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Analysis Report

RAP110411-OCJ-EN

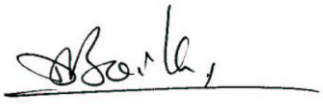
ANALYSIS
Object : Evaluation of the environmental consequences in Japan caused by the Fukushima nuclear power plant accident
comment(s):These analyses are performed free of charge at the demand of Japanese citizens.

REPORT ID
RAP110411-OCJ-EN FROM **: 04/11/11** version : **01**
Number of pages : 7 (including annexes)
comment(s) :

SAMPLES TYPES
☑ ENVIRONMENT MATRICES (SOILS, LIQUIDS)

QUANTITY	
9 Samples	received : 04/04/2011

ANALYSES PERFORMED
☑ MEASUREMENT OF GAMMA EMITTERS RADIONUCLIDES BY GAMMA SPECTROMETRY
SEARCH FOR ARTIFICIAL NUCLIDES

VISA	
EDITOR	APPROVAL
	
Name	Name
Mylène JOSSET	David BOILLEY

1. SAMPLE IDENTIFICATION

Reception date : April 4th , 2011
The samples were collected by Japanese citizens according to the regular instructions and methodology provided by ACRO. The samples characteristics are given in the table below.

N°	Nature	Collection Date (local)	Location	origine	Dimensions	Mass/Volume collected	References
1	Soil	03/31/11 1 :10 pm	Kawamata ville, Yamakiya Mukaihigashiyama 川俣町山木屋向東山	Garden	10 cm x 10 cm Depth 0-2 cm	311 g	110322-XFD-01
2	Fresh water	03/31/11 2 :40 pm	Iitate Village Iidoi Takishita 飯舘村飯樋滝下	River	-	500 ml	110322-XFD-02
3	Soil	03/31/11 3 :20 pm	Iitate Village Sekine 飯舘村関根	Farm	10 cm x 10 cm Depth 0-2 cm	244 g	110322-XFD-03
4	Fresh water	03/31/11 3 :23 pm	Iitate Village Sekine 飯舘村関根	Well	-	500 ml	110322-XFD-04
5	Soil	03/31/11 3 :58 pm	Iitate Village Maeda 飯舘村前田	Rice paddy	10 cm x 10 cm Depth 0-2 cm	268 g	110322-XFD-05
6	Soil	03/31/11 3 :00 pm	Iitate Village Maeda 飯舘村前田	Farm	10 cm x 10 cm Depth 0-2 cm	233 g	110322-XFD-06
7	Rain water	03/31/11 3 :08 pm	Iitate Village Maeda 飯舘村前田	Collected in a bucket since the earthquake		500 ml	110322-XFD-07
8	Soil	03/31/11 5 :00 pm	Fukushima City Ohnami 福島市大波	Rice paddy	10 cm x 10 cm Depth 0-2 cm	225 g	110322-XFD-08
9	Soil	03/31/11 5 :50 pm	Kawamata Town Iisaka 川俣町飯坂	Rice Paddy	10 cm x 10 cm Depth 0-2 cm	243 g	110322-XFD-03

ANALYSIS METHOD

The analyses are performed by Gamma spectrometry (see annex 1).
The results are displayed in the following tables.
Please note that the analyses will be performed again later after the decay of short-lived nuclides. This is mandatory for checking the presence of other radionuclides (time needed for the equilibrium decay from disintegration chains, suppression of the Compton background).

1. RESULTS 1/3 – ACTIVITY FOR SOILS (Bq/kg)

Sample identification												
Registration number		110404-OCJ-01			110404-OCJ-03			110404-OCJ-05		110404-OCJ-06		110404-OCJ-08			110404-OCJ-09		
Kind - species		Soil			Soil			Soil		Soil		Soil			Soil		
Depth		*0 - 2 cm*			*0 - 2 cm*			*0 - 2 cm*		*0 - 2 cm*		*0 - 2 cm*			*0 - 2 cm*		
Sample																	
Date		31/03/11			31/03/11			31/03/11		31/03/11		31/03/11			31/03/11		
Place		**Kiya**			**Sekine**			**Maeda**		**Maeda**		**Ohnami**			**Iisaka**		
		Mukaihigashiyama															
City, Town		**Kawamata**			**Iitate**			**Iitate**		**Iitate**		**Fukushima**			**Kawamata**		
Localisation		**flower bed**			**Farm**			**rice paddy**		**Farm**		**rice paddy**			**rice paddy**		
surface area		100 cm^2			100 cm^2			100 cm^2		100 cm^2		100 cm^2			100 cm^2		
total mass (g)		311			244			268		233		225			243		
Counting																	
Geometry or volume (en cm^3)		61cm^3			61cm^3			61cm^3		61cm^3		61cm^3			61cm^3		
analysed sample mass		80,2 g			63,4 g			91,2 g		72,3 g		84,4 g			76,8		
age of the sample (days)		8,7			4,1			7		7,3		4,4			6,2		
Result																	
Reference date		31/03/2011			31/03/2011			31/03/2011		31/03/2011		31/03/2011			31/03/2011		
Unit		Bq/kg			Bq/kg			Bq/kg		Bq/kg		Bq/kg			Bq/kg		
ARTIFICIALS RADIONUCLIDES																	
Zr-95 / Nb-95	64 days	INQ			INQ			INQ		INQ		INQ			INQ		
Te-132 / I-132	3.2 days	**3,600**	±	**500**	**6,800**	±	**800**	**7,300**	±	**900**	**16,400**	±	**1,900**	**6,700**	±	**1,000**	**1,460**	±	**200**
I-131	8 days	**26,500**	±	**3,200**	**48,300**	±	**4,200**	**43,400**	±	**3,800**	**81,000**	±	**7,000**	**47,000**	±	**6,000**	**19,800**	±	**1,700**
Cs-134	2.1 years	**6,800**	±	**800**	**13,900**	±	**1,200**	**17,900**	±	**1,500**	**39,600**	±	**3,300**	**16,300**	±	**1,900**	**3,230**	±	**280**
Cs-136	1.2 days		<	20	**1,020**	±	**110**	**1,400**	±	**130**	**2,960**	±	**280**	**1,370**	±	**180**	**236**	±	**26**
Cs-137	30 year	**6,800**	±	**800**	**13,900**	±	**1,200**	**17,900**	±	**1,500**	**39,600**	±	**3,300**	**16,300**	±	**1,900**	**3,230**	±	**280**
Ba-140 / La-140	12.7 days	**270**	±	**150**	**890**	±	**130**	**830**	±	**200**	**1,520**	±	**260**	INQ			**104**	±	**75**

Note : Te-132/I-132 and Ba-140/La-140 are separate disintegration pairs and are observed at equilibrium. The indicated activity takes into account the presence of both elements.

2. RESULTS 2/3 – SURFACE ACTIVITY FOR SOILS (Bq/m²)

Sample identification													
Registration number		110404-OCJ-01			110404-OCJ-03			110404-OCJ-05			110404-OCJ-06			110404-OCJ-08			110404-OCJ-09		
Kind - species		Soil			Soil			Soil			Soil			Soil			Soil		
depth		*0 - 2 cm*			*0 - 2 cm*			*0 - 2 cm*			*0 - 2 cm*			*0 - 2 cm*			*0 - 2 cm*		
Sample																			
Date		31/03/11			31/03/11			31/03/11			31/03/11			31/03/11			31/03/11		
Place		**Kiya**			**Sekine**			**Maeda**			**Maeda**			**Ohnami**			**Iisaka**		
		Mukaihigashiyama																	
City, Town		**Kawamata**			**Iitate**			**Iitate**			**Iitate**			**Fukushima**			**Kawamata**		
Localisation		**flower bed**			**farm**			**rice paddy**			**farm**			**rice paddy**			**rice paddy**		
surface area		100 cm²			100 cm²			100 cm²			100 cm²			100 cm²			100 cm²		
total mass (g)		311			244			268			233			225			243		
Counting																			
Geometry or volume (en cm³)		61cm³			61cm³			61cm³			61cm³			61cm³			61cm³		
analysed sample mass		80.2 g			63.4 g			91.2 g			72.3 g			84.4 g			76.8 g		
Results																			
Reference date		31/03/2011			31/03/2011			31/03/2011			31/03/2011			31/03/2011			31/03/2011		
Unit		Bq/m²			Bq/m²			Bq/m²			Bq/m²			Bq/m²			Bq/m²		
ARTIFICIALS RADIONUCLIDES																			
Zr-95 / Nb-95	64 days	INQ			INQ			INQ			INQ			INQ			INQ		
Te-132 / I-132	3.2 jours	**111,960**	±	**15,550**	**165,920**	±	**19,520**	**195,640**	±	**24,120**	**382,120**	±	**44,270**	**150,750**	±	**22,500**	**35,478**	±	**4,860**
I-131	8 jours	**824,150**	±	**99,520**	**1,178,520**	±	**102,480**	**1,163,120**	±	**101,840**	**1,887,300**	±	**163,100**	**1,057,500**	±	**135,000**	**481,140**	±	**41,310**
Cs-134	2.1 ans	**211,480**	**±**	**24,880**	**339,160**	**±**	**29,280**	**479,720**	**±**	**40,200**	**922,680**	**±**	**76,890**	**366,750**	**±**	**42,750**	**78,489**	**±**	**6,804**
Cs-136	13.2 jours		<	622	**24,888**	**±**	**2,684**	**37,520**	**±**	**3,484**	**68,968**	**±**	**6,524**	**30,825**	**±**	**4,050**	**5,735**	**±**	**631**
Cs-137	30 ans	**211,480**	±	**24,880**	**339,160**	±	**29,280**	**479,720**	±	**40,200**	**922,680**	±	**76,890**	**366,750**	±	**42,750**	**78,489**	±	**6,804**
Ba-140 / La-140	12.7 jours	**8,397**	±	**4,665**	**21,176**	±	**3,172**	**22,244**	±	**5,360**	**35,416**	±	**6,058**	INQ			**2,527**	±	**1,823**

3. RESULTS 3/3 – VOLUME ACTIVITY FOR LIQUIDS (Bq/L)

Sample identification											
Registration number		110404-OCJ-02			110404-OCJ-04			110404-OCJ-07			
kind		Fresh water			Fresh water			Fresh water			
species		**river water**			**well water**			**rain water**			
Sample											
Date		31-mars-11			31-mars-11			31-mars-11			
Place		**Iidoi Takishita**			**Sekine**			**Maeda**			
City, Town		**Iitate**			**Iitate**			**Iitate**			
Localisation		**river**			**well**			**in a bucket**			
surface area		-			-			-			
total mass (g)		520			520			520			
Counting											
Geometry or volume (en cm^3)			500 ml			500 ml			500 ml		
analysed sample mass			500 ml			500 ml			500 ml		
age of the sample (days)			8.5			4.5			6		
Analysed fraction		settle			settle			settle			
Results											
Reference date		31/03/2011			31/03/2011			31/03/2011			
Unit		Bq/L			Bq/L			Bq/L			
ARTIFICIALS RADIONUCLIDES											
Zr-95 / Nb-95	64 days		<	0.8		<	0.7	INQ			
Te-132 / I-132	3.2 days	**7.4**	±	**2.9**		<	1.2	**260**	±	**40**	
I-131	8 days	**32.9**	±	**4.4**	**11.6**	±	**0.53**	**30,900**	±	**2,700**	
Cs-134	2.1 years	**7.1**	**±**	**1.0**		<	0.6	**495**	**±**	**42**	
Cs-136	13.2 days		<	0.9		<	0.8	**41.0**	**±**	**4.0**	
Cs-137	30 years	**7.1**	±	**1.0**		<	0.7	**495**	±	**42**	
Ba-140 / La-140	12.7 days		<	3.0		<	2.8		<	17	

ANNEX 1

ANALYSIS	
TITLE	**Measurement of gamma emitters nuclides by gamma spectrometry**
TREATMENT	The raw sample is homogenised. A representative part is taken to be conditioned in a geometry adapted to the gamma measurement.
MATERIAL	High-Purity Germanium (HPGe), type N coaxial , 32% efficiency, mounted in a vertical cryostate. The samples are placed in a 10-cm thick lead shielding. Data are readout by a digital acquisition system (DSPEC-ORTECH). The energy range is taken as 27-2000 keV. The containers are plastic round boxes with a fiducial volume of 61ml (ref. 7215) and standard geometries of 500ml.
UNITS	The measured quantity is the activity in becquerel (Bq) per kilogram of raw material (raw kg), in becquerel (Bq) per liter (L) and becquerel (Bq) per squared meter (m2)

RESULTS	
IN GENERAL	Measurements are performed with identical geometries as thoses of the standard (calibrated) sources. They concern gamma-emitters radionuclides displaying one or several emission peaks within the reference energy range. Among all the radionuclides detected in the samples, only the most abundant are displayed in the tables, without any specific demand from the client. In all cases, the tables display at least all detected artificial radionuclides. Only elements with activity larger than the decision threshold are given. On the contrary, for the specified radionuclides, the detection limit –LD- (detection limit) is indicated, with the inferior "<" sign. When it is not possible to deduce a satisfying detection limit LD, the data are replaced by the sign "-". When an element has been detected but cannot be quantified properly, the mention "Identified but Not Quantified" (INQ) is reported. The measured activity of each radioelement is given with its absolute uncertainty calculated within a 95% interval of confidence (2 times the standard deviation). Each expressed activity, including the detection limit, is calculated at the reference date indicated in the table (collection date and time).

ANNEX 2

INFORMATION ABOUT THE LABORATORY ACRO	
Measurements capacities	The ACRO laboratory can measure radon concentration in the air, tritium (HTO) in liquids and gamma radionuclides in all kind of matrices. Other measurements are under development. The measurement protocols are in accordance to the actual French and International standards (ISO/CEI 17025).

AGREEMENT

The laboratory is legally authorized for radioactivity measurements in the environment and the radon measurement in air by the French nuclear safety authority.

Décision n°DEP-DEU-0704-2009 du 8/12/09 De l'Autorité de Sûreté Nucléaire	- Measurement of gamma-emitters radionuclides in biological matrices - Tritium measurement in waters
Décision n°DEP-DIS-346-2008 de l'Autorité de Sûreté Nucléaire	- Radon concentration (volume activity) in public places
Décision n°CODEP-DEU-2010-031543 du 15/06/10 de l'Autorité de Sureté Nucléaire	- Measurement of gamma-emitters radionuclides in waters - Uranium isotopes in soils - Thorium isotopes in soils - Radium-226/228 and decaying partners in soils.