Mineral Resources Tasmania

Mineralogical/Petrology Report
LJN2015/147

XRD ANALYSES: DRILLCORE, NORTHERN TERRITORY

An unpublished Mineral Resources Tasmania report for
NT Geological Survey

by R S Bottrill and R N Woolley

15 April 2016

Mineral Resources Tasmania
Department of State Growth

Tasmanian Government

SUMMARY

The XRD results generally confirm the presence of most of the minerals indicated by the Hylogger/IR methods. There are very few significant misidentifications or misses in the Hylogger results. In some cases the Hylogger results have misidentified some minerals, e.g. the TIR seems to identify Fe-serpentine as montmorillonite. The Hylogger has identified two feldspars and two pyroxenes, but XRD shows only one of each.

INTRODUCTION & BACKGROUND

The Hylogger IR spectroscopic analyses of drillcore being conducted by various Geological Surveys in Australia routinely return analyses indicating various minerals that often cannot be readily confirmed in the hand specimens, and require XRD (X-ray diffraction) or other methods for confirmation.

The objective of this study is mostly to determine the presence or absence of various minerals, or their more specific identity, in samples from these drillholes in the Northern Territory.

SAMPLES

The details of the five drillhole sample, submitted for XRD by Belinda Smith, Northern Territory Geological Survey (NTGS), are given in Table 1 below. The eight drill core samples were all from the Arnhem area, on the Alligator River, NT.

Table 1: Sample details

Client ID	TSG DDH File Name	HyLogger Sample #	Hole Depth (m)	Description
AL15BRS001	OBRD14-127 /194.05	000305	194.05	aspectral inSWIR; augite, oligoclase in TIR. CLS shows augite, oligoclase, hedenbergite, labradorite, prehnite, biotite, montmorillonite, muscovite.
AL15BRS002	OBRD14-127 /203.78	001728	203.78	Aspectral in SWIR, Labradorite, augite, oligoclase, montmorillonite, prehnite
AL15BRS003*	OBRD14-127 /219.97	004155	219.97	Mg chlorite in SWIR. Chlorite, augite, oligoclase in TIR
AL15BRS004	OBRD14-127 /225.1	004950	225.10	chlorite, illitic phengite in SWIR. Quartz, illite in TIR.
AL15BRS005	OBRD14-127 /272.6	012070	272.60	Phengite, Mg chlorite in SWIR. Quartz, muscovite in TIR

* Not submitted

ANALYTICAL TECHNIQUES

The samples were all prepared, examined and analysed by XRD and chemical techniques in the Mineral Resources Tasmania (MRT) laboratories, Rosny Park, Tasmania.

XRD

The samples were prepared, examined and analysed in the MRT laboratories, Rosny Park, Tasmania. They were run on an automated Philips X-Ray diffractometer system: PW 1729 generator, PW 1050 goniometer and PW 1710 microprocessor with nickel-filtered copper radiation at 35kV/25mA, a graphite monochromator (PW1752), sample spinner and a proportional detector (sealed gas filled PW1711). Our typical step-size is 0.02 degrees, and the standard scanning speed is 0.02 degrees/second. The PW1710 system is presently driven by the CSIRO XRD software: "VisualXRD", "PW1710 for Windows" and "XPLOT for Windows". Interpretation and quantification is largely manual, using a series of prepared standards of the more common minerals to enable some semi-quantitative analysis. Quartz, if present, is used as an internal standard; and if not present, it is often added to the sample for a supplementary scan. Our semi-quantitative results are calculated using single-peak calibration factors derived from scans of known mixtures of minerals.

The XRD results are attached in Appendix 1 and are summarised in Table 2, with comparison to the Hylogger and petrology results. The results are discussed further below.

Table 2: Summary of Main Results, discrepancies highlighted

TSG DDH File Name	Client ID	IR mineralogy (NTGS)	Main XRD mineralogy	Comments
OBRD14-127 /194.05	AL15BRS001	Aspectral in SWIR; augite, oligoclase in TIR. CLS shows augite, oligoclase, hedenbergite, labradorite, prehnite, biotite, montmorillonite, muscovite.	Ca-Na Plagioclase, Clinopyroxene, Quartz, Mica (biotite), Fe-Serpentine	Fair. Only one plagioclase (Ca>Na) and Ca-pyroxene found; no montmorillonite or prehnite. Maybe two micas
OBRD14-127 /203.78	AL15BRS002	Aspectral in SWIR, Labradorite, augite, oligoclase, montmorillonite, prehnite	Ca-Na Plagioclase Clinopyroxene Mica (biotite) Fe-Serpentine	Fair. Only one plagioclase (Ca>Na) and Ca-pyroxene found; no montmorillonite or prehnite. Maybe two micas
OBRD14-127 /219.97	AL15BRS003	Mg chlorite in SWIR. Chlorite, augite, oligoclase in TIR	Not submitted	
OBRD14-127 /225.1	AL15BRS004	Chlorite, illitic phengite in SWIR. Quartz, illite in TIR.	Quartz Mica (Phengitic muscovite?), Chlorite	Good
OBRD14-127 /272.6	AL15BRS005	Phengite, Mg chlorite in SWIR. Quartz, muscovite in TIR	Quartz Mica (Phengitic muscovite?), Chlorite	Good

SUMMARY AND DISCUSSION

The XRD results generally confirm the presence of most of the minerals indicated by the Hylogger/IR methods. There are very few significant misidentifications or misses in the Hylogger results. The Hylogger results shown in Table 2 are classified here as:

Good: Two or more main minerals identified, subordinates detected correctly.

Fair: One main mineral confirmed, and/or only one incorrectly identified; some subordinates detected correctly.

Poor: Main phases not detected, some subordinates detected correctly.

Very poor: No phases detected correctly.

The results thus vary from fair to good, and overall the results are generally quite good.

Notable XRD results and possible issues include that:

1. In two samples the feldspar was identified by Hylogger as both Labradorite and oligoclase but XRD indicated just a Na-anorthite (Labradorite?). XRD cannot precisely identify the plagioclase composition.
2. In two samples the pyroxene was identified by Hylogger as both augite and hedenbergite but XRD indicated just clinopyroxene. XRD cannot precisely identify the pyroxene composition.
3. The Hylogger only missed some minor constituents like Fe-serpentine (greenalite/berthierine?) and talc.
4. The mica is mostly trioctahedral (biotite?) in two samples and dioctahedral (phengitic muscovite?) in two others but there is insufficient to be more precise.
5. Only minor probable false positives came from the Hylogger, for minor montmorillonite and prehnite.

Mineral Resources Tasmania

R S Bottrill

MINERALOGIST/PETROLOGIST

R N Woolley

TECHNICAL OFFICER

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This and other data collected in MRT laboratories may enter the MRT databases but every attempt will be made to ensure it remains closed file and not be available externally, unless at your request.

APPENDIX 1: MINERAL RESOURCES TASMANIA LABORATORY REPORT

MINERAL RESOURCES TASMANIA

Client: B. Smith, NTGS
Sample Source:
MRT Job Number: LJN2015/147
Analysis: Approximate Mineralogy
Method: X-Ray Diffraction

Results:

Sample	AL15BRS001	AL15BRS002	AL15BRS004	AL15BRS005
Depth	194.05m	203.78m	225.1m	272.6m
Hylogger #	000305	001728	004950	012070
Abundance	*Mineralogy*	*Mineralogy*	*Mineralogy*	*Mineralogy*
>80%				
65%-80%				
50%-65%			Quartz	Quartz
35%-50%	Ca-Na Plagioclase[1]	Ca-Na Plagioclase[1]		
25%-35%	Clinopyroxene			
15%-25%		Clinopyroxene	Mica[8], Chlorite	Mica[8], Chlorite
10%-15%		Mica[2]		
5%-10%	Quartz, Mica[2], Fe-Serpentine[3]	Fe-Serpentine[3]		
2%-5%	Talc	Quartz, Talc		
<2%	Amphibole, Chlorite[4], Smectite[5], ? [6]	Amphibole, Prehnite, Pumpellyite, ? [7]		

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NOTES

[1] peaks at 6.43, 4.68, 4.04, 3.90, 3.76, 3.64, 3.47, 3.37, (3.24, overlapped), 3.21, 3.18, 3.13, 3.02, 2.95, (2.93), (2.91), 2.84, 2.82, 2.65, 2.52, etc – probably Na-Anorthite

[2] trioctahedral; removed by warm HCl; too much overlapping to accurately determine (060) peak; very small peaks at 10Å and 5.0Å in residue after acid treatment may indicate that a trace of dioctahedral Mica is also present

[3] peaks at 7.15Å-7.18Å, 3.55Å-3.57Å and 2.74Å-2.75Å; destroyed by heating to 580°C; soluble in warm HCl; similar to Greenalite/Berthierine

[4] confirmed by transformation of small peak at 14.3Å to 13.9Å after heating to 580°C

[5] confirmed by glycolation (14.3Å peak splits to form 16.7Å and 14.2Å peaks)

[6] trace amounts of Prehnite and Pumpellyite may also be present

[7] trace amounts of Chlorite may be present (barely detectable peaks at 14.0Å and, after heating, 13.9Å)

[8] dioctahedral; (060) peak at 1.503Å; probably Muscovite

Analyst: R N Woolley
Date: 20 January 2016

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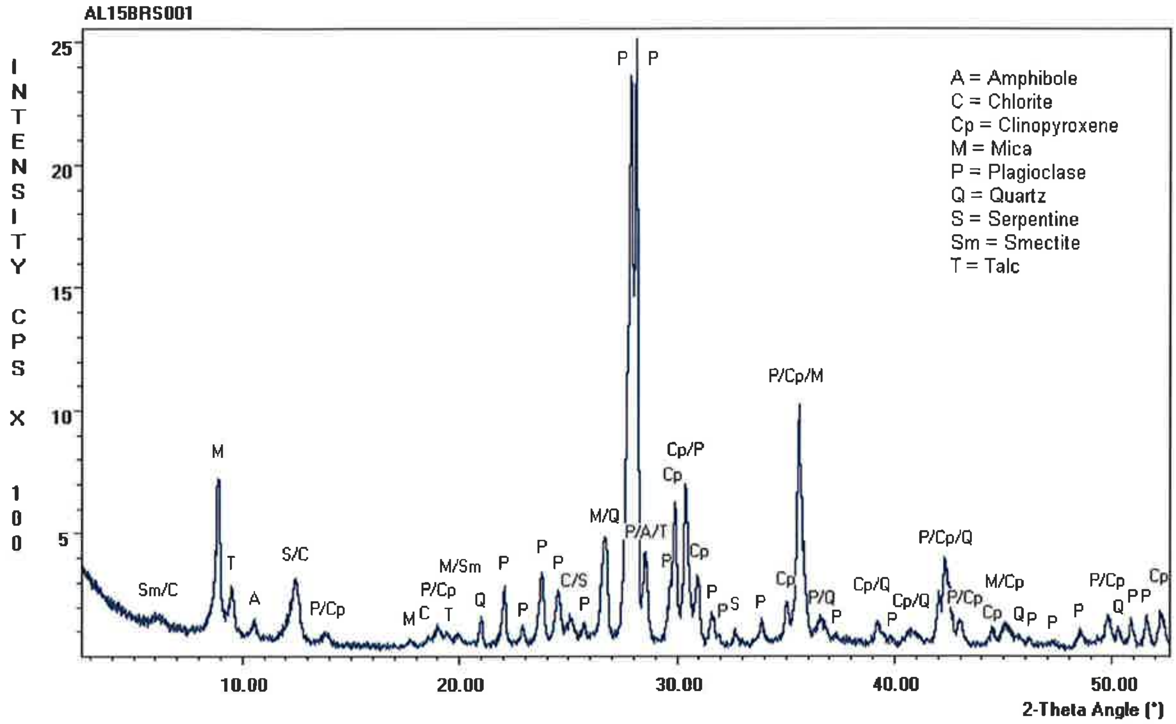

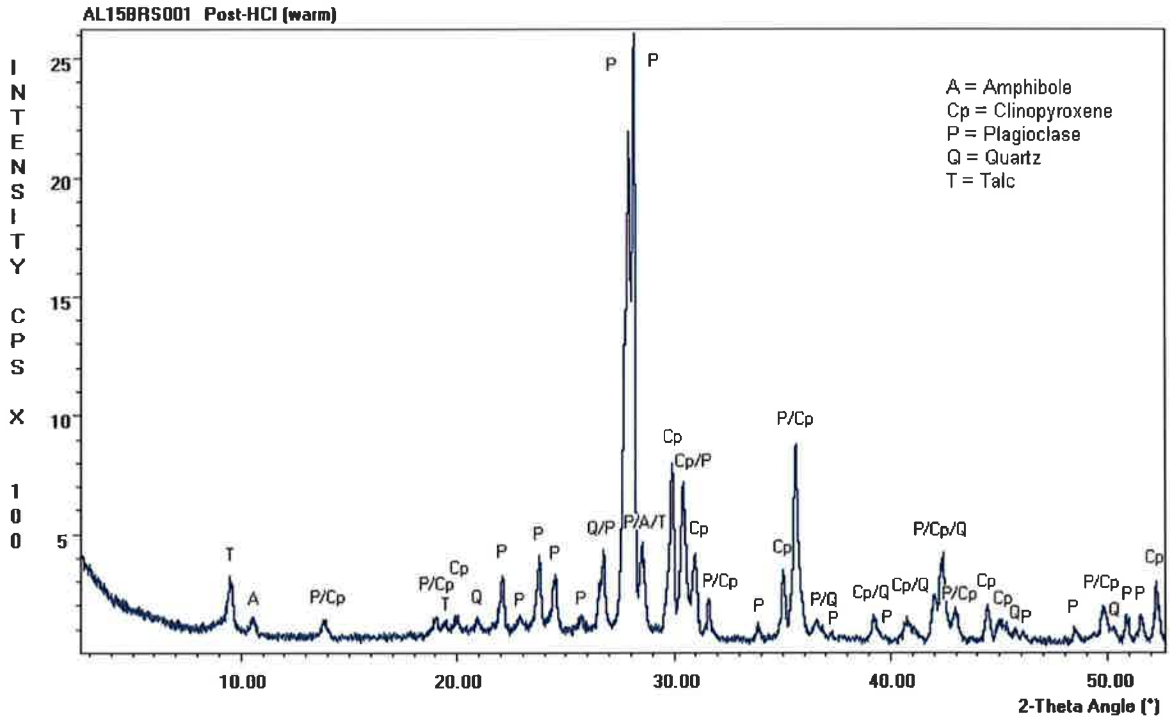

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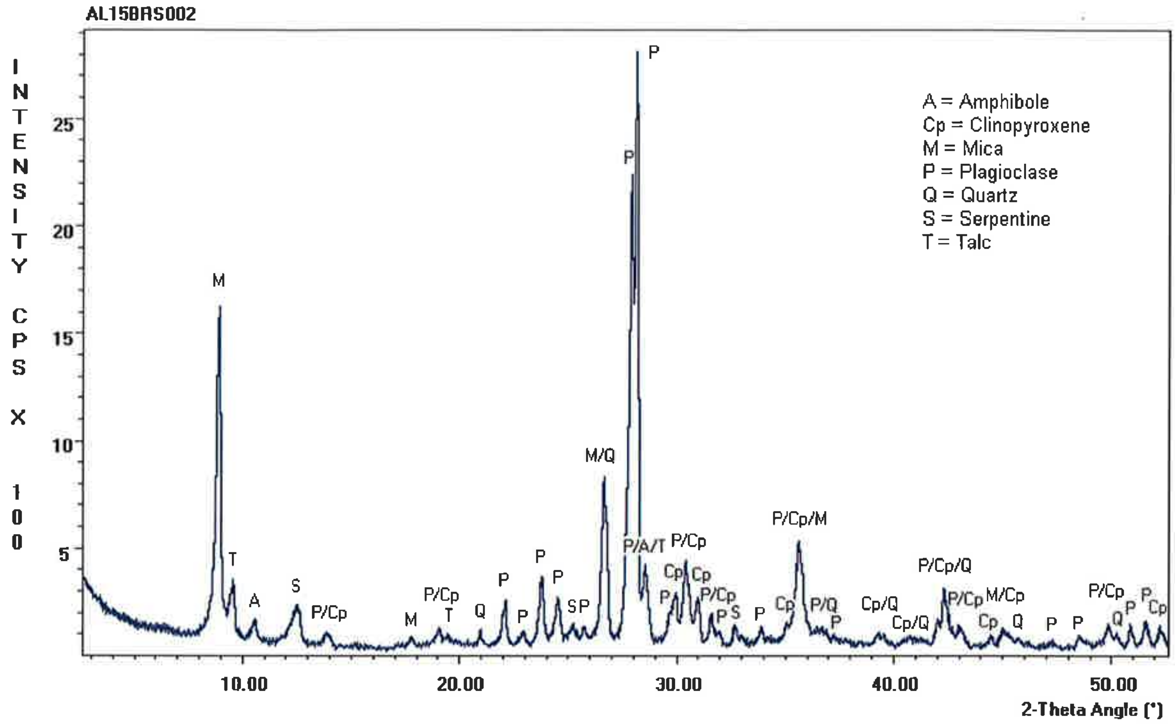

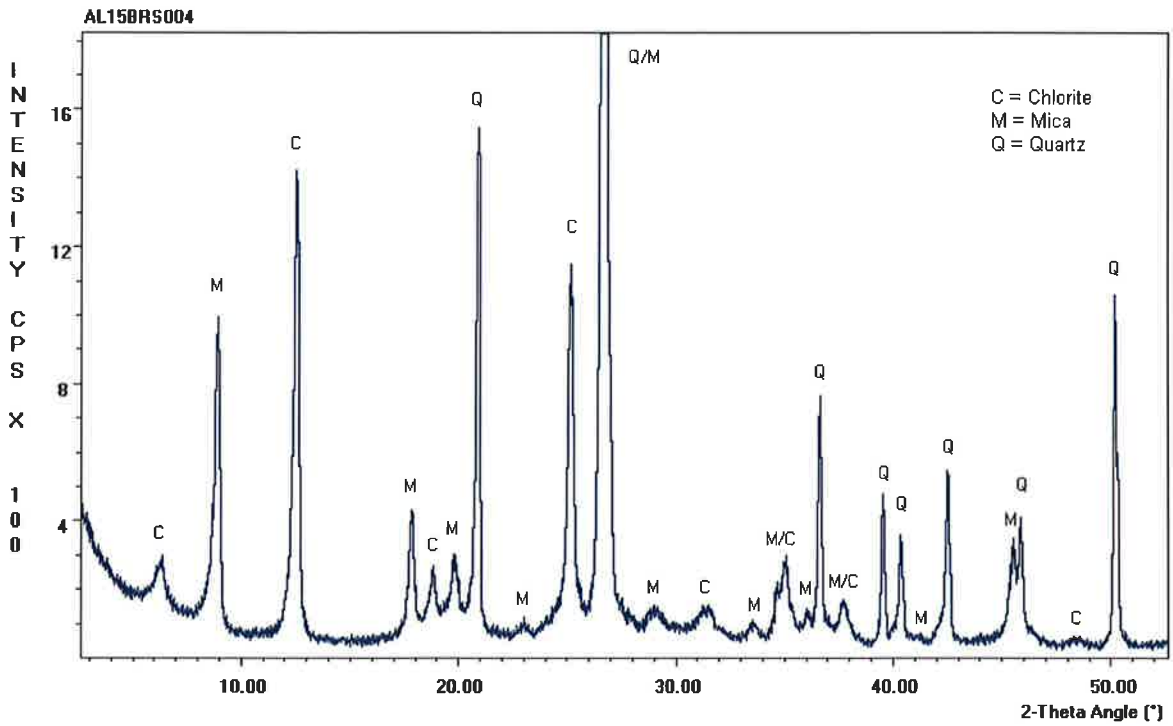

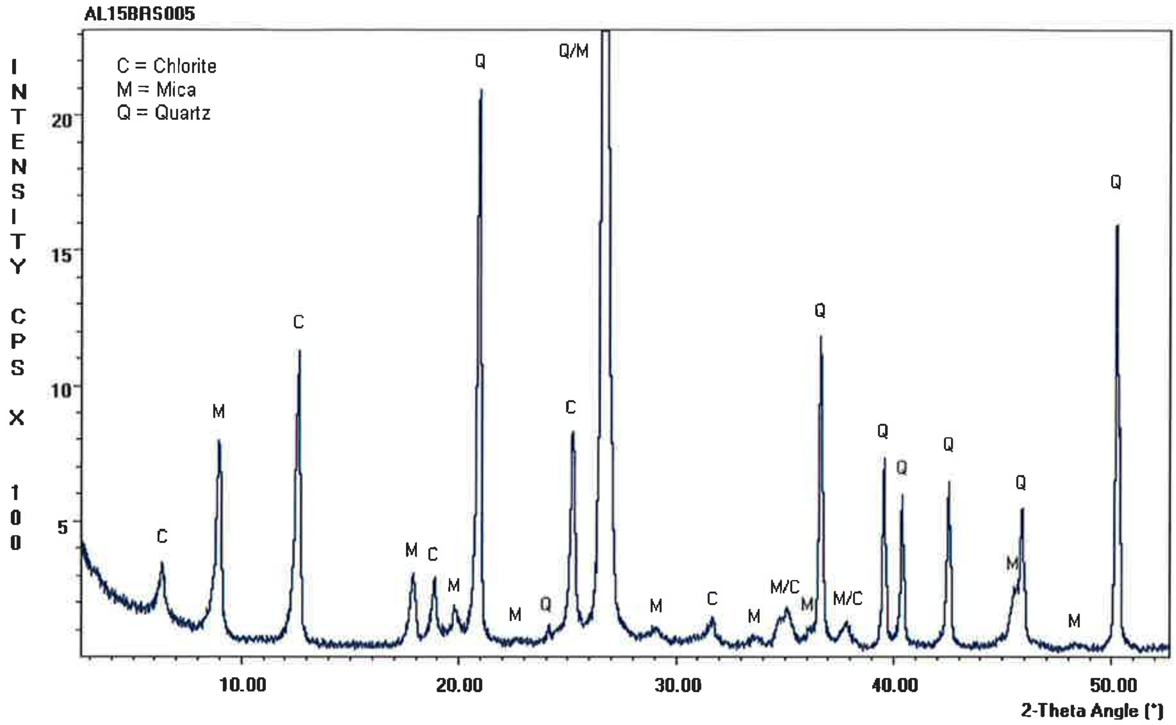
AL15BRS005
C = Chlorite
M = Mica
Q = Quartz
INTENSITY CPS X 100
20
15
10
5
10.00
20.00
30.00
40.00
50.00
2-Theta Angle (°)
C
M
C
M
C
M
Q
M
Q
C
Q/M
M
C
M
M/C
M
Q
M/C
Q
Q
Q
M
Q
M
Q