

2011 Radiological Monitoring Results Associated with the Advanced Test Reactor Complex Cold Waste Pond

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ABSTRACT

This report summarizes radiological monitoring performed of the Idaho National Laboratory Site's Advanced Test Reactor Complex Cold Waste wastewater prior to discharge into the Cold Waste Pond and of specific groundwater monitoring wells associated with the Industrial Wastewater Reuse Permit (#LA-000161-01, Modification B). All radiological monitoring is performed to fulfill Department of Energy requirements under the Atomic Energy Act.

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1 BACKGROUND

The radiological information presented in this report is provided based upon an agreement between the Idaho Department of Environmental Quality and the U.S. Department of Energy Idaho Operations Office. This report fulfills the terms of agreement documented in the current Industrial Wastewater Reuse Permit (IWRP) #LA-000161-01 for the Idaho National Laboratory Site's Advanced Test Reactor Complex (ATR Complex, formerly Reactor Technology Complex) Cold Waste Pond (CWP). The IWRP was issued on February 26, 2008 (Johnston 2008) and modified (Modification B) on August 20, 2008 (Eager 2008).

As stated in Section H ("Standard Reporting Requirements"), items 6 and 7 of the IWRP:

- The permittee agrees to provide to the Department the results of radiological monitoring of the effluent, prior to discharge into the percolation pond, with respect to the INL-ATR Complex Cold Waste Pond that is performed to fulfill Department of Energy requirements under the Atomic Energy Act. The permittee agrees to provide the results with the Annual Report.
- The permittee agrees to provide to the Department the results of ground water radiological monitoring with respect to the INL-ATR Complex Cold Waste Pond that is performed to fulfill Department of Energy requirements under the Atomic Energy Act. The permittee agrees to provide the results with the Annual Report.

2 RADIOLOGICAL SAMPLE RESULTS

2.1 Reporting Period

For the ATR Complex CWP, this IWRP reporting year runs from November 1, 2010 through October 31, 2011. As stated in the "Facility Monitoring Table" of Section G of the IWRP, groundwater sampling shall be conducted in April and October each year. Therefore, the groundwater results presented will be from the April and October 2011 sampling events.

2.2 Effluent Sample Results

Samples were collected to satisfy the surveillance objectives of DOE Order 450.1A and the release objectives of DOE Order 5400.5.

Monthly composite samples were collected from TRA-764 (WW-016101) using a flow proportional composite sampler. The monthly composite samples were analyzed by gamma spectrometry, and for gross alpha and gross beta. If the gross beta activity exceeded 15 pCi/L, a contingency analysis for strontium-90 was performed on the sample. Gross beta levels exceeded 15 pCi/L in the samples collected in December and July. In addition, a strontium-90 analysis was performed on the August sample. Strontium-90 levels were below detection levels in all three samples.

Additional iodine-129 and tritium analyses were performed on the sample collected in August 2011. The results for these radionuclides were reported as undetected by the laboratory.

All monthly gamma spectrometry results were reported as undetected with the exception of the July 26, 2011 duplicate potassium-40 sample at 39.7 pCi/L. Potassium-40 is a naturally occurring isotope of potassium and has been detected occasionally in samples collected in previous years.

Table 1 shows the monthly gross alpha and gross beta results. Positive detections are considered measurements exceeding the instrument's minimum detection level and greater than two times the uncertainty. Low activity levels for these two parameters (DEQ 2005) can be found in groundwater samples collected from wells considered to be representative of background conditions (wells not impacted by INL operations). It is likely that some of the gross alpha and gross beta activity detected in the ATR Complex Cold Waste Pond effluent is from the background activity found in the groundwater that is used in the Cold Waste System.

Table 1. Advanced Test Reactor Complex Cold Waste Pond effluent gross alpha and gross beta radiological results for the period of November 2010 through October 2011.

Sample Month	Gross Alpha (pCi/L)	Gross Beta (pCi/L)
November 2010	ND ^a	6.66 (± 1.43) ^b
December 2010	2.84 (± 0.855)	23.3 (± 2.18)
January 2011	ND	11.4 (± 1.58)
February 2011	2.51 (± 0.951)	ND
March 2011	ND	ND
April 2011	ND	9.13 (± 1.57)
May 2011	2.51 (± 1.1)	4.12 (± 1.3)
June 2011	ND	ND
July 2011	2.98 (± 0.798) 2.6 ^c (± 0.825)	21.6 (± 2.12) 21.1 ^c (± 2.15)
August 2011	ND	3.91 (± 1.16)
September 2011	ND	5.24 (± 1.3)
October 2011	2.42 (± 0.969)	3.34 (± 1.08)

a. ND – Not detected.
b. One sigma uncertainty shown in parenthesis.
c. Duplicate sample result.

2.3 Groundwater Sample Results

Samples were collected to satisfy the surveillance objectives of DOE Order 450.1A.

Groundwater samples for radiological parameters were collected from aquifer wells Middle-1823, TRA-07, TRA-08, USGS-065, and USGS-076 in April and October 2011. A field duplicate sample was collected from USGS-076 on April 5, 2011. Samples were analyzed by gamma spectrometry, and for gross alpha, gross beta, tritium, and strontium-90.

Table 2 shows the positive detections for gross alpha, gross beta, and tritium in well samples collected in April and October 2011. Low activity levels for these three parameters (DEQ 2005) can be found in groundwater samples collected from wells considered to be representative of background conditions (wells not impacted by INL operations).

In addition, cobalt-60 was detected in the October 12, 2011 sample collected from well TRA-07 (Table 2). Positive detections are considered measurements exceeding the instrument's minimum detection level and greater than two times the uncertainty. All other radiological sample results for April and October were reported as undetected.

Table 2. Positive detection results from samples collected in April and October 2011 from the Advanced Test Reactor Complex Cold Waste Pond Industrial Wastewater Reuse Permit monitoring wells.

Monitoring Well	Sample Date	Parameter	Sample Result (pCi/L)	
USGS-065	04/06/11	Gross Alpha	2.83 (\pm 1.09) ^a	
		Gross Beta	7.54 (\pm 1.52)	
		Tritium	4,280 (\pm 450)	
	10/11/11	Gross Alpha	4.28 (\pm 1.15)	
		Gross Beta	4.71 (\pm 1.23)	
		Tritium	4,230 (\pm 455)	
TRA-07	04/06/11	Gross Alpha	2.43 (\pm 0.939)	
		Gross beta	13.7 (\pm 1.88)	
		Tritium	8,750 (\pm 888)	
	10/12/11	Gross Alpha	7.52 (\pm 1.7)	
		Gross Beta	9.08 (\pm 1.51)	
		Cobalt-60	4.74 (\pm 1.05)	
		Tritium	8,810 (\pm 902)	
TRA-08	04/06/11	Gross Alpha	4.33 (\pm 1.36)	
		Gross Beta	4.09 (\pm 1.33)	
		Tritium	1,500 (\pm 185)	
	10/11/11	Gross Alpha	4.38 (\pm 1.18)	
		Gross Beta	4.36 (\pm 1.16)	
		Tritium	1,420 (\pm 191)	
USGS-076	04/05/11	Gross Alpha	ND ^b 5.7 ^c (\pm 1.12)	
		Gross Beta	ND 6.11 ^c (\pm 0.992)	
		Tritium	519 (\pm 100) 548 ^c (\pm 105)	
	10/12/11	Gross Alpha	2.44 (\pm 0.935)	
		Gross Beta	3.27 (\pm 1)	
		Tritium	751 (\pm 138)	
	Middle-1823	04/05/11	Gross Alpha	1.56 (\pm 0.575)
			Gross Beta	ND
Tritium			976 (\pm 139)	
10/12/11		Gross Alpha	2.92 (\pm 1.04)	
		Gross Beta	ND	
		Tritium	1,070 (\pm 162)	
a. One sigma uncertainty shown in parentheses. b. ND – Not detected. c. Analytical result from field duplicate sample collected on April 5, 2011.				

3 REFERENCES

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