

G-probe 20 Summary Report  
October 25, 2018  
Stephen Wilson

A total of thirty labs submitted final results during this stage of the G-probe 20 study. Technique breakdown was, twenty labs used LA-ICP-MS, two used SEM, and nine used EPMA. Three labs reported results using multiple techniques or provided multiple datasets. In a departure from previous G-probe studies the median concentration value determined in the study was used as the target value.

Starting material for this test sample was derived from an archived glass sample prepared in 1976 at the Corning Glass Works for the USGS. The starting material (GSE) was used as a six-step emission spectroscopy calibration material (Myers A.T., et al, 1976, USGS professional paper 1013). The glass was converted to a basalt matrix (BCR-2) through the addition of specific reagent grade compounds (Fe<sub>2</sub>O<sub>3</sub>, Al<sub>2</sub>O<sub>3</sub>, MgO, CaO, TiO<sub>2</sub>). Conversion of glass was accomplished at the USGS by melting 780 g in a one liter platinum bowl at 1325° C over a period of six hours. At the end of the melting period the molten material was poured into a platinum boat and rapidly lowered into a water bath for quenching. Twenty grams of random fragments were selected, ground and then split into representative aliquots for bulk analysis testing. Samples were analyzed for their total element content using techniques at the USGS and Agat Laboratories, Canada.

Below you will find summary results for each element studied in this test. In the element diagrams you will find information for each technique providing a value. Also included is the target value (◆) and calculated precision ( $X \pm Ha$ ) (◈) based on the Horowitz equation. A figure is also presented representing the data compilation for the entire study when more than one technique reported values. The study median is represented by ■, the standard deviation of the median by ■ and the maximum and minimum values by □. This study median is calculated primarily for the analysis of the major elements where multiple techniques provided data. For each technique an average value is presented (ex. LA-ICP-MS, ▲) as well as  $\pm$  one standard deviation (ex. LA-ICP-MS, ▲), and the maximum and minimum values reported (ex. LA-ICP-MS, △).

Table 1. Symbols used on figures 1 through 53

<u>Symbol type</u>		<u>Represents</u>
Large solid symbol,	●	Study or method average
Small solid symbol,	•	Study or method one standard deviation
Large open symbol,	○	Study or method Maximum or Minimum

Myers A.T., Havens R.G., Connor J.J., Conklin N.M., Rose H.J. Jr., Glass Reference Standards for the Trace-Element Analysis of Geologic Materials-Compilation of Interlaboratory Data, 1976 Geological Professional Paper 1013.

Table 2. Summary results for GP-20, GSD-2G

Oxide	Xa %m/m	Ha %m/m	s.d.m. %m/m	GP-20 median	MAX %m/m	Min %m/m
SiO2	55.84	1.22	0.95	55.84	58.85	53.88
TiO2	1.15	0.05	0.08	1.15	1.23	0.89
Al2O3	13.26	0.36	0.54	13.26	14.90	12.56
Fe2O3	13.17	0.36	3.23	13.17	13.84	2.41
FeO	11.85	0.33	2.74	11.85	12.45	2.68
MnO	0.08	0.00	0.01	0.08	0.12	0.08
MgO	3.51	0.12	0.18	3.51	3.95	3.02
CaO	6.42	0.19	0.17	6.42	6.61	5.72
Na2O	3.90	0.13	0.25	3.90	4.24	3.20
K2O	2.62	0.09	0.15	2.62	3.02	2.26
P2O5	0.31	0.01	0.09	0.31	0.63	0.12

Element	Xa mg/kg	Ha mg/kg	s.d.m. mg/kg	GP-20 median	MAX mg/kg	Min mg/kg
Ag	22.96	2.29	3.52	22.96	35.86	18.55
As	29.02	2.80	7.01	29.02	51.53	18.67
Au	1.25	0.19	0.24	1.25	1.99	1.14
B	40.45	3.71	7.68	40.45	66.39	36.93
Ba	44.60	4.03	5.32	44.60	64.66	37.32
Be	45.24	4.08	5.69	45.24	59.85	33.78
Bi	18.10	1.87	2.21	18.10	23.64	14.53
Br	-	-	-	-	-	-
Cd	2.28	0.32	0.75	2.28	4.02	1.25
Ce	42.47	3.86	4.15	42.47	59.86	35.09
Cl	-	-	-	-	-	-
Co	38.79	3.58	10.69	38.79	96.06	33.63
Cr	44.30	4.01	5.25	44.30	66.49	34.27
Cs	32.04	0.05	3.38	32.04	45.64	26.11
Cu	36.96	3.43	5.21	36.96	51.50	23.80
Dy	43.18	3.92	4.03	43.18	56.98	35.14
Er	41.99	3.83	4.03	41.99	53.92	34.58
Eu	41.80	3.81	3.80	41.80	56.30	34.58
F	-	-	-	-	-	-
Ga	51.32	4.54	5.09	51.32	73.23	44.25
Gd	42.23	3.85	3.75	42.23	54.61	34.24
Ge	35.27	3.30	7.09	35.27	54.05	26.76
Hf	40.32	3.70	3.52	40.32	51.66	33.62
Hg	-	-	-	-	-	-
Ho	43.20	3.92	3.94	43.20	57.03	36.01
I	-	-	-	-	-	-

Element	Xa mg/kg	Ha mg/kg	s.d.m. mg/kg	GP-20 median	MAX mg/kg	Min mg/kg
In	26.96	2.63	4.43	26.96	47.29	24.89
Ir	0.01	0.00	0.57	0.01	1.00	0.01
La	39.56	3.64	3.69	39.56	53.86	32.76
Li	42.57	3.87	5.10	42.57	65.37	32.21
Lu	46.40	4.17	3.98	46.40	61.46	38.87
Mn	641	39	64	641	928	549
Mo	39.93	3.67	3.99	39.93	58.38	33.45
Nb	45.67	4.11	4.85	45.67	66.76	37.97
Nd	44.27	4.00	3.65	44.27	60.01	35.90
Ni	45.99	4.13	5.48	45.99	66.35	28.95
Os	-	-	-	-	-	-
Pb	30.67	2.93	3.11	30.67	44.31	26.57
Pd	19.78	2.02	13.09	19.78	41.32	9.49
Pr	42.32	3.85	3.97	42.32	57.90	34.52
Pl	0.51	0.09	0.09	0.51	0.63	0.46
Rb	38.34	3.54	4.81	38.34	55.79	29.45
Re	-	-	-	-	-	-
Rh	-	-	-	-	-	-
Ru	-	-	-	-	-	-
S	-	-	-	-	-	-
Sb	39.36	3.62	5.36	39.36	57.22	30.58
Sc	41.93	3.82	5.31	41.93	58.89	29.82
Se	-	-	1.30	-	5.36	1.60
Sm	43.30	3.93	3.82	43.30	60.49	35.89
Sn	28.06	2.72	4.50	28.06	46.41	25.12
Sr	66.27	5.64	6.30	66.27	91.38	55.49
Ta	43.17	3.92	6.48	43.17	60.97	33.59
Tb	42.54	3.87	3.86	42.54	54.71	35.04
Te	-	-	-	-	-	-
Th	43.36	3.93	3.92	43.36	57.16	36.09
Tl	0.31	0.06	0.05	0.31	0.44	0.26
Tm	42.68	3.88	4.49	42.68	57.75	35.35
U	42.10	3.84	3.84	42.10	60.02	35.52
V	44.37	4.01	8.05	44.37	63.63	1.81
W	43.59	3.95	4.41	43.59	63.83	36.33
Y	42.91	3.90	5.33	42.91	54.99	34.62
Yb	46.37	4.16	4.18	46.37	61.76	38.50
Zn	48.44	4.32	7.90	48.44	77.81	40.22
Zr	45.31	4.08	8.09	45.31	74.83	36.83

Xa = Target value - GP-20 compiled median results  
 Ha = Target precision calculated using modified version of Horowitz equation  
 for data quality 2 (Ha = 0.01Xa<sup>0.8495</sup>)  
 s.d.m. = Standard deviation of population mean  
 GP-20 med. = Median element concentration for all techniques reporting  
 Max. = Maximum element/oxide concentration reported  
 Min. = Minimum element/oxide concentration reported

Table 3 G-probe 20 contributed data for GSD-2G

Lab Identifier Data Quality Method Elem/Cmpnd	units	1	2	2	3	3	4	4	5	6	6	7	7
		LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS
SiO2	% m/m	55.902			55.81	55.8			56.14				
TiO2	% m/m	1.226			1.08	1.14			1.16				
Al2O3	% m/m	13.247			14.9	14.78			13.28				
Fe2O3T	% m/m	12.162			2.41	2.78			13.18				
Fe(II)O	% m/m	10.95			2.68	3.09			11.86				
MnO	% m/m	0.0855			0.09	0.09			0.09				
MgO	% m/m	3.574			3.91	3.95			3.51				
CaO	% m/m	6.609			6.39	6.41			6.44				
Na2O	% m/m	3.864			3.2	3.24			3.94				
K2O	% m/m	2.585			2.26	2.39			2.68				
P2O5	% m/m	0.632			0.12	0.14			0.31				
Ag	mg/kg	22.074	22	21.46	20.06	20.36			18.55	27.4	22.9	21.58	22.86
As	mg/kg	23.258	29.13	28.21						33.8	29.8	28.90	30.72
Au	mg/kg	1.138	1.18	1.29						1.31	1.24	1.21	1.25
B	mg/kg	38.504	38.52	38.93						44.7	39.8		
Ba	mg/kg	44.927	37.32	37.99	47.27	48.46	40.80	42.35	45.87	46.3	45.2	43.08	43.74
Be	mg/kg	51.437	33.78	34.95			38.43	36.93	52.33	44.8	44.1	49.84	51.19
Bi	mg/kg	16.375	14.79	14.53	16.41	16.94	14.75	14.81		20.6	16.6		
Br	mg/kg												
Cd	mg/kg	1.537	2.13	2.19	3.27	3.39				2.98	2.47	2.28	2.33
Ce	mg/kg	42.081	35.09	35.58	44.56	43.41	37.47	38.62	43.81	43.7	43.3	44.94	46.10
Cl	mg/kg												
Co	mg/kg	39.038	34.37	34.44	34.17	34.69	33.63	34.29	37.42	39.0	39.8	34.47	35.30
Cr	mg/kg	42.934	38.7	38.7	46.36	45	38.20	40.83	44.52	42.6	42.8	44.24	43.15
Cs	mg/kg	31.351	27.93	27.92	29.15	29.9	27.11	27.33	32.33	34.1	31.0	26.11	26.88
Cu	mg/kg	23.804	30.34	30.92	30.66	30.72	30.08	28.18	40.20	39.0	34.6	37.69	35.80
Dy	mg/kg	42.359	35.14	35.21	43.88	42.29	45.15	44.15	44.20	44.1	42.8	49.85	51.60
Er	mg/kg	40.734	34.68	34.58	38.81	38.43	44.87	48.20	42.90	42.5	41.4	47.68	49.38
Eu	mg/kg	40.990	34.58	34.78	47.13	45.34	41.54	40.81	42.33	42.2	41.7	45.89	45.51
F	mg/kg												
Ga	mg/kg	46.473	44.25	44.65	44.74	44.29			51.97	53.5	48.5	48.18	49.49
Gd	mg/kg	42.223	35.03	34.24	42.01	40.34	43.05	42.03	42.72	43.6	42.1	46.74	48.50
Ge	mg/kg	31.356	36.64	36.31	27.37	28.32				44.2	35.3		
Hf	mg/kg	39.174	33.62	34.18	42.48	41.41	41.41	38.84	40.70	42.5	41.4	47.23	49.00
Hg	mg/kg												
Ho	mg/kg	42.430	36.3	36.62	44.41	43.15	47.47	45.87	45.43	46.1	43.6	49.75	52.05
I	mg/kg												
In	mg/kg	25.057	25.93	26.12	25.01	25.84				30.8	26.7		
Ir	mg/kg	0.997	0.0106	0.013									
La	mg/kg	39.775	32.76	33.04	38.19	38.88	38.69	38.56	40.35	41.8	40.9	44.94	46.34
Li	mg/kg	44.378	35.68	37	40.65	42.59	37.32	32.21	40.97	44.4	43.1	41.22	42.95
Lu	mg/kg	45.304	39.13	38.87	46.59	46.15	50.60	48.05	48.60	49.2	46.3	52.12	52.43
Mn	mg/kg		548.6	560	700.6	697.3				633	612	599.56	588.35
Mo	mg/kg	41.299	35.56	35.3	37.34	38.36	33.45	33.81	41.34	41.1	38.4		
Nb	mg/kg	45.200	37.97	37.98	41.41	42.97	47.90	48.93	47.88	45.9	44.9	46.64	48.22
Nd	mg/kg	42.967	35.9	36.08	45.65	45.37	44.46	44.77	44.27	44.6	44.4	46.35	47.85
Ni	mg/kg	26.950	40.53	40.48	42.45	43.18			44.08	48.4	46.3	43.70	43.98
Os	mg/kg												
Pb	mg/kg	28.458	26.59	26.57	28.58	29.29	27.01	26.98	32.35	34.5	28.0	28.58	29.63
Pd	mg/kg		9.49	10.35									
Pr	mg/kg	40.994	34.52	34.92	42.6	41.97	37.05	38.33	44.03	43.5	43.1	45.33	46.86
Pt	mg/kg	0.826	0.46	0.51									
Rb	mg/kg	37.325	33.99	33.74	36.11	36.87	32.47	33.29	38.28	40.9	37.5	37.31	39.16
Re	mg/kg	18.984	16.36	15.99						19.6	16.3		
Rh	mg/kg		0.27	0.27									
Ru	mg/kg		nd	nd									
S	mg/kg		186	232									
Sb	mg/kg	41.298	32.33	32.16			30.58	31.51		39.1	34.6		
Sc	mg/kg	46.472	29.82	30.16	37.6	36.12	44.54	43.91	42.99	43.4	42.0	45.73	44.76
Se	mg/kg	3.180	3.71	3.77						5.36	4.89		
Sm	mg/kg	42.883	35.89	36	44.46	44.2	42.34	43.23	43.60	44.7	44.1	48.07	49.22
Sn	mg/kg	25.361	28.75	28.84	26.56	27.08	27.94	28.18		33.9	30.2	25.77	26.89
Sr	mg/kg	67.217	55.91	55.49	67.48	67.59	69.93	79.12	67.94	67.7	67.4	64.53	65.56
Ta	mg/kg	38.751	34.82	34.91	46.84	46.24	51.49	51.43	47.07	44.0	42.0	51.03	52.13
Tb	mg/kg	41.091	35.71	35.68	44.2	42.46	43.22	43.29	45.00	45.4	42.9	49.64	51.91
Te	mg/kg												
Th	mg/kg	41.017	36.11	36.09	41.21	43.65	45.90	46.01	45.21	45.4	43.9	49.99	50.28
Ti	mg/kg	0.269	0.266	0.259					0.37	0.37	0.3		
Tm	mg/kg	40.978	35.35	35.68			47.79	46.34	46.59	45.1	42.4	49.71	50.89
U	mg/kg	40.842	35.52	35.71	44.86	45.81	39.58	41.35	44.44	44.2	42.9	40.40	40.33
V	mg/kg	47.041	36.71	38.35	46.6	46.91	38.47	39.27	42.60	44.3	44.1	41.59	41.83
W	mg/kg	42.236	36.33	36.43	44.35	43.09	39.69	40.47	44.28	44.5	40.6		
Y	mg/kg	43.145	34.93	35.21	34.85	34.83	43.70	42.33	45.75	44.0	42.2	52.01	53.14
Yb	mg/kg	44.986	38.5	38.59	44.45	44.91	50.37	48.84	48.45	47.4	45.7	51.70	51.82
Zn	mg/kg	48.647	43.57	44.73	63.75	57.5	43.83	45.40	42.97	58.9	59.6	40.22	44.16
Zr	mg/kg	46.740	36.85	36.83	38.57	36.31	48.23	46.19	48.08	46.3	45.0	50.93	52.66

Table 3 cont.

Lab Identifier Data Quality Method		8 2 LA-ICP-MS	9 2 LA-ICP-MS	10 2 LAICPMS	10 2 LAICPMS	11 2 LA-ICP-MS	11 2 LA-ICP-MS	12 2 LA-ICPMS	12 2 LA-ICPMS	13 2 LAICPMS	13 2 LAICPMS	14 2 LA-ICP-MS	14 2 LA-ICP-MS	
Elem/Cmpnd	units													
SiO2	% m/m	55.82		57.09	53.88	55.83	58.00					57.5	57.6	
TiO2	% m/m			1.14	1.15	1.18	1.19			1.09	1.10	1.13	1.13	
Al2O3	% m/m	13.73		13.28	13.02	13.27	13.28			13.5	13.5	12.7	12.6	
Fe2O3T	% m/m			13.34	13.45	13.45	13.28					12.38	12.55	
Fe(III)O	% m/m			12.01	12.11	12.10	11.96					11.15	11.30	
MnO	% m/m			0.08	0.08	0.08	0.08					0.084	0.084	
MgO	% m/m	3.46		3.43	3.48	3.52	3.49			3.51	3.49	3.02	3.02	
CaO	% m/m	6.44		6.44	6.44	6.38	6.43					5.86	5.72	
Na2O	% m/m	3.78		3.63	3.70	4.04	3.97			3.80	3.81	3.90	3.94	
K2O	% m/m			2.49	2.45	2.60	2.60			3.02	3.02	2.831	2.869	
P2O5	% m/m	0.26		0.26	0.25							0.334	0.340	
Ag	mg/kg		35.8615	22.74	21.93	23.01	23.05			24.5	24.5	27.36	28.20	
As	mg/kg		51.53	23.29	18.67	22.83	22.78			31.2	31.5	35.30	33.25	
Au	mg/kg		1.9925			1.18	1.37					1.60	1.54	
B	mg/kg		66.385	36.93	44.69					50.1	52.8			
Ba	mg/kg	42.41		64.48	42.30	45.88	45.83	44.54	44.65	42.3	42.7	43	43	
Be	mg/kg	41.82		59.845	44.95	44.70		45.27	45.21	44.5	44.9	40.45	39.06	
Bi	mg/kg		23.6365	18.31	16.90	17.06	16.83	18.84	18.75			20.54	21.97	
Br	mg/kg													
Cd	mg/kg		4.021	1.67	1.25	1.79	1.68			2.50	2.55	3.05	3.20	
Ca	mg/kg	40.2		59.855	41.50	41.20	42.54	42.85	41.56	42.10	41.4	41.8	38.2	38.6
Cl	mg/kg		438.5											
Co	mg/kg	37.08		54.815	38.00	38.88	36.50	38.68	38.78	39.7	39.6	41.0	41.9	
Cr	mg/kg		60.065	43.64	42.64	48.30	45.67	44.85	44.8	44.2	44.0	44.3	45.2	
Cs	mg/kg	30.68		45.635	31.88	30.44	32.44	32.30	32.77	32.2	32.3	33.9	34.8	
Cu	mg/kg	36.9		51.495	36.57	37.02	37.42	38.55	39.3	37.92		40.9	42.2	
Dy	mg/kg	40.18		56.975	41.11	41.15	43.38	43.33	43.11	43.16	41.7	42.4	36.50	36.28
Er	mg/kg	37.08		53.919	41.34	41.83	41.93	42.13	42.04	41.74	39.0	39.7	35.35	35.08
Eu	mg/kg	40.67		56.3	41.97	40.65	40.94	41.30	41.32	41.70	41.9	42.3	37.70	37.85
F	mg/kg													
Ga	mg/kg	52.2		73.225	50.27	49.12	49.80	50.00	51.67	51.91	53.4	53.0	54.7	55.2
Gd	mg/kg	38.75		54.605	42.99	42.09	41.97	41.71	42.47	42.24	39.4	39.9	36.63	36.27
Ge	mg/kg		54.045	31.56	30.26	28.78	28.77	36.45	36.80	41.8	41.5	43.07	43.32	
Hf	mg/kg	38.22		51.655	39.40	38.24	39.89	39.33	41.00	40.85	39.8	40.4	34.48	34.25
Hg	mg/kg													
Ho	mg/kg	42.23		57.03	42.10	42.44	42.78	42.82	42.95	42.89	43.1	43.8	36.43	36.01
I	mg/kg													
In	mg/kg		47.29	24.89	25.01					29.8	29.8	30.11	30.80	
Ir	mg/kg													
La	mg/kg	39.44		53.855	39.01	38.91	39.43	39.33	39.20	39.22	40.7	41.1	33.4	33.3
Li	mg/kg	42.54		65.365	38.20	41.25	42.95	42.52	43.47	43.10	46.2	46.6	48.12	49.21
Lu	mg/kg	44.29		61.46	46.75	45.10	46.39	45.81	46.33	46.40	45.7	46.2	40.06	39.76
Mn	mg/kg	615.31		927.85	653.57	644.04	641.08	835.88	639.4	644.4	641	641	647.6	651.7
Mo	mg/kg		58.38	39.17	38.43	40.07	39.53	40.60	40.68	37.5	37.4	42.43	42.70	
Nb	mg/kg	38.09		65.755	43.61	42.33	47.57	47.63	45.43	45.69	40.3	40.5	48.0	47.0
Nd	mg/kg	42.6		60.005	43.92	44.80	44.78	44.88	42.97	43.17	42.8	43.1	39.8	39.5
Ni	mg/kg	45.23		66.35	44.05	45.52	46.01	45.43	46.01	45.97	47.5	47.6	50.5	49.8
Os	mg/kg													
Pb	mg/kg	29.45		44.305	29.25	27.86	30.91	30.84	30.51	31.07	30.9	31.1	32.9	33.8
Pd	mg/kg		27.025	40.71	41.32									
Pr	mg/kg	39.21		57.896			42.59	42.62	41.06	41.41	39.7	40.2	35.56	35.42
Pt	mg/kg													
Rb	mg/kg	29.45		55.785	36.43	37.19	38.85	38.39	39.11	39.38	41.2	41.2	42.4	42.5
Re	mg/kg	39.29		26.159										
Rh	mg/kg													
Ru	mg/kg													
S	mg/kg													
Sb	mg/kg		57.215	39.59	36.39	41.59	41.48			34.3	34.2	39.36	40.42	
Sc	mg/kg	37.82		58.885	41.93	43.62	41.79	41.58	42.06	41.59	40.1	40.2	35.2	34.4
Se	mg/kg			2.53	2.36									
Sm	mg/kg	42.07		60.49	43.75	43.19	42.87	42.94	43.06	43.44	42.5	42.9	38.63	38.38
Sn	mg/kg	30.18		46.41	25.89	25.12	25.17	25.17			31.0	31.3	34.34	35.28
Sr	mg/kg	61.4		91.375	65.54	65.90	65.88	65.74	65.57	65.76	62.9	63.4	60.1	58.3
Ta	mg/kg	33.59		60.965	39.78	38.64	45.22	45.39	41.86	41.85	34.8	35.2	37.19	37.08
Tb	mg/kg	41.29		54.705	41.31	40.60	43.49	43.04	41.86	41.85	42.2	42.9	35.26	35.04
Te	mg/kg													
Th	mg/kg	41.34		57.16	42.24	41.24	43.75	43.71	42.59	42.78	42.2	43.0	40.60	40.65
Ti	mg/kg		0.4356	0.26	0.27	0.29	0.29				0.32	0.30	0.34	0.35
Tm	mg/kg	39.88		57.745	41.81	42.53	45.51	44.70	42.31	42.37	41.1	41.7	36.04	35.72
U	mg/kg	40.95		60.02	41.69	40.15	44.31	44.14	41.53	41.82	42.5	43.2	45.35	46.51
V	mg/kg	40.58		63.63	45.90	44.60	43.50	43.16	44.44	44.81	44.3	44.2	46.3	46.7
W	mg/kg		63.825	42.02	41.39	44.08	43.59	43.35	43.68	44.5	44.5	44.69	45.56	
Y	mg/kg	39.7		54.9945	43.77	43.56	42.89	42.68	42.92	42.78	40.9	41.2	35.1	34.6
Yb	mg/kg	44.71		61.755	46.64	45.73	47.51	48.38	46.31	46.15	46.6	47.0	39.00	38.52
Zn	mg/kg	52.47		77.805	48.24	46.84	47.73	45.78	46.67	46.96	53.3	53.3	54.8	57.3
Zr	mg/kg	43.17		59.525	45.50	44.77	45.31	45.40	45.27	45.25	43.9	44.1	38.1	37.7

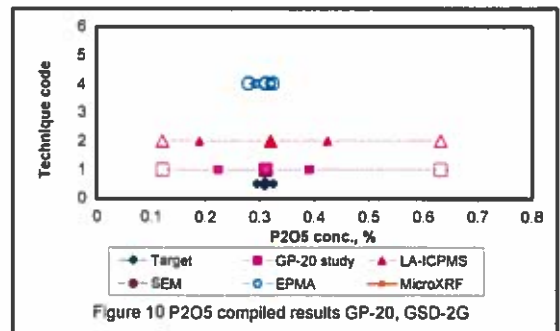
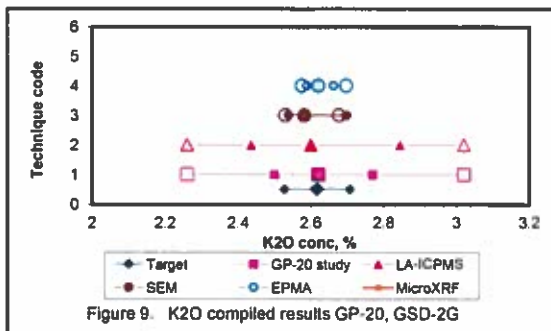
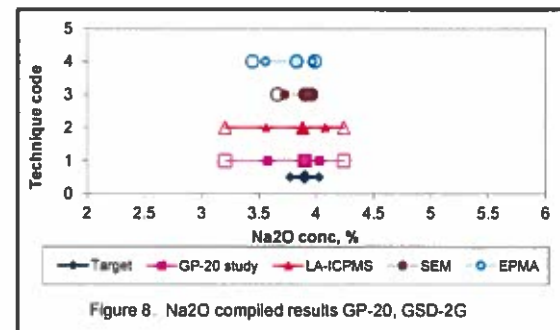
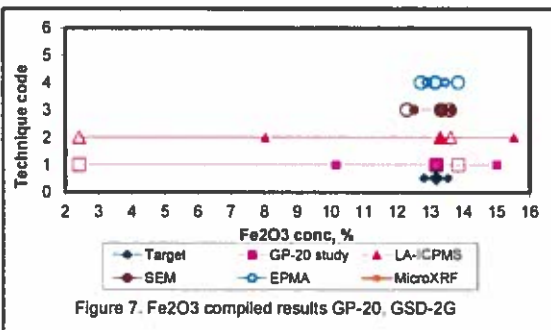
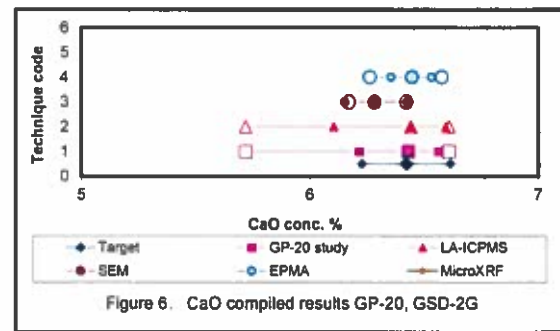
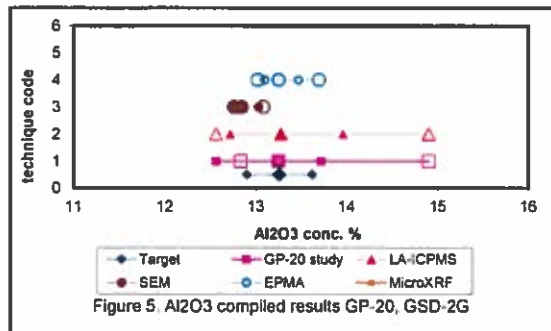
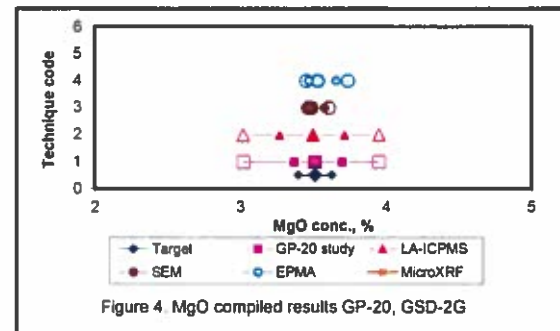
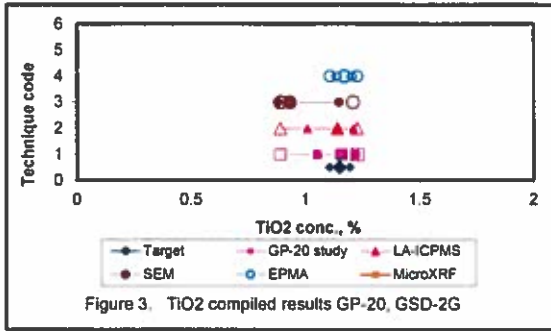
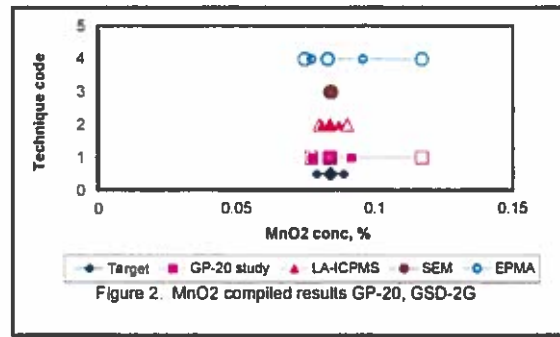
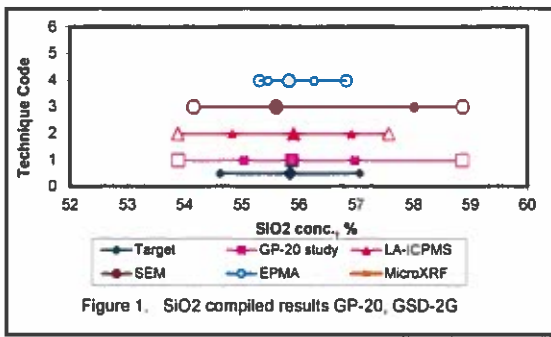
Table 3 cont.

Lab identifier Data Quality Method Elem/Cmpnd	units	15	15	16	16	17	17	18	18	19	20	20
		2	2	2	2	2	2	2	2	2	2	2
		LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS
SiO2	% m/m					56.388	56.367			54.16	54.8	54.6
TiO2	% m/m					1.19	1.19			0.93	0.890	0.896
Al2O3	% m/m					13.02	13.04				12.9	12.8
Fe2O3T	% m/m					13.60	13.61				13.6	13.6
Fe(II)O	% m/m					12.24	12.25				12.22	12.23
MnO	% m/m					0.08	0.08				0.0839	0.0842
MgO	% m/m					3.50	3.50				3.49	3.46
CaO	% m/m					6.441	6.443					
Na2O	% m/m	4.24	4.20			3.910	3.898				3.66	3.72
K2O	% m/m					2.650	2.652				2.53	2.56
P2O5	% m/m	0.333	0.332			0.334	0.334					
Ag	mg/kg			25.0	25.9	25.788	25.920				23.5	24.1
As	mg/kg			24.8	25.3	34.02	34.39				21.4	23.1
Au	mg/kg						1.25					
B	mg/kg	49.5	49.4	37.9	38.2	37	37				41.3	41.1
Ba	mg/kg	46.5	46.8	44.1	44.9	44.15	44.25	50.80	50.51		44	44
Be	mg/kg	45.4	46.5	49.1	49.2	48.8	48.9			43	46.2	46.3
Bi	mg/kg	19.8	19.8	19.2	19.5			18.10	18.18	18.1	19.6	19.9
Br	mg/kg											
Cd	mg/kg			1.6	1.8	1.8	1.8			2.9	1.56	1.57
Ce	mg/kg	42.9	42.8	42.8	43.3	42.4	42.4	46.27	52.48	42	42.0	41.9
Cl	mg/kg											
Co	mg/kg	40.1	39.7	39.8	40.3	39	39			35.7	38.9	38.8
Cr	mg/kg	45.5	45.0	43.1	44.3	45.703	45.613			43.9	42.8	42.7
Cs	mg/kg	34.6	34.4	33.7	34.0	32.5	32.6			28.7	31.1	31.7
Cu	mg/kg	40.5	39.8	38.9	40.0	40.55	40.52			36.7	32.7	35.6
Dy	mg/kg	41.0	42.2	44.9	45.2	43.212	43.323	47.12	46.87	42.2	43.2	42.6
Er	mg/kg	38.8	40.2	45.3	45.2	42.81	42.85	44.95	45.00	43.1	42.8	42.5
Eu	mg/kg	39.8	40.20	42.9	43.1	41.627	41.706	47.45	48.80	38.1	43.1	42.8
F	mg/kg											
Ga	mg/kg	55.5	54.9	53.3	53.1	52.92	53.05	52.28	50.96	49.6	49.3	49.5
Gd	mg/kg	41.3	42.5	45.8	46.2	43.215	43.366	48.87	47.27	39.9	44.3	43.2
Ge	mg/kg	46.9	46.6			32.80	33.00	36.34	35.24		31.7	31.9
Hf	mg/kg	39.0	40.1	41.8	41.9	40.141	40.247	42.77	42.58	39.8	39.6	39.1
Hg	mg/kg											
Ho	mg/kg	40.7	41.9	45.4	45.7	43.140	43.258	46.24	44.56	44.7	43.5	43.0
I	mg/kg											
In	mg/kg			27.7	27.5	26.877	26.957	27.88	26.67	29.8	28.8	28.5
Ir	mg/kg											
La	mg/kg	39.7	40	41.4	41.8	39.49	39.64	43.86	43.50	39.1	39.9	39.7
Li	mg/kg	46.3	45.7	43.2	43.9	42.450	42.328			40.9	39.7	41.6
Lu	mg/kg	43.0	44.4	48.8	49.1	46.55693992	46.64797383	51.04	48.35	46.4	46.60	45.90
Mn	mg/kg	647	639	634.5	671	628.54	628.67			559		
Mo	mg/kg	42.0	41.7	41.7	41.6	41.21	41.23	39.83	39.14	41.8	39.3	39.4
Nb	mg/kg	45.9	45.7	45.5	45.9	45.7	45.7	52.82	53.28	42.4	44.5	44.3
Nd	mg/kg	43.6	44.2	45.7	46.2	44.2	44.3	47.37	47.18	42.4	43.9	43.6
Ni	mg/kg	49.1	48.6	47.5	47.7	46.966	46.962			43.9	45.8	46.3
Os	mg/kg											
Pb	mg/kg	32.3	31.7	32.0	32.5	31.918	31.956			32.6	30.5	30.4
Pd	mg/kg					19.05	19.78					
Pr	mg/kg	42.5	42.6	43.0	43.3	41.994	42.138	42.53	42.65	42.6	42.1	41.7
Pt	mg/kg											
Rb	mg/kg	43.7	43.7	39.6	40.1	38.666	38.688			35	37.0	37.6
Re	mg/kg			19.4	19.7	19.356	19.565					
Rh	mg/kg					0.447	0.449					
Ru	mg/kg											
S	mg/kg											
Sb	mg/kg	39.1	38.5	42.2	42.0	41.8	42.0			35.4	39.6	40.1
Sc	mg/kg	40.9	41.1	44.7	45.3	42.00	41.92			40.5	49.5	48.8
Se	mg/kg										1.9	1.6
Sm	mg/kg	42.9	43.2	45.4	45.6	43.36	43.48	45.05	45.30	41.9	41.5	41.9
Sn	mg/kg	36.4	36.4	27.8	27.6	27	27			31.1	28.8	28.8
Sr	mg/kg	66.1	66.4	67.6	68.1	66.063	66.144			60.5	69.9	69.8
Ta	mg/kg	43.6	44.1	42.2	42.5	42.847	42.846	54.23	59.36	39.5	43.5	42.8
Tb	mg/kg	40.6	41.5	44.2	44.4	42.469	42.603	45.25	45.12	41.5	42.4	41.8
Te	mg/kg					8.13	8.23					
Th	mg/kg	41.6	42.5	45.7	44.2	43.741	43.871			44	38.1	36.7
Tl	mg/kg					0.306	0.310			0.348		
Tm	mg/kg	39.7	41.0	44.2	44.4	42.824	42.893	46.42	43.79	44	42	42
U	mg/kg	43.4	43.2	41.5	42.3	42	41			40.1	42	42
V	mg/kg	45.0	44.5	45.7	46.1	44.187	43.975			40.6	45.3	45.1
W	mg/kg			45.0	45.4	43.7	43.6	39.77	38.83	39.7	43.2	43.2
Y	mg/kg	39.5	40.6	45.7	46.1	43.91	44.02	50.28	50.82	39.5	43.7	43.0
Yb	mg/kg	43.0	44.0	47.9	48.4	46.4	46.5	51.03	50.24	46.9	46.2	45.4
Zn	mg/kg	55.1	52.5	44.3	44.5	44	43			58.4	49.2	49.3
Zr	mg/kg	43.4	44.2	47.9	48.1	45.72	45.93	57.07	57.92	43	45.3	44.7

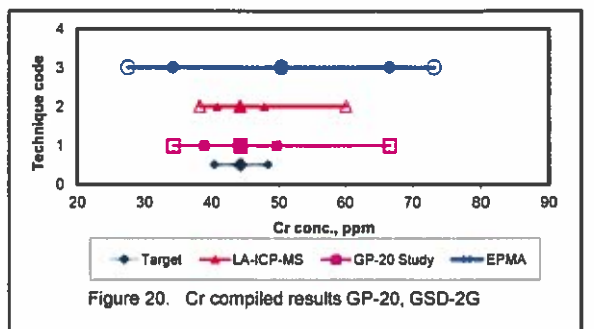
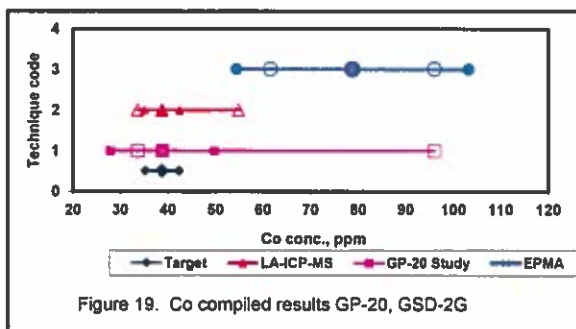
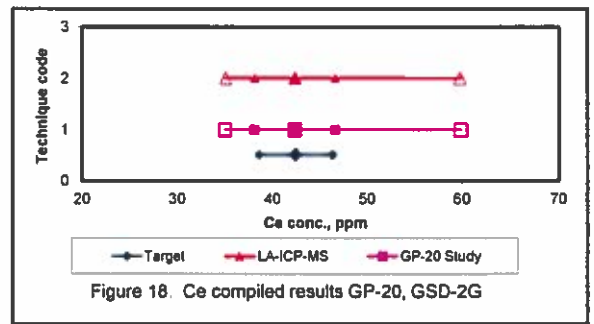
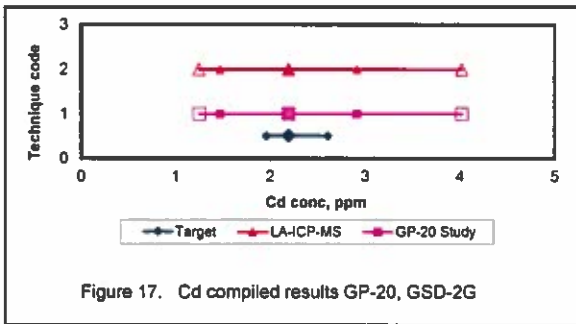
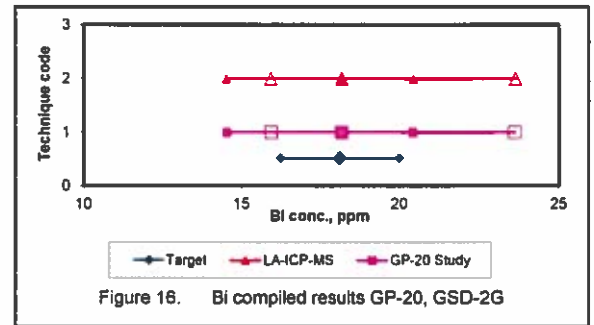
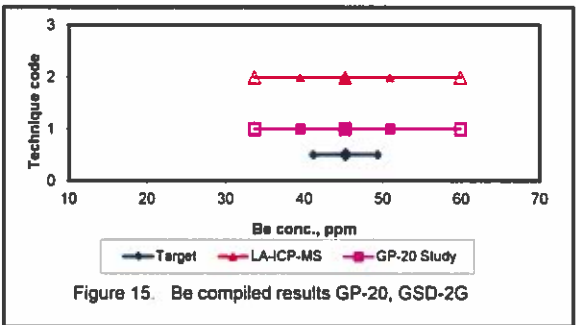
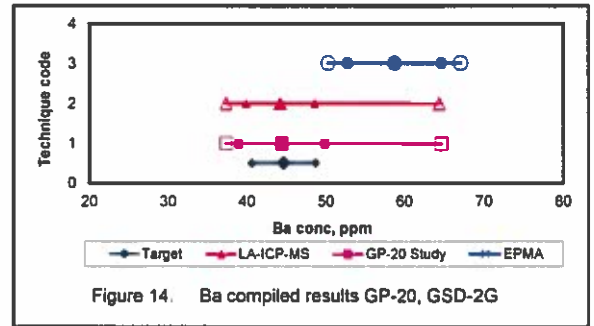
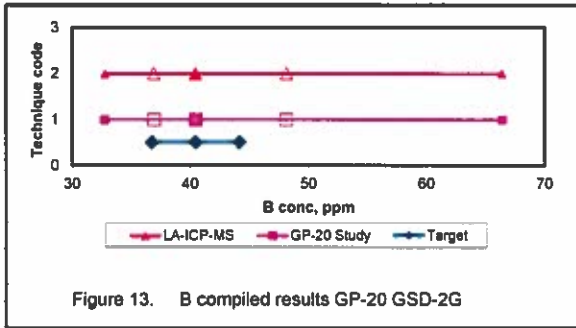
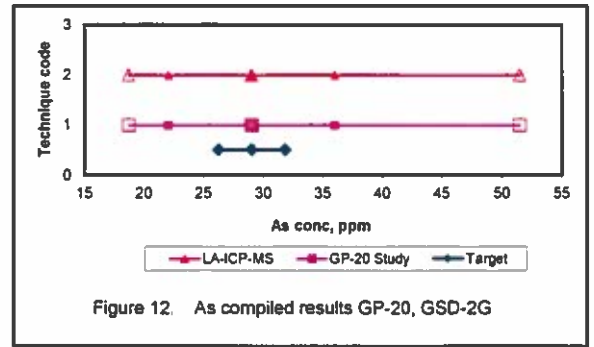
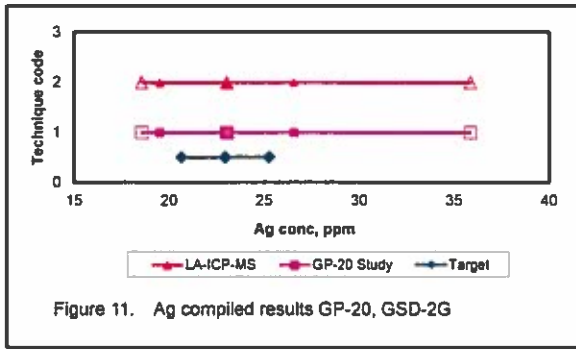


Table 3 cont.

Lab Identifier Data Quality Method Elem/Cmpnd		26 2 EPMA	26 2 EPMA	27 2 EPMA	27 2 EPMA	28 2 EPMA	28 2 EPMA	16A 2 EPMA	16A 2 EPMA	15A 2 LA-ICP-MS	15A 2 LA-ICP-MS	29 2 EPMA	29 2 EPMA
SiO2	% m/m	55.95	55.85	57	57	55.31	55.51	55.9	56.29	55.46	55.49	55.941	55.965
TiO2	% m/m	1.14	1.14	1	1	1.23	1.22	1.17	1.17	1.17	1.17	1.14	1.142
Al2O3	% m/m	13.03	13.02	14	14	13.23	13.24	13.38	13.48	13.11	13.13	13.377	13.427
Fe2O3T	% m/m	13.11	13.11	13.15	13.31	13.77	13.84	12.97	13.21	12.83	12.72	13.138	13.261
Fe(II)O	% m/m	11.8	11.8	12	12	12.39	12.45	11.67	11.89	11.547	11.448	11.82	11.93
MnO	% m/m	0.08	0.08			0.089	0.080					0.08	0.084
MgO	% m/m	3.52	3.54	4	4	3.69	3.64	3.58	3.48	3.47	3.45	3.688	3.711
CaO	% m/m	6.42	6.43	7	7	6.47	6.47	6.26	6.29	6.46	6.40	6.37	6.406
Na2O	% m/m	3.94	3.96	4	4	3.93	3.97	3.90	3.91			3.597	3.589
K2O	% m/m	2.6	2.59	2.679	2.697	2.62	2.62	2.60	2.64	2.68	2.63	2.672	2.698
P2O5	% m/m	0.31	0.31	0.278	0.270	0.323	0.318	0.31	0.32			0.32	0.309
Ag	mg/kg												
As	mg/kg												
Au	mg/kg												
B	mg/kg												
Ba	mg/kg					53	65						
Be	mg/kg												
Bi	mg/kg												
Br	mg/kg												
Cd	mg/kg												
Ce	mg/kg												
Cl	mg/kg					733	730						
Co	mg/kg					62	96						
Cr	mg/kg					66	34						
Cs	mg/kg												
Cu	mg/kg												
Dy	mg/kg												
Er	mg/kg												
Eu	mg/kg												
F	mg/kg												
Ga	mg/kg												
Gd	mg/kg												
Ge	mg/kg												
Hf	mg/kg												
Hg	mg/kg												
Ho	mg/kg												
I	mg/kg												
In	mg/kg												
Ir	mg/kg												
La	mg/kg												
Li	mg/kg												
Mn	mg/kg												
Mo	mg/kg												
Nb	mg/kg												
Nd	mg/kg												
Ni	mg/kg					53	56						
Os	mg/kg												
Pb	mg/kg												
Pd	mg/kg												
Pr	mg/kg												
Pt	mg/kg												
Rb	mg/kg					52	45						
Re	mg/kg												
Rh	mg/kg												
Ru	mg/kg												
S	mg/kg					15	21						
Sb	mg/kg												
Sc	mg/kg												
Se	mg/kg												
Sm	mg/kg												
Sn	mg/kg												
Sr	mg/kg					70	81						
Ta	mg/kg												
Tb	mg/kg												
Te	mg/kg												
Th	mg/kg												
Tl	mg/kg												
Tm	mg/kg												
U	mg/kg												
V	mg/kg					2	49						
W	mg/kg												
Y	mg/kg												
Yb	mg/kg												
Zn	mg/kg												
Zr	mg/kg					71	75						







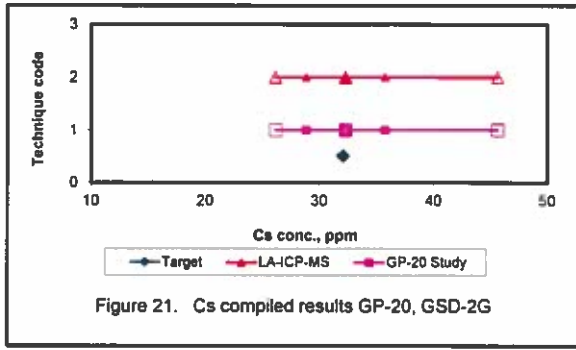


Figure 21. Cs compiled results GP-20, GSD-2G

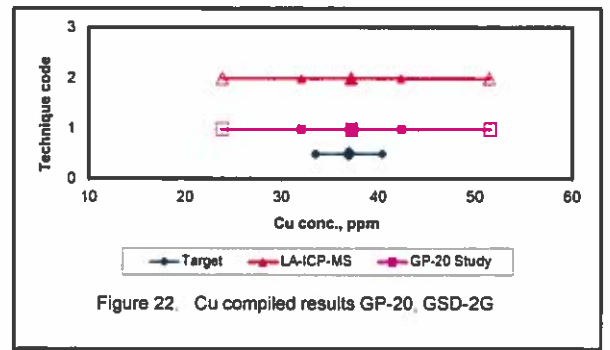


Figure 22. Cu compiled results GP-20, GSD-2G

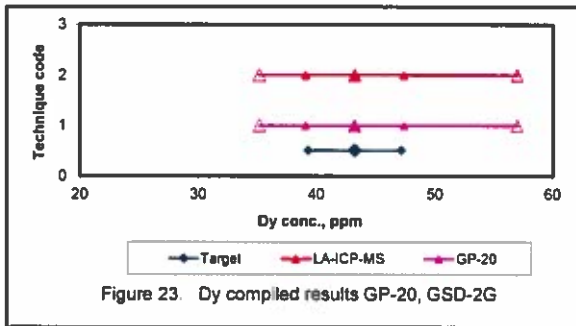


Figure 23. Dy compiled results GP-20, GSD-2G

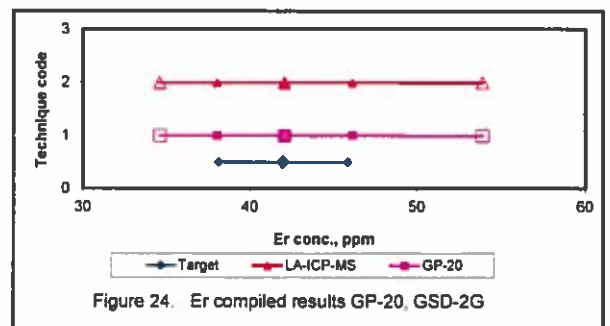


Figure 24. Er compiled results GP-20, GSD-2G

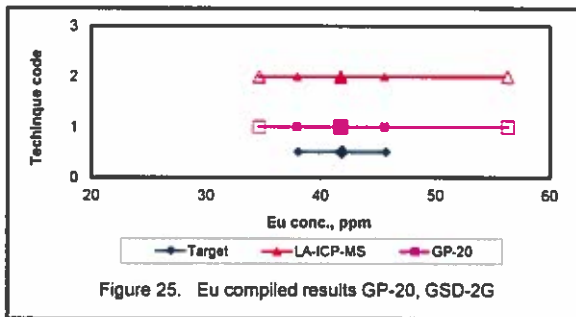


Figure 25. Eu compiled results GP-20, GSD-2G

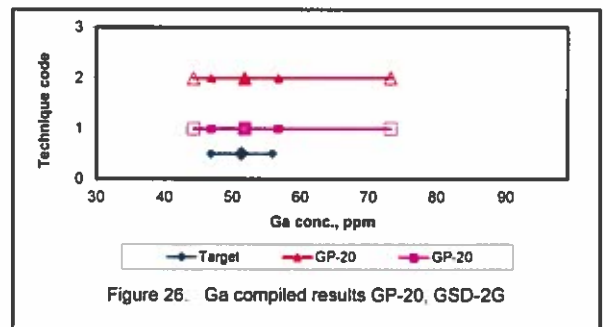


Figure 26. Ga compiled results GP-20, GSD-2G

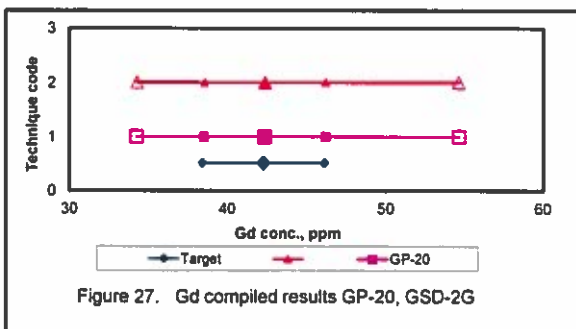


Figure 27. Gd compiled results GP-20, GSD-2G

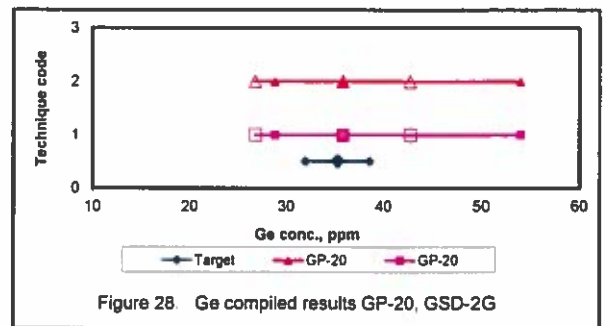


Figure 28. Ge compiled results GP-20, GSD-2G

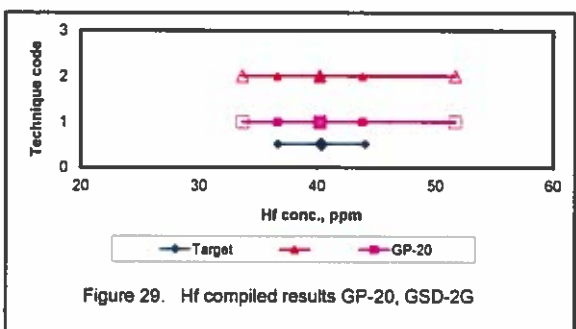


Figure 29. Hf compiled results GP-20, GSD-2G

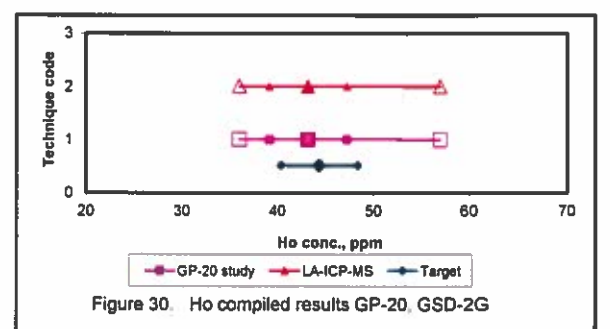


Figure 30. Ho compiled results GP-20, GSD-2G

