

Analysis Report for L1-010-101-FR-GS-CO3-SB
L1-010-101C WTB EXCAVATION

GAMMA SPECTRUM ANALYSIS

Sample Identification : L1-010-101-FR-GS-CO3-SB
Sample Description : L1-010-101C WTB EXCAVATION
Sample Type : Silt
Unit :
Sample Point :

Sample Size : 2.973E+03 grams
Facility : Diaryland_NPP

Sample Taken On : 9/14/2017 3:10:00PM
Acquisition Started : 9/14/2017 6:05:47PM

Procedure : Silt
Operator : Administrator
Detector Name : DET01-ENV
Geometry : 1.5L Marinelli
Live Time : 3600.0 seconds
Real Time : 3624.5 seconds

Dead Time : 0.68 %

Peak Locate Threshold : 3.00
Peak Locate Range (in channels) : 100 - 4096
Peak Area Range (in channels) : 100 - 4096
Identification Energy Tolerance : 1.000 keV

Energy Calibration Used Done On : 6/3/2014
Efficiency Calibration Used Done On : 6/3/2014
Efficiency Calibration Description : 1.5 Marinelli

Sample Number : 3400

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 9/14/2017 7:06:16PM
Peak Analysis From Channel : 100
Peak Analysis To Channel : 4096

Analysis Report for L1-010-101-FR-GS-CO3-SB

L1-010-101C

WTB EXCAVATION

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	76.74	146 -	191	154.33	4.36E+02	31.80	8.75E+02	1.53
m	2	83.73	146 -	191	168.32	1.01E+02	23.23	8.47E+02	1.55
m	3	86.80	146 -	191	174.46	1.89E+02	27.80	9.17E+02	1.56
m	4	92.65	146 -	191	186.17	2.24E+02	27.48	8.10E+02	1.57
F	5	128.83	255 -	264	258.55	7.23E+01	21.49	8.16E+02	0.77
F	6	185.61	366 -	376	372.14	1.91E+02	27.25	7.46E+02	1.50
F	7	238.29	469 -	486	477.53	1.44E+03	43.23	9.50E+02	1.50
F	8	269.97	537 -	547	540.93	1.01E+02	20.71	5.12E+02	1.35
M	9	294.88	587 -	605	590.75	4.21E+02	26.79	3.01E+02	1.56
m	10	299.85	587 -	605	600.70	1.08E+02	17.58	3.33E+02	1.57
M	11	327.63	648 -	683	656.28	4.58E+01	19.11	3.02E+02	1.16
m	12	338.01	648 -	683	677.05	1.67E+02	68.49	2.92E+02	1.17
F	13	351.49	698 -	710	704.02	8.44E+02	33.34	3.69E+02	1.57
F	14	408.96	814 -	825	819.00	5.61E+01	17.19	2.92E+02	1.88
F	15	462.59	922 -	935	926.31	9.76E+01	17.83	3.10E+02	1.95
F	16	510.41	1014 -	1031	1021.98	3.13E+02	23.30	2.89E+02	2.45
F	17	582.74	1159 -	1176	1166.69	5.58E+02	27.21	2.65E+02	1.83
F	18	608.87	1212 -	1226	1218.96	6.18E+02	28.90	2.52E+02	1.84
F	19	661.18	1317 -	1330	1323.63	1.08E+03	35.65	2.08E+02	1.91
F	20	726.56	1447 -	1460	1454.44	1.47E+02	16.96	1.80E+02	2.00
M	21	755.19	1508 -	1541	1511.71	2.48E+01	9.90	1.12E+02	1.46
m	22	767.34	1508 -	1541	1536.02	4.39E+01	11.66	1.30E+02	1.47
F	23	794.44	1579 -	1596	1590.25	4.70E+01	10.18	1.88E+02	0.98
F	24	860.10	1716 -	1728	1721.61	7.01E+01	12.68	1.23E+02	1.76
M	25	903.32	1802 -	1830	1808.09	3.41E+01	10.36	1.13E+02	2.21
m	26	910.67	1802 -	1830	1822.80	4.21E+02	23.06	1.18E+02	2.22
F	27	968.34	1926 -	1944	1938.19	2.50E+02	19.39	1.92E+02	2.15
F	28	1119.83	2231 -	2250	2241.27	1.48E+02	17.51	2.20E+02	2.62
F	29	1172.72	2338 -	2354	2347.10	1.37E+02	16.75	2.27E+02	2.01
F	30	1237.33	2470 -	2482	2476.39	4.78E+01	13.44	1.89E+02	1.74
F	31	1331.84	2657 -	2672	2665.49	1.48E+02	15.55	1.00E+02	2.67
F	32	1460.07	2908 -	2932	2922.06	4.03E+03	64.19	8.17E+01	2.85
F	33	1587.73	3170 -	3184	3177.49	3.75E+01	8.23	3.35E+01	2.38
F	34	1728.42	3452 -	3465	3458.99	2.33E+01	6.13	1.23E+01	2.72
F	35	1763.89	3521 -	3540	3529.97	1.35E+02	12.30	1.87E+01	2.85

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet
Errors quoted at 1.000sigma

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 9/14/2017 7:06:16PM

Env. Background File : C:\Canberra\Apex\Root\Diaryland_NPP\Data\0000003388.CNF

Analysis Report for L1-010-101-FR-GS-CO3-SB

L1-010-101C

WTB EXCAVATION

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
M	1	76.74	4.36E+02	31.80			4.36E+02	3.18E+01
m	2	83.73	1.01E+02	23.23			1.01E+02	2.32E+01
m	3	86.80	1.89E+02	27.80			1.89E+02	2.78E+01
m	4	92.65	2.24E+02	27.48	5.07E+01	8.63E+00	1.74E+02	2.88E+01
F	5	128.83	7.23E+01	21.49			7.23E+01	2.15E+01
F	6	185.61	1.91E+02	27.25	3.67E+01	8.25E+00	1.54E+02	2.85E+01
F	7	238.29	1.44E+03	43.23	3.14E+01	6.41E+00	1.41E+03	4.37E+01
F	8	269.97	1.01E+02	20.71			1.01E+02	2.07E+01
M	9	294.88	4.21E+02	26.79	1.00E+01	5.91E+00	4.11E+02	2.74E+01
m	10	299.85	1.08E+02	17.58			1.08E+02	1.76E+01
M	11	327.63	4.58E+01	19.11			4.58E+01	1.91E+01
m	12	338.01	1.67E+02	68.49	9.67E+00	5.86E+00	1.57E+02	6.87E+01
F	13	351.49	8.44E+02	33.34	2.24E+01	5.47E+00	8.22E+02	3.38E+01
F	14	408.96	5.61E+01	17.19			5.61E+01	1.72E+01
F	15	462.59	9.76E+01	17.83			9.76E+01	1.78E+01
F	16	510.41	3.13E+02	23.30	1.52E+02	8.10E+00	1.61E+02	2.47E+01
F	17	582.74	5.58E+02	27.21	2.14E+01	4.78E+00	5.37E+02	2.76E+01
F	18	608.87	6.18E+02	28.90	2.18E+01	4.83E+00	5.96E+02	2.93E+01
F	19	661.18	1.08E+03	35.65	1.38E+01	4.37E+00	1.07E+03	3.59E+01
F	20	726.56	1.47E+02	16.96			1.47E+02	1.70E+01
M	21	755.19	2.48E+01	9.90			2.48E+01	9.90E+00
m	22	767.34	4.39E+01	11.66			4.39E+01	1.17E+01
F	23	794.44	4.70E+01	10.18			4.70E+01	1.02E+01
F	24	860.10	7.01E+01	12.68			7.01E+01	1.27E+01
M	25	903.32	3.41E+01	10.36			3.41E+01	1.04E+01
m	26	910.67	4.21E+02	23.06	1.35E+01	3.68E+00	4.08E+02	2.34E+01
F	27	968.34	2.50E+02	19.39			2.50E+02	1.94E+01
F	28	1119.83	1.48E+02	17.51	1.09E+01	3.21E+00	1.37E+02	1.78E+01
F	29	1172.72	1.37E+02	16.75			1.37E+02	1.68E+01
F	30	1237.33	4.78E+01	13.44			4.78E+01	1.34E+01
F	31	1331.84	1.48E+02	15.55			1.48E+02	1.56E+01
F	32	1460.07	4.03E+03	64.19	5.78E+01	4.59E+00	3.98E+03	6.44E+01
F	33	1587.73	3.75E+01	8.23			3.75E+01	8.23E+00
F	34	1728.42	2.33E+01	6.13			2.33E+01	6.13E+00
F	35	1763.89	1.35E+02	12.30	1.38E+01	2.34E+00	1.21E+02	1.25E+01

M = First peak in a multiplet region

m = Other peak in a multiplet region

F = Fitted singlet

Errors quoted at 1.000sigma

Analysis Report for L1-010-101-FR-GS-CO3-SB

L1-010-101C

WTB EXCAVATION

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Diaryland_NPP\Library\ENVLIB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty		
K-40	0.91	1460.81 *	10.67	6.37E+00	2.04E-01		
CO-60	0.94	1173.22 *	100.00	2.01E-02	2.51E-03		
		1332.49 *	100.00	2.38E-02	2.58E-03		
		CS-137	0.96	661.65 *	85.12	1.21E-01	5.23E-03
BI-212	0.55	727.17 *	11.80	1.28E-01	1.52E-02		
		785.42	2.00				
		1620.56	2.75				
PB-212	0.94	77.11 *	17.50	2.75E-01	2.21E-02		
		87.20 *	6.30	2.53E-01	3.81E-02		
		89.80	1.75				
		238.63 *	44.60	1.79E-01	7.25E-03		
BI-214	0.59	300.09 *	3.41	1.97E-01	3.23E-02		
		609.31 *	46.30	1.18E-01	6.65E-03		
		768.36	5.04				
		806.17	1.23				
		934.06	3.21				
		1120.29 *	15.10	1.29E-01	1.70E-02		
		1155.19	1.69				
		1238.11 *	5.94	1.23E-01	3.47E-02		
		1280.96	1.47				
		1377.67	4.11				
		1401.50	1.39				
		1407.98	2.48				
		1509.19	2.19				
		1661.28	1.15				
1729.60	3.05						
PB-214	0.69	1764.49 *	15.80	1.44E-01	1.56E-02		
		1847.44	2.12				
		74.81	6.33				
		77.11 *	10.70	4.49E-01	3.61E-02		
		87.20 *	3.70	4.30E-01	6.49E-02		
		89.80	1.03				
		241.98	7.49				
		295.21 *	19.20	1.32E-01	9.37E-03		
RA-226	0.94	351.92 *	37.20	1.48E-01	7.06E-03		
		785.91	1.10				
		186.21 *	3.28	2.50E-01	4.66E-02		
		AC-228	0.75	129.08 *	2.80	1.43E-01	4.26E-02
				209.28	4.40		
270.23 *	3.60			1.67E-01	3.44E-02		
327.64 *	3.20			9.23E-02	3.86E-02		
338.32 *	11.40	9.02E-02	3.96E-02				

Analysis Report for L1-010-101-FR-GS-CO3-SB

L1-010-101C

WTB EXCAVATION

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
AC-228	0.75	409.51 *	2.13	1.90E-01	5.85E-02
		463.00 *	4.40	1.71E-01	3.17E-02
		794.70 *	4.60	1.12E-01	2.44E-02
		911.60 *	27.70	1.79E-01	1.10E-02
		964.60	5.20		
		969.11 *	16.60	1.92E-01	1.54E-02
		1587.90 *	3.71	1.81E-01	4.01E-02

* = Energy line found in the spectrum.

- = Manually added nuclide.

? = Manually edited nuclide.

@ = Energy line not used for Weighted Mean Activity

Energy Tolerance : 1.000 keV

Nuclide confidence index threshold = 0.30

Errors quoted at 1.000sigma

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.916	6.37E+00	2.04E-01	
CO-60	0.948	2.19E-02	1.80E-03	
CS-137	0.966	1.21E-01	5.23E-03	
X EU-155	0.300			
BI-212	0.552	1.28E-01	1.52E-02	
PB-212	0.946	1.80E-01	6.64E-03	
BI-214	0.591	1.22E-01	5.68E-03	
PB-214	0.699	1.42E-01	5.56E-03	
RA-226	0.943	2.50E-01	4.66E-02	
AC-228	0.751	1.68E-01	7.29E-03	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000sigma

Analysis Report for L1-010-101-FR-GS-CO3-SB

L1-010-101C

WTB EXCAVATION

UNIDENTIFIED PEAKS

Peak Locate Performed on : 9/14/2017 7:06:16PM
 Peak Locate From Channel : 100
 Peak Locate To Channel : 4096

<i>Peak No.</i>	<i>Energy (keV)</i>	<i>Peak Size (CPS)</i>	<i>Peak CPS (%) Uncertainty</i>	<i>Peak Type</i>	<i>Tolerance Nuclide</i>
m	2	83.73	2.80631E-02	22.99	
m	4	92.65	4.82586E-02	16.58	
F	16	510.41	4.48515E-02	15.28	
F	17	582.74	1.49125E-01	5.15	Tol. TL-208
M	21	755.19	6.88877E-03	39.90	
m	22	767.34	1.22021E-02	26.54	
F	24	860.10	1.94762E-02	18.09	Tol. TL-208
M	25	903.32	9.46399E-03	30.40	Sum
F	34	1728.42	6.47010E-03	26.32	Sum

M = First peak in a multiplet region
 m = Other peak in a multiplet region
 F = Fitted singlet
 Errors quoted at 1.000sigma

NUCLIDE MDA REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Diaryland_NPP\Library\ENVLIB.NLB

	<i>Nuclide Name</i>	<i>Energy (keV)</i>		<i>Yield(%)</i>	<i>Activity (pCi/grams)</i>	<i>Nuclide MDA (pCi/grams)</i>	<i>Line MDA (pCi/grams)</i>
+	K-40	1460.81	*	10.67	6.37E+00	1.14E-01	1.14E-01
+	MN-54	834.83		99.97	9.37E-03	1.20E-02	1.20E-02
+	CO-60	1173.22	*	100.00	2.01E-02	9.61E-03	1.33E-02
		1332.49	*	100.00	2.38E-02		9.61E-03
+	ZN-65	1115.52		50.75	3.55E-02	3.36E-02	3.36E-02
+	KR-85	513.99		0.43	6.24E+00	2.83E+00	2.83E+00

Analysis Report for L1-010-101-FR-GS-CO3-SB

L1-010-101C

WTB EXCAVATION

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CD-109	88.03		3.72	1.42E+00	5.70E-01	5.70E-01
+	CS-134	604.70		97.60	7.49E-02	1.38E-02	1.56E-02
		795.84		85.40	9.27E-03		1.38E-02
+	CS-137	661.65	*	85.12	1.21E-01	9.52E-03	9.52E-03
+	EU-154	123.07		40.40	-6.03E-03	3.27E-02	3.27E-02
		722.30		20.00	1.07E-01		6.25E-02
		873.20		12.09	6.39E-02		9.80E-02
		996.30		10.34	1.04E-01		1.23E-01
		1004.76		17.90	3.30E-02		7.19E-02
		1274.51		34.40	1.17E-02		4.43E-02
+	EU-155	86.54	*	32.80	4.86E-02	3.69E-02	3.69E-02
		105.31		21.80	3.90E-02		6.89E-02
+	TL-208	72.80		2.02	-3.22E+18	4.94E+16	4.67E+18
		74.97		3.41	-1.08E+18		2.56E+18
		84.90		1.51	-1.76E+19		4.05E+18
		277.36		6.31	2.83E+17		5.33E+17
		583.19		84.50	1.72E+17		4.94E+16
		763.13		1.81	2.15E+18		2.01E+18
		860.56		12.42	1.45E+17		2.92E+17
		1093.90		0.40	-4.61E+16		1.07E+19
+	BI-214	609.31	*	46.30	1.18E-01	1.86E-02	1.86E-02
		768.36		5.04	-2.97E-02		2.42E-01
		806.17		1.23	-7.03E-02		8.99E-01
		934.06		3.21	2.22E-02		3.87E-01
		1120.29	*	15.10	1.29E-01		8.97E-02
		1155.19		1.69	-1.05E+00		9.76E-01
		1238.11	*	5.94	1.23E-01		1.96E-01
		1280.96		1.47	-6.74E-01		1.01E+00
		1377.67		4.11	2.72E-01		3.09E-01
		1401.50		1.39	3.36E-01		7.99E-01
		1407.98		2.48	5.95E-01		4.65E-01
		1509.19		2.19	-1.68E-01		4.20E-01
		1661.28		1.15	-1.24E-01		5.99E-01
		1729.60		3.05	-6.12E-03		2.68E-01
		1764.49	*	15.80	1.44E-01		3.90E-02
		1847.44		2.12	3.74E-01		3.93E-01
+	PB-214	74.81		6.33	-1.99E-01	1.94E-02	4.68E-01
		77.11	*	10.70	4.49E-01		1.45E-01
		87.20	*	3.70	4.30E-01		3.27E-01
		89.80		1.03	-9.71E-02		1.98E+00
		241.98		7.49	-2.70E-01		2.06E-01
		295.21	*	19.20	1.32E-01		2.77E-02
		351.92	*	37.20	1.48E-01		1.94E-02
		785.91		1.10	1.40E-01		1.06E+00
+	RA-223	81.07		15.00	6.56E-02	8.30E-02	1.64E-01
		83.78		24.80	-3.33E-01		8.68E-02
		94.90		11.30	4.54E-03		1.60E-01
		122.31		1.19	-4.10E-01		1.12E+00
		144.20		3.26	-3.27E-01		3.71E-01
		154.19		5.59	1.64E-02		2.11E-01
		269.41		13.60	1.96E-02		8.30E-02

Analysis Report for L1-010-101-FR-GS-CO3-SB

L1-010-101C

WTB EXCAVATION

Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
RA-223	323.89		3.90	-7.50E-02	8.30E-02	2.73E-01
	338.32		2.78	2.66E-02		4.22E-01
	444.94		1.27	6.17E-01		7.82E-01
+	RA-226	*	3.28	2.50E-01	2.35E-01	2.35E-01
+	AC-228	*	2.80	1.43E-01	2.46E-02	2.85E-01
	209.28		4.40	2.08E-02		2.67E-01
	270.23	*	3.60	1.67E-01		1.94E-01
	327.64	*	3.20	9.23E-02		1.69E-01
	338.32	*	11.40	9.02E-02		4.90E-02
	409.51	*	2.13	1.90E-01		3.11E-01
	463.00	*	4.40	1.71E-01		1.74E-01
	794.70	*	4.60	1.12E-01		2.01E-01
	911.60	*	27.70	1.79E-01		2.46E-02
	964.60		5.20	7.64E-01		3.22E-01
	969.11	*	16.60	1.92E-01		6.63E-02
	1587.90	*	3.71	1.81E-01		1.69E-01
+	Th-230		8.43	0.00E+00	9.58E+00	8.87E+10
	67.60		0.37	-1.15E+01		9.58E+00
	168.10		0.07	-3.89E+00		1.60E+01
+	PA-234M		0.29	-2.18E-01	1.54E+00	4.15E+00
	1001.03		0.84	1.21E-01		1.54E+00
+	TH-234		4.50	-2.73E-01	7.35E-01	9.82E-01
	92.38		2.60	1.37E-01		7.42E-01
	92.80		2.60	1.30E-01		7.35E-01
+	AM-241		36.30	-1.32E-01	1.56E-01	1.56E-01
+	CM-243		14.30	-1.10E-02	6.63E-02	1.14E-01
	103.76		23.00	7.04E-02		6.63E-02
	117.00		10.80	-1.48E-02		1.25E-01
	228.18		10.60	-2.63E-02		1.06E-01
	277.60		14.00	2.91E-02		8.07E-02

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level