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Consultant's Report

To

Havilah Resources NL

Geochemical Survey
Testing Surface Sampling Techniques
Highland Rocks EL's
Northern Territory

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Sydney, November 2000

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SUMMARY

Nine field days from September 10-18, 2000 exclusive of travel to and from the district, were spent with Dr Chris Giles, Technical Director for Havilah Resources NL, in sampling Havilah's exploration licence areas in the Highland Rocks district of the Tanami Desert.

With some rare exceptions, outcrop was virtually absent over the areas visited. A generally thin (from RAB drill evidence) regolith of transported aeolian loess and sand, which is usually hardpanized prevails. This underlies wind winnowed, coarse sandy deflation lag from the hardpan soil. Unlike areas at Tanami and elsewhere, "lag" as coarse rock detritus of 4-5 millimeters grain size or more is absent.

Angular, coarse sandy lag probably represents breakdown of arkosic sediments and gneiss, as "gruss", with muscovite and feldspar particles seen under the hand lens. Sheetwash is also present to a variable extent. Long east-west sand dunes are superimposed in some areas, while others are underlain by large paleo drainages, as evidenced from surface vegetation changes, RAB drill information and calcrete formation.

Termite mounds are an almost ubiquitous feature over loess hardpan. These have brought coarser particles of iron oxide coated, angular quartz sand grains, some feldspar grains and minor dark brown micropisolites to surface. Older mounds in various stages of rain denudation, have spread these subsurface products over the present surface. Numerous now denuded mounds have coalesced to add a veneer of angular iron oxide coated quartz grains and micropisolites to the daylight surface. Field photographs were taken to illustrate these features.

Since termites burrow down towards the water table which is often at the (transported) regolith/bedrock boundary, sampling their coarse products could give a micro sample of the buried former paleo lag on the paleo surface, or bring up particles of lateritized bedrock. Some of these micropisolites are magnetic, and can be separated from quartz detritus (apart from inevitable composite grains) as "maglag". Maglag sampling has proved successful for Marshall Geoscience Services in the Tanami area, and in parts of the Tennant Creek and Cloncurry districts, as well as in he WA Yilgarn.

The Highland Rocks area constitutes an extreme test for the development and application of a surface reconnaissance geochemical technique which is both practical and relatively inexpensive in the field and laboratory.

A variety of sample types such as pisolites, coarse, sandy swept lag and maglag were collected, with multi-media sampling where available being carried out at most sites. Samples were analyzed by Ultra Trace Laboratories Pty Ltd in Perth.

Some RAB sample lines drilled over airmagnetic highs in 1998 reported highly anomalous arsenic. RAB follow up drilling in 1999 reported only very low arsenic values, however. Both data sets were from Analabs Laboratories. Resampling of some of these RAB holes and analysis by Ultra Trace Laboratories Pty Ltd in Perth confirmed the low arsenic values.

A limited batch of multi-media orientation samples over the Marla prospect were initially subject to orientation analyses for an extended range of elements using various moderately weak to strong digests.

Due to the very weak and limited nature of the sulfide deficient mineralization at Marla, and to geochemical landscape factors discussed elsewhere, these results were equivocal.

Routine sampling also failed to produce convincingly high anomalies, such that none of the techniques tried can be recommended with certainty.

All sampling media displayed ***relative*** multi-element highs, but in an absolute sense these are of low magnitude compared to this author's experience elsewhere. They are probably too weak to be regarded as being due to mineralization. See Appendices V and VI.

It is suggested that in the absence of significant, sulfide related mineralization with its redox electrochemical dispersion process, the highs simply represent lithological variations such as quartz sweat-out veins and more mafic phases in a barren gneissic complex.

Although this possibility can not be discounted, the ultimate success or otherwise of any technique can not be proven in this district unless significant mineralization, in both size and grade can be orientation tested.

Nick Marshall
Sydney, 4 Nov, 2000

CONTENTS

Geology and Geochemical Landscape

Inspection of RAB holes and described field relationships show that unlike the known Tanami Complex to the northeast, with its productive Mt Charles beds, former true ferricrete (with nodular pisolites) and underlying mottled and pallid zones have been largely stripped by erosion. Pallid zone material may still be present in some RAB holes under transported regolith. In some instances, however, as at Marla, bedrock is virtually fresh or has undergone subsequent weathering, possibly after stripping to fresh bedrock in a new cycle not yet mature enough to develop a classic laterite profile.

Erosional products are redistributed as transported regolith with its aeolian and sheetwash clay (loess) and sand components.

This landscape is largely covered by hardpanized, windblown loess ± sheetwash. Termite mounds, on rain denudation, add their coarser subsurface components as described in the Summary. East-west aeolian sand ridges are superimposed in places.

Outcrop is virtually non existent over much of the area, and that which was observed was limited to:

- Two quartz blows with minor float of fresh sillimanite-quartz-biotite gneiss and banded arkosic biotite metaquartzite.
- Ferricrete outcrop and associated desert armour on some low rises.
- Drainage calcrete on some low rises, due to topographic inversion on erosion.
- A small barren vein quartz outcrop among ferricrete.
- Residual low pediments and ridges with low breakaway escarpements of a folded migmatitic complex of schists, gneisses and metasediments of predominately quartzofeldspathic nature. Small, centimeter to sub meter size quartz sweat out veins were observed. The outcropping gneissic complex is weaky lateritized and possibly represents incipient lateritization under restricted rainfall conditions in an erosional/depositional regolith regime.

Field evidence suggests that incipient lateritization has (and still is) taking place, cementing aggregates of wind frosted quartz grains to form nodular, friable “P” samples. These are unlike the classic pisolites successfully used as a geochemical sampling medium in the Yilgarn and parts of the Tanami complex near Tanami.

Aeromagnetics show broad elongate lows corresponding to known granite gneiss terrane and interpreted granite gneiss in covered and undrilled areas. Fringing E-W linear magnetic highs were the locus of previous RAB drill traverses and the reconnaissance surface sampling traverses in this survey, which used a variety of sampling media. The magnetic highs possibly represent “basic fronts” in a gneiss/migmatite complex.

The landscape here is unlike that in the Tanami district: coarser rock lag is absent, quartz blows are rare, BIF subcrop with its characteristic high As ± Au is not yet known, termite mounds are smaller and less well developed, and ant nests with circular dark purple and black pisolitic particles including maglag are absent, as are strands of mulga (Acacia aneura).

It is suggested that this district is more akin to the well exposed and largely barren Arunta Complex to the southeast than to the gold mineralized Tanami Complex. The difference being that at Highland Rocks, outcrop is largely obscured by transported overburden over fairly fresh bedrock which is possibly undergoing a new cycle of incipient lateritization. At Tanami, regolith, including transported components largely overlies a lateritic profile which is

preserved in part, with some ferricrete, mottled and pallid zones evident in plateau breakaways (as at Talbot Hills) and in open pits and RAB holes.

Comparison of the broad aeromagnetic picture for Highland Rocks with that over exposed granite gneiss terrain in the Arunta Complex, versus the Tanami Complex may help support the suggested similarity.

Marla Prospect Orientation

This area was chosen as RAB drilling showed weak Au and Cu mineralization over narrow intervals in inclined holes. See Appendix I for field descriptions, Appendix II for laboratory analysis specifications, and Appendix III for orientation results.

C samples

These were hand picked chips of ferruginized quartz biotite gneiss (avoiding any vein quartz), from 0-3m of the 60º angled holes. A conc. HCl /hypochlorite leach was used to selectively dissolve the iron oxide component in these definite in situ rock samples. The idea was that if the thin overburden was transported, and/or failed to respond, cheaper Gemco type auger drilling to this zone should reveal dispersion anomalies to provide a rapid focus for follow up deeper, angled RAB drilling. C sample data should also dictate what elements could be considered as pathfinders in the surface pisolite(“P”), maglag (“M), and swept lag(“L”) samples.

Various leach procedures were tried on P, M and L samples to then ascertain which would give the best anomaly contrast for use in subsequent analysis of the routine survey samples.

With such a limited data set for each sample type, and generally disappointingly low results, one could only apply a subjective approach to these data.

Of the C samples, 104C gave an elevated response for Cu (Pb) Zn (Ni Mo) W Tl (Ba), elements in brackets indicating only a weak relative high.

105C was high in Au, and 106C in Au, Sb (Ni).

108C was high in Bi.

M, L and P samples

Responses were disappointing, which is not surprising considering the weak primary C sample data, and the fact that surface samples are possibly transported. In the M samples, conc. HCl/hypochlorite gave a better contrast for Zn, W and Tl for 106M than aqua regia.

Discussion

These data are equivocal, due to:

- Only very weak mineralization, limited and narrow in the original drilling. Note no evidence for As anomalism as previously reported in RAB holes.
- No sulfides were observed in the RAB chips.

- 105C and 106C upper 3m are only weakly anomalous in Au (17 ppb and 5.5 ppb), and 104C in Cu (162 ppm). Therefore the narrow Cu and Au intersections further down the inclined holes do not effectively disperse to near surface, even though these C samples are in situ lateritized bedrock. The lack of sulfides and very small, spotty mineralization does not set up an effective enough electrochemical cell for redox dispersion through several meters of lateritized bedrock.

- Hence if C samples are low, deriviatives such as L, M and P samples can not be expected to be high. Relative highs in this limited data set are background fluctuations, and in fact other, routine samples gave stronger relative anomalies — see Appendix V line profiles.

- There is field evidence (see descriptions, Appendix I) that Marla drilling was in thin transported regolith overlying stripped profiles to essentially fresh schist/gneiss. This bedrock is probably undergoing renewed incipient lateritization, with FeOx accretion of lag to form the sandy textured P samples.

- Outcrop 200m away is lateritized gneiss with quartz veins, typical, in my experience, of largely barren Arunta complex to the southeast. Quartz veins are metamorphic sweat outs which can carry minor, sporadic mineralization.

- There is always the possibility that these innovative sampling techniques “do not work” here. Nevertheless, they have worked elsewhere, and their failure to be convincing here is due to weak mineralization possibly compounded by transported cover.

Routine analyses

As a compromise between conc. HCL digestion and aqua regia digest, it was decided that L, M and P samples were to be leached in hot concentrated HCl/hypochlorite for 2 hours at 95ºC, then left overnight, with three agitations. Analyses were limited to Au Cu Pb Zn Ni As W Fe Mn and Mo. L samples were treated as 40g, unpulverized, others were 4g. pulverized.

I, R and some nominated C samples were treated by aqua regia digest.

These results are given in Appendix IV.

Discussion of RAB controlled routine results

HRRB 51-C1 to C3 are RAB samples on the flank of a sand dune. All have very low As, confirming the second, 1999 redrilling. Values are all background, and elevated in the more Fe-Mn rich hand picked nodular ferricrete C1 sample.

HRRB 436-C1 to C7 are from a vertical 1998 RAB hole. All except C5 and C6 are low barren background. Selected vein quartz chips (C7) are also barren. C5 and C6, from 9-15m depth, have anomalous Cu, Zn and possibly Ni. All samples are remarkably low in As. The hand picked ferricrete nodules C1 show no convincing response, and overlie transported hardpan soil above a shallow water table.

HRRB 965C1 to C4 samples are from a 1999 angled hole within a few meters of the vertical hole HRRB 436, drilled in 1998. There is 15m of transported cover here, including hardpan soil with ferricrete nodules overlying pallid zone sericitic siltstone. This is intruded by a dolerite dyke. The water table is at the regolith/bedrock interface. Note that the bedrock has been stripped to the pallid zone, with wind blown loess and possible sheetwash superimposed along with wind blown sand. Subsequent weak pisolite development has taken place from the shallow water table. These pisolites are somewhat friable, sandy nodules cemented by iron oxide, rather than true pisolites. True pisolites, as used successfully in the WA Yilgarn and elsewhere are more indurated, have an onion skin growth around a nucleus, and conchoidal fracture. ie) These “pisolites” are more likely a more recent, FeOx cemented version of the sandy deflation lag from the transported hardpan regolith. HRRB 965C3, which intersected the weathered dolerite dyke, has relatively higher Cu (165 ppm) but not Ni. All samples are very low in As.

86W -101L and M are surface samples from around the adjacent RAB holes HRRB 436 and HRRB 965. Of these, maglag 86W -101M does give a somewhat elevated Zn, Pb, Ni (Cu) response — see line profiles, sequence no. 42.

HRRB 962-C1 is hand picked nodular ferricrete from 0-3m in dune sand. This 60º angled hole intersected a fresh dolerite dyke — ie) the laterite profile has been stripped to fresh bedrock, and transported cover superimposed. The C1 dolerite dyke sample has only low background values in Cu, Ni and other analyzed elements. 86W-102L and M are surface samples around this hole. The maglag sample 86W-102M (sequence no 43 in line profiles, Appendix V) has elevated Zn Pb Ni Mo (Cu).

HRRB 1000-C2, a whole sample of weathered, ferruginized sericitic siltstone from 12-15m RAB hole depth confirms the previous high Cu result, with 350 ppm Cu and 259 ppm Ni. HRRB 1000-C1, hand picked ferricrete type pisolites from 0-3m show no convincing response, particularly in view of their dramatically higher Mn (but not Fe) content.

Surface samples from here, 86W-103L, M and P were all reported by Ultra Trace Laboratories Pty Ltd as “missing”. This is obviously a disappointment, and must be a laboratory error since all samples were carefully numbered twice by Chris Giles, then stock taken and check listed by myself and Chris together before dispatch. Moreover, there are three samples reported as missing among the L series, with three other samples having duplicate numbers with A and B suffixes, not used in the field. Similarly, 86W-103M is “missing”, while “44-T103MA” and “44-T103MB” do not exist as such.

Ironstone samples

These were all low in the elements analyzed, particularly arsenic. This is contrary to my experience with ironstones taken over Mt Charles beds in the Tanami district to the northeast.

Vein quartz outcrop

87-T105R was the only outcrop sample collected, as a composite of two quartz veins among massive ferricrete subcrop and desert armour. This sample was barren. Its site equivalent 87-T105L is actually a hybrid of coarse, 3-6mm sieved pisolites mixed with 30% angular coarse quartz lag. Accordingly this was split, with one half treated as an unpulverized 40g L sample, and the other half pulverized and treated as a 4g P sample. The pulverized version was anomalous in Au (6.5 ppb) with weak Cu and Pb, while the unpulverized lag version was relatively higher in non Fe normalized Cu and Zn.

Appendix I

Field Logs and Sample Descriptions

Sample No.	Sample types	Amount L	% Fe pisolites in L	Amount M	size M	Eastings	Northings	
44-W1	I					663380	7588580	Hand picked ironsto bedrock. Among 2 c metaqtzite.Some ve stages of denudatio magnetic. Erosional

44T-101	LM			L	F	662744	7583648	Sand plain on spinif
44T-102	LM			L	F	662562	7583523	
44T-103	LM			M	M	662388	7583442	
44T-104	LM			L	F	662019	7583291	
44T-105	LM		20	M	M	661836	7583221	
44T-106	LM		8	M	M	661652	7583149	
44T-107	LM		15	L	F	661487	7583047	Some coarse, friabl
44T-108	LM		10	L	F	661300	7582955	Some coarse, friabl
44T-109	LMP			L	F	661124	7582869	P is 50% of total lag
44T-110	LMP			L	F	660947	7582788	
44T-111	LM			L	F	660771	7582702	
44T-112	LM					660597	7582617	
44T-201	L		2			679490	7601411	On traverse 2, no M Indicates deep dune
44T-202	L		<1			679267	7601428	
44T-203	L					679072	7601416	Mostly wind blown s
44T-204	L					678863	7601404	As above, but only 2
44T-301	L	3				680530	7586555	Traverse 3 over pro
44T-302	L	50	<<1			680480	7586097	As above. Photos 7 mallee suggest bedr cover (C. Giles, pers
44T-303	L	20	<<1			680437	7585685	
44T-304	L	15	<1			680409	7585314	
44T-305	L	5	<<1			680383	7584925	
44T-306	L	2	<<1			680394	7584532	
44T-307	L	10	<1			680405	7584150	
44T-308	L					680398	7583757	
44T-309	L	10	<1			680401	7583370	
44T-310	L	20	<1			680407	7582979	
44T-311	L	5	1			680360	7583496	
44T-312	L	30	<<1			680635	7582395	
44T-313	L	30	<1			680862	7582345	
44T-314	L	25	<1			681045	7582305	
44T-315	L	25	<1			681247	7582298	
44T-316	L	25	<1			681518	7582251	
44T-317	L	10	1			681977	7582184	approx. 1% sandy b
44-W2	LMP	10	1	VL	M	678317	7595484	L is angular granitic
44-T401	LM	50	7	M	M	700101	7599856	Traverse 4 over disc
44-T402	LM	8	8	M	M	699571	7600187	

44-T403	LMP	15	8	M	M	699217	7600377	4 photos. P is handp cements angular qtz
44-T404	LM	50	2	M	M	698860	7600523	
44-T405	LM	15	4	L	M	698500	7600682	
44-T406	LM	20	2	L	F	698133	7600841	
44-T407	LM	10	3	M	M	697767	7600376	
44-T408	LMP	3	3	M	M	697346	7601124	P is 0.3 - 1cm nodul underlying ferricrete
44T-501	LMP	10	2	M	M	698465	7602672	P = 70% of 4 - 6mm
44T-502	LMP	10	2	M	M	698647	7602894	P = 40% Fe ferricret
44T-503	LMP	10	3	M	M	698809	7603149	
44T-504	LMP	3	3	M	M	698958	7603403	Some large + 3.13m
44T-505	LMP	10	2	M	M	699138	603673	
44T-601	LM	60	3	M	F-M	707723	7602829	Traverse 6 along ma
44T-602A	P					703015	7602762	At far edge of low ris 2cm. Chocolate brow these is magnetic ie
44T-602	L	50	<1			703122	7602734	Past low rise. M not with lack of other ve
44T-603	L	50	<1			703522	7602649	No M available.
44T-604	L	70	<1			703907	7602619	L is Fe stained, subr surface by termites. calcrete & silcrete su
44T-701	L	30	3	very low		706987	7601034	
44T-702	L	5	2	very low		706989	7600701	Before sieving, L is
44T-703	L	10	2	very low		706991	7600470	Before sieving, L is
44T-801	LM	5	1	L	F-M	698716	7597955	Similar landscapes t
44T-802	LM	10	1	M	M	698608	7597761	
44T-803	LM	10	1	M	F-M	698479	7597522	
44T-804	LM	50	1	L	M	698390	7597318	Photos of denuded t
44T-805	LM	1	2	L	M	698261	7597060	samples upgraded b
44T-806	LM	20	3	L	M	698098	7596810	L is subrounded, wi

44T-807	LM	5	3	M	M	697895	7596468	
44T-808	LM	5	1	L	M	697738	7596107	
44T-809	LM	5	<1	L	M	697939	7595735	M sample includes s
44T-810	L	2	<1	very low		698292	7595532	No M collected (too
44T-811	L	20	<1			698627	7595312	L = qtz & feldspar, s
44T-812	LM	20	<1	L	F-M	699119	7594997	L is somewhat more
44T-813	LM	3	2	L	F-M	699818	7594580	M sample has orang
44T-814	LM	40	3	M	M	700304	7594385	L = subangular qtz &
44T-815	LMP	20	1	L	M	700745	7594178	M is 50/50 limonite &
44T-816	LP	20	2			701195	7594016	*GPS reading not no* (not true pisolites) c
44T-817	L	20	1	very low		701654	7593853	
44T-818	L	5	1			702098	7593644	L = subangular grain
44T-819	L	30	1			702509	7593399	L = subangular grain
44T-820	L	5	<1			703016	7593225	L = subangular grain
44T-821	L	5	<1			703203	7593515	
44T-822	L	20	1			703442	7593864	
44T-823	L	2	<1			703640	7594184	Very thin veneer of l
44T-824	L	15	<1			703819	7594602	Same as before. At
87T-101	I					609633	7602420	EL8387, traverse al "basin"). Desert arr chocolate brown, ro magnetic, otherwise >9m in weathered q
87T-102	I					608596	7602887	At E edge of lateritic micropisolites.

87T-103	I					606064	7603657	Desert armour on ea about 5% of total de through desert armo
87T-104	I					604725	7603221	I = <1%, indurated,
87T-105	LMIR1	coarse	70			603298	7602264	R1 = composite of s approx. 2cm irregula 30% angular coarse
87T-106	LM	10	5	H	M	600681	7594340	Basin S of escarpen mounds on hardpan micropisolites
87T-107	LM	20	3	M	M	600585	7593964	As before, with all M scarp retreat from th
87T-108	LM	10	2	M	M	600542	7593579	As before, L is well s
87T-109	LM	10	1	L	M	600500	7593179	*GPS position not no*

Marla Prospect, EL 8951, orientation traverse from S to N downslope, over 60* RAB holes with 690 & 900 ppb A sloping gently down to the N from a low ridge of lateritized (ferruginized) gneiss with qtz veins 300m to the S. Surfa pisolites occur in lag +/- patches of ferricrete type nodular brown pisolites (P samples). Most holes have 0-3m "late feldspar + clear, angular quartz and decussate texture after biotite. "C samples" are hand picked 0-3m lateritized b Objective is to examine 0-3m in situ laterite as a cheap, rapid alternative (use Gemco type power auge

51T-101	LMP	10	1	H	F		0	At RAB 535. No C *a* impregnated biotite- angular qtz. *Coords*
51T-102	LMPC	15	1	H	F-C		50	At RAB 531. C is cle
51T-103	LMPC	7	1	H	F-C		100	At RAB 527. C is ra
51T-104	LMPC	12	1	H	F-M		125	At RAB 525. C = ran crystalline) qtz lag.
51T-105	LMPC	15	2	H	F-M		150	At RAB 523. C is ra surface.
51T-106	LMC	5	2	M	M-F		175	At RAB 521. C is sm are hand picked, fer Fe component only.
51T-107	LMC	10	2	M	F-M		200	At RAB 519. P is ve
51T-108	LMC	3	2	M	F-M		250	"515" (no RAB hole, from water flow on h precipitation via oxid

HRRB 436-C1	C					591482	7647355	EL 8386. Approx. 30 of large granitic bod gave only low As. S is hand picked, fron the usual surface P including angular ve Gemco auger samp
HRRB 436-C2	C							0-3m whole sample
HRRB 436-C3	C							3-6m, buff colored lu
HRRB 436-C4	C							6-9m, light buff colo
HRRB 436-C5	C							9-12m, mix of C4 ar
HRRB 436-C6	C							12-15m, off white, to
HRRB 436-C7	C							12-15m, hand selec
HRRB 965-C1	C							1999 RAB hole near ferricrete nodules, h
HRRB 965-C2	C							C2 from 0-3m is wh wind blown dune sa
HRRB 965-C3	C							6-9m, selected chips
HRRB 965-C4	C							33-39m composite t cover gives way to b
86W-101	LM	10	1	L	F			Surface samples fro
HRRB 962-C1	C					591466	7647399	0-3m, ferricrete nod angled hole intersec
86W-102	LM	5	2	L	F	591466	7647399	Surface samples arc
86T-101	LM	5	1	L	F	591556	7647252	Traverse across line
86T-102	LM	10	1	L	F	591542	7646890	
86T-103	LM	5	2	H	M	591477	7646602	Slightly upslope to S

86T-201	LM	5	1	L	F	597807	7647639	Traverse 2 at 400m sample site.
86T-202	LM	5	<1	L	F	598033	7647285	*NB. In all cases, M samples.*
86T-203	LM	5	<1	L	F	598239	7646969	L is well sorted and
86T-204	LM	10	<1	L	F	598433	7646642	
86T-205	LM	10	<1	M	F-M	598669	7646308	
86W-103	LMP	2	2	L	F	600510	7647953	Surface spot sample magnetic. P is sand
HRRB 1000-C1	P					600510	7647953	0-3m, hand picked p
HRRB 1000-C2	C					600510	7647953	12-15m, whole sam definite quartz-musc
86T-301	LM	1	3	M	F	611275	7642898	Traverse 3 at 320Tc termite mounds. L h
86T-302	LM	10	10	M	F-M	611082	7643165	On incipient sand du
86T-303	LM	2	10	M	F-M	610869	7643417	L contains 10% friab
86T-304	LM	10	<<1	L	F	610647	7643736	Essentially drift sand
86T-305	LM	10	5	M	F-M	610520	7644025	As previous, but app
HRRB 51-C1	P							RAB site is on S flar Au. Holes 51 and 52 ppm As. C1 sample sand.
HRRB 51-C2	"C"							3-6m, whole sample
HRRB 51-C3	"P"							6-15m composite. *F*
86W-104	LMP	1	5	M	F			Surface samples are

Appendix II

Analysis Specifications to Ultra Trace Laboratories Pty Ltd

ABN 33 001 675 350

4 Oct., 2000

Mr Alex Christ
Ultra Trace Analytical Laboratories
FAX: (08) 9456 0403
PH: (08) 9456 0404

Dear Alex

Re: Havilah Resources NL Orientation Samples

Following receipt of these samples which involve orientation analyses using various leaches, we have had a number of telephone discussions, as a result of which the main change is to substitute a nominal 40g aqua regia digest in lieu of a mixed acid digest. I understand that due to the HF component of the mixed acid digest, only samples of the order of 0.3g can be handled efficiently. Since we must have maximum sensitivity for Au, we agreed to substitute aqua regia for mixed acid.

These changes have already been adopted by you, but for the record (analytical requests are included as an Appendix in my report), amendments from the heading "Orientation Samples" on page 2 of my previous letter follow:

Orientation Samples — ***all 51 series, packed separately.***

Lag Samples — 51-T101L to 51-T108L

Do not pulverize

Split into 2 portions:

1. Conc. HCl + Na hypochlorite (Au leach) on 50 – 100g of <u>whole</u> sample. Warm to boiling, then let stand for a day or so with occasional stirring, so that the quartz residue is bleached. Trace micropisolites present are not visibly attacked.

2. Your cold 4M HCl + Na hypochlorite leach on a 50 – 100g portion of the whole sample.

Both solutions to be analyzed by ICP-MS to best possible detection limit for Au, and ICP-MS for Cu, Pb, Zn, Ni, As, Mo, Sb, Bi, W, Tl, Ag, Ba and for Fe and Mn by the most suitable technique (ICP-OES or AAS?)

Maglag samples — 51-T101M to 51-T108M

Pulverize and split into three portions:

1. Digest by your cold 4M HCl + hypochlorite leach.

2. Digest with conc, HCl + hypochlorite leach as for lag samples, above.

3. Aqua regia digest.

Analyze all three digests for Au and other elements as above, by ICP-MS.

Pisolite samples — 51-T101P to 51-T105P

Pulverize lightly to disaggregate, then split into 3 portions:

1. Conc. HCl + hypochlorite leach as before.

2. Cold 4M HCl + hypochlorite leach as before.

3. Aqua regia digest.

Analyze these digest solutions as for lag and maglag elements.

The routine P samples are of a less indurated, sandier nature than these. ie) They are FeOx cemented quartz and feldspar lag debris, rather than (weakly) lateritized bedrock (albeit possibly transported) as these appear to be. ie) These P samples are generically a variant of orientation C samples, whereas the routine P samples are mostly a more ferruginized variant of L samples. Routine I samples ("ironstone") are generically considered to be strongly lateritized bedrock.

RAB samples — 51-T102C to 51-T108C

Pulverize, then conc. HCl + hypochlorite digest as for lag 1, maglag 2 and pisolite 1 leaches, and analysis for Au and other elements as above.

In typing up the field notes I found that these orientation C samples are ferruginized bedrock from 0-3m of RAB holes, not fresh bedrock chips from deeper down hole as in most of the remaining, routine C samples. They represent a potential sampling medium under thin transported cover, and are more likely to reflect mobilized elements from below than fresher bedrock samples.

In all cases, please use maximum amounts of material available to ensure optimum detection limits.

A list of the remaining samples will be sent later.

Please do not hesitate to call me to discuss any aspects of this work.

Yours sincerely

Nick Marshall
cc. Dr Chris Giles

ABN 33 001 675 350

17 Oct., 2000

Mr Alex Christ
Ultra Trace Analytical Laboratories
FAX: (08) 9456 0403
PH: (08) 9456 0404

Dear Alex

Re: Havilah Resources NL Routine Samples

Thank you for the receipt of the orientation results, and your high Au rechecks using mini aqua regia on the C suffix samples. The agreement in Au and base metals, despite the small sample weight of only 0.8g, is encouraging. On this basis, we agreed to use the orientation conc. HCl/hypochlorite procedure (2hrs at 95º C on water bath, then 24 hrs at ambient temperature, with three inversions to mix contents), rather than your standard procedure (4 hrs. at 24º C, ± 1º C, for a lower extraction gradient).

Due to previous delays, and impending ground relinquishment decisions, my client requests that these remaining samples be treated as most urgent.

Samples are categorised as in my previous letter, with the suffix indicating sample type.

<u>L (lag) samples.</u>

Do not pulverise.

50g hot conc. HCl hypochlorite digest, with ICP- MS and ICP- OES to best detection limits except for Fe and Mn) for Au, Cu, Pb, Zn, Ni, As, Mo, W, Fe%, Mn.

44-T101L to 112L 44-T201L to 204L 44-T301L to 317L 44-W2L
44-T401L to 408L 44-T501L to 505L 44-T601L to 604L 44-T701L to 703L
44-T801L to 824L
86-W101L to 104L 86-T 101L to 103L 86-T201L to 205L 86-T301L to 305L
87-T106L to 109L

87-T105L *** This is actually a coarse sieved lag with quartz and pisolites, actually a hybrid between a P and an L sample. Therefore split, treat half unpulverized as for L samples, and pulverize the other half, to treat as a P sample.

M (maglag) samples

Pulverize, then treat with hot, conc. HCl /hypochlorite as above, for same elements. Please use maximum weight (to 50g), perhaps reserving say 1g for any Au checks by mini aqua regia. Please note approx. sample weights used.

44-T101M to 112M	44-W2M	44-T401M to 408M	44-T501M to 505M
44-T601M	44-T801M to 809M		44-T812M to 815M
86-W101M to 104M	86-T101M to 103M		86-T201M to 205M
86-T301M to 305M	87-T105M to 109M		

P (pisolite) samples

Pulverize lightly to disaggregate, then treat with hot, conc. HCl as above, for same elements. Please use maximum weight (up to 50g) perhaps reserving say 1g for any Au checks by mini aqua regia. Please note approx. sample weights used.

44-T109P to 110P	44-W2P	44-T403P	44-T408P
44-T501P to 502P	44-T815P to 816P	86-W103P to 104P	87-T101P to 104P
87-T110P			

87-T105L *** See note for L samples but treat this half as a P sample.

I (Ironstone) samples

Pulverize, use maximum weight up to 40g (record sample weights used) keeping a little in reserve in case of Au checks. Aqua regia digest and elements as above.

44-W1I "(w one ironstone)"
87-T101I to 105I
44-T 602AP *** Although labelled as a P sample, this is a true pisolitic ironstone, rather than nodular ferricrete, and should be treated as an "I" sample by aqua regia.

R (rock outcrop) samples

87-T105R1 vein quartz outcrop composite. Pulverize and treat as for I samples.

<u>C (chips ex RAB holes) samples.</u>

HRRB 436-C1 to C6. Pulverize, take max. weight up to 40g (record weight, etc.) then hot conc. HCl leach as for P samples, same elements.

HRRB 436-C7 vein quartz chips, hand selected. *** Treat as for R and I samples.

HRRB 965-C1 to C4 and HRRB 962-C1. Pulverize and treat as for P samples.

HRRB 1000-C1 to C2. Pulverize and treat as a P sample.

HRRB 51-C1 to C3. Pulverize, split in half. Treat one half as P sample, and the other as an aqua regia I and R sample.

Please do not hesitate to call me to discuss any aspects of this work.

Yours sincerely

Nick Marshall
cc. Dr Chris Giles

ABN 33 001 675 350

21 Sept., 2000

Mr Colin Eldridge
Manager
Ultra Trace Analytical Laboratories
FAX: (08) 94560403

Dear Colin

We have recently dispatched to you some multi-media samples, of which the marked orientation batch (only) should be analyzed first, urgently. Pending review of data from the various digests used, I shall advise the preferred technique to be applied to the remaining samples.

Please invoice my client, Havilah Resources NL (Attn. Dr Chris Giles, Exploration Director) of 235 Glen Osmond Rd, Frewville SA 5063 direct for your services. Their ABN is 39 077 435 520, phone (08) 8338 9292, fax (08) 8338 9293. Please email results in Excel format to me at nmarshall@optusnet.com.au and to Chris Giles at geocom@cobweb.com.au.

Sample Numbering System

The first two digits (44, 81 etc) define the area as the last two digits of the exploration licence. "W" and "T" signify "waypoint" (spot sample) or "traverse" respectively, followed by a digit indicating the traverse no. and then the sample no. along that traverse. The letter suffix indicates sample type. For example, 44-T813M indicates the 13th maglag sample on traverse 8 from area "44".

Sample Types

These are indicated by a letter suffix:

L = 2mm - 3.13mm sieved lag sample, essentially ironstained quartz detritus with a minor to trace micropisolite component.

I = ironstone, hand picked. Essentially a dark brown, highly indurated pisolite.

M = unsieved maglag, essentially maghemite particles (± minor fine magnetite) and composites grains.

P = coarse pisolites, hand picked, generally friable (weakly indurated) nodular ferricrete cemented sand.

C = rock chip samples from RAB drill holes.

R = rock outcrop sample.

Orientation Samples — ***all 51 series, packed separately.***

Lag Samples — 51-T101L to 51-T108L

Do not pulverize

Split into 2 portions:

3. Conc. HCl + Na hypochlorite (AU leach) on 50 – 100g of whole sample. Warm to boiling, then let stand for a day or so with occasional stirring, so that the quartz residue is bleached. Trace micropisolites present are not visibly attacked.

4. Your cold 4M HCl + Na hypochlorite leach on a 50 – 100g portion of the whole sample.

Both solutions to be analyzed by ICP-MS to best possible detection limit for Au, and ICP-MS for Cu, Pb, Zn, Ni, As, Mo, Sb, Bi, W, Tl, Ag, Ba and for Fe and Mn by the most suitable technique (ICP-OES or AAS?)

Maglag samples — 51-T101M to 51-T108M

Split into three portions:

4. Whole, unpulverized sample by your cold 4M HCl + hypochlorite leach.

5. Pulverized sample, conc, HCl + hypochlorite leach as for lag samples, above.

6. Pulverized sample, aqua regia digest.

Analyze all three digests for Au and other elements as above, by ICP-MS.

Pisolite samples — 51-T101P to 51-T105P

Pulverize, then split into 3 portions:

4. Conc. HCl + hypochlorite leach as before.

5. Cold 4M HCl + hypochlorite leach as before.

6. Aqua regia digest.

Analyze these digest solutions as for lag and maglag elements.\

RAB samples — 51-T102C to 51-T108C

Pulverize, then aqua regia digest and analysis for Au and other elements as above.

A list of the remaining samples will be sent later.

Please do not hesitate to call me to discuss any aspects of this work.

Yours sincerely

Nick Marshall

Appendix III

Initial Orientation Sample Results using different sample digests and expanded element array, Marla prospect

Sample	Au(AR)	Au(AR)	Cu	Pb	Zn	Ni	As	Mo	Sb	Bi	W	Tl	Ag	Ba	Fe	Mn
UNITS	ppb	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm
51 T101 P	-1		28	17	19	22	5.6	1.5	0.42	1.26	0.2	0.04	-0.05	199	23.1	109
51 T102 P	-1		15	17	7	8	4.6	1	0.2	0.6	0.1	0.1	-0.05	94	20.1	233
51 T103 P	-1		21	27	13	9	7.6	1.5	0.28	0.7	0.1	0.24	-0.05	102	21.7	500
51 T104 P	-1		35	23	22	9	12	2.7	0.58	1.26	0.3	0.08	-0.05	31	34.9	194
51 T105 P	1		32	21	44	16	9	1.7	0.4	0.82	0.2	0.06	-0.05	28	27	118

Sample Preparation
The samples have been sorted and dried. The whole sample has been pulverised in a ring pulveriser.

Analytical Methods
The samples have been digested with Aqua Regia. Because of limited sample availability, a reduced analysis weight was used (approx 4 grams). This is a partial digest though it is extremely efficient for extraction of Gold. Easily digested elements show good recoveries however others (particularly the refractory oxides and silicates) are poorly extracted.

Au(AR), Pb, As, Mo, Sb, Bi, W, Tl, Ag, Ba
have been determined by Inductively Coupled Plasma (ICP) Mass Spectrometry.

Cu, Zn, Ni, Fe, Mn
have been determined by Inductively Coupled Plasma (ICP) Optical Emission Spectrometry.

Sample	Au(AR)	Au(AR)	Cu	Pb	Zn	Ni	As	Mo	Sb	Bi	W	Ag	Tl	Ba	Fe	Mn
UNITS	ppb	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm
51 T101 M	1		28	31	32	34	8.4	2	0.26	1.42	0.4	-0.05	0.13	36	32.7	214
51 T102 M	-1		16	31	31	37	7.8	2.4	0.34	1.38	0.3	-0.05	0.13	47	32.4	227
51 T103 M	-1		16	28	25	21	7.4	1.5	0.24	1.4	0.3	-0.05	0.13	30	30.2	199
51 T104 M	-1		14	27	21	21	7.6	1.4	0.3	1.4	0.3	-0.05	0.13	27	31.2	217
51 T105 M	-1		15	30	38	21	8.4	4.6	0.34	1.46	0.3	-0.05	0.15	31	33.5	252
51 T106 M	-1	-1	14	30	50	17	8	8.1	0.32	1.44	0.3	-0.05	0.14	26	31.3	251
51 T107 M	-1		12	30	25	15	8	2.2	0.28	1.44	0.3	-0.05	0.15	27	30.8	237
51 T108 M	-1		10	29	21	16	7.4	1.7	0.28	1.48	0.3	-0.05	0.14	22	30.3	221

Sample Preparation

The samples have been sorted and dried. The samples have then been split with a riffle splitter and a portion then pulverised in a ring pulveriser.

Analytical Methods

The samples have been digested with Aqua Regia. Because of limited sample availability, a reduced analysis weight was used (approx 4 grams). This is a partial digest though it is extremely efficient for extraction of Gold. Easily digested elements show good recoveries however others (particularly the refractory oxides and silicates) are poorly extracted.

Au(AR), Pb, As, Mo, Sb, Bi, W, Ag, Tl
have been determined by Inductively Coupled Plasma (ICP) Mass Spectrometry.

Cu, Zn, Ni, Fe, Mn
have been determined by Inductively Coupled Plasma (ICP) Optical Emission Spectrometry.

The samples have been digested with Aqua Regia. This is a partial digest though it is extremely efficient for extraction of Gold. Easily digested elements show good recoveries however others (particularly the refractory oxides and silicates) are poorly extracted.

If Barium occurs as the Sulphate mineral, then at high levels (more than 4000 ppm) it may re-precipitate after the digest giving seriously low results.

Ba
has been determined by Inductively Coupled Plasma (ICP) Mass Spectrometry.

Sample	Au(P)	Cu	Pb	Zn	Ni	As	Mo	Sb	Bi	W
UNITS	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppb	ppb	ppb
51 T101 P	-0.5	19.4	14.4	11.7	16	4.2	1.77	567	898	
51 T102 P	-0.5	9	12.6	1.4	6	2.8	0.95	191	348	
51 T103 P	-0.5	12.4	21.6	6.1	6	3.4	1.05	215	397	
51 T104 P	-0.5	18.2	14.6	8	6	4.2	1.42	297	629	
51 T105 P	1	16.2	13.8	9.4	9	4	1.11	258	430	

Sample Preparation
The samples have been sorted and dried. The whole sample has been pulverised in a ring pulveriser.

Analytical Methods
These MagLag samples have been treated with a concentrated Hydrochloric acid leach to extract moderately bound elements from the surface of sample grains Recovery of elements is always PARTIAL however the results may be used in establishment of path-finder elements.

Au(P), Cu, Pb, Zn, Ni, As, Mo, Sb, Bi, W, Tl, Ag, Ba
have been determined by Inductively Coupled Plasma (ICP) Mass Spectrometry.

Fe, Mn
have been determined by Inductively Coupled Plasma (ICP) Optical Emission Spectrometry.

Sample	Au(P)	Cu	Pb	Zn	Ni	As	Mo	Sb	Bi	W	Tl	Ag	Ba	Fe	Mn
UNITS	ppb	ppm	ppm	ppm	ppm	ppm	ppb	ppb	ppb	ppb	ppb	ppb	ppm	ppm	ppm
51 T101 L	-0.1	-0.2	0.4	0.1	-0.2	-0.05	20	3.5	8.6	3.5	1	-1	1	510	2
51 T102 L	-0.1	-0.2	0.4	0.1	-0.2	-0.05	10	2.5	6.4	10	1.5	-1	2	359	5
51 T103 L	-0.1	-0.2	0.3	-0.1	-0.2	-0.05	15	2.5	6.2	34	1	-1	1	770	4
51 T104 L	-0.1	-0.2	0.8	-0.1	-0.2	-0.05	15	3.5	8.6	5	3.5	-1	2	574	11
51 T105 L	-0.1	-0.2	0.4	-0.1	-0.2	-0.05	15	3	6.8	5.5	1.5	-1	1	514	4
51 T106 L	-0.1	0.2	0.6	-0.1	-0.2	0.05	25	3.5	9.6	1.5	3.5	-1	2	942	8
51 T107 L	-0.1	-0.2	0.3	-0.1	-0.2	-0.05	15	2	5.6	4.5	2	-1	2	384	7
51 T108 L	-0.1	-0.2	0.4	-0.1	-0.2	-0.05	15	2.5	6.6	4	1.5	-1	-1	414	4

Sample Preparation

No sample preparation was required on these samples.

Analytical Methods

The samples have been treated with a diluted Hydrochloric Acid leach to extract elements from the surface coatings on sample grains. Recovery of elements is always PARTIAL however the results may be used in establishment of path-finder elements.

Au(P), Cu, Pb, Zn, Ni, As, Mo, Sb, Bi, W, Tl, Ag, Ba, Fe, Mn
have been determined by Inductively Coupled Plasma (ICP) Mass Spectrometry.

Sample	Au(P)	Cu	Pb	Zn	Ni	As	Mo	Sb	Bi	W	Tl	Ag	Ba	Fe	Mn
UNITS	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppb	ppb	ppb	ppb	ppb	ppm	%	ppm
51 T102 C	-0.5	15.2	11.9	1.6	6.2	2.15	0.905	111	327	335	86	20	125	16.2	189
51 T103 C	-0.5	15.4	17.5	6.4	7.2	2.4	1.12	151	517	460	91.5	40	216	17.1	205
51 T104 C	-0.5	162	21.2	45.1	15.8	1.95	1.86	98.5	324	1180	241	50	268	17.3	119
51 T105 C	17	21.8	12	7	6.8	2.85	1.11	139	413	340	35	40	87	15.4	49
51 T106 C	5.5	25.2	15.5	13.6	14.6	3.8	1.53	215	600	375	48.5	60	86	20.2	77
51 T107 C	0.5	15.4	15.6	8.1	13	2	1.7	187	780	285	54.5	60	101	19.8	49
51 T108 C	-0.5	16.8	10.9	3.9	6.4	2.2	1.67	123	830	365	13.5	70	33	17.6	28

Sample Preparation

The samples have been sorted and dried. The whole sample has been pulverised in a ring pulveriser.

Analytical Methods

The samples have been treated with a concentrated Hydrochloric Acid leach to extract moderately bound elements from the surface of sample grains. Recovery of elements is always PARTIAL however the results may be used in establishment of path-finder elements.

Au(P), Cu, Pb, Zn, Ni, As, Mo, Sb, Bi, W, Tl, Ag, Ba
have been determined by Inductively Coupled Plasma (ICP) Mass Spectrometry.

Fe, Mn
have been determined by Inductively Coupled Plasma (ICP) Optical Emission Spectrometry.

Sample	Au(P)	Cu	Pb	Zn	Ni	As	Mo	Sb	Bi	W	Tl	Ag	Ba	Fe	Mn
UNITS	ppb	ppm	ppm	ppm	ppm	ppm	ppb	ppb	ppb	ppb	ppb	ppb	ppm	%	ppm
51 T101 L	-0.5	4.6	4	2	4.5	1.4	455	59	133	80	16	-10	9	3.09	33
51 T102 L	-0.5	2.2	2	0.2	1	1	245	36	64.6	79	13	-10	8	2.06	26
51 T103 L	-0.5	3.4	2.4	0.2	1.5	1.2	305	53	121	102	8	-10	5	3.03	20
51 T104 L	-0.5	4	4.2	0.3	1.5	1.8	440	74	186	204	20	-10	10	4.44	52
51 T105 L	-0.5	3	3.8	0.2	1.5	2.2	425	80	165	83	11	-10	6	5	25
51 T106 L	-0.5	3.2	2.8	0.5	2	2	405	87	168	79	14	-10	9	3.64	81
51 T107 L	-0.5	3.8	3.4	2.8	4	2	545	76	114	102	14	-10	9	3.77	53
51 T108 L	-0.5	1.8	2.8	0.1	2	1.8	400	84	2110	127	13	-10	6	3.46	33

Sample Preparation
No sample preparation was required on these samples.

Analytical Methods
These MagLag samples have been treated with a concentrated Hydrochloric acid leach to extract moderately bound elements from the surface of sample grains Recovery of elements is always PARTIAL however the results may be used in establishment of path-finder elements.

Au(P), Cu, Pb, Zn, Ni, As, Mo, Sb, Bi, W, Tl, Ag, Ba
have been determined by Inductively Coupled Plasma (ICP) Mass Spectrometry.

Fe, Mn
have been determined by Inductively Coupled Plasma (ICP) Optical Emission Spectrometry.

Sample	Au(P)	Cu	Pb	Zn	Ni	As	Mo	Sb	Bi	W	Tl	Ag	Ba	Fe	Mn
UNITS	ppb	ppm	ppm	ppm	ppm	ppm	ppb	ppb	ppb	ppb	ppb	ppb	ppm	ppm	ppm
51 T101 P	0.3	9	2.9	6	5.6	0.3	325	136	171	58.5	23	-1	28	9930	38
51 T102 P	-0.1	2.4	2.8	1.6	1	0.15	120	44.5	31.2	38.5	33.5	-1	29	4380	87
51 T103 P	0.2	5.6	7.5	5	1.6	0.25	310	64	64.8	29	106	-1	50	11100	227
51 T104 P	-0.1	9	3.8	7.7	1.8	0.3	305	55	111	36	28.5	-1	14	10400	55
51 T105 P	1.2	7.6	3.3	5.8	1.6	0.25	260	54	63.2	42.5	20	-1	13	10100	28

Sample Preparation

The samples have been sorted and dried. The whole sample has been pulverised in a ring pulveriser.

Analytical Methods

The samples have been treated with a diluted Hydrochloric Acid leach to extract elements from the surface coatings on sample grains. Recovery of elements is always PARTIAL however the results may be used in establishment of path-finder elements.

Au(P), Cu, Pb, Zn, Ni, As, Mo, Sb, Bi, W, Tl, Ag, Ba, Fe, Mn
have been determined by Inductively Coupled Plasma (ICP) Mass Spectrometry.

Sample	Au(P)	Cu	Pb	Zn	Ni	As	Mo	Sb	Bi	W	Tl	Ag	Ba	Fe	Mn
UNITS	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppb	ppb	ppb	ppb	ppb	ppm	%	ppm
51 T101 M	-0.5	18	25.6	21.2	28.5	3.8	2.24	493	975	838	96	-10	42	22.2	188
51 T102 M	-0.5	11.4	24.8	17.3	26	3.4	2.1	491	886	669	92	-10	54	19.7	185
51 T103 M	-0.5	12	23.8	16.4	16	3.8	1.91	497	983	754	97	-10	34	21.8	185
51 T104 M	-0.5	9.4	21	12.9	14	3.8	1.66	479	882	674	92	-10	28	19.5	175
51 T105 M	-0.5	10.4	22.6	21.9	15	3.8	2.91	549	887	727	96	-10	31	20.3	217
51 T106 M	-0.5	9	22.4	32.5	12	4	3.01	523	872	698	94	-10	26	19.5	199
51 T107 M	-0.5	8.6	23.8	14.9	12.5	4.2	2.17	539	914	749	110	-10	29	21	203
51 T108 M	-0.5	7.8	25.2	12.9	10.5	4	1.96	529	1020	726	103	-10	24	21.4	201

Sample Preparation

The samples have been sorted and dried. The samples have then been split with a riffle splitter and a portion then pulverised in a ring pulveriser.

Analytical Methods

These MagLag samples have been treated with a concentrated Hydrochloric acid leach to extract moderately bound elements from the surface of sample grains Recovery of elements is always PARTIAL however the results may be used in establishment of path-finder elements.

Au(P), Cu, Pb, Zn, Ni, As, Mo, Sb, Bi, W, Tl, Ag, Ba
have been determined by Inductively Coupled Plasma (ICP) Mass Spectrometry.

Fe, Mn
have been determined by Inductively Coupled Plasma (ICP) Optical Emission Spectrometry.

Appendix IV

Routine Survey results, Multi-media samples

Sample	Au(P)	Au(AR)	Au(AR)
UNITS	ppb	ppb	ppb
HRRB 436 C1	1		
HRRB 436 C2	1.5		
HRRB 436 C3	-0.5		
HRRB 436 C4	0.5	-1	
HRRB 436 C5	0.5		
HRRB 436 C6	0.5	1	
HRRB 965 C1	-0.5		
HRRB 965 C2	-0.5		
HRRB 965 C3	-0.5	-1	
HRRB 965 C4	0.5	-1	
HRRB 962 C1	-0.5		
HRRB 1000 C1	0.5		
HRRB 1000 C2	0.5	-1	
HRRB 51 C1	-0.5		
HRRB 51 C2	-0.5		
HRRB 51 C3	-0.5		
HRRB 436 C7	-1		
HRRB 51 C1	-1		
HRRB 51 C2	2		
HRRB 51 C3	1		

Sample Preparation

The samples have been sorted and dried. The whole sample has been pulverised in a ring pulveriser.

Analytical Methods

The samples have been treated with a concentrated Hydrochloric Acid leach to extract moderately bound elements from the surface of sample grains. Recovery of elements is always PARTIAL however the results may be used in establishment of path-finder elements.

Au(P), Pb, As, Mo, W

have been determined by Inductively Coupled Plasma (ICP) Mass Spectrometry.

Cu, Zn, Ni, Fe, Mn

have been determined by Inductively Coupled Plasma (ICP) Optical Emission Spectrometry.

The samples have been digested with Aqua Regia. Because of limited sample availability, a very small sample weight was used (approx 1 gram). This is a partial digest though it is extremely efficient for extraction of Gold. Easily digested elements show good recoveries however others (particularly the refractory oxides and silicates) are poorly extracted.

Au(AR)
has been determined by Inductively Coupled Plasma (ICP) Mass Spectrometry.

Sequence No.	Sample	Au(P)	Cu	Pb	Zn	Ni	As	Mo	W	
	UNITS	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppb	
1	44-T101M	0.5	14	27.4	70	19	2.25	1.25	350	2
2	44-T102M	0.5	10	23.8	26	16	2.5	1.32	285	1
3	44-T103M A	1	9	23.8	27	16	2.7	1.25	285	
4	44-T103M B	0.5	9	23	25	12	2.7	1.34	270	1
5	44-T104M	-0.5	10	26.6	31	14	3.65	1.35	330	2
6	44-T105M	0.5	9	24.2	25	14	2.6	1.22	260	1
7	44-T106M	-0.5	9	23.8	25	14	2.75	1.33	295	
8	44-T107M	-0.5	9	23.2	28	15	2.55	1.24	275	1
9	44-T108M	0.5	9	24.6	32	15	3	1.46	420	2
10	44-T109M	-0.5	11	25.4	30	12	2.5	1.28	295	1
11	44-T110M	-0.5	11	25.2	31	14	2.35	1.09	250	2
12	44-T111M	-0.5	13	27	34	14	2.95	1.31	295	2
13	44-T112M	-0.5	11	28.6	32	16	2.6	1.05	245	2
14	44-W2M	-0.5	10	30.6	21	14	2.95	0.975	220	2
15	44-T401M	-0.5	8	23.8	25	10	2.45	1.46	280	1
16	44-T402M	-0.5	9	25.2	26	10	2.65	1.43	245	
17	44-T403M	0.5	8	24.4	24	9	2.5	1.38	260	1
18	44-T404M	-0.5	9	27.2	24	11	2.6	1.28	230	1
19	44-T405M	1	9	27.4	28	10	2.25	1.44	280	1
20	44-T406M	-0.5	9	23.8	29	11	2.4	1.45	250	1
21	44-T407M	0.5	8	23	28	11	2.35	1.51	295	1
22	44-T408M	-0.5	11	26.4	28	12	2.65	1.47	325	1
23	44-T501M	-0.5	9	27	33	12	2.3	1.32	320	1
24	44-T502M	-0.5	9	24.2	28	13	2.6	1.39	245	1
25	44-T503M	-0.5	8	24	30	11	2.35	1.51	350	1
26	44-T504M	0.5	9	23.4	28	12	2.5	1.59	265	1
27	44-T505M	0.5	9	26.2	32	13	2.45	1.47	315	1
28	44-T601M	-0.5	10	23.4	19	6	1.15	0.87	175	1
29	44-T801M	0.5	9	26.4	30	11	1.85	1.17	350	1
30	44-T802M	-0.5	8	24.6	24	11	1.95	1.23	240	1
31	44-T803M	-0.5	8	28.2	28	10	1.75	1.28	400	
32	44-T804M	-0.5	9	25.8	27	11	2.05	1.29	280	1
33	44-T805M	-0.5	10	27.4	34	9	1.55	1.23	360	1
34	44-T806M	-0.5	13	24	31	8	1.7	1.15	355	1
35	44-T807M	-0.5	11	26.4	24	7	1.6	1.07	230	1
36	44-T808M	0.5	10	19.8	31	9	1.45	1.03	370	1
37	44-T809M	-0.5	10	22.2	30	8	1.8	1.13	380	
38	44-T812M	-0.5	9	20.4	28	8	1.95	0.96	290	1
39	44-T813M	0.5	9	24.6	30	12	2.1	1.16	350	1
40	44-T814M	-0.5	8	23.2	24	13	2.3	1.35	250	1
41	44-T815M	0.5	9	24.4	37	13	2.1	1.38	475	1
42	86-W101M	-0.5	14	39.4	35	31	2.6	0.7	300	2
43	86-W102M	-0.5	16	39.2	44	35	2.6	2.56	390	2
44	86-W103M	MISSING								
45	86-W301M	-0.5	20	32.8	33	33	1.55	0.78	240	2
46	86-W104M	1	12	28.2	23	10	2.05	1.98	280	2
47	86-T101M	-0.5	14	40.6	34	36	2.7	0.68	315	2
48	86-T102M	0.5	19	43	52	53	2	0.615	220	2
49	86-T103M	-0.5	26	43	71	65	3.8	0.59	240	2
50	86-T201M	-0.5	15	34	36	26	1.75	0.73	265	2

51	86-T202M	-0.5	16	33.2	39	25	1.9	0.64	265	2
52	86-T203M	-0.5	12	32.6	35	21	1.7	0.76	290	2
53	86-T204M	-0.5	12	30.6	31	18	1.85	0.78	230	2
54	86-T205M	0.5	13	31.2	27	17	1.95	0.94	240	2
55	86-T301M	-0.5	8	33	14	8	2.45	0.81	380	2
56	86-T302M	-0.5	7	27.4	11	6	2.6	1.14	360	1
57	86-T303M	-0.5	8	24.8	14	5	1.75	1.08	320	2
58	86-T304M	0.5	9	29.4	17	10	1.7	0.825	380	2
59	86-T305M	0.5	7	23.8	13	6	1.65	0.94	305	
60	87-T105M	-0.5	15	27.2	21	9	1.15	0.81	125	2
61	87-T106M	-0.5	10	29.6	18	7	1.55	0.9	130	1
62	87-T107M	-0.5	12	33.6	18	11	1.65	1.15	125	2
63	87-T108M	-0.5	11	35.6	15	8	2.1	1.65	135	1
64	87-T109M	-0.5	17	36.4	19	9	2.2	1.48	190	2
65	51 T101 M	-0.5	18	25.6	21.2	28.5	3.8	2.24	838	2
66	51 T102 M	-0.5	11.4	24.8	17.3	26	3.4	2.1	669	1
67	51 T103 M	-0.5	12	23.8	16.4	16	3.8	1.91	754	2
68	51 T104 M	-0.5	9.4	21	12.9	14	3.8	1.66	674	1
69	51 T105 M	-0.5	10.4	22.6	21.9	15	3.8	2.91	727	2
70	51 T106 M	-0.5	9	22.4	32.5	12	4	3.01	698	1
71	51 T107 M	-0.5	8.6	23.8	14.9	12.5	4.2	2.17	749	
72	51 T108 M	-0.5	7.8	25.2	12.9	10.5	4	1.96	726	2

Sample	Au	Cu	Pb	Zn	Ni	As	Mo	W	Fe	M
UNITS	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	pp
44-W1I	2	20.5	26	10	15	9.8	1.4	1.1	19.1	30
87-T101I	2	8	17	9	2	0.6	0.2	1.1	18.7	15
87-T102I	2	3.5	11	3	2	1	0.6	0.9	15.8	8
87-T103I	1	10	17	4	6	0.8	0.1	0.9	16.8	7
87-T104I	2	4	14	3	5	1.8	0.7	0.8	17	16
87-T105I	2	9.5	24	5	3	1	0.3	0.7	18	11
44-T602A	-1	6	20	3	6	2	0.5	0.7	18.2	10
87-T105R	1	11	3	18	7	1.4	2.3	0.6	6	9
HRRB 436 C7	-1	8	6	6	10	9.6	0.9	1.6	3.21	14
HRRB 51 C1	-1	30.5	42	10	20	7.4	0.7	0.5	15.4	11
HRRB 51 C2	2	10	9	13	6	6.2	1.7	0.6	7.49	38
HRRB 51 C3	1	12.5	6	12	6	3.6	0.7	0.7	4.37	27

Sample Preparation

The samples have been sorted and dried. The whole sample has been pulverised in a ring pulveriser.

Analytical Methods

The samples have been digested with Aqua Regia. This is a partial digest though it is extremely efficient for extraction of Gold. Easily digested elements show good recoveries however others (particularly the refractory oxides and silicates) are poorly extracted.

Au, Pb, As, Mo, W

have been determined by Inductively Coupled Plasma (ICP) Mass Spectrometry.

Cu, Zn, Ni, Fe, Mn

have been determined by Inductively Coupled Plasma (ICP) Optical Emission Spectrometry.

Sample	Sequence No.	Au(P)	Cu	Pb	Zn	Ni	As	Mo	W	Fe	Mn
UNITS		ppb	ppm	ppm	ppm	ppm	ppm	ppb	ppb	%	ppm
44-T101L	1	-0.5	4	3.2	4	1	1.9	270	160	1.88	79
44-T102L	2	-0.5	4	4.3	5	2	2.2	370	185	2.43	81
44-T103L A	3	-0.5	10	10.9	8	4	8.95	1020	235	7.32	200
44-T103L B	4	-0.5	6	8.9	6	2	4.65	645	250	4.15	180
44-T104L	5	-0.5	21	10.1	19	-1	1.95	345	195	2.18	527
44-T105L	6	-0.5	3	4.6	4	-1	2.15	325	225	2.3	163
44-T106L	7	-0.5	5	5	6	-1	3.45	555	245	3.74	92
44-T107L	8	-0.5	11	24.9	11	7	8.75	1190	210	6.91	629
44-T108L	9	-0.5	20	18.8	13	15	14.7	1510	215	10.8	330
44-T109L	10	-0.5	4	6.4	5	-1	2.55	450	240	3.02	168
44-T110L	11	-0.5	7	4.6	7	2	2.9	505	235	3.12	90
44-T111L	12	-0.5	6	9.4	6	2	3.4	595	255	3.4	207
44-T112L	13	-0.5	5	2.6	5	-1	1.25	220	130	1.51	43
44-T201L	14	-0.5	6	3.8	5	2	2.2	230	130	1.88	74
44-T202L	15	-0.5	2	2	2	-1	1	110	95	0.799	34
44-T203L	16	-0.5	6	3.9	3	-1	3.15	235	160	2.28	55
44-T204L	17	-0.5	3	1.9	3	-1	1.25	130	100	1.15	17
44-T301L	18	MISSING									
86-W301L	19	-0.5	7	3	2	3	1.3	305	780	2.5	23
44-T302L	20	-0.5	2	1.4	3	-1	0.65	95	95	0.541	19
44-T303L	21	-0.5	2	1.6	3	-1	0.7	110	95	0.575	14
44-T304L	22	-0.5	2	1.8	3	-1	1.1	195	120	0.802	17
44-T305L	23	-0.5	2	1.2	2	-1	0.55	95	90	0.538	14
44-T306L	24	-0.5	2	1.5	4	-1	0.65	90	90	0.504	15
44-T307L	25	-0.5	2	1.4	3	-1	0.55	90	90	0.532	13
44-T308L	26	-0.5	2	1.4	2	-1	0.5	90	80	0.509	14
44-T309L	27	-0.5	2	2.1	3	-1	0.75	120	105	0.624	20
44-T310L	28	-0.5	2	1.9	3	-1	1	160	140	0.77	20
44-T311L	29	-0.5	2	1.8	3	-1	0.7	150	115	0.805	17
44-T312L A	30	-0.5	2	2.1	3	-1	0.9	205	145	0.839	20
44-T312L B	31	-0.5	2	1.7	3	-1	0.7	140	115	0.679	14
44-T313L	32	MISSING									
44-T314L	33	-0.5	2	2.5	3	-1	1.05	300	270	0.772	25
44-T315L	34	-0.5	2	2.1	3	-1	0.85	180	135	0.851	24
44-T316L	35	-0.5	2	2.1	3	-1	0.8	125	120	0.714	17
44-T317L	36	-0.5	1	1.5	2	-1	0.8	105	105	0.581	15
44-W2L	37	-0.5	5	2.2	4	1	2.1	210	155	1.81	17
44-T401L A	38	-0.5	3	2.5	3	-1	1.25	165	120	0.898	33
44-T401L B	39	-0.5	4	4.7	4	-1	3.25	455	215	3.23	58
44-T402L	40	-0.5	4	5.3	4	-1	3.05	360	215	2.69	129
44-T403L	41	-0.5	2	2.6	3	-1	2.1	240	145	1.71	29
44-T404L	42	-0.5	3	3.1	5	-1	1.9	250	160	2.04	39
44-T405L	43	-0.5	4	4.7	5	-1	2.35	305	195	2.23	274
44-T406L	44	-0.5	3	3.1	4	-1	1.95	245	145	1.7	74
44-T407L	45	-0.5	4	6.7	4	-1	2.25	285	160	1.93	90
44-T408L	46	-0.5	3	2.7	3	-1	2.55	290	180	2.19	29
44-T501L	47	-0.5	3	3.6	4	-1	1.9	215	155	1.69	97
44-T502L	48	-0.5	3	3	4	-1	2.55	305	180	2.2	46
44-T503L	49	-0.5	3	2.8	4	1	1.9	265	160	1.82	31
44-T504L	50	-0.5	2	3.2	3	-1	2.15	300	160	1.93	78
44-T505L	51	-0.5	2	2.4	4	-1	1.45	185	120	1.28	22

44-T601L	52	-0.5	2	4.8	3	-1	2.25	360	220	4.14	30
44-T602L	53	-0.5	2	1.5	2	-1	0.65	90	60	1.01	14
44-T603L	54	-0.5	3	1.5	3	-1	0.8	85	65	0.933	21
44-T604L	55	-0.5	1	1.3	1	-1	0.85	95	70	1	18
44-T701L	56	-0.5	5	6.2	5	1	3.35	365	210	2.56	116
44-T702L	57	-0.5	4	3.2	7	-1	2.5	305	180	2.25	53
44-T703L	58	-0.5	3	2.6	3	-1	1.95	220	155	1.68	36
44-T801L	59	-0.5	2	2.1	3	-1	1.65	195	130	1.56	19
44-T802L	60	-0.5	2	2.9	4	-1	1.8	220	130	1.7	41
44-T803L	61	-0.5	2	2.4	4	1	1.3	170	120	1.36	38
44-T804L	62	-0.5	1	2.7	3	-1	1.15	140	110	1	37
44-T805L	63	-0.5	3	4.5	7	-1	2.5	405	205	2.71	68
44-T806L	64	-0.5	2	2.8	3	-1	0.95	140	110	1.2	43
44-T807L	65	-0.5	1	1.9	3	-1	1	130	95	1.16	22
44-T808L	66	-0.5	2	2.3	3	-1	0.75	105	95	0.728	79
44-T809L	67	-0.5	2	1.7	4	-1	0.8	100	85	0.741	19
44-T810L	68	-0.5	3	3.3	5	-1	1.15	155	115	1.27	51
44-T811L	69	-0.5	2	2.2	4	-1	0.75	80	75	0.662	36
44-T812L	70	-0.5	1	1.9	3	-1	0.75	95	90	0.717	27
44-T813L	71	-0.5	3	3.3	4	-1	1.85	185	145	1.53	76
44-T814L	72	-0.5	4	2.2	4	1	1.5	200	125	1.44	29
44-T815L	73	-0.5	3	2.1	3	-1	1.6	180	115	1.45	21
44-T816L	74	-0.5	2	1.9	3	-1	1.4	165	100	1.3	16
44-T817L	75	-0.5	2	2.2	3	-1	1.1	140	100	1.06	30
44-T818L	76	-0.5	1	2.2	4	-1	1.35	170	125	1.44	20
44-T819L	77	-0.5	2	1.6	3	1	1	110	80	0.86	18
44-T820L	78	-0.5	2	1.6	2	-1	0.95	110	85	0.844	46
44-T821L	79	-0.5	3	3.8	4	-1	1.75	210	125	1.61	58
44-T822L	80	-0.5	2	1.9	4	2	1	130	105	1.1	24
44-T823L	81	-0.5	2	2.1	3	-1	1.2	135	120	1.31	26
44-T824L	82	-0.5	2	2.6	3	-1	0.8	95	80	0.751	53
86-W101L	83	-0.5	6	3.5	6	1	2.2	280	210	3.14	26
86-W102L	84	-0.5	3	3.8	2	-1	2.3	300	205	3.09	18
86-W103L	85	MISSING									
86-W104L	86	-0.5	6	7.4	7	-1	3.8	680	315	5.83	134
86-T101L	87	-0.5	1	2	1	2	1.25	140	120	1.56	10
86-T102L	88	-0.5	2	3.4	4	-1	1	165	95	1.48	45
86-T103L	89	-0.5	9	4.7	16	6	5	460	370	4.02	67
86-T201L	90	-0.5	1	1.8	1	1	0.95	125	105	1.43	16
86-T202L	91	-0.5	3	2	2	1	1	140	140	1.64	14
86-T203L	92	-0.5	1	1.1	2	-1	0.65	90	110	1.05	13
86-T204L	93	-0.5	-1	1.1	2	-1	0.5	90	85	0.862	9
86-T205L	94	-0.5	2	2.2	3	1	0.9	150	90	1.58	21
86-T301L	95	-0.5	6	11.6	3	1	7	880	690	8.02	65
86-T302L	96	-0.5	4	14.5	4	2	6.55	1400	745	11.4	123
86-T303L	97	-0.5	3	12.5	3	2	5.4	1200	585	11.7	111
86-T304L	98	-0.5	-1	0.7	1	-1	0.35	55	80	0.696	5
86-T305L	99	-0.5	1	5.5	1	1	3.2	775	515	6.22	32
87-T106L	100	-0.5	3	10.4	3	1	2.95	795	215	8.42	41
87-T107L	101	-0.5	3	6	3	-1	2.55	595	195	4.86	35
87-T108L	102	-0.5	2	5.5	3	-1	2.6	585	170	4.32	25
87-T109L	103	-0.5	2	2.8	2	-1	1.65	265	125	1.9	16
87-T105L	104	-0.5	13	20.6	9	2	4	1370	190	14.2	231
51-T101L	105	-0.5	4.6	4	2	4.5	1.4	455	80	3.09	33

51-T102L	106	-0.5	2.2	2	0.2	1	1	245	79	2.06	26
51-T103L	107	-0.5	3.4	2.4	0.2	1.5	1.2	305	102	3.03	20
51-T104L	108	-0.5	4	4.2	0.3	1.5	1.8	440	204	4.44	52
51-T105L	109	-0.5	3	3.8	0.2	1.5	2.2	425	83	5	25
51-T106L	110	-0.5	3.2	2.8	0.5	2	2	405	79	3.64	81
51-T107L	111	-0.5	3.8	3.4	2.8	4	2	545	102	3.77	53
51-T108L	112	-0.5	1.8	2.8	0.1	2	1.8	400	127	3.46	33

Sample Preparation
No sample preparation was required on these samples.

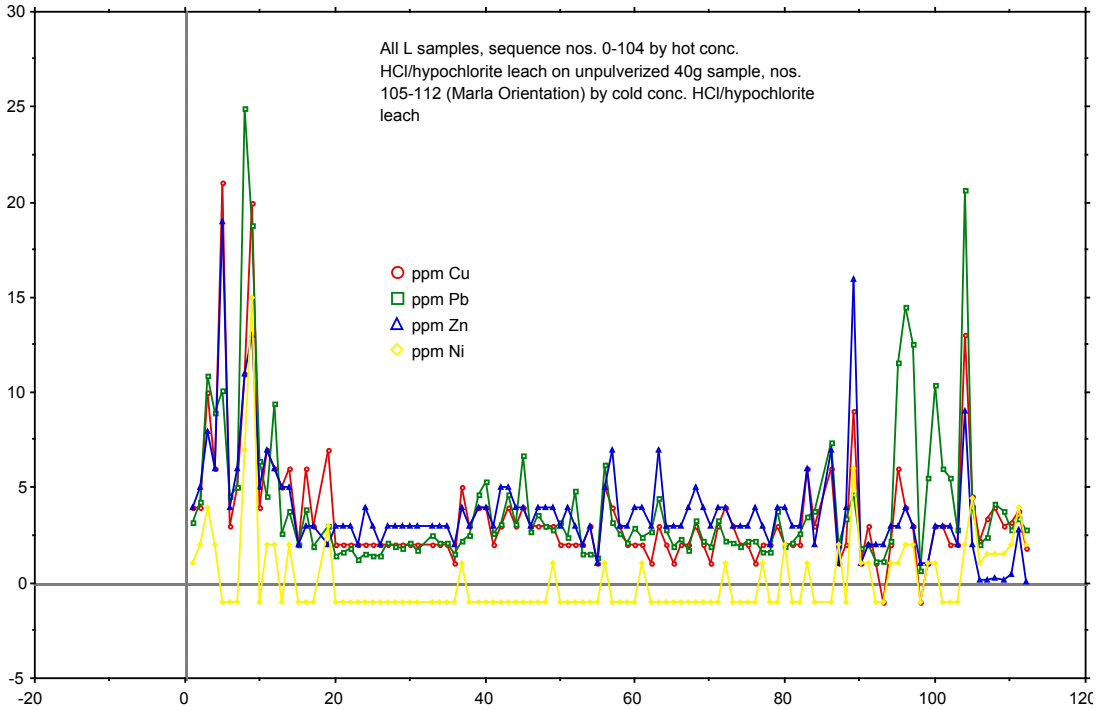
Analytical Methods
The samples have been treated with a concentrated Hydrochloric Acid leach to extract moderately bound elements from the surface of sample grains. Recovery of elements is always PARTIAL however the results may be used in establishment of path-finder elements.

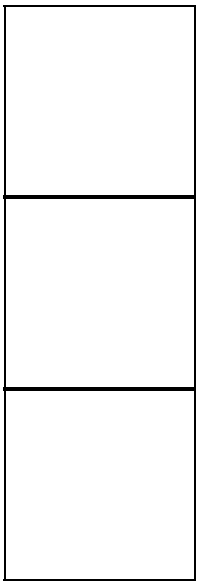
Au(P), Pb, As, Mo, W
have been determined by Inductively Coupled Plasma (ICP) Mass Spectrometry.

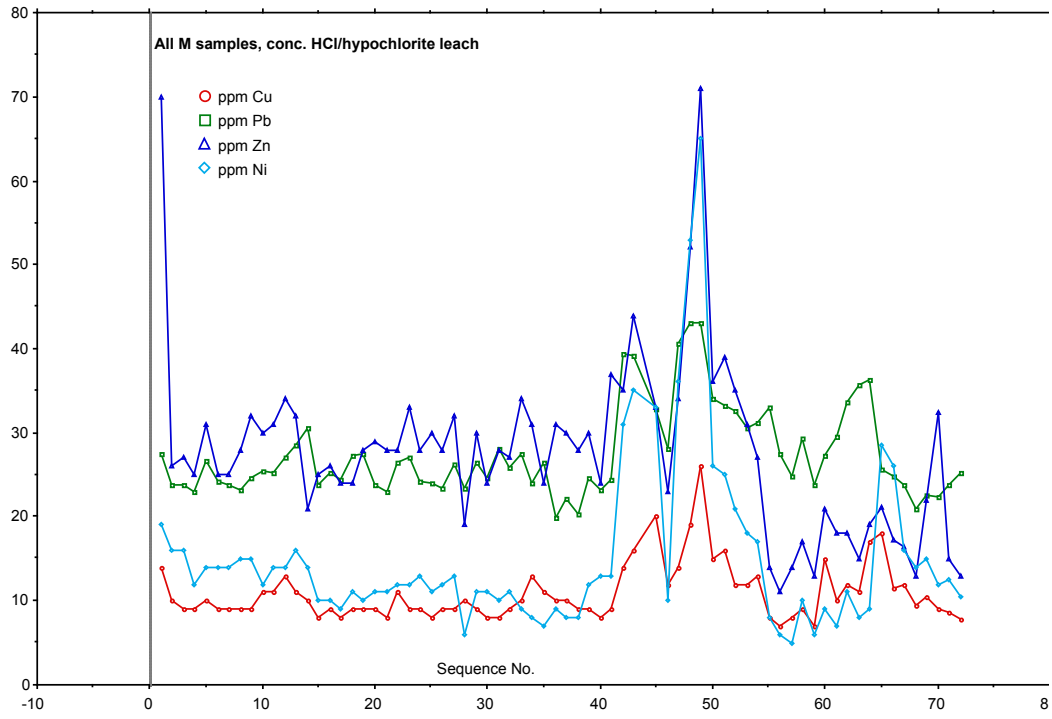
Cu, Zn, Ni, Fe, Mn
have been determined by Inductively Coupled Plasma (ICP) Optical Emission Spectrometry.

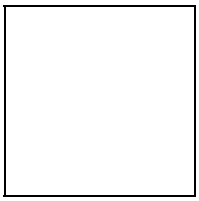
Appendix V

Line profiles for sample types — for sequence nos. versus sample nos. refer to Appendix IV






All M samples, conc. HCl/hypochlorite leach
ppm Cu
ppm Pb
ppm Zn
ppm Ni
Sequence No.
80
70
60
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
70
8



Appendix VI

Summary Interpretation of Line profiles

Summary interpretation of line profiles

Line profiles were generated (Appendix V) for the various elements among different sample types. A subjective pattern recognition approach was then used, to simply identify peaks which stand out above background noise. These peaks were then related back to actual sample nos. from their sequence no. in the results listed in Appendix IV. Weak highs are shown in parenthesis, and strong highs are in bold.

All M samples

1	**Zn**	44T-101M
41	Zn	44T-815M Au anomalous in P equivalent.
42	Zn Pb (Cu) Ni	86W-101M
43	Zn Pb (Cu) Ni Mo	86W-102M
45	(Cu) Ni Mo	86W-301M
47	(Cu) Pb Ni	86T-101M
48	(Cu) Pb Zn Ni	86T-102M
49	(Cu) Pb Zn **Ni**	86T-103M matches non normalized 86T-103L
50	Zn Ni	86T-201M
51	(Cu) Zn Ni	86T-202M
52	Zn Ni	86T-203M
53	Ni	86T-204M
63	Pb	87T-108M
64	(Cu) Pb	87T-109M
65	(Cu) Ni	51T- 101M
66	Ni	51T-102M

All L samples.

Fe-As, Fe-Mo and Fe-Pb are all highly correlated — see regression scattergrams. Therefore profiles for elements normalized to Fe, by simply dividing the raw value by corresponding % Fe, were generated

Fe normalized L samples

5	**Cu** (Pb) **Zn Mn**	44T-104L
8	(Pb)	44T-107L
19	**W**	86W-301L
20	Cu Zn W	44T-302L
21	Mo W Cu Zn	44T-303L
22	Mo W Zn	44T-304L
23	W (Cu) Zn	44T-305L
24	W (Cu) **Zn**	44T-306L
25	W (Cu) Zn	44T-307L
26	W (Cu) Zn	44T-308L
27-31 (313L"missing")	Mo W Zn	44T-309L to 312LB
33	**Mo W** Zn	44T-314L
34	W Zn	44T-315L
35	W Zn	44T-316L
36	W Zn	44T-317L

43	Mn	44T-405L
45	(Pb)	44T-407L
66	Mn	44T-808L

L samples non Fe normalized profiles were also considered but not for the highly Fe dependent elements Mo, As and Pb.

L samples, non normalized

3	Cu	“44T-103LA”
5	Mn **Cu Zn**	44T-104L matches normalized L result
8	Mn Cu Zn **Ni**	44T-107L matches normalized L result
9	Mn **Cu**	44T-108L
43	(Mn)	44T-405L matches normalized L result
89	Cu **Zn** Ni	86T-103L matches 86T-103M for these elements.
95-97	W	86T-301L to 303L
99	W	86T-305L
104	Cu Zn	87T-105L matches 87T-105L/P hybrid.