J. Noggle (RI)

From: "Sandike, Steven" <SSandik@entergy.com>
To: "Mayer, Don" <DMayer1@entergy.com>, "'jdn@nrc.gov'" <jdn@nrc.gov>
Date: 3/21/06 5:04PM
Subject: IPEC GW&SW Dose-3-21-6.doc, Dose CoverSheet.doc

Don.... Update incorporated into report, but no reviews yet.
Dan Wilson and Ron Lavera will help me review.
But I think this is ready for you.

We will need to re-do the cover sheet (me, dan, you).

Jim.... Previous rev of attached was finalized, made into PDF, signed, (see draft cover sheet), and nearly sent to Fred Dacimo when we got the word regarding Nickel in MW-37.

Our new source term inputs are on Table 6, and show that the 2005 dose from these pathways is still less than 0.1 % of our limits.

See Table 1 summary.
We will get you the formal version soon.

Additionally, the letter from Lic on the docket will be sent to you as soon as we incorporate these changes in the abbreviated dose summary therein (which is of course a separate work from the Lic department, covering more than just the dose assessment, eg commitments, etc).

Please remember that the attached dose assessment is still (again) in draft mode and not intended for the docket.

<<IPEC GW&SW Dose-3-21-6.doc>> <<Dose CoverSheet.doc>>

CC: "Lavera, Ron" <RLavera@entergy.com>, "Axelson, William L" <WAxelso@entergy.com>, "Croulet, Donald" <dcroule@entergy.com>

B-3

Table 1

Total IPEC Summary for Ground Water releases in 2005 (H-3, Ni-63, Sr-90)

Sum of two monitoring well calculations, IP2 and IP3, Areas 2 and 3

Doses, in mrem

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	DCI
H-3	0.00E+00	1.52E-05	1.52E-05	1.52E-05	1.52E-05	1.52E-05	1.52E-05	1.36E+06
Ni-63	1.32E-03	9.17E-05	4.44E-05	0.00E+00	0.00E+00	0.00E+00	1.91E-05	6.70E+02
Sr-90	8.40E-03	0.00E+00	2.06E-03	0.00E+00	0.00E+00	0.00E+00	2.42E-04	3.35E+02
totals	9.72E-03	1.07E-04	2.12E-03	1.50E-05	1.50E-05	1.50E-05	2.76E-04	**1.36E+06**

Storm Drain Water from Zone B, East/West Unit 2, near MH-2, going to river directly

Doses, in mrem

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	DCI
H-3	0.00E+00	1.63E-07	1.63E-07	1.63E-07	1.63E-07	1.63E-07	1.63E-07	1.46E+04

Storm Drain Water from Zones C and D/E (Central U2 & U1/U3) to Discharge Canal

Doses, in mrem

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	DCI
H-3	0.00E+00	2.82E-08	2.82E-08	2.82E-08	2.82E-08	2.82E-08	2.82E-08	1.58E+05

Totals:

Doses, in mrem.

H-3 only	0.00E+00	1.54E-05	1.54E-05	1.54E-05	1.54E-05	1.54E-05	1.54E-05	1.53E+06
	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	DCI H-3
H-3, Ni-63, Sr-90	9.72E-03	1.07E-04	2.12E-03	1.54E-05	1.54E-05	1.54E-05	2.76E-04	
% Annual Limit	0.097	0.001	0.071	0.000	0.000	0.000	0.003	

	BONE	dose	TOT BODY
IPEC Routine Effluents	1.70E-03	mrem	1.26E-03
GW/Storm Drains	9.72E-03	mrem	2.12E-03
Total Site Liq Dose	1.14E-02	mrem	3.38E-03
Percent Limit	**0.11%**		**0.11%**
GW/SD % of total	**85%**		**63%**

Comparing the assessed groundwater and storm water pathways (with **very conservative source terms**), versus the total routine liquid effluent for the site in 2005. While still well below the limit, these GW/SD pathways indicate they can be as much as 5 times more significant than the routine effluent.

Table 2

Storm Drain Zone B (MH-2 East & West Unit 2) to the Hudson River directly, 2005

Release Rate 6.15E+07 ml/day or 1.62E+04 gpd or 11.28 gpm

Duration of Release, in days 365 Waste vol released = 5.93E+06 gal

Dilution flow 1.11E+05 gpm Dilution vol released = 5.83E+10 gal

Dil Factor 1.02E-04 *(dilution data per **IP-CHM-05-042** from Dr. John Hamawi)*

ISOTOPE	Activity Released uCi/ml	10CFR20 EC*10 conc limit	PRE DILUTION CONC/MPC	POST DILUTION uCi/ml	POST DILUTION CONC/MPC	MICRO-CURIES RELEASED
H-3	6.51E-07	1.00E-02	6.51E-05	6.62E-11	6.62E-09	1.46E+04
MN-54		3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55		1.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58		2.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60		3.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63		1.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR-90		5.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SB-125		3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134		9.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137		1.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-57		6.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	**6.51E-07**	**n/a**	**6.51E-05**	**6.62E-11**	**6.62E-09**	**1.46E+04**

NUREG 0133 "Applicable Factor" for Near Field Dilution = 1.00E+00

Adult Total Body mrem

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	1.63E-07	1.63E-07	1.63E-07	1.63E-07	1.63E-07	1.63E-07
MN-54	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SB-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-57	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	0.00E+00	1.63E-07	1.63E-07	1.63E-07	1.63E-07	1.63E-07	1.63E-07

Table 3

Central Unit 2 Storm Drain Releases of Tritium to the Hudson River via the Discharge Canal in 2005 (Zone C)

Release Rate 3.23E+07 ml/day or 8.54E+03 gpd or 5.93 gpm

Duration of Release, in days 365 Waste vol released = 3.12E+06 gal

Dilution flow 1.39E+06 gpm Dilution vol released = 7.31E+11 gal

Dil Factor 4.27E-06 *(dilution from actual 2005 data)*

ISOTOPE	Activity Released uCi/ml	10CFR20 EC*10 conc limit	PRE DILUTION CONC/MPC	POST DILUTION uCi/ml	POST DILUTION CONC/MPC	MICRO-CURIES RELEASED
H-3 *	2.90E-06	1.00E-02	2.90E-04	1.24E-11	1.24E-09	3.42E+04
MN-54		3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55		1.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58		2.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60		3.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63		1.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR-90		5.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SB-125		3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134		9.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137		1.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-57		6.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	**2.90E-06**	**n/a**	**2.90E-04**	**1.24E-11**	**1.24E-09**	**3.42E+04**

* No gamma identified in storm drains, and 2.9E-6 was avg effluent H-3 in 2005 from MH-4a.

NUREG 0133 "Applicable Factor" for Near Field Dilution = 5.00E+00

Adult Total Body mrem

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	6.11E-09	6.11E-09	6.11E-09	6.11E-09	6.11E-09	6.11E-09
MN-54	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SB-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-57	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	0.00E+00	6.11E-09	6.11E-09	6.11E-09	6.11E-09	6.11E-09	6.11E-09

Table 4

Storm Drain Releases of Tritium to the Hudson River via the Discharge Canal in 2005 from Units 1 and 3 (Zones D and E)

Release Rate 2.17E+08 ml/day or 5.72E+04 gpd or 39.75 gpm

Duration of Release, in days 365 Waste vol released = 2.09E+07 gal

Dilution flow 1.39E+06 gpm Dilution vol released = 7.31E+11 gal

Dil Factor 2.86E-05 *(dilution from actual 2005 data)*

ISOTOPE	Activity Released uCi/ml	10CFR20 EC*10 conc limit	PRE DILUTION CONC/MPC	POST DILUTION uCi/ml	POST DILUTION CONC/MPC	MICRO-CURIES RELEASED
H-3 *	1.56E-06	1.00E-02	1.56E-04	4.46E-11	4.46E-09	1.23E+05
MN-54		3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55		1.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58		2.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60		3.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63		1.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR-90		5.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SB-125		3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134		9.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137		1.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-57		6.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	**1.56E-06**	**n/a**	**1.56E-04**	**4.46E-11**	**4.46E-09**	**1.23E+05**

* No gamma identified in storm drains, and 1.56E-6 was average of effected Storm Drains in 2005

NUREG 0133 "Applicable Factor" for Near Field Dilution = **6.00E+00**

Adult Total Body mrem

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	2.20E-08	2.20E-08	2.20E-08	2.20E-08	2.20E-08	2.20E-08
MN-54	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SB-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-57	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	0.00E+00	2.20E-08	2.20E-08	2.20E-08	2.20E-08	2.20E-08	2.20E-08

Table 5

IP3 Tritium Released to Hudson River via Bedrock Pathway in 2005

(from the area near IP3 waterfront, as determined by samples from Monitoring Wells - Area 3)

Release Rate 7.53E+07 ml/day or 1.99E+04 gpd or 13.81 gpm

Duration of Release, in days 365 Waste vol released = 7.26E+06 gal

Dilution flow 1.11E+05 gpm Dilution vol released = 5.83E+10 gal

Dil Factor 1.24E-04 *(dilution data per **IP-CHM-05-042** from Dr. John Hamawi)*

ISOTOPE	Activity Released uCi/ml	10CFR20 EC*10 conc limit	PRE DILUTION CONC/MPC	POST DILUTION uCi/ml	POST DILUTION CONC/MPC	MICRO-CURIES RELEASED
H-3	6.20E-07	1.00E-02	6.20E-05	7.71E-11	7.71E-09	1.70E+04
MN-54		3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55		1.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58		2.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60		3.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63		1.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR-90		5.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SB-125		3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134		9.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137		1.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-57		6.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	**6.20E-07**	**n/a**	**6.20E-05**	**7.71E-11**	**7.71E-09**	**1.70E+04**

NUREG 0133 "Applicable Factor" for Near Field Dilution = 1.00E+00

Adult Total Body mrem

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	1.91E-07	1.91E-07	1.91E-07	1.91E-07	1.91E-07	1.91E-07
MN-54	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SB-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-57	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	0.00E+00	1.91E-07	1.91E-07	1.91E-07	1.91E-07	1.91E-07	1.91E-07

Table 6

IP2 Activity Released to Hudson River via Bedrock Pathway, 2005

(from the area near IP2 transformer yard, as determined by samples from Monitoring Wells - Area 2)

Release Rate 1.84E+07 ml/day or 4.85E+03 gpd or 3.37 gpm

Duration of Release, in days 365 Waste vol released = 1.77E+06 gal

Dilution flow 1.11E+05 gpm Dilution vol released = 5.83E+10 gal

Dil Factor 3.03E-05 *(dilution data per **IP-CHM-05-042** from Dr. John Hamawi)*

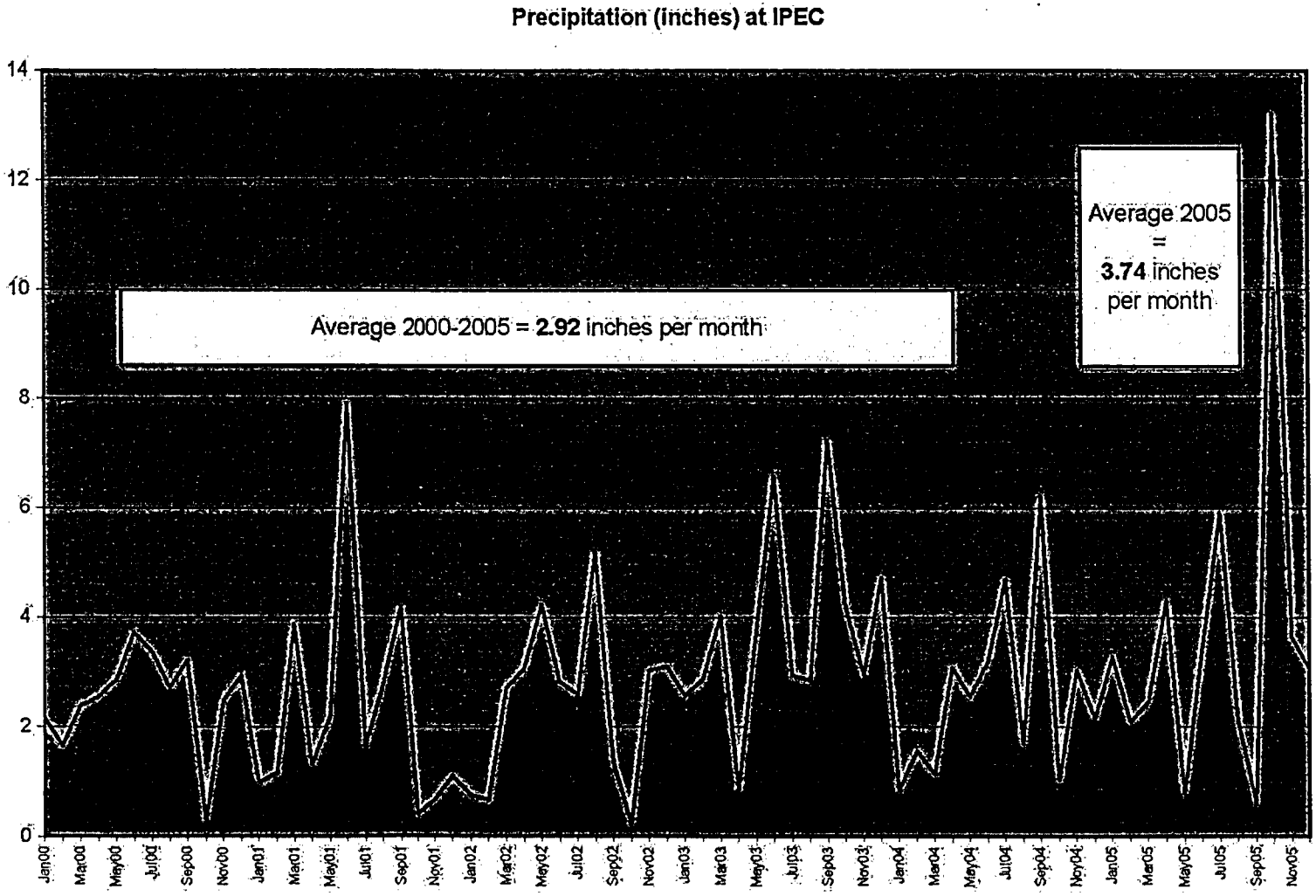
ISOTOPE	Activity Released uCi/ml	10CFR20 EC*10 conc limit	PRE DILUTION CONC/MPC	POST DILUTION uCi/ml	POST DILUTION CONC/MPC	MICRO-CURIES RELEASED
H-3	2.00E-04	1.00E-02	2.00E-02	6.07E-09	6.07E-07	1.34E+06
MN-54		3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55		1.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58		2.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60		3.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63	1.00E-07	1.00E-03	1.00E-04	3.03E-12	3.03E-09	6.70E+02
SR-90	5.00E-08	5.00E-06	1.00E-02	1.52E-12	3.03E-07	3.35E+02
SB-125		3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134		9.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137		1.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-57		6.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	**2.00E-04**	**n/a**	**3.01E-02**	**6.07E-09**	**9.13E-07**	**1.34E+06**

NUREG 0133 "Applicable Factor" for Near Field Dilution = 1.00E+00

Adult Total Body mrem

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	1.50E-05	**1.50E-05**	1.50E-05	1.50E-05	1.50E-05	1.50E-05
MN-54	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63	**1.32E-03**	9.17E-05	**4.44E-05**	0.00E+00	0.00E+00	0.00E+00	1.91E-05
SR-90	**8.40E-03**	0.00E+00	**2.06E-03**	0.00E+00	0.00E+00	0.00E+00	2.42E-04
SB-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-57	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	**9.72E-03**	1.07E-04	**2.12E-03**	1.50E-05	1.50E-05	1.50E-05	2.76E-04

Figure 3


Precipitation (inches) at IPEC
Average 2000-2005 = 2.92 inches per month
Average 2005 = 3.74 inches per month
14
12
10
8
6
4
2
0
Jan00
Mar00
May00
Jul00
Sep00
Nov00
Jan01
Mar01
May01
Jul01
Sep01
Nov01
Jan02
Mar02
May02
Jul02
Sep02
Nov02
Jan03
Mar03
May03
Jul03
Sep03
Nov03
Jan04
Mar04
May04
Jul04
Sep04
Nov04
Jan05
Mar05
May05
Jul05
Sep05
Nov05