RESULTS OF A MINERALOGICAL INVESTIGATION OF SEVEN ROCK SAMPLES WITH ELEVATED SCINTILLOMETER READINGS

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EXECUTIVE SUMMARY

Seven rock samples with elevated scintillometer readings were submitted to the SGS Advanced Mineralogy Facility in Brisbane for mineralogical investigation. The client was particularly interested in information on the uranium-bearing minerals in the samples.

It should be noted that, in most cases, only a single fragment, with a maximum dimension of about 30mm, was selected for mineralogical investigation.. This fragment is unlikely to be representative of the entire sample and it is recommended that any further mineralogical work be carried out on a larger number of fragments.

The results show that the two porphyry samples (83003 and 83004) are mainly composed of quartz, feldspars and sericite. The four ironstone samples (83006 to 83009) are composed of variable proportions of quartz, sericite, chlorite and iron and/or titanium oxides. The dominant minerals in the altered granite sample (83023) are quartz, K-feldspar and kaolinite.

Although high resolution analyses were carried out on the samples, no classical, discreet, uranium-rich minerals (such as uraninite, autunite and coffinite) larger than a few micrometres were detected. Of these discrete uranium minerals, brannerite, apparently with a relatively high iron content, is the most common.

Trace amounts of REE-bearing minerals were detected in all of the samples. Semi-quantitative analyses of a large number of points on these REE minerals show that some contain uranium at levels ranging between 1 and 30 mass percent.

It appears that titanium-iron-oxide phases associated with the REE-bearing phases may also have uranium contents of up to 5 mass percent.

Most of the uranium-bearing minerals that were detected in the samples have complicated chemistries and display very complex textural relationships with the associated minerals such as clays and micas. The presence of these complex intergrowths makes unambiguous identification of the minerals and their uranium contents very difficult.

Due to the complex mineralogy and textures of the uranium-bearing minerals, it is not possible to provide quantitative uranium deportment data. However, it is possible that the titanium-iron-oxide type minerals host the bulk of the uranium with most of the balance hosted by the uranium-bearing REE minerals.

Detailed microprobe work will need to be done to confirm the observation made during this investigation.

1. INTRODUCTION

Seven rock samples with elevated scintillometer readings were submitted to the SGS Advanced Mineralogy Facility in Brisbane for mineralogical investigation. The client was particularly interested in information on the uranium-bearing minerals in the samples.

2. SAMPLES RECEIVED

The samples listed in **Table 2.1** were received for mineralogical investigation.

Table 2.1: List of samples received for the mineralogical investigation

SGS label	Sample	Lithology (provided by client)
C	83003	Porphyry with orbicular texture
D	83004	Fine grained porphyry
E	83006	Ironstone
F	83007	Ironstone
G	83008	Ironstone
H	83009	Ironstone
K	83023	Vuggy weathered granite

3. SAMPLE PREPARATION

Epoxy-mounted, polished blocks were prepared of sub-samples of each of the samples. All samples were carbon-coated prior to analysis using the QEMSCAN® system. It should be noted that, for most samples, only a single fragment with maximum dimensions of close to 30mm was selected for mineralogical investigation. This fragment is unlikely to be representative of the entire sample and it is recommended that any further mineralogical work be carried out on a larger number of fragments.

4. ANALYTICAL PROCEDURES USED

The QEMSCAN® modes of measurement used to analyse these samples are listed below. Descriptions of the analysis types are given in Appendix A: QEMSCAN® Analysis Modes.

- Bulk Mineral Analysis (BMA – Line analyses)
- Field Scan Analysis (FSA – full X-ray mapping on the polished block)
- Specific Mineral Search (SMS – Full X-ray mapping on selected particles)

All data has been processed using QEMSCAN® analysis software iExplorer v4.2.

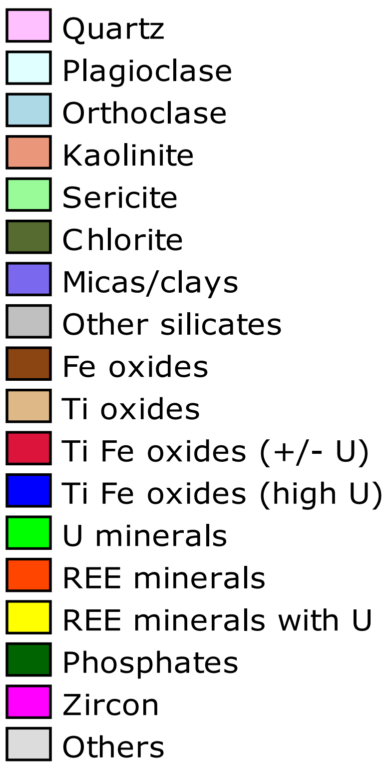
5. RESULTS

5.1 Bulk mineralogy

The results of the QEMSCAN BMA (Bulk Mineral Analysis) analyses were used to determine the modal mineralogy of the samples.

QEMSCAN® data are classified using a very detailed chemical-based mineral list. Typically, this list would contain over 500 species, with the resulting data too detailed to be directly interpreted. iExplorer allows for a simplification of these mineral species into a manageable format, by creation of mineral groupings. Figure 5.1 shows the list of minerals used for this investigation. Details of the minerals in each group are provided overleaf.

Figure 5.1: Mineral list used during this report.



Mineral Group Descriptions

- Quartz: includes quartz
- Plagioclase: includes plagioclase feldspar minerals (mainly Na-rich)
- Orthoclase: includes all K-bearing feldspar minerals
- Kaolinite: includes kaolinite and similar minerals
- Sericite: includes K-Al-rich micas (mainly sericite and muscovite)
- Chlorite: includes chlorite-type minerals
- Micas/clays: includes mica-type minerals not included in the Sericite group
- Other Silicates: includes all other silicate phases not included in the groups above
- Fe-oxides: includes all Fe-oxide minerals such as magnetite and hematite;
- Ti-oxides: includes rutile and other Ti-rich oxides
- Ti Fe oxides (+/- U): includes ilmenite and similar oxides generally very finely intergrown with silicate minerals and sometimes containing uranium
- Ti Fe oxides (high U): includes ilmenite and similar oxides apparently containing a relatively high uranium content
- U minerals: discrete uranium minerals, apparently mainly iron-rich brannerite
- REE minerals: includes various Rare Earth Element minerals, mainly florencite
- REE minerals with U: includes various Rare Earth Element minerals that apparently have with high uranium contents
- Phosphates: phosphate minerals other than REE phosphates, mainly apatite and crandallite
- Zircon: includes zircon
- Others: includes all other minerals not include above

The bulk modal mineralogical compositions of the samples, based on the QEMSCAN Bulk Modal Analyses, are shown in **Table 5.1**

The results show that the two porphyry samples (83003 and 83004) are mainly composed of quartz, feldspars and sericite. The four ironstone samples (83006-83009) are composed of variable proportions of quartz, sericite, chlorite and iron and/or titanium oxides. The dominant minerals in the altered granite sample (83023) are quartz, K-feldspar and kaolinite.

Field scans carried out on polished sections of each of the seven samples are included in Appendix B.

5.2 Uranium-bearing minerals

Although high resolution analyses were carried out on the samples, no classical, discreet, uranium-rich minerals (such as uraninite, autunite and coffinite) larger than a few micrometres were detected. Of these discrete uranium minerals, brannerite, apparently with a relatively high iron content, is the most common. Brannerite is included in the category “U minerals” in **Table 5.1** and **Figure 5.1**.

Trace amounts of REE-bearing minerals were detected in all of the samples. Semi-quantitative analyses of a large number of points on these REE minerals show that some contain uranium at levels ranging between 1 and 30 mass percent. Some examples are shown in Appendix C.

It appears that titanium-iron-oxide phases associated with the REE-bearing phases may also have uranium contents of up to 5 mass percent. Some examples of these phases and their compositions are shown in Appendix C.

Table 5.1: Bulk modal mineralogy based on QEMSCAN BMA analyses

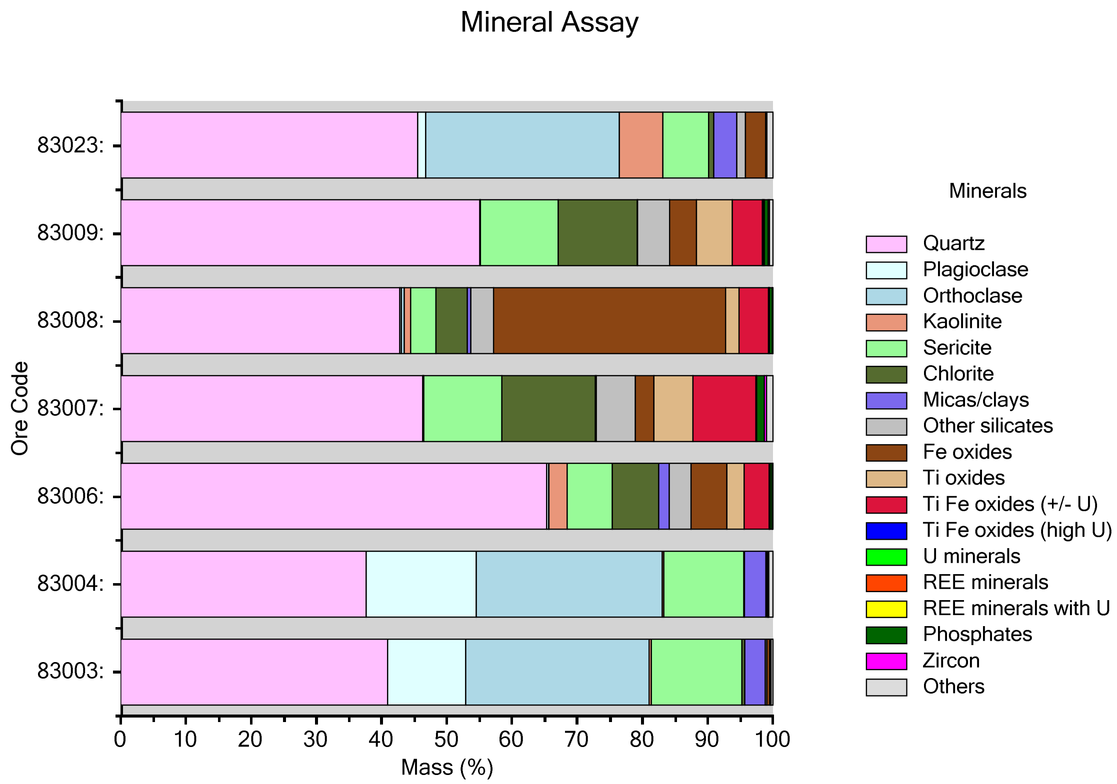
Sample	C 83003	D 83004	E 83006	F 83007	G 83008	H 83009	K 83023
Quartz	40.92	37.64	65.32	46.32	42.82	55.09	45.54
Plagioclase	11.99	16.91	0.30	0.02	0.21	0.01	1.23
Orthoclase	28.11	28.49	0.06	0.02	0.44	0.01	29.70
Kaolinite	0.37	0.25	2.77	0.12	0.98	0.07	6.67
Sericite	13.87	12.27	6.92	11.98	3.90	11.91	7.02
Chlorite	0.46	0.12	7.15	14.34	4.78	12.10	0.81
Micas/clays	3.11	3.28	1.60	0.13	0.53	0.07	3.53
Other silicates	0.29	0.21	3.35	5.98	3.49	4.89	1.32
Fe oxides	0.41	0.09	5.51	2.85	35.57	4.16	3.06
Ti oxides	0.03	0.02	2.63	6.01	2.10	5.49	0.12
Ti Fe oxides (+/- U)	0.13	0.04	3.82	9.64	4.51	4.60	0.08
Ti Fe oxides (high U)	0.00	0.00	0.03	0.00	0.04	0.10	0.00
U minerals	0.00	0.00	0.00	0.00	0.00	0.09	0.00
REE minerals	0.00	0.00	0.03	0.02	0.03	0.02	0.00
REE minerals with U	0.01	0.01	0.10	0.06	0.08	0.11	0.01
Phosphates	0.01	0.05	0.30	1.20	0.41	0.60	0.00
Zircon	0.02	0.02	0.03	0.32	0.01	0.17	0.01
Others	0.28	0.59	0.09	0.98	0.09	0.52	0.91
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Most of the uranium-bearing minerals that were detected in the samples have complicated chemistries and display very complex textural relationships with the associated minerals such as clays and micas. The presence of these complex intergrowths makes unambiguous identification of the minerals and their uranium contents very difficult.

Due to the complex mineralogy and textures of the uranium-bearing minerals, it is not possible to provide quantitative uranium deportment data. However, it is possible that the titanium-iron-oxide type minerals host the bulk of the uranium with most of the balance hosted by the uranium-bearing REE minerals.

Detailed microprobe work will need to be done to confirm the observation made during this investigation.

Figure 5.2: Graphical display of QEMSCAN BMA modal data for all samples.



6. CONCLUSIONS

- Seven rock samples, mainly represented by a single fragment with maximum dimensions of about 30mm, were investigated using QEMSCAN techniques in order provide information on the uranium-bearing minerals.

- The results show that the two porphyry samples (83003 and 83004) are mainly composed of quartz, feldspars and sericite. The four ironstone samples (83006 to 83009) are composed of variable proportions of quartz, sericite, chlorite and iron and/or titanium oxides. The dominant minerals in the altered granite sample (83023) are quartz, K-feldspar and kaolinite.

- No classical, discreet, uranium-rich minerals (such as uraninite, autunite and coffinite) larger than a few micrometres were detected. Of these discrete uranium minerals, brannerite, apparently with a relatively high iron content, is the most common.

- Trace amounts of REE-bearing minerals, sometimes containing between 1 and 30% uranium, were detected in all of the samples.

- It appears that titanium-iron-oxide phases associated with the REE-bearing phases may also have uranium contents of up to 5 mass percent.

- Due to the complex mineralogy and textures of the uranium-bearing minerals, it is not possible to provide quantitative uranium deportment data. However, it is possible that the titanium-iron-oxide type minerals host the bulk of the uranium with most of the balance hosted by the uranium-bearing REE minerals.

Appendix A : Modes of Analyses

BMA analysis

BMA is a linear method. Each block is scanned in the X direction, with the Y-direction line spacing being set such that each particle is intersected once.

As the entire block is scanned, this produces an extremely high statistical population – with the random alignment of the particles ensuring appropriate sampling.

All information listed below is available from this mode of measurement. The new Intellection processing software, iExplorer, now enables liberation and locking information to be extrapolated from this form of analysis method.

- Modal Mineralogy
- Grain Size Estimation
- Elemental Deportment
- Mineral Associations
- Liberation *(area % only)*
- Locking *(area % only)*
- Size-by-size elemental & mineralogical reconciliation

This is a good analysis method for low grade species, as the intercept statistics are higher.

TMS and SMS analyses

TMS & SMS are particle analysis methods, which only analyse a pre-set subpopulation of the particles present. They are based on the premise that the phases of primary interest (ie target phases) have a higher back-scattered electron brightness than the bulk of the gangue phases.

This enables each block to be scanned for particles containing the target phase(s), and only those of interest are fully analysed. As the entire block is scanned, this also produces the highest possible statistical population for the trace phase.

All information listed below is available from this mode of measurement, but relates only to the subpopulation analysed. This is a particularly good analysis method for determining losses of sulphides and precious metal phases to silicate-rich tails.

- Modal Mineralogy
- Grain Size Estimation
- Elemental Deportment
- Mineral Associations
- Liberation *(area % and surface area %)*
- Size-by-size elemental & mineralogical reconciliation

SMS and TMS differ, only on the basis of bright-phase content. E.g. if bright phases are ~ >1%, SMS is applied, if bright phases are ~<1%, TMS is used.

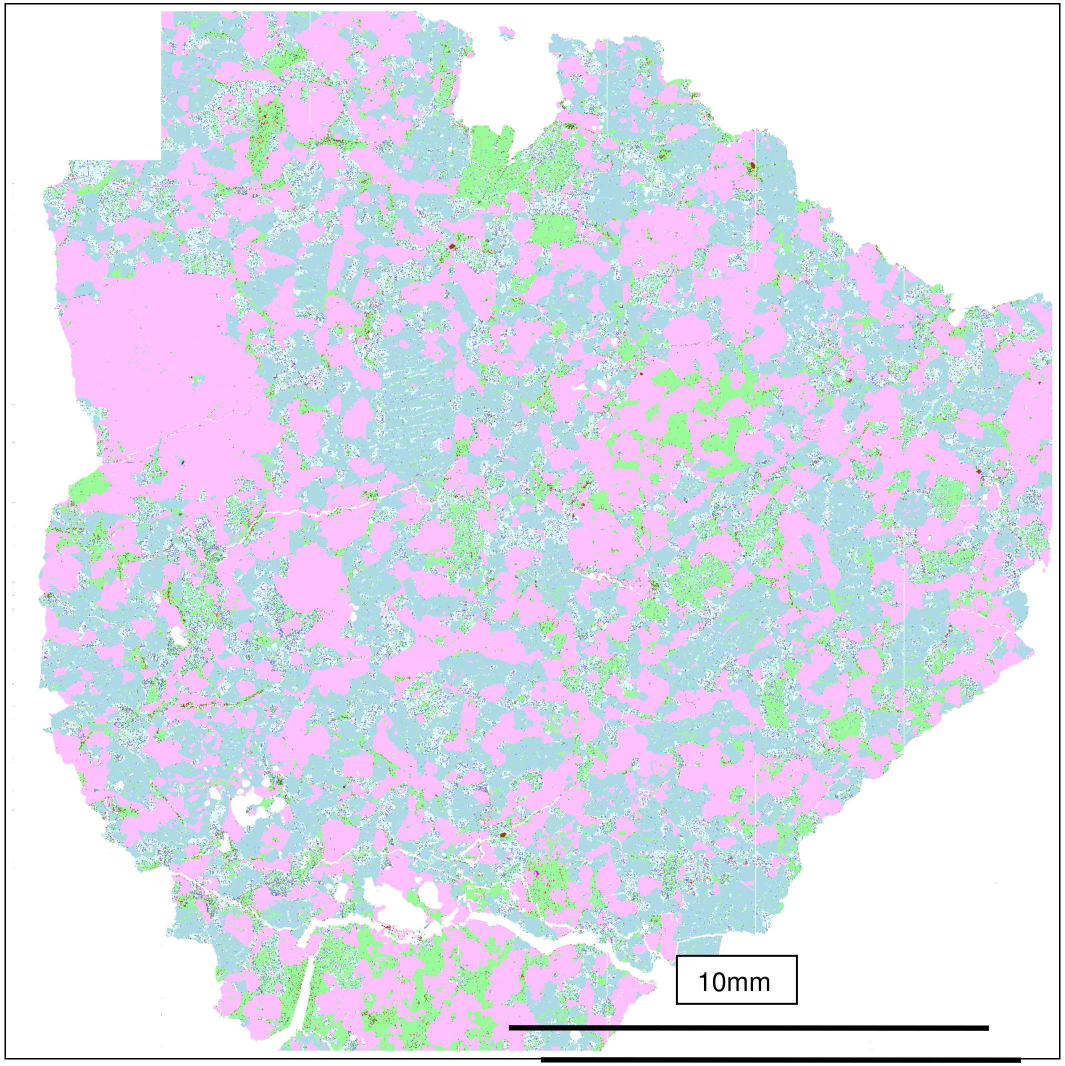
Recommended for good statistics on the trace phases.

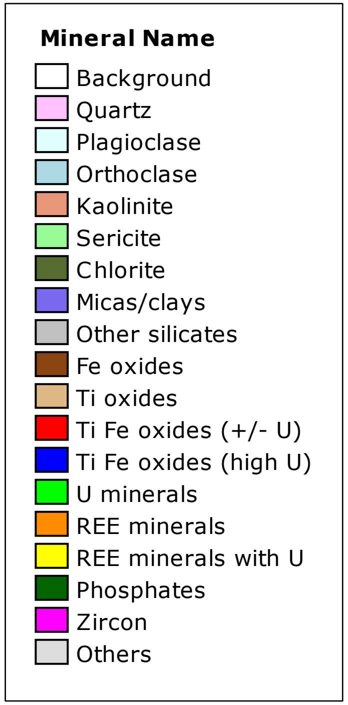
Field Scan analysis

The Field Scan (FS) mode of measurement maps a rock chip or core sample that has been mounted in the polished section. It collects a chemical spectrum at a set interval within the field of view. Each field of view is them processed offline to generate a single integrated image and a false-colour image of the core sample is produced.

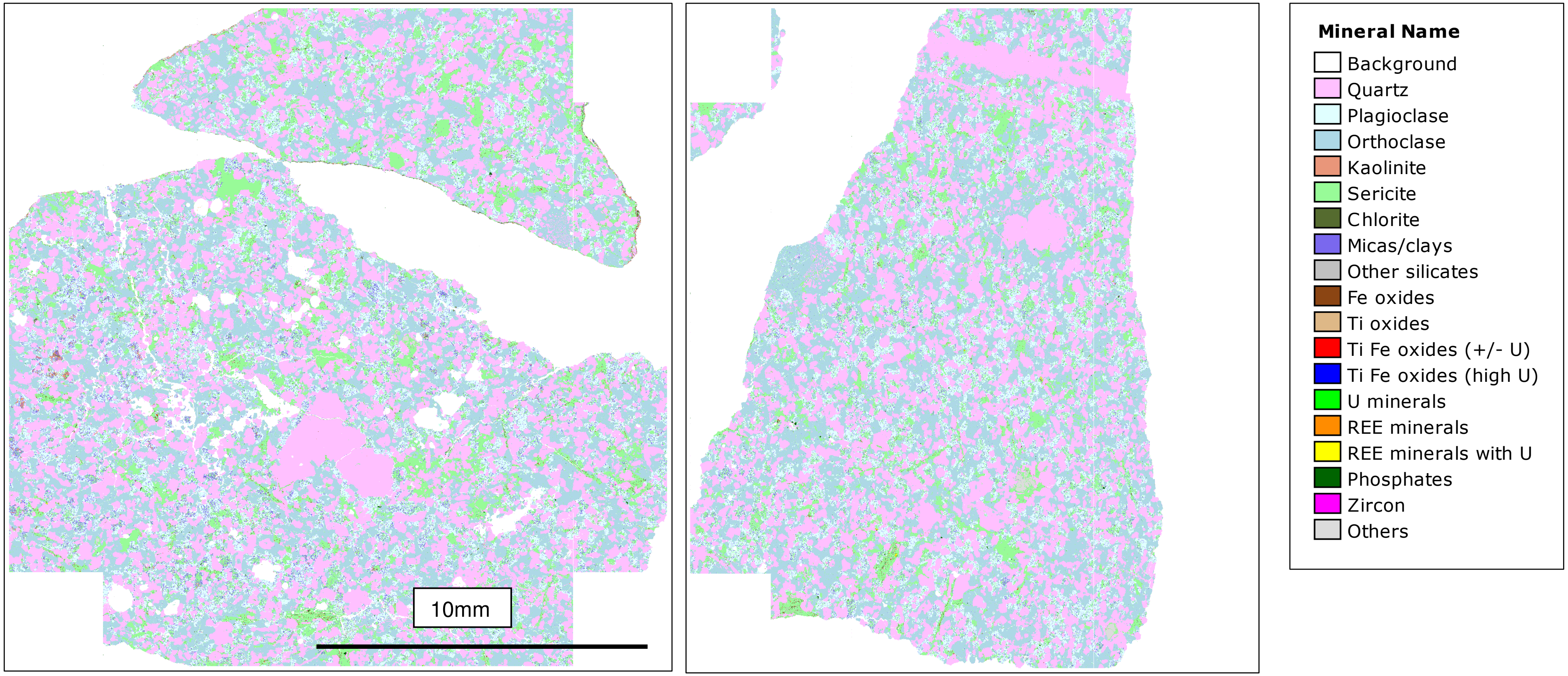
Appendix B: Field scans

Sample 83003 Field scan

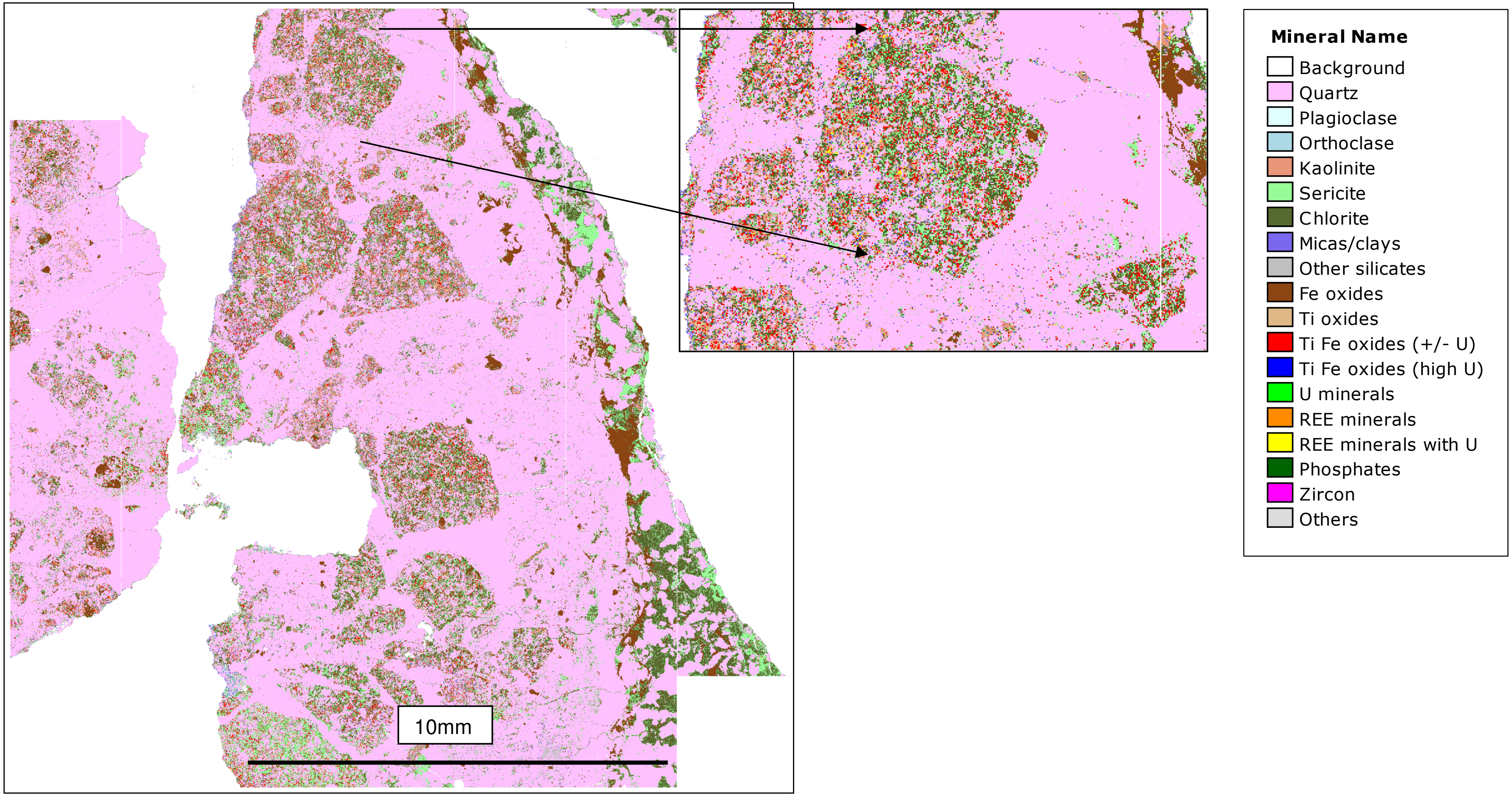




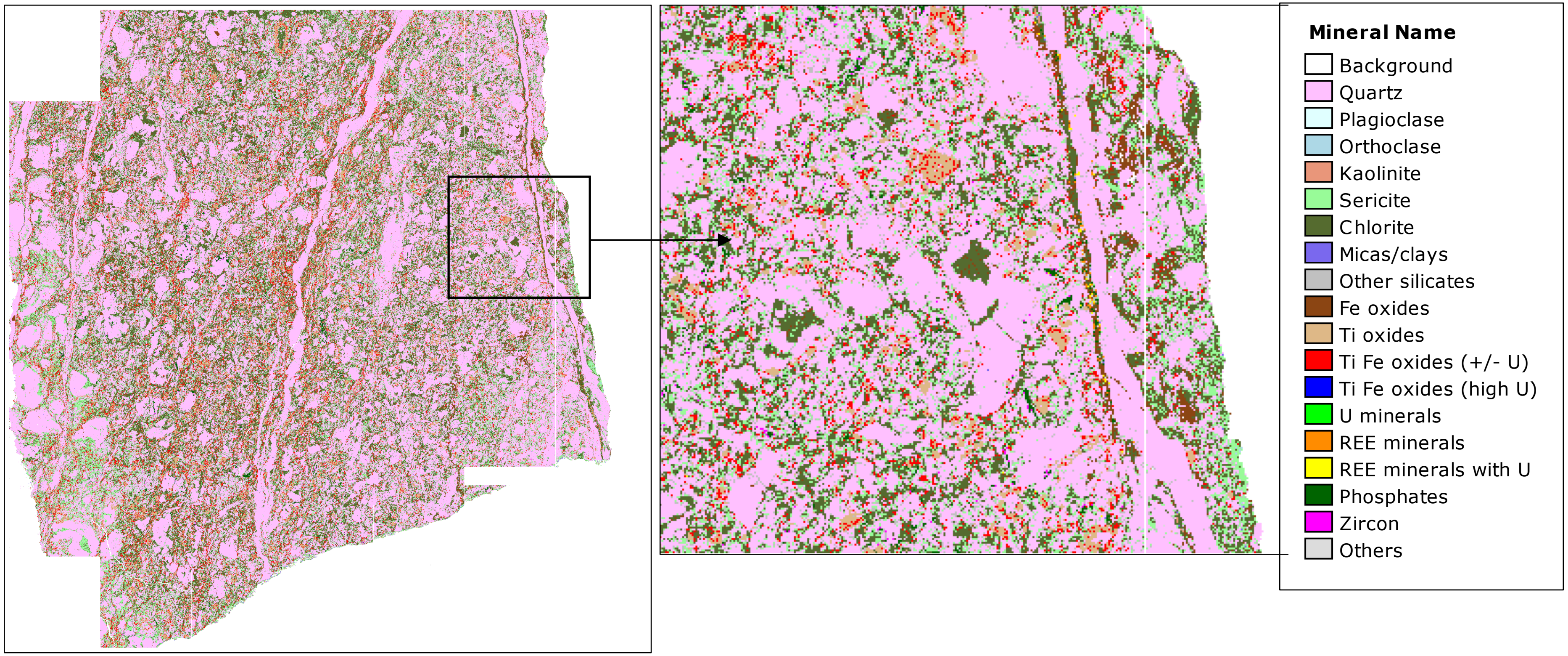
Sample 83004 Field scan

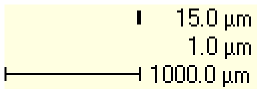


Sample 83006 Field scan

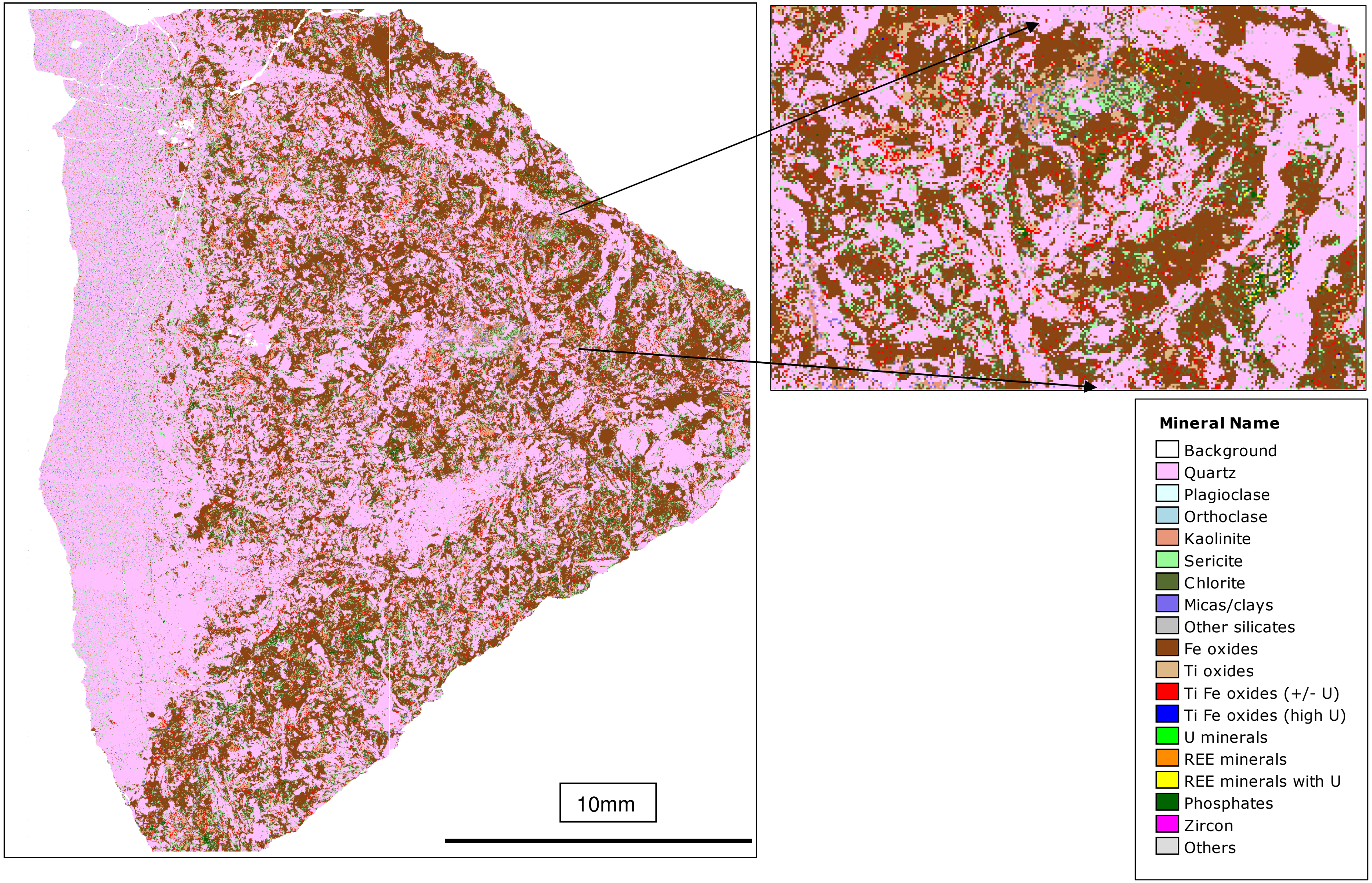


Sample 83007 Field scan

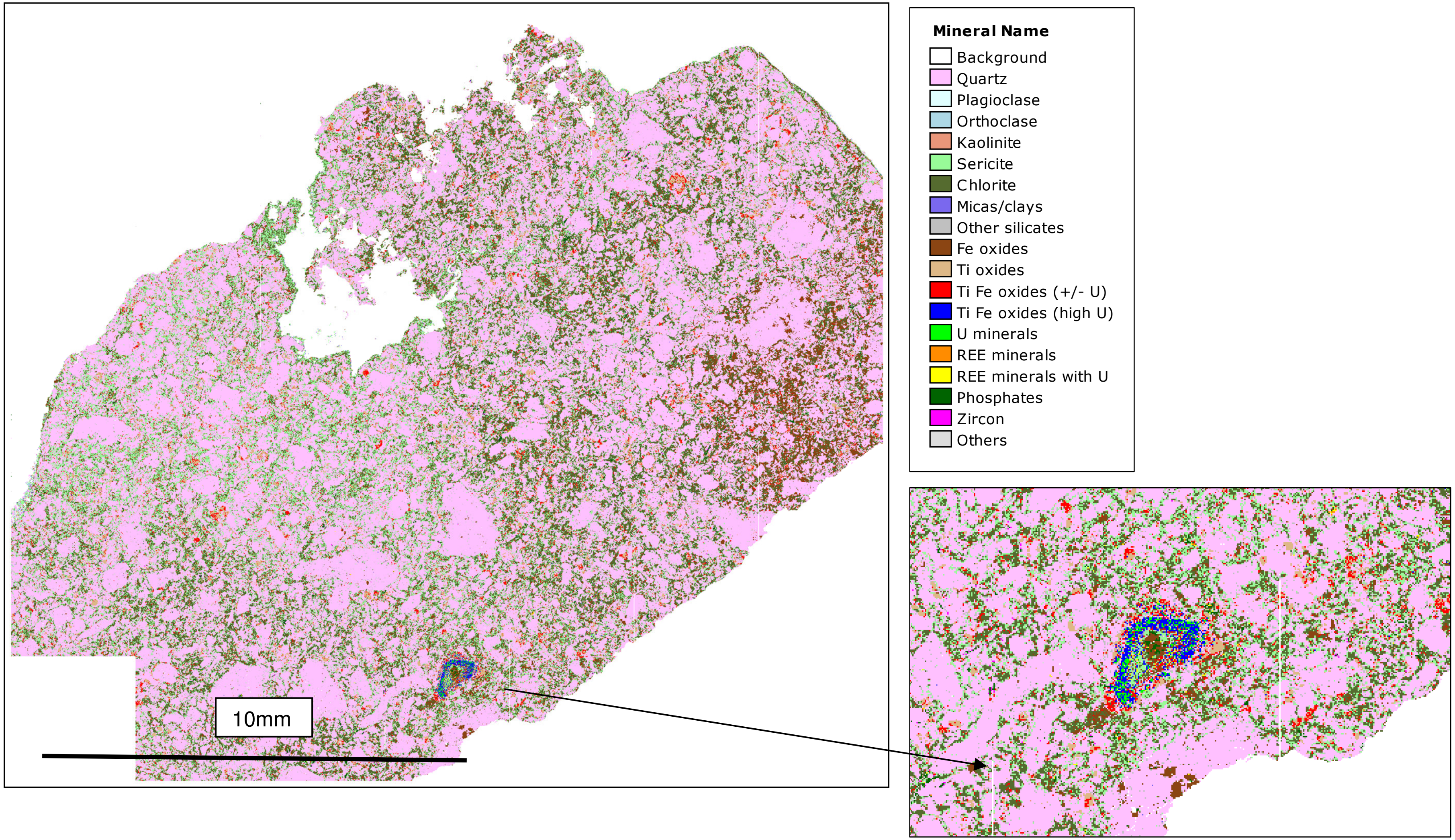




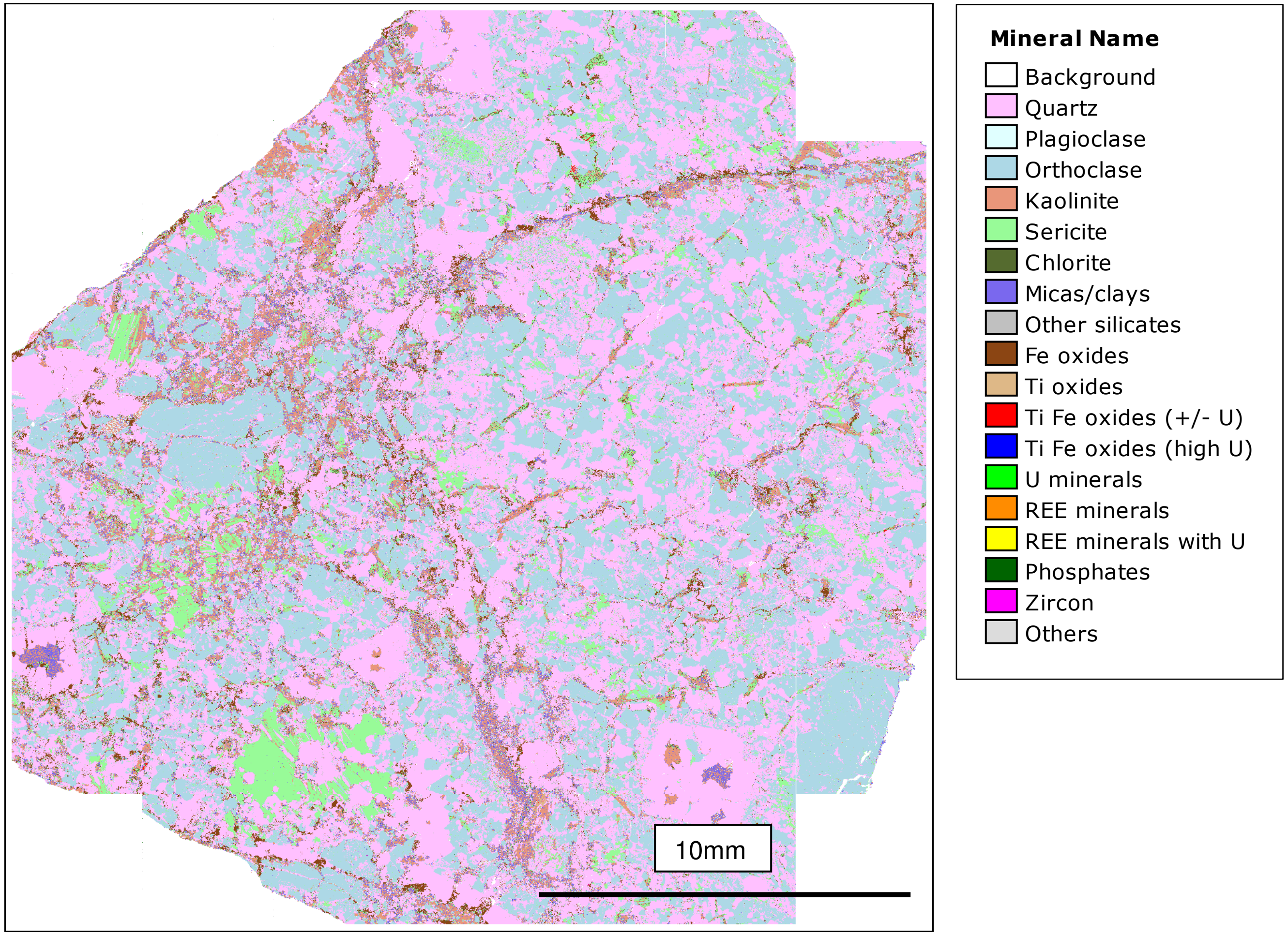
Sample 83008 Field scan



Sample 83009 Field scan



Sample 83023 Field scan



Appendix C: Example spectra

DISCLAIMER

This report has been prepared by SGS Lakefield Oretest Pty Ltd (SGS) at the request of Jason Cherry of Uranium Exploration Australia.

This report presents the results of the metallurgical test work conducted by SGS on the samples provided by the Client.

This report is provided to the Client on the basis that the Client expressly acknowledges that:

(a) no representations have been made to SGS as to the purpose for which the tests are required to be conducted; and

(b) the test work was carried out by SGS on the Samples provided by the Client.

(c) SGS was not involved in:

- the drilling, collection or transportation of the Samples; and
- the handling of the Samples prior to their delivery to SGS.

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