ATTACHMENT 1 DESIGN CALCULATION COVER SHEET

Title: Review of Scientech Calculation 17080-M-04, Control Room, EAB, and LPZ Doses Following a CRDA	Calculation No: NEDC 99-034
System/Structure: HVAC, CRD	Task Identification No: N/A
Component: N/A	Design Change No: N/A
Classification: [X] Essential; [ ] Non-Essential	Discipline: Mechanical Design

Calc. Description:

PURPOSE:

This calculation incorporates by attachment Scientech Engineering Calculation No. 17080-M-04, Rev. 0, prepared under Task Agreement 99A-C20, in accordance with CNS Engineering Procedure 3.4.7, Section 4. The calculation determines the doses to a Control Room operator and to a person at the Exclusion Area Boundary (EAB) and Low Population Zone (LPZ) following a postulated design basis Control Rod Drop Accident (CRDA). This calculation has been prepared as a Status 2 calculation for NRC review and will be as-built upon NRC approval.

RESULTS:

The results are tabulated in Section 10, Table 6 of Scientech's calculation for each of the three (3) receptor locations:

1. Control Room,
2. Exclusion Area Boundary (EAB), and
3. Low Population Zone (LPZ).

All calculated doses are less than the corresponding regulatory limits.

ATTACHMENTS:

1. Scientech Engineering Calculation No. 17080-M-04, Rev.0 (including attachments thereto).
2. Reviewer Comments and Resolutions
3. GE Letters REK:99-152 and REK:99-161 (References 5.18 and 5.15 of Scientech calculation)

0	2	Original Issue	Scientech, Inc. 12/3/99	J. J. Drasler (signature) 12/8/99	N/A	(signature) 12/10/99
Rev. No.	Status	Revision Description	Prepared By/Date	Reviewed By/Date	Independent Design Verification/Date	Approved By/Date

Status Codes

1. As - Built
2. Information Only
3. For Construction
4. Superseded or Deleted

Nebraska Public Power District

DESIGN CALCULATION CROSS REFERENCE INDEX

NEDC: 99-034 Preparer: Scientech, Inc. Reviewer: J. J. Drasler

Rev. No: 0 Date: 12/3/99 Date: 12/8/99

Item No.	DESIGN INPUTS	Rev. No.	PENDING CHANGES TO DESIGN INPUTS
1	NEDC 99-031	0	none
2	NEDC 99-036	0	none
3	Burns and Roe Dwg 2009	N22	DCNs 99-0753, 99-0910
4	Burns and Roe Dwg 2019	N35	none
5	Burns and Roe Dwg 2051	N16	DCN 99-0915
6	Burns and Roe Dwg 2052	N14	DCNs 98-0071, 98-0994, 98-1043
7	Burns and Roe Dwg 4506	N06	none
8	TS 1.1	178	none
9	TS 3.7.4	178	none
10	TS 5.5.7	178	none
11	STP 94-199	0	none
12	STP 94-199-1	0	none
13	SP 6.HV.101	4	none
14	NUREG 0800, SRP Section 15.4.9	2	none
15	NUREG 0800, SRP Section 6.4	2	none
16	Reg Guide 1.3	2	none
17	Reg Guide 1.25	0	none
18	Reg Guide 1.77	0	none
19	TID-14844	1962	none
20	ICRP Publication 30	1979	none
21	GE NEDO-31400A	1992	none
22	GE NEDE-31152-P	6	none
23	GE NEDC-32868P	0	none
24	GE 23A4720	1	none
25	GE Letter REK:99-152	9/1/ 99	none
26	GE Letter REK:99-161	9/17/99	none

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DESIGN CALCULATION CROSS REFERENCE INDEX

NEDC: 99-034 Preparer: Scientech, Inc. Reviewer: J. J. Drasler JJD

Rev. No: 0 Date: 12/3/99 Date: 12/8/99

Item No.	Affected Documents	Rev. No.	CHANGE Required	Action Item Tracking Number (If change is required)
	none			

Nebraska Public Power District

DESIGN CALCULATIONS SHEET

NEDC: 99-034	Preparer: Scientech, Inc.	Reviewer: J. J. Drasler
Rev. No: 0	Date: 12/3/99	Date: 12/8/99

PURPOSE

This calculation incorporates by attachment Scientech Engineering Calculation No. 17080-M-04, Rev. 0, prepared under Task Agreement 99A-C20, in accordance with CNS Engineering Procedure 3.4.7, Section 4. The calculation determines the doses to a Control Room operator and to a person at the Exclusion Area Boundary (EAB) and Low Population Zone (LPZ) following a postulated design basis Control Rod Drop Accident (CRDA).

EXTENT OF REVIEW

Scientech's calculation was performed under their own QA program, which included an independent technical review. Therefore, the NPPD review does not include in-depth checks of mathematical calculations, but rather focuses on general acceptability of design inputs, assumptions, methodology, and conclusions. Any significant comments or concerns identified during the review have been resolved with Scientech and incorporated.

REVIEW SUMMARY

Scientech's calculation is organized into a single main portion and Attachments 1 through 4, which include the computer code input and output.

1. **Purpose** - The purpose of the calculation is as given above and as stated in Section 1 of Scientech's calculation. This section was reviewed and found to be acceptable.

2. **Design Inputs** - Design Inputs are identified throughout the text and particularly in Section 4 of Scientech's calculation with the references for the design inputs listed in Section 5. The source term considers worst case of 8X8 NB (GE9B) and 10X10 (GE14) fuel and is conservatively based on an entire core load of the GE14 fuel design since the calculations performed in Section 8.1 indicate that the GE14 source term is higher due to the increased power level multiplier (radial peaking factor). Atmospheric dispersion factors for the Control Room were taken from Reference 5.13 (NEDC 99-031) and from Reference 5.14 (NEDC 99-036) for the LPZ and EAB.

   The design inputs were reviewed and found to be acceptable.

   Documents comprising CNS-controlled source documents whose revision could impact input used in this calculation are identified on the Cross Reference Index in the front of this calculation. Non-status 1 inputs were verified using additional information and were found to be acceptable for use in this calculation.

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3. **Assumptions** - Major assumptions are identified in Section 6 of Scientech's calculation. Additional assumptions are inferred in the input documents used and identified throughout Scientech's calculation by inference according to context and use. The assumptions were reviewed and found to be acceptable.

4. **Methodology** - The methodology is described in Section 3, Technical Approach. In general, the Scientech-NUS computer code AXIDENT is used to predict the radiological dose consequences of the postulated Control Rod Drop Accident at the 3 receptor locations:

   1. Control Room,
   2. Exclusion Area Boundary (EAB), and
   3. Low Population Zone (LPZ).

   The AXIDENT code models the transport of radioactivity to the environment and to the control room. This code accounts for HVAC recirculation, filtration, atmospheric dispersion, and natural decay. The CRDA release is modeled as a single release path from the Turbine Building which is modeled as a diffuse ground level release. The condenser leakage is assumed to be 1% per day with no mixing or holdup in the Turbine Building. Control Room doses were calculated for a 30 day period to account for any residual activity which remains in the Control Room envelope after the 24 hour CRDA release duration.

   The AXIDENT computer code version and computer used are listed in Section 7. Additional supporting calculations are performed in Section 8 to determine the source term, control room volume, and condenser release rate. Control Room isolation and filtration were conservatively neglected in the analysis. Attachment 1 lists the dose conversion factors (DCFs) from ICRP Publication 30 which were used in the AXIDENT model. Computer output for the unfiltered and filtered modes of Control Room ventilation are listed in Attachments 3 and 4 respectively. The total Control Room operator dose is the sum of the doses accumulated during unfiltered and filtered modes. The LPZ results are included in Attachment 3 and the EAB results in Attachment 4.

   The methodology was reviewed and found to be acceptable.

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DESIGN CALCULATIONS SHEET

NEDC: 99-034 | Preparer: Scientech, Inc. | Reviewer: J. J. Drasler

Rev. No: 0 | Date: 12/3/99 | Date: 12/8/99

5. **Results / Conclusions** - Results and conclusions are given in Sections 10 and 11, respectively, of Scientech's calculation. Table 6 gives the calculated dose consequences at the Control Room, EAB, and LPZ. These results are summarized in the following table. The regulatory dose limits are from Table 1 of the Scientech calculation.

TABLE 1: SUMMARY OF CRDA ACCIDENT DOSES

	Control Room (30 days)			EAB (2 hours)		LPZ (30 days)	
	Thyroid	Whole Body	Beta	Thyroid	Whole Body	Thyroid	Whole Body
Dose (rem)	2.80	5.91E-3	0.133	0.634	0.132	1.65	0.151
Limit (rem)	30	5	30	75	6	75	6

The results and conclusions sections were reviewed and found to be acceptable. All calculated doses are below the corresponding regulatory limits, without control room isolation (worst case). The calculation gives acceptable results based on a radial peaking factor of 1.7, which is valid through at least Cycle 23 per assumption 6.6 (Reference 5.26).

SCIENTECH.

ENGINEERING CALCULATION

CLIENT/PROJECT NPPD/Cooper CALC. NO. 17080 -M-04 REV. 0

TITLE Control Room, EAB, and LPZ Doses Following a CRDA

AUTHOR/DATE:	VERIFIED BY/DATE:	APPROVED BY/DATE:
R. F. Ely, Jr. and H. A. Wagage Henry A. Wagage 12/3/1999	D. Studley 12/3/99	M.D.D. 12/3/99

Purpose

The purpose of this calculation is to determine the doses to the Control Room operator and to a person at the Exclusion Area Boundary (EAB) and at the Low Population Zone (LPZ) of the Cooper Nuclear Station following a design basis Control Rod Drop Accident (CRDA).

Summary of Results

The total activity released from GE14 fuel is shown to exceed that from GE9B fuel when the power level multiplier specified by SRP 15.4.9 is increased to 1.7 for the GE14 fuel, the maximum radial peaking factor through Cycle 23

The AXIDENT code predicted doses following a design basis CRDA at CNS are given in Table 6. These doses are below the regulatory limits given in Table 1.

SUPERSEDED BY REV. SUPPLEMENTED BY CALC. NO.:	QUALITY CLASS ■ SAFETY-RELATED ☐ NON-SR ☐ OTHER	DISTRIBUTION ■ PROJECT ■ DCC ☐ OTHER	VERIFICATION METHOD ■ REVIEW ☐ ALT. ANALYSIS

SCIENTECH/NUS, Inc. and Subsidiaries		STANDARD CALCULATION SHEET	
CLIENT: NPPD/Cooper	FILE NO.: 17080 -M-04	BY: R. F. Ely, Jr. and H. A. Wagage	PAGE: 2 of 18
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1.0 PURPOSE OF ANALYSIS

The purpose of this calculation is to determine the doses to the Control Room operator and to a person at the Exclusion Area Boundary (EAB) and at the Low Population Zone (LPZ) of the Cooper Nuclear Station (CNS) following a design basis Control Rod Drop Accident (CRDA).

2.0 INTENDED USE OF ANALYSIS RESULTS

This analysis is intended to confirm that the calculated doses resulting from a design basis CRDA for the Control Room operator, a person at the EAB, and a person at the LPZ are less than the regulatory dose limits as given in Table 1.

Table 1. Regulatory Dose Limits (Rem)

Dose Type	Control Room	EAB and LPZ
Thyroid Dose	30[a]	75[b]
Whole Body Dose	5[a]	6[b]
Beta Skin Dose	30[a]	-

Notes: [a] SRP, Section 6.4, Acceptance Criteria-6 [5.1]
[b] SRP 15.4.9 [5.1]

3.0 TECHNICAL APPROACH

This section provides a general discussion of the analysis methodology. The detailed input parameters and associated references are developed in more detail in subsequent sections.

3.1 Background Information

GE utilizing methodology that predated the regulatory guidance prepared the original radiological consequences of the limiting design basis accidents, for both CNS and other BWRs licensed in the early 70s. The objective of the analyses that were summarized in the PSARs and FSARs was to demonstrate in a conservative manner that the plant met the reactor siting criteria of 10 CFR Part 100. [5.2] The NRC's confirmatory analyses, as described in the SERs, were in general performed in accordance with the more conservative Regulatory Guides that were being developed at that time (as a note, the Regulatory Guide on CRDAs, Regulatory Guide 1.77, was issued in 1974). [5.3]

As a result of NUREG-0737, plants with existing licenses were required to assess the habitability of the Control Room following the spectrum of design basis accidents using the methodology contained in the Standard Review Plans. In regards to the CRDA, there was no detailed analysis performed in response to NUREG-0737, Action Item III.D.3.4.

The CRDA was re-evaluated in support of the project to remove the automatic isolation function of the Main Steam Line Radiation Monitors. [5.4] In the 1991 time frame, the BWR Owner's Group requested permission from the NRC to eliminate Main Steam Isolation Valve (MSIV) automatic closure function and scram function by the Main Steam Line Radiation Monitors (MSLRM). The MSLRM provided protection from a CRDA by isolating the MSIVs and minimizing the quantity of activity released.

General Electric documented the generic safety evaluation of eliminating the MSIV action on high radiation alarm in NEDO-31400A, which has been accepted by the NRC for reference in licensing applications and has been implemented at CNS. [5.5] The bounding source term presented in NEDO-31400A is based on 8x8 fuel. Data specific to the fuel designs used at CNS (GE9B, an 8x8 fuel, and GE14) are used.

This calculation will use the requirements and guidance found in the SRP Section 15.4.9 (Ref. 5.1) as a basis for the evaluation. [5.1]

3.2 Release Path Model

CRDA release path is modeled as a single release path that occurs as a result of the leakage from the condenser to the turbine building. The condenser will conservatively be assumed to instantaneously leak to the environment at the start of the CRDA. This leakage will be assumed to leak at a rate of 1% per day to the Turbine Building from which it will conservatively be assumed to *pass directly to the environment with no mixing or holdup in the Turbine Building volume*. This leakage will occur for 24 hours in accordance with the guidance of Standard Review Plan 15.4.9 Appendix A; after 24 hours, the leakage will end. [5.1] Per SRP 15.4.9, 100% of the activity released from the failed fuel is assumed to reach the condenser; credit is not taken for closure of the MSIVs to limit the activity reaching the condenser.

This approach is very conservative since the condenser leakage will enter the Turbine Building in the Condenser Bay area. This activity will be distributed throughout the Turbine Building. The activity will be released to the environment as a low-level release via the Turbine Bldg. exhaust.

The release from the Turbine Building is considered diffuse ground level release.

As described in NEDO-31400A, the design basis case prescribed in SRP 15.4.9 bounds other scenarios such as continued SJAE operation with some or all of the release being processed by the off gas system. [5.5, 5.1] Thus, analysis of other scenarios is not required.

3.3 *Control Room Model*

It was conservatively assumed that the radioactive release concentration at the Control Room intake following a design basis CRDA will be below the radioactive concentration necessary to activate the isolation of the control room intake. Thus, Control Room isolation was ignored in the analysis. Control Room isolation would reduce Control Room doses.

3.4 *Source Term Model*

The source term of activity available for release following a CRDA will be based on the methodology and guidelines in References 5.1 and 5.7 adjusted for the Cooper Site. The Cooper Source Term will be calculated using the computer code "AXIDENT". [5.6] This code uses TID-14844 as the initial bases for a source term. [5.7] A factor of four was applied to the iodine isotopes to compensate for an internal function of the AXIDENT code which reduces the initial iodine inventory to 25% of the input value for plate-out which is not appropriate for this accident scenario.

The NEDO-31400A analysis uses a value of 850 failed rods, consistent with a GE bounding evaluation for 8x8 fuel bundles. [5.5] The failed fuel fraction is based on 63 rods per assembly. CNS currently uses 8x8NB fuel (GE9B) with 60 rods per assembly, but is changing to GE14 fuel over several fuel cycles. The bounding case of GE9B and GE14 is determined in Section 8.1 based on the respective number of failed rods, rods per assembly, and peaking factor, and used for the analysis.

The analysis uses the standard assumptions prescribed by the NRC in SRP 15.4.9, Appendix A (see §6 for a listing of all major assumptions). [5.1]

3.5 *Atmospheric Dispersion Factors (X/Qs)*

Control Room dose calculations were performed using values calculated by the ARCON96 computer code (SCIENTECH Calculation 17080-M-01; see §4.3.7). [5.8] The ARCON96 code used site-specific information for CNS, including weather data.

Doses at the EAB and LPZ were determined using the X/Q values for ground level releases obtained from SCIENTECH Calculation 17080-M-06 (see §4.4). [5.9]

3.6 *ICRP 30 DCFs*

The existing licensing basis accident analysis is based on the Dose Conversion Factors (DCFs) from Regulatory Guide 1.3 and TID-14844, which were developed in the early 1960's. [5.3, 5.7] Since the development of Regulatory Guide 1.3, work has been and continues to be performed in both the US and overseas on developing new DCFs. Regulatory Guide 1.109 recommends DCFs that are significantly lower than those specified in Regulatory Guide 1.3 or TID-14844. [5.3, 5.7] ICRP Publication 30, "Limits for Intakes of Radionuclides by Workers," issued in 1979, provides more accurate DCFs. [5.10] Although these DCFs have not been included in a regulatory guide for use in accident analyses, they have been submitted and approved by NRC in a number of Post-TMI Control Room Habitability analyses. This analysis will use the ICRP 30 Dose Conversion Factors. The various DCFs are compared in Table 2.

Table 2. Comparison of Different Dose Conversion Factors for Iodine Isotopes

Isotope	Dose Conversion Factor (Rem/Ci)		
	ICRP 2 [5.10]	RG 1.109 [5.11]	ICRP 30 [5.3]
I-131	1.48E+6	1.49E+6	1.10E+6
I-132	5.35E+4	1.43E+4	6.30E+3
I-133	4.00E+5	2.69E+5	1.80E+5
I-134	2.50E+4	3.73E+3	1.10E+3
I-135	1.24E+5	5.60E+4	3.10E+4

3.7 Modeling Approach for AXIDENT Code

The analysis conservatively assumes that the activity is instantaneously available for release from the condenser where it is released to the environment at a rate of 1% per day. For the AXIDENT code, this is accomplished by generating an available activity in a single release volume ("primary containment") and releasing the activity at a rate of 1% per day.

The analysis period for the CRDA is 24 hours at which time all release is terminated, the duration of the release per SRP 15.4.9, Appendix A, III-12. [5.1] The AXIDENT model will be executed for the 30-day period to account for the dose associated with the residual activity in the Control Room envelope at the end of the 24-hour release period.

4.0 DESIGN INPUT

Table 3 lists the design input.

Table 3. Design-Input

No.	Item	Value	Source	Comments
4.1 Reactor Data				
4.1.1	Power Level, MWt	2381	T.S. 1.1 [5.12]	The T.S. value will be increased by 2% to account for power measurement uncertainties in accordance with SRP 15.6.5 (2429 MWt). [5.1]
4.1.2	Operating History	Constant power for 1000 days	Regulatory Guide 1.3 C.1.a [5.3]	Built into AXIDENT
4.2 Source Term				
4.2.1	Rods per Assembly 8x8NB (GE9B) 10x10 (GE14)	 60 87.3333	 Ref. 5.13 Ref. 5.14	Note GE14 fuel has 92 rods per assembly, some of which are part length, resulting in a fractional number of equivalent fuel pins per assembly.
4.2.2	Number of assemblies in core	548		
4.2.3	Number of rods that fail 8x8NB (GE9B) 10x10 (GE14)	 850 1200	 Ref. 5.5 & 5.15 Ref. 5.20 & 5.15	
4.2.4	Mass fraction of fuel in damaged rods that melts (8x8)	0.0077	Ref. 5.5	
4.3 Control Room				
4.3.1	Inleakage (duration of accident), scfm infiltration ingress/egress	 45±26 10	 STP 94-199-1 [5.16] SRP 6.4 III.3.d.2)ii [5.1]	Maximum value of 81 scfm is used to maximize unfiltered intake.
4.3.2	Air Supply Flow Rate, scfm 0 – 24 hours 24 hours – 30 days	 3235 810 (=900 - 10%)	 CNS drawing 2019 [5.17] TS 3.7.4 [5.12]	 Conservatively dropped to the emergency air supply rate.
4.3.3	Recirculation is not considered, because it has no effect on airborne iodine and noble gas activity (no charcoal).	0	CNS drawing 2019 [5.17]	Drawing shows only particulate filters in recirculation flow path

No.	Item	Value	Source	Comments
4.3.4	Control Room Proper Width Length Floor El High point of roof slab Cable Room West of column H7 Outside wall to H7 N-S Floor El Column H7 to G H7 to G E-W Floor El	 72' 80'9"– 13'3" = 67.5' 932'6" 949'1.5" 80'9" – 13'3" = 67.5' 72' 918' 35' + 13'3" = 48.25' 37'3" 918'	CNS drwgs: [5.17] 2051 2052 2052 4506 2052 2051 2051 2052 2051 2051	These are gross dimensions. A reduction factor of 20% to account for walls, floors, and equipment is used to determine the net volume (see §8.3).
4.3.5	Breathing Rate (duration of accident), m^3/sec	3.47E-4	R. G. 1.3 [5.3]	Use maximum breathing rate from R. G. 1.3 consistent with NRC review for TS Amendment 167. [5.3, 5.12] Built into the AXIDENT code.
4.3.6	Occupancy Factor 0 - 24 hr	1.0	SRP 6.4, Table 6.4-1 [5.1]	
4.3.7	X/Q, Turbine Building release (s/m^3) 0 - 2 hr 2 - 8 hr 8 - 24 hr	 5.24E-4 2.68E-4 1.41E-4	17080-M-01 [5.8]	17080 -M-01 calculated 5 X/Qs for each time period based on meteorological data for 1994 through 1998. [5.8] The maximum value was chosen for each time period.
4.4 EAB and LPZ Dispersion				
4.4.1	EAB X/Q, Ground Level Release (s/m^3) 0-2 hours	5.2E-4	17080-M-06 [5.9}	
4.4.2	LPZ X/Q, Ground Level Release (s/m^3) 0-8 hours 8-24 hours	 2.9E-4 7.3E-5	17080-M-06 [5.9}	

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5.0 REFERENCES

5.1 NUREG-0800, Standard Review Plan, Rev. 2, July 1981.:
  Section 6.4, "Control Room Habitability Systems,"
  Section 15.4.9, Radiological Consequences of Control Rod Drop Accident (BWR), Appendix A

5.2 Code of Federal Regulations: 10 CFR Part 100, Section 100.11.

5.3 Regulatory Guides:
  1.3, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Boiling Water Reactors".
  1.25, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors".
  1.77, "Assumptions Used for Evaluating a Control Rod Ejection Accident for Pressurized Water Reactors".
  1.109," Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I," Revision 1, issued in 1977. – Information Only

5.4 NUREG-0737

5.5 NEDO-31400A, October 1992, "Safety Evaluation for Eliminating the Boiling Water Reactor Main Steam Isolation Valve Closure Function and Scram Function of the Main Steam Line Radiation Monitor," May 1987 (prepared by GE).

5.6 SCIENTECH "AXIDENT, A Digital Computer Dose Calculation Model," Version 2, Mod 4, dated 2/18/92.

5.7 TID- 14844, "Calculation of Distance Factors for Power and Test Reactors Sites," 1962.

5.8 SCIENTECH Calc. 17080-M-01, "Control Room Dispersion Factors Using ARCON96," Rev. 0.

5.9 SCIENTECH Calc. 17080-M-06, "EAB & LPZ Meteorological Dispersion- Accident Analyses," Rev. 0.

5.10 ICRP Publication 30, "Limits for Intakes of Radionuclides by Workers," 1979.

5.11 ICRP Publication 2, "Report of Committee II, Permissible Dose for Internal Radiation," 1959.

5.12 CNS Technical Specifications:
  Section 1.1
  Section 5.5.7
  Section 3.7.4

5.13 23A4720, Rev. 1, Fuel Bundle Data Sheet for GE9B.

5.14 NEDC-32868P, GE14 Compliance With Amendment 22 of NEDE-24011-P-A (GESTAR II), Rev. 0.
5.15 GE Letter REK:99-161, R.E. Kingston to J.L. Lewis, dated September 17, 1999.
5.16 CNS Test Procedure:
STP-94-199, Control Room Envelope Unfiltered Inleakage Test
STP-94-199-1, Control Room Envelope Unfiltered Inleakage Test (Amendment 1)
5.17 CNS Burns & Roe Drawings:
2009, Revision N22
2019, Sheet 1, Revision N35.
2051, Revision N16.
2052, Revision N14
4506, Revision N06.
5.18 GE letter REK:99-152, R.E. Kingston to J.L. Lewis, dated September 1,1999.
5.19 Software Verification Memo from H. Wagage to T. Bladen, 11/4/1999.
5.20 Section 3.7 of NEDE-31152-P, General Electric Fuel Bundle Designs, Rev. 6.

6.0 MAJOR ASSUMPTIONS

6.1 All leakage will be from the main condenser through the Turbine Building with no mixing or holdup in the Turbine Building. This is a conservative assumption; mixing in the turbine building would significantly add to the decay and holdup.

6.2 The SJAE's & Mechanical Vacuum Pumps will be isolated upon high radiation signals from the MSLRM and the SJAE radiation monitor. [5.17]

6.3 A coincident loss of offsite power is assumed at the time of the accident (SRP 15.4.9, Appendix A, III-1). [5.1]

6.4 The amount of activity accumulated in the fuel cladding gap is assumed to be the same as established in Reg. Guide 1.77, i.e., 10% for both noble gases and iodines (SRP 15.4.9, Appendix A, III-5). [5.3, 5.1]

6.5 NEDO-31400A, Section 3.2.1, states the maximum mass fraction of fuel in the damaged rods which reaches temperatures in excess of the melting point is 0.0077 in 8x8 fuel bundles. [5.5] GE has not provided the mass fraction for GE14 fuel, but has stated that radiological consequences for GE12 fuel are essentially the same as for the 8x8 fuel designs and that the GE12 estimate is applicable to GE 14 (Refs. 5.23 and 5.24). Thus, a mass fraction of 0.0077 is assumed for both the 8x8 and GE14 fuel designs. 100% of the noble gases and 50% of the iodines contained in this fraction of damaged rods are assumed released to the reactor coolant (SRP 15.4.9, Appendix A, III-6). [5.1]

6.6 SRP 15.4.9, Appendix A, III-7 states, "Those fuel rods presumed to fail are assumed to have operated at power levels 1.5 times that of the average power level of the core." [5.1] Although the SRP does not state that this is a radial peaking factor (compare with Regulatory Guide 1.25 which specifies a minimum radial peaking factor of 1.5 for BWRs), a factor of 1.7, the maximum radial peaking factor for GE14 fuel at CNS through Cycle 23, is used for the GE14 fuel. [5.3, 5.18] A factor of 1.5 is used for the 8x8 fuel. Note the calculation applies this factor in a rod that has operated at 102% power. The loss-of-coolant accident analysis' guidance conservatively identifies the use of a power level at 102% rated power to account for instrument uncertainties. Since the basis of the CRDA factor is not clear, this analysis conservatively applies both the CRDA power level factor and the LOCA uncertainty factor.

6.7 The activity from failed fuel is assumed to mix instantaneously with the reactor coolant (SRP 15.4.9, Appendix A, III-8). [5.1]

6.8 The analysis assumes that 10% of all Iodine's and 100% of all Noble Gases are transported to the turbine/condenser (SRP 15.4.9, Appendix A, III-9). [5.1]

6.9 The analysis assumes that 100% of all Noble Gases are available for leakage from the turbine/condenser (SRP 15.4.9, Appendix A, III-10). [5.1]

6.10 The analysis assumes that 90% of all Iodine's that reach the turbine/condenser plate out leaving only 10% in the gaseous state available for leakage from the turbine/condenser (SRP 15.4.9, Appendix A, III-11). [5.1]

6.11 The analysis assumes that the turbine/condenser leaks directly to the atmosphere at a rate of 1% of the volume per day for an evaluation period of 24 hours (SRP 15.4.9, Appendix A, III-12). [5.1]

6.12 Credit is taken for decay due to hold up in the condenser (SRP 15.4.9, Appendix A, III-13). [5.1]

6.13 In accordance with the SRP, the analysis uses, where appropriate, the same atmospheric dispersion factors, breathing rates, and dose conversion factors as those used in the LOCA analysis (SRP 15.4.9, Appendix A, III-14). [5.1]

6.14 The analysis assumes that the iodine release fractions are the same as for the LOCA analysis, i.e., 4% Organic, 91% Elemental, 5% Particulate. The AXIDENT code uses this as the default distribution. Since the assumed efficiencies and removal mechanisms are the same for all the forms of iodines, the chemical form does not affect the results of this CRDA analysis.

6.15 The Control Room volume is based on gross dimensions with a 20% reduction to account for walls, floors, and equipment.

6.16 It is conservative to assume that the radioactive release concentration at the Control Room intake following a design basis CRDA will be below the radioactive concentration necessary to activate the isolation of the control room intake. Control Room isolation was ignored in the analysis. Control Room isolation would reduce Control Room doses.

6.17 Exfiltration from the Control Room is assumed to equal the intake flow (supply air plus inleakage). This assumes pressure remains constant in the Control Room. The AXIDENT code automatically assumes this.

7.0 COMPUTER CODES AND COMPUTER USED

The AXIDENT program was executed on a Dell Latitude laptop computer running a Windows NT Version 4.0 operating system as currently assigned to Hanry A. Wagage. Satisfactory operation of the AXIDENT code on this computer has been confirmed by revalidation. [5.19] The original "AXIDENT" code library data used the very conservative DCFs that were in effect and used for the 10CFR100-type reactor siting analyses (i.e., TID-14844 and ICRP Publication 2). [5.2, 5.7, 5.11] During this calculation the AXIDENT-code library data file was changed to use the newer and more realistic DCFs presented in ICRP 30. [5.10] See section 3.6 for additional discussion. A listing of the updated library (with the changes indicated) is provided in attachment 1.

8.0 DETAILED CALCULATIONS

8.1 Source term Development

The core inventory is determined using the methodology of TID-14844 by running the SCIENTECH's AXIDENT computer code. [5.7, 5.6] The power level used is 2429 MWt (102% of rated power per §4.1.1). Most parameters are arbitrarily set to 1 or 0 so that the program will generate the source term; realistic values are not necessary. This run is included as Attachment 2 (only the first page is retained in the attachment).

SCIENTECH/NUS, Inc. and Subsidiaries		STANDARD CALCULATION SHEET	
CLIENT: NPPD/Cooper	FILE NO.: 17080 -M-04	BY: R. F. Ely, Jr. and H. A. Wagage	PAGE: 14 of 18
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To determine whether GE9B or GE14 fuel results in the larger release, the failed fuel fraction is determined and multiplied by the CRDA power level multiplier (§6.6). Note minimizing the number of rods in the core maximizes the percentage of the core released.

	GE9B	GE14
Number of failed rods (§4.2.3)	850	1200
Number of rods per assembly (§4.2.1)	60	87.3333
Number of assemblies (§4.2.2)	548	548
Power level multiplier (§6.6)	1.5	1.7
Fraction failed fuel	0.0259	0.0251
Fraction failed fuel corrected by power level multiplier	0.0388	0.0426

Although the fraction of failed rods is less for GE14 fuel than for GE9B fuel, there is a net increase in the source term resulting from use of the increased power level multiplier. Thus, the source term will be based on GE14 fuel. Addition of activity released from melted fuel will not affect this conclusion, since the fraction of damaged rods assumed to melt is the same for both fuel types (§6.5).

The fraction of the total core that is assumed to melt is:
0.0077 of the damaged rods (§6.5) = 0.0077*0.0251 = 1.93E-4

In order to avoid double accounting of the activity in the melted fuel, the fraction of damaged rods can be reduced by this fraction:
0.0251 – 1.93E-4 = 0.0249

The activity released from the melted fuel is determined as follows:
(total core activity) * (core fraction melted) * (power level multiplier) * (fraction released)
where:

core fraction melted	= 1.93E-4
power level multiplier	= 1.7
fraction released	= 100% noble gas/ 50% iodine

The activity released from the damaged, but not melted fuel is determined as follows:
(total core activity) * (core fraction not melted) * (power level multiplier) * (gap fraction)

SCIENTECH/NUS, Inc. and Subsidiaries		**STANDARD CALCULATION SHEET**	
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where:

core fraction not melted = 0.0249
power level multiplier = 1.7
gap fraction = 0.1 for noble gas and iodine

The total core activity is obtained from Attachment 2. The total activity released from damaged fuel is the sum of these releases.

Table 4: Determination of Activity Released from Damaged Fuel

Isotope	Total Core Activity (Ci) (Attachment 2)	Activity Released from Damaged Rods (Ci)	Activity Released from Melted Rods (Ci)	Total Activity Released from Damaged Fuel (Ci)
I-131	6.11E+7	2.59E+5	1.00E+4	2.69E+5
I-132	9.10E+7	3.85E+5	1.49E+4	4.00E+5
I-133	1.41E+8	5.95E+5	2.31E+4	6.18E+5
I-134	1.64E+8	6.94E+5	2.69E+4	7.21E+5
I-135	1.30E+8	5.52E+5	2.14E+4	5.73E+5
Xe-131m	4.62E+5	1.96E+3	1.52E+2	2.11E+3
Xe-133m	3.57E+6	1.51E+4	1.17E+3	1.63E+4
Xe-133	1.41E+8	5.95E+5	4.61E+4	6.41E+5
Xe-135m	3.78E+7	1.60E+5	1.24E+4	1.73E+5
Xe-135	1.32E+8	5.61E+5	4.34E+4	6.04E+5
Xe-138	1.24E+8	5.25E+5	4.07E+4	5.66E+5
Kr-83m	1.09E+7	4.63E+4	3.59E+3	4.99E+4
Kr-85m	2.73E+7	1.16E+5	8.96E+3	1.25E+5
Kr-85	9.17E+5	3.88E+3	3.01E+2	4.18E+3
Kr-87	5.25E+7	2.22E+5	1.72E+4	2.40E+5
Kr-88	7.48E+7	3.17E+5	2.45E+4	3.41E+5

The following table summarizes the source term development using the transport and release assumptions provided in §6. The AXIDENT code reduces the source term input to it by a factor of 75% to account for fraction airborne and plate-out to automatically take into consideration these parameters used in LOCA analyses, a factor of four is applied to the iodine isotopes to compensate for this reduction.

SCIENTECH/NUS, Inc. and Subsidiaries		**STANDARD CALCULATION SHEET**	
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SUBJECT: Control Room, EAB, and LPZ Doses Following a CRDA		CHECKED BY: DRS	DATE: 12/3/99

Table 5. Determination of CRDA Source Term

Isotope	Total Activity Released from Damaged Fuel (Ci) (Table 4)	Fraction Transported to Turbine/ Condenser	Fraction Released from Turbine/ Condenser	Adjustment for AXIDENT Input (2)	AXIDENT Source Term (Ci)
I-131	2.69E+5	0.1	0.1	4	1.08E+4
I-132	4.00E+5	0.1	0.1	4	1.60E+4
I-133	6.18E+5	0.1	0.1	4	2.47E+4
I-134	7.21E+5	0.1	0.1	4	2.88E+4
I-135	5.73E+5	0.1	0.1	4	2.29E+4
Xe-131m	2.11E+3	1	1	1	2.11E+3
Xe-133m	1.63E+4	1	1	1	1.63E+4
Xe-133	6.41E+5	1	1	1	6.41E+5
Xe-135m	1.73E+5	1	1	1	1.73E+5
Xe-135	6.04E+5	1	1	1	6.04E+5
Xe-138	5.66E+5	1	1	1	5.66E+5
Kr-83m	4.99E+4	1	1	1	4.99E+4
Kr-85m	1.25E+5	1	1	1	1.25E+5
Kr-85	4.18E+3	1	1	1	4.18E+3
Kr-87	2.40E+5	1	1	1	2.40E+5
Kr-88	3.41E+5	1	1	1	3.41E+5

8.2 Control Room Volume

Control Room parameters provided in §4.3.4.

Control Room proper

Height = 949'1.5" – 932'6" = 16.625'

Volume = (72') * (67.5') * (16.625') = 80,800 ft3

Cable Room

Height = 932'6" – 918' = 14.5'

Volume = (72') * (67.5') * (14.5') + (37.25') * (48.25') * (14.5') = 96,530 ft^3

Total volume = 80,800 + 96,530 = 177,330 ft^3

Assuming 20% of the volumes include walls, floors, and equipment, the net volumes are:

Control Room proper = 64,640 ft^3

Control Room envelope = 141,860 ft^3

8.3 X/Q Values

The X/Q values for the Control Room intake are provided in §4.3.7. They are not adjusted for occupancy, since the occupancy factor is assumed to be one for the duration of the accident.

SCIENTECH/NUS, Inc. and Subsidiaries		STANDARD CALCULATION SHEET	
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AXIDENT determines the dose for one site boundary location in a run. Since the site boundary doses are not affected by changes in the Control Room intake, the EAB and LPZ are run separately with the two Control Room runs (LPZ included with the unfiltered mode and EAB with the filtered mode).

8.4 *Other Parameters Required by AXIDENT*

8.4.1 *Activity Release Rate from Condenser*

Convert the 1-% per day to a release fraction as follows:

$$Release\ rate\ factor\ (\sec^{-1}) = \frac{0.01\ per\ day}{(24\ hrs\ per\ day)(3600\sec\ per\ hr)} = 1.157E\text{-}7\sec^{-1}$$

8.4.2 *Activity Release Rate From the Turbine Building*

Since the analysis is conservatively neglecting any holdup in the Turbine Building, the release rate is 1 volume per sec.

8.4.3 *Spray Removal*

Although there is no spray removal, AXIDENT requires values for the following parameters:

- FRA- time at which spray removal starts = 30 days = 2.6E6 sec (i.e. no spray removal)
- Spray removal rates = 0
- Mixing flow rate between sprayed and unsprayed regions = 1
- Sprayed region volume = 1 ft^3
- Unsprayed region volume = 1 ft^3 (this is arbitrary volume, since all removal is based on volume/day)
- Fraction of initial release to sprayed region = 0

8.4.4 *Secondary Removal Rate*

- 1 volume per second

9.0 COMPUTER INPUT AND OUTPUT

Attachments 3 and 4 give the AXIDENT code output for calculations of LPZ and control room doses, and EAB doses. At the beginning of each output is the listing of input values. Table 6 summarizes the results.

SCIENTECH/NUS, Inc. and Subsidiaries		STANDARD CALCULATION SHEET	
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Table 6. AXIDENT Predictions for LPZ, Control Room, and EAB Doses at Cooper following a Design Basis CRDA

Location	Duration	Thyroid	Whole Body	Beta	Attachment
LPZ	0 – 30 days	1.65	0.151	0.106	3
Control Room	0 – 30 days	2.80	5.91E-3	0.133	3
EAB	0 – 2 hours	0.634	0.132	6.51E-2	4

10.0 SUMMARY OF RESULTS

The calculated doses to the Control Room operator and to a person located at EAB and LPZ are listed in Table 6. These dose values are below the regulatory limits given in Table 1.

11.0 CONCLUSIONS

The calculated doses for the Control Room, EAB, and LPZ as given in Table 6 are below the regulatory limits given in Table1.

AXIDENT Library File

The *AXIDENT* library file is a plain ASCII text file which is read by the code. The dose conversion factors used in the original code are very conservative. They were in effect and used for the design basis 10 CFR 100 type reactor siting analyses (i.e., TID 14844 and ICRP Publication 2). For this analysis, more realistic DCFs are used. The DCFs used are obtained from ICRP 30. This required a change to the *AXIDENT* library file. The changes made are shown below.

Section of original library file

I-131	9.97E-07	**1.48E+06**	2.91	0.197	0.371	9
I-132	8.37E-05	**5.35E+04**	4.33	0.448	2.40	34
I-133	9.17E-06	**4.00E+05**	6.69	0.423	0.477	6
I-134	2.22E-04	**2.50E+04**	7.8	0.455	1.939	24
I-135	2.87E-05	**1.24E+05**	6.2	0.308	1.779	25

Section of new library file

I-131	9.97E-07	**1.10E+06**	2.91	0.197	0.371	9
I-132	8.37E-05	**6.30E+03**	4.33	0.448	2.40	34
I-133	9.17E-06	**1.80E+05**	6.69	0.423	0.477	6
I-134	2.22E-04	**1.10E+03**	7.8	0.455	1.939	24
I-135	2.87E-05	**3.10E+04**	6.2	0.308	1.779	25

The complete library file used is presented below.

I-131	9.97E-07	1.10E+06	2.91	0.197	0.371	9
I-132	8.37E-05	6.30E+03	4.33	0.448	2.40	34
I-133	9.17E-06	1.80E+05	6.69	0.423	0.477	6
I-134	2.22E-04	1.10E+03	7.8	0.455	1.939	24
I-135	2.87E-05	3.10E+04	6.2	0.308	1.779	25
XE-131M	6.79E-07	0	0.022	0.135	0.022	3
XE-133M	3.55E-06	0	0.17	0.155	0.033	3
XE-133	1.52E-06	0	6.69	0.146	0.030	8
XE-135M	7.40E-04	0	1.8	0.097	0.422	3
XE-135	2.11E-05	0	6.3	0.322	0.246	13
XE-138	6.60E-04	0	5.9	0.800	2.870	9
KR-83M	1.03E-04	0	0.52	0.034	0.005	3
KR-85M	4.38E-05	0	1.3	0.233	0.156	4
KR-85	2.04E-09	0	0.27	0.223	0.0021	1
KR-87	1.52E-04	0	2.5	1.050	1.375	13
KR-88	6.88E-05	0	3.56	0.341	1.743	19

0.03	5.6	E-02	0.08016	2.5	E-02	0.17723	2.5	E-03	0.28431	5.9	E-02
0.32578	2.5	E-02	0.36447	7.97	E-01	0.503	3.6	E-03	0.637	6.8	E-02
0.7229	1.5	E-02	0.1472	2.	E-03	0.263	2.	E-02	0.285	5.	E-03
0.504	1.	E-02	0.508	2.	E-02	0.523	1.6	E-01	0.6206	4.	E-02
0.63	1.9	E-01	0.6502	4.	E-02	0.6521	4.	E-02	0.6678	9.2	E-01
0.6697	6.	E-02	0.6715	6.	E-02	0.727	3.2	E-02	0.729	3.2	E-02
0.7729	8.3	E-01	0.9547	1.94	E-01	1.138	2.	E-02	1.14	4.	E-02
1.22	7.	E-03	1.28	6.	E-02	1.36	2.	E-02	1.398	8.	E-02
1.44	3.	E-02	1.72	3.	E-03	1.77	5.	E-03	1.91	1.3	E-02
1.99	1.3	E-02	2.08	3.	E-03	2.16	2.	E-03	2.22	2.	E-03
2.39	2.	E-03	2.55	5.	E-04	2.68	2.	E-04	0.53	9.4	E-01
0.75	2.	E-02	0.86	7.	E-02	1.03	1.	E-02	1.24	2.	E-02
1.35	2.	E-02	0.136	5.	E-02	0.18	7.	E-02	0.39	7.	E-02
0.41	6.	E-03	0.43	3.	E-02	0.51	9.	E-03	0.54	8.	E-02
0.61	2.4	E-01	0.69	7.	E-02	0.75	1.	E-02	0.77	6.	E-02
0.85	9.5	E-01	0.86	4.	E-02	0.89	7.	E-01	0.96	2.	E-02
1.	5.	E-02	1.07	1.8	E-01	1.15	1.2	E-01	1.28	1.	E-02

```
1.34      2.   E-02 1.46     4.   E-02 1.49     1.   E-02 1.62     5.   E-02
1.79      5.   E-02 0.2204   1.8  E-02 0.2884   3.4  E-02 0.4175   3.2  E-02
0.434     8.2  E-03 0.5269   1.49 E-01 0.5465   6.2  E-02 0.7077   5.9  E-03
0.8369    5.   E-02 0.9724   1.8  E-02 1.0387   9.   E-02 1.1017   1.7  E-02
1.1243    3.3  E-02 1.1316   1.75 E-01 1.1691   7.9  E-03 1.2604   2.58 E-01
1.4575    7.1  E-02 1.5029   1.2  E-02 1.5659   1.4  E-02 1.6785   9.5  E-02
1.707     3.8  E-02 1.7919   7.6  E-02 1.8314   6.4  E-03 2.0467   8.3  E-03
2.2567    6.3  E-03 2.4079   9.   E-03 0.005    6.   E-02 0.03     5.9  E-01
0.16398   2.3  E-02 0.0297   1.41 E-01 0.0338   3.2  E-02 0.2328   8.   E-02
0.0308    3.82 E-01 0.0353   8.6  E-02 0.0796   6.   E-03 0.081    3.7  E-01
0.1607    6.6  E-04 0.2234   2.4  E-06 0.3031   5.1  E-05 0.3841   2.3  E-04
0.0045    4.   E-04 0.0304   1.35 E-01 0.527    8.2  E-01 0.031    4.5  E-02
0.1585    2.1  E-03 0.1999   2.   E-04 0.2498   9.16 E-01 0.3586   2.2  E-03
0.3731    1.1  E-04 0.4082   3.1  E-03 0.5733   5.   E-05 0.6086   2.4  E-02
0.6546    3.2  E-04 0.7319   4.6  E-04 0.8126   5.   E-04 1.063    3.   E-05
0.03      3.   E-02 0.155    7.8  E-02 0.243    3.6  E-02 0.259    3.7  E-01
0.397     7.4  E-02 0.402    2.8  E-02 0.434    2.3  E-01 1.77     2.   E-01
2.00      1.6  E-01 0.0016   8.   E-02 0.0093   8.   E-02 0.0128   1.6  E-01
0.0016    6.5  E-04 0.0128   5.2  E-02 0.1495   7.7  E-01 0.305    1.35 E-01
0.514     4.35 E-03 0.403    5.9  E-01 0.6743   2.5  E-02 0.836    8.   E-03
0.8458    8.1  E-02 1.1755   1.4  E-02 1.338    7.5  E-03 1.384    5.5  E-03
1.741     2.   E-02 2.012    2.6  E-02 2.556    9.5  E-02 2.559    5.1  E-02
2.8112    4.   E-03 3.3098   6.   E-03 0.166    6.9  E-02 0.1961   3.81 E-01
0.3626    3.   E-02 0.3904   6.   E-03 0.4723   6.   E-03 0.8347   1.31 E-01
0.8624    5.   E-03 0.9867   1.6  E-02 1.1417   1.8  E-02 1.1833   9.   E-03
1.25      1.1  E-02 1.5185   1.5  E-02 1.5298   1.14 E-01 2.0295   4.8  E-02
2.0353    4.8  E-02 2.1959   1.51 E-01 2.2316   3.6  E-02 2.3524   2.   E-03
2.392     3.82 E-01
    0.01      4.99      0.015     1.55      0.02      0.752     0.03      0.349
    0.04      0.248     0.05      0.208     0.06      0.188     0.08      0.167
    0.1       0.154     0.15      0.136     0.2       0.123     0.3       0.107
    0.4       0.0954    0.5       0.087     0.6       0.0805    0.8       0.0707
    1.        0.0636    1.5       0.0518    2.0       0.0445    3.0       0.0358
    4.0       0.0308
    4.61      1.27      0.511     0.148     0.0669    0.0406    0.0305    0.0243
    0.0234    0.0250    0.0268    0.0288    0.0295    0.0297    0.0296    0.0289
    0.0280    0.0257    0.0238    0.0212    0.0194
I-131   I-132   I-133   I-134   I-135   I-131   I-132   I-133   I-134
I-135   I-131   I-132   I-133   I-134   I-135   XE-131M XE-133M XE-133
XE-135M XE-135  XE-138  KR-83M  KR-85M  KR-85   KR-87   KR-88
```

```
AXIDENT VER 2 MOD 4
PRODUCTION DATE 02/18/92
BEGIN EXECUTION DATE:  12/03/1999
BEGIN EXECUTION TIME:  09:24:03.05


CNS CRDA: Source Term Run for 2429 MWt (102 %)
1 2 1.0 1.0
+2429 2.6E6 1.4186E5 6.464E4
0.0 0.0 0.0 1.0 6.994E4 1.0 1.0
60
11.
1.0
0.0
1.0
1.0
1.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
1.0 1.0 1.0 1.0 1.0 1.0
1.0 1.0 1.0
```

1

CNS CRDA: Source Term Run for 2429 MWt (102 %)

INITIAL CONTAINMENT INVENTORY

ISOTOPE	ACTIVITY (CURIES)
I-131	6.114E+07
I-132	9.098E+07
I-133	1.406E+08
I-134	1.639E+08
I-135	1.303E+08
XE-131M	4.622E+05
XE-133M	3.572E+06
XE-133	1.406E+08
XE-135M	3.782E+07
XE-135	1.324E+08
XE-138	1.240E+08
KR-83M	1.093E+07
KR-85M	2.731E+07
KR-85	9.167E+05
KR-87	5.253E+07
KR-88	7.480E+07

```
AXIDENT VER 2 MOD 4
PRODUCTION DATE 02/18/92
BEGIN EXECUTION DATE:  12/02/1999
BEGIN EXECUTION TIME:  18:14:24.14


 1 QDC CRDA: LPZ Doses & CR Doses Isolation
 2 5 2 1.0 1.0
 3 -2429 2.6E6 1.4186E5 6.464E4
 4 0.0 0.0 0.0 1.0 1.0 1.0 0.0
 5 7.2E3 2.88E4 8.64E4 3.456E5 2.592E6
 6 3*1.157E-7 2*0.0
 7 5*1.0
 8 5*1.0
 9 3*3316 2*891
10 2*2.9E-4 7.3E-5 2*0.0
11 5.24E-4 2.68E-4 1.41E-4 2*0.0
12 5*0.0
13 5*0.0
14 5*0.0
15 5*0.0
16 5*0.0
17 5*0.0
18 5*0.0
19 5*0.0
20 5*0.0
21 6*1.0
22 3*1.0
23 1.08E+04 1.60E+04 2.47E+04 2.88E+04 2.29E+04 2.11E+03 1.63E+04 6.41E+05
24 1.73E+05 6.04E+05 5.66E+05 4.99E+04 1.25E+05 4.18E+03 2.40E+05 3.41E+05
1
       QDC CRDA: LPZ Doses & CR Doses Isolation
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INITIAL CONTAINMENT INVENTORY

ISOTOPE	ACTIVITY (CURIES)
I-131	1.080E+04
I-132	1.600E+04
I-133	2.470E+04
I-134	2.880E+04
I-135	2.290E+04
XE-131M	2.110E+03
XE-133M	1.630E+04
XE-133	6.410E+05
XE-135M	1.730E+05
XE-135	6.040E+05
XE-138	5.660E+05
KR-83M	4.990E+04
KR-85M	1.250E+05
KR-85	4.180E+03
KR-87	2.400E+05
KR-88	3.410E+05

1 QDC CRDA: LPZ Doses & CR Doses Isolation

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 1. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 2.000 HOURS: X/Q(SITE)= .29E-03 SEC/M3 PRIMARY LEAK RATE= 1.000 PERCENT/DAY CONTROL ROOM INTAKE=3316.0 CFM

X/Q CONT ROOM= .52E-03 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

	CLEANUP RATES (HR-1)				FILTER NON-REMOVAL FACTORS	
	SPRAY	PRIMARY	SECONDARY	CONT CENTER	RELEASE	CONT CENTER
ELEMENTAL	.000	.000	.000	.000	1.000	1.000
PARTICULATE	.000	.000	.000	.000	1.000	1.000
ORGANIC	.000	.000	.000	.000	1.000	1.000

ISOTOPE	ACTIVITY (CURIES) PRIMARY	SECONDARY	RELEASE	CONTROL ROOM (CURIES)	(UCI/CM3)	SITE BOUNDARY DOSES (REM) THYROID	WH BODY	BETA	CONTROL ROOM DOSES (REM) THYROID	WH BODY	BETA

ELEMENTAL

I-131	2.44E+03	2.82E-04	2.04E+00	5.58E-04	1.39E-07	2.26E-01	5.48E-05	2.68E-05	2.71E-01	2.44E-06	3.22E-05
I-132	1.99E+03	2.30E-04	2.28E+00	4.56E-04	1.13E-07	1.44E-03	3.96E-04	6.80E-05	1.62E-03	1.42E-05	7.65E-05
I-133	5.26E+03	6.08E-04	4.53E+00	1.20E-03	2.99E-07	8.20E-02	1.57E-04	1.28E-04	9.79E-02	8.66E-06	1.52E-04
I-134	1.32E+03	1.53E-04	2.72E+00	3.03E-04	7.54E-08	3.01E-04	3.83E-04	8.26E-05	3.00E-04	1.62E-05	8.22E-05
I-135	4.23E+03	4.90E-04	3.92E+00	9.69E-04	2.41E-07	1.22E-02	5.05E-04	8.05E-05	1.44E-02	1.50E-05	9.46E-05
PARTICULATE											
I-131	1.34E+02	1.55E-05	1.12E-01	3.06E-05	7.63E-09	1.24E-02	3.01E-06	1.47E-06	1.49E-02	1.34E-07	1.77E-06
I-132	1.09E+02	1.27E-05	1.25E-01	2.50E-05	6.23E-09	7.93E-05	2.18E-05	3.74E-06	8.91E-05	7.83E-07	4.20E-06
I-133	2.89E+02	3.34E-05	2.49E-01	6.61E-05	1.65E-08	4.51E-03	8.60E-06	7.02E-06	5.38E-03	4.76E-07	8.38E-06
I-134	7.27E+01	8.42E-06	1.50E-01	1.66E-05	4.14E-09	1.66E-05	2.10E-05	4.54E-06	1.65E-05	8.89E-07	4.52E-06
I-135	2.33E+02	2.69E-05	2.15E-01	5.32E-05	1.33E-08	6.72E-04	2.78E-05	4.42E-06	7.90E-04	8.22E-07	5.20E-06
ORGANIC											
I-131	1.07E+02	1.24E-05	8.96E-02	2.45E-05	6.10E-09	9.92E-03	2.41E-06	1.18E-06	1.19E-02	1.07E-07	1.41E-06
I-132	8.75E+01	1.01E-05	1.00E-01	2.00E-05	4.99E-09	6.34E-05	1.74E-05	2.99E-06	7.13E-05	6.26E-07	3.36E-06
I-133	2.31E+02	2.67E-05	1.99E-01	5.29E-05	1.32E-08	3.60E-03	6.88E-06	5.61E-06	4.30E-03	3.81E-07	6.70E-06
I-134	5.82E+01	6.73E-06	1.20E-01	1.33E-05	3.32E-09	1.32E-05	1.68E-05	3.63E-06	1.32E-05	7.11E-07	3.61E-06
I-135	1.86E+02	2.15E-05	1.72E-01	4.26E-05	1.06E-08	5.37E-04	2.22E-05	3.54E-06	6.32E-04	6.58E-07	4.16E-06
NOBLE GASES											
XE-131M	2.10E+03	2.43E-04	1.75E+00	4.80E-04	1.20E-07	0.00E+00	2.80E-06	1.58E-05	0.00E+00	5.42E-07	1.90E-05
XE-133M	1.59E+04	1.84E-03	1.34E+01	3.63E-03	9.04E-07	0.00E+00	3.21E-05	1.39E-04	0.00E+00	1.83E-06	1.66E-04
XE-133	6.33E+05	7.33E-02	5.31E+02	1.45E-01	3.61E-05	0.00E+00	1.15E-03	5.17E-03	0.00E+00	1.63E-04	6.20E-03
XE-135M	8.39E+02	9.71E-05	2.69E+01	1.92E-04	4.78E-08	0.00E+00	8.23E-04	1.74E-04	0.00E+00	1.93E-05	1.07E-04
XE-135	5.18E+05	6.00E-02	4.67E+02	1.19E-01	2.95E-05	0.00E+00	8.32E-03	1.00E-02	0.00E+00	3.65E-04	1.18E-02
XE-138	4.88E+03	5.65E-04	9.83E+01	1.12E-03	2.78E-07	0.00E+00	2.05E-02	5.24E-03	0.00E+00	1.33E-04	3.47E-03
KR-83M	2.38E+04	2.75E-03	2.93E+01	5.44E-03	1.35E-06	0.00E+00	1.06E-05	6.65E-05	0.00E+00	6.47E-06	7.36E-05
KR-85M	9.11E+04	1.05E-02	8.93E+01	2.09E-02	5.19E-06	0.00E+00	1.01E-03	1.39E-03	0.00E+00	4.67E-05	1.61E-03
KR-85	4.18E+03	4.83E-04	3.48E+00	9.56E-04	2.38E-07	0.00E+00	5.30E-07	5.18E-05	0.00E+00	2.41E-08	6.22E-05
KR-87	8.03E+04	9.29E-03	1.21E+02	1.84E-02	4.57E-06	0.00E+00	1.21E-02	8.51E-03	0.00E+00	2.37E-04	9.02E-03
KR-88	2.08E+05	2.40E-02	2.24E+02	4.75E-02	1.18E-05	0.00E+00	2.83E-02	5.09E-03	0.00E+00	1.02E-03	5.80E-03
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						3.53E-01	7.38E-02	3.63E-02	4.23E-01	2.06E-03	3.89E-02

1 QDC CRDA: LPZ Doses & CR Doses Isolation

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 1. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 8.000 HOURS: X/Q(SITE)= .29E-03 SEC/M3 PRIMARY LEAK RATE= 1.000 PERCENT/DAY CONTROL ROOM INTAKE=3316.0 CFM

X/Q CONT ROOM= .27E-03 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

	CLEANUP RATES (HR-1)				FILTER NON-REMOVAL FACTORS	
	SPRAY	PRIMARY	SECONDARY	CONT CENTER	RELEASE	CONT CENTER
ELEMENTAL	.000	.000	.000	.000	1.000	1.000
PARTICULATE	.000	.000	.000	.000	1.000	1.000
ORGANIC	.000	.000	.000	.000	1.000	1.000

	ACTIVITY (CURIES)			CONTROL ROOM		SITE BOUNDARY DOSES (REM)			CONTROL ROOM DOSES (REM)		
ISOTOPE	PRIMARY	SECONDARY	RELEASE	(CURIES)	(UCI/CM3)	THYROID	WH BODY	BETA	THYROID	WH BODY	BETA
ELEMENTAL											
I-131	2.38E+03	2.75E-04	6.02E+00	2.97E-04	7.38E-08	6.66E-01	1.62E-04	7.91E-05	6.78E-01	6.09E-06	8.04E-05
I-132	3.26E+02	3.77E-05	2.30E+00	4.06E-05	1.01E-08	1.46E-03	4.00E-04	6.87E-05	1.59E-03	1.39E-05	7.47E-05
I-133	4.30E+03	4.98E-04	1.19E+01	5.36E-04	1.33E-07	2.16E-01	4.12E-04	3.36E-04	2.21E-01	1.95E-05	3.44E-04
I-134	1.09E+01	1.26E-06	6.84E-01	1.36E-06	3.39E-10	7.57E-05	9.61E-05	2.08E-05	9.14E-05	4.94E-06	2.51E-05
I-135	2.27E+03	2.63E-04	7.88E+00	2.83E-04	7.05E-08	2.46E-02	1.02E-03	1.62E-04	2.55E-02	2.66E-05	1.68E-04
PARTICULATE											
I-131	1.31E+02	1.51E-05	3.31E-01	1.63E-05	4.06E-09	3.66E-02	8.89E-06	4.35E-06	3.72E-02	3.35E-07	4.42E-06
I-132	1.79E+01	2.07E-06	1.26E-01	2.23E-06	5.55E-10	8.01E-05	2.20E-05	3.77E-06	8.71E-05	7.65E-07	4.11E-06
I-133	2.36E+02	2.73E-05	6.54E-01	2.94E-05	7.33E-09	1.18E-02	2.26E-05	1.85E-05	1.21E-02	1.07E-06	1.89E-05
I-134	6.00E-01	6.94E-08	3.76E-02	7.48E-08	1.86E-11	4.16E-06	5.28E-06	1.14E-06	5.02E-06	2.71E-07	1.38E-06
I-135	1.25E+02	1.44E-05	4.33E-01	1.56E-05	3.87E-09	1.35E-03	5.58E-05	8.89E-06	1.40E-03	1.46E-06	9.24E-06
ORGANIC											
I-131	1.05E+02	1.21E-05	2.65E-01	1.30E-05	3.24E-09	2.93E-02	7.12E-06	3.48E-06	2.98E-02	2.68E-07	3.54E-06
I-132	1.43E+01	1.66E-06	1.01E-01	1.78E-06	4.44E-10	6.41E-05	1.76E-05	3.02E-06	6.97E-05	6.12E-07	3.29E-06
I-133	1.89E+02	2.19E-05	5.23E-01	2.36E-05	5.86E-09	9.48E-03	1.81E-05	1.48E-05	9.70E-03	8.58E-07	1.51E-05
I-134	4.80E-01	5.55E-08	3.01E-02	5.98E-08	1.49E-11	3.33E-06	4.23E-06	9.12E-07	4.02E-06	2.17E-07	1.10E-06
I-135	9.99E+01	1.16E-05	3.46E-01	1.24E-05	3.10E-09	1.08E-03	4.47E-05	7.11E-06	1.12E-03	1.17E-06	7.39E-06
NOBLE GASES											
XE-131M	2.06E+03	2.39E-04	5.20E+00	2.57E-04	6.40E-08	0.00E+00	8.29E-06	4.68E-05	0.00E+00	1.36E-06	4.76E-05
XE-133M	1.47E+04	1.70E-03	3.81E+01	1.83E-03	4.55E-07	0.00E+00	9.13E-05	3.94E-04	0.00E+00	4.44E-06	4.02E-04
XE-133	6.12E+05	7.08E-02	1.56E+03	7.62E-02	1.90E-05	0.00E+00	3.38E-03	1.51E-02	0.00E+00	4.05E-04	1.54E-02
XE-135M	9.57E-05	1.11E-11	1.31E-01	1.19E-11	2.97E-15	0.00E+00	4.01E-06	8.49E-07	0.00E+00	2.18E-07	1.21E-06
XE-135	3.28E+05	3.79E-02	1.04E+03	4.09E-02	1.02E-05	0.00E+00	1.85E-02	2.23E-02	0.00E+00	7.10E-04	2.31E-02
XE-138	3.14E-03	3.63E-10	8.56E-01	3.91E-10	9.73E-14	0.00E+00	1.78E-04	4.57E-05	0.00E+00	2.47E-06	6.44E-05

KR-83M	2.56E+03	2.96E-04	2.38E+01	3.19E-04	7.94E-08	0.00E+00	8.62E-06	5.39E-05	0.00E+00	5.24E-06	5.96E-05
KR-85M	3.53E+04	4.08E-03	1.47E+02	4.40E-03	1.09E-06	0.00E+00	1.66E-03	2.29E-03	0.00E+00	6.97E-05	2.41E-03
KR-85	4.17E+03	4.82E-04	1.04E+01	5.19E-04	1.29E-07	0.00E+00	1.59E-06	1.55E-04	0.00E+00	6.11E-08	1.58E-04
KR-87	3.00E+03	3.47E-04	5.88E+01	3.74E-04	9.32E-08	0.00E+00	5.86E-03	4.12E-03	0.00E+00	1.24E-04	4.73E-03
KR-88	4.69E+04	5.42E-03	2.70E+02	5.84E-03	1.45E-06	0.00E+00	3.41E-02	6.14E-03	0.00E+00	1.16E-03	6.60E-03
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						9.98E-01	6.61E-02	5.14E-02	1.02E+00	2.56E-03	5.37E-02

1 QDC CRDA: LPZ Doses & CR Doses Isolation

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 1. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 24.000 HOURS: X/Q(SITE)= .73E-04 SEC/M3 PRIMARY LEAK RATE= 1.000 PERCENT/DAY CONTROL ROOM INTAKE=3316.0 CFM

X/Q CONT ROOM= .14E-03 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

	CLEANUP RATES (HR-1)				FILTER NON-REMOVAL FACTORS	
	SPRAY	PRIMARY	SECONDARY	CONT CENTER	RELEASE	CONT CENTER
ELEMENTAL	.000	.000	.000	.000	1.000	1.000
PARTICULATE	.000	.000	.000	.000	1.000	1.000
ORGANIC	.000	.000	.000	.000	1.000	1.000

	ACTIVITY (CURIES)			CONTROL ROOM		SITE BOUNDARY DOSES (REM)			CONTROL ROOM DOSES (REM)		
ISOTOPE	PRIMARY	SECONDARY	RELEASE	(CURIES)	(UCI/CM3)	THYROID	WH BODY	BETA	THYROID	WH BODY	BETA
ELEMENTAL											
I-131	2.23E+03	2.58E-04	1.54E+01	1.46E-04	3.64E-08	2.17E-01	1.04E-04	5.08E-05	8.61E-01	7.74E-06	1.02E-04
I-132	2.61E+00	3.02E-07	4.46E-01	1.71E-07	4.25E-11	3.61E-05	1.95E-05	3.35E-06	1.60E-04	1.40E-06	7.52E-06
I-133	2.52E+03	2.91E-04	2.22E+01	1.65E-04	4.11E-08	5.13E-02	1.93E-04	1.58E-04	2.05E-01	1.82E-05	3.20E-04
I-134	3.03E-05	3.51E-12	5.69E-03	1.99E-12	4.95E-16	8.04E-08	2.01E-07	4.35E-08	4.06E-07	2.19E-08	1.11E-07
I-135	4.32E+02	5.00E-05	7.39E+00	2.83E-05	7.05E-09	2.94E-03	2.40E-04	3.82E-05	1.21E-02	1.26E-05	7.95E-05
PARTICULATE											
I-131	1.23E+02	1.42E-05	8.44E-01	8.04E-06	2.00E-09	1.19E-02	5.71E-06	2.79E-06	4.73E-02	4.26E-07	5.62E-06
I-132	1.43E-01	1.66E-08	2.45E-02	9.39E-09	2.34E-12	1.98E-06	1.07E-06	1.84E-07	8.77E-06	7.70E-08	4.13E-07
I-133	1.38E+02	1.60E-05	1.22E+00	9.07E-06	2.26E-09	2.82E-03	1.06E-05	8.66E-06	1.13E-02	9.99E-07	1.76E-05
I-134	1.67E-06	1.93E-13	3.13E-04	1.09E-13	2.72E-17	4.42E-09	1.11E-08	2.39E-09	2.23E-08	1.21E-09	6.12E-09
I-135	2.37E+01	2.75E-06	4.06E-01	1.56E-06	3.87E-10	1.62E-04	1.32E-05	2.10E-06	6.63E-04	6.90E-07	4.37E-06
ORGANIC											
I-131	9.81E+01	1.14E-05	6.75E-01	6.43E-06	1.60E-09	9.54E-03	4.57E-06	2.23E-06	3.79E-02	3.40E-07	4.49E-06
I-132	1.15E-01	1.33E-08	1.96E-02	7.51E-09	1.87E-12	1.59E-06	8.59E-07	1.47E-07	7.02E-06	6.16E-08	3.31E-07
I-133	1.11E+02	1.28E-05	9.76E-01	7.26E-06	1.81E-09	2.26E-03	8.49E-06	6.93E-06	9.03E-03	7.99E-07	1.41E-05
I-134	1.33E-06	1.54E-13	2.50E-04	8.74E-14	2.18E-17	3.53E-09	8.85E-09	1.91E-09	1.79E-08	9.65E-10	4.90E-09
I-135	1.90E+01	2.20E-06	3.25E-01	1.25E-06	3.10E-10	1.29E-04	1.05E-05	1.68E-06	5.30E-04	5.52E-07	3.49E-06
NOBLE GASES											
XE-131M	1.97E+03	2.28E-04	1.34E+01	1.29E-04	3.21E-08	0.00E+00	5.39E-06	3.04E-05	0.00E+00	1.75E-06	6.12E-05
XE-133M	1.19E+04	1.37E-03	8.81E+01	7.78E-04	1.94E-07	0.00E+00	5.31E-05	2.29E-04	0.00E+00	5.11E-06	4.63E-04
XE-133	5.57E+05	6.44E-02	3.89E+03	3.65E-02	9.08E-06	0.00E+00	2.13E-03	9.53E-03	0.00E+00	5.04E-04	1.92E-02
XE-135M	2.93E-23	3.39E-30	1.50E-08	1.92E-30	4.78E-34	0.00E+00	1.15E-13	2.44E-14	0.00E+00	1.35E-14	7.49E-14
XE-135	9.66E+04	1.12E-02	1.26E+03	6.33E-03	1.58E-06	0.00E+00	5.66E-03	6.82E-03	0.00E+00	4.32E-04	1.40E-02
XE-138	9.62E-20	1.11E-26	5.50E-07	6.31E-27	1.57E-30	0.00E+00	2.88E-11	7.38E-12	0.00E+00	8.55E-13	2.23E-11
KR-83M	6.74E+00	7.80E-07	2.87E+00	4.42E-07	1.10E-10	0.00E+00	2.61E-07	1.64E-06	0.00E+00	3.30E-07	3.76E-06
KR-85M	2.81E+03	3.25E-04	8.56E+01	1.84E-04	4.59E-08	0.00E+00	2.44E-04	3.35E-04	0.00E+00	2.06E-05	7.11E-04
KR-85	4.14E+03	4.79E-04	2.77E+01	2.71E-04	6.75E-08	0.00E+00	1.06E-06	1.04E-04	0.00E+00	8.07E-08	2.08E-04
KR-87	4.70E-01	5.44E-08	2.28E+00	3.08E-08	7.67E-12	0.00E+00	5.73E-05	4.03E-05	0.00E+00	2.56E-06	9.75E-05
KR-88	8.85E+02	1.02E-04	7.72E+01	5.80E-05	1.44E-08	0.00E+00	2.46E-03	4.42E-04	0.00E+00	1.71E-04	9.72E-04
						--------	--------	--------	--------	--------	--------
						2.98E-01	1.12E-02	1.78E-02	1.19E+00	1.18E-03	3.63E-02

1 QDC CRDA: LPZ Doses & CR Doses Isolation

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 1. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 96.000 HOURS: X/Q(SITE)= .00E+00 SEC/M3 PRIMARY LEAK RATE= .000 PERCENT/DAY CONTROL ROOM INTAKE= 891.0 CFM

X/Q CONT ROOM= .00E+00 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

	CLEANUP RATES (HR-1)				FILTER NON-REMOVAL FACTORS	
	SPRAY	PRIMARY	SECONDARY	CONT CENTER	RELEASE	CONT CENTER
ELEMENTAL	.000	.000	.000	.000	1.000	1.000
PARTICULATE	.000	.000	.000	.000	1.000	1.000
ORGANIC	.000	.000	.000	.000	1.000	1.000

	ACTIVITY (CURIES)			CONTROL ROOM		SITE BOUNDARY DOSES (REM)			CONTROL ROOM DOSES (REM)		
ISOTOPE	PRIMARY	SECONDARY	RELEASE	(CURIES)	(UCI/CM3)	THYROID	WH BODY	BETA	THYROID	WH BODY	BETA
ELEMENTAL											
I-131	1.72E+03	0.00E+00	2.58E-04	1.86E-16	4.63E-20	0.00E+00	0.00E+00	0.00E+00	1.32E-01	1.18E-06	1.56E-05
I-132	9.86E-10	0.00E+00	3.02E-07	1.06E-28	2.65E-32	0.00E+00	0.00E+00	0.00E+00	4.94E-07	4.33E-09	2.33E-08
I-133	2.34E+02	0.00E+00	2.91E-04	2.52E-17	6.28E-21	0.00E+00	0.00E+00	0.00E+00	2.26E-02	2.00E-06	3.51E-05
I-134	3.10E-30	0.00E+00	3.51E-12	3.34E-49	8.33E-53	0.00E+00	0.00E+00	0.00E+00	5.78E-13	3.12E-14	1.59E-13
I-135	2.54E-01	0.00E+00	5.00E-05	2.74E-20	6.82E-24	0.00E+00	0.00E+00	0.00E+00	5.69E-04	5.92E-07	3.74E-06
PARTICULATE											
I-131	9.47E+01	0.00E+00	1.42E-05	1.02E-17	2.54E-21	0.00E+00	0.00E+00	0.00E+00	7.23E-03	6.50E-08	8.58E-07
I-132	5.42E-11	0.00E+00	1.66E-08	5.84E-30	1.45E-33	0.00E+00	0.00E+00	0.00E+00	2.71E-08	2.38E-10	1.28E-09
I-133	1.29E+01	0.00E+00	1.60E-05	1.39E-18	3.45E-22	0.00E+00	0.00E+00	0.00E+00	1.24E-03	1.10E-07	1.93E-06
I-134	1.70E-31	0.00E+00	1.93E-13	1.84E-50	4.57E-54	0.00E+00	0.00E+00	0.00E+00	3.18E-14	1.72E-15	8.71E-15
I-135	1.40E-02	0.00E+00	2.75E-06	1.50E-21	3.75E-25	0.00E+00	0.00E+00	0.00E+00	3.12E-05	3.25E-08	2.06E-07
ORGANIC											
I-131	7.58E+01	0.00E+00	1.14E-05	8.17E-18	2.03E-21	0.00E+00	0.00E+00	0.00E+00	5.78E-03	5.20E-08	6.86E-07
I-132	4.34E-11	0.00E+00	1.33E-08	4.68E-30	1.16E-33	0.00E+00	0.00E+00	0.00E+00	2.17E-08	1.90E-10	1.02E-09
I-133	1.03E+01	0.00E+00	1.28E-05	1.11E-18	2.76E-22	0.00E+00	0.00E+00	0.00E+00	9.91E-04	8.77E-08	1.54E-06
I-134	1.36E-31	0.00E+00	1.54E-13	1.47E-50	3.66E-54	0.00E+00	0.00E+00	0.00E+00	2.54E-14	1.37E-15	6.97E-15
I-135	1.12E-02	0.00E+00	2.20E-06	1.20E-21	3.00E-25	0.00E+00	0.00E+00	0.00E+00	2.50E-05	2.60E-08	1.65E-07
NOBLE GASES											
XE-131M	1.65E+03	0.00E+00	2.28E-04	1.78E-16	4.44E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.71E-07	9.47E-06
XE-133M	4.73E+03	0.00E+00	1.37E-03	5.10E-16	1.27E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.05E-07	6.38E-05
XE-133	3.75E+05	0.00E+00	6.44E-02	4.05E-14	1.01E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.54E-05	2.87E-03
XE-135M	1.46-106	0.00E+00	3.39E-30	1.58-125	3.93-129	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.27E-33	1.26E-32
XE-135	4.07E+02	0.00E+00	1.12E-02	4.39E-17	1.09E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.86E-05	9.28E-04
XE-138	4.87E-94	0.00E+00	1.11E-26	5.25-113	1.31-116	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.45E-29	3.78E-28
KR-83M	1.72E-11	0.00E+00	7.80E-07	1.85E-30	4.60E-34	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.64E-10	4.14E-09
KR-85M	3.30E-02	0.00E+00	3.25E-04	3.56E-21	8.86E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-07	1.66E-05
KR-85	4.14E+03	0.00E+00	4.79E-04	4.46E-16	1.11E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-08	3.31E-05
KR-87	3.65E-18	0.00E+00	5.44E-08	3.93E-37	9.79E-41	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.90E-10	7.22E-09
KR-88	1.59E-05	0.00E+00	1.02E-04	1.72E-24	4.28E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-06	6.53E-06
						0.00E+00	0.00E+00	0.00E+00	1.70E-01	1.11E-04	3.99E-03

1 QDC CRDA: LPZ Doses & CR Doses Isolation

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 1. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 720.000 HOURS: X/Q(SITE)= .00E+00 SEC/M3 PRIMARY LEAK RATE= .000 PERCENT/DAY CONTROL ROOM INTAKE= 891.0 CFM

X/Q CONT ROOM= .00E+00 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

	CLEANUP RATES (HR-1)				FILTER NON-REMOVAL FACTORS	
	SPRAY	PRIMARY	SECONDARY	CONT CENTER	RELEASE	CONT CENTER
ELEMENTAL	.000	.000	.000	.000	1.000	1.000
PARTICULATE	.000	.000	.000	.000	1.000	1.000
ORGANIC	.000	.000	.000	.000	1.000	1.000

	ACTIVITY (CURIES)			CONTROL ROOM		SITE BOUNDARY DOSES (REM)			CONTROL ROOM DOSES (REM)		
ISOTOPE	PRIMARY	SECONDARY	RELEASE	(CURIES)	(UCI/CM3)	THYROID	WH BODY	BETA	THYROID	WH BODY	BETA
ELEMENTAL											
I-131	1.84E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.67E-13	1.50E-18	1.98E-17
I-132	2.17E-91	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.07E-28	2.70E-30	1.45E-29
I-133	2.65E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.44E-15	3.05E-19	5.37E-18
I-134	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.73E-50	5.25E-51	2.67E-50
I-135	2.54E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E-19	5.73E-22	3.62E-21
PARTICULATE											
I-131	1.01E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.18E-15	8.26E-20	1.09E-18
I-132	1.19E-92	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.69E-29	1.48E-31	7.96E-31
I-133	1.45E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.89E-16	1.68E-20	2.95E-19
I-134	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.35E-51	2.89E-52	1.47E-51
I-135	1.40E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.02E-20	3.15E-23	1.99E-22

ORGANIC											
I-131	8.07E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.35E-15	6.61E-20	8.72E-19
I-132	9.54E-93	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.35E-29	1.19E-31	6.37E-31
I-133	1.16E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.51E-16	1.34E-20	2.36E-19
I-134	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.28E-51	2.31E-52	1.17E-51
I-135	1.12E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.42E-20	2.52E-23	1.59E-22
NOBLE GASES											
XE-131M	3.59E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.74E-19	1.31E-17
XE-133M	1.63E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.62E-19	4.18E-17
XE-133	1.23E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.37E-17	3.19E-15
XE-135M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.87-128	1.04-127
XE-135	1.06E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.98E-19	6.44E-18
XE-138	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20-115	3.15-114
KR-83M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.52E-33	1.73E-32
KR-85M	6.13E-45	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.27E-24	3.20E-22
KR-85	4.12E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.11E-20	5.44E-17
KR-87	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.42E-39	9.21E-38
KR-88	1.20E-72	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.40E-26	1.93E-25
						--------	--------	--------	--------	--------	--------
						0.00E+00	0.00E+00	0.00E+00	1.87E-13	8.67E-17	3.33E-15
						========	========	========	========	========	========
				TOTAL DOSES 0-30 DAYS		1.65E+00	1.51E-01	1.06E-01	2.80E+00	5.91E-03	1.33E-01

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QDC CRDA: LPZ Doses & CR Doses Isolation

ISOTOPE	ACTIVITY RELEASED (CURIES)				
	2. HRS	8. HRS	24. HRS	96. HRS	720. HRS
ELEMENTAL					
I-131	2.04E+00	6.02E+00	1.54E+01	2.58E-04	0.00E+00	2.34E+01
I-132	2.28E+00	2.30E+00	4.46E-01	3.02E-07	0.00E+00	5.02E+00
I-133	4.53E+00	1.19E+01	2.22E+01	2.91E-04	0.00E+00	3.86E+01
I-134	2.72E+00	6.84E-01	5.69E-03	3.51E-12	0.00E+00	3.41E+00
I-135	3.92E+00	7.88E+00	7.39E+00	5.00E-05	0.00E+00	1.92E+01
PARTICULATE						
I-131	1.12E-01	3.31E-01	8.44E-01	1.42E-05	0.00E+00	1.29E+00
I-132	1.25E-01	1.26E-01	2.45E-02	1.66E-08	0.00E+00	2.76E-01
I-133	2.49E-01	6.54E-01	1.22E+00	1.60E-05	0.00E+00	2.12E+00
I-134	1.50E-01	3.76E-02	3.13E-04	1.93E-13	0.00E+00	1.87E-01
I-135	2.15E-01	4.33E-01	4.06E-01	2.75E-06	0.00E+00	1.05E+00
ORGANIC						
I-131	8.96E-02	2.65E-01	6.75E-01	1.14E-05	0.00E+00	1.03E+00
I-132	1.00E-01	1.01E-01	1.96E-02	1.33E-08	0.00E+00	2.21E-01
I-133	1.99E-01	5.23E-01	9.76E-01	1.28E-05	0.00E+00	1.70E+00
I-134	1.20E-01	3.01E-02	2.50E-04	1.54E-13	0.00E+00	1.50E-01
I-135	1.72E-01	3.46E-01	3.25E-01	2.20E-06	0.00E+00	8.43E-01
NOBLE GASES						
XE-131M	1.75E+00	5.20E+00	1.34E+01	2.28E-04	0.00E+00	2.04E+01
XE-133M	1.34E+01	3.81E+01	8.81E+01	1.37E-03	0.00E+00	1.40E+02
XE-133	5.31E+02	1.56E+03	3.89E+03	6.44E-02	0.00E+00	5.98E+03
XE-135M	2.69E+01	1.31E-01	1.50E-08	3.39E-30	0.00E+00	2.70E+01
XE-135	4.67E+02	1.04E+03	1.26E+03	1.12E-02	0.00E+00	2.77E+03
XE-138	9.83E+01	8.56E-01	5.50E-07	1.11E-26	0.00E+00	9.91E+01
KR-83M	2.93E+01	2.38E+01	2.87E+00	7.80E-07	0.00E+00	5.60E+01
KR-85M	8.93E+01	1.47E+02	8.56E+01	3.25E-04	0.00E+00	3.22E+02
KR-85	3.48E+00	1.04E+01	2.77E+01	4.79E-04	0.00E+00	4.16E+01
KR-87	1.21E+02	5.88E+01	2.28E+00	5.44E-08	0.00E+00	1.83E+02
KR-88	2.24E+02	2.70E+02	7.72E+01	1.02E-04	0.00E+00	5.71E+02

END EXECUTION DATE: 12/02/1999
END EXECUTION TIME: 18:14:24.25

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AXIDENT VER 2 MOD 4
PRODUCTION DATE 02/18/92
BEGIN EXECUTION DATE:  12/02/1999
BEGIN EXECUTION TIME:  17:44:57.51


 1 QDC CRDA: EAB Doses
 2 1 2 1.0 1.0
 3 -2429 2.6E6 1.4186E5 6.464E4
 4 0.0 0.0 0.0 1.0 1.0 1.0 0.0
 5 7.2E3
 6 1.157E-7
 7 1.0
 8 1.0
 9 0.0
10 5.2E-4
11 0.0
12 0.0
13 0.0
14 0.0
15 0.0
16 0.0
17 0.0
18 0.0
19 0.0
20 0.0
21 6*1.0
22 3*1.0
23 1.08E+04 1.60E+04 2.47E+04 2.88E+04 2.29E+04 2.11E+03 1.63E+04 6.41E+05
24 1.73E+05 6.04E+05 5.66E+05 4.99E+04 1.25E+05 4.18E+03 2.40E+05 3.41E+05
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QDC CRDA: EAB Doses

INITIAL CONTAINMENT INVENTORY

ISOTOPE	ACTIVITY (CURIES)
I-131	1.080E+04
I-132	1.600E+04
I-133	2.470E+04
I-134	2.880E+04
I-135	2.290E+04
XE-131M	2.110E+03
XE-133M	1.630E+04
XE-133	6.410E+05
XE-135M	1.730E+05
XE-135	6.040E+05
XE-138	5.660E+05
KR-83M	4.990E+04
KR-85M	1.250E+05
KR-85	4.180E+03
KR-87	2.400E+05
KR-88	3.410E+05

1 QDC CRDA: EAB Doses

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 1. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 2.000 HOURS: X/Q(SITE)= .52E-03 SEC/M3 PRIMARY LEAK RATE= 1.000 PERCENT/DAY CONTROL ROOM INTAKE= .0 CFM

X/Q CONT ROOM= .00E+00 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

	CLEANUP RATES (HR-1)				FILTER NON-REMOVAL FACTORS	
	SPRAY	PRIMARY	SECONDARY	CONT CENTER	RELEASE	CONT CENTER
ELEMENTAL	.000	.000	.000	.000	1.000	1.000
PARTICULATE	.000	.000	.000	.000	1.000	1.000
ORGANIC	.000	.000	.000	.000	1.000	1.000

	ACTIVITY (CURIES)			CONTROL ROOM		SITE BOUNDARY DOSES (REM)			CONTROL ROOM DOSES (REM)		
ISOTOPE	PRIMARY	SECONDARY	RELEASE	(CURIES)	(UCI/CM3)	THYROID	WH BODY	BETA	THYROID	WH BODY	BETA

ELEMENTAL

I-131	2.44E+03	2.82E-04	2.04E+00	0.00E+00	0.00E+00	4.05E-01	9.83E-05	4.80E-05	0.00E+00	0.00E+00	0.00E+00
I-132	1.99E+03	2.30E-04	2.28E+00	0.00E+00	0.00E+00	2.59E-03	7.10E-04	1.22E-04	0.00E+00	0.00E+00	0.00E+00
I-133	5.26E+03	6.08E-04	4.53E+00	0.00E+00	0.00E+00	1.47E-01	2.81E-04	2.29E-04	0.00E+00	0.00E+00	0.00E+00
I-134	1.32E+03	1.53E-04	2.72E+00	0.00E+00	0.00E+00	5.40E-04	6.86E-04	1.48E-04	0.00E+00	0.00E+00	0.00E+00
I-135	4.23E+03	4.90E-04	3.92E+00	0.00E+00	0.00E+00	2.19E-02	9.06E-04	1.44E-04	0.00E+00	0.00E+00	0.00E+00
PARTICULATE											
I-131	1.34E+02	1.55E-05	1.12E-01	0.00E+00	0.00E+00	2.22E-02	5.40E-06	2.64E-06	0.00E+00	0.00E+00	0.00E+00
I-132	1.09E+02	1.27E-05	1.25E-01	0.00E+00	0.00E+00	1.42E-04	3.90E-05	6.70E-06	0.00E+00	0.00E+00	0.00E+00
I-133	2.89E+02	3.34E-05	2.49E-01	0.00E+00	0.00E+00	8.08E-03	1.54E-05	1.26E-05	0.00E+00	0.00E+00	0.00E+00
I-134	7.27E+01	8.42E-06	1.50E-01	0.00E+00	0.00E+00	2.97E-05	3.77E-05	8.14E-06	0.00E+00	0.00E+00	0.00E+00
I-135	2.33E+02	2.69E-05	2.15E-01	0.00E+00	0.00E+00	1.20E-03	4.98E-05	7.93E-06	0.00E+00	0.00E+00	0.00E+00
ORGANIC											
I-131	1.07E+02	1.24E-05	8.96E-02	0.00E+00	0.00E+00	1.78E-02	4.32E-06	2.11E-06	0.00E+00	0.00E+00	0.00E+00
I-132	8.75E+01	1.01E-05	1.00E-01	0.00E+00	0.00E+00	1.14E-04	3.12E-05	5.36E-06	0.00E+00	0.00E+00	0.00E+00
I-133	2.31E+02	2.67E-05	1.99E-01	0.00E+00	0.00E+00	6.46E-03	1.23E-05	1.01E-05	0.00E+00	0.00E+00	0.00E+00
I-134	5.82E+01	6.73E-06	1.20E-01	0.00E+00	0.00E+00	2.38E-05	3.02E-05	6.51E-06	0.00E+00	0.00E+00	0.00E+00
I-135	1.86E+02	2.15E-05	1.72E-01	0.00E+00	0.00E+00	9.64E-04	3.98E-05	6.35E-06	0.00E+00	0.00E+00	0.00E+00
NOBLE GASES											
XE-131M	2.10E+03	2.43E-04	1.75E+00	0.00E+00	0.00E+00	0.00E+00	5.01E-06	2.83E-05	0.00E+00	0.00E+00	0.00E+00
XE-133M	1.59E+04	1.84E-03	1.34E+01	0.00E+00	0.00E+00	0.00E+00	5.75E-05	2.48E-04	0.00E+00	0.00E+00	0.00E+00
XE-133	6.33E+05	7.33E-02	5.31E+02	0.00E+00	0.00E+00	0.00E+00	2.07E-03	9.27E-03	0.00E+00	0.00E+00	0.00E+00
XE-135M	8.39E+02	9.71E-05	2.69E+01	0.00E+00	0.00E+00	0.00E+00	1.48E-03	3.12E-04	0.00E+00	0.00E+00	0.00E+00
XE-135	5.18E+05	6.00E-02	4.67E+02	0.00E+00	0.00E+00	0.00E+00	1.49E-02	1.80E-02	0.00E+00	0.00E+00	0.00E+00
XE-138	4.88E+03	5.65E-04	9.83E+01	0.00E+00	0.00E+00	0.00E+00	3.67E-02	9.40E-03	0.00E+00	0.00E+00	0.00E+00
KR-83M	2.38E+04	2.75E-03	2.93E+01	0.00E+00	0.00E+00	0.00E+00	1.91E-05	1.19E-04	0.00E+00	0.00E+00	0.00E+00
KR-85M	9.11E+04	1.05E-02	8.93E+01	0.00E+00	0.00E+00	0.00E+00	1.81E-03	2.49E-03	0.00E+00	0.00E+00	0.00E+00
KR-85	4.18E+03	4.83E-04	3.48E+00	0.00E+00	0.00E+00	0.00E+00	9.50E-07	9.28E-05	0.00E+00	0.00E+00	0.00E+00
KR-87	8.03E+04	9.29E-03	1.21E+02	0.00E+00	0.00E+00	0.00E+00	2.17E-02	1.53E-02	0.00E+00	0.00E+00	0.00E+00
KR-88	2.08E+05	2.40E-02	2.24E+02	0.00E+00	0.00E+00	0.00E+00	5.07E-02	9.13E-03	0.00E+00	0.00E+00	0.00E+00
						6.34E-01	1.32E-01	6.51E-02	0.00E+00	0.00E+00	0.00E+00
TOTAL DOSES 0-30 DAYS						6.34E-01	1.32E-01	6.51E-02	0.00E+00	0.00E+00	0.00E+00

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QDC CRDA: EAB Doses

ACTIVITY RELEASED (CURIES)

ISOTOPE	2. HRS	
ELEMENTAL		
I-131	2.04E+00	2.04E+00
I-132	2.28E+00	2.28E+00
I-133	4.53E+00	4.53E+00
I-134	2.72E+00	2.72E+00
I-135	3.92E+00	3.92E+00
PARTICULATE		
I-131	1.12E-01	1.12E-01
I-132	1.25E-01	1.25E-01
I-133	2.49E-01	2.49E-01
I-134	1.50E-01	1.50E-01
I-135	2.15E-01	2.15E-01
ORGANIC		
I-131	8.96E-02	8.96E-02
I-132	1.00E-01	1.00E-01
I-133	1.99E-01	1.99E-01
I-134	1.20E-01	1.20E-01
I-135	1.72E-01	1.72E-01
NOBLE GASES		
XE-131M	1.75E+00	1.75E+00
XE-133M	1.34E+01	1.34E+01
XE-133	5.31E+02	5.31E+02
XE-135M	2.69E+01	2.69E+01
XE-135	4.67E+02	4.67E+02
XE-138	9.83E+01	9.83E+01
KR-83M	2.93E+01	2.93E+01
KR-85M	8.93E+01	8.93E+01
KR-85	3.48E+00	3.48E+00
KR-87	1.21E+02	1.21E+02
KR-88	2.24E+02	2.24E+02

END EXECUTION DATE: 12/02/1999
END EXECUTION TIME: 17:44:57.57