Offsite Dose Calculating Manual

for

Ginna Station

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7906050359

Rochester Gas and Electric Corporation

Revision 0

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Ginna Station Offsite Dose Calculating Manual

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The radiological effluent Technical Specifications require alarm/trip setpoints for radiation monitors on each effluent line. Precautions, limitations and setpoints applicable to the operation of Ginna Station liquid effluent monitors are provided in Procedures P-9 and RD-13. Setpoint values are to be calculated to assure that alarm and trip actions occur prior to exceeding the limits of 10 CFR 20 at the release point to the unrestricted area. The calculated alarm and trip action setpoints for each radioactive liquid effluent line monitor and flow determination must satisfy the following equation:

Equation (1): $$\frac{cf}{F+f} \leq C$$

Where:

C = the effluent concentration limit implementing 10 CFR 20 for unrestricted areas, in μCi/ml.

c = the setpoint, in μCi/ml, of the radioactivity monitor measuring the radioactivity concentration in the discharge line prior to dilution and subsequent release; the setpoint, which is proportional to the volumetric flow of the dilution stream plus the effluent stream, represents a value which, if exceeded, would result in concentrations exceeding the limits of 10 CFR 20 in the unrestricted area.

f = the flow as measured at the radiation monitor location, in volume per unit time, in the same units as F below.

F = The dilution water flow as determined prior to the release point, in volume per unit time.

Liquid effluent batch releases from Ginna Station are discharged through a liquid waste disposal monitor. The liquid waste stream is diluted in the plant discharge canal prior to entering Lake Ontario.

The limiting batch release concentration (c) corresponding to the liquid waste monitor setpoint is calculated from the above expression. Since the value of (f) is very small in comparison to (F), the expression becomes:

Equation (2) $$c \leq \frac{C \cdot F}{f}$$

Where:

C = the maximum permissible concentration of gross beta activity above background in the circulating water discharge at the unrestricted area boundary (1×10^{-7} μCi/ml.)

F = the dilution flow assuming operation of only 1 circulating water pump (200,000 gpm).

f = the waste effluent discharge rate based upon pump curves.

The limiting release concentration (c) is then converted to a setpoint count rate by use of the monitor calibration factor determined per procedure RD-13. The expression becomes:

Equation (2a)

$$\text{Setpoint (cpm)} = \frac{c(\mu Ci/ml)}{\text{Cal. Factor } (\mu Ci/ml \text{ per cpm})}$$

<u>Example</u> (Liquid Radwaste Monitor R-18):

If one assumes, for example, that the effluent discharge rate (f) is 30 gpm, then the limiting batch release concentration (c) would be determined as follows:

$$c\ (\mu Ci/ml) \leq \frac{1 \times 10^{-7}\ (\mu Ci/ml) \cdot 200{,}000\ (gpm)}{30\ (gpm)}$$

$$c \leq 6.7 \times 10^{-4}\ (\mu Ci/ml)$$

The monitor R-18 alarm/trip setpoint (in cpm) is then determined utilizing the monitor calibration factor calculated in procedure RD-13. Assuming a calibration factor of $9.5 \times 10^{-9}\ \frac{(\mu Ci/ml)}{cpm}$, the alarm/trip setpoint for monitor R-18 would be:

$$\frac{6.7 \times 10^{-4}\ (\mu Ci/ml)}{9.5 \times 10^{-9}\ \frac{(\mu Ci/ml)}{cpm}} = 7 \times 10^{4}\ cpm$$

The setpoint values for the Steam Generator Blowdown monitor (R-19), the Retention Tank monitor (R-21), and the All Volatile Treatment waste discharge monitor (R-22) are calculated in a similar manner using Equations (2) and (2a), substituting appropriate values of (f) and the corresponding calibration factor.

II. Gaseous Effluent Monitor Setpoints

Precautions, limitations and setpoints applicable to the operation of Ginna Station gaseous effluent monitors are provided in Procedures P-9 and RD-13. Setpoints are conservatively established for each ventilation effluent monitor so that dose rates in unrestricted areas corresponding to 10 CFR Part 20 limits will not be exceeded. Conservatism is to be incorporated into the determination of each setpoint to account for:

1. All exposure pathways of significance at the critical receptor location;

2. Dose contributions to the critical receptor from multiple release locations

3. Dose contributions from major isotopes expected to be present in effluents.

The general methodology for establishing plant ventilation monitor setpoints is based upon a vent concentration limit (in µCi/cc) derived from site specific meteorology and vent release characteristics. The vent concentration limit is then converted to cpm or Δcpm per unit time depending upon the particular monitor's method of operation, sampling rate and detection efficiency.

A. Containment and Plant Vent Radioiodine (Monitors R-10A and R-10B)

The containment and plant vent radioiodine monitors (R-10A and R-10B) employ fixed charcoal cartridges which will show an increase in count rate when radioiodine is present.

The food and ground plane pathway and infant dose are used as the basis for the limiting release rate and vent concentration limit for I-131. The limiting release rate for I-131 is determined for each vent using the equation:

Equation (3)

$$Q_{iv}(\mu Ci/sec.) = \frac{1500 \text{ mrem/yr}}{(P_i)\ (D/Q_v)}$$

Where:

P_i = the dose parameter for radionuclide i based upon the maximum organ dose from the food and ground plane pathways, in $m^2 \cdot$ mrem/yr per µCi/sec. Refer to Table 1.

(D/Q_v) = the highest calculated annual average dispersion parameter for estimating the dose to the critical offsite receptor from vent release point (v), in m^{-2}.

Q_{iv} = the release rate of radionuclide i from vent (v) which results in a dose rate of 1500 mrem/yr to the critical offsite receptor organ, in µCi/sec.

The value of Q_{I-131} (µCi/sec) determined for the containment and plant vent is used to calculate the corresponding vent concentration limit by dividing by the respective maximum release flow rate for each vent (in cc/sec.). Finally, the calibration factor (in µCi/cc per Δ cpm/hour) that is determined annually for each monitor is then applied to the limiting vent concentration to arrive at a corresponding Δcpm/hour value in the following manner.

Equation (3a) $$\text{Setpoint (cpm/hr)} = \frac{Q_{iv}\ (\mu Ci/sec)}{\text{Flow Rate (cc/sec)} \cdot \text{Cal.Factor}(\mu Ci/cc \text{ per } \Delta cpm/hr)}$$

<u>Example</u> (Plant Vent Radioiodine Monitor R-10B):

Assuming $D/Q_v = 3.0 \times 10^{-8}$ (m^{-2}) at the critical receptor location and substituting the appropriate dose parameter into equation (3), the calculated release rate limit becomes:

$$Q_{I-131}\ (\mu Ci/sec) = \frac{1500 (mrem/yr)}{1.1 \times 10^{12} (m^2 \cdot mrem/yr \text{ per } \mu Ci/sec) \cdot 3.0 \times 10^{-8}\ (m^{-2})}$$

$$Q_{I-131} = 0.05\ (\mu Ci/sec)$$

With a maximum vent release flow rate of 3.77×10^7 (cc/sec) and a calibration factor equal to 1.72×10^{-12} (µCi/cc per Δcpm/hour), the limiting count rate increase is calculated to be:

$$\text{Limiting Count rate increase} = \frac{0.05 (\mu Ci/sec)}{3.77 \times 10^7 (cc/sec) \cdot 1.72 \times 10^{-12}\ (\mu Ci/cc \text{ per } \Delta cpm/hr)}$$

$$= 770\ (cpm/hr)$$

If the plant vent (R-10B) reading's rate-of-change in any 15-minute period exceeds 1/4 the count rate increase limit, the plant computer will initiate an alarm. Also, each radioiodine monitor alarm setpoint is fixed at a (cpm) level which will alarm R-10A following approximately 1 hour of containment venting or R-10B after 2.25 hours of auxiliary building venting at the vent concentration limits.

B. Containment and Plant Vent Particulates (Monitors R-11 and R-13)

The containment and plant vent particulate monitors (R-11 and R-13) are set to alarm while venting at levels at or below concentration limits based upon average isotope mixtures. The monitors detect particulate activity collected on a moving filter tape.

Vent concentration limits may be calculated for radioactive particulates with half-lives greater than 8 days by use of equation (3) and the assumption that Cs-137 will be the controlling isotope. Substituting the appropriate parameters, Equation (3) becomes:

$$Q_{Cs-137}\ (\mu Ci/sec) = \frac{1500\ (mrem/yr)}{4.7 \times 10^{10}\ (m^2.mrem/yr\ per\ ^{\mu Ci}/sec)\ .\ D/Q_v (m^{-2})}$$

The resulting release rate limit for Cs-137 is used in the calculation of the plant vent and containment vent concentration limits, taking into account the maximum flow rates from each vent. The corresponding monitor count rate (cpm) is then calculated using the calibration factor determined annually for each vent, following the same method expressed in Equation (3a).

C. Containment, Plant Vent and Air Ejector Noble Gas Monitors (Monitors R-12, R-14 and R-15)

Monitor R-12 measures noble gas activity in containment when isolated, or in the containment vent during purge releases. Noble gases being released via the plant vent are detected by R-14. Monitor R-15 on the air ejector normally indicates only background activity, however it serves as one of the first means for detection of primary-to-secondary leakage.

The release rate limit for noble gases shall be calculated by the following equation for total body dose:

$$\text{Equation (4)} \quad Q_{iv}(\mu Ci/sec) = \frac{500\ (mrem/yr)}{K_i\ (mrem/yr\ per\ \mu Ci/m^3) \cdot X/Q_v\ (sec/m^3)}$$

and by the following equation for skin doses:

$$\text{Equation (5)} \quad Q_{iv}(\mu Ci/sec) = \frac{3000\ (mrem/yr)}{(L_i + 1.1M_i)\ (mrem/yr\ per\ \mu Ci/m^3) \cdot X/Q_v\ (sec/m^3)}$$

Where:

K_i = The total body dose factor due to gamma emissions for each identified noble gas radionuclide, in mrem/yr per $\mu Ci/m^3$ from Table 2.

L_i = The skin dose factor due to beta emissions for each identified noble gas radionuclide, in mrem/yr per $\mu Ci/m^3$ from Table 2.

M_i = The air dose factor due to gamma emissions for each identified noble gas radionuclide, in mrad/yr per $\mu Ci/m^3$ from Table 2 (unit conversion constant of 1.1 mrem/mrad converts air dose to skin dose).

X/Q_v = The highest calculated annual average dispersion parameter for estimating the dose to the critical offsite receptor from vent release point (v), in sec/m^3.

Q_{iv} = the release rate of radionuclide i from vent (v) which results in a dose rate of 500 mrem/yr to the whole body or 3000 mrem/yr to the skin of the critical receptor, in $\mu Ci/sec$.

Xenon-133 is the principal noble gas released from all vents and is appropriate for use as the reference isotope for establishing monitor setpoints. The whole body dose will be the most limiting and the Xe-133 release rate limit is calculated by substituting the appropriate values in Equation (4). After the release rate limit for Xe-133 is determined for each vent, the corresponding vent concentration limits are calculated based on maximum vent flow rates. Annually-derived monitor calibration factors ($\mu Ci/cc$ per cpm) convert limiting vent concentrations to count rate following the same method expressed in Equation (3a).

TABLE 1

DOSE PARAMETERS FOR RADIOIODINES AND RADIOACTIVE PARTICULATE, GASEOUS EFFLUENTS*

lio- clide	P_i Inhalation Pathway (mrem/yr per μCi/m^3)	P_i Food & Ground Pathways (m^2 · mrem/yr per μCi/sec)	Radio- nuclide	P_i Inhalation Pathway (mrem/yr per μCi/m^3)	P_i Food & Ground Pathways (m^2 · mrem/yr per μCi/sec)
3	6.5E+02	2.4E+03	Cd-115m	7.0E+04	4.8E+07
-51	3.6E+02	1.1E+07	Sn-126	1.2E+06	1.1E+09
-54	2.5E+04	1.1E+09	Sb-125	1.5E+04	1.1E+09
-59	2.4E+04	7.0E+08	Te-127m	3.8E+04	7.4E+10
-58	1.1E+04	5.7E+08	Te-129m	3.2E+04	1.3E+09
-60	3.2E+04	4.6E+09	Te-132	1.0E+03	7.2E+07
-65	6.3E+04	1.7E+10	Cs-134	7.0E+05	5.3E+10
-86	1.9E+05	1.6E+10	Cs-136	1.3E+05	5.4E+09
-89	4.0E+05	1.0E+10	Cs-137	6.1E+05	4.7E+10
-90	4.1E+07	9.5E+10	Ba-140	5.6E+04	2.4E+08
91	7.0E+04	1.9E+09	Ce-141	2.2E+04	8.7E+07
-95	2.2E+04	3.5E+08	Ce-144	1.5E+05	6.5E+08
-95	1.3E+04	3.6E+08	Np-239	2.5E+04	2.5E+06
-99	2.6E+02	3.3E+08	I-131	1.5E+07	1.1E+12
-103	1.6E+04	3.4E+10	I-133	3.6E+06	9.6E+09
-106	1.6E+05	4.4E+11	Unidentified	4.1E+07	9.5E+10
-110m	3.3E+04	1.5E+10			

he listed dose parameters are for radionuclides that may be detected in gaseous effluents. Additional dose parameters or isotopes not included in Table 1 may be calculated using the methodology described in NUREG-0133.

TABLE 2

DOSE FACTORS FOR NOBLE GASES AND DAUGHTERS*

adionuclide	Total Body Dose Factor K_i (mrem/yr per μCi/m^3)	Skin Dose Factor L_i (mrem/yr per μCi/m^3)	Gamma Air Dose Factor M_i (mrad/yr per μCi/m^3)	Beta Air Dose Factor N_i (mrad/yr per μCi/m^3)
r-83m	7.56E-02**	---	1.93E+01	2.88E+02
r-85m	1.17E+03	1.46E+03	1.23E+03	1.97E+03
r-85	1.61E+01	1.34E+03	1.72E+01	1.95E+03
r-87	5.92E+03	9.73E+03	6.17E+03	1.03E+04
r-88	1.47E+04	2.37E+03	1.52E+04	2.93E+03
r-89	1.66E+04	1.01E+04	1.73E+04	1.06E+04
r-90	1.56E+04	7.29E+03	1.63E+04	7.83E+03
e-131m	9.15E+01	4.76E+02	1.56E+02	1.11E+03
e-133m	2.51E+02	9.94E+02	3.27E+02	1.48E+03
e-133	2.94E+02	3.06E+02	3.53E+02	1.05E+03
e-135m	3.12E+03	7.11E+02	3.36E+03	7.39E+02
e-135	1.81E+03	1.86E+03	1.92E+03	2.46E+03
e-137	1.42E+03	1.22E+04	1.51E+03	1.27E+04
e-138	8.83E+03	4.13E+03	9.21E+03	4.75E+03
r-41	8.84E+03	2.69E+03	9.30E+03	3.28E+03

*The listed dose factors are for radionuclides that may be detected in gaseous effluents.

*7.56E-02 = 7.56 x 10^{-2}.

III. Liquid Effluent Release Concentrations

Liquid batch releases are controlled individually and each batch release is authorized based upon sample analysis and the existing dilution flow in the discharge canal. Plant procedures RD-7 and RD-8 establish the methods for sampling and analysis of each batch prior to release. A release rate limit, derived from Equation (1), is calculated for each batch based upon sample analysis, dilution flow and all procedural conditions being met before it is authorized for release. The waste effluent stream entering the discharge canal is monitored and will automatically terminate the release if the pre-selected monitor setpoint is exceeded. (See Section I.)

If gross beta analysis is performed for each batch release in lieu of gamma isotopic analysis, then a weekly composite for principal gamma emitters and I-131 is performed. Additional monthly and quarterly composite analyses are to be performed as specified in Table 4.12-1 of the Ginna Technical Specifications.

IV. Liquid Effluent Dose

The dose contribution received by the maximally exposed individual from the ingestion of Lake Ontario fish and drinking water is determined using the following methodology. These calculations will assume a near field dilution factor of 1.0 in evaluating the fish pathway dose, and a dilution factor of 20 between the plant discharge and the Ontario Water District drinking water intake location (Figure 4).

Dose contributions from shoreline recreation, boating and swimming have been shown to be negligible in the Appendix I dose analysis (June, 1976) and do not need to be routinely evaluated.

The following expression is used to calculate ingestion pathway dose contributions for the total release period $\sum_{\ell=1}^{m} \Delta t_\ell$ from all radionuclides identified in liquid effluents released to unrestricted areas:

Equation (6)

$$D_\tau = \sum_i \left[A_{i\tau} \sum_{\ell=1}^{m} \Delta t_\ell \, C_{i\ell} \, F_\ell\right]$$

Where:

D_τ = the cumulative dose commitment to the total body or any organ, τ, from the liquid effluents for the total time period $\sum_{\ell=1}^{m} \Delta t_\ell$, in mrem.

Δt_ℓ = the length of the ℓth time period over which $C_{i\ell}$ and F_ℓ are averaged for all liquid releases, in hours.

$C_{i\ell}$ = the average concentration of radionuclide, i, in undiluted liquid effluent during time period Δt_ℓ from any liquid release, in μCi/ml.

$A_{i\tau}$ = the site-related ingestion dose commitment factor to the total body or any organ τ for each identified principal gamma and beta emitter in mrem/hr per μCi/ml. See Equation (7).

F_ℓ = the discharge canal dilution factor for $C_{i\ell}$ during any liquid effluent release. Defined as the ratio of the maximum undiluted liquid waste flow during release to the average flow from the site discharge structure to unrestricted receiving waters. The dilution factor will depend on the number of circulation pumps operating and during icing conditions the percentage opening of the recirculating gate.

Equation (7) $A_{i\tau} = k_o (U_w/D_w + U_F BF_i) DF_i$

Where:

$A_{i\tau}$ = the site-related ingestion dose commitment factor to the total body or to any organ, τ, for each identified principal gamma and beta emitter, in mrem/hr per μCi/ml.

k_o = units conversion factor, $1.14 \times 10^5 = 10^6$ pCi/μCi x 10^3ml/kg ÷ 8760 hr/yr.

U_w = a receptor person's water consumption by age group from table E-5 of Regulatory Guide 1.109.

D_w = Dilution factor from the near field area of the release point to potable water intake. The site specific dilution factor is 20, taken from Appendix B, Ginna Station Environmental Report (August 1972). This factor is assumed to be 1.0 for the fish ingestion pathway.

U_F = a receptor person's fish consumption by age group from table E-5 of Regulatory Guide 1.109.

BF_i = Bioaccumulation factor for nuclide, i, in fish pCi/kg per PCi/ℓ, from Table A-1 of Regulatory Guide 1.109.

DF_1 = Dose conversion factor for nuclide, i, for a receptor person in pre-selected organ, τ, in mrem/pCi, from Tables E-11, E-12, E-13, E-14 of Regulatory Guide 1.109.

The projected monthly dose contribution from releases for which radionuclide concentrations are determined by periodic composite sample analysis may be approximated by assuming an average monthly concentration based on the previous monthly or quarterly composite analyses. However, for reporting purposes, the calculated dose contributions from these radionuclides shall be based on the actual composite analyses.

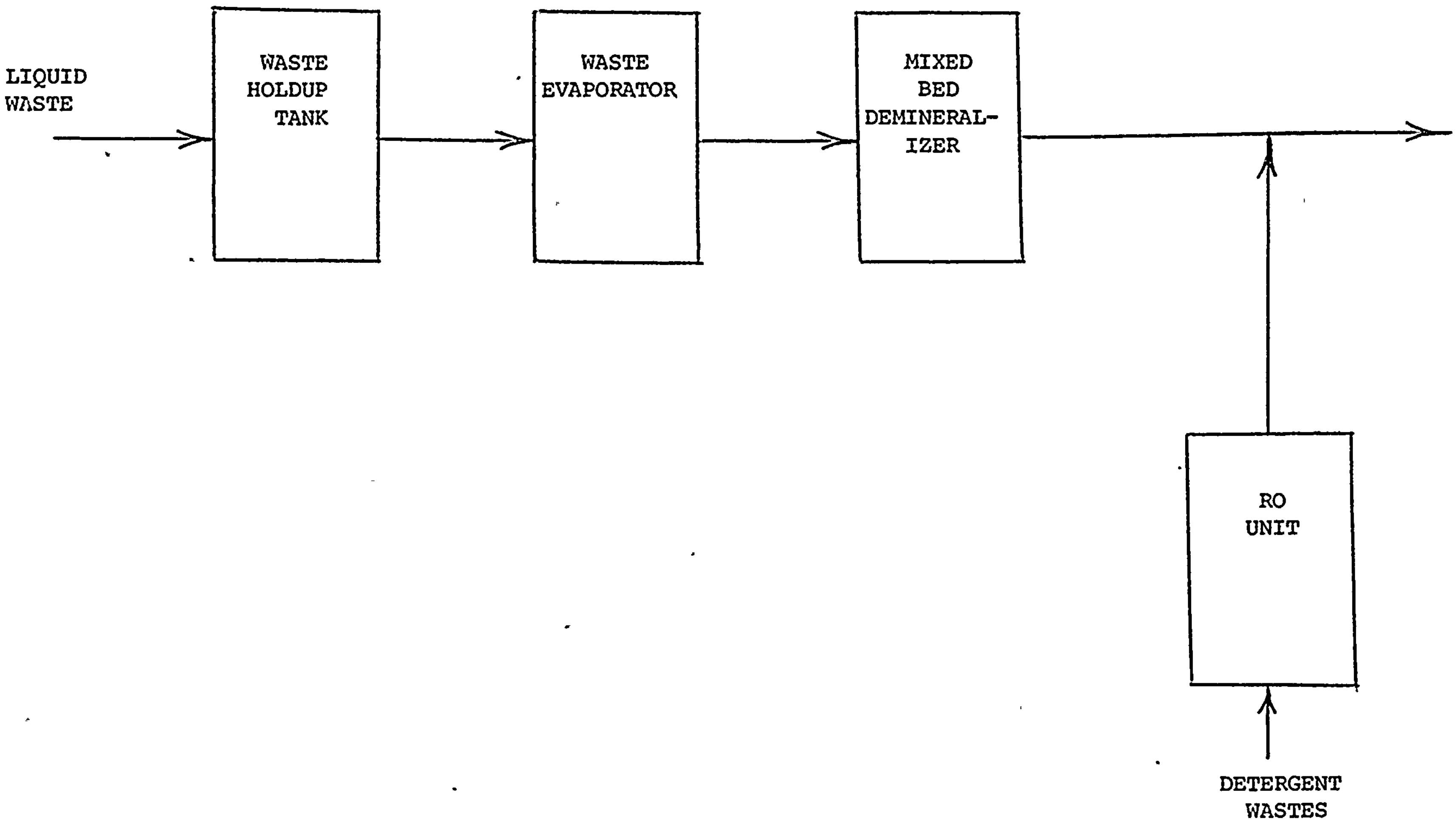
V. Liquid Waste Treatment and Operability

The dose contribution to the maximally exposed individual from liquid effluent releases is projected once each month for the subsequent 31-day period to determine the necessity for operating the liquid radwaste treatment system. The dose projection is to be based upon an estimate of the number of tank releases and level of untreated liquid waste activity which could be discharged over the ensuing 31 days. The number of releases is estimated from an historical average number of Laundry Tank and Waste Condensate Tank releases for comparable reactor operating periods. Average tank radioactivity concentrations are similarly determined by historical averaging. The maximum individual total body and organ dose commitments are then calculated using Equation (6).

When the 31-day projected dose commitment for predicted releases exceeds 0.06 mrem to the total body or 0.2 mrem to any organ, appropriate equipment in the liquid radwaste system shall be used to reduce the quantities of radioactive material in liquid effluents to be released. Liquid radioactive wastes are generally treated by the liquid radwaste system as defined in section 5.5.1 of the Ginna Technical Specifications, the requirement for liquid radwaste treatment will be satisfied by routine plant practices. These systems are shown in Figure 1. If, during the 31-day period, greater operational flexibility would be achieved by suspending treatment of a given waste batch prior to release, a dose evaluation must be performed to demonstrate compliance with Technical Specification requirement 3.9.1.3.a. The dose evaluation must show that the calculated dose contribution from the untreated batch, when added to the cumulative dose from earlier releases during the month, does not exceed 0.06 mrem to the total body or 0.2 mrem to any organ. If this and all other procedural requirements are met, the batch may be authorized for release without treatment.

FIGURE 1

GINNA STATION
LIQUID WASTE TREATMENT SYSTEM



VI. Gaseous Effluent Dose Rate

Gaseous effluent monitor setpoints as described in Section II of this manual are established at concentrations which permit some margin for corrective action to be taken before exceeding offsite dose rates corresponding to 10 CFR Part 20 limitations. Plant procedures RD-1.1, RD-1.2, RD-1.3, RD-2, RD-3, RD-5 and RD-12 establish the methods for sampling and analysis for continuous ventilation releases and for containment purge releases. Plant procedure RD-6 establishes the methods for sampling and analysis prior to gas decay tank releases. The dose rate in unrestricted areas due to radioactive materials released in gaseous effluents may be averaged over a 24-hour period and shall be determined using the following expressions:

Equation (8) $$D = \sum_i [K_i \ (X/Q)_v \ Q_{iv}]$$ (to total body)

Equation (9) $$D = \sum_i [(L_i + 1.1 \ M_i) \ (X/Q)_v \ Q_{iv}]$$ (to the skin)

Equation (10) $$D = \sum_i [P_i \ W_v \ Q_{iv}]$$ (critical organ)

K_i = The total body dose factor due to gamma emissions for each identified noble gas radionuclide, in mrem/yr per $\mu Ci/m^3$ from Table 2.

L_i = The skin dose factor due to beta emissions for each identified noble gas radionuclide, in mrem/yr per $\mu Ci/m^3$ from Table 2.

M_i = The air dose factor due to gamma emissions for each identified noble gas radionuclide, in mrad/yr per $\mu Ci/m^3$ from Table 2 (unit conversion constant of 1.1 mrem/mrad converts air dose to skin dose).

P_i = The dose parameter for radionuclides other than noble gases for the inhalation/pathway, in mrem/yr per $\mu Ci/m^3$ and for food and ground plane pathways, in $m^2 \cdot$ mrem/yr per μCi/sec from Table 1. The dose factors are based on the critical individual organ and most restrictive age group.

$(X/Q)_v$ = The highest calculated annual average relative concentration for any area at or beyond the unrestricted area boundary, in sec/m^3.

W_v = The highest annual average dispersion parameter for estimating the dose to the critical receptor; in sec/m^3 for the inhalation pathway, and in m^{-2} for the food and ground pathways.

Q_{iv} = the release rate of radionuclide i from vent (v), in μCi/sec.

VII. Gaseous Effluent Doses

The air dose in unrestricted areas due to noble gases released in gaseous effluents from the site shall be determined using the following expressions:

During any desired time period, for gamma radiation:

Equation (11) $$D_\gamma = 3.17 \times 10^{-8} \sum_i [M_i \, (\chi/Q)_v \, \tilde{Q}_{iv}], \text{ and}$$

During any desired time period, for beta radiation:

Equation (12) $$D_\beta = 3.17 \times 10^{-8} \sum_i [N_i \, (\chi/Q)_v \, \tilde{Q}_{iv}], \text{ and}$$

Where:

M_i = The air dose factor due to gamma emissions for each identified noble gas radionuclide, in mrad/yr per $\mu Ci/m^3$ from Table 2.

N_i = The air dose factor due to beta emissions for each identified noble gas radionuclide, in mrad/yr per $\mu Ci/m^3$ from Table 2.

$(\chi/Q)_v$ = For vent releases. The highest calculated annual average relative concentration for any area at or beyond the unrestricted area boundary, in sec/m^3.

D_γ = The total gamma air dose from gaseous effluents, in mrad, for the desired time period.

D_β = The total beta air dose from gaseous effluents, in mrad, for the desired time period.

$\tilde{Q}_{iv}$ = The release of noble gas radionuclides, i, in gaseous effluents from all vents, in µCi. Releases shall be cumulative over the desired time period.

3.17×10^{-8} = The inverse of the number of seconds in a year.

The dose to an individual from radioiodines and radioactive materials in particulate form with half-lives greater than 8 days in gaseous effluents released from the site to unrestricted areas shall be determined using the following expression:

During any desired time period:

Equation (13) $$D_I = 3.17 \times 10^{-8} \sum_i R_i \, [W_v \, \tilde{Q}_{iv}]$$

Where:

$\tilde{Q}_{iv}$ = The release of radioiodines, and radioactive materials in particulate form in gaseous effluents, i, with half-lives greater than 8 days, in μCi. Releases shall be cumulative over the desired time period as appropriate.

D_I = The total dose from radioiodines and radioactive materials in particulate form with half-lives greater than 8 days in gaseous effluents, in mrem, for the desired time period.

W_v = The annual average dispersion parameter for estimating the dose to an individual at the critical location; in sec/m^3 for the inhalation pathway, and in m^{-2} for the food and ground pathways.

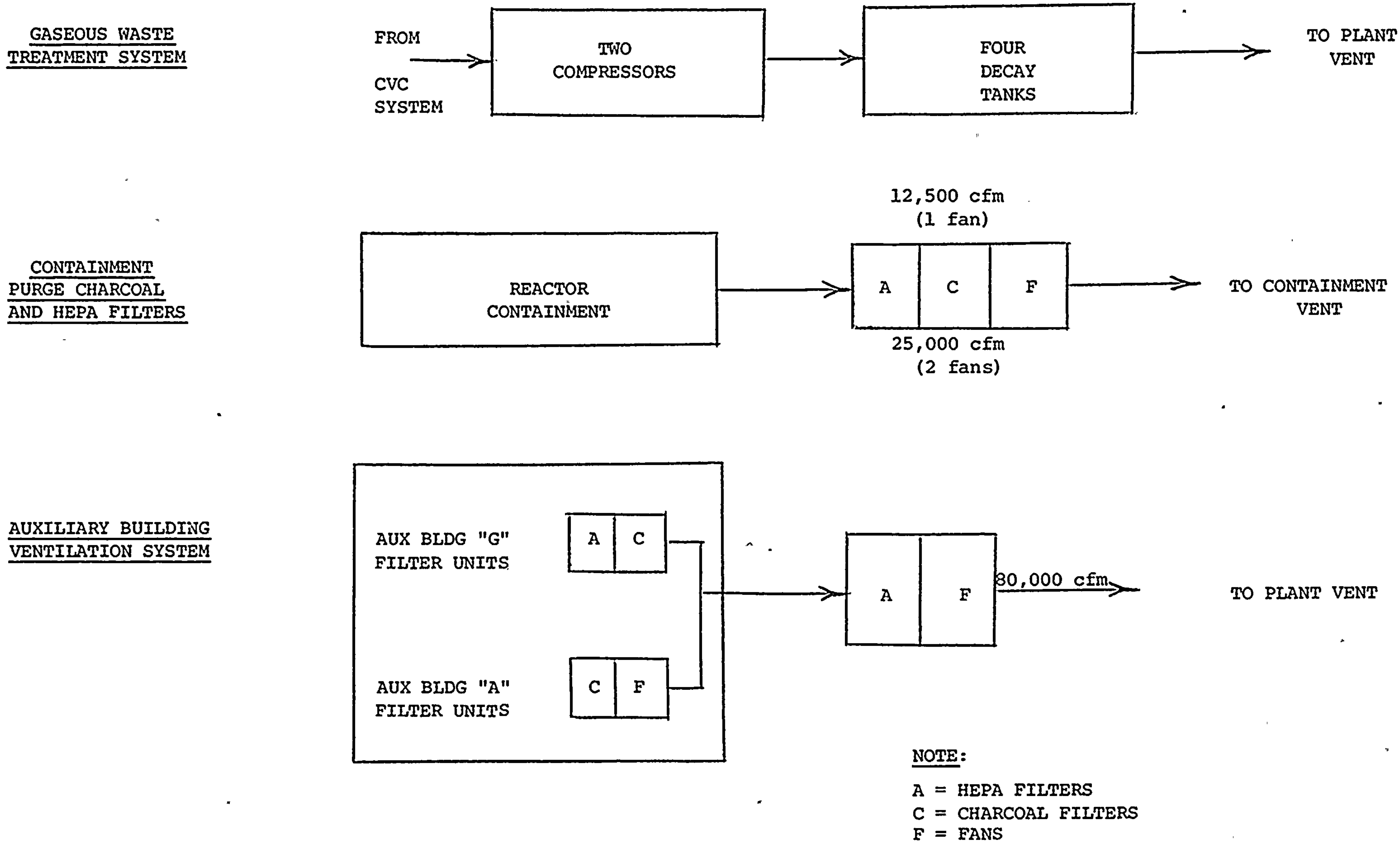
R_i = The dose factor for each identified radionuclide, i, in m^2 · mrem/yr per μCi/sec or mrem/yr per μCi/m^3 from Table 9.

VIII. Gaseous Waste Treatment and Operability

Normal plant procedures and practices call for treatment of gaseous effluents prior to release, using the appropriate waste treatment systems described in Section 5.5 of Ginna Technical Specifications. These are shown in Figure 2.

FIGURE 2

GINNA STATION
GASEOUS WASTE TREATMENT
AND VENTILATION EXHAUST SYSTEMS



IX. Environmental Monitor Sample Locations

Figure 3 shows the onsite indicator sample locations for airborne particulates, radioiodine and direct radiation. Respective sample locations are specified below. Also indicated on Figure 3 is the onsite vegetable garden, as well as the placement of post-accident TLD's (locations 13-24). The onsite garden is located in the sector having the highest D/Q value near the site boundary.

Figure 4 gives the location of the only milk herds within 5 miles of the plant. On this map is also included the Ontario Water District intake pumping station where lake water is sampled prior to treatment.

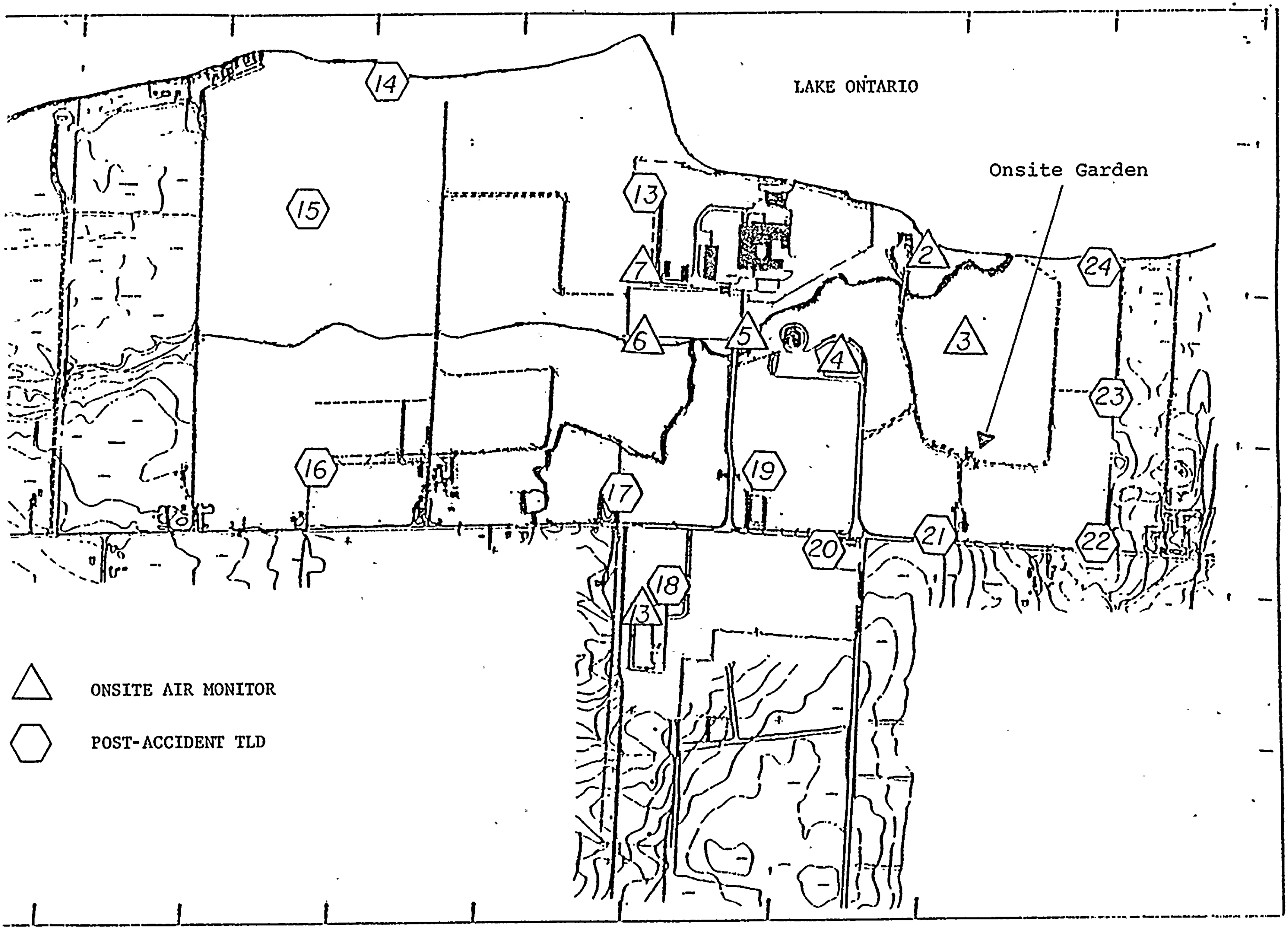
Figure 5 shows the offsite control sample locations for airborne particulates, radioiodine and direct radiation. Sample stations 9 and 11 are situated near population centers (Webster and Williamson) located approximately 7 miles from the Ginna site.

Key to Figures 3 and 5:

Type		Location
Radioiodine:	3 indicator	#3, 4 and 7
	1 control	#9
Particulate:	5 indicator	#3, 4, 5, 6 and 7
	2 control	#8 and 12
Direct Radiation:	6 indicator	#2, 3, 4, 5, 6, and 7
	2 control	#8 and 12

Note: Map locations not specified above may serve as additional sampling locations if required.

FIGURE 3



LAKE ONTARIO
Onsite Garden
14
15
13
7
2
24
3
6
5
4
23
16
19
17
21
22
20
18
3
ONSITE AIR MONITOR
POST-ACCIDENT TLD

FIGURE 4

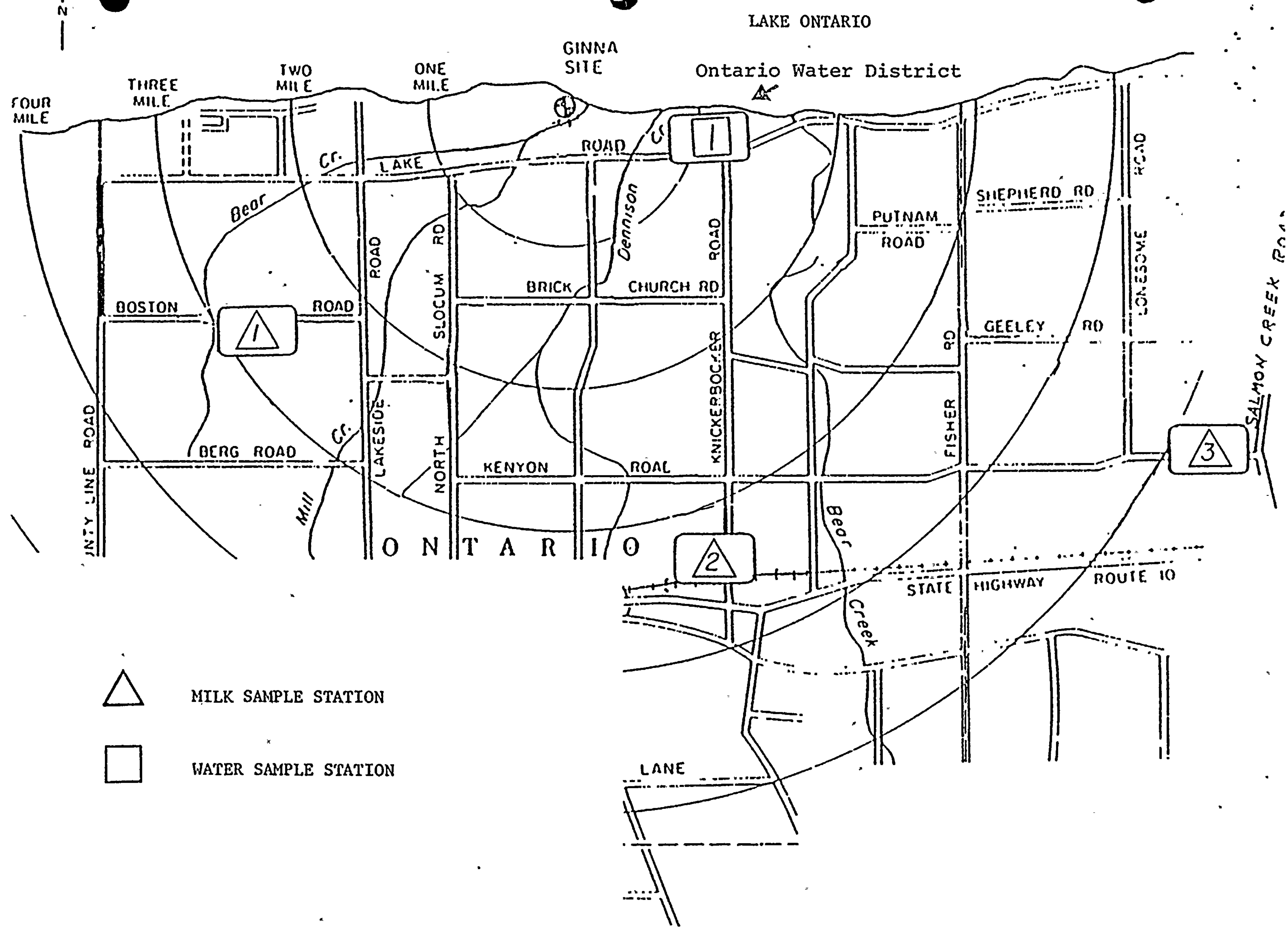
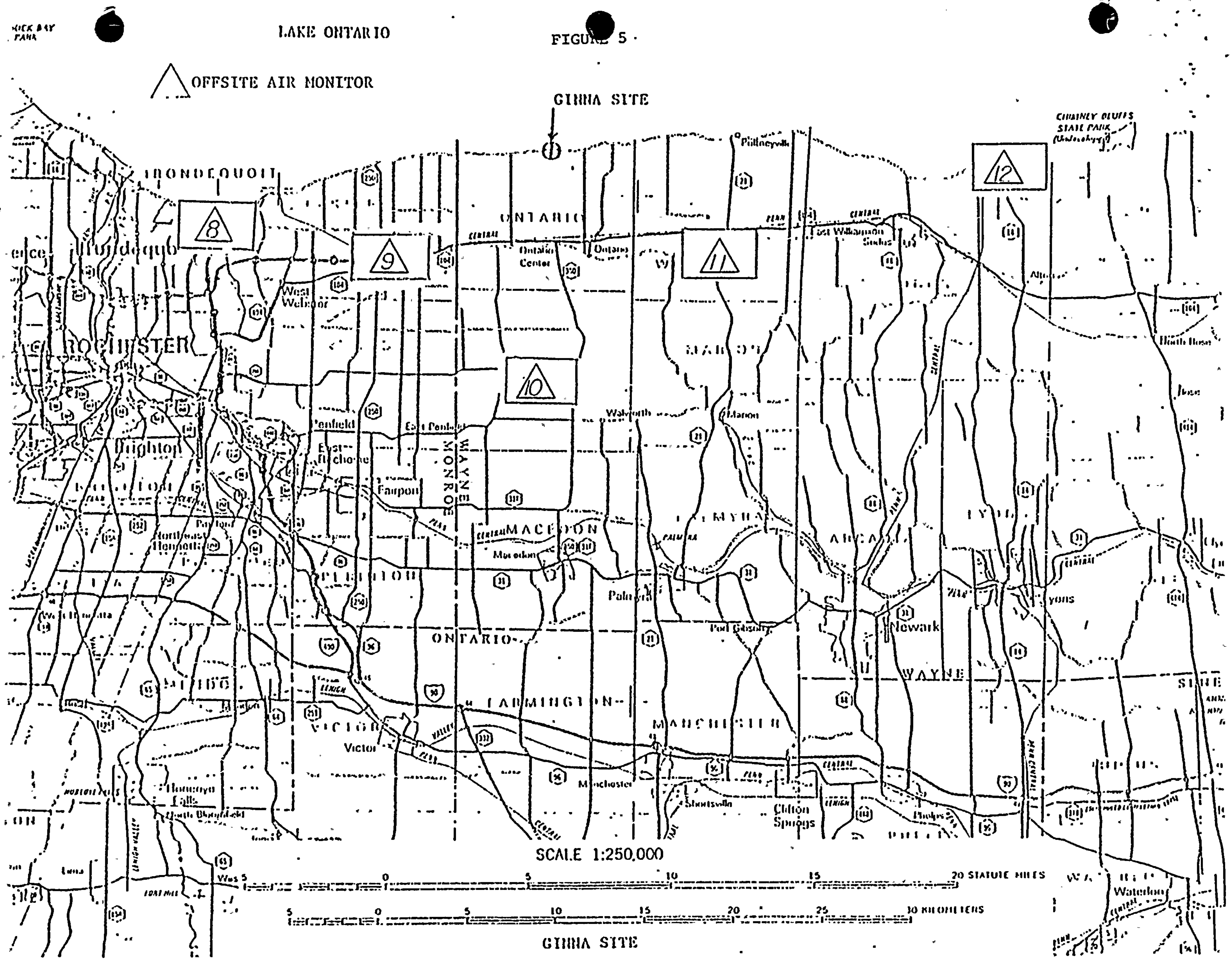

N
LAKE ONTARIO
GINNA SITE
Ontario Water District
FOUR MILE
THREE MILE
TWO MILE
ONE MILE
LAKE ROAD
Bear Cr.
Dennison Cr.
SHEPHERD RD
PUTNAM ROAD
BRICK CHURCH RD
BOSTON ROAD
SLOCUM RD
GEELEY RD
LONESOME ROAD
SALMON CREEK ROAD
KNICKERBOCKER ROAD
FISHER RD
LAKESIDE ROAD
NORTH
BERG ROAD
KENYON ROAD
Mill Cr.
COUNTY LINE ROAD
ONTARIO
STATE HIGHWAY ROUTE 10
Bear Creek
LANE
MILK SAMPLE STATION
WATER SAMPLE STATION

FIGURE 5



LAKE ONTARIO
OFFSITE AIR MONITOR
GINNA SITE
8
9
10
11
12
IRONDEQUOIT
ROCHESTER
ONTARIO
West Webster
Ontario Center
Pultneyville
East Williamson
Sodus
Walworth
Marion
Penfield
East Penfield
Fairport
Brighton
Pittsford
WAYNE
MONROE
MACEDON
Macedon
Palmyra
Port Gibson
Newark
Lyons
ONTARIO
WAYNE
FARMINGTON
MANCHESTER
VICTOR
Victor
Manchester
Shortsville
Clifton Springs
Honeoye Falls
Waterloo
SCALE 1:250,000
0 5 10 15 20 STATUTE MILES
5 0 5 10 15 20 25 30 KILOMETERS
GINNA SITE

TABLE

DISPERSION PARAMETER ($\overline{X/Q}$) FOR LONG TERM RELEASES > 500 HR/YR OR > 125 HR/QTR

Plant Vent

Distance to the control location, in miles

ector*	0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
	8.8 E-6	2.1 E-6	1.0 E-6	4.7 E-7	2.5 E-7	1.8 E-7	1.3 E-7	1.1 E-7	9.4 E-8	8.2 E-8
:NE	7.4 E-6	1.7 E-6	9.2 E-7	4.5 E-7	2.5 E-7	1.8 E-7	1.4 E-7	1.2 E-7	9.9 E-8	9.0 E-8
E	9.7 E-6	2.3 E-6	1.2 E-6	5.9 E-7	3.2 E-7	2.3 E-7	1.8 E-7	1.5 E-7	1.2 E-7	1.1 E-7
NE	9.2 E-6	2.2 E-6	1.1 E-6	5.0 E-7	2.6 E-7	1.8 E-7	1.4 E-7	1.2 E-7	9.8 E-8	8.7 E-8
:	1.1 E-5	2.7 E-6	1.3 E-6	5.4 E-7	2.7 E-7	1.9 E-7	1.4 E-7	1.2 E-7	9.6 E-8	8.5 E-8
:SE	8.5 E-6	2.1 E-6	1.1 E-6	4.4 E-7	2.2 E-7	1.5 E-7	1.1 E-7	9.4 E-8	7.9 E-8	6.9 E-8
SE	6.5 E-6	1.4 E-6	6.9 E-7	3.0 E-7	1.5 E-7	1.1 E-7	8.5 E-8	6.9 E-8	5.6 E-8	4.8 E-8
SSE	3.6 E-6	1.1 E-6	5.0 E-7	2.3 E-7	1.2 E-7	8.4 E-8	6.3 E-8	5.2 E-8	4.2 E-8	3.5 E-8
S	2.1 E-6	8.8 E-7	4.5 E-7	1.9 E-7	1.0 E-7	7.6 E-8	5.9 E-8	4.8 E-8	4.0 E-8	3.3 E-8
SSW	2.0 E-6	5.8 E-7	3.4 E-7	1.8 E-7	9.6 E-8	6.8 E-8	5.3 E-8	4.5 E-8	3.8 E-8	3.2 E-8
SW	2.3 E-6	5.6 E-7	3.0 E-7	1.4 E-7	7.6 E-8	5.4 E-8	4.2 E-8	3.5 E-8	2.9 E-8	2.4 E-8
WSW	2.9 E-6	7.1 E-7	5.3 E-7	1.6 E-7	9.0 E-8	6.4 E-8	4.8 E-8	3.9 E-8	3.3 E-8	2.9 E-8
W	3.3 E-6	1.0 E-6	5.1 E-7	2.4 E-7	1.3 E-7	9.6 E-8	7.2 E-8	5.9 E-8	4.9 E-8	4.3 E-8
WNW	2.7 E-6	8.9 E-7	4.7 E-7	2.3 E-7	1.2 E-7	9.0 E-8	6.9 E-8	5.8 E-8	4.8 E-8	4.2 E-8
NW	2.0 E-6	6.4 E-7	3.6 E-7	1.8 E-7	9.8 E-8	7.4 E-8	5.7 E-8	4.6 E-8	3.9 E-8	3.4 E-8
NNW	4.3 E-6	1.2 E-6	5.7 E-7	2.7 E-7	1.4 E-7	1.0 E-7	8.0 E-8	6.7 E-8	5.6 E-8	4.9 E-8

* Direction wind blows into

TABLE 4

DISPERSION PARAMETER $\overline{(D/Q)}$ FOR LONG TERM RELEASES > 500 HR/YR OR > 125 HR/QTR

Plant Vent

Distance to the control location, in miles

Sector*	0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N	8.3 E-8	1.7 E-8	6.1 E-9	2.5 E-9	1.2 E-9	7.3 E-10	5.1 E-10	4.1 E-10	2.9 E-10	2.5 E-10
NNE	4.5 E-8	1.0 E-8	3.7 E-9	1.5 E-9	7.0 E-10	4.4 E-10	3.1 E-10	2.4 E-10	1.8 E-10	1.5 E-10
NE	6.5 E-8	1.5 E-8	5.4 E-9	2.2 E-9	1.0 E-9	6.5 E-10	4.5 E-10	3.6 E-10	2.6 E-10	2.2 E-10
ENE	8.3 E-8	1.8 E-8	6.4 E-9	2.6 E-9	1.2 E-9	7.5 E-10	5.3 E-10	4.1 E-10	3.1 E-10	2.6 E-10
E	1.4 E-7	2.9 E-8	1.0 E-8	4.2 E-9	1.9 E-9	1.2 E-9	8.6 E-10	6.7 E-10	4.8 E-10	4.1 E-10
ESE	1.4 E-7	3.0 E-8	1.1 E-8	4.3 E-9	1.9 E-9	1.2 E-9	8.7 E-10	6.7 E-10	5.2 E-10	4.5 E-10
SE	1.3 E-7	2.7 E-8	9.3 E-9	3.7 E-9	1.7 E-9	1.0 E-9	7.7 E-10	6.1 E-10	4.6 E-10	4.0 E-10
SSE	5.8 E-8	1.4 E-8	4.7 E-9	1.9 E-9	8.9 E-10	5.6 E-10	4.1 E-10	3.5 E-10	2.7 E-10	2.3 E-10
S	2.8 E-8	8.6 E-9	3.1 E-9	1.3 E-9	5.8 E-10	3.8 E-10	2.9 E-10	2.4 E-10	1.8 E-10	1.6 E-10
SSW	3.1 E-8	7.8 E-9	3.1 E-9	1.3 E-9	5.9 E-10	3.7 E-10	2.7 E-10	2.2 E-10	1.8 E-10	1.5 E-10
SW	4.5 E-8	1.0 E-8	3.6 E-9	1.5 E-9	6.8 E-10	4.4 E-10	3.1 E-10	2.5 E-10	1.9 E-10	1.6 E-10
WSW	5.6 E-8	1.3 E-8	4.6 E-9	1.8 E-9	8.4 E-10	5.3 E-10	3.7 E-10	2.9 E-10	2.1 E-10	1.8 E-10
W	4.2 E-8	1.0 E-8	3.9 E-9	1.6 E-9	7.4 E-10	4.7 E-10	3.3 E-10	2.6 E-10	1.9 E-10	1.6 E-10
WNW	2.2 E-8	5.9 E-9	2.4 E-9	1.0 E-9	4.7 E-10	3.0 E-10	2.1 E-10	1.7 E-10	1.3 E-10	1.0 E-10
NW	1.5 E-8	4.1 E-9	1.7 E-9	7.0 E-10	3.3 E-10	2.1 E-10	1.5 E-10	1.2 E-10	8.8 E-11	7.4 E-11
NNW	4.0 E-8	9.2 E-9	3.5 E-9	1.4 E-9	6.6 E-10	4.2 E-10	2.9 E-10	2.3 E-10	1.7 E-10	1.4 E-10

* Direction wind blows into

TABLE 5

DISPERSION PARAMETER $(\overline{X/Q})_{cp}$ FOR LONG TERM RELEASES > 500 HR/YR OR > 125 HR/QTR

Containment Purge

Distance to the control location, in miles

Sector*	0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N	3.7 E-6	1.2 E-6	7.2 E-7	3.6 E-7	2.0 E-7	1.4 E-7	1.1 E-7	9.6 E-8	8.1 E-8	7.1 E-8
NNE	3.1 E-6	1.0 E-6	6.6 E-7	3.5 E-7	2.0 E-7	1.5 E-7	1.2 E-7	1.0 E-7	8.9 E-8	7.9 E-8
NE	4.1 E-6	1.4 E-6	9.0 E-7	4.7 E-7	2.7 E-7	2.0 E-7	1.6 E-7	1.3 E-7	1.1 E-7	1.0 E-7
ENE	3.9 E-6	1.3 E-6	7.7 E-7	3.9 E-7	2.1 E-7	1.5 E-7	1.2 E-7	1.0 E-7	8.5 E-8	7.5 E-8
E	4.9 E-6	1.6 E-6	8.8 E-7	4.1 E-7	2.2 E-7	1.5 E-7	1.2 E-7	1.0 E-7	8.3 E-8	7.3 E-8
ESE	4.3 E-6	1.5 E-6	9.1 E-7	3.9 E-7	2.0 E-7	1.4 E-7	1.1 E-7	8.6 E-8	7.4 E-8	6.4 E-8
SE	4.2 E-6	1.2 E-6	6.1 E-7	2.8 E-7	1.4 E-7	9.9 E-8	8.0 E-8	6.5 E-8	5.4 E-8	4.6 E-8
SSE	2.3 E-6	9.7 E-7	4.6 E-7	2.2 E-7	1.2 E-7	8.1 E-8	6.1 E-8	5.0 E-8	4.0 E-8	3.4 E-8
S	1.3 E-6	7.7 E-7	4.1 E-7	1.9 E-7	1.0 E-7	7.4 E-8	5.8 E-8	4.7 E-8	3.8 E-8	3.2 E-8
SSW	1.2 E-6	4.5 E-7	3.3 E-7	1.7 E-7	9.5 E-8	6.7 E-8	5.3 E-8	4.5 E-8	3.7 E-8	3.2 E-8
SW	1.3 E-6	4.1 E-7	2.7 E-7	1.3 E-7	7.3 E-8	5.2 E-8	4.1 E-8	3.4 E-8	2.7 E-8	2.3 E-8
WSW	1.7 E-6	5.3 E-7	3.2 E-7	1.5 E-7	8.6 E-8	6.0 E-8	4.5 E-8	3.8 E-8	3.2 E-8	2.8 E-8
W	1.7 E-6	7.2 E-7	4.4 E-7	2.1 E-7	1.2 E-7	8.6 E-8	6.6 E-8	5.5 E-8	4.6 E-8	4.0 E-8
WNW	1.2 E-6	6.0 E-7	3.9 E-7	2.0 E-7	1.1 E-7	8.2 E-8	6.3 E-8	5.3 E-8	4.5 E-8	3.9 E-8
NW	8.5 E-7	4.4 E-7	3.0 E-7	1.6 E-7	8.9 E-8	6.5 E-8	5.1 E-8	4.3 E-8	3.5 E-8	3.2 E-8
NNW	1.8 E-6	7.0 E-7	4.4 E-7	2.2 E-7	1.2 E-7	9.0 E-8	7.1 E-8	6.0 E-8	5.0 E-8	4.4 E-8

* Direction wind blows into

TABLE 6

DISPERSION PARAMETER ($\overline{D/Q}$) FOR LONG TERM RELEASES > 500 HR/YR OR > 125 HR/QTR

Containment Purge

Distance to the control location, in miles

Sector*	0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N	4.2 E-8	1.0 E-8	4.0 E-9	1.6 E-9	7.6 E-10	4.6 E-10	3.4 E-10	2.7 E-10	1.9 E-10	1.6 E-10
NNE	2.3 E-8	6.2 E-9	2.5 E-9	1.0 E-9	4.8 E-10	2.9 E-10	2.2 E-10	1.7 E-10	1.2 E-10	1.0 E-10
NE	3.4 E-8	9.3 E-9	3.7 E-9	1.5 E-9	7.1 E-10	4.5 E-10	3.2 E-10	2.5 E-10	1.8 E-10	1.6 E-10
ENE	4.2 E-8	1.1 E-8	4.3 E-9	1.8 E-9	8.3 E-10	5.3 E-10	3.8 E-10	2.9 E-10	2.1 E-10	1.8 E-10
E	7.3 E-8	1.9 E-8	7.4 E-9	3.0 E-9	1.4 E-9	9.0 E-10	6.4 E-10	5.0 E-10	3.6 E-10	3.1 E-10
ESE	9.1 E-8	2.4 E-8	9.1 E-9	3.6 E-9	1.6 E-9	9.9 E-10	7.5 E-10	5.9 E-10	4.8 E-10	4.2 E-10
SE	1.0 E-7	2.4 E-8	8.4 E-9	3.4 E-9	1.6 E-9	9.6 E-10	7.4 E-10	5.9 E-10	4.6 E-10	4.1 E-10
SSE	4.3 E-8	1.3 E-8	4.3 E-9	1.8 E-9	8.3 E-10	5.4 E-10	4.0 E-10	3.6 E-10	2.7 E-10	2.3 E-10
S	2.1 E-8	8.1 E-9	2.9 E-9	1.7 E-9	5.5 E-10	3.7 E-10	3.0 E-10	2.5 E-10	1.9 E-10	1.6 E-10
SSW	2.1 E-8	6.9 E-9	2.9 E-9	1.2 E-9	5.7 E-10	3.6 E-10	2.7 E-10	2.2 E-10	1.8 E-10	1.5 E-10
SW	3.4 E-8	8.9 E-9	3.3 E-9	1.4 E-9	6.3 E-10	4.1 E-10	3.0 E-10	2.5 E-10	1.9 E-10	1.6 E-10
WSW	4.3 E-8	1.1 E-8	4.2 E-9	1.7 E-9	7.8 E-10	4.9 E-10	3.4 E-10	2.7 E-10	2.0 E-10	1.7 E-10
W	3.0 E-8	8.8 E-9	3.4 E-9	1.4 E-9	6.5 E-10	4.2 E-10	2.9 E-10	2.3 E-10	1.7 E-10	1.4 E-10
WNW	1.2 E-8	4.5 E-9	2.0 E-9	8.4 E-10	4.0 E-10	2.6 E-10	1.8 E-10	1.4 E-10	1.1 E-10	9.1 E-11
NW	8.8 E-9	3.2 E-9	1.4 E-9	5.9 E-10	2.8 E-10	1.8 E-10	1.3 E-10	1.0 E-10	7.6 E-11	6.5 E-11
NNW	2.2 E-8	6.4 E-9	2.6 E-9	1.1 E-9	5.0 E-10	3.3 E-10	2.3 E-10	1.8 E-10	1.4 E-10	1.1 E-10

* Direction wind blows into

TABLE 7

DISPERSION PARAMETER ($\overline{X/Q}$) FOR LONG TERM RELEASES > 500 HR/YR OR > 125 HR/QTR

Ground Vent

Distance to the control location, in miles

Sector*	0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N	4.4 E-5	8.2 E-6	3.4 E-6	1.4 E-6	6.9 E-7	4.7 E-7	3.4 E-7	2.7 E-7	2.2 E-7	1.9 E-7
NNE	5.5 E-5	1.0 E-5	4.2 E-6	1.8 E-6	8.7 E-7	5.9 E-7	4.3 E-7	3.5 E-7	2.9 E-7	2.4 E-7
NE	6.5 E-5	1.2 E-5	5.1 E-6	2.1 E-6	1.0 E-6	6.9 E-7	5.1 E-7	4.1 E-7	3.4 E-7	2.8 E-7
ENE	4.4 E-5	8.3 E-6	3.5 E-6	1.4 E-6	6.9 E-7	4.8 E-7	3.4 E-7	2.8 E-7	2.2 E-7	1.9 E-7
E	3.7 E-5	7.1 E-6	2.9 E-6	1.2 E-6	5.7 E-7	3.7 E-7	2.8 E-7	2.2 E-7	1.8 E-7	1.5 E-7
ESE	2.6 E-5	4.8 E-6	2.0 E-6	7.8 E-7	3.8 E-7	2.5 E-7	1.8 E-7	1.5 E-7	1.1 E-7	9.9 E-8
SE	1.7 E-5	3.1 E-6	1.3 E-6	5.0 E-7	2.4 E-7	1.6 E-7	1.1 E-7	9.3 E-8	7.6 E-8	6.3 E-8
SSE	1.3 E-5	2.4 E-6	9.5 E-7	3.7 E-7	1.8 E-7	1.2 E-7	8.6 E-8	7.0 E-8	5.7 E-8	4.6 E-8
S	1.2 E-5	2.2 E-6	9.0 E-7	3.5 E-7	1.7 E-7	1.1 E-7	8.4 E-8	6.7 E-8	5.4 E-8	4.5 E-8
SSW	1.2 E-5	2.1 E-6	8.7 E-7	3.5 E-7	1.7 E-7	1.1 E-7	8.3 E-8	6.6 E-8	5.4 E-8	4.5 E-8
SW	9.7 E-6	1.7 E-6	6.8 E-7	2.7 E-7	1.3 E-7	8.7 E-8	6.3 E-8	5.1 E-8	4.1 E-8	3.4 E-8
WSW	1.4 E-5	2.4 E-6	9.9 E-7	4.0 E-7	1.9 E-7	1.3 E-7	9.3 E-8	7.6 E-8	6.3 E-8	5.2 E-8
W	2.5 E-5	4.5 E-6	1.8 E-6	7.5 E-7	3.6 E-7	2.4 E-7	1.8 E-7	1.4 E-7	1.1 E-7	9.8 E-8
WNW	2.4 E-5	4.6 E-6	1.9 E-6	7.7 E-7	3.7 E-7	2.5 E-7	1.8 E-7	1.5 E-7	1.2 E-7	9.7 E-8
NW	2.1 E-5	4.0 E-6	1.6 E-6	6.7 E-7	3.3 E-7	2.2 E-7	1.6 E-7	1.3 E-7	1.1 E-7	8.8 E-8
NNW	2.9 E-5	5.4 E-6	2.2 E-6	9.2 E-7	4.5 E-7	3.0 E-7	2.2 E-7	1.8 E-7	1.5 E-7	1.2 E-7

* Direction wind blows into

TABLE 8

DISPERSION PARAMETER ($\overline{D/Q}$) FOR LONG TERM RELEASES > 500 HR/YR OR > 125 HR/QTR

Ground Vent

Distance to the control location, in miles

Sector*	0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N	2.0 E-7	3.7 E-8	1.2 E-8	5.0 E-9	2.3 E-9	1.4 E-9	9.7 E-10	7.6 E-10	5.5 E-10	4.7 E-10
NNE	1.8 E-7	3.4 E-8	1.1 E-8	4.5 E-9	2.1 E-9	1.3 E-9	9.0 E-10	6.9 E-10	5.0 E-10	4.3 E-10
NE	2.5 E-7	4.5 E-8	1.5 E-8	6.1 E-9	2.8 E-9	1.7 E-9	1.1 E-9	9.2 E-10	6.9 E-10	5.8 E-10
ENE	2.1 E-7	3.9 E-8	1.3 E-8	5.3 E-9	2.4 E-9	1.5 E-9	1.0 E-9	8.0 E-10	6.0 E-10	5.0 E-10
E	2.5 E-7	4.6 E-8	1.5 E-8	6.2 E-9	2.8 E-9	1.7 E-9	1.2 E-9	9.4 E-10	7.0 E-10	5.8 E-10
ESE	2.2 E-7	4.1 E-8	1.3 E-8	5.5 E-9	2.5 E-9	1.6 E-9	1.1 E-9	8.4 E-10	6.3 E-10	5.2 E-10
SE	1.8 E-7	3.7 E-8	1.1 E-8	4.5 E-9	2.1 E-9	1.3 E-9	9.0 E-10	6.9 E-10	5.1 E-10	4.3 E-10
SSE	9.8 E-8	1.8 E-8	6.0 E-9	2.4 E-9	1.1 E-9	6.8 E-10	4.8 E-10	3.7 E-10	2.7 E-10	2.3 E-10
S	6.8 E-8	1.3 E-8	4.2 E-9	1.7 E-9	7.7 E-10	4.8 E-10	3.3 E-10	2.6 E-10	1.9 E-10	1.6 E-10
SSW	6.7 E-8	1.2 E-8	4.1 E-9	1.7 E-9	7.6 E-10	4.7 E-10	3.3 E-10	2.5 E-10	1.8 E-10	1.5 E-10
SW	7.6 E-8	1.4 E-8	4.7 E-9	1.9 E-9	8.6 E-10	5.5 E-10	3.8 E-10	2.9 E-10	2.1 E-10	1.7 E-10
WSW	9.9 E-8	1.8 E-8	6.1 E-9	1.5 E-9	1.1 E-9	6.9 E-10	4.9 E-10	3.7 E-10	2.8 E-10	2.3 E-10
W	1.1 E-7	2.0 E-8	6.7 E-9	2.7 E-9	1.2 E-9	7.5 E-10	5.4 E-10	4.1 E-10	3.0 E-10	2.5 E-10
WNW	8.9 E-8	1.6 E-8	5.4 E-9	2.2 E-9	1.0 E-9	6.3 E-10	4.3 E-10	3.3 E-10	2.5 E-10	2.1 E-10
NW	7.0 E-8	1.3 E-8	4.3 E-9	1.7 E-9	7.9 E-10	4.9 E-10	3.4 E-10	2.6 E-10	2.0 E-10	1.6 E-10
NNW	1.2 E-7	1.2 E-8	7.1 E-9	1.9 E-9	1.3 E-9	8.1 E-10	5.7 E-10	4.4 E-10	3.2 E-10	2.7 E-10

* Direction wind blows into

TABLE 9

PATHWAY DOSE FACTORS DUE TO RADIONUCLIDES OTHER THAN NOBLE GASES*

Radio-nuclide	Inhalation Pathway R_i (mrem/yr per μCi/m^3)	Meat Pathway R_i (M^2·mrem/yr per μCi/sec)	Ground Plane Pathway R_i (m^2·mrem/yr per μCi/sec)	Cow-Milk-Infant Pathway R_i (m^2·mrem/yr per μCi/sec)	Leafy Vegetables Pathway R_i (m^2·mrem/yr) per μCi/sec)
H-3	1.12E 03	2.33E 02	0.	2.38E 03	2.47E 02
CR-51	1.70E 04	4.98E 05	5.31E 06	5.75E 06	1.63E 06
MN-54	1.57E 06	7.60E 06	1.56E 09	3.70E 07	5.38E 07
FE-59	1.27E 06	6.49E 08	3.09E 08	4.01E 08	1.10E 08
CO-58	1.10E 06	9.49E 07	4.27E 08	7.01E 07	4.55E 07
CO-60	7.06E 06	3.61E 08	2.44E 10	2.25E 08	1.54E 08
ZN-65	9.94E 05	1.05E 09	8.28E 08	1.99E 10	2.24E 08
SR-89	2.15E 06	4.89E 08	2.42E 04	1.28E 10	5.39E 09
SR-90	1.01E 08	1.01E 10	0.	1.19E 10	9.85E 10
ZR-95	2.23E 06	6.09E 08	2.73E 08	8.76E 05	1.13E 08
I-131	1.62E 07	2.60E 09	1.01E 07	4.95E 11	2.08E 10
I-133	3.84E 06	6.45E 01	1.43E 06	4.62E 09	3.88E 08
CS-134	1.01E 06	1.42E 09	7.70E 09	6.37E 10	1.96E 09
CS-136	1.71E 05	5.06E 07	1.64E 03	6.61E 09	1.60E 08
CS-137	9.05E 05	1.27E 09	1.15E 10	5.75E 10	1.80E 09
BA-140	1.74E 06	5.00E 07	2.26E 07	2.75E 08	2.03E 08
CE-141	5.43E 05	1.45E 07	1.48E 07	1.43E 07	8.99E 07

*Additional dose factors for isotopes not included in Table 9 may be calculated using the methodology described in NUREG-0133.

IX. Preparation of Special Report to Demonstrate Compliance with Environmental Radiation Protection Standards

Ginna Technical Specification 3.9.2.4.a requires the preparation and submittal of a Special Report to the Commission when calculated effluent release doses exceed twice the limits of Specifications 3.9.1.2.a, 3.9.2.2.a or 3.9.2.2.b. In addition, subsequent releases are to be limited such that the dose or dose commitment to a real individual from all uranium fuel cycle sources is limited to ≤ 25 mrem to the total body or any organ (except the thyroid, which is limited to ≤ 75 mrem) over 12 consecutive months. This includes the dose contributions from the the calendar quarter in which the limits were exceeded and the subsequent 3 calendar quarters.

The following general guidelines are presented for preparation of the Special Report:

1) The maximally exposed real member of the public will generally be the same individual considered in the Technical Specification;

2) Dose contributions to the maximally exposed individual need only be considered to be those resulting from the Ginna plant itself. All other uranium fuel cycle facilities or operations are of sufficient distance to contribute a negligible portion of the individual's dose.

3) For determining the total dose to the maximally exposed individual from the major gaseous and liquid effluent pathways and from direct radiation, dose evaluation techniques used in preparing the Special Report may be those described in this manual or other applicable methods where appropriate.