

ANALYTICAL REPORT

SOURCE ROCK ORGANIC MATTER REFLECTANCE AND TYPING

FORTESCUE 1

**PREPARED FOR
GEOLOGICAL SURVEY AND RESOURCE STRATEGY DIVISION
DMIRS**

SEPTEMBER 2021



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SOURCE ROCK ORGANIC MATTER REFLECTANCE AND TYPING

INTRODUCTION

Samples were received (see table below) to be evaluated for the reflectance of organic matter (vitrinite where possible) as well as an assessment of the types of organic matter present. If HAWK pyrolysis was also requested, the equivalent sample number is also indicated. HAWK data are reported separately.

ERC Sample No.		Company Reference	Sample Type	Other information
V _r	HAWK			
E4444		237710	Cuttings	1830 - 40 ft
E4445		237711	Cuttings	1980 - 90 ft

METHODS

Sample preparation methods may vary slightly depending upon whether core/ outcrop or cuttings were received.

With core and outcrop samples, a flat face perpendicular to bedding is prepared by grinding. This is placed in a 30 mm diameter mould along with several randomly oriented grains. The whole is mounted in epoxy resin.

With cuttings, the samples are passed through a 2 mm sieve and where necessary are gently cracked in a mortar and pestle. This is then mounted in epoxy resin.

The epoxy resin mounted samples are polished using a variety of wet and dry papers, diamond polishing compounds and colloidal silica. The polished samples are dried in a desiccator for a minimum of 12 hours prior to analysis.

Analysis is made using a Leica MP4500P system with Hilgers DISKUS software. A mechanical stage is used to traverse the sample in a regular pattern. Mean maximum reflectance in oil of the organic matter is determined by rotating the microscope stage. Reflectance is determined of a 2 μm^2 area at 546nm using a total magnification of 500X.

A visual estimation of organic matter types and abundances was also made using comparison charts under both reflected and blue light excitation. The categories used are:

Descriptor	%
Absent	0
Rare	<0.1
Sparse	$0.1 < x < 0.5$
Common	$0.5 < x < 2.0$
Abundant	$2.0 < x < 10.0$
Major	$10.0 < x < 40.0$
Dominant	>40.0

The samples are also examined in blue light fluorescence using a Royal Blue LED as the excitation source.

RESULTS

Results are tabulated as follows. Low resolution images are provided in an appendix for reference purposes. High quality images are provided in a separate image file.

Data presentation

Individual sample results are reported in the following format:

ERC No. Client No.	Depth (ft / m)	R_{Vmax}^{*1}	Range ^{*2}	SD ^{*3}	N ^{*4}
x1234	3106	0.79	0.64 - 0.91	0.145	25
	R_I^{*5}				
	Alginite ^{*5}				
	Bitumen ^{*5}				

*1 Mean of all the maximum reflectance readings obtained.

*2 Lowest Rmax and highest Rmax of the population considered to represent the first generation vitrinite population.

*3 Standard Deviation

*4 Number of fields measured (Number of measurements = 2N because 2 maximum values are recorded for each field)

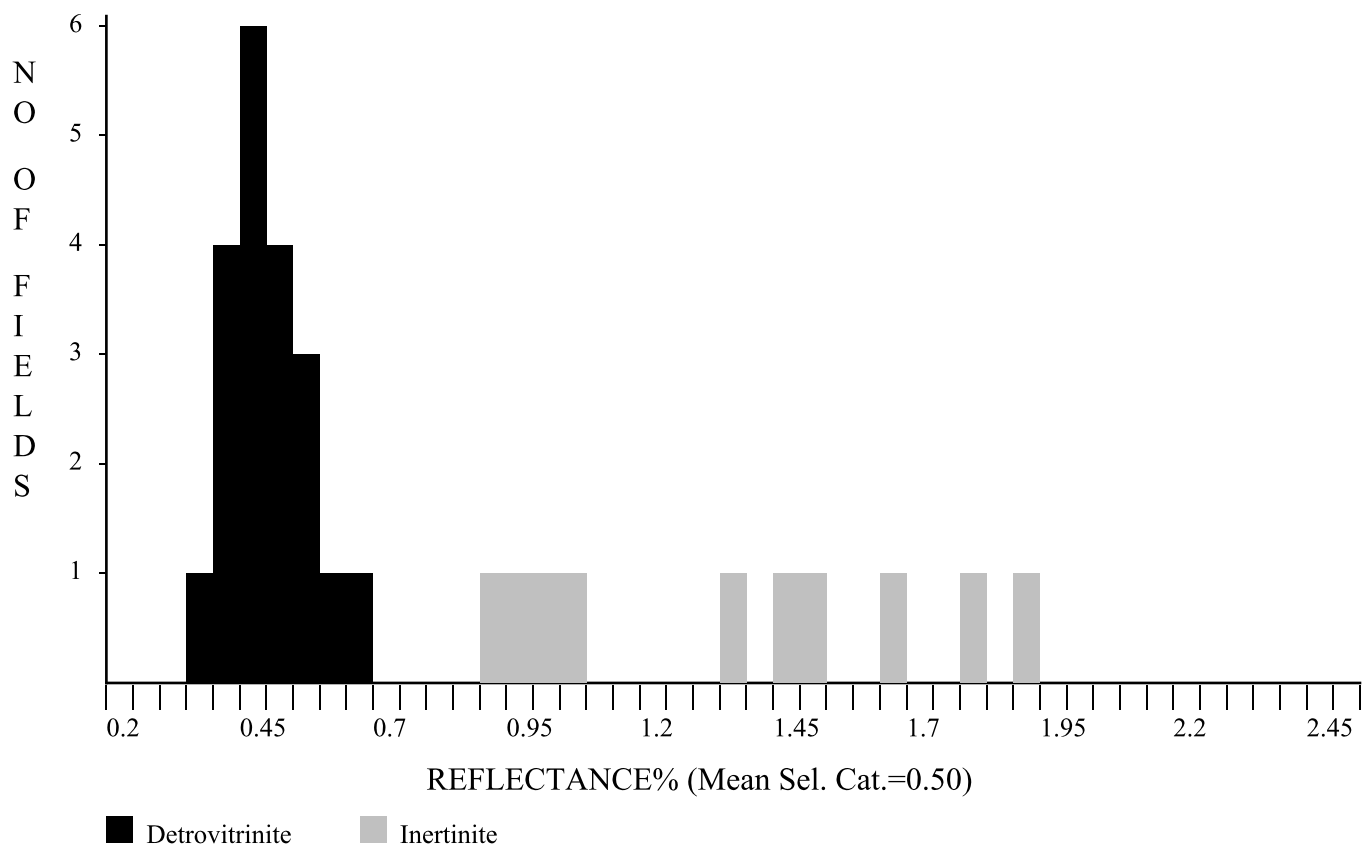
*5 Reflectance of multiple vitrinite populations or of other organic matter types. R_I = Inertinite mean maximum reflectance etc; subscripts may be expanded as necessary.

HAWK data, where requested, are reported separately in spread sheet format.

Note that if samples are retained by ERC, they will be held for at least 12 months after reporting but may be discarded after that date.

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Sample# Client ref.	Depth (ft)	\overline{R}_{vmax}	Range	SD	N	Sample description including liptinite fluorescence, maceral abundances, mineral fluorescence FORTESCUE 1 GSWA# 237710
E4444	1830-1840	0.50	0.39-0.65	0.067	20	Sparse lamalginite and rare liptodetrinite yellow to orange, sparse sporinite orange to dull orange. (Claystone> argillaceous siltstone>carbonate>sandstone. Dom common, I>L>V. Inertinite common, liptinite sparse to common, vitrinite rare. Mineral fluorescence weak to moderate orange. Glauconite sparse. Iron oxides sparse. Pyrite common.) GSWA# 237711
237710	\overline{R}_I	1.37	0.92-1.90	0.340	10	
Ctgs						
E4445	1980-1990	0.51	0.41-0.66	0.063	25	Common sporinite and rare liptodetrinite orange to dull orange, sparse to common lamalginite yellow to orange. (Claystone>carbonate. Dom common to abundant, L>I>V. Liptinite and inertinite common, vitrinite rare. Mineral fluorescence weak to moderate orange. Glauconite sparse. Iron oxides sparse. Pyrite common.)
237711	\overline{R}_I	1.33	0.82-2.29	0.431	10	
Ctgs						

GSWA, 237710, Fortescue 1, 1830-1840ft, Ctgs(E4444)

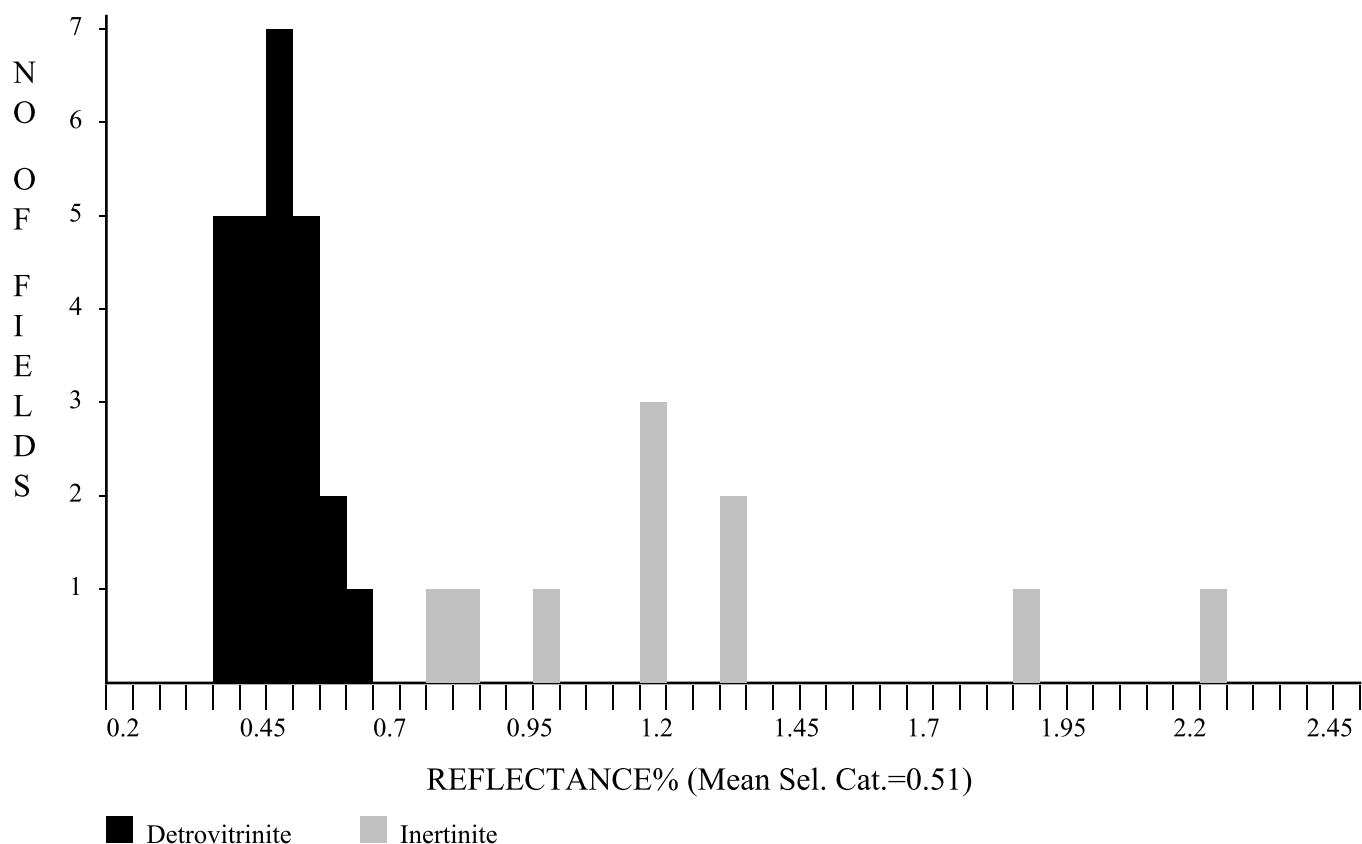


Maceral Category	N	Mean	Standard Deviation
Detrovitrinite	20	0.50	0.067
Inertinite	10	1.37	0.340
Total	30	0.79	0.459

Selected categories: Detrovitrinite:

No. of Readings:	20
Mean of Selected Categories:	0.50
Standard Deviation of Selected categories:	0.067

GSWA, 237711, Fortescue 1, 1980-1990ft, Ctgs(E4445)



Maceral Category	N	Mean	Standard Deviation
Detrovitrinite	25	0.51	0.063
Inertinite	10	1.33	0.431
Total	35	0.75	0.438

Selected categories: Detrovitrinite:

No. of Readings:	25
Mean of Selected Categories:	0.51
Standard Deviation of Selected categories:	0.063

Dr Peter Crosdale (MAIG)
Director, ERC
29th September, 2021

APPENDIX - PLATES

High quality images are provided in a separate image file. Images provided in this report are for reference purposes only.

E4444A Detrovitrinite in argillaceous siltstone, $R_{v\max} = 0.51\%$, reflected white light, X50

E4444B Same as E4444A, in fluorescence mode

E4444C Common lamalginite in claystone, reflected white light, X50

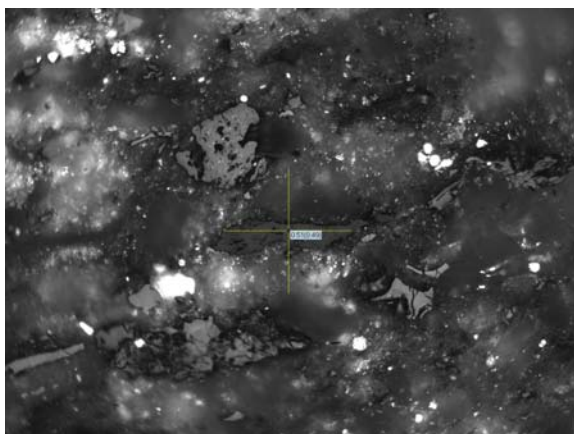
E4444D Same as E4444C, in fluorescence mode

E4445A Detrovitrinite in claystone, $R_{v\max} = 0.49\%$, reflected white light, X50

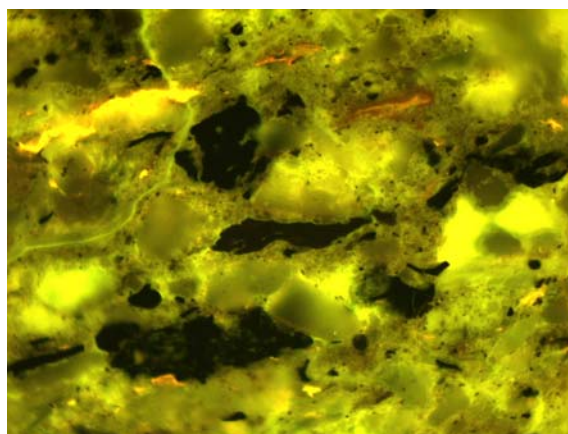
E4445B Same as E4445A, in fluorescence mode

E4445C Sporinite in carbonate, reflected white light, X50

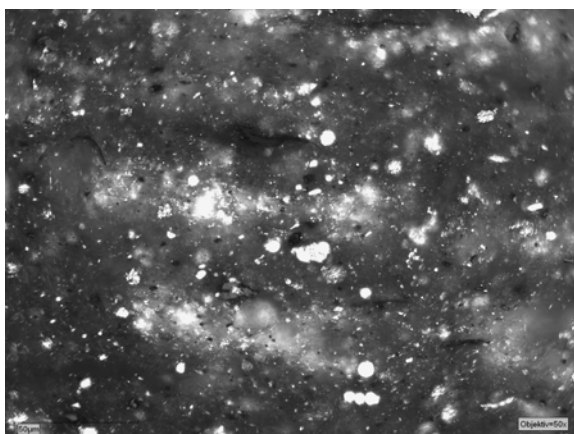
E4445D Same as E4445C, in fluorescence mode



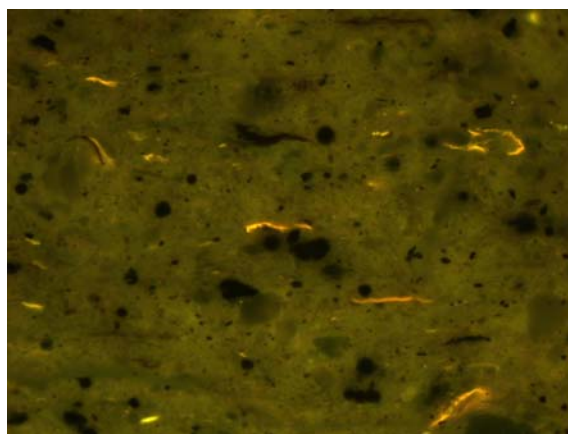
E4444A Detrovitrinite in argillaceous siltstone, $R_{v\max} = 0.51\%$, reflected white light, X50



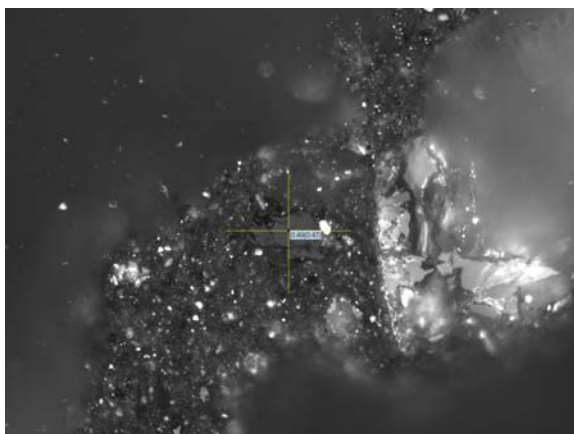
E4444B Same as E4444A, in fluorescence mode



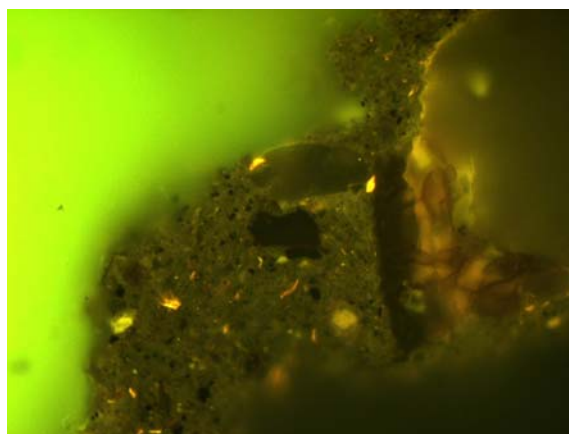
E4444C Common lamalginite in claystone, reflected white light, X50



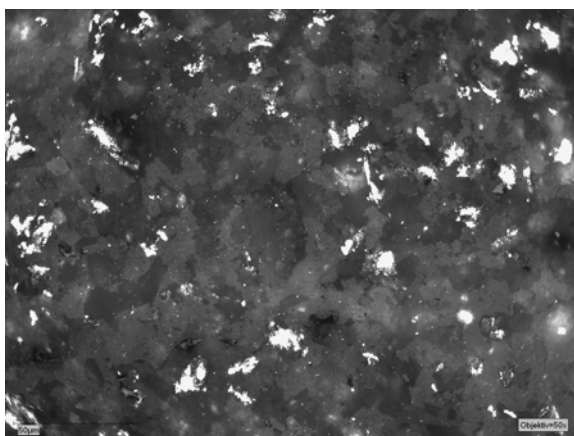
E4444D Same as E4444C, in fluorescence mode



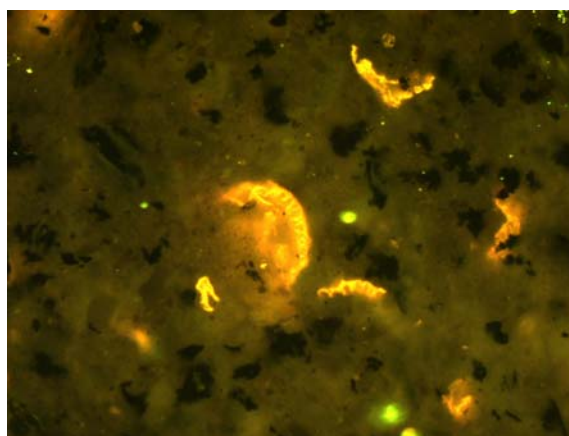
E4445A Detrovitrinite in claystone, $R_{v\max} = 0.49\%$, reflected white light, X50



E4445B Same as E4445A, in fluorescence mode



E4445C Sporinite in carbonate, reflected white light, X50



E4445D Same as E4445C, in fluorescence mode