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Pressure leaching characteristics of a magnetically enhanced concentrate with specific refrence to the precious metal components

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APPENDIX D

Mineralogical Data

Tertiary Leach Run 1

Name	ALR Area%	1 Hour Area%	2 Hour Area%	3 Hour Area%	4 Hour Area%		Final Area%		
silicates (mainly silica)	2.2	2.5	6.3	11.7	10.0		8.5		
spinel	0.1	0.1	0.2	0.3	0.3		0.2		
Total sil and spinel	2.2	2.6	6.5	12.0	10.2		8.8	Refractory	
BMS	66.8	57.1	13.4	0.9	0.1		9.7	BMSulphides	
BMSO4	9.7	0.1	0.0	0.0	0.2		0.8	BMSulphates	
BM>PGE sulph ox	14.0	29.7	32.3	0.6	0.5		5.1	PGE BM Sulphoxides	
PGE>BM sulph ox	1.1	1.0	0.2	0.1	1.0		0.9	PGE Sulphoxides	can see decrease in BMS
Total BM PGE sulph ox	15.2	30.6	32.4	0.7	1.5		6.0		can see decrease in BMS04
									decrease in BM PGE sulph ox as Pd matrix 1 >
xBMxAs Pd matrix	0.8	2.9	28.2	45.9	50.2		30.3		very sml > in Pd matrix T2
xBM As Pd matrix	0.1	0.7	5.1	10.8	3.5		1.9		
Total Pd matrix T1	1.0	3.5	33.3	56.7	53.6		32.2	Pd oxide -type 1	PdRhRu ox solid > and PGEox>Pdox>>Ru ox solid
									Pt-rich alloy > especially rims as base metals get leached from cores
Pd matrix T2	0.0	0.0	0.1	1.9	2.6		3.9	Pd oxide - type 2	
Pd ox solid	0.3	0.9	2.2	5.9	9.7		10.7	Pd oxide (compact)	
PGE ox solid	0.8	1.0	3.2	9.2	10.2		11.5	PGE (PdRhRu) oxide compact	
Ru ox solid	0.2	0.5	2.9	5.0	4.1		5.2	Total Ru oxide compact	
Total PGE ox solid	1.3	2.4	8.2	20.1	24.0		27.3		
Pt core	0.5	0.3	0.6	0.6	0.9		2.8	Pt core	
Pt rim	1.2	1.6	4.1	5.7	5.5		7.2	PtPd rim	
Total Pt-rich alloy	1.6	1.8	4.7	6.3	6.4		9.9		
Other alloy	0.1	0.2	0.7	0.8	0.8		0.8	Other alloy	
Unknown	2.1	1.7	0.6	0.6	0.6		0.6	Unknown	
TOTAL	100.0	100.0	100.0	100.0	100.0		100.0	Total	

Tertiary Leach Run 2

Name	ALR Area%	5½ Hours Area%	Final Area%		
sil insols	0.6	1.3	2.6		
Spinel	0.1	0.1	0.5		
Total sil and spinel	0.7	1.4	3.2	Refractory	
BMS	64.7	33.0	2.2	BMSulphides	perfect example of what happens in TL
					bms < /BMSO4 </ convert to BM PGE sulph ox / these in turn form Pd matrix T1.
BMSO4	4.5	0.4	0.0	BMSulphates	some Pd matrix T2 formed at end of leach as Pd 1 'refined'
					PdRhRu ox solid conc towards end of leach by decrease in other phases - PGE>Pd…Ru ox solid, i.e the usual pattern
BM>PGE sulph ox	16.8	37.5	1.2	PGE BM Sulphoxides	Pt-rich alloy apparent increase in conc as other phases leached and Pt-rims > Pt cores by removal of base metals from the Pt cores
PGE>BM sulph ox	5.6	0.5	0.0	PGE Sulphoxides	
Total BM PGE sulph ox	22.4	37.9	1.2		
xBMxAs Pd matrix	0.3	5.9	7.0		
xBM As Pd matrix	0.0	4.2	7.1		
Total Pd matrix T1	0.3	10.1	14.1	Pd oxide -type 1	
Pd matrix T2		0.2	2.2	Pd oxide - type 2	
Pd ox solid	0.6	2.8	12.7	Pd oxide (compact)	
PGE ox solid	0.7	3.4	19.2	PGE (PdRhRu) oxide compact	
Ru ox solid	0.1	1.6	4.6	Total Ru oxide compact	
Total PtPdRu ox solid	1.3	7.8	36.5		
Pt core	2.3	3.3	12.5	Pt core	
Pt rim	2.4	4.5	25.8	PtPd rim	
Total PGE alloy	4.7	7.8	38.3		
Other alloy	0.7	0.7	1.5	Other alloy	
Unknown	0.7	0.6	0.9	Unknown	
TOTAL	100.0	100.0	100.0	Total	

Tertiary Leach Run 4

Name	ALR Area%	Final Area%		
SILICATES, MAINLY SIL	0.7	2.8		
Spinel	0.2	0.5		
Total sil and spinel			Refractory	
BMS	64.7	1.9	BMSulphides	perfect example of what happens in TL
				bms < /BMSO4 </ convert to BM PGE sulph ox / these in turn form Pd matrix T1.
BMSO4	2.5	0.1	BMSulphates	Pd matrix T2 formed at end of leach as Pd 1 'refined' - note that the amt of Pd matrix T2 is VERY high!!
				PdRhRu ox solid conc towards end of leach by decrease in other phases - PGE>Pd…Ru ox solid, i.e the usual pattern
BM>PGE sulph ox	14.8	1.2	PGE BM Sulphoxides	Pt-rich alloy apparent increase in conc as other phases leached and Pt-rims > Pt cores by removal of base metals from the Pt cores
PGE>BM sulph ox	4.2	0.0	PGE Sulphoxides	Note also that the ratios of Pd to Rh to Ru ox's has changed there is adefinate increase in Ru type - again this points to PGE solubilising
Total BM PGE sulph ox	18.9	1.2		
xBMxAs Pd matrix	0.4	10.0		
xBM As Pd matrix	0.0	2.1		
Total Pd matrix T1	0.4	12.1	Pd oxide -type 1	
Pd matrix T2		10.5	Pd oxide - type 2	
Pd ox solid	0.8	16.8	Pd oxide (compact)	
PGE ox solid	1.2	12.5	PGE (PdRhRu) oxide compact	
Ru ox solid	0.2	7.4	Total Ru oxide compact	
Total PtPdRu ox solid	2.2	36.8		
Pt core	3.4	7.6	Pt core	
Pt rim	3.0	24.9	PtPd rim	
Total Pt-rich alloy	6.4	32.5		
Other alloy	0.4	0.8	Other alloy	
Unknown	3.5	0.8	Unknown	
TOTAL	100.0	100.0	Total	

Tertiary Leach Run 6

Name	ALR Area %	5 Hour Area %	5.7 Hour Area %	10 Hour Area %	10.6 Hour Area %	12 Hour Area %	13.5 Hour Area %	15.5 Hour Area %	
silicates	1.6	1.4	1.2	2.27	2.4	8.6	15.0	2.9	
Spinel	0.2	0.1	0.1	0.13	0.1	0.3	0.6	0.3	
Total sil and spinel	1.8	1.5	1.3	2.40	2.6	9.0	15.6	3.3	Refractory
hematite plus jarosite	0.1	0.7	0.0	0.07	0.1	0.2	0.8	0.1	
BMS	61.9	25.0	20.1	23.09	16.7	3.1	0.4	9.1	BMSulphides
BMSO4	3.0	0.7	0.5	1.16	1.3	0.4	0.3	0.1	BMSulphates
BM>PGE sulph ox	20.1	54.8	55.0	35.03	36.8	6.5	0.2	5.6	PGE BM Sulphoxides
PGE>BM sulph ox	4.8	0.9	0.7	0.49	0.5	0.2	0.0	0.5	PGE Sulphoxides
Total BM PGE sulph ox	24.9	55.7	55.7	35.52	37.3	6.7	0.3	6.1	
xBMxAs Pd matrix	0.1	2.2	4.0	9.78	11.9	17.0	9.3	5.4	
xBM As Pd matrix	0.4	3.3	4.6	8.85	10.8	27.8	32.9	9.5	
Total Pd matrix T1	0.4	5.4	8.6	18.63	22.7	44.8	42.1	14.9	Pd oxide -type 1
Pd matrix T2	0.0	0.0	0.0	0.13	0.1	0.2	1.3	0.3	Pd oxide - type 2
Pd ox solid	0.9	3.2	3.7	4.42	5.0	4.7	6.5	9.0	Pd oxide (compact)
PGE ox solid	1.2	2.8	3.5	5.57	5.9	18.8	20.6	22.6	PGE (PdRhRu) oxide compact
Ru ox solid	0.5	1.6	1.9	2.99	3.1	5.0	3.7	7.0	Ru oxide compact
Total PtPdRu ox solid	2.5	7.6	9.1	12.98	14.0	28.5	30.9	38.7	
Pt core	2.2	0.5	0.9	0.99	0.8	0.8	0.6	6.9	Pt core
Pt rim	2.8	2.4	3.3	4.65	4.1	5.9	7.2	20.3	PtPd rim
Total Pt-rich alloy	5.0	2.9	4.2	5.65	4.9	6.7	7.9	27.1	
Other alloy	0.4	0.4	0.4	0.36	0.4	0.4	0.5	0.4	Other alloy
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	Total

Tertiary Leach Run 7

Name	ALR Area%	1 Hour Area%	2 Hour Area%	3 Hour Area%	4 Hour Area%	6 Hour Area%		
silicates	0.8	0.9	1.4	1.2	1.0	1.4		
Spinel	0.2	0.2	0.1	0.2	0.1	0.2		
Total sil and spinel	1.0	1.1	1.5	1.3	1.1	1.6	Refractory	
BMS	66.4	59.0	48.1	48.3	58.5	32.3	BMSulphides	
BMSO4	3.4	3.3	1.0	0.8	3.1	4.4	BMSulphates	
BM>PGE sulph ox	16.5	27.0	38.8	37.2	28.1	32.7	PGE BM Sulphoxides	
PGE>BM sulph ox	3.7	2.5	1.6	1.2	2.7	0.1	PGE Sulphoxides	
Total BM PGE sulph ox	20.2	29.5	40.3	38.5	30.8	32.7		
xBMxAs Pd matrix	0.2	0.2	0.9	1.1	0.1	9.4		
xBM As Pd matrix	0.3	0.4	1.0	1.2	0.4	3.8		
Total Pd matrix T1	0.6	0.6	2.0	2.3	0.5	13.2	Pd oxide -type 1	base metal sulphides not decreasing enough
								BM PGE sulph oxs forming but not good S removal so Pd matrix T1 not able to increase
Pd matrix T2							Pd oxide - type 2	Note that there is no Pd T2 MATRIX AT ALL - AS EXPECTED.
								since no phases really being leached, the concentration effect of the PdRhRu ox solids and Pt-rich alloy is not seen
Pd ox solid	0.8	0.9	1.5	1.7	0.7	1.6	Pd oxide (compact)	
PGE ox solid	1.3	0.9	1.7	1.7	0.8	1.0	PGE (PdRhRu) oxide compact	
Ru ox solid	0.5	0.3	0.6	0.9	0.3	2.0	Ru oxide compact	
Total PtPdRu ox solid	2.6	2.1	3.9	4.3	1.7	4.5		
Pt core	2.1	0.6	0.3	0.6	0.4	2.5	Pt core	
Pt rim	2.7	1.5	1.7	2.6	1.7	5.4	PtPd rim	
Total Pt-rich alloy	4.8	2.1	2.0	3.2	2.1	7.9		
Other alloy	0.6	0.8	0.5	0.4	0.7	0.9	Other alloy	
Unknown	0.5	1.6	0.7	0.9	1.4	2.4	Unknown	
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	Total	

Tertiary Leach Run 10

Mineral	ALR Mineral Area (%)		0.5 Hour Mineral Area (%)		1.5 Hour Mineral Area (%)		7 Hour Mineral Area (%)		9 Hour Mineral Area (%)		10.5 Hour Mineral Area (%)		11.5 Hour Mineral Area (%)		13.5 Hour Mineral Area (%)		14.5 Hour Mineral Area (%)		16 Hour Mineral Area (%)		19 Hour Mineral Area (%)		Mineral
Insols	0.32	0.32	0.33	0.33	0.38	0.38	0.40	0.40	0.56	0.56	0.54	0.54	0.58	0.59	0.57	0.57	2.60	2.61	0.72	0.72	3.33	3.33	Insols
Spinel	0.29	0.29	0.28	0.28	0.28	0.28	0.18	0.18	0.20	0.20	0.20	0.20	0.22	0.22	0.19	0.19	0.28	0.28	0.59	0.59	0.48	0.48	Spinel
	0.60	0.61	0.61	0.61	0.66	0.66	0.58	0.58	0.76	0.76	0.74	0.74	0.80	0.81	0.76	0.76	2.89	2.89	1.31	1.31	3.80	3.81	**Refractory**
CuS	30.32	30.50	30.98	31.19	32.40	32.54	13.56	13.58	10.49	10.50	3.73	3.74	3.81	3.81	0.93	0.93	0.13	0.13	0.28	0.28	0.14	0.14	CuS
Pentlandite	0.27	0.27	0.34	0.34	0.19	0.19	0.12	0.12	0.19	0.19		0.00		0.00		0.00		0.00		0.00		0.00	Pentlandite
NiCu_sulphide	13.21	13.29	13.88	13.98	14.43	14.49	13.54	13.56	0.59	0.59		0.00	0.56	0.56	0.12	0.12		0.00		0.00		0.00	NiCu_sulphide
Leached_NiCu_BMS	0.54	0.55	0.98	0.98	1.37	1.37	1.40	1.40	0.63	0.63		0.00	0.12	0.12		0.00		0.00		0.00		0.00	Leached_NiCu_BMS
Fletcherite	5.42	5.45	5.72	5.76	3.12	3.13	1.25	1.25		0.00		0.00		0.00		0.00		0.00		0.00		0.00	Fletcherite
CuFe_sulphide	17.62	17.72	15.82	15.93	12.42	12.47	6.68	6.69	6.73	6.73	1.97	1.97	2.16	2.16	0.37	0.37		0.00	0.13	0.13		0.00	CuFe_sulphide
Total BMS	**67.38**	67.78	**67.73**	**68.18**	**63.92**	64.20	**36.54**	36.59	**18.63**	18.65	**5.70**	5.71	**6.64**	6.65	**1.42**	1.42	**0.13**	0.13	**0.41**	0.41	**0.14**	0.14	**BM Sulphides**
BM>PdSO4	1.67	1.68	0.43	0.44	0.24	0.24		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	**BM Sulphates**
PGE_sulphate1 (CuBM>S<pge)	11.39	11.46	15.90	16.01	20.35	20.44	30.24	30.28	17.83	17.85	9.40	9.42	7.45	7.46	2.41	2.41	0.66	0.67	0.31	0.31	0.47	0.47	PGE_sulphate1 (CuBM>S<pge)
	0.51	0.52	0.34	0.34	0.25	0.25	1.50	1.50	1.96	1.96		0.00		0.00		0.00		0.00		0.00		0.00	
LowPGE_sulphate (BM>S pge)	2.67	2.69		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	LowPGE_sulphate (BM>S pge)
		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
PGE_sulphate_2 (RuPGE bm s o)	0.68	0.69		0.00	0.12	0.12		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	PGE_sulphate_2 (RuPGE bm s o)
PGE_ox_lowS_7 (PdPGE bm s o)	3.12	3.14	0.60	0.61	0.45	0.45	0.22	0.22		0.00		0.00		0.00		0.00		0.00		0.00		0.00	PGE_ox_lowS_7 (PdPGE bm s o)
PGE_ox_lowS_6 (PdPGE bm s o)	0.16	0.16		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	PGE_ox_lowS_6 (PdPGE bm s o)
Total PGE_sulphate1 (CuBM>S<pge)	**18.54**	18.65	**16.84**	16.95	**21.18**	21.27	**31.96**	32.00	**19.79**	19.81	**9.40**	9.42	**7.45**	7.46	**2.41**	2.41	**0.66**	0.67	**0.31**	0.31	**0.47**	0.47	**PGE BM Sulphoxides**
PGE_sulphate_3 (PdRhRuPGE S)		0.00		0.00		0.00	6.21	6.22	18.47	18.48	15.29	15.32	14.14	14.16	10.45	10.46	1.72	1.73	0.14	0.14	0.18	0.18	PGE_sulphate_3 (PdRhRuPGE S)
		0.00		0.00		0.00		0.00		0.00	3.45	3.46	2.63	2.63	3.07	3.07		0.00		0.00		0.00	
PGE sox no BM TYPE 1		0.00		0.00		0.00	**6.21**	6.22	**18.47**	18.48	**18.74**	18.78	**16.77**	16.79	**13.52**	13.53	**1.72**	1.73	**0.14**	0.14	**0.18**	0.18	PGE sox no BM TYPE 1
PGE_ox_highS_3 (PdPGE s as o)	0.18	0.18	0.65	0.66	0.72	0.72	1.28	1.28	1.57	1.57	1.64	1.64	1.53	1.54	1.43	1.43	7.13	7.14	1.81	1.82	2.03	2.03	PGE_ox_highS_3 (PdPGE s as o)
PGE_ox_highS_2 (PdPGE s as o)		0.00		0.00	0.39	0.39	1.91	1.91	2.42	2.42	3.95	3.96	4.78	4.79	6.62	6.62	4.27	4.28	1.06	1.07	0.81	0.82	PGE_ox_highS_2 (PdPGE s as o)
PGE_ox_HiS8 (PdPGE s as o)		0.00	0.21	0.21	0.35	0.35	7.20	7.21	18.01	18.02	35.31	35.38	37.22	37.26	49.16	49.20	26.23	26.29	0.94	0.95	0.86	0.87	PGE_ox_HiS8 (PdPGE s as o)
		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
PGE sox no BM TYPE 2	**0.18**	0.18	**0.86**	0.87	**1.46**	1.46	**10.38**	10.40	**21.99**	22.01	**40.90**	40.98	**43.54**	43.58	**57.21**	57.26	**37.63**	37.71	**3.82**	3.83	**3.70**	3.71	Total Pd FG TYPE 1
Total PGE sox no BM	**0.18**	0.18	**0.86**	0.87	**1.46**	1.46	**16.59**	16.62	**40.46**	40.49	**59.64**	59.76	**60.31**	60.37	**70.73**	70.79	**39.35**	39.43	**3.96**	3.97	**3.89**	3.90	**Total Pd FG TYPE 1**
Pd(S)_ox_fic		0.00	0.20	0.20	0.23	0.23	0.58	0.58	0.57	0.57	0.67	0.67	0.70	0.70	0.75	0.75	0.42	0.42	0.25	0.25	0.13	0.13	Pd(S)_ox_fic
PdAu_ox_lowS (v v < s)	1.21	1.21	2.38	2.40	2.34	2.35	2.45	2.45	2.13	2.13	3.08	3.09	3.09	3.10	2.80	2.81	15.55	15.58	18.69	18.73	21.38	21.43	PdAu_ox_lowS (v v < s)
		0.00		0.00		0.00	0.27	0.27	1.24	1.24	2.32	2.32	2.53	2.53	3.39	3.39	7.17	7.19	0.23	0.23	0.11	0.11	
Type 1 Pd_matrix_lowS (v v < s)	**1.21**	1.21	**2.58**	2.59	**2.57**	2.58	**3.30**	3.31	**3.95**	3.95	**6.06**	6.08	**6.32**	6.32	**6.94**	6.95	**23.14**	23.19	**19.17**	19.21	**21.63**	21.68	**Total Pd ox**
Type 2 Pd_matrix_lowS (v v < s)		0.00	0.33	0.33	0.35	0.36	0.33	0.33	0.20	0.20	0.25	0.25	0.34	0.34	0.46	0.46	0.26	0.26	13.38	13.40	10.40	10.43	**Pd Matrix FG Type 2**
Total Pd ox	**1.21**	1.21	**2.90**	2.92	**2.93**	2.94	**3.63**	3.63	**4.15**	4.15	**6.31**	6.32	**6.66**	6.67	**7.41**	7.41	**23.40**	23.45	**32.55**	32.61	**32.03**	32.11	PGE Sulphoxide
PGE_ox		0.00		0.00		0.00	0.15	0.15	0.35	0.35	0.44	0.44	0.43	0.43	0.61	0.61	0.38	0.38		0.00		0.00	PGE_ox
	2.21	2.22	4.50	4.53	4.47	4.49	4.56	4.56	5.67	5.67	7.51	7.53	7.37	7.38	7.61	7.61	18.39	18.43	17.15	17.18	24.96	25.02	
Total PGE ox	**2.21**	2.22	**4.50**	4.53	**4.47**	4.49	**4.70**	4.71	**6.02**	6.02	**7.96**	7.97	**7.80**	7.81	**8.21**	8.22	**18.77**	18.81	**17.15**	17.18	**24.96**	25.02	**Total PGE ox**
PGE_ox_lowS_2 (RuPGE<<o s)		0.00		0.00		0.00	0.13	0.13	0.24	0.24	0.22	0.22	0.24	0.24	0.21	0.21	0.42	0.42	1.52	1.53	0.70	0.70	PGE_ox_lowS_2 (RuPGE<<o s)
PGE_OX_HIAS (RuPGE<<o s)	0.27	0.27	0.73	0.73	0.69	0.69	0.85	0.86	1.38	1.38	1.27	1.27	1.22	1.22	1.06	1.06	0.82	0.82	1.42	1.42	0.92	0.92	PGE_OX_HIAS (RuPGE<<o s)
RuAu_OX_LOWS (RuPGE<<o s)	0.26	0.26	0.54	0.54	0.47	0.47	0.98	0.99	2.02	2.02	1.88	1.88	1.75	1.75	1.55	1.56	2.74	2.74	4.56	4.57	5.47	5.49	RuAu_OX_LOWS (RuPGE<<o s)
Total Ru ox	**0.53**	0.54	**1.26**	1.27	**1.16**	1.16	**1.97**	1.97	**3.64**	3.64	**3.37**	3.37	**3.20**	3.20	**2.83**	2.83	**3.97**	3.98	**7.50**	7.52	**7.09**	7.11	**Total Ru ox**
Total PGE ox	**3.95**	3.98	**8.67**	8.72	**8.55**	8.59	**10.30**	10.31	**13.80**	13.81	**17.64**	17.67	**17.66**	17.68	**18.45**	18.46	**46.14**	46.24	**57.20**	57.31	**64.08**	64.24	Total PGE ox
Pt_Core	3.14	3.16	0.77	0.77	0.45	0.45	0.40	0.40	1.24	1.24	0.78	0.78	0.88	0.88	0.40	0.40	0.80	0.80	7.21	7.23	4.06	4.07	**Pt_Core**
Pt_Pd_rim	3.34	3.36	2.80	2.82	2.26	2.27	2.46	2.47	4.70	4.71	5.14	5.15	5.33	5.33	4.86	4.87	8.90	8.92	28.49	28.55	21.78	21.83	**Pt_Pd_rim**
Total alloy	**6.48**	6.52	**3.57**	3.60	**2.71**	2.72	**2.86**	2.86	**5.94**	5.95	**5.91**	5.93	**6.21**	6.21	**5.27**	5.27	**9.69**	9.72	**35.71**	35.78	**25.84**	25.90	Total alloy
Other alloy	0.61	0.61	0.63	0.63	0.86	0.86	1.03	1.03	0.52	0.52	0.78	0.78	0.83	0.83	0.89	0.89	0.92	0.92	0.91	0.91	1.54	1.54	**Other alloy**
GRAND TOTAL	**99.41**	**100.00**	**99.34**	**100.00**	**99.57**	**100.00**	**99.85**	**100.00**	**99.92**	**100.00**	**99.81**	**100.00**	**99.90**	**100.00**	**99.92**	**100.00**	**99.78**	**100.00**	**99.80**	**100.00**	**99.75**	**100.00**	**GRAND TOTAL**

Tertiary Leach Run 11

Mineral	ALR Mineral Area (%)	1.5 Hour Mineral Area (%)	2 Hour Mineral Area (%)	3 Hour Mineral Area (%)	5 Hour Mineral Area (%)	6 Hour Mineral Area (%)	7 Hour Mineral Area (%)	9 Hour Mineral Area (%)	10.5 Hour Mineral Area (%)	11.5 Hour Mineral Area (%)	11.5 Hour Mineral Area (%)	Mineral
Pores	0	0	0	0	0	0	0	0	0	0	0	Pores
Insols	0.32	0.92	0.64	0.91	0.62	0.26	2.24	0.43	0.25	0.57	0.60	Insols
Spinel	0.29	0.13	0.07	0.09	0.06	0.08	0.09	0.07	0.07	0.34	0.11	Spinel
hematite	0.00	0	0	0	0	1.82	0	8.84	1.89	1.84	9.23	hematite
FeOx_lowPGE	0.03	0.02	0.01	0.02	0.01	0.66	0.02	8.88	3.39	0.40	4.43	FeOx_lowPGE
FeOx_highPGE	0.02	0	0	0	0	0	0	0.00	0.06	0	0.00	FeOx_highPGE
Feox_edge1	0.51	0.36	0.42	0.51	0.48	7.82	5.33	14.28	19.92	9.60	11.64	Feox_edge1
BMSO4	1.67	3.61	3.66	3.54	1.93	75.94	0.01	62.61	63.37	74.21	67.39	BMSO4
BMA	0.03	0.01	0.00	0	0	0.00	0	0	0	0.30	0.00	BMA
Pt_Core	3.14	0.87	0.91	0.12	0.24	0.51	0.09	0.23	0.26	2.40	0.53	Pt_Core
Pt_Pd_rim	3.34	1.64	1.49	0.81	0.99	0.62	3.29	0.36	0.28	2.32	0.76	Pt_Pd_rim
Other	0.61	0.21	0.21	0.16	0.18	0.03	0.12	0	0.02	0.05	0.01	Other
FePGEox_lowS	0.00	0.00	0	0	0.00	0.06	2.20	0.05	0.04	0.17	0.05	FePGEox_lowS
CuS	0.03	0.03	0.01	0.02	0.00	0	0	0	0	0.00	0	CuS
CuPd_sulphate	30.32	21.81	21.61	22.61	24.44	4.99	0.14	0.11	0.03	0.76	0.25	CuPd_sulphate
PGE_sulphate1	11.39	29.64	34.94	40.43	45.56	1.91	0.46	2.17	2.62	1.24	2.59	PGE_sulphate1
PGE_sulphate_3	0.00	0.13	0.11	0.08	0.06	0.03	1.57	0	0.00	0.08	0.01	PGE_sulphate_3
LowPGE_sulphate	2.67	0.88	1.51	1.33	0.89	0.11	0	0.15	2.01	0.08	0.61	LowPGE_sulphate
PGE_sulphate_4	0.06	0.06	0.08	0.04	0.03	0.01	0	0.01	0.36	0.01	0.04	PGE_sulphate_4
PGE_sulphate_2	0.68	0.52	0.75	0.63	0.42	0.03	0	0.01	0.53	0.00	0.02	PGE_sulphate_2
PGE_ox_lowS_4	0.02	0.06	0.11	0.08	0.04	0.01	0	0.01	1.71	0.05	0.11	PGE_ox_lowS_4
PGE_ox_lowS_5	0.04	0.00	0	0.00	0.01	0	0	0.01	0.10	0	0.01	PGE_ox_lowS_5
PGE_ox_lowS_7	3.12	1.58	1.34	2.31	0.88	0.08	0.02	0.02	1.37	0	0.23	PGE_ox_lowS_7
PGE_ox_lowS_6	0.16	0.00	0	0.01	0.01	0	0		0.25	0	0	PGE_ox_lowS_6
PGE_ox_lowS_3	0.03	0.00	0	0.00	0	0	0	0	0	0	0	PGE_ox_lowS_3
PdAu_ox_lowS	1.21	0.56	0.58	0.69	0.64	0.04	3.63	0	0.21	0.02	0.01	PdAu_ox_lowS
Pd(S)_ox_fic	0.07	0.13	0.09	0.07	0.06	0.01	0.26	0	0.06	0.02	0.00	Pd(S)_ox_fic
Pd_matrix_lowS	0.07	0.03	0.04	0.03	0.01	0	0.15	0	0.09	0.00	0.00	Pd_matrix_lowS
PGE_ox_HiS_As	0	0	0.00	0	0	0	0.34	0	0.00	0	0	PGE_ox_HiS_As
PGE_ox_HiS8	0.03	0.25	0.11	0.21	0.05	0.01	46.92	0.00	0.01	0.01	0.00	PGE_ox_HiS8
PGE_ox_highS_3	0.18	0.30	0.23	0.28	0.14	0.01	3.29	0	0.02	0.01	0.00	PGE_ox_highS_3
PGE_ox_highS_2	0.08	0.10	0.07	0.06	0.02	0.00	8.26	0	0	0.02	0	PGE_ox_highS_2
PGE_ox_lowS_2	0.03	0.16	0.16	0.05	0.05	0.03	0.09	0	0.01	0.19	0.01	PGE_ox_lowS_2
PGE_ox_highRu_S	2.21	4.27	3.29	4.53	3.25	0.34	18.80	0.10	0.27	0.58	0.14	PGE_ox_highRu_S
PGE_OX_HIAS	0.27	2.35	2.05	1.99	1.93	0.60	1.00	0.30	0.28	1.42	0.29	PGE_OX_HIAS
RuAu_OX_LOWS	0.26	1.59	1.33	1.63	1.41	0.41	1.64	0.60	0.20	0.99	0.53	RuAu_OX_LOWS
Pentlandite	0.27	0.13	0.12	0.09	0.07	0.37	0	0.71	0.29	1.76	0.22	Pentlandite
NiCu_sulphide	13.21	9.29	8.01	6.09	6.27	1.35	0	0.01	0.00	0.17	0.06	NiCu_sulphide
Leached_NiCu_BMS	0.54	0.31	0.22	0.19	0.33	0.17	0	0.01	0	0.04	0.03	Leached_NiCu_BMS
Haezlewoodite	0	0	0.00	0.00	0	0	0	0	0	0.05	0	Haezlewoodite
Millerite	0.04	0.10	0.08	0.29	0.02	0	0	0	0	0.01	0	Millerite
Fletcherite	5.42	6.93	6.41	3.36	2.67	0.10	0	0	0.01	0.11	0.02	Fletcherite
CuFe_sulphide	17.62	10.99	9.31	6.74	6.24	1.57	0.02	0.04	0.00	0.19	0.03	CuFe_sulphide
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	Total

Essentially during the tertiary leach the majority of the base metal sulphides are removed by conversion to sulphates, which renders them soluble in the leaching medium. In doing so, the PGM content is enriched, however, during the leaching process the PGMs themselves also move through various states and phases as the base metals are removed from the rims and phases. The leach conditions are extremely oxidising but the ALR material is very reducing, and this is visible by the low redox levels recorded at the outset of the leach (~300mV).

The situation regarding the various stages that the PGMs progress through have been divided into individual categories that are present throughout the leach, namely:

PGE Base Metal Sulphoxide :
The PGE in this phase is comprised of palladium, rhodium and ruthenium in the ratio of 3:1:1 Pd:Rh:Ru.

PGE Sulphoxide :
Once again the PGE consists of predominantly palladium and then to a lesser degree of rhodium and ruthenium.
This phase is considered to be palladium rich.

Palladium Oxide :
This mineral phase is fine grained and microscopically very different from the palladium oxide found in the PGE oxide mineral. Even though this phase is named palladium oxide it also contains rhodium and ruthenium in smaller amounts.
This mineral phase is where it is estimated that solubilisation of PGM's will most likely take place.

PGE Oxide :
All three phases are already present in the ALR but in minute quantities and again undergo enrichment by base metal leaching.
The matrix of these phases take on a solid type of texture, it is certainly differentiated from the finer grained material.

Platinum cores and rims :
These cores are already present in ALR but in very small amounts

They are modified during leaching as the base metals are removed from the rims, thus making spaces available and are more amenable for other precipitates to reside. The main elements found to be present in the rims around the cores are palladium, ruthenium and selenium.

Platinum / palladium rims are already present in the ALR and like the cores, they are concentrated as the leach progresses simply by enrichment as a result of the impurities (base metals) being removed.