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Evaluation of Reduced Silver Content Relative to the Activation Products in Remaining R- and P-Reactor Structures

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Remaining R- and P-Reactor Structures**

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1.0 EXECUTIVE SUMMARY

An analytic model and calculational methodology have been established previously to quantify the radioisotopes present in the Savannah River Site (SRS) P-reactor and R-reactor tanks and in the structural materials surrounding those tanks. These radioisotopes are the result of neutron activation of the materials during reactor operation. The analysis results were based upon a specific set of input assumptions for the elemental composition of the materials of construction. Based upon the results of that analysis, efforts to more accurately quantify the silver content in the stainless steel used in the fabrication of the reactor vessel have been completed. Laboratory testing of vintage stainless steel from stainless piping extracted from R-reactor indicates a maximum silver content that is nearly an order of magnitude lower than that assumed in the previous calculation. Based on the new silver content information simulations were completed to evaluate the impact of the reduced silver content.

2.0 INTRODUCTION

An analysis has been completed to evaluate the effect of silver content in stainless steel relative to the analysis of R- and P-reactor radioisotopic inventory reported previously.¹ Those calculations use a value of 75 ppm for the silver content of the stainless steel. That value for silver content is now believed to be considerably higher than the actual silver content of the stainless steel of construction.

Laboratory analysis of vintage stainless steel and a literature study on the topic was conducted to develop a more accurate assessment of the silver content in the reactor vessel. The new silver concentration was then evaluated analytically to determine the impact of the change in the initial silver content on the estimated post-irradiation composition of R-reactor and P-reactor.

3.0 DETERMINATION OF SILVER CONTENT OF STAINLESS STEEL COMPONENTS OF R- AND P-REACTOR

The initial composition of the stainless steel used in the reactor analysis calculations detailed in Reference 1 is provided in Table 1. There are indications that this value may be higher than originally present in the reactor steel. A review of available literature and experimental work is detailed in this section. The findings from that effort were used to establish a reasonable and conservative estimation of the silver content in the stainless steel reactor tanks prior to irradiation.

Table 1 Composition of Reactor Stainless Steel (weight fraction)

Element	Reactor Tank (304SS)
Mass (g)	1.269E+07
ρ (g/cm ³)	8.000E+00
Vol. (cm ³)	1.586E+06
C	5.910E-04
Ag	7.500E-05
Al	3.500E-05
As	2.750E-04
B	1.900E-05
Bi	4.000E-04
Ca	—
Cd	8.300E-05
Cl	—

Element	Reactor Tank (304SS)
Co	1.286E-03
Cr	1.864E-01
Cu	2.891E-03
Fe	6.903E-01
H	4.000E-06
In	2.950E-04
K	—
Mg	—
Mn	1.271E-02
Mo	3.453E-03
N	4.1600E-04
Nb	3.200E-04
Ni	9.234E-02
O	5.210E-04
P	2.600E-04
Pb	5.000E-04
S	1.850E-04
Sb	4.000E-04
Si	4.689E-03
Sn	4.400E-04
Ti	1.050E-04
V	5.100E-04
Zn	—
Zr	5.000E-04

3.1 Literature Data on Silver Content in Stainless Steel

A review of the literature for information on the silver content of Type 304 stainless steel finds very little quantitative data. Review of the task documents² from the extensive test program to characterize the metallurgical properties of the materials extracted from the Savannah River C- and R- reactor tanks indicates only upper bounds for the silver content of the materials. For the four R-tank specimens, silver content was characterized as ≤ 0.01 wt. % for two specimens and ≤ 0.005 wt. % for the remaining two. All five C-tank specimens were characterized as ≤ 0.01 wt. % in silver. It is deduced that the value of 75 ppm assumed in the original R- and P-reactor analysis document¹ was derived from averaging the values provided in Reference 2 for the four R-tank specimens.

A 1998 report on the radiological characterization of shut down nuclear reactors published by the International Atomic Energy Agency (IAEA)³ provides some quantitative data for silver content in vintage stainless steel used in reactor construction. This IAEA report provides technical information related to important considerations for decommissioning reactor facilities and provides several case studies of characterization activities performed on shut down reactors. One such case study considered two French reactors that were commissioned 1959 and 1960, respectively. These reactors are pertinent in that the materials of construction included stainless steel of similar vintage as the stainless steel used in the R- and P-reactor fabrication efforts. Silver content in the steel used in the construction of the two French reactors are reported to range from 0.025 to 0.82 ppm. This range is two to nearly four orders of magnitude lower than that assumed in Reference 1 (0.005-0.010 wt. % = 50-100 ppm).

3.2 Laboratory Analysis of Steel Samples

Samples extracted from the piping in R-reactor in the mid 1980's are currently stored at SRNL. The stainless steel used in the piping is similar to that used in the reactor vessel, but without the accompanying activation products. Therefore, samples were taken from the stored vintage R-piping samples to allow for quantification of the silver content of the stainless steel for application to the activation analysis for R- and P-reactors.

Roughly 0.25g from each of two samples was digested in concentrated HCl and in concentrated nitric acid. The dissolutions were then diluted up to 10 ml. Each sample was digested in triplicate. Diluted aliquots of dissolution were spiked with Ag and run again through the ICP-MS along with non-spiked aliquots. Aliquots of sample dissolutions were then diluted and analyzed by the routine ICP-MS analysis.

To ensure the Ag results from the direct ICP-MS analyses weren't biased high from interferences from the high concentrations of dissolved metals in these dissolutions, two sets of dissolutions were run through a clean-up routine which separated the Ag from the bulk of the other metals. One set was spiked with trace levels of silver; one was run through the procedure directly. These cleaned solutions were then analyzed by the ICP-MS. The results of the analysis of the dissolutions were corrected with the tracer recoveries from the spiked set.

The results of these analyses determined silver content in the stainless steel sample to be in the range from about 5 ppm to a maximum of 7.61 ppm. The value of 7.61 ppm was adopted for further analysis of the R- and P-reactor activation product content to ensure conservatism.

4.0 MATERIALS ACTIVATION ANALYSIS

The activation analysis for R- and P-reactors was completed and documented in Reference 1. The silver content assumed in the previous analysis was 75 ppm. Based upon the information detailed previously in the current report, the silver content of the 304 Stainless Steel used in reactor construction should be approximately 7.61 ppm.

Calculations were completed that simulated the exposure of natural silver to the neutron flux generated by reactor operation of R- and P-reactors. The simulated quantities of silver to be exposed is consistent with the difference between the total silver assuming a concentration of 75 ppm in stainless steel and the total silver assuming a concentration of 7.61 ppm in stainless steel. That is to say 67.39 milligrams of silver is subjected to simulated exposure for each kilogram of stainless steel in a given modeling region. The results of this simulated exposure would yield the contribution to the total activation product content of the activated stainless steel that is due to the presence of silver in excess of the expected 7.61 ppm. The difference, therefore, between the contents determined in Reference 1 minus the results from simulated activation of 67.39 ppm silver only yields the modified activation product contents of the stainless steel containing material with an initial silver content of 7.61 ppm.

4.1 R-Reactor

Results of the previous activation analysis calculations for R-reactor are provided in Tables 2 - 5. These tables provide the results based on a silver content in stainless steel of 75 ppm. Table 6 contains the results of calculations that simulate the exposure of only silver at a concentration of 67.39 ppm in stainless steel. The modified results in which the contents based on 75 ppm silver in steel in Tables 2 - 5 have been adjusted by the activation products of 67.39 ppm silver in stainless steel presented in Table 6 to yield the content of the reactor system with an assumed initial silver content of 7.61 ppm in stainless steel are presented in Tables 7 - 10. The data in Tables 7 - 10 that are changed due to the reduction in the silver content are highlighted. Those data that are not highlighted are not affected by the reduction in

silver content. Table 6 shows the handful of activation products produced by the transmutation of silver. Several of those isotopes listed in Table 6 are shown to be very small probability activation products of silver exposure and are therefore not affected in Tables 7 - 10 by the reduction of silver content. That is to say, there are some activation products in Table 6 that are generated at higher rates from the exposure of other elements contained within stainless steel than from exposure of silver.

These tables contain the total curie content by radioisotope for each of the material regions specified in the reactor model. Table 2 contains the total curie content in the internal components and within the reactor tank, for an assumed concentration of 75 ppm silver in stainless steel. Table 7 contains the total curie content in the internal components and within the reactor tank, for an assumed concentration of 7.61 ppm silver in the stainless steel. These tables also contain curie content contained within the surface deposit layer on the internal tank surfaces and the total content summed over the entire system.

Table 2 Original Curie Contents for Reactor Tank, Aluminum Internals, Surface Deposits and Total System for R-Reactor System[†]

Isotope	Total Activity (Curies)				
	Tank	Internals	Tank Deposits	Internal Deposits	System Totals
h 3	6.04E-05	2.22E-04	4.49E-04	5.16E-01	5.17E-01
be 10	7.06E-07	3.75E-06	2.83E-11	2.71E-07	1.18E-05
c 14	6.53E+01	5.48E-03	7.69E-03	1.22E+00	8.99E+01
na 22	5.87E-24	6.89E-16	2.20E-25	7.73E-21	1.00E-09
si 32	1.89E-06	1.25E-05	3.58E-08	1.21E-04	1.36E-04
p 32	1.89E-06	1.25E-05	3.58E-08	1.21E-04	1.36E-04
cl 36	3.73E-05	6.24E-14	4.13E-01	3.56E+01	3.60E+01
ar 39	3.81E-10	1.99E-14	4.84E-03	4.45E-01	5.35E-01
ar 42	1.08E-13	2.65E-10	1.40E-10	9.99E-07	9.99E-07
k 40	—	—	5.85E-07	6.05E-05	2.59E-03
k 42	1.08E-13	2.65E-10	1.40E-10	9.99E-07	9.99E-07
ca 40	—	—	4.70E-03	6.78E-01	6.82E-01
ca 41	—	8.19E-18	—	—	1.61E-01
ca 45	5.00E-32	3.36E-30	2.96E-29	5.39E-27	6.43E-27
v 49	2.35E-18	4.21E-25	6.46E-24	4.36E-20	3.77E-18
v 50	7.92E-13	5.32E-21	2.06E-18	4.28E-16	5.19E-11
mn 54	2.41E-12	9.12E-14	2.08E-16	9.24E-14	6.60E-12
fe 55	2.91E+01	5.15E-01	3.24E-03	5.31E-01	5.45E+01
co 60	2.28E+03	1.04E+00	7.98E-04	1.61E+00	3.11E+03
ni 59	4.25E+02	2.33E-10	2.01E-02	1.19E+00	5.91E+02
ni 63	3.94E+04	3.05E+00	1.92E+00	1.95E+02	5.41E+04
zn 65	2.04E-18	7.21E-16	2.33E-19	3.77E-17	7.61E-16
se 79	2.05E-07	1.43E-16	—	7.41E-18	2.05E-07
kr 81	1.31E-17	—	—	—	1.31E-17
kr 85	8.50E-22	—	—	—	8.50E-22
sr 90	5.73E-08	—	—	—	5.87E-08
y 90	5.74E-08	—	—	—	5.87E-08
zr 93	1.06E-03	—	—	—	1.44E-03

[†] Original curie contents are taken from data tables in Reference 1.

Isotope	Total Activity (Curies)				
	Tank	Internals	Tank Deposits	Internal Deposits	System Totals
nb 91	1.43E-09	—	—	—	1.64E-09
nb 92	2.19E-07	—	—	—	5.16E-07
nb 93m	5.61E-01	—	—	—	1.07E+00
nb 94	1.92E+00	—	—	—	2.58E+00
mo 93	7.83E-01	—	—	—	1.50E+00
tc 97	1.32E-16	—	—	—	1.34E-16
tc 98	7.58E-10	—	—	—	8.32E-10
tc 99	1.38E-01	—	—	2.29E-20	2.66E-01
ru106	1.31E-25	—	1.68E-29	6.38E-24	6.52E-24
rh102	3.96E-33	—	1.34E-34	3.30E-31	3.35E-31
rh106	1.31E-25	—	1.68E-29	6.38E-24	6.52E-24
pd107	5.79E-09	—	1.93E-11	8.43E-09	1.71E-08
ag108	4.11E+00	—	2.05E-04	1.80E-01	5.83E+00
ag108m	4.73E+01	—	2.36E-03	2.07E+00	6.71E+01
ag109m	2.30E-09	—	4.62E-10	2.13E-08	2.44E-08
ag110	3.17E-18	—	1.27E-22	2.39E-20	4.48E-18
ag110m	2.33E-16	—	9.36E-21	1.76E-18	3.29E-16
cd109	2.30E-09	—	4.62E-10	2.13E-08	2.44E-08
cd113	3.20E-15	—	1.60E-15	3.08E-14	1.48E-09
cd113m	1.16E-01	—	5.83E-02	1.12E+00	2.36E+00
in115	1.46E-08	—	2.35E-12	7.29E-11	1.14E-06
sn119m	6.37E-14	—	3.59E-21	9.84E-17	8.31E-14
sn121	9.51E-02	—	1.43E-15	3.21E-09	1.27E-01
sn121m	1.23E-01	—	1.85E-15	4.13E-09	1.64E-01
sb125	1.26E-04	—	2.23E-28	1.08E-17	1.44E-04
te123	4.88E-11	—	—	1.83E-21	4.95E-11
te125m	3.09E-05	—	5.43E-29	2.63E-18	3.51E-05
i129	3.84E-18	—	—	—	3.84E-18
cs134	—	—	—	—	0.00E+00
tl204	4.11E-09	—	—	—	2.92E-08
tl206	8.42E-05	—	—	—	1.13E-04
pb205	1.16E-05	—	—	—	4.79E-05
bi208	1.72E-05	—	—	—	2.70E-05
bi210m	8.42E-05	—	—	—	1.13E-04
po210	2.11E-33	—	—	—	2.87E-33
total	4.22E+04	4.62E+00	2.44E+00	2.40E+02	5.81E+04

Table 3 Original Curie Contents for Regions 1V for R-Reactor System[†]

Isotope	Total Activity (Curies)				
	1h1v	2h1v	3h1v	4h1v	5h1v
h 3	5.29E-16	2.26E-15	4.60E-13	6.82E-09	1.33E-12
be 10	4.42E-17	3.22E-15	7.52E-12	5.93E-09	5.33E-11
c 14	2.89E-09	2.36E-08	1.19E-05	3.91E-02	3.22E-05
na 22	—	2.17E-15	4.77E-12	6.46E-10	2.62E-11
si 32	3.89E-26	1.24E-22	4.10E-17	6.96E-13	1.13E-15
p 32	3.89E-26	1.24E-22	4.10E-17	6.96E-13	1.13E-15
cl 36	9.86E-25	3.30E-10	2.19E-07	2.48E-05	5.48E-07
ar 39	—	1.86E-07	4.04E-04	5.59E-02	2.13E-03
ar 42	—	4.52E-23	1.61E-17	1.52E-13	3.03E-16
k 40	—	1.77E-04	6.85E-04	1.24E-03	4.06E-04
k 42	—	4.52E-23	1.61E-17	1.52E-13	3.03E-16
ca 41	—	1.31E-06	8.27E-04	1.05E-01	1.71E-03
ca 45	—	8.21E-33	5.17E-30	6.51E-28	1.06E-29
v 49	—	3.73E-27	1.04E-23	8.31E-21	8.54E-23
v 50	6.15E-14	5.24E-13	2.58E-12	2.74E-11	2.28E-12
mn 54	4.09E-27	1.60E-21	4.12E-18	6.58E-15	2.71E-17
fe 55	1.29E-09	2.12E-08	1.47E-05	1.94E-02	3.21E-05
co 60	1.07E-07	4.54E-07	1.10E-04	1.83E+00	3.37E-04
ni 59	2.03E-08	1.12E-07	3.83E-05	2.66E-01	1.06E-04
ni 63	1.79E-06	9.89E-06	3.35E-03	2.30E+01	9.27E-03
zn 65	—	—	4.59E-31	6.28E-26	4.25E-30
se 79	—	—	—	1.94E-23	—
sr 90	—	2.71E-26	4.18E-21	5.48E-15	1.27E-19
y 90	—	2.70E-26	4.19E-21	5.48E-15	1.27E-19
zr 93	4.91E-14	2.08E-13	5.70E-11	9.97E-07	1.87E-10
nb 91	—	2.04E-27	2.72E-21	4.05E-16	2.02E-19
nb 92	5.60E-19	1.30E-16	3.04E-13	6.05E-10	2.45E-12
nb 93m	3.14E-11	3.82E-10	6.33E-07	1.75E-03	2.24E-06
nb 94	9.54E-11	1.59E-09	1.84E-06	3.30E-03	5.94E-06
mo 93	4.39E-11	5.34E-10	8.85E-07	2.45E-03	3.14E-06
tc 98	—	1.29E-27	1.20E-21	2.49E-16	3.86E-20
tc 99	8.06E-12	9.71E-11	1.59E-07	4.41E-04	5.54E-07
pd107	1.11E-19	1.15E-18	8.20E-16	1.62E-11	5.72E-15
ag108	2.02E-10	8.53E-10	2.19E-07	3.78E-03	6.85E-07
ag108m	2.32E-09	9.81E-09	2.52E-06	4.34E-02	7.88E-06
ag109m	4.25E-20	1.75E-19	7.56E-17	1.59E-12	2.69E-16
ag110	1.92E-28	8.04E-28	3.00E-25	6.07E-21	1.03E-24
ag110m	1.41E-26	5.87E-26	2.21E-23	4.46E-19	7.60E-23
cd109	4.25E-20	1.75E-19	7.56E-17	1.59E-12	2.69E-16
cd113	3.32E-12	3.13E-12	4.19E-12	1.01E-09	3.93E-12
cd113m	3.53E-10	1.48E-09	4.55E-07	8.52E-03	1.50E-06
in115	1.91E-09	1.80E-09	2.41E-09	5.81E-07	2.26E-09
sn119m	3.62E-24	3.51E-23	5.52E-20	2.02E-16	1.95E-19

[†] Original curie contents are taken from data tables in Reference 1.

Isotope	Total Activity (Curies)				
	1h1v	2h1v	3h1v	4h1v	5h1v
sn121	4.77E-12	4.76E-11	4.91E-08	1.62E-04	1.62E-07
sn121m	6.14E-12	6.13E-11	6.32E-08	2.09E-04	2.09E-07
sb125	2.97E-15	2.90E-14	4.33E-11	1.57E-07	1.52E-10
te123	2.74E-30	4.87E-29	7.93E-24	1.52E-17	1.08E-22
te125m	7.26E-16	7.07E-15	1.06E-11	3.84E-08	3.72E-11
tl204	3.46E-20	7.25E-19	5.35E-16	1.01E-11	4.20E-15
tl206	4.04E-15	1.69E-14	5.61E-12	1.08E-07	1.90E-11
pb205	5.34E-16	2.27E-15	6.13E-13	1.08E-08	2.00E-12
bi208	—	2.98E-15	2.26E-12	4.09E-08	1.96E-11
bi210m	4.04E-15	1.69E-14	5.61E-12	1.08E-07	1.90E-11
total	1.92E-06	1.89E-04	5.44E-03	2.54E+01	1.40E-02

Table 4 Original Curie Contents for Regions 2V for R-Reactor System[†]

Isotope	Total Activity (Curies)				
	1h2v	2h2v	3h2v	4h2v	5h2v
h 3	3.03E-16	6.11E-16	6.82E-08	2.23E-06	1.52E-09
be 10	3.75E-17	1.22E-15	6.80E-08	6.52E-06	1.40E-09
c 14	1.67E-09	3.42E-09	3.72E-01	1.03E+01	8.33E-03
na 22	—	1.00E-16	3.04E-10	1.83E-23	1.92E-11
si 32	2.63E-26	8.18E-25	1.28E-10	2.89E-07	1.52E-13
p 32	2.63E-26	8.18E-25	1.28E-10	2.89E-07	1.53E-13
cl 36	1.57E-25	1.78E-12	1.51E-05	3.20E-07	5.54E-07
ar 39	—	8.06E-09	2.51E-02	2.05E-13	1.53E-03
ar 42	—	2.02E-25	3.68E-12	4.78E-15	2.21E-14
k 40	—	5.36E-06	1.30E-05	—	4.76E-06
k 42	—	2.02E-25	3.68E-12	4.78E-15	2.21E-14
ca 41	—	3.88E-09	5.20E-02	—	1.96E-03
ca 45	—	2.42E-35	3.27E-28	1.82E-32	1.23E-29
v 49	—	1.73E-27	5.40E-20	8.66E-19	2.04E-21
v 50	1.22E-13	1.59E-13	3.67E-12	2.41E-12	8.62E-13
mn 54	1.06E-26	1.76E-21	5.24E-14	3.51E-12	2.01E-15
fe 55	7.49E-10	1.51E-09	1.94E-01	1.85E+01	3.73E-03
co 60	8.14E-08	1.48E-07	1.39E+01	3.71E+02	3.06E-01
ni 59	1.16E-08	2.31E-08	2.62E+00	7.21E+01	5.81E-02
ni 63	1.00E-06	2.02E-06	2.31E+02	6.38E+03	5.11E+00
zn 65	—	—	2.07E-23	9.46E-20	3.47E-26
se 79	—	—	6.71E-18	5.06E-12	6.95E-23
sr 90	—	1.55E-26	1.74E-12	1.11E-09	6.15E-15
y 90	—	1.55E-26	1.74E-12	1.11E-09	6.15E-15
zr 93	4.40E-14	7.86E-14	6.49E-06	1.69E-04	1.43E-07
nb 91	—	3.71E-27	1.38E-13	2.00E-10	9.24E-16
nb 92	1.46E-18	1.54E-16	4.25E-09	2.52E-07	1.77E-10

[†] Original curie contents are taken from data tables in Reference 1.

Isotope	Total Activity (Curies)				
	1h2v	2h2v	3h2v	4h2v	5h2v
nb 93m	6.92E-11	1.07E-10	4.84E-03	4.26E-01	9.72E-05
nb 94	1.25E-10	2.00E-10	1.38E-02	3.06E-01	2.76E-04
mo 93	9.67E-11	1.50E-10	6.76E-03	5.96E-01	1.36E-04
tc 97	—	—	—	1.52E-18	—
tc 98	—	5.27E-28	3.30E-14	7.14E-11	1.03E-16
tc 99	1.76E-11	2.60E-11	1.21E-03	1.07E-01	2.35E-05
ru106	—	—	9.14E-33	1.37E-28	6.83E-36
rh106	—	—	—	1.43E-28	—
pd107	2.89E-19	3.38E-18	9.22E-11	1.77E-09	3.70E-12
ag108	1.68E-10	2.98E-10	2.63E-02	6.91E-01	5.76E-04
ag108m	1.93E-09	3.42E-09	3.02E-01	7.94E+00	6.62E-03
ag109m	7.03E-20	1.09E-19	5.89E-12	1.45E-10	1.24E-13
ag110	2.70E-28	4.24E-28	2.60E-20	6.03E-19	5.49E-22
ag110m	1.99E-26	3.12E-26	1.91E-18	4.43E-17	4.04E-20
cd109	7.03E-20	1.09E-19	5.89E-12	1.45E-10	1.24E-13
cd113	6.58E-12	8.59E-12	1.45E-10	2.05E-12	4.48E-11
cd113m	3.79E-10	6.35E-10	4.44E-02	3.11E-01	1.01E-03
in115	3.79E-09	4.94E-09	9.40E-08	7.27E-08	2.60E-08
sn119m	8.27E-24	1.24E-23	5.44E-16	1.01E-14	1.08E-17
sn121	6.64E-12	1.07E-11	6.74E-04	1.52E-02	1.40E-05
sn121m	8.55E-12	1.38E-11	8.69E-04	1.96E-02	1.80E-05
sb125	6.44E-15	9.71E-15	4.44E-07	9.08E-06	8.84E-09
te123	4.60E-30	8.00E-30	1.07E-15	5.50E-13	1.65E-18
te125m	1.57E-15	2.37E-15	1.08E-07	2.22E-06	2.16E-09
tl204	9.00E-20	2.59E-18	6.83E-11	2.43E-08	2.91E-12
tl206	4.80E-15	7.97E-15	5.43E-07	1.33E-05	1.17E-08
pb205	4.73E-16	8.83E-16	7.14E-08	3.41E-05	1.60E-09
bi208	—	1.25E-14	3.21E-07	6.24E-06	1.43E-08
bi210m	4.80E-15	7.97E-15	5.43E-07	1.33E-05	1.17E-08
po210	—	—	—	3.56E-34	—
total	1.10E-06	7.58E-06	2.49E+02	6.86E+03	5.50E+00

Table 5 Original Curie Contents for Regions 3V for R-Reactor System[†]

Isotope	Total Activity (Curies)			
	1h3v	2h3v	3h3v	5h3v
h 3	1.06E-14	1.44E-14	1.28E-06	1.16E-06
be 10	7.87E-16	6.23E-14	2.27E-07	2.10E-07
c 14	5.77E-08	8.09E-08	6.53E+00	6.10E+00
si 32	2.10E-25	4.19E-23	4.39E-09	1.89E-09
p 32	2.11E-25	4.19E-23	4.39E-09	1.89E-09
cl 36	1.96E-23	2.99E-23	1.04E-07	5.30E-08
ar 39	—	—	3.39E-14	9.42E-15

[†] Original curie contents are taken from data tables in Reference 1.

Isotope	Total Activity (Curies)			
	1h3v	2h3v	3h3v	5h3v
ar 42	—	1.68E-28	5.72E-16	1.33E-16
k 42	—	—	5.72E-16	1.33E-16
ca 45	—	—	1.03E-32	4.41E-33
v 49	—	9.72E-26	2.39E-19	2.11E-19
v 50	1.29E-12	1.38E-12	3.16E-12	5.16E-12
mn 54	7.48E-27	9.55E-20	2.31E-13	2.13E-13
fe 55	2.59E-08	3.55E-08	2.93E+00	2.73E+00
co 60	1.96E-06	4.36E-06	2.31E+02	2.12E+02
ni 59	4.11E-07	5.40E-07	4.65E+01	4.30E+01
ni 63	3.63E-05	4.63E-05	4.11E+03	3.80E+03
zn 65	—	—	5.45E-21	2.73E-21
se 79	—	—	3.42E-13	4.09E-14
sr 90	—	3.34E-24	1.43E-10	6.97E-11
y 90	—	3.34E-24	1.43E-10	6.97E-11
zr 93	8.42E-13	2.63E-12	1.03E-04	9.32E-05
nb 91	—	1.32E-24	3.52E-12	1.72E-12
nb 92	1.03E-18	8.49E-15	2.10E-08	1.90E-08
nb 93m	1.73E-10	5.09E-09	4.67E-02	3.19E-02
nb 94	1.28E-09	7.89E-09	1.80E-01	1.53E-01
mo 93	2.40E-10	7.11E-09	6.52E-02	4.44E-02
tc 97	—	—	7.51E-21	1.50E-21
tc 98	—	1.60E-25	1.67E-12	6.19E-13
tc 99	4.56E-11	1.22E-09	1.19E-02	8.11E-03
ru106	—	—	7.85E-30	1.73E-30
pd107	2.02E-19	1.82E-16	5.26E-10	4.40E-10
ag108	3.57E-09	9.34E-09	4.28E-01	3.90E-01
ag108m	4.10E-08	1.07E-07	4.92E+00	4.48E+00
ag109m	4.38E-19	4.71E-18	7.69E-11	6.01E-11
ag110	2.42E-27	1.72E-26	3.51E-19	2.96E-19
ag110m	1.78E-25	1.26E-24	2.58E-17	2.18E-17
cd109	4.38E-19	4.71E-18	7.69E-11	6.01E-11
cd113	6.81E-11	7.27E-11	1.96E-11	8.69E-11
cd113m	5.49E-09	2.30E-08	3.15E-01	3.85E-01
in115	3.92E-08	4.18E-08	9.24E-08	1.59E-07
sn119m	1.69E-23	5.86E-22	5.06E-15	3.42E-15
sn121	6.05E-11	4.36E-10	8.81E-03	7.42E-03
sn121m	7.79E-11	5.62E-10	1.14E-02	9.56E-03
sb125	1.71E-14	4.51E-13	4.50E-06	3.12E-06
te123	1.03E-29	1.85E-27	1.32E-13	4.67E-14
te125m	4.18E-15	1.10E-13	1.10E-06	7.63E-07

Isotope	Total Activity (Curies)			
	1h3v	2h3v	3h3v	5h3v
tl204	6.32E-20	1.41E-16	3.67E-10	3.25E-10
tl206	5.87E-14	3.05E-13	7.89E-06	6.85E-06
pb205	9.21E-15	3.01E-14	1.13E-06	1.02E-06
bi208	—	6.81E-13	1.64E-06	1.52E-06
bi210m	5.87E-14	3.05E-13	7.89E-06	6.85E-06
po210	—	—	1.87E-34	2.13E-34
total	3.88E-05	5.15E-05	4.40E+03	4.07E+03

Table 6 Results of the Activation of 67.39 mg of Silver in R-Reactor

Isotope	Vessel	1H1V	2H1V	3H1V	4H1V	5H1V	1H2V	2H2V	3H2V	4H2V	5H2V	1H3V	2H3V	3H3V	5H3V
	curies	curies	curies	curies	curies	curies	curies	curies	curies	curies	curies	curies	curies	curies	curies
h 3	1.72E-14				2.63E-26				5.98E-22	1.41E-17	1.58E-25			1.06E-18	2.68E-19
ru106	1.18E-25								8.20E-33	1.23E-28	6.83E-36			7.05E-30	1.55E-30
rh106	1.18E-25									1.43E-28					
pd107	5.18E-09	9.96E-20	1.03E-18	7.34E-16	1.45E-11	5.11E-15	2.59E-19	3.01E-18	8.24E-11	1.58E-09	3.30E-12	1.82E-19	1.62E-16	4.70E-10	3.93E-10
ag108	3.70E+00	1.81E-10	7.67E-10	1.97E-07	3.39E-03	6.15E-07	1.51E-10	2.67E-10	2.36E-02	6.21E-01	5.17E-04	3.20E-09	8.39E-09	3.85E-01	3.50E-01
ag108m	4.25E+01	2.08E-09	8.81E-09	2.26E-06	3.90E-02	7.07E-06	1.74E-09	3.07E-09	2.71E-01	7.13E+00	5.95E-03	3.68E-08	9.64E-08	4.42E+00	4.03E+00
ag109m	1.47E-09	5.59E-29	1.03E-27	8.56E-23	1.29E-16	1.01E-21	3.87E-29	8.15E-29	2.05E-14	1.49E-11	3.41E-17	4.96E-28	1.31E-26	4.14E-12	1.77E-12
ag110	2.85E-18	1.73E-28	7.18E-28	2.70E-25	5.45E-21	9.28E-25	2.42E-28	3.80E-28	2.33E-20	5.41E-19	4.93E-22	2.18E-27	1.54E-26	3.16E-19	2.66E-19
ag110m	2.09E-16	1.27E-26	5.28E-26	1.98E-23	4.01E-19	6.82E-23	1.78E-26	2.80E-26	1.72E-18	3.98E-17	3.63E-20	1.60E-25	1.13E-24	2.32E-17	1.95E-17
cd109	1.47E-09	5.60E-29	1.04E-27	8.56E-23	1.29E-16	1.01E-21	3.90E-29	8.21E-29	2.05E-14	1.49E-11	3.41E-17	4.99E-28	1.31E-26	4.14E-12	1.77E-12
cd113	1.37E-19									3.70E-23				3.32E-24	4.70E-25
cd113m	4.99E-06			1.49E-30	1.24E-20	2.05E-28			2.99E-15	1.30E-09	3.15E-20			1.15E-10	1.62E-11
in115	2.29E-20														
sn119m	5.71E-34														
total	4.62E+01	2.26E-09	9.58E-09	2.46E-06	4.24E-02	7.69E-06	1.89E-09	3.34E-09	2.95E-01	7.75E+00	6.46E-03	4.00E-08	1.05E-07	4.80E+00	4.38E+00

Table 7 Modified Curie Contents for Reactor Tank, Aluminum Internals, Surface Deposits and Total System for R-Reactor System

Isotope	Total Activity (Curies)				
	Tank	Internals	Tank Deposits	Internal Deposits	System Totals
h 3	6.04E-05	2.22E-04	4.49E-04	5.16E-01	5.17E-01
be 10	7.06E-07	3.75E-06	2.83E-11	2.71E-07	1.18E-05
c 14	6.53E+01	5.48E-03	7.69E-03	1.22E+00	8.99E+01
na 22	5.87E-24	6.89E-16	2.20E-25	7.73E-21	1.00E-09
si 32	1.89E-06	1.25E-05	3.58E-08	1.21E-04	1.36E-04
p 32	1.89E-06	1.25E-05	3.58E-08	1.21E-04	1.36E-04
cl 36	3.73E-05	6.24E-14	4.13E-01	3.56E+01	3.60E+01
ar 39	3.81E-10	1.99E-14	4.84E-03	4.45E-01	5.35E-01
ar 42	1.08E-13	2.65E-10	1.40E-10	9.99E-07	9.99E-07
k 40	—	—	5.85E-07	6.05E-05	2.59E-03
k 42	1.08E-13	2.65E-10	1.40E-10	9.99E-07	9.99E-07
ca 40	—	—	4.70E-03	6.78E-01	6.82E-01
ca 41	—	8.19E-18	—	—	1.61E-01
ca 45	5.00E-32	3.36E-30	2.96E-29	5.39E-27	6.43E-27
v 49	2.35E-18	4.21E-25	6.46E-24	4.36E-20	3.77E-18
v 50	7.92E-13	5.32E-21	2.06E-18	4.28E-16	5.19E-11
mn 54	2.41E-12	9.12E-14	2.08E-16	9.24E-14	6.60E-12
fe 55	2.91E+01	5.15E-01	3.24E-03	5.31E-01	5.45E+01
co 60	2.28E+03	1.04E+00	7.98E-04	1.61E+00	3.11E+03
ni 59	4.25E+02	2.33E-10	2.01E-02	1.19E+00	5.91E+02
ni 63	3.94E+04	3.05E+00	1.92E+00	1.95E+02	5.41E+04
zn 65	2.04E-18	7.21E-16	2.33E-19	3.77E-17	7.61E-16
se 79	2.05E-07	1.43E-16	—	7.41E-18	2.05E-07
kr 81	1.31E-17	—	—	—	1.31E-17
kr 85	8.50E-22	—	—	—	8.50E-22
sr 90	5.73E-08	—	—	—	5.87E-08
y 90	5.74E-08	—	—	—	5.87E-08
zr 93	1.06E-03	—	—	—	1.44E-03
nb 91	1.43E-09	—	—	—	1.64E-09
nb 92	2.19E-07	—	—	—	5.16E-07
nb 93m	5.61E-01	—	—	—	1.07E+00
nb 94	1.92E+00	—	—	—	2.58E+00
mo 93	7.83E-01	—	—	—	1.50E+00
tc 97	1.32E-16	—	—	—	1.34E-16
tc 98	7.58E-10	—	—	—	8.32E-10
tc 99	1.38E-01	—	—	2.29E-20	2.66E-01
ru106	1.33E-26	—	1.68E-29	6.38E-24	6.40E-24
rh102	3.96E-33	—	1.34E-34	3.30E-31	3.35E-31
rh106	1.33E-26	—	1.68E-29	6.38E-24	6.40E-24
pd107	6.14E-10	—	1.93E-11	8.43E-09	9.37E-09
ag108	4.18E-01	—	2.05E-04	1.80E-01	7.55E-01
ag108m	4.80E+00	—	2.36E-03	2.07E+00	8.67E+00

Isotope	Total Activity (Curies)				
	Tank	Internals	Tank Deposits	Internal Deposits	System Totals
ag109m	8.30E-10	—	4.62E-10	2.13E-08	2.29E-08
ag110	3.22E-19	—	1.27E-22	2.39E-20	4.76E-19
ag110m	2.37E-17	—	9.36E-21	1.76E-18	3.50E-17
cd109	8.30E-10	—	4.62E-10	2.13E-08	2.29E-08
cd113	3.20E-15	—	1.60E-15	3.08E-14	1.48E-09
cd113m	1.16E-01	—	5.83E-02	1.12E+00	2.36E+00
in115	1.46E-08	—	2.35E-12	7.29E-11	1.14E-06
sn119m	6.37E-14	—	3.59E-21	9.84E-17	8.31E-14
sn121	9.51E-02	—	1.43E-15	3.21E-09	1.27E-01
sn121m	1.23E-01	—	1.85E-15	4.13E-09	1.64E-01
sb125	1.26E-04	—	2.23E-28	1.08E-17	1.44E-04
te123	4.88E-11	—	—	1.83E-21	4.95E-11
te125m	3.09E-05	—	5.43E-29	2.63E-18	3.51E-05
i129	3.84E-18	—	—	—	3.84E-18
cs134	—	—	—	—	0.00E+00
tl204	4.11E-09	—	—	—	2.92E-08
tl206	8.42E-05	—	—	—	1.13E-04
pb205	1.16E-05	—	—	—	4.79E-05
bi208	1.72E-05	—	—	—	2.70E-05
bi210m	8.42E-05	—	—	—	1.13E-04
po210	2.11E-33	—	—	—	2.87E-33
total	4.22E+04	4.62E+00	2.44E+00	2.40E+02	5.80E+04

Table 8 Modified Curie Contents for Regions 1V for R-Reactor System

Isotope	Total Activity (Curies)				
	1h1v	2h1v	3h1v	4h1v	5h1v
h 3	5.29E-16	2.26E-15	4.60E-13	6.82E-09	1.33E-12
be 10	4.42E-17	3.22E-15	7.52E-12	5.93E-09	5.33E-11
c 14	2.89E-09	2.36E-08	1.19E-05	3.91E-02	3.22E-05
na 22	—	2.17E-15	4.77E-12	6.46E-10	2.62E-11
si 32	3.89E-26	1.24E-22	4.10E-17	6.96E-13	1.13E-15
p 32	3.89E-26	1.24E-22	4.10E-17	6.96E-13	1.13E-15
cl 36	9.86E-25	3.30E-10	2.19E-07	2.48E-05	5.48E-07
ar 39	—	1.86E-07	4.04E-04	5.59E-02	2.13E-03
ar 42	—	4.52E-23	1.61E-17	1.52E-13	3.03E-16
k 40	—	1.77E-04	6.85E-04	1.24E-03	4.06E-04
k 42	—	4.52E-23	1.61E-17	1.52E-13	3.03E-16
ca 41	—	1.31E-06	8.27E-04	1.05E-01	1.71E-03
ca 45	—	8.21E-33	5.17E-30	6.51E-28	1.06E-29
v 49	—	3.73E-27	1.04E-23	8.31E-21	8.54E-23
v 50	6.15E-14	5.24E-13	2.58E-12	2.74E-11	2.28E-12
mn 54	4.09E-27	1.60E-21	4.12E-18	6.58E-15	2.71E-17
fe 55	1.29E-09	2.12E-08	1.47E-05	1.94E-02	3.21E-05
co 60	1.07E-07	4.54E-07	1.10E-04	1.83E+00	3.37E-04

Isotope	Total Activity (Curies)				
	1h1v	2h1v	3h1v	4h1v	5h1v
ni 59	2.03E-08	1.12E-07	3.83E-05	2.66E-01	1.06E-04
ni 63	1.79E-06	9.89E-06	3.35E-03	2.30E+01	9.27E-03
zn 65	—	—	4.59E-31	6.28E-26	4.25E-30
se 79	—	—	—	1.94E-23	—
sr 90	—	2.71E-26	4.18E-21	5.48E-15	1.27E-19
y 90	—	2.70E-26	4.19E-21	5.48E-15	1.27E-19
zr 93	4.91E-14	2.08E-13	5.70E-11	9.97E-07	1.87E-10
nb 91	—	2.04E-27	2.72E-21	4.05E-16	2.02E-19
nb 92	5.60E-19	1.30E-16	3.04E-13	6.05E-10	2.45E-12
nb 93m	3.14E-11	3.82E-10	6.33E-07	1.75E-03	2.24E-06
nb 94	9.54E-11	1.59E-09	1.84E-06	3.30E-03	5.94E-06
mo 93	4.39E-11	5.34E-10	8.85E-07	2.45E-03	3.14E-06
tc 98	—	1.29E-27	1.20E-21	2.49E-16	3.86E-20
tc 99	8.06E-12	9.71E-11	1.59E-07	4.41E-04	5.54E-07
pd107	1.12E-20	1.21E-19	8.67E-17	1.70E-12	6.14E-16
ag108	2.04E-11	8.65E-11	2.22E-08	3.83E-04	6.99E-08
ag108m	2.35E-10	9.95E-10	2.55E-07	4.40E-03	8.04E-07
ag109m	4.25E-20	1.75E-19	7.56E-17	1.59E-12	2.69E-16
ag110	1.97E-29	8.61E-29	3.04E-26	6.16E-22	1.05E-25
ag110m	1.43E-27	5.95E-27	2.24E-24	4.53E-20	7.75E-24
cd109	4.25E-20	1.75E-19	7.56E-17	1.59E-12	2.69E-16
cd113	3.32E-12	3.13E-12	4.19E-12	1.01E-09	3.93E-12
cd113m	3.53E-10	1.48E-09	4.55E-07	8.52E-03	1.50E-06
in115	1.91E-09	1.80E-09	2.41E-09	5.81E-07	2.26E-09
sn119m	3.62E-24	3.51E-23	5.52E-20	2.02E-16	1.95E-19
sn121	4.77E-12	4.76E-11	4.91E-08	1.62E-04	1.62E-07
sn121m	6.14E-12	6.13E-11	6.32E-08	2.09E-04	2.09E-07
sb125	2.97E-15	2.90E-14	4.33E-11	1.57E-07	1.52E-10
te123	2.74E-30	4.87E-29	7.93E-24	1.52E-17	1.08E-22
te125m	7.26E-16	7.07E-15	1.06E-11	3.84E-08	3.72E-11
tl204	3.46E-20	7.25E-19	5.35E-16	1.01E-11	4.20E-15
tl206	4.04E-15	1.69E-14	5.61E-12	1.08E-07	1.90E-11
pb205	5.34E-16	2.27E-15	6.13E-13	1.08E-08	2.00E-12
bi208	—	2.98E-15	2.26E-12	4.09E-08	1.96E-11
bi210m	4.04E-15	1.69E-14	5.61E-12	1.08E-07	1.90E-11
total	1.92E-06	1.89E-04	5.44E-03	2.54E+01	1.40E-02

Table 9 Modified Curie Contents for Regions 2V for R-Reactor System

Isotope	Total Activity (Curies)				
	1h2v	2h2v	3h2v	4h2v	5h2v
h 3	3.03E-16	6.11E-16	6.82E-08	2.23E-06	1.52E-09
be 10	3.75E-17	1.22E-15	6.80E-08	6.52E-06	1.40E-09
c 14	1.67E-09	3.42E-09	3.72E-01	1.03E+01	8.33E-03
na 22	—	1.00E-16	3.04E-10	1.83E-23	1.92E-11

Isotope	Total Activity (Curies)				
	1h2v	2h2v	3h2v	4h2v	5h2v
si 32	2.63E-26	8.18E-25	1.28E-10	2.89E-07	1.52E-13
p 32	2.63E-26	8.18E-25	1.28E-10	2.89E-07	1.53E-13
cl 36	1.57E-25	1.78E-12	1.51E-05	3.20E-07	5.54E-07
ar 39	—	8.06E-09	2.51E-02	2.05E-13	1.53E-03
ar 42	—	2.02E-25	3.68E-12	4.78E-15	2.21E-14
k 40	—	5.36E-06	1.30E-05	—	4.76E-06
k 42	—	2.02E-25	3.68E-12	4.78E-15	2.21E-14
ca 41	—	3.88E-09	5.20E-02	—	1.96E-03
ca 45	—	2.42E-35	3.27E-28	1.82E-32	1.23E-29
v 49	—	1.73E-27	5.40E-20	8.66E-19	2.04E-21
v 50	1.22E-13	1.59E-13	3.67E-12	2.41E-12	8.62E-13
mn 54	1.06E-26	1.76E-21	5.24E-14	3.51E-12	2.01E-15
fe 55	7.49E-10	1.51E-09	1.94E-01	1.85E+01	3.73E-03
co 60	8.14E-08	1.48E-07	1.39E+01	3.71E+02	3.06E-01
ni 59	1.16E-08	2.31E-08	2.62E+00	7.21E+01	5.81E-02
ni 63	1.00E-06	2.02E-06	2.31E+02	6.38E+03	5.11E+00
zn 65	—	—	2.07E-23	9.46E-20	3.47E-26
se 79	—	—	6.71E-18	5.06E-12	6.95E-23
sr 90	—	1.55E-26	1.74E-12	1.11E-09	6.15E-15
y 90	—	1.55E-26	1.74E-12	1.11E-09	6.15E-15
zr 93	4.40E-14	7.86E-14	6.49E-06	1.69E-04	1.43E-07
nb 91	—	3.71E-27	1.38E-13	2.00E-10	9.24E-16
nb 92	1.46E-18	1.54E-16	4.25E-09	2.52E-07	1.77E-10
nb 93m	6.92E-11	1.07E-10	4.84E-03	4.26E-01	9.72E-05
nb 94	1.25E-10	2.00E-10	1.38E-02	3.06E-01	2.76E-04
mo 93	9.67E-11	1.50E-10	6.76E-03	5.96E-01	1.36E-04
tc 97	—	—	—	1.52E-18	—
tc 98	—	5.27E-28	3.30E-14	7.14E-11	1.03E-16
tc 99	1.76E-11	2.60E-11	1.21E-03	1.07E-01	2.35E-05
ru106	—	—	9.41E-34	1.39E-29	0.00E+00
rh106	—	—	—	0.00E+00	—
pd107	2.93E-20	3.62E-19	9.85E-12	1.89E-10	3.97E-13
ag108	1.71E-11	3.02E-11	2.67E-03	7.02E-02	5.85E-05
ag108m	1.96E-10	3.47E-10	3.07E-02	8.07E-01	6.72E-04
ag109m	7.03E-20	1.09E-19	5.87E-12	1.30E-10	1.23E-13
ag110	2.81E-29	4.37E-29	2.63E-21	6.12E-20	5.58E-23
ag110m	2.01E-27	3.16E-27	1.94E-19	4.50E-18	4.10E-21
cd109	7.03E-20	1.09E-19	5.87E-12	1.30E-10	1.23E-13
cd113	6.58E-12	8.59E-12	1.45E-10	2.05E-12	4.48E-11
cd113m	3.79E-10	6.35E-10	4.44E-02	3.11E-01	1.01E-03
in115	3.79E-09	4.94E-09	9.40E-08	7.27E-08	2.60E-08
sn119m	8.27E-24	1.24E-23	5.44E-16	1.01E-14	1.08E-17
sn121	6.64E-12	1.07E-11	6.74E-04	1.52E-02	1.40E-05
sn121m	8.55E-12	1.38E-11	8.69E-04	1.96E-02	1.80E-05
sb125	6.44E-15	9.71E-15	4.44E-07	9.08E-06	8.84E-09
te123	4.60E-30	8.00E-30	1.07E-15	5.50E-13	1.65E-18

Isotope	Total Activity (Curies)				
	1h2v	2h2v	3h2v	4h2v	5h2v
te125m	1.57E-15	2.37E-15	1.08E-07	2.22E-06	2.16E-09
tl204	9.00E-20	2.59E-18	6.83E-11	2.43E-08	2.91E-12
tl206	4.80E-15	7.97E-15	5.43E-07	1.33E-05	1.17E-08
pb205	4.73E-16	8.83E-16	7.14E-08	3.41E-05	1.60E-09
bi208	—	1.25E-14	3.21E-07	6.24E-06	1.43E-08
bi210m	4.80E-15	7.97E-15	5.43E-07	1.33E-05	1.17E-08
po210	—	—	—	3.56E-34	—
total	1.10E-06	7.57E-06	2.48E+02	6.85E+03	5.50E+00

Table 10 Modified Curie Contents for Regions 3V for R-Reactor System

Isotope	Total Activity (Curies)			
	1h3v	2h3v	3h3v	5h3v
h 3	1.06E-14	1.44E-14	1.28E-06	1.16E-06
be 10	7.87E-16	6.23E-14	2.27E-07	2.10E-07
c 14	5.77E-08	8.09E-08	6.53E+00	6.10E+00
si 32	2.10E-25	4.19E-23	4.39E-09	1.89E-09
p 32	2.11E-25	4.19E-23	4.39E-09	1.89E-09
cl 36	1.96E-23	2.99E-23	1.04E-07	5.30E-08
ar 39	—	—	3.39E-14	9.42E-15
ar 42	—	1.68E-28	5.72E-16	1.33E-16
k 42	—	—	5.72E-16	1.33E-16
ca 45	—	—	1.03E-32	4.41E-33
v 49	—	9.72E-26	2.39E-19	2.11E-19
v 50	1.29E-12	1.38E-12	3.16E-12	5.16E-12
mn 54	7.48E-27	9.55E-20	2.31E-13	2.13E-13
fe 55	2.59E-08	3.55E-08	2.93E+00	2.73E+00
co 60	1.96E-06	4.36E-06	2.31E+02	2.12E+02
ni 59	4.11E-07	5.40E-07	4.65E+01	4.30E+01
ni 63	3.63E-05	4.63E-05	4.11E+03	3.80E+03
zn 65	—	—	5.45E-21	2.73E-21
se 79	—	—	3.42E-13	4.09E-14
sr 90	—	3.34E-24	1.43E-10	6.97E-11
y 90	—	3.34E-24	1.43E-10	6.97E-11
zr 93	8.42E-13	2.63E-12	1.03E-04	9.32E-05
nb 91	—	1.32E-24	3.52E-12	1.72E-12
nb 92	1.03E-18	8.49E-15	2.10E-08	1.90E-08
nb 93m	1.73E-10	5.09E-09	4.67E-02	3.19E-02
nb 94	1.28E-09	7.89E-09	1.80E-01	1.53E-01
mo 93	2.40E-10	7.11E-09	6.52E-02	4.44E-02
tc 97	—	—	7.51E-21	1.50E-21
tc 98	—	1.60E-25	1.67E-12	6.19E-13
tc 99	4.56E-11	1.22E-09	1.19E-02	8.11E-03
ru106	—	—	7.98E-31	1.76E-31
pd107	2.05E-20	1.95E-17	5.59E-11	4.70E-11

Isotope	Total Activity (Curies)			
	1h3v	2h3v	3h3v	5h3v
ag108	3.62E-10	9.46E-10	4.35E-02	3.96E-02
ag108m	4.16E-09	1.09E-08	5.00E-01	4.55E-01
ag109m	4.38E-19	4.71E-18	7.28E-11	5.83E-11
ag110	2.41E-28	1.75E-27	3.57E-20	3.00E-20
ag110m	1.81E-26	1.28E-25	2.62E-18	2.21E-18
cd109	4.38E-19	4.71E-18	7.28E-11	5.83E-11
cd113	6.81E-11	7.27E-11	1.96E-11	8.69E-11
cd113m	5.49E-09	2.30E-08	3.15E-01	3.85E-01
in115	3.92E-08	4.18E-08	9.24E-08	1.59E-07
sn119m	1.69E-23	5.86E-22	5.06E-15	3.42E-15
sn121	6.05E-11	4.36E-10	8.81E-03	7.42E-03
sn121m	7.79E-11	5.62E-10	1.14E-02	9.56E-03
sb125	1.71E-14	4.51E-13	4.50E-06	3.12E-06
te123	1.03E-29	1.85E-27	1.32E-13	4.67E-14
te125m	4.18E-15	1.10E-13	1.10E-06	7.63E-07
tl204	6.32E-20	1.41E-16	3.67E-10	3.25E-10
tl206	5.87E-14	3.05E-13	7.89E-06	6.85E-06
pb205	9.21E-15	3.01E-14	1.13E-06	1.02E-06
bi208	—	6.81E-13	1.64E-06	1.52E-06
bi210m	5.87E-14	3.05E-13	7.89E-06	6.85E-06
po210	—	—	1.87E-34	2.13E-34
total	3.88E-05	5.14E-05	4.40E+03	4.06E+03

4.2 P-Reactor

Results of the previous activation analysis calculations for P-reactor are provided in Tables 11 - 14. These tables provide the results based on a silver content in stainless steel of 75 ppm. Table 15 contains the results of calculations that simulate the exposure of only silver at a concentration of 67.39 ppm in stainless steel. The modified results in which the contents based on 75 ppm silver in steel in Tables 11 - 14 have been adjusted by the activation products of 67.39 ppm silver in stainless steel presented in Table 15 to yield the content of the reactor system with an assumed initial silver content of 7.61 ppm in stainless steel are presented in Tables 16 - 19. The data in that are changed due to the reduction in the silver content are highlighted in Tables 16 - 19. Those data that are not highlighted are not affected by the reduction in silver content. Table 15 shows the handful of activation products produced by the transmutation of silver. Several of those isotopes listed in Table 15 are shown to be very small probability activation products of silver exposure and are therefore not affected in Tables 16 - 19 by the reduction of silver content. That is to say, there are some activation products in Table 6 that are generated at higher rates from the exposure of other elements contained within stainless steel than from exposure of silver.

These tables contain the total curie content by radioisotope for each of the material regions specified in the reactor model. Table 11 contains the total curie content in the internal aluminum components and the reactor tank, for an assumed concentration of 75 ppm silver in stainless steel. Table 16 contains the total curie content in the internal aluminum components and the reactor tank, for an assumed concentration of 7.61 ppm silver in stainless steel. These tables also contain curie content contained within the surface deposit layer on the internal tank surfaces and the total content summed over the entire system.

Table 11 Original Curie Contents for Reactor Tank, Aluminum Internals, Surface Deposits and Total System for P-Reactor System[†]

Isotope	Total Activity (Curies)				
	Tank	Internals	Tank Deposits	Internals Deposits	System Totals
h 3	1.12E-03	2.54E-04	1.00E-02	7.49E-01	7.61E-01
be 10	1.15E-06	2.20E-06	1.77E-10	9.89E-08	1.91E-05
c 14	1.75E+02	3.23E-03	2.09E-02	7.39E-01	2.37E+02
na 22	9.05E-21	2.50E-13	5.22E-22	1.57E-18	1.17E-07
si 32	4.30E-06	4.91E-06	8.66E-08	4.90E-05	5.90E-05
p 32	4.30E-06	4.91E-06	8.66E-08	4.90E-05	5.90E-05
s 35	8.48E-24	3.61E-33	1.26E-24	3.48E-22	3.60E-22
cl 36	2.72E-04	3.13E-15	1.00E+00	2.74E+01	2.84E+01
ar 39	6.33E-09	7.00E-15	7.76E-03	3.54E-01	5.57E-01
ar 42	2.59E-13	1.42E-10	3.95E-10	4.66E-07	4.66E-07
k 40	6.49E-20	—	1.45E-06	4.30E-05	2.58E-03
k 42	2.59E-13	1.42E-10	3.95E-10	4.66E-07	4.66E-07
ca 40	—	—	1.27E-02	—	1.27E-02
ca 41	—	1.75E-18	—	4.19E-01	8.16E-01
ca 45	8.95E-17	1.72E-14	1.12E-13	2.74E-11	3.01E-11
sc 46	7.01E-28	1.44E-25	7.41E-27	3.36E-24	3.51E-24
v 49	2.11E-11	4.54E-18	2.12E-16	8.99E-13	3.69E-11
v 50	7.47E-13	2.09E-21	4.54E-18	3.38E-16	5.18E-11
mn 54	9.94E-05	1.06E-05	1.14E-08	1.10E-05	2.77E-04
fe 55	5.37E+03	1.16E+02	6.13E-01	1.23E+02	9.14E+03
co 58	9.23E-28	6.63E-35	4.51E-32	1.91E-29	1.57E-27
co 60	3.09E+04	7.96E+00	5.15E-02	1.22E+01	4.23E+04
ni 59	1.01E+03	6.71E-11	4.46E-02	1.05E+00	1.43E+03
ni 63	1.07E+05	2.42E+00	5.12E+00	1.65E+02	1.47E+05
zn 65	1.15E-07	2.03E-05	4.58E-09	1.08E-06	2.15E-05
se 79	9.05E-06	1.43E-18	4.06E-24	9.24E-20	9.05E-06
kr 81	1.74E-14	—	—	—	1.74E-14
kr 85	4.03E-17	—	—	—	4.03E-17
sr 90	3.86E-07	—	—	—	3.96E-07
y 90	3.87E-07	—	—	—	3.96E-07
zr 93	2.82E-03	—	—	—	3.78E-03
zr 95	1.14E-32	—	—	—	1.49E-32
nb 91	7.52E-09	—	—	—	8.57E-09
nb 92	4.98E-07	—	—	—	1.17E-06
nb 93m	1.29E+00	—	—	—	2.43E+00
nb 94	4.90E+00	—	—	—	6.57E+00
nb 95	2.51E-32	—	—	—	3.30E-32
mo 93	1.93E+00	—	—	—	3.63E+00
tc 97	1.53E-15	—	—	—	1.54E-15

[†] Original curie contents are taken from data tables in Reference 1.

Isotope	Total Activity (Curies)				
	Tank	Internals	Tank Deposits	Internals Deposits	System Totals
tc 98	3.94E-09	—	—	—	4.32E-09
tc 99	3.34E-01	—	1.48E-24	7.42E-21	6.37E-01
ru106	2.79E-19	—	1.53E-22	7.91E-18	8.18E-18
rh102	6.54E-20	—	2.51E-22	7.31E-19	7.96E-19
rh106	2.79E-19	—	1.53E-22	7.91E-18	8.18E-18
pd107	1.30E-08	—	4.97E-11	4.85E-09	2.46E-08
ag108	1.03E+01	—	1.43E-03	9.91E-02	1.45E+01
ag108m	1.18E+02	—	1.64E-02	1.14E+00	1.67E+02
ag109m	8.71E-04	—	8.36E-05	8.80E-03	9.80E-03
ag110	2.08E-08	—	3.90E-12	5.49E-10	3.24E-08
ag110m	1.53E-06	—	2.87E-10	4.04E-08	2.38E-06
cd109	8.71E-04	—	8.36E-05	8.80E-03	9.80E-03
cd113	3.05E-15	—	1.59E-15	2.90E-14	1.37E-09
cd113m	3.58E-01	—	1.89E-01	3.46E+00	6.80E+00
in113m	4.45E-18	—	9.51E-29	5.23E-26	5.79E-18
in115	6.07E-09	—	3.56E-12	7.01E-11	1.12E-06
sn113	4.45E-18	—	9.50E-29	5.23E-26	5.78E-18
sn119m	1.38E-05	—	8.48E-12	1.53E-08	1.78E-05
sn121	2.68E-01	—	2.44E-13	3.53E-10	3.59E-01
sn121m	3.46E-01	—	3.15E-13	4.55E-10	4.62E-01
sn123	2.37E-18	—	7.67E-36	4.45E-31	3.16E-18
sb124	1.40E-32	—	—	—	1.86E-32
sb125	1.21E-02	—	7.24E-24	3.12E-17	1.43E-02
te123	2.05E-10	—	—	—	2.10E-10
te123m	9.81E-17	—	1.71E-32	7.86E-28	9.91E-17
te125m	2.94E-03	—	1.77E-24	7.62E-18	3.50E-03
te127	3.80E-24	—	—	—	3.80E-24
te127m	3.88E-24	—	—	4.82E-37	3.88E-24
i129	4.23E-16	—	—	—	4.23E-16
cs134	1.35E-21	—	—	—	1.35E-21
tl204	1.15E-07	—	—	—	6.26E-07
tl206	2.21E-04	—	—	—	2.95E-04
pb205	3.06E-05	—	—	—	1.20E-04
bi208	3.91E-05	—	—	—	6.17E-05
bi210m	2.21E-04	—	—	—	2.95E-04
po210	6.45E-15	—	—	—	8.48E-15
total	1.44E+05	1.27E+02	7.09E+00	3.36E+02	2.00E+05

Table 12 Original Curie Contents for Regions 1V for P-Reactor System[†]

Isotope	Total Activity (Curies)				
	1h1v	2h1v	3h1v	4h1v	5h1v
h 3	1.43E-15	9.85E-15	1.64E-12	2.87E-08	2.73E-12
be 10	9.06E-17	6.31E-15	1.81E-11	1.37E-08	8.90E-11
c 14	5.80E-09	6.08E-08	2.77E-05	9.87E-02	5.51E-05
na 22	—	1.71E-13	7.09E-10	8.42E-08	1.00E-10
si 32	7.82E-26	2.80E-22	8.86E-17	1.50E-12	2.10E-15
p 32	7.83E-26	2.80E-22	8.86E-17	1.50E-12	2.10E-15
s 35	6.62E-35	1.60E-30	6.73E-28	1.65E-25	2.08E-28
cl 36	4.13E-24	8.38E-10	5.11E-07	6.17E-05	9.30E-07
ar 39	—	3.74E-07	9.85E-04	1.31E-01	3.58E-03
ar 42	—	1.01E-22	3.98E-17	3.78E-13	6.24E-16
k 40	8.23E-32	1.77E-04	6.85E-04	1.24E-03	4.06E-04
k 42	—	1.01E-22	3.98E-17	3.78E-13	6.24E-16
ca 41	—	3.37E-06	1.92E-03	2.64E-01	2.93E-03
ca 45	—	2.43E-17	8.97E-15	1.77E-12	2.31E-15
sc 46	—	—	1.16E-32	6.12E-30	1.52E-34
v 49	—	2.29E-20	1.19E-16	8.33E-14	8.43E-21
v 50	6.15E-14	5.24E-13	2.58E-12	2.74E-11	2.28E-12
mn 54	1.35E-19	4.27E-14	2.06E-10	2.88E-07	6.71E-15
fe 55	5.05E-08	3.22E-06	1.37E-03	2.71E+00	4.56E-04
co 58	—	—	2.49E-34	2.51E-30	—
co 60	6.01E-07	5.85E-06	1.01E-03	2.06E+01	1.03E-03
ni 59	4.08E-08	2.90E-07	8.90E-05	6.72E-01	1.83E-04
ni 63	3.70E-06	2.69E-05	8.11E-03	6.13E+01	1.62E-02
zn 65	5.02E-28	1.61E-25	1.11E-20	2.21E-15	9.17E-21
se 79	—	—	—	6.38E-22	—
sr 90	—	1.28E-25	3.03E-20	3.69E-14	3.76E-19
y 90	—	1.28E-25	3.03E-20	3.69E-14	3.76E-19
zr 93	1.01E-13	5.39E-13	1.33E-10	2.42E-06	3.20E-10
nb 91	—	7.63E-27	1.58E-20	2.16E-15	5.64E-19
nb 92	1.30E-18	2.54E-16	7.30E-13	1.39E-09	4.09E-12
nb 93m	6.77E-11	9.39E-10	1.40E-06	3.85E-03	3.77E-06
nb 94	2.03E-10	4.13E-09	4.29E-06	7.83E-03	1.02E-05
mo 93	9.96E-11	1.40E-09	2.07E-06	5.70E-03	5.38E-06
tc 98	—	5.12E-27	6.88E-21	1.32E-15	1.08E-19
tc 99	1.82E-11	2.55E-10	3.72E-07	1.02E-03	9.51E-07
ru106	—	—	—	2.70E-30	—
rh102	—	—	8.53E-35	1.09E-28	—
pd107	2.58E-19	2.53E-18	1.95E-15	3.73E-11	9.59E-15
ag108	4.23E-10	2.30E-09	5.27E-07	9.56E-03	1.19E-06
ag108m	4.87E-09	2.64E-08	6.06E-06	1.10E-01	1.37E-05
ag109m	2.03E-15	2.02E-14	6.14E-12	1.35E-07	2.45E-12
ag110	5.39E-19	6.14E-18	1.56E-15	3.46E-11	6.18E-16
ag110m	3.96E-17	4.51E-16	1.15E-13	2.54E-09	4.54E-14

[†] Original curie contents are taken from data tables in Reference 1.

Isotope	Total Activity (Curies)				
	1h1v	2h1v	3h1v	4h1v	5h1v
cd109	2.03E-15	2.02E-14	6.14E-12	1.35E-07	2.45E-12
cd113	3.32E-12	3.13E-12	4.19E-12	1.01E-09	3.93E-12
cd113m	9.76E-10	5.97E-09	1.53E-06	3.02E-02	2.99E-06
in113m	1.06E-28	2.05E-27	2.21E-24	7.92E-21	8.56E-25
in115	1.91E-09	1.80E-09	2.41E-09	5.81E-07	2.26E-09
sn113	1.06E-28	2.05E-27	2.21E-24	7.92E-21	8.55E-25
sn119m	3.84E-16	6.65E-15	8.21E-12	2.92E-08	3.17E-12
sn121	1.09E-11	1.36E-10	1.24E-07	4.17E-04	2.88E-07
sn121m	1.40E-11	1.76E-10	1.60E-07	5.37E-04	3.71E-07
sn123	2.60E-29	8.86E-28	6.58E-25	2.21E-21	1.73E-25
sb125	2.09E-13	3.68E-12	4.21E-09	1.50E-05	2.04E-09
te123	1.34E-29	3.33E-28	4.33E-23	8.25E-17	3.19E-22
te123m	1.47E-36	6.83E-35	6.75E-30	1.31E-23	7.75E-30
te125m	5.11E-14	8.98E-13	1.03E-09	3.67E-06	4.99E-10
tl204	6.83E-19	1.24E-17	1.38E-14	2.33E-10	1.24E-14
tl206	8.50E-15	4.40E-14	1.31E-11	2.58E-07	3.25E-11
pb205	1.10E-15	5.87E-15	1.43E-12	2.62E-08	3.44E-12
bi208	—	5.72E-15	5.43E-12	9.39E-08	3.28E-11
bi210m	8.50E-15	4.40E-14	1.31E-11	2.58E-07	3.25E-11
po210	8.19E-26	1.06E-24	2.29E-22	5.11E-18	8.87E-23
total	4.40E-06	2.17E-04	1.42E-02	8.60E+01	2.49E-02

Table 13 Original Curie Contents for Regions 2V for P-Reactor System[†]

Isotope	Total Activity (Curies)				
	1h2v	2h2v	3h2v	4h2v	5h2v
h 3	2.84E-15	1.52E-14	2.64E-07	1.49E-05	3.95E-09
be 10	3.71E-15	2.53E-14	1.52E-07	1.45E-05	2.41E-09
c 14	7.52E-09	3.26E-08	8.93E-01	2.55E+01	1.60E-02
na 22	—	6.49E-13	3.12E-08	1.94E-20	2.90E-10
si 32	7.32E-25	1.22E-22	2.71E-10	6.32E-07	2.84E-13
p 32	7.32E-25	1.22E-22	2.71E-10	6.32E-07	2.84E-13
s 35	4.81E-34	5.50E-32	1.05E-25	9.00E-25	1.28E-27
cl 36	3.27E-24	2.78E-11	3.58E-05	2.05E-06	1.03E-06
ar 39	—	1.79E-07	5.66E-02	3.12E-12	2.62E-03
ar 42	3.45E-30	2.38E-23	8.89E-12	1.13E-14	4.56E-14
k 40	—	5.36E-06	1.41E-05	—	4.79E-06
k 42	—	2.38E-23	8.89E-12	1.13E-14	4.56E-14
ca 41	—	3.61E-08	1.25E-01	—	3.76E-03
ca 45	6.02E-25	7.79E-19	7.05E-13	2.74E-17	1.11E-14
sc 46	4.15E-36	2.70E-35	5.94E-29	2.10E-28	1.05E-31
v 49	1.52E-19	9.23E-19	4.11E-13	6.93E-12	1.92E-15
v 50	1.22E-13	1.59E-13	3.67E-12	2.42E-12	8.62E-13

[†] Original curie contents are taken from data tables in Reference 1.

Isotope	Total Activity (Curies)				
	1h2v	2h2v	3h2v	4h2v	5h2v
mn 54	6.67E-13	4.10E-12	1.74E-06	1.22E-04	8.27E-09
fe 55	3.23E-07	2.39E-06	2.19E+01	2.37E+03	1.80E-01
co 58	4.91E-36	3.99E-35	1.48E-29	2.97E-28	8.06E-32
co 60	2.42E-06	1.27E-05	1.41E+02	4.15E+03	1.60E+00
ni 59	5.11E-08	2.16E-07	6.30E+00	1.77E+02	1.11E-01
ni 63	4.82E-06	2.13E-05	5.80E+02	1.65E+04	1.01E+01
zn 65	2.84E-27	4.93E-26	6.03E-13	3.29E-09	3.23E-16
se 79	—	—	2.00E-16	1.71E-10	7.81E-22
kr 81	—	—	—	6.85E-22	—
sr 90	3.61E-25	4.85E-24	1.07E-11	6.95E-09	1.93E-14
y 90	3.61E-25	4.86E-24	1.07E-11	6.95E-09	1.93E-14
zr 93	1.72E-13	5.70E-13	1.54E-05	4.12E-04	2.68E-07
zr 95	—	—	—	1.15E-33	—
nb 91	5.33E-26	1.74E-24	6.89E-13	1.01E-09	2.67E-15
nb 92	5.04E-16	3.29E-15	9.46E-09	5.64E-07	3.01E-10
nb 93m	2.07E-10	3.99E-10	1.04E-02	9.33E-01	1.65E-04
nb 94	4.25E-10	1.02E-09	3.23E-02	7.37E-01	5.07E-04
nb 95	—	—	—	2.82E-33	—
mo 93	3.24E-10	6.41E-10	1.53E-02	1.38E+00	2.36E-04
tc 97	—	—	3.17E-22	1.71E-17	—
tc 98	7.43E-27	5.63E-26	1.64E-13	3.61E-10	2.97E-16
tc 99	5.46E-11	8.94E-11	2.72E-03	2.47E-01	4.09E-05
ru106	—	—	7.78E-27	1.59E-22	—
rh102	—	—	2.52E-26	2.57E-23	1.62E-29
rh106	—	—	7.79E-27	1.59E-22	—
pd107	1.06E-17	6.50E-17	2.05E-10	3.96E-09	6.28E-12
ag108	6.85E-10	2.33E-09	6.46E-02	1.75E+00	1.11E-03
ag108m	7.87E-09	2.67E-08	7.43E-01	2.01E+01	1.28E-02
ag109m	2.25E-14	6.16E-14	4.53E-07	1.64E-05	2.75E-09
ag110	5.33E-18	1.65E-17	1.35E-10	3.67E-09	9.45E-13
ag110m	3.92E-16	1.22E-15	9.93E-09	2.70E-07	6.95E-11
cd109	2.25E-14	6.16E-14	4.53E-07	1.64E-05	2.75E-09
cd113	6.58E-12	8.59E-12	1.23E-10	1.32E-14	4.44E-11
cd113m	2.54E-09	8.43E-09	1.45E-01	7.60E-01	2.37E-03
in113m	1.22E-27	2.44E-27	1.98E-20	4.58E-19	8.90E-23
in115	3.79E-09	4.94E-09	9.38E-08	6.98E-08	2.60E-08
sn113	1.22E-27	2.43E-27	1.98E-20	4.58E-19	8.90E-23
sn119m	4.88E-15	9.96E-15	6.49E-08	1.40E-06	2.35E-10
sn121	2.65E-11	6.69E-11	1.70E-03	3.98E-02	2.67E-05
sn121m	3.41E-11	8.62E-11	2.19E-03	5.13E-02	3.45E-05
sn123	1.45E-27	8.35E-27	1.08E-20	2.81E-19	7.58E-23
sb124	—	—	—	1.64E-33	—
sb125	2.27E-12	4.78E-12	3.62E-05	8.19E-04	1.67E-07
te123	4.58E-29	1.17E-28	5.57E-15	2.98E-12	5.22E-18
te123m	2.04E-35	6.15E-35	7.99E-22	5.20E-19	2.56E-25
te125m	5.55E-13	1.17E-12	8.83E-06	2.00E-04	4.07E-08

Isotope	Total Activity (Curies)				
	1h2v	2h2v	3h2v	4h2v	5h2v
te127	—	—	—	7.03E-29	—
te127m	—	—	1.28E-33	7.18E-29	—
tl204	4.05E-16	2.44E-15	1.30E-09	4.85E-07	1.30E-11
tl206	1.72E-14	4.67E-14	1.27E-06	3.22E-05	2.17E-08
pb205	1.98E-15	6.98E-15	1.69E-07	8.32E-05	2.99E-09
bi208	4.09E-14	2.69E-13	7.14E-07	1.40E-05	2.42E-08
bi210m	1.72E-14	4.67E-14	1.27E-06	3.22E-05	2.17E-08
po210	8.38E-25	3.33E-24	2.34E-17	6.77E-16	1.79E-19
total	7.64E-06	4.22E-05	7.52E+02	2.32E+04	1.20E+01

Table 14 Original Curie Contents for Regions 3V for P-Reactor System[†]

Isotope	Total Activity (Curies)			
	1h3v	2h3v	3h3v	5h3v
h 3	4.19E-14	2.05E-13	1.12E-05	4.17E-06
be 10	2.10E-15	3.78E-13	6.34E-07	3.76E-07
c 14	1.42E-07	5.09E-07	2.13E+01	1.31E+01
na 22	—	—	1.90E-23	—
si 32	9.51E-25	6.27E-22	1.38E-08	3.55E-09
p 32	9.51E-25	6.27E-22	1.38E-08	3.55E-09
s 35	4.70E-33	3.86E-32	1.41E-24	4.02E-25
cl 36	1.23E-22	1.22E-21	1.17E-06	2.54E-07
ar 39	—	—	1.20E-12	9.46E-14
ar 42	—	3.01E-27	2.14E-15	2.74E-16
k 40	1.69E-30	—	—	—
k 42	—	2.88E-27	2.14E-15	2.74E-16
ca 45	—	3.25E-23	5.97E-17	6.13E-19
sc 46	—	2.30E-34	4.59E-28	4.71E-30
v 49	—	5.13E-18	7.33E-12	1.54E-13
v 50	1.29E-12	1.38E-12	3.16E-12	5.15E-12
mn 54	3.21E-18	2.20E-11	3.08E-05	6.79E-07
fe 55	3.10E-06	2.63E-05	8.82E+02	2.59E+02
co 58	—	2.17E-34	3.06E-28	6.67E-30
co 60	2.34E-05	2.68E-04	5.26E+03	1.78E+03
ni 59	1.01E-06	3.38E-06	1.51E+02	9.19E+01
ni 63	9.31E-05	3.15E-04	1.43E+04	8.46E+03
zn 65	3.55E-26	2.22E-24	6.22E-10	6.16E-11
se 79	—	—	3.72E-11	7.38E-13
sr 90	—	1.80E-22	2.04E-09	2.15E-10
y 90	—	1.80E-22	2.04E-09	2.15E-10
zr 93	2.28E-12	1.82E-11	3.35E-04	1.97E-04
zr 95	—	—	1.89E-33	4.60E-34
nb 91	—	4.89E-23	3.64E-11	4.90E-12

[†] Original curie contents are taken from data tables in Reference 1.

Isotope	Total Activity (Curies)			
	1h3v	2h3v	3h3v	5h3v
nb 92	1.83E-17	5.15E-14	6.72E-08	3.20E-08
nb 93m	1.02E-09	3.28E-08	1.34E-01	5.74E-02
nb 94	4.11E-09	5.75E-08	5.80E-01	3.16E-01
nb 95	—	—	4.20E-33	8.42E-34
mo 93	1.59E-09	5.28E-08	2.07E-01	8.29E-02
tc 97	—	—	2.45E-19	7.20E-21
tc 98	—	6.26E-24	1.70E-11	1.76E-12
tc 99	2.91E-10	9.11E-09	3.75E-02	1.52E-02
ru106	—	—	1.32E-22	1.05E-25
rh102	—	—	4.61E-24	2.48E-26
rh106	—	—	1.32E-22	1.05E-25
pd107	3.59E-18	1.13E-15	1.67E-09	7.41E-10
ag108	9.86E-09	6.94E-08	1.46E+00	8.51E-01
ag108m	1.13E-07	7.98E-07	1.68E+01	9.78E+00
ag109m	7.51E-14	3.76E-12	2.37E-05	3.85E-06
ag110	2.27E-17	8.82E-16	5.91E-09	1.29E-09
ag110m	1.67E-15	6.48E-14	4.34E-07	9.50E-08
cd109	7.51E-14	3.76E-12	2.37E-05	3.85E-06
cd113	6.81E-11	7.27E-11	1.74E-13	2.29E-11
cd113m	2.49E-08	3.39E-07	9.96E-01	8.60E-01
in113m	3.23E-27	2.23E-25	7.52E-19	9.49E-20
in115	3.92E-08	4.18E-08	8.96E-08	1.58E-07
sn113	3.23E-27	2.23E-25	7.52E-19	9.48E-20
sn119m	1.05E-14	8.59E-13	2.33E-06	1.95E-07
sn121	2.26E-10	3.77E-09	3.23E-02	1.63E-02
sn121m	2.91E-10	4.86E-09	4.16E-02	2.10E-02
sn123	1.28E-27	7.52E-26	4.11E-19	8.83E-20
sb124	—	—	2.44E-33	4.89E-34
sb125	6.28E-12	4.12E-10	1.27E-03	1.42E-04
te123	2.02E-28	9.92E-26	1.33E-12	1.80E-13
te123m	3.02E-35	4.78E-32	5.01E-19	2.27E-20
te125m	1.53E-12	1.01E-10	3.11E-04	3.48E-05
te127	—	—	3.10E-29	3.40E-31
te127m	—	—	3.17E-29	3.37E-31
tl204	1.78E-17	1.73E-14	2.29E-08	1.32E-09
tl206	1.78E-13	2.19E-12	2.55E-05	1.43E-05
pb205	2.49E-14	2.07E-13	3.67E-06	2.16E-06
bi208	—	4.12E-12	5.25E-06	2.57E-06
bi210m	1.78E-13	2.19E-12	2.55E-05	1.43E-05
po210	3.88E-24	1.20E-22	1.07E-15	2.54E-16
total	1.21E-04	6.14E-04	2.07E+04	1.06E+04

Table 15 Results of the Activation of 67.39 mg of Silver in P-Reactor

Isotope	Vessel	1H1V	2H1V	3H1V	4H1V	5H1V	1H2V	2H2V	3H2V	4H2V	5H2V	1H3V	2H3V	3H3V	5H3V
	curies	curies	curies	curies	curies	curies	curies	curies	curies	curies	curies	curies	curies	curies	curies
h 3	1.15E-12				9.12E-25	1.60E-31			1.70E-20	4.86E-16	1.84E-24			9.98E-17	5.23E-18
ru106	2.48E-19				2.41E-30				6.99E-27	1.43E-22	6.93E-32			1.18E-22	9.44E-26
rh102	6.69E-29								4.82E-35	3.38E-31				3.35E-32	7.11E-35
rh106	2.48E-19								6.98E-27	1.43E-22				1.18E-22	9.44E-26
pd107	1.17E-08	2.32E-19	2.26E-18	1.75E-15	3.33E-11	8.57E-15	9.44E-18	5.80E-17	1.83E-10	3.54E-09	5.60E-12	3.22E-18	1.01E-15	1.49E-09	6.62E-10
ag108	9.24E+00	3.80E-10	2.07E-09	4.73E-07	8.59E-03	1.07E-06	6.15E-10	2.09E-09	5.81E-02	1.57E+00	9.99E-04	8.86E-09	6.24E-08	1.31E+00	7.65E-01
ag108m	1.06E+02	4.37E-09	2.38E-08	5.44E-06	9.88E-02	1.23E-05	7.07E-09	2.40E-08	6.68E-01	1.80E+01	1.15E-02	1.02E-07	7.17E-07	1.51E+01	8.79E+00
ag109m	6.90E-04	6.96E-24	3.85E-22	2.03E-17	3.34E-11	2.03E-17	5.81E-23	3.89E-22	4.64E-09	4.16E-06	1.82E-12	2.84E-22	8.73E-20	4.29E-06	2.85E-07
ag110	1.87E-08	4.84E-19	5.51E-18	1.40E-15	3.11E-11	5.55E-16	4.79E-18	1.49E-17	1.21E-10	3.30E-09	8.49E-13	2.04E-17	7.92E-16	5.31E-09	1.16E-09
ag110m	1.37E-06	3.56E-17	4.05E-16	1.03E-13	2.29E-09	4.08E-14	3.52E-16	1.09E-15	8.92E-09	2.43E-07	6.24E-11	1.50E-15	5.83E-14	3.90E-07	8.53E-08
cd109	6.90E-04	6.96E-24	3.85E-22	2.03E-17	3.34E-11	2.03E-17	5.81E-23	3.89E-22	4.64E-09	4.16E-06	1.82E-12	2.84E-22	8.73E-20	4.29E-06	2.85E-07
cd113	2.15E-18					2.26E-27				6.86E-22				1.99E-22	7.13E-24
cd113m	2.52E-04			8.12E-29	8.03E-19				1.72E-13	6.37E-08	5.89E-19			1.97E-08	5.18E-10
in115	2.09E-18									1.60E-24				1.79E-25	
sn113	6.94E-33														
sn119m	4.52E-22														
sn121	4.24E-25														
sn121m	5.46E-25														
total	1.15E+02	4.75E-09	2.58E-08	5.91E-06	1.07E-01	1.34E-05	7.69E-09	2.61E-08	7.26E-01	1.96E+01	1.25E-02	1.11E-07	7.79E-07	1.64E+01	9.55E+00

Table 16 Modified Curie Contents for Reactor Tank, Aluminum Internals, Surface Deposits and Total System for P-Reactor System

Isotope	Total Activity (Curies)				
	Tank	Internals	Tank Deposits	Internals Deposits	System Totals
h 3	1.12E-03	2.54E-04	1.00E-02	7.49E-01	7.61E-01
be 10	1.15E-06	2.20E-06	1.77E-10	9.89E-08	1.91E-05
c 14	1.75E+02	3.23E-03	2.09E-02	7.39E-01	2.37E+02
na 22	9.05E-21	2.50E-13	5.22E-22	1.57E-18	1.17E-07
si 32	4.30E-06	4.91E-06	8.66E-08	4.90E-05	5.90E-05
p 32	4.30E-06	4.91E-06	8.66E-08	4.90E-05	5.90E-05
s 35	8.48E-24	3.61E-33	1.26E-24	3.48E-22	3.60E-22
cl 36	2.72E-04	3.13E-15	1.00E+00	2.74E+01	2.84E+01
ar 39	6.33E-09	7.00E-15	7.76E-03	3.54E-01	5.57E-01
ar 42	2.59E-13	1.42E-10	3.95E-10	4.66E-07	4.66E-07
k 40	6.49E-20	—	1.45E-06	4.30E-05	2.58E-03
k 42	2.59E-13	1.42E-10	3.95E-10	4.66E-07	4.66E-07
ca 40	—	—	1.27E-02	—	1.27E-02
ca 41	—	1.75E-18	—	4.19E-01	8.16E-01
ca 45	8.95E-17	1.72E-14	1.12E-13	2.74E-11	3.01E-11
sc 46	7.01E-28	1.44E-25	7.41E-27	3.36E-24	3.51E-24
v 49	2.11E-11	4.54E-18	2.12E-16	8.99E-13	3.69E-11
v 50	7.47E-13	2.09E-21	4.54E-18	3.38E-16	5.18E-11
mn 54	9.94E-05	1.06E-05	1.14E-08	1.10E-05	2.77E-04
fe 55	5.37E+03	1.16E+02	6.13E-01	1.23E+02	9.14E+03
co 58	9.23E-28	6.63E-35	4.51E-32	1.91E-29	1.57E-27
co 60	3.09E+04	7.96E+00	5.15E-02	1.22E+01	4.23E+04
ni 59	1.01E+03	6.71E-11	4.46E-02	1.05E+00	1.43E+03
ni 63	1.07E+05	2.42E+00	5.12E+00	1.65E+02	1.47E+05
zn 65	1.15E-07	2.03E-05	4.58E-09	1.08E-06	2.15E-05
se 79	9.05E-06	1.43E-18	4.06E-24	9.24E-20	9.05E-06
kr 81	1.74E-14	—	—	—	1.74E-14
kr 85	4.03E-17	—	—	—	4.03E-17
sr 90	3.86E-07	—	—	—	3.96E-07
y 90	3.87E-07	—	—	—	3.96E-07
zr 93	2.82E-03	—	—	—	3.78E-03
zr 95	1.14E-32	—	—	—	1.49E-32
nb 91	7.52E-09	—	—	—	8.57E-09
nb 92	4.98E-07	—	—	—	1.17E-06
nb 93m	1.29E+00	—	—	—	2.43E+00
nb 94	4.90E+00	—	—	—	6.57E+00
nb 95	2.51E-32	—	—	—	3.30E-32
mo 93	1.93E+00	—	—	—	3.63E+00
tc 97	1.53E-15	—	—	—	1.54E-15
tc 98	3.94E-09	—	—	—	4.32E-09
tc 99	3.34E-01	—	1.48E-24	7.42E-21	6.37E-01

Isotope	Total Activity (Curies)				
	Tank	Internals	Tank Deposits	Internals Deposits	System Totals
ru106	3.06E-20	—	1.53E-22	7.91E-18	7.94E-18
rh102	6.54E-20	—	2.51E-22	7.31E-19	7.96E-19
rh106	3.06E-20	—	1.53E-22	7.91E-18	7.94E-18
pd107	1.39E-09	—	4.97E-11	4.85E-09	6.99E-09
ag108	1.04E+00	—	1.43E-03	9.91E-02	1.57E+00
ag108m	1.20E+01	—	1.64E-02	1.14E+00	1.80E+01
ag109m	1.81E-04	—	8.36E-05	8.80E-03	9.10E-03
ag110	2.11E-09	—	3.90E-12	5.49E-10	3.79E-09
ag110m	1.55E-07	—	2.87E-10	4.04E-08	2.79E-07
cd109	1.81E-04	—	8.36E-05	8.80E-03	9.10E-03
cd113	3.05E-15	—	1.59E-15	2.90E-14	1.37E-09
cd113m	3.57E-01	—	1.89E-01	3.46E+00	6.80E+00
in113m	4.45E-18	—	9.51E-29	5.23E-26	5.79E-18
in115	6.07E-09	—	3.56E-12	7.01E-11	1.12E-06
sn113	4.45E-18	—	9.50E-29	5.23E-26	5.78E-18
sn119m	1.38E-05	—	8.48E-12	1.53E-08	1.78E-05
sn121	2.68E-01	—	2.44E-13	3.53E-10	3.59E-01
sn121m	3.46E-01	—	3.15E-13	4.55E-10	4.62E-01
sn123	2.37E-18	—	7.67E-36	4.45E-31	3.16E-18
sb124	1.40E-32	—	—	—	1.86E-32
sb125	1.21E-02	—	7.24E-24	3.12E-17	1.43E-02
te123	2.05E-10	—	—	—	2.10E-10
te123m	9.81E-17	—	1.71E-32	7.86E-28	9.91E-17
te125m	2.94E-03	—	1.77E-24	7.62E-18	3.50E-03
te127	3.80E-24	—	—	—	3.80E-24
te127m	3.88E-24	—	—	4.82E-37	3.88E-24
i129	4.23E-16	—	—	—	4.23E-16
cs134	1.35E-21	—	—	—	1.35E-21
tl204	1.15E-07	—	—	—	6.26E-07
tl206	2.21E-04	—	—	—	2.95E-04
pb205	3.06E-05	—	—	—	1.20E-04
bi208	3.91E-05	—	—	—	6.17E-05
bi210m	2.21E-04	—	—	—	2.95E-04
po210	6.45E-15	—	—	—	8.48E-15
total	1.44E+05	1.27E+02	7.09E+00	3.36E+02	2.00E+05

Table 17 Modified Curie Contents for Regions 1V for P-Reactor System

Isotope	Total Activity (Curies)				
	1h1v	2h1v	3h1v	4h1v	5h1v
h 3	1.43E-15	9.85E-15	1.64E-12	2.87E-08	2.73E-12
be 10	9.06E-17	6.31E-15	1.81E-11	1.37E-08	8.90E-11
c 14	5.80E-09	6.08E-08	2.77E-05	9.87E-02	5.51E-05
na 22	—	1.71E-13	7.09E-10	8.42E-08	1.00E-10
si 32	7.82E-26	2.80E-22	8.86E-17	1.50E-12	2.10E-15
p 32	7.83E-26	2.80E-22	8.86E-17	1.50E-12	2.10E-15
s 35	6.62E-35	1.60E-30	6.73E-28	1.65E-25	2.08E-28
cl 36	4.13E-24	8.38E-10	5.11E-07	6.17E-05	9.30E-07
ar 39	—	3.74E-07	9.85E-04	1.31E-01	3.58E-03
ar 42	—	1.01E-22	3.98E-17	3.78E-13	6.24E-16
k 40	8.23E-32	1.77E-04	6.85E-04	1.24E-03	4.06E-04
k 42	—	1.01E-22	3.98E-17	3.78E-13	6.24E-16
ca 41	—	3.37E-06	1.92E-03	2.64E-01	2.93E-03
ca 45	—	2.43E-17	8.97E-15	1.77E-12	2.31E-15
sc 46	—	—	1.16E-32	6.12E-30	1.52E-34
v 49	—	2.29E-20	1.19E-16	8.33E-14	8.43E-21
v 50	6.15E-14	5.24E-13	2.58E-12	2.74E-11	2.28E-12
mn 54	1.35E-19	4.27E-14	2.06E-10	2.88E-07	6.71E-15
fe 55	5.05E-08	3.22E-06	1.37E-03	2.71E+00	4.56E-04
co 58	—	—	2.49E-34	2.51E-30	—
co 60	6.01E-07	5.85E-06	1.01E-03	2.06E+01	1.03E-03
ni 59	4.08E-08	2.90E-07	8.90E-05	6.72E-01	1.83E-04
ni 63	3.70E-06	2.69E-05	8.11E-03	6.13E+01	1.62E-02
zn 65	5.02E-28	1.61E-25	1.11E-20	2.21E-15	9.17E-21
se 79	—	—	—	6.38E-22	—
sr 90	—	1.28E-25	3.03E-20	3.69E-14	3.76E-19
y 90	—	1.28E-25	3.03E-20	3.69E-14	3.76E-19
zr 93	1.01E-13	5.39E-13	1.33E-10	2.42E-06	3.20E-10
nb 91	—	7.63E-27	1.58E-20	2.16E-15	5.64E-19
nb 92	1.30E-18	2.54E-16	7.30E-13	1.39E-09	4.09E-12
nb 93m	6.77E-11	9.39E-10	1.40E-06	3.85E-03	3.77E-06
nb 94	2.03E-10	4.13E-09	4.29E-06	7.83E-03	1.02E-05
mo 93	9.96E-11	1.40E-09	2.07E-06	5.70E-03	5.38E-06
tc 98	—	5.12E-27	6.88E-21	1.32E-15	1.08E-19
tc 99	1.82E-11	2.55E-10	3.72E-07	1.02E-03	9.51E-07
ru106	—	—	—	2.86E-31	—
rh102	—	—	8.53E-35	1.09E-28	—
pd107	2.62E-20	2.65E-19	2.06E-16	3.92E-12	1.03E-15
ag108	4.30E-11	2.33E-10	5.34E-08	9.70E-04	1.22E-07
ag108m	4.94E-10	2.68E-09	6.14E-07	1.12E-02	1.40E-06
ag109m	2.03E-15	2.02E-14	6.14E-12	1.35E-07	2.45E-12
ag110	5.47E-20	6.22E-19	1.58E-16	3.51E-12	6.30E-17
ag110m	4.02E-18	4.58E-17	1.16E-14	2.58E-10	4.63E-15
cd109	2.03E-15	2.02E-14	6.14E-12	1.35E-07	2.45E-12
cd113	3.32E-12	3.13E-12	4.19E-12	1.01E-09	3.93E-12

Isotope	Total Activity (Curies)				
	1h1v	2h1v	3h1v	4h1v	5h1v
cd113m	9.76E-10	5.97E-09	1.53E-06	3.02E-02	2.99E-06
in113m	1.06E-28	2.05E-27	2.21E-24	7.92E-21	8.56E-25
in115	1.91E-09	1.80E-09	2.41E-09	5.81E-07	2.26E-09
sn113	1.06E-28	2.05E-27	2.21E-24	7.92E-21	8.55E-25
sn119m	3.84E-16	6.65E-15	8.21E-12	2.92E-08	3.17E-12
sn121	1.09E-11	1.36E-10	1.24E-07	4.17E-04	2.88E-07
sn121m	1.40E-11	1.76E-10	1.60E-07	5.37E-04	3.71E-07
sn123	2.60E-29	8.86E-28	6.58E-25	2.21E-21	1.73E-25
sb125	2.09E-13	3.68E-12	4.21E-09	1.50E-05	2.04E-09
te123	1.34E-29	3.33E-28	4.33E-23	8.25E-17	3.19E-22
te123m	1.47E-36	6.83E-35	6.75E-30	1.31E-23	7.75E-30
te125m	5.11E-14	8.98E-13	1.03E-09	3.67E-06	4.99E-10
tl204	6.83E-19	1.24E-17	1.38E-14	2.33E-10	1.24E-14
tl206	8.50E-15	4.40E-14	1.31E-11	2.58E-07	3.25E-11
pb205	1.10E-15	5.87E-15	1.43E-12	2.62E-08	3.44E-12
bi208	—	5.72E-15	5.43E-12	9.39E-08	3.28E-11
bi210m	8.50E-15	4.40E-14	1.31E-11	2.58E-07	3.25E-11
po210	8.19E-26	1.06E-24	2.29E-22	5.11E-18	8.87E-23
total	4.40E-06	2.17E-04	1.42E-02	8.58E+01	2.49E-02

Table 18 Modified Curie Contents for Regions 2V for P-Reactor System

Isotope	Total Activity (Curies)				
	1h2v	2h2v	3h2v	4h2v	5h2v
h 3	2.84E-15	1.52E-14	2.64E-07	1.49E-05	3.95E-09
be 10	3.71E-15	2.53E-14	1.52E-07	1.45E-05	2.41E-09
c 14	7.52E-09	3.26E-08	8.93E-01	2.55E+01	1.60E-02
na 22	—	6.49E-13	3.12E-08	1.94E-20	2.90E-10
si 32	7.32E-25	1.22E-22	2.71E-10	6.32E-07	2.84E-13
p 32	7.32E-25	1.22E-22	2.71E-10	6.32E-07	2.84E-13
s 35	4.81E-34	5.50E-32	1.05E-25	9.00E-25	1.28E-27
cl 36	3.27E-24	2.78E-11	3.58E-05	2.05E-06	1.03E-06
ar 39	—	1.79E-07	5.66E-02	3.12E-12	2.62E-03
ar 42	3.45E-30	2.38E-23	8.89E-12	1.13E-14	4.56E-14
k 40	—	5.36E-06	1.41E-05	—	4.79E-06
k 42	—	2.38E-23	8.89E-12	1.13E-14	4.56E-14
ca 41	—	3.61E-08	1.25E-01	—	3.76E-03
ca 45	6.02E-25	7.79E-19	7.05E-13	2.74E-17	1.11E-14
sc 46	4.15E-36	2.70E-35	5.94E-29	2.10E-28	1.05E-31
v 49	1.52E-19	9.23E-19	4.11E-13	6.93E-12	1.92E-15
v 50	1.22E-13	1.59E-13	3.67E-12	2.42E-12	8.62E-13
mn 54	6.67E-13	4.10E-12	1.74E-06	1.22E-04	8.27E-09
fe 55	3.23E-07	2.39E-06	2.19E+01	2.37E+03	1.80E-01
co 58	4.91E-36	3.99E-35	1.48E-29	2.97E-28	8.06E-32
co 60	2.42E-06	1.27E-05	1.41E+02	4.15E+03	1.60E+00

Isotope	Total Activity (Curies)				
	1h2v	2h2v	3h2v	4h2v	5h2v
ni 59	5.11E-08	2.16E-07	6.30E+00	1.77E+02	1.11E-01
ni 63	4.82E-06	2.13E-05	5.80E+02	1.65E+04	1.01E+01
zn 65	2.84E-27	4.93E-26	6.03E-13	3.29E-09	3.23E-16
se 79	—	—	2.00E-16	1.71E-10	7.81E-22
kr 81	—	—	—	6.85E-22	—
sr 90	3.61E-25	4.85E-24	1.07E-11	6.95E-09	1.93E-14
y 90	3.61E-25	4.86E-24	1.07E-11	6.95E-09	1.93E-14
zr 93	1.72E-13	5.70E-13	1.54E-05	4.12E-04	2.68E-07
zr 95	—	—	—	1.15E-33	—
nb 91	5.33E-26	1.74E-24	6.89E-13	1.01E-09	2.67E-15
nb 92	5.04E-16	3.29E-15	9.46E-09	5.64E-07	3.01E-10
nb 93m	2.07E-10	3.99E-10	1.04E-02	9.33E-01	1.65E-04
nb 94	4.25E-10	1.02E-09	3.23E-02	7.37E-01	5.07E-04
nb 95	—	—	—	2.82E-33	—
mo 93	3.24E-10	6.41E-10	1.53E-02	1.38E+00	2.36E-04
tc 97	—	—	3.17E-22	1.71E-17	—
tc 98	7.43E-27	5.63E-26	1.64E-13	3.61E-10	2.97E-16
tc 99	5.46E-11	8.94E-11	2.72E-03	2.47E-01	4.09E-05
ru106	—	—	7.92E-28	1.62E-23	—
rh102	—	—	2.52E-26	2.57E-23	1.62E-29
rh106	—	—	8.10E-28	1.62E-23	—
pd107	1.14E-18	7.01E-18	2.19E-11	4.24E-10	6.74E-13
ag108	6.95E-11	2.36E-10	6.56E-03	1.78E-01	1.13E-04
ag108m	7.99E-10	2.71E-09	7.54E-02	2.04E+00	1.30E-03
ag109m	2.25E-14	6.16E-14	4.48E-07	1.23E-05	2.75E-09
ag110	5.41E-19	1.68E-18	1.37E-11	3.73E-10	9.59E-14
ag110m	3.97E-17	1.24E-16	1.01E-09	2.74E-08	7.05E-12
cd109	2.25E-14	6.16E-14	4.48E-07	1.23E-05	2.75E-09
cd113	6.58E-12	8.59E-12	1.23E-10	1.32E-14	4.44E-11
cd113m	2.54E-09	8.43E-09	1.45E-01	7.60E-01	2.37E-03
in113m	1.22E-27	2.44E-27	1.98E-20	4.58E-19	8.90E-23
in115	3.79E-09	4.94E-09	9.38E-08	6.98E-08	2.60E-08
sn113	1.22E-27	2.43E-27	1.98E-20	4.58E-19	8.90E-23
sn119m	4.88E-15	9.96E-15	6.49E-08	1.40E-06	2.35E-10
sn121	2.65E-11	6.69E-11	1.70E-03	3.98E-02	2.67E-05
sn121m	3.41E-11	8.62E-11	2.19E-03	5.13E-02	3.45E-05
sn123	1.45E-27	8.35E-27	1.08E-20	2.81E-19	7.58E-23
sb124	—	—	—	1.64E-33	—
sb125	2.27E-12	4.78E-12	3.62E-05	8.19E-04	1.67E-07
te123	4.58E-29	1.17E-28	5.57E-15	2.98E-12	5.22E-18
te123m	2.04E-35	6.15E-35	7.99E-22	5.20E-19	2.56E-25
te125m	5.55E-13	1.17E-12	8.83E-06	2.00E-04	4.07E-08
te127	—	—	—	7.03E-29	—
te127m	—	—	1.28E-33	7.18E-29	—
tl204	4.05E-16	2.44E-15	1.30E-09	4.85E-07	1.30E-11
tl206	1.72E-14	4.67E-14	1.27E-06	3.22E-05	2.17E-08

Isotope	Total Activity (Curies)				
	1h2v	2h2v	3h2v	4h2v	5h2v
pb205	1.98E-15	6.98E-15	1.69E-07	8.32E-05	2.99E-09
bi208	4.09E-14	2.69E-13	7.14E-07	1.40E-05	2.42E-08
bi210m	1.72E-14	4.67E-14	1.27E-06	3.22E-05	2.17E-08
po210	8.38E-25	3.33E-24	2.34E-17	6.77E-16	1.79E-19
total	7.63E-06	4.22E-05	7.51E+02	2.32E+04	1.20E+01

Table 19 Modified Curie Contents for Regions 3V for P-Reactor System

Isotope	Total Activity (Curies)			
	1h3v	2h3v	3h3v	5h3v
h 3	4.19E-14	2.05E-13	1.12E-05	4.17E-06
be 10	2.10E-15	3.78E-13	6.34E-07	3.76E-07
c 14	1.42E-07	5.09E-07	2.13E+01	1.31E+01
na 22	—	—	1.90E-23	—
si 32	9.51E-25	6.27E-22	1.38E-08	3.55E-09
p 32	9.51E-25	6.27E-22	1.38E-08	3.55E-09
s 35	4.70E-33	3.86E-32	1.41E-24	4.02E-25
cl 36	1.23E-22	1.22E-21	1.17E-06	2.54E-07
ar 39	—	—	1.20E-12	9.46E-14
ar 42	—	3.01E-27	2.14E-15	2.74E-16
k 40	1.69E-30	—	—	—
k 42	—	2.88E-27	2.14E-15	2.74E-16
ca 45	—	3.25E-23	5.97E-17	6.13E-19
sc 46	—	2.30E-34	4.59E-28	4.71E-30
v 49	—	5.13E-18	7.33E-12	1.54E-13
v 50	1.29E-12	1.38E-12	3.16E-12	5.15E-12
mn 54	3.21E-18	2.20E-11	3.08E-05	6.79E-07
fe 55	3.10E-06	2.63E-05	8.82E+02	2.59E+02
co 58	—	2.17E-34	3.06E-28	6.67E-30
co 60	2.34E-05	2.68E-04	5.26E+03	1.78E+03
ni 59	1.01E-06	3.38E-06	1.51E+02	9.19E+01
ni 63	9.31E-05	3.15E-04	1.43E+04	8.46E+03
zn 65	3.55E-26	2.22E-24	6.22E-10	6.16E-11
se 79	—	—	3.72E-11	7.38E-13
sr 90	—	1.80E-22	2.04E-09	2.15E-10
y 90	—	1.80E-22	2.04E-09	2.15E-10
zr 93	2.28E-12	1.82E-11	3.35E-04	1.97E-04
zr 95	—	—	1.89E-33	4.60E-34
nb 91	—	4.89E-23	3.64E-11	4.90E-12
nb 92	1.83E-17	5.15E-14	6.72E-08	3.20E-08
nb 93m	1.02E-09	3.28E-08	1.34E-01	5.74E-02
nb 94	4.11E-09	5.75E-08	5.80E-01	3.16E-01
nb 95	—	—	4.20E-33	8.42E-34
mo 93	1.59E-09	5.28E-08	2.07E-01	8.29E-02
tc 97	—	—	2.45E-19	7.20E-21

Isotope	Total Activity (Curies)			
	1h3v	2h3v	3h3v	5h3v
tc 98	—	6.26E-24	1.70E-11	1.76E-12
tc 99	2.91E-10	9.11E-09	3.75E-02	1.52E-02
ru106	—	—	1.34E-23	1.07E-26
rh102	—	—	4.61E-24	2.48E-26
rh106	—	—	1.34E-23	1.07E-26
pd107	3.64E-19	1.21E-16	1.78E-10	7.91E-11
ag108	1.00E-09	7.03E-09	1.49E-01	8.64E-02
ag108m	1.15E-08	8.08E-08	1.71E+00	9.93E-01
ag109m	7.51E-14	3.76E-12	1.94E-05	3.57E-06
ag110	2.30E-18	8.94E-17	6.00E-10	1.31E-10
ag110m	1.69E-16	6.57E-15	4.41E-08	9.64E-09
cd109	7.51E-14	3.76E-12	1.94E-05	3.57E-06
cd113	6.81E-11	7.27E-11	1.74E-13	2.29E-11
cd113m	2.49E-08	3.39E-07	9.96E-01	8.60E-01
in113m	3.23E-27	2.23E-25	7.52E-19	9.49E-20
in115	3.92E-08	4.18E-08	8.96E-08	1.58E-07
sn113	3.23E-27	2.23E-25	7.52E-19	9.48E-20
sn119m	1.05E-14	8.59E-13	2.33E-06	1.95E-07
sn121	2.26E-10	3.77E-09	3.23E-02	1.63E-02
sn121m	2.91E-10	4.86E-09	4.16E-02	2.10E-02
sn123	1.28E-27	7.52E-26	4.11E-19	8.83E-20
sb124	—	—	2.44E-33	4.89E-34
sb125	6.28E-12	4.12E-10	1.27E-03	1.42E-04
te123	2.02E-28	9.92E-26	1.33E-12	1.80E-13
te123m	3.02E-35	4.78E-32	5.01E-19	2.27E-20
te125m	1.53E-12	1.01E-10	3.11E-04	3.48E-05
te127	—	—	3.10E-29	3.40E-31
te127m	—	—	3.17E-29	3.37E-31
tl204	1.78E-17	1.73E-14	2.29E-08	1.32E-09
tl206	1.78E-13	2.19E-12	2.55E-05	1.43E-05
pb205	2.49E-14	2.07E-13	3.67E-06	2.16E-06
bi208	—	4.12E-12	5.25E-06	2.57E-06
bi210m	1.78E-13	2.19E-12	2.55E-05	1.43E-05
po210	3.88E-24	1.20E-22	1.07E-15	2.54E-16
total	1.21E-04	6.14E-04	2.06E+04	1.06E+04

5.0 CONCLUSIONS

Radioisotopes are present in the Savannah River Site (SRS) P-reactor and R-reactor tanks and their surrounding structural materials as a result of neutron activation of those materials during reactor operation. An analytic model and calculational methodology was established previously to quantify the radioisotopes present in those components. The results were based upon an initial silver content of 75 ppm in the stainless steel components of the system. Evaluation of available literature and laboratory analysis of vintage stainless steel has shown that a conservative value for the silver content in stainless steel is 7.61 ppm. Calculations have been completed to assess the impact of the reduced silver content on the final assessment of activation products present in R- and P-reactors. Revised tables of activation

products have been developed to incorporate the reduced assumption of initial silver content in the stainless steel used in construction of the reactor facilities.

6.0 REFERENCES

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