Summary of Analytical Results
Environmental Monitoring for Radionuclides
Associated with the Fukushima Nuclear Accident

May 5, 2011

Preface

The IEMA Bureau of Environmental Safety (BES) routinely monitors for radioactivity in various media in the environment surrounding nuclear generating stations and other nuclear facilities in Illinois. The monitoring program also includes the collection of "background" data from locations away from the nuclear sites. In the aftermath of the Japanese earthquake and tsunami and the subsequent release of radioactive effluents from their Fukushima nuclear installations, BES began reviewing data from background locations and collecting additional samples of the various media at locations away from nuclear sites in an attempt to identify radionuclides that may be transported by the north pacific wind currents.

The result has been the identification of minute quantities of radioactive elements that are consistent with those released from the Fukushima reactors or fuel pools. BES results are consistent with those identified by the United States Environmental Protection Agency (USEPA) and other states in the western part of the U.S. In all cases where radionuclides could be detected, the concentrations were an extremely small fraction of the allowable limit and resulting dose for their respective exposure pathway.

This report is an update to the report posted April 19, 2010. Updates are highlighted in blue.

Air Particulates

Post Fukushima air particulate monitoring performed by IEMA has detected trace amounts of I-131 in samples collected in Springfield, Illinois. The results are consistent with airborne concentrations that would be anticipated as a consequence of the Japanese nuclear accident. Other radionuclides associated with the accident have not been detected in air samples. As we would anticipate, the concentrations observed in Illinois are much lower than those seen in western states and are more than 2,000 times less than the USNRC limit for airborne emissions. (Previously the result was reported as more than 200,000 times smaller than the limit; this was due to incorrectly converting the units used). Breathing air containing these trace

amounts of I-131 would result in an individual receiving a radiation dose that would be 500 times less than they would receive from a single chest x-ray.

Under the IEMA Environmental Monitoring program, air samples are collected in two parts: particulates and cartridges. Particulate filters use a glass-fiber filter, similar to those used in vacuum cleaners or home air cleaning systems, to collect small particles in the air. Cartridges use an absorbent material like charcoal to collect vapors and gases. Both types of filters are analyzed by the IEMA radiochemistry laboratory for radionuclides associated with nuclear power plant operations. The results in the table below are given in picocuries per cubic meter of air (pCi/m^3) and compared to the regulatory limit. "ND" indicates that the radionuclide was not detected and the smallest quantity we expect to see is given in parenthesis.

Concentrations in both Springfield and West Chicago have decreased as the I-131 is washed out of the atmosphere. As air sampling is the most sensitive method of detecting new incidents of I-131, IEMA will continue to monitor the air even after the concentrations have decreased to levels we cannot detect.

No fallout materials have been detected in air samples since the second week of April. If no fallout materials are detected at either location in the next two weeks, we will cease I-131 analysis for West Chicago air samples. Routine I-131 analysis of samples collected in Springfield will continue as part of the background monitoring program.

IEMA Air Sampling Concentrations

Location	Start Date	Stop Date	Type	I-131 (pCi/m^3)	Limit (pCi/m^3)	Cs-137 (pCi/m^3)	Limit (pCi/m^3)	Cs-134 (pCi/m^3)	Limit (pCi/m^3)
Springfield	21-Mar	28-Mar	Total	0.098	200	ND (0.01)	200	ND (0.01)	200
			Particulate	0.031		ND (0.01)		ND (0.01)	
			Cartridge	0.067					
Springfield	28-Mar	4-Apr	Total	0.074	200	ND (0.01)	200	ND (0.01)	200
			Particulate	0.026		ND (0.01)		ND (0.01)	
			Cartridge	0.048					
Springfield	4-Apr	11-Apr	Total	0.04	200	ND (0.01)	200	ND (0.01)	200
			Particulate	ND (.01)		ND (0.01)		ND (0.01)	
			Cartridge	0.029					
Springfield	11-Apr	18-Apr	Total	ND	200	ND (0.01)	200	ND (0.01)	200
			Particulate	ND (0.02)		ND (0.01)		ND (0.01)	
			Cartridge	ND (0.02)					
Springfield	18-Apr	25-Apr	Total	ND	200	ND (0.03)	200	ND (0.03)	200
			Particulate	ND (0.03)		ND (0.03)		ND (0.03)	
			Cartridge	ND (0.05)					
Springfield	25-Apr	5-May	Total	ND	200	ND (0.01)	200	ND (0.01)	200
			Particulate	ND (0.01)		ND (0.01)		ND (0.01)	
			Cartridge	ND (0.04)					
West Chicago	30-Mar	6-Apr	Total	0.091	200	ND (0.01)	200	ND (0.01)	200
			Particulate	0.017		ND (0.01)		ND (0.01)	

			Cartridge	0.074					
West Chicago	6-Apr	13-Apr	Total	0.02	200	ND (0.01)	200	ND (0.01)	200
			Particulate	ND (0.02)		ND (0.01)		ND (0.01)	
			Cartridge	0.012					
West Chicago	13-Apr	20-Apr	Total	ND	200	ND (0.01)	200	ND (0.01)	200
			Particulate	ND (0.02)		ND (0.01)		ND (0.01)	
			Cartridge	ND (0.02)					
West Chicago	20-Apr	27-Apr	Total	ND	200	ND (0.01)	200	ND (0.01)	200
			Particulate	ND (0.02)		ND (0.01)		ND (0.01)	
			Cartridge	ND (0.01)					

Grass

IEMA has detected minute quantities of I-131, Cs-137 and Cs-134 on grass and vegetation samples collected from various locations throughout the State of Illinois. The materials identified are consistent with the materials released by the Japanese nuclear accident. As radioactive materials from the Japanese nuclear accident are carried across the country on air currents, particulates eventually settle out and fall to the ground. Grass and leafy vegetables provide a large surface area where these materials can collect and eventually be consumed by grazing animals or humans. To date, no leafy vegetable samples have been collected as it is too early in the growing season. Although humans do not consume grass, the analysis results for grass provide a good indication of what we might expect on leafy vegetables. I-131 has been detected on all samples; Cs-137 and Cs-134 were detected on two of the samples. In all cases, the amount of Cs-137 and Cs-134 was less than 1% of the guideline established by FDA for human consumption. I-131 was less than 25% of the guideline. Concentrations are decreasing somewhat faster than anticipated, presumably because it is washing off the vegetation into the ground. As there is no I-131 detected in the air samples, it is unlikely that more has collected on the ground. Concentrations at the Central Illinois station have decreased to undetectable levels. A follow-up sample will be collected and analyzed from a Southern location; if all these samples are undetectable, we will cease collection and analysis.

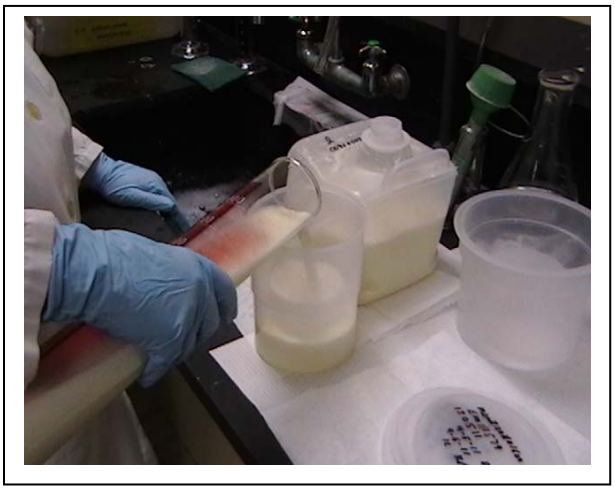
Grass and vegetation samples are analyzed by the IEMA laboratory for radionuclides associated with nuclear power plants. The results are given in picocuries per kilogram of sample (pCi/kg) and compared to the FDA recommended limit. "ND" indicates that the radionuclide was not detected and the smallest quantity we expect to see is given in parenthesis.

IEMA Vegetation Sampling Concentrations

Location	Date	I-131 (pCi/kg)	Limit (pCi/kg)	Cs-137 (pCi/kg)	Cs-134 (pCi/kg)	Limit (pCi/kg)[1]
Northern IL	23-Mar	180	4600	ND(12)	ND(12)	32000
Southern IL 1	30-Mar	450	4600	50	50	32000
	12-Apr	68	4600	15	11	32000
Southern IL 2	30-Mar	1050	4600	160	140	32000
Central IL	31-Mar	480	4600	ND (35)	30	32000
	6-Apr	201	4600	ND (23)	ND (23)	32000
	15-Apr	57	4600	ND (13)	ND (12)	32000
	26-Apr	(ND) 19	4600	ND (17)	ND (20)	32000
	3-May	(ND) 39	4600	ND (43)	ND (40)	32000

[1] Limit for combined Cs-137 and Cs-134

Milk



Historically, milk had been a primary media for concentration of effluents deposited on vegetation. As domestic grazing animals, cows represent the consummate bio-accumulator for certain radionuclides. While grazing practices have changed and results can be affected seasonally, IEMA has detected trace amounts of I-131 in milk samples at levels consistent with the concentrations anticipated from the Japanese nuclear accident. Other nuclides associated with the accident were not detected.

The concentrations of I-131 in milk identified by IEMA are higher than those reported by USEPA in other states. However, the results are still extremely low when compared to FDA limits for human consumption. It is important to note that the samples collected were obtained with the express intent of finding the highest concentration available. The milk sample labeled "Central IL 1" was a bottled milk sample purchased from a central Illinois supermarket and represents what can be expected to reach the Illinois consumer.

To that end, IEMA sought out individual farms where cows were grazing on local grass; most dairy cows in Illinois are fed a diet of stored feed which would not be affected by the Japanese fallout. This explains why I-131 is not detected in milk from northern dairies. The highest concentration measured is still more than 240 times less than the guideline established by the FDA. An individual would have to consume over 80 gallons of milk in order to receive the same radiation dose they would receive from a single chest x-ray. Since I-131 has a short half-life (eight days), it is anticipated that the concentrations in Illinois milk will decrease to undetectable levels in a few weeks. This is borne out by the data below.

Even with detectable concentrations of I-131 on grass and in the air, we have seen very few cases of detects in milk – primarily because the cattle are consuming stored feed. It is clear that the Japanese fallout has had little or no impact on Illinois milk. Given that the concentrations in air and on grass have reached undetectable levels, IEMA will return to routine collection and analysis of milk samples. The importance of having background sampling locations well away from Illinois' nuclear power plants has become clear. To that end, IEMA is working with other State agencies to identify and establish suitable sampling locations.

Milk samples are analyzed by the IEMA laboratory for radionuclides associated with nuclear power plants. The results are given in picocuries per liter of milk (pCi/L) and compared to the FDA recommended limit. "ND" indicates that the radionuclide was not detected and the smallest quantity we expect to see is given in parenthesis.

IEMA Milk Sampling Concentrations

Location	Date	I-131 (pCi/L)	Limit (pCi/L)	Cs-137 (pCi/L)	Cs-134 (pCi/L)	Limit (pCi/L)[1]
Southern IL 1	30-Mar	4	4600	ND (3)	ND (3)	32000
Southern IL 2	31-Mar	19	4600	ND (2)	ND (2)	32000
	15-Apr	9	4600	ND (2)	ND (2)	32000
Northern IL 1	30-Mar	ND (4)	4600	ND (4)	ND (5)	32000
	5-Apr	ND(3)	4600	ND (3)	ND (4)	32000
	19-Apr	ND(3)	4600	ND (3)	ND (4)	32000
Northern IL 2	31-Mar	ND (4)	4600	ND (3)	ND (4)	32000
	7-Apr	ND (5)	4600	ND (4)	ND (4)	32000
	26-Apr	ND(3)	4600	ND (2)	ND (2)	32000
Northern IL 3	31-Mar	ND (4)	4600	ND (3)	ND (4)	32000
	7-Apr	ND (4)	4600	ND (2)	ND (3)	32000
	26-Apr	ND (4)	4600	ND (3)	ND (4)	32000
Northern IL 4	5-Apr	ND (3)	4600	ND (2)	ND (3)	32000
Northern IL 5	1-Apr	ND (3)	4600	ND (4)	ND (3)	32000
	15-Apr	ND (5)	4600	ND (4)	ND (4)	32000
Northern IL 6	5-Apr	ND (4)	4600	ND (4)	ND (4)	32000
Northern IL 7	28-Apr	ND (7)	4600	ND (2)	ND (2)	32000
Central IL 1	6-Apr	ND (4)	4600	ND (3)	ND (4)	32000
	15-Apr	ND (2)	4600	ND (2)	ND (2)	32000

[1] Limit for combined Cs-137 and Cs-134

Rain Water

IEMA has detected minute quantities of I-131 in rain water collected in Springfield and West Chicago, consistent with materials released by the Japanese nuclear accident. Other nuclides associated with the accident were not detected. The samples consisted of the collected run-off from the roofs of IEMA's Springfield laboratory and two buildings near IEMA's West Chicago laboratory. The samples were analyzed for all radionuclides associated with nuclear power plants.

There is no standard for radionuclides in rainwater. Other states have compared rainwater concentrations to the USEPA's standard for drinking water. As in those states, the concentrations seen in Illinois are higher than the drinking water standard. We believe, however that comparison to drinking water invites false comparisons for several reasons. First, most drinking water sources in Illinois are ground water sources; while rain water will impact these sources, much of the iodine will have decayed or been diluted before it becomes drinking water. Second, the water treatment process will remove much of the remaining iodine before the water is distributed.

A more appropriate and useful standard is to compare to the USNRC standard for liquid effluents. This standard is used for any runoff or liquid discharge from a site. The concentrations of I-131 were more than 30 times less than the limit for liquid effluents released from operating nuclear power plants. Those limits are given below in the table of results. An individual consuming only this rainwater for a year would receive the same amount of radiation as from a dental x-ray. Of course, concentrations are not expected to remain at this level for an entire year as the I-131 will decay and be diluted.

No fallout materials have been detected in Springfield precipitation since the second week of April; no precipitation has been collected in West Chicago since that time, but it is likely that concentrations there have similarly decreased. Another precipitation sample

will be collected from the West Chicago stations as soon as conditions permit. If no fallout is detected in that sample, IEMA will reduce the frequency of precipitation sampling at both locations.

Rain water samples are analyzed by the IEMA laboratory for radionuclides associated with nuclear power plants. The results are given in picocuries per liter of water (pCi/L). "ND" indicates that the radionuclide was not detected and the smallest quantity we expect to see is given in parenthesis.

IEMA Precipitation Sampling Concentrations

Location	Date	I-131 (pCi/L)	Limit (pCi/L)	Cs-137 (pCi/L)	Limit (pCi/L)	Cs-134 (pCi/L)	Limit (pCi/L)	Sr-90/Sr-89 (pCi/L)	Limit (pCi/L)
Springfield (roof drain)	4-Apr	12	1000	ND (4)	1000	ND (4)	900	ND (0.5)	500
	9-Apr	2	1000	ND (3)	1000	ND (4)	900	ND (0.5)	500
	11-Apr	ND (3)	1000	ND (3)	1000	ND (3)	900	ND (0.5)	500
	15-Apr	2	1000	ND (2)	1000	ND (2)	900	ND (0.5)	500
	18-Apr	ND (3)	1000	ND (3)	1000	ND (3)	900	ND (0.5)	500
	26-Apr	ND (5)	1000	ND (4)	1000	ND (3)	900	ND (0.5)	500
	5-May	ND (3)	1000	ND (3)	1000	ND (3)	900	ND (0.5)	500
W. Chicago PSF (roof drain)	1-Apr	27	1000	ND (3)	1000	ND (3)	900	ND (0.5)	500
	15-Apr	10	1000	ND (4)	1000	ND (4)	900		
W. Chicago WTP (roof drain)	1-Apr	33	1000	ND (3)	1000	ND (4)	900	ND (0.5)	500
	15-Apr	9	1000	ND (3)	1000	ND (3)	900		