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GEOCHEMICAL DISPERSION IN TRANSPORTED AND RESIDUAL REGOLITH, FENDER GOLD DEPOSIT, CUE, WESTERN AUSTRALIA

C.R.M. Butt

CRC LEME OPEN FILE REPORT 105

June 2001

(CRC LEME Restricted Report 22R/
CSIRO Division of Exploration and Mining Report 313R, 1996.
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CRC LEME is an unincorporated joint venture between The Australian National University,
University of Canberra, Australian Geological Survey Organisation and CSIRO Exploration and Mining
Headquarters: CRC LEME c/o CSIRO Exploration and Mining, Private Bag No 5, PO Wembley, Western Australia, 6913.

RESEARCH ARISING FROM CSIRO/AMIRA YILGARN REGOLITH GEOCHEMISTRY PROJECTS 1987-1996

In 1987, CSIRO commenced a series of multi-client research projects in regolith geology and geochemistry which were sponsored by companies in the Australian mining industry, through the Australian Mineral Industries Research Association Limited (AMIRA). The initial research program, "Exploration for concealed gold deposits, Yilgarn Block, Western Australia" had the aim of developing improved geological, geochemical and geophysical methods for mineral exploration that would facilitate the location of blind, buried or deeply weathered gold deposits. The program commenced with the following projects:

P240: Laterite geochemistry for detecting concealed mineral deposits (1987-1991). Leader: Dr R.E. Smith.
Its scope was development of methods for sampling and interpretation of multi-element laterite geochemistry data and application of multi-element techniques to gold and polymetallic mineral exploration in weathered terrain. The project emphasised viewing laterite geochemical dispersion patterns in their regolith-landform context at local and district scales. It was supported by 30 companies.

P241: Gold and associated elements in the regolith - dispersion processes and implications for exploration (1987-1991). Leader: Dr C.R.M. Butt.
The project investigated the distribution of ore and indicator elements in the regolith. It included studies of the mineralogical and geochemical characteristics of weathered ore deposits and wall rocks, and the chemical controls on element dispersion and concentration during regolith evolution. This was to increase the effectiveness of geochemical exploration in weathered terrain through improved understanding of weathering processes. It was supported by 26 companies.

These projects represented 'an opportunity for the mineral industry to participate in a multi-disciplinary program of geoscience research aimed at developing new geological, geochemical and geophysical methods for exploration in deeply weathered Archaean terrains'. This initiative recognised the unique opportunities, created by exploration and open-cut mining, to conduct detailed studies of the weathered zone, with particular emphasis on the near-surface expression of gold mineralisation. The skills of existing and specially recruited research staff from the Floreat Park and North Ryde laboratories (of the then Divisions of Minerals and Geochemistry, and Mineral Physics and Mineralogy, subsequently Exploration Geoscience and later Exploration and Mining) were integrated to form a task force with expertise in geology, mineralogy, geochemistry and geophysics. Several staff participated in more than one project. Following completion of the original projects, two continuation projects were developed.

P240A: Geochemical exploration in complex lateritic environments of the Yilgarn Craton, Western Australia (1991-1993). Leaders: Drs R.E. Smith and R.R. Anand.
The approach of viewing geochemical dispersion within a well-controlled and well-understood regolith-landform and bedrock framework at detailed and district scales continued. In this extension, focus was particularly on areas of transported cover and on more complex lateritic environments typified by the Kalgoorlie regional study. This was supported by 17 companies.

P241A: Gold and associated elements in the regolith - dispersion processes and implications for exploration (1991-1993). Leader: Dr. C.R.M. Butt.
The significance of gold mobilisation under present-day conditions, particularly the important relationship with pedogenic carbonate, was investigated further. In addition, attention was focussed on the recognition of primary lithologies from their weathered equivalents. This project was supported by 14 companies.

Most reports related to the above research projects were published as CRC LEME Open File Reports Series (Nos 1-74), with an index (Report 75), by June 1999. Publication now continues with release of reports from further projects.

P252: Geochemical exploration for platinum group elements in weathered terrain. Leader: Dr C.R.M. Butt.
This project was designed to gather information on the geochemical behaviour of the platinum group elements under weathering conditions using both laboratory and field studies, to determine their dispersion in the regolith and to apply this to concepts for use in exploration. The research was commenced in 1988 by CSIRO Exploration Geoscience and the University of Wales (Cardiff). The Final Report was completed in December 1992. It was supported by 9 companies.

P409: Geochemical exploration in areas of transported overburden, Yilgarn Craton and environs, WA.
Leaders: Drs C.R.M. Butt and R.E. Smith.
About 50% or more of prospective terrain in the Yilgarn is obscured by substantial thicknesses of transported overburden that varies in age from Permian to Recent. Some of this cover has undergone substantial weathering. Exploration problems in these covered areas were the focus of Project 409. The research was commenced in June 1993 by CSIRO Exploration and Mining but was subsequently incorporated into the activities of CRC LEME in July 1995 and was concluded in July 1996. It was supported by 22 companies.

Although the confidentiality periods of Projects P252 and P409 expired in 1994 and 1998, respectively, the reports have not been released previously. CRC LEME acknowledges the Australian Mineral Industries Research Association and CSIRO Division of Exploration and Mining for authority to publish these reports. It is intended that publication of the reports will be a substantial additional factor in transferring technology to aid the Australian mineral industry.

This report (CRC LEME Open File Report 105) is a second impression (second printing) of CSIRO, Division of Exploration and Mining Restricted Report 313R, first issued in 1996, which formed part of the CSIRO/AMIRA Project P409.

Copies of this publication can be obtained from:
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PREFACE

CSIRO-AMIRA Project 409 has as its principal objective the development of geochemical methods for mineral exploration in areas having substantial transported overburden in the Yilgarn Craton and its environs, through investigations of the processes of geochemical dispersion from concealed mineralization. The project has investigated the geochemical expression, in the regolith, of gold deposits a variety of geomorphological environments. The Fender deposit is concealed by 2-5 m of colluvial and alluvial sands and silty clays derived from the erosion of weathered granites. Mineralization includes a small lateritic resource, in the southern part of the deposit, but to the north the regolith is truncated and mineralization is confined to the saprolite. In places, the saprolite is depleted in Au to about 15 m depth. The deposit is blind to 'conventional' soil sampling (10-30 cm depth) using both total and bulk leach (BLEG) analysis, although shallow drilling (>2-4 m) penetrating the colluvium intersects the lateritic resource. Detailed investigation of the sedimentary cover shows that secondary dispersion of As, Sb and, in places W, has occurred in the lower, silty clay unit. Gold dispersion into the sediments is only minor, except immediately downslope from the laterite resource. The dispersion observed is, however, almost entirely due to mechanical erosion and transport of ferruginous nodules derived from the lateritic horizon and there appears to have been little, if any, post-depositional chemical dispersion.

The results demonstrate that a sampling strategy that targets lateritic residuum, whether outcropping or buried, would locate the deposit itself. In the absence of such materials, sampling of the lowermost sedimentary units, possibly including the unconformity, is recommended to give the broadest anomaly. Because the dispersed ore-related elements are mostly confined to the ferruginous nodules, preferential sampling of these materials may be advantageous, particularly where they form only a small proportion of the total sample. Failing that, normalization to Fe content is recommended. In the absence of ferruginous nodules, sampling should be across the unconformity and into the upper saprolite. The results also provide strong evidence for the advantages of multi-element analysis. This is particularly appropriate in the district around Big Bell, where mineralization is strongly enriched in a number of potential pathfinder elements. Other deposits have much lower contents of such elements and hence the multi-element response will be of lower contrast and give more restricted dispersion haloes, but nevertheless the data will at least complement that obtained for gold.

C.R.M. Butt and R.E. Smith
Project Leaders
August 1996

SUMMARY

Fender is a small Au deposit (248000t @ 2.4g/t Au) approximately 2 km south of Big Bell, WNW of Cue, on the margin of a colluvial-alluvial plain. The deposit itself is entirely overlain by a thin (2-5 m) cover of transported overburden and does not outcrop. The overburden consists of two units, fine- to coarse-grained sandy clay, sand and gravel, overlying silty clays. Both the sands and the silty clays locally contain detrital lateritic gravels. The sands are weakly cemented in the top metre to form hardpan and some deeper sediments are mottled; there is no pedogenic carbonate. The sediments contain feldspar grains (0.5-1.0 cm) and are probably derived from the granites to the west. There are two principal regolith situations beneath the overburden. In the south, the lateritic profile appears largely complete and a small Au resource is hosted by lateritic residuum and ferruginous saprolite. In the north, the lateritic profile is truncated and the sediments are deposited on saprolite which, in some places, is depleted in Au but, in others, has Au at ore-grade concentrations immediately beneath the unconformity. Similar situations are present 200 m to the west, where lateritic residuum and saprolite outcrop. There is no surface geochemical expression of the deposit in soils (15-30 cm depth), determined by conventional total analysis or by bulk cyanide leach (BLEG) analysis, nor in composite samples (4 m) of the sediments, except where drilling has penetrated into the concealed lateritic residuum. Possible geochemical dispersion into the sediments has been investigated by careful sampling of the sediments and uppermost residuum by RAB drilling, with care taken to avoid cross hole contamination. The primary mineralization (Au >1000 ppb) is characterized by enrichment in Ag (mean 1.4 ppm), As (145 ppm), Sb (450 ppm), W (130 ppm), Cd (1.2 ppm) Mo (37 ppm), Tl (7 ppm), Zn (475 ppm) and Hg (100 ppm). However, of these, only As, Sb and W are detectable in the near-surface samples. In the residuum, the W distribution indicates the weathered primary mineralization, even where Au has been depleted in saprolite or enriched and dispersed in lateritic residuum. In comparison, As and Sb are both enriched and widely dispersed in the nodular ferruginous clays and ferruginous saprolite to give a broad anomalies. Concentrations are homogeneous and remain anomalous (>50 ppm As, 70 ppm Sb) in shallow ferruginous saprolite and outcropping lateritic gravels for at least 200 W of the subcropping mineralization. Gold abundances are generally <5 ppb in the sediments over saprolite, except for some spot concentrations (80-245 ppb) immediately above subcropping mineralization, and an associated weak enrichment (5-16 ppb) extending 50 m downslope. However, they are significantly anomalous (60 ppb Au) for over 100 m east of the subcropping lateritic residuum. In comparison, As (40-120 ppm), Sb (12-50 ppm) and, over saprolite, W (5-17 ppm) are anomalous in the clays for at least 200 m downslope to the east. Essentially all of the As and Sb in the silty clay unit is hosted by mechanically transported ferruginous nodules (80 to over 100 ppm Sb, 300-450 ppm As). Neither Au nor W is concentrated in the nodules. The sands and soils contain background concentrations of Au, As, Sb and W, except where directly overlying lateritic residuum. It is concluded that a sampling strategy that targets lateritic residuum, whether outcropping or buried, would locate this deposit. Where the regolith is truncated, restricted dispersion in residual and transported units implies that analysis for Au alone is unsatisfactory in the top 20 m. Multi-element analysis would reveal broad, low-order As+Sb+/-W anomalies in the silty clays, which can be markedly enhanced by selective sampling of ferruginous nodules. Such selective sampling is preferable to the common practice of compositing samples over intervals of 2-6 m. However, composites of ferruginous nodules from the lowermost 2-4 m of the sediments may be suitable, especially if they are scarce. The preferential concentration of As and Sb in detrital ferruginous nodules, rather than in the matrix, of the silty clays, implies that there has been little or no post-depositional chemical dispersion.

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1. INTRODUCTION

The Fender deposit is approximately 2 km south of Big Bell, about 28 km WNW of Cue (AMG: 562600E 6975353N; RL 437.5). The site is on the margin of a colluvial-alluvial plain which slopes gently to the north and east. The deposit itself is entirely overlain by a thin cover of transported overburden and does not outcrop, although residual regolith is exposed within 200 m to the west. The site was selected for study in this project because there appears to be no surface geochemical expression of the deposit. For example, there are no anomalous concentrations of Au in soils or composite samples that represent the top four metres of the regolith. Nevertheless, ore-grade concentrations (>2 ppm Au) are present in subcropping mineralization in saprolite immediately beneath the sediments at 5 m depth. This suggests that even a very thin cover of transported material may represent a very severe barrier to surface exploration techniques. The objective of this study has been to examine whether there is a geochemical expression of the mineralization in any unit of the overburden, and whether these materials can be used as exploration sample media. Research has concentrated on the properties of the sedimentary cover and the uppermost unit of the residual regolith, including study of possible use of partial extraction analyses for gold and appropriate pathfinder elements. Apart from a few analyses of the primary mineralization to determine the pathfinder element suite, the deeper regolith and fresh rocks have not been included in the investigation. These are the subject of an on-going Honours research project by Shanta Dries, Curtin University.

2. GEOLOGICAL SETTING

The stratigraphy and mineralization are known only from exploration drilling, but appear to be essentially the same as at Big Bell. Fender and Big Bell are hosted by a regional volcanic and sedimentary sequence within the Murchison Province of the Archaean Yilgarn Craton (Handley and Cary, 1990). At Big Bell, the greenstone belt is narrow, steeply-dipping, strongly attenuated and overturned. It forms the west limb of a north-plunging regional antiform, which closes 14 km north of Big Bell. Deformation increases to the south and the whole belt, which is only about 1500 m wide at Big Bell, narrows to about 830 m at Fender, between confining granitic rocks to both east and west (Figure 1). The regional metamorphic grade is lower to middle greenschist. The stratigraphic sequence at the mine is summarized in Table 1. Precise identification of the individual units is not yet possible at Fender, although amphibolitic, porphyritic and schistose rocks are present, equivalent to those of the lower mafic (Hanging wall) and felsic volcanic (Host) sequences. The lithological contacts dip at about 75° east at Big Bell and a similar dip is assumed at Fender. Primary mineralization at Big Bell is confined largely to quartz-muscovite-potassium feldspar schists in the felsic volcanic (Host) sequence and is associated with similar rocks at Fender. Exploitable mineralization at Fender appears to be confined to the weathered zone. There are two styles, namely a small 'laterite' resource, in the southern part of the deposit, and weathered primary mineralization in the saprolite and saprock. The total reserve is 248000t @ 2.4g/t Au. In addition to Au, the mineralization in the saprolite is enriched in a range of pathfinder elements including As, Sb, W and, in places, Mo, a similar suite to that present at Big Bell (N. Radford, Normandy Exploration, verbal communication, 1996).

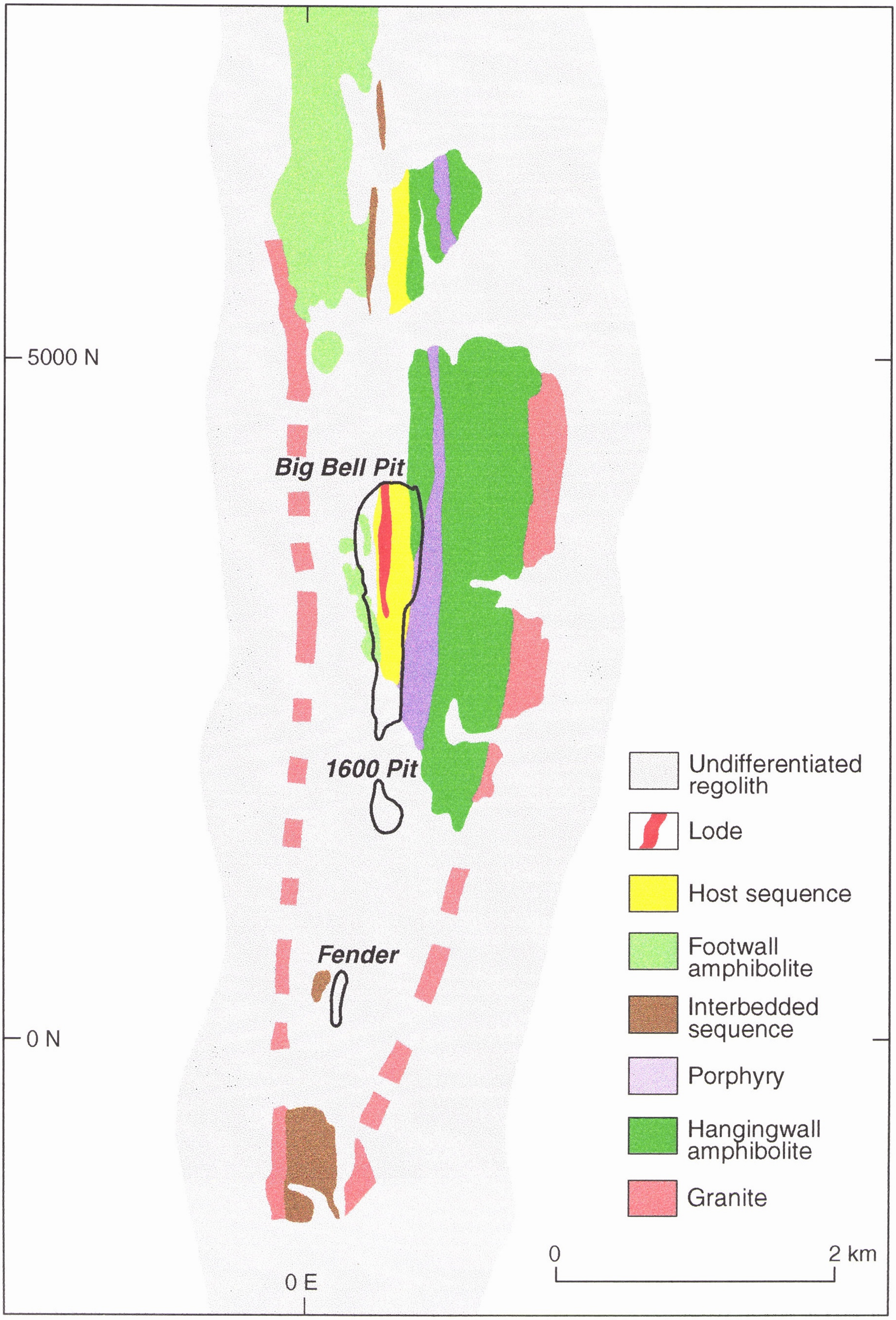


Figure 1: Outcrop geology, Big Bell area (from data supplied by PosGold Pty. Ltd.).

Table 1: Principal lithologies in the Big Bell sequence (after Handley and Cary, 1990).

REGIONAL SEQUENCE	LOCAL STRATIGRAPHY	PRECURSOR
Upper mafic sequence	Chlorite schist	Pillow basalt
(Footwall amphibolite)		
Felsic volcanic sequence	Felsic volcanic unit	Rhyolite (in part tuffaceous)
(Host sequence)	Cordierite schist	Aluminous mafic tuff
Lode	Potassium feldspar schist	Altered tuff (sinter)
Lode	Altered schist	Altered mafic tuff (Fe-rich)
	Biotite (garnet- magnetite) schist	Mafic tuff (Fe-rich)
	Intermediate schist	Intermediate tuffaceous volcanics
	Porphyroblastic garnet schist	Iron formation
Lower mafic sequence	Quartz-feldspar porphyry	Porphyritic rhyolite
(Hangingwall amphibolites)	Amphibole schist	Mafic flows

3. SAMPLING AND ANALYSIS

Because of probable cross-hole contamination of existing samples, the overburden and uppermost residuum were resampled. Holes were RAB drilled on three traverses across the subcrop of the deposit, extending to presumed background 200 m E of subcropping mineralization. Prior to drilling each hole, a pilot hole was drilled to purge the rods and cyclone of cuttings remaining from the previous hole, to minimize contamination. In addition, the whole system was cleaned periodically. They exemplify where the sediments overlie:

1. ore-grade lateritic mineralization (2000-6600 ppb Au, section 240N);

2. leached saprolite mineralization (100 ppb Au, section 340N). High concentrations of pathfinder elements suggest this material was originally Au-rich and is now depleted;

3. ore-grade saprolite mineralization (2000 ppb Au, section 400N).

In addition, 34 samples of partly oxidized primary mineralization and adjacent wall rocks were collected from reverse circulation drill cuttings to determine pathfinder element associations.

Samples were collected at 1 m intervals and split. All samples selected for analysis were dried (40°C), a sub-sample taken for reference and the remainder jaw-crushed to less than 4 mm. The material was then riffle split and a minimum of 100 g extracted for grinding to less than 75 µm in a hardened Mn carbon steel mill.

All samples were analysed by neutron activation analysis (10 g aliquot, Becquerel Laboratories Pty. Ltd.) for 30 elements: Sb, As, Ba, Br, Ce, Cs, Cr, Co, Eu, Au, Hf, Ir, Fe, La, Lu, Hg, Mo, K, Rb, Sm, Sc, Se, Ag, Na, Ta, Th, W, U, Yb and Zn.

High Hg contents in some samples determined by INAA were confirmed by atomic absorption spectrometry.

Selected samples were also analysed by inductively-coupled plasma mass spectrometry (ICP-MS), following digestion in $HClO_4$-HNO_3-HF acid mixture and dissolution in dilute HCl (Analabs Pty. Ltd) for Bi, Cd, Ag, Te and Tl.

Some samples were also analysed by X-Ray fluorescence (XRF) on pressed powders using a Philips PW1220C instrument by the methods of Norrish and Chappell (1977) and Hart (1989), with Fe determined for matrix correction (CSIRO): Cu, Fe, Pb, Mo, Sn, S and Zn.

The detection limits are listed in the Appendix (Table A1).

The mineralogy of selected samples was determined by X-ray diffractometry, using CuKα radiation and a graphite-crystal monochromator.

Two diamond drill holes, DDH4 (310E 320N) and DDH6 (340E 400N), that had been cored from surface, were sub-sampled and thin sections prepared for petrographic study. Thin sections were also prepared from a few additional samples collected after mining had commenced.

4. REGOLITH GEOLOGY

4.1 General

The Fender deposit is entirely concealed by a shallow cover of transported overburden (Figures 2, 3 and 4). Outcropping residuum occurs about 150-200 m west of the mineralized unit and the sediments thicken to over 13 m about 200 m to the east. In the vicinity of the deposit, the transported overburden consists of 1-5 m of fine- to coarse-grained sandy clay, sand and gravel, overlying silty clays. Both the sands and the silty clays locally contain detrital lateritic gravels. The sands are weakly cemented in the top metre to form hardpan and some deeper sediments are mottled; there is no pedogenic carbonate. The sediments contain feldspar grains (0.5-1.0 cm) and are probably derived from the granites to the west. The mineralogy of samples representing the principal units of the upper regolith is shown in Table 2.

There are two principal regolith situations beneath the overburden:

1. Lateritic profile apparently largely complete: in the southern part of the deposit, a small Au resource is contained in lateritic residuum and ferruginous saprolite. The ferruginous unit consists of pisoliths and nodules in a clay-rich matrix.

2. Lateritic profile truncated: in the northern part of the deposit, sediments are deposited on saprolite which, in some places, is leached and mostly depleted in Au but, in others, Au is at ore-grade concentrations immediately beneath the unconformity.

Similar situations are present to the west, where lateritic residuum and saprolite outcrop (Figure 2).

The depth of weathering exceeds 50 m over the mineralized felsic sequence but the amphibolites of the hanging-wall in the east are almost fresh at the unconformity (12-14 m depth). The unconformity between the sediments (generally the silty clays) and saprolite is recognisable by changes in fabric, the presence of muscovite in drill cuttings and/or the presence of rock fragments having lithic fabrics. The unconformity is less easy to identify in the south, where the material underlying the sands and silty clays is highly ferruginous nodular clay, because muscovite (if originally present) and lithic fabrics have been destroyed by weathering. The ferruginous unit is interpreted as being residual because of the monomictic composition of the coarse fraction seen in outcrop and hand specimen, and the presence of cutans on the nodules and pisoliths that comprise this fraction.

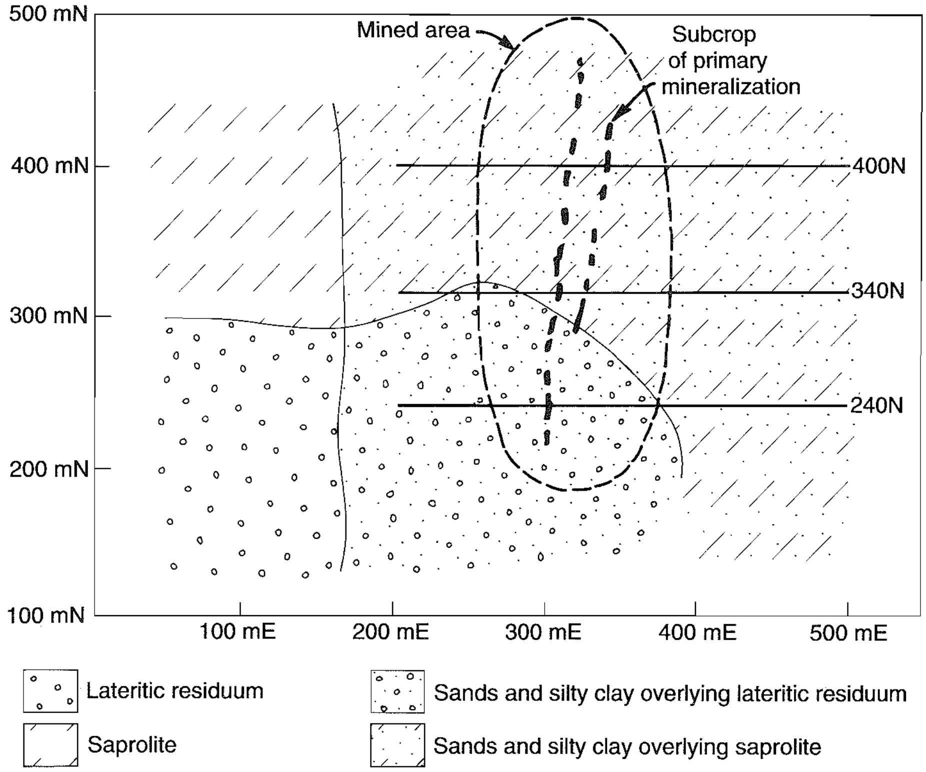


Figure 2: Regolith landform setting of the Fender deposit.

4.2 Regolith units

Hardpan, 0-1.0 m. Red brown siliceous hardpan, rarely as much as 1 m thick, occurs beneath 20-30 cm of sandy red soil. It consists predominantly of a poorly sorted medium to coarse grained quartz sand in a porous, weakly ferruginous, kaolinitic matrix. The matrix appears rather more clay-rich towards the east and on section 240N, where it also contains ferruginous nodules and pisoliths. Unweathered feldspar is present in the hardpan and overlying soil. The hardpan has a typically laminated appearance, with Mn oxides on partings. It is commonly weakly cemented although, in places, the sandy hardpan is very strongly indurated towards the base.

In thin section, the sandy hardpan consists of randomly distributed silt- and sand-sized detritus in a sparse kaolinitic matrix, cemented by opaline silica (Figures 5A and B). The fabric is grain-supported and the grains themselves are mostly sub-angular and consist dominantly of quartz and minor feldspar (albite and microcline), with numerous goethite and hematite nodules (to 1 mm). The material is very porous, with abundant voids and a few tubules. The larger voids have coatings of weakly ferruginous clay (ferriargillans) and similar coatings are present around the quartz and feldspar grains. Manganese oxides form the final coatings (mangans) on voids and grains. The more clay-rich hardpan has a more laminar appearance, with scattered, mostly silt-sized, quartz grains in a ferruginous, kaolinitic matrix. Opaline silica occurs as coatings and veins along major voids and laminar partings, and as thin skins around fine matrix aggregates, as well as impregnating and, apparently partly replacing, the matrix. Minor smectite is present in some samples.

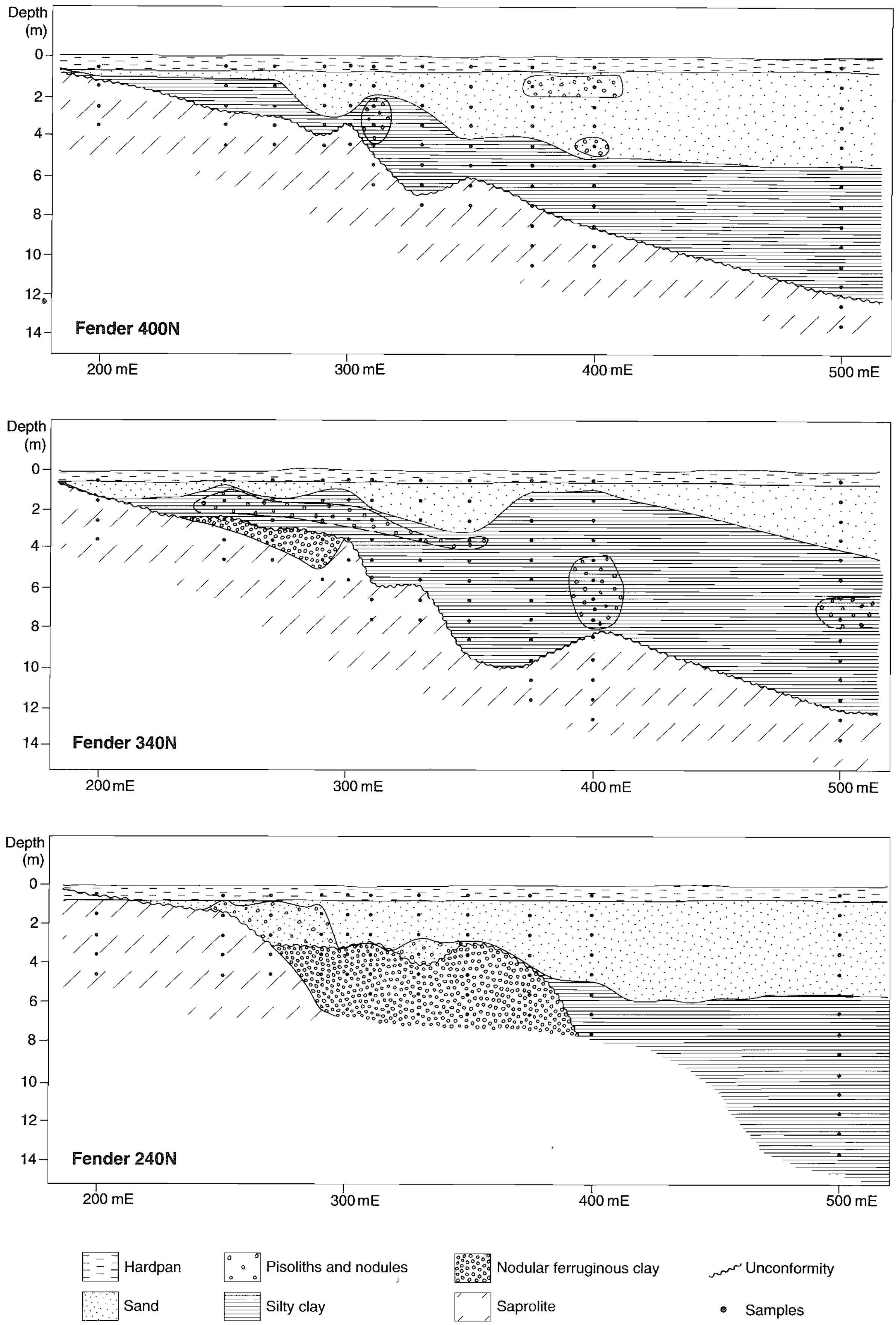


Figure 3: Regolith sections, Fender deposit, derived from shallow drilling.

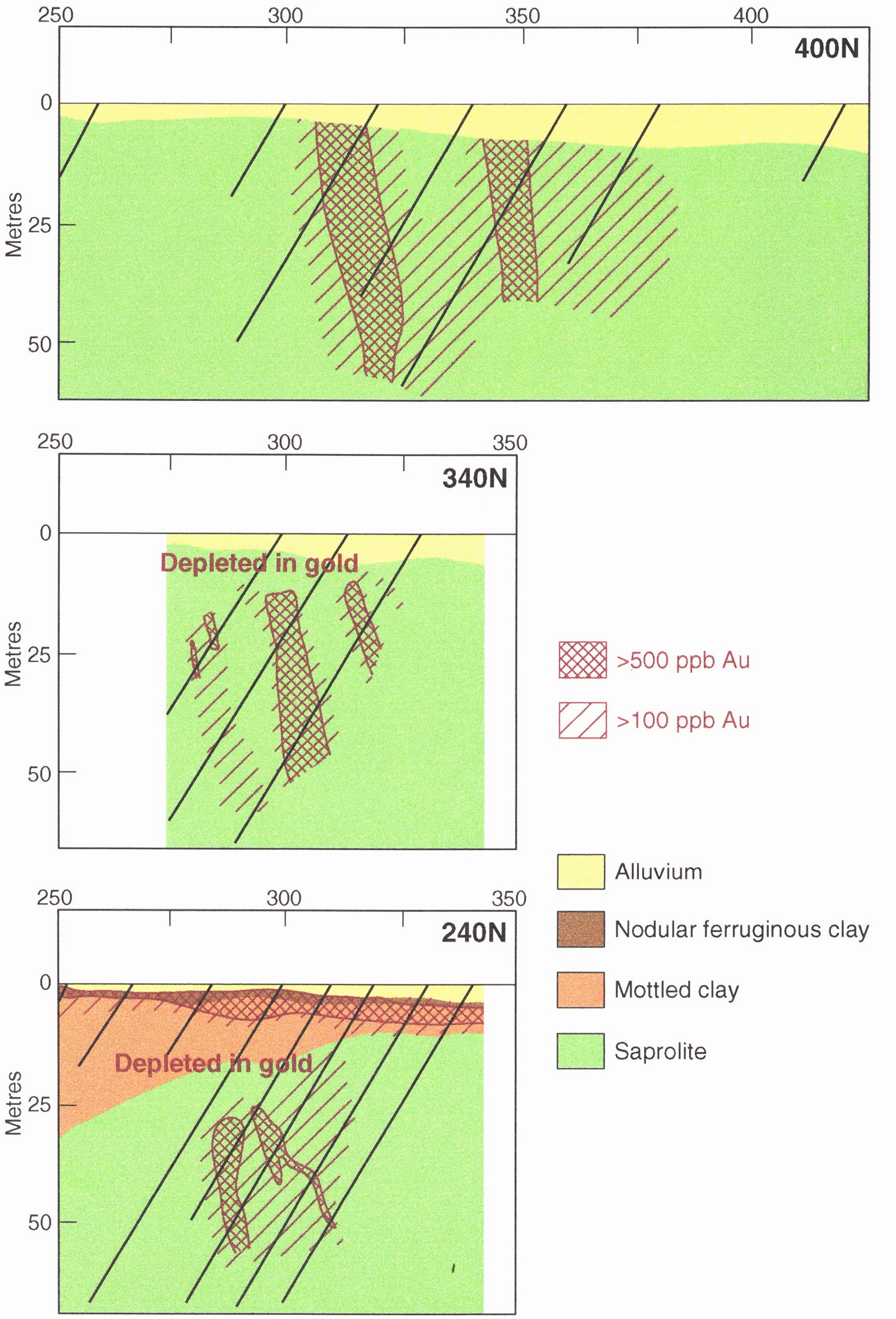


Figure 4: Drill section, Fender deposit. Regolith geology and gold distributions (from data supplied by PosGold Pty. Ltd.).

Table 2: Mineralogy of different regolith units. Relative abundances relate to comparisons between samples, not between minerals in individual samples.

SAMPLE	Easting	Northing	Depth m	Au ppb	Fe %	Quartz	Kaolinite	Smectite	Muscovite	Hematite	Goethite	Microcline	Albite	Calcite	Dolomite	Andalusite
Peak						26.6	12.3	5.6	8.8	33.2	21.2	27.3	27.7	29.4	30.9	15.6
		HARDPAN														
09-2680	350	400	1	<5	2.95	xxx	xx	x				xxx	xxx			
09-2688	350	400	1	5.8	3.01	xxx	xx	x				xxx	xx			
09-2788	310	340	1	<5	2.6	xxx	xx		x			xxx	xxx			
		SAND														
09-2689	350	400	2	<5	3.48	xxx	xx	xx				xxx	xx			
09-2789	310	340	2	<5	3.74	xxx	xx	xx			x	xxx	xx			
09-2682	330	400	3	<5	3.61	xxx	xx	x				xxx	xxx			
09-2862	350	240	3	18.5	2.83	xxx	xx	xx				xxx	xx			
09-2711	400	400	5	18.6	8.23	xxx	xx	xx		xx		xx	x			
		SILTY CLAY														
09-2791	310	340	4	<5	9.27	xxx	xx	xx	xx	xxx		x	x			
09-2684	330	400	5	<5	5.16	xxx	xx	xxx			xxx	xx				
09-2692	350	400	5	7.6	4.42	xxx	xx	xx	x	x	x	xx	xx			
09-2792	310	340	5	<5	4.77	xxx	xx	xx	xx	xx	xxx	x	x	xx	x (siderite)	
09-2685	330	400	6	9.1	5.01	xxx	xx	xxx			xxx	xx				
09-2693	350	400	6	9.4	3.9	xxx	xx	xxx		x	xx	x		x	xx	
09-2686	330	400	7	13.1	5.79	xxx	xx	xxx			xxx	x				
09-2702	375	400	7	16.4	3.4	xxx	xx	xxx	x	x		x	x			
09-2713	400	400	7	14.3	3.4	xxx	xx	xxx	xx	x	xx	xx	xx			
09-2880	400	240	7	317	11.5	xx	xx			xx	xxx	x				
09-2726	500	400	9	<5	2.6	xxx	xx	xxx				xxx	xx			
09-2728	500	400	11	<5	4.13	xxx	xx	xxx	x		xx	xx	x			x
		FERRUGINOUS CLAY														
09-2840	290	240	4	6680	13.3	xx	xx	x		xxx	xxx	xx	xx			xx
09-2864	350	240	5	230	14.3	xx	xx	x		xxx	xxx	x				
09-2866	350	240	7	681	10.9	xx	xx			x	xxx					
		SAPROLITE														
09-2678	310	400	6	2380	3.95	xxx	xx	xx	xxx		x					xx
09-2687	330	400	8	33.7	7.12	xxx	xxx	xx	x		xxx					
09-2695	350	400	8	285	1.59	xxx	xxx	xx	xx			xx				
09-2795	310	340	8	<5	2.13	xxx	xx		xxx		xx					xx

Medium to coarse sand and gravel. The hardpan grades downwards into variably indurated, weakly bedded to unbedded sands, ranging from silt to coarse gravel (to >3-4 mm), in a mostly sparse clay matrix (Figures 5C and D). Similar sands and gravels occur as lenses in the underlying silty clay unit. In places, the sand unit is intensely indurated at 0.5-2.0 m but, mostly, it is only moderately cemented and highly porous. It has a grain-supported fabric and consists dominantly of sub-angular quartz, with subordinate feldspar (albite and microcline), minor kaolinite and smectite, and minor muscovite, biotite, ilmenite and tourmaline. Iron oxide nodules (1-5 mm) and weathered lithic fragments are scattered throughout the sand unit, and locally concentrated in gravel lenses. The matrix consists of thin kaolinitic coatings (argillans) along voids and on grains.

Silty clay. This unit consists of massive pale grey to very pale yellow to white smectitic and kaolinitic clay, with isolated grains of silt-sized quartz and feldspar. The contact between the silty clay unit and the overlying sand is mostly sharp, although there may be some lenses of fine to coarse sand and gravel within the clays. The contact between clay and saprolite appears transitional in field exposure and this is confirmed by petrographic examination. The upper part, which constitutes the bulk of the unit, is characterized by zones of Fe oxide mottling, some with abundant Fe oxide nodules, and contains albite, whereas the basal horizon has fewer nodules, no albite, is possibly more smectitic and contains fragments of the underlying saprolite. Many of the ferruginous nodules are sub-angular and appear to be detrital. They were probably derived from the equivalent of the ferruginous clay unit that hosts the lateritic Au resource. Their apparently random distribution and matrix-supported occurrence suggests that the unit may have undergone post-depositional settling and churning, thereby destroying most primary sedimentary features.

The *upper* horizon of the silty clays has abundant, mostly fine-grained, sub-angular quartz and minor feldspar (albite > microcline) grains, together with sub-angular ferruginous nodules, randomly distributed in a clay matrix (Figures 5E and F). The matrix is commonly goethite-impregnated and cross-cut by irregular veins and patches of paler clay. The goethitic zones have diffuse boundaries and, in places, contain the majority of the grains. Illite (after muscovite) is present in the matrix and some pseudomorphs of muscovite can be recognised in the goethite mottles. The clays show little structure, although several phases of illuviation are evident as argillans of fine clay along larger voids and channels.

The *basal* horizon (up to 1 m thick) of the silty clay unit comprises a massive grey clay with isolated fine, sub-angular quartz grains and randomly-oriented weathered lithic fragments. No feldspars appear to be present, but there may be minor and accessory minerals, such as mica (or mica pseudomorphs) and andalusite, similar to those in the underlying saprolite. There are some diffuse goethite mottles and scattered small (3 mm) hematite nodules. The clays consist of kaolinite and smectite and have orientation fabrics that indicate churning has occurred, probably as a result of swelling and shrinking of the smectites during alternate wetting and drying episodes. The lithic fragments in the clays have similar fabrics to the underlying mica schists and it appears that this churning has resulted in the mixing of saprolite and basal clay.

Nodular ferruginous clay. Ferruginous clays containing abundant nodules and pisoliths are present in the southern part of the deposit where they form a 'lateritic' Au resource (Figures 5G and 5H). They immediately underlie medium to coarse-grained sands and gravels, with a sharp unconformity between the two units, and hence are at the same stratigraphic position as the silty clay unit. The matrix to the pisoliths and nodules is variable. In places, it consists of ferruginous (kaolinitic) clay containing up to 30% angular quartz, mostly very fine grained (<0.2 mm), but with a few grains >3.0 mm. This material is very similar to the silty clays, except that it is much more ferruginous. Elsewhere, however, the matrix has much less quartz, except in large voids that probably represent root channels, which are infilled by grey or weakly ferruginized silty clays. The pisoliths and nodules are round (spherical) to irregular, mostly very Fe-rich and about 3-5 mm in diameter. They commonly have a ferruginous, clay-rich cutan. Where silty clays form the matrix, the pisoliths and nodules may be essentially quartz-free, or contain very fine, scattered quartz or have quartz contents similar to the matrix. Some nodules exhibit multiple stages in growth, with outer (later) parts having higher quartz contents - probably derived from illuviation down voids. Weak nodule formation, again with cutan development, is visible in the matrix.

The abundance of pisoliths and nodules decreases to the north and the equivalent unit consists of grey to white, prismatic to massive clays with scattered Fe-rich, hematitic nodules (to 5 mm), irregular to diffuse mottles (1-5 mm) of goethite and Mn oxides. The clays contain less than 10% quartz as fine, scattered irregular grains and no feldspar. These clays have possible lithic fabrics present locally and are overlain by more silty and silicified clays. The transition to the latter is ill-defined, but may represent an unconformable contact.

The origin of these materials is not clear, but it is probable that they are essentially residual, although their composition is influenced by the overlying silty clays and sands, which have been incorporated by illuviation and churning. For example, some albite and microcline is detected in shallower samples by XRD (Table 2). Although it is possible that intense post-depositional ferruginization of the silty clays has occurred, it seems improbable that the feldspars could survive as relicts; rather, they have been introduced later.

Saprolite. The transported silty clays directly overlie saprolite on lines 400N and 340N, and east of 400E on line 240N. The saprolites of the mineralized sequence and adjacent wall-rocks are derived dominantly from quartz-feldspar-mica schists and consist of white kaolinite (after feldspar) and kaolinite and illite (after muscovite), with bands of fragmented quartz grains delineating the original schistosity. Minor phases include andalusite and fine needles of tourmaline. The saprolite is commonly bleached near the surface, with some diffuse goethite mottles, and ferriargillans around large pores. Towards the east, the rocks are more mafic, *e.g.*, mafic mica schist occurs at 500E on 400N, and essentially fresh amphibolite underlies the transported clays at 500E on 340N.

5. COMPOSITION OF PRIMARY MINERALIZATION

Weakly oxidized primary mineralization and associated wallrocks were analysed to determine the element associations and potential pathfinder elements. Samples were collected from reverse circulation drill holes on, or close to, each of the sampled traverses, to represent the potential source units. Selected data are summarized in Table 3 and listed in full in the Appendix (Table A2). The data for 14 samples containing >1000 ppb Au (Table 4) indicate that the primary mineralization is significantly enriched in Ag (1.4 ppm), As (145 ppm), Sb (450 ppm), W (130 ppm), Cd (1.2 ppm) Mo (37 ppm), Tl (7 ppm), Zn (475 ppm) and, surprisingly, Hg (100 ppm). Tin, Bi and Te contents are at or below the detection limits.

Inspection of these limited data suggests that, along strike, Cu contents are higher to the south (240N), Au, Hg and Mo at 345N, and Ag, As, Sb, Tl, W and Zn to the centre and north (345 and 400N). With the exception of Mo, which is highly variable, the enriched elements are anomalous across the whole mineralized interval and several, such as Sb, W and Hg, probably give broader primary haloes than Au itself. Investigation of the primary dispersion is beyond the scope of this project, but the high concentrations of several of these elements, particularly Hg, is unusual, and deserves further investigation. XRD and scanning electron microscope examination of the heavy mineral fraction of sulphide-bearing ore showed that it is dominated by pyrite, with minor quartz, andalusite and rutile. In addition, there are minor amounts of Hg (+/-Zn) sulphide, presumably cinnabar or metacinnabarite, occurring as platy coatings on pyrite, fractured grains of Sb sulphide (presumably stibnite), some Mo sulphide (presumably molybdenite) and very rare grains (1-2 μm) containing Cd and Ag. No W-bearing minerals were found.

Figure 5 (opposite): Photomicrographs of upper regolith units, Fender (photography: A. Koning).

A and B: Red brown siliceous hardpan: poorly sorted medium to coarse grained quartz sand in a porous, weakly ferruginous, silty kaolinitic matrix, cemented by opaline silica. Typically laminated appearance, with Mn oxides on partings.

C and D: Medium to coarse grained, weakly bedded silt, sand and gravel. Grain-supported fabric, consisting dominantly of sub-angular quartz, with subordinate feldspar (albite and microcline). The matrix consists of thin kaolinitic coatings (argillans) along voids and on grains.

E and F: Silty clays, with abundant, mostly fine-grained, sub-angular quartz and minor feldspar (albite > microcline) grains, together with sub-angular ferruginous nodules, randomly distributed in a clay matrix. The matrix is commonly diffusely impregnated with goethite and cross-cut by irregular veins and patches of paler clay.

G and H: Ferruginous clays, with abundant nodules and pisoliths, forming the 'lateritic' Au resource. The pisoliths and nodules are round (spherical) to irregular, mostly very Fe-rich and about 3-5 mm in diameter. They commonly have a ferruginous, clay-rich cutan.

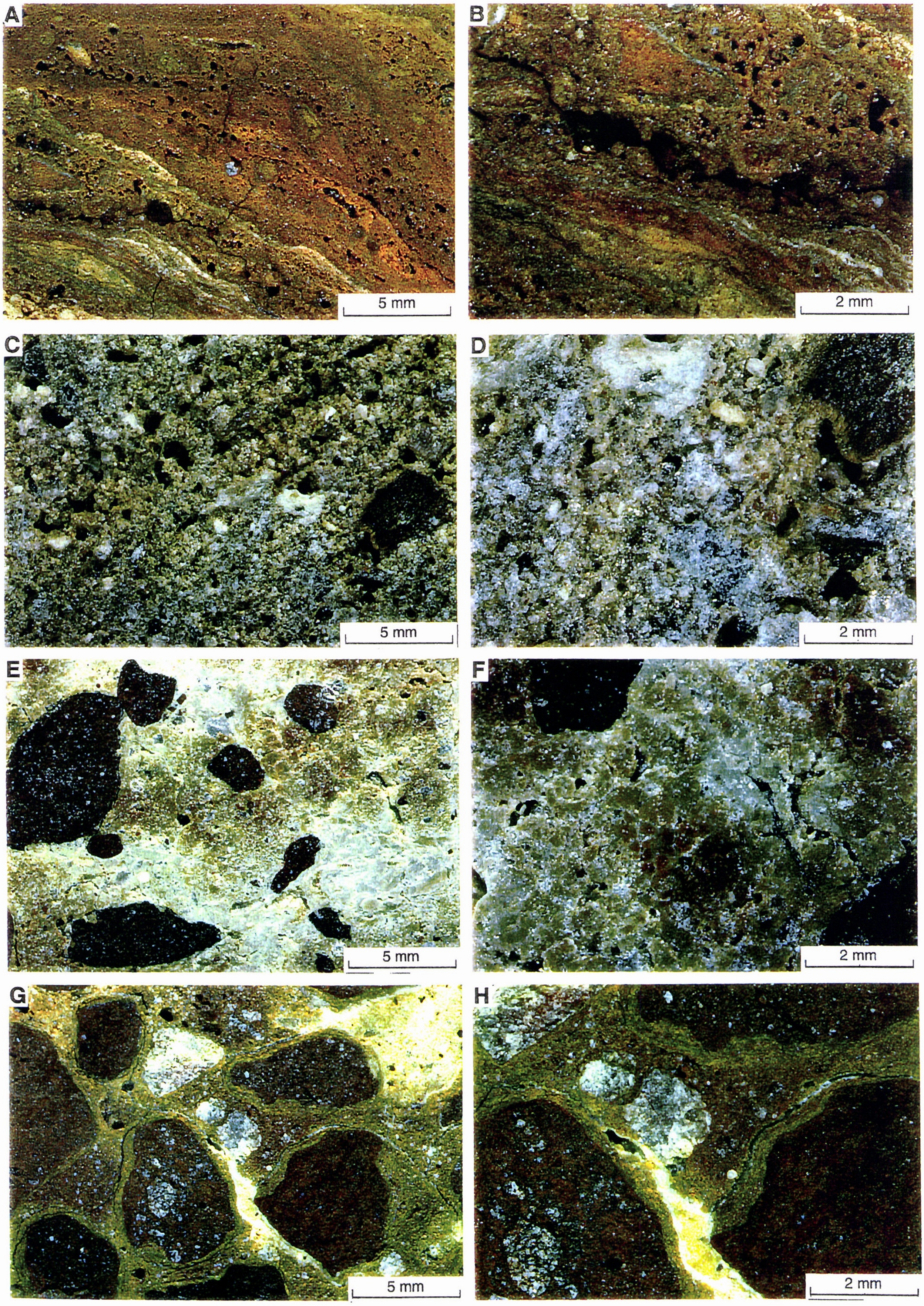


Figure 5: Photomicrographs of upper regolith units, Fender (photography: A. Koning).

6. GEOCHEMICAL DISPERSION IN THE UPPER REGOLITH

6.1 Element distributions

The distributions of Au, the principal pathfinder elements (As, Sb, W) and Fe are given in contoured form on Figures 6 to 10. The plotting/contouring intervals were selected on the basis of the principal populations evident in histograms and cumulative frequency plots of the whole data set. The data for the other elements determined byINAA are listed in Appendix A3.

6.2 Gold

Gold abundances in the residuum immediately underlying the transported units varies in each section. Ore-grade concentrations are present in the nodular ferruginous clays on 240N (1120-6680 ppb Au) and in saprolite on 400N (1140-2380 ppb Au), but saprolite derived from mineralization on 340N appears to be depleted (80-105 ppb Au). This finding agrees with data obtained by exploration drilling on the same sections (Figure 4). Gold abundances in the sediments are at least an order of magnitude lower than in the residuum.

Section 240N. This represents the situation where the sediments overlie lateritic Au mineralization. RAB and RC drilling indicate that this mineralization is up to 5 m thick, extending to about 7 m depth. It is underlain by a depletion zone (<100 ppb Au, commonly <50 ppb Au) 5-15 m thick, with weathered primary and supergene mineralization present below 25 m. Nodular ferruginous clays and ferruginous saprolite containing over 1000 ppb Au are present between 260E and 320E, to within 2 m of the surface. Laterally, concentrations >100 ppb Au delineate a more extensive dispersion halo in these units, between about 230 and 400E. Compared to the other sections, Fe-rich saprolite at 3-6 m depth on 200E is still anomalous (50-80 ppb Au), but it is uncertain from the available data whether this represents more widespread secondary dispersion, reflecting the fuller preservation of the regolith, or that primary mineralization is also more extensive.

Table 3: Composition of weakly oxidized primary mineralization and associated wallrocks, Fender.

Hole BRC251: 350E 400N

Sample	Interval m	Au ppb naa	Sb ppm naa	As ppm naa	W ppm naa	Ba ppm naa	Fe % naa	K % naa	S % xrf	Cu ppm xrf	Pb ppm xrf	Zn ppm xrf	Ag ppm icpms	Cd ppm icpms	Hg ppm naa	Hg ppm aas	Mo ppm xrf	Tl ppm icpms	Sn ppm xrf	Bi ppm icpms	Te ppm icpms
09-2960	47-48	275	229	61	134	472	1.51	1.80	1.098	98	4	335	0.2	0.5	8.2	6.1	2	9.8	1	<0.1	0.3
09-2961	48-49	1330	775	215	162	479	4.68	2.54	2.894	81	7	1069	0.5	0.7	24.1	22.9	13	9.9	0	<0.1	0.3
09-2962	49-50	1680	618	203	208	311	4.14	1.80	3.664	101	10	429	0.7	1.1	20.8	17.0	16	9.2	0	0.1	0.3
09-2963	50-51	1880	389	157	162	567	4.38	1.82	3.694	79	10	347	0.7	0.6	16.5	13.0	41	9.2	0	0.1	<0.2
09-2964	51-52	310	234	87	194	480	3.41	2.40	2.516	108	6	155	0.2	0.3	11.9	8.8	4	12.9	0	<0.1	<0.2
09-2965	52-53	392	502	68	207	581	1.82	1.82	0.969	68	1	403	0.4	0.5	26.5	30.7	5	9.3	1	<0.1	<0.2
09-2966	53-54	1290	322	70	211	742	2.45	1.99	1.620	79	3	542	0.5	0.6	30.9	27.8	3	9.3	0	0.2	<0.2
09-2967	54-55	1760	718	142	204	827	1.77	2.51	0.654	65	10	353	0.7	0.6	26.1	23.1	11	13.1	0	0.2	<0.2
09-2968	55-56	326	1480	273	238	911	2.05	3.69	1.060	74	11	316	0.3	0.5	18.8	16.0	12	13.4	0	0.2	<0.2

Hole BRC302: 330E 345N

Sample	Interval m	Au ppb naa	Sb ppm naa	As ppm naa	W ppm naa	Ba ppm naa	Fe % naa	K % naa	S % xrf	Cu ppm xrf	Pb ppm xrf	Zn ppm xrf	Ag ppm icpms	Cd ppm icpms	Hg ppm naa	Hg ppm aas	Mo ppm xrf	Tl ppm icpms	Sn ppm xrf	Bi ppm icpms	Te ppm icpms
09-2969	39-40	11	337	111	32	827	3.69	0.92	0.543	94	25	308	0.2	0.8	<5	0.7	2	5.3	1	<0.1	<0.2
09-2970	41-42	317	482	92	118	292	2.56	1.19	0.277	64	9	171	<0.1	0.7	7.0	1.4	4	5.4	0	<0.1	<0.2
09-2971	43-44	1910	306	122	137	541	1.60	2.20	0.382	92	18	177	0.9	0.7	28.1	24.9	1	9.4	2	0.2	0.3
09-2972	45-46	10800	601	215	93	320	6.36	1.58	5.084	46	9	504	3.0	1.9	129.0	149.0	152	7.5	0	0.4	0.5
09-2973	47-48	4000	251	172	123	391	4.35	1.90	3.603	64	3	704	1.0	0.7	86.9	88.2	79	9.9	0	0.2	0.3
09-2974	49-50	3050	1020	213	112	233	4.17	1.65	3.400	51	<1	817	4.4	6.8	415.0	502.0	148	5.9	0	<0.1	<0.2
09-2975	51-52	860	357	123	237	156	1.89	1.28	1.465	83	5	541	0.5	1.3	153.0	164.0	18	5.6	0	<0.1	<0.2
09-2976	53-54	3890	623	112	180	219	1.70	0.62	0.592	131	12	115	2.1	1.6	244.0	249.0	13	2.1	0	0.3	0.2
09-2977	55-56	260	96.2	588	8	678	7.59	0.51	0.425	113	3	202	0.1	0.2	15.7	13.0	3	2.0	0	0.1	<0.2
09-2978	57-58	44	46.5	59	15	760	2.45	1.09	0.043	134	10	104	<0.1	0.5	7.7	6.6	2	2.4	5	0.1	<0.2
09-2979	59-60	35	55.2	279	14	351	1.88	0.70	0.045	74	12	80	<0.1	0.6	8.6	6.2	3	1.4	3	<0.1	<0.2
09-2980	61-62	30	76.7	16	60	427	1.59	1.14	0.622	110	11	88	<0.1	0.3	<5	1.7	2	1.4	0	<0.1	<0.2

Table 3: Composition of weakly oxidized primary mineralization and associated wallrocks, Fender (continued)

Hole BRD235: 320E 240N

Sample	Interval	Au	Sb	As	W	Ba	Fe	K	S	Cu	Pb	Zn	Ag	Cd	Hg	Hg	Mo	Tl	Sn	Bi	Te
	m	ppb	ppm	ppm	ppm	ppm	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
		naa	naa	naa	naa	naa	naa	naa	xrf	xrf	xrf	xrf	icpms	icpms	naa	aas	xrf	icpms	xrf	icpms	icpms
09-2981	51-52	54	77	65	67	210	1.46	0.25	0.112	346	6	73	0.2	0.3	32.6	30.2	4	0.6	4	<0.1	<0.2
09-2982	52-53	21	80	28	45	203	0.69	0.39	0.054	292	8	55	0.1	0.3	31.7	30.1	1	0.8	1	<0.1	<0.2
09-2983	53-54	255	149	37	55	395	0.80	0.79	0.042	237	9	56	0.2	0.5	56.0	56.3	2	2.0	0	<0.1	<0.2
09-2984	54-55	2530	120	18	20	664	0.95	1.18	0.033	201	13	57	0.4	0.2	35.9	35.8	2	4.1	1	<0.1	<0.2
09-2985	55-56	1020	142	56	45	432	1.14	0.58	0.048	565	8	142	0.6	0.5	102.0	97.5	<1	2.7	0	<0.1	<0.2
09-2986	56-57	1190	279	329	110	591	3.72	1.95	4.682	1254	5	75	2.3	0.8	181.0	173.0	37	6.9	4	<0.1	<0.2
09-2987	57-58	362	124	23	74	<100	1.03	0.28	0.875	130	10	116	0.4	0.9	23.4	18.0	<1	1.6	2	<0.1	0.2
09-2988	58-59	6440	108	32	40	289	2.22	0.33	1.293	154	9	1289	1.3	0.5	30.5	23.8	<1	4.0	2	<0.1	0.4
09-2989	59-60	328	122	22	172	780	1.59	1.51	0.442	141	8	213	0.3	0.7	26.1	23.5	<1	3.2	0	0.2	<0.2
09-2990	60-61	29	118	8	9	810	0.57	1.21	0.151	107	15	111	0.1	0.1	<5	4.9	2	1.7	2	<0.1	<0.2
09-2991	61-62	23	140	21	<2	365	1.80	1.03	1.220	118	13	401	<0.1	0.2	<5	5.4	<1	2.7	4	<0.1	<0.2
09-2992	62-63	27	101	22	9	361	1.88	0.96	0.724	97	11	130	<0.1	0.2	<5	4.9	1	2.5	1	<0.1	<0.2
09-2993	63-64	13	75	14	7	402	1.94	1.14	0.630	124	10	79	0.2	0.7	<5	5.2	<1	1.4	2	0.1	<0.2

Table 4: Composition of weakly oxidized primary mineralization containing more than 1000 ppb Au

Sample	Interval m	Au ppb naa	Sb ppm naa	As ppm naa	W ppm naa	Ba ppm naa	Fe % naa	K % naa	S % xrf	Cu ppm xrf	Pb ppm xrf	Zn ppm xrf	Ag ppm icpms	Cd ppm icpms	Hg ppm naa	Hg ppm aas	Mo ppm xrf	Tl ppm icpms	Sn ppm xrf	Bi ppm icpms	Te ppm icpms
09-2961	48-49	1330	775	215	162	479	4.68	2.54	2.894	81	7	1069	0.5	0.7	24.1	22.9	13	9.9	0	<0.1	0.3
09-2962	49-50	1680	618	203	208	311	4.14	1.80	3.664	101	10	429	0.7	1.1	20.8	17.0	16	9.2	0	0.1	0.3
09-2963	50-51	1880	389	157	162	567	4.38	1.82	3.694	79	10	347	0.7	0.6	16.5	13.0	41	9.2	0	0.1	<0.2
09-2966	53-54	1290	322	70	211	742	2.45	1.99	1.620	79	3	542	0.5	0.6	30.9	27.8	3	9.3	0	0.2	<0.2
09-2967	54-55	1760	718	142	204	827	1.77	2.51	0.654	65	10	353	0.7	0.6	26.1	23.1	11	13.1	0	0.2	<0.2
09-2971	43-44	1910	306	122	137	541	1.60	2.20	0.382	92	18	177	0.9	0.7	28.1	24.9	1	9.4	2	0.2	0.3
09-2972	45-46	10800	601	215	93	320	6.36	1.58	5.084	46	9	504	3.0	1.9	129.0	149.0	152	7.5	0	0.4	0.5
09-2973	47-48	4000	251	172	123	391	4.35	1.90	3.603	64	3	704	1.0	0.7	86.9	88.2	79	9.9	0	0.2	0.3
09-2974	49-50	3050	1020	213	112	233	4.17	1.65	3.400	51	0	817	4.4	6.8	415.0	502.0	148	5.9	0	<0.1	<0.2
09-2976	53-54	3890	623	112	180	219	1.70	0.62	0.592	131	12	115	2.1	1.6	244.0	249.0	13	2.1	0	0.3	0.2
09-2984	54-55	2530	120	18	20	664	0.95	1.18	0.033	201	13	57	0.4	0.2	35.9	35.8	2	4.1	1	<0.1	<0.2
09-2985	55-56	1020	142	56	45	432	1.14	0.58	0.048	565	8	142	0.6	0.5	102.0	97.5	0	2.7	0	<0.1	<0.2
09-2986	56-57	1190	279	329	110	591	3.72	1.95	4.682	1254	5	75	2.3	0.8	181.0	173.0	37	6.9	4	<0.1	<0.2
09-2988	58-59	6440	108	32	40	289	2.22	0.33	1.293	154	9	1289	1.3	0.5	30.5	23.8	0	4.0	2	<0.1	0.4
Mean		**3055**	**448**	**146**	**129**	**472**	**3.12**	**1.62**	**2.26**	**212**	**8**	**473**	**1.4**	**1.2**	**97.9**	**103.3**	**37**	**7.4**	**-**	**-**	**-**

Residual and semi-residual lateritic gravels (nodules and pisoliths) outcrop west from about 180E and these were sampled at surface and from drill cuttings to determine the lateral extent of the surficial anomaly. Similar, scattered lateritic lag was sampled at 200E. Data from the RAB drill hole at 200E are also shown, this being the most westerly hole on the section depicted in Figure 3. Summarized results are presented in Table 5. Although the detection limit is greater than normal for some samples, there is no Au anomaly in these materials.

Table 5: Compositions of surficial lateritic gravels west of Fender.

Sample	Type	Depth m	Easting m	Northing m	Au * ppb	As ppm	Sb ppm	W * ppm	Fe %
4411	Lag	Surface	100	240	<10	50	70	<10	20.0
4401	RC cuttings	0-1	110	250	<5	60	95	<10	16.2
4412	Lag	Surface	150	240	<10	90	125	<10	18.3
4406	RC cuttings	0-1	160	250	<10	915	65	<10	19.3
4413	Lag	Surface	200	240	<10	325	115	<10	25.7
2822	RAB cuttings	0-1	200	240	<5	90	30	<2	9.6

*Some high detection limits due to delayed counting.

Gold concentrations in the transported overburden rarely exceed 100 ppb. Those samples which have higher concentrations are all ferruginous and may either be misclassified or be mixtures. Thus, two samples with >1000 ppb Au at 3 m depth, at 270 and 290E, are largely derived from the nodular clays, and the basal sample on 400E may include saprolite. The weakly silicified sands immediately overlying the nodular clays are anomalous in Au, against background concentrations, both laterally and on the other sections, of <5 ppb. Gold contents decline upwards, from 50-70 ppb at 1 - 3 m, to 10 - 27 ppb at 0 - 1 m. The anomalous sands are approximately coextensive with the enrichment in saprolite. The possibility of cross-hole contamination remains, despite the precautions taken during drilling, but inspection of the data shows no direct evidence (holes drilled from west to east). A broader anomaly is present in the silty clays, with concentrations of 20-65 ppb Au present at 500E, i.e., nearly 200 m from mineralized zones.

Section 340N. Although small amounts of nodular ferruginous clays are present (3-5 m depth at 240-300E), there is no lateritic resource on this section and the residual and transported units all have very low Au contents; the maximum concentrations, both in saprolite, are 105 ppb. These probably represent intersections of weathered mineralization; deeper RC drilling suggests that this depletion extends to depths of 10-15 m. Adjacent saprolite samples mostly contain much less than 50 ppb and there is no dispersion halo equivalent to that on section 240N. The transported units have similarly low Au contents, mostly below the 5 ppb detection limit. Exceptions are the silty clays immediately overlying the two Au maxima in the upper saprolite. The distributions suggest a weak, vertical dispersion of about 2 m, possibly via churning; some Au is possibly associated with ferruginous nodules in the sediments. The lateral extent of this dispersion is uncertain, but is less than 10 m at the detection limit used in this study (5 ppb). Gold concentrations in the sands are generally below detection, with the exception of two isolated samples (6 and 16 ppb).

Section 400N. This section is less ferruginous than either 340N or 240N, with no nodular ferruginous clays and only a restricted occurrence of nodules in the sediments. Unlike the apparently equivalent, truncated, regolith of 340N, however, Au depletion is, seemingly, less severe and ore-grade mineralization is present at the top of the saprolite. Two zones of weathered primary mineralization have been intersected by the shallow drilling, with maxima of 2380 ppb and 755 ppb Au - although the latter, at 350E, may represent the margin of the main zone. Lateral dispersion in the saprolite is restricted, however, and Au concentrations are less than 20 ppb within 20 m of these intersections. There is minor vertical (2 to 3 m) and eastwards lateral (up to 50 m) dispersion into the silty clay unit of the transported overburden, defined by the 5 ppb detection limit. At 310E, the vertical dispersion of up to 2 m involves a ten-fold decrease in Au abundance, to 250 ppb. The material is possibly a mixture of saprolite and sediment, either as an artefact of drilling or as a result of the churning noted petrographically (see Section 4.2). Apart from these two samples, however, the 'enrichment' of the silty clays is to 5-20 ppb only. The sands have no detectable Au, except for two basal samples overlying weakly anomalous silty clays, and two isolated surface (0-1 m) samples; concentrations are all <20 ppb. The presence of a weakly anomalous surface sample (18 ppb Au) directly overlying mineralization on 310E is curious, but there is no obvious relationship and is probably coincidental. Cross-hole contamination is unlikely; the previous sample contained 8 ppb Au and was the first collected that had detectable Au.

6.3 Arsenic, antimony and tungsten

As noted in Section 5, As, Sb and W are strongly enriched in the mineralization at Fender and have considerable potential as pathfinder elements. This has been borne out by preliminary work by PosGold, who have shown that these elements are retained through the depleted zone (N.W. Radford, Normandy Exploration, personal communication, 1994). This study of the shallow regolith has confirmed this characteristic, from limited samples, and also suggests that each of these elements has been widely dispersed in the transported overburden and gives a far more widespread halo than Au.

Section 240N. Arsenic and, in particular, Sb are both enriched and widely dispersed in the nodular ferruginous clays, ferruginous saprolite and transported silty clays, to give a broad, anomaly across the whole section. The distributions of both elements broadly follow those of Fe and Au, with the exception that concentrations are more homogeneous and remain elevated in shallow saprolite on 200E. Sampling of the residual and semi-residual lateritic gravels (nodules and pisoliths) to the west demonstrates the wide dispersion of these elements, with anomalous concentrations (50 ppm As, 70 ppm Sb) extending to at least 100E (Table 5). Lateritic residuum and ferruginous saprolite in the top 4 m at 160E 250N contain 915-1170 ppm As, about three times greater than that in the mineralized nodular, ferruginous clays, although similar to some ferruginous saprolite on 340N. In contrast, the W distribution is quite restricted, with detectable concentrations (2-22 ppm) mainly in the most Au-rich portions of the nodular ferruginous clays and ferruginous saprolite - and possibly indicating the position of the primary source. There is no apparent W enrichment in the lateritic residuum and lag to the west, notwithstanding the high detection limit. Overall, As abundances are much greater in the residual regolith (100-410 ppm) than in the primary mineralization and wallrocks (8-330 ppm) intersected in BRD 235. In comparison, although regionally high, Sb abundances in the residual regolith (30-125 ppm) are reduced compared to the primary mineralization (75-280 ppm), with the higher concentrations generally associated with the nodular ferruginous clays. There is a proportionately greater reduction in W abundance, which is 20-170 ppm in primary mineralization.

Unlike Au, neither As nor Sb is apparently enriched or dispersed in the sands overlying the nodular clays. (In other districts, concentrations of 2 to 7 ppm Sb in colluvial sand could be considered anomalous). There are also low level (2-8 ppm) W enrichments in the sand, both overlying mineralization and extending laterally to the east. However, both As and Sb seem to be dispersed laterally to the east in the silty clays, with elevated concentrations (30-115 ppm As, 16-20 ppm Sb) at 500E.

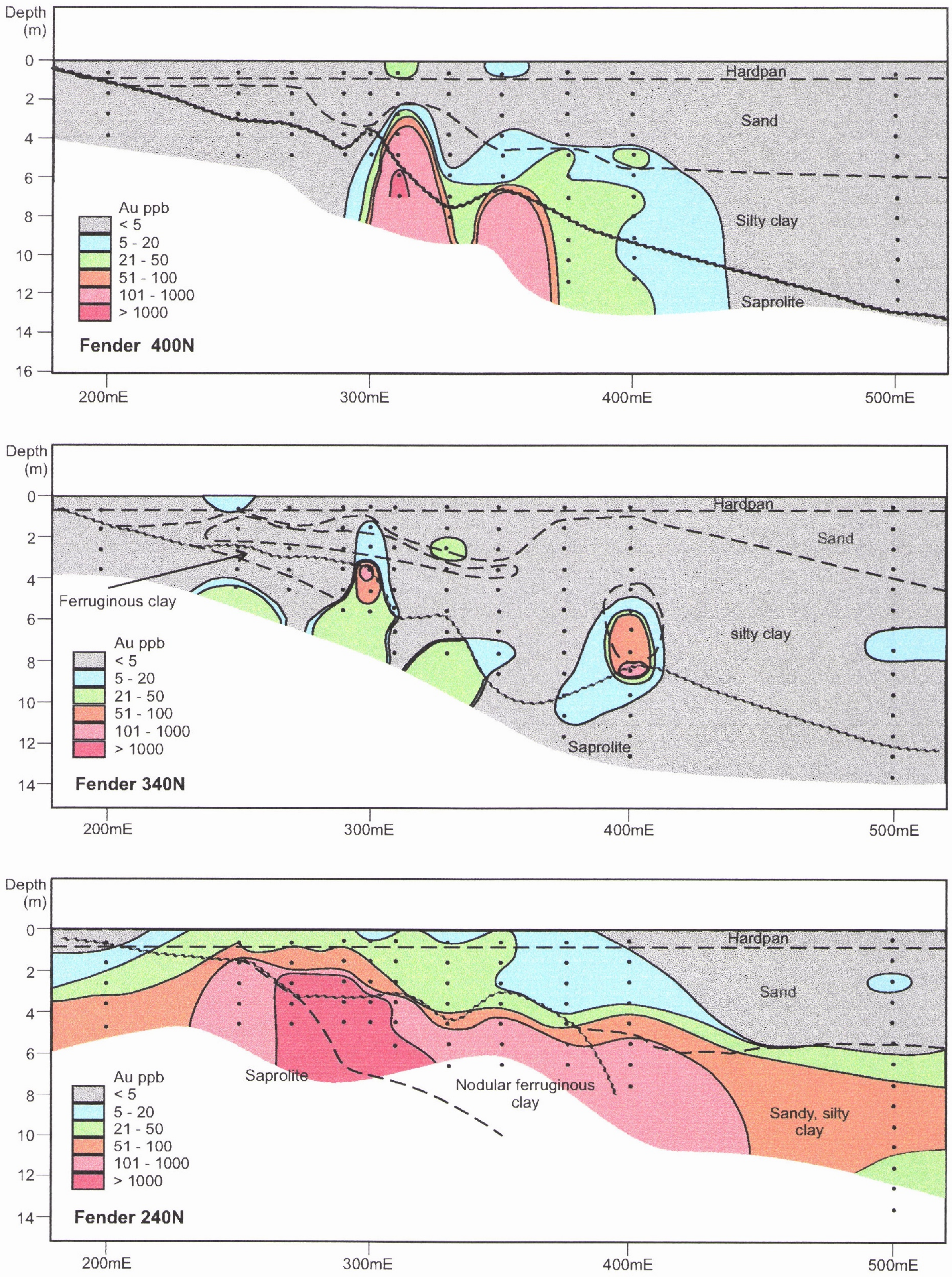


Figure 6: Gold distributions in the upper regolith, Fender deposit

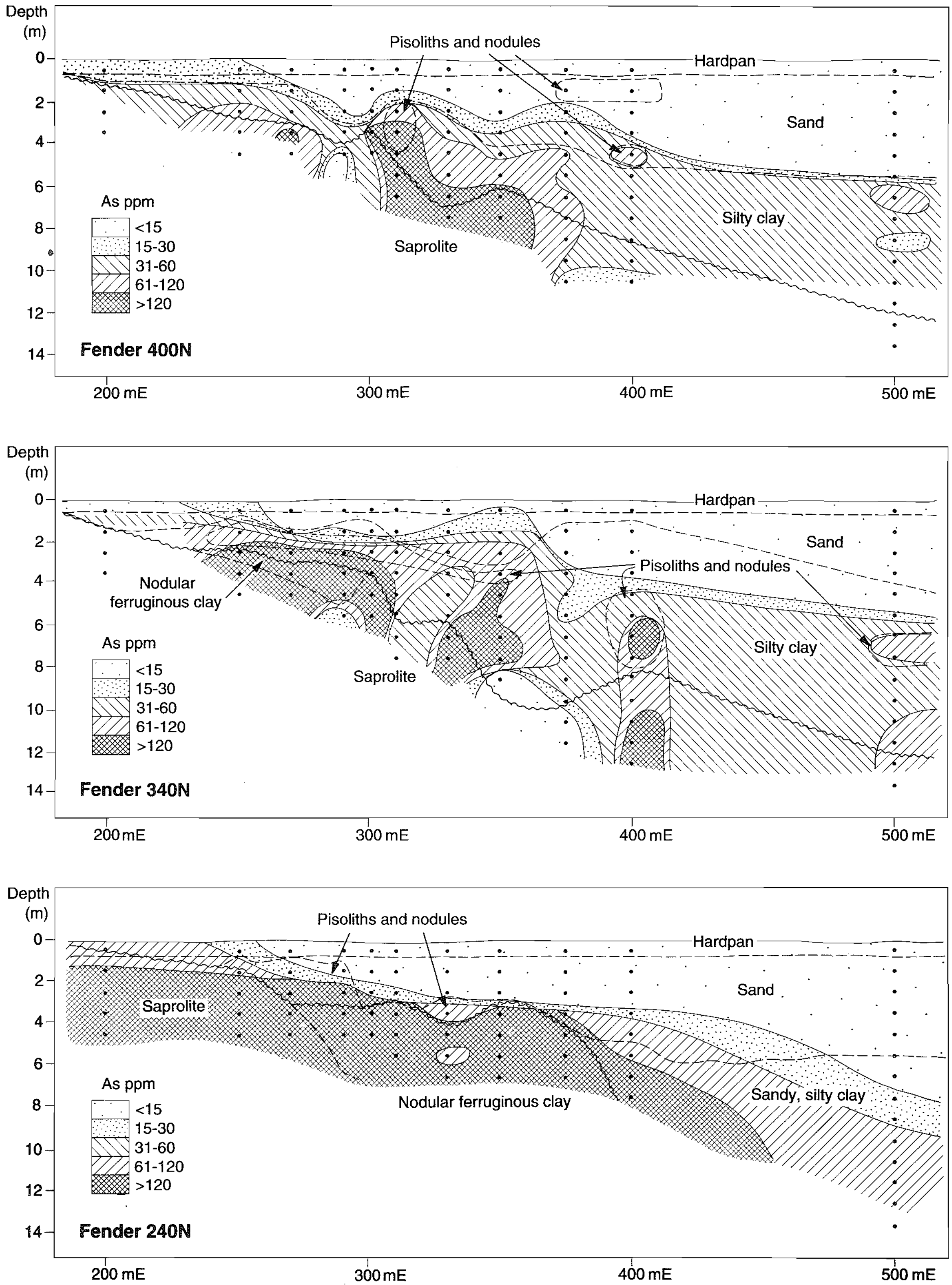


Figure 7: Arsenic distributions in the upper regolith, Fender deposit

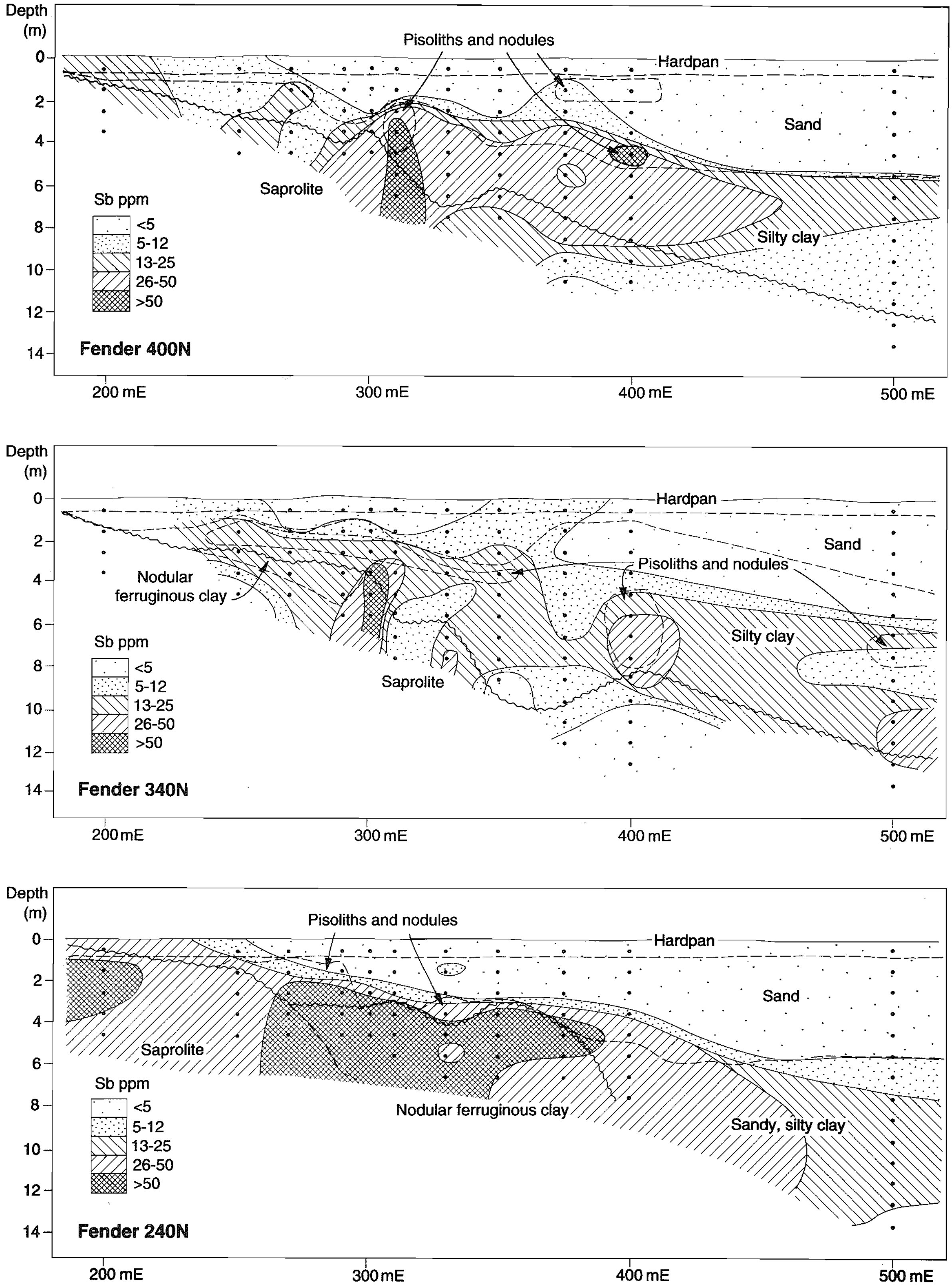


Figure 8: Antimony distributions in the upper regolith, Fender deposit

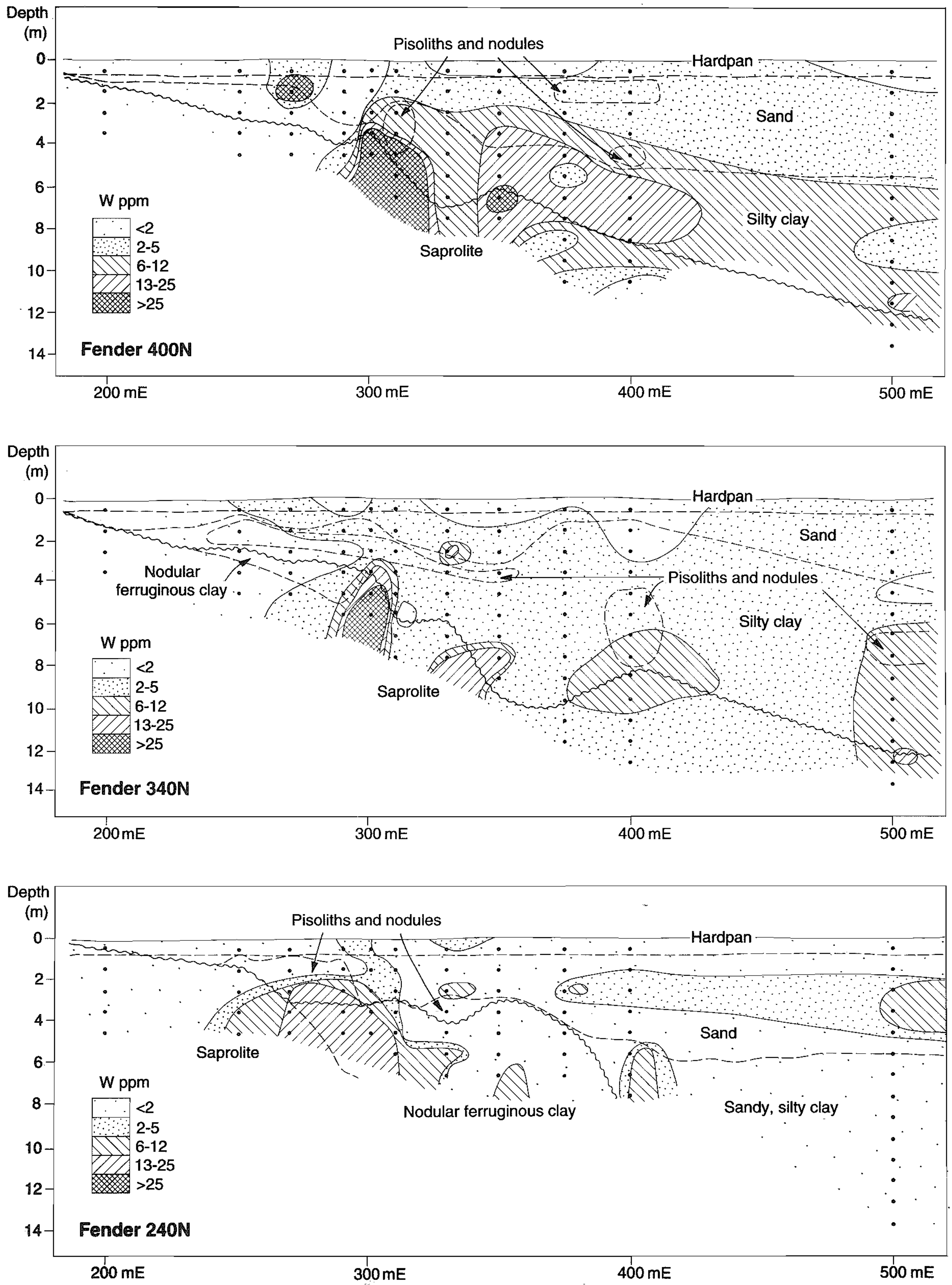


Figure 9: Tungsten distributions in the upper regolith, Fender deposit.

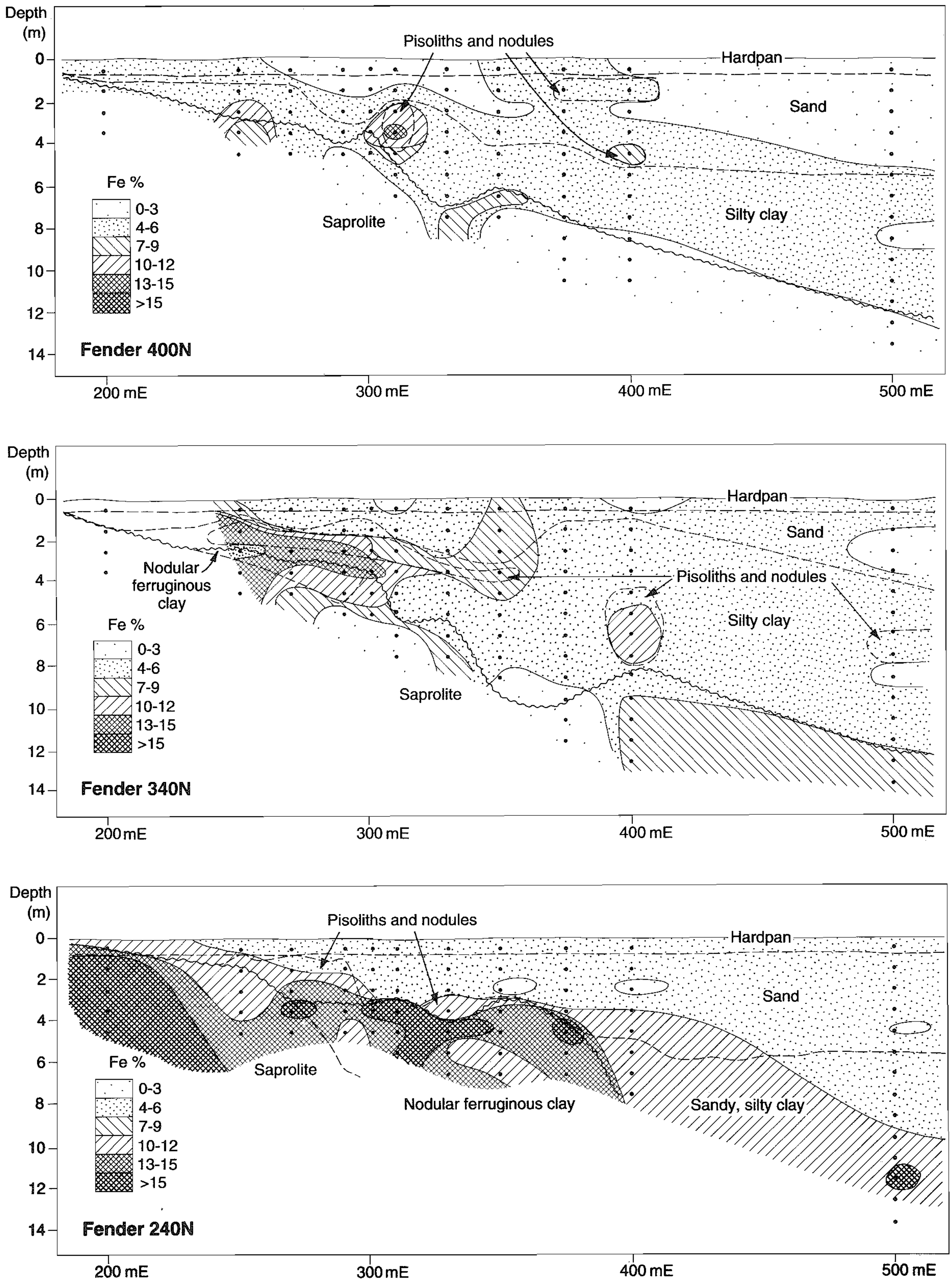


Figure 10: Iron distributions in the upper regolith, Fender deposit.

Section 340N. Although Au is mostly leached, Sb, W and, especially, As give strong anomalies in saprolite that indicate the probable site of the depleted, weathered primary source. For example, at 300E, where Au contents are 45-105 ppb, these pathfinders elements have high abundances (175-505 ppm Sb, 15-95 ppm W and 185-250 ppm As), broadly similar to those in underlying primary mineralization intersected by BRC 302 (Table 3). Arsenic also gives a broad anomaly (>120 ppm) in the upper saprolite of the wallrocks, extending 50 m from the source. In comparison, Sb and W have more restricted distributions - with little apparent lateral dispersion. These three elements are also dispersed in the transported overburden, particularly in the silty clays, with an approximately tenfold decrease in abundance compared to the subcropping saprolite. Both As and Sb appear to give relatively homogeneous, dispersion haloes, delineated by the 25 ppm and 12 ppm limits, respectively, extending for over 100 m east from the source. Some higher concentrations correspond to local Fe enrichments, and the occurrence of nodules. Tungsten is more patchily distributed, using a 6 ppm limit, although detectable W (>2 ppm) is present in both sand and silty clay only east (downslope) of subcropping mineralization, and hence *may* indicate a general, weak, enrichment of the sediments.

Section 240N. The As, Sb and W distributions are broadly similar to those on 340N. The highest abundances identify the weathered mineralization and, particularly As, give wider dispersion haloes than Au. All three elements give broad haloes in the silty clays, extending laterally for over 80 m downslope to the east. Detectable W is again present in both sand and silty clay only east of the subcropping mineralization.

7. LOCALIZATION OF DISPERSED GOLD AND PATHFINDER ELEMENTS

7.1 Distribution patterns

The distribution patterns described above suggest that As, Sb and W have been retained throughout the regolith, including zones in the upper saprolite where the weathered primary mineralization has been strongly depleted in Au. The nodular, ferruginous horizon (and ferruginous saprolite) is weakly anomalous in W (13-22 ppm), consistent with this material being largely residual, although concentrations are depleted relative to underlying mineralization (20-170 ppm in BRD 235, Table 3). On a weight percent basis, Sb contents (50-175 ppm) are similar to 50% depleted relative to primary mineralization, whereas As contents (150-380 ppm) have been enhanced five- to ten-fold. The data also show that As and Sb are more widely dispersed in the upper residual regolith and the overlying sediments (mainly in the silty clay unit) than is Au. There may also be weak dispersion of W into the sediments. The dispersion has probably been towards the east or north east, but it is not evident whether this has been chemical or physical, or a combination of both, hence a number of investigations were made to establish the mineral hosts of these elements in both residual and transported materials.

7.2 Ferruginous nodules

Ferruginous nodules, commonly sub-angular, without cutans and 3-7 mm in diameter, are irregularly distributed through the silty clays (Figures 5E and F). Nodules were collected from selected samples within the dispersion halo on sections 340N and 400N, washed to remove excess clay and analysed, without further preparation, by neutron activation. The results show that the nodules are strongly enriched in As and Sb, but that W and, in particular, Au are erratically distributed and commonly below detection. Only two samples on each section had detectable Au, with similar or lower concentrations than the equivalent total sample. High Cr contents (>2000 ppm, Appendix A4) in most nodules from section 400N probably reflect the occurrence of an ultramafic unit in the western wallrocks. The Fe contents of the nodule fractions are very variable (3.97-72.00%), especially on Section 400N; low Fe contents are mainly in samples in which nodules were rare and suggest that those that were collected are comprised dominantly of Fe oxide-stained silicified clay. In order to facilitate comparisons and the determination of dispersion trends, the As, Sb and W data have been normalized to constant Fe - selected as 35%, based on inspection of results from 340N.

On Section 340N (Figure 11), the Sb content of the nodules increases steadily from 40-60 ppm west of the subcropping mineralization to 80->100 ppm to the east. Arsenic contents are generally 300-450 ppm across the section, being lower only west of 270E, thus seemingly reflecting the broader distribution of As in the saprolite. Tungsten contents are lower (<8 ppm) than in the silty clays and very erratic. For all three elements, the highest abundances are east of the mineralization, at 375-400E, declining to the east. Because the Fe contents of the nodule fraction are fairly constant, except in the west, normalization has little effect.

Total Fe contents of the nodule fraction are variable and mostly lower on Section 400N, so that concentrations of As, Sb and W are greatly enhanced by normalization (Figure 12). High concentrations occur in the highly ferruginous sample close to mineralization at 300E, but the maxima are again to the east, at 350-400E, although not coincident. Although raw As and Sb abundances are broadly similar on the two sections, those of W are greater on 400N (10-30 ppm), indicating that W is less closely associated with the nodules.

The high As and Sb concentrations in the nodules suggests them to be the principal hosts for these elements in the silty clays. This was tested by similar normalization for the original bulk samples of silty clay from which the nodules had been extracted. These clays contain 2.2-13.5% Fe, and the As and Sb data are highly variable. Normalization results in minor smoothing but, more significantly, yields abundances and trends very similar to those portrayed by the normalized nodule data (Figures 13- 16), strongly suggesting a controlling association between nodule and element distributions in the silty clays. For W, normalization gave strong enhancement in the clays relative to the nodules, implying that W may be hosted by the fine matrix. There is no clear relationship in the Au contents of clays or nodules; the normalized maximum is similar and coincident on 340N, but much lower in the nodules and displaced on 400N, although still close to subcropping mineralization.

7.3 Size fraction analysis

Four samples were investigated to determine whether there was any preferred fraction for the accumulation of Au and associated elements in the matrix (<500 μm) of the samples - i.e., largely excluding ferruginous nodules. The effectiveness of size fractionation, of course, is limited in partly indurated materials such as these, because cementation prevents disaggregation. This may have influenced the results, even though some of the least indurated materials were selected. The results (Table 6) indicate that there is no distinct partition of any elements in the samples and fractions tested, although the highest concentrations of each element are mostly in the finest fraction (<75μm). Such accumulation, however, is minor in comparison to that present in the coarse ferruginous nodules.

7.4 Heavy mineral separations

The composition of the heavy mineral fraction of a small number of samples was investigated to determine the nature of the Au grains and the probable host of the pathfinder elements, especially W. The grains were examined for fluorescence in ultra-violet light and by scanning electron microscopy. However, although some Ag-poor Au grains and platelets were found in mineralized nodular ferruginous clay (sample 09-2840, 240N) and mineralized saprolite (sample 09-2678, 400N), no base metal minerals were found. Although some fluorescent grains resembling scheelite were seen, further examination indicated that these were quartz with Fe oxide coatings.

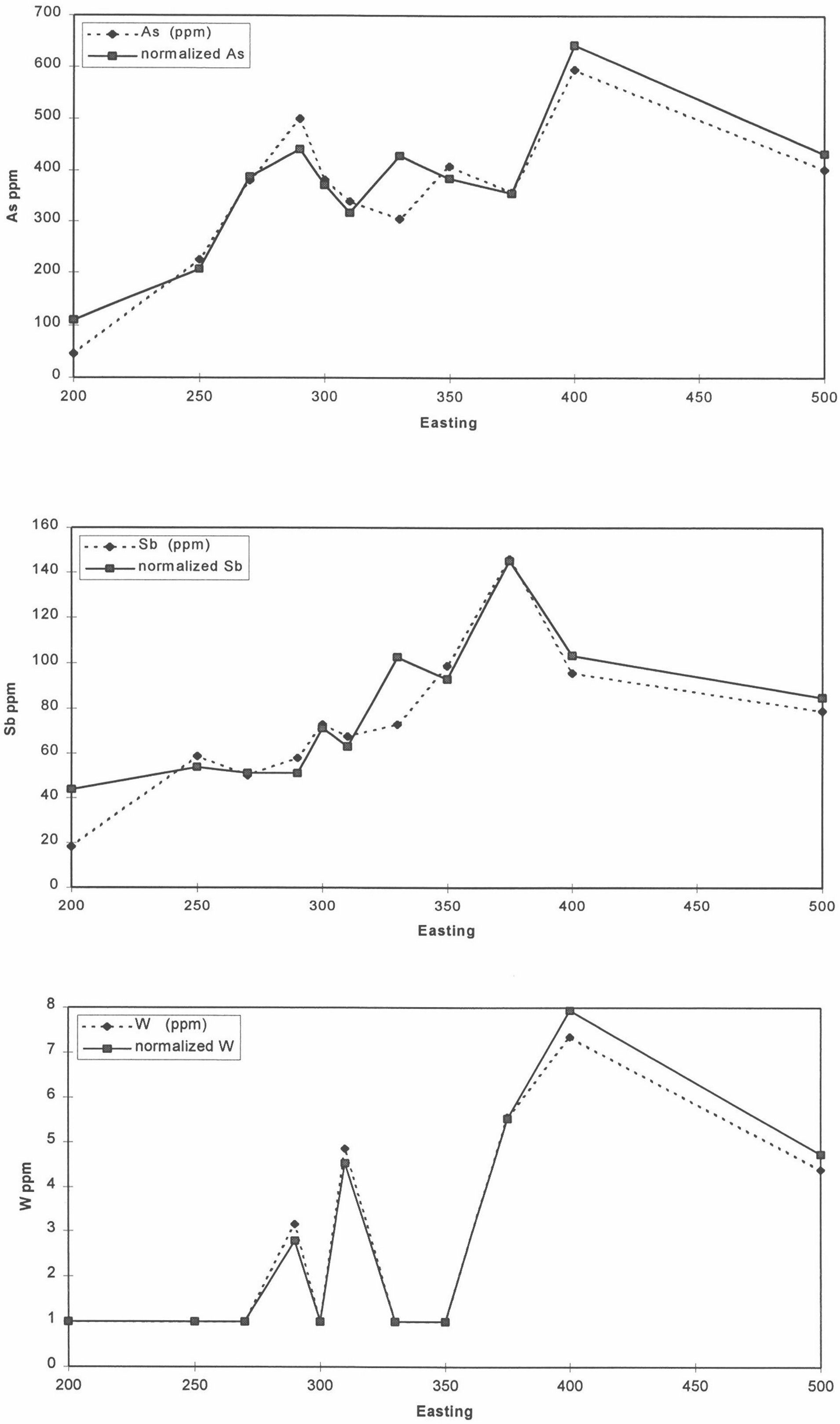


Figure 11: Arsenic, antimony and tungsten distributions in ferruginous nodules, section 340N; raw data and with normalization to 35% Fe.

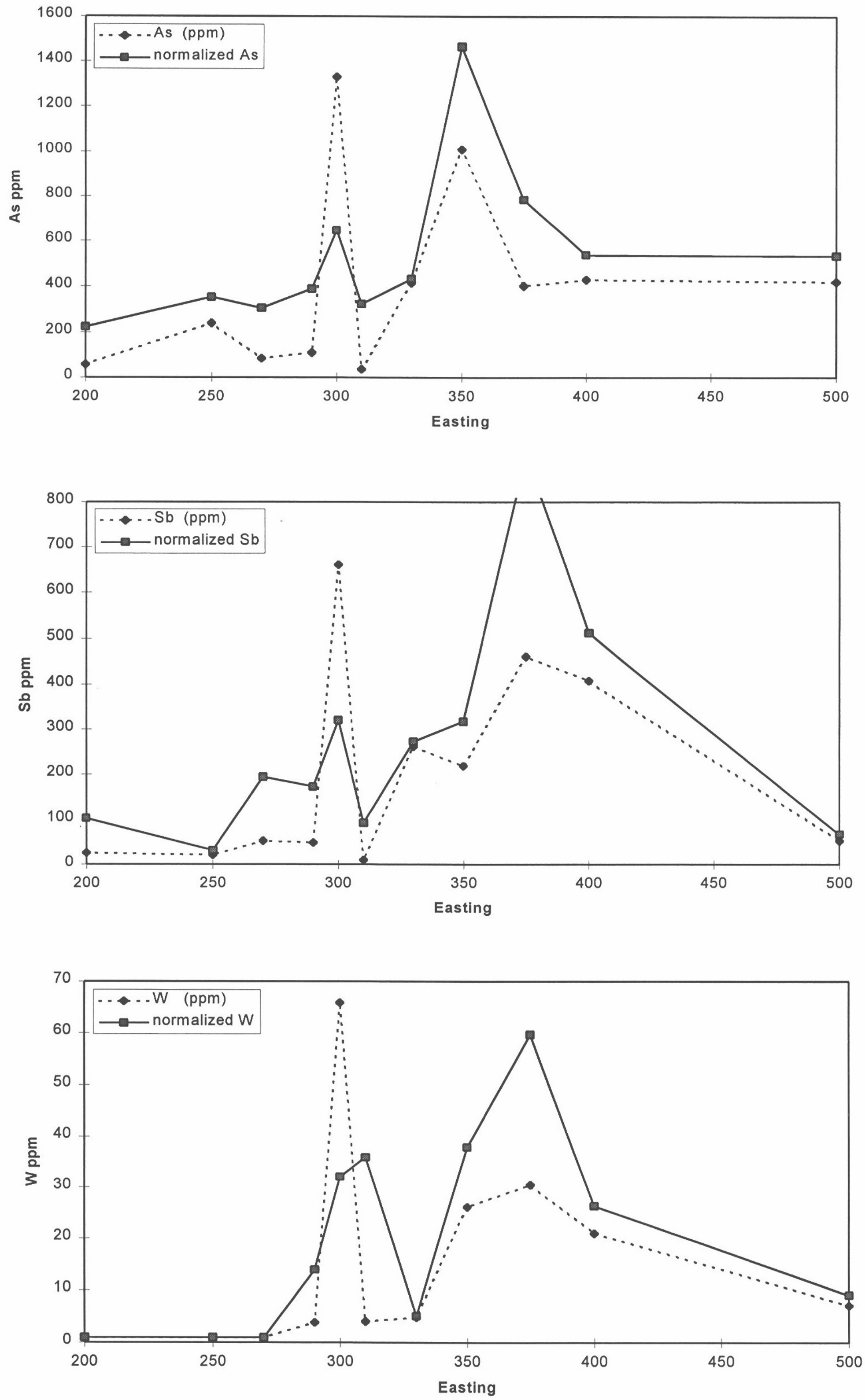
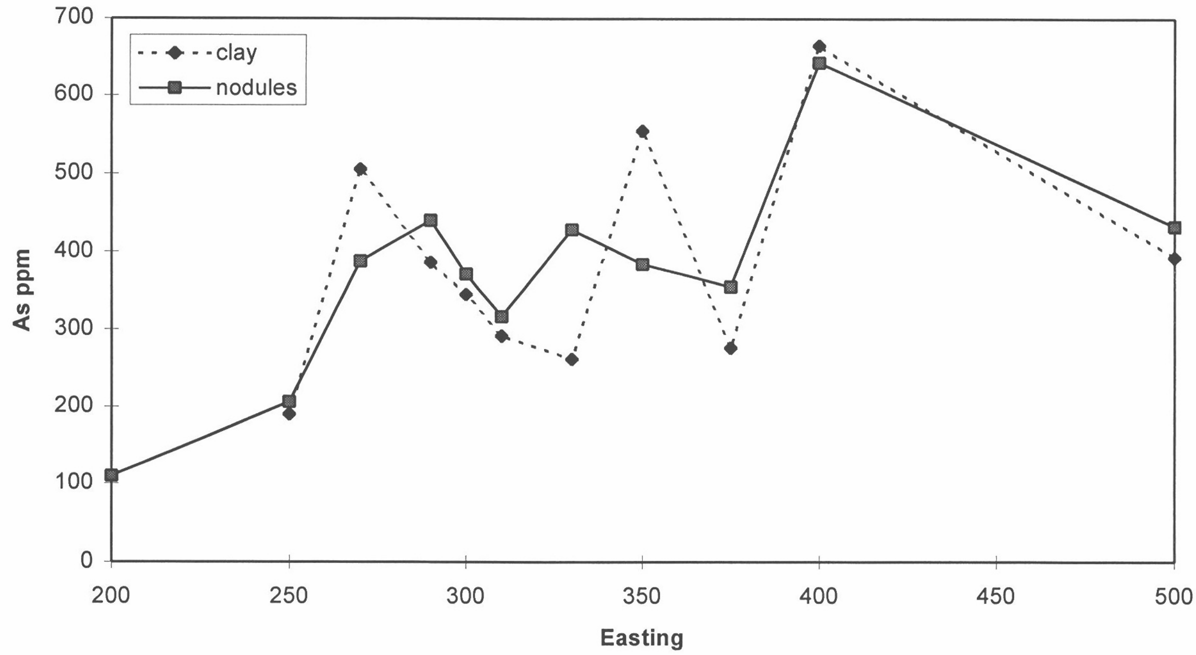


Figure 12: Arsenic, antimony and tungsten distributions in ferruginous nodules, section 400N; raw data and with normalization to 35% Fe.

Section 340N: normalized As in clay and nodules



Section 340N: normalized Sb in clay and nodules

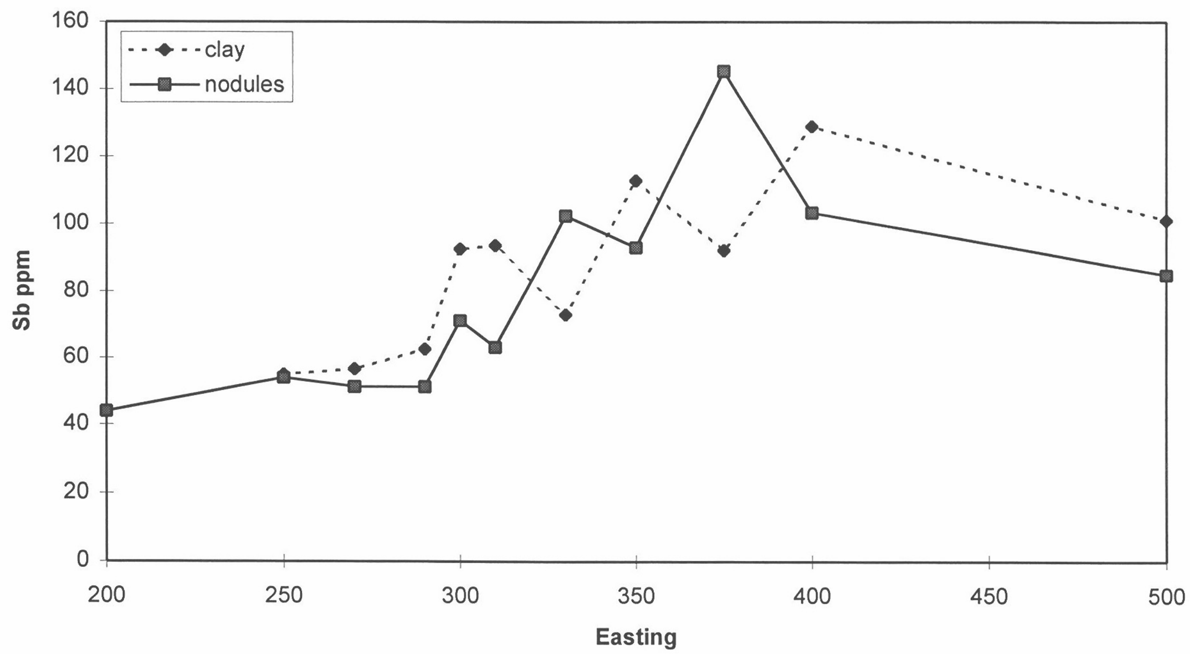
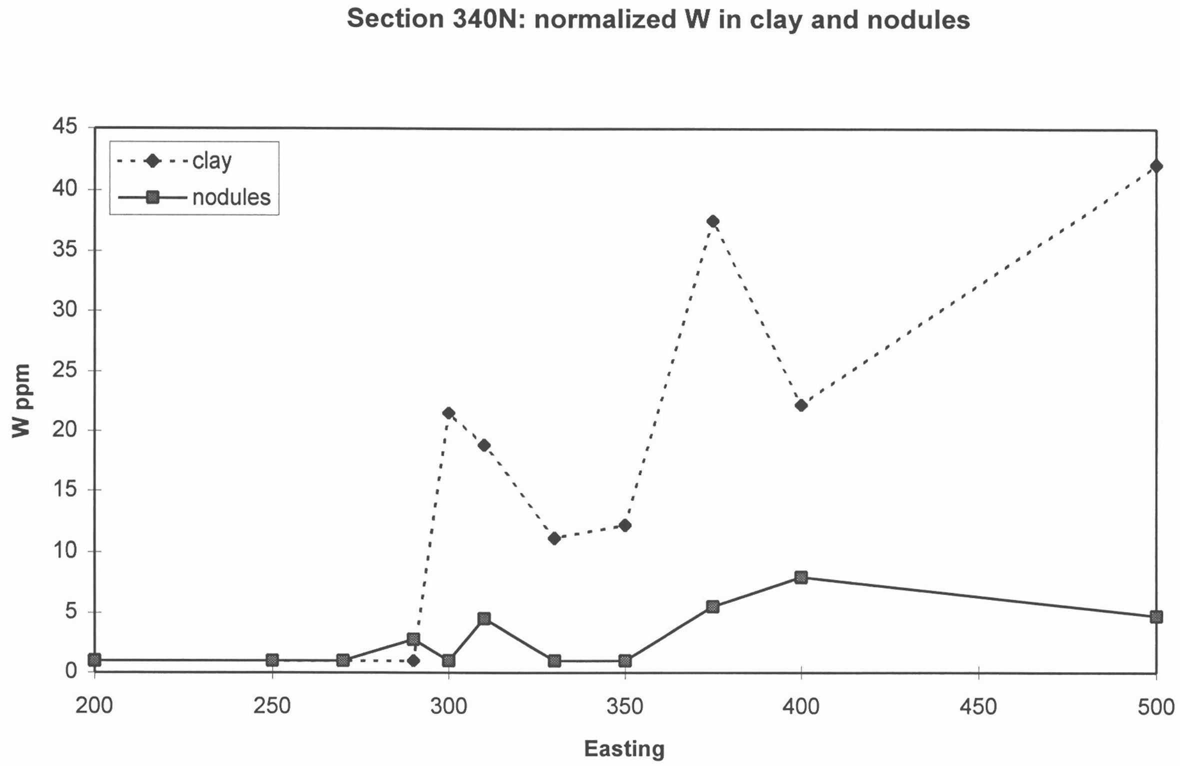


Figure 13: Arsenic and antimony distributions in ferruginous nodules and silty clays, section 340N; data normalized to 35% Fe.



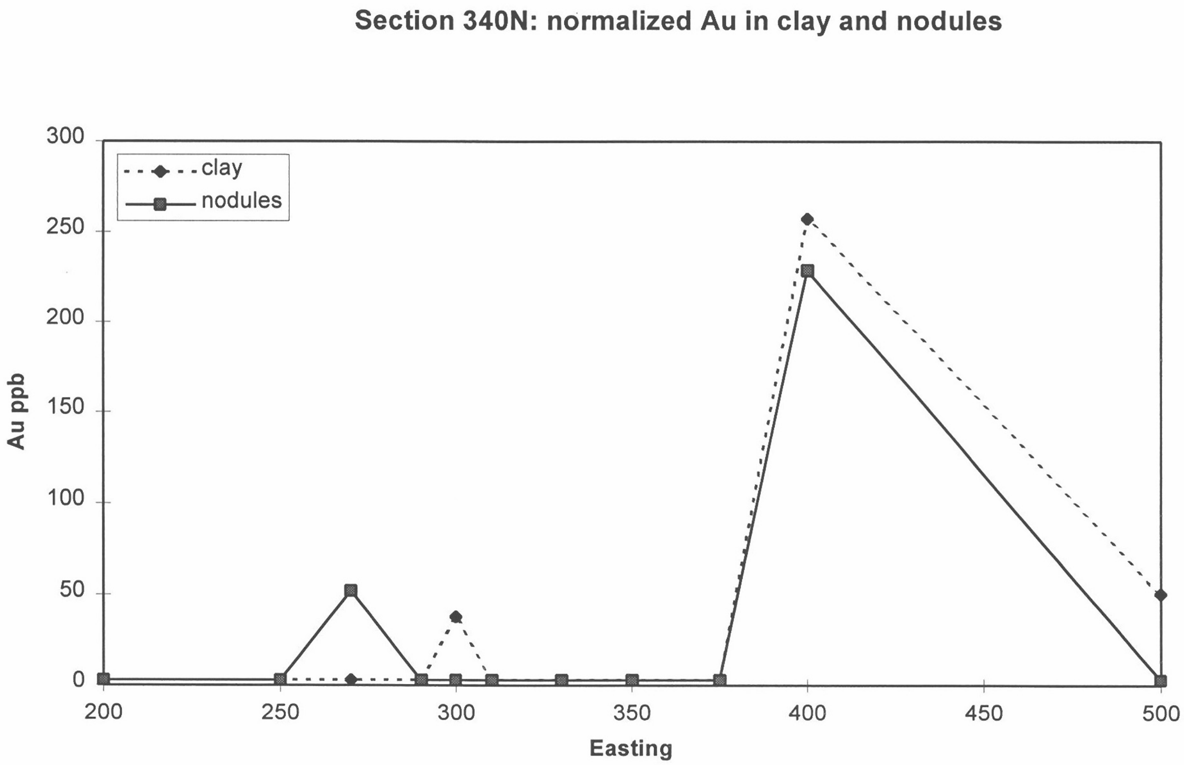
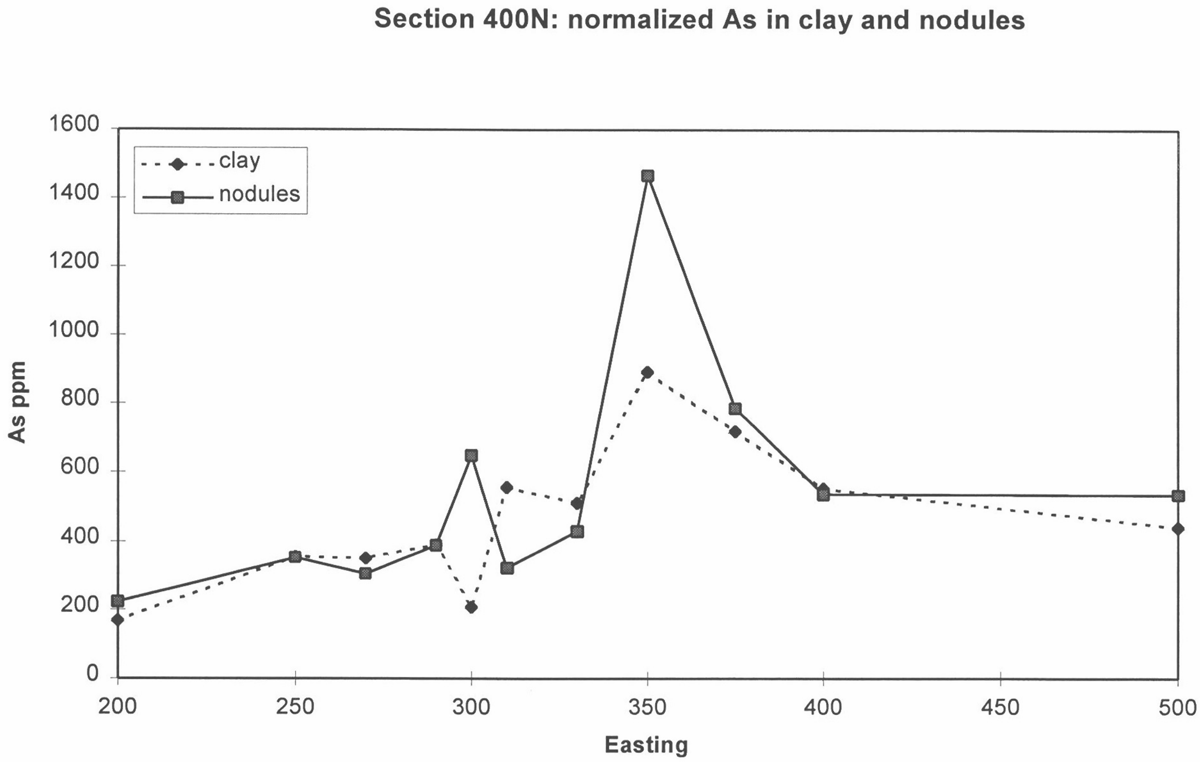


Figure 14: Gold and tungsten distributions in ferruginous nodules and silty clays, section 340N; data normalized to 35% Fe.



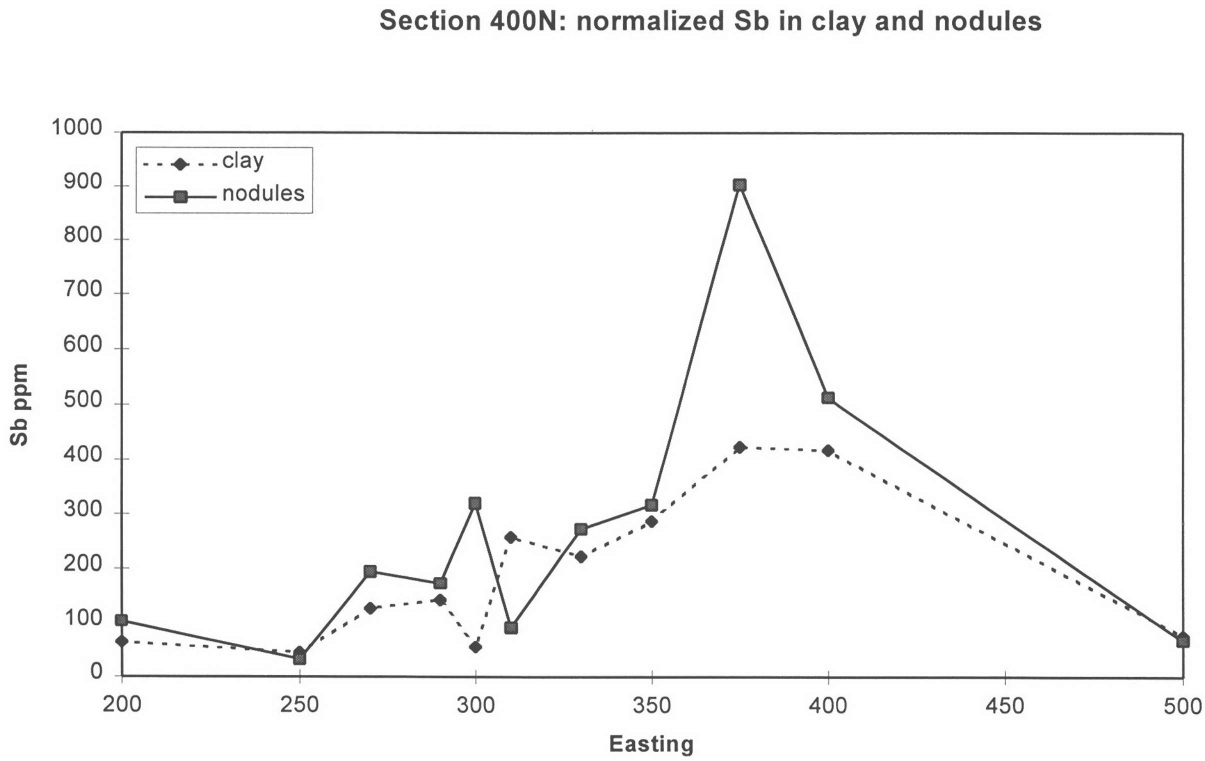
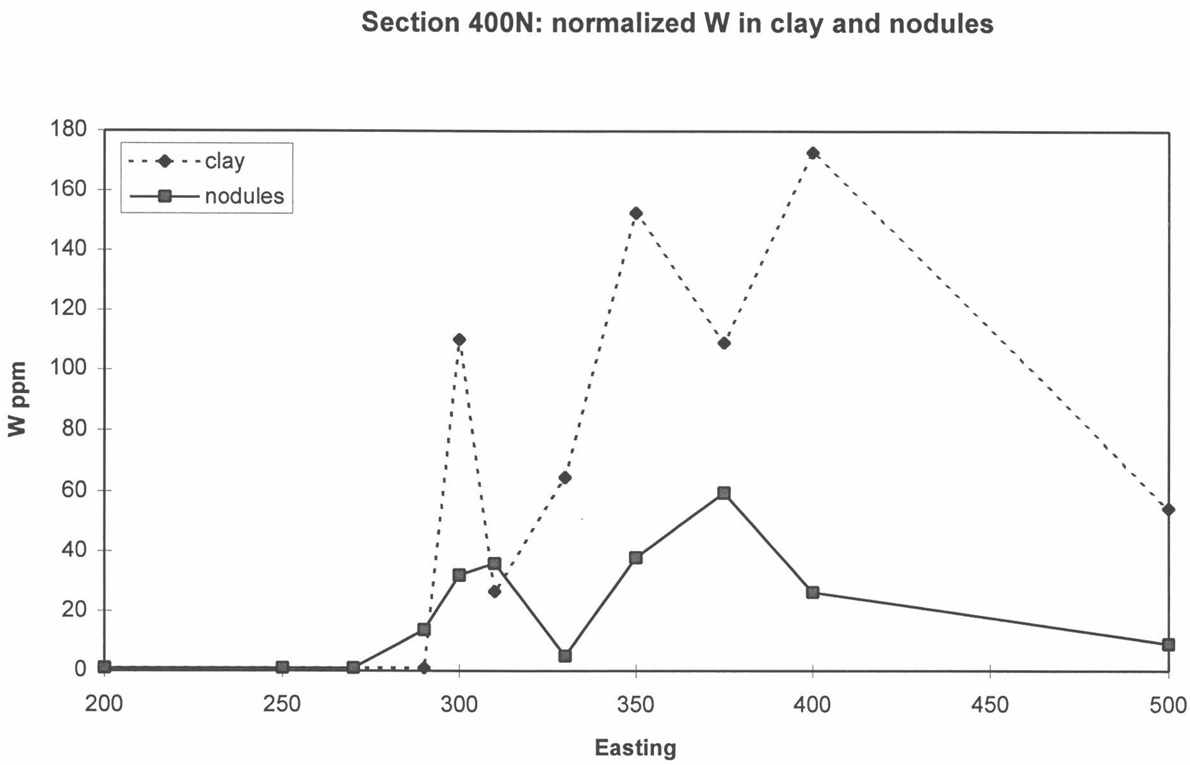


Figure 15: Arsenic and antimony distributions in ferruginous nodules and silty clays, section 400N; data normalized to 35% Fe.



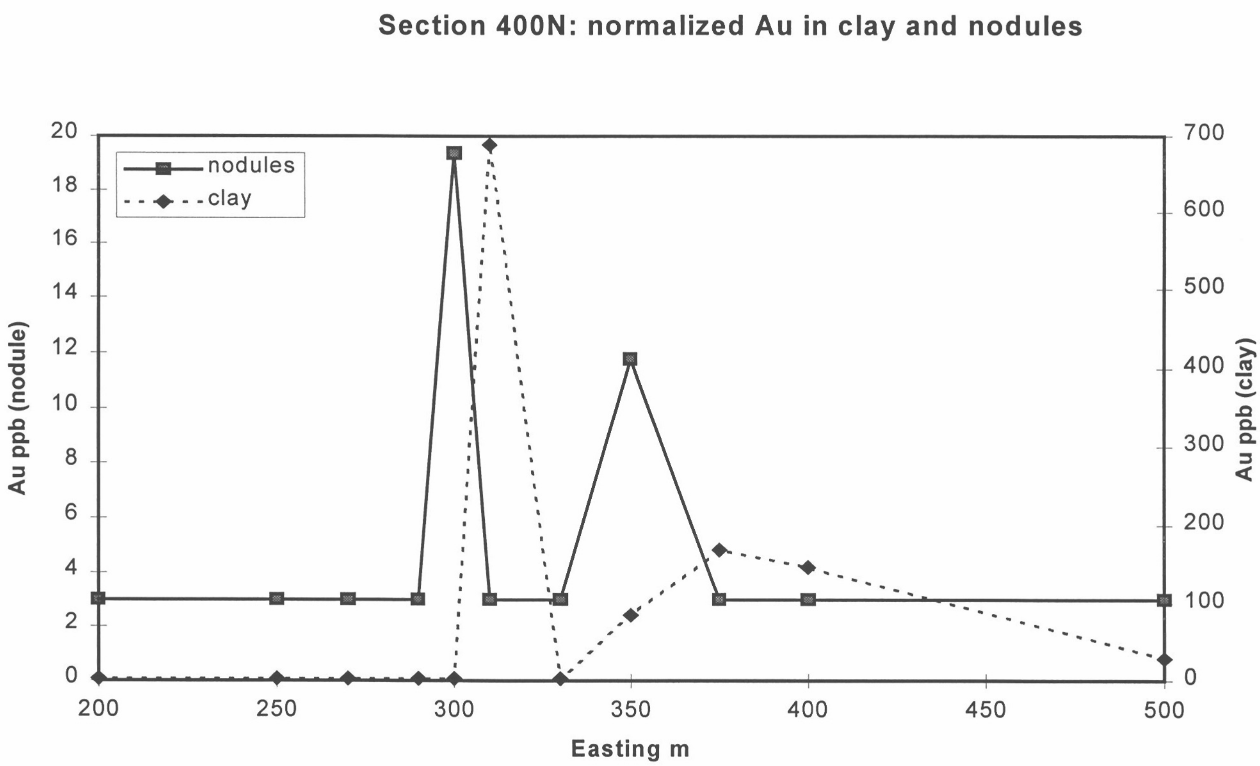


Figure 16: Gold and tungsten distributions in ferruginous nodules and silty clays, section 400N; data normalized to 35% Fe.

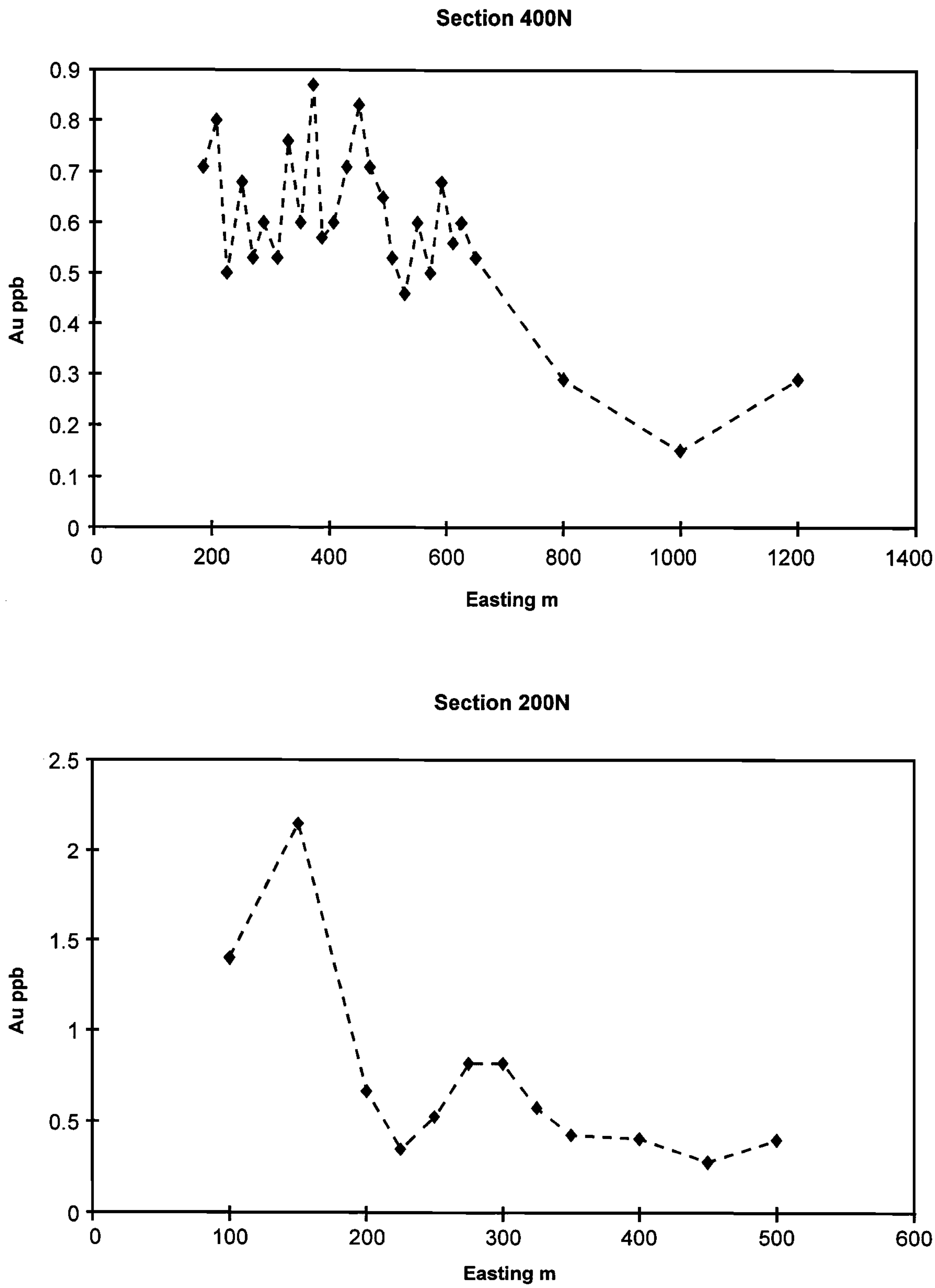


Figure 17: Gold distributions in soils determined by bulk leach extraction (BLEG). (After N.W. Radford, Normandy Exploration, July 1996).

7.5 Partial extraction analysis

Selective extraction analyses for Fe, W, As and Sb were done on samples of primary mineralization (2678) and mineralized laterite (2840), using a variety of acid and alkaline extractions, and extractions designed to partially or wholly dissolve Fe oxides.

In primary mineralization, only about 25% of the Fe, and little or no W, As or Sb, dissolved in reagents designed to extract separate phase Fe oxides. Up to half of the As was dissolved by strong acids. Similar proportions of Sb could be dissolved, if the reagent conditions were kept reducing. In contrast, a maximum of 4% of the W was dissolved, even in concentrated HCl, indicating the W to occur in highly resistant phases. In the laterite, at least 60% of the Fe and 35% of As, but only minor (<10%) W and Sb occurred in separate phase Fe oxides. Strong acid dissolved the remaining As and Sb, but only a maximum of 25% of the W.

These preliminary results illustrate that chemical weathering can result in substantial redistribution of As, to concentrate in Fe oxides. The moderate solubility of Sb reflects that this element may also be chemically dispersed, although the relationship with Fe oxides in the laterite sample is less pronounced than that observed in the nodules (Section 7.2). In contrast, W is weakly soluble in both samples, suggesting a very low degree of chemical dispersion, a feature observed in the distribution data.

Table 6: Compositions of different size fractions.

Size µm	**Sb** ppm	**As** ppm	**W** ppm	**Au** ppb	**Fe** %	**Co** ppm	**Cr** ppm
Mineralized saprolite 2678: 310E 400N, 5-6 m							
Total	389	185	102	2380	3.95	6.8	69.0
250-500	242	118	51	813	3.09	5.7	69.0
142-250	279	129	85	620	3.24	6.2	69.2
75-142	363	154	154	648	3.76	8.8	72.3
<75	449	229	76	2440	5.04	15.8	84.5
Silty clay 2713: 400E 400N, 6-7 m							
Total	40.6	53.7	17	54	3.40	17.3	142
250-500	23.9	33	<10	16	2.48	16.5	112
142-250	23.5	30	15	12	2.28	16.1	109
75-142	28.3	36	22	<5	2.72	20.0	128
<75	25.9	45	22	<10	3.47	26.5	159
Ferruginous clay 2840: 290E 240N, 3-4 m							
Total	81.6	293	15	6680	13.3	8.4	423
250-500	44.1	146	<10	2300	8.17	8.4	351
142-250	37.1	115	<10	1720	6.92	7.4	317
75-142	40.7	120	18	1630	7.32	7.6	349
<75	35.3	107	<10	1990	7.31	10.4	374
Silty clay 2880: 400E 240N, 6-7 m							
Total	49.6	138	12	317	11.5	12.3	583
250-500	37.1	103	<10	182	9.37	12.0	460
142-250	34.0	98	<10	132	8.91	11.9	436
75-142	32.8	95	<10	187	9.01	14.6	438
<75	35.0	108	<10	414	10.2	18.7	494

8. DISCUSSION AND CONCLUSIONS

8.1 Geochemical expression in different sample media

Soil and hardpan. Soil and hardpan over Fender are developed in the top metre of the sandy sediments. Over the laterite resource, the sands are only 2-3 m thick and the soil/hardpan is weakly anomalous in Au (10-27 ppb compared to <5 ppb background) although, again, As and Sb contents increase to the west. N.W. Radford (Normandy Exploration: verbal communication, July 1996) reports that soil sampling along 200N gave no anomaly in total Au, although there is a very weak BLEG (bulk leach extractable gold) anomaly (Figure 17). It is possible that the Au in the top metre drill sample is due to cross-hole contamination, despite the precautions taken. However, similar anomalies are also seen through shallow cover (<0.5 m) in soil samples at the Harmony deposit, Baxter (Robertson *et al.*, 1996) and, like here, may be attributed to bioturbation. The As, Sb and W contents of the soils are at background abundances over mineralization, but As, Sb and BLEG contents increase to the west, reflecting the contribution of shallowly buried and outcropping lateritic residuum to the soil. To the north, on sections 340N and 400N, where the sands and silty clays overlie saprolite, samples from the top metre have background concentrations of Au, As, Sb and W. Shallow soils on 400N also give no response to total Au or BLEG (Figure 17). The effectiveness of a specific series of partial extraction analyses of the 0-1 m drill samples for indicating the concealed mineralization are given by Gray *et al.*, 1996.

Medium-coarse sand. This unit of the transported overburden generally contains background concentrations of Au, As, Sb and W, except where it directly overlies the lateritic residuum and, locally, at its base, where there are more Fe oxide nodules and clay.

Silty clays. The silty clays directly overlie saprolite, but appear to be absent where the lateritic residuum is preserved. Gold abundances are generally <5 ppb. However, there are some spot concentrations (80-245 ppb) immediately above subcropping mineralization, and an associated weak enrichment (5-16 ppb) extending 50 m downslope. In comparison, the silty clays in the southern part of the deposit are significantly anomalous (60 ppb Au) for over 100 m east of the subcropping lateritic residuum (nodular ferruginous clays), probably representing mechanical dispersion from this Au-rich unit. Arsenic (40-120 ppm), Sb (12-50 ppm) and, in the north, W (5-17 ppm) are enriched in the clays and yield an anomaly extending at least 200 m downslope to the east. For As, like Au, the enrichment is strongest in the more ferruginous silty clays in the south, closest to the lateritic residuum; in comparison, the W content is below detection here, and increases to the north. Essentially all of the As and Sb in the silty clay unit is hosted by mechanically transported ferruginous nodules (80 to over 100 ppm Sb, 300-450 ppm As). Neither Au nor W is concentrated in the nodules.

Nodular ferruginous clays and ferruginous saprolite. These host the laterite resource in the south of the deposit, and are enriched in Au, As, Sb and, in part, W. Arsenic (100->300 ppm) and Sb (30->130 ppm) give the most widespread anomaly, which extends to the surface 150 m west of the deposit. Gold enrichment (100->6000 ppb) is also quite extensive, but has no surface exposure, whereas W (10-16 ppm) is confined to the centre of the ferruginous nodular clays, possibly indicating the position of the primary source.

Saprolite. Exploration drilling indicated a well developed depletion zone beneath the ferruginous nodular clays which, where these are absent, may extend to the unconformity. Elsewhere, ore-grade mineralization subcrops. In both situations, As, Sb and W concentrations remain high.

8.2 Geochemical dispersion models

Despite its small size, Fender and its environs have a range of regolith relationships, which can be expressed in terms of established general geochemical dispersion models (Butt and Zeegers, 1992):

Pre-existing profile preserved, outcropping	Model A**[0]
Pre-existing profile preserved, buried	Model A**[3]
Pre-existing profile truncated, outcropping	Model B**[0]
Pre-existing profile truncated, buried	Model B**[3]

In areas represented by A-type models, the preferred exploration procedure is to sample lateritic residuum, whether outcropping or buried, since this will detect broad multi-element anomalies. The results from Section 240N demonstrate that this procedure is appropriate in the southern part of the area, and that Fender is indicated by a wide (>250 m) anomaly in As, Sb +/- Au, W. The As + Sb anomaly extends to the area where lateritic residuum outcrops, reflecting the presence of mineralization concealed by the shallow sandy cover sediments.

In areas represented by B-type models, where saprolite outcrops or is buried, different and, in some respects, less satisfactory, sampling options are available. Gold anomalies are likely to be small in area and, if corresponding to the depletion zone, of low contrast. Wider dispersion is possible for some mobile pathfinder elements (*e.g.*, As) or contrast may be greater for less mobile elements (*e.g.* W). These features are evident in the uppermost buried saprolite on sections 340 and 400N, which Au and W haloes are very restricted, whereas those of As and Sb are more extensive, although it is uncertain whether the latter reflect secondary dispersion or are related to primary alteration. More significant dispersion haloes are evident in the silty clay unit of the transported overburden, in which As and Sb, in particular, are anomalous 200 m east of the subcrop of mineralization. These anomalies are strongest in detrital ferruginous nodules.

8.3 Implications for exploration

The Fender deposit appears to be geochemically blind to shallow (<2 m) sampling if Au alone is determined. Although a low order anomaly directly overlies the laterite resource, this was not observed in soils sampled by Normandy exploration on 200N and hence could be missed unless very close sample intervals are used. The presence of this anomaly, assuming it is not due to contamination, is dependent on the overburden being shallow and amenable to dispersion by bioturbation. Multi-element analysis, however, would locate a strong As-Sb anomaly in lateritic residuum to the west.

A sampling strategy that targets lateritic residuum, whether outcropping or buried, would locate the deposit itself. Multi-element analysis gives a broader anomaly than analysis for Au alone.

Where the regolith is truncated, restricted dispersion in both residual and transported regolith implies that Au analysis alone again may be unsatisfactory in the top 20 m, unless close spaced, overlapping angle drilling were used; anomalies in saprolite may only be single point, and of low contrast in the depleted zone. Multi-element analysis would reveal broader anomalies in the upper saprolite and indicate the weathered primary source where this is intersected in the leached and depleted saprolite.

Multi-element analysis would reveal broad, low-order As+Sb+/-W anomalies in the silty clays. Selective sampling of ferruginous nodules strongly enhances this anomaly. ***Such selective sampling is preferable to the common practice of compositing samples over intervals of 2-6 m.*** However, compositing of ferruginous nodules over 2-4 m may be advantageous, especially if they are scarce.

The preferential concentration of As and Sb in detrital ferruginous nodules, rather than in the matrix, of the silty clays implies that there has been little or no post-depositional chemical dispersion of these elements. Consequently, the anomalous response of mineralization at Fender in the clays is dependent on the partial preservation, and on-going erosion, of lateritic residuum at the time they were being deposited. This being the case, if no lateritic material had been formed initially, or had been eroded prior to clay deposition, then it is possible that similar mineralization would be completely blind. Exploration would then have to rely on the narrower targets presented by dispersion in the saprolite. It is possible there could be some dispersion along the unconformity, as noted at the deeply truncated Quasar deposit at Mt. Magnet (Robertson *et al.,* 1994), but this is not evident in the present data at Fender.

The results provide strong evidence for the advantages of multi-element analysis. This is particularly appropriate in the district around Big Bell, where mineralization is strongly enriched in a number of potential pathfinder elements. Other deposits have much lower contents of such elements and hence the multi-element response will be of lower contrast and give more restricted dispersion haloes, but nevertheless the data will at least complement that obtained for gold.

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APPENDIX

Table A1: Analytical detection limits

Element	Detection Limit (ppm)	Methods
Ag	5, 0.4	INAA, ICP-MS
As	2	INAA
Au	0.005	INAA
Ba	100	INAA
Bi	0.1	ICP-MS
Br	2	INAA
Cd	0.1	ICP-MS
Ce	2	INAA
Co	1	INAA
Cr	5	INAA
Cs	1	INAA
Cu	5	XRF
Eu	1	INAA
Fe	0.05, 0.01%	INAA, XRF
Hf	1	INAA
Hg	5, 0.005	INAA, AAS
Ir	0.02	INAA
La	0.5	INAA
Lu	0.2	INAA
Mo	5	INAA XRF
Pb	5	XRF
Rb	3,20	INAA
S	0.01%	XRF
Sb	0.2	INAA
Sc	0.1	INAA
Se	10	INAA
Sm	0.2	INAA
Sn	5	XRF
Ta	1	INAA
Te	0.1	ICP-MS
Th	0.5	INAA
Tl	0.5	ICP-MS
U	2	INAA
W	3	INAA
Yb	0.5	INAA
Zn	100, 5	INAA, XRF
Zr	5	XRF

INAA: Instrumental Neutron Activation Analysis; Becquerel Laboratories
XRF: X-ray Fluorescence Analysis; CSIRO, Floreat Park
ICP-MS: Inductively Coupled Plasma Mass Spectrometry; Analabs Pty. Ltd.

Table A2: Primary mineralization data: NAA, ICP and AAS

Sample	Hole	Easting	Northing	Depth (m)		Sb	As	Ba	Bi	Br	Cd	Ce	Cs	Cr	Co	Cu
				Upper	Lower	(inaa)	(inaa)	(inaa)	(icpms)	(inaa)	(icpms)	(inaa)	(inaa)	(inaa)	(inaa)	
						ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
09-2960	BRC251	350	400	47	48	229.00	61.40	472	<0.1	1.00	0.5	38.6	6.54	25	132.00	98
09-2961	BRC251	350	400	48	49	775.00	215.00	479	<0.1	4.65	0.7	29.4	7.70	52	156.00	81
09-2962	BRC251	350	400	49	50	618.00	203.00	311	0.1	2.44	1.1	37.4	4.69	17	90.40	101
09-2963	BRC251	350	400	50	51	389.00	157.00	567	0.1	2.55	0.6	34.4	5.41	22	62.40	79
09-2964	BRC251	350	400	51	52	234.00	87.30	480	<0.1	2.75	0.3	37.9	7.91	17	51.70	108
09-2965	BRC251	350	400	52	53	502.00	67.80	581	<0.1	2.28	0.5	31.2	4.65	23	57.40	68
09-2966	BRC251	350	400	53	54	322.00	70.30	742	0.2	1.00	0.6	32.2	6.68	21	76.20	79
09-2967	BRC251	350	400	54	55	718.00	142.00	827	0.2	2.48	0.6	34.7	9.45	19	74.00	65
09-2968	BRC251	350	400	55	56	1480.00	273.00	911	0.2	7.18	0.5	25.6	9.85	3	63.40	74
09-2969	BRC302	330	345	39	40	337.00	111.00	827	<0.1	1.00	0.8	51.1	10.90	21	70.60	94
09-2970	BRC302	330	345	41	42	482.00	92.20	292	<0.1	2.42	0.7	30.0	5.54	27	54.20	64
09-2971	BRC302	330	345	43	44	306.00	122.00	541	0.2	1.00	0.7	48.9	10.50	37	48.50	92
09-2972	BRC302	330	345	45	46	601.00	215.00	320	0.4	3.86	1.9	21.1	3.54	19	71.50	46
09-2973	BRC302	330	345	47	48	251.00	172.00	391	0.2	1.00	0.7	33.2	5.48	22	157.00	64
09-2974	BRC302	330	345	49	50	1020.00	213.00	233	<0.1	4.30	6.8	28.0	2.62	23	111.00	51
09-2975	BRC302	330	345	51	52	357.00	123.00	156	<0.1	2.05	1.3	31.5	6.10	22	105.00	83
09-2976	BRC302	330	345	53	54	623.00	112.00	219	0.3	4.30	1.6	36.2	0.50	19	50.30	131
09-2977	BRC302	330	345	55	56	96.20	588.00	678	0.1	2.09	0.2	32.7	4.45	55	87.50	113
09-2978	BRC302	330	345	57	58	46.50	58.80	760	0.1	1.00	0.5	46.7	11.10	18	48.00	134
09-2979	BRC302	330	345	59	60	55.20	27.20	351	<0.1	1.00	0.6	46.8	5.74	23	40.00	74
09-2980	BRC302	330	345	61	62	76.70	16.40	427	<0.1	1.00	0.3	37.3	7.53	24	57.80	110
09-2981	BRD235	320	240	51	52	77.10	64.70	210	<0.1	2.35	0.3	37.8	2.12	91	45.50	346
09-2982	BRD235	320	240	52	53	79.50	28.20	203	<0.1	1.00	0.3	30.4	1.89	95	12.50	292
09-2983	BRD235	320	240	53	54	149.00	37.30	395	<0.1	2.72	0.5	30.1	4.19	69	35.10	237
09-2984	BRD235	320	240	54	55	120.00	17.50	664	<0.1	1.00	0.2	59.3	5.83	29	25.20	201
09-2985	BRD235	320	240	55	56	142.00	56.10	432	<0.1	1.00	0.5	72.9	3.42	58	53.70	565
09-2986	BRD235	320	240	56	5	279.00	329.00	591	<0.1	3.16	0.8	37.7	4.46	21	111.00	1254
09-2987	BRD235	320	240	57	58	124.00	23.20	50	<0.1	1.00	0.9	64.0	0.50	88	56.40	130
09-2988	BRD235	320	240	58	59	108.00	31.80	289	<0.1	1.00	0.5	52.3	3.67	87	150.00	154
09-2989	BRD235	320	240	59	60	122.00	21.90	780	0.2	1.00	0.7	43.6	7.91	39	67.80	141
09-2990	BRD235	320	240	60	61	118.00	8.06	810	<0.1	1.00	0.1	60.0	5.40	23	77.80	107
09-2991	BRD235	320	240	61	62	140.00	21.30	365	<0.1	1.00	0.2	53.5	5.96	34	113.00	118
09-2992	BRD235	320	240	62	63	101.00	22.30	361	<0.1	1.00	0.2	55.3	7.06	32	81.50	97
09-2993	BRD235	320	240	63	64	75.10	13.70	402	0.1	1.00	0.7	56.1	6.04	30	111.00	124

Table A2: Primary mineralization data: NAA, ICP and AAS

Sample	Eu	Au	Hf	Fe	La	Pb	Lu	Hg	Hg	Mo	K	Rb	Sm	Sc	Se	Ag
	(inaa)	(inaa)	(inaa)	(inaa)	(inaa)	(xrf)	(inaa)	(inaa)	(aas)	(xrf)	(inaa)	(inaa)	(inaa)	(inaa)	(inaa)	(icpms)
	ppm	ppb	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm
09-2960	1.50	275	3.62	1.51	20.0	4	0.63	8.2	6.12	2	1.80	40.2	4.70	44.80	2.5	0.2
09-2961	1.38	1330	2.22	4.68	21.6	7	0.52	24.1	22.9	13	2.54	76.2	3.52	38.30	2.5	0.5
09-2962	1.07	1680	2.48	4.14	18.7	10	0.65	20.8	17	16	1.80	43.9	4.61	30.70	2.5	0.7
09-2963	1.27	1880	2.70	4.38	16.1	10	0.64	16.5	13	41	1.82	65.4	3.76	28.30	2.5	0.7
09-2964	0.98	310	3.34	3.41	20.0	6	0.54	11.9	8.75	4	2.40	56.9	4.62	38.60	2.5	0.2
09-2965	1.21	392	2.69	1.82	17.8	1	0.25	26.5	30.7	5	1.82	40.2	3.76	36.50	2.5	0.4
09-2966	1.11	1290	2.67	2.45	17.0	3	0.29	30.9	27.8	3	1.99	47.7	3.68	36.30	2.5	0.5
09-2967	0.83	1760	2.19	1.77	17.1	10	0.25	26.1	23.1	11	2.51	66.4	3.64	31.20	2.5	0.7
09-2968	1.86	326	1.47	2.05	19.5	11	0.10	18.8	16	12	3.69	59.9	3.44	45.70	2.5	0.3
09-2969	1.89	11	3.53	3.69	32.1	25	1.27	2.5	0.668	2	0.92	57.3	7.73	49.30	2.5	0.2
09-2970	1.48	317	3.52	2.56	19.6	9	0.81	7	1.35	4	1.19	44.3	4.89	44.00	2.5	<0.1
09-2971	2.02	1910	3.62	1.60	29.9	18	0.49	28.1	24.9	1	2.20	72.7	6.36	57.60	2.5	0.9
09-2972	0.83	10800	1.32	6.36	15.3	9	0.59	129	149	152	1.58	46.9	3.39	22.70	2.5	3.0
09-2973	1.24	4000	2.59	4.35	21.1	3	0.87	86.9	88.2	79	1.90	49.9	4.63	29.10	2.5	1.0
09-2974	1.51	3050	0.25	4.17	20.3	0	0.47	415	502	148	1.65	44.9	4.18	22.50	2.5	4.4
09-2975	1.22	860	3.10	1.89	22.3	5	0.54	153	164	18	1.28	30.2	4.48	36.10	2.5	0.5
09-2976	0.81	3890	2.12	1.70	18.8	12	0.25	244	249	13	0.62	26.5	4.04	20.50	2.5	2.1
09-2977	1.03	260	2.68	7.59	15.3	3	0.59	15.7	13	3	0.51	21.9	4.03	45.40	2.5	0.1
09-2978	1.77	44	4.02	2.45	23.8	10	0.57	7.7	6.63	2	1.09	79.7	6.21	51.00	2.5	<0.1
09-2979	1.48	35	3.86	1.88	21.8	12	0.43	8.6	6.23	3	0.70	39.7	5.92	47.40	2.5	<0.1
09-2980	1.37	29	4.10	1.59	18.1	11	0.39	2.5	1.733	2	1.14	41.5	4.46	42.80	2.5	<0.1
09-2981	1.11	54	1.95	1.46	17.6	6	0.10	32.6	30.2	4	0.25	10.0	4.71	66.50	2.5	0.2
09-2982	1.00	21	2.24	0.69	14.0	8	0.10	31.7	30.1	1	0.39	23.1	3.82	69.20	2.5	0.1
09-2983	0.84	255	2.84	0.80	14.5	9	0.54	56	56.3	2	0.79	23.1	3.39	48.00	2.5	0.2
09-2984	1.74	2530	3.92	0.95	30.0	13	0.77	35.9	35.8	2	1.18	53.1	5.87	48.10	2.5	0.4
09-2985	1.54	1020	2.97	1.14	35.2	8	0.57	102	97.5	0	0.58	29.1	6.89	51.00	2.5	0.6
09-2986	1.18	1190	3.05	3.72	15.6	5	0.81	181	173	37	1.95	63.0	4.00	32.10	2.5	2.3
09-2987	1.31	362	2.34	1.03	33.2	10	0.10	23.4	18	0	0.28	10.0	6.87	54.50	2.5	0.4
09-2988	2.88	6440	1.47	2.22	24.9	9	0.57	30.5	23.8	0	0.33	22.1	10.70	50.40	2.5	1.3
09-2989	2.65	328	3.31	1.59	19.5	8	1.59	26.1	23.5	0	1.51	69.5	8.34	39.70	2.5	0.3
09-2990	1.82	29	4.38	0.57	31.2	15	0.66	2.5	4.88	2	1.21	54.9	6.77	67.30	2.5	0.1
09-2991	2.02	23	4.90	1.80	27.8	13	0.81	2.5	5.43	0	1.03	50.7	6.81	52.20	2.5	<0.1
09-2992	2.03	27	4.52	1.88	27.8	11	1.13	2.5	4.88	1	0.96	52.0	6.98	48.40	2.5	<0.1
09-2993	2.53	13	4.62	1.94	31.9	10	0.89	2.5	5.19	0	1.14	54.0	7.50	48.00	2.5	0.2

Table A2: Primary mineralization data: NAA, ICP and AAS

Sample	Na	S	Ta	Te	Tl	Th	Sn	W	U	Yb	Zn
	(inaa)	(xrf)	(inaa)	(icpms)	(icpms)	(inaa)	(xrf)	(inaa)	(inaa)	(inaa)	(xrf)
	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
09-2960	0.327	1.098	1.61	0.3	9.8	6.01	1	134.00	4.12	4.22	335
09-2961	0.432	2.894	0.50	0.3	9.9	6.55	0	162.00	3.10	3.42	1069
09-2962	0.350	3.664	0.50	0.3	9.2	4.37	0	208.00	1.00	4.43	429
09-2963	0.283	3.694	0.50	<0.2	9.2	5.00	0	162.00	1.00	4.43	347
09-2964	0.236	2.516	0.50	<0.2	12.9	5.33	0	194.00	4.03	3.56	155
09-2965	0.206	0.969	0.50	<0.2	9.3	4.79	1	207.00	2.48	1.81	403
09-2966	0.244	1.62	1.58	<0.2	9.3	5.69	0	211.00	1.00	2.06	542
09-2967	0.298	0.654	0.50	<0.2	13.1	5.56	0	204.00	1.00	1.84	353
09-2968	0.326	1.06	0.50	<0.2	13.4	5.91	0	238.00	1.00	1.15	316
09-2969	0.161	0.543	1.33	<0.2	5.3	6.15	1	31.60	8.30	7.47	308
09-2970	0.341	0.277	1.59	<0.2	5.4	5.98	0	118.00	3.56	5.42	171
09-2971	0.678	0.382	2.42	0.3	9.4	7.64	2	137.00	1.00	3.52	177
09-2972	0.323	5.084	0.50	0.5	7.5	3.14	0	93.20	1.00	3.60	504
09-2973	0.375	3.603	1.93	0.3	9.9	5.11	0	123.00	10.30	5.75	704
09-2974	0.353	3.4	0.50	<0.2	5.9	3.15	0	112.00	14.00	3.32	817
09-2975	0.563	1.465	2.04	<0.2	5.6	5.78	0	237.00	2.85	3.70	541
09-2976	0.187	0.592	1.21	0.2	2.1	4.51	0	180.00	1.00	1.80	115
09-2977	0.332	0.425	0.50	<0.2	2.0	3.96	0	7.91	2.77	4.07	202
09-2978	0.515	0.043	0.50	<0.2	2.4	7.01	5	14.90	7.18	3.78	104
09-2979	1.080	0.045	2.10	<0.2	1.4	6.18	3	13.70	10.90	3.11	80
09-2980	1.100	0.622	2.43	<0.2	1.4	6.28	0	60.10	1.00	2.61	88
09-2981	0.049	0.112	0.50	<0.2	0.6	3.64	4	67.30	1.00	1.43	73
09-2982	0.032	0.054	0.50	<0.2	0.8	3.31	1	44.60	2.85	1.05	55
09-2983	0.083	0.042	0.50	<0.2	2.0	3.98	0	54.40	1.00	3.46	56
09-2984	0.193	0.033	1.25	<0.2	4.1	5.15	1	19.90	1.00	4.75	57
09-2985	0.116	0.048	1.84	<0.2	2.7	4.85	0	44.80	5.30	4.28	142
09-2986	0.236	4.682	0.50	<0.2	6.9	4.32	4	110.00	1.00	5.13	75
09-2987	0.028	0.875	1.12	0.2	1.6	2.92	2	73.80	41.20	1.36	116
09-2988	0.049	1.293	1.40	0.4	4.0	2.84	2	40.10	50.90	3.99	1289
09-2989	0.193	0.442	0.50	<0.2	3.2	4.78	0	172.00	43.20	10.20	213
09-2990	0.135	0.151	1.37	<0.2	1.7	6.60	2	8.77	12.10	4.47	111
09-2991	0.094	1.22	1.13	<0.2	2.7	7.49	4	1.00	27.20	5.50	401
09-2992	0.124	0.724	1.22	<0.2	2.5	7.09	1	8.78	10.60	7.36	130
09-2993	0.094	0.63	0.50	<0.2	1.4	7.21	2	7.07	78.40	6.67	79

Table A3: RAB data: NAA

Sample	Hole	Depth		Easting	Northing	Sb	As	Ba	Br	Ce	Cs	Cr	Co	Eu	Au	Hf	Fe	La	Lu	K	Rb	Sm	Sc	Na	Ta	Th	W	U	Yb	Zn
	Hole	Upper	Lower			(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppb)	(ppm)	%	(ppm)	(ppm)	%	(ppm)	(ppm)	(ppm)	%	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
09-2649	CSR001	0	1	200	400	7.4	19.5	421	2.89	86.6	3.05	255	15	0.58	3	4.04	4.04	33.0	0.35	1.50	145	4.53	18.5	0.48	1.95	20.5	1.0	4.2	2.53	106
09-2650	CSR001	1	2	200	400	6.4	37.2	311	3.84	16.7	2.47	186	9	0.25	3	3.53	3.78	8.0	0.10	0.49	58	1.20	17.9	0.21	1.08	12.6	1.0	3.0	1.12	50
09-2651	CSR001	2	3	200	400																									
09-2652	CSR001	3	4	200	400																									
09-2653	CSR002	0	1	250	400	18.8	20.9	746	2.25	79.0	3.54	363	17	0.83	3	4.80	5.75	32.1	0.40	1.33	157	4.87	18.4	0.40	1.62	28.4	1.0	4.3	2.90	50
09-2654	CSR002	1	2	250	400	16.4	34.4	171	2.93	21.2	2.54	275	8	0.25	3	4.92	5.25	14.1	0.24	0.63	76	2.24	26.5	0.12	1.93	20.8	1.0	1.0	1.81	101
09-2655	CSR002	2	3	250	400	12.1	96.5	128	1.00	37.9	1.58	140	10	0.25	3	3.26	9.51	26.3	0.21	0.26	47	2.62	34.0	0.09	1.10	15.6	1.0	3.4	1.77	164
09-2656	CSR002	3	4	250	400	10.6	67.2	185	1.00	27.6	1.65	120	10	0.25	3	3.34	7.71	16.9	0.10	0.23	34	2.05	27.7	0.08	0.50	12.5	1.0	2.4	1.23	159
09-2657	CSR002	4	5	250	400																									
09-2658	CSR003	0	1	270	400	1.0	4.5	554	2.84	64.7	3.76	99	7	0.71	3	5.34	2.67	39.5	0.40	2.25	203	5.01	9.4	0.81	1.48	24.8	3.1	6.1	2.84	50
09-2659	CSR003	1	2	270	400	12.8	25.9	336	2.54	49.4	3.65	221	13	0.25	3	5.05	4.37	21.5	0.28	1.21	124	2.77	19.0	0.42	1.74	25.8	48.4	2.6	2.16	50
09-2660	CSR003	2	3	270	400	17.1	47.1	176	4.34	56.4	1.74	251	13	0.25	3	4.36	4.70	16.1	0.26	0.49	66	2.62	23.3	0.14	2.15	19.9	1.0	2.7	2.08	109
09-2661	CSR003	3	4	270	400	10.2	367.0	282	5.03	47.7	2.15	113	19	0.83	3	3.53	4.17	29.1	0.32	0.10	39	4.25	27.8	0.12	1.23	15.3	1.0	1.0	2.06	134
09-2662	CSR003	4	5	270	400																									
09-2663	CSR004	0	1	290	400	2.3	7.5	468	2.47	73.5	3.65	95	4	0.57	3	4.58	2.39	43.6	0.42	2.87	260	5.49	8.2	1.07	1.91	30.6	1.0	5.9	3.22	50
09-2664	CSR004	1	2	290	400	1.1	5.2	572	3.21	90.5	4.70	109	7	0.65	3	6.67	2.31	50.5	0.54	3.10	244	6.50	9.2	1.31	2.18	35.4	1.0	4.2	4.10	50
09-2665	CSR004	2	3	290	400	6.1	19.4	505	1.00	83.3	4.71	150	7	0.79	3	5.27	3.70	41.5	0.47	1.90	195	5.62	12.8	0.99	2.14	31.8	1.0	1.0	3.46	123
09-2666	CSR004	3	4	290	400	15.9	43.4	226	2.61	54.2	3.60	192	14	0.60	3	4.31	3.89	20.5	0.31	0.71	96	2.95	26.5	0.22	1.94	20.0	1.0	1.0	2.01	110
09-2667	CSR004	4	5	290	400	37.2	8.7	562	3.14	78.5	5.69	81	8	2.01	3	4.05	1.97	53.2	0.30	0.44	52	6.51	33.5	0.25	0.50	13.2	5.1	1.0	2.28	126
09-2668	CSR005	0	1	300	400	1.3	3.8	465	1.00	65.6	3.43	90	10	0.70	3	4.23	2.68	35.3	0.36	2.04	204	4.59	9.4	0.81	2.91	23.1	1.0	3.8	2.67	50
09-2669	CSR005	1	2	300	400	0.5	1.5	514	1.00	63.7	2.98	65	4	0.25	3	4.25	1.52	35.3	0.40	2.73	258	4.22	6.3	1.37	3.22	27.6	1.0	4.5	2.74	50
09-2670	CSR005	2	3	300	400	3.5	13.1	447	1.00	62.0	3.36	109	4	0.25	3	3.20	2.20	36.6	0.37	3.37	278	4.27	7.5	1.16	2.08	29.6	6.9	4.6	2.54	50
09-2671	CSR005	3	4	300	400	35.1	156.0	225	3.60	27.4	3.26	345	7	0.65	3	5.07	9.80	12.3	0.29	0.41	42	2.43	40.0	0.20	1.62	27.6	24.6	3.2	2.24	116
09-2672	CSR005	4	5	300	400	31.5	50.7	480	1.00	31.8	3.25	162	10	0.56	8	4.38	4.20	17.3	0.47	0.83	65	2.89	32.8	0.31	1.27	16.2	67.1	2.9	3.45	123
09-2673	CSR006	0	1	310	400	2.2	5.0	697	1.00	52.9	3.46	79.9	7	0.25	18	3.73	2.49	34.6	0.33	2.45	224	4.01	8.4	0.77	1.81	22.6	2.7	6.6	2.39	50
09-2674	CSR006	1	2	310	400	3.8	15.5	513	2.96	35.7	3.72	144	7	0.25	3	3.15	4.01	19.8	0.34	1.92	189	2.13	12.2	0.44	2.66	28.8	5.8	5.3	2.28	50
09-2675	CSR006	2	3	310	400	46.8	79.8	268	3.48	30.9	2.88	455	9	0.25	14	5.88	9.28	14.6	0.26	1.00	85	2.13	24.4	0.19	2.03	32.8	7.3	2.7	1.76	50
09-2676	CSR006	3	4	310	400	91.4	197.0	378	2.39	23.4	3.02	412	10	0.25	244	6.00	12.40	14.4	0.25	0.46	33	2.20	32.7	0.11	2.11	33.7	9.4	1.0	1.86	50
09-2677	CSR006	4	5	310	400	258.0	242.0	614	3.48	18.2	2.93	171	8	0.25	254	3.85	8.39	10.1	0.35	1.31	43	1.45	24.0	0.16	1.29	17.1	40.1	1.0	2.27	50
09-2678	CSR006	5	6	310	400	389.0	185.0	148	5.38	24.5	4.51	69	7	0.25	2380	3.34	3.95	12.6	0.44	1.47	60	1.73	33.7	0.17	0.50	10.9	102.0	1.0	2.32	131
09-2679	CSR006	6	7	310	400	366.0	160.0	383	2.05	19.1	5.61	30	3	0.66	1140	3.53	2.27	12.8	0.65	2.53	59	1.72	43.2	0.25	0.50	6.0	158.0	1.0	4.45	129
09-2680	CSR007	0	1	330	400	1.8	4.5	583	2.01	61.6	3.39	123	9	0.72	3	4.56	2.95	33.2	0.35	1.83	186	4.23	11.2	0.64	2.17	22.1	1.0	6.2	2.71	50
09-2681	CSR007	1	2	330	400	1.0	4.2	472	1.00	65.0	2.46	64	10	0.58	3	4.47	1.95	29.9	0.41	2.43	237	3.97	7.3	0.64	1.34	15.6	4.1	2.2	2.91	50
09-2682	CSR007	2	3	330	400	9.6	20.7	574	2.29	42.2	2.08	130	4	0.25	3	4.20	3.61	23.4	0.36	2.36	221	2.44	8.8	0.59	2.29	23.8	6.0	2.1	2.57	50
09-2683	CSR007	3	4	330	400	26.6	56.2	244	1.00	35.8	2.10	234	10	0.25	3	5.18	5.41	13.9	0.23	1.12	83	1.92	22.6	0.17	2.12	25.3	7.0	4.7	1.85	106
09-2684	CSR007	4	5	330	400	32.8	75.5	227	1.00	21.7	3.16	226	13	0.50	3	4.96	5.16	10.5	0.24	0.48	57	1.76	23.0	0.11	1.74	18.4	9.5	1.0	1.79	50
09-2685	CSR007	5	6	330	400	33.6	85.0	425	1.00	16.0	3.46	213	12	0.25	9	4.66	5.01	8.8	0.20	0.10	51	1.42	22.7	0.11	1.58	17.3	9.6	2.5	1.54	106
09-2686	CSR007	6	7	330	400	26.7	160.0	206	3.40	12.9	4.64	135	19	0.25	13	3.83	5.79	7.3	0.10	0.70	61	1.23	27.8	0.10	1.33	10.7	9.1	2.6	1.46	125
09-2687	CSR007	7	8	330	400	21.9	319.0	189	3.28	12.9	8.44	75	23	0.81	34	1.78	7.12	5.9	0.37	0.45	45	2.33	59.8	0.08	0.50	4.1	10.5	4.4	2.69	265
09-2688	CSR008	0	1	350	400	1.8	4.4	814	1.00	75.3	3.41	109	11	0.73	6	4.18	3.01	43.0	0.38	2.14	214	5.25	11.5	0.65	1.90	21.8	1.0	3.6	2.84	100
09-2689	CSR008	1	2	350	400	1.4	5.4	872	2.60	75.1	3.44	117	12	0.77	3	3.77	3.48	35.2	0.46	1.84	182	4.78	14.3	0.39	2.27	21.9	3.2	1.0	3.06	50
09-2690	CSR008	2	3	350	400	1.2	3.3	658	2.17	46.6	2.76	68	6	0.25	3	4.60	2.13	26.3	0.43	2.72	243	2.84	8.7	0.67	2.24	23.9	7.5	3.6	2.98	50
09-2691	CSR008	3	4	350	400	14.9	30.0	389	1.00	32.0	2.20	121	5	0.25	10	3.40	3.38	15.6	0.28	2.13	192	1.98	8.8	0.37	1.80	23.5	13.3	2.6	1.89	50
09-2692	CSR008	4	5	350	400	29.1	58.3	255	1.00	30.3	2.06	169	8	0.25	8	3.80	4.42	14.4	0.25	1.23	101	1.87	14.5	0.17	2.00	20.3	14.6	1.0	1.63	50
09-2693	CSR008	5	6	350	400	32.1	99.2	127	1.00	14.3	2.50	134	8	0.25	9	3.59	3.90	9.3	0.10	0.52	53	1.34	18.1	0.10	1.53	12.4	17.0	1.0	1.28	102
09-2694	CSR008	6	7	350	400	42.3	601.0	454	2.90	9.0	3.64	94	13	0.25	757	2.03	8.82	4.4	0.10	0.51	47	0.98	35.1	0.07	0.50	7.8	38.1	1.0	1.12	174

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Table A3: RAB data: NAA

Sample	Hole	Depth		Easting	Northing	Sb	As	Ba	Br	Ce	Cs	Cr	Co	Eu	Au	Hf	Fe	La	Lu	K	Rb	Sm	Sc	Na	Ta	Th	W	U	Yb	Zn
	Hole	Upper	Lower			(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppb)	(ppm)	%	(ppm)	(ppm)	%	(ppm)	(ppm)	(ppm)	%	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
09-2695	CSR008	7	8	350	400	19.3	140.0	1520	2.60	27.5	2.51	90	8	0.78	285	1.14	1.59	14.9	0.23	0.66	28	3.17	53.9	0.06	0.50	3.3	14.1	1.0	1.89	177
09-2696	CSR009	0	1	375	400	3.0	9.0	676	1.00	84.5	3.46	128	11	0.89	3	4.93	3.60	44.6	0.40	1.99	178	5.75	12.8	0.47	2.65	23.2	1.0	3.9	2.91	50
09-2697	CSR009	1	2	375	400	7.8	11.6	371	1.00	32.6	3.24	269	7	0.54	3	4.38	4.39	25.2	0.28	1.31	147	2.94	14.4	0.27	1.55	25.0	4.8	3.6	2.18	112
09-2698	CSR009	2	3	375	400	10.8	27.5	382	2.01	75.7	3.40	198	12	0.78	3	4.13	4.53	28.1	0.34	1.19	133	4.53	14.3	0.20	1.94	27.0	5.3	1.0	2.61	50
09-2699	CSR009	3	4	375	400	26.6	54.7	283	2.59	58.2	3.25	193	11	0.53	3	4.65	5.10	32.2	0.34	0.77	97	4.08	17.3	0.12	1.36	25.2	8.3	1.0	2.40	112
09-2700	CSR009	4	5	375	400	33.5	65.1	295	2.95	78.5	2.38	142	15	1.04	12	4.51	3.66	45.5	0.34	0.66	93	5.60	19.9	0.11	2.48	18.6	14.1	1.0	2.39	113
09-2701	CSR009	5	6	375	400	16.4	34.9	604	4.98	55.5	3.40	107	13	1.49	10	2.95	2.65	55.4	0.52	0.57	65	7.76	18.0	0.09	2.32	14.6	1.0	2.7	3.58	50
09-2702	CSR009	6	7	375	400	41.2	69.6	257	2.81	91.5	4.71	111	28	2.10	16	4.09	3.40	61.3	0.48	0.58	73	9.74	26.7	0.11	1.80	16.4	10.6	1.0	3.36	110
09-2703	CSR009	7	8	375	400	45.7	75.1	882	1.00	122.0	6.44	67	66	1.04	15	3.91	3.12	39.5	0.26	0.94	90	4.52	27.0	0.11	0.50	12.8	16.4	2.7	2.07	100
09-2704	CSR009	8	9	375	400	26.3	69.3	347	2.11	37.0	7.50	48	6	0.25	17	3.69	2.81	25.2	0.10	1.62	92	1.86	23.9	0.07	0.50	8.8	5.4	1.0	1.12	109
09-2705	CSR009	9	10	375	400	11.9	52.2	443	2.31	41.9	8.68	39	5	0.25	16	2.90	2.34	23.3	0.10	1.25	78	2.27	19.2	0.08	0.50	5.8	6.9	3.3	0.86	50
09-2706	CSR009	10	11	375	400	3.9	15.0	535	2.11	90.9	11.10	21	7	1.31	10	3.18	1.64	38.7	0.29	1.83	135	5.09	11.6	1.26	1.20	8.3	5.4	1.0	2.08	106
09-2707	CSR010	0	1	400	400	1.6	5.2	411	2.14	50.8	3.49	106	7	0.25	3	5.87	2.83	30.9	0.41	1.77	187	3.71	10.3	0.39	2.91	28.8	5.0	3.2	3.21	50
09-2708	CSR010	1	2	400	400	1.70	4.41	428	1.00	60.7	3.27	89	6.66	0.77	16	3.71	2.50	34.4	0.34	1.83	175.0	4.47	9.26	0.488	1.87	19.10	5.07	2.72	2.32	50
09-2709	CSR010	2	3	400	400	1.2	4.3	356	1.00	71.6	3.00	87	8	0.25	3	4.88	2.48	31.6	0.43	2.71	205	3.95	8.3	0.42	3.54	28.9	5.5	2.9	2.90	50
09-2710	CSR010	3	4	400	400	6.65	10.70	386	2.70	50.2	3.07	107	7.62	0.25	3	4.98	2.97	15.2	0.29	1.28	139.0	2.42	13.00	0.229	1.77	23.40	5.61	1.00	1.95	50
09-2711	CSR010	4	5	400	400	79.4	105.0	635	3.75	80.2	2.30	245	11	0.54	19	4.68	8.23	23.3	0.37	1.25	105	3.71	20.4	0.24	1.83	29.7	10.0	1.0	2.59	50
09-2712	CSR010	5	6	400	400	35.00	44.50	305	2.36	89.6	2.89	154	18.80	0.69	13	4.48	4.12	16.9	0.32	0.50	69.4	3.28	24.30	0.124	1.53	18.80	11.60	1.00	2.19	50
09-2713	CSR010	6	7	400	400	40.6	53.7	386	2.71	67.6	2.57	142	17	0.72	14	4.91	3.40	14.9	0.32	0.88	74	3.14	22.0	0.16	1.70	15.1	16.8	1.0	2.43	102
09-2714	CSR010	7	8	400	400	41.80	62.90	515	2.06	69.4	3.89	101	31.30	0.25	13	4.63	3.07	13.3	0.30	0.58	57.8	2.45	20.00	0.183	2.17	13.30	19.10	2.28	2.12	50
09-2715	CSR010	8	9	400	400	27.8	53.2	465	1.00	34.6	5.92	56.2	12	0.63	7	3.88	2.52	20.1	0.25	1.69	99	2.73	13.8	1.08	1.43	11.9	13.3	1.0	1.79	117
09-2716	CSR010	9	10	400	400	13.3	54.0	507	1.00	16.6	7.55	31	8	0.25	7	3.47	2.23	11.5	0.20	1.86	139	1.66	8.7	1.52	1.15	8.0	6.5	1.0	1.35	50
09-2717	CSR010	10	11	400	400	10.4	25.9	584	2.21	29.4	7.75	36	14	0.66	19	3.78	2.23	18.5	0.10	1.12	150	2.42	9.9	1.86	0.50	9.1	1.0	1.0	1.38	115
09-2718	CSR011	0	1	500	400	1.6	5.0	672	3.21	81.2	3.70	127	10	0.71	3	4.88	3.06	40.4	0.37	1.85	193	5.26	9.9	0.55	1.64	22.7	1.0	5.1	2.90	50
09-2719	CSR011	1	2	500	400																									
09-2720	CSR011	2	3	500	400	0.4	2.1	490	1.00	49.5	2.88	56	3	0.25	3	4.16	1.61	29.7	0.33	2.65	244	3.38	5.7	0.54	2.04	24.6	5.4	3.6	2.53	50
09-2721	CSR011	3	4	500	400																									
09-2722	CSR011	4	5	500	400	0.8	2.4	553	1.00	53.9	3.76	77	6	0.25	3	4.52	2.51	25.8	0.33	2.08	210	3.48	10.7	0.49	2.34	30.1	4.6	4.1	2.51	50
09-2723	CSR011	5	6	500	400																									
09-2724	CSR011	6	7	500	400	14.2	60.5	449	1.00	51.6	2.31	214	9	0.59	3	4.59	5.96	15.6	0.28	1.38	108	2.86	21.0	0.23	1.48	30.9	6.5	1.0	2.20	50
09-2725	CSR011	7	8	500	400																									
09-2726	CSR011	8	9	500	400	10.7	28.0	323	1.00	59.6	2.60	97	9	0.25	3	5.36	2.60	20.0	0.30	1.24	130	2.75	16.0	0.26	1.86	27.0	5.0	1.0	2.38	50
09-2727	CSR011	9	10	500	400	6.8	39.1	341	1.00	36.5	3.00	101	7	0.57	3	4.54	3.11	22.5	0.34	1.59	159	2.94	13.6	0.31	2.46	30.7	4.8	2.9	2.48	50
09-2728	CSR011	10	11	500	400	9.3	42.1	305	1.00	20.3	3.56	142	12	0.25	3	3.41	4.13	12.6	0.22	0.77	109	1.56	15.4	0.20	3.43	23.7	7.4	3.5	1.61	50
09-2729	CSR011	11	12	500	400	11.6	50.6	365	2.61	28.9	3.67	416	53	0.65	3	2.81	4.76	13.4	0.10	0.44	82	2.06	18.6	0.19	1.58	12.3	16.0	2.7	1.36	50
09-2730	CSR011	12	13	500	400																									
09-2731	CSR011	13	14	500	400																									
09-2732	CSR012	0	1	500	340	3.42	9.25	764	3.07	65.6	3.09	242	9.82	0.76	3	5.50	4.06	35.2	0.36	1.76	152.0	4.60	11.00	0.514	1.45	23.60	4.91	3.68	2.31	50
09-2733	CSR012	1	2	500	340																									
09-2734	CSR012	2	3	500	340	0.67	2.90	501	1.00	47.2	2.80	66	3.91	0.25	3	3.63	1.88	27.6	0.33	1.88	198.0	3.35	6.86	0.442	3.18	22.30	4.22	1.00	2.23	50
09-2735	CSR012	3	4	500	340																									
09-2736	CSR012	4	5	500	340	2.73	8.13	194	2.67	78.3	4.10	136	21.00	0.71	3	3.53	3.55	35.5	0.33	0.66	98.0	4.65	16.70	0.179	3.90	26.90	1.00	2.38	2.29	50
09-2737	CSR012	5	6	500	340																									
09-2738	CSR012	6	7	500	340	15.60	60.60	598	1.00	65.4	2.17	253	9.66	0.65	8	4.31	5.40	15.6	0.31	0.63	74.8	3.27	20.70	0.156	1.23	21.30	6.50	1.00	2.01	50
09-2739	CSR012	7	8	500	340																									
09-2740	CSR012	8	9	500	340	9.70	32.00	346	1.00	50.3	2.84	132	9.16	0.25	3	5.28	2.72	15.1	0.28	1.06	126.0	2.27	16.30	0.241	1.59	18.10	6.89	1.00	2.08	50

Table A3: RAB data: NAA

Sample	Hole	Depth		Easting	Northing	Sb	As	Ba	Br	Ce	Cs	Cr	Co	Eu	Au	Hf	Fe	La	Lu	K	Rb	Sm	Sc	Na	Ta	Th	W	U	Yb	Zn
	Hole	Upper	Lower			(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppb)	(ppm)	%	(ppm)	(ppm)	%	(ppm)	(ppm)	(ppm)	%	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
09-2741	CSR012	9	10	500	340																									
09-2742	CSR012	10	11	500	340	27.40	92.20	414	1.00	25.6	3.33	186	12.30	0.25	15	4.23	5.59	9.1	0.21	0.38	49.0	1.77	29.30	0.096	1.94	21.70	10.50	2.40	1.43	50
09-2743	CSR012	11	12	500	340																									
09-2744	CSR012	12	13	500	340	25.30	71.40	206	1.00	27.3	3.38	369	43.40	0.66	19	2.35	7.93	10.8	0.31	0.45	56.0	2.84	32.30	1.420	1.69	7.48	13.40	1.00	1.97	139
09-2745	CSR012	13	14	500	340																									
09-2746	CSR013	0	1	400	340	1.43	4.47	497	2.18	59.6	3.13	111	7.00	0.84	3	3.27	2.62	34.6	0.30	1.33	126.0	4.59	10.00	0.373	0.50	16.90	1.00	2.72	2.13	50
09-2747	CSR013	1	2	400	340																									
09-2748	CSR013	2	3	400	340	1.32	5.02	388	2.14	65.7	2.75	126	12.30	0.62	3	3.86	3.47	40.1	0.33	1.16	134.0	3.77	11.80	0.291	1.10	17.20	1.00	1.00	2.13	50
09-2749	CSR013	3	4	400	340																									
09-2750	CSR013	4	5	400	340	12.20	41.80	524	1.00	34.0	2.87	240	6.26	0.25	3	4.15	5.41	22.6	0.32	1.83	181.0	2.48	14.30	0.454	2.31	30.10	3.50	2.80	2.14	50
09-2751	CSR013	5	6	400	340																									
09-2752	CSR013	6	7	400	340	40.50	209.00	846	1.00	15.3	2.24	330	6.56	0.25	81	4.93	11.00	8.6	0.10	0.35	36.2	1.46	39.60	0.099	0.50	25.90	7.00	1.00	1.21	50
09-2753	CSR013	7	8	400	340																									
09-2754	CSR013	8	9	400	340	31.10	108.00	1590	1.00	7.3	2.84	112	6.12	0.25	103	3.06	5.37	5.1	0.10	0.37	47.5	0.77	31.80	0.096	1.20	10.20	10.60	1.00	0.73	50
09-2755	CSR013	9	10	400	340																									
09-2756	CSR013	10	11	400	340	5.36	142.00	50	1.00	9.4	1.32	16	4.98	0.25	3	4.06	6.51	4.1	0.31	0.10	10.0	1.37	33.60	0.024	0.50	5.90	5.20	6.41	2.20	119
09-2757	CSR013	11	12	400	340																									
09-2758	CSR013	12	13	400	340	6.14	152.00	162	1.00	29.6	11.40	19	7.18	0.58	3	2.92	7.17	14.0	0.29	0.28	43.5	2.25	30.80	0.027	0.50	5.21	5.02	6.31	2.20	128
09-2759	CSR014	0	1	375	340	11.10	14.10	659	2.17	61.9	2.52	137	7.65	0.55	3	3.59	3.47	36.9	0.34	1.63	166.0	4.65	11.30	0.560	2.26	25.40	2.11	3.28	2.37	50
09-2760	CSR014	1	2	375	340																									
09-2761	CSR014	2	3	375	340	2.62	5.72	220	1.00	54.9	3.33	245	7.21	0.25	3	3.45	3.19	23.0	0.30	0.94	110.0	3.75	14.60	0.260	1.63	24.30	2.13	1.00	1.95	50
09-2762	CSR014	3	4	375	340	10.00	30.40	269	1.00	41.3	2.57	219	6.70	0.25	3	4.45	4.28	22.5	0.32	0.87	114.0	2.86	16.90	0.231	1.78	23.10	4.14	1.00	2.09	50
09-2763	CSR014	4	5	375	340																									
09-2764	CSR014	5	6	375	340	9.09	27.20	406	1.00	31.5	2.37	180	6.11	0.25	3	4.93	3.45	14.1	0.28	1.31	133.0	2.30	16.00	0.284	2.07	19.40	3.70	1.00	1.93	50
09-2765	CSR014	6	7	375	340	11.70	46.50	316	1.00	16.9	2.64	200	6.08	0.25	3	4.99	3.73	9.9	0.22	0.85	96.7	1.55	19.40	0.178	2.29	17.20	4.04	1.00	1.50	50
09-2766	CSR014	7	8	375	340	13.00	51.80	471	1.00	13.7	2.27	211	7.95	0.25	3	4.89	3.87	6.7	0.10	0.51	61.7	1.15	22.20	0.107	1.47	15.60	4.18	1.00	1.40	50
09-2767	CSR014	8	9	375	340	11.60	34.80	160	1.00	11.1	2.55	155	7.06	0.25	3	4.38	3.20	6.4	0.10	0.48	51.6	1.03	21.40	0.109	1.38	12.10	6.01	1.00	1.25	50
09-2768	CSR014	9	10	375	340	9.08	24.60	217	1.00	12.8	2.61	55	16.50	0.25	9	4.09	2.27	4.5	0.10	0.74	55.6	0.80	16.70	0.075	1.28	11.00	6.04	1.00	0.98	50
09-2769	CSR014	10	11	375	340	6.09	14.00	202	1.00	6.7	2.37	20	1.15	0.25	14	4.16	1.61	2.1	0.10	0.73	51.7	0.60	12.30	0.038	0.50	9.41	4.96	1.00	0.76	50
09-2770	CSR014	11	12	375	340	5.93	10.30	215	1.00	4.7	1.37	14	1.05	0.25	3	4.23	1.62	1.7	0.10	0.67	38.9	0.54	9.63	0.033	0.50	9.53	2.30	1.00	0.81	50
09-2771	CSR015	0	1	350	340	8.65	18.10	530	2.33	58.2	2.83	675	8.10	0.25	3	5.19	6.68	32.1	0.39	2.03	174.0	4.32	15.40	0.569	1.48	29.00	1.00	5.19	2.53	50
09-2772	CSR015	1	2	350	340																									
09-2773	CSR015	2	3	350	340	17.70	69.80	268	2.49	129.0	2.70	390	29.80	1.10	3	3.55	7.27	23.3	0.41	0.67	83.4	5.27	20.50	0.164	1.54	27.60	3.58	4.14	2.98	50
09-2774	CSR015	3	4	350	340																									
09-2775	CSR015	4	5	350	340	24.60	121.00	134	2.17	36.4	2.30	388	8.10	0.25	3	4.51	7.63	16.3	0.10	0.26	53.4	1.56	26.90	0.132	1.83	22.70	2.66	1.00	1.31	50
09-2776	CSR015	5	6	350	340	13.20	60.40	770	1.00	28.6	2.78	231	8.39	0.25	3	4.90	3.98	8.3	0.21	0.46	60.4	1.38	23.40	0.146	1.63	17.20	4.13	1.00	1.46	50
09-2777	CSR015	6	7	350	340																									
09-2778	CSR015	7	8	350	340	17.50	135.00	307	2.50	14.6	2.15	96	15.90	0.25	7	2.80	5.37	5.1	0.10	0.10	43.1	1.23	31.90	0.098	0.50	9.56	15.80	1.00	0.94	50
09-2779	CSR015	8	9	350	340	1.31	4.62	521	1.00	68.8	3.83	82	4.70	0.51	3	4.60	2.08	35.7	0.37	2.06	205.0	4.57	7.56	0.794	1.66	23.90	2.55	4.09	2.50	50
09-2780	CSR016	0	1	330	340	3.87	14.70	393	1.00	58.1	3.61	122	2.73	0.25	3	2.70	4.07	31.3	0.37	2.56	248.0	4.05	8.17	0.779	2.76	35.90	1.00	3.61	2.56	50
09-2781	CSR016	1	2	330	340																									
09-2782	CSR016	2	3	330	340	11.50	86.10	409	1.00	12.6	2.62	30	10.00	0.25	16	2.65	3.83	3.2	0.10	0.35	10.0	0.91	28.80	0.067	0.50	6.23	23.40	1.00	1.28	50
09-2783	CSR016	3	4	330	340	14.40	51.70	257	1.00	78.8	2.29	463	10.00	0.51	3	4.15	6.91	34.7	0.42	1.27	125.0	5.34	23.40	0.409	3.04	39.80	2.20	3.51	2.94	50
09-2784	CSR016	4	5	330	340	10.30	35.60	184	2.46	46.9	2.49	284	12.20	0.25	3	4.15	4.87	11.0	0.27	0.52	54.9	2.93	24.10	0.144	2.08	18.20	3.07	2.46	2.04	101
09-2785	CSR016	5	6	330	340																									
09-2786	CSR016	6	7	330	340	19.10	176.00	203	3.08	16.5	1.48	117	9.85	0.25	3	2.12	5.63	6.6	0.10	0.29	29.8	1.29	34.40	0.130	1.27	7.57	5.71	1.00	0.85	50

Table A3: RAB data: NAA

Sample	Hole	Depth		Easting	Northing	Sb	As	Ba	Br	Ce	Cs	Cr	Co	Eu	Au	Hf	Fe	La	Lu	K	Rb	Sm	Sc	Na	Ta	Th	W	U	Yb	Zn
	Hole	Upper	Lower			(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppb)	(ppm)	%	(ppm)	(ppm)	%	(ppm)	(ppm)	(ppm)	%	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
09-2787	CSR016	7	8	330	340	25.60	278.00	388	3.90	18.9	2.14	145	9.40	0.25	41	2.74	7.13	6.4	0.10	0.10	21.5	1.71	55.70	0.119	0.50	5.04	13.50	1.00	1.37	152
09-2788	CSR017	0	1	310	340	1.36	6.15	526	3.10	63.5	4.26	87	7.17	0.61	3	4.55	2.60	32.7	0.37	2.67	259.0	4.59	9.00	0.799	1.97	24.70	3.93	4.50	2.49	50
09-2789	CSR017	1	2	310	340	4.50	13.50	467	2.65	55.3	3.26	173	6.84	0.25	3	3.25	3.74	17.4	0.26	1.68	189.0	2.77	14.80	0.435	2.25	32.10	2.60	1.00	1.80	50
09-2790	CSR017	2	3	310	340	20.30	63.20	325	3.80	51.8	2.91	547	10.10	0.25	3	5.04	7.59	13.2	0.24	0.66	78.3	2.20	27.60	0.182	1.53	34.10	4.09	1.00	1.63	50
09-2791	CSR017	3	4	310	340	28.90	107.00	329	2.38	39.4	2.68	712	11.30	0.25	3	6.20	9.27	14.4	0.30	0.42	59.8	2.57	31.70	0.116	2.19	28.10	2.55	1.00	1.88	50
09-2792	CSR017	4	5	310	340	17.00	61.80	647	3.46	40.8	3.11	390	9.21	0.25	3	6.53	4.77	14.5	0.33	0.46	65.8	2.73	27.30	0.117	2.17	21.30	2.79	1.00	2.36	50
09-2793	CSR017	5	6	310	340	11.70	51.20	244	4.13	32.4	3.27	208	14.90	0.25	10	5.46	3.24	14.2	0.27	0.58	52.7	2.21	23.30	0.117	1.23	15.70	1.00	2.14	1.78	50
09-2794	CSR017	6	7	310	340	8.75	39.60	459	1.00	9.7	2.39	16	5.54	0.25	3	3.88	2.36	5.9	0.10	0.61	31.3	0.88	15.50	0.084	0.50	9.17	2.93	1.00	1.04	50
09-2795	CSR017	7	8	310	340	6.66	32.50	431	1.00	7.3	2.52	25	4.36	0.25	3	3.84	2.13	4.2	0.10	0.65	28.1	0.74	15.30	0.089	1.14	8.70	2.64	1.00	1.07	50
09-2796	CSR018	0	1	300	340	4.06	10.70	548	2.44	86.9	4.54	305	10.00	0.67	3	5.00	4.49	46.8	0.46	2.02	191.0	6.44	14.40	0.633	2.02	31.00	3.84	3.34	3.15	50
09-2797	CSR018	1	2	300	340	6.15	10.70	384	2.31	43.9	3.99	319	10.70	0.25	7	5.04	4.77	27.4	0.31	0.81	105.0	3.56	20.00	0.239	1.88	26.60	4.27	1.00	2.23	50
09-2798	CSR018	2	3	300	340	22.50	83.90	404	2.25	20.8	2.85	644	7.10	0.25	9	5.59	8.51	13.1	0.25	0.76	88.8	1.88	25.80	0.182	2.22	32.40	5.24	2.24	1.66	50
09-2799	CSR018	3	4	300	340	176.00	251.00	598	3.43	16.1	2.37	492	7.88	0.25	107	4.31	13.60	9.8	0.10	0.47	32.8	1.69	37.30	0.112	2.09	25.50	14.50	1.00	1.21	50
09-2800	CSR018	4	5	300	340	491.00	246.00	358	4.12	13.8	2.68	139	8.88	0.25	80	1.17	9.21	8.0	0.10	0.89	27.8	1.34	42.00	0.167	1.26	10.30	29.10	1.00	1.24	119
09-2801	CSR018	5	6	300	340	505.00	183.00	501	3.27	9.9	3.79	93	30.30	0.25	46	1.39	7.73	7.0	0.10	0.94	81.5	1.14	32.40	0.178	1.44	7.24	47.80	1.00	1.04	50
09-2802	CSR019	0	1	290	340	2.42	5.24	806	3.45	98.7	3.38	155	13.30	1.02	3	5.04	3.10	67.2	0.52	1.75	156.0	7.47	13.10	0.536	1.32	22.30	1.00	3.18	3.13	50
09-2803	CSR019	1	2	290	340	7.63	16.70	573	2.34	71.8	2.73	232	6.98	0.58	3	5.54	3.95	23.7	0.38	1.56	142.0	3.14	16.20	0.324	1.89	30.30	2.79	3.01	2.52	50
09-2804	CSR019	2	3	290	340	24.10	149.00	353	2.60	47.3	1.37	1250	6.83	0.25	3	6.52	13.50	15.8	0.31	0.65	71.2	2.47	37.10	0.148	2.21	42.90	1.00	4.24	1.91	101
09-2805	CSR019	3	4	290	340	23.10	214.00	168	1.00	19.3	2.37	713	9.16	0.25	3	5.87	14.50	11.9	0.24	0.29	36.7	2.05	38.60	0.091	1.23	31.40	3.33	4.04	1.71	101
09-2806	CSR019	4	5	290	340	21.10	172.00	593	2.82	16.4	2.12	418	7.97	0.25	3	4.91	9.49	7.7	0.10	0.37	45.6	1.32	34.00	0.135	2.04	19.00	6.41	1.00	1.29	50
09-2807	CSR019	5	6	290	340	35.40	25.50	200	1.00	79.2	5.04	67	9.42	1.14	40	4.13	1.15	38.3	0.46	1.04	43.5	5.41	52.40	0.355	0.50	6.21	93.50	1.00	3.12	131
09-2808	CSR020	0	1	270	340	5.88	13.90	870	1.00	82.5	3.48	218	9.94	0.51	3	5.27	3.90	46.1	0.46	1.93	191.0	6.25	13.20	0.551	2.63	25.40	2.73	4.62	2.77	50
09-2809	CSR020	1	2	270	340	4.43	9.35	896	1.00	58.1	2.82	187	8.35	0.25	3	5.64	3.55	29.1	0.47	1.80	175.0	3.71	15.50	0.529	2.51	33.80	4.28	2.71	3.03	50
09-2810	CSR020	2	3	270	340	21.80	195.00	417	2.24	36.5	1.87	966	10.20	0.25	3	6.14	13.50	17.9	0.29	0.61	52.2	2.57	39.50	0.133	0.50	38.90	1.00	4.57	1.94	104
09-2811	CSR020	3	4	270	340	13.50	161.00	411	2.44	13.9	2.89	559	7.30	0.25	3	5.28	10.00	8.3	0.20	0.22	43.6	1.36	35.20	0.079	1.24	23.80	1.00	3.27	1.26	50
09-2812	CSR020	4	5	270	340	12.50	130.00	1040	2.01	18.7	3.36	266	10.40	0.25	3	3.93	6.96	10.3	0.10	0.52	41.9	1.12	34.30	0.098	0.50	12.10	4.95	1.00	1.05	132
09-2813	CSR021	0	1	250	340	10.40	20.30	537	3.19	57.2	2.79	537	12.00	0.63	6	5.18	6.16	44.1	0.35	1.28	140.0	4.54	20.60	0.418	2.03	26.90	2.01	3.66	2.40	50
09-2814	CSR021	1	2	250	340	19.60	67.80	653	2.98	21.8	3.29	1310	8.97	0.25	3	6.45	12.50	16.5	0.23	0.44	42.9	1.76	34.30	0.119	2.22	36.80	1.00	4.89	1.69	50
09-2815	CSR021	2	3	250	340	22.50	293.00	254	1.00	13.5	1.53	1110	6.67	0.25	3	5.83	16.00	8.9	0.10	0.26	33.1	1.37	48.00	0.082	1.72	37.50	1.00	1.00	1.15	50
09-2816	CSR021	3	4	250	340																									
09-2817	CSR021	4	5	250	340	5.31	1030.00	387	5.46	13.9	0.50	85	6.19	0.25	21	2.68	14.40	7.5	0.10	0.10	10.0	1.54	40.50	0.089	0.50	6.51	1.00	1.00	1.36	154
09-2818	CSR022	0	1	200	340																									
09-2819	CSR022	1	2	200	340																									
09-2820	CSR022	2	3	200	340																									
09-2821	CSR022	3	4	200	340																									
09-2822	CSR023	0	1	200	240	30.4	90.0	543	2.45	47.1	2.62	608	12	0.25	3	6.59	9.59	23.2	0.31	1.34	115	3.31	39.2	0.31	1.50	35.2	1.0	5.2	2.19	139
09-2823	CSR023	1	2	200	240	68.3	382.0	199	3.67	9.1	0.50	1120	8	0.25	19	6.18	20.40	4.8	0.10	0.10	42	1.51	108.0	0.08	1.63	40.1	1.0	6.5	1.10	260
09-2824	CSR023	2	3	200	240	56.3	281.0	170	2.56	6.2	0.50	988	8	0.25	49	5.23	22.60	3.5	0.10	0.36	10	1.20	79.5	0.07	0.50	26.4	1.0	4.8	1.17	193
09-2825	CSR023	3	4	200	240																									
09-2826	CSR023	4	5	200	240	40.6	255.0	536	1.00	7.5	1.44	997	8	0.25	82	5.03	17.90	4.0	0.10	0.10	49	0.88	47.3	0.08	1.23	23.3	1.0	3.5	1.18	129
09-2827	CSR024	0	1	250	240	8.5	16.6	450	2.15	54.4	3.00	347	14	0.25	26	4.30	5.63	25.5	0.27	1.32	118	3.37	22.5	0.34	1.95	25.7	1.0	4.5	2.11	112
09-2828	CSR024	1	2	250	240	33.5	118.0	248	2.57	19.7	2.92	652	12	0.25	271	5.26	11.70	12.3	0.10	0.32	58	1.73	40.7	0.16	1.45	35.8	1.0	4.7	1.58	132
09-2829	CSR024	2	3	250	240																									
09-2830	CSR024	3	4	250	240	34.6	198.0	50	3.37	4.5	2.03	420	7	0.25	254	4.60	11.50	3.9	0.10	0.36	10	0.78	38.1	0.10	1.81	21.6	7.1	2.7	1.03	105
09-2831	CSR024	4	5	250	240																									
09-2832	CSR025	0	1	270	240	4.6	10.9	443	1.00	69.6	3.68	284	13	0.78	24	5.00	5.14	35.4	0.35	0.93	108	4.59	21.8	0.31	2.64	25.7	1.0	5.9	2.74	106

Table A3: RAB data: NAA

Sample	Hole	Depth		Easting	Northing	Sb	As	Ba	Br	Ce	Cs	Cr	Co	Eu	Au	Hf	Fe	La	Lu	K	Rb	Sm	Sc	Na	Ta	Th	W	U	Yb	Zn
	Hole	Upper	Lower			(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppb)	(ppm)	%	(ppm)	(ppm)	%	(ppm)	(ppm)	(ppm)	%	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
09-2833	CSR025	1	2	270	240	7.0	15.9	365	1.00	50.9	2.92	349	16	0.25	52	5.25	5.57	20.6	0.31	0.96	96	2.95	27.0	0.25	1.66	34.8	1.0	7.2	2.40	50
09-2834	CSR025	2	3	270	240	176.0	243.0	439	2.53	31.7	1.43	623	8	0.68	1760	6.01	14.10	13.2	0.33	1.45	49	2.10	75.7	0.19	2.46	55.8	21.9	7.8	2.08	170
09-2835	CSR025	3	4	270	240	124.0	300.0	50	1.00	11.7	1.78	636	6	0.25	2390	6.75	18.30	5.6	0.22	0.10	33	1.19	72.1	0.10	1.33	46.1	16.8	3.4	1.55	175
09-2836	CSR025	4	5	270	240	84.8	307.0	115	2.96	9.5	2.91	390	6	0.25	3670	5.54	15.00	5.4	0.10	0.10	34	1.01	50.5	0.11	1.41	28.4	17.3	3.6	1.42	125
09-2837	CSR026	0	1	290	240	4.8	11.6	580	2.19	96.2	4.03	307	16	0.55	27	4.45	4.70	37.9	0.35	1.16	158	4.83	15.7	0.46	1.69	26.6	5.0	4.5	2.63	50
09-2838	CSR026	1	2	290	240	5.1	10.0	357	1.00	81.3	3.67	287	17	0.63	88	5.39	3.92	37.0	0.41	1.04	100	4.64	23.2	0.22	2.47	25.5	1.0	3.4	2.95	50
09-2839	CSR026	2	3	290	240	54.9	163.0	659	1.00	63.9	3.01	618	13	0.56	1120	5.42	10.00	18.7	0.30	0.42	76	3.65	67.1	0.18	2.38	53.6	10.6	5.3	2.17	163
09-2840	CSR026	3	4	290	240	81.6	293.0	193	1.00	18.7	2.78	423	8	0.25	6680	5.11	13.30	9.6	0.25	0.10	34	1.73	63.1	0.12	1.15	41.0	15.3	1.0	1.66	148
09-2841	CSR026	4	5	290	240	63.1	244.0	101	3.49	9.3	2.52	377	6	0.25	2750	5.23	11.20	5.3	0.10	0.49	26	0.87	40.0	0.13	1.93	25.5	12.6	2.7	1.15	106
09-2842	CSR027	0	1	300	240	3.9	9.5	604	1.00	67.1	3.33	145	10	0.81	10	4.22	3.84	39.2	0.38	1.84	189	4.91	12.6	0.65	2.41	27.5	1.0	5.0	2.72	109
09-2843	CSR027	1	2	300	240	3.8	6.1	283	2.07	82.1	2.91	268	15	0.60	50	4.71	3.70	23.6	0.35	0.89	85	3.63	21.5	0.23	2.20	24.1	3.1	3.4	2.63	50
09-2844	CSR027	2	3	300	240	14.5	27.3	808	1.00	103.0	3.72	346	17	0.77	72	4.90	4.63	37.5	0.44	1.95	169	5.15	20.5	0.41	2.46	30.7	5.6	3.3	3.32	50
09-2845	CSR027	3	4	300	240	76.9	363.0	355	2.73	15.6	1.78	879	7	0.25	2930	5.73	18.20	8.7	0.10	0.51	34	1.70	78.9	0.12	1.44	50.7	7.3	1.0	1.20	189
09-2846	CSR027	4	5	300	240	59.7	363.0	165	3.65	12.0	1.86	364	7	0.25	2780	5.25	14.40	5.6	0.10	0.40	35	1.31	53.7	0.11	1.94	29.9	15.3	1.0	1.32	124
09-2847	CSR028	0	1	310	240	2.8	7.3	515	3.82	126.0	4.22	214	30	1.67	27	3.96	4.50	49.2	0.48	1.10	101	7.75	17.9	0.28	2.02	23.7	1.0	4.9	3.96	119
09-2848	CSR028	1	2	310	240	4.2	6.8	166	3.88	48.0	3.10	268	13	0.73	70	4.87	3.92	19.1	0.35	0.58	78	3.28	21.3	0.18	2.63	24.2	1.0	2.9	2.51	50
09-2849	CSR028	2	3	310	240	7.0	15.6	795	2.07	113.0	2.56	346	13	0.88	50	4.66	4.55	35.6	0.42	1.50	166	5.37	16.4	0.30	2.86	33.1	1.0	3.5	3.15	50
09-2850	CSR028	3	4	310	240	79.0	190.0	383	2.89	33.1	2.16	1220	8	0.25	917	6.12	17.40	15.0	0.25	0.52	43	2.52	71.4	0.12	1.40	54.7	1.0	6.2	1.61	155
09-2851	CSR028	4	5	310	240	67.8	300.0	50	4.56	13.8	1.48	468	6	0.25	847	6.10	14.00	6.8	0.22	0.49	41	1.34	71.2	0.10	1.76	42.7	1.0	1.0	1.36	165
09-2852	CSR028	5	6	310	240	58.2	408.0	361	4.54	9.0	3.88	305	5	0.25	2210	5.48	15.80	5.3	0.10	0.55	44	1.09	84.6	0.09	0.50	30.3	10.2	1.0	0.95	176
09-2853	CSR029	0	1	330	240	3.5	10.9	490	1.00	85.9	3.25	240	14	0.79	12	4.70	4.20	40.1	0.40	1.11	137	5.59	15.4	0.32	0.50	23.4	4.7	5.8	2.95	112
09-2854	CSR029	1	2	330	240	7.0	14.3	503	2.96	95.0	2.78	448	20	0.71	56	4.73	5.71	25.0	0.33	0.61	105	4.10	22.3	0.20	2.04	27.8	1.0	2.7	2.72	104
09-2855	CSR029	2	3	330	240	4.4	14.1	535	2.12	69.2	2.53	234	14	0.25	22	4.03	4.09	29.0	0.37	1.70	178	3.45	12.9	0.32	1.79	32.2	8.7	2.6	2.99	50
09-2856	CSR029	3	4	330	240	32.8	86.7	400	2.03	31.1	3.20	669	10	0.25	27	4.83	10.40	19.5	0.25	0.91	107	2.33	37.0	0.16	1.95	41.8	1.0	4.3	1.90	117
09-2857	CSR029	4	5	330	240	52.0	151.0	353	2.05	19.0	2.86	818	9	0.25	81	6.29	15.40	9.4	0.10	0.10	40	1.59	41.8	0.08	1.69	37.4	1.0	4.1	1.62	119
09-2858	CSR029	5	6	330	240	39.6	103.0	418	2.23	27.9	2.63	600	10	0.25	318	5.94	9.85	11.3	0.25	0.69	84	1.64	31.1	0.16	2.57	27.2	6.3	1.0	1.54	50
09-2859	CSR029	6	7	330	240	82.7	222.0	430	2.70	7.5	2.04	750	7	0.25	836	5.71	14.40	4.8	0.10	0.10	43	0.83	44.4	0.11	1.24	33.7	1.0	4.2	1.01	124
09-2860	CSR030	0	1	350	240	2.0	6.9	379	1.00	59.1	3.44	153	11	0.74	21	4.08	3.36	34.0	0.33	1.78	155	4.38	14.1	0.39	0.50	20.3	1.0	3.4	2.47	104
09-2861	CSR030	1	2	350	240	3.4	6.7	411	2.05	124.0	3.41	268	15	0.88	31	4.33	4.36	30.0	0.38	0.68	129	4.67	20.3	0.25	2.02	27.4	1.0	2.9	2.92	50
09-2862	CSR030	2	3	350	240	2.2	4.4	456	1.00	117.0	3.64	122	8	0.53	19	4.23	2.83	24.5	0.38	1.81	183	3.94	13.5	0.42	1.49	27.1	1.0	2.5	2.95	50
09-2863	CSR030	3	4	350	240	55.8	145.0	549	2.35	43.7	2.56	1040	18	0.25	40	6.00	14.90	18.7	0.25	0.89	61	3.20	49.3	0.12	2.03	51.6	1.0	5.8	2.18	134
09-2864	CSR030	4	5	350	240	57.0	190.0	314	2.09	21.8	2.32	684	9	0.25	230	6.56	14.30	12.4	0.25	0.51	55	1.98	50.3	0.09	1.44	42.8	1.0	5.0	1.72	141
09-2865	CSR030	5	6	350	240																									
09-2866	CSR030	6	7	350	240	34.8	181.0	229	1.00	9.4	2.99	308	9	0.25	681	4.21	10.90	4.9	0.10	0.10	27	0.82	48.8	0.12	1.36	21.7	7.7	2.3	0.89	132
09-2867	CSR031	0	1	375	240	2.7	6.9	467	2.89	67.7	3.72	185	11	0.78	10	4.19	3.74	44.7	0.38	1.51	152	5.32	15.4	0.46	1.57	22.1	1.0	4.7	2.93	105
09-2868	CSR031	1	2	375	240																									
09-2869	CSR031	2	3	375	240	5.4	13.2	509	2.54	33.1	2.76	141	7	0.25	11	3.58	3.39	18.2	0.25	2.17	219	2.05	11.7	0.44	2.32	27.9	6.1	2.7	1.96	50
09-2870	CSR031	3	4	375	240																									
09-2871	CSR031	4	5	375	240	71.1	170.0	326	2.16	17.6	2.47	1240	9	0.25	92	6.87	17.90	10.3	0.23	0.10	38	1.81	47.0	0.08	1.95	51.7	1.0	5.5	1.62	118
09-2872	CSR031	5	6	375	240																									
09-2873	CSR031	6	7	375	240	43.9	216.0	233	1.00	14.3	1.65	383	9	0.25	733	4.95	14.50	6.6	0.10	0.89	27	1.21	55.1	0.11	1.60	28.6	1.0	2.1	1.17	119
09-2874	CSR032	0	1	400	240	1.7	7.0	643	4.37	86.0	3.67	141	12	1.23	3	4.59	3.80	47.9	0.45	1.97	188	6.38	13.3	0.55	2.08	26.1	1.0	3.5	3.34	107
09-2875	CSR032	1	2	400	240																									
09-2876	CSR032	2	3	400	240	1.0	2.4	567	4.62	155.0	3.31	107	17	0.79	10	4.93	2.74	47.1	0.53	1.72	203	5.69	14.1	0.50	1.99	29.6	4.9	3.7	3.98	50
09-2877	CSR032	3	4	400	240																									
09-2878	CSR032	4	5	400	240	46.9	102.0	641	2.34	30.9	1.65	865	9	0.25	56	5.41	11.50	15.6	0.24	0.99	125	2.01	30.4	0.21	1.44	36.4	1.0	4.5	1.87	50

Table A3: RAB data: NAA

Sample	Hole	Depth		Easting	Northing	Sb	As	Ba	Br	Ce	Cs	Cr	Co	Eu	Au	Hf	Fe	La	Lu	K	Rb	Sm	Sc	Na	Ta	Th	W	U	Yb	Zn
	Hole	Upper	Lower			(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppb)	(ppm)	%	(ppm)	(ppm)	%	(ppm)	(ppm)	(ppm)	%	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
09-2879	CSR032	5	6	400	240	41.4	108.0	540	2.51	24.8	2.45	545	10	0.25	111	5.99	11.50	13.6	0.26	1.05	80	1.90	28.8	0.15	1.82	31.7	8.4	4.7	1.95	50
09-2880	CSR032	6	7	400	240	49.6	138.0	300	4.29	26.4	1.75	583	12	0.25	317	5.03	11.50	9.9	0.10	0.10	49	1.66	42.4	0.11	2.27	29.4	11.7	3.2	1.67	113
09-2881	CSR032	7	8	400	240																									
09-2882	CSR033	0	1	500	240	2.5	6.8	682	1.00	80.4	3.23	243	10	0.82	3	4.99	3.83	47.7	0.40	2.48	182	5.98	11.5	0.56	1.18	24.7	1.0	4.9	3.02	100
09-2883	CSR033	1	2	500	240																									
09-2884	CSR033	2	3	500	240	2.4	5.2	370	1.00	46.9	3.28	121	6	0.25	6	3.75	3.05	27.2	0.30	2.02	207	3.05	9.5	0.36	2.93	26.0	8.3	3.6	2.09	50
09-2885	CSR033	3	4	500	240																									
09-2886	CSR033	4	5	500	240	1.0	5.4	518	1.00	65.0	2.70	102	9	0.25	3	3.18	2.99	27.1	0.34	1.78	189	2.92	11.5	0.32	2.90	28.2	7.4	2.9	2.55	50
09-2887	CSR033	5	6	500	240																									
09-2888	CSR033	6	7	500	240	7.8	13.2	368	1.00	70.3	3.66	236	18	0.54	22	4.86	4.26	22.3	0.32	0.77	99	3.45	22.9	0.15	2.54	25.6	1.0	2.4	2.40	50
09-2889	CSR033	7	8	500	240																									
09-2890	CSR033	8	9	500	240	16.4	28.8	255	1.00	25.1	2.28	328	13	0.25	61	5.46	5.29	14.3	0.27	0.63	58	1.94	27.4	0.10	2.38	25.7	1.0	4.5	1.93	50
09-2891	CSR033	9	10	500	240																									
09-2892	CSR033	10	11	500	240	17.4	70.8	416	1.00	17.0	1.37	499	12	0.25	64	4.92	10.60	12.3	0.10	1.35	80	1.44	35.7	0.13	2.79	28.7	1.0	3.4	1.36	50
09-2893	CSR033	11	12	500	240	20.6	114.0	216	1.00	5.7	3.15	1030	12	0.25	24	3.88	19.40	5.4	0.10	0.84	40	0.70	73.9	0.06	4.06	20.1	1.0	4.8	0.76	159
09-2894	CSR033	12	13	500	240																									
09-2895	CSR033	13	14	500	240	7.2	61.5	456	3.49	6.8	1.45	307	9	0.25	42	3.23	11.30	3.4	0.10	0.61	30	0.68	27.3	0.72	1.85	6.3	1.0	1.0	0.69	108

Table A4: Ferruginous nodules: NAA

Sample_id	Easting	Sb (pp	normSb	As (pp	normAs	W (pp	normW	Au (ppb)	Fe (%)	normFe	Ba (pp	Br (pp	Ce (pp	Cs (pp	Cr (ppm	Co (pp
09-2819Fe	200	18.30	43.87	45.70	109.55	1.00	2.40	3.0	14.60	2.40	558.0	2.83	72.60	-1.00	1410.0	17.50
09-2814Fe	250	58.80	53.87	225.00	206.15	1.00	0.92	33.0	38.20	0.92	4530.0	2.16	12.50	-1.00	5540.0	7.35
09-2810Fe	270	50.10	51.12	380.00	387.76	1.00	1.02	51.2	34.30	1.02	749.0	-2.00	11.80	-1.00	3520.0	8.84
09-2804Fe	290	58.00	51.13	500.00	440.81	3.15	2.78	3.0	39.70	0.88	262.0	-2.00	21.20	1.48	3320.0	5.62
09-2798Fe	300	72.90	71.07	381.00	371.45	1.00	0.97	3.0	35.90	0.97	835.0	-2.00	15.50	-1.00	2860.0	5.66
09-2790Fe	310	67.50	63.00	339.00	316.40	4.86	4.54	3.0	37.50	0.93	767.0	-2.00	111.00	-1.00	2360.0	6.20
09-2783Fe	330	72.90	102.47	305.00	428.71	1.00	1.41	3.0	24.90	1.41	858.0	2.19	160.00	-1.00	1200.0	18.80
09-2775Fe	350	98.90	93.05	408.00	383.87	1.00	0.94	3.0	37.20	0.94	296.0	-2.00	35.70	-1.00	2490.0	10.90
09-2764Fe	375	146.00	145.17	357.00	354.97	5.56	5.53	3.0	35.20	0.99	2860.0	-2.00	37.90	-1.00	1720.0	7.23
09-2752Fe	400	95.70	103.38	595.00	642.75	7.35	7.94	212.0	32.40	1.08	2570.0	-2.00	13.80	-1.00	751.0	4.38
09-2738Fe	500	78.90	84.97	402.00	432.92	4.40	4.74	3.0	32.50	1.08	2150.0	2.55	41.40	-1.00	1420.0	10.60
09-2649Fe	200	26.50	103.17	57.40	223.47	1.00	3.89	3.0	8.99	3.89	564.0	3.43	90.00	2.99	577.0	25.50
09-2655Fe	250	21.50	31.62	240.00	352.94	1.00	1.47	3.0	23.80	1.47	155.0	-2.00	37.80	-1.00	107.0	8.44
09-2660Fe	270	53.30	194.73	83.60	305.43	1.00	3.65	3.0	9.58	3.65	130.0	2.72	181.00	3.18	518.0	13.50
09-2666Fe	290	48.90	172.88	110.00	388.89	3.92	13.86	3.0	9.90	3.54	777.0	2.39	148.00	2.88	471.0	30.30
09-2676Fe	300	660.00	320.83	1330.00	646.53	65.90	32.03	39.9	72.00	0.49	753.0	-5.00	65.00	8.88	2040.0	18.50
09-2670Fe	310	10.50	92.57	36.50	321.79	4.07	35.88	3.0	3.97	8.82	267.0	-2.00	3.91	-1.00	260.0	-1.00
09-2684Fe	330	262.00	272.92	414.00	431.25	4.86	5.06	3.0	33.60	1.04	3610.0	2.90	125.00	-1.00	1230.0	16.10
09-2693Fe	350	219.00	318.05	1010.00	1466.80	26.10	37.90	8.1	24.10	1.45	1370.0	-2.00	28.30	2.59	458.0	27.20
09-2702Fe	375	462.00	903.35	401.00	784.08	30.50	59.64	3.0	17.90	1.96	2480.0	3.58	355.00	3.75	346.0	286.00
09-2713Fe	400	409.00	513.08	428.00	536.92	21.00	26.34	3.0	27.90	1.25	1400.0	2.00	161.00	-1.00	915.0	67.50
09-2727Fe	500	53.00	67.45	419.00	533.27	7.17	9.13	3.0	27.50	1.27	324.0	-2.00	39.30	2.21	509.0	14.60

Table A4: Ferruginous nodules: NAA

Sample_id	Eu (pp	Hf (pp	Ir (ppb	La (pp	Lu (pp	Mo (pp	K (%	Rb (pp	Sm (pp	Sc (pp	Se (pp	Ag (pp	Na (%	Ta (pp	Th (pp	U (pp	Yb (pp	Zn (pp
09-2819Fe	0.76	5.12	-20.0	24.00	0.36	-10.0	0.94	78.4	4.18	23.10	-5.0	-5.0	0.332	-1.00	51.70	5.10	2.49	-100.0
09-2814Fe	-0.50	6.88	-20.0	14.10	-0.20	-10.0	-0.20	-20.0	1.36	73.40	-5.0	-5.0	0.032	-1.00	81.90	6.69	0.61	224.0
09-2810Fe	-0.50	5.84	-20.0	9.18	-0.20	-10.0	-0.20	-20.0	1.46	58.40	-5.0	-5.0	0.036	-1.00	59.50	7.46	1.02	126.0
09-2804Fe	-0.50	7.19	-20.0	17.30	-0.20	-10.0	-0.20	-20.0	2.26	70.10	-5.0	-5.0	0.038	-1.00	77.00	6.95	0.97	277.0
09-2798Fe	0.61	7.17	-20.0	16.00	-0.20	-10.0	-0.20	-20.0	2.23	70.70	-5.0	-5.0	0.043	-1.00	85.70	5.71	1.48	228.0
09-2790Fe	0.89	6.93	-20.0	32.80	0.24	-5.0	-0.20	-20.0	4.59	51.50	-5.0	-5.0	0.049	-1.00	64.50	4.01	2.16	122.0
09-2783Fe	1.07	3.77	-20.0	24.30	0.35	-10.0	-0.20	-20.0	5.22	44.90	-5.0	-5.0	0.056	-1.00	47.10	3.21	2.77	-100.0
09-2775Fe	-0.50	7.32	-20.0	74.10	-0.20	-5.0	0.24	27.0	3.44	62.30	-5.0	-5.0	0.029	-1.00	66.70	3.98	1.22	259.0
09-2764Fe	-0.50	7.04	-20.0	19.90	-0.20	-10.0	0.23	31.5	3.15	44.20	-5.0	-5.0	0.039	-1.00	96.10	-2.00	1.48	-100.0
09-2752Fe	-0.50	5.65	-20.0	9.74	-0.20	-5.0	0.26	-20.0	1.54	68.70	-5.0	-5.0	0.041	-1.00	60.10	3.42	1.08	152.0
09-2738Fe	0.81	6.35	-20.0	29.10	0.32	-10.0	0.54	66.6	3.98	49.60	-5.0	-5.0	0.069	1.89	73.40	4.69	2.13	-100.0
09-2649Fe	0.97	3.81	-20.0	31.80	0.41	-10.0	0.52	69.0	4.79	29.40	-5.0	-5.0	0.231	1.69	20.80	4.27	2.92	-100.0
09-2655Fe	0.82	4.03	-20.0	25.90	0.30	-10.0	-0.20	-20.0	3.22	53.80	-5.0	-5.0	0.036	-1.00	22.40	5.05	2.26	192.0
09-2660Fe	-0.50	5.07	-20.0	22.60	0.30	-10.0	0.30	50.8	3.72	25.00	-5.0	-5.0	0.102	-1.00	33.90	-2.00	2.25	-100.0
09-2666Fe	0.81	4.59	-20.0	23.20	0.32	-10.0	0.61	47.2	3.59	26.10	-5.0	-5.0	0.137	1.21	33.00	2.95	2.18	-100.0
09-2676Fe	1.47	15.20	-20.0	41.30	0.80	-30.0	1.36	88.8	6.91	133.00	-10.0	-10.0	0.313	3.06	153.00	16.80	5.54	219.0
09-2670Fe	-0.50	1.67	-20.0	2.17	-0.20	-5.0	-0.20	-20.0	0.49	9.25	-5.0	-5.0	0.294	-1.00	26.50	2.94	-0.50	-100.0
09-2684Fe	-0.50	5.00	-20.0	38.70	-0.20	-10.0	0.47	28.6	5.02	41.40	-5.0	-5.0	0.037	1.32	68.80	2.99	1.35	-100.0
09-2693Fe	-0.50	3.80	-20.0	19.70	0.28	-10.0	0.57	30.7	2.65	37.40	-5.0	-5.0	0.062	1.59	38.10	7.10	1.89	-100.0
09-2702Fe	3.81	4.00	-20.0	101.00	0.60	-10.0	0.94	41.5	17.30	31.00	-5.0	-5.0	0.111	-1.00	39.00	-2.00	4.29	-100.0
09-2713Fe	1.35	4.58	-20.0	37.00	0.37	-10.0	0.67	29.6	7.30	38.50	-5.0	-5.0	0.085	1.35	48.10	-2.00	2.82	-100.0
09-2727Fe	-0.50	7.93	-20.0	20.90	0.25	-10.0	-0.20	-20.0	2.29	56.60	-5.0	-5.0	0.052	1.66	142.00	6.71	1.88	158.0

Table A5: Size fraction analyses: NAA

Sample	Hole	Size		Sb	As	W	Au (ppb)	Fe	Co	Cr	Ba	Br	Ce	Cs	Eu	Hf	La	Lu	Rb	Sm	Sc	Na	Ta	Th	U	Yb	Zn
2678A	sieved	<75um		449	229	76	2440	5.04	15.8	84.5	542	5.78	48.7	5.31	1.01	4.53	26.4	0.87	83.5	3.42	48.1	0.251	1.22	15.1	4.38	4.59	127
2678B	sieved	<142um	>75um	363	154	154	648	3.76	8.77	72.3	147	3.95	23.1	3.56	-0.5	3.56	12.7	0.42	64.2	1.53	45.7	0.169	-1.0	11.3	3.17	2.78	127
2678C	sieved	<250um	>142um	279	129	85	620	3.24	6.24	69.2	185	3.54	15.7	2.56	0.58	2.70	10.8	0.28	68.4	1.44	37.8	0.154	-1.0	8.89	-2.0	1.91	109
2678D	sieved	<500um	>250um	242	118	51	813	3.09	5.66	69.0	-100	3.07	17.8	2.93	0.58	2.43	10.1	0.30	62.7	1.46	30.2	0.157	-1.0	8.62	-2.0	2.07	103
2713A	sieved	<75um		25.9	45	22	-10	3.47	26.5	159	382	5.05	106	4.78	0.99	6.06	19.8	0.49	90.3	4.45	27.7	0.173	1.57	17.9	-2.0	3.14	-100
2713B	sieved	<142um	>75um	28.3	36	22	-5	2.72	20.0	128	330	3.70	80.7	3.71	0.55	4.91	15.6	0.29	91.9	3.34	22.2	0.196	2.12	14.0	-2.0	2.28	-100
2713C	sieved	<250um	>142um	23.5	30	15	12	2.28	16.1	109	206	-2.0	63.2	2.74	0.67	3.93	12.6	0.27	71.4	2.60	18.5	0.162	1.79	11.5	-2.0	1.91	-100
2713D	sieved	<500um	>250um	23.9	33	-10	16	2.48	16.5	112	265	-2.0	59.8	2.34	-0.5	4.07	12.5	0.29	77.3	2.48	18.5	0.142	1.89	11.7	-2.0	2.16	-100
2840A	sieved	<75um		35.3	107	-10	1990	7.31	10.4	374	129	5.26	25.3	3.23	-0.5	7.91	15.9	0.30	52.3	2.34	51.7	0.185	2.07	33.6	-2.0	2.22	120
2840B	sieved	<142um	>75um	40.7	120	18	1630	7.32	7.56	349	164	3.28	22.5	3.59	-0.5	6.33	12.5	0.21	67.2	1.80	48.3	0.174	2.03	28.5	-2.0	1.46	139
2840C	sieved	<250um	>142um	37.1	115	-10	1720	6.92	7.44	317	280	5.93	16.5	1.54	-0.5	4.78	10.1	-0.2	44.9	1.58	43.1	0.140	1.88	26.3	-2.0	1.66	109
2840D	sieved	<500um	>250um	44.1	146	-10	2300	8.17	8.44	351	-100	5.41	16.9	3.01	-0.5	5.29	9.38	0.20	40.3	1.38	47.8	0.127	1.86	30.5	2.80	1.52	123
2880A	sieved	<75um		35.0	108	-10	414	10.2	18.7	494	414	3.98	52.7	2.29	-0.5	6.46	15.2	0.26	64.2	2.49	45.9	0.142	1.14	30.5	3.86	2.17	131
2880B	sieved	<142um	>75um	32.8	95	-10	187	9.01	14.6	438	163	4.50	32.2	2.65	-0.5	5.51	11.3	0.25	55.0	1.84	40.4	0.154	1.56	24.9	2.49	1.71	113
2880C	sieved	<250um	>142um	34.0	98	-10	132	8.91	11.9	436	253	-2.0	27.1	3.46	-0.5	4.77	9.07	-0.2	41.7	1.50	38.9	0.140	1.29	23.6	2.64	1.53	104
2880D	sieved	<500um	>250um	37.1	103	-10	182	9.37	12.0	460	263	4.40	23.2	2.37	-0.5	5.15	8.44	-0.2	49.5	1.38	39.5	0.127	1.56	24.6	4.13	1.35	104