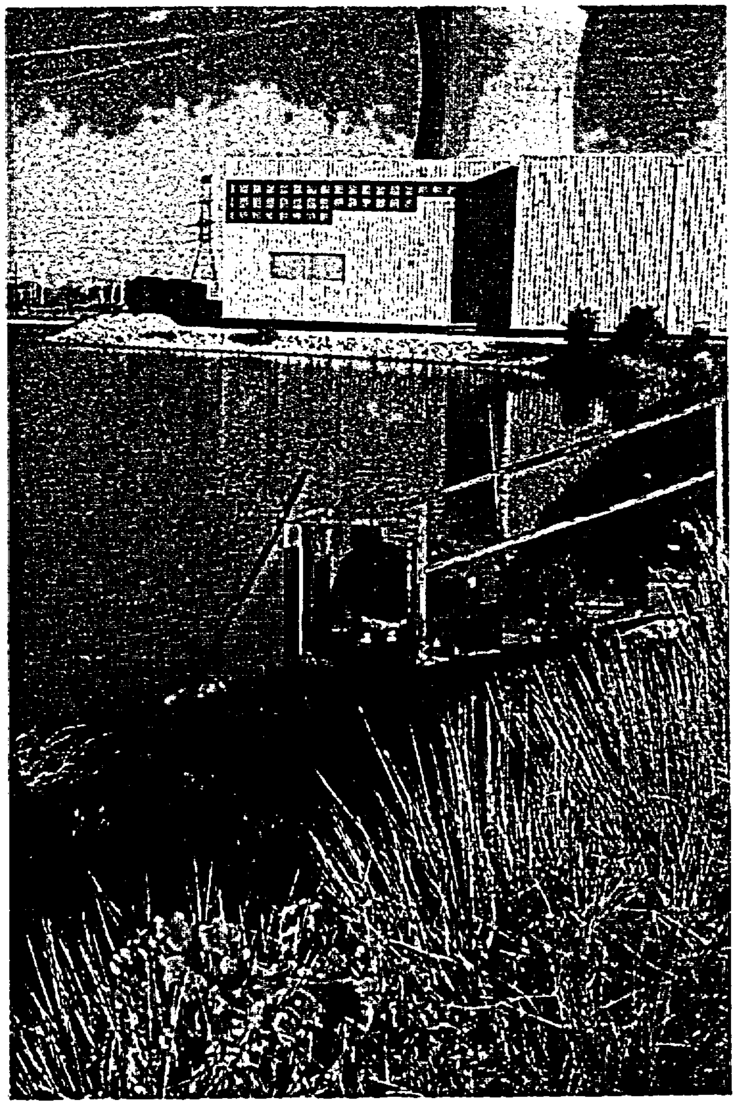


Radioactive Effluent Release Report

Radioactive Effluent Release Report January 1 through December 31, 2002

Protection Standards

Soon after the discovery of x-rays in 1895 by Wilhelm Roentgen, the potential hazards of ionizing radiation were recognized and efforts were made to establish radiation protection standards. The primary source of recommendations for radiation protection standards within the United States is the National Council on Radiation Protection and Measurement (NCRP). Many of these recommendations have been given legislative authority through publication in the Code of Federal Regulations (CFR) by the Nuclear Regulatory Commission (NRC).

The main objective in the control of radiation is to ensure that any dose is kept not only within regulatory limits, but As Low As Reasonably Achievable (ALARA). The ALARA principle applies to reducing radiation dose both to the individual working at Davis-Besse and to the general public. "Reasonably achievable" means that exposure reduction is based on sound economic decisions and operating practices. By practicing ALARA, Davis-Besse minimizes health risk and environmental detriment and ensures that doses are maintained well below regulatory limits.

Sources of Radioactivity Released

During the normal operation of a nuclear power station, most of the fission products are retained within the fuel and fuel cladding. However, small amounts of radioactive fission products and trace amounts of the component and structure surfaces, which have been activated, are present in the primary coolant water. The three types of radioactive material released are noble gases, iodine and particulates, and tritium.

The noble gas fission products in the primary coolant are given off as a gas when the coolant is depressurized. These gases are then collected by a system designed for gas collection and stored for radioactive decay prior to release.

Small releases of radioactivity in liquids may occur from valves, piping or equipment associated with the primary coolant system. These liquids are collected through a series of floor and equipment drains and sumps. All liquids of this nature are monitored and processed, if necessary, prior to release.

Noble Gas

Some of the fission products released in airborne effluents are radioactive isotopes of noble gases, such as xenon and krypton. Noble gases are biologically and chemically inert.

They do not concentrate in humans or other organisms. They contribute to human radiation dose by being an external source of radiation exposure to the body. Xenon-133 and xenon-135, with half-lives of approximately five days and nine hours, respectively, are the major radioactive noble gases released. They are readily dispersed in the atmosphere.

Iodine and Particulates

Annual releases of radioisotopes of iodine, and those particulates with half-lives greater than 8 days, in gaseous and liquid effluents are small. Factors such as their high chemical reactivity and solubility in water, combined with the high efficiency of gaseous and liquid processing systems, minimize their discharge. The predominant radioiodine released is iodine-131 with a half-life of approximately eight days. The main contribution of radioactive iodine to human dose is to the thyroid gland, where the body concentrates iodine.

The principal radioactive particulates released are fission products (e.g., cesium-134 and cesium-137) and activation products (e.g., cobalt-58 and cobalt-60). Radioactive cesium and cobalt contribute to internal radiation exposure of tissues such as the muscle, liver, and intestines. These particulates are also a source of external radiation exposure if deposited on the ground.

Tritium

Tritium, a radioactive isotope of hydrogen, is the predominant radionuclide in liquid effluents. It is also present in gaseous effluents. Tritium is produced in the reactor coolant as a result of neutron interaction with deuterium (also a hydrogen isotope) present in the water and with the boron in the primary coolant. When tritium, in the form of water or water vapor, is ingested or inhaled it is dispersed throughout the body until eliminated.

Processing and Monitoring

Effluents are strictly controlled to ensure radioactivity released to the environment is minimal and does not exceed regulatory limits. Effluent control includes the operation of monitoring systems, in-plant and environmental sampling and analyses programs, quality assurance programs for effluent and environmental programs, and procedures covering all aspects of effluent and environmental monitoring.

The radioactive waste treatment systems at Davis-Besse are designed to collect and process the liquid and gaseous wastes that contain radioactivity. For example, the Waste Gas Decay Tanks allow radioactivity in gases to decay prior to release via the station vent.

Radioactivity monitoring systems are used to ensure that all releases are below regulatory limits. These instruments provide a continuous indication of the radioactivity present. Each instrument is equipped with alarms and indicators in the control room. The alarm setpoints are low enough to ensure the limits will not be exceeded. If a monitor alarms, a release from a tank is automatically stopped.

All wastes are sampled prior to release and analyzed in a laboratory to identify the specific concentrations of radionuclides being released. Sampling and analysis provide a more sensitive and precise method of determining effluent composition than with monitoring instruments alone.

A meteorological tower is located in the southwest sector of the Station. It is linked to computers that record the meteorological data. Coupled with the effluent release data, the meteorological data are used to calculate the dose to the public.

Beyond the plant, devices maintained in conjunction with the Radiological Environmental Monitoring Program continuously sample the air in the surrounding environment. Frequent samples of other environmental media, such as water and vegetation, are also taken to determine if buildup of deposited radioactive material has occurred in the area.

Exposure Pathways

Radiological exposure pathways define the methods by which people may become exposed to radioactive material. The major pathways of concern are those which could cause the highest calculated radiation dose. These projected pathways are determined from the type and amount of radioactive material released, the environmental transport mechanism, and the use of the environment. The environmental transport mechanism includes consideration of physical factors, such as the hydrological (water) and meteorological (weather) characteristics of the area. An Annual average on the water flow, wind speed, and wind direction are used to evaluate how the radionuclides will be distributed in an area for gaseous or liquid releases. An important factor in evaluating the exposure pathways is the use of the environment. Many factors are considered such as dietary intake of residents, recreational use of the area, and the locations of homes and farms in the area.

The external and internal exposure pathways considered are shown in Figure 29. The release of radioactive gaseous effluents involves pathways such as external whole body exposure, deposition of radioactive material on plants, deposition on soil, inhalation by animals destined for human consumption, and inhalation by humans. The release of radioactive material in liquid effluents involves pathways such as drinking water, fish consumption, and direct exposure from the lake at the shoreline while swimming.

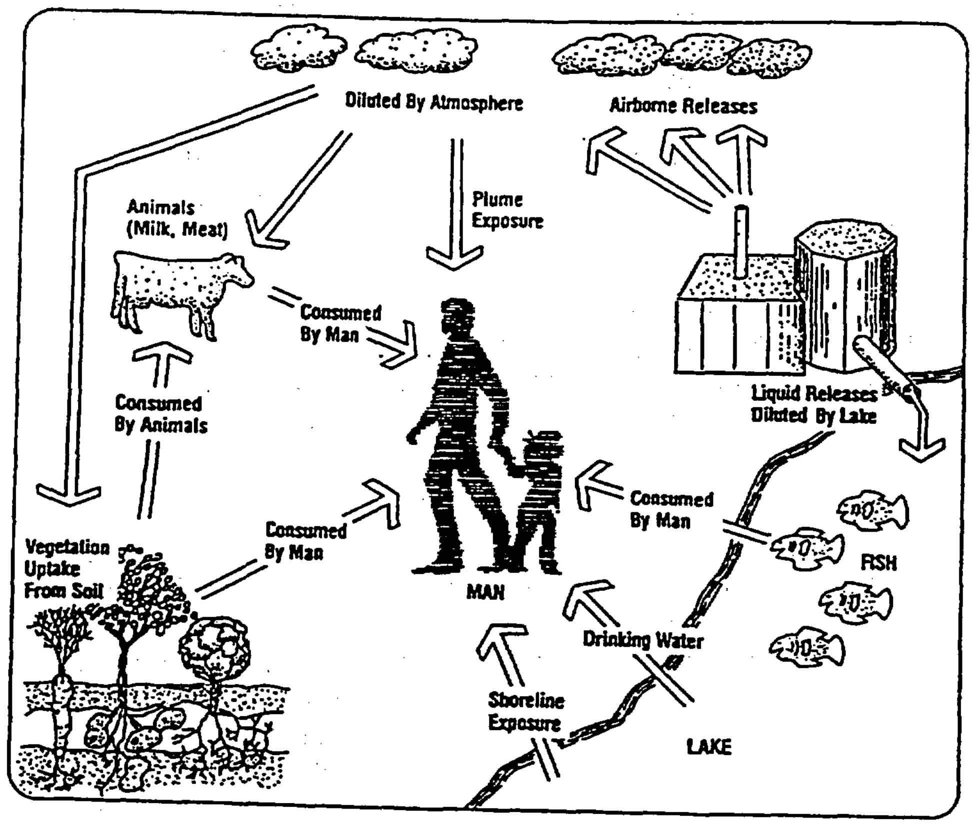


Figure 29: The exposure pathways shown here are monitored through the Radiological Environmental Monitoring Program (REMP) and are considered when calculating doses to the public.

Although radionuclides can reach humans by many different pathways, some result in more dose than others. The critical pathway is the exposure route that will provide, for a specific radionuclide, the greatest dose to a population, or to a specific group of the population called the critical group. The critical group may vary depending on the radionuclides involved, the age and diet of the group, or other cultural factors. The dose may be delivered to the whole body or to a specific organ. The organ receiving the greatest fraction of the dose is called the critical organ.

Dose Assessment

Dose is the energy deposited by radiation in an exposed individual. Whole body exposure to radiation involves the exposure of all organs. Most background exposures are of this form. Both non-radioactive and radioactive elements can enter the body through inhalation or ingestion. When they do, they are usually not distributed evenly. For example, iodine concentrates in the thyroid gland, cesium collects in muscle and liver tissue, and strontium collects in bone tissue.

The total dose to organs from a given radionuclide depends on the amount of radioactive material present in the organ and the amount of time that the radionuclide remains in the organ. Some radionuclides remain for very short times due to their rapid radioactive decay and/or elimination rate from the body, while other radionuclides may remain in the body for longer periods of time.

The dose to the general public in the area surrounding Davis-Besse is calculated for each liquid or gaseous release. The dose due to radioactive material released in gaseous effluents is calculated using factors such as the amount of radioactive material released, the concentration beyond the site boundary, the average weather conditions at the time of the release, the locations of exposure pathways (cow milk, goat milk, vegetable gardens and residences), and usage factors (inhalation, food consumption). The dose due to radioactive material released in liquid effluents is calculated using factors such as the total volume of liquid, the total volume of dilution water, near field dilution, and usage factors (water and fish consumption, shoreline and swimming factors). These calculations produce a conservative estimation of the dose.

Results

The Radioactive Effluent Release Report is a detailed listing of radioactivity released from the Davis-Besse Nuclear Power Station during the period from January 1, 2002 through December 31, 2002.

- Summation of the quantities of radioactive material released in gaseous and liquid effluents (Tables 17-21)
- Summation of the quantities of radioactive material contained in solid waste packaged and shipped for offsite disposal at federally approved sites (Table 22)
- A listing of all radioactive effluent monitoring instrumentation required by the Offsite Dose Calculation Manual, but which were inoperable for more than 30 days

During this reporting period, the estimated maximum individual offsite dose due to radioactivity released in effluent was:

Liquid Effluents:

- 1.00E-02 **mrem**, whole body
- 2.17E-01 **mrem**, gastro-intestinal/lower large intestine

Gaseous Effluents:

Noble Gas:

- 9.04E-06 **mrad**, whole body
- 5.99E-05 **mrad**, skin

Iodine - 131, Tritium, and Particulates with Half-lives greater than 8 Days:

- 5.70E-04 **mrem**, whole body
- 5.70E-04 **mrem**, lung

These doses are an extremely small fraction of the limits set by the NRC in the Davis-Besse ODCM.

Additional normal release pathways from the secondary system exist. For gaseous effluents, these pathways include the auxiliary feed pump turbine exhausts, the main steam safety valve system and the atmospheric vent valve system, steam packing exhaust and main feed water. For liquid effluents, the additional pathways include the Turbine Building drains via the settling basins. Releases via these pathways are included in the normal release tables in this report.

Regulatory Limits

Gaseous Effluents

In accordance with Offsite Dose Calculation Manual, dose rates due to radioactivity released in gaseous effluents from the site to areas at and beyond the site boundary shall be limited to the following:

Noble gases:

- Released at a rate equal to or less than 500 mrem TEDE per year. (Note: the total dose due to these releases is also limited to 50 mrem in any calendar year.)
- Released at a rate such that the total dose to the skin will be less than or equal to 3000 mrem in a year.

Iodine-131, tritium, and all radionuclides in particulate form with half-lives greater than 8 days:

- Released at a rate such that the total dose to any organ will be less than or equal to 1500 mrem in a year.

In accordance with 10CFR50, Appendix I, Sec. IIB. 1, air dose due to radioactivity released in gaseous effluents to areas at and beyond the site boundary shall be limited to the following:

- Less than or equal to 10 mrad total for gamma radiation and less than or equal to 20 mrad total for beta radiation in any calendar year.

In accordance with 10CFR50, Appendix I, Sec. IIC, dose to a member of the public from Iodine-131, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released to areas at and beyond the site boundary shall be limited to the following:

- Less than or equal to 15 total mrem to any organ in any calendar year.

Liquid Effluents

In accordance with 10CFR50, Appendix I, Sec IIA, the dose or dose commitment to a member of the public from radioactivity in liquid effluents released to unrestricted areas shall be limited to accumulated doses of:

- Less than or equal to 3 mrem to the total body and less than or equal to 10 mrem to any organ in any calendar year.

Effluent Concentration Limits

The Effluent Concentration Limits (ECs) for liquid and gaseous effluents at and beyond the site boundary are listed in 10CFR20, Appendix B, Table II, Column 2, with the most restrictive EC being used in all cases. For dissolved and entrained gases the EC of 2.0E-04 uCi/ml is applied. This EC is based on the Xe-135 DAC of 1E-05 uCi/ml of air (submersion dose) converted to an equivalent concentration in water as discussed in the International Commission on Radiological Protection (ICRP), Publication 2.

Average Energy

The Davis-Besse ODCM limits the dose equivalent rates due to the release of fission and activation products to less than or equal to 500 mrem per year to the total body and less than or equal to 3000 mrem per year to the skin. Therefore, the average beta and gamma energies (E) for gaseous effluents as described in Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants" are not applicable.

Measurements of Total Activity

Fission and Activation Gases:

These gases, excluding tritium, are collected in a marinelli beaker specially modified for gas sampling, steel flasks, or glass vials, and are counted on a germanium detector for principal gamma emitters. Radionuclides that are detected are quantified via gamma spectroscopy.

Tritium gas is collected using a bubbler apparatus and counted by liquid scintillation.

Iodine

Iodine is collected on a charcoal cartridge filter and counted on a germanium detector. Specific quantification of each iodine radionuclide is via gamma spectroscopy.

Particulates

Particulates are collected on filter paper and counted on a germanium detector. Specific quantification of each radionuclide present on the filter paper is via gamma spectroscopy.

Liquid Effluents

Liquid effluents are collected in a marinelli beaker and counted on a germanium detector. Quantification of each gamma-emitting radionuclide present in liquid samples is via gamma spectroscopy. Tritium in the liquid effluent is quantified by counting an aliquot of a composite sample in a liquid scintillation counting system.

Batch Releases

Liquid from 1/1/02 through 12/31/02

1. Number of batch releases: 48
2. Total time period for the batch releases: 104.7 hours
3. Maximum time period for a batch release: 300 minutes
4. Minimum time period for a batch release: 58 minutes
5. Average time period for a batch release: 124.8 minutes

Gaseous from 1/1/02 through 12/31/02

1. Number of batch releases: 7
2. Total time period for the batch releases: 67 hours
3. Maximum time period for a batch release: 1440 minutes
4. Minimum time period for a batch release: 33 minutes
5. Average time period for batch release: 802 minutes

Abnormal Releases

Total 2002 activity due to Abnormal Releases 0.0 E+00 Ci

Total 2002 Dose due to Abnormal Releases is 0.00E+00 mRem

Percent of ODCM Release Limits

The following table presents the ODCM annual dose limits and the associated offsite dose to the public, in percent of limits, for January 1, 2002 through December 31, 2002.

	SPECIFICATION	ANNUAL DOSE	LIMIT	PERCENT OF LIMIT
Report Period: January 1, 2002- December 31, 2002 (gaseous)				
	Noble gases (gamma)	9.04E-06 **mrad**	10 **mrad**	9.04E-05
	Noble gases (beta)	5.99E-05 **mrad**	20 **mrad**	3.00E-04
	I-131, tritium and particulates	5.70E-04 **mrem**	15 **mrem**	3.80E-03
Report Period: January 1, 2002 - December 31, 2002 (liquid)				
	Total body	1.00E-02 **mrem**	3 **mrem**	6.67E-01
	Organ	2.17E-01 **mrem**	10 **mrem**	2.17E+00

Sources of Input Data

- Water Usage: Survey of Water Treatment Plants (DSR-95-00347)
- 0-50 mile meat, milk, vegetable production, and population data was taken from 1982 Annual Environmental Operating Report entitled, "Evaluation of Compliance with Appendix I to 10CFR50: Updated Population, Agricultural, Meat - Animal, and Milk Production Data Tables for 1982". This evaluation was based on the 1980 Census, the Agricultural Ministry of Ontario 1980 report entitled "Agricultural Statistics and Livestock Marketing Account", the Agricultural Ministry of Ontario report entitled "Agricultural Statistics for Ontario, Publication 21, 1980", the Michigan Department of Agriculture report entitled "Michigan Agricultural Statistics, 1981", and the Ohio Crop Reporting Service report entitled "Ohio Agricultural Statistics, 1981".
- Gaseous and liquid source terms: Tables 17 through 21 of this report.
- Location of the nearest individuals and pathways by sector within 5 miles, see Land Use Census Section of the report.
- Population of the 50-mile Radius of Davis-Besse (DSR-95-00398).

Dose to Public Due to Activities Inside the Site Boundary

In accordance with ODCM Section 7.2, the Radioactive Effluent Release Report includes an assessment of radiation doses from radioactivity released in liquid and gaseous effluents to members of the public due to activities inside the site boundary.

In special instances, members of the public are permitted access to the Radiologically Restricted Area within the Davis-Besse Station. Tours for the public are conducted with the assurance that no individual will receive any appreciable dose due to radioactivity released in gaseous or liquid effluents (i.e., not more than a small fraction of the 40 CFR190 standards.)

The Wellness Center, Pavilion, Training Center pond and the forebay/canal area located inside DBNPS Owner Controlled Area are accessible to members of the public. The Pavilion is accessible to the public for social activities. The Training Center pond, forebay/canal area allows the member of the public to fish on site under a "catch-an-release" program; therefore the fish pathway is not considered applicable. Considering the frequency and duration of the visits, the resultant dose would be a small fraction of the calculated maximum site boundary dose. For purposes of assessing the dose to members of the public in accordance with ODCM Section 7.2, the following exposure assumptions are used:

- Exposure time for maximally-exposed visitors is 250 hours (1 hr/day, 5 day/ week, 50 wk/yr)
- Annual average meteorological dispersion (conservative, default use of maximum site boundary dispersion).
- For direct "shine" from the Independent Spent Fuel Storage Installation (ISFSI), default use of the maximum dose rate for a completed (full) ISFSI, and a distance of 950 feet.

The equations in the ODCM may be used for calculating the potential dose to a member of the public for activities inside the site boundary. Based on these assumptions, this dose would be at least a factor of 35 less than the maximum site boundary air dose, as calculated in the ODCM. Nowhere onsite are areas accessible to the public where exposure to liquid effluents could occur. Therefore, the modeling of the ODCM conservatively estimates the maximum potential dose to members of the public.

Inoperable Radioactive Effluent Monitoring Equipment

There were no radioactive effluent monitoring equipment required to be operable that was in operable for greater than 30 days during the reporting period.

Changes to the ODCM and PCP

There was one alteration to the OCDM, Revision 16.0. There were no changes to the Process Control Program (PCP) during this reporting period.

Borated Water Storage Tank Radionuclide Concentrations

During the Reporting Period of 2002, the BWST tank concentration did not exceed the ODCM Section 2.2.4 sum of the limiting fraction of nuclides. This is a unitless number between 0 and 1, and the BWST did not exceed the limit of 1.

Table 17

Gaseous Effluents - Summation of All Releases

Type	Unit	1st Qtr 2002	2nd Qtr 2002	3rd Qtr 2002	4th Qtr 2002	Est. Total % Error
Fission and Activation Gases						
Total Release	Ci	1.74E+02	0.00E+00	6.20E-02	0.00E+00	2.5E+01
Average Release Rate for Period	μCi/sec	2.21E+01	0.00E+00	7.86E-03	0.00E+00	
Percent of ODCM Limits	See Supplemental Information in ODCM Release Limits Section 3.3, Gaseous Effluent Setpoint Determination					
Iodines						
Total Iodines (I-131)	Ci	2.54E-03	1.30E-05	0.00E+00	0.00E+00	2.5E+01
Average Release Rate for Period	μCi/sec	3.22E-04	1.66E-06	0.00E+00	0.00E+00	
Percent of ODCM Limits	See Supplemental Information in ODCM Release Limits Section 3.3, Gaseous Effluent Setpoint Determination					
Particulates						
Particulates with half-lives greater than 8 days	Ci	6.31E-03	0.00E+00	0.00E+00	0.00E+00	2.5E+01
Average Release Rate for Period	μCi/sec	8.00E-04	0.00E+00	0.00E+00	0.00E+00	
Percent of ODCM Limits	See Supplemental Information in ODCM Release Limits Section 3.3, Gaseous Effluent Setpoint Determination					
Gross Alpha Activity	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.5E+01
Tritium						
Total Release	Ci	1.59E+01	2.66E+01	1.49E+01	1.18E+01	2.5E+01
Average Release Rate for Period	μCi/sec	2.02E+00	3.39E+00	1.85E+00	1.39E+00	
Percent of ODCM Limits	See Supplemental Information in ODCM Release Limits Section 3.3, Gaseous Effluent Setpoint Determination					

[a] The average release rate is taken over the entire quarter. It is NOT averaged over the time period of the releases.

Table 18

Gaseous Effluents - Ground Level Releases

Batch Mode[a]

Nuclide	Unit	1st Qtr 2002	2nd Qtr 2002	3rd Qtr 2002	4th Qtr 2002
Fission Gases	Ci				
Kr-85		LLD[b]	LLD[b]	LLD[b]	LLD[b]
Kr-85m		LLD	LLD	LLD	LLD
Kr-87		LLD	LLD	LLD	LLD
Kr-88		LLD	LLD	LLD	LLD
Xe-133		LLD	LLD	LLD	LLD
Xe-135		LLD	LLD	LLD	LLD
Xe-135m		LLD	LLD	LLD	LLD
Xe-138		LLD	LLD	LLD	LLD
Total for Period:		N/A	N/A	N/A	N/A
Iodines	Ci				
I-131		LLD	LLD	LLD	LLD
I-132		LLD	LLD	LLD	LLD
I-133		LLD	LLD	LLD	LLD
I-135		LLD	LLD	LLD	LLD
Total for Period:		N/A	N/A	N/A	N/A
Particulates and Tritium	Ci				
H-3		6.15E-03	LLD	LLD	LLD
Sr-89		LLD	LLD	LLD	LLD
Sr-90		LLD	LLD	LLD	LLD
Cs-134		LLD	LLD	LLD	LLD
Cs-137		LLD	LLD	LLD	LLD
Ba-140		LLD	LLD	LLD	LLD
Co-58		LLD	LLD	LLD	LLD
Total for Period:		6.15E-03	LLD	LLD	LLD

Table 18 (Continued)
Gaseous Effluents - Ground Level Releases
Continuous Mode[c]

Nuclide	Unit	1st Qtr 2002	2nd Qtr 2002	3rd Qtr 2002	4th Qtr 2002
Fission Gases	Ci				
Kr-85		LLD[b]	LLD[b]	LLD[b]	LLD
Kr-85m		LLD	LLD	LLD	LLD
Kr-87		LLD	LLD	LLD	LLD
Kr-88		LLD	LLD	LLD	LLD
Xe-133		LLD	LLD	LLD	LLD
Xe-135		LLD	LLD	LLD	LLD
Xe-135m		LLD	LLD	LLD	LLD
Xe-138		LLD	LLD	LLD	LLD
Total for Period:		N/A	N/A	N/A	N/A
Iodines	Ci				
I-131		LLD	LLD	LLD	LLD
I-133		LLD	LLD	LLD	LLD
I-135		LLD	LLD	LLD	LLD
Total for Period:		N/A	N/A	N/A	N/A
Particulates and Tritium	Ci				
H-3		8.46E-03	LLD	LLD	LLD
Sr-89		LLD	LLD	LLD	LLD
Sr-90		LLD	LLD	LLD	LLD
Cs-134		LLD	LLD	LLD	LLD
Cs-137		LLD	LLD	LLD	LLD
Ba-140		LLD	LLD	LLD	LLD
Total for Period:		8.46E-03	N/A	N/A	N/A

Table 18 (Continued)

Gaseous Effluents - Ground Level Releases

Continuous and Batch Mode

Ar-41:	<2.2E-08	μCi/ml
Kr-85:	<6.2E-06	μCi/ml
Kr-85m:	<2.0E-08	μCi/ml
Kr-87:	<3.4E-08	μCi/ml
Kr-88:	<4.0E-08	μCi/ml
Xe-131m:	<9.0E-08	μCi/ml
Xe-133:	<4.6E-08	μCi/ml
Xe-133m:	<1.6E-07	μCi/ml
Xe-135:	<1.9E-08	μCi/ml
Xe-135m:	<4.0E-07	μCi/ml
Xe-138:	<2.5E-07	μCi/ml
I-131:	<1.0E-07	μCi/ml
I-133:	<2.1E-08	μCi/ml
I-135:	<2.1E-08	μCi/ml
Mn-54	<2.0E-08	μCi/ml
Fe-59:	<4.0E-08	μCi/ml
Co-58:	<3.0E-08	μCi/ml
Co-60:	<2.0E-08	μCi/ml
Zn-65:	<4.0E-08	μCi/ml
Mo-99:	<2.0E-07	μCi/ml
Cs-134:	<2.1E-08	μCi/ml
Cs-137:	<3.0E-08	μCi/ml
Ce-141:	<3.0E-08	μCi/ml
Ce-144:	<1.2E-07	μCi/ml
Ba-140:	<7.0E-08	μCi/ml
La-140:	<3.0E-08	μCi/ml
Sr-89:	<5.0E-08	μCi/ml
Sr-90:	<6.0E-09	μCi/ml

a Auxiliary Feed Pump Turbine Exhaust, Main Steam Safety Valves, and Auxiliary Boiler Outage Release are listed as batch releases

b These radionuclides were not identified in concentrations above the lower limit of detection (LLD).

c Atmospheric Vent Valve weepage and Steam Packing Exhaust are continuous releases.

Table 19

Gaseous Effluents - Mixed Mode Releases

Batch Mode

Nuclide	Unit	1st Qtr 2002	2nd Qtr 2002	3rd Qtr 2002	4th Qtr 2002
Fission Gases					
Ar-41	Ci	LLD	LLD	LLD	LLD
Kr-85	Ci	8.71E+00	LLD	6.20E-02	LLD
Kr-85m	Ci	LLD	LLD	LLD	LLD
Kr-87	Ci	LLD	LLD	LLD	LLD
Kr-88	Ci	LLD	LLD	LLD	LLD
Xe-133	Ci	4.80E+01	LLD	LLD	LLD
Xe-133m	Ci	4.47E-01	LLD	LLD	LLD
Xe-135	Ci	4.03E-01	LLD	LLD	LLD
Xe-135m	Ci	LLD	LLD	LLD	LLD
Xe-138	Ci	LLD	LLD	LLD	LLD
Xe-131m	Ci	9.18E-01	LLD	LLD	LLD
Total for Period:		5.84E+01	N/A	6.20E-02	N/A
***Iodines**					
I-131	Ci	LLD	LLD	LLD	LLD
I-132	Ci	LLD	LLD	LLD	LLD
I-133	Ci	LLD	LLD	LLD	LLD
I-135	Ci	LLD	LLD	LLD	LLD
Total for Period:	Ci	N/A	N/A	N/A	N/A
***Particulates & Tritium**					
H-3	Ci	5.07E-01	LLD	2.15E-04	LLD
Total for Period:	Ci	5.07E-01	N/A	2.15E-04	N/A

* Release of iodines and particulates are quantified in Mixed Mode Releases, Continuous Mode (Unit Station Vent)

Table 19 (Continued)

Gaseous Effluents - Mixed Mode Releases

Continuous Mode

Nuclide	Unit	1st Qtr 2002	2nd Qtr 2002	3rd Qtr 2002	4th Qtr 2002
Fission Gases					
Ar-41	Ci	LLD	LLD	LLD	LLD
Kr-85	Ci	LLD	LLD	LLD	LLD
Kr-85m	Ci	LLD	LLD	LLD	LLD
Kr-87	Ci	LLD	LLD	LLD	LLD
Kr-88	Ci	LLD	LLD	LLD	LLD
Xe-133	Ci	1.09E+02	LLD	LLD	LLD
Xe-133m	Ci	LLD	LLD	LLD	LLD
Xe-135	Ci	7.42E+00	LLD	LLD	LLD
Xe-135m	Ci	LLD	LLD	LLD	LLD
Xe-138	Ci	LLD	LLD	LLD	LLD
Total for Period:		1.16E+02	N/A	N/A	N/A
Iodines					
I-131	Ci	2.54E-03	1.30E-05	LLD	LLD
I-133	Ci	3.56E-04	LLD	LLD	LLD
I-135	Ci	LLD	LLD	LLD	LLD
I-132	Ci	7.94E-04	LLD	LLD	LLD
Total for Period:		3.69E-03	1.30E-05	N/A	N/A
Particulates and Tritium					
H-3	Ci	1.54E+01	2.66E+01	1.46E+01	1.18E+01
Sr-89[b,c]	Ci	LLD	LLD	LLD	LLD
Sr-90[b,c]	Ci	LLD	LLD	LLD	LLD
Cs-134	Ci	LLD	LLD	LLD	LLD
Cs-137	Ci	LLD	LLD	LLD	LLD
Ba-140	Ci	LLD	LLD	LLD	LLD
Co-58	Ci	LLD	LLD	LLD	LLD
La-140	Ci	LLD	LLD	LLD	LLD
Co-60	Ci	LLD	LLD	LLD	LLD
Total for Period:		1.54E+01	2.66E+01	1.46E+01	1.18E+01

Table 19 (Continued)

Gaseous Effluents - Mixed Mode Releases

Continuous Mode[a]

Ar-41	<2.9E-08	μCi/ml
Kr-85	<3.3E-06	μCi/ml
Kr-85m	<1.3E-08	μCi/ml
Kr-87	<6.0E-08	μCi/ml
Kr-88	<6.0E-08	μCi/ml
Xe-131m	<4.4E-07	μCi/ml
Xe-133m	<7.2E-08	μCi/ml
Xe-135	<1.1E-08	μCi/ml
Xe-135m	<5.9E-06	μCi/ml
Xe-138	<2.0E-05	μCi/ml
I-135[c]	<3.9E-10	μCi/ml
Mn-54[c]	<2.6E-14	μCi/ml
Fe-59[c]	<3.0E-14	μCi/ml
Co-58[c]	<3.0E-14	μCi/ml
Co-60[c]	<2.5E-14	μCi/ml
Zn-65[c]	<1.0E-13	μCi/ml
Mo-99[c]	<1.8E-14	μCi/ml
Cs-134[c]	<1.6E-14	μCi/ml
Cs-137[c]	<1.3E-14	μCi/ml
Ce-141[c]	<1.2E-13	μCi/ml
Ce-144[c]	<1.2E-14	μCi/ml
Ba-140[c]	<4.0E-14	μCi/ml
La-140[c]	<1.0E-14	μCi/ml
Sr-89[b,c]	<9.3E-16	μCi/ml
Sr-90[b,c]	<3.1E-16	μCi/ml

Batch Mode[a]

Kr-87	<4.5E-06	μCi/ml
Kr-88	<6.6E-06	μCi/ml
Xe-135	<1.4E-05	μCi/ml
Xe-135m	<2.1E-06	μCi/ml
Xe-138	<2.8E-05	μCi/ml
Ar-41	<1.8E-06	μCi/ml
Kr-85	<1.2E-06	μCi/ml
Xe-133	<2.4E-06	μCi/ml
Xe-133m	<1.0E-05	μCi/ml

a These radionuclides were not identified in every quarter in concentrations above the lower limit of detection (LLD). The largest LLD value is listed.

b Quarterly composite sample for continuous mode.

c Analysis not required for batch release.

Table 20
Liquid Effluents - Summation of All Releases

Type	Unit	1st Qtr 2002	2nd Qtr 2002	3rd Qtr 2002	4th Qtr 2002	Est. Total % Error
Fission and Activation Products						
Total Release (without Tritium, Gases, Alpha)	Ci	1.66E-01	6.31E-03	4.74E-02	3.63E-03	2.0E+01
Average Diluted Concentration During Period[a]	μCi/ml	1.68E-08	9.30E-10	5.99E-09	6.17E-10	
Percent of ODCM Limits	%	See Supplement information in ODCM Release Limits Section				
Percent of 10CFR20 Limit	%	1.28E-01	7.43E-03	4.73E-02	8.09E-03	
Tritium						
Total Release	Ci	3.06E+02	5.85E+01	3.33E+00	1.61E+01	2.0E+01
Average Diluted Concentration During Period[a]	μCi/ml	3.09E-05	8.61E-06	4.20E-07	2.74E-06	
Percent of 10CFR20 Limit	%	3.09E+00	8.61E-01	4.20E-02	2.74E-01	
Dissolved and Entrained Gases						
Total Release	Ci	3.20E+00	7.28E-03	0.00E+00	5.87E-04	2.0E+01
Average Diluted Concentration During Period[a]	μCi/ml	3.23E-07	1.07E-09	0.00E+00	9.99E-11	
Percent of 10CFR20 Limit	%	1.62E-01	5.36E-04	0.00E+00	5.00E-05	
Gross Alpha						
Total Release	Ci	0.00E+00	0.00E+00	5.04E-04	2.1E-04	2.0E+01
Volume of Waste Released (prior to dilution)						
Batch	liter	1.03E+06	3.46E+05	2.31E+05	2.47E+05	2.0E+01
Continuous	liter	5.59E+07	1.28E+08	1.43E+08	5.35E+07	2.0E+01
Volume of Dilution Water						
Batch	liter	3.15E+08	8.92E+07	1.15E+08	6.81E+07	2.0E+01
Continuous	liter	9.47E+09	6.45E+09	7.52E+09	5.70E+09	2.0E+01
Total Volume of Water Released	liter	9.85E+09	6.66E+09	7.77E+09	5.82E+09	

[a] Tritium and alpha are found in both continuous and batch releases. Average diluted concentrations are based on total volume of water released during the quarter. Fission and Activation products and Dissolved and Entrained Gases are normally only detected in batch releases.

Table 21

Liquid Effluents - Nuclides Released

Batch Releases

Nuclide	Unit	1st Qtr 2002	2nd Qtr 2002	3rd Qtr 2002	4th Qtr 2002
Fission and Activation Products					
Co-58	Ci	1.13E-01	4.95E-03	3.06E-02	9.21E-04
Co-60	Ci	7.18E-03	1.91E-04	4.22E-03	2.80E-04
Ag-110m	Ci	1.11E-02	2.36E-04	1.59E-03	9.25E-04
Sb-125	Ci	6.64E-04	1.26E-04	6.45E-03	1.11E-04
Cs-134	Ci	1.97E-04	3.86E-05	7.92E-06	8.82E-06
Cs-137	Ci	3.84E-04	9.65E-05	1.20E-04	1.56E-04
Sr-89[a, b]	Ci	LLD	LLD	LLD	LLD
Sr-90[a, b]	Ci	LLD	LLD	LLD	LLD
Fe-55	Ci	8.30E-03	5.29E-04	2.88E-03	1.21E-03
Cr-51	Ci	7.26E-03	LLD	LLD	LLD
I-131	Ci	8.24E-04	LLD	LLD	LLD
I-132	Ci	LLD	LLD	LLD	LLD
I-133	Ci	9.07E-06	LLD	LLD	2.00E-05
Te-132	Ci	LLD	LLD	LLD	LLD
Tc-99m	Ci	8.27E-05	LLD	LLD	LLD
Sb-124	Ci	LLD	LLD	4.63E-06	LLD
Sn-113	Ci	1.26E-04	LLD	LLD	LLD
Ru-103	Ci	1.67E-03	3.53E-05	8.91E-05	LLD
Mn-54	Ci	2.36E-04	LLD	4.31E-05	LLD
Np-239	Ci	LLD	LLD	LLD	LLD
Co-57	Ci	3.60E-04	2.11E-05	2.11E-04	1.57E-05
Nb-95	Ci	7.75E-03	6.54E-05	4.74E-04	LLD
Zr-95	Ci	3.73E-03	2.65E-05	2.82E-04	LLD
Se-75	Ci	LLD	LLD	LLD	LLD
Fe-59	Ci	3.82E-04	LLD	LLD	LLD
Zn-65	Ci	LLD	LLD	LLD	LLD
Ce-144	Ci	7.56E-04	LLD	3.94E-04	LLD
Na-24	Ci	LLD	LLD	LLD	LLD
Zr-97	Ci	2.53E-05	7.73E-06	LLD	LLD
Ce-141	Ci	3.48E-04	LLD	2.06E-5	LLD
Nb-97	Ci	LLD	LLD	LLD	LLD
La-140	Ci	3.88E-04	LLD	LLD	LLD
Ba-140	Ci	LLD	LLD	LLD	LLD
Ru-106	Ci	9.59E-04	LLD	LLD	LLD
Ba-139	Ci	LLD	LLD	LLD	LLD
Mo-99	Ci	LLD	LLD	LLD	LLD
Total for Period:	Ci	1.66E-01	6.31E-03	4.74E-02	3.63E-03

Table 21 (continued)

Liquid Effluents - Nuclides Released

Batch Releases

Nuclide	Unit	1st Qtr 2002	2nd Qtr 2002	3rd Qtr 2002	4th Qtr 2002
Tritium	Ci	3.06E+02	5.85E+01	3.33E+00	1.61E+01
Dissolved and Entrained Gases					
Kr-85m	Ci	LLD[a]	LLD[a]	LLD[a]	LLD[a]
Kr-85	Ci	2.55E-02	6.99E-03	LLD	5.87E-04
Xe-131m	Ci	4.59E-02	2.18E-04	LLD	LLD
Xe-133	Ci	3.10E+00	7.23E-05	LLD	LLD
Xe-135	Ci	1.64E-03	LLD	LLD	LLD
Xe-133m	Ci	2.42E-02	LLD	LLD	LLD
I-135	Ci	LLD	LLD	LLD	LLD
Total for Period:	Ci	3.09E+02	5.85E+01	3.33E+00	1.61E+01

Table 21 (continued)

Liquid Effluents - Nuclides Released

Continuous Releases

Nuclide	Unit	1st Qtr 2002	2nd Qtr 2002	3rd Qtr 2002	4th Qtr 2002
Fission and Activation Products					
Cr-51	Ci	LLD[a]	LLD[a]	LLD[a]	LLD[a]
Fe-59	Ci	LLD	LLD	LLD	LLD
Co-58	Ci	LLD	LLD	LLD	LLD
Co-60	Ci	LLD	LLD	LLD	LLD
Zn-65	Ci	LLD	LLD	LLD	LLD
Sr-89[a,b]	Ci	LLD	LLD	LLD	LLD
Sr-90[a,b]	Ci	LLD	LLD	LLD	LLD
Nb-95	Ci	LLD	LLD	LLD	LLD
Zr-95	Ci	LLD	LLD	LLD	LLD
Mo-99	Ci	LLD	LLD	LLD	LLD
Tc-99m	Ci	LLD	LLD	LLD	LLD
I-131	Ci	LLD	LLD	LLD	LLD
Cs-134	Ci	LLD	LLD	LLD	LLD
Cs-137	Ci	LLD	LLD	LLD	LLD
Ba-140/La-140	Ci	LLD	LLD	LLD	LLD
Ce-141	Ci	LLD	LLD	LLD	LLD
Total for Period:		N/A	N/A	N/A	N/A
Tritium	Ci	2.24E-01	LLD	LLD	LLD
Dissolved and Entrained Gases					
Kr-85	Ci	LLD	LLD	LLD	LLD
Xe-131m	Ci	LLD	LLD	LLD	LLD
Xe-133	Ci	LLD	LLD	LLD	LLD
Xe-133m	Ci	LLD	LLD	LLD	LLD
Xe-135	Ci	LLD	LLD	LLD	LLD
Total for Period:	Ci	N/A	N/A	N/A	N/A

Table 21 (continued)

Liquid Effluents - Nuclides Released[a]

Na-24	<2.0E-08	μCi/ml	Sb-124	<1.0E-08	μCi/ml
Cr-51	<1.7E-07	μCi/ml	Sb-125	<1.7E-08	μCi/ml
Mn-54	<2.1E-08	μCi/ml	Te-132	<1.8E-08	μCi/ml
Fe-55[b]	<7.0E-07	μCi/ml	Ce-141	<3.0E-08	μCi/ml
Fe-59	<4.2E-08	μCi/ml	Ce-144	<1.7E-07	μCi/ml
Co-57	<1.6E-08	μCi/ml	Cs-134	<2.1E-08	μCi/ml
Co-58	<1.9E-08	μCi/ml	Ce-136	<2.8E-08	μCi/ml
Co-60	<2.5E-08	μCi/ml	Cs-137	<2.7E-08	μCi/ml
Zn-65	<5.2E-08	μCi/ml	Ba-140	<7.0E-08	μCi/ml
Se-75	<2.4E-08	μCi/ml	La-140	<3.0E-08	μCi/ml
Sr-89[b]	<3.0E-08	μCi/ml	Np-239	<1.2E-07	μCi/ml
Sr-90[b]	<8.0E-09	μCi/ml	I-131	<2.5E-08	μCi/ml
Zr-95	<4.0E-08	μCi/ml	I-132	<1.0E-08	μCi/ml
Zr-97	<2.5E-08	μCi/ml	I-133	<2.1E-08	μCi/ml
Nb-95	<2.1E-08	μCi/ml	I-135	<1.7E-07	μCi/ml
Mo-99	<1.6E-07	μCi/ml	Kr-85	<6.2E-06	μCi/ml
Tc-99m	<1.8E-08	μCi/ml	Xe-131	<7.7E-07	μCi/ml
Ru-103	<2.2E-08	μCi/ml	Xe-133	<4.6E-08	μCi/ml
Ag-110m	<2.5E-08	μCi/ml	Xe-133m	<1.6E-07	μCi/ml
Sn-113	<2.8E-08	μCi/ml	Xe-135	<1.9E-08	μCi/ml

[a] These radionuclides were not identified every quarter in concentrations above the lower limit of detection (LLD). The largest LLD value is used for each radionuclide. LLDs are applicable to both batch and continuous modes due to identical sample and analysis methods.

[b] Quarterly composite sample

Table 22

Solid Waste and Irradiated Fuel Shipments

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not irradiated fuel)

1. Type of Waste		Unit	12-month Period	Est. Total Error, %
a.	Spent resins, filter sludges,	m^3	3.41E+01	2.5E+01
	evaporator bottoms, etc.	Ci	2.4E+02	2.5E+01
b.	Dry compressible waste,	m^3	1.6E+03	2.5E+01
	contaminated equip., etc.	Ci	4.5E+00	2.5E+01
c.	Irradiated components,	m^3		
	control rods, etc.	Ci	N/A	N/A
d.	Others: dewatered primary	m^3	4.4E+00	2.5E+01
	system cartridge filters	Ci	1.3E+01	2.5E+01

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

	Type	Percent (%)	Est. Total Error, %
a. Spent Resins	Cs^{137}	4.94E+01	2.50E+01
	Ni^{63}	3.60E+01	2.50E+01
	Co^{60}	5.69E+00	2.50E+01
	Cs^{134}	3.15E+01	2.50E+01
	Fe^{55}	2.33E+00	2.50E+01
	Co^{58}	1.54E+00	2.50E+01
	C^{14}	1.25E+00	2.50E+01
	Sr^{90}	1.30E-01	2.50E+01
	H^3	1.30E-01	2.50E+01
b. Dry compressible waste, contaminated equipment, etc.	Fe^{55}	4.94E+01	2.50E+01
	Co^{60}	1.56E+01	2.50E+01
	Cs^{137}	7.35E+00	2.50E+01
	C^{14}	6.58E+00	2.50E+01
	Ni^{63}	5.83E+00	2.50E+01
	Co^{58}	5.27E+00	2.50E+01
	H^3	3.40E+00	2.50E+01
	Cs^{134}	2.02E+00	2.50E+01
c. None			
d. Cartridge filters	Fe^{55}	5.20E+01	2.50E+01
	Co^{60}	1.91E+01	2.50E+01
	Ni^{63}	1.18E+01	2.50E+01
	C^{14}	3.26E+00	2.50E+01
	Ag^{110m}	2.06E+00	2.50E+01
	H^3	1.37E+00	2.50E+01
	Cs^{137}	1.35E+00	2.50E+01

Table 22 (continued)
Solid Waste and Irradiated Fuel Shipments

3. Solid Waste Disposition

Number of Shipments:	3
Mode of Transportation:	Truck
Destination:	Barnwell, SC
Type of Container (Container Volume):	3 resin/filter media HIC
Volume shipped for processing	44 m^3
Volume disposed	44 m^3
Number of Shipments:	7
Mode of Transportation:	Truck
Destination:	GTS Duratek, Oak Ridge, TN for processing then disposal at Envirocare of Utah or Barnwell S.C.
Type of Container (Container Volume):	Metal boxes (36.3 m^3)
Volume shipped for processing	326.25m^3
Volume disposed	54.4 m^3
Number of Shipments:	4
Mode of Transportation:	Truck
Destination:	Alaron, Wampum, PA for processing then disposal at Envirocare of Utah
Type of Container (Container Volume):	Oversize boxes on lowboy trailers (73.405 m^3)
Volume shipped for processing	293.62m^3
Volume disposed	69.09 m^3
Number of Shipments:	1
Mode of Transportation:	Truck
Destination:	AERC, Oak Ridge Tenn. for processing then disposal at Envirocare of Utah
Type of Container (Container Volume):	Metal liners (4.82m^3)
Volume shipped for processing	19.28m^3
Volume disposed	16.85 m^3
Number of Shipments:	22
Mode of Transportation:	Truck
Destination:	AERC, Oak Ridge Tenn. for processing then disposal at Envirocare of Utah
Type of Container (Container Volume):	Metal boxes (36.3 m^3, 2.72 m^3, or 3.12 m^3)
Volume shipped for processing	1160 m^3
Volume disposed	193.33 m^3

Table 22 (continued)

Solid Waste and Irradiated Fuel Shipments

Number of Shipments:	4
Mode of Transportation:	Truck
Destination:	Studsvick Erwin, TN. for processing then disposal at Envirocare of Utah
Type of Container (Container Volume):	Metal liners ($5.72m^3$ or $3.75m^3$)
Volume shipped for processing	$18.94m^3$
Volume disposed	$2.2\ m^3$

B. IRRADIATED FUEL SHIPMENTS

There were no shipments of irradiated fuel.

Table 23

Doses Due to Gaseous Releases

for January through December 2002

Maximum Individual Dose Due to I-131, H-3 and Particulates with Half-Lives Greater than 8 days.

Whole Body Dose	5.70E-04 mrem
Significant Organ Dose	5.70E-04 mrem

Maximum Individual Dose Due to Noble Gas

Whole Body Dose	9.04E-06 mrad
Skin Dose	5.99E-05 mrad

Population Dose Due to I-131, H-3 and Particulates with Half-Lives Greater than 8 days.

Total Integrated Population Dose	1.58E-02 person-rem
Average Dose to Individual in Population	7.25E-06 mrem

Population Dose Due to Noble Gas

Total Integrated Population Dose	4.83E-03 person-rem
Average Dose to Individual in Population	2.21E-06 mrem

Table 24
Doses Due to Liquid Releases
for January through December 2002

Maximum Individual Whole Body Dose	1.00E-02 mrem
Maximum Individual Significant Organ Dose	2.17E-01 mrem
Population Dose	
Total Integrated Population Dose	8.78E-01 person-rem
Average Dose to Individual	4.02E-04 mrem

Table 25

Annual Dose to The Most Exposed (from all pathways) Member of The Public 2002

	ANNUAL DOSE (mrem)	40CFR190 LIMIT (mrem)	PERCENT OF LIMIT
Whole Body Dose*			
Noble Gas	9.94E-06		
Iodine, Tritium, Particulates	5.70E-04		
Liquid	1.00E-02		
Total Whole Body Dose	1.06E-02	25	4.24E-02
Thyroid Dose			
Iodine, Tritium, Particulates	3.21E-03	75	4.28E-03
Skin Dose			
Noble Gas	7.58E-05	25	2.40E-04
Significant Organ Dose (Gastro-intestinal/lower large intestines)	2.17E-01	25	8.68E-01

Meteorological Data

Meteorological data on 3½ inch microdisk for January through December 31, 2002, has been submitted with this document to the U. S. Nuclear Regulatory Commission, Document Control Desk, Washington, D.C. 20555.

*Direct radiation from the facility is not distinguishable from natural background and is, therefore, not included in this compilation.

Land Use Census

Program Design

Each year a Land Use Census is conducted by Davis-Besse in order to update information necessary to estimate radiation dose to the general public and to determine if any modifications are necessary to the Radiological Environmental Monitoring Program (REMP). The Land Use Census is required by Title 10 of the Code of Federal Regulations, Part 50, Appendix I and Davis-Besse Nuclear Power Station Offsite Dose Calculation Manual, Section 5, Assessment of Land Use Census Data. The Land Use Census identifies gaseous pathways by which radioactive material may reach the general population around Davis-Besse. The information gathered during the Land Use Census for dose assessment and input into the REMP ensure these programs are as current as possible. The pathways of concern are listed below:

- **Inhalation Pathway** - Internal exposure as a result of breathing radionuclides carried in the air.
- **Ground Exposure Pathway** - External exposure from radionuclides deposited on the ground
- **Plume Exposure Pathway** - External exposure directly from a plume or cloud of radioactive material.
- **Vegetation Pathway** - Internal exposure as a result of eating vegetables, fruit, etc. which have a build up of deposited radioactive material or which have absorbed radionuclides through the soil.
- **Milk Pathway** - Internal exposure as a result of drinking milk, which may contain radioactive material as a result of a cow or goat grazing on a pasture contaminated by radionuclides.

Methodology

The Land Use Census consists of recording and mapping the locations of the closest residences, dairy cattle and goats, and broad leaf vegetable gardens (greater than 500 square feet) in each meteorological sector within a five mile radius of Davis-Besse.

The surveillance portion of the 2002 Land Use Census was performed during the month of August. In order to gather as much information as possible, the locations of residences, dairy cows, dairy goats, and vegetable gardens were recorded. The residences, vegetable gardens, and milk animals are used in the dose assessment program. The gardens must be at least 500 square feet in size, with at least 20% of the vegetables being broadleaf plants (such as lettuce and cabbage).

Each residence is tabulated as being an inhalation pathway, as well as ground and plume exposure pathways. Each garden is tabulated as a vegetation pathway.

All of the locations identified are plotted on a map (based on the U.S. Geological Survey 7.5 minute series of the relevant quadrangles) which has been divided into 16 equal sectors corresponding to the 16 cardinal compass points (Figure 31). The closest residence, milk animal, and vegetable garden in each sector are determined by measuring the distance from each to the Station Vent at Davis-Besse.

Results

The following changes in the pathways were recorded in the 2002 census:

- **S Sector** – A garden at 4960 meters replaced a garden at 4230 meters
- **SW Sector** – No gardens were reported in this sector in 2002
- **WSW Sector** – The garden at 7430 meters was replaced with a garden at 7770 meters.
- **NW Sector** – No gardens were reported in this sector in 2002.

The critical receptor identified by the 2002 Land Use Census is a garden in the W sector at 1610 meters from Davis-Besse.

The detailed list in Table 26 was used to update the database of the effluent dispersion model used in dose calculations. Table 26 is divided by sectors and lists the distance (in meters) of the closest pathway in each meteorological sector.

Table 27 provided information on pathways, critical age group, atmospheric dispersion (X/Q) and deposition (D/Q) parameters for each sector. This information is used to update the Offsite Dose Calculation Manual (ODCM). The ODCM describes the methodology and parameters used in calculating offsite doses from radioactivity released in liquid and gaseous effluents and in calculating liquid and gaseous effluent monitoring instrumentation alarm/trip setpoints.

DAVIS-BESSE NUCLEAR POWER STATION RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

PRIMARY PATHWAYS WITHIN A 5 MILE RADIUS

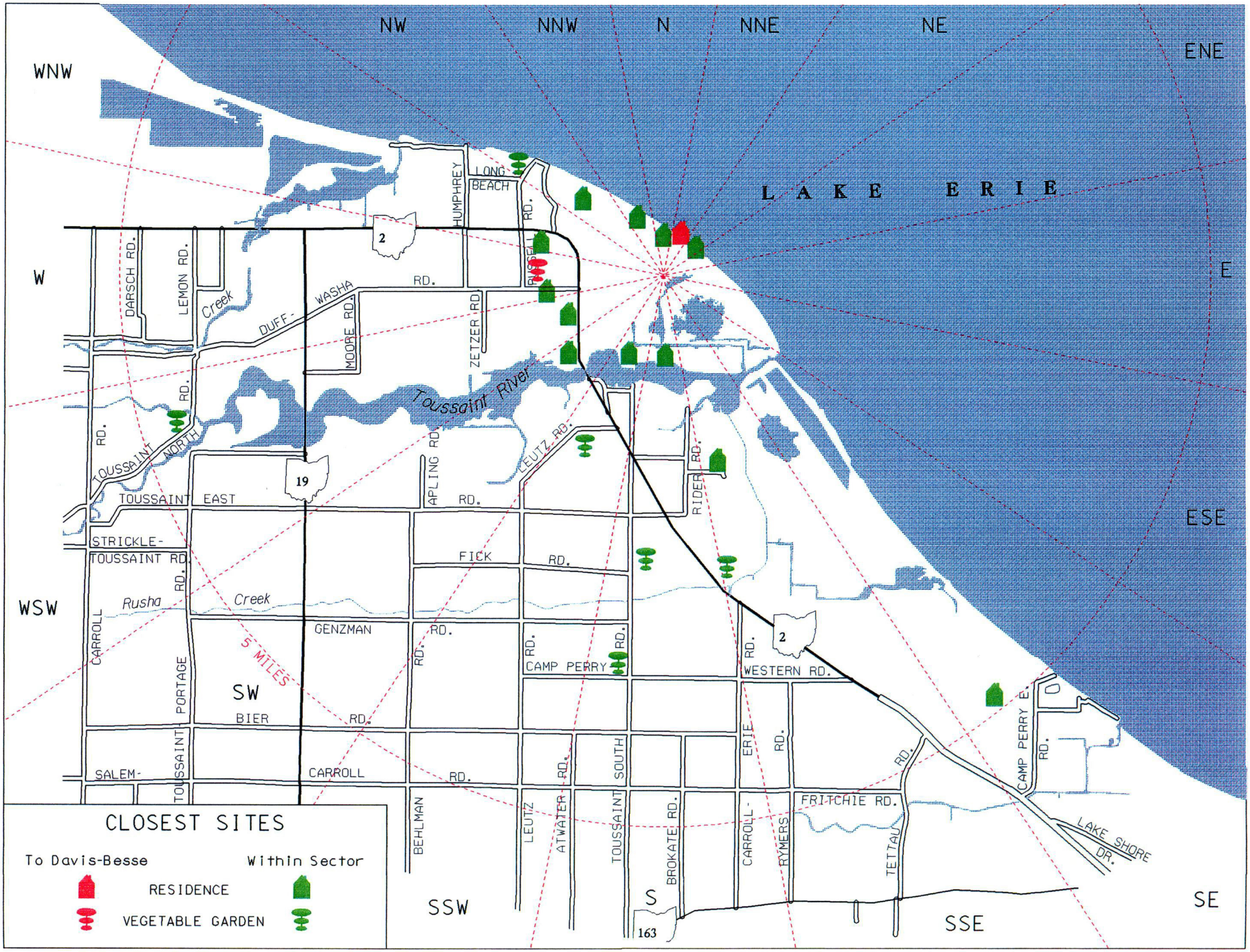


Figure 31: Land Use Census Map

Davis-Besse Nuclear Power Station 2002 Annual Radiological Environmental Operating Report

C01

Table 26
Closest Exposure Pathways Present in 2002

Sector	Distance from Station (meters)	Closest Pathways
N	880	Inhalation Ground Exposure Plume Exposure
NNE	880	Inhalation Ground Exposure Plume Exposure
NE	900	Inhalation Ground Exposure Plume Exposure
ENE, E, ESE	N/A	Located over Lake Erie
SE	8000	Inhalation Ground Exposure Plume Exposure
SSE	2860	Vegetation
SSE	1970	Inhalation Ground Exposure Plume Exposure
S**	4230	Vegetation
S	1030	Inhalation Ground Exposure Plume Exposure
SSW	2350	Vegetation
SSW	980	Inhalation Ground Exposure Plume Exposure
SW	1070	Inhalation Ground Exposure Plume Exposure

** changed since 2001

Table 26
Closest Exposure Pathways Present in 2002

Sector	Distance from Station (meters)	Closest Pathways
WSW	1540	Inhalation Ground Exposure Plume Exposure
WSW**	7770	Vegetation
W	980	Inhalation Ground Exposure Plume Exposure
W	1610	Vegetation
WNW	1750	Inhalation Ground Exposure Plume Exposure
NW	1490	Inhalation Ground Exposure Plume Exposure
NNW	1270	Inhalation Ground Exposure Plume Exposure

** Changed since 2001

Table 27
Pathway Locations and Corresponding Atmospheric Dispersion (X/Q) and Deposition (D/Q) Parameters

SECTOR	METERS	CRITICAL PATHWAY	AGE GROUP	X/Q (SEC/M^3)	D/Q (M^{-2})
N	880	Inhalation	Child	9.15E-07	8.40E-09
NNE	880	Inhalation	Child	1.24E-06	1.44E-08
NE	900	Inhalation	Child	1.26E-06	1.58E-08
ENE*	---	---	---	---	---
E*	---	---	---	---	---
ESE*	---	---	---	---	---
SE	8000	Inhalation	Child	3.43E-08	1.45E-10
SSE	2860	Vegetation	Child	6.91E-08	8.13E-10
S**	4230	Vegetation	Child	3.71E-08	3.09E-10
SSW	2350	Vegetation	Child	5.90E-08	1.03E-09
SW	1070	Inhalation	Child	2.86E-07	5.23E-09
WSW**	7770	Vegetation	Child	3.25E-08	1.64E-10
W	1610	Vegetation	Child	2.77E-07	4.37E-09
WNW	1750	Inhalation	Child	1.46E-07	1.72E-09
NW	1490	Inhalation	Child	1.43E-07	1.35E-09
NNW	1270	Inhalation	Child	2.41E-07	1.73E-09

* Since these sectors are located over marsh areas and Lake Erie, no ingestion pathways are present.

** Changed since 2001

Non-Radiological Environmental Programs

Non-Radiological Environmental Programs

Meteorological Monitoring

The Meteorological Monitoring Program at Davis-Besse is required by the Nuclear Regulatory Commission (NRC) as part of the program for evaluating the effects of routine operation of nuclear power stations on the surrounding environment. Both NRC regulations and the Davis-Besse Technical Requirements Manual provide guidelines for the Meteorological Monitoring Program. These guidelines ensure that Davis-Besse has the proper equipment, in good working order, to support the many programs utilizing meteorological data.

Meteorological observations at Davis-Besse began in October 1968. The Meteorological Monitoring Program at Davis-Besse has an extensive record of data with which to perform climatological studies which are used to determine whether Davis-Besse has had any impact upon the local climate. After extensive statistical comparative research the meteorological personnel have found no impact upon local climate or short-term weather patterns.

The Meteorological Monitoring Program also provides data that can be used by many other groups and programs: Radiological Environmental Monitoring Program, The Emergency Preparedness Program, The Chemistry Unit, and groups such as Plant Operations, Plant Security, Materials Management, Industrial Safety Program, plant personnel and members of the surrounding community.

The Radiological Environmental Monitoring Program uses meteorological data to aid in evaluating the radiological impact, if any, of radioactivity released in Station effluents. The meteorological data is used to evaluate radiological environmental monitoring sites to assure the program is as current as possible. The Emergency Preparedness Program uses meteorological data to calculate emergency dose scenarios for emergency drills and exercises and uses weather data to plan evacuations or station isolation during adverse weather. The Chemistry Unit uses meteorological data for chemical spill response activities, marsh management studies, and wastewater discharge flow calculations. Plant Operations uses meteorological data for cooling tower efficiency calculations, forebay water level availability and plant work which needs certain environmental conditions to be met before work begins. Plant Security utilizes weather data in their routine planning and activities. Materials Management plans certain plant shipments around adverse weather conditions to avoid high winds and precipitation, which would cause delays in material deliveries and safety concerns. Industrial Safety uses weather and climatological data to advise personnel of unsafe working conditions due to environmental conditions, providing a safer place to work. Legal Affairs uses climatological data for their investigation into adverse weather accidents to the plant and personnel.

On-site Meteorological Monitoring

System Description

At Davis-Besse there are two meteorological systems, a primary and a backup. They are both housed in separate environmentally controlled buildings with independent power supplies. Both primary and backup systems have been analyzed to be "statistically identical" to the other so if one system fails the other can take its place. The instrumentation of each system follows:

PRIMARY	BACKUP
100 Meter Wind Speed	100 Meter Wind Speed
75 Meter Wind Speed	75 Meter Wind Speed
10 Meter Wind Speed	10 Meter Wind Speed
100 Meter Wind Direction	100 Meter Wind Direction
75 Meter Wind Direction	75 Meter Wind Direction
10 Meter Wind Direction	10 Meter Wind Direction
100 Meter Delta Temperature	100 Meter Delta Temperature
75 Meter Delta Temperature	75 Meter Delta Temperature
10 Meter Ambient Temperature	10 Meter Ambient Temperature
10 Meter Dew Point	10 Meter Solar Incidence
Precipitation	

Meteorological Instrumentation

The meteorological system consists of one monitoring site located at an elevation of 577 feet above mean sea level (IGLD 1955)*, a 100m free-standing tower located about 3,000 feet SSW of the cooling tower, and an auxiliary 10m foot tower located 100 feet west of the 100 m tower, are used to gather the meteorological data. The 100m tower has primary and backup instruments for wind speed and wind direction at 100m and 75m. The 100m tower also measures differential temperature (delta Ts): 100-10m and 75-10m. The 10m tower has instruments for wind speed and wind direction. Precipitation is measured by a tipping bucket rain gauge located near the base of the 10m tower.

According to the Davis-Besse Nuclear Power Station Technical Requirements Manual, a minimum of five instruments are required to be operable at the two lower levels (75m and 10m) to measure temperature, wind speed, and wind direction. During 2002, annual data recoveries for all required instruments were 98.9 percent. Minor losses of data occurred during routine instrument maintenance, calibration, and data validation.

Personnel at Davis-Besse inspect the meteorological site and instrumentation regularly. Data is reviewed daily to ensure that all communication pathways, data availability and data reliability are working as required. Tower instrumentation maintenance and semiannual calibrations are performed by in-house facilities and by an outside consulting firm. These instruments are wind tunnel tested to assure compliance with applicable regulations and plant specifications.

* International Great Lakes Data - 1955

Meteorological Data Handling and Reduction

Each meteorological system, primary and backup, have two Campbell Scientific Dataloggers (model 21XL) assigned to them. The primary system has a first datalogger to communicate 900 second averages to the control room via a Digital Alpha computer system. This is a dedicated line. If a failure occurs at any point between the primary meteorological system and the control room the control room can utilize the second data logger in the primary shelter. Each datalogger has its own dedicated communication link with battery backup. The backup meteorological system is designed the same as the primary; so to lose all meteorological data the primary and backup meteorological systems would have to lose all four dataloggers. However, this would be difficult since each is powered by a different power supply and equipped with lightning and surge protection, plus four independent communication lines and datalogger battery backup.

The data from the primary and backup meteorological systems are stored in a 30-day circular storage module with permanent storage held by the Digital Alpha computer. Data goes back to 1988 in this format and to 1968 in both digital and hardcopy formats. All data points are scrutinized every 900 seconds by meteorological statistics programs running continuously. These are then reviewed by meteorological personnel daily for validity based on actual weather conditions. A monthly review is performed using 21 NRC computer codes, which statistically analyze all data points for their availability and validity. If questionable data on the primary system can not be corroborated by the backup system, the data in question is eliminated and not incorporated into the final database. All validated data is then documented and stored on hard copy and in digital format for a permanent record of meteorological conditions.

Meteorological Data Summaries

This section contains Tables 28-30, which summarize meteorological data collected from the on-site monitoring program in 2002.

Wind Speed and Wind Direction

Wind sector graphics represent the frequency of wind direction by sector and the wind speed in mph by sector. This data is used by the NRC to better understand local wind patterns as they relate to defined past climatological wind patterns reported in Davis-Besse's Updated Safety Analysis Report. The maximum measured sustained wind speeds for 2002 occurred on March 9, when they were measured at 55.98 mph at the 100m level, 52.27 mph at the 75m level, and 39.02mph at the 10m level.

Figures 32-34 give an annual sector graphic of average wind speed and percent frequency by direction measured at the three monitoring levels. Each wind sector graphic has two radial bars. The darker bar represents the percent of time the wind blew from that direction. The hatched bar represents the average wind speed from that direction. Wind direction sectors are classified using Pasquill Stabilities. Percent calms (less than or equal to 1.0 mph) are shown in the middle of the wind sector graphic.

Ambient and Differential Temperatures

Monthly average, minimum and maximum ambient temperatures for 2002 are given in Table 29. These data are measured at the 10m level; with differential temperatures taken from 100m and 75m levels. The yearly average ambient temperature was 51.29°F. The maximum temperature was 92.67°F on July 2 with a minimum temperature of 6.74°F on March 4. Yearly average differential temperatures were -0.21°F (100m), and -0.08°F (75m). Maximum differential temperatures for 100m and 75m levels were 7.99°F on Octoberber 10, (100m), and 7.99°F on October 10, (75m). Minimum differential temperatures for 100m and 75m levels were –3.31°F on October 19, (100m) and –2.47°F on April 26, (75m). Differential temperatures are a measurement of atmospheric stability and used to calculate radioactive plume dispersions based on Gaussian Plume Models of continuous effluent releases.

Dew Point Temperatures and Relative Humidity

Monthly average and extreme dew point and humidity temperatures for 2002 are provided in Table 29. These data are measured at the 10 meter level. The average dew point temperature was 42.08°F with a maximum dew point temperature of 75.20°F on July 28. Please note that dew point temperatures above 75°F are highly suspect and are possibly due to calm winds and high solar heating allowing the aspirated dew point processor to retain heat. The minimum dew point (dew point under 32°F is frost point) temperature was 3.40°F on March 4. Average relative humidity is 73.52 percent for the year. The maximum relative humidity was 100.00 percent on August 23. The minimum relative humidity was 14.52 on April 16. It is possible to have relative humidity above 100 percent, which is known as supersaturation. Conditions for supersaturation have been met a few times at Davis-Besse due to its close proximity to Lake Erie, and the evaporative pool of moisture available from such a large body of water.

Precipitation

Monthly totals and extremes of precipitation at Davis-Besse for 2002 are given in Table 29. Total precipitation for the year was 29.26 inches. The maximum daily precipitation total was 1.61 inches in January. The minimum was 0.36 inches recorded in December. It is likely that precipitation totals recorded in colder months are somewhat less than actual due to snow/sleet blowing across the collection unit rather than accumulating in the gauge.

Lake Breeze and Lake Level Monitoring

Lake Breeze is monitored at Davis-Besse because of its potential to cause major atmospheric/ dispersion problems during an unlikely radioactive release. A lake breeze event occurs during the daytime, usually during the summer, where the land surface heats up faster than the water, and therefore reaches higher temperatures than the water. The warmer air above the land rises faster because it is less dense than the cooler air over the lake. This leads to rising air currents over the land with descending denser air over the lake. This starts a wind circulation, which draws air from the water to the land during the daytime, creating a "Lake Breeze" effect. This event could be problematic if a release were to occur because diffusion would be slow thus creating an adverse atmosphere to the surrounding site.

Lake and forebay levels are monitored at Davis-Besse to observe, evaluate, predict and disseminate high or low lake level information. This data is critical in the running of the plant due to the large amounts of water needed to cool plant components. If water levels get too low the plant operators can take measures for the safe shutdown of the plant. Since Lake Erie is the shallowest of the Great Lakes, it is not uncommon for a plus or minus five feet lake level fluctuation to occur within an eight to ten hour period. High water levels also effect the plant due to emergency transportation and evacuation pathways.

Table 28
Summary of Meteorological Data Recovery for 2002

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2002
100m Wind Speed	94.35	98.66	93.68	99.72	100	100	100	77.69	100	100	100	100	96.96
100M Wind Direction	100	100	100	91.25	100	100	100	98.79	100	100	100	100	99.18
75M Wind speed	94.49	95.83	79.44	99.72	100	100	100	98.79	100	100	100	100	97.34
75M Wind Direction	100	100	100	99.72	100	100	100	98.79	100	100	100	100	99.87
10M Wind Speed	97.72	97.62	96.10	99.72	100	100	100	98.79	100	100	100	100	99.17
10M Wind Direction	100	100	100	99.72	100	100	100	98.79	100	100	100	100	99.87
10M Ambient Air Temp	100	100	100	99.72	100	100	100	77.15	100	100	100	100	98.04
10M Dew Point Temp	100	100	100	99.72	100	100	100	98.79	100	100	100	100	99.87
Delta T (100M-10M)	100	100	100	99.72	100	100	100	77.15	100	100	100	100	98.04
Delta T (75M-10M)	100	100	100	99.72	100	100	100	77.15	100	100	100	100	98.04
Joint 100M Winds and Delta T (100M-10M)	94.35	98.66	93.68	91.25	100	100	100	77.15	100	100	100	100	96.22
Joint 75M Winds and Delta T (100M-10M)	94.49	95.83	79.44	99.72	100	100	100	77.15	100	100	100	100	95.50
Joint 10M Winds and Delta T (75M-10M)	97.72	97.62	96.10	99.72	100	100	100	77.15	100	100	100	100	97.33

***all data for individual months expressed as percent of time instrument was operable during the month, divided by the maximum number of hours in that month that the instrument could be operable. Values for annual data recoveries equals the percent of time instrument was operable during the year, divided by the number of hours in the year that the instrument was operable.**

Table 29
Summary of Meteorological Data Measured for 2002

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2002
100M WIND													
Max Speed (mph)	37.23	42.97	55.48	46.81	34.62	36.04	26.61	32.25	31.28	35.75	38.58	33.94	55.48
Date of Max Speed	01/09	02/01	03/09	04/28	05/09	06/05	07/10	08/02	09/10	10/18	11/29	12/19	03/09
Min Speed (mph)	2.31	0.05	1.37	1.73	3.67	2.46	2.43	2.41	1.05	0.71	3.34	1.75	0.05
Date of Min Speed	01/19	02/26	03/20	04/04	05/26	06/08	07/07	08/02	09/09	10/10	11/21	12/04	02/26
Ave Wind Speed	19.63	20.65	19.70	17.35	17.00	13.43	12.91	13.57	13.21	14.98	19.26	18.75	16.07
75M WIND													
Max Speed (mph)	34.14	40.70	52.27	44.67	33.13	33.49	24.86	28.56	30.05	33.10	37.21	31.06	52.27
Date of Max Speed	01/09	02/01	03/09	04/28	05/09	06/05	07/11	08/02	09/11	10/04	11/22	12/19	03/09
Min Speed (mph)	1.51	2.12	2.06	1.42	3.61	2.44	1.84	1.40	0.72	0.75	3.31	1.72	0.72
Date of Min Speed	01/19	02/22	03/29	04/04	05/26	06/29	07/14	08/26	09/25	10/10	11/21	12/04	09/25
Ave Wind Speed	17.76	19.14	18.58	15.96	15.65	12.39	11.80	12.23	12.13	13.94	17.83	17.22	15.29
10M WIND													
Max Speed (mph)	26.37	31.72	41.22	33.66	24.79	23.51	21.22	20.59	20.42	26.66	28.53	24.48	41.22
Date of Max Speed	01/04	02/01	03/09	04/28	05/09	06/05	07/05	08/06	09/10	10/30	11/22	12/02	03/09
Min Speed (mph)	0.88	2.00	1.49	1.35	1.71	1.55	1.44	0.45	1.36	0.86	1.80	0.80	0.45
Date of Min Speed	01/19	02/23	03/12	04/04	05/11	06/08	07/19	08/26	09/25	10/12	11/05	12/10	08/26
Ave Wind Speed	11.00	12.49	12.43	10.94	9.82	7.75	7.75	7.78	6.63	8.83	11.71	11.09	9.79

Table 29 (continued)
Summary of Meteorological Data Measured for 2002

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2002
10M AMBIENT TEMP													
Max (F)	59.03	58.44	68.51	84.50	84.03	88.08	92.67	90.85	89.23	82.85	66.22	53.43	92.67
Date of Max	01/28	02/25	03/08	04/18	05/31	06/30	07/02	08/01	09/10	10/01	11/10	12/31	07/02
Min (F)	15.78	16.14	6.74	30.85	36.23	54.39	63.82	60.35	46.51	32.79	22.67	8.09	6.74
Date of Min	01/03	02/28	03/04	04/07	05/19	06/03	07/13	08/09	09/23	10/31	11/28	12.04	03/04
Ave Temp	33.25	33.60	35.37	50.35	55.22	70.70	76.27	74.60	68.51	52.19	40.00	29.93	51.29
10M DEW POINT TEMP													
Mean (F)	26.74	25.47	28.29	40.72	44.57	58.98	62.70	62.41	56.87	41.49	31.91	24.09	42.08
Max (F)	48.12	48.60	52.91	65.47	65.91	71.65	75.20	73.83	70.46	67.91	58.26	49.66	75.20
Date of Max	01/29	02/20	03/09	04/15	05/09	06.22	07/28	08/04	09/20	10/04	11/10	12/31	07/28
Min (F)	11.78	3.51	3.40	19.94	25.35	43.35	46.13	48.92	39.72	24.99	13.10	5.34	3.40
Date of Min	01/01	02/04	03/04	04/06	05/03	06/02	07/11	08/06	09/24	10/14	11/27	12/04	03/04
PRECIPITATION													
Total (inches)	3.45	1.38	2.63	4.59	3.77	1.52	2.88	2.49	1.21	1.62	1.89	1.83	29.26
Max. in One Day	1.61	0.63	0.77	0.84	0.88	0.45	0.87	0.80	0.62	0.92	0.73	0.36	1.61
Date	01/31	02/10	03/26	04/16	05/12	06/03	07/29	08/22	09/14	10/28	11/10	12/31	01/31

Figure 32
Wind Rose Annual Average 100M

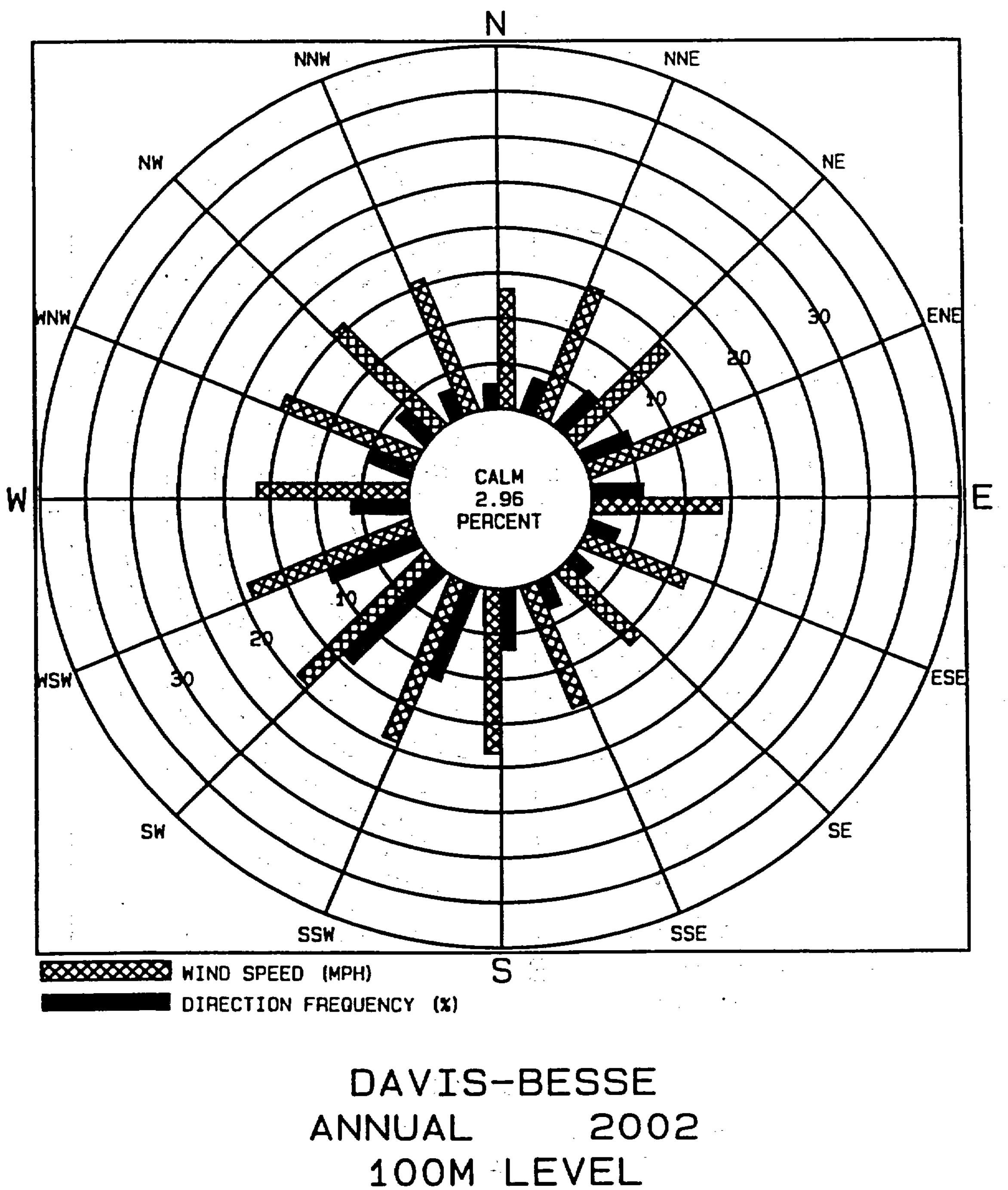


Figure 33
Wind Rose Annual Average 75M

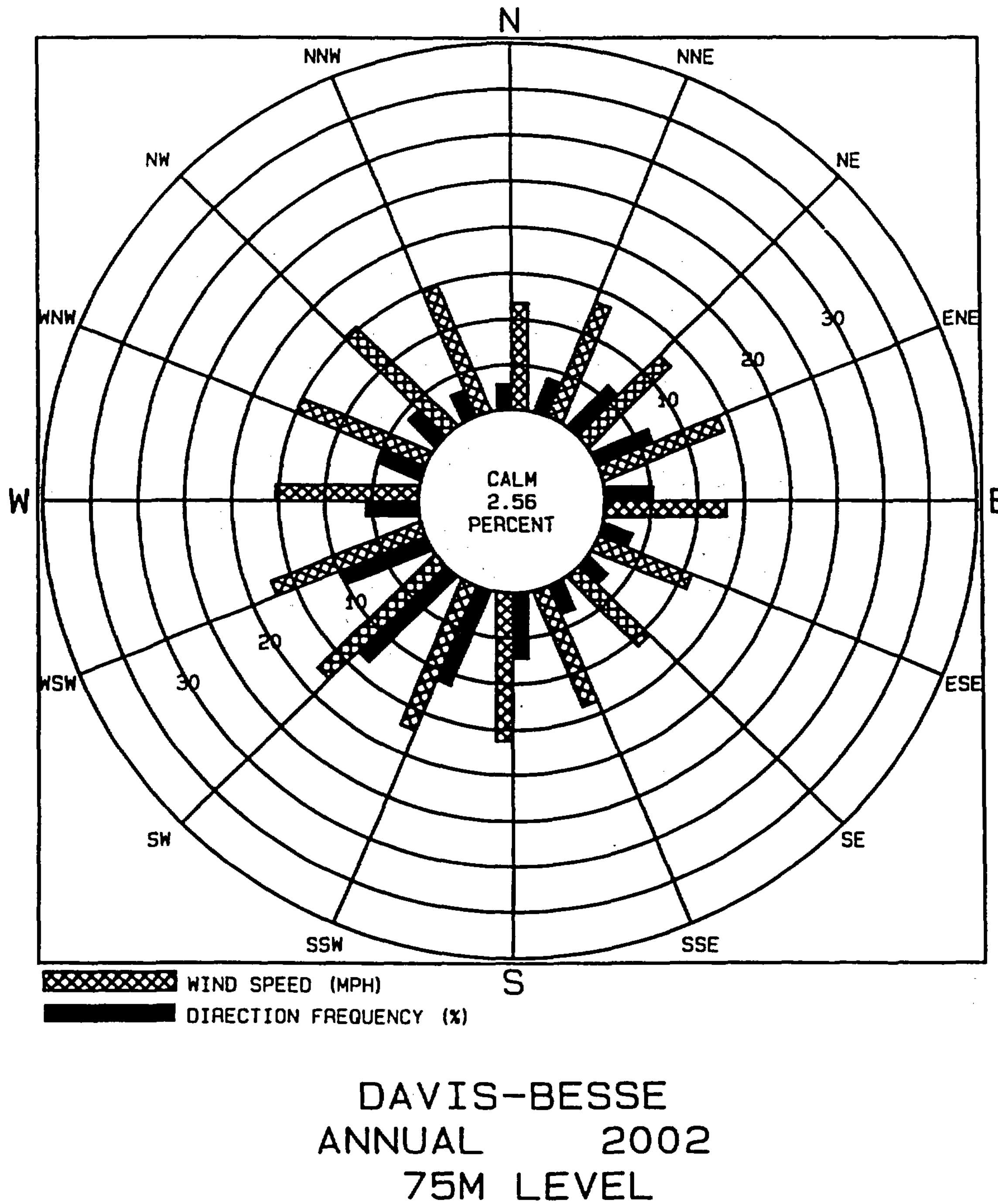
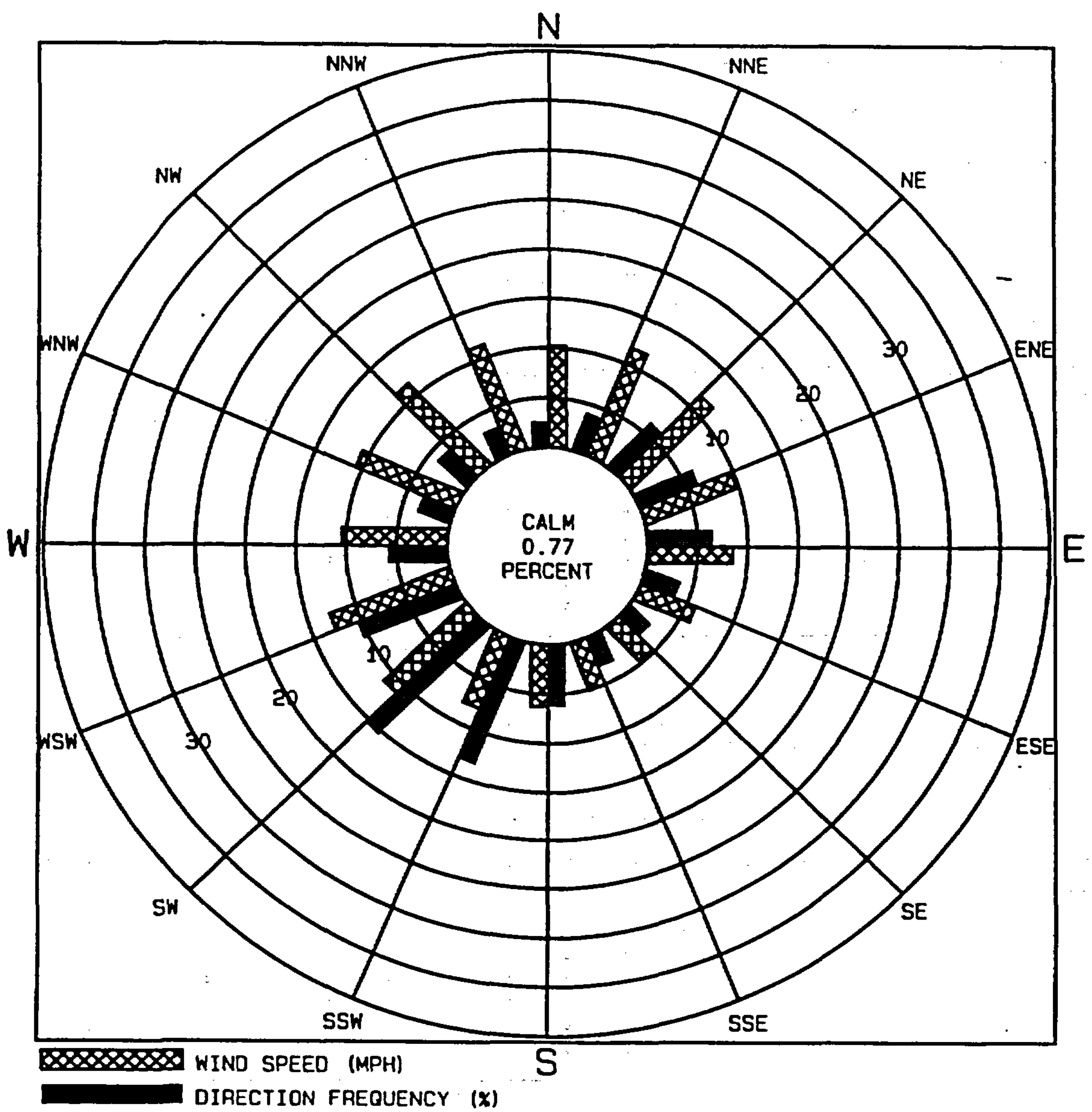


Figure 34
Wind Rose Annual Average 10M



DAVIS-BESSE
ANNUAL 2002
10M LEVEL

Table 30
Joint Frequency Distribution by Stability Class

*** * *** DAVIS-BESSE ENVIRONMENTAL COMPLIANCE UNIT ***   * **18-JAN-03   PAGE 91

TIME OF DAY: 08:41:56

PROGRAM: JFD   VERSION: F77-1.0

******** DAVIS-BESSE 75-10 DT, NO BACKUP ********   SITE IDENTIFIER: 2

DATA PERIOD EXAMINED: 1/ 1/ 2 - 12/ 31/ 2

*** ANNUAL ***

STABILITY CLASS A

STABILITY BASED ON: DELTA T   BETWEEN 250.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: 1.00 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
1.01- 3.49	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
3.50- 7.49	3	2	0	0	0	0	0	0	0	0	0	0	0	1	1	0	7
7.50-12.49	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4
12.50-18.49	0	0	1	1	1	0	0	0	0	0	0	0	2	0	0	0	5
18.50-24.49	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2
>24.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	6	2	1	1	1	1	0	0	0	0	0	1	2	3	1	0	19

STABILITY CLASS B

STABILITY BASED ON: DELTA T   BETWEEN 250.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: 1.00 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
1.01- 3.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.50- 7.49	6	6	0	0	0	0	0	0	1	2	0	0	0	1	0	5	21
7.50-12.49	9	1	0	3	3	1	0	0	2	12	4	2	0	0	3	11	51
12.50-18.49	1	0	1	8	3	0	0	0	0	1	3	0	2	0	1	1	21
18.50-24.49	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2
>24.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	16	7	1	11	6	1	0	0	3	15	7	3	3	1	4	17	95

Table 30 (continued)
Joint Frequency Distribution by Stability Class

*** * *** DAVIS-BESSE ENVIRONMENTAL COMPLIANCE UNIT ***   * **18-JAN-03   PAGE 92

TIME OF DAY: 08:41:56

PROGRAM: JFD   VERSION: F77-1.0

******** DAVIS-BESSE 75-10 DT, NO BACKUP ********   SITE IDENTIFIER: 2

DATA PERIOD EXAMINED: 1/ 1/ 2 - 12/ 31/ 2

*** ANNUAL ***

STABILITY CLASS C

STABILITY BASED ON: DELTA T   BETWEEN 250.0 AND 35.0 FEET

WIND MEASURED AT: 35.0 FEET

WIND THRESHOLD AT: 1.00 MPH

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
1.01- 3.49	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
3.50- 7.49	12	11	1	0	0	0	1	0	6	5	4	5	1	0	7	5	58
7.50-12.49	10	6	7	12	8	1	0	1	8	12	23	11	2	1	17	15	134
12.50-18.49	4	6	8	9	2	0	0	0	0	7	16	15	5	5	10	5	92
18.50-24.49	0	0	0	0	0	0	0	0	0	0	1	8	8	2	3	4	26
>24.49	0	0	0	0	0	0	0	0	0	0	0	6	2	0	0	0	8
TOTAL	26	24	16	21	10	1	1	1	14	24	44	45	18	8	37	30	320

STABILITY CLASS D

STABILITY BASED ON: DELTA T   BETWEEN 250.0 AND 35.0 FEET

WIND MEASURED AT: 35.0 FEET

WIND THRESHOLD AT: 1.00 MPH

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
1.01- 3.49	0	2	3	1	1	1	6	11	8	6	3	4	6	2	2	1	57
3.50- 7.49	27	45	55	89	85	50	31	32	41	72	85	51	41	39	29	24	796
7.50-12.49	65	112	207	180	133	41	24	22	35	144	156	141	101	69	91	82	1593
12.50-18.49	37	96	130	78	68	3	2	2	6	82	224	183	99	71	88	58	1227
18.50-24.49	12	37	52	23	8	0	0	0	3	6	95	140	26	16	15	28	461
>24.49	4	4	3	0	0	0	0	0	0	0	14	32	5	1	2	4	69
TOTAL	145	296	450	371	295	95	53	67	93	310	577	551	278	198	227	197	4203

Table 30 (continued)
Joint Frequency Distribution by Stability Class

*** * *** DAVIS-BESSE ENVIRONMENTAL COMPLIANCE UNIT *** * **18-JAN-03 PAGE 93

TIME OF DAY: 08:41:56

PROGRAM: JFD VERSION: F77-1.0

******** DAVIS-BESSE 75-10 DT, NO BACKUP ******** SITE IDENTIFIER: 2

DATA PERIOD EXAMINED: 1/ 1/ 2 - 12/ 31/ 2

*** ANNUAL ***

STABILITY CLASS E

STABILITY BASED ON: DELTA T BETWEEN 250.0 AND 35.0 FEET

WIND MEASURED AT: 35.0 FEET

WIND THRESHOLD AT: 1.00 MPH

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	1
1.01- 3.49	2	4	4	11	17	22	17	29	24	20	14	7	8	4	3	4	190
3.50- 7.49	14	7	16	71	110	98	94	62	122	255	124	65	64	23	13	19	1157
7.50-12.49	14	11	14	22	53	35	8	30	92	244	219	116	73	45	22	11	1009
12.50-18.49	1	11	4	2	4	1	0	2	15	61	129	62	18	4	18	2	334
18.50-24.49	3	1	4	1	3	0	0	0	2	0	26	15	0	4	2	0	61
>24.49	0	2	0	0	0	0	0	0	0	0	2	5	0	0	1	0	10
TOTAL	34	36	42	107	187	156	119	123	255	580	514	270	163	80	59	36	2762

STABILITY CLASS F

STABILITY BASED ON: DELTA T BETWEEN 250.0 AND 35.0 FEET

WIND MEASURED AT: 35.0 FEET

WIND THRESHOLD AT: 1.00 MPH

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	1
1.01- 3.49	4	2	3	3	5	9	21	48	44	48	30	17	6	4	3	1	248
3.50- 7.49	0	1	0	7	25	48	39	36	73	96	74	55	31	13	2	1	501
7.50-12.49	2	0	2	2	12	2	1	2	5	26	4	3	3	2	1	1	68
12.50-18.49	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
18.50-24.49	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
>24.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	6	3	5	12	42	59	62	86	122	170	108	75	40	20	6	3	820

Table 30 (continued)
Joint Frequency Distribution by Stability Class

*** * *** DAVIS-BESSE ENVIRONMENTAL COMPLIANCE UNIT *** * **18-JAN-03 PAGE 94

TIME OF DAY: 08:41:56

PROGRAM: JFD VERSION: F77-1.0

******** DAVIS-BESSE 75-10 DT, NO BACKUP ******** SITE IDENTIFIER: 2

DATA PERIOD EXAMINED: 1/ 1/ 2 - 12/ 31/ 2

*** ANNUAL ***

STABILITY CLASS G

STABILITY BASED ON: DELTA T BETWEEN 250.0 AND 35.0 FEET

WIND MEASURED AT: 35.0 FEET

WIND THRESHOLD AT: 1.00 MPH

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	2
1.01- 3.49	0	0	0	0	3	4	8	12	31	37	27	13	6	2	0	1	144
3.50- 7.49	0	0	0	2	6	12	3	9	20	42	41	8	6	0	0	0	149
7.50-12.49	0	0	0	0	4	4	0	1	1	0	1	0	0	0	0	0	11
12.50-18.49	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
18.50-24.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>24.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	2	13	20	11	22	52	79	69	22	12	2	0	1	307

STABILITY CLASS ALL

STABILITY BASED ON: DELTA T BETWEEN 250.0 AND 35.0 FEET

WIND MEASURED AT: 35.0 FEET

WIND THRESHOLD AT: 1.00 MPH

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	4
1.01- 3.49	6	9	10	15	26	37	52	100	107	111	74	41	26	12	8	8	642
3.50- 7.49	62	72	72	169	226	208	168	139	263	472	328	184	143	77	52	54	2689
7.50-12.49	103	130	230	219	213	84	23	56	143	438	407	273	179	118	134	120	2870
12.50-18.49	43	113	144	98	78	4	3	4	21	151	372	261	126	80	117	66	1681
18.50-24.49	15	38	56	24	11	0	0	0	5	6	122	165	35	24	20	32	553
>24.49	4	6	3	0	0	0	0	0	0	0	16	43	7	1	3	4	87
TOTAL	233	368	515	525	554	333	246	299	539	1178	1319	967	516	312	334	284	8526

Table 30 (continued)
Joint Frequency Distribution by Stability Class

```
*** * *** DAVIS-BESSE ENVIRONMENTAL COMPLIANCE UNIT ***                    * **18-JAN-03        PAGE  95
                                                                        TIME OF DAY:  08:41:56
PROGRAM: JFD     VERSION: F77-1.0

******** DAVIS-BESSE 75-10 DT, NO BACKUP ********                        SITE IDENTIFIER:  2
DATA PERIOD EXAMINED:    1/   1/   2 -   12/  31/   2
                                             ***  ANNUAL  ***
STABILITY BASED ON: DELTA T      BETWEEN 250.0 AND  35.0 FEET
WIND  MEASURED  AT:  35.0 FEET
WIND THRESHOLD  AT:  1.00 MPH

TOTAL NUMBER OF OBSERVATIONS:  8760
TOTAL NUMBER OF VALID OBSERVATIONS:  8526
TOTAL NUMBER OF MISSING OBSERVATIONS:   234
PERCENT DATA RECOVERY FOR THIS PERIOD:  97.3 %
MEAN WIND SPEED FOR THIS PERIOD:   9.8 MPH
TOTAL NUMBER OF OBSERVATIONS WITH BACKUP DATA:     0
```

PERCENTAGE OCCURRENCE OF STABILITY CLASSES

A	B	C	D	E	F	G
0.22	1.11	3.75	49.30	32.40	9.62	3.60

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	6	2	1	1	1	1	0	0	0	0	0	1	2	3	1	0	0
B	16	7	1	11	6	1	0	0	3	15	7	3	3	1	4	17	0
C	26	24	16	21	10	1	1	1	14	24	44	45	18	8	37	30	0
D	145	296	450	371	295	95	53	67	93	310	577	551	278	198	227	197	0
E	34	36	42	107	187	156	119	123	255	580	514	270	163	80	59	36	1
F	6	3	5	12	42	59	62	86	122	170	108	75	40	20	6	3	1
G	0	0	0	2	13	20	11	22	52	79	69	22	12	2	0	1	2
TOTAL	233	368	515	525	554	333	246	299	539	1178	1319	967	516	312	334	284	4

Land and Wetlands Management

The Navarre Marsh, which is part of the Ottawa National Wildlife Refuge, makes up 733 acres of wetlands on the southwestern shore of Lake Erie and surrounds the Davis-Besse Nuclear Power Station. The marsh is owned by FirstEnergy and jointly managed by the U.S. Fish and Wildlife Service and FirstEnergy. Navarre Marsh is divided into three pools. The pools are separated from Lake Erie and each other by a series of dikes and revetments. Davis-Besse is responsible for the maintenance and repair of the dikes and controlling the water levels in each of the pools.

A revetment is a retaining structure designed to hold water back for the purposes of erosion control and beach formation. Revetments are built with a gradual slope, which causes waves to dissipate their energy when they strike their large surface area. Beach formation is encouraged through the passive deposition of sediment. A dike is a retaining structure designed to hold water for the purpose of flood control and to aid in the management of wetland habitat. When used as a marsh management tool, dikes help in controlling water levels in order to maintain desired vegetation and animal species. Manipulating water levels is one of the most important marsh management techniques used in the Navarre Marsh. Three major types of wetland communities exist in Navarre Marsh, the freshwater marsh, the swamp forest, and the wet meadow. Also, there exists a narrow dry beach ridge along the lakefront, with a sandbar extending out into Lake Erie. All these areas provide essential food, shelter and nesting habitat, as well as a resting area for migratory birds.

Davis-Besse personnel combine their efforts with a number of conservation agencies and organizations. The Ottawa National Wildlife Refuge, the Ohio Department of Natural Resources (ODNR), and the Black Swamp Bird Observatory work to preserve and enhance existing habitat. Knowledge is gained through research and is used to help educate the public about the importance of preserving wetlands.

With its location along two major migratory flyways, the Navarre Marsh serves as a refuge for a variety of birds in the spring and fall, giving them an area to rest and restore energy reserves before continuing their migration. The Black Swamp Bird Observatory, a volunteer research group, captures, bands, catalogues, and releases songbirds in the marsh during these periods.

Navarre Marsh is also home to wildlife that is typical of much of the marshland in this area, including deer, fox, coyote, muskrats, mink, rabbits, groundhogs, hawks, owls, ducks, geese, herons, snakes and turtles. For the first time in recent history, a pair of mature American Bald Eagles chose the Navarre Marsh as their nesting site in late 1994, and fledged a healthy eaglet in July 1995. The young eagle was one of record 38 fledged in Ohio in 1995. A new nest was built in 1999-2000, and fledged a pair of eaglets in the summer of 2000. Three more eaglets were fledged at Davis-Besse in 2001, and again in 2002, bringing the site total to nine since 1995. Ohio has gone from a low of 4 nests in 1978 to a record of 79 nests in 2002.

Ohio's eighth Federal Junior Duck Stamp Art Contest was held at Davis-Besse. Young Ohio artists in grades K-12 submit entries in four age brackets. The contest is designed to teach conservation through the arts and give students a chance to experience the beauty and diversity of wildlife. A total of 101 ribbons are awarded to young Ohio artists, with the state Best-of-Show entry submitted to Washington, D.C. to compete in the national contest with other state Best-of-Show entries. The winner of this competition is used to make this year's Junior Duck Stamp. The 1996 Ohio Junior Duck Stamp Art Contest winner of Best-of-Show, Adam Grimm, became the youngest artist ever to win the adult Federal Duck Stamp contest, at age 21. His artwork was displayed on the 2000 federal duck stamp.

Davis-Besse also hosted a Volunteer Eagle Watchers Workshop. Training was given to over 80 volunteers, who observed Ohio's expanding eagle population during 2002.

Water Treatment Plant Operation

Description

The Davis-Besse Nuclear Power Station draws water from Lake Erie for its water treatment plant. The lake water is treated with chlorine, lime, sodium aluminate and coagulant aid to produce high purity water, which is used by many of the Station's cooling systems.

Treatment System

Raw water from Lake Erie enters an intake structure, then passes through traveling screens which will remove debris greater than one-half inch in size. The water is then pumped to chlorine detention tanks. Next, the water passes through one of two clarifiers. Davis-Besse uses upflow clarifiers, or precipitators, to remove sediment, organic debris, and dissolved agents from the raw water prior to filtration. Upflow clarifiers combine the conventional treatment steps of coagulation, flocculation, and sedimentation into a single unit. Coagulation is the process by which a chemical, called a coagulant, is added, causing the small particles in the water to adhere to each other and form larger particles. During flocculation, the water is gently circulated, allowing these conglomerate particles to mass together further. Finally, during sedimentation, large conglomerate particles settle to the bottom of the clarifier. These processes normally require large separate tanks. However, the use of clarifiers saves both space and the manpower needed to operate the treatment plant.

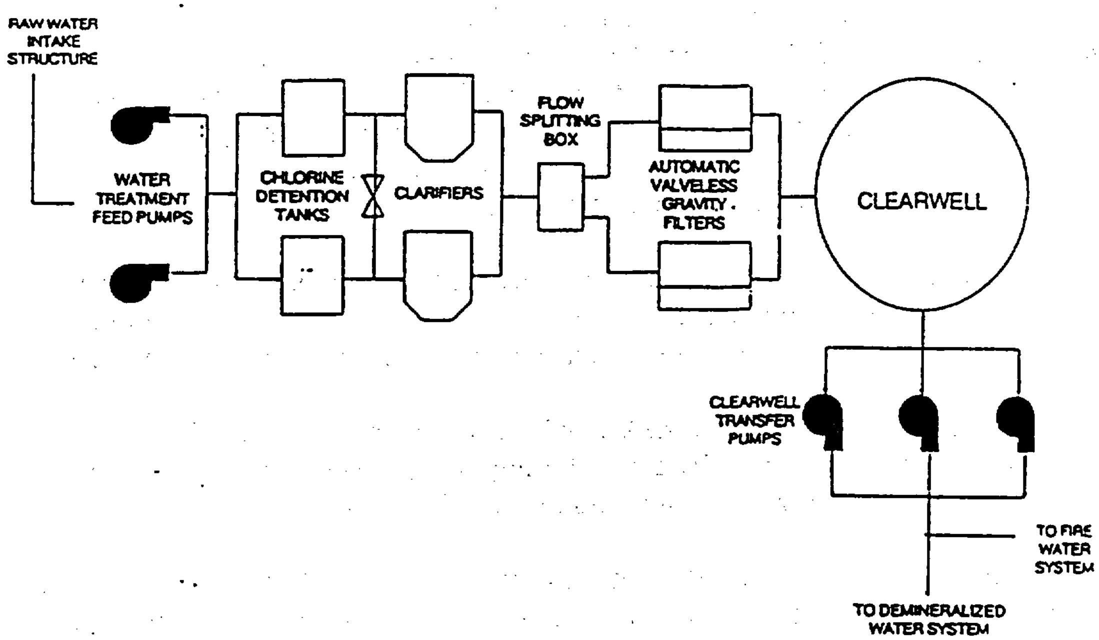


Figure 35: At Davis-Besse, raw lake water is drawn into the water treatment plant and processed into water for plant systems.

After the clarifier, the water goes through a flow-splitting box, which equally divides the water flow to the Automatic Valveless Gravity Filters (AVGFs). The AVGFs contain a 50:50 ratio of anthracite to filter sand. During this filtration process, suspended matter is removed from the water and turbidity is reduced.

After filtration, the water goes to a 32,000-gallon clearwell. The clearwell acts as a reservoir from which water can be drawn as needed for all systems, including firewater and demineralized water.

Domestic Water

When Davis-Besse began operation over 20 years ago, all site domestic water was produced in the Water Treatment Facility. Operation of the domestic water treatment and distribution system, including the collection and analysis of daily samples, was reportable to the Ohio Environmental Protection Agency.

Since December of 1998, domestic water needs at Davis-Besse have been met by the Carroll Township Water District. Since the Station no longer produces its own domestic water, these regulatory requirements no longer apply.

Zebra Mussel Control

Introduction

The plant receives all of its water from an intake system from Lake Erie. Zebra mussels can severely impact the availability of water for plant processes. *Dreissena polymorpha*, commonly known as the zebra mussel, is a native European bivalve that was introduced into the Great Lakes in 1986 and was discovered in Lake Erie in 1989. Zebra mussels are prolific breeders that rapidly colonize an area by forming byssal threads that enable them to attach to solid surfaces and to each other. Because of their ability to attach in this manner, they may form layers several inches deep. This poses a problem to facilities that rely on water intakes from Lake Erie because mussels may attach to the intake structures and restrict water flow.

Zebra mussels have not caused any significant problems at Davis-Besse, but mussels have been found attached to the intake crib (the structure that allows water to be pulled in from the lake) and the first section of the intake conduit (the pipe that connects the crib to the intake canal).

Mussels have also been found on the trash racks, and the intake bay #3 walls prior to the traveling screens. These mussels are periodically cleaned using high-pressure water. Davis-Besse uses continuous low level chlorination of the intake bays to control the mussels.

The mussel population appears to be leveling off or declining. This is likely due to the increasing clarity of Lake Erie. As the food source for the zebra mussel declines, mussel populations decline correspondingly.

Wastewater Treatment Plant (WWTP) Operation

The WWTP operation is supervised by an Ohio licensed Wastewater Operator. Wastewater generated by site personnel is treated in an onsite extended aeration package treatment facility designed to accommodate up to 38,000 gallons per day. In the treatment process, wastewater from the various collection points around the site enters the facility through a grinder, from where it is distributed to the surge tanks of one or both of the treatment plants.

The wastewater is then pumped into aeration tanks, where it is digested by microorganisms. Oxygen is necessary for good sewage treatment, and is provided to the microbes by blowers and diffusers. The mixture of organics, microorganisms, and decomposed wastes is called activated sludge. The treated wastewater settles in a clarifier, and the clear liquid leaves the clarifier over a weir and exits the plant through an effluent trough. The activated sludge contains the organisms necessary for continued treatment, and is pumped back to the aeration tank to digest incoming wastewater. The effluent leaving the plant is pumped to the wastewater basin (NPDES Outfall 601) where further treatment takes place.

Summary of 2002 Wastewater Treatment Plant Operations

All wastewater parameters were within specifications during the year 2002.

National Pollutant Discharge Elimination System (NPDES) Reporting

The Ohio Environmental Protection Agency (OEPA) has established limits on the amount of pollutants that Davis-Besse may discharge to the environment. These limits are regulated through the Station's National Pollutant Discharge Elimination System (NPDES) permit, number 2IB00011. Parameters such as chlorine, suspended solids and pH are monitored under the NPDES permit. Davis-Besse personnel prepare the NPDES Reports and submit them to the OEPA each month.

Davis-Besse has eight sampling points described in the NPDES permit. Seven of these locations are discharge points, or outfalls, and one is a temperature monitoring location. Descriptions of these sampling points follow:

Outfall 001

Collection Box: a point representative of discharge to Lake Erie
Source of Wastes: Low volume wastes (Outfalls 601 and 602), Circulating Water system blowdown and service water

Outfall 002

Area Runoff: Discharge to Toussaint River
Source of Wastes: Storm water runoff, Circulating Water pump house sumps

Outfall 003

Screenwash Catch Basin: Outfall to Navarre Marsh
Source of Wastes: Backwash water and debris from water intake screens

Outfall 004

Cooling Tower Basin Ponds: Outfall to State Route 2 Ditch
Source of Wastes: Circulating Water System drain (only during system outages)

Outfall 588

Sludge Monitoring
Source of Wastes: Wastewater Plant sludge shipped for offsite processing

Outfall 601

Wastewater Plant Tertiary Treatment Basin: Discharge from Wastewater Treatment Plant
Sources of Wastes: Wastewater Treatment Plant

Outfall 602

Low volume wastes: Discharge from settling basins
Sources of wastes: Water treatment residues, Condensate Polishing Holdup Tank decantation and Condensate Pit sumps

Sampling Point 801

Intake Temperature: Intake water prior to cooling operation

2002 NPDES Summary

During 2002, the NPDES permit was renewed by the Ohio EPA, and it will be effective for five years. A new sampling requirement with Outfall designation 004 was added to the permit, and will be used to monitor water drained from the Circulating Water System during outages. Three violations of the NPDES permit occurred during 2002. Two exceedances were measured at Outfall 001. Total Residual Oxidant and Total Residual Chlorine were each detected above the permit limit once during the year. An instrument error resulted in a 9.1 pH being recorded at Outfall 002, exceeding the limit of 9.0 pH units. Corrective actions were taken to prevent reoccurrence of these exceedances.

Chemical Waste Management

The Chemical Waste Management Program for hazardous and nonhazardous chemical wastes generated at the Davis-Besse Nuclear Power Station was developed to ensure wastes are managed and disposed of in accordance with all applicable state and federal regulations.

Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) is the statute which regulates solid hazardous waste. Solid waste is defined as a solid, liquid, semi-solid, or contained gaseous material. The major goals of RCRA are to establish a hazardous waste regulatory program to protect human health and the environment and to encourage the establishment of solid waste management, resource recovery, and resource conservation systems. The intent of the hazardous waste management program is to control hazardous wastes from the time they are generated until they are properly disposed of, commonly referred to as "cradle to grave" management. Anyone who generates, transports, stores, treats, or disposes of hazardous waste are subject to regulation under RCRA.

Under RCRA, there are essentially three categories of waste generators:

- Large quantity Generators - A facility which generates 1000 kilograms/month

(2200 lbs./month) or more.

- Small quantity Generators - A facility which generates less than 1000 kilograms/ month (2200 lbs./month).
- Conditionally Exempt Small Quantity Generators - A facility which generates 100 kilograms/month (220 lbs./month).

In 2002, the Davis-Besse Nuclear Power Station qualified as a small quantity generator, generating 2,100 pounds of hazardous waste. Davis-Besse personnel continuously strive to identify ways of reducing hazardous waste.

Non-hazardous waste disposed of in 2002 included 18,500 gallons of used oil, 800 gallons of oil filters and solid oily debris. Other non-hazardous regulated waste generated included 560 gallons of other chemicals such as microfilm process chemicals, polystyrene resins and sandblasting debris.

RCRA mandates other requirements such as the use of proper storage and shipping containers, labels, manifests, reports, personnel training, a spill control plan and an accident contingency plan. These are part of the Chemical Management Program at Davis-Besse. The following are completed as part of the hazardous waste management program and RCRA regulations:

- Weekly Inspections of the Chemical Waste Accumulation Areas are designated throughout the site to ensure proper handling and disposal of chemical waste. These, along with the Chemical Waste Storage Area, are routinely patrolled by security personnel and inspected weekly by Environmental and Chemistry personnel. All areas used for storage or accumulation of hazardous waste are posted with warning signs and drums are color-coded for easy identification of waste categories.

- Waste Inventory Forms are placed on waste accumulation drums or provided in the accumulation area for employees to record the waste type and amount when chemicals are added to the drum. This ensures that incompatible wastes are not mixed and also identifies the drum contents for proper disposal.

Other Environmental Regulating Acts

Comprehensive Environmental Response, Compensation and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or Superfund) established a federal authority and source of funding for responding to spills and other releases of hazardous materials, pollutants and contaminants into the environment. Superfund establishes "reportable quantities" for several hundred hazardous materials and regulates the cleanup of abandoned hazardous waste disposal sites.

Superfund Amendment and Reauthorization Act (SARA)

Superfund was amended in October 1986 to establish new reporting programs dealing with emergency preparedness and community right-to-know laws. As part of this program, CERCLA is enhanced by ensuring that the potential for release of hazardous substances is minimized, and that adequate and timely responses are made to protect surrounding populations.

Davis-Besse conducts site-wide inspections to identify and record all hazardous products and chemicals onsite as required by SARA. Determinations are made as to which products and chemicals are present in reportable quantities.

Annual SARA reports are submitted to local fire departments and state and local planning commissions by March 1 for the preceding calendar year.

Toxic Substances Control Act (TSCA)

The Toxic Substance Control Act (TSCA) was enacted to provide the USEPA with the authority to require testing of new chemical substances for potential health effects before they are introduced into the environment, and to regulate them where necessary. This law would have little impact on utilities except for the fact that one family of chemicals, polychlorinated biphenyls (PCBs), has been singled out by TSCA. This has resulted in an extensive PCB management system, very similar to the hazardous waste management system established under RCRA.

In 1992, Davis-Besse completed an aggressive program that eliminated PCB transformers onsite. PCB transformers were either changed out with non-PCB fluid transformers or retrofilled with non-PCB liquid.

Retro-filling PCB transformers involves flushing the PCB fluid out of a transformer, refilling it with PCB-leaching solvents and allowing the solvent to circulate in the transformer during operation. The entire retro-fill process takes several years and will extract almost all of the PCB. In all, Davis-Besse performed retro-fill activities on eleven PCB transformers between 1987 and 1992. The only remaining PCB containing equipment onsite are a limited number of capacitors. These capacitors are being replaced and disposed of during scheduled maintenance activities.

Clean Air Act

The Clean Air Act identifies substances that are considered air pollutants. Davis-Besse holds an OEPA permit to operate an Air Contaminant Source for the station Auxiliary Boiler. This boiler is used to heat the station and provide steam to plant systems when the reactor is not operating. A report detailing the Auxiliary Boiler operation is submitted annually.

The Ohio EPA has granted an exemption from permitting our six emergency diesel engines, including the Station Blackout Diesel Generator, the 2 Emergency Diesel Generators, the Emergency Response Facility Diesel Generator, the Miscellaneous Diesel, and the Fire Pump Diesel. These sources are operated infrequently to verify their reliability, and would only be used in the event of an emergency.

In response to recent "Clean Air Act Title V" legislation, an independent study identifying and quantifying all of the air pollution sources onsite was performed. Of particular significance is asbestos removal from renovation and demolition projects for which USEPA has outlined specific regulations concerning handling, removal, environmental protection, and disposal. Also, the Occupational Safety and Health Protection Administration (OSHA) strictly regulates asbestos with a concern for worker protection. Removal teams must meet medical surveillance, respirator fit tests, and training requirements prior to removing asbestos-containing material. Asbestos is not considered a hazardous waste by RCRA, but the EPA does require special handling and disposal of this waste under the Clean Air Act.

Transportation Safety Act

The transportation of hazardous chemicals, including chemical waste, is regulated by the Transportation Safety Act of 1976. These regulations are enforced by the United States Department of Transportation (DOT) and cover all aspects of transporting hazardous materials, including packing, handling, labeling, marking, and placarding. Before any wastes are transported off site, Davis-Besse must ensure that the wastes are identified, labeled and marked according to DOT regulations, including verification that the vehicle has appropriate placards and it is in good operating condition.

Other Environmental Programs

Underground Storage Tanks

According to RCRA, facilities with Underground Storage Tanks (USTs) are required to notify the State. This regulation was implemented in order to provided protection from tank contents leaking and causing damage to the environment. Additional standards require leak detection systems and performance standards for new tanks. At Davis-Besse two 40,000 gallon and one 8,000 gallon diesel fuel storage tanks are registered USTs.

Spill Kits

Spill control equipment is maintained throughout the Station at chemical storage areas and hazardous chemical and oil use areas. Equipment in the kits may include chemical-resistant coveralls, gloves, boots, decontamination agents, absorbent cloth, goggles and warning signs.

Waste Minimization and Recycling

Municipal Solid Waste (MSW) is normal trash produced by individuals at home and by industries. In some communities, MSW is burned in specially designed incinerators to produce power or is separated into waste types (such as aluminum, glass, and paper) and recycled. The vast majority of MSW is sent to landfills for disposal. As the population increases and older landfills reach their capacity, MSW disposal becomes an important economic, health, and resource issue.

The State of Ohio has addressed the issue with the State Solid Waste Management Plan, otherwise known as Ohio House Bill 592. The intent of the bill is to extend the life of existing landfills by reducing the amount of MSW produced, by reusing certain waste material, and by recycling other wastes. This is frequently referred to as "**Reduce, Reuse, and Recycle.**"

Davis-Besse has implemented and participated in company wide programs that emphasize the reduction, reuse, recycle approach to MSW management. An active Investment Recovery Program has greatly contributed to the reduction of both hazardous and municipal waste generated by evaluating options for uses of surplus materials prior to the materials entering Davis-Besse's waste streams. Such programs include paper, cardboard, aluminum cans, used tires, and metals recycling or recovery. Paper and cardboard recycling is typically in excess of 50 tons annually. This represents a large volume of recyclable resources, which would have otherwise been placed in a landfill. Aluminum soft drink cans are collected for the Boy Scouts of America to recycle. Additionally, lead-acid batteries are recycled and tires are returned to the seller for proper disposal.

Although scrap metal is not usually considered part of the MSW stream, Davis-Besse does collect and recycle scrap metals, which are sold at current market price to a scrap dealer for resource recovery. These programs are continuously being expanded and reinforced as other components of MSW stream are targeted for reduction.

Appendices

APPENDIX A

INTERLABORATORY COMPARISON PROGRAM RESULTS

NOTE: Environmental Inc., Midwest Laboratory participates in intercomparison studies administered by Environmental Resources Associates, and serves as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada. Results are reported in Appendix A. TLD Intercomparison results, in-house spikes, blanks, duplicates and mixed analyte performance evaluation program results are also reported. Appendix A is updated four times a year; the complete Appendix is included in March, June, September and December monthly progress reports only.

January, 2002 through December, 2002

APPENDIX A

Interlaboratory Comparison Program Results

Environmental, Inc., Midwest Laboratory, formerly Teledyne Brown Engineering Environmental Services Midwest Laboratory has participated in interlaboratory comparison (crosscheck) programs since the formulation of it's quality control program in December 1971. These programs are operated by agencies which supply environmental type samples (e.g., mile or water) containing concentrations of radionuclides known to the issuing agency but not to participant laboratories. The purpose of such a program is to provide an independent check on a laboratory's analytical procedures and to alert it of any possible problems.

Participant laboratories measure the concentration of specified radionuclides and report them to the issuing agency. Several months later, the agency reports the known values to the participant laboratories and specifies control limits. Results consistently higher or lower than the known values or outside the control limits indicate a need to check the instruments or procedures used.

Results in Table A-1 were obtained through participation in the environmental sample crosscheck program administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada.

The results in Table A-2 were obtained for Thermoluminescent Dosimeters (TLDs), via International Intercomparison of Environmental Dosimeters under the sponsorships listed in Table A-2. Results of internal laboratory testing is also listed.

Table A-3 lists results of the analyses on in-house "spiked" samples for the past twelve months. All samples are prepared using NIST traceable sources. Data foar previous years available upon request.

Table A-4 lists results of the analyses on in-house "blank" samples for the past twelve months. Data for previous years available upon request.

Table A-5 list results of the in-house "duplicate" program for the past twelve months. Acceptance is based on the difference of the results being less than the sum of the errors. Data for previous years available upon request.

The results in Table A-6 were obtained through participation in the Mixed Analyte Performance Evaluation Program.

The results in Table A-7 were obtained through participation in the Environmental Measurement Laboratory Quality Assessment Program.

Attachment A lists acceptance criteria for "spiked" samples.

Out-of-limit results are explained directly below the result.

Appendix A

Interlaboratory Comparison Program Results

Environmental, Inc., Midwest Laboratory, formerly Teledyne Brown Engineering Environmental Services Midwest Laboratory, has participated in interlaboratory comparison (crosscheck) programs since the formulation of its quality control program in December, 1971. These programs are operated by agencies which supply environmental-type samples containing concentrations of radionuclides known to the issuing agency, but not to participant laboratories. The purpose of such a program is to provide an independent check on a laboratory's analytical procedures and to alert it of any possible problems.

Participant laboratories measure the concentration of specified radionuclides and report them to the issuing agency. Several months later, the agency reports the known values to the participant laboratories and specifies control limits. Results consistently higher or lower than the known values or outside the control limits indicate a need to check the instruments or procedures used.

Results in Table A-1 were obtained through participation in the environmental sample crosscheck program administered by the Environmental Resources Associates, serving as a replacement for studies studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada.

The results in Table A-2 were obtained for Thermoluminescent Dosimeters (TLDs), via International Intercomparison of Environmental Dosimeters under the sponsorships listed in Table A-2. Results of internal laboratory testing is also listed.

Table A-3 lists results of the analyses on in-house "spiked" samples for the past twelve months. All samples
are prepared using NIST traceable sources. Data for previous years available upon request.

Table A-4 lists results of the analyses on in-house "blank" samples for the past twelve months. Data for previous years available upon request. request.

Table A-5 list results of the in-house "duplicate" program for the past twelve months. Acceptance is based on the difference of the results being less than the sum of the errors. Data for previous years available upon request.

The results in Table A-6 were obtained through participation in the Mixed Analyte Performance Evaluation Program.

The results in Table A-7 were obtained through participation in the Environmental Measurement Laboratory Quality Assessment Program.

Attachment A lists acceptance criteria for "spiked" samples.

Out-of-limit results are explained directly below the result.

ACCEPTANCE CRITERIA FOR "SPIKED" SAMPLES

LABORATORY PRECISION: ONE STANDARD DEVIATION VALUES FOR VARIOUS ANALYSES[a]

Analysis	Level	One standard deviation for single determination
Gamma Emitters	5 to 100 pCi/liter or kg	5.0 pCi/liter
	> 100 pCi/liter or kg	5% of known value
Strontium-89[b]	5 to 50 pCi/liter or kg	5.0 pCi/liter
	> 50 pCi/liter or kg	10% of known value
Strontium-90[b]	2 to 30 pCi/liter or kg	5.0 pCi/liter
	> 30 pCi/liter or kg	10% of known value
Potassium-40	> 0.1 g/liter or kg	5% of known value
Gross alpha	20 pCi/liter	5.0 pCi/liter
	> 20 pCi/liter	25% of known value
Gross beta	100 pCi/liter	5.0 pCi/liter
	> 100 pCi/liter	5% of known value
Tritium	4,000 pCi/liter	1s = (pCi/liter) = 169.85 x $(known)^{0.0933}$
	> 4,000 pCi/liter	10% of known value
Radium-226,-228	0.1 pCi/liter	15% of known value
Plutonium	0.1 pCi/liter, gram, or sample	10% of known value
Iodine-131, Iodine-129[b]	55 pCi/liter	6.0 pCi/liter
	> 55 pCi/liter	10% of known value
Uranium-238, Nickel-63[b] Technetium-99[b]	35 pCi/liter	6.0 pCi/liter
	> 35 pCi/liter	15% of known value
Iron-55[b]	50 to 100 pCi/liter	10 pCi/liter
	> 100 pCi/liter	10% of known value

[a] From EPA publication, "Environmental Radioactivity Laboratory Intercomparison Studies Program, Fiscal Year, 1981-1982, EPA-600/4-81-004.

[b] Laboratory limit.

TABLE A-1. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)[a].

Lab Code	Date	Concentration (pCi/L) Analysis	Laboratory Result[b]	ERA Result[c]	Control Limits
STW-940	02/20/02	Sr-89	53.0 ± 2.5	55.3 ± 5.0	46.6 - 64.0
STW-940	02/20/02	Sr-90	16.6 ± 0.5	15.9 ± 5.0	7.2 - 24.6
STW-942	02/20/02	Gr. Alpha	6.5 ± 0.6	8.0 ± 5.0	0.0 - 16.7
STW-942	02/20/02	Gr. Beta	45.7 ± 3.1	48.3 ± 5.0	39.6 - 57.0
STW-944	02/20/02	Ba-133	25.8 ± 1.5	28.9 ± 5.0	20.2 - 37.6
STW-944	02/20/02	Co-60	76.9 ± 2.7	73.4 ± 5.0	64.7 - 82.1
STW-944	02/20/02	Cs-134	38.7 ± 1.6	42.1 ± 5.0	33.4 - 50.8
STW-944	02/20/02	Cs-137	92.9 ± 2.7	88.8 ± 5.0	80.1 - 97.5
STW-944	02/20/02	Ra-226	15.3 ± 0.7	14.3 ± 2.2	10.6 - 18.0
STW-944	02/20/02	Ra-228	17.5 ± 0.4	16.9 ± 4.2	9.6 - 24.2
STW-944	02/20/02	Uranium	23.8 ± 1.1	28.3 ± 3.0	23.1 - 33.5
STW-944	02/20/02	Zn-65	361.0 ± 9.2	359.0 ± 35.9	298.0 - 420.0
STW-951	05/22/02	Gr. Alpha	23.9 ± 2.5	22.8 ± 5.7	13.0 - 32.6
STW-951	05/22/02	Ra-226	5.9 ± 0.5	6.1 ± 0.9	4.5 - 7.7
STW-951	05/22/02	Ra-228	5.6 ± 0.9	4.5 ± 1.1	2.6 - 6.5
STW-951	05/22/02	Uranium	7.6 ± 0.2	9.3 ± 3.0	4.1 - 14.5
STW-952	05/22/02	Co-60	37.9 ± 0.7	39.1 ± 5.0	30.4 - 47.8
STW-952	05/22/02	Cs-134	14.5 ± 0.8	17.1 ± 5.0	8.4 - 25.8
STW-952	05/22/02	Cs-137	50.0 ± 2.0	52.1 ± 5.0	43.4 - 60.8
STW-952	05/22/02	Gr. Beta	171.0 ± 2.5	189.0 ± 28.4	140.0 - 238.0
STW-952	05/22/02	Sr-89	28.4 ± 4.8	31.7 ± 5.0	23.0 - 40.4
STW-952	05/22/02	Sr-90	32.4 ± 3.1	28.3 ± 5.0	19.6 - 37.0
STW-953[d]	05/22/02	H-3	13900.0 ± 100.0	17400.0 ± 1740.0	14400.0 - 20400.0
STW-954	05/22/02	I-131	14.6 ± 0.3	14.7 ± 2.0	11.2 - 18.2
STW-965	08/21/02	Ba-133	71.9 ± 2.1	80.0 ± 8.0	66.4 - 93.6
STW-965	08/21/02	Co-60	23.8 ± 1.0	23.3 ± 5.0	14.6 - 32.0
STW-965	08/21/02	Cs-134[e]	62.9 ± 1.2	71.7 ± 5.0	63.0 - 80.4
STW-965	08/21/02	Cs-137	219.3 ± 10.7	214.0 ± 10.7	195.0 - 233.0
STW-965	08/21/02	Gr. Alpha	74.4 ± 0.6	58.8 ± 14.7	33.5 - 84.1
STW-965	08/21/02	Gr. Beta	26.7 ± 0.4	21.9 ± 2.2	13.2 - 30.6
STW-965	08/21/02	Ra-226	5.0 ± 0.5	5.0 ± 0.8	3.7 - 6.3
STW-965	08/21/02	Ra-228	6.0 ± 0.7	4.7 ± 1.2	2.7 - 6.7
STW-965	08/21/02	Sr-89	28.4 ± 1.5	29.0 ± 5.0	20.3 - 37.7
STW-965	08/21/02	Sr-90	36.5 ± 1.1	36.4 ± 5.0	27.7 - 45.1
STW-965	08/21/02	Uranium	4.1 ± 0.1	5.0 ± 3.0	0.0 - 10.2
STW-965	08/21/02	Zn-65	92.4 ± 2.2	95.7 ± 9.6	79.4 - 112.0
STW-966	11/20/02	Gr. Alpha	9.3 ± 0.4	12.2 ± 5.0	3.5 - 20.9
STW-966	11/20/02	Gr. Beta	44.7 ± 1.0	47.0 ± 5.0	38.3 - 55.7
STW-967	11/20/02	H-3	10100.0 ± 38.7	10200.0 ± 1020.0	8440.0 - 12000.0
STW-968	11/20/02	Ra-226	11.6 ± 0.1	12.1 ± 1.8	9.0 - 15.2
STW-968	11/20/02	Ra-228	16.0 ± 1.4	15.1 ± 3.8	8.6 - 21.6
STW-968	11/20/02	Uranium	15.5 ± 0.5	19.2 ± 3.0	14.0 - 24.4
STW-969	11/20/02	I-131	6.0 ± 0.4	6.8 ± 2.0	3.3 - 10.2

TABLE A-1. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)[a].

		Concentration (pCi/L)			
Lab Code	Date	Analysis	Laboratory Result[b]	ERA Result[c]	Control Limits
STW-970	11/20/02	Co-60	104.0 ± 7.1	104.0 ± 5.2	95.0 - 113.0
STW-970	11/20/02	Cs-134	48.2 ± 2.3	55.5 ± 5.0	46.8 - 64.2
STW-970	11/20/02	Cs-137	109.0 ± 12.6	117.0 ± 5.9	107.0 - 127.0
STW-970	11/20/02	Gr. Beta	252.0 ± 26.8	288.0 ± 49.5	244.0 - 416.0
STW-970	11/20/02	Sr-89	43.2 ± 0.7	47.6 ± 5.0	38.9 - 56.3
STW-970	11/20/02	Sr-90	7.5 ± 0.2	7.6 ± 5.0	0.0 - 16.2
STW-971	11/20/02	Gr. Alpha	74.9 ± 1.5	103.0 ± 25.8	58.4 - 148.0
STW-971	11/20/02	Ra-226	8.9 ± 0.0	9.1 ± 1.4	6.7 - 11.5
STW-971	11/20/02	Ra-228	15.3 ± 0.1	17.8 ± 4.5	10.1 - 25.5
STW-971	11/20/02	Uranium	51.7 ± 1.6	61.7 ± 6.2	51.0 - 72.4

[a] Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the environmental samples crosscheck program operated by Environmental Resources Associates (ERA)

[b] Unless otherwise indicated, the laboratory result is given as the mean ± standard deviation for three determinations.

[c] Results are presented as the known values, expected laboratory precision (1 sigma, 1 determination) and control limits as provided by ERA.

[d] Analysis was repeated; result of reanalysis: 16114±487 pCi/L

[e] ERA acknowledged an unacceptably high percentage of failure for Cs-134 and questioned its own control limits. No problems were identified in the analysis.

TABLE A-2. Crosscheck program results; Thermoluminescent Dosimetry, (TLDs).

Lab Code	TLD Type	Date	mR Measurement	Known Value	Lab Result ± 2 sigma	Control Limits
Environmental, Inc.						
2001-1	CaSO4: Dy Cards	12/24/2001	Reader 1, #1	3.98	3.71 ± 0.12	2.79 - 5.17
2001-1	CaSO4: Dy Cards	12/24/2001	Reader 1, #1	3.98	3.38 ± 0.09	2.79 - 5.17
2001-1	CaSO4: Dy Cards	12/24/2001	Reader 1, #2	7.07	7.89 ± 0.18	4.95 - 9.19
2001-1	CaSO4: Dy Cards	12/24/2001	Reader 1, #2	7.07	7.64 ± 0.25	4.95 - 9.19
2001-1	CaSO4: Dy Cards	12/24/2001	Reader 1, #3	15.9	18.62 ± 0.40	11.13 - 20.67
2001-1	CaSO4: Dy Cards	12/24/2001	Reader 1, #3	15.9	19.58 ± 0.12	11.13 - 20.67
2001-1	CaSO4: Dy Cards	12/24/2001	Reader 1, #4	63.61	78.24 ± 1.23	44.53 - 82.69
2001-1	CaSO4: Dy Cards	12/24/2001	Reader 1, #4	63.61	79.89 ± 2.47	44.53 - 82.69
Environmental, Inc.						
2002-1	CaSO4: Dy Cards	5/28/2002	Reader 1, #1	4.84	4.44 ± 0.16	3.39 - 6.29
2002-1	CaSO4: Dy Cards	5/28/2002	Reader 1, #1	4.84	4.37 ± 0.20	3.39 - 6.29
2002-1	CaSO4: Dy Cards	5/28/2002	Reader 1, #2	8.60	9.08 ± 0.14	6.02 - 11.18
2002-1	CaSO4: Dy Cards	5/28/2002	Reader 1, #2	8.60	8.76 ± 0.16	6.02 - 11.18
2002-1	CaSO4: Dy Cards	5/28/2002	Reader 1, #3	19.34	22.14 ± 0.27	13.54 - 25.14
2002-1	CaSO4: Dy Cards	5/28/2002	Reader 1, #3	19.34	24.03 ± 0.30	13.54 - 25.14
2002-1	CaSO4: Dy Cards	5/28/2002	Reader 1, #4	77.36	92.77 ± 0.58	54.15 - 100.57
2002-1	CaSO4: Dy Cards	5/28/2002	Reader 1, #4	77.36	85.25 ± 0.37	54.15 - 100.57
Environmental, Inc.						
2002-2	CaSO4: Dy Cards	12/13/2002	Reader 1, 30	56.73	71.61 ± 1.79	39.71 - 73.75
2002-2	CaSO4: Dy Cards	12/13/2002	Reader 1, 45[a]	25.21	33.49 ± 1.38	17.65 - 32.77

[a] Precision of the distance (cm) measurement can significantly increase the error. The placement of the card holder could account for the error.

Lab Code	TLD Type	Date	mR Measurement	Known Value	Lab Result ± 2 sigma	Control Limits
2002-2	CaSO4: Dy Cards	12/13/2002	Reader 1, 60	14.18	17.37 ± 1.24	9.93 - 18.43
2002-2	CaSO4: Dy Cards	12/13/2002	Reader 1, 75	9.08	10.65 ± 1.02	6.36 - 11.80
2002-2	CaSO4: Dy Cards	12/13/2002	Reader 1, 90	6.30	6.37 ± 0.54	4.41 - 8.19
2002-2	CaSO4: Dy Cards	12/13/2002	Reader 1, 120	3.55	4.60 ± 0.41	2.49 - 4.62
2002-2	CaSO4: Dy Cards	12/13/2002	Reader 1, 135	2.80	2.51 ± 0.23	1.96 - 3.64
2002-2	CaSO4: Dy Cards	12/13/2002	Reader 1, 150	2.28	2.22 ± 0.28	1.60 - 2.96

[c] Control limits are based on Attachment A, Page A2 of this report.

TABLE A-3. In-House "Spike" Samples

Lab Code	Sample Type	Date	Concentration (pCi/L)[a] Analysis	Laboratory results 2s, n=1[b]		Known Activity	Control Limits[c]	
SPW-11552	Water	1/7/2002	Gr. Alpha	35.33	± 1.83	34.57	17.29	- 51.86
SPW-11552	Water	1/7/2002	Gr. Beta	112.62	± 2.44	107.70	96.93	- 118.47
SPMI-595	Milk	1/31/2002	Cs-134	29.63	± 4.98	27.10	17.10	- 37.10
SPMI-595	Milk	1/31/2002	Cs-137	51.31	± 7.55	50.89	40.89	- 60.89
SPMI-597	Milk	1/31/2002	Co-60	44.18	± 7.76	41.36	31.36	- 51.36
SPMI-597	Milk	1/31/2002	Cs-134	20.15	± 5.08	22.59	12.59	- 32.59
SPMI-597	Milk	1/31/2002	Cs-137	54.88	± 8.32	50.89	40.89	- 60.89
SPAP-594	Air Filter	2/6/2002	Gr. Beta	1.58	± 0.02	1.55	0.00	- 11.55
SPW-599	Water	2/19/2002	H-3	47607	± 595	50189	40151	± 60227
SPMI-1446	Milk	3/8/2002	I-131(G)	87.84	± 11.47	85.20	75.20	- 95.20
SPW-1446	Water	3/8/2002	I-131	82.98	± 1.20	85.20	68.16	- 102.24
SPW-1446	Water	3/8/2002	I-131(G)	92.75	± 12.87	85.20	75.20	- 95.20
SPMI-1448	Milk	3/8/2002	I-131	88.00	± 1.13	85.20	68.16	- 102.24
SPVE-1444	Vegetation	3/11/2002	I-131(G)	0.39	± 0.04	0.42	0.25	- 0.58
SPAP-2078	Air Filter	4/8/2002	Gr. Beta	1.43	± 0.01	1.55	0.00	- 11.55
SPW-2080	Water	4/5/2002	H-3	49121	± 608	46912	37530	± 56294
SPF-2082	Fish	4/5/2002	Cs-134	0.83	± 0.04	0.83	0.50	- 1.16
SPF-2082	Fish	4/5/2002	Cs-137	1.29	± 0.07	1.35	0.81	- 1.89
SPMI-2084	Milk	4/8/2002	Cs-134	20.93	± 5.82	24.69	14.69	- 34.69
SPMI-2084	Milk	4/8/2002	Cs-137	51.83	± 10.23	50.56	40.56	- 60.56
SPMI-2084	Milk	4/8/2002	I-131	87.72	± 1.28	88.37	70.70	- 106.04
SPMI-2084	Milk	4/8/2002	I-131(G)	84.08	± 10.75	88.37	78.37	- 98.37
SPMI-2084	Milk	4/8/2002	Sr-90	62.81	± 1.99	66.85	53.48	- 80.22
SPW-2115	Water	4/8/2002	I-131	82.42	± 1.27	88.37	70.70	- 106.04
SPW-2116	Water	4/8/2002	Co-60	32.47	± 5.78	33.09	23.09	- 43.09
SPW-2116	Water	4/8/2002	Cs-134	30.80	± 3.60	28.80	18.80	- 38.80
SPW-2116	Water	4/8/2002	Cs-137	53.85	± 7.07	50.56	40.56	- 60.56
SPW-2116	Water	4/8/2002	I-131(G)	79.09	± 7.58	88.37	78.37	- 98.37
SPW-2116	Water	4/8/2002	Sr-90	70.35	± 2.32	66.85	53.48	- 80.22
SPW-2019	Water	5/3/2002	Gr. Alpha	25.89	± 1.71	34.57	17.29	- 51.86
SPW-2019	Water	5/3/2002	Gr. Beta	101.19	± 2.37	107.70	96.93	- 118.47
SPCH-3064	Charcoal	5/11/2002	I-131(G)	0.74	± 0.04	0.85	0.51	- 1.18
SPW-4682	Water	7/17/2002	H-3	40856	± 548	46179	36943	± 55415
SPAP-4685	Air Filter	7/17/2002	Gr. Beta	1.58	± 0.02	1.55	0.00	- 11.55
W-71702S	Water	7/17/2002	Fe-55	10463.00	± 126.00	12200.60	9760.48	- 14640.72
W-71702S	Water	07/17/02	H-3	45779	± 583	46179	36943	± 55415
W-71702S	Water	07/17/02	Ni-63	17.02	± 1.50	17.10	10.26	- 23.94
SPVE-4910	Vegetation	07/22/02	Sr-90	10.22	± 0.80	9.04	0.00	- 19.04
W-72302S	Water	07/23/02	Sr-90	21.43	± 0.97	26.55	16.55	- 36.55
W-80102S	Water	08/01/02	Gr. Alpha	41.25	± 4.58	34.45	17.23	- 51.68
W-80102S	Water	08/01/02	Gr. Beta	113.66	± 5.30	107.70	96.93	- 118.47
W-80202S	Water	08/02/02	Tc-99	16.39	± 0.72	14.13	2.13	- 26.13
SPW-7188	Water	10/25/02	Fe-55	20396	± 265	22778	18222	- 27334
SPW-7190	Water	10/25/02	Ni-63	227.18	± 11.60	170.80	102.48	- 239.12

TABLE A-3. In-House "Spike" Samples

Lab Code	Sample Type	Date	Analysis	Concentration (pCi/L) Laboratory results 2s, n=1[b]	Known Activity	Control Limits[c]
SPW-7192	Water	10/25/02	H-3	96310 ± 871	90963	72770 - 109156
SPW-7194	Water	10/25/02	C-14	42938 ± 167	49661	29796 - 69525
SPAP-7198	Air Filter	10/25/02	Gr. Beta	1.65 ± 0.02	1.53	0.00 - 11.53
SPW-7335	Water	10/30/02	Co-60	39.67 ± 7.38	37.05	27.05 - 47.05
SPW-7335	Water	10/30/02	Cs-134	33.09 ± 5.96	34.11	24.11 - 44.11
SPW-7335	Water	10/30/02	Cs-137	46.80 ± 10.39	49.90	39.90 - 59.90
SPMI-7336	Milk	10/30/02	Cs-134	34.40 ± 4.99	34.11	24.11 - 44.11
SPMI-7336	Milk	10/30/02	Cs-137	46.52 ± 8.52	49.91	39.91 - 59.91
SPF-7340	Fish	10/30/02	Cs-134	0.66 ± 0.03	0.68	0.41 - 0.95
SPF-7340	Fish	10/30/02	Cs-137	1.35 ± 0.05	1.33	0.80 - 1.86
SPS-8102	Sediment	11/01/02	Sr-90	14.69 ± 0.67	13.45	3.45 - 23.45

[a] Results are reported in units of pCi/L, except for air filters (pCi/Filter), food products, vegetation, soil, sediment (pCi/g).
[b] Results are based on single determinations.
[c] Control limits are based on Attachment A, Page A2 of this report.

NOTE: For fish, Jello is used for the Spike matrix. For Vegetation, cabbage is used for the Spike matrix.

TABLE A-4. In-House "Blank" Samples

Lab Code	Sample Type	Date	Analysis	Concentration (pCi/L)[a] Laboratory results (4.66σ) LLD	Activity[b]	Acceptance Criteria (4.66 σ)
SPW-11551	water	1/7/2002	Gr. Alpha	0.47	0.45 ± 0.39	1
SPW-11551	water	1/7/2002	Gr. Beta	1.37	0.55 ± 1.03	3.2
SPAP-590	Air Filter	1/31/2002	Co-60	1.78		100
SPAP-590	Air Filter	1/31/2002	Cs-134	3.42		100
SPAP-590	Air Filter	1/31/2002	Cs-137	2.33		100
SPAP-590	Air Filter	1/31/2002	Gr. Beta	0.74	-0.096 ± 0.38	3.2
SPMI-596	Milk	1/31/2002	Co-60	3.54		10
SPMI-596	Milk	1/31/2002	Cs-134	3.24		10
SPMI-596	Milk	1/31/2002	Cs-137	3.89		10
SPMI-596	Milk	1/31/2002	K-40		1472.1 ± 101.50	0
SPW-598	water	1/31/2002	Co-60	2.30		10
SPW-598	water	1/31/2002	Cs-134	3.74		10
SPW-598	water	1/31/2002	Cs-137	3.23		10
SPW-600	water	1/31/2002	H-3	138.80	-96.5 ± 63.40	200
SPMI-1447	Milk	3/7/2002	I-131(G)	7.63		20
SPVE-1443	Vegetation	3/8/2002	I-131(G)	0.02		20
SPW-1445	water	3/8/2002	Co-60	2.76		10
SPW-1445	water	3/8/2002	Cs-134	2.87		10
SPW-1445	water	3/8/2002	Cs-137	4.34		10
SPW-1445	water	3/8/2002	I-131	0.45	0.17 ± 0.31	0.5
SPW-1445	water	3/8/2002	I-131(G)	6.50		20
SPMI-1447	Milk	3/8/2002	I-131	0.31	0.15 ± 0.22	0.5
SPAP-2077	Air Filter	4/8/2002	Gr. Beta	0.32	-0.055 ± 0.19	3.2
SPW-2079	water	4/5/2002	H-3	134.17	16.13 ± 67.39	200
SPF-2081	Fish	4/5/2002	Cs-134	7.67		100
SPF-2081	Fish	4/5/2002	Cs-137	9.54		100
SPMI-2083	Milk	4/8/2002	Cs-134	2.90		10
SPMI-2083	Milk	4/8/2002	Cs-137	3.03		10
SPMI-2083	Milk	4/8/2002	I-131	0.52	-0.38 ± 0.34	0.5
SPMI-2083	Milk[c]	4/8/2002	Sr-90	0.48	1.29 ± 0.36	1
SPW-2115	water	4/8/2002	Co-60	1.49		10
SPW-2115	water	4/8/2002	Cs-134	2.09		10
SPW-2115	water	4/8/2002	Cs-137	3.78		10
SPW-2115	water	4/8/2002	I-131	0.50	-0.16 ± 0.33	0.5
SPW-2115	water	4/8/2002	I-131(G)	3.30		20
SPW-2115	water	4/8/2002	Sr-90	0.66	0.10 ± 0.32	1
SPW-2018	water	4/22/2002	Gr. Alpha	0.56	-0.24 ± 0.38	1
SPW-2018	water	4/22/2002	Gr. Beta	1.38	3.19 ± 1.03	3.2
SPch-3063	Charcoal	5/11/2002	I-131(G)	8.27		9.6
SPW-4683	water	7/17/2002	H-3	129.00	-62.8 ± 60.30	200
W-71702	water	7/17/2002	Fe-55	33.61	-1.72 ± 15.63	1000
W-71702	water	7/17/2002	Ni-63	2.56	0.71 ± 1.37	20
W-71802B	water	7/18/2002	Gr. Alpha	0.48	0.31 ± 0.36	1
W-71802B	water	7/18/2002	Gr. Beta	1.33	0.9 ± 0.95	3.2

TABLE A-4. In-House "Blank" Samples

Lab Code	Sample Type	Date	Analysis	Concentration (pCi/L)[a] Laboratory results (4.66σ) LLD	Activity[b]	Acceptance Criteria (4.66 σ)
W-72302	water	7/23/2002	Sr-90	0.27	0.027 ± 0.13	1
W-80202	water	8/2/2002	Tc-99	0.34	-0.051 ± 0.16	10
SPW-7189	water	10/25/2002	Fe-55	978.21	21.77 ± 595.33	1000
SPW-7191	water	10/25/2002	Ni-63	11.74	4.47 ± 7.24	20
SPW-7193	water	10/25/2002	H-3	146.00	-92 ± 65.00	200
SPAP-7199	Air Filter	10/25/2002	Gr. Beta	0.00	-0.0024 ± 0.00	3.2
SPMI-7333	Milk	10/30/2002	Cs-134	5.30		10
SPMI-7333	Milk	10/30/2002	Cs-137	4.80		10
SPW-7334	water	10/30/2002	Co-60	3.69		10
SPW-7334	water	10/30/2002	Cs-134	5.37		10
SPW-7334	water	10/30/2002	Cs-137	3.90		10
SPF-7339	Fish	10/30/2002	Cs-134	4.69		100
SPF-7339	Fish	10/30/2002	Cs-137	11.18		100

[a] Liquid sample results are reported in pCi/Liter, air filters(pCi/filter), charcoal (pCi/charcoal canister), and solid samples (pCi/kg).
[b] The activity reported is the net activity result.
[c] Low levels of Sr-90 are still detected in the environment. A concentration of (1-5 pCi/L) in milk is not unusual.

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L)[a] First Result	Second Result	Averaged Result
CF-20, 21	1/2/2002	Be-7	0.47 ± 0.25	0.37 ± 0.12	0.42 ± 0.14
CF-20, 21	1/2/2002	Gr. Beta	7.82 ± 0.20	7.95 ± 0.21	7.89 ± 0.14
CF-20, 21	1/2/2002	K-40	6.65 ± 0.55	6.53 ± 0.36	6.59 ± 0.33
CF-20, 21	1/2/2002	Sr-90	0.01 ± 0.01	0.01 ± 0.01	0.01 ± 0.00
AP-11804, 11805	1/2/2002	Be-7	0.054 ± 0.011	0.049 ± 0.019	0.052 ± 0.011
AP-11825, 11826	1/2/2002	Be-7	0.053 ± 0.013	0.043 ± 0.013	0.048 ± 0.009
AP-11846, 11847	1/2/2002	Be-7	0.054 ± 0.018	0.048 ± 0.016	0.051 ± 0.012
WW-150, 151	1/7/2002	Gr. Beta	1.26 ± 0.50	1.04 ± 0.46	1.15 ± 0.34
MI-124, 125	1/8/2002	K-40	1332.30 ± 158.90	1271.70 ± 151.50	1302.00 ± 109.77
W-172, 173	1/8/2002	H-3	153.00 ± 68.00	148.00 ± 68.00	150.50 ± 48.08
SW-11698, 11699	1/8/2002	Gr. Alpha	2.51 ± 1.36	3.71 ± 1.80	3.11 ± 1.13
SW-11698, 11699	1/8/2002	Gr. Beta	7.68 ± 1.33	8.49 ± 1.43	8.09 ± 0.98
U-275, 276	1/10/2002	Gr. Alpha	1.40 ± 1.00	1.10 ± 1.20	1.25 ± 0.78
LW-356, 357	1/16/2002	Gr. Beta	3.47 ± 0.65	2.94 ± 0.61	3.21 ± 0.45
LW-377, 378	1/16/2002	Gr. Beta	2.75 ± 0.68	2.84 ± 0.61	2.79 ± 0.46
SW-525, 526	1/30/2002	Gr. Alpha	0.56 ± 0.35	0.24 ± 0.35	0.40 ± 0.25
SW-525, 526	1/30/2002	Gr. Beta	2.29 ± 0.41	2.58 ± 0.39	2.43 ± 0.28
DW-504, 505	1/31/2002	Gr. Alpha	2.30 ± 1.70	3.90 ± 1.40	3.10 ± 1.10
MI-649, 650	2/5/2002	K-40	1319.40 ± 176.70	1210.80 ± 118.20	1265.10 ± 106.29
DW-697, 698	2/6/2002	Gr. Beta	5.10 ± 1.20	4.70 ± 1.20	4.90 ± 0.85
DW-927, 928	2/8/2002	Sr-90	0.69 ± 0.29	0.71 ± 0.29	0.70 ± 0.21
W-973, 974	2/18/2002	Fe-55	7.29 ± 0.97	6.86 ± 0.94	7.08 ± 0.68
W-1673, 1674	2/25/2002	H-3	2640.00 ± 155.00	2908.00 ± 161.00	2774.00 ± 111.74
SWT-1395, 1396	2/26/2002	Gr. Beta	2.96 ± 0.59	2.29 ± 0.53	2.63 ± 0.40
MI-1268, 1269	2/27/2002	K-40	1460.50 ± 162.50	1573.00 ± 168.00	1516.75 ± 116.87
MI-1268, 1269	2/27/2002	Sr-90	0.77 ± 0.36	0.95 ± 0.40	0.86 ± 0.27
MI-1332, 1333	3/5/2002	K-40	1503.00 ± 164.00	1305.00 ± 168.00	1404.00 ± 117.39
MI-1332, 1333	3/5/2002	Sr-90	1.35 ± 0.38	1.07 ± 0.40	1.21 ± 0.28
MI-1458, 1459	3/6/2002	K-40	1411.70 ± 166.70	1390.00 ± 172.30	1400.85 ± 119.87
DW-10100, 10101	3/9/2002	Gr. Alpha	4.10 ± 1.70	1.80 ± 1.60	2.95 ± 1.17
DW-10111, 10112	3/9/2002	Gr. Alpha	7.10 ± 2.00	8.30 ± 2.30	7.70 ± 1.52
MI-1521, 1522	3/11/2002	K-40	1270.80 ± 103.30	1369.10 ± 121.60	1319.95 ± 79.78
MI-1521, 1522	3/11/2002	Sr-90	1.69 ± 0.46	2.46 ± 0.49	2.07 ± 0.34
MI-1541, 1542	3/11/2002	K-40	1562.20 ± 122.80	1529.30 ± 126.10	1545.75 ± 88.01
MI-1541, 1542	3/11/2002	Sr-90	0.85 ± 0.57	1.48 ± 0.43	1.16 ± 0.36
LW-1651, 1652	3/14/2002	Gr. Beta	2.90 ± 0.57	2.57 ± 0.56	2.74 ± 0.40
DW-10134, 10135	3/16/2002	Gr. Alpha	5.60 ± 1.90	5.40 ± 1.60	5.50 ± 1.24
WW-1694, 1695	3/18/2002	Gr. Beta	1.79 ± 0.59	1.53 ± 0.50	1.66 ± 0.39
SO-1715, 1716	3/19/2002	Cs-137	0.03 ± 0.01	0.02 ± 0.01	0.03 ± 0.01
SO-1715, 1716	3/19/2002	Gr. Beta	18.50 ± 1.70	19.10 ± 1.70	18.80 ± 1.20
DW-10302, 10303	3/20/2002	Gr. Alpha	2.30 ± 1.40	3.30 ± 1.60	2.80 ± 1.06
W-1758, 1759	3/25/2002	Gr. Alpha	2.50 ± 0.70	2.30 ± 0.60	2.40 ± 0.46
W-1758, 1759	3/25/2002	Gr. Beta	4.10 ± 1.20	2.50 ± 1.10	3.30 ± 0.81

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L)[a] First Result	Second Result	Averaged Result
MI-1926, 1927	3/26/2002	K-40	1414.00 ± 115.00	1316.00 ± 128.00	1365.00 ± 86.04
MI-1926, 1927	3/26/2002	Sr-90	2.30 ± 0.70	2.40 ± 0.70	2.35 ± 0.49
SWU-2010, 2011	3/26/2002	Gr. Beta	2.90 ± 0.60	2.20 ± 0.50	2.55 ± 0.39
DW-10376, 10377	3/27/2002	Gr. Beta	10.50 ± 1.30	10.10 ± 1.50	10.30 ± 0.99
AP-2479, 2480	3/28/2002	Be-7	0.064 ± 0.023	0.068 ± 0.014	0.066 ± 0.013
DW-10395, 10396	3/29/2002	Gr. Alpha	10.20 ± 2.10	14.60 ± 2.40	12.40 ± 1.59
LW-2181, 2182	3/31/2002	Gr. Beta	2.98 ± 0.68	1.99 ± 0.70	2.48 ± 0.49
LW-2181, 2182	3/31/2002	H-3	2694.43 ± 156.53	2688.84 ± 156.40	2691.64 ± 110.64
CW-2437, 2438	3/31/2002	Gr. Beta	1.09 ± 0.61	1.14 ± 0.58	1.11 ± 0.42
CW-2437, 2438	3/31/2002	H-3	6456.70 ± 229.20	6292.80 ± 226.52	6374.75 ± 161.12
MI-1947, 1948	4/1/2002	K-40	1421.40 ± 130.90	1256.80 ± 104.20	1339.10 ± 83.65
AP-2458, 2459	4/1/2002	Be-7	0.077 ± 0.011	0.081 ± 0.010	0.079 ± 0.008
DW-10409, 10410	4/1/2002	Gr. Alpha	39.30 ± 4.00	35.30 ± 3.60	37.30 ± 2.69
MI-2052, 2053	4/3/2002	K-40	1283.70 ± 103.20	1434.80 ± 147.90	1359.25 ± 90.17
MI-2052, 2053	4/3/2002	Sr-90	0.81 ± 0.36	0.75 ± 0.35	0.78 ± 0.25
AP-2711, 2712	4/3/2002	Be-7	0.071 ± 0.01	0.07 ± 0.01	0.07 ± 0.01
W-938, 939	4/9/2002	Ni-63	1.73 ± 0.10	1.82 ± 0.10	1.78 ± 0.07
SS-2202, 2203	4/9/2002	Gr. Beta	5.83 ± 1.16	5.52 ± 1.19	5.67 ± 0.83
SS-2202, 2203	4/9/2002	K-40	5.75 ± 0.48	6.11 ± 0.51	5.93 ± 0.35
F-2307, 2308	4/10/2002	K-40	2.75 ± 0.27	2.49 ± 0.32	2.62 ± 0.21
DW-10476, 10477	4/12/2002	Gr. Alpha	5.10 ± 1.30	3.90 ± 1.60	4.50 ± 1.03
W-2244, 2245	4/15/2002	Gr. Beta	1.70 ± 1.10	1.60 ± 1.00	1.65 ± 0.74
DW-10509, 10510	4/17/2002	Gr. Alpha	6.00 ± 2.00	7.30 ± 1.80	6.65 ± 1.35
SW-2690, 2691	4/24/2002	Gr. Beta	2.25 ± 0.68	2.15 ± 0.59	2.20 ± 0.45
SO-2903, 2904	4/24/2002	Be-7	1.22 ± 0.57	0.78 ± 0.43	1.00 ± 0.36
SO-2903, 2904	4/24/2002	Cs-137	0.13 ± 0.05	0.09 ± 0.05	0.11 ± 0.04
SO-2903, 2904	4/24/2002	K-40	21.06 ± 1.48	19.91 ± 1.16	20.48 ± 0.94
DW-10562, 10563	4/24/2002	Gr. Alpha	2.17 ± 1.13	3.25 ± 1.54	2.71 ± 0.96
DW-10578, 10579	4/29/2002	Gr. Alpha	8.20 ± 2.20	7.40 ± 2.00	7.80 ± 1.49
SO-2861, 2862	4/30/2002	Cs-137	236.40 ± 46.00	200.70 ± 52.60	218.55 ± 34.94
SO-2861, 2862	4/30/2002	K-40	10191.00 ± 784.60	11025.00 ± 941.30	10608.00 ± 612.71
SL-2819, 2820	5/1/2002	Be-7	805.70 ± 301.50	860.73 ± 164.80	833.22 ± 171.80
SL-2819, 2820	5/1/2002	Gr. Beta	5566.00 ± 124.00	5359.00 ± 122.00	5462.50 ± 86.98
SL-2819, 2820	5/1/2002	K-40	5524.00 ± 632.90	5277.50 ± 431.40	5400.75 ± 382.97
SL-2840, 2841	5/1/2002	Be-7	1010.00 ± 352.10	872.95 ± 181.70	941.48 ± 198.11
SL-2840, 2841	5/1/2002	Gr. Beta	4399.00 ± 221.80	4593.00 ± 276.00	4496.00 ± 177.04
SL-2840, 2841	5/1/2002	K-40	2422.80 ± 352.10	2254.10 ± 371.40	2338.45 ± 255.89
MI-2971, 2972	5/5/2002	K-40	1338.90 ± 83.44	1345.80 ± 100.90	1342.35 ± 65.47
MI-2971, 2972	5/5/2002	Sr-90	0.83 ± 0.47	1.65 ± 0.46	1.24 ± 0.33
DW-10603, 10604	5/6/2002	Gr. Alpha	6.30 ± 1.70	5.50 ± 1.60	5.90 ± 1.17
SS-3037, 3038	5/9/2002	K-40	11585.00 ± 749.00	11612.00 ± 787.00	11598.50 ± 543.22
MI-3124, 3125	5/13/2002	K-40	1329.50 ± 103.80	1373.00 ± 107.40	1351.25 ± 74.68
MI-3208, 3209	5/14/2002	K-40	1494.60 ± 158.40	1462.60 ± 182.50	1478.60 ± 120.83
LW-3250, 3251	5/15/2002	Gr. Beta	3.14 ± 0.55	3.28 ± 0.63	3.21 ± 0.42

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L)[a] First Result	Second Result	Averaged Result
CF-3292, 3293	5/20/2002	K-40	1.33 ± 0.99	1.14 ± 0.91	1.23 ± 0.67
MI-3376, 3377	5/26/2002	K-40	1333.30 ± 159.40	1090.70 ± 143.40	1212.00 ± 107.21
MI-3418, 3419	5/28/2002	K-40	1423.70 ± 121.30	1443.30 ± 164.30	1433.50 ± 102.11
SWT-3461, 3462	5/28/2002	Gr. Beta	2.65 ± 0.54	3.28 ± 0.60	2.97 ± 0.40
SO-3503, 3504	5/29/2002	Cs-137	0.17 ± 0.04	0.18 ± 0.05	0.18 ± 0.03
SO-3503, 3504	5/29/2002	Gr. Beta	27.72 ± 2.26	25.45 ± 2.03	26.58 ± 1.52
SO-3503, 3504	5/29/2002	K-40	20.24 ± 1.19	20.54 ± 1.24	20.39 ± 0.86
SL-3545, 3546	6/3/2002	Gr. Beta	4436.00 ± 90.00	4281.00 ± 89.00	4358.50 ± 63.29
SL-3545, 3546	6/3/2002	K-40	4684.20 ± 734.40	5242.50 ± 884.50	4963.35 ± 574.82
DW-10754, 10755	6/6/2002	Sr-90	0.50 ± 0.30	0.60 ± 0.30	0.55 ± 0.21
SW-3777, 3778	6/11/2002	Gr. Alpha	4.42 ± 1.50	2.97 ± 1.40	3.70 ± 1.02
SW-3777, 3778	6/11/2002	Gr. Beta	7.57 ± 1.22	6.83 ± 1.16	7.20 ± 0.84
MI-3798, 3799	6/11/2002	K-40	1433.40 ± 124.20	1401.20 ± 96.96	1417.30 ± 78.78
LW-3924, 3925	6/13/2002	Gr. Beta	3.05 ± 0.59	3.38 ± 0.72	3.21 ± 0.46
MI-3966, 3967	6/18/2002	K-40	1245.20 ± 109.20	1340.20 ± 121.90	1292.70 ± 81.83
MI-3966, 3967	6/18/2002	Sr-90	2.38 ± 0.51	2.63 ± 0.52	2.51 ± 0.36
MI-3987, 3988	6/19/2002	Sr-90	0.98 ± 0.35	0.97 ± 0.35	0.98 ± 0.25
MI-4095, 4096	6/25/2002	K-40	1256.10 ± 138.20	1199.00 ± 128.30	1227.55 ± 94.29
SWU-4221, 4222	6/25/2002	Gr. Beta	6.89 ± 1.97	5.38 ± 1.93	6.13 ± 1.38
LW-4179, 4180	6/27/2002	Gr. Beta	2.37 ± 0.58	2.00 ± 0.62	2.19 ± 0.42
G-4329, 4330	7/1/2002	Be-7	1394.80 ± 538.40	1098.10 ± 437.40	1246.45 ± 346.84
G-4329, 4330	7/1/2002	Gr. Beta	8.10 ± 0.27	8.00 ± 0.25	8.05 ± 0.18
G-4329, 4330	7/1/2002	K-40	7758.20 ± 1100.00	8399.80 ± 929.30	8079.00 ± 720.00
SL-4337, 4338	7/1/2002	Be-7	1480.90 ± 223.80	1726.40 ± 552.60	1603.65 ± 298.10
SL-4337, 4338	7/1/2002	Cs-137	32.30 ± 14.70	50.97 ± 27.10	41.64 ± 15.42
SL-4337, 4338	7/1/2002	Gr. Beta	5262.40 ± 522.10	5432.40 ± 540.00	5347.40 ± 375.56
SL-4337, 4338	7/1/2002	K-40	2249.00 ± 381.90	2989.90 ± 509.60	2619.45 ± 318.41
AP-4864, 4865	7/1/2002	Be-7	0.085 ± 0.009	0.085 ± 0.006	0.085 ± 0.006
MI-4359, 4360	7/2/2002	K-40	1390.10 ± 168.30	1567.40 ± 194.30	1478.75 ± 128.53
AP-4569, 4570	7/2/2002	Be-7	0.068 ± 0.016	0.086 ± 0.018	0.077 ± 0.012
AP-4843, 4844	7/2/2002	Be-7	0.077 ± 0.016	0.090 ± 0.020	0.084 ± 0.013
AP-4789, 4790	7/3/2002	Be-7	0.080 ± 0.013	0.078 ± 0.015	0.079 ± 0.010
SWU-4810, 4811	7/3/2002	Gr. Beta	2.40 ± 0.84	2.47 ± 0.88	2.43 ± 0.61
MI-4548, 4549	7/9/2002	K-40	1511.80 ± 127.00	1446.80 ± 101.80	1479.30 ± 81.38
DW-4737, 4738	7/12/2002	I-131	0.52 ± 0.20	0.49 ± 0.29	0.51 ± 0.18
MI-4632, 4633	7/15/2002	K-40	1198.40 ± 114.10	1371.30 ± 146.90	1284.85 ± 93.00
MI-5054, 5055	7/30/2002	K-40	1428.80 ± 105.60	1344.30 ± 106.40	1386.55 ± 74.95
G-5075, 5076	7/30/2002	Gr. Beta	7.11 ± 0.07	6.99 ± 0.07	7.05 ± 0.05
SWU-5124, 5125	7/30/2002	Gr. Beta	1.75 ± 0.84	1.90 ± 0.78	1.82 ± 0.57
G-5151, 5152	7/31/2002	Be-7	1.82 ± 0.30	2.05 ± 0.32	1.93 ± 0.22
G-5151, 5152	7/31/2002	K-40	5.13 ± 0.66	5.72 ± 0.70	5.42 ± 0.48
MI-5103, 5104	8/2/2002	K-40	1415.90 ± 70.57	1423.80 ± 129.20	1419.85 ± 73.61
LW-5434, 5435	8/5/2002	Gr. Beta	2.77 ± 0.35	2.26 ± 0.35	2.52 ± 0.25
MI-5215, 5216	8/7/2002	K-40	1361.10 ± 111.90	1358.30 ± 115.80	1359.70 ± 80.52

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L)[a] First Result	Second Result	Averaged Result
MI-5355, 5356	8/13/2002	K-40	1405.00 ± 165.80	1549.30 ± 114.40	1477.15 ± 100.72
F-5413, 5414	8/15/2002	Gr. Beta	2.37 ± 0.10	2.55 ± 0.10	2.46 ± 0.07
F-5413, 5414	8/15/2002	K-40	1.47 ± 0.32	1.73 ± 0.43	1.60 ± 0.27
MI-5603, 5604	8/26/2002	I-131	0.64 ± 0.34	0.52 ± 0.36	0.58 ± 0.25
MI-5603, 5604	8/26/2002	K-40	1353.60 ± 83.13	1261.40 ± 117.80	1307.50 ± 72.09
MI-5578, 5579	8/27/2002	K-40	1301.50 ± 161.70	1381.60 ± 111.20	1341.55 ± 98.12
VE-5682, 5683	8/28/2002	Be-7	0.29 ± 0.10	0.25 ± 0.11	0.27 ± 0.08
VE-5682, 5683	8/28/2002	Gr. Beta	3.79 ± 0.08	3.80 ± 0.08	3.79 ± 0.06
VE-5682, 5683	8/28/2002	K-40	3.06 ± 0.29	3.31 ± 0.42	3.18 ± 0.25
WW-6188, 6189	8/31/2002	Gr. Beta	2.70 ± 0.57	2.30 ± 0.57	2.50 ± 0.41
SL-5724, 5725	9/3/2002	Be-7	0.92 ± 0.19	1.04 ± 0.23	0.98 ± 0.15
SL-5724, 5725	9/3/2002	Cs-137	0.05 ± 0.02	0.05 ± 0.02	0.05 ± 0.01
SL-5724, 5725	9/3/2002	K-40	2.09 ± 0.31	2.28 ± 0.48	2.19 ± 0.29
MI-5877, 5878	9/9/2002	K-40	1340.70 ± 165.00	1168.50 ± 172.50	1254.60 ± 119.35
MI-6157, 6158	9/19/2002	K-40	1372.10 ± 115.10	1136.50 ± 222.70	1254.30 ± 125.34
MI-6258, 6259	9/24/2002	K-40	1328.60 ± 201.00	1312.60 ± 118.60	1320.60 ± 116.69
LW-6278, 6279	9/30/2002	Gr. Beta	2.15 ± 0.51	1.70 ± 0.50	1.93 ± 0.36
MI-6385, 6386	10/1/2002	K-40	1297.10 ± 168.90	1310.10 ± 128.30	1303.60 ± 106.05
BS-6453, 6454	10/1/2002	Cs-137	0.43 ± 0.03	0.44 ± 0.03	0.44 ± 0.02
BS-6453, 6454	10/1/2002	K-40	16.50 ± 0.51	16.80 ± 0.61	16.65 ± 0.40
SO-6478, 6479	10/1/2002	Cs-137	0.074 ± 0.016	0.070 ± 0.016	0.072 ± 0.011
SO-6478, 6479	10/1/2002	Gr. Alpha	8.01 ± 4.36	7.55 ± 4.57	7.78 ± 3.16
SO-6478, 6479	10/1/2002	Gr. Beta	30.41 ± 4.07	33.04 ± 4.28	31.73 ± 2.95
SO-6478, 6479	10/1/2002	K-40	19.82 ± 0.53	20.39 ± 0.58	20.10 ± 0.39
SO-6478, 6479	10/1/2002	Sr-90	0.087 ± 0.017	0.094 ± 0.020	0.091 ± 0.013
AP-6641, 6642	10/1/2002	Be-7	0.070 ± 0.016	0.080 ± 0.015	0.075 ± 0.011
MI-6544, 6545	10/2/2002	K-40	1331.60 ± 125.20	1326.50 ± 171.60	1329.05 ± 106.21
AP-6857, 6858	10/3/2002	Be-7	0.062 ± 0.015	0.071 ± 0.015	0.066 ± 0.010
AP-6857, 6858	10/3/2002	Be-7	0.062 ± 0.015	0.071 ± 0.015	0.066 ± 0.010
AP-6857, 6858	10/3/2002	Be-7	0.062 ± 0.015	0.071 ± 0.015	0.066 ± 0.010
BS-6620, 6621	10/7/2002	Co-60	0.090 ± 0.020	0.11 ± 0.02	0.10 ± 0.01
BS-6620, 6621	10/7/2002	Cs-137	0.62 ± 0.04	0.63 ± 0.03	0.62 ± 0.02
BS-6620, 6621	10/7/2002	K-40	11.38 ± 0.48	10.78 ± 0.52	11.08 ± 0.35
MI-6651, 6652	10/8/2002	K-40	1565.50 ± 141.00	1640.60 ± 189.20	1603.05 ± 117.98
G-6760, 6761	10/9/2002	Be-7	2.17 ± 0.49	2.31 ± 0.34	2.24 ± 0.30
G-6760, 6761	10/9/2002	K-40	6.24 ± 1.00	6.61 ± 0.60	6.42 ± 0.58
SWU-7054, 7055	10/10/2002	Gr. Beta	3.09 ± 0.57	2.06 ± 0.52	2.57 ± 0.39
U-7126, 7127	10/11/2002	Gr. Beta	2.61 ± 1.24	2.61 ± 1.08	2.61 ± 0.82
XW-7768, 7769	10/14/2002	Cs-137	2.25 ± 0.25	2.09 ± 0.18	2.17 ± 0.15
XW-7768, 7769	10/14/2002	H-3	2.63 ± 0.10	2.64 ± 0.10	2.64 ± 0.07
F-7148, 7149	10/15/2002	K-40	2.57 ± 0.28	2.98 ± 0.44	2.77 ± 0.26
BS-7337, 7338	10/23/2002	Co-60	0.083 ± 0.025	0.073 ± 0.031	0.078 ± 0.020
BS-7337, 7338	10/23/2002	Cs-137	0.082 ± 0.019	0.11 ± 0.04	0.10 ± 0.02
BS-7337, 7338	10/23/2002	Gr. Beta	12.54 ± 2.34	12.99 ± 2.22	12.77 ± 1.61
SO-7407, 7408	10/29/2002	Cs-137	0.14 ± 0.03	0.15 ± 0.03	0.15 ± 0.02
SO-7407, 7408	10/29/2002	Gr. Beta	16.73 ± 2.21	16.62 ± 2.27	16.67 ± 1.58
SO-7407, 7408	10/29/2002	K-40	12.05 ± 0.61	12.27 ± 0.81	12.16 ± 0.51

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L)[a] First Result	Second Result	Averaged Result
MI-7428, 7429	10/29/2002	K-40	1542.60 ± 213.00	1355.80 ± 185.70	1449.20 ± 141.29
pw-7621, 7622	10/30/2002	Gr. Beta	2.22 ± 0.92	2.08 ± 0.83	2.15 ± 0.62
TD-7653, 7654	10/31/2002	H-3	11122.00 ± 387.00	11259.00 ± 390.00	11190.50 ± 274.71
SW-7569, 7570	11/5/2002	Gr. Beta	15.90 ± 1.25	16.24 ± 1.27	16.07 ± 0.89
SW-7569, 7570	11/5/2002	K-40	14.79 ± 1.48	14.79 ± 1.48	14.79 ± 1.05
SO-8010, 8011	11/7/2002	Cs-137	0.11 ± 0.02	0.11 ± 0.03	0.11 ± 0.02
SO-8010, 8011	11/7/2002	K-40	6.91 ± 0.54	7.21 ± 0.54	7.06 ± 0.38
VE-7747, 7748	11/11/2002	Gr. Beta	3.59 ± 0.05	3.25 ± 0.05	3.42 ± 0.03
VE-7747, 7748	11/11/2002	K-40	3.17 ± 0.36	3.26 ± 0.46	3.22 ± 0.29
MI-7789, 7790	11/13/2002	K-40	1319.30 ± 167.60	1301.20 ± 140.70	1310.25 ± 109.41
DW-8082, 8083	11/29/2002	I-131	0.83 ± 0.24	0.98 ± 0.22	0.90 ± 0.16
SW-8054, 8055	12/2/2002	Gr. Beta	2.60 ± 0.46	2.21 ± 0.39	2.41 ± 0.30
SW-8054, 8055	12/2/2002	K-40	1.44 ± 0.14	1.43 ± 0.14	1.44 ± 0.10
MI-8105, 8106	12/4/2002	K-40	1300.60 ± 111.30	1315.40 ± 108.90	1308.00 ± 77.86
TD-8298, 8299	12/5/2002	H-3	355.00 ± 94.00	469.00 ± 99.00	412.00 ± 68.26
MI-8396, 8397	12/17/2002	K-40	1409.20 ± 117.30	1449.60 ± 108.60	1429.40 ± 79.93
SWT-8654, 8655	12/30/2002	Gr. Beta	1.63 ± 0.50	1.40 ± 0.47	1.51 ± 0.34
AP-8783, 8784	12/31/2002	Be-7	0.044 ± 0.009	0.042 ± 0.008	0.043 ± 0.006

Note: Duplicate analyses are performed on every twentieth sample received in-house. Results are not listed for those analyses with activities that measure below the LLD.

[a] Results are reported in units of pCi/L, except for air filters (pCi/Filter), food products, vegetation, soil, sediment (pCi/g).

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP)[a].

Lab Code	Type	Date	Analysis	Concentration[b] Laboratory result	Known Activity	Control Limits[c]
STW-939	water	12/01/01	Am-241	1.25 ± 0.0	1.19 ± 0.0	0.83 - 1.6
STW-939	water	12/01/01	Co-57	138.9 ± 0.5	143 ± 14.3	100.1 - 185.9
STW-939	water	12/01/01	Co-60	139.1 ± 0.5	141 ± 14.1	98.7 - 183.3
STW-939	water	12/01/01	Cs-134	25.16 ± 0.2	28.5 ± 0.3	19.95 - 37.1
STW-939	water	12/01/01	Cs-137	279.96 ± 0.9	286 ± 28.6	200.2 - 371.8
STW-939[d]	water	12/01/01	Fe-55	19.68 ± 23.2	9.2 ± 0.9	6.44 - 12.0
STW-939	water	12/01/01	Mn-54	253.64 ± 0.9	246 ± 0.2	172.2 - 319.8
STW-939	water	12/01/01	Ni-63	65.88 ± 1.9	88.3 ± 8.8	61.81 - 114.8
STW-939[e]	water	12/01/01	Pu-238	0.060 ± 0.01	0.0 ± 0.0	-
STW-939	water	12/01/01	Pu-239/40	2.79 ± 0.0	2.99 ± 0.3	2.09 - 3.9
STW-939	water	12/01/01	Sr-90	4.88 ± 0.3	4.8 ± 0.5	3.36 - 6.2
STW-939	water	12/01/01	U-233/4	0.89 ± 0.0	0.98 ± 0.1	0.69 - 1.3
STW-939	water	12/01/01	U-238	6.75 ± 0.0	7.8 ± 0.8	5.46 - 10.1
STW-939	water	12/01/01	Zn-65	70.6 ± 1.1	67.3 ± 6.7	47.11 - 87.5
STSO-955	soil	10/16/02	Am-241	40.54 ± 2.7	43.5 ± 4.4	30.45 - 56.6
STSO-955	soil	10/16/02	Co-57	210.58 ± 2.0	246 ± 24.6	172.2 - 319.8
STSO-955	soil	10/16/02	Co-60	84.38 ± 0.9	87.5 ± 8.8	61.25 - 113.8
STSO-955	soil	10/16/02	Cs-134	692.6 ± 2.1	862 ± 86.0	603.4 - 1120.6
STSO-955	soil	10/16/02	Cs-137	96.98 ± 1.7	111 ± 11.1	77.7 - 144.3
STSO-955	soil	10/16/02	Fe-55	1714.6 ± 299.6	1870 ± 187.0	1309 - 2431.0
STSO-955	soil	10/16/02	Mn-54	509.74 ± 3.4	546 ± 54.6	382.2 - 709.8
STSO-955	soil	10/16/02	Ni-63	890.6 ± 22.4	1180 ± 118.0	826 - 1534.0
STSO-955	soil	10/16/02	Pu-238	34.04 ± 6.0	33.3 ± 3.3	23.31 - 43.3
STSO-955	soil	10/16/02	Pu-239/40	68.7 ± 3.7	72.9 ± 7.3	51.03 - 94.8
STSO-955[e]	soil	10/16/02	Sr-90	1.5 ± 3.0	0.0 ± 0.0	-
STSO-955	soil	10/16/02	U-233/4	166.33 ± 3.8	229 ± 22.9	160.3 - 297.7
STSO-955	soil	10/16/02	U-238	169.76 ± 3.8	220 ± 22.0	154 - 286.0
STSO-955	soil	10/16/02	Zn-65	783.59 ± 6.4	809 ± 80.9	566.3 - 1051.7

[a] Results obtained by Environmental, Inc. ,Midwest Laboratory as a participant in the Department of Energy's Mixed Analyte Performance Evaluation Program, Idaho Operations office, Idaho Falls, Idaho

[b] All results are in Bq/kg or Bq/L as requested by the Department of Energy.

[c] MAPEP results are presented as the known values and expected laboratory precision (1 sigma, 1 determination) and control limits as defined by the MAPEP.

[d] Known activity below the laboratory LLD. The sample was recounted for 2000 minutes; result : 11.52 ± 5.55 Bq /L.

[e] Included in the testing series as a "false positive". No activity expected.

TABLE A-7. Environmental Measurements Laboratory Quality Assessment Program (EML)
Concentration[a]

Lab Code	Type	Date	Analysis	Laboratory results	EML Result[b]	Control Limits[c]
STW-945	Water	03/01/02	Am-241	1.68 ± 0.14	1.47	0.79 - 1.41
STW-945	Water	03/01/02	Co-60	349.20 ± 2.60	347.33	0.80 - 1.20
STW-945	Water	03/01/02	Cs-134	3.40 ± 0.60	3.36	0.80 - 1.30
STW-945	Water	03/01/02	Cs-137	57.20 ± 1.70	56.07	0.80 - 1.22
STW-945	Water	03/01/02	Pu-238	0.45 ± 0.11	0.49	0.74 - 1.20
STW-945	Water	03/01/02	Pu-239/40	4.47 ± 0.28	4.22	0.79 - 1.20
STW-945	Water	03/01/02	Sr-90	7.40 ± 1.30	7.58	0.69 - 1.34
STW-945	Water	03/01/02	Uranium	3.27 ± 0.43	2.84	0.75 - 1.33
STW-946	Water	03/01/02	Gr. Alpha	265.40 ± 7.70	375.00	0.58 - 1.29
STW-946	Water	03/01/02	Gr. Beta	930.60 ± 12.00	1030.00	0.61 - 1.43
STW-946	Water	03/01/02	H-3	226.30 ± 32.70	283.70	0.78 - 2.45
STSO-947	Soil	03/01/02	Ac-228	55.00 ± 5.50	51.17	0.80 - 1.38
STSO-947	Soil	03/01/02	Am-241	8.30 ± 3.30	10.93	0.65 - 2.28
STSO-947	Soil	03/01/02	Bi-212	49.20 ± 12.40	53.43	0.50 - 1.34
STSO-947	Soil	03/01/02	Bi-214	46.60 ± 3.10	53.93	0.78 - 1.42
STSO-947	Soil	03/01/02	Cs-137	1401.60 ± 9.10	1326.67	0.80 - 1.25
STSO-947	Soil	03/01/02	K-40	613.10 ± 28.10	621.67	0.80 - 1.32
STSO-947	Soil	03/01/02	Pb-212	51.60 ± 2.60	51.10	0.78 - 1.32
STSO-947	Soil	03/01/02	Pb-214	52.00 ± 3.60	54.37	0.76 - 1.46
STSO-947	Soil	03/01/02	Pu-239/40	14.70 ± 3.50	19.10	0.71 - 1.30
STSO-947	Soil	03/01/02	Sr-90	52.10 ± 6.30	53.76	0.67 - 2.90
STSO-947	Soil	03/01/02	Th-234	122.40 ± 6.30	89.30	0.63 - 2.35
STSO-947	Soil	03/01/02	Uranium	143.40 ± 9.40	194.77	0.71 - 1.32
STVE-948	Vegetation	03/01/02	Am-241	3.10 ± 2.20	2.23	0.73 - 2.02
STVE-948	Vegetation	03/01/02	Cm-244	0.90 ± 0.80	1.32	0.61 - 1.59
STVE-948	Vegetation	03/01/02	Co-60	13.50 ± 2.10	11.23	0.80 - 1.44
STVE-948	Vegetation	03/01/02	Cs-137	350.40 ± 6.30	313.67	0.80 - 1.31
STVE-948	Vegetation	03/01/02	K-40	940.80 ± 45.60	864.33	0.79 - 1.39
STVE-948[d]	Vegetation	03/01/02	Pu-239/40	16.90 ± 0.70	3.54	0.69 - 1.31
STVE-948	Vegetation	03/01/02	Sr-90	543.40 ± 24.90	586.28	0.55 - 1.21
STAP-949	Air Filter	03/01/02	Am-241	0.09 ± 0.05	0.09	0.70 - 2.34
STAP-949	Air Filter	03/01/02	Co-60	30.10 ± 0.30	30.52	0.80 - 1.26
STAP-949	Air Filter	03/01/02	Cs-137	29.90 ± 0.30	28.23	0.80 - 1.32
STAP-949	Air Filter	03/01/02	Mn-54	40.40 ± 0.40	38.53	0.80 - 1.35
STAP-949	Air Filter	03/01/02	Pu-238	0.05 ± 0.02	0.06	0.67 - 1.33
STAP-949	Air Filter	03/01/02	Pu-239/40	0.15 ± 0.02	0.19	0.73 - 1.26
STAP-949	Air Filter	03/01/02	Sr-90	3.40 ± 0.40	4.83	0.53 - 1.84
STAP-949	Air Filter	03/01/02	Uranium	0.80 ± 0.20	0.61	0.79 - 2.10
STAP-950	Air Filter	03/01/02	Gr. Alpha	0.43 ± 0.04	0.53	0.73 - 1.43
STAP-950	Air Filter	03/01/02	Gr. Beta	1.34 ± 0.05	1.30	0.76 - 1.36
STW-959	Water	09/01/02	Am-241	3.00 ± 0.10	3.04	0.79 - 1.41
STW-959	Water	09/01/02	Co-60	258.40 ± 2.30	268.67	0.80 - 1.20
STW-959	Water	09/01/02	Cs-134	50.80 ± 3.30	60.20	0.80 - 1.30
STW-959	Water	09/01/02	Cs-137	80.10 ± 0.30	81.43	0.80 - 1.22
STW-959	Water	09/01/02	Cs-137	80.10 ± 0.30	81.43	0.80 - 1.22
STW-959	Water	09/01/02	Am-241	3.00 ± 0.10	3.04	0.79 - 1.41

TABLE A-7. Environmental Measurements Laboratory Quality Assessment Program (EML)[a].

Lab Code	Type	Date	Analysis	Concentration[b] Laboratory results	EML Result[c]	Control Limits[d]
STW-959	Water	09/01/02	Am-241	3.00 ± 0.10	3.04	0.79 - 1.41
STW-959	Water	09/01/02	Co-60	258.40 ± 2.30	268.67	0.80 - 1.20
STW-959	Water	09/01/02	Cs-134	50.80 ± 3.30	60.20	0.80 - 1.30
STW-959	Water	09/01/02	Cs-137	80.10 ± 0.30	81.43	0.80 - 1.22
STW-959	Water	09/01/02	H-3	271.90 ± 20.90	227.30	0.78 - 2.45
STW-959	Water	09/01/02	Pu-238	4.40 ± 0.20	4.33	0.74 - 1.20
STW-959	Water	09/01/02	Pu-239/40	2.10 ± 0.10	2.07	0.79 - 1.20
STW-959	Water	09/01/02	Sr-90	9.70 ± 0.20	8.69	0.69 - 1.34
STW-959	Water	09/01/02	Uranium	5.60 ± 0.10	6.84	0.75 - 1.33
STW-960	Water	09/01/02	Gr. Alpha	204.90 ± 3.20	210.00	0.58 - 1.29
STW-960	Water	09/01/02	Gr. Beta	852.00 ± 26.50	900.00	0.61 - 1.43
STSO-961	Soil	09/01/02	Ac-228	47.60 ± 1.90	42.30	0.80 - 1.38
STSO-961	Soil	09/01/02	Am-241	7.80 ± 1.40	6.77	0.65 - 2.28
STSO-961	Soil	09/01/02	Bi-212	45.60 ± 1.70	45.93	0.50 - 1.34
STSO-961[e]	Soil	09/01/02	Bi-214	48.80 ± 4.90	33.63	0.78 - 1.42
STSO-961	Soil	09/01/02	Cs-137	819.60 ± 16.60	829.33	0.80 - 1.25
STSO-961	Soil	09/01/02	K-40	705.30 ± 31.40	637.67	0.80 - 1.32
STSO-961	Soil	09/01/02	Pb-212	48.60 ± 3.40	43.43	0.78 - 1.32
STSO-961	Soil	09/01/02	Pb-214	51.10 ± 5.10	35.20	0.76 - 1.46
STSO-961[f]	Soil	09/01/02	Pu-239/40	20.20 ± 0.80	12.90	0.71 - 1.30
STSO-961	Soil	09/01/02	Sr-90	38.50 ± 0.10	41.16	0.67 - 2.90
STSO-961[g]	Soil	09/01/02	Uranium	58.90 ± 0.70	87.21	0.71 - 1.32
STVE-962	Vegetation	09/01/02	Am-241	2.10 ± 0.30	2.25	0.73 - 2.02
STVE-962	Vegetation	09/01/02	Cm-244	1.00 ± 0.30	1.25	0.61 - 1.59
STVE-962	Vegetation	09/01/02	Co-60	11.80 ± 1.50	9.66	0.80 - 1.44
STVE-962	Vegetation	09/01/02	Cs-137	340.30 ± 16.80	300.67	0.80 - 1.31
STVE-962	Vegetation	09/01/02	K-40	1646.00 ± 74.40	1480.00	0.79 - 1.39
STVE-962	Vegetation	09/01/02	Pu-239/40	3.00 ± 0.30	3.43	0.69 - 1.31
STVE-962	Vegetation	09/01/02	Sr-90	345.60 ± 97.80	476.26	0.55 - 1.21
STAP-963[h]	Air Filter	09/01/02	Am-241	0.20 ± 0.01	0.19	0.70 - 2.34
STAP-963	Air Filter	09/01/02	Co-60	24.90 ± 0.60	23.00	0.80 - 1.26
STAP-963	Air Filter	09/01/02	Cs-137	38.00 ± 1.30	32.50	0.80 - 1.32
STAP-963	Air Filter	09/01/02	Mn-54	60.80 ± 1.90	52.20	0.80 - 1.35
STAP-963[h]	Air Filter	09/01/02	Pu-238	0.11 ± 0.02	0.12	0.67 - 1.33
STAP-963[h]	Air Filter	09/01/02	Pu-239/40	0.21 ± 0.01	0.21	0.73 - 1.26
STAP-963	Air Filter	09/01/02	Sr-90	5.20 ± 0.20	5.56	0.53 - 1.84
STAP-963[h]	Air Filter	09/01/02	Uranium	0.41 ± 0.04	0.47	0.79 - 2.10
STAP-964	Air Filter	09/01/02	Gr. Alpha	0.40 ± 0.10	0.29	0.73 - 1.43
STAP-964	Air Filter	09/01/02	Gr. Beta	0.80 ± 0.10	0.87	0.76 - 1.36

[a] Results are reported in Bq/L with the following exceptions: Air Filters (Bq/Filter), Soil and Vegetation (Bq/kg).
[b] The EML result listed is the mean of replicate determinations for each nuclide ± the standard error of the mean.
[c] Control limits are reported by EML as the ratio of Reported Value / EML value.

[d] An error was found in the conversion from pCi/g to Bq/kg. Corrected result : 2.84 ± 0.59 Bq/kg.
[e] Naturally-occurring radium daughters are present in the shield background, and a probable cause of the higher bias seen for isotopes of lead and bismuth.

[f] Reporting error.The average result of the triplicate analyses was 14.1± 5.7 Bq/kg.
[g] The analysis was repeated in duplicate; result of reanalysis, 87.05 ± 7.64 Bq/kg.
[h] STAP-963, Calculations for the transuranics analyses (Am-241, Uranium, Pu-238, -239/40) were not converted to Bq/total filter.
The data listed is the result of recalculation.

APPENDIX B

DATA REPORTING CONVENTIONS

Data Reporting Conventions

1.0. All activities, except gross alpha and gross beta, are decay corrected to collection time or the end of the collection period.

2.0. Single Measurements

Each single measurement is reported as follows: x ± s

where: x = value of the measurement;

s = 2s counting uncertainty (corresponding to the 95% confidence level).

In cases where the activity is less than the lower limit of detection L, it is reported as: <L,

where L = the lower limit of detection based on 4.66s uncertainty for a background sample.

3.0. Duplicate analyses

3.1 Individual results: For two analysis results; $x_1 \pm s_1$ and $x_2 \pm s_2$

Reported result: x ± s; where $x = (1/2)(x_1 + x_2)$ and $s = (1/2)\sqrt{s_1^2 + s_2^2}$

3.2. Individual results: $<L_1$, $<L_2$ Reported result: <L, where L = lower of L_1 and L_2

3.3. Individual results: x ± s, <L Reported result: x ± s if x ≥ L; <L otherwise.

4.0. Computation of Averages and Standard Deviations

4.1 Averages and standard deviations listed in the tables are computed from all of the individual measurements over the period averaged; for example, an annual standard deviation would not be the average of quarterly standard deviations. The average $\bar{x}$ and standard deviation s of a set of n numbers $x_1, x_2 \ldots x_n$ are defined as follows:

$$\bar{x} = \frac{1}{n}\sum x \qquad s = \sqrt{\frac{\sum (x-\bar{x})^2}{n-1}}$$

4.2 Values below the highest lower limit of detection are not included in the average.

4.3 If all values in the averaging group are less than the highest LLD, the highest LLD is reported.

4.4 If all but one of the values are less than the highest LLD, the single value x and associated two sigma error is reported.

4.5 In rounding off, the following rules are followed:

4.5.1. If the number following those to be retained is less than 5, the number is dropped, and the retained number s are kept unchanged. As an example, 11.443 is rounded off to 11.44.

4.5.2. If the number following those to be retained is equal to or greater than 5, the number is dropped and the last retained number is raised by 1. As an example, 11.445 is rounded off to 11.45.

APPENDIX C

Maximum Permissible Concentrations of Radioactivity in Air and Water Above Background in Unrestricted Areas

Table C-1. Maximum permissible concentrations of radioactivity in air and water above natural background in unrestricted areas[a].

	Air (pCi/m^3)	Water (pCi/L)	
Gross alpha	1×10^{-3}	Strontium-89	8,000
Gross beta	1	Strontium-90	500
Iodine-131[b]	2.8×10^{-1}	Cesium-137	1,000
		Barium-140	8,000
		Iodine-131	1,000
		Potassium-40[c]	4,000
		Gross alpha	2
		Gross beta	10
		Tritium	1×10^6

[a] Taken from Table 2 of Appendix B to Code of Federal Regulations Title 10, Part 20, and appropriate footnotes. Concentrations may be averaged over a period not greater than one year.

[b] Value adjusted by a factor of 700 to reduce the dose resulting from the air-grass-cow-milk-child pathway.

[c] A natural radionuclide.

APPENDIX D

REMP SAMPLING SUMMARY

Table 4.5 Radiological Environmental Monitoring Program Summary

Name of Facility	Davis-Besse Nuclear Power Station	Docket No.	50-346
Location of Facility	Ottawa, Ohio (County, State)	Reporting Period	January-December, 2002

Sample Type (Units)	Type and Number of Analyses[a]		LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean		Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
					Location[d]	Mean (F)[c] Range[c]		
Airborne Particulates (pCi/m3)	GB	519	0.005	0.025 (311/311) (0.011-0.045)	Site Boundary 0.9 mi. E	0.027 (52/52) (0.014-0.040)	0.025 (208/208) (0.011-0.042)	0
	Sr-89		0.001	< LLD	-	-	< LLD	0
	Sr-90		0.0008	< LLD	-	-	< LLD	0
	GS	40						
	Be-7		0.015	0.073 (24/24) (0.046-0.098)	T-2, Site Boundary 0.9 mi. E	0.080 (4/4) (0.053-0.093)	0.067 (16/16) (0.041-0.095)	0
	K-40		0.034	< LLD	-	-	< LLD	0
	Nb-95		0.0013	< LLD	-	-	< LLD	0
	Zr-95		0.0026	< LLD	-	-	< LLD	0
	Ru-103		0.0013	< LLD	-	-	< LLD	0
	Ru-106		0.0077	< LLD	-	-	< LLD	0
	Cs-134		0.0011	< LLD	-	-	< LLD	0
	Cs-137		0.0010	< LLD	-	-	< LLD	0
	Ce-141		0.0023	< LLD	-	-	< LLD	0
	Ce-144		0.0073	< LLD	-	-	< LLD	0
Airborne Iodine (pCi/m3)	I-131	519	0.07	< LLD	-	-	< LLD	0
TLD (Quarterly) (mR/91 days)	Gamma	295	1.0	15.5 (255/255) (5.7-26.1)	T-45, Site Boundary 0.5 mi. WNW	22.0 (4/4) (18.5-26.1)	15.8 (40/40) (9.6-21.5)	0
TLD (Quarterly) (mR/91 days) (Shield)	Gamma	4	1.0	7.2 (4/4) (6.4-7.8)	-	-	None	0
TLD (Annual) (mR/365 days)	Gamma	85	1.0	62.2 (75/75) (36.5-95.6)	T-8, Farm 2.7 mi. WSW	95.6 (1/1)	68.0 (10/10) (50.2-82.2)	0
TLD (Annual) (mR/365 days) (Shield)	Gamma	1	1.0	28.3 (1/1)	-	-	None	0

Table 4.5 Radiological Environmental Monitoring Program Summary

Name of Facility: Davis-Besse Nuclear Power Station — Docket No. 50-346

Location of Facility: Ottawa, Ohio (County, State) — Reporting Period: January-December, 2002

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Milk (pCi/L)	I-131 12	0.5	none	-	-	< LLD	0
	Sr-89 12	1.3	none	-	-	< LLD	0
	Sr-90 12	0.0	none	T-24, Sandusky 21.0 mi. SE	1.1 (12/12) (0.7-2.3)	1.1 (12/12) (0.7-2.3)	0
	GS 12						
	K-40	100	none	T-24, Sandusky 21.0 mi. SE	1351 (12/12) (1229-1517)	1351 (12/12) (1229-1517)	0
	Cs-134	7.8					
	Cs-137	6.4	none	-	-	< LLD	0
	Ba-La-140	11.5	none	-	-	< LLD	0
(g/L)	Ca 12	0.50	none	T-24, Sandusky 21.0 mi. SE	0.90 (12/12) (0.80-0.97)	0.90 (12/12) (0.80-0.97)	0
(g/L)	K (stable) 12		none	T-24, Sandusky 21.0 mi. SE	1.56 (12/12) (1.42-1.75)	1.56 (12/12) (1.42-1.75)	0
(pCi/g)	Sr-90/Ca 12		none	T-24, Sandusky 21.0 mi. SE	1.24 (12/12) (0.74-2.56)	1.24 (12/12) (0.74-2.56)	0
(pCi/g)	Cs-137/K 12		none	-	-	< LLD	0
Ground Water (pCi/L)	GB (TR) 8	3.5	3.8 (3/4) (3.6-4.1)	T-225, residence 1.55 mi. NW	3.8 (3/4) (3.6-4.1)	< LLD	
	H-3 8	330	440 (1/4)	T-225, residence 1.55 mi. NW	440 (1/4)	< LLD	0
	Sr-89 8	1.2	< LLD	-	-	< LLD	0
	Sr-90 8	0.7	1.2 (1/4)	T-225, residence 1.55 mi. NW	1.2 (1/4)	0.8 (1/4)	0
	GS						
	Mn-54	15	< LLD	-	-	< LLD	0
	Fe-59	30	< LLD	-	-	< LLD	0
	Co-58	15	< LLD	-	-	< LLD	0
	Co-60	15	< LLD	-	-	< LLD	0
	Zn-65	30	< LLD	-	-	< LLD	0
	Zr-95	15	< LLD	-	-	< LLD	0
	Cs-134	10	< LLD	-	-	< LLD	0
	Cs-137	10	< LLD	-	-	< LLD	0
	Ba-La-140	15	< LLD	-	-	< LLD	0

Table 4.5 Radiological Environmental Monitoring Program Summary

Name of Facility	Davis-Besse Nuclear Power Station	Docket No.	50-346
Location of Facility	Ottawa, Ohio (County, State)	Reporting Period	January-December, 2002

Sample Type (Units)	Type and Number of Analyses[a]		LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Edible Meat	GS	4						
(pCi/g wet)	K-40		0.10	3.05 (2/2) (2.71-3.38)	T-197, residence 4.0 mi. W	3.38 (1/1)	2.86 (2/2) (2.66-3.06)	0
	Nb-95		0.057	< LLD	-	-	< LLD	0
	Zr-95		0.042	< LLD	-	-	< LLD	0
	Ru-103		0.037	< LLD	-	-	< LLD	0
	Ru-106		0.20	< LLD	-	-	< LLD	0
	Cs-134		0.019	< LLD	-	-	< LLD	0
	Cs-137		0.024	< LLD	-	-	< LLD	0
	Ce-141		0.075	< LLD	-	-	< LLD	0
	Ce-144		0.097	< LLD	-	-	< LLD	0
Fruits and	Sr-89	3	0.003	< LLD	-	-	< LLD	0
Vegetables (pCi/g wet)	Sr-90	3	0.001	< LLD	-	-	< LLD	0
	I-131	3	0.022	< LLD	-	-	< LLD	0
	GS	3						
	K-40		0.50	1.14 (2/2) (1.03-1.25)	T-25, residence 1.6 mi. S	1.25 (1/1)	1.09 (1/1)	0
	Nb-95		0.011	< LLD	-	-	< LLD	0
	Zr-95		0.024	< LLD	-	-	< LLD	0
	Cs-134		0.012	< LLD	-	-	< LLD	0
	Cs-137		0.011	< LLD	-	-	< LLD	0
	Ce-141		0.018	< LLD	-	-	< LLD	0
	Ce-144		0.10	< LLD	-	-	< LLD	0
Broad Leaf	Sr-89	12	0.009	< LLD	-	-	< LLD	0
Vegetation (pCi/g wet)	Sr-90	12	0.001	0.005 (7/8) (0.003-0.009)	T-17, Farm 1.8 mi. SSE	0.007 (3/3) (0.004-0.009)	0.004(4/4) (0.002-0.006)	0
	I-131	12	0.027	< LLD	-	-	< LLD	0
	GS	12						
	K-40		0.50	2.32 (8/8) (1.70-2.81)	T-19, Farm 0.68 mi. W	2.48 (4/4) (2.03-2.81)	2.14 (4/4) (1.82-2.41)	0
	Nb-95		0.014	< LLD	-	-	< LLD	0
	Zr-95		0.027	< LLD	-	-	< LLD	0
	Cs-134		0.014	< LLD	-	-	< LLD	0
	Cs-137		0.018	< LLD	-	-	< LLD	0
	Ce-141		0.031	< LLD	-	-	< LLD	0
	Ce-144		0.13	< LLD	-	-	< LLD	0

Table 4.5 Radiological Environmental Monitoring Program Summary

Name of Facility	Davis-Besse Nuclear Power Station	Docket No.	50-346
Location of Facility	Ottawa, Ohio (County, State)	Reporting Period	January-December, 2002

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean		Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
				Location[d]	Mean (F)[c] Range[c]		
Animal / Wildlife Feed (pCi/g wet)	GS 4						
	Be-7	0.24	0.33 (1/3)	T-31, Onsite Roving location	0.33 (1/1)	< LLD	0
	K-40	0.10	2.87 (3/3) (1.46-5.48)	T-34, Offsite Roving location	7.09 (1/1)	4.29 (2/2) (1.49-7.09)	0
	Nb-95	0.017	< LLD	-	-	< LLD	0
	Zr-95	0.044	< LLD	-	-	< LLD	0
	Ru-103	0.021	< LLD	-	-	< LLD	0
	Ru-106	0.16	< LLD	-	-	< LLD	0
	Cs-134	0.023	< LLD	-	-	< LLD	0
	Cs-137	0.023	< LLD	-	-	< LLD	0
	Ce-141	0.031	< LLD	-	-	< LLD	0
	Ce-144	0.15	< LLD	-	-	< LLD	0
Soil (pCi/g dry)	GS 20						
	Be-7	0.40	0.88 (6/12) (0.43-1.41)	T-4, Site Boundary 0.8 mi. S	1.14 (2/2) (0.87-1.41)	0.77 (4/8) (0.47-1.00)	0
	K-40	0.10	11.18 (12/12) (4.60-23.01)	T-8, Farm 2.7 mi. WSW	22.39 (2/2) (21.76-23.01)	19.11 (8/8) (14.55-21.88)	0
	Nb-95	0.084	< LLD		-	< LLD	0
	Zr-95	0.092	< LLD	- -	-	< LLD	0
	Ru-103	0.051	< LLD	-	-	< LLD	0
	Ru-106	0.38	< LLD	-	-	< LLD	0
	Cs-134	0.062	< LLD	-	-	< LLD	0
	Cs-137	0.029	0.12 (8/12) (0.039-0.19)	T-12, Water Treatment Plant, 23.5 mi. WNW	0.21 (2/2) (0.18-0.24)	0.14 (8/8) (0.036-0.24)	0
	Ce-141	0.090	< LLD	-	-	< LLD	0
	Ce-144	0.22	< LLD	-	-	< LLD	0

Table 4.5 Radiological Environmental Monitoring Program Summary

Name of Facility	Davis-Besse Nuclear Power Station	Docket No.	50-346
Location of Facility	Ottawa, Ohio (County, State)	Reporting Period	January-December, 2002

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Treated Surface Water (pCi/L)	GB (TR) 48	1.0	2.5 (24/24) (1.7-3.6)	T-22, Carroll Twp. WTP, 3.0 mi. NW	2.7 (12/12) (1.8-3.6)	2.1 (24/24) (1.3-3.5)	0
	H-3 16	330				< LLD	0
	Sr-89 16	1.5	< LLD	-	-	< LLD	0
	Sr-90 16	0.7	< LLD	-	-	< LLD	0
	GS 16						
	Mn-54	15	< LLD	-	-	< LLD	0
	Fe-59	30	< LLD	-	-	< LLD	0
	Co-58	15	< LLD	-	-	< LLD	0
	Co-60	15	< LLD	-	-	< LLD	0
	Zn-65	30	< LLD	-	-	< LLD	0
	Zr-Nb-95	15	< LLD	-	-	< LLD	0
	Cs-134	10	< LLD	-	-	< LLD	0
	Cs-137	10	< LLD	-	-	< LLD	0
	Ba-La-140	15	< LLD	-	-	< LLD	0
Untreated Surface Water (pCi/L)	GB (TR) 95	1.0	2.9 (50/50) (1.7-6.5)	T-3, Site Boundary 1.4 mi. ESE	3.3 (12/12) (1.8-6.5)	2.8 (45/45) (1.7-4.9)	0
	H-3 95	330	< LLD	-	-	< LLD	0
	Sr-89 20	1.2	< LLD	-	-	< LLD	0
	Sr-90 20	0.8	< LLD	-	-	< LLD	0
	GS 95						
	Mn-54	15	< LLD	-	-	< LLD	0
	Fe-59	30	< LLD	-	-	< LLD	0
	Co-58	15	< LLD	-	-	< LLD	0
	Co-60	15	< LLD	-	-	< LLD	0
	Zn-65	30	< LLD	-	-	< LLD	0
	Zr-Nb-95	15	< LLD	-	-	< LLD	0
	Cs-134	10	< LLD	-	-	< LLD	0
	Cs-137	10	< LLD	-	-	< LLD	0
	Ba-La-140	15	< LLD	-	-	< LLD	0

Table 4.5 Radiological Environmental Monitoring Program Summary

Name of Facility	Davis-Besse Nuclear Power Station	Docket No.	50-346
Location of Facility	Ottawa, Ohio (County, State)	Reporting Period	January-December, 2002

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Fish (pCi/g wet)	GB 6	0.1	3.33 (3/3) (2.90-3.73)	T-33, Lake Erie 1.5 mi. NE	3.33 (3/3) (2.90-3.73)	3.00 (3/3) (2.76-3.19)	0
	GS 6						
	K-40	0.10	2.73 (3/3) (2.51-3.12)	T-33, Lake Erie 1.5 mi. NE	2.73 (3/3) (2.51-3.12)	2.67 (3/3) (2.30-3.11)	0
	Mn-54	0.019	< LLD	-	-	< LLD	0
	Fe-59	0.131	< LLD	-	-	< LLD	0
	Co-58	0.030	< LLD	-	-	< LLD	0
	Co-60	0.013	< LLD	-	-	< LLD	0
	Zn-65	0.028	< LLD	-	-	< LLD	0
	Cs-134	0.018	< LLD	-	-	< LLD	0
	Cs-137	0.018	< LLD	-	-	< LLD	0
Shoreline Sediments (pCi/g dry)	GS 8						
	K-40	0.10	13.38 (6/6) (9.67-18.89)	T-4, Site Boundary 0.8 mi. S	17.40 (2/2) (15.91-18.89)	8.62 (2/2) (6.06-11.17)	0
	Mn-54	0.038	< LLD	-	-	< LLD	0
	Co-58	0.049	< LLD	-	-	< LLD	0
	Co-60	0.028	< LLD	-	-	< LLD	0
	Cs-134	0.059	< LLD	-	-	< LLD	0
	Cs-137	0.024	0.056 (2/6) (0.027-0.084)	T-4, Site Boundary 0.8 mi. S	0.084 (1/2)	< LLD	0

[a] GB = gross beta, GS = gamma scan.

[b] LLD = nominal lower limit of detection based on a 4.66 sigma counting error for background sample.

[c] Mean and range are based on detectable measurements only (i.e., >LLD) Fraction of detectable measurements at specified locations is indicated in parentheses (F).

[d] Locations are specified by station code (Table 4.1) and distance (miles) and direction relative to reactor site..

[e] Non-routine results are those which exceed ten times the control station value.