Co Targeting Methodology

Introduction

The Co targeting was carried out with a primary focus on the Co average (ppm) regolith values. These targets were filtered by considering the overburden thickness, proximity to previously defined Cu targets and proximity to Sc trends associated with lineaments. Other factors were also considered such as the hydrogeochemistry and the average regolith concentrations of elements shown to correlate with Co elsewhere (Cu, Mo, Zn, Pb, Ni, Sc).

KGP regolith data

The assays for the regolith as previously extracted from the KGP data were investigated for Co anomalies. Four parameters were plotted and are defined as follows:

- Co_ppm: the average of the Co ppm values in the regolith
- Coxmxppm: total thickness of the regolith multiplied by the Co_ppm value
- Co_ppmT: The total Co ppm in the regolith
- CoT_M : Co_ppmT divided by the total thickness of the regolith

The KGP regolith assays are a sample of the KGP data and show concentrations at the regolith (/bedrock interface) only. It is not based on the KGP data above the regolith (Table 1). The extraction is based on correlating the regolith lithologies and assays via the depth. By excluding assays from the material above the regolith it is believed that a clearer picture of true Co anomalies can be achieved. It can be seen from table 1 that typically only assays towards the bottom of each hole (> +-50 m depth) are included in the regolith dataset.

Table 1 Definition of KGP regolith values.

Hole_ID	Xco	Yco	Zco	Thickness	DH_From	DH_To	Co_ppm	Coxmxppm	Co_ppmT	CoT/M
KGPDD0027	585999	7962475	966.132205	0.5	52.36	52.86	6.4			
KGPDD0027	585999	7962475	965.632205	0.5	52.86	53.36	16.1			
KGPDD0027	585999	7962475	964.882205	1	53.36	54.36	13.9			
KGPDD0027	585999	7962475	963.882205	1	54.36	55.36	10.3			
KGPDD0027	585999	7962475	962.712205	1.34	55.36	56.7	11.1			
KGPDD0027	585999	7962475	962.712205	4.34			11.56	50.1704	57.8	13.3179724
KGPDD0028	583997	7962479	969.691972	2	52.2	54.2	1.1			
KGPDD0028	583997	7962479	967.691972	2	54.2	56.2	1.1			
KGPDD0028	583997	7962479	965.691972	2	56.2	58.2	0.9			
KGPDD0028	583997	7962479	963.691972	2	58.2	60.2	0.7			
KGPDD0028	583997	7962479	961.691972	2	60.2	62.2	0.7			
KGPDD0028	583997	7962479	959.691972	2	62.2	64.2	0.5			
KGPDD0028	583997	7962479	957.691972	2	64.2	66.2	0.7			
KGPDD0028	583997	7962479	955.691972	2	66.2	68.2	0.8			
KGPDD0028	583997	7962479	953.691972	2	68.2	70.2	0.8			
KGPDD0028	583997	7962479	952.441972	0.5	70.2	70.7	9.5			
KGPDD0028	583997	7962479	951.941972	0.5	70.7	71.2	12.9			
KGPDD0028	583997	7962479	951.191972	1	71.2	72.2	11.1			
KGPDD0028	583997	7962479	950.116972	1.15	72.2	73.35	12.6			
KGPDD0028	583997	7962479	950.116972	1.62692308			4.10769231	6.68289941	53.4	32.822695

Each of the four regolith indicators reflect to varying degrees the general quality (/concentration), quantity and how difficult it is to extract the element in question. They are interpreted to be potentially indicative of economically interesting targets. The average Co ppm is the most basic indicator and has been selected to delineate the anomalies in this work.

Correlations with other elements

An examination of the correlation matrix (Appendix 1, table 1) created for the regolith only data showed the relationships summarised in Table 2.

Table 2 Elements that correlate best with Cobalt (Summary of KGP regolith correlation matrix)

Correlation observation	Elements (correlation coefficient)
very strong	Li 0.86; Fe 0.85; Ni 0.83; Mn 0.82; Mg 0.81
strong	K (0.75); Pb (0.74); Se (0.71); Zr (0.64); Sc (0.63)
moderate	Cu (0.6); Mo (0.58); Te (0.54); Zn (0.54)
weak	S (0.33); Sb (0.23)

Experiences elsewhere in the Central Kalahari Copperbelt (Catterall, pers. comm.. 2018) have shown the following elements correlate best with Cobalt soil geochemistry data: Cu, Mo, Zn (very strong) , 2) Fe, Ni, Mn, Mg, Pb (strong) and S (moderate). Based on these observations and the fact that regolith assays were not available for certain elements such as Li, the following elements were selected for further investigations to aid the cobalt targeting: Cu, Mo, Zn, Pb, Ni and Sc.

Analysis of the Cobalt regolith data

The four Cobalt regolith parameters are shown in figures 1 - 2. The point data was gridded to produce contours for each of the parameters (figure 3). These were simplified to define potential anomaly areas based on the top value of each parameter. Various gridding tests were carried out on the Cobalt data and the spatial neighbour algorithm with a cell size of 160m proved the most effective. All subsequent gridding was carried out in the same manner to facilitate comparisons. All the grids suggest an association with a central NNW-SSE trend - similar to the Cu regolith data (see further) and also probably associated with structural features / lineaments in this orientation.

Definition of Co targets

The Co average ppm best value contours were used to define a first set of 36 anomalies. Additional anomalies were added from the other three Co regolith parameters (figure 4). The first pass of 52 potential anomaly centres is shown in figure 5. This initial set of anomaly centres was reduced to 21 targets through various filters, the first of which was the overburden thickness. The following factors were used to further prioritise the targets: 1) Proximity to Cu targets, 2) Proximity to Sc average regolith trends and 3) Proximity to Cu average regolith anomaly. The data was also examined relative to 1) the average regolith value anomalies observed for: Zn, Mo, Pb and Ni and 2) areas of interest based on historical drilling (1822C10 and L9670).

Overburden Thickness

Of the 52 Co anomaly centres based on the regolith contours, 29 locations were rejected either because of lower Co ppm value or because they lie in areas of very thin overburden thickness. This resulted in a reduced set of 21 targets for further prioritisation.

The Cobalt average regolith values are shown relative to the bedrock topography and overburden in figure 6. The bedrock topography values range from 900 to 1010 m (RL). The overburden thickness varies from 20 to 110m. The overburden thickness may be used to prioritise anomalies of similar average Co value. If two anomalies are of similar magnitude, then the one covered by greater overburden may be speculated to be of greater significance.

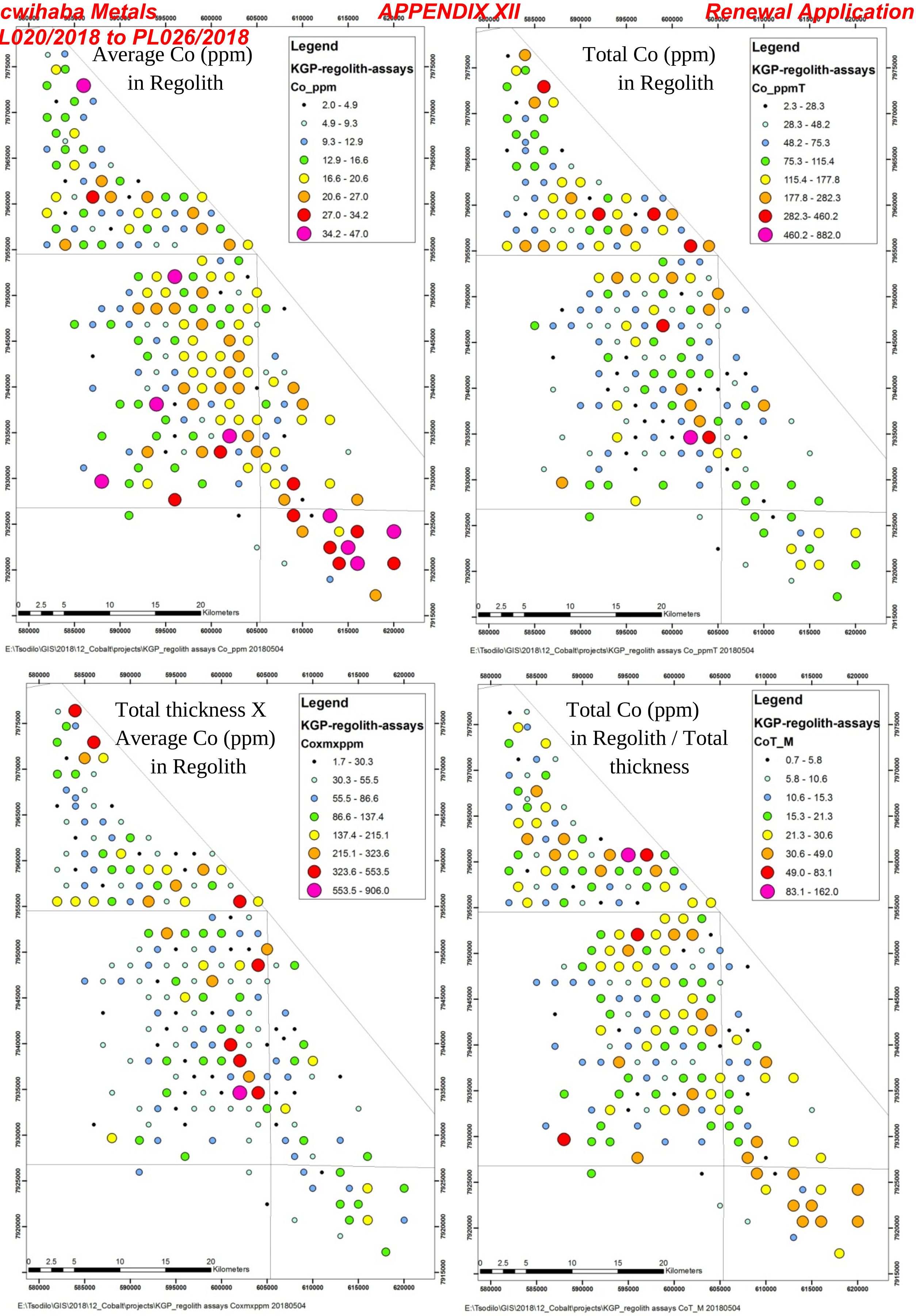

Figure 1 KGP regolith Co data plotted as points (Natural breaks Jenks 8 classes used).

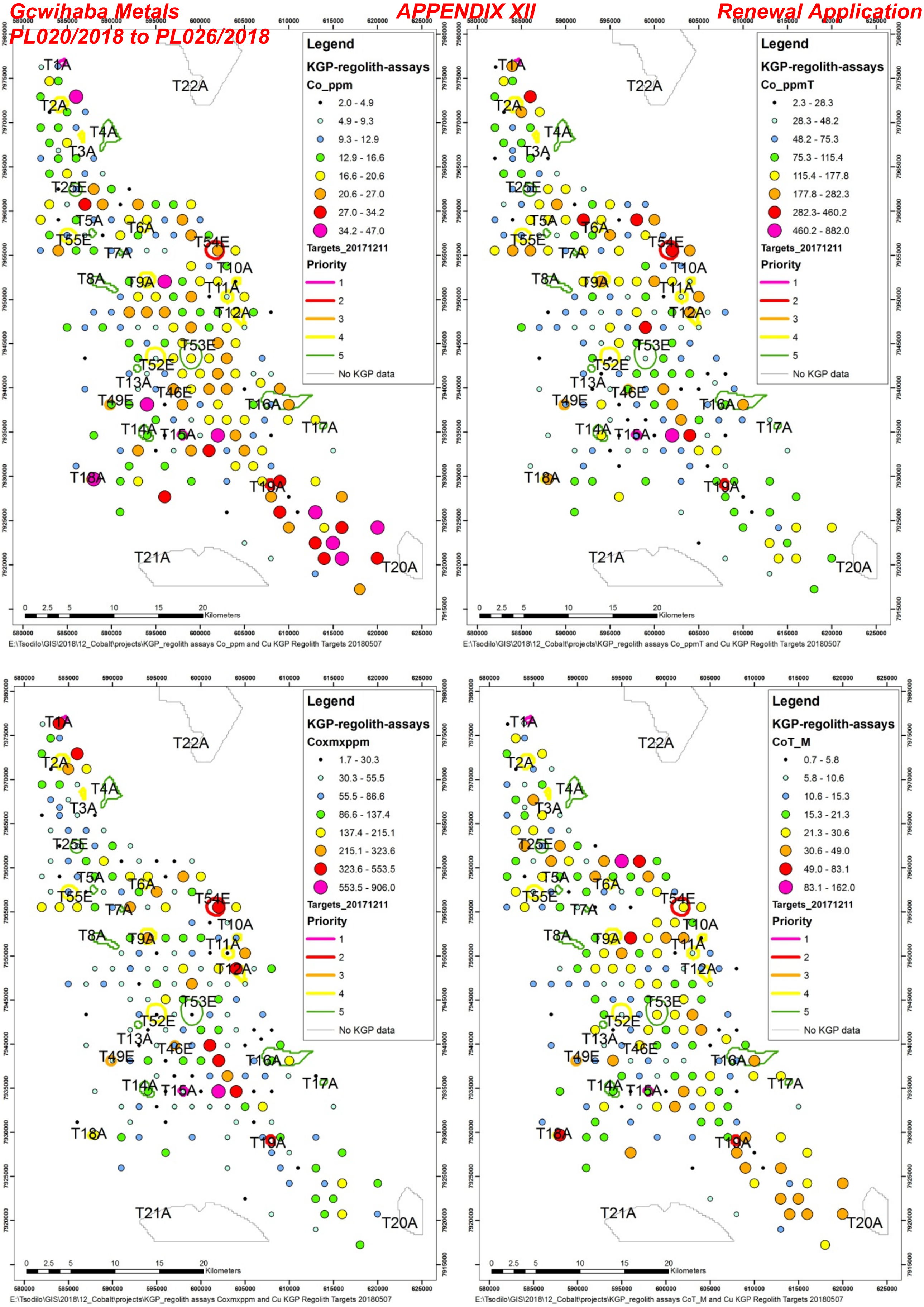

Figure 2 KGP regolith Co data plotted as points over Cu targets as at 2017/12/21.

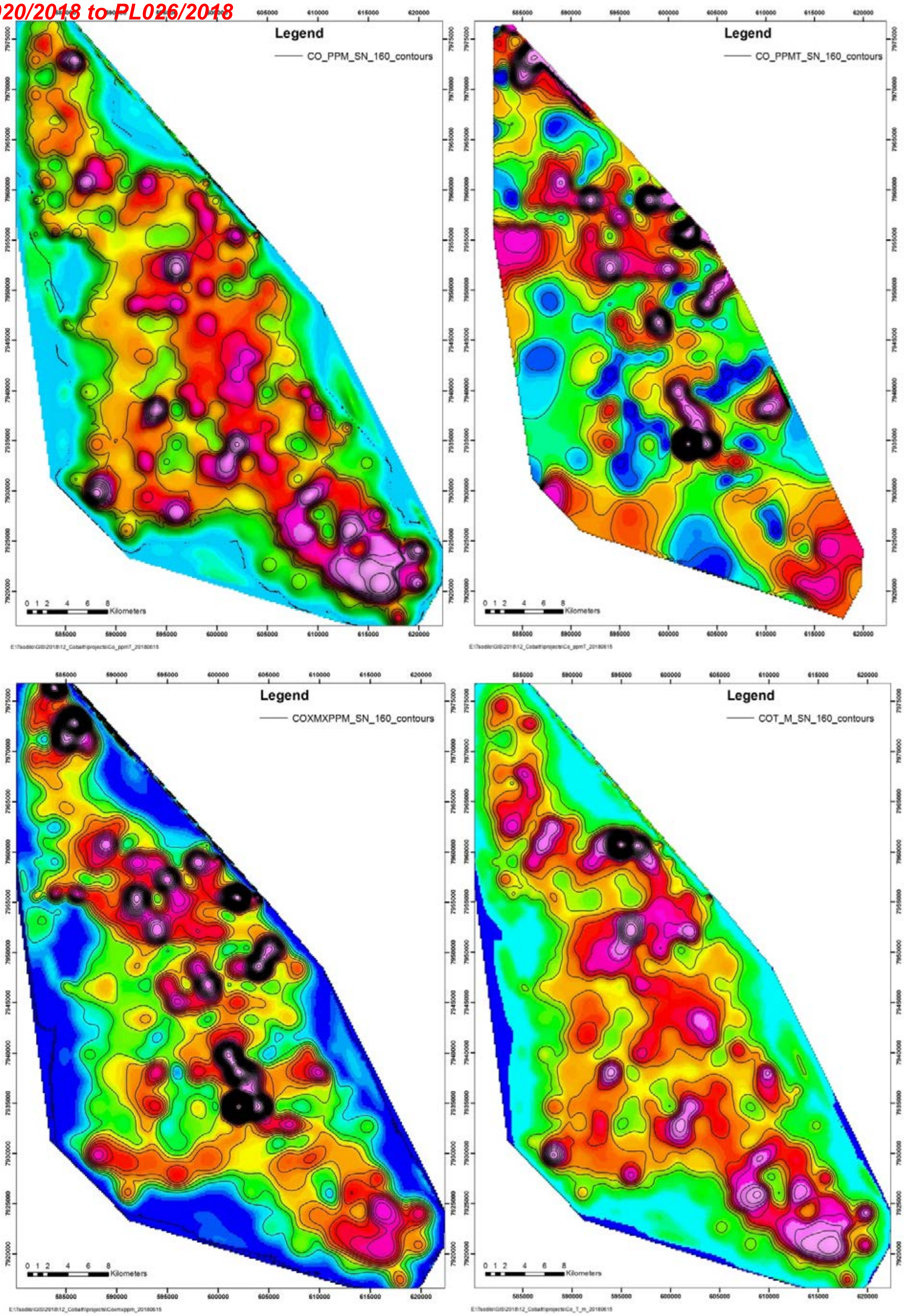

Figure 3 Co_ppm, Co_ppmT, CoT_M and Coxmxppm grids and contours (clockwise from top left).

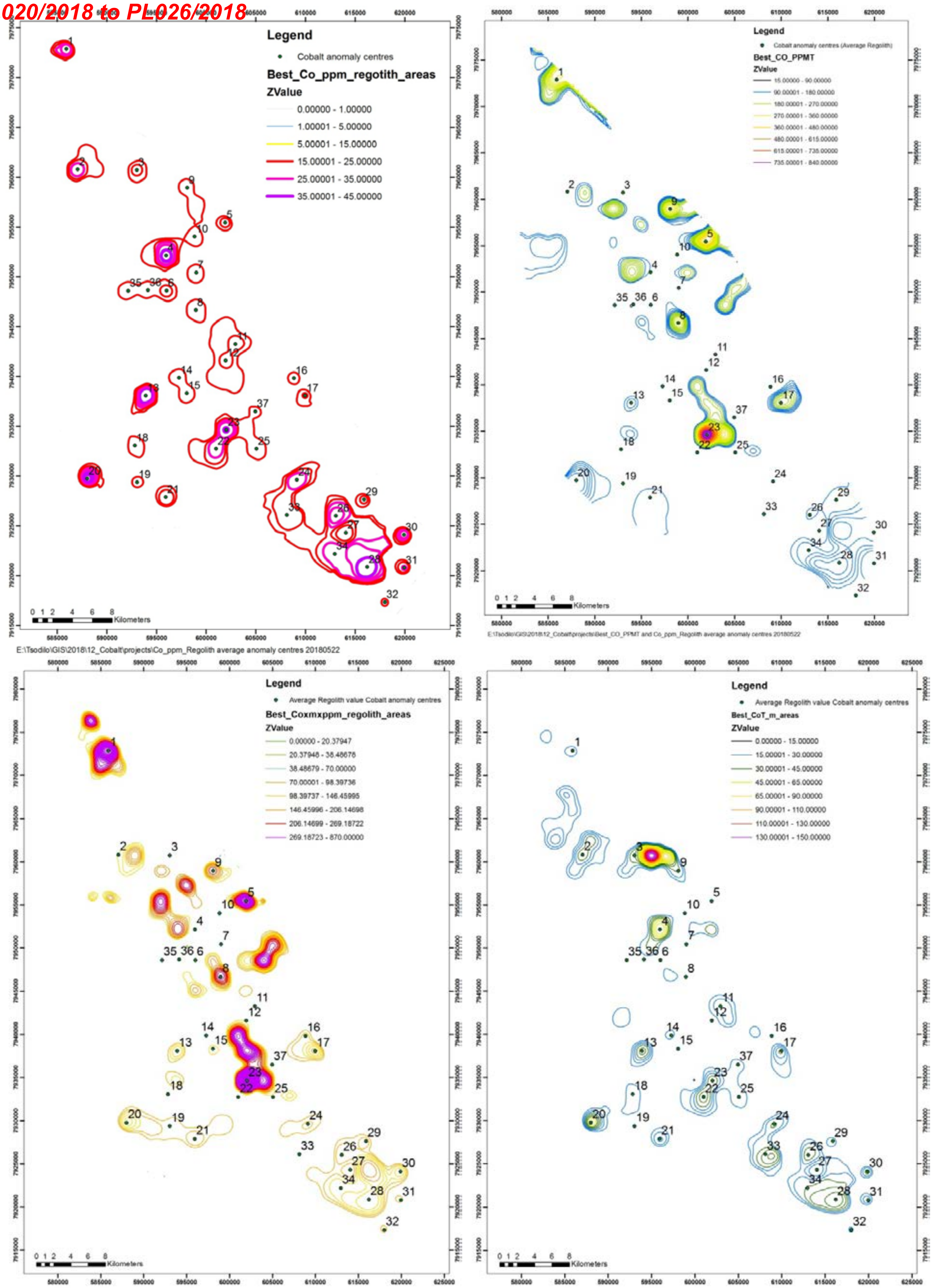

Figure 4 Best Co regolith anomalies. The anomaly centre is based on (clockwise top left to bottom left) the average regolith Co ppm, Co_ppmT, CoTm and Coxmxppm.

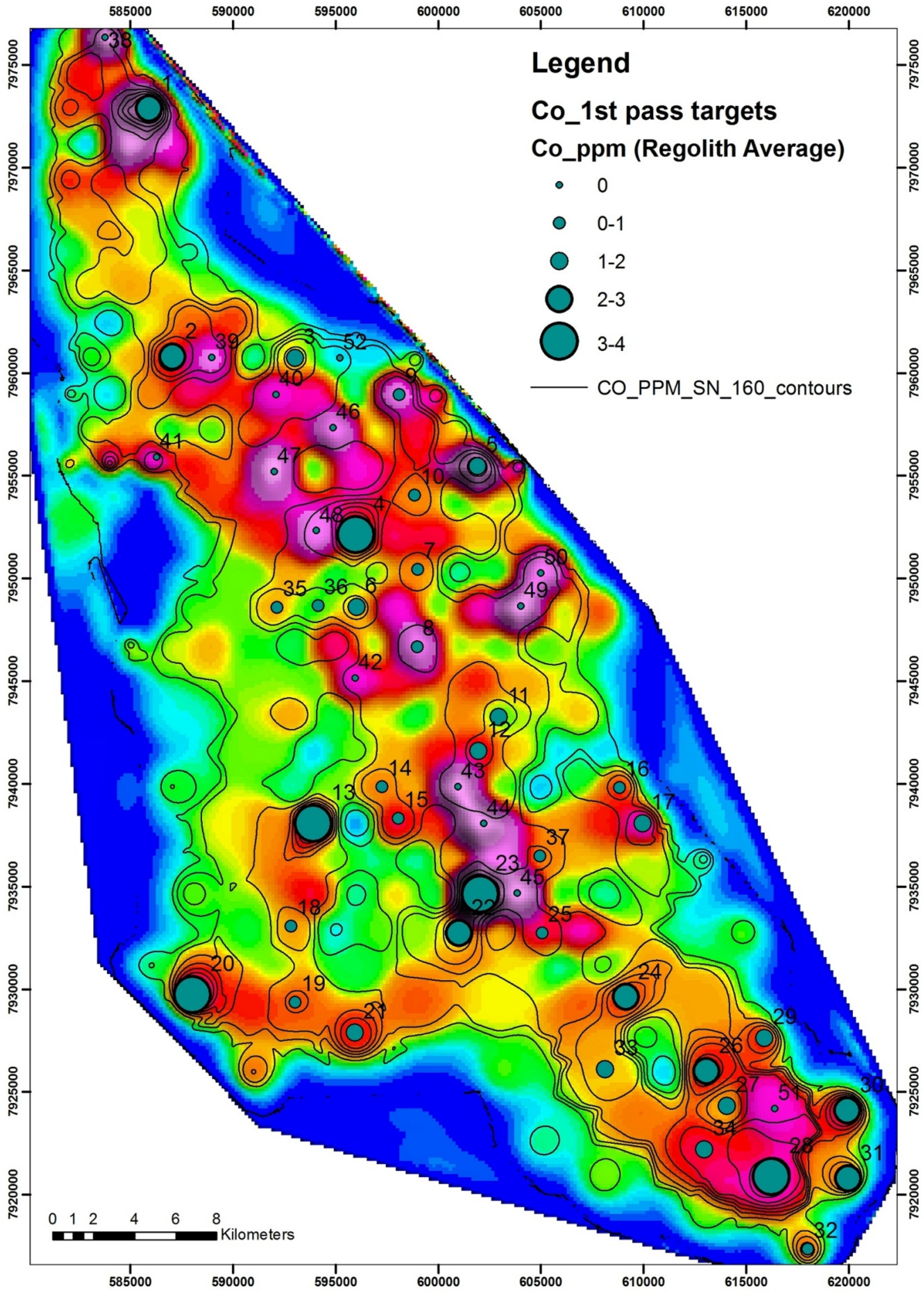

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Figure 5 First pass of 52 potential cobalt targets based on the average regolith Co_ppm, Co_ppmT, CoT_M and Coxmxppm best value contours on the average Co ppm grid. The points are graded by the average Co ppm value in the regolith and give a first impression of potential anomaly priorities.

To apply the overburden thickness as a prioritisation tool, two approaches were tried. First the overburden thickness at each sampled location was normalised to the whole KGP regolith dataset using: z i = [x i -min(x)] / [max(x)-min(x)] , where x=(x 1 ,...,x n) x=(x1,...,xn) and "zi" is now your ith normalized data. This resulted in a score between 0 and 1 for each potential target. This has been termed the overburden index (see Appendix 3 where all 52 original potential Cobalt anomalies are listed). A low overburden thickness index (e.g. 0.000003) would be less conducive of a good anomaly relative to a high value (>0.5). This overburden Index was summed with the Co_ppm score to incorporate the overburden thickness factor into the prioritisation. For comparison, the impact of summing the 4 regolith parameters is also shown (Sum_Co= Co_ppm + Coxmxppm + Co_ppmT + CoT_M), however the average Co ppm has been used to delineate targets here. Adding the overburden thickness impact causes the priorities of target 1 to decrease and of 31 to increase, but the overall effect is minimal (figure 7). Instead an alternative method was used to screen the targets based on the overburden thickness. The overburden thickness contours were separated into thick and thin contour features to filter out possibly less significant anomalies situated under thin overburden (figures 8-9).

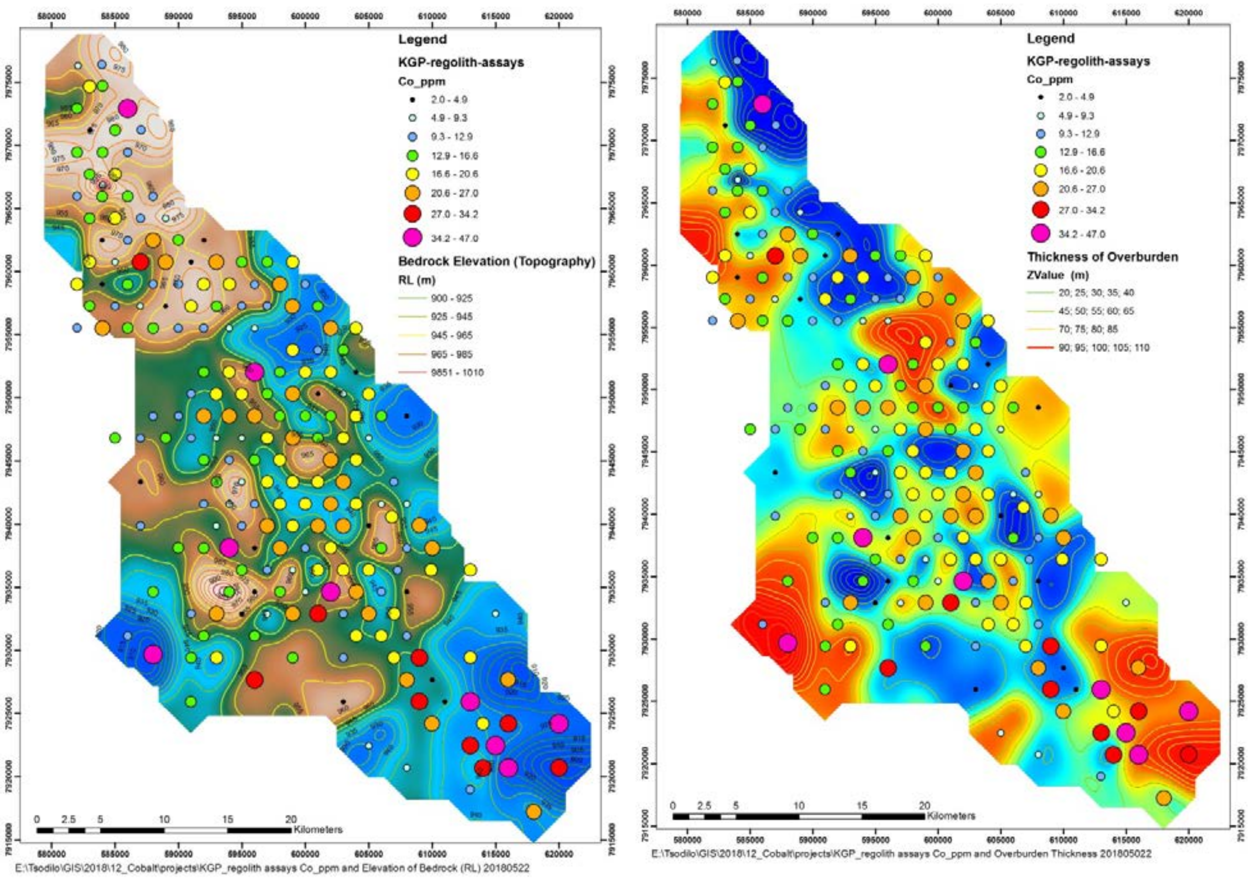


Figure 6 Average Co (ppm) data in KGP regolith data plotted as points (Natural breaks Jenks 8 classes used) on the bedrock surface elevation (topography) (RL) contour map (left). The bedrock topography values range from 900 to 1010 m (RL). The overburden thickness map is shown on the right and ranges from 20 to 110 m.

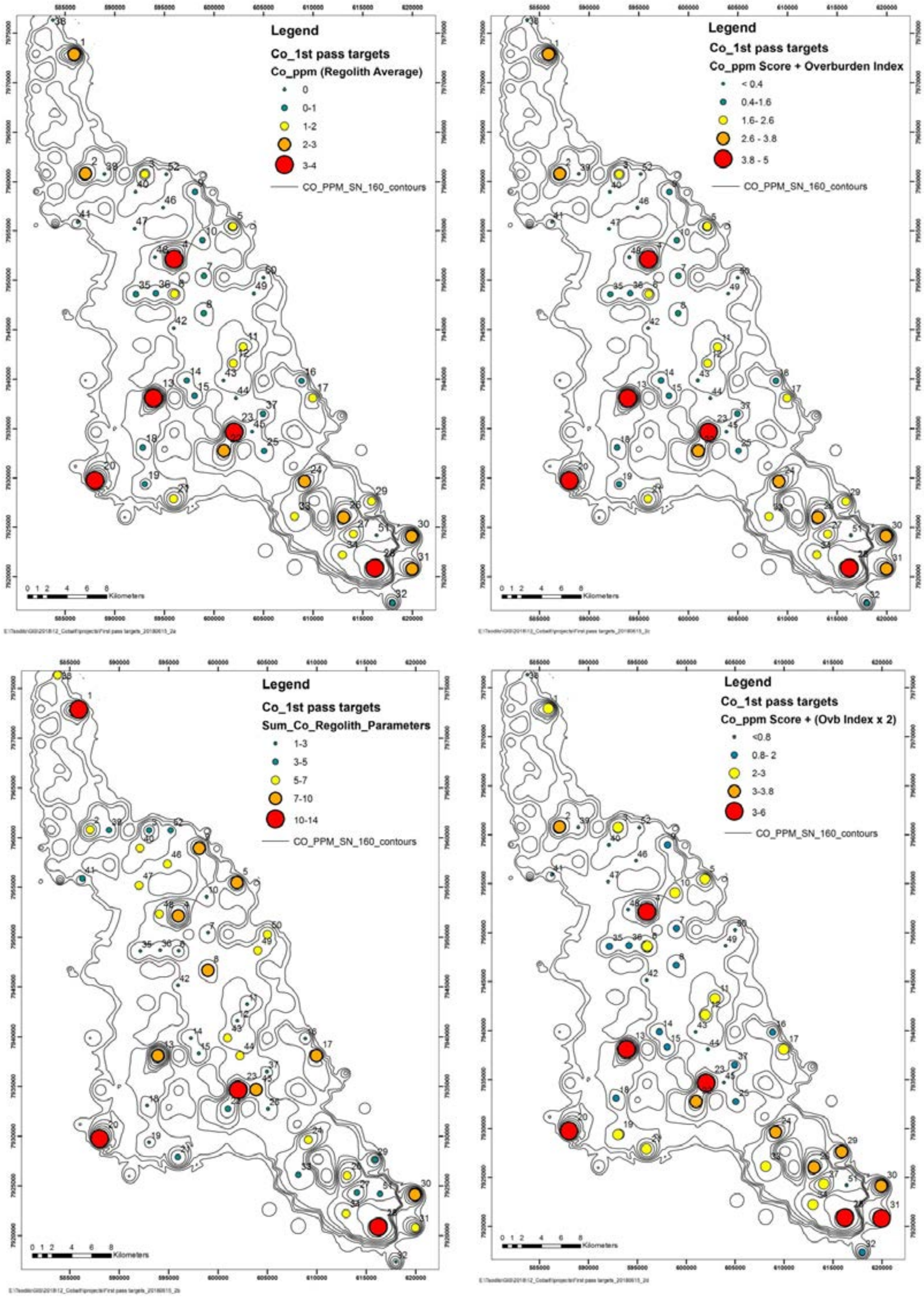


Figure 7 Clockwise from top left: First pass Co targets ranked by 1) Co ppm, 2)Co ppm +Overburden Index, 3) Co ppm +Overburden Index, 3) Co ppm + (Overburden Index)x2 and 4) sum of the four Co regolith parameters.

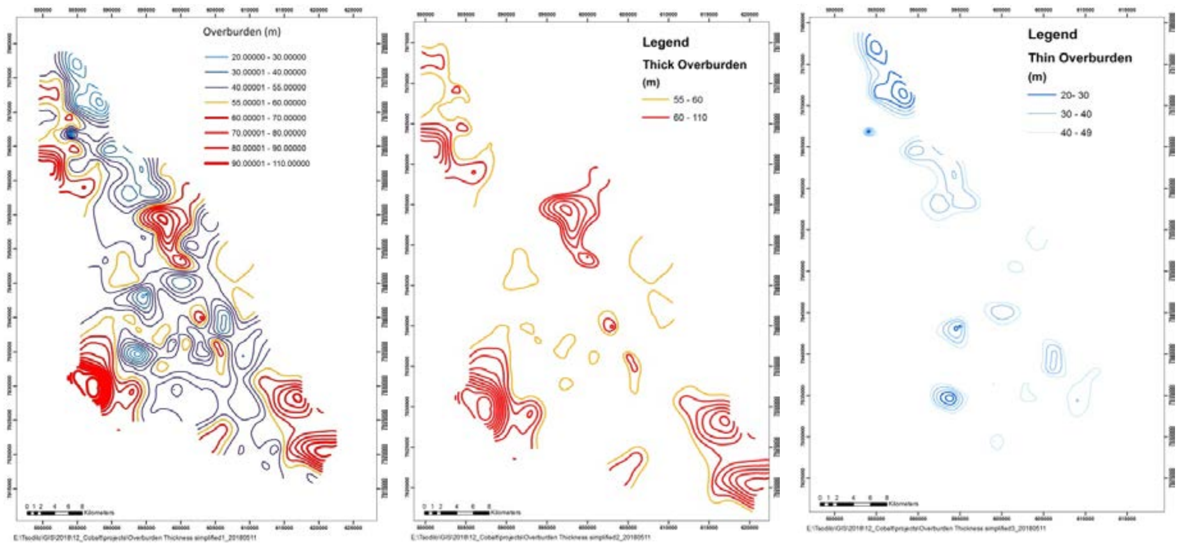


Figure 8 Overburden thickness contours separated in to thick and thin overburden thickness features.

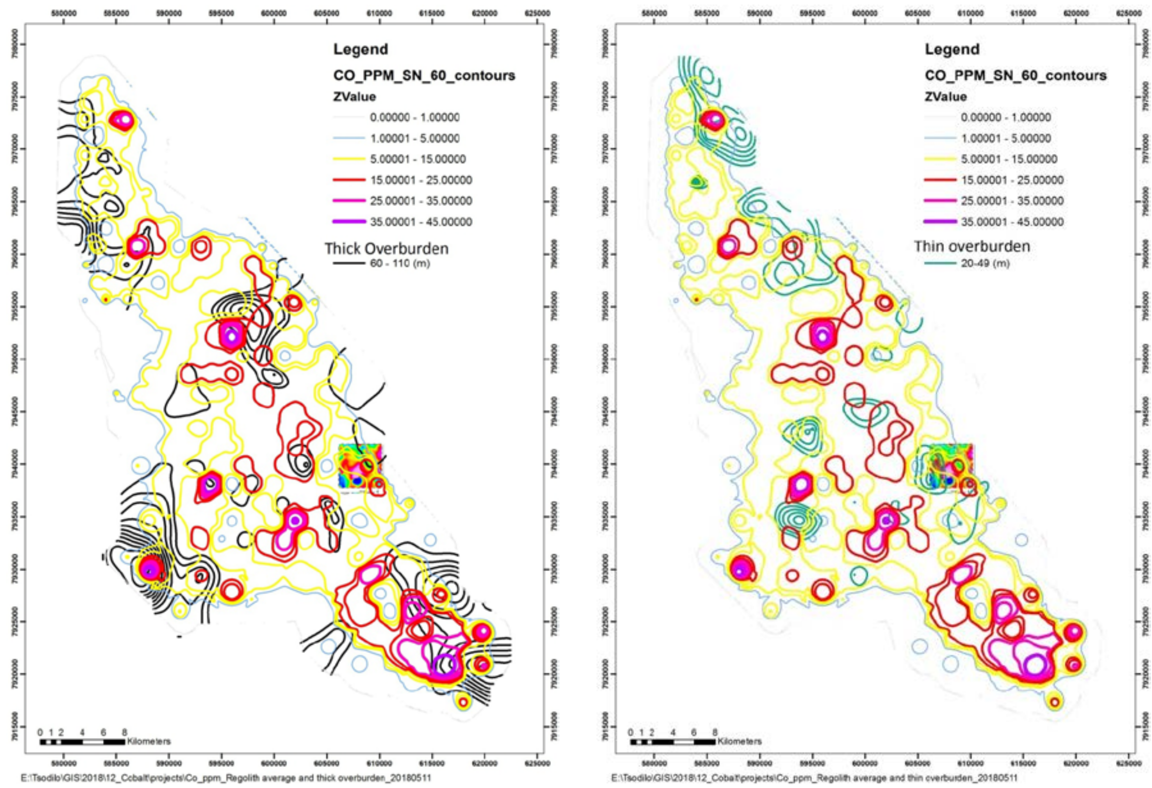


Figure 9 Co anomalies under thick overburden (left) are likely more significant than those under thin anomalies (right). (Also shown is the geophysics over the 1822C10 area.)

Subsequent to applying the overburden thickness filters the 52 anomalies were reduced to 21 potential targets and ranked on the basis of the Co ppm + Overburden Index value (figure 10). The following rules were applied to reach the 21 targets (see Appendix 3 table 2):

Rule 1: Co_ppm (Regolith Average) score >=2
Rule 2: Sum_Co_Regolith_Parameters score >=7
Rule 3: Overburden index >= 0.3

These were further reduced on the basis of 1) Proximity to Cu targets, 2) Proximity to Sc average regolith trends and 3) Proximity to Cu average regolith anomaly.

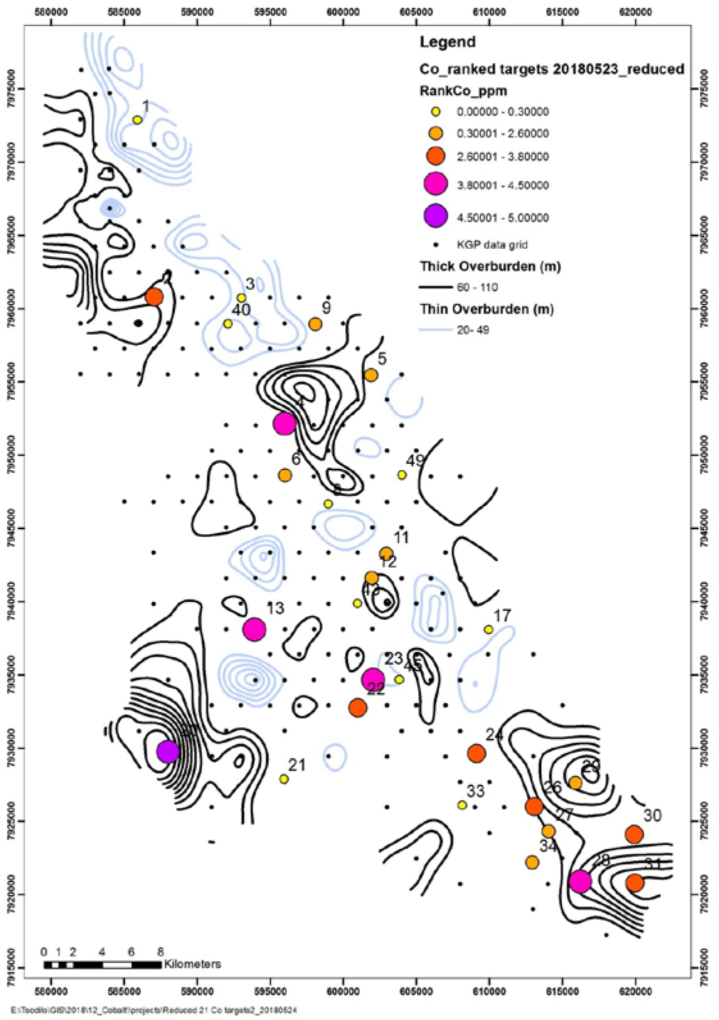


Figure 10 Reduced (21) targets ranked on the basis of the Co ppm + Overburden Index value.

Scandium trends

The Co data was also examined relative to the average regolith value anomalies observed for: Zn, Mo, Pb, Sc and Ni. The correlation coefficients of the average Co with other elements in the regolith are as follows: Co-Ni: 0.83, Co-Cu: 0.60, Co-Pb: 0.74, Co-Zn: 0.54, Co-Sc: 0.63, Co-Mo: 0.58. The grids and contours for the elements are shown in figures 11a-b. Scandium in particular shows anomalies that appear to be controlled by structural lineaments. These anomalies were used to highlight distinct positive and negative trends through the data. One would expect that given scandium’s lower mobility, these trends are good indicators of the pathways of the mineralisation fluids. Anomalies in the cobalt and copper coinciding with these trends would thus be more favourable targets as they would be seen to be situated closer to the origin of mineralising fluids.

Co shows good alignment with the main central positive Sc trend. Ni is very interesting as it corresponds well in the south east but deviates from the rest of the main Sc trend. Pb is dominated by a large anomaly in the central western edge of the area. One would expect to see a better graphical match with Pb if an outlier is excluded. Zn shows some elevated values along the main Sc axis but better values occur elsewhere. Cu shows a good correlation with the main Sc positive trends (Figure 12).

Most of the Mo anomalies plot where expected - on Sc positive trends. Two appear to plot on Sc negative trend lines. They seem shifted in a west/ north westerly direction relative to the nearest Sc anomaly. This is perhaps indicative of the direction of mineralisation fluid movement or of lithogeochemical factors favouring the entrapment (/extraction) of Mo mineralisation relative to the surrounding areas.

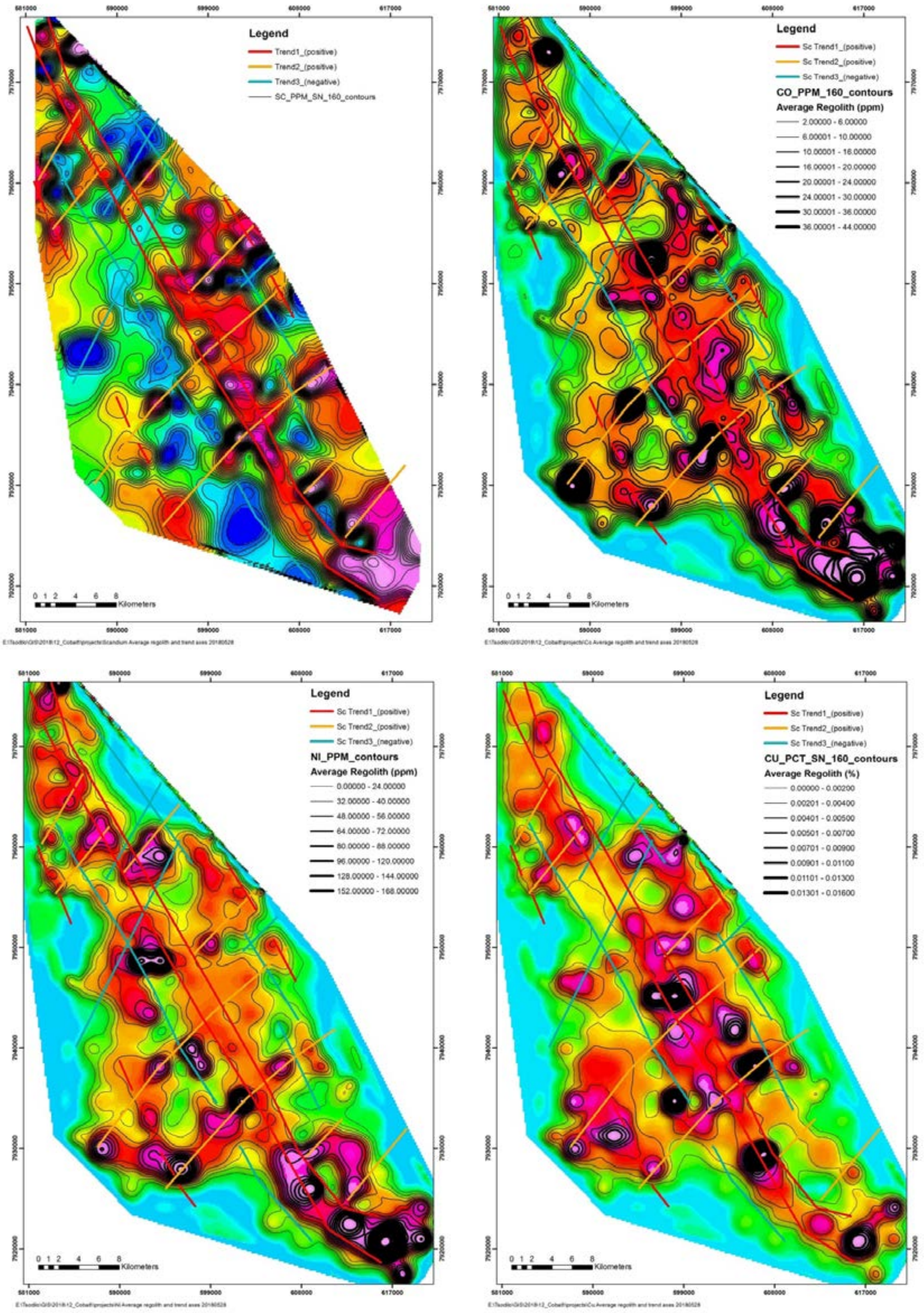


Figure 11 a) Average regolith value grids and contours for Sc, Co, Ni and Cu. Sc trends shown.

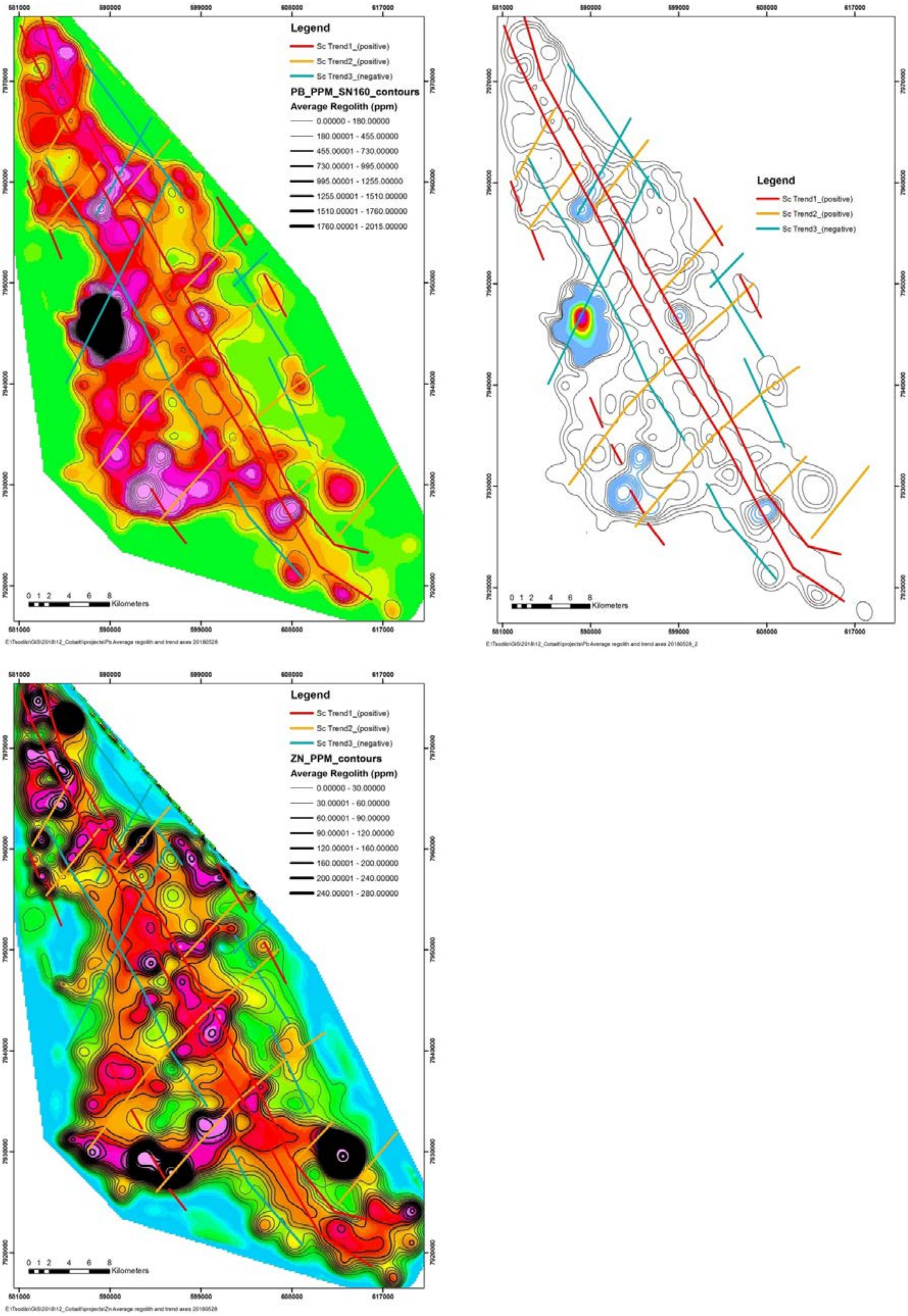


Figure 11 b Average regolith value grids and contours for Pb and Zn. Sc trends shown.

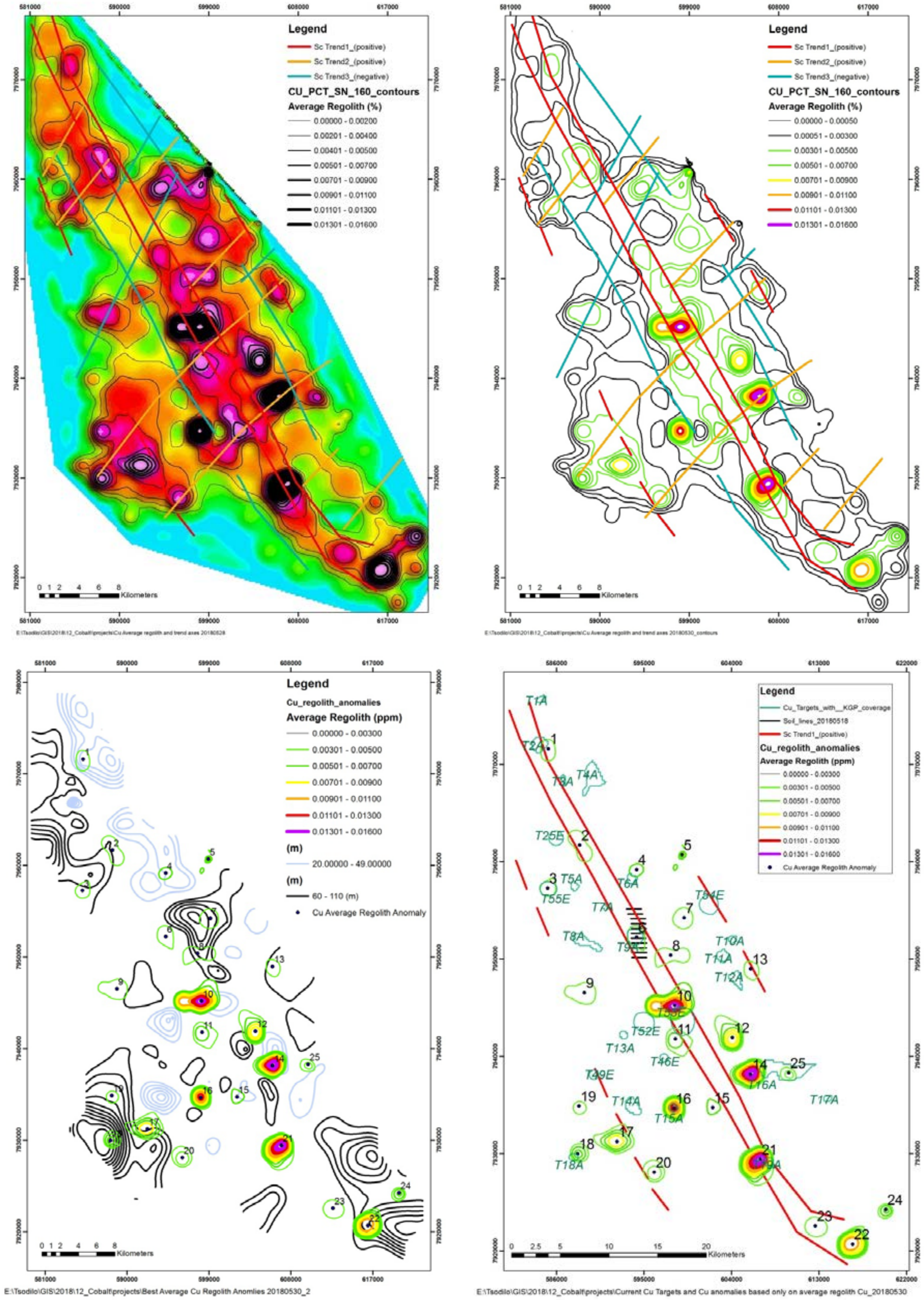


Figure 12 Cu average regolith anomalies relative overburden thickness and Cu targets.

Prioritisation of final targets

The 21 Co targets were analysed in terms of proximity to the Sc positive trends and the Cu targets. Buffer zones were set up around the features to establish target proximity to the features of interest. The results are shown in figure 13 and summarised in Table 3 and 4. The following rules were applied to establish the final 8 targets:

Rule 4: Situated <= 2.5 km away from final Cu Target.
Rule 5: Situated on or < 2.5 km away from Scandium positive anomaly trends
Rule 6: Situated on or < 2.5 km away from Cu Average Regolith anomaly.

Table 3 Application of rules 4 – 6 to select the top 21targets.

							Rank	Rule 4	Rule 5		Rule 6
Co anomaly targets			Overburden				Co_ppm	Proximity to	Sc+ trend 1	Sc+ trend 2	Cu Average
#	Co_ppm	Sum_Co	index	Rule 1	Rule 2	Rule 3	+ Ovb Index	Cu Target	association	association	Regolith
20	4	12	1.0	1.Co_ppm >=2	2.Sum_Co_Regolith >=7	Ovb index >= 0.3	5.0	<=0.2km		<=500m	<=500m
28	4	11	0.5	1.Co_ppm >=2	2.Sum_Co>=7	Ovb index >= 0.3	4.5	<=12.0km	<=2500m		<=500m
13	4	9	0.4	1.Co_ppm >=2	2.Sum_Co_Regolith >=7	Ovb index >= 0.3	4.4	<=2.3km		<=500m	
4	4	10	0.3	1.Co_ppm >=2	2.Sum_Co_Regolith >=7	Ovb index >= 0.3	4.3	<=1.5km	<=1000m		<=2000m
23	4	14	0.2	1.Co_ppm >=2	2.Sum_Co_Regolith >=7	Exception	4.2	<=3.6km	<=2500m		<=250m
31	3	5.5	0.8	1.Co_ppm >=2		Ovb index >= 0.3	3.8	<=14.5km			
30	3	8	0.4	1.Co_ppm >=2	2.Sum_Co_Regolith >=7	Ovb index >= 0.3	3.4	<=13.0km			<=250m
2	3	7	0.4	1.Co_ppm >=2	2.Sum_Co_Regolith >=7	Ovb index >= 0.3	3.4	<=1.5km	<=2500m	<=1000m	<=2000m
26	3	7	0.4	1.Co_ppm >=2	2.Sum_Co_Regolith >=7	Ovb index >= 0.3	3.4	<=5.5km	<=2500m	<=500m	
22	3	5	0.3	1.Co_ppm >=2		Ovb index >= 0.3	3.3	<=3.2km			<=2500m
24	3	5.5	0.2	1.Co_ppm >=2		Exception, on trend	3.2	<=0.9km	<=2500m	<=500m	<=2500m
1	3	11.5	0.0	1.Co_ppm >=2	2.Sum_Co_Regolith >=7			<=1.0km	<=2500m		<=1500m
29	2	4	0.6	1.Co_ppm >=2		Ovb index >= 0.3	2.6	<=8.0km		<=1000m	
12	2	3	0.4	1.Co_ppm >=2		Ovb index >= 0.3	2.4	<=2.4km	<=1000m		<=2500m
5	2	10	0.4	1.Co_ppm >=2	2.Sum_Co_Regolith >=7	Ovb index >= 0.3	2.4	<=0.7km	<=1000m	<=1000m	
27	2	4	0.4	1.Co_ppm >=2		Ovb index >= 0.3	2.4	<=7.2km	<=1000m	<=2500m	<=2500m
6	2	2	0.3	1.Co_ppm >=2		Ovb index >= 0.3	2.3	<=3.3km	<=1000m	<=2500m	<=2500m
34	2	7	0.3	1.Co_ppm >=2	2.Sum_Co_Regolith >=7	Ovb index >= 0.3	2.3	<=8.0km	<=2500m		<=500m
11	2	3	0.3	1.Co_ppm >=2		Ovb index >= 0.3	2.3	<=2.8km	<=2500m		<=2000m
21	2	4.5	0.2	1.Co_ppm >=2				<=6.5km	<=1000m		<=250m
33	2	5	0.2	1.Co_ppm >=2				<=2.6km	<=500m		
17	2	9	0.2	1.Co_ppm >=2	2.Sum_Co_Regolith >=7			<=0,5 km		<=2500m	<=250m
3	2	4	0.1	1.Co_ppm >=2				<=2.0km	<=2500m	<=500m	<=2000m
9	1	10	0.3		2.Sum_Co_Regolith >=7	Ovb index >= 0.3	1.3	<=3.9km			<=2000m
8	1	9	0.2		2.Sum_Co_Regolith >=7			<=1.7km	<=500m		<=2000m
43	0	7	0.3		2.Sum_Co_Regolith >=7	Ovb index >= 0.3	0.3	<=2.9km	<=1000m		
49	0	7	0.3		2.Sum_Co_Regolith >=7	Ovb index >= 0.3	0.3	<=0.1km	<=2500m	<=1000m	<=2000m
45	0	8.5	0.2		2.Sum_Co_Regolith >=7			<=4.7km	<=1000m	<=2500m	<=2000m
40	0	7	0.1		2.Sum_Co_Regolith >=7			<=1.5km	<=1000m	<=500m	<=2500m

Table 4 Prioritisation of final Co targets (see last field).

	Rule 4		Rule 5		Rule 5		Rule 6	Summary:		Prioritsed Result:	
Target	Proximity to	Target	Sc+ trend 1	Target	Sc+ trend 1	Target	Cu Average	Target	Rank	Target	Rank
#	Cu Target	#	association	#	association	#	Regolith	#		#	
20	<=0.2km	4	<=1000m	4	<=1000m	23	<=250m	20	1	20	1
24	<=0.9km	28	<=2500m	28	<=2500m	30	<=250m	28	2	4	1
4	<=1.5km	23	<=2500m	23	<=2500m	20	<=500m	23	2	28	2
2	<=1.5km	2	<=2500m	2	<=2500m	28	<=500m	30	4	23	2
28	<=12.0km	26	<=2500m	26	<=2500m	4	<=2000m	22		2	3
30	<=13.0km	24	<=2500m	24	<=2500m	2	<=2000m	24		13	3
31	<=14.5km	20		20		22	<=2500m	4	1	31	3
13	<=2.3km	13		13		24	<=2500m	2	3	30	4
22	<=3.2km	31		31		13		13	3		
23	<=3.6km	30		30		31		31	3		
26	<=5.5km	22		22		26		26			

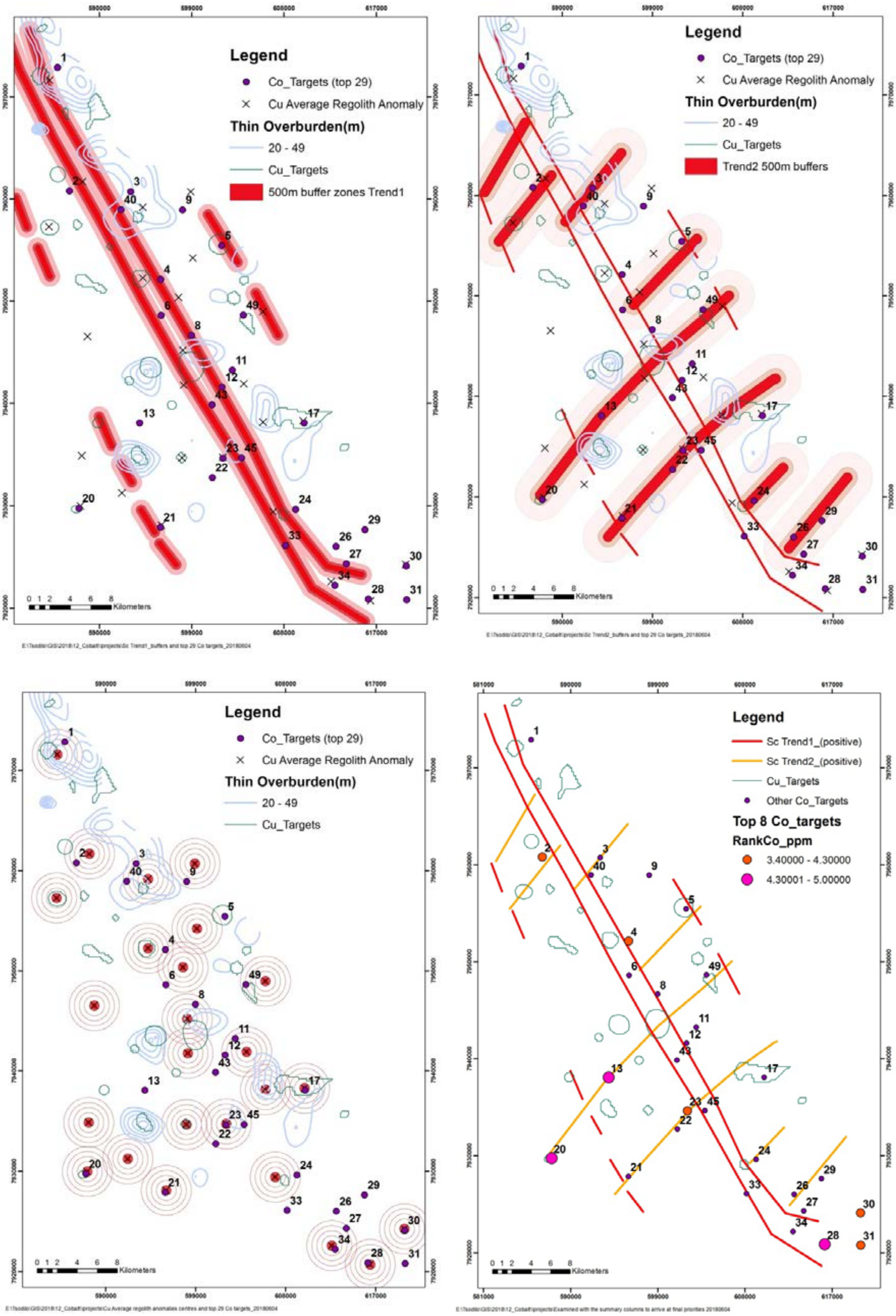


Figure 13Co targets relative to scandium trends (top) and distance from Cu targets

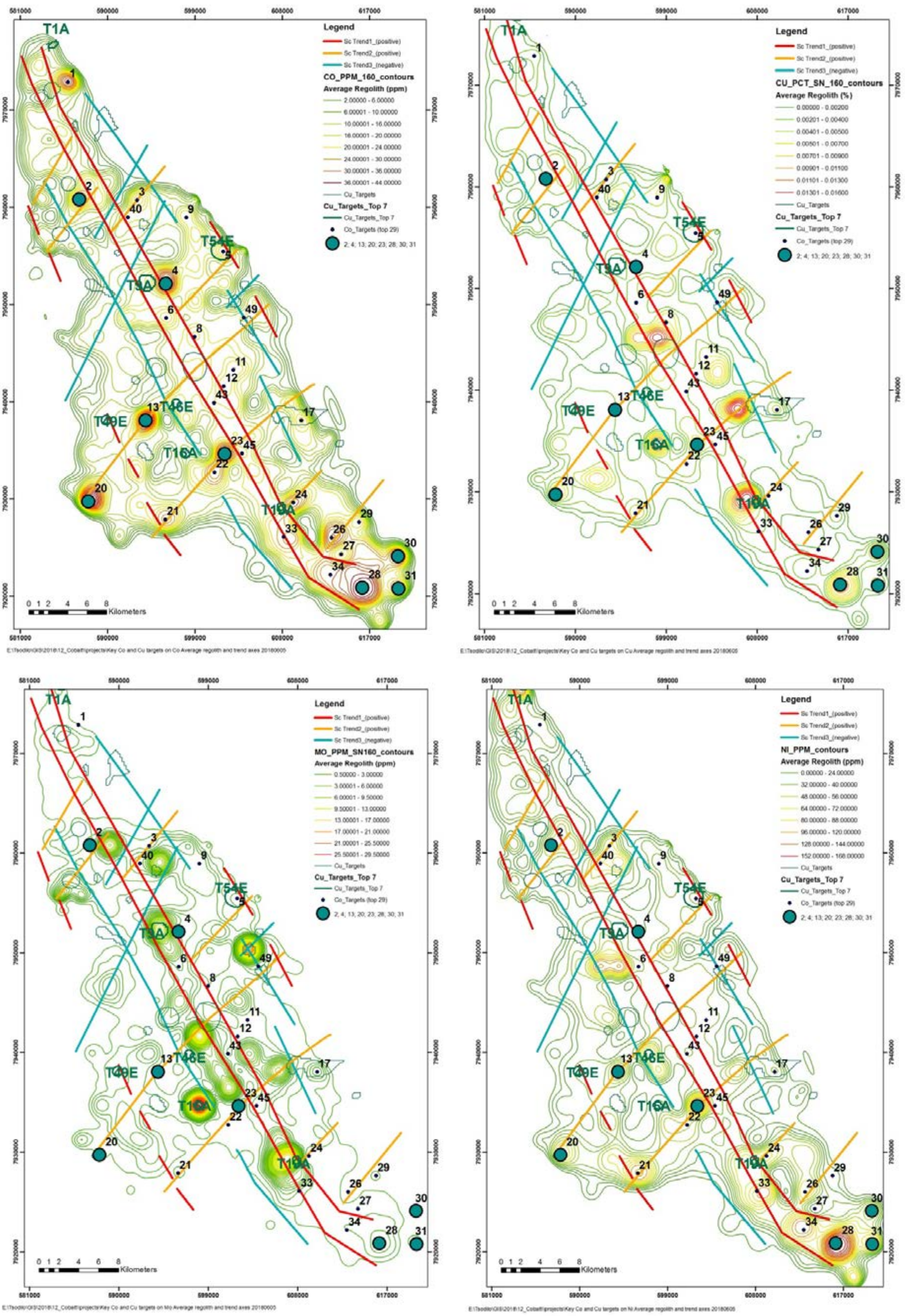


Figure 14a) The final targets relative to the Sc trend axes, Cu targets and Co, Cu, Mo, Ni element contours.

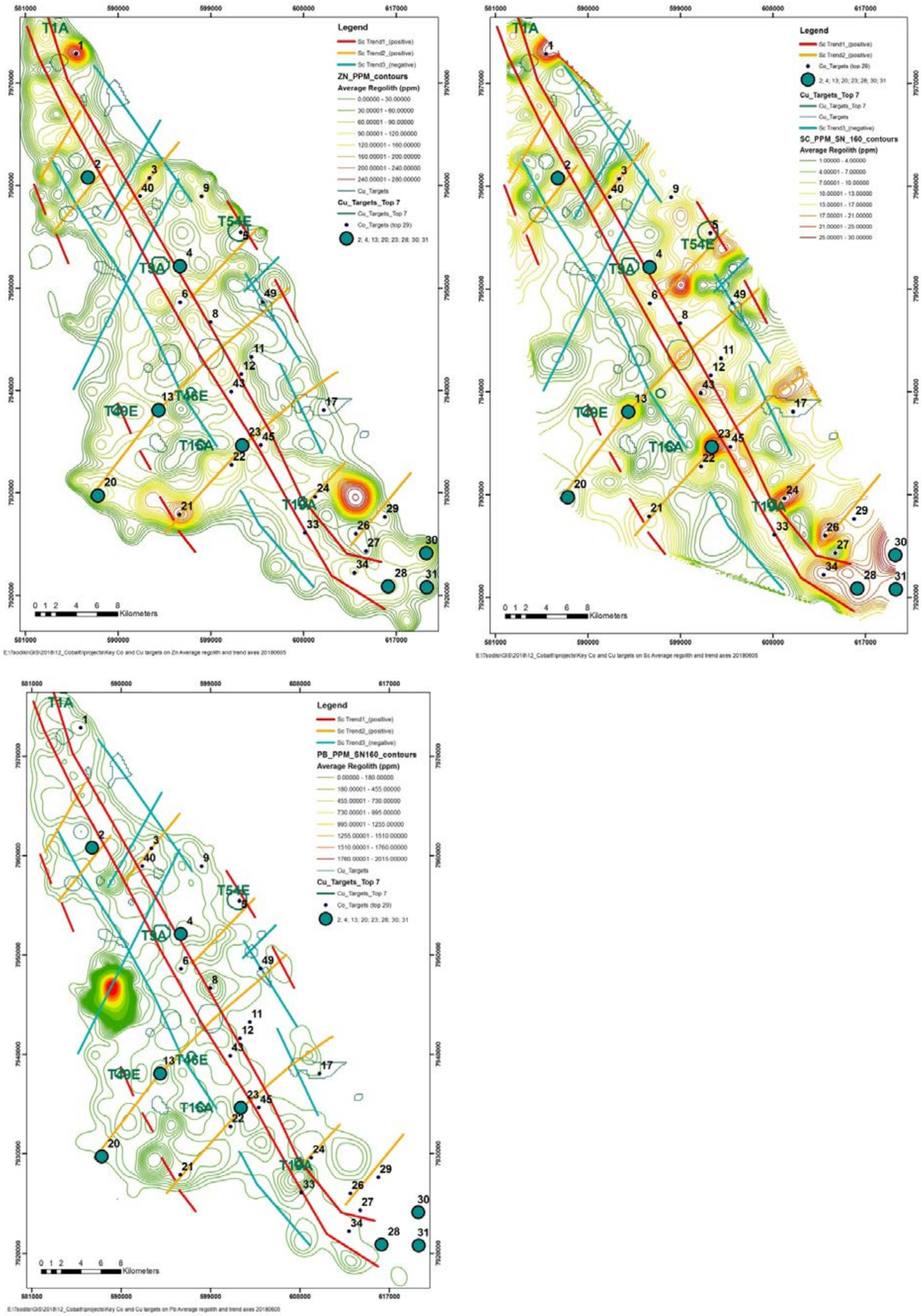


Figure 14 b) The final Co targets relative to the Sc trend axes, Cu targets and Zn, Scand Pb element contours.

The final targets are shown relative to the Sc trend axes and various element contours in figure 14. The final Co and Cu targets are further compared against the areas of thin overburden (areas to avoid) in figure 15.

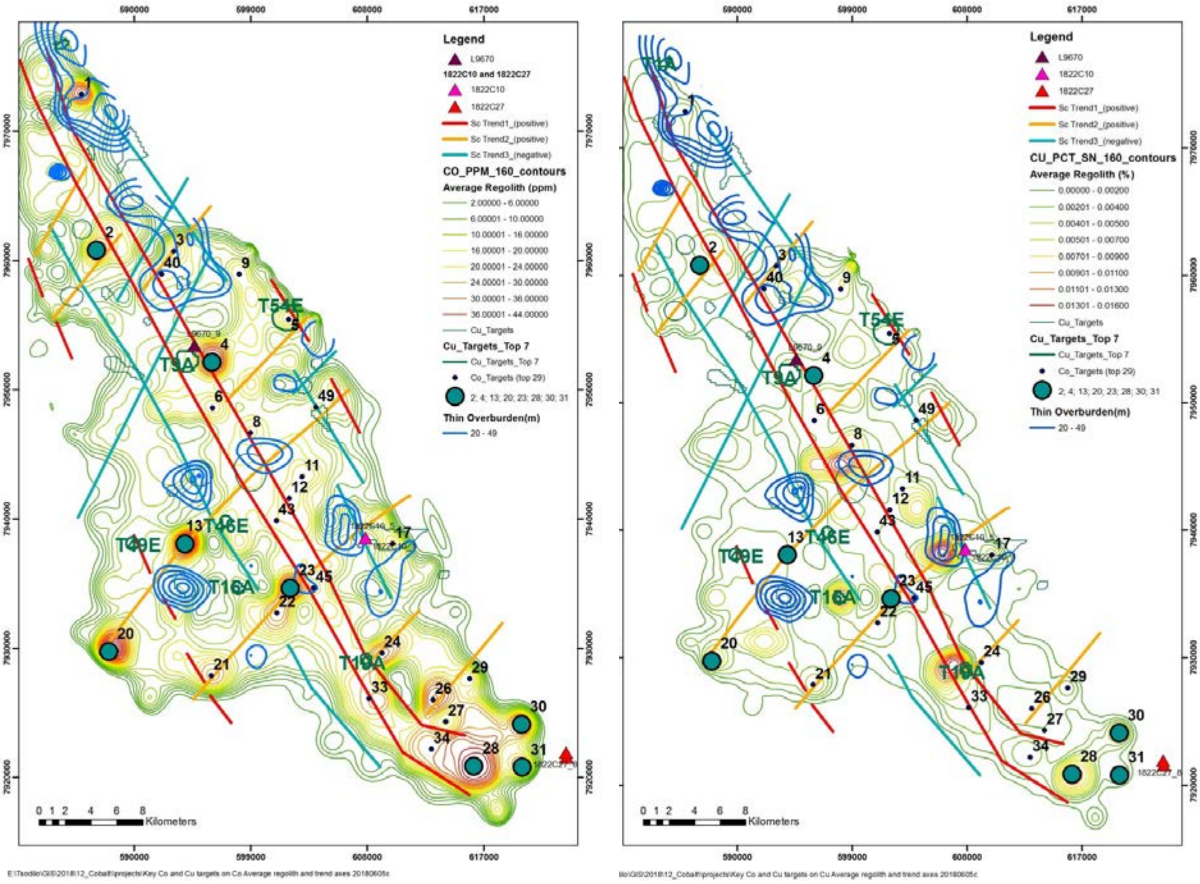


Figure 15 Comparison of the top Co and Cu targets against their respective regolith anomalies and thin overburden areas. (Left: Co regolith contours, Right: Cu regolith contours)

Targets compared to historical drilling

Three areas of interest: 1822C10, 1822C27 and L9670, were examined closer as the historical drilling suggested promising results. L9670/9 showed some of the best Cu values is situated next to a strong Cobalt anomaly, Co target 4 and Cu target T9A(figure 15 left) and has been selected as the first target for TerraLeach™ soil sampling analyses (figure 16).

The 1822C10 shows abundant disseminated pyrite and is associated with a good Cu regolith anomaly and is cut by a positive Scandium trend. The thin overburden in this area makes the location possibly less favourable as a target. This area is not apriority for Co exploration (see Figure 17 left), but it overlaps Cu target T16A and is adjacent to a prominent Cu regolith anomaly 14 (Figure 17 left).

Some of the best Cu assays are found in the 1822C27 skarn meta mafic units in the south east 1822C27/6 (0.16 %). High values of Co and Ni are associated with amphibole (Co=0.3%, Ni=1.6%) and schist (Co: 1.7%, Ni: 5.1%) in 1822C27/8. These holes lie beyond the extent of the KGP regolith dataset; however, strong anomalies are visible in the Cobalt and Nickel regolith data in the south eastern area (Figure 11a). These initial drill results favour targets 28, 30 and 31 as amongst top Cobalt targets.

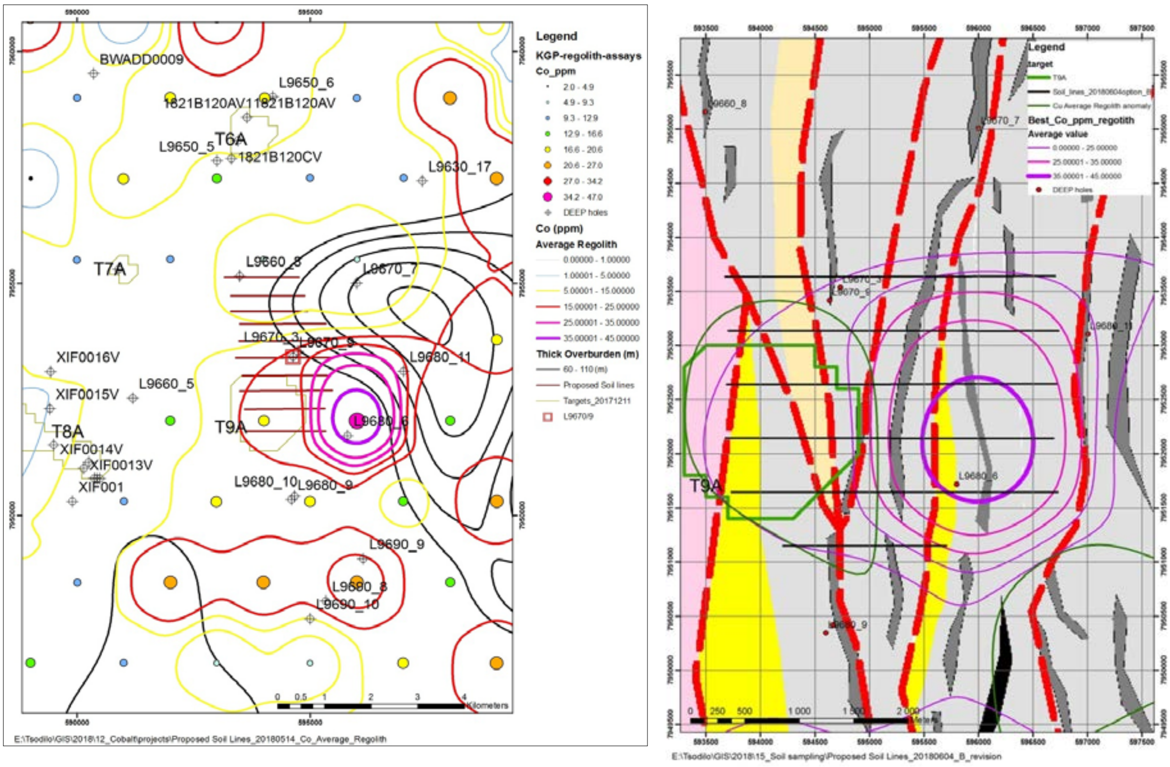


Figure 16 Initial and revised proposed soil sampling lines around hole L9670/9. The lines have been extended to encompass both Co target 4 and Cu targets T9A.

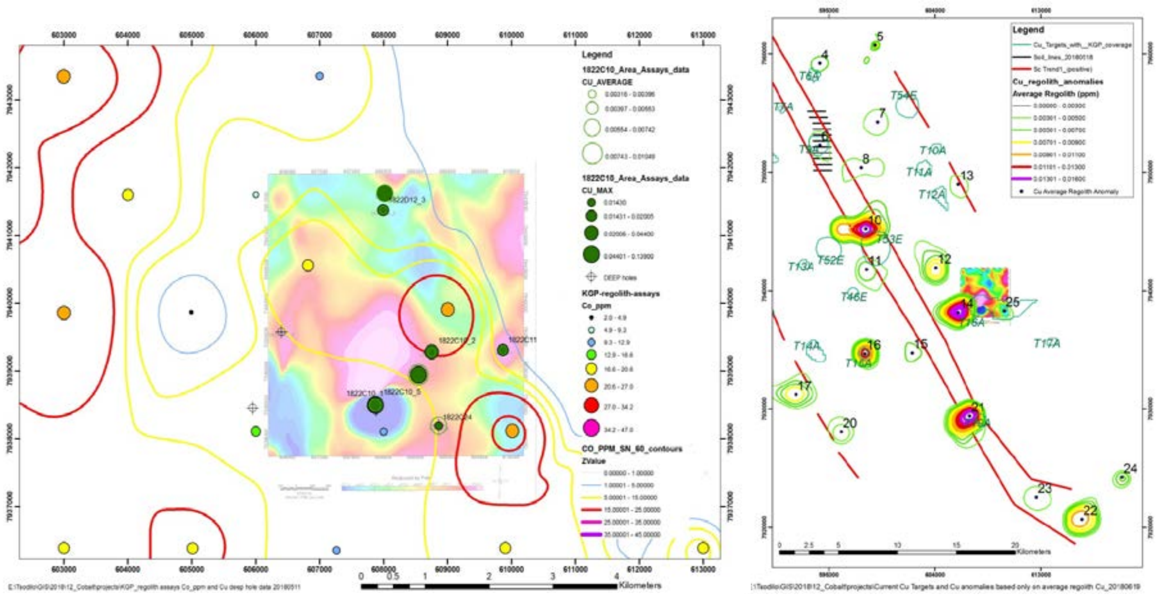


Figure 17 Cu maximum and average historical assays in the 1822C10 area shown against Co regolith contours (left). Location 1822C10 shown relative to the regional Cu regolith data (right).

Targets compared with hydrogeochemistry

The top cobalt targets overlie cobalt hydrogeochemistry anomalies (red) where the data is available (figure 18 left). These include targets 2,4,13, and 23. Targets 20, 28, 30 and 31 extend beyond the hydrogeochemistry data cover. There is one large hydrogeochemistry Co anomaly immediately west of targets 24 and 33 which lies on the main Sc trend but is not covered by a Co regolith target. The Cu targets show similar overlaps with the Cu hydrogeochemistry anomalies (blue) T49, T46, T15, and T19.

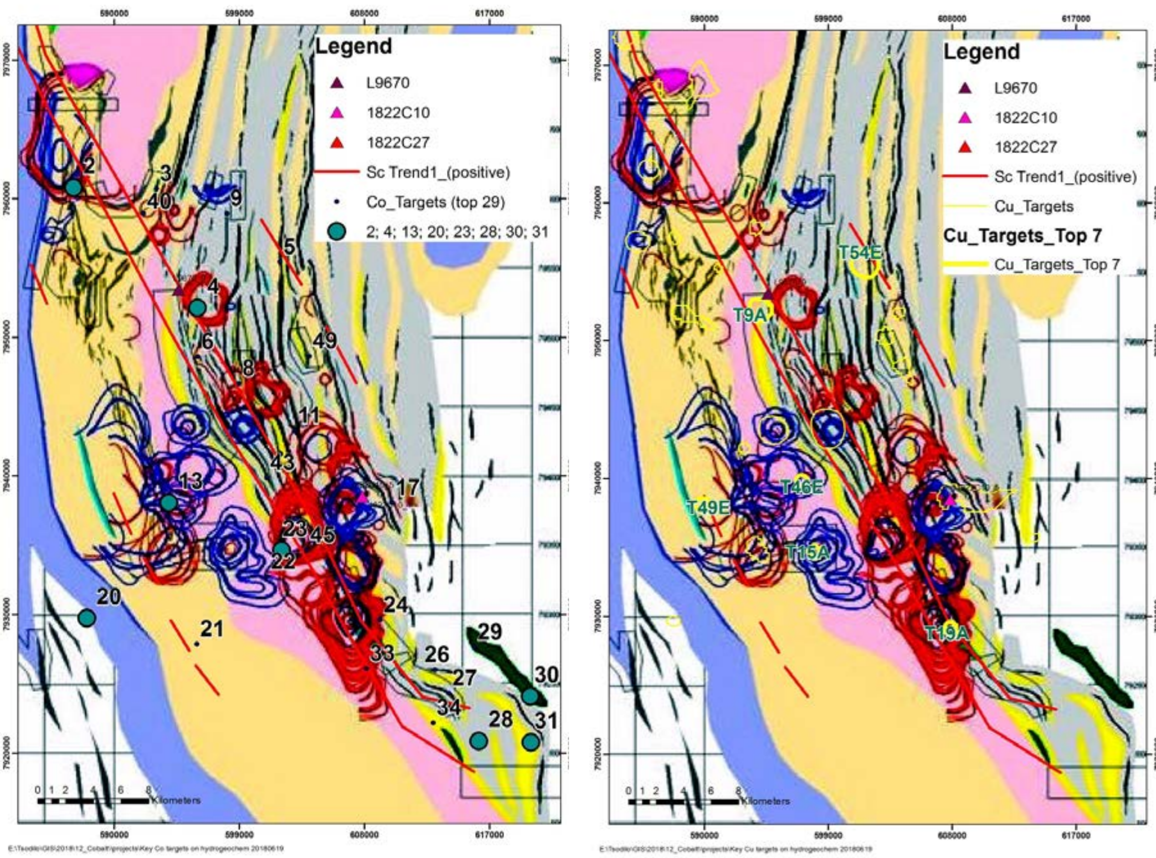
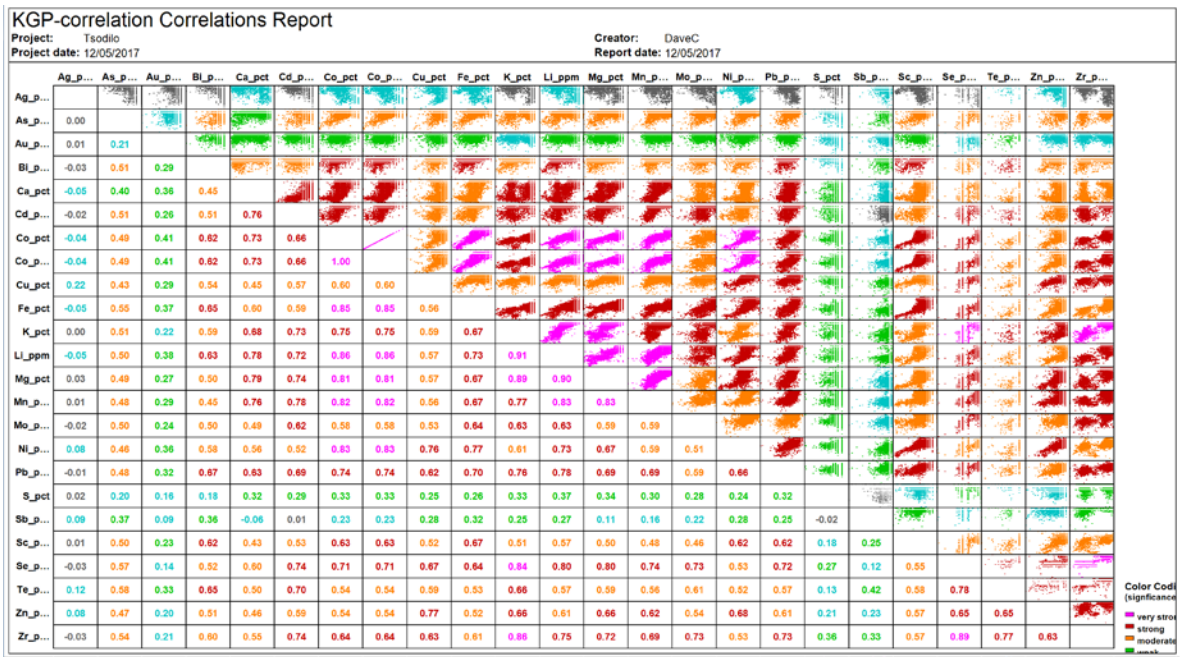


Figure 18 Co and Cu targets shown against Co hydrogeochemistry (left, Co is shown by the red contours) and Cu hydrogeochemistry (right, Cu is shown by the blue contours).

Appendix 1: KGP regolith data Correlation matrix.



KGP-correlation Correlations Report

Project: Tsodilo
Project date: 12/05/2017
Creator: DaveC
Report date: 12/05/2017

	Ag_p...	As_p...	Au_p...	Bi_p...	Ca_pct	Cd_p...	Co_pct	Co_p...	Cu_pct	Fe_pct	K_pct	Li_ppm	Mg_pct	Mn_p...	Mo_p...	Ni_p...	Pb_p...	S_pct	Sb_p...	Sc_p...	Se_p...	Te_p...	Zn_p...	Zr_p...
Ag_p...																								
As_p...	0.00																							
Au_p...	0.01	0.21																						
Bi_p...	-0.03	0.51	0.29																					
Ca_pct	-0.05	0.40	0.36	0.45																				
Cd_p...	-0.02	0.51	0.26	0.51	0.76																			
Co_pct	-0.04	0.49	0.41	0.62	0.73	0.66																		
Co_p...	-0.04	0.49	0.41	0.62	0.73	0.66	1.00																	
Cu_pct	0.22	0.43	0.29	0.54	0.45	0.57	0.60	0.60																
Fe_pct	-0.05	0.55	0.37	0.65	0.60	0.59	0.85	0.85	0.56															
K_pct	0.00	0.51	0.22	0.59	0.68	0.73	0.75	0.75	0.59	0.67														
Li_ppm	-0.05	0.50	0.38	0.63	0.78	0.72	0.86	0.86	0.57	0.73	0.91													
Mg_pct	0.03	0.49	0.27	0.50	0.79	0.74	0.81	0.81	0.57	0.67	0.89	0.90												
Mn_p...	0.01	0.48	0.29	0.45	0.76	0.78	0.82	0.82	0.56	0.67	0.77	0.83	0.83											
Mo_p...	-0.02	0.50	0.24	0.50	0.49	0.62	0.58	0.58	0.53	0.64	0.63	0.63	0.59	0.59										
Ni_p...	0.08	0.46	0.36	0.58	0.56	0.52	0.83	0.83	0.76	0.77	0.61	0.73	0.67	0.59	0.51									
Pb_p...	-0.01	0.48	0.32	0.67	0.63	0.69	0.74	0.74	0.62	0.70	0.76	0.78	0.69	0.69	0.59	0.66								
S_pct	0.02	0.20	0.16	0.18	0.32	0.29	0.33	0.33	0.25	0.26	0.33	0.37	0.34	0.30	0.28	0.24	0.32							
Sb_p...	0.09	0.37	0.09	0.36	-0.06	0.01	0.23	0.23	0.28	0.32	0.25	0.27	0.11	0.16	0.22	0.28	0.25	-0.02						
Sc_p...	0.01	0.50	0.23	0.62	0.43	0.53	0.63	0.63	0.52	0.67	0.51	0.57	0.50	0.48	0.46	0.62	0.62	0.18	0.25					
Se_p...	-0.03	0.57	0.14	0.52	0.60	0.74	0.71	0.71	0.67	0.64	0.84	0.80	0.80	0.74	0.73	0.53	0.72	0.27	0.12	0.55				
Te_p...	0.12	0.58	0.33	0.65	0.50	0.70	0.54	0.54	0.59	0.53	0.66	0.57	0.59	0.56	0.61	0.52	0.57	0.13	0.42	0.58	0.78			
Zn_p...	0.08	0.47	0.20	0.51	0.46	0.59	0.54	0.54	0.77	0.52	0.66	0.61	0.66	0.62	0.54	0.68	0.61	0.21	0.23	0.57	0.65	0.65		
Zr_p...	-0.03	0.54	0.21	0.60	0.55	0.74	0.64	0.64	0.63	0.61	0.86	0.75	0.72	0.69	0.73	0.53	0.73	0.36	0.33	0.57	0.89	0.77	0.63	

Color Codi
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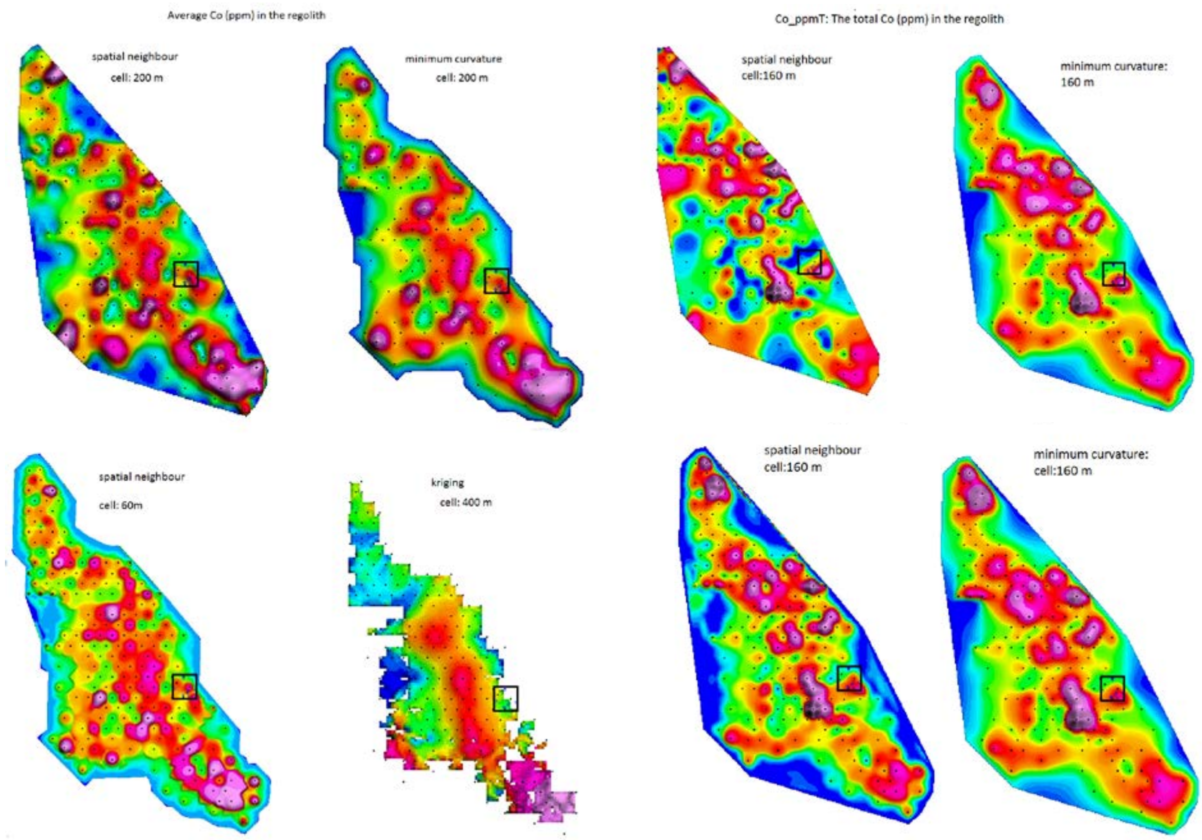
moderate

Appendix 2 Gridding tests on Cobalt regolith data.



Appendix 3: Table 1 Initial 52 Cobalt anomalies extracted from the regolith data.

Co anomaly targets						Overburden	Overburden					Co	Proximity to	Distance from	Distance from	Cu Average
#	Co_ppm	Coxmxppm	Co_ppmT	CoT_M	Sum_Co	Thickness (m)	index	Comment	Comment 2	X	Y	#	Cu Target	Sc +ve Trend1	Sc +ve Trend2	Regolith
1	3	4	4	0.5	11.5	31.5	0.0		thin cover!	585908	7972883	1	<=1.0km	<=2500m		<=1500m
2	3	1	1	2	7	63.0	0.4	Part of 39?		587062	7960810	2	<=1.5km	<=2500m	<=1000m	<=2000m
3	2	0	0	2	4	41.3	0.1		thin cover!	593034	7960733	3	<=2.0km	<=2500m	<=500m	<=2000m
4	4	0	2	4	10	55.1	0.3			595982	7952144	4	<=1.5km	<=1000m		<=2000m
5	2	4	4	0	10	60.3	0.4			601915	7955463	5	<=0.7km	<=1000m	<=1000m	
6	2	0	0	0	2	58.7	0.3			596024	7948618	6	<=3.3km	<=1000m	<=2500m	<=2500m
7	1	0	1	0	2	68.6	0.5			599011	7950443	7	<=3.5km	<=2500m		
8	1	4	4	0	9	50.8	0.2		thin cover!	598969	7946668	8	<=1.7km	<=500m		<=2000m
9	1	3	4	2	10	52.3	0.3			598098	7958948	9	<=3.9km			<=2000m
10	1	0	1	0	2	80.4	0.6			598845	7954052	10	<=2.3km			
11	2	0	0	1	3	53.9	0.3			602952	7943266	11	<=2.8km	<=2500m		<=2000m
12	2	0	1	0	3	60.6	0.4			601956	7941607	12	<=2.4km	<=1000m		<=2500m
13	4	2	1	2	9	60.5	0.4			593908	7938080	13	<=2.3km		<=500m	
14	1	0	0	0	1	54.9	0.3			597268	7939864	14	<=0.3km	<=2500m		
15	1	1	0	0	2	62.7	0.4			598057	7938329	15	<=1.5km			
16	1	0.5	0	0	1.5	58.9	0.3			608843	7939823	16	<=0,5 km			
17	2	2	3	2	9	46.5	0.2		thin cover!	609963	7938080	17	<=0,5 km		<=2500m	<=250m
18	1	0	0	0.5	1.5	48.4	0.2		thin cover!	592829	7933069	18	<=1.5km	<=2500m		
19	1	0.5	0	0	1.5	75.4	0.6			593037	7929376	19	<=4.8km	<=2500m		
20	4	2	2	4	12	110.0	1.0			588017	7929750	20	<=0.2km		<=500m	<=500m
21	2	0.5	1	1	4.5	50.9	0.2		thin cover!	595941	7927883	21	<=6.5km	<=1000m	<=500m	<=250m
22	3	0	0	2	5	56.3	0.3			601002	7932737	22	<=3.2km		<=500m	<=2500m
23	4	4	4	2	14	45.9	0.2		thin cover!	602039	7934645	23	<=3.6km	<=2500m	<=500m	<=250m
24	3	0.5	0	2	5.5	47.2	0.2			609133	7929625	24	<=0.9km	<=2500m	<=500m	<=2500m
25	1	0	1	0.5	2.5	59.2	0.4			605068	7932737	25	<=4.1km	<=2500m		
26	3	1	1	2	7	60.3	0.4			613075	7926016	26	<=5.5km	<=2500m	<=500m	
27	2	1	0	1	4	60.1	0.4			614070	7924315	27	<=7.2km	<=1000m	<=2500m	<=2500m
28	4	2	2	3	11	73.5	0.5			616227	7920872	28	<=12.0km	<=2500m		<=500m
29	2	0.5	1	0.5	4	81.5	0.6			615896	7927634	29	<=8.0km		<=1000m	
30	3	1	2	2	8	66.3	0.4			619920	7924108	30	<=13.0km			<=250m
31	3	0.5	1	1	5.5	90.4	0.8			619961	7920789	31	<=14.5km			
32	1	1	0	0	2	56.1	0.3			618011	7917346	32	<=15km			
33	2	0	0	3	5	48.8	0.2		thin cover!	608138	7926099	33	<=2.6km	<=500m		
34	2	2	1	2	7	55.8	0.3			612950	7922199	34	<=8.0km	<=2500m		<=500m
35	1	0	0	0	1	62.6	0.4			592148	7948603	35	<=2.8km			
36	1	0	0	0	1	52.7	0.3			594141	7948674	36	<=2.8km	<=2500m		
37	1	0	0	0.5	1.5	64.3	0.4			604964	7936499	37	<=2.7km			
38	0	4	2	0	6	32.3	0.0		thin cover!	583764	7976353	38	<=0.2km	<=2500m		
39	0	2	2	0.5	4.5	57.5	0.3	Is this 2 shifted?		588963	7960756	39	<=2.8km	<=2500m		
40	0	2	4	1	7	38.8	0.1	Is this 3 shifted?	thin cover!	592100	7958963	40	<=1.5km	<=1000m	<=500m	<=2500m
41	0	2	2	0	4	60.4	0.4			586274	7955915	41	<=1.0km	<=2500m		
42	0	2	1	0	3	52.0	0.3			595955	7945159	42	<=1.0km	<=2500m		
43	0	4	3	0	7	54.3	0.3			600974	7939870	43	<=2.9km	<=1000m		
44	0	4	2	0	6	47.9	0.2		thin cover!	602229	7938078	44	<=4.7km	<=2500m		
45	0	4	4	0.5	8.5	43.5	0.2	Is this 23 shifted?	thin cover!	603843	7934671	45	<=4.7km	<=1000m	<=2500m	<=2000m
46	0	4	2	0	6	42.3	0.1			594879	7957350	46	<=0.9km	<=2500m		
47	0	4	2	0	6	50.2	0.2		thin cover!	592011	7955198	47	<=0.8km	<=2500m		
48	0	3	3	0	6	50.7	0.2	is this 4 shifted?	thin cover!	594072	7952330	48	<=0.7km	<=2500m		
49	0	4	3	0	7	53.5	0.3			604022	7948655	49	<=0.1km	<=2500m	<=1000m	<=2000m
50	0	4	2	0	6	55.9	0.3			605008	7950268	50	<=1.5km	<=2500m		
51	0	2	2	0.5	4.5	65.8	0.4	Is this 27 shifted?		616392	7924184	51	<=10km	<=2500m		
52	0	0	1	4	5	37.7	0.1	between to 3 and 9	thin cover!	595200	7960738	52	<=14km			
	Ranks:	Ranks:	Ranks:	Ranks:												
	4 excellent+	4 excellent+	4 excellent+	4 excellent+	max											
	3 excellent	3 excellent	3 excellent	3 excellent	14											
	2 good	2 good	2 good	2 good	ave											
	1 poor	1 poor	1 poor	1 poor	5.5											
	0 dreadful	0 dreadful	0 dreadful	0 dreadful												

Overburden Index:
$z_i = [x_i - \min(x)] / [\max(x) - \min(x)]$
where X is the overburden thickness and min and max are the minimum and maximum thicknesses of the data set.

Appendix 3: Table 2 The 21 Cobalt targets reduced from the 52 anomalies by applying rules 1 to 3. (Caveat: while target 20 scores high it is situated at the edge of the dataset which reduces its statistical significance)

Co anomaly targets						Overburden	Ovb					Rank
#	Co_ppm	Coxmxppm	Co_ppmT	CoT_M	Sum_Co	Thickness (m)	index	Comment 2	Rule 1	Rule 2	Rule 3	Co_ppm + Ovb Index
20	4	2	2	4	12	110.0	1.0	Very good, thick cover, data edge	1.Co_ppm score >=2	2.Sum_Co score >=7	Overburden index >= 0.3	5.0
28	4	2	2	3	11	73.5	0.5	Good, thick cover	1.Co_ppm score >=2	2.Sum_Co score >=7	Overburden index >= 0.3	4.5
13	4	2	1	2	9	60.5	0.4	OK, slightly < average thickness	1.Co_ppm score >=2	2.Sum_Co score >=7	Overburden index >= 0.3	4.4
4	4	0	2	4	10	55.1	0.3	OK, slightly < average thickness	1.Co_ppm score >=2	2.Sum_Co score >=7	Overburden index >= 0.3	4.3
23	4	4	4	2	14	45.9	0.2	Thin cover! Complicated.	1.Co_ppm score >=2	2.Sum_Co score >=7	Exception	4.2
31	3	0.5	1	1	5.5	90.4	0.8	Very good, thick cover	1.Co_ppm score >=2		Overburden index >= 0.3	3.8
30	3	1	2	2	8	66.3	0.4	Good, thick cover	1.Co_ppm score >=2	2.Sum_Co score >=7	Overburden index >= 0.3	3.4
2	3	1	1	2	7	63.0	0.4	OK, slightly < average thickness	1.Co_ppm score >=2	2.Sum_Co score >=7	Overburden index >= 0.3	3.4
26	3	1	1	2	7	60.3	0.4	Good, thick cover	1.Co_ppm score >=2	2.Sum_Co score >=7	Overburden index >= 0.3	3.4
22	3	0	0	2	5	56.3	0.3	OK, slightly < average thickness	1.Co_ppm score >=2		Overburden index >= 0.3	3.3
24	3	0.5	0	2	5.5	47.2	0.2	Thin cover!	1.Co_ppm score >=2		Exception, on trend	3.2
1	3	4	4	0.5	11.5	31.5	0.0	Thin cover! Less favourable.	1.Co_ppm score >=2	2.Sum_Co score >=7		
29	2	0.5	1	0.5	4	81.5	0.6	Good, thick cover	1.Co_ppm score >=2		Overburden index >= 0.3	2.6
12	2	0	1	0	3	60.6	0.4	OK, slightly < average thickness	1.Co_ppm score >=2		Overburden index >= 0.3	2.4
5	2	4	4	0	10	60.3	0.4	OK, slightly < average thickness	1.Co_ppm score >=2	2.Sum_Co score >=7	Overburden index >= 0.3	2.4
27	2	1	0	1	4	60.1	0.4	OK, slightly < average thickness	1.Co_ppm score >=2		Overburden index >= 0.3	2.4
6	2	0	0	0	2	58.7	0.3		1.Co_ppm score >=2		Overburden index >= 0.3	2.3
34	2	2	1	2	7	55.8	0.3		1.Co_ppm score >=2	2.Sum_Co score >=7	Overburden index >= 0.3	2.3
11	2	0	0	1	3	53.9	0.3		1.Co_ppm score >=2		Overburden index >= 0.3	2.3
21	2	0.5	1	1	4.5	50.9	0.2	Thin cover! Less favourable.	1.Co_ppm score >=2			
33	2	0	0	3	5	48.8	0.2	Thin cover! Less favourable.	1.Co_ppm score >=2			
17	2	2	3	2	9	46.5	0.2	Thin cover! Less favourable.	1.Co_ppm score >=2	2.Sum_Co score >=7		
3	2	0	0	2	4	41.3	0.1	Thin cover! Less favourable.	1.Co_ppm score >=2			
9	1	3	4	2	10	52.3	0.3			2.Sum_Co score >=7	Overburden index >= 0.3	1.3
8	1	4	4	0	9	50.8	0.2	Thin cover!		2.Sum_Co score >=7		
43	0	4	3	0	7	54.3	0.3			2.Sum_Co score >=7	Overburden index >= 0.3	0.3
49	0	4	3	0	7	53.5	0.3			2.Sum_Co score >=7	Overburden index >= 0.3	0.3
45	0	4	4	0.5	8.5	43.5	0.2	Thin cover! Less favourable.		2.Sum_Co score >=7		
40	0	2	4	1	7	38.8	0.1	Thin cover! Less favourable.		2.Sum_Co score >=7		

21 Targets have been retained and ranked (see field P)

Endnotes

[1] Cu_Targeting_20171221_UM_DC_MK_rev2. (Martinez, Catterall, Kahari, 21 December 2017)
[2] Cu_Targeting_20171221_UM_DC_MK_rev2. (Martinez, Catterall, Kahari, 21 December 2017) See methodology p1-2.
[3] The KGP-regolith-assays values indicate what is happening in the KGP data at depth. All of the previous KGP work before December 2017 was based on the whole KGP data interval.
[4]Interpretting the regolith parameters in layman's terms : Co_ppm: gives a feel for how good / how much the Co is in the regolith (general quality/ concentration). Coxmxppm and Co_ppmT: give a feel for how much extractable. i.e. Bigger values potentially means more regolith and more reserve/ resource. (quantity)
CoT_M : The bigger the anomaly the more concentrated the Co is (quality/ concentration affected by how difficult to get it).
[5] A number of anomalies with previous good scores are reduced to a score of 0 as they have been filtered by one of the 3 rules. For example target one now lies in the 0 – 0.3 class as it fails rule 3 (Overburden index >= 0.3) and is effectively excluded from the top 21 targets. As with anomaly 1, target 20 suffers statistically as it is at the data edge, but it occurs under thick overburden, so it has been retained – although the priority should be lowered because of its edge location
[6] It could be the large local Pb anomaly in the central west is masking a correlation of other anomalies along the main Sc trend. One expects a better match for Pb as looking at the element correlations with Sc we see: Co-Sc: 0.63; Cu-Sc: 0.52, Ni-Sc: 0.62, Pb-Sc:0.62, Zn-Sc: 0.57 and Mo-Sc: 0.46. Something is causing a very strong spike in the Pb data. A better match might result if one excludes the outlier data and re-grids the data.
[7] The Cu targets as defined in: Cu_Targeting_20171221_UM_DC_MK_rev2

Dr I. Martinez
June 2018