lung, GI-LLI, thyroid, and whole body of a child, S 1210m
        (6)   Thyroid of a child, SW 1130m
        (7)   Liver, kidney, lung, GI-LLI, thyroid, and whole body of a child, W 1320m
        (8)   Liver, kidney, lung, GI-LLI, thyroid, and whole body of a child, NNW 1010m
        (9)   ESE 2276m
      (10)   SW 1022m
      (11)   W 974m
      (12)   ENE 2276m
      (13)   NW 914m
      (14)   Liver, kidney, lung, GI-LLI, thyroid, and whole body of a child, NW 1270m
      (15)   Lung of a teen
      (16)   Liver, kidney, lung, GI-LLI, thyroid, and whole body of a teen

(c)   "Maximum" dose for the year is the sum of the maximum doses for each quarter. This results in a conservative yearly dose estimate, but still well within the limits of 10CFR50.

(d)   For each special receptor location, the whole body and organ doses calculated for the airborne effluent releases were adjusted by the occupancy factor provided in Seabrook's ODCM (i.e., 0.0014 for the Science and Nature Center and 0.0076 for the "Rocks").

(e)   Only station sources are considered since there are no other facilities within five miles of Seabrook Station. 1999 data for the closest off-site environmental TLD locations in each sector (as listed in Table B.4-1 of Seabrook's ODCM) were compared to preoperation data from 1986-1988 for the same locations. No statistical difference which could be attributed to station sources was identified.

TABLE B
(Sheet 1)

Seabrook Station
1999 Annual Radioactive Effluent Release Report

Sources of the Values of Factors Used in Liquid Dose Equations

Factor	Definition	Source
U_{ap}	Usage factor	Table B.7-1, Station ODCM
M_p	Mixing ratio	Section B.7.1, Station ODCM (value=0.1 for aquatic foods and 0.025 for shoreline)
B_{ip}	Equilibrium bioaccumulation factor	Table A-1, Reg. Guide 1.109
D_{aipi}	Dose factor	Tables E-11 through E-14, R.G. 1.109
t_p	Nuclide transit time	Section B.7.1, Station ODCM
K_c	Transfer coefficient from water to sediment	Reg. Guide 1.109
t_b	Soil exposure time	Table B.7-2, Station ODCM
W	Shoreline width factor	Table A-2, Reg. Guide 1.109 (value=0.5)

TABLE C
(Sheet 1)

Seabrook Station
1999 Annual Radioactive Effluent Release Report

Sources of Values for the Factors Used in Dose Equations for Gaseous Releases

Factor	Definition	Source
t_b	Period of activity buildup in sediment or soil	Reg. Guide 1.109
λ_i	Nuclide decay constant	Kocher (Reference 3)
DFG_{ij}	Ground plane dose factor	Table E-6, Reg. Guide 1.109
$[X/Q]^D$	Atmospheric dispersion factor	Calculated by AEOLUS 2 (Mod 5)
R_a	Breathing rate	Table B.7-3, Station ODCM
DFA_{ija}	Inhalation dose factor	Tables E-7 through E-10, R.G.1.109
d_i	Nuclide deposition rate	Reg. Guide 1.109
P	Soil surface density	Table B.7-2, Station ODCM
t_e	Crop, leafy vegetable, or pasture grass exposure period	Table B.7-2, Station ODCM
t_h	Average time from crop harvest to consumption	Table B.7-2, Station ODCM
Y_v	Agricultural productivity by unit area	Table B.7-2, Station ODCM
r	Fraction of deposited activity retained on crops, leafy vegetables, or pasture grass	Table E-15, Reg. Guide 1.109
B_{iv}	Stable element transfer coefficient from soil to produce, leafy vegetable, or pasture grass	Table E-1, Reg. Guide 1.109
p	Fractional equilibrium ratio	Reg. Guide 1.109
H	Ambient absolute humidity	Table B.7-2, Station ODCM
F_m	Stable element transfer coefficient from feed to milk	Tables E-1 and E-2, R.G. 1.109
t_f	Average time from feed to milk to consumption	Reg. Guide 1.109
f_p	Fraction of the year that animals graze on pasture	Table B.7-2, Station ODCM
f_s	Fraction of animal daily feed that is pasture grass	Table B.7-2, Station ODCM
F_f	Stable element transfer coefficient from feed to meat	Table E-1, Reg. Guide 1.109
t_s	Average time from meat animal slaughter to consumption	Table E-15, Reg. Guide 1.109
DFI_{ija}	Ingestion dose factor	Tables E-11 through E-14, R.G.1.109

TABLE C
(Sheet 2)

Seabrook Station
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Factor	Definition	Source
U_a^v	Annual intake of produce	Table B.7-3, Station ODCM
U_a^m	Annual intake of milk	Table B.7-3, Station ODCM
U_a^F	Annual intake of meat	Table B.7-3, Station ODCM
U_a^L	Annual intake of leafy vegetables	Table B.7-3, Station ODCM
f_g	Ingestion rate fractions for garden produce	Reg. Guide 1.109
f_l	Ingestion rate fractions for garden leafy vegetables	Reg. Guide 1.109
λ_w	Rate constant for activity removal from plant and leaf surfaces by weathering	Table E-15, Reg. Guide 1.109
Q_F	Animal consumption rate	Table E-3, Reg. Guide 1.109

TABLE D
(Sheet 1)

Seabrook Station
1999 Annual Radioactive Effluent Release Report

Receptor Locations* for Seabrook Station

Sector	Nearest Resident mile (km)	Nearest Garden mile (km)	Milk Animals within 5 Mile Radius mile (km)
N	2.69 (4.34)	2.76 (4.44)	---
NNE	1.89 (3.04)	1.95 (3.14)	---
NE	1.82 (2.93)	2.25 (3.62)	---
ENE	1.44 (2.32)	---	---
E	1.60 (2.57)	---	---
ESE	1.70 (2.74)	---	---
SE	1.46 (2.35)	---	---
SSE	2.13 (3.43)	---	---
S	0.75 (1.21)	0.75 (1.21)	---
SSW	0.69 (1.11)	0.76 (1.22)	---
SW	0.70 (1.13)	1.09 (1.75)	3.26 (5.25)
WSW	1.02 (1.64)	1.02 (1.64)	---
W	0.82 (1.32)	0.83 (1.34)	---
WNW	0.69 (1.11)	0.85 (1.37)	2.95 (4.74) 3.79 (6.10) 4.73 (7.61)
NW	0.79 (1.27)	0.79 (1.27)	4.30 (6.93)
NNW	0.63 (1.01)	0.75 (1.21)	3.30 (5.32)

* Locations based on 1999 Land Use Census.