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To N. K. Lane H6-30	From P. D. Rittmann H6-30	Page 1 of 1			
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ENGINEERING DATA TRANSMITTAL

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12/12/94

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7. Abstract Version 1.485 of the GENII software was released by the PNL GENII custodian in December of 1990. At that time the WHC GENII custodian performed several tests to verify that the advertised revisions were indeed present and that these changes had not introduced errors in the calculations normally done by WHC. These tests were not documented at that time. The purpose of this document is to summarize suitable acceptance tests of GENII and compare them with a few hand calculations. The testing is not as thorough as that used by the PNL GENII Custodian, but is sufficient to establish that the GENII program appears to work correctly on WHC managed personal computers.		
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Test Documentation for the GENII Software Version 1.485

Paul D. Rittmann, PhD CHP

November 7, 1994

The GENII software developed by the Battelle Pacific Northwest Laboratories (PNL)¹ is public domain and thus issued without restrictions. The program is used within the Westinghouse Hanford Company (WHC) to evaluate the consequences of postulated radioactivity releases into the air and river from facilities on the Hanford Site. It is most frequently used for accident analyses in Safety Analysis Reports.

Version 1,485 of the GENII software was released by the PNL GENII custodian in December of 1990. At that time the WHC GENII custodian performed several tests to verify that the advertised revisions were indeed present and that these changes had not introduced errors in the calculations normally done by WHC. These tests were not documented at that time. The purpose of this document is to summarize suitable acceptance tests of GENII and compare them with a few hand calculations. The testing is not as thorough as that used by the PNL GENII Custodian, but is sufficient to establish that the GENII program appears to work correctly on WHC managed personal computers.

Application of Models from GENII

The GENII software offers a large selection of models for use in accident evaluation. Some of the models should be avoided by WHC GENII users since WHC has decided to use other methods rather than those available in GENII.

WHC no longer uses the GENII air transport models to compute the normalized time-integrated exposure for short duration (acute) releases. It has been replaced with NRC methods². The current practice at WHC is to compute the integrated exposure independently and then use this value as input to GENII. This eliminates concerns that WHC has had with parts of the air transport models in GENII, such as building wake and plume rise.

The exposure scenarios most commonly used at WHC are the following:

1. Acute and chronic air releases where the worst-case receptor receives radiation dose from submersion in the plume (inhalation and external), and also grows most of his food on land contaminated by deposition on the ground.
2. Chronic doses from releases to the Columbia River. The maximally exposed individual irrigates from the river onto his farmland in addition to consuming fish and drinking water from the river.
3. Exposure to contaminated soil by someone who lives in the contaminated area and plants his garden on the soil. The individual receives radiation dose by external exposure, ingestion of soil directly (trace

¹Napier, B. A., et al., *GENII - The Hanford Environmental Radiation Dosimetry Software System* (PNL-6584), Battelle Pacific Northwest Laboratory, Richland, WA, December, 1988.

²Rittmann, P. D., *Comparison of Old and New Hanford Site Wind Data for Atmospheric Dispersion Calculations*, WHC-SD-GN-TI-30006 Rev 0, July 1993.

amounts) as well as produce grown on the soil, and inhalation of resuspended dust.

The GENII program was checked by creating one input file for each of the above exposure scenarios. These input files are listed in Appendix A for reference. These test cases are not intended to be exhaustive. That task is left to the PNL GENII Custodian. The test cases used by WHC are intended to verify that the program does what it should for the types of problems normally solved by WHC employees. It is assumed that if the portion of the GENII program which is checked is working correctly, then all of it works correctly.

When GENII runs, it reads information from several data files. The title lines from those data files are listed below. These title lines are a brief summary of the file contents and give the date of its last revision along with the initials of the person who changed the file. "Sv" and "Bq" are the abbreviations for sievert and becquerel, the SI units for dose equivalent and activity.

Table 1. Data Files Used by GENII Version 1.485

GENII Default Parameter Values (28-Mar-90 RAP)
Bioaccumulation Factor Library - (30-Aug-88) RAP
External Dose Factors for GENII in person Sv/yr per Bq/n (8-May-90 RAP)
Worst-Case Solubilities, Yearly Dose Increments (23-Jul-93 PDR)
Radionuclide Library - Times < 100 years (23-July-93 PDR)
Radionuclide Master Library - Long Times (23-July-93 PDR)
PNL Food Transfer Factor Library (by Z, with Fr&Os 7/19/93 PDR)

Hand Calculations -- Inhalation Dose Equivalent

Radionuclide inventories for the test cases include the following: H-3, C-14, Sr-90, Y-90, Tc-99, Cs-137, Th-232, Pu-239 and Am-241. The first two radionuclides (H-3 and C-14) use special transport and accumulation models in farm produce. The other radionuclides use the standard models with different input parameters. The Sr-90, Th-232, and Am-241 are used to verify the operation of the decay chain calculations.

Portions of the dose calculations can be easily checked by hand. In particular, the external dose and the inhalation dose can be checked. The basic equation used to compute the inhalation doses is the following:

$$\text{Inhalation Dose} = \text{Activity Inhaled} * \text{Inhalation Dose Factor}$$

The dose factors are taken from the GENII data files. The internal and external dose factors for the nuclides of interest are shown in Table 2 below. The internal dose factors are the 50 year committed dose equivalent per unit activity inhaled or ingested. The lung clearance category, "Lung Model", is shown next to the inhalation dose factors. The lung model abbreviations are "D" for days, "W" for weeks, and "Y" for years. The column labelled "f1" lists the gut absorption factors for the ingestion dose factors. These give the fraction of what is ingested which enters the body fluid. External dose factors are also called dose rate factors because they give the dose rate for

a unit concentration in the soil. Also included in Table 2 are the dose factors for short-lived progeny which are used in the decay chain calculations.

Table 2. Halflives and Dose Factors for the Radionuclides Being Tested

Nuclide	Lung Model	Internal Dose Factor (rem/ μ Ci)		f1	Halflife*	External Dose Factor - Soil (rem/hr per μ Ci/g)
		Inhale	Ingest			
H-3	D	9.03E-05	6.12E-05	1	12.28 Y	6.58E-12
C-14	D	2.07E-03	2.07E-03	1	5730 Y	1.41E-06
Sr-90	D	2.03E-01	1.21E-01	0.3	28.6 Y	6.71E-05
Y-90	Y	8.72E-03	1.08E-02	0.0001	64.1 H	3.75E-03
Tc-99	W	8.99E-03	2.23E-03	0.8	213000 Y	9.50E-06
Cs-137	D	3.00E-02	4.79E-02	1	30.17 Y	3.56E-01
Pb-212	D	1.78E-01	4.92E-02	0.2	10.643 H	6.84E-02
Bi-212	D	2.27E-02	1.11E-03	0.05	60.55 M	8.99E-01
Ra-224	W	3.00E+00	1.30E-01	0.2	3.62 D	5.32E-03
Ra-228	W	4.09E+00	8.41E-01	0.2	5.75 Y	2.05E-09
Ac-228	D	3.08E-01	2.15E-03	0.001	6.13 H	6.01E-01
Th-228	Y	3.45E+02	3.99E-01	0.0002	1.9132 Y	6.39E-04
Th-232	W	1.65E+03	2.74E+00	0.0002	1.405E+10 Y	4.02E-05
Pa-233	Y	9.55E-03	3.56E-03	0.001	27 D	1.33E-01
Np-237	W	6.36E+02	5.24E+00	0.001	2140000 Y	5.54E-03
Pu-239	W	4.34E+02	3.57E+00	0.001	24131 Y	2.62E-05
Am-241	W	4.43E+02	3.63E+00	0.001	432.2 Y	2.68E-03

*Note: The half-life units are years (Y), days (D), hours (H), minutes (M).

The "Activity Inhaled" is computed two ways in GENII. The first is used in air transport calculations. The second is used in soil resuspension calculations. The formula used in air transport calculations is shown below. The number at the end of the formula converts between cubic meters and cubic centimeters.

$$\text{Activity Inhaled (AIR)} = Q \cdot (X/Q) \cdot \text{BR} \cdot (1\text{E-}6 \text{ m}^3/\text{cc})$$

where,

AIR = indicates an air transport calculation

Q = total activity released into the air, in curies. The activity released into the air is 1.0 curie in all the test cases.

X/Q = normalized integrated exposure, in seconds per cubic meter. This is also set to 0.001 sec/ m^3 in the acute release cases and 1.0 sec/ m^3 in the chronic release cases.

BR = breathing rate, cubic centimeters per second. For acute releases this is 330 cc/sec, while for the chronic cases this is 270 cc/sec.

Using the above information, the acute air release cases lead to the inhalation of 0.33 microcurie. The chronic air release cases lead to 270 microcurie inhaled. Results from GENII are compared with hand calculations in Table 3 below.

Table 3. Inhalation Dose Comparison with Hand Calculations -- Air Transport

Nuclide	Acute Release Case			Chronic Release Case		
	GENII	Check	Ratio	GENII	Check	Ratio
H-3	3.0E-05	2.98E-05	1.01	2.4E-02	2.44E-02	0.98
C-14	6.8E-04	6.83E-04	1.00	5.6E-01	5.59E-01	1.00
Sr-90	6.7E-02	6.70E-02	1.00	5.5E+01	5.48E+01	1.00
Y-90	2.9E-03	2.88E-03	1.01	2.4E+00	2.35E+00	1.02
Tc-99	3.0E-03	2.97E-03	1.01	2.4E+00	2.43E+00	0.99
Cs-137	9.9E-03	9.90E-03	1.00	8.1E+00	8.10E+00	1.00
Pb-212	4.1E-09	5.87E-02	0.0	4.1E-06	4.81E+01	0.0
Bi-212	5.2E-10	7.49E-03	0.0	5.2E-07	6.13E+00	0.0
Ra-224	6.9E-08	9.90E-01	0.0	6.9E-05	8.10E+02	0.0
Ra-228	9.0E-07	1.35E+00	0.0	9.0E-04	1.10E+03	0.0
Ac-228	6.8E-08	1.02E-01	0.0	6.8E-05	8.32E+01	0.0
Th-228	8.3E-06	1.14E+02	0.0	8.3E-03	9.32E+04	0.0
Th-232	5.5E+02	5.45E+02	1.01	4.5E+05	4.46E+05	1.01
Pu-239	1.4E+02	1.43E+02	0.98	1.2E+05	1.17E+05	1.02
Am-241	1.5E+02	1.46E+02	1.03	1.2E+05	1.20E+05	1.00

All doses are in units of rem. The "Ratio" is the GENII result divided by the hand calculation result.

The large differences for Pb-212, Bi-212, Ra-224, Ra-228, Ac-228, and Th-228 are due to the treatment of the progeny of Th-232. The hand calculations assumed that these were in equilibrium, i.e., there was one curie of each present initially. However, GENII should show zero for these doses since there is no decay time allowed by the input data. The non-zero GENII results are due to a limitation of the decay chain algorithm. The values shown are created when GENII takes the difference between two very small numbers using single precision real variables. Because the dose from these progeny does not affect the final answer for Th-232, it is considered to be correct.

For resuspended soil, the following equation applies:

$$\text{Activity Inhaled (SOIL)} = \text{Cs} \cdot \text{M} \cdot \text{Ti} \cdot \text{BR} \cdot \text{DK}$$

where,

SOIL = indicates a soil resuspension calculation

Cs = soil concentration, in curies per kilogram of soil. In the intruder case, the soil concentration is the concentration in the waste (1.0 Ci/m³) divided by the area density of the soil (224,000 g/m²) and multiplied by the "manual redistribution factor" which is the ratio of the waste volume exhumed to the area of the garden (2.57E-04 meter). The soil concentration turns out to be 1.15E-09 Ci/g.

M = mass loading of the air, in grams per cubic centimeter. The default in GENII is normally used, and this is 1.0E-10 g/cc.

Ti = inhalation exposure time, in seconds. The exposure time assumed in the intruder case is one year, or 3.156E+07 seconds.

DK = radioactive decay factor (unitless), which depends on the halflife of the nuclide and the decay time.

Using the above information, the well digging intruder will inhale $9.78\text{E-}10$ curie (undecayed) over the course of a year. The resulting doses are shown in Table 4 below. The last column shows the decay factors which are applied to account for radioactive decay during the 500 year wait before intrusion.

Table 4. Inhalation Dose Comparison with Hand Calculations -- Intruder

Nuclide	GENII	Check	Ratio	Decay Factor
H-3	2.3E-20	4.89E-20	0.47	5.53E-13
C-14	8.5E-07	1.90E-06	0.45	9.41E-01
Sr-90	1.1E-09	1.08E-09	1.02	5.46E-06
Y-90	4.7E-11	4.65E-11	1.01	5.46E-06
Tc-99	4.0E-06	8.77E-06	0.46	9.98E-01
Cs-137	3.0E-10	3.01E-10	1.00	1.03E-05
Pb-212	1.7E-04	1.74E-04	0.98	1.00E+00
Bi-212	2.2E-05	2.22E-05	0.99	1.00E+00
Ra-224	2.9E-03	2.93E-03	0.99	1.00E+00
Ra-228	4.0E-03	4.00E-03	1.00	1.00E+00
Ac-228	3.0E-04	3.01E-04	1.00	1.00E+00
Th-228	3.4E-01	3.37E-01	1.01	1.00E+00
Th-232	1.6E+00	1.61E+00	0.99	1.00E+00
Pa-233	1.1E-09	1.04E-09	1.06	1.11E-04
Np-237	7.0E-05	6.92E-05	1.01	1.11E-04
Pu-239	4.2E-01	4.18E-01	1.00	9.86E-01
Am-241	1.9E-01	1.94E-01	0.98	4.48E-01

All doses are in units of rem. The "Ratio" is the GENII column divided by the Check column.

The significant differences for H-3, C-14, and Tc-99 are due to the soil leaching model used in GENII. These three nuclides are mobile in the soil and move away from the surface during the year of exposure. Thus the doses computed by GENII for resuspended soil are lower than the hand calculation results, which did not take this into account. The GENII calculations for this case are considered to be correct.

Hand Calculations -- External Dose Equivalent

Portions of the external doses computed by GENII are easily checked by hand. The equation used to compute the external dose equivalent is shown below.

$$\text{External Dose} = \text{Cs} \cdot \text{DRF} \cdot \text{Te} \cdot \text{DK}$$

where,

Cs = soil concentration for the intruder, in microcurie per gram. From the inhalation case, this is $0.00115 \mu\text{Ci/g}$.

DRF = external dose rate factor shown on Table 2, in rem/hr per $\mu\text{Ci/g}$ in the surface layer (top 6 inches) of soil.

- Te = external radiation exposure time, in hours. This time is half a year, or 4383 hours.
- DK = radioactive decay factor, which depends on the halflife of the nuclide and the decay time. Same values as used for inhalation.

The resulting doses are shown in Table 5 below. The last column shows the decay factors which are applied to account for radioactive decay during the 500 year wait before intrusion.

External Dose Comparison with Hand Calculations -- Intruder

Nuclide	GENII	Check	Ratio	Decay Factor
H-3	8.5E-24	1.83E-23	0.46	5.53E-13
C-14	3.0E-06	6.68E-06	0.45	9.41E-01
Sr-90	1.9E-09	1.84E-09	1.03	5.46E-06
Y-90	1.0E-07	1.03E-07	0.97	5.46E-06
Tc-99	2.1E-05	4.77E-05	0.44	9.98E-01
Cs-137	1.8E-05	1.84E-05	0.98	1.03E-05
Pb-212	3.5E-01	3.44E-01	1.02	1.00E+00
Bi-212	5.5E+00	4.52E+00	1.22	1.00E+00
Ra-224	2.7E-02	2.68E-02	1.01	1.00E+00
Ra-228	1.0E-08	1.03E-08	0.97	1.00E+00
Ac-228	3.1E+00	3.02E+00	1.02	1.00E+00
Th-228	3.2E-03	3.22E-03	1.00	1.00E+00
Th-232	2.0E-04	2.02E-04	0.99	1.00E+00
Pa-233	7.3E-05	7.45E-05	0.98	1.11E-04
Np-237	0.0E+00	3.10E-06	0.00	1.11E-04
Pu-239	1.3E-04	1.30E-04	1.00	9.86E-01
Am-241	6.1E-03	6.05E-03	1.01	4.48E-01

All doses are in units of rem. The "Ratio" is the GENII column divided by the Check column.

The significant differences for H-3, C-14, and Tc-99 are due to the soil leaching model used in GENII. These three nuclides are mobile in the soil and move away from the surface during the year of exposure. Thus the doses computed by GENII are lower than the hand calculation results, which did not take this into account.

The difference for Bi-212 is due to the contribution from buried waste. The buried waste external dose factor used by GENII is $3.39\text{E-}4$ rem/hr per $\mu\text{Ci/g}$. Since the concentration of the buried waste is assumed to be 1 Ci/m^3 ($0.667\text{ }\mu\text{Ci/g}$), the buried waste gives an additional 0.99 rem. The total external dose for Bi-212 is therefore $4.52\text{ rem} + 0.99\text{ rem} = 5.51\text{ rem}$, which agrees with the GENII result.

In summary, the GENII calculations of external dose for this case are considered to be correct.

Appendix A

Input Data Files for GENII Test Cases

GENII Test Case: Acute Air Release

Program GENII Input File ##### 8 Jul 88

Title: Acute MI Dose

\ACUTE.IN

Created on 10-21-1994 at 07:30

OPTIONS===== Default =====

F Near-field scenario? (Far-field) NEAR-FIELD: narrowly-focused
 F Population dose? (Individual) release, single site
 T Acute release? (Chronic) FAR-FIELD: wide-scale release,
 Maximum Individual data set used multiple sites

TRANSPORT OPTIONS===== Section Complete
 T Air Transport 1 F Finite plume, external 5
 F Surface Water Transport 2 T Infinite plume, external 5
 F Biotic Transport (near-field) 3,4 T Ground, external 5
 F Waste Form Degradation (near) 3,4 F Recreation, external 5
 T Inhalation uptake 5,6
 F Drinking water ingestion 7,8
 F Aquatic foods ingestion 7,8
 T Terrestrial foods ingestion 7,9
 T Animal product ingestion 7,10
 T Inadvertent soil ingestion

REPORT OPTIONS=====

T Report AEDE only
 T Report by radionuclide
 T Report by exposure pathway
 F Debug report on screen

INVENTORY #####

- 4 Inventory input activity units: (1-pCi 2-uCi 3-mCi 4-Ci 5-Bq)
 0 Surface soil source units (1- m² 2- m³ 3- kg)
 Equilibrium question goes here

Use when	Release Terms			Basic Concentrations				
	transport selected			near-field scenario, optionally				
Release	Air	Surface	Buried	Air	Surface	Deep	Ground	Surface
Radio-		Water	Waste		Soil	Soil	Water	Surface
nuclide	/yr	/yr	/m ³	/m ³	/unit	/m ³	/L	/L
H 3	1.0E+00							
C 14	1.0E+00							
SR90	1.0E+00							
Y 90	1.0E+00							
TC99	1.0E+00							
CS137	1.0E+00							
TH232	1.0E+00							
PU239	1.0E+00							
AM241	1.0E+00							

Use when	Derived Concentrations			
	measured values are known			
Release	Terres.	Animal	Drink	Aquatic
Radio-	Plant	Product	Water	Food
nuclide	/kg	/kg	/L	/kg

TIME #####

- 1 Intake ends after (yr)
 50 Dose calc. ends after (yr)
 0 Release ends after (yr)
 0 No. of years of air deposition prior to the intake period
 0 No. of years of irrigation water deposition prior to the intake period

FAR-FIELD SCENARIOS (IF POPULATION DOSE) #####

- 0 Definition option: 1-Use population grid in file POP.IN
 0 2-Use total entered on this line

NEAR-FIELD SCENARIOS

0 Prior to the beginning of the intake period: (yr)
 0 When was the inventory disposed? (Package degradation starts)
 0 When was LOIC? (Biotic transport starts)
 0 Fraction of roots in upper soil (top 15 cm)
 0 Fraction of roots in deep soil
 0 Manual redistribution: deep soil/surface soil dilution factor
 0 Source area for external dose modification factor (m²)

TRANSPORT

=====AIR TRANSPORT=====SECTION 1=====

0	0-Calculat PM	0	Release type (0-3)
1	Option: 1-Use chi/Q or PM value	F	Stack release (T/F)
	2-Select MI dist & dir	0	Stack height (m)
	3-Specify MI dist & dir	0	Stack flow (m ³ /sec)
1.00E-03	Acute Chi/Q	0	Stack radius (m)
0	Wind transport direction	0	Effluent temp. (C)
0	Distance to MI (meters)	0	Building x-section (m ²)
F	Use JF data?	0	Building height (m)

=====SURFACE WATER TRANSPORT=====SECTION 2=====

0 Mixing ratio model: 0-use value, 1-river, 2-lake
 0 Mixing ratio, dimensionless
 0 Average river flow rate for: MIXFLG=0 (m³/s), MIXFLG=1,2 (m/s),
 0 Transit time to irrigation withdrawal location (hr)
 0 If mixing ratio model > 0:
 0 Rate of effluent discharge to receiving water body (m³/s)
 0 Longshore distance from release point to usage location (m)
 0 Offshore distance to the water intake (m)
 0 Average water depth in surface water body (m)
 0 Average river width (m), MIXFLG=1 only
 0 Depth of effluent discharge point to surface water (m), lake only

=====WASTE FORM AVAILABILITY=====SECTION 3=====

0 Waste form/package half life, (yr)
 0 Waste thickness, (m)
 0 Depth of soil overburden, m

=====BIOTIC TRANSPORT OF BURIED SOURCE=====SECTION 4=====

T Consider during inventory decay/buildup period (T/F)?
 T Consider during intake period (T/F)? 1-Arid non agricultural
 0 Pre-Intake site condition..... 2-Humid non agricultural
 3-Agricultural

EXPOSURE

=====EXTERNAL EXPOSURE=====SECTION 5=====

Exposure time:
 0 Plume (hr) T Residential irrigation:
 4380.0 Soil contamination (hr) 0 Consider: (T/F)
 0 Swimming (hr) 0 Source: 1-ground water
 0 Boating (hr) 0 2-surface water
 0 Shoreline activities (hr) 0 Application rate (in/yr)
 0 Shoreline type: (1-river, 2-lake, 3-ocean, 4-tidal basin)
 0 Duration (mo/yr)
 0 Transit time for release to reach aquatic recreation (hr)
 1.0 Average fraction of time submersed in acute cloud (hr/person hr)

=====INHALATION=====SECTION 6=====

8766.0 Hours of exposure to contamination per year
 1 0-No resus- 1-Use Mass Loading 2-Use Anspaugh model
 0.0001 pension Mass loading factor (g/m³) Top soil available (cm)

=====INGESTION POPULATION=====SECTION 7=====

1 Atmospheric production definition (select option):
 0 0-Use food-weighted chi/Q, (food-sec/m³), enter value on this line
 1-Use population-weighted chi/Q
 2-Use uniform production
 3-Use chi/Q and production grids (PRODUCTION will be overridden)
 0 Population ingesting aquatic foods, 0 defaults to total (person)
 0 Population ingesting drinking water, 0 defaults to total (person)
 F Consider dose from food exported out of region (default=F)

Note below: S* or Source: 0-none, 1-ground water, 2-surface water
3-Derived concentration entered above

==== AQUATIC FOODS / DRINKING WATER INGESTION=====SECTION 8=====

F Salt water? (default is fresh)

USE ?	FOOD T/F TYPE	TRAN- SIT hr	PROD- UCTION kg/yr	-CONSUMPTION- HOLDUP da	RATE kg/yr	DRINKING WATER	
F	FISH	0.00	0.0E+00	0.00	0.0	0	Source (see above)
F	MOLLUS	0.00	0.0E+00	0.00	0.0	T	Treatment? T/F
F	CRUSTA	0.00	0.0E+00	0.00	0.0	0	Holdup/transit(da)
F	PLANTS	0.00	0.0E+00	0.00	0.0	0	Consumption (L/yr)

====TERRESTRIAL FOOD INGESTION=====SECTION 9=====

USE ?	FOOD T/F TYPE	GROW TIME da	--IRRIGATION-- S RATE * in/yr	TIME mo/yr	YIELD kg/m ²	PROD- UCTION kg/yr	--CONSUMPTION-- HOLDUP da	RATE kg/yr
T	LEAF V	90.00	0	0.0	0.0	1.5	0.0E+00	1.0
T	ROOT V	90.00	0	0.0	0.0	4.0	0.0E+00	5.0
T	FRUIT	90.00	0	0.0	0.0	2.0	0.0E+00	5.0
T	GRAIN	90.00	0	0.0	0.0	0.8	0.0E+00	180.0

====ANIMAL PRODUCTION CONSUMPTION=====SECTION 10=====

USE ?	FOOD T/F TYPE	---HUMAN--- CONSUMPTION RATE kg/yr	TOTAL HOLDUP da	PROD- UCTION kg/yr	DRINK WATER CONTAM FRACT.	DIET FRAC- TION	GROW TIME da	---STOR- ED FEED--- -IRRIGATION-- S RATE * in/yr	TIME mo/yr	YIELD kg/m ³	STOR- AGE da
T	BEEF	80.0	15.0	0.00	0.00	0.25	90.0	0	0.0	0.00	0.80
T	POULTR	18.0	1.0	0.00	0.00	1.00	90.0	0	0.0	0.00	0.80
T	MILK	270.0	1.0	0.00	0.00	0.25	45.0	0	0.0	0.00	2.00
T	EGG	30.0	1.0	0.00	0.00	1.00	90.0	0	0.0	0.00	0.80
	BEEF					0.75	45.0	0	0.0	0.00	2.00
	MILK					0.75	30.0	0	0.0	0.00	1.50

#####

GENII Test Case: Chronic Air Release

Program GENII Input File ##### 8 Jul 88

Title: Chronic MI Dose

\CHRONIC.IN

Created on 10-21-1994 at 07:30

OPTIONS===== Default =====

F Near-field scenario? (Far-field) NEAR-FIELD: narrowly-focused
 F Population dose? (Individual) release, single site
 F Acute release? (Chronic) FAR-FIELD: wide-scale release,
 Maximum Individual data set used multiple sites

TRANSPORT OPTIONS===== Section EXPOSURE PATHWAY OPTIONS===== Section

T Air Transport 1 F Finite plume, external 5
 F Surface Water Transport 2 T Infinite plume, external 5
 F Biotic Transport (near-field) 3,4 T Ground, external 5
 F Waste Form Degradation (near) 3,4 F Recreation, external 5
 T Inhalation uptake 5,6

REPORT OPTIONS=====

T Report AEDE only F Drinking water ingestion 7,8
 T Report by radionuclide F Aquatic foods ingestion 7,8
 T Report by exposure pathway T Terrestrial foods ingestion 7,9
 F Debug report on screen T Animal product ingestion 7,10
 T Inadvertent soil ingestion

INVENTORY #####

- 4 Inventory input activity units: (1-pCi 2-uCi 3-mCi 4-Ci 5-Bq)
 0 Surface soil source units (1- m² 2- m³ 3- kg)
 Equilibrium question goes here

Use when	Release Terms-- transport selected			Basic Concentrations-- near-field scenario, optionally				
	Air	Surface	Buried	Air	Surface	Deep	Ground	Surface
Radio-nuclide	/yr	Water	Waste	/m3	Soil	Soil	Water	Water
	/yr	/yr	/m3	/m3	/unit	/m3	/L	/L
H 3	1.0E+00							
C 14	1.0E+00							
SR90	1.0E+00							
Y 90	1.0E+00							
TC99	1.0E+00							
CS137	1.0E+00							
TH232	1.0E+00							
PU239	1.0E+00							
AM241	1.0E+00							

Use when	Derived Concentrations-- measured values are known			
	Terres.	Animal	Drink	Aquatic
Radio-nuclide	Plant	Product	Water	Food
	/kg	/kg	/L	/kg

TIME #####

- 1 Intake ends after (yr)
 50 Dose calc. ends after (yr)
 1 Release ends after (yr)
 0 No. of years of air deposition prior to the intake period
 0 No. of years of irrigation water deposition prior to the intake period

FAR-FIELD SCENARIOS (IF POPULATION DOSE) #####

- 0 Definition option: 1-Use population grid in file POP.IN
 0 2-Use total entered on this line

NEAR-FIELD SCENARIOS

0 Prior to the beginning of the intake period: (yr)
 0 When was the inventory disposed? (Package degradation starts)
 0 When was LOIC? (Biotic transport starts)
 0 Fraction of roots in upper soil (top 15 cm)
 0 Fraction of roots in deep soil
 0 Manual redistribution: deep soil/surface soil dilution factor
 0 Source area for external dose modification factor (m²)

TRANSPORT

=====AIR TRANSPORT=====SECTION 1=====

0	0-Calculate PM	0	Release type (0-3)
1	Option: 1-Use chi/Q or PM value	F	Stack release (T/F)
	2-Select MI dist & dir	0	Stack height (m)
	3-Specify MI dist & dir	0	Stack flow (m ³ /sec)
1.0	Chronic X/Q	0	Stack radius (m)
0	Wind transport direction	0	Effluent temp. (C)
0	Distance to MI (meters)	0	Building x-section (m ²)
F	Use JF data	0	Building height (m)

=====SURFACE WATER TRANSPORT=====SECTION 2=====

0 Mixing ratio model: 0-use value, 1-river, 2-lake
 0 Mixing ratio, dimensionless
 0 Average river flow rate for: MIXFLG=0 (m³/s), MIXFLG=1,2 (m/s),
 0 Transit time to irrigation withdrawal location (hr)
 0 If mixing ratio model > 0:
 0 Rate of effluent discharge to receiving water body (m³/s)
 0 Longshore distance from release point to usage location (m)
 0 Offshore distance to the water intake (m)
 0 Average water depth in surface water body (m)
 0 Average river width (m), MIXFLG=1 only
 0 Depth of effluent discharge point to surface water (m), lake only

=====WASTE FORM AVAILABILITY=====SECTION 3=====

0 Waste form/package half life, (yr)
 0 Waste thickness, (m)
 0 Depth of soil overburden, m

=====BIOTIC TRANSPORT OF BURIED SOURCE=====SECTION 4=====

T Consider during inventory decay/buildup period (T/F)?
 T Consider during intake period (T/F)? 1-Arid non agricultural
 0 Pre-Intake site condition..... 2-Humid non agricultural
 3-Agricultural

EXPOSURE

=====EXTERNAL EXPOSURE=====SECTION 5=====

Exposure time: Residential irrigation:
 8766.0 Plume (hr) T Consider: (T/F)
 4380.0 Soil contamination (hr) 0 Source: 1-ground water
 0 Swimming (hr) 0 2-surface water
 0 Boating (hr) 0 Application rate (in/yr)
 0 Shoreline activities (hr) 0 Duration (mo/yr)
 0 Shoreline type: (1-river, 2-lake, 3-ocean, 4-tidal basin)
 0 Transit time for release to reach aquatic recreation (hr)
 0 Average fraction of time submersed in acute cloud (hr/person hr)

=====INHALATION=====SECTION 6=====

8766.0 Hours of exposure to contamination per year
 1 0-No resus- 1-Use Mass Loading 2-Use Anspaugh model
 0.0001 pension Mass loading factor (g/m³) Top soil available (cm)

=====INGESTION POPULATION=====SECTION 7=====

1 Atmospheric production definition (select option):
 0 0-Use food-weighted chi/Q, (food-sec/m³), enter value on this line
 1-Use population-weighted chi/Q
 2-Use uniform production
 3-Use chi/Q and production grids (PRODUCTION will be overridden)
 0 Population ingesting aquatic foods, 0 defaults to total (person)
 0 Population ingesting drinking water, 0 defaults to total (person)
 F Consider dose from food exported out of region (default=F)

Note below: S* or Source: 0-none, 1-ground water, 2-surface water
3-Derived concentration entered above

==== AQUATIC FOODS / DRINKING WATER INGESTION=====SECTION 8=====

F Salt water? (default is fresh)

USE ? FOOD T/F TYPE	TRAN- SIT hr	PROD- UCTION kg/yr	-CONSUMPTION- HOLDUP da	RATE kg/yr	DRINKING WATER	
F FISH	0.00	0.0E+00	0.00	0.0	0	Source (see above)
F MOLLUS	0.00	0.0E+00	0.00	0.0	T	Treatment? T/F
F CRUSTA	0.00	0.0E+00	0.00	0.0	0	Holdup/transit(da)
F PLANTS	0.00	0.0E+00	0.00	0.0	0	Consumption (L/yr)

====TERRESTRIAL FOOD INGESTION=====SECTION 9=====

USE ? FOOD T/F TYPE	GROW TIME da	--IRRIGATION-- S RATE * in/yr	TIME mo/yr	YIELD kg/m ²	PROD- UCTION kg/yr	--CONSUMPTION-- HOLDUP da	RATE kg/yr
T LEAF V	90.00	0	0.0	0.0	1.5	0.0E+00	1.0
T ROOT V	90.00	0	0.0	0.0	4.0	0.0E+00	5.0
T FRUIT	90.00	0	0.0	0.0	2.0	0.0E+00	5.0
T GRAIN	90.00	0	0.0	0.0	0.8	0.0E+00	180.0

====ANIMAL PRODUCTION CONSUMPTION=====SECTION 10=====

USE ? FOOD T/F TYPE	---HUMAN--- CONSUMPTION RATE kg/yr	TOTAL HOLDUP da	PROD- UCTION kg/yr	DRINK WATER CONTAM FRACT.	DIET FRAC- TION	GROW TIME da	---STORED FEED--- -IRRIGATION-- S RATE * in/yr	TIME mo/yr	YIELD kg/m ³	STOR- AGE da
T BEEF	80.0	15.0	0.00	0.00	0.25	90.0	0	0.0	0.00	0.80
T POULTR	18.0	1.0	0.00	0.00	1.00	90.0	0	0.0	0.00	0.80
T MILK	270.0	1.0	0.00	0.00	0.25	45.0	0	0.0	0.00	2.00
T EGG	30.0	1.0	0.00	0.00	1.00	90.0	0	0.0	0.00	0.80
BEEF					0.75	45.0	0	0.0	0.00	2.00
MILK					0.75	30.0	0	0.0	0.00	1.50

#####

GENII Test Case: Chronic Releases to the Columbia River

Program GENII Input File ##### 8 Jul 88

Title: Surface Water Source

\SURF-WAT.IN

Created on 10-24-1994 at 07:30

OPTIONS===== Default =====

T Near-field scenario? (Far-field) NEAR-FIELD: narrowly-focused
 F Population dose? (Individual) release, single site
 F Acute release? (Chronic) FAR-FIELD: wide-scale release,
 Maximum individual data set used multiple sites

TRANSPORT OPTIONS===== Complete EXPOSURE PATHWAY OPTIONS===== Complete
 F Air Transport 1 F Finite plume, external 5
 F Surface Water Transport 2 F Infinite plume, external 5
 F Biotic Transport (near-field) 3,4 T Ground, external 5
 F Waste Form Degradation (near) 3,4 T Recreation, external 5

REPORT OPTIONS===== T Inhalation uptake 5,6
 T Report AEDE only T Drinking water ingestion 7,8
 T Report by radionuclide T Aquatic foods ingestion 7,8
 T Report by exposure pathway T Terrestrial foods ingestion 7,9
 F Debug report on screen T Animal product ingestion 7,10
 T Inadvertent soil ingestion

INVENTORY #####

- 2 Inventory input activity units: (1-pCi 2-μCi 3-mCi 4-Ci 5-Bq)
 0 Surface soil source units (1- m² 2- m³ 3- kg)
 Equilibrium question goes here

Use when	Release Terms- transport selected			Basic Concentrations- near-field scenario, optionally				
	Air	Surface Water	Buried Waste	Air	Surface Soil	Deep Soil	Ground Water	Surface Water
Radio-nuclide	/yr	/yr	/m ³	/m ³	/unit	/m ³	/L	/L
H 3								1.0E+00
C 14								1.0E+00
SR90								1.0E+00
Y 90								1.0E+00
TC99								1.0E+00
CS137								1.0E+00
TH232								1.0E+00
PU239								1.0E+00
AM241								1.0E+00

Use when	Derived Concentrations- measured values are known			
	Terres. Plant	Animal Product	Drink Water	Aquatic Food
Radio-nuclide	/kg	/kg	/L	/kg

TIME #####

- 1 Intake ends after (yr)
 50 Dose calc. ends after (yr)
 0 Release ends after (yr)
 0 No. of years of air deposition prior to the intake period
 50 No. of years of irrigation water deposition prior to the intake period

FAR-FIELD SCENARIOS (IF POPULATION DOSE) #####

- 0 Definition option: 1-Use population grid in file POP.IN
 0 2-Use total entered on this line

NEAR-FIELD SCENARIOS

Prior to the beginning of the intake period: (yr)
 0 When was the inventory disposed? (Package degradation starts)
 0 When was LOIC? (Biotic transport starts)
 1.0 Fraction of roots in upper soil (top 15 cm)
 0 Fraction of roots in deep soil
 0.0 Manual redistribution: deep soil/surface soil dilution factor
 1250 Source area for external dose modification factor (m²)
 TRANSPORT #####

====AIR TRANSPORT=====SECTION 1=====
 0 0-Calculate PM 0 Release type (0-3)
 1 Option: 1-Use chi/Q or PM value F Stack release (T/F)
 2-Select MI dist & dir 0 Stack height (m)
 3-Specify MI dist & dir 0 Stack flow (m³/sec)
 0 Chi/Q or PM value 0 Stack radius (m)
 0 MI sector index (1=S) 0 Effluent temp. (C)
 0 MI distance from release point (m) 0 Building x-section (m²)
 T Use jf data, (T/F) else chi/Q grid 0 Building height (m)

====SURFACE WATER TRANSPORT=====SECTION 2=====
 0 Mixing ratio model: 0-use value, 1-river, 2-lake
 0 Mixing ratio, dimensionless
 0 Average river flow rate for: MIXFLG=0 (m³/s), MIXFLG=1,2 (m/s),
 0 Transit time to irrigation withdrawal location (hr)
 If mixing ratio model > 0:
 0 Rate of effluent discharge to receiving water body (m³/s)
 0 Longshore distance from release point to usage location (m)
 0 Offshore distance to the water intake (m)
 0 Average water depth in surface water body (m)
 0 Average river width (m), MIXFLG=1 only
 0 Depth of effluent discharge point to surface water (m), lake only

====WASTE FORM AVAILABILITY=====SECTION 3=====
 0 Waste form/package half life, (yr)
 0 Waste thickness, (m)
 0 Depth of soil overburden, m

====BIOTIC TRANSPORT OF BURIED SOURCE=====SECTION 4=====
 T Consider during inventory decay/buildup period (T/F)?
 T Consider during intake period (T/F)? 1-Arid non agricultural
 0 Pre-Intake site condition..... 2-Humid non agricultural
 3-Agricultural

EXPOSURE

====EXTERNAL EXPOSURE=====SECTION 5=====
 Exposure time:
 0 Plume (hr) T Residential irrigation:
 4380.0 Soil contamination (hr) 2 Consider: (T/F)
 100.0 Swimming (hr) 2 Source: 1-ground water
 100.0 Boating (hr) 40.0 Application rate (in/yr)
 500.0 Shoreline activities (hr) 6.0 Duration (mo/yr)
 1 Shoreline type: (1-river, 2-lake, 3-ocean, 4-tidal basin)
 0 Transit time for release to reach aquatic recreation (hr)
 0 Average fraction of time submersed in acute cloud (hr/person hr)

====INHALATION=====SECTION 6=====
 8766.0 Hours of exposure to contamination per year
 1 0-No resus- 1-Use Mass Loading 2-Use Anspaugh model
 0.0001 pension Mass loading factor (g/m³) Top soil available (cm)

====INGESTION POPULATION=====SECTION 7=====
 Atmospheric production definition (select option):
 0 0-Use food-weighted chi/Q, (food-sec/m³), enter value on this line
 1-Use population-weighted chi/Q
 2-Use uniform production
 3-Use chi/Q and production grids (PRODUCTION will be overridden)
 0 Population ingesting aquatic foods, 0 defaults to total (person)
 0 Population ingesting drinking water, 0 defaults to total (person)
 F Consider dose from food exported out of region (default=F)

Note below: S* or Source: 0-none, 1-ground water, 2-surface water
3-Derived concentration entered above

==== AQUATIC FOODS / DRINKING WATER INGESTION=====SECTION 8=====

F Salt water? (default is fresh)

USE ? T/F	FOOD TYPE	TRAN- SIT hr	PROD- UCTION kg/yr	-CONSUMPTION- HOLDUP da	RATE kg/yr	DRINKING WATER	
T	FISH	0.00	0.0E+00	1.00	40.0	2	Source (see above)
T	MOLLUS	0.00	0.0E+00	0.00	6.9	F	Treatment? T/F
T	CRUSTA	0.00	0.0E+00	0.00	6.9	1.0	Holdup/transit(da)
T	PLANTS	0.00	0.0E+00	0.00	6.9	730.0	Consumption (L/yr)

====TERRESTRIAL FOOD INGESTION=====SECTION 9=====

USE ? T/F	FOOD TYPE	GROW TIME da	--IRRIGATION-- S RATE * in/yr	TIME mo/yr	YIELD kg/m ²	PROD- UCTION kg/yr	--CONSUMPTION-- HOLDUP da	RATE kg/yr
T	LEAF V	90.00	2	35.0	6.0	1.5	0.0E+00	1.0
T	ROOT V	90.00	2	40.0	6.0	4.0	0.0E+00	5.0
T	FRUIT	90.00	2	35.0	6.0	2.0	0.0E+00	5.0
T	GRAIN	90.00	2	0.0	0.0	0.8	0.0E+00	180.0

====ANIMAL PRODUCTION CONSUMPTION=====SECTION 10=====

USE ? T/F	FOOD TYPE	---HUMAN--- CONSUMPTION RATE kg/yr	TOTAL HOLDUP da	PROD- UCTION kg/yr	DRINK WATER CONTAM FRACT.	DIET FRAC- TION	GROW TIME da	---STORED FEED--- --IRRIGATION-- S RATE * in/yr	TIME mo/yr	YIELD kg/m ³	STOR- AGE da
T	BEEF	80.0	15.0	0.00	1.00	0.25	90.0	2	35.0	6.00	0.80
T	POULTR	18.0	1.0	0.00	1.00	1.00	90.0	2	0.0	0.00	0.80
T	MILK	270.0	1.0	0.00	1.00	0.25	45.0	2	47.0	6.00	2.00
T	EGG	30.0	1.0	0.00	1.00	1.00	90.0	2	0.0	0.00	0.80
	BEEF					0.75	45.0	2	47.0	6.00	2.00
	MILK					0.75	30.0	2	47.0	6.00	1.50

#####

GENII Test Case: Buried Waste Intruder After 500 Years

Program GENII Input File ##### 8 Jul 88 ####
 Title: Post-Driller Scenario (500 year wait)

\POST-DRL.IN

Created on 10-21-1994 at 07:30

OPTIONS===== Default =====

T Near-field scenario? (Far-field) NEAR-FIELD: narrowly-focused
 F Population dose? (Individual) release, single site
 F Acute release? (Chronic) FAR-FIELD: wide-scale release,
 Maximum individual data set used multiple sites

TRANSPORT OPTIONS===== Section EXPOSURE PATHWAY OPTIONS===== Section

F Air Transport 1 F Finite plume, external 5
 F Surface Water Transport 2 F Infinite plume, external 5
 F Biotic Transport (near-field) 3,4 T Ground, external 5
 F Waste Form Degradation (near) 3,4 F Recreation, external 5
 T Inhalation uptake 5,6

REPORT OPTIONS=====

T Report AEDE only F Drinking water ingestion 7,8
 T Report by radionuclide F Aquatic foods ingestion 7,8
 T Report by exposure pathway T Terrestrial foods ingestion 7,9
 F Debug report on screen F Animal product ingestion 7,10
 T Inadvertent soil ingestion

INVENTORY #####

- 4 Inventory input activity units: (1-pCi 2-μCi 3-mCi 4-Ci 5-Bq)
 0 Surface soil source units (1- m² 2- m³ 3- kg)
 Equilibrium question goes here

Use when	Release Terms-- transport selected			Basic Concentrations-- near-field scenario, optionally				
	Air	Surface	Buried	Air	Surface	Deep	Ground	Surface
Radio- nuclide	/yr	Water	Waste	/m³	Soil	Soil	Water	Water
		/yr	/m³		/unit	/m³	/L	/L
H 3						1.0E+00		
C 14						1.0E+00		
SR90						1.0E+00		
Y 90						1.0E+00		
TC99						1.0E+00		
CS137						1.0E+00		
TH232						1.0E+00		
PU239						1.0E+00		
AM241						1.0E+00		

Use when	Derived Concentrations-- measured values are known			
	Terres.	Animal	Drink	Aquatic
Radio- nuclide	Plant	Product	Water	Food
	/kg	/kg	/L	/kg

TIME #####

- 1 Intake ends after (yr)
 50 Dose calc. ends after (yr)
 0 Release ends after (yr)
 0 No. of years of air deposition prior to the intake period
 0 No. of years of irrigation water deposition prior to the intake period

FAR-FIELD SCENARIOS (IF POPULATION DOSE) #####

- 0 Definition option: 1-Use population grid in file POP.IN
 0 2-Use total entered on this line

NEAR-FIELD SCENARIOS

Prior to the beginning of the intake period: (yr)
 500 When was the inventory disposed? (Package degradation starts)
 0 When was LOIC? (Biotic transport starts)
 1.0 Fraction of roots in upper soil (top 15 cm)
 0.0 Fraction of roots in deep soil
 2.57E-04 Manual Redistribution Factor = waste volume/garden area (meter)
 1250 Source area for external dose modification factor (m²)
 TRANSPORT #####

====AIR TRANSPORT=====SECTION 1=====
 0-Calculates PM | 0 Release type (0-3)
 1 Option: 1-Use chi/Q or PM value | F Stack release (T/F)
 2-Select MI dist & dir | 0 Stack height (m)
 3-Specify MI dist & dir | 0 Stack flow (m³/sec)
 0 Chi/Q or PM value | 0 Stack radius (m)
 0 MI sector index (1=S) | 0 Effluent temp. (C)
 0 MI distance from release point (m) | 0 Building x-section (m²)
 T Use jf data, (T/F) else chi/Q grid | 0 Building height (m)

====SURFACE WATER TRANSPORT=====SECTION 2=====
 0 Mixing ratio model: 0-use value, 1-river, 2-lake
 0 Mixing ratio, dimensionless
 0 Average river flow rate for: MIXFLG=0 (m³/s), MIXFLG=1,2 (m/s),
 0 Transit time to irrigation withdrawal location (hr)
 If mixing ratio model > 0:
 0 Rate of effluent discharge to receiving water body (m³/s)
 0 Longshore distance from release point to usage location (m)
 0 Offshore distance to the water intake (m)
 0 Average water depth in surface water body (m)
 0 Average river width (m), MIXFLG=1 only
 0 Depth of effluent discharge point to surface water (m), lake only

====WASTE FORM AVAILABILITY=====SECTION 3=====
 0 Waste form/package half life, (yr)
 0 Waste thickness, (m)
 5.0 Depth of soil overburden, m

====BIOTIC TRANSPORT OF BURIED SOURCE=====SECTION 4=====
 T Consider during inventory decay/buildup period (T/F)?
 T Consider during intake period (T/F)? | 1-Arid non agricultural
 0 Pre-Intake site condition..... | 2-Humid non agricultural
 | 3-Agricultural

EXPOSURE

====EXTERNAL EXPOSURE=====SECTION 5=====
 Exposure time: Residential irrigation:
 0 Plume (hr) | T Consider: (T/F)
 4383.0 Soil contamination (hr) | 0 Source: 1-ground water
 0 Swimming (hr) | 2-surface water
 0 Boating (hr) | 0 Application rate (in/yr)
 0 Shoreline activities (hr) | 0 Duration (mo/yr)
 0 Shoreline type: (1-river, 2-lake, 3-ocean, 4-tidal basin)
 0 Transit time for release to reach aquatic recreation (hr)
 0 Average fraction of time submersed in acute cloud (hr/person hr)

====INHALATION=====SECTION 6=====
 8766.0 Hours of exposure to contamination per year
 1 0-No resuspension 1-Use Mass Loading 2-Use Anspaugh model
 0.0001 Mass loading factor (g/m³) Top soil available (cm)

====INGESTION POPULATION=====SECTION 7=====
 Atmospheric production definition (select option):
 0 0-Use food-weighted chi/Q, (food-sec/m³), enter value on this line
 1-Use population-weighted chi/Q
 2-Use uniform production
 3-Use chi/Q and production grids (PRODUCTION will be overridden)
 0 Population ingesting aquatic foods, 0 defaults to total (person)
 0 Population ingesting drinking water, 0 defaults to total (person)
 F Consider dose from food exported out of region (default=F)

Note below: S* or Source: 0-none, 1-ground water, 2-surface water
3-Derived concentration entered above

==== AQUATIC FOODS / DRINKING WATER INGESTION=====SECTION 8=====

F Salt water? (default is fresh)

USE ?	FOOD T/F	TYPE	TRAN- SIT hr	PROD- UCTION kg/yr	-CONSUMPTION- HOLDUP da	RATE kg/yr	DRINKING WATER	
F	FISH		0.00	0.0E+00	0.00	0.0	0	Source (see above)
F	MOLLUS		0.00	0.0E+00	0.00	0.0	T	Treatment? T/F
F	CRUSTA		0.00	0.0E+00	0.00	0.0	0	Holdup/transit(da)
F	PLANTS		0.00	0.0E+00	0.00	0.0	0	Consumption (L/yr)

====TERRESTRIAL FOOD INGESTION=====SECTION 9=====

USE ?	FOOD T/F	TYPE	GROW TIME da	--IRRIGATION-- S RATE * in/yr	TIME mo/yr	YIELD kg/m²	PROD- UCTION kg/yr	--CONSUMPTION-- HOLDUP da	RATE kg/yr
T	LEAF	V	90.00	0	0.0	0.0	1.5	0.0E+00	1.0
T	ROOT	V	90.00	0	0.0	0.0	4.0	0.0E+00	5.0
T	FRUIT		90.00	0	0.0	0.0	2.0	0.0E+00	5.0
T	GRAIN		90.00	0	0.0	0.0	0.8	0.0E+00	180.0

====ANIMAL PRODUCTION CONSUMPTION=====SECTION 10=====

USE ?	FOOD T/F	TYPE	---HUMAN---		TOTAL PROD- UCTION kg/yr	DRINK WATER CONTAM FRACT.	---STORED FEED---				STOR- AGE da		
			CONSUMPTION RATE kg/yr	HOLDUP da			DIET FRAC- TION	GROW TIME da	--IRRIGATION-- S RATE * in/yr	TIME mo/yr		YIELD kg/m³	
T	BEEF		80.0	15.0	0.00	0.00	0.25	90.0	0	0.0	0.00	0.80	180.0
T	POULTR		18.0	1.0	0.00	0.00	1.00	90.0	0	0.0	0.00	0.80	180.0
T	MILK		270.0	1.0	0.00	0.00	0.25	45.0	0	0.0	0.00	2.00	100.0
T	EGG		30.0	1.0	0.00	0.00	1.00	90.0	0	0.0	0.00	0.80	180.0
	BEEF						0.75	45.0	0	0.0	0.00	2.00	100.0
	MILK						0.75	30.0	0	0.0	0.00	1.50	0.0

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Appendix B

Peer Review and Approval Checklist

PEER REVIEW CHECKLIST

Document Reviewed: "Test Documentation for the GENII Software Version 1.485",
by Paul D. Rittmann

Yes No N/A

- ☒ ☐ ☐ Previous reviews complete and cover analysis, up to scope of this review, with no gaps.
- ☒ ☐ ☐ Necessary assumptions explicitly stated and supported.
- ☒ ☐ ☐ Computer codes and data files documented.
- ☒ ☐ ☐ Data used in calculations explicitly stated in document.
- ☒ ☐ ☐ Data checked for consistency with original source information as applicable.
- ☒ ☐ ☐ Mathematical derivations checked including dimensional consistency of results.
- ☒ ☐ ☐ Models appropriate and used within range of validity or use outside range of established validity justified.
- ☒ ☐ ☐ Hand calculations checked for errors. Spreadsheet results should be treated exactly the same as hand calculations.
- ☒ ☐ ☐ Software input correct and consistent with document reviewed.
- ☒ ☐ ☐ Software output consistent with input and with results reported in document reviewed.
- ☒ ☐ ☐ Limits/criteria/guidelines applied to analysis results are appropriate.
- ☒ ☐ ☐ Conclusions consistent with analytical results and applicable limits.
- ☐ ☒ ☐ Review calculations, comments, and/or notes are attached.
- ☒ ☐ Document approved.

Peer Reviewer:

Don P. Harris
Signature

11/9/94
Date