

Analysis Report for L1-010-101-FR-GS-CO2-SB  
L1-010-101C WTB EXCAVATION

---

## GAMMA SPECTRUM ANALYSIS

---

Sample Identification : L1-010-101-FR-GS-CO2-SB  
Sample Description : L1-010-101C WTB EXCAVATION  
Sample Type : Silt  
Unit :  
Sample Point :  
  
Sample Size : 2.966E+03 grams  
Facility : Diaryland\_NPP  
  
Sample Taken On : 9/14/2017 3:00:00PM  
Acquisition Started : 9/14/2017 5:04:04PM  
  
Procedure : Silt  
Operator : Administrator  
Detector Name : DET01-ENV  
Geometry : 1.5L Marinelli  
Live Time : 3600.0 seconds  
Real Time : 3624.6 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 : 3399

---

## PEAK ANALYSIS REPORT

---

Peak Analysis Performed on : 9/14/2017 6:04:32PM  
Peak Analysis From Channel : 100  
Peak Analysis To Channel : 4096

Analysis Report for L1-010-101-FR-GS-CO2-SB

L1-010-101C

WTB EXCAVATION

	<b>Peak No.</b>	<b>Energy (keV)</b>	<b>ROI start</b>	<b>ROI end</b>	<b>Peak Centroid</b>	<b>Net Peak Area</b>	<b>Net Area Uncertainty</b>	<b>Continuum Counts</b>	<b>FWHM (keV)</b>
F	1	76.78	146 -	162	154.41	3.77E+02	31.78	1.45E+03	1.44
M	2	86.98	171 -	194	174.82	1.29E+02	26.11	7.79E+02	1.36
m	3	92.61	171 -	194	186.08	2.17E+02	28.30	8.67E+02	1.38
F	4	128.49	253 -	261	257.86	7.45E+01	20.30	6.87E+02	0.82
F	5	185.47	363 -	376	371.85	2.20E+02	26.81	8.71E+02	1.45
F	6	208.93	415 -	423	418.81	1.48E+02	23.51	5.08E+02	1.35
F	7	238.32	473 -	486	477.59	1.36E+03	42.49	7.88E+02	1.40
F	8	269.84	535 -	547	540.66	1.07E+02	21.55	5.64E+02	1.57
M	9	294.89	585 -	605	590.78	4.70E+02	28.11	3.64E+02	1.49
m	10	299.64	585 -	605	600.28	1.04E+02	17.29	3.47E+02	1.49
M	11	327.65	652 -	680	656.33	7.53E+01	15.66	2.84E+02	1.43
m	12	337.92	652 -	680	676.87	2.78E+02	22.88	2.60E+02	1.45
F	13	351.54	694 -	713	704.12	7.88E+02	32.76	5.54E+02	1.59
F	14	409.14	815 -	824	819.36	5.16E+01	15.32	2.22E+02	1.58
F	15	462.41	920 -	931	925.94	1.12E+02	17.52	2.36E+02	1.84
F	16	510.48	1014 -	1032	1022.11	3.69E+02	24.85	2.66E+02	3.29
F	17	582.67	1161 -	1172	1166.54	5.41E+02	26.68	1.72E+02	1.78
F	18	608.77	1213 -	1227	1218.76	6.74E+02	29.21	2.09E+02	1.87
F	19	661.16	1312 -	1329	1323.59	5.89E+02	27.70	2.41E+02	1.83
F	20	727.03	1443 -	1460	1455.38	9.89E+01	15.02	2.05E+02	2.08
F	21	794.12	1582 -	1595	1589.60	6.16E+01	12.71	1.29E+02	2.06
F	22	859.85	1715 -	1727	1721.11	4.13E+01	11.97	1.35E+02	1.82
F	23	910.68	1813 -	1832	1822.82	4.16E+02	23.20	2.01E+02	2.19
F	24	933.39	1860 -	1875	1868.25	4.74E+01	12.07	1.29E+02	2.21
M	25	964.28	1923 -	1945	1930.07	9.71E+01	13.52	1.30E+02	2.30
m	26	968.41	1923 -	1945	1938.31	2.43E+02	18.65	1.32E+02	2.30
F	27	1119.58	2232 -	2248	2240.79	1.19E+02	15.78	1.62E+02	2.43
F	28	1172.72	2338 -	2354	2347.11	4.57E+01	10.92	1.91E+02	1.21
F	29	1237.08	2468 -	2483	2475.88	7.55E+01	14.50	1.71E+02	2.35
F	30	1376.72	2745 -	2762	2755.28	6.41E+01	11.14	5.40E+01	4.14
F	31	1460.01	2908 -	2933	2921.93	3.81E+03	62.43	6.30E+01	2.84
F	32	1587.53	3172 -	3183	3177.09	2.79E+01	7.44	2.68E+01	2.14
F	33	1620.44	3237 -	3248	3242.94	1.94E+01	5.56	1.98E+01	1.23
F	34	1729.09	3455 -	3467	3460.35	3.42E+01	6.95	1.25E+01	3.20
F	35	1763.97	3520 -	3538	3530.12	1.45E+02	12.62	1.42E+01	2.77

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 6:04:32PM

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

Analysis Report for L1-010-101-FR-GS-CO2-SB

L1-010-101C

WTB EXCAVATION

<i>Peak No.</i>	<i>Energy (keV)</i>	<i>Original Area</i>	<i>Orig. Area Uncertainty</i>	<i>Ambient Background</i>	<i>Backgr. Uncert.</i>	<i>Subtracted Area</i>	<i>Subtracted Uncert.</i>	
F	1	76.78	3.77E+02	31.78		3.77E+02	3.18E+01	
M	2	86.98	1.29E+02	26.11		1.29E+02	2.61E+01	
m	3	92.61	2.17E+02	28.30	5.07E+01	8.63E+00	1.67E+02	2.96E+01
F	4	128.49	7.45E+01	20.30		7.45E+01	2.03E+01	
F	5	185.47	2.20E+02	26.81	3.67E+01	8.25E+00	1.83E+02	2.81E+01
F	6	208.93	1.48E+02	23.51		1.48E+02	2.35E+01	
F	7	238.32	1.36E+03	42.49	3.14E+01	6.41E+00	1.33E+03	4.30E+01
F	8	269.84	1.07E+02	21.55		1.07E+02	2.16E+01	
M	9	294.89	4.70E+02	28.11	1.00E+01	5.91E+00	4.60E+02	2.87E+01
m	10	299.64	1.04E+02	17.29		1.04E+02	1.73E+01	
M	11	327.65	7.53E+01	15.66		7.53E+01	1.57E+01	
m	12	337.92	2.78E+02	22.88	9.67E+00	5.86E+00	2.68E+02	2.36E+01
F	13	351.54	7.88E+02	32.76	2.24E+01	5.47E+00	7.66E+02	3.32E+01
F	14	409.14	5.16E+01	15.32		5.16E+01	1.53E+01	
F	15	462.41	1.12E+02	17.52		1.12E+02	1.75E+01	
F	16	510.48	3.69E+02	24.85	1.52E+02	8.10E+00	2.17E+02	2.61E+01
F	17	582.67	5.41E+02	26.68	2.14E+01	4.78E+00	5.19E+02	2.71E+01
F	18	608.77	6.74E+02	29.21	2.18E+01	4.83E+00	6.52E+02	2.96E+01
F	19	661.16	5.89E+02	27.70	1.38E+01	4.37E+00	5.75E+02	2.80E+01
F	20	727.03	9.89E+01	15.02		9.89E+01	1.50E+01	
F	21	794.12	6.16E+01	12.71		6.16E+01	1.27E+01	
F	22	859.85	4.13E+01	11.97		4.13E+01	1.20E+01	
F	23	910.68	4.16E+02	23.20	1.35E+01	3.68E+00	4.03E+02	2.35E+01
F	24	933.39	4.74E+01	12.07		4.74E+01	1.21E+01	
M	25	964.28	9.71E+01	13.52		9.71E+01	1.35E+01	
m	26	968.41	2.43E+02	18.65		2.43E+02	1.87E+01	
F	27	1119.58	1.19E+02	15.78	1.09E+01	3.21E+00	1.08E+02	1.61E+01
F	28	1172.72	4.57E+01	10.92		4.57E+01	1.09E+01	
F	29	1237.08	7.55E+01	14.50		7.55E+01	1.45E+01	
F	30	1376.72	6.41E+01	11.14		6.41E+01	1.11E+01	
F	31	1460.01	3.81E+03	62.43	5.78E+01	4.59E+00	3.75E+03	6.26E+01
F	32	1587.53	2.79E+01	7.44		2.79E+01	7.44E+00	
F	33	1620.44	1.94E+01	5.56		1.94E+01	5.56E+00	
F	34	1729.09	3.42E+01	6.95		3.42E+01	6.95E+00	
F	35	1763.97	1.45E+02	12.62	1.38E+01	2.34E+00	1.31E+02	1.28E+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-CO2-SB

L1-010-101C

WTB EXCAVATION

## NUCLIDE IDENTIFICATION REPORT

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

### IDENTIFIED NUCLIDES

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
K-40	0.90	1460.81 *	10.67	6.02E+00	1.95E-01
CS-137	0.96	661.65 *	85.12	6.54E-02	3.65E-03
BI-212	0.80	727.17 *	11.80	8.66E-02	1.33E-02
		785.42	2.00		
		1620.56 *	2.75	1.28E-01	3.69E-02
PB-212	0.94	77.11 *	17.50	2.38E-01	2.16E-02
		87.20 *	6.30	1.72E-01	3.53E-02
		89.80	1.75		
		238.63 *	44.60	1.69E-01	7.02E-03
		300.09 *	3.41	1.89E-01	3.18E-02
BI-214	0.63	609.31 *	46.30	1.29E-01	6.88E-03
		768.36	5.04		
		806.17	1.23		
		934.06 *	3.21	1.83E-01	4.68E-02
		1120.29 *	15.10	1.02E-01	1.54E-02
		1155.19	1.69		
		1238.11	5.94		
		1280.96	1.47		
		1377.67 *	4.11	2.57E-01	4.52E-02
		1401.50	1.39		
		1407.98	2.48		
		1509.19	2.19		
		1661.28	1.15		
		1729.60 *	3.05	2.10E-01	4.31E-02
		1764.49 *	15.80	1.57E-01	1.61E-02
		1847.44	2.12		
PB-214	0.70	74.81	6.33		
		77.11 *	10.70	3.89E-01	3.53E-02
		87.20 *	3.70	2.93E-01	6.01E-02
		89.80	1.03		
		241.98	7.49		
		295.21 *	19.20	1.48E-01	9.91E-03
		351.92 *	37.20	1.38E-01	6.86E-03
		785.91	1.10		
RA-226	0.91	186.21 *	3.28	2.98E-01	4.63E-02
AC-228	0.93	129.08 *	2.80	1.48E-01	4.03E-02
		209.28 *	4.40	1.83E-01	2.96E-02
		270.23 *	3.60	1.77E-01	3.59E-02
		327.64 *	3.20	1.52E-01	3.19E-02
		338.32 *	11.40	1.54E-01	1.41E-02
		409.51 *	2.13	1.75E-01	5.22E-02
		463.00 *	4.40	1.98E-01	3.13E-02

Analysis Report for L1-010-101-FR-GS-CO2-SB

L1-010-101C

WTB EXCAVATION

<b>Nuclide Name</b>	<b>Id Confidence</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Activity Uncertainty</b>
AC-228	0.93	794.70 *	4.60	1.47E-01	3.06E-02
		911.60 *	27.70	1.77E-01	1.10E-02
		964.60 *	5.20	2.37E-01	3.34E-02
		969.11 *	16.60	1.86E-01	1.49E-02
		1587.90 *	3.71	1.35E-01	3.62E-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

<b>Nuclide Name</b>	<b>Nuclide Id Confidence</b>	<b>Wt mean Activity (pCi/grams)</b>	<b>Wt mean Activity Uncertainty</b>	<b>Comments</b>
K-40	0.902	6.02E+00	1.95E-01	
CS-137	0.963	6.54E-02	3.65E-03	
BI-212	0.801	9.13E-02	1.25E-02	
PB-212	0.949	1.66E-01	6.44E-03	
BI-214	0.633	1.33E-01	5.70E-03	
PB-214	0.703	1.39E-01	5.56E-03	
RA-226	0.915	2.98E-01	4.63E-02	
AC-228	0.931	1.73E-01	6.27E-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-CO2-SB

L1-010-101C

WTB EXCAVATION

---

## UNIDENTIFIED PEAKS

---

Peak Locate Performed on : 9/14/2017 6:04:32PM  
 Peak Locate From Channel : 100  
 Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
m 3	92.61	4.62712E-02	17.76		
F 16	510.48	6.02908E-02	12.04		
F 17	582.67	1.44253E-01	5.22		
F 22	859.85	1.14589E-02	29.01		
F 28	1172.72	1.26867E-02	23.91	Sum	
F 29	1237.08	2.09844E-02	19.20		

---

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\EN\LIB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.81	* 10.67	6.02E+00	1.03E-01	1.03E-01
+	MN-54	834.83	99.97	5.77E-03	1.15E-02	1.15E-02
+	CO-60	1173.22	100.00	1.02E-02	1.41E-02	1.67E-02
		1332.49	100.00	1.33E-02		1.41E-02
+	ZN-65	1115.52	50.75	2.35E-04	3.21E-02	3.21E-02
+	KR-85	513.99	0.43	8.41E+00	2.79E+00	2.79E+00
+	CD-109	88.03	3.72	-5.85E-02	5.69E-01	5.69E-01
+	CS-134	604.70	97.60	6.52E-02	1.33E-02	1.53E-02
		795.84	85.40	6.45E-03		1.33E-02
+	CS-137	661.65	* 85.12	6.54E-02	1.10E-02	1.10E-02

Analysis Report for L1-010-101-FR-GS-CO2-SB

L1-010-101C

WTB EXCAVATION

	<b>Nuclide Name</b>	<b>Energy (keV)</b>	<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
+	EU-154	123.07	40.40	-2.17E-02	3.17E-02	3.17E-02
		722.30	20.00	3.89E-02		5.96E-02
		873.20	12.09	-2.77E-02		9.51E-02
		996.30	10.34	1.49E-02		1.18E-01
		1004.76	17.90	-2.40E-02		6.66E-02
		1274.51	34.40	-2.30E-02		4.30E-02
+	EU-155	86.54	32.80	-6.85E-03	6.62E-02	6.62E-02
		105.31	21.80	1.14E-02		6.78E-02
+	TL-208	72.80	2.02	-1.90E+13	3.84E+11	3.67E+13
		74.97	3.41	-3.72E+12		2.02E+13
		84.90	1.51	-3.63E+12		3.18E+13
		277.36	6.31	3.06E+11		4.07E+12
		583.19	84.50	1.33E+12		3.84E+11
		763.13	1.81	1.13E+13		1.53E+13
		860.56	12.42	1.75E+12		2.33E+12
		1093.90	0.40	-7.52E+12		8.40E+13
+	BI-214	609.31	* 46.30	1.29E-01	1.73E-02	1.73E-02
		768.36	5.04	7.44E-02		2.33E-01
		806.17	1.23	-1.69E-01		8.70E-01
		934.06	* 3.21	1.83E-01		2.61E-01
		1120.29	* 15.10	1.02E-01		7.39E-02
		1155.19	1.69	8.77E-01		9.42E-01
		1238.11	5.94	-1.37E-01		2.98E-01
		1280.96	1.47	6.94E-01		9.84E-01
		1377.67	* 4.11	2.57E-01		1.87E-01
		1401.50	1.39	7.76E-01		8.93E-01
		1407.98	2.48	3.99E-01		4.95E-01
		1509.19	2.19	4.21E-02		4.16E-01
		1661.28	1.15	1.50E-01		6.24E-01
		1729.60	* 3.05	2.10E-01		1.33E-01
		1764.49	* 15.80	1.57E-01		3.56E-02
		1847.44	2.12	-4.78E-02		4.10E-01
+	PB-214	74.81	6.33	-8.57E-02	2.69E-02	4.64E-01
		77.11	* 10.70	3.89E-01		2.32E-01
		87.20	* 3.70	2.93E-01		3.01E-01
		89.80	1.03	1.82E-01		1.99E+00
		241.98	7.49	1.28E+00		2.04E-01
		295.21	* 19.20	1.48E-01		3.02E-02
		351.92	* 37.20	1.38E-01		2.69E-02
		785.91	1.10	1.58E-01		1.04E+00
+	RA-223	81.07	15.00	-1.72E-02	8.12E-02	1.61E-01
		83.78	24.80	-9.71E-03		8.56E-02
		94.90	11.30	-2.03E-02		1.60E-01
		122.31	1.19	-3.37E-01		1.09E+00
		144.20	3.26	7.93E-02		3.67E-01
		154.19	5.59	9.60E-02		2.08E-01
		269.41	13.60	5.54E-02		8.12E-02
		323.89	3.90	-4.94E-02		2.66E-01
		338.32	2.78	-5.53E-01		4.02E-01
		444.94	1.27	-1.24E-01		7.54E-01
+	RA-226	186.21	* 3.28	2.98E-01	2.71E-01	2.71E-01

Analysis Report for L1-010-101-FR-GS-CO2-SB

L1-010-101C

WTB EXCAVATION

	<b>Nuclide Name</b>	<b>Energy (keV)</b>		<b>Yield(%)</b>	<b>Activity (pCi/grams)</b>	<b>Nuclide MDA (pCi/grams)</b>	<b>Line MDA (pCi/grams)</b>
+	AC-228	129.08	*	2.80	1.48E-01	4.02E-02	2.55E-01
		209.28	*	4.40	1.83E-01		1.38E-01
		270.23	*	3.60	1.77E-01		2.14E-01
		327.64	*	3.20	1.52E-01		1.64E-01
		338.32	*	11.40	1.54E-01		4.66E-02
		409.51	*	2.13	1.75E-01		2.59E-01
		463.00	*	4.40	1.98E-01		1.45E-01
		794.70	*	4.60	1.47E-01		1.55E-01
		911.60	*	27.70	1.77E-01		4.02E-02
		964.60	*	5.20	2.37E-01		1.36E-01
		969.11	*	16.60	1.86E-01		4.32E-02
		1587.90	*	3.71	1.35E-01		1.44E-01
+	Th-230	12.30		8.43	0.00E+00	9.46E+00	8.89E+10
		67.60		0.37	-1.06E+01		9.46E+00
		168.10		0.07	-7.23E+00		1.57E+01
+	PA-234M	766.36		0.29	5.25E+00	1.43E+00	4.03E+00
		1001.03		0.84	-1.70E+00		1.43E+00
+	TH-234	63.29		4.50	-1.88E-01	7.38E-01	9.57E-01
		92.38		2.60	-4.18E-02		7.45E-01
		92.80		2.60	-4.33E-02		7.38E-01
+	AM-241	59.54		36.30	-8.53E-02	1.52E-01	1.52E-01
+	CM-243	99.55		14.30	1.29E-02	6.54E-02	1.16E-01
		103.76		23.00	-1.28E-02		6.54E-02
		117.00		10.80	2.97E-02		1.23E-01
		228.18		10.60	-5.08E-01		1.06E-01
		277.60		14.00	1.40E-02		7.75E-02

+ = Nuclide identified during the nuclide identification

\* = Energy line found in the spectrum

&gt; = 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