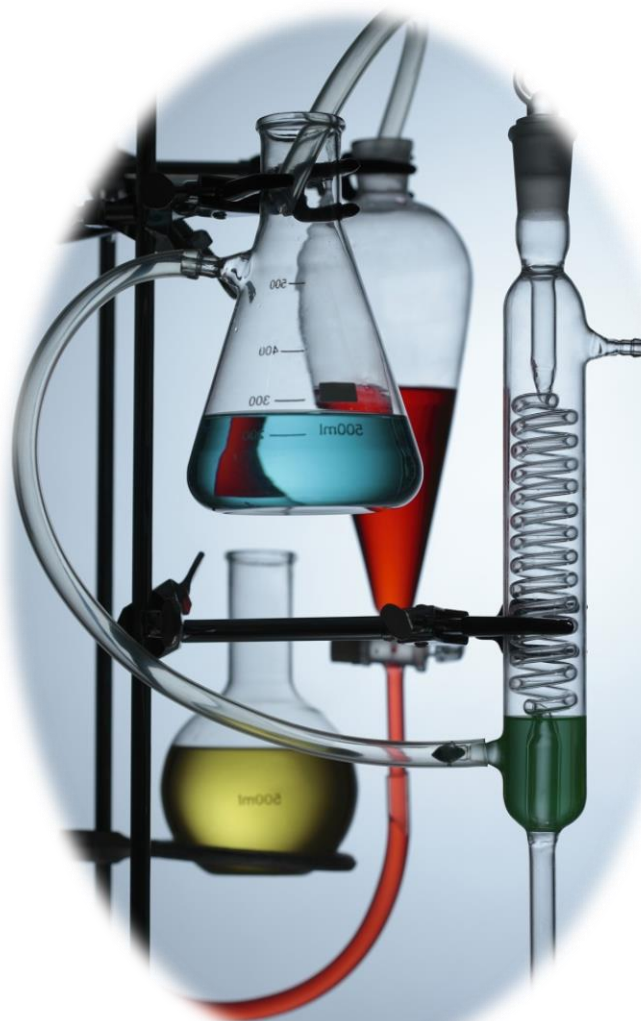


ENCON LABORATORY

**MINING AND
ARD
ANALYSES
COSTS
(2022)**



GEOCHEMISTRY – SAMPLE PREPERATION

Code	Parameter	Cost (USD/Sample)			
		# OF SAMPLES			
		1-4	5-10	11-30	30-50
ENC-01	Crushing	2.92	2.63	2.48	2.19
ENC-02	Grinding	4.42	3.98	3.76	3.32
ENC-03	Drying	3.63	3.27	3.09	2.73
ENC-04	Screening	3.63	3.27	3.09	2.73



MINING ANALYSES

GOLD AND SILVER ANALYSES – GEOCHEMISTRY

Code	Parameter	Method		Sample Amount (g)	DL	Cost (USD/Sample)
ENC-05-a	Gold (Au)	AR ¹ ICP-MS	EPA 6020 B	10	<25 ppb	25.11
ENC-05-b	Gold (Au)	CB ² ICP-MS	EPA 6020 B	30	<25 ppb	26.84
ENC-06	Silver (Ag)	MW ³ ICP-OES	EPA 6020 B	0,5	<0,5 ppb	12.93

TRACE ELEMENT ANALYSES - GEOCHEMISTRY

Code	Parameter	Method		Sample Amount (g)	DL	Cost ⁴ (USD/Sample)
ENC-07	Antimony (Sb)	ICP-MS	EPA 3051 A EPA 6020 B	200	<1ppm	47.37 (or first parameter 17.97 additional parameter 10.08)
	Arsenic (As)				<1ppm	
	Beryllium (Be)				<1ppm	
	Mercury (Hg)				<10ppb	
	Cadmium (Cd)				<0,25ppm	
	Lead (Pb)				<0,5ppm	
	Selenium (Se)				<1ppm	
	Thallium (Tl)				<0,5ppm	
	Uranium (U)				<0,5ppm	
	Tungsten (W)				<0,5ppm	
	Thorium (Th)				<0,5ppm	
	Tin (Sn)				<0,5ppm	
	Molybdenum (Mo)				<0,5ppm	
	Lanthanum (La)				<0,5ppm	
	Gallium (Ga)				<0,5ppm	
	Boron (B)				<1ppm	
ENC-08	Zirconium (Zr)	ICP-MS	EPA 3051 A EPA 6020 B	200	<0,5ppm	35.94 (or first parameter 14.36 additional parameter 7.14)
	Cerium (Ce)				<0,5ppm	
	Hafnium (Hf)				<0,5ppm	
	Indium (In)				<0,5ppm	
	Lutetium (Lu)				<0,5ppm	
	Niobium (Nb)				<0,5ppm	
	Rubidium (Rb)				<0,5ppm	
	Scandium (Sc)				<0,5ppm	
	Tantalum (Ta)				<0,5ppm	
	Terbium (Tb)				<0,5ppm	
	Telluric (Te)				<0,5ppm	
	Ytterbium (Yb)				<0,5ppm	

¹ AR: Aqua Regia Digestion

² CB: Cold Block Digestion

³ MW: Micro Wave Digestion

⁴ In case more than 20 samples are delivered in one series, 10% discount is applied.

TRACE ELEMENT ANALYSES - GEOCHEMISTRY

Code	Parameter	Method		Sample Amount (g)	DL	Cost ⁵ (USD/Sample)
ENC-09	Aluminum (Al)	ICP-OES	EPA 3051 A EPA 6010 D	200	<10ppm	35.94 (or first parameter 14.36 additional parameter 7.14)
	Barium (Ba)				<10ppm	
	Zinc (Zn),				<10ppm	
	Iron (Fe)				<10ppm	
	Manganese (Mn)				<10ppm	
	Strontium (Sr)				<10ppm	
	Vanadium (V)				<10ppm	
	Silica (Si)				<10ppm	
	Phosphorus (P)				<10ppm	
	Lithium (Li)				<10ppm	
	Bismuth (Bi)				<10ppm	
	Titanium (Ti)				<10ppm	
ENC-10	Copper (Cu)	ICP-OES	EPA 3051 A EPA 6010 D	200	<0,5ppm	24.44 (or first parameter 14.36 additional parameter 7.14)
	Cobalt (Co)				<0,5ppm	
	Chromium (Cr)				<0,5ppm	
	Nickel (Ni)				<0,5ppm	
ENC-11	Calcium (Ca)	ICP-OES	EPA 3051 A EPA 6010 D	200	<100ppm	24.44 (or first parameter 14.36 additional parameter 7.14)
	Magnesium (Mg)				<100ppm	
	Potassium (K)				<100ppm	
	Sodium (Na)				<100ppm	

WHOLE ROCK ANALYSES (Lithium Borate Fusion)

Code	Parameter	Method		Sample Amount (g)	DL	Cost ⁶ (USD/Sample)			
						# of Samples			
						1-4	5-10	11-30	30-
ENC-12	SiO ₂	ICP-OES	TSISO 14869-2 EPA 3051 A EPA 6010 D	250	<0,002 %	62.23	56.92	53.68	47.37
	Al ₂ O ₃				<0,002 %				
	Fe ₂ O ₃				<0,001 %				
	Na ₂ O				<0,013 %				
	K ₂ O				<0,012 %				
	CaO				<0,001 %				
	FeO				<0,001 %				
	MgO				<0,002 %				
	MnO				<0,001 %				
	TiO ₂				<0,002 %				
	P ₂ O ₅				<0,002 %				
	LOI				-				

⁵ In case more than 20 samples are delivered in one series, 10% discount is applied.

⁶ In case more than 20 samples are delivered in one series, 10% discount is applied.

ACID ROCK DRAINAGE (ARD)

STATIC ARD TESTS

Code	Parameter	Method	Sample Amount (g)	DL	Cost ⁷ (USD/Sample)			
					# of Samples			
					1-4	5-10	11-30	30-50
ENC-13	Sample Preparation			-	6.32	5.69	5.37	4.74
	Sulfide-Sulfur (S ⁻²)	ASTM E 1915-13	250	<0.013%	68.73	61.86	58.42	51.55
ENC-14	Sample Preparation		2000	-	7.11	6.40	6.04	5.33
	Total Inorganic Carbon	SOBEK(EPA 600, ASTM E 1915-13)			9.48	8.53	8.06	7.11
	Modified Acid-Base Account ⁸ , Total S, pH (NP, AP, NP/AP, NNP)	SOBEK(EPA 600, ASTM E 1915-13)		-	41.87	37.68	35.59	31.40
STATIC TESTS ENC-13 and ENC-14 TOTAL					133.51	120.16	113.48	100.13
ENC-15	Net Acid Generation Test (NAG, pH, Acidity)	AMIRA. 2002. ARD Test Handbook	2000	-	33.97	30.57	28.87	25.48
	Multi Acid Digestion Metal Analyses (ICP-MS)	EPA 200.7, EPA 6020 B, TS EN ISO 17294-1/2		-	72.68	65.41	61.78	54.51
	Whole Rock Analyses	TS ISO 14869-2 (Lithium Borate Fusion) EPA 3051 A EPA 6010 D		-	63.20	56.88	53.72	47.40
	(3:1) Leach Test Parameters, ICP-MS, Cl, F	BS EN 12457-1:2002		-	138.25	124.43	117.51	103.69
	Blank Leach Test Whole Analyses (with Cl and F)	BS EN 12457-1:2003		-	138.25	124.43	117.51	103.69
	Blank Leach Test Whole Analyses (only pH and EC)	BS EN 12457-1:2004		-	0.00	0.00	0.00	0.00
OTHER STATIC TESTS ENC-15 TOTAL					446.35	401.72	379.40	334.76

⁷ In case more than 50 samples are delivered in one series, special discount would be applied

⁸ In order to conduct ABA tests, Sulfide-sulfur analyses should be done, for that reason in case only ECE-14 tests are required the cost mentioned in EC-13 is added to the final cost

KINETIC HUMIDITY CELL ARD TESTS

Code	Parameter	Method	Sample Amount (g)	DL	Cost (USD/Sample)	
					# of Samples	
					1-4	5-20
ENC-16	Preparatory Works					
	Humidity Cell Preparation (for once)	ASTM D 5744-96	2000	-	52.93	47.64
	Size Analyses (for once)	ASTM C136-06	-	-	32.39	29.15
Preparatory Works Total (ENC-16)					85,32	76,79
ENC-17	Weekly Analyses					
	pH	SM 4500 H ⁺ B	-		3.95	3.56
	Conductivity	SM 2510 B	-		3.95	3.56
	Redox Potential	SM 2580 B	-		3.95	3.56
	Dissolved Oxygen	SM 4500 O-G	-		3.95	3.56
	Acidity	SM 2310 B	-		6.32	5.69
	Alkalinity	SM 2320 B	-		6.32	5.69
	Sulfate	SM 4110 B/SM 4500 SO ₄ E	-		6.32	5.69
	Chloride	SM 4110 B/SM 4500 Cl- B	-		6.32	5.69
	Fluoride	SM 4110 B	-		6.32	5.69
	Metals with ICP-OES and ICP-MS (Ag, Al , As, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, Se, Sb, Si, Sn, Sr, Te, Th, Tl, Ti, U, V, Zn, Zr, Hg)	EPA 6020 B EPA 200.7 TS EN ISO 17294-1/2	-		63.20	56.88
1 Week Analyses Total (ENC-17)					110.60	99.54
KINETIC TESTS 1 WEEK ANALYSES TOTAL (ENC-16 + ENC-17)					195.92	176.33

Not:

1. In kinetic tests, the costs specified as ENC-16 code are applied once at the beginning of the tests.
2. The weekly costs for the code ENC-17 are applied for each week required to run and finalize the tests. For instance, if tests run for 10 weeks;

Total Cost for Kinetic Tests can be calculated as = ENC-16 + (ENC-17 x 10)

MONOLYTIC DYNAMIC ARD TESTS (TS EN 15863 or TS EN 15864)

Code	Parameter	Method	Sample Amount (g)	DL	Cost (USD/Sample)			
					# of Samples			
					1-4	5-10	11-30	30-50
ENC-18	Preparatory Works							
	Humidity Cell Preparation (for once)	TS EN 15863 TS EN 15864	3000	-	52.93	52.93	52.93	52.93
	Size Analyses (for once)		-	-	32.39	32.39	32.39	32.39
	Humidity Cell Operation (for once)	TS EN 15863 TS EN 15864	-	-	158.00	158.00	158.00	158.00
ENC-19	Analyses (Total for 8 sets of analyses)							
	pH	SM 4500 H+ B	-		18.96	18.01	17.06	15.17
	Conductivity	SM 2510 B	-		18.96	18.01	17.06	15.17
	Redox Potential	SM 2580 B	-		37.92	36.02	34.13	30.34
	Acidity	SM 2310 B	-		50.56	48.03	45.51	40.45
	Alkalinity	SM 2320 B	-		50.56	48.03	45.51	40.45
	Arsenic	EPA 6020 B	-		44.24	42.03	39.82	35.39
	Barium	EPA 6020 B	-		44.24	42.03	39.82	35.39
	Cadmium	EPA 6020 B	-		44.24	42.03	39.82	35.39
	Total Chromium	EPA 6020 B	-		44.24	42.03	39.82	35.39
	Copper	EPA 6020 B	-		44.24	42.03	39.82	35.39
	Mercury	EPA 6020 B	-		44.24	42.03	39.82	35.39
	Molybdenum	TS EN ISO 17294-1/2	-		44.24	42.03	39.82	35.39
	Nickel	EPA 6020 B	-		44.24	42.03	39.82	35.39
	Lead	EPA 6020 B	-		44.24	42.03	39.82	35.39
	Antimony	EPA 6020 B	-		44.24	42.03	39.82	35.39
	Selenium	EPA 6020 B	-		44.24	42.03	39.82	35.39
	Zinc	EPA 6020 B	-		44.24	42.03	39.82	35.39
	Chloride	SM 4110 B/SM 4500 Cl- B	-		44.24	42.03	39.82	35.39
	Fluoride	SM 4110 B	-		50.56	48.03	45.51	40.45
	Sulfate	SM 4110 B/SM 4500 SO42- E	-		50.56	48.03	45.51	40.45
	Dissolved Organic Carbon	Kit Method	-		126.40	120.08	113.76	101.12
	Total Dissolved Solids	SM 2540 C	-		75.84	72.05	68.25	60.67
MONOLITHIC DYNAMIC TESTS TOTAL					1,298.78	1,246.00	1,193.23	1,087.69

Note:

The required time for the monolithic dynamic tests is 64 for days in accordance with TS EN 15863 or TS EN 15864 Standards. Hence, the above mentioned costs are calculated considering 8 sets of analyses.

STANDARD TEST METHOD FOR SEQUENTIAL BATCH EXTRACTION OF WASTE WITH WATER (ASTM 4793-09, 2017)

Code	Parameter	Method	Sample Amount (g)	Cost (USD/Sample)			
				# of Samples			
				1-4	5-10	11-30	31-50
ENC-20	Sequential Batch Extraction of Waste with Water. ICP-MS. Cl. F	ASTM D4793-09	200	1,382.50	1,244.25	1,175.13	1,036.88
	Blank Leach Test. Sequential Batch Extraction of Waste with Water. ICP-MS. Cl. F	ASTM D4793-09		138.25	124.43	117.51	103.69
	Blank Leach Test. Sequential Batch Extraction of Waste with Water. only pH and EC	ASTM D4793-09		0.00	0.00	0.00	0.00
ASTM 4793-09 TEST TOTAL				1,520.75	1,368.68	1,292.64	1,140.57

**CHARACTERIZATION OF WASTE - LEACHING BEHAVIOUR TEST - UP
FLOW PERCOLATION TEST (UNDER SPECIFIED CONDITIONS)
(TS EN 14405: 2018-01, LEAF EPA 1314)**

Code	Parameter	Method	Sample Amount (g)	DL	Cost (USD/Sample)	
					# of Samples	
					1-4	5-20
ENC-21	Preparatory Works					
	Column Preparation (for once)	TS EN 14405,EPA 1314	1000	-	908.50	817.65
	Size Analyses (for once)	ASTM C136-06	-	-	32.39	29.15
Sum of Preparatory Works (ENC-21)					940,89	846,80
ENC-22	Set of Analyses					
	pH	SM 4500 H ⁺ B	-		43.45	39.11
	Conductivity	SM 2510 B	-		43.45	39.11
	Redox Potential	SM 2580 B	-		43.45	39.11
	Dissolved Oxygen	SM 4500 O-G	-		43.45	39.11
	DOC/DIC	Kit			86.90	78.21
	Acidity	SM 2310 B	-		69.52	62.57
	Alkalinity	SM 2320 B	-		69.52	62.57
	Sulfate	SM 4110 B/SM 4500 SO ₄ E	-		69.52	62.57
	Chloride	SM 4110 B/SM 4500 Cl- B	-		69.52	62.57
	Fluoride	SM 4110 B	-		69.52	62.57
	Metals with ICP-OES and ICP-MS (Ag, Al , As, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, Se, Sb, Si, Sn, Sr, Te, Th, Tl, Ti, U, V, Zn, Zr, Hg)	EPA 6020 B EPA 200.7 TS EN ISO 17294-1/2	-		695.20	625.68
	Sum of Analyses (ENC-21)					1,303.53
PERCOLATION TEST TOTAL (ENC-21 + ENC-22)					2,244.42	2,019.98

CHARACTERIZATION OF WASTE - LIQUID-SOLID PARTITIONING AS A FUNCTION OF EXTRACT pH USING A PARALLEL BATCH EXTRACTION PROCEDURE (LEAF EPA 1313)

Code	Parameter	Method	Sample Amount (g)	DL	Cost (USD/Sample)	
					# of Samples	
					1-4	5-20
ENC-23	Preparatory Works and Operation					
	Column Preparation and Test Operation	USEPA 1313	2000	-	750.50	675.45
	Size Analyses (for once)	ASTM C136-06	-	-	32.39	29.15
Sum of Preparatory Works (ENC-23)					782.89	704.60
ENC-24	Set of Analyses					
	pH	SM 4500 H ⁺ B	-		75.06	67.55
	Conductivity	SM 2510 B	-		47.40	42.66
	Redox Potential	SM 2580 B	-		47.40	42.66
	Dissolved Oxygen	SM 4500 O-G	-		47.40	42.66
	DOC/DIC	Kit			94.80	85.32
	Acidity	SM 2310 B	-		75.84	68.26
	Alkalinity	SM 2320 B	-		75.84	68.26
	Sulfate	SM 4110 B/SM 4500 SO ₄ E	-		75.84	68.26
	Chloride	SM 4110 B/SM 4500 Cl- B	-		75.84	68.26
	Fluoride	SM 4110 B	-		75.84	68.26
	Metals with ICP-OES and ICP-MS (Ag, Al , As, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, Se, Sb, Si, Sn, Sr, Te, Th, Tl, Ti, U, V, Zn, Zr, Hg)	EPA 6020 B EPA 200.7 TS EN ISO 17294-1/2	-		758.40	682.56
Sum of Analyses (ENC-23)					1,449.69	1,304.72
SUM of pH BASED PARALLEL BATCH EXTRACTION (ENC-23 + ENC-24)					2,232.58	2,009.32

CHARACTERIZATION OF WASTE - LIQUID-SOLID PARTITIONING AS A FUNCTION OF LIQUID-TO-SOLID RATIO USING A PARALLEL BATCH EXTRACTION PROCEDURE (LEAF EPA 1316)

Code	Parameter	Method	Sample Amount (g)	DL	Cost (USD/Sample)	
					# of Samples	
					1-4	5-20
ENC-25	Preparatory Works					
	Column Preparation and Test Operation	USEPA 1316	1000	-	672.30	605.07
	Size Analyses (for once)	ASTM C136-06	-	-	34.03	30.63
Sum of Preparatory Works (ENC-25)					706.33	635.70
ENC-26	Set of Analyses					
	pH	SM 4500 H ⁺ B	-		24.90	22.41
	Conductivity	SM 2510 B	-		24.90	22.41
	Redox Potential	SM 2580 B	-		24.90	22.41
	Dissolved Oxygen	SM 4500 O-G	-		24.90	22.41
	DOC/DIC	Kit			49.80	44.82
	Acidity	SM 2310 B	-		39.84	35.86
	Alkalinity	SM 2320 B	-		39.84	35.86
	Sulfate	SM 4110 B/SM 4500 SO ₄ E	-		39.84	35.86
	Chloride	SM 4110 B/SM 4500 Cl- B	-		39.84	35.86
	Fluoride	SM 4110 B	-		39.84	35.86
	Metals with ICP-OES and ICP-MS (Ag, Al , As, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, Se, Sb, Si, Sn, Sr, Te, Th, Tl, Ti, U, V, Zn, Zr, Hg)	EPA 6020 B EPA 200.7 TS EN ISO 17294-1/2	-		398.40	358.56
	Sum of Analyses (ENC-25)					747.00
LIQUID-SOLID PARTITIONING TEST TOTAL (ENC-25 + ENC-26)					1,453.33	1,308.00