

Analysis of SRS Bioassay Data with and without TRACK Results 1991 to 1999

White Paper

National Institute for Occupational Safety and Health

November 21, 2024

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INTRODUCTION

In the *Analysis of SRS TRACK Database* White Paper, NIOSH concluded that over 97% of the entries in the TRACK database have corresponding bioassay data in the co-exposure files¹, providing evidence that a bounding co-exposure model could be constructed [NIOSH 2023, PDF p. 26]. During a subsequent SRS work group meeting on September 25, 2024, Dr. James Lockey requested an additional analysis comparing the SRS bioassay data with and without the TRACK results. This White Paper presents the requested evaluation.

ANALYSIS DETAILS

This analysis of SRS bioassay data with and without TRACK results focuses on data from 1991 to 1999. TRACK data covers the years 1990 through 2000, but there is very little TRACK data for 1990 (1 row) and 2000 (3 rows) [NIOSH 2023, PDF p. 7]. Therefore, those years have not been included in this discussion. For this analysis, data cleanup for the tritium legacy (TL) and non-tritium legacy (NTL) bioassay files is the same as described in Tables 4 through 21 of the White Paper *Analysis of Subcontractor CTW Data at SRS 1991 to 2007* [NIOSH 2024], except for the difference in included years.

In the TRACK database, each row includes only incident information (person, date, description) without corresponding bioassay results. “TRACK results” are any bioassay results from TL or NTL that match all of the following from a row of the TRACK database:

- Social Security Number
- Assumed/prescribed nuclide, described in NIOSH [2023]
- Within the “30-day window,” described in NIOSH [2023]

Table 1 presents a summary of the number of bioassay results (TRACK and nonTRACK) by nuclide from 1991 through 1999. The TRACK results represent only 0.66% of the total bioassay results in this period. Unless the TRACK results are much higher than nonTRACK results, including or excluding the TRACK results will have little-to-no effect.

¹ The other 3% of the TRACK entries have legitimate reasons that are addressed in Attachment A of NIOSH [2023].

Table 1. Number of SRS bioassay results with and without TRACK by nuclide, 1991–1999.

Nuclide	# of TRACK results	# of nonTRACK results	Total # of bioassay results	% TRACK
Plutonium-238	2,240	81,888	84,128	2.66%
Plutonium-239	2,228	81,853	84,081	2.65%
Strontium	218	42,061	42,279	0.52%
Americium	163	5,907	6,070	2.69%
Curium	25	4,338	4,363	0.57%
Californium	[redacted]	4,337	4,338	0.02%
Neptunium	[redacted]	4,318	4,326	0.18%
Tritium	259	522,547	522,806	0.05%
Uranium	119	40,311	40,430	0.29%
Total	5,261	787,560	792,821	0.66%

ANALYSIS RESULTS

Analyses for plutonium-238 (Pu-238), plutonium-239 (Pu-239), and strontium (Sr-90) are included in the body of this document because these nuclides are of primary radiological significance. Analyses for all other nuclides are in Attachment A.

To avoid making distributional assumptions and to visualize all dosimetry data, jittered scatterplots were created for each nuclide. In the scatterplots, data are presented by year; the red triangles (presented on the left for each year) correspond to TRACK results, while black circles (presented on the right for each year) are from nonTRACK results. If the red points tend to be higher than the black points for a year, the TRACK results tend to be higher than the nonTRACK results. Note that each plot has a horizontal dashed line at zero.

If a plot has a horizontal dotted line at some y-value, the next plot is zoomed in to that value on the y-axis, so more detail is visible. The numbers at the top of each plot are the number of results for that group for that year. Interesting patterns in the data (rounding, censoring levels, etc.) are described and explained in the corresponding sections of NIOSH [2024] and are not reiterated here.

Following the plot(s), a summary table is presented for bioassay results with and without TRACK² results for each nuclide. For each year, the table reports the following summary statistics: number of bioassay results, mean, median, and 95th percentile.

Supporting files for the analysis described in the following sections are provided in ORAUT [2024a].

² Note that the plots are comparing TRACK and nonTRACK results (mutually exclusive groups) to be able to compare the groups to each other. The tables include summary statistics with and without TRACK results to illustrate the effect of excluding TRACK results.

Plutonium-238

The clean NTL file yields 84,128 usable Pu-238 results in the period of interest, of which 2.66% are TRACK results. Figures 1 and 2 are the full-scale and zoomed scatterplots of the Pu-238 bioassay data. Table 2 contains the summary statistics for the Pu-238 bioassay data. Based on these figures and table, the TRACK Pu-238 results do not tend to exceed nonTRACK results for each year except for 1991, where the TRACK results appear to be higher (see 1991 in Figure 1 and mean columns in Table 2).

In [redacted], there are 20 TRACK results greater than 3 disintegrations per minute/Liter (dpm/L). All 20 results were from [redacted] workers involved in the [redacted] incident who were chelated [redacted]. For co-exposure modeling, results within 100 days of a worker's chelation are excluded, so these high TRACK results in [redacted] would not be considered [ORAUT 2024b, PDF p. 56].

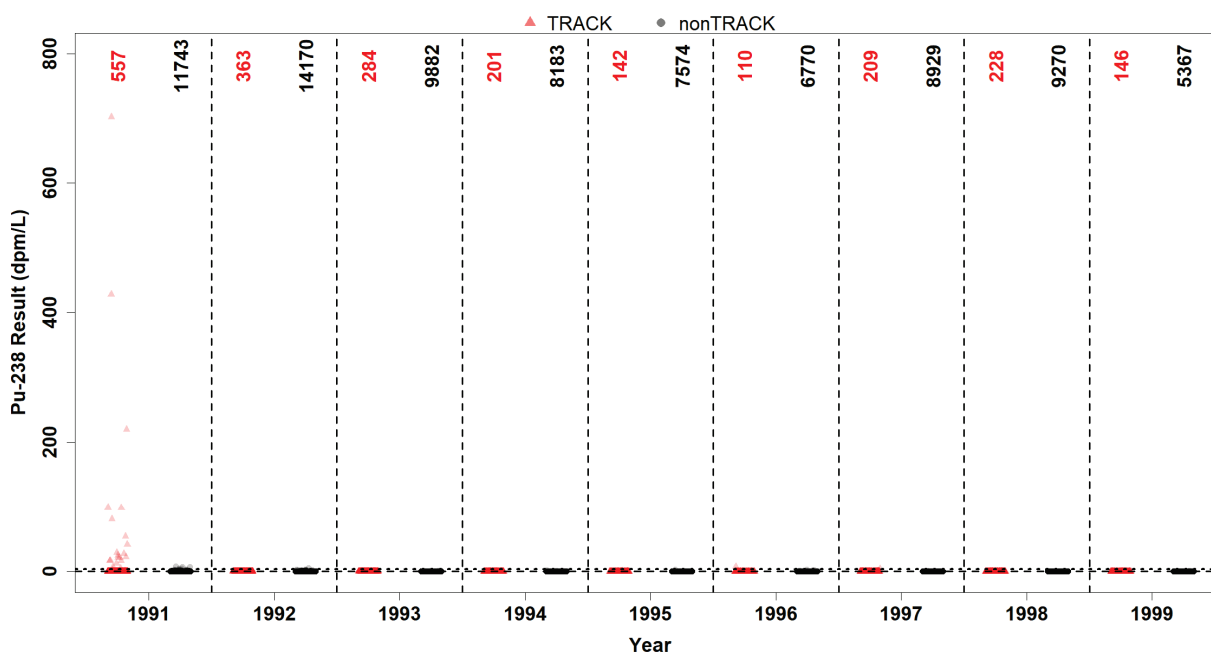


Figure 1. Scatterplot of TRACK (red triangle, left) and nonTRACK (black circle, right) Pu-238 bioassay data, SRS 1991 to 1999. There are 2,240 TRACK results and 81,888 nonTRACK results.

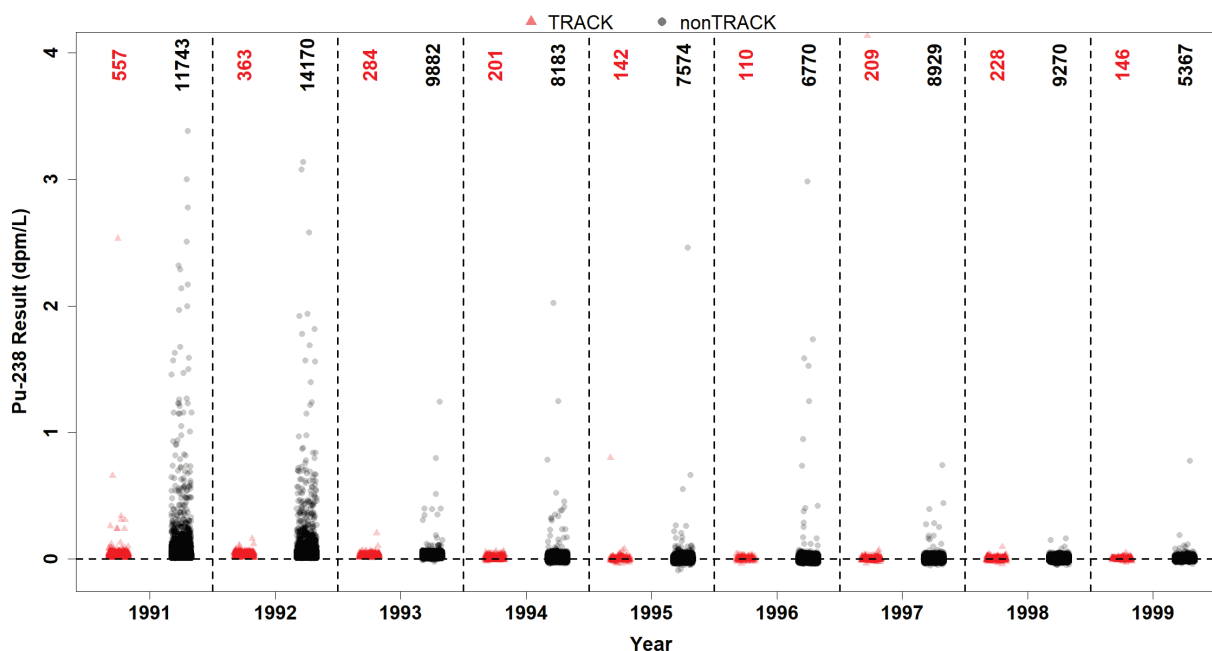


Figure 2: Scatterplot of TRACK (red triangle, left) and nonTRACK (black circle, right) Pu-238 bioassay data with a zoomed y-axis, SRS 1991 to 1999. There are 2,240 TRACK results and 81,888 nonTRACK results.

Table 2: Summary of bioassay results for Pu-238 with and without TRACK results, SRS 1991 to 1999.

Year	# of bioassay results (with TRACK)	# of bioassay results (without TRACK)	Mean result in dpm/L (with TRACK)	Mean result in dpm/L (without TRACK)	Median result in dpm/L (with TRACK)	Median Result in dpm/L (without TRACK)	95th Percentile Result in dpm/L (with TRACK)	95th Percentile Result in dpm/L (without TRACK)
1991	12,300	11,743	0.201	0.043	0.030	0.030	0.070	0.070
1992	14,533	14,170	0.042	0.042	0.030	0.030	0.060	0.060
1993	10,166	9,882	0.030	0.030	0.030	0.030	0.050	0.050
1994	8,384	8,183	0.008	0.008	0.004	0.004	0.034	0.033
1995	7,716	7,574	0.004	0.004	0.001	0.001	0.026	0.026
1996	6,880	6,770	0.007	0.006	0.003	0.003	0.029	0.029
1997	9,138	8,929	0.004	0.004	0.001	0.001	0.025	0.025
1998	9,498	9,270	0.003	0.003	0.003	0.003	0.022	0.022
1999	5,513	5,367	0.005	0.005	0.003	0.003	0.021	0.021

Plutonium-239

The clean NTL file yields 84,081 usable Pu-239 results in the period of interest, of which 2.65% are TRACK results. Figures 3 and 4 are the full-scale and zoomed scatterplots of the Pu-239 bioassay data. Table 3 contains the summary statistics for the Pu-239 bioassay data. Based on these figures and table, the TRACK Pu-239 results do not tend to exceed nonTRACK results for each year except for 1995, where the TRACK results appear to be higher (see 1995 in Figure 3 and mean columns in Table 3).

In [redacted], there are [redacted] TRACK results greater than 3 dpm/L. All [redacted] results were from [redacted] who [redacted] chelated [redacted] as the incident. For co-exposure modeling, results within 100 days of a worker's chelation are excluded, so these high TRACK results in [redacted] would not be considered [ORAUT 2024b, PDF p. 56].

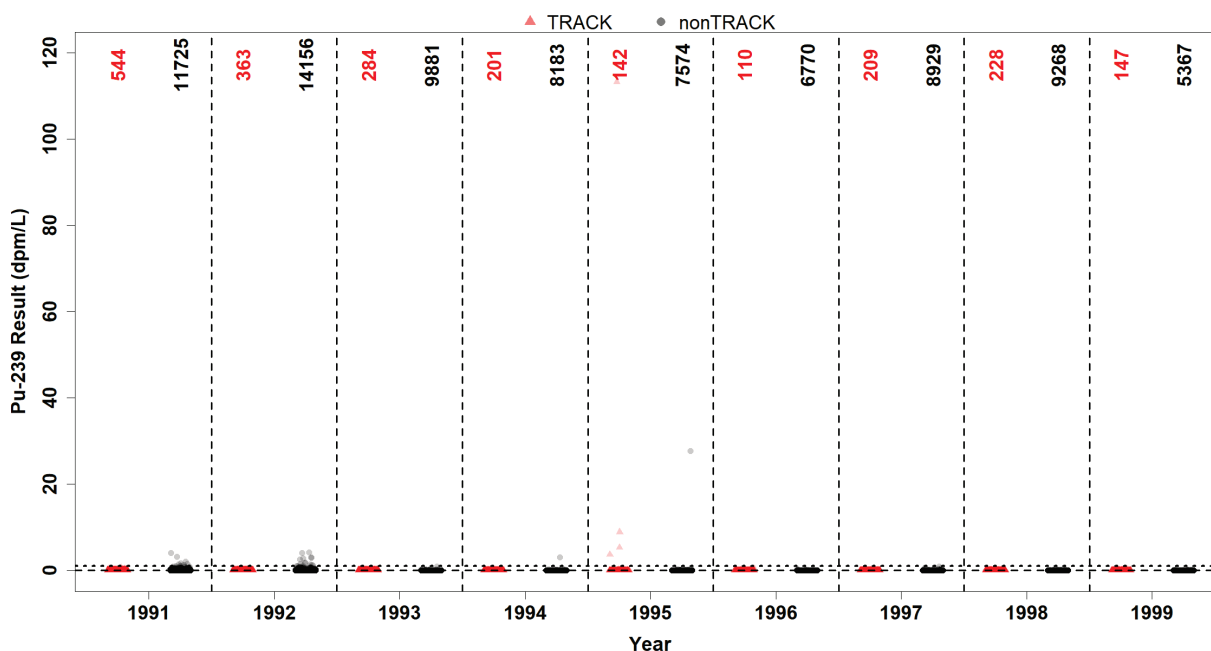


Figure 3: Scatterplot of TRACK (red triangle, left) and nonTRACK (black circle, right) Pu-239 bioassay data, SRS 1991 to 1999. There are 2,228 TRACK results and 81,853 nonTRACK results.

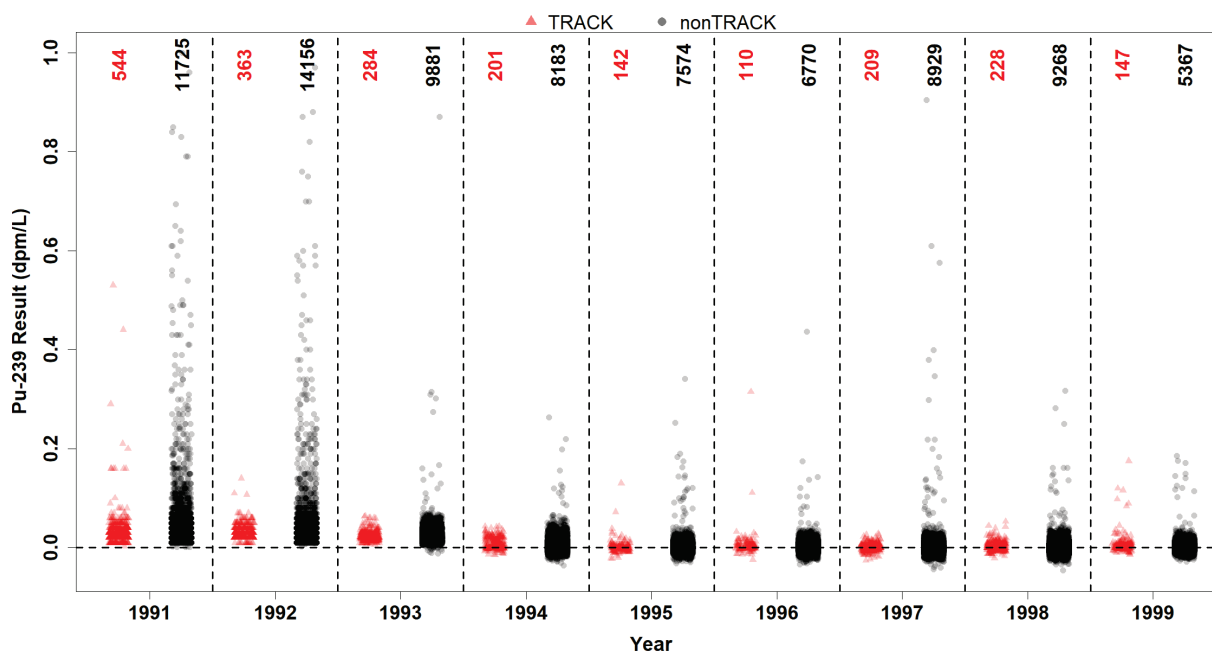


Figure 4: Scatterplot of TRACK (red triangle, left) and nonTRACK (black circle, right) Pu-239 bioassay data with a zoomed y-axis, SRS 1991 to 1999. There are 2,228 TRACK results and 81,853 nonTRACK results.

Table 3: Summary of bioassay results for Pu-239 with and without TRACK results, SRS 1991 to 1999.

Year	# of bioassay results (with TRACK)	# of bioassay results (without TRACK)	Mean result in dpm/L (with TRACK)	Mean result in dpm/L (without TRACK)	Median result in dpm/L (with TRACK)	Median Result in dpm/L (without TRACK)	95th Percentile Result in dpm/L (with TRACK)	95th Percentile Result in dpm/L (without TRACK)
1991	12,269	11,725	0.033	0.033	0.020	0.020	0.060	0.060
1992	14,519	14,156	0.033	0.033	0.030	0.030	0.060	0.060
1993	10,165	9,881	0.023	0.023	0.020	0.020	0.040	0.040
1994	8,384	8,183	0.005	0.005	0.000	0.000	0.026	0.026
1995	7,716	7,574	0.022	0.005	0.000	0.000	0.015	0.015
1996	6,880	6,770	0.002	0.002	0.000	0.000	0.017	0.017
1997	9,138	8,929	0.002	0.002	0.000	0.000	0.017	0.017
1998	9,496	9,268	0.002	0.002	0.000	0.000	0.018	0.018
1999	5,514	5,367	0.002	0.002	0.000	0.000	0.017	0.016

Strontium

The clean NTL file yields 42,279 usable strontium results in the period of interest, of which 0.52% are TRACK results. Figures 5 and 6 are the full-scale and zoomed scatterplots of the Sr-90 bioassay data. Table 4 contains the summary statistics for the Sr-90 bioassay data. Based on these figures and table, the TRACK Sr-90 results do not tend to exceed nonTRACK results for each year.

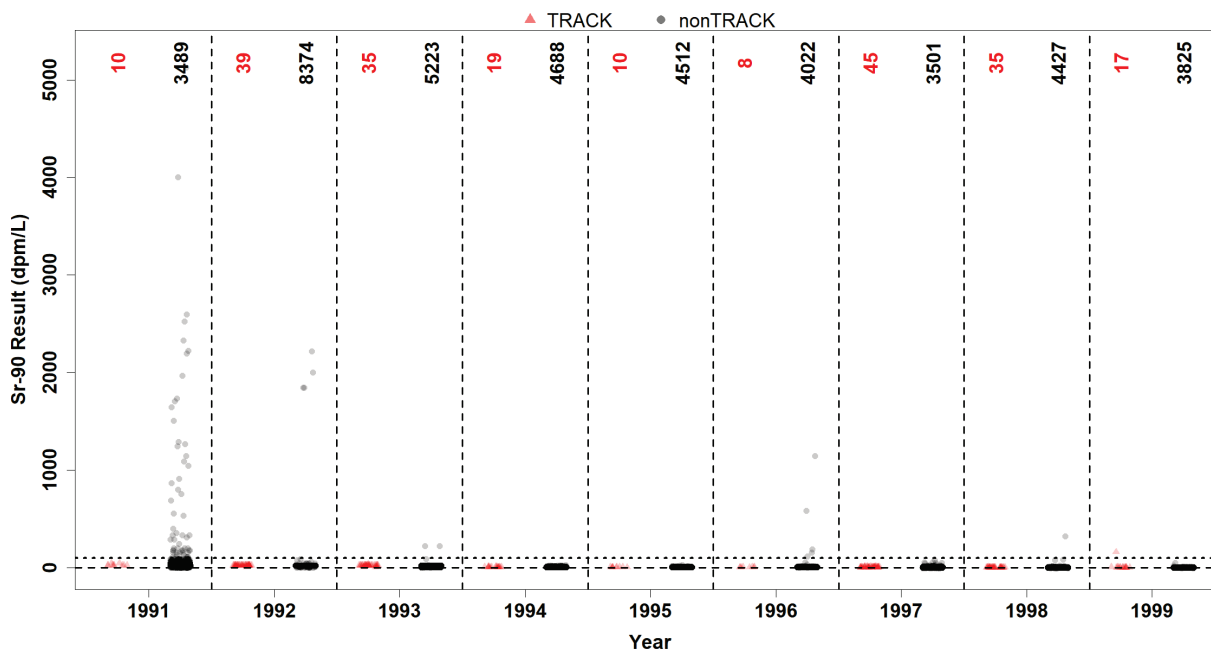


Figure 5: Scatterplot of TRACK (red triangle, left) and nonTRACK (black circle, right) strontium bioassay data, SRS 1991 to 1999. There are 218 TRACK results and 42,061 nonTRACK results.

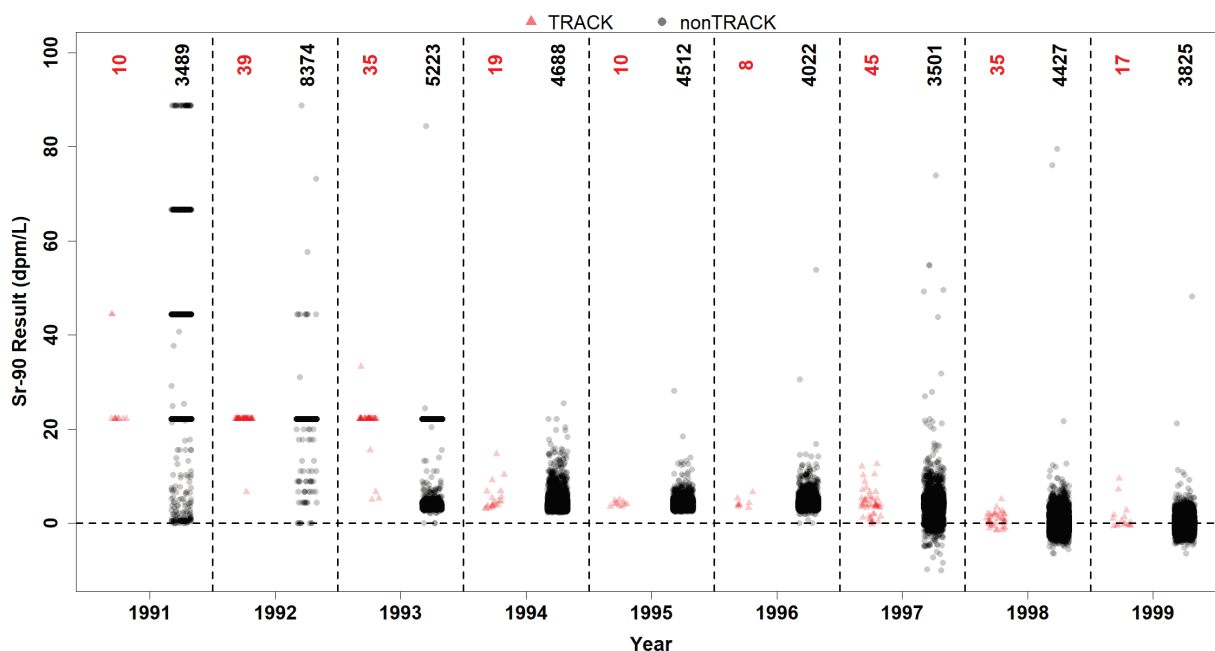


Figure 6. Scatterplot of TRACK (red triangle, left) and nonTRACK (black circle, right) strontium bioassay data with a zoomed y-axis, SRS 1991 to 1999. There are 218 TRACK results and 42,061 nonTRACK results.

Table 4: Summary of bioassay results for strontium with and without TRACK results, SRS 1991 to 1999.

Year	# of bioassay results (with TRACK)	# of bioassay results (without TRACK)	Mean result in dpm/L (with TRACK)	Mean result in dpm/L (without TRACK)	Median result in dpm/L (with TRACK)	Median Result in dpm/L (without TRACK)	95th Percentile Result in dpm/L (with TRACK)	95th Percentile Result in dpm/L (without TRACK)
1991	3,499	3,489	38.055	38.088	22.200	22.200	44.400	44.400
1992	8,413	8,374	23.082	23.088	22.200	22.200	22.200	22.200
1993	5,258	5,223	19.763	19.755	22.200	22.200	22.200	22.200
1994	4,707	4,688	4.150	4.144	3.758	3.758	6.747	6.708
1995	4,522	4,512	4.043	4.043	3.903	3.901	5.375	5.379
1996	4,030	4,022	4.735	4.736	3.959	3.960	5.954	5.952
1997	3,546	3,501	3.863	3.858	3.978	3.980	7.161	7.082
1998	4,462	4,427	0.577	0.576	0.364	0.355	3.643	3.645
1999	3,842	3,825	-0.105	-0.152	-0.374	-0.375	2.841	2.834

CONCLUSION

Based on the Figures (1 through 6, A-1 through A-10) and Tables (2 through 4, A-1 through A-6), the TRACK results do not tend to exceed nonTRACK results for each year except for three nuclide and year combinations (Pu-238 in 1991, Pu-239 in 1995, Am in 1999), where the TRACK results appear to be higher. For all three nuclide and year combinations, the high TRACK results are within 100 days of a worker's chelation, so those results would not be considered in co-exposure modeling [ORAUT 2024b]. Therefore, there is little difference in the SRS bioassay data with and without the TRACK results. TRACK data represent only 0.66% of the total bioassay results.

REFERENCES

NIOSH [2023]. Analysis of SRS TRACK database 2023. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health December 1. [SRDB Ref ID: 2000000]

NIOSH [2024]. NIOSH/ORAU: Analysis of subcontractor CTW data at SRS 1991 to 2007 white paper. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health. March 20. [SRDB Ref ID: 200945]

ORAUT [2024a]. Supporting documentation for white paper "Analysis of SRS Bioassay Data With and Without TRACK Results 1991-1999" zip file. Data file. Oak Ridge, TN: Oak Ridge Associated Universities Team. October 17. [SRDB Ref ID: 205586]

ORAUT [2024b]. Savannah River Site – internal dosimetry co-exposure data. Oak Ridge, TN: Oak Ridge Associated Universities Team. ORAUT-TKBS-0003-7 Rev. 00, March 5. [SRDB Ref ID: 192894]

ATTACHMENT A – ANALYSIS RESULTS FOR OTHER NUCLIDES**Americium**

The clean NTL file yields 6,070 usable americium results in the period of interest, of which 2.69% are TRACK results. Figures A-1 and A-2 are the full-scale and zoomed scatterplots of the americium bioassay data. Table A-1 contains the summary statistics for the americium bioassay data. Based on these figures and table, the TRACK americium results do not tend to exceed nonTRACK results for each year except for 1999, where the TRACK results appear to be higher (see 1999 in Figures A-1 and A-2 and mean columns in Table A-1).

In [redacted], there are [redacted] TRACK results greater than 0.2 dpm/L. All [redacted] results were from [redacted] workers involved in the [redacted] incident who were chelated [redacted]. For co-exposure modeling, results within 100 days of a worker's chelation are excluded, so these high TRACK results in [redacted] would not be considered [ORAUT 2024b, PDF p. 46].

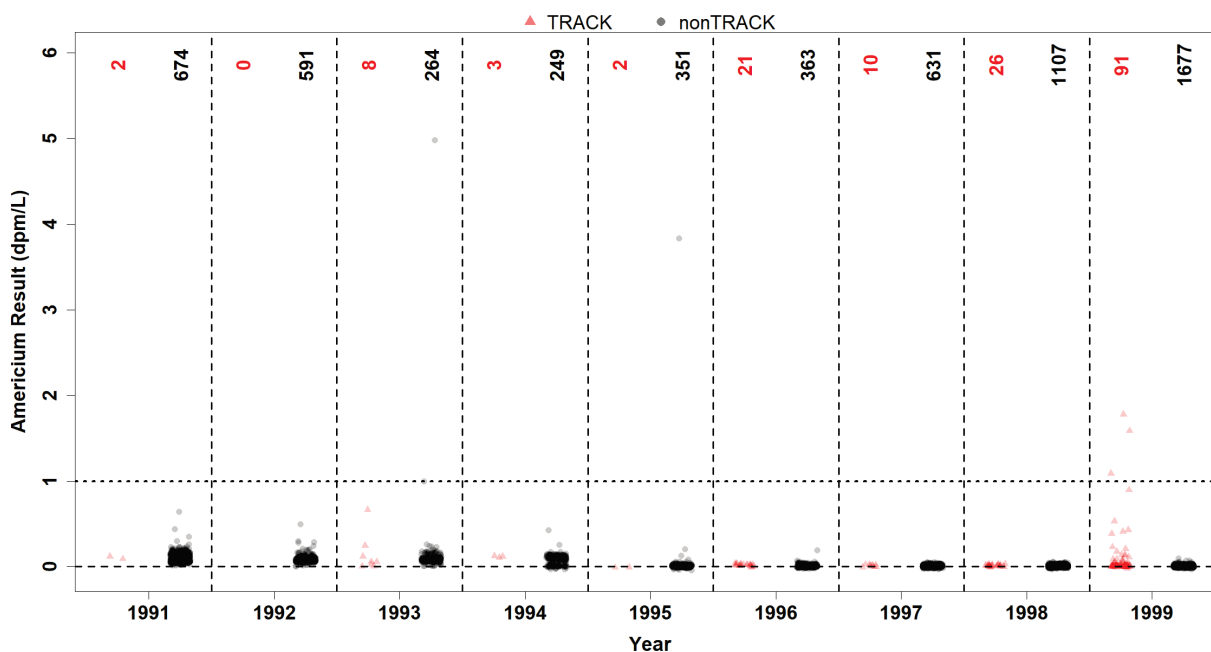


Figure A-1: Scatterplot of TRACK (red triangle, left) and nonTRACK (black circle, right) americium bioassay data, SRS 1991 to 1999. There are 163 TRACK results and 5,907 nonTRACK results.

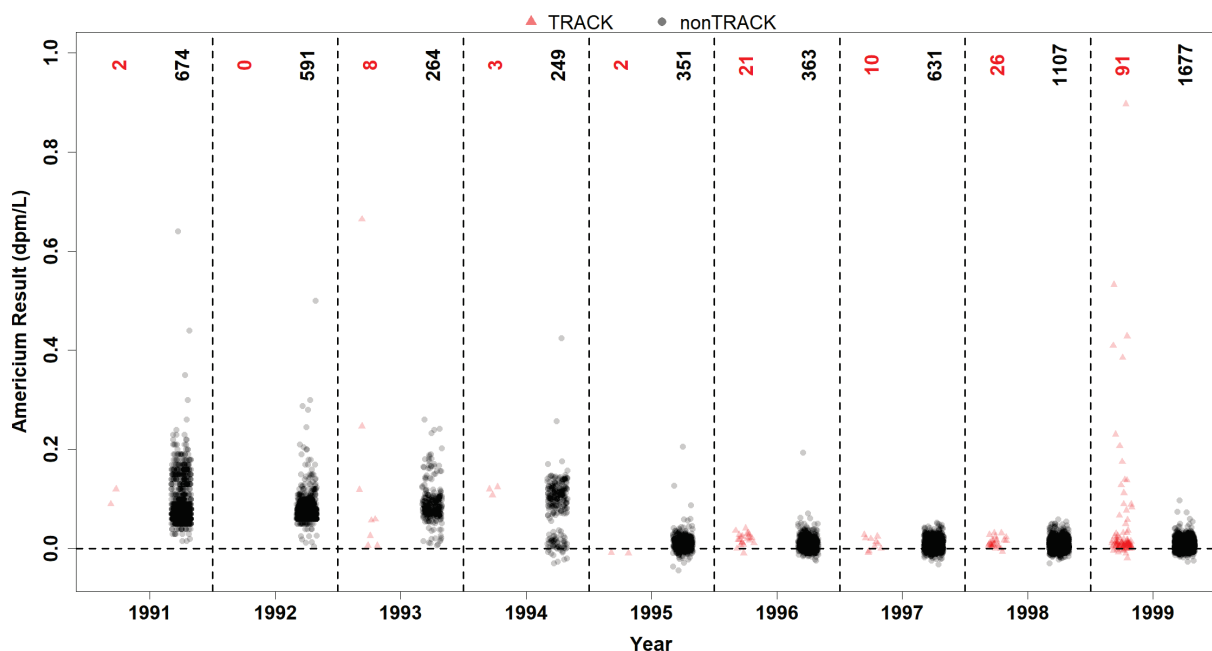


Figure A-2: Scatterplot of TRACK (red triangle, left) and nonTRACK (black circle, right) americium bioassay data with a zoomed y-axis, SRS 1991 to 1999. There are 163 TRACK results and 5,907 nonTRACK results.

Table A-1: Summary of bioassay results for americium with and without TRACK results, SRS 1991 to 1999.

Year	# of bioassay results (with TRACK)	# of bioassay results (without TRACK)	Mean result in dpm/L (with TRACK)	Mean result in dpm/L (without TRACK)	Median result in dpm/L (with TRACK)	Median Result in dpm/L (without TRACK)	95th Percentile Result in dpm/L (with TRACK)	95th Percentile Result in dpm/L (without TRACK)
1991	676	674	0.098	0.098	0.080	0.080	0.190	0.190
1992	591	591	0.083	0.083	0.076	0.076	0.130	0.130
1993	272	264	0.115	0.114	0.084	0.084	0.181	0.175
1994	252	249	0.087	0.087	0.101	0.101	0.144	0.145
1995	353	351	0.023	0.023	0.011	0.011	0.035	0.036
1996	384	363	0.012	0.012	0.011	0.011	0.038	0.038
1997	641	631	0.010	0.010	0.008	0.008	0.032	0.032
1998	1,133	1,107	0.010	0.009	0.008	0.008	0.029	0.029
1999	1,768	1,677	0.014	0.009	0.009	0.009	0.028	0.026

Curium

The clean NTL file yields 4,363 usable curium results in the period of interest, of which 0.57% are TRACK results. Figure A-3 is the full-scale scatterplot of the curium bioassay data. Table A-2 contains the summary statistics for the curium bioassay data. Based on this figure and table (and the fact that there are only 25 TRACK results), the TRACK curium results do not tend to exceed nonTRACK results for each year.

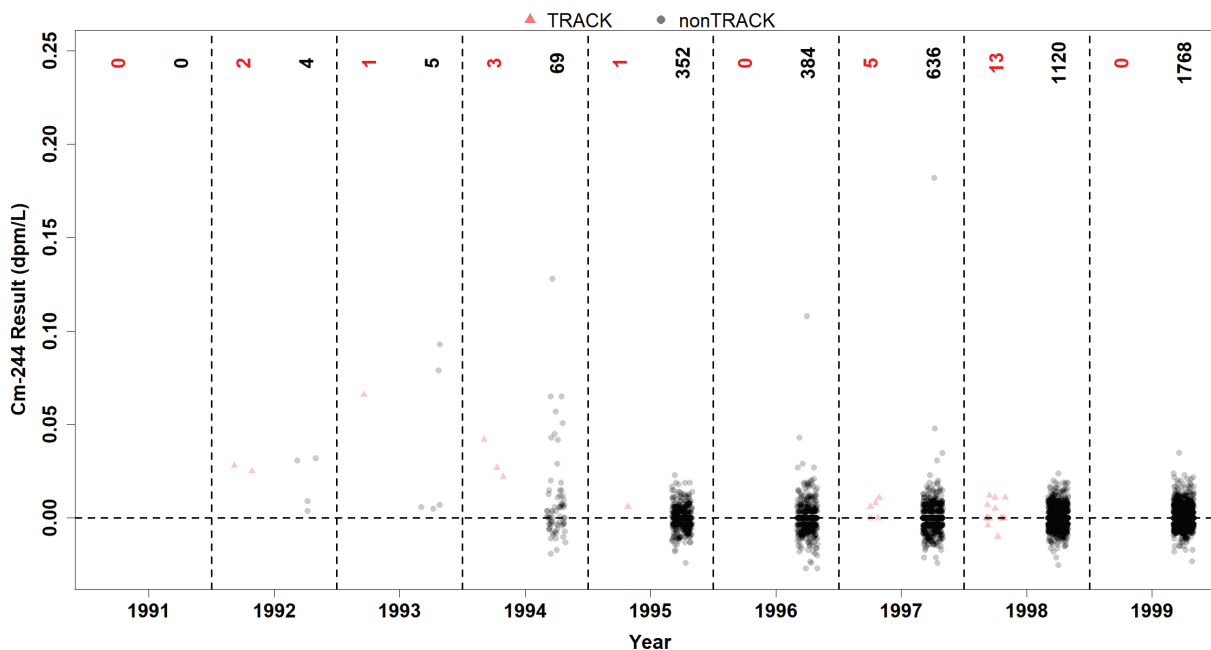


Figure A-3: Scatterplot of TRACK (red triangle, left) and nonTRACK (black circle, right) curium bioassay data, SRS 1991 to 1999. There are 25 TRACK results and 4,338 nonTRACK results.

Table A-2: Summary of bioassay results for curium with and without TRACK results, SRS 1991 to 1999^a.

Year	# of bioassay results (with TRACK)	# of bioassay results (without TRACK)	Mean result in dpm/L (with TRACK)	Mean result in dpm/L (without TRACK)	Median result in dpm/L (with TRACK)	Median Result in dpm/L (without TRACK)	95th Percentile Result in dpm/L (with TRACK)	95th Percentile Result in dpm/L (without TRACK)
1991	0	0	ND	ND	ND	ND	ND	ND
1992	[redacted]	[redacted]	0.022	0.019	0.027	0.020	0.032	0.032
1993	[redacted]	[redacted]	0.043	0.038	0.037	0.007	0.090	0.090
1994	72	69	0.009	0.008	0.002	0.001	0.054	0.055
1995	353	352	0.000	0.000	0.000	0.000	0.012	0.012
1996	384	384	0.000	0.000	0.000	0.000	0.016	0.016
1997	641	636	0.000	0.000	0.000	0.000	0.011	0.011
1998	1,133	1,120	0.000	0.000	0.000	0.000	0.010	0.010
1999	1,768	1,768	0.000	0.000	0.000	0.000	0.009	0.009

a. ND = no data. There were no curium results in 1991.

Californium

The clean NTL file yields 4,338 usable californium results in the period of interest, of which 0.02% are TRACK results. Figure A-4 is the full-scale scatterplot of the californium bioassay data. Table A-3 contains the summary statistics for the californium bioassay data. Based on this figure and table (and the fact that there is only one TRACK result), the TRACK californium results do not tend to exceed nonTRACK results for each year.

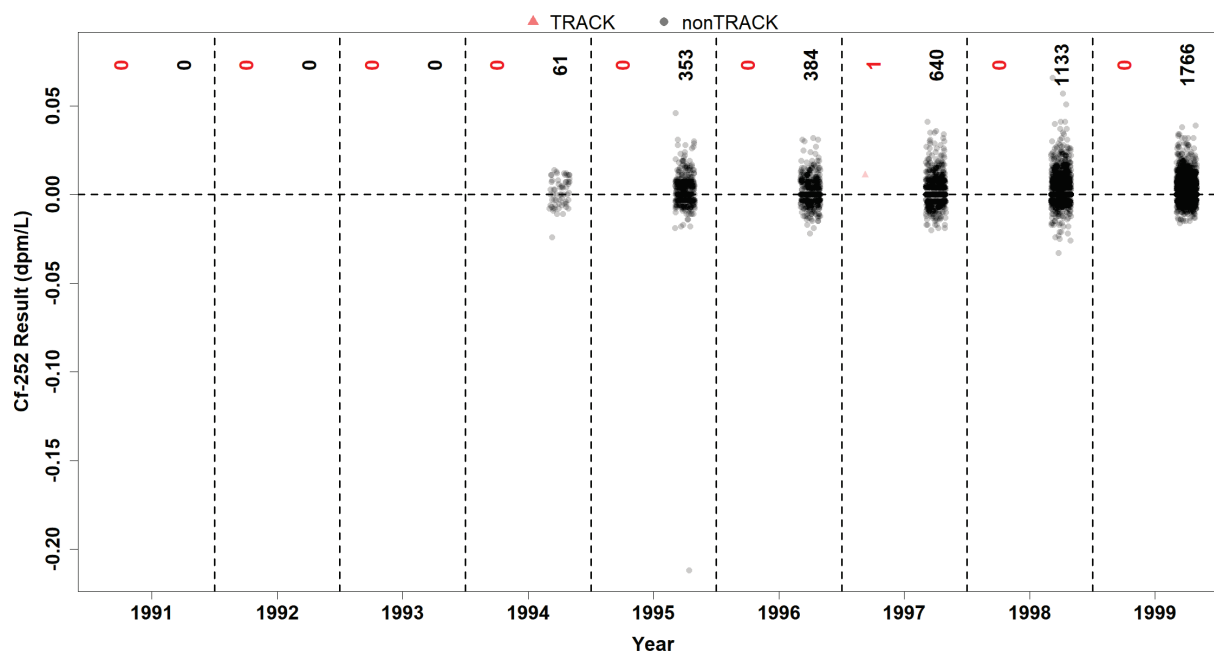


Figure A-4: Scatterplot of TRACK (red triangle, left) and nonTRACK (black circle, right) californium bioassay data, SRS 1991 to 1999. There is one TRACK results and 4,337 nonTRACK results.

Table A-3: Summary of bioassay results for californium with and without TRACK results, SRS 1991 to 1999^a.

Year	# of bioassay results (with TRACK)	# of bioassay results (without TRACK)	Mean result in dpm/L (with TRACK)	Mean result in dpm/L (without TRACK)	Median result in dpm/L (with TRACK)	Median Result in dpm/L (without TRACK)	95th Percentile Result in dpm/L (with TRACK)	95th Percentile Result in dpm/L (without TRACK)
1991	0	0	ND	ND	ND	ND	ND	ND
1992	0	0	ND	ND	ND	ND	ND	ND
1993	0	0	ND	ND	ND	ND	ND	ND
1994	61	61	0.001	0.001	0.000	0.000	0.012	0.012
1995	353	353	0.002	0.002	0.001	0.001	0.018	0.018
1996	384	384	0.002	0.002	0.000	0.000	0.016	0.016
1997	641	640	0.002	0.002	0.000	0.000	0.018	0.018
1998	1,133	1,133	0.003	0.003	0.000	0.000	0.020	0.020
1999	1,766	1,766	0.003	0.003	0.000	0.000	0.015	0.015

a. ND = no data. There were no californium results in 1991, 1992, or 1993.

Neptunium

The clean NTL file yields 4,326 usable neptunium results in the period of interest, of which 0.18% are TRACK results. Figures A-5 and A-6 are the full-scale and zoomed scatterplots of the neptunium bioassay data. Table A-4 contains the summary statistics for the neptunium bioassay data. Based on these figures and table (and the fact that there are only eight TRACK results), the TRACK neptunium results do not tend to exceed nonTRACK results for each year.

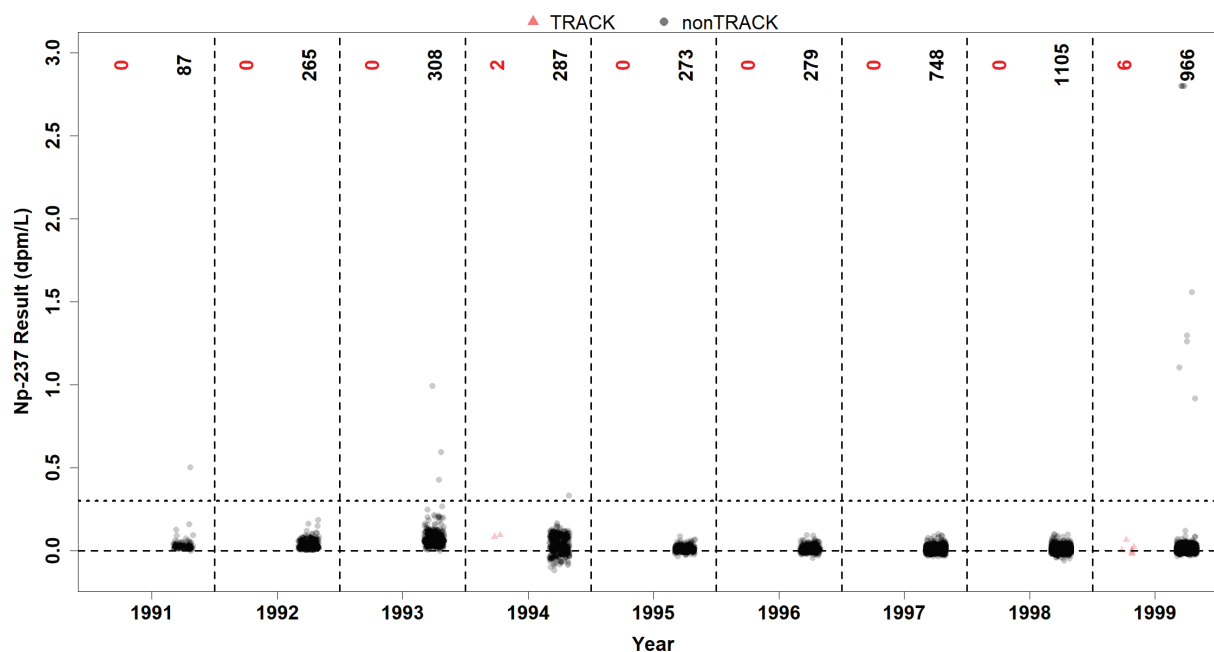


Figure A-5: Scatterplot of TRACK (red triangle, left) and nonTRACK (black circle, right) neptunium bioassay data, SRS 1991 to 1999. There are eight TRACK results and 4,318 nonTRACK results.

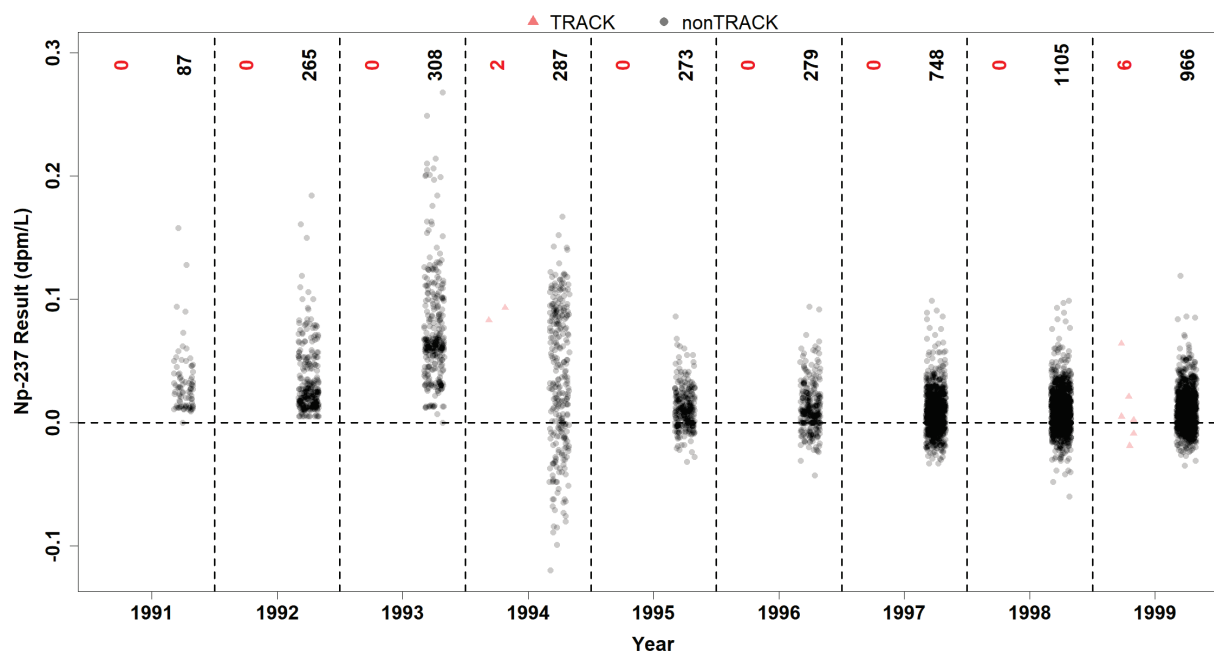


Figure A-6: Scatterplot of TRACK (red triangle, left) and nonTRACK (black circle, right) neptunium bioassay data with a zoomed y-axis, SRS 1991 to 1999. There are eight TRACK results and 4,318 nonTRACK results.

Table A-4: Summary of bioassay results for neptunium with and without TRACK results, SRS 1991 to 1999.

Year	# of bioassay results (with TRACK)	# of bioassay results (without TRACK)	Mean result in dpm/L (with TRACK)	Mean result in dpm/L (without TRACK)	Median result in dpm/L (with TRACK)	Median Result in dpm/L (without TRACK)	95th Percentile Result in dpm/L (with TRACK)	95th Percentile Result in dpm/L (without TRACK)
1991	87	87	0.036	0.036	0.027	0.027	0.085	0.085
1992	265	265	0.034	0.034	0.025	0.025	0.081	0.081
1993	308	308	0.080	0.080	0.064	0.064	0.171	0.171
1994	289	287	0.038	0.038	0.037	0.035	0.116	0.116
1995	273	273	0.012	0.012	0.010	0.010	0.041	0.041
1996	279	279	0.012	0.012	0.009	0.009	0.049	0.049
1997	748	748	0.010	0.010	0.008	0.008	0.040	0.040
1998	1,105	1,105	0.009	0.009	0.007	0.007	0.039	0.039
1999	972	966	0.029	0.029	0.010	0.010	0.043	0.043

Tritium

The clean TL file yields 522,806 usable tritium results in the period of interest, of which 0.05% are TRACK results (1991 through 1993 only). Figures A-7 and A-8 are the full-scale and zoomed scatterplots of the tritium bioassay data. Table A-5 contains the summary statistics for the tritium bioassay data. Based on these figures and table, the TRACK tritium results do not tend to exceed nonTRACK results for each year.

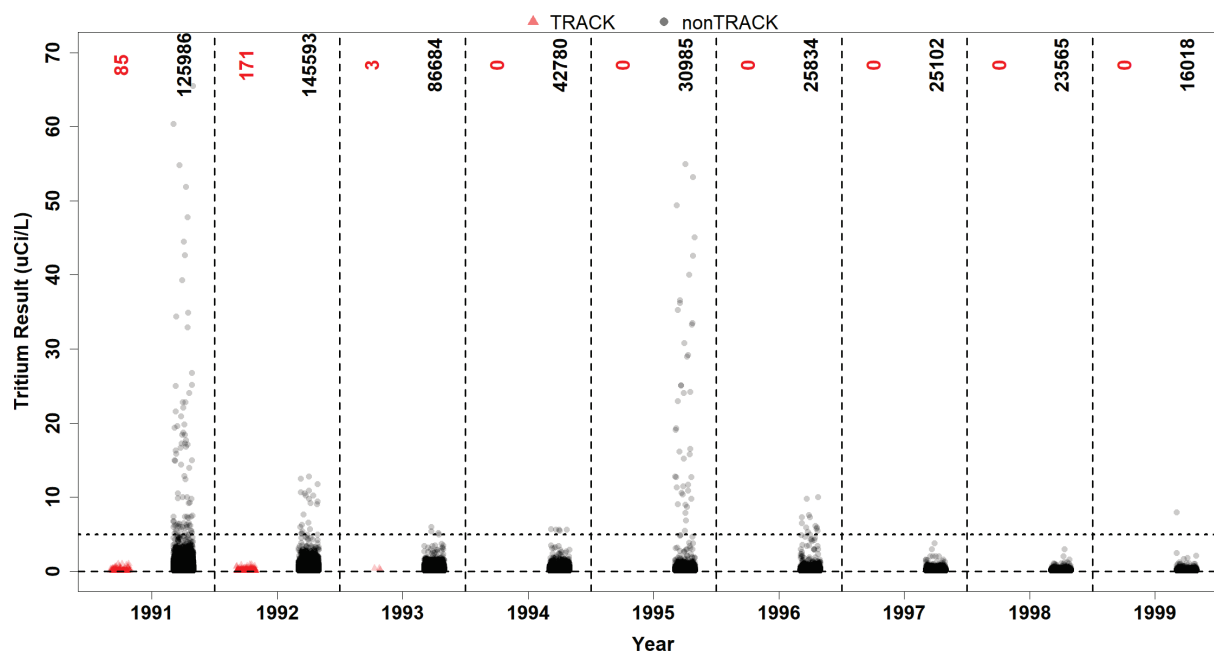


Figure A-7: Scatterplot of TRACK (red triangle, left) and nonTRACK (black circle, right) tritium bioassay data, SRS 1991 to 1999. There are 259 TRACK results and 522,547 nonTRACK results.

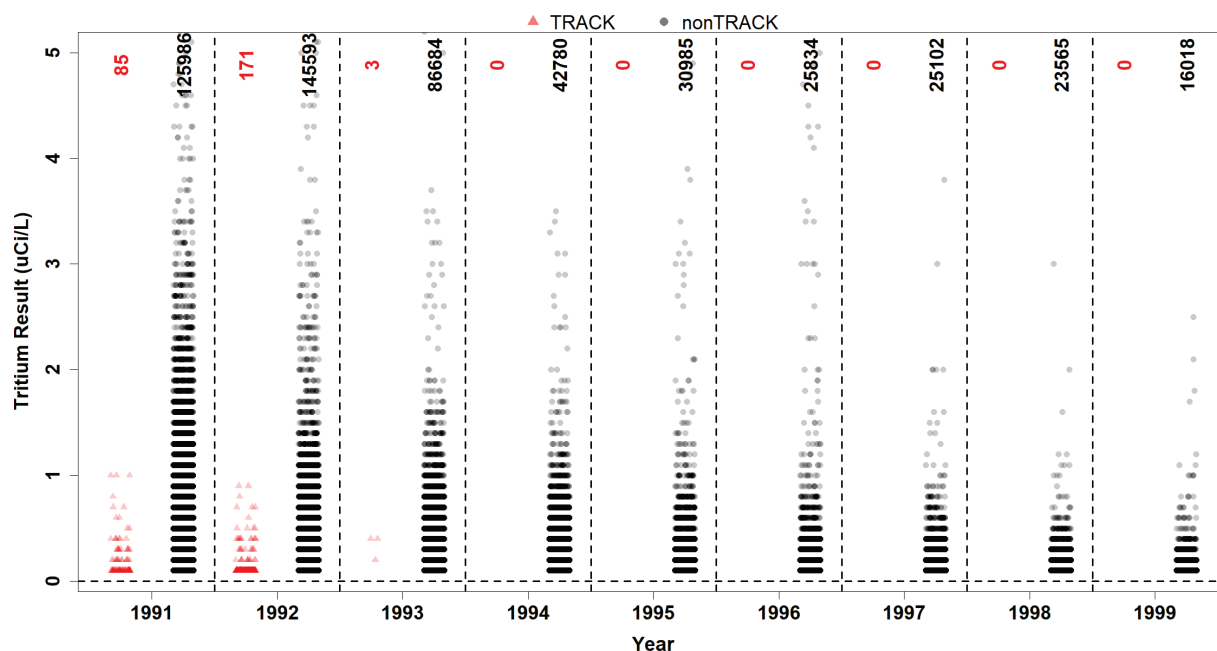


Figure A-8: Scatterplot of TRACK (red triangle, left) and nonTRACK (black circle, right) tritium bioassay data with a zoomed y-axis, SRS 1991 to 1999. There are 259 TRACK results and 522,547 nonTRACK results.

Table A-5: Summary of bioassay results for tritium with and without TRACK results, SRS 1991 to 1999.

Year	# of bioassay results (with TRACK)	# of bioassay results (without TRACK)	Mean result in $\mu\text{Ci/L}$ (with TRACK)	Mean result in $\mu\text{Ci/L}$ (without TRACK)	Median result in $\mu\text{Ci/L}$ (with TRACK)	Median Result in $\mu\text{Ci/L}$ (without TRACK)	95th Percentile Result in $\mu\text{Ci/L}$ (with TRACK)	95th Percentile Result in $\mu\text{Ci/L}$ (without TRACK)
1991	126,071	125,986	0.195	0.195	0.100	0.100	0.500	0.500
1992	145,764	145,593	0.141	0.141	0.100	0.100	0.300	0.300
1993	86,687	86,684	0.131	0.131	0.100	0.100	0.300	0.300
1994	42,780	42,780	0.130	0.130	0.100	0.100	0.300	0.300
1995	30,985	30,985	0.148	0.148	0.100	0.100	0.200	0.200
1996	25,834	25,834	0.119	0.119	0.100	0.100	0.200	0.200
1997	25,102	25,102	0.109	0.109	0.100	0.100	0.100	0.100
1998	23,565	23,565	0.106	0.106	0.100	0.100	0.100	0.100
1999	16,018	16,018	0.106	0.106	0.100	0.100	0.100	0.100

Uranium

The clean NTL file yields 40,430 usable uranium results in the period of interest, of which 0.29% are TRACK results. Figures A-9 and A-10 are the full-scale and zoomed scatterplots of the uranium bioassay data. Table A-6 contains the summary statistics for the uranium bioassay data. Based on these figures and table, the TRACK uranium results do not tend to exceed nonTRACK results for each year.

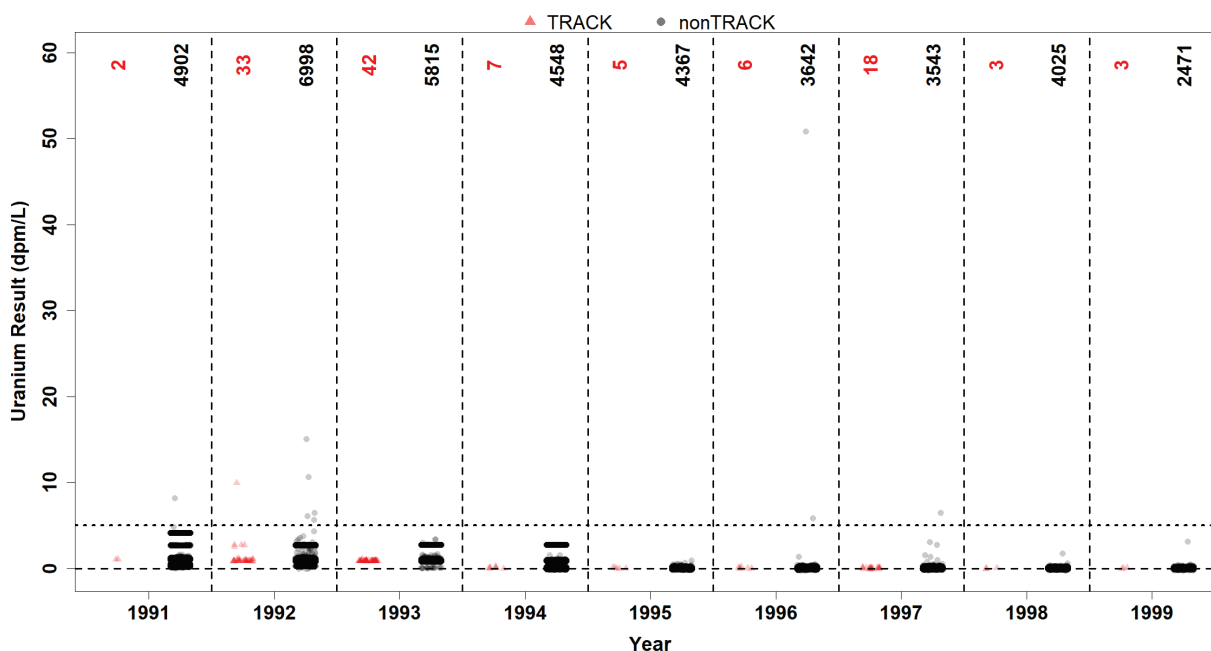


Figure A-9: Scatterplot of TRACK (red triangle, left) and nonTRACK (black circle, right) uranium bioassay data, SRS 1991 to 1999. There are 119 TRACK results and 40,311 nonTRACK results.

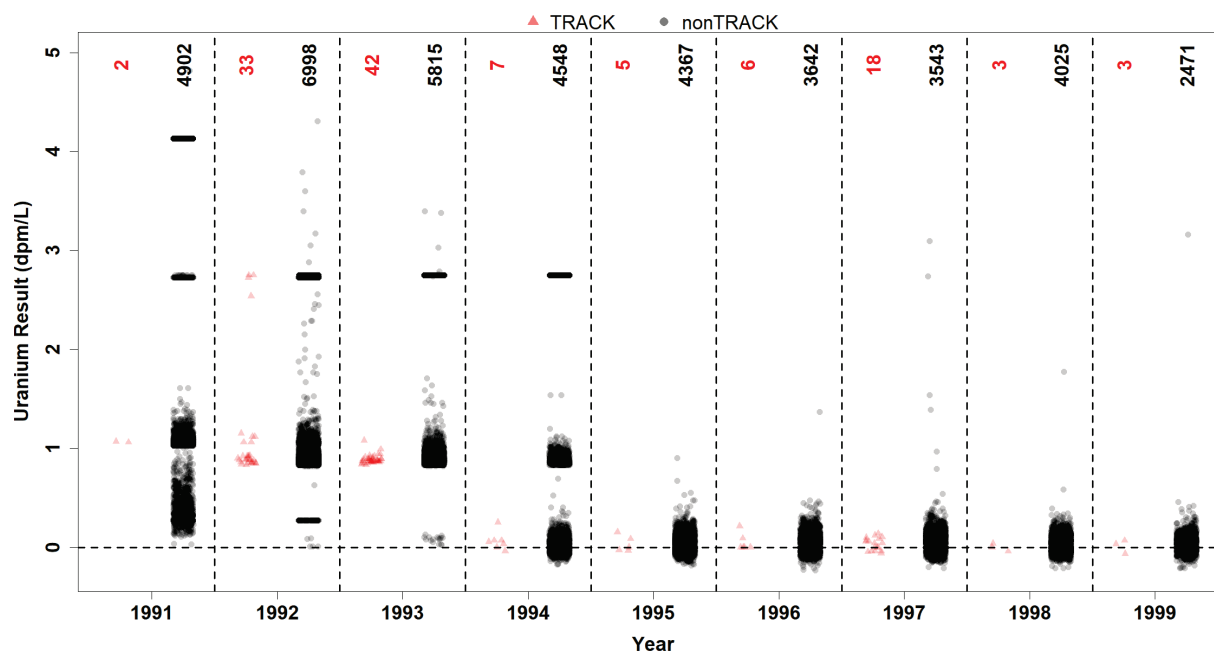


Figure A-10: Scatterplot of TRACK (red triangle, left) and nonTRACK (black circle, right) uranium bioassay data with a zoomed y-axis, SRS 1991 to 1999. There are 119 TRACK results and 40,311 nonTRACK results.

Table A-6: Summary of bioassay results for uranium with and without TRACK results, SRS 1991 to 1999.

Year	# of bioassay results (with TRACK)	# of bioassay results (without TRACK)	Mean result in dpm/L (with TRACK)	Mean result in dpm/L (without TRACK)	Median result in dpm/L (with TRACK)	Median Result in dpm/L (without TRACK)	95th Percentile Result in dpm/L (with TRACK)	95th Percentile Result in dpm/L (without TRACK)
1991	4,904	4,902	1.446	1.446	1.070	1.070	4.130	4.130
1992	7,031	6,998	1.139	1.138	0.900	0.900	2.751	2.751
1993	5,857	5,815	1.297	1.300	0.900	0.900	2.751	2.751
1994	4,555	4,548	0.416	0.417	0.062	0.062	2.751	2.751
1995	4,372	4,367	0.031	0.031	0.002	0.002	0.160	0.161
1996	3,648	3,642	0.052	0.052	0.000	0.001	0.181	0.181
1997	3,561	3,543	0.051	0.051	0.039	0.039	0.194	0.194
1998	4,028	4,025	0.027	0.027	0.002	0.002	0.151	0.151
1999	2,474	2,471	0.032	0.032	0.027	0.027	0.147	0.147