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STRATIGRAPHIC DRILLING PROJECT PETROGRAPHIC SAMPLING AND ANALYSES

PROGRESS REPORTS NOS 3, 5 AND 7 RE. WILKINSON 1 DRILLHOLE

Submitted by
Amdel Ltd
1979

Enquiries: Customer Services Branch
Minerals and Energy Resources
7th Floor
101 Grenfell Street, Adelaide 5000

Telephone: (08) 8463 3000
Facsimile: (08) 8204 1880

Government of South Australia
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28 November, 1978

Director-General,
Department of Mines & Energy,
P.O. Box 151,
EASTWOOD, S.A. 5063

STRATIGRAPHIC DRILLING

PROGRESS REPORT No. 3

5438 RS 34-65

Investigation and Report by: Dr. Brian Steveson

Manager, Geological Services Division: Dr. Keith J. Henley

Keith Henley.

for Norton Jackson,
Managing Director.

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STRATIGRAPHIC DRILLING

Department of Mines & Energy
South Australia

Progress Report No. 3

1.1.232 November 1978

1. INTRODUCTION

This report includes petrography of 32 rocks from the carbonate sequence (above the salt section) in Wilkinson No. 1, a stratigraphic bore. This hole is situated close to the Karari fault on its N.W. side, in the Tallaringa Trough. The age of the rocks is unknown.

2. SUMMARY OF PETROGRAPHY

Most of the rocks in the section are micritic limestones characterised by variously distorted and disturbed bedding. There is evidence of the presence of ooliths, pellets and microfossils but recrystallisation has obscured some of these and interpretation of textures is not without ambiguities. Disturbance of bedding has been so intense in places that the rocks have a brecciated aspect - confined sometimes to beds less than 10 mm thick in otherwise laminar sequences. Bedding is generally shown by variations such as this in the carbonates but also by variations in the amount and nature of silicate detrital material. Most of this is of silt-grade and comprises less than 10% of the rocks but there are silty limestones and thin beds are sandy. These presumably represent sporadic incursions of non-marine material onto a carbonate tidal flat or lagoonal environment. The silicate fraction commonly contains fresh microcline and biotite.

Dolomite is - apart from a few micritic dolomite samples - of authigenic origin; it forms small rhombs which have replaced calcite. Some dolomite is polycrystalline and granular and is present in equant aggregates which may well be pseudomorphs of carbonate clasts of some kind, slightly reworked and incorporated into the calcite mud.

Other authigenic minerals present are quartz, gypsum and anhydrite. Quartz is fairly common and many small crystals filled with carbonate inclusions showing evidence of rational crystal faces have been interpreted as having grown in the limestone. Coarser grained and more abundant secondary silica occurs in sub-concordant veins either as granular material or with radial and colloform textures. Gypsum, and rare anhydrite, have a restricted occurrence but where they are present, they form large aggregates which are essentially monominerallic. In some places both quartz and gypsum occur in veins. The age of these secondary minerals cannot be determined petrographically; although an early diagenetic age might be suggested in places where veins appear to conform to irregularities in adjacent bedding.

It seems most likely that these sediments are tidal deposits; however, most references use macroscopic and stratigraphic information to identify such deposits in ancient rocks. Ginsburg, 1975 ("Tidal Deposits" Springer-Verlag, Berlin) is a typical example.

3. DESCRIPTION OF CORE SPECIMENS

The sample from 210.1 to 210.2 m is a speckled brown to green mudstone with a few circular green spots (<1 cm). Bedding can only be seen indistinctly; it is marked by variations in sandy and silty material. To about 250 m the material is generally similar with, however, variations in the amount of sand/silt and of bedding. At 242.15 m brown and green lithologies occur in contorted bedding and there are patches with coarse-sand grade grains. At 254.4 m the sediment is green in colour and shows pale patches (up to 15 mm) which occupy the bulk of the

rock. At 274.5 m the bedding is more regular but there are sandy and green beds among the aphanitic brown mudstone. Clean patches of gypsum are up to 10 mm in size. Fragments are 3 to 12 m in diameter at 280.4 m; the rock is an unusual kind of ?intraformational breccia with aggregates of secondary ?gypsum. Sandy/silty clasts of silicate cannot be identified. An intraformational breccia of carbonate mud is well shown at 299.6 m. Samples from 304.9 m and 307.1 m also show disturbed bedding. The last-named samples are grey to green rocks free from visible silicate grains. At 333.8 m the core is a grey aphanitic rock with dark veins or beds perpendicular to the core length. These beds are 1 to 3 mm thick. Some contain coarse white materials. The next sample, from 338.35 m shows small-scale cross-beds. At 342.15 m the bedding is extremely disturbed and there are diverse aphanitic fragments up to 20 mm in length. Some elongate fragments are disposed at 45° to the core length. Rocks from 356.2 to 449.3 m are aphanitic rocks and are essentially massive. Green colouration ranges from spotting and veining at 356.2 m to the whole of the rock at 449.3 m.

Very fine, almost laminar bedding is present in part of the sample from 390.32 - 390.4 m but there are displaced blocks also. Core samples from 439.8 m to 462.86 m show grossly distorted textures and are virtually breccias; silicate clasts cannot be seen and the rocks are essentially carbonate muds. At 493.1 m there is a return to fine, laminar bedding.

The core samples submitted are carbonate muds with a sparse contribution of silicate detritus. Some samples show small-scale cross-beds, others are massive; most characteristic however, are disturbed samples, in some cases conglomeratic, but otherwise essentially breccias.

4. PETROGRAPHY

Sample: RS34; TSC20804

07

Location:
Wilkinson No. 1; 210.12 to 210.2 metres

Rock Name:
Sandy, dolomitic limestone

Thin Section:
An optical estimate of the constituents gives the following:

	%
Calcite	80
Dolomite	10
Quartz and silica	7
Opaques and semi-opaques	2
Feldspar	1-2
Muscovite	1
?Gypsum	Trace
Opaque grains	Trace

The sample is a micritic limestone with a fairly abundant population of silicate grains. The sample shows slight heterogeneity but there is no very well defined banding.

The bulk of the rock consists of a fine-grained mosaic of carbonate minerals. For the most part, crystals are less than 0.1 mm in size and commonly significantly smaller than this. Within this granular mosaic of carbonates calcite and dolomite generally occur together with a considerable preponderance of the former. Both of the carbonates also form monomineralic, fine-grained aggregates interpreted as being detrital grains of some kind, probably recrystallized. Most typical are rather small aggregates of fine-grained dolomite, but there are larger and rather more heterogeneous sub-spherical aggregates of calcite and dolomite also. Calcite is present in a narrow veinlet which transects the texture of the rock.

Silicate minerals occur as crystals generally less than 0.1 mm in size but exceptionally as large as 1.5 mm. The grains are subangular in shape most commonly, and are equant. The feldspar is fresh and both plagioclase and microcline were positively identified. Silica is present as a few aggregates of ?chalcedonic material and one of these is, exceptionally, about 1.3 mm in size. This may well represent authigenic silica which has grown in the limestone, but elsewhere it appears that fine-grained chalcedony/silica is of detrital origin. The rock also contains detrital mica as long, narrow flakes and a few round grains of opaques.

Other components of the rock are iron oxide/hydroxide generally present in discontinuous, elongate aggregates which contribute as much as anything in the texture of the rock to a definition of the bedding.

The sample is, therefore, a somewhat heterogeneous, micritic limestone with a moderate amount of fine-grained detrital silicate material. There is evidence also of detrital carbonates and both fine-grained calcite and dolomite were identified. There is a cross-cutting vein of calcite and there are one or two patches of a mineral tentatively identified as gypsum.

Sample; RS35; TSC20805

08

Location:
Wilkinson No.1; 222.0 to 222.04 metres

Rock Name:
Calcareous dolomite

Thin Section:
An optical estimate of the constituents gives the following:

	%
Dolomite	>60
Calcite	<30
Quartz	3-5
Clay	1-2
Muscovite	1
Opaque grains	Trace

This is a somewhat heterogeneous, but essentially micritic, rock consisting principally of dolomite with a subordinate amount of calcite. Non-carbonate components comprise less than 10% of the total volume of the rock.

In the coarsest parts of the rock calcite and dolomite form crystals of the order of 0.03 mm in size and both minerals occur in a fairly interlocked mosaic. There is a tendency for the development of rhombic crystal outlines and it is tentatively suggested that in these parts of the rock the dolomite is somewhat later than the calcite. In finer-grained parts of the rock the sample is dark and turbid in plane polarized light in thin section, indicating the extremely small crystal size of the material. In some of these finer-grained parts there are slightly coarser patches and the relative proportions of calcite and dolomite in the finest parts of the rock can only be inferred from their proportions in the adjacent, slightly coarser material. In only a few places in the rock is carbonate present in large amounts coarser than about 0.04 mm and many fields of view contain abundant material which is probably finer than 0.002 mm.

Within this carbonate mosaic there are equant but angular crystals of quartz and elongate flakes of both muscovite and biotite. The quartz grains have been corroded by the carbonate but the micas probably retain their original detrital form. No feldspar was unambiguously identified in the sample but there are one or two slightly altered, colourless grains and some of these may be untwinned feldspar. Apart from these silicate detrital grains there are one or two aggregates of extremely fine-grained carbonate which may well be pseudomorphs of original relatively large grains. One of these, for example, is 1 mm in length and about 0.3 mm in width and may be part of a ?dolomitic bed somehow incorporated within the limestone. Elsewhere patches of fine-grained material are indistinct and irregular in shape and it is not possible to tell whether these were original fragments or, more likely, simply reflections of a varying rate of crystallization of the carbonate minerals.

The sample is, therefore, a micritic carbonate sediment apparently consisting principally of dolomite which may have replaced a pre-existing calcite. Terrigenous components are present only to a very small extent but the sample may originally have contained some dolomitic clasts.

Sample: RS36; TSC20806

09

Location:
Wilkinson No. 1; 224.24 to 224.3 metres

Rock Name:
Sandy, silty limestone

Thin Section:
An optical estimate of the constituents gives the following:

	%
Calcite	30-50
Dolomite	30-40
Quartz	15-20
Opaques and semi-opaques	3
Feldspar	2
Mica	1
Tourmaline	Trace

The sample consists essentially of a heterogeneous mosaic of carbonate minerals within which are detrital grains of quartz and feldspar. The sample is somewhat heterogeneous and the proportions given above are an average.

Some carbonate is clearly present as detrital material and this can be distinguished as equant, and commonly rounded, aggregates mainly of dolomite. This material varies from micritic to relatively coarsely granular. In some places these aggregates are rather shadowy and indeterminate amongst the secondary carbonates but elsewhere are fairly well defined. On average, these aggregates are about 0.3 mm in diameter but range up to 0.7 mm. In the remainder of the rock the carbonates form a more or less fine-grained mosaic and are intergrown with opaque and semi-opaque ferruginous material. The most characteristic feature of this part of the rock is the presence of rhombs of dolomite which appear to have replaced adjacent material and probably grew after the development of the generally finer-grained and more abundant calcite. It appears, therefore, that calcite is essentially of primary origin and forms in a fine-grained mosaic, whereas dolomite is present both as detrital material and as authigenic rhombs.

The detrital grains range in size up to about 0.5 mm but the average size is probably about 0.1 to 0.5 mm. Some of the grains of quartz and feldspar show excellent rounding but most are subangular to subround. Microcline is the predominant feldspar but some plagioclase was also identified. There are a few polycrystalline grains of quartz and one or two of secondary, vein quartz. These detrital minerals, and the presence of a little tourmaline, do not suggest any specific provenance apart, possibly, from acid igneous or metamorphic terrains.

The sample is, therefore, a coarsely-banded, rather heterogeneous limestone containing both sand and silt silicate grains. Also present are generally large grains of dolomite. These components rest in a mosaic of fine-grained calcite, ferruginous material and occasional rhombs of dolomite. The thin section contains a pale brown aggregate of secondary silica and clay, occasionally forming sub-spherical aggregates which could be ?silicified oolites. Apart from this possibility, the material appears to be merely some kind of siliceous and/or argillaceous aggregate within the limestone. The patch of material is about 1.5 mm in diameter.

Sample: RS37; TSC20807

10

Location:
Wilkinson No. 1; 228.48 to 228.58 metres

Rock Name:
Silty, dolomitic limestone

Thin Section:
An optical estimate of the constituents gives the following:

	%
Calcite	65-70
Dolomite	15-20
Quartz and feldspar	7-10
Opaques and semi-opaques	5
Mica	1
Opaque grains	Trace

The sample consists principally of a micritic mosaic of iron-stained calcite within which are grains of silicates and dolomite. The sample also contains a little authigenic dolomite.

The bulk of the rock is more or less red or brown in colour and consists of micritic calcite ranging in places to clearer patches containing relatively coarse-grained material. It is possible that the latter is a relatively late, recrystallized calcite but the bulk of the calcite in the rock, and in fact the bulk of the rock as a whole, is comprised of a featureless, micritic mosaic. Dolomite occurs within the aggregates of calcite partly as pseudomorphs of original grains and partly as rhombs. The latter are commonly not more than about 0.1 mm in size and are widely scattered throughout the calcite. Most of the dolomite in the sample occurs as equant, and commonly round, aggregates of relatively coarse material which are interpreted as being derived from original carbonate grains. The largest of these is about 0.6 mm in diameter and many are of the order of 0.2 to 0.3 mm. These dolomitic grains are not randomly distributed throughout the rock and probably comprise no more than about 5-7% of the total volume of the sample.

Quartz, and a little potassium feldspar and plagioclase, occur as angular to subangular crystals up to 0.15 mm in size but commonly not more than about 0.1 mm. These are interpreted as being partly resorbed remnants of detrital grains. The feldspar is fresh but tends to occur as relatively small grains. There are flakes of fresh biotite and muscovite also.

This is a limestone with a fairly complex history, probably involving the authigenesis of dolomite and possibly of a little calcite also. The textures indicate that dolomite developed after even the coarse-grained calcite.

Sample: RS38; TSC20807

11

Location:
Wilkinson No. 1; 237.16 to 237.20 metres

Rock Name:
Silty, dolomitic limestone with sandy beds

Thin Section:
An optical estimate of the constituents gives the following:

	%
Iron-stained calcite	75-80
Quartz and feldspar	10-15
Dolomite	10
Mica	1

The list above indicates the significant phases in the bulk of the rock; in two places in the thin section there are sandier beds containing a little more dolomite and silicates than is indicated above.

The bulk of the rock is a micritic calcite more or less stained with ferruginous material. The crystal size of the calcite is rarely about 0.04 mm and commonly very much smaller than this. The proportion of quartz is rather difficult to estimate in places since this mineral is distinctly fine-grained. It is thought that there may be virtually sub-microscopic quartz grains possibly comprising more than the 10-15% indicated above. At any rate, most of the quartz is present as silt-grade grains which are rather angular in shape. There is a gradation towards material perhaps as coarse as 0.1 mm. Feldspar is fresh and forms grains similar in size and shape to those of quartz; however, feldspar is present only in trace amounts but grains of both microcline and plagioclase were specifically identified. Also present in the rock is a little quartz present as chert grains and there are detrital flakes of both fresh muscovite and biotite.

In this part of the rock dolomite occurs as relatively large crystals (up to 0.05 mm), some of which show rhombic outlines. There are also one or two aggregates of dolomite up to about 0.15 mm in size.

In two places in the thin section the rock shows a somewhat sandier character with the development of detrital grains of both quartz and dolomite as much as 0.6 mm in size. Some of these large grains (of both minerals) are notably round in shape and they are interpreted as being essentially unmodified detrital grains. Dolomite occurs both as micritic aggregates and as more coarsely granular material (average grain size about 0.06 mm). The dolomite may well have been recrystallized after deposition. Even in the sandy beds it is thought likely that calcite comprises more than two-thirds of the volume of the rock.

The sample is essentially a micritic limestone with some authigenic dolomite and detrital grains of quartz, feldspar, mica and, rarely, dolomite. There are narrow indefinite beds containing sand-grade grains of both quartz and dolomite.

Sample: RS39; TSC20809 12

Location:
Wilkinson No.1; 242.11 to 242.16 metres

Rock Name:
Dolomitic and silty limestone

Thin Section:
This rock contains more abundant calcite and correspondingly smaller amounts of silicates and dolomite than do the rocks described above. Additional features of this sample are the presence of more abundant secondary, coarse-grained calcite and a rather heterogeneous, brecciated texture.

Probably more than 85% of the volume of the rock is composed of an iron-stained micritic mosaic of calcite. Individual crystals are probably less than 0.005 mm in size and in many places could be much smaller than this. Texture in this part of the rock is shown by variations in the amount of iron-staining and in some places these appear to define what could be interpreted as broken blocks in a later micritic cement. There is widely dispersed silt-grade quartz in this part of the rock but many of the original grains appear to have been corroded by the calcite and are now present as rather irregular and angular chips. Only traces of feldspar were identified.

In some places in the rock calcite is distinctly coarser-grained and forms in rather irregular and cuspate patches commonly of the order of 1 mm in size. The average crystal size in these patches is rather difficult to estimate but is probably of the order of about 0.05 mm. This coarser calcite is probably later material introduced into cavities and, possibly, fractures in the original micritic material.

Dolomite occurs as a few sub-circular, fine-grained aggregates interpreted as being original carbonate clasts now incorporated in the limestone. There are a few rhombs of dolomite but these are small and comprise only a small proportion of the total volume of the rock.

The limestone is, therefore, essentially a micrite, but it contains large patches of authigenic calcite and small amounts of authigenic dolomite present as dispersed rhombs. Dolomite is also present as pseudomorphs of clasts (largely of sand-grade) and there is a trace to accessory amount of fine-grained quartz probably derived from original silt-grade grains.

Sample: RS40; TSC20810 13

Location:
Wilkinson No.1; 250.6 to 250.66 metres

Rock Name:
Dolomitic limestone

Thin Section:
An optical estimate of the constituents gives the following:

	%
Iron-stained calcite	65
Dolomite	30
Quartz and feldspar	3-5
Mica	1
Anhydrite	1

As in the limestones higher in the section, this sample consists principally of a micritic mosaic of goethite- or limonite-stained calcite. In this rock, within the calcite there is fairly abundant authigenic dolomite and only a small amount of detrital silicates. There are a few patches of a mineral identified as anhydrite.

The bulk of the sample is more or less red or brown in plane polarized light and is thought to consist essentially of calcite obscured by a staining of goethite and/or limonite. Individual crystals cannot be seen but it is clear that the calcite is essentially a micritic mosaic, homogeneous throughout the area of the thin section, apart from slight variations in the amount of goethitic staining. In a few places in the thin section there are rare, large crystals of calcite (up to 0.15 mm in size). These are probably late calcite deposited in cavities. Dolomite occurs very largely as subhedral rhombic crystals ranging in size commonly up to 0.1 mm. In some fields of view these crystals of dolomite occupy 50% of the rock but they are generally somewhat less abundant. Only a very small proportion of the dolomite occurs as relicts of detrital grains and these, as in other rocks in this collection, are sub-round, fine-grained mosaics generally in the sand-grade range.

Detrital silicates are not abundant but both quartz and potassium feldspar were specifically identified. Some quartz crystals are as much as 0.15 mm in size and the average grain size of both the quartz and the feldspar is probably in the medium to coarse silt range. The grains tend to be angular but this is thought to be due mainly to corrosion by the carbonate minerals.

In some places in the thin section there are crystals of a mineral positively identified as anhydrite. The crystals are as much as 0.2 mm in length. They show subhedral, tabular shapes.

The sample is a micritic limestone with a fairly abundant component of subhedral, authigenic dolomite. Terrigenous grains consist mainly of quartz with minor amounts of mica, potassium feldspar and dolomite. The sample contains a few relatively large crystals of anhydrite.

Sample: RS41; TSC20811

14

Location:
Wilkinson No. 1; 254.35 to 254.41 metres

Rock name:
Micritic dolomitic limestone

Thin Section:
An optical estimate of the constituents gives the following:

	%
Calcite	65
Dolomite	30-35
Quartz	3-5
Opaques	1
Mica	Trace
Feldspar	Trace

This is essentially a fine grained carbonate rock consisting of micritic calcite within which is fairly fine grained but probably authigenic dolomite. Both minerals also occur as equant patches which are either detrital limestone clasts or, possibly, pseudomorphs after ooliths or pellets.

The calcite is generally extremely fine grained and forms more-or-less turbid aggregates. In some places there are elongate fragments of the calcite as much as 2 mm in length and these are probably broken fragments of limestone mud disturbed soon after deposition. Elsewhere the material is somewhat clearer and the calcite is intergrown with dolomite which commonly forms rhombs up to about 0.1 mm in size. Both minerals form more equant fragments of finely granular material interpreted as indicated above. The whole of the sectioned sample in fact gives the impression of being disturbed material and it is possible that the sample is a partly modified intraformational conglomerate or similar disturbed deposit.

Detrital silicate material is present as silt-grade angular chips of quartz and potassium feldspar and fairly well defined flakes of mica. Some of the quartz crystals contain numerous inclusions of carbonate and these probably represent a rather sparse phase of secondary quartz which actually developed within the limestone.

This is a fairly simple rock and it is interpreted as a limestone mud with a sparse terrigenous component. The sample probably originally contained previously partly cemented fragments of limestone as well as ooliths and pellets. The sample has been partly dolomitised and this mineral now forms fairly well formed,but small rhombs. The rock contains a sprinkling of fine grained opaques.

Sample: RS42; TSC20812 15

Location:
Wilkinson No. 1; 274.4 to 274.52 metres

Rock Name:
Dolomitic limestone with gypsum

Thin Section:
An optical estimate of the constituents gives the following:

	%
Calcite	45-50
Dolomite	45-50
Gypsum	2-3
Quartz	1-2

This is a fairly homogeneous rock consisting principally of a micritic mosaic of dolomite and calcite. There are slight variations in the extent of ferruginous staining but these do not define any systematic textural features of the rock.

For the most part calcite and dolomite are present in a fairly homogeneous aggregate which is turbid and dark in plane polarized light. Individual crystals in this part of the rock are probably less than 0.005 mm in size. Staining with alizarin red-S solution indicates the general proportions of the two minerals and it appears that in most of the rock they are randomly intergrown together. There are one or two features of each of the carbonates in a few places in the thin section; in some places there are dolomite rhombs which, although well formed, are commonly not more than about 0.03 mm in size. A little dolomite also occurs as sub-spherical, fine-grained aggregates interpreted as being remnants of original sand-grade grains. Calcite occurs in a similar way and this appears to be a feature of this rock not noted in most of those described above. The rounded aggregates of fairly coarsely granular calcite are generally relatively small and up to about 0.15 mm in size; some show a radial texture. Some calcite also occurs in what are interpreted as being pseudomorphs after micro-fossils. These vary considerably in size but are commonly not more than approximately 0.3 mm.

The sample contains widely dispersed silt-grade and finer quartz, much corroded by the carbonate minerals.

Gypsum occurs in relatively large aggregates, possibly as much as about 2 mm in size. The gypsum itself forms elongate crystals associated with a little dusty opaque material. The patches of gypsum are generally fairly well defined and equant but have, in detail, irregular, sharp boundaries with the adjacent carbonate.

16

Sample: RS43; TSC20813

Location:
Wilkinson No.1; 280.4 to 280.5 metres

Rock Name:
Gypsiferous and dolomitic limestone (breccia)

Thin Section:
This is a rather heterogeneous rock and it is difficult to give precise mineral proportions. Dolomite and calcite appear to be present in sub-equal amounts and there are trace to accessory amounts of detrital silt-grade quartz. The amount of gypsum is difficult to estimate; there are large patches of this mineral possibly comprising perhaps 2% of the volume of the rock but in dolomite-rich areas there appears to be abundant intergranular gypsum which can be identified largely by the pale red stain acquired from the alizarin red-S solution. If all this material is gypsum then this mineral may comprise of the order of 10% of the total volume of the rock.

The most distinctive feature of the rock is the presence of angular to almost round fragments commonly more than 1 mm in size. These occupy the greater part of the volume of the rock and most consist largely of dolomite with intergranular gypsum. Calcite is principally concentrated in the irregular and cuspate intergranular spaces and the calcite is notably associated with dispersed iron oxide/hydroxide. The roundness of the dolomite-rich patches suggests an origin possibly involving rounding during transport, but there is no evidence of sorting of these particles and it is thought more likely that the sample is possibly some kind of intraformational conglomerate or breccia. In one or two places there almost appears to be banding passing from one fragment to another and this also suggests that the material has not moved very far and is some kind of breccia formed when the sediment was still somewhat soft.

As well as occurring as a rather indefinite and distinctly fine-grained phase amongst the micritic dolomite of the fragments, gypsum also occurs in one or two relatively large patches essentially associated with the micritic calcite which forms a matrix between the dolomite fragments. Some of the gypsum aggregates are as much as 1.5 mm in size and they contain fairly well defined prismatic crystals.

This rock is interpreted as being a micritic, granular dolomite with a small to moderate amount of intergranular, fine-grained gypsum; this rock has been brecciated, probably soon after deposition, and the space between the fragments is now occupied by iron-stained micritic calcite.

Sample: RS44; TSC20814 17

Location:
Wilkinson No. 1; 282 to 282.1 metres

Rock Name:
Silty and sandy dolomite

Thin Section:
An optical estimate of the constituents gives the following:

	%
Dolomite	90
Quartz	5
Gypsum	2
Opaques and semi-opaques	2
Feldspar	1
Mica	Trace

This is a rather heterogeneous sample but the bulk of it is a fine-grained granular dolomite with remnant detrital grains of silicates. At one end of the thin section there is a much sandier dolomite with relatively abundant opaque and semi-opaque material and patches of gypsum.

The bulk of the sample consists primarily of dolomite in a virtually submicroscopic mosaic. Within this there are dolomite rhombs up to about 0.1 mm in size and a few relatively coarse-grained aggregates of dolomite interpreted as being relicts of subround clasts. Some of the latter are as much as 0.4 mm in length. Such limestone clasts comprise only a small proportion of the total amount of dolomite in the sample. In this part of the rock, the silicates are rather irregularly distributed and generally occur as equant, rather angular grains/crystals not more than 0.1 mm in size. Both plagioclase and potassium feldspar were identified and both feldspars are fresh. There are very small, straight flakes of both biotite and muscovite also.

At one end of the thin section the sample has a completely different appearance in that it contains much more sandy material and there are clasts of dolomite (and also some ?replaced ooliths) up to about 0.5 mm in size. Clasts of quartz and feldspar are generally of fine sand grade but there is, for example, a rounded plagioclase grain 0.4 mm in diameter. The grains probably occupy more than 50% of this part of the rock. As well as being extremely fine-grained and obscured by ferruginous material, dolomite occurs as clear rhombs and crystals and aggregates up to about 0.06 mm in size. It is clear, therefore, that there is in the rock a phase of authigenesis of dolomite resulting in relatively coarse-grained material compared to abundant, extremely fine-grained dolomite.

Also present in the latter part of the rock are aggregates of ?gypsum up to about 3 mm in length. The gypsum may well have filled cavities in the sample since most of the aggregates are rather irregular in shape.

Sample: RS45; TSC20815 18

Location:
Wilkinson No. 1; 299.56 to 299.70 metres

Rock Name:
Dolomitic limestone with disturbed bedding

Thin Section:
The rock consists essentially of fine-grained carbonates and it is thought that calcite predominates over dolomite by a ratio of about two to one. Much of the carbonate is partly obscured by ferruginous oxides. Detrital silicates are present in accessory or trace amounts only and no gypsum was identified in the thin section with confidence.

When viewed macroscopically it can be seen that the thin section contains a distinctly contorted and deformed part of the stratigraphic section. In one place in the thin section it is almost possible to distinguish micro-fractures but elsewhere the appearance given is that of intense, small-scale disturbance of the bedding.

Under the microscope the rock appears to consist of a micritic aggregate of calcite and dolomite with some variations in the proportions of these minerals but, more particularly in the crystal size and in the amount of ferruginous staining. These variations delineate irregular patches and aggregates commonly ranging in size from about 0.4 mm up to several millimetres. There are two lithological extremes; one is an aggregate of dolomite and calcite having an average crystal size of about 0.02 mm and containing remnants of detrital grains of quartz and mica up to about 0.04 mm in size. The other lithological extreme is a much finer-grained and iron-stained lithology in which the terrigenous components are virtually completely absent. The range is therefore from an extremely fine-grained dolomitic limestone to a rock probably better described as some kind of silty and dolomitic lithology. Commonly there are no gradations between these but simply fragments and bands of each of the two extreme lithologies.

The rock does contain a small amount of authigenic dolomite, present as minute rhombs and there are one or two subround aggregates of micritic dolomite interpreted, as in samples described above, as being derived from limestone or dolomite clasts. Some of these in this rock are so circular in the plane of the thin section that they could also be, for example, cross-sections of fossils.

The sample is, therefore, from a mineralogical point of view, similar to most of the other rocks described above, but it has a disturbed appearance probably as a result of processes which occurred soon after deposition of the sediment when it was still soft.

Sample: RS46; TSC20816

19

Location:
Wilkinson No. 1; 338.35 to 338.4 metres

Rock Name:
Cross-bedded limestone

Thin Section:
An optical estimate of the constituents gives the following:

	%
Dolomite and calcite	90
Quartz	3-5
Opaques and semi-opaques	1-2
Mica	Trace-1
Feldspar	Trace
Gypsum	Trace (to 2?)

When the thin section is viewed macroscopically it can be seen that it contains finely cross-bedded units adjacent to a more contorted lithology. Under the microscope it is clear that all of the rock consists very largely of intergrown dolomite and calcite present in approximately equal proportions. The bedding is shown by slight variations in the amount of iron staining, but more definitely, by variations in the crystal size of the carbonate.

The finest beds generally consist of crystals of dolomite and calcite not more than 0.005 mm in size. These lithologies are also the most ferruginous and contain the smallest proportion of detrital silicate material. Coarser beds contain grains/crystals as much as 0.05 mm in size, although quartz and feldspar are generally not more than about 0.04 mm in size. The carbonates in this part of the rock form equant, anhedral to subhedral crystals in a fairly interlocked mosaic. Dolomite shows some tendency towards the development of rhomb shapes. Quartz and feldspar (apparently mainly potassium feldspar) are present as rather irregular crystals, probably partly resorbed by the dolomite. Mica flakes are, on the other hand, fairly well defined and generally straight.

It is difficult to estimate the amount of gypsum in the sample but it may well be of the order of 2%. For the most part, this mineral occurs in small, irregular aggregates but there are also cross-cutting veinlets filled with elongate gypsum crystals.

The sample is a thinly bedded carbonate rock consisting of approximately equal amounts of dolomite and calcite in essentially granular intergrowths with minor amounts of detrital quartz, feldspar and mica and a little late gypsum.

Sample: RS47; TSC20817

Location:
Wilkinson No.1; 356.23 to 356.34 metres

Rock Name:
Dolomitic limestone with gypsum veinlets

Thin Section:
The sample is similar in many respects to the rock described immediately above, particularly in that it contains subequal amounts of closely intergrown dolomite and calcite. The sample is rather soft and difficulty was experienced in making the thin section and hence no attempt has been made to give an estimate of the mineral proportions. The rock shows less bedding than the sample described above and is distinctly more homogeneous. Dolomite tends to occur as slightly larger crystals than of the calcite and some of these show an approach towards rhombic outlines. Rare, fine-grained aggregates of dolomite may well be relicts of original detrital grains but for the most part the dolomite appears to be a relatively later mineral which has possibly partly replaced some of the finer-grained calcite.

Quartz and feldspar do not comprise more than about 5-7% of the volume of the rock and occur as silt-grade grains which are generally equant and angular to subangular in shape. As far as can be determined the shape characteristics are an integral part of the nature of the material and do not result, for example, from corrosion by the carbonates. The thin section contains part of a vein system containing gypsum veinlets up to about 0.3 mm in width. The gypsum appears to be associated with marginal areas of particularly fine-grained carbonate. The rock contains trace amounts of detrital heavy minerals and mica and irregular patches of somewhat ferruginous material.

Sample: RS48; TSC20818 021

Location:
Wilkinson No. 1; 448.18 to 448.29 metres

Rock Name:
Dolomitic limestone with anhydrite

Thin Section:
The rock consists very largely of dolomite and calcite with possibly 2-3% of quartz and 1% each of mica and anhydrite. The proportions of dolomite and calcite are rather difficult to estimate, particularly in the micritic parts of the rock, but where these materials are a little coarser it appears that calcite probably occupies about 60% of the rock and dolomite the bulk of the remainder.

Essentially the sample consists of a micritic mosaic of calcite and dolomite more or less obscured by ferruginous material. There are some variations in the crystal size of the material and in the amount of goethite/limonite staining and these variations possibly indicate that the sample has a somewhat brecciated texture although much less well defined than in RS45 and RS43, for example. Furthermore, this brecciated appearance is a feature of about 50% of the area of the thin section; the other half of the section is much more massive and featureless. Within the micritic material there are one or two aggregates of calcite which are subround in shape and generally have either radial or concentric textures. These are probably pseudomorphs after original fossils. Sub-spherical aggregates of dolomite are distinctly rare and these are interpreted more as pseudomorphs of detrital carbonate grains since they tend to have a more equigranular texture and are commonly not as perfectly round as are the calcite fossil pseudomorphs. Dolomite also occurs as widely distributed, small rhombs which are clearly of authigenic origin.

Quartz is generally of silt or very fine sand grade and is present as rather equant crystals which are angular in shape. The latter feature is probably due to corrosion by the carbonate minerals. There are traces of potassium feldspar (microcline) and widely disseminated small flakes of detrital mica.

It can be seen when the thin section is examined macroscopically that there is a cross-cutting, diffuse zone, about 3 mm in width, and under high magnification this can be seen to contain slightly more detrital silicate and all of the anhydrite in the rock. The anhydrite forms small crystals or aggregates up to about 0.2 mm in size. One or two of the aggregates have a distinctly round shape and these appears to be concretions which have developed in the carbonate and it certainly appears that the anhydrite is a relatively late mineral. This part of the rock also contains sub-circular calcite aggregates (after fossils) and rhombs of dolomite.

Sample: RS49; TSC20819

022

Location:
Wilkinson No. 1; 449.29 to 449.39 metres

Rock Name:
Micritic limestone

Thin Section:
This is probably the most fine-grained and featureless limestone intersected in the interval from 200 to 450 metres. In thin section the sample appears to be simply a turbid, brown mosaic of sub-microscopic calcite crystals with a small amount of authigenic dolomite and terrigenous material.

The bulk of the rock is a massive, very fine-grained mosaic of calcite within which are widely scattered rhombs of dolomite rarely exceeding about 0.1 mm in size. There are also a few crystals and aggregates of calcite (approximately 0.05 mm in size) and these are subround and may be pseudomorphs of either fossil cross-sections or detrital grains (probably the former). Silicate terrigenous material is widely distributed but is generally of silt-grade and probably comprises no more than a few percent of the volume of the rock. Quartz and mica were identified but it is possible that the rock also contains a little feldspar not noted during the survey of the section. The quartz grains have been corroded by the carbonate and now have equant but distinctly irregular shapes.

The sample is a fine-grained limestone with a little authigenic dolomite and a very sparse, terrigenous silicate component.

Sample: RS50; TSC20820

Location: 023
Wilkinson No. 1; 276.53 to 276.68 metres

Rock Name:
Dolomitic limestone with gypsum

Thin Section:
An optical estimate of the constituents gives the following:

	%
Calcite	60-70
Dolomite	10-20
Gypsum	15
Quartz	3
Feldspar	Trace
Mica	Trace
Opaques	Trace

Most of the area thin sectioned consists of a micritic mosaic of calcite with minor amounts of dolomite and a little detrital silicate material but in one part of the thin section there are large aggregates of gypsum and the material is coarser and there is more evidence of the presence of secondary quartz and dolomite.

In most of the thin section the minerals are present as equant anhedral to subhedral crystals generally not more than 0.06 mm in size. In fact, most of the material consists of distinctly micritic calcite with, in a few places, slightly coarser grained aggregates up to about 0.3 mm in size. Some of these aggregates have distinctly round outlines and may be remnants of original fossils or ooliths. Similar features are present consisting of dolomite but these tend to have a more granular texture in contrast to the fine grained or radial textures seen in some of the calcite examples. In this part of the rock, and in the thin section as a whole, dolomite occurs mainly as subhedral or euhedral rhombs generally in the order of 0.05 to 0.1 mm in size. The presence of these clearly indicates that the dolomite is essentially later than the calcite and is, in effect, an authigenic mineral. In the bulk of the rock quartz, feldspar and mica are present as silt-grade detrital components widely distributed amongst the carbonate.

In one part of the thin section the carbonates are somewhat coarser grained than described immediately above and the rock contains large aggregates of gypsum. Some of these are as much as 1 cm in size and consist of distinctly fine grained material showing complex growth patterns with tendencies towards colloform textures and radial arrangements. Associated with the gypsum are euhedral quartz crystals which appear to be of secondary origin and (probably) preceded the gypsum. Also present in this part of the thin section is a circular patch (0.4 mm in size) apparently consisting largely of anhydrite.

The sample is therefore essentially a micritic limestone with widely dispersed authigenic dolomite and a minor amount of terrigenous silicates. In places there are large aggregates of gypsum associated with secondary quartz and ?anhydrite.

Sample: RS51: TSC20821

Location:
Wilkinson No. 1; 304.85 to 305.0 metres

024

Rock name:
Oolitic limestone with gypsum

Thin Section:
The thin section consists of two distinct lithologies both of which are essentially limestone. One is micritic with a small amount of heterogeneous silicate component, hence it is similar to many other limestones in this drill hole, but the other has a rather distinctive texture and consists of aggregates of limestone (including ooliths and ?pellets) in a cement of abundant gypsum.

The micritic limestone consists very largely of a mosaic of equant anhedral calcite crystals not more than 0.02 mm in size. There is a small amount of dolomite associated with these but only a little of the dolomite forms identifiable rhombs and it is not possible to indicate with precision the relative ages of these two minerals. Within the aggregate of carbonate are some small irregular crystals of quartz up to about 0.1 mm in size. As far as can be determined this quartz is most likely to be relict detrital material rather than having grown in the limestone. There are traces of feldspar and mica also. The material is essentially homogeneous and featureless in thin section although in places there appears to be some organisation of the crystals of carbonate into a grumose texture. Also present are some radiating aggregates of calcite which may be psuedomorphs after original ooliths.

The other lithology in the thin section consists of about 30 to 40% of carbonate fragments (ooliths or pellets), possibly approximately 20% of finer grained granular carbonate and 50% of coarse grained gypsum. The calcite forms more-or-less circular aggregates in the thin section ranging in size from 0.2 to approximately 1 mm. Some of these fragments are extremely fine grained and turbid and are probably pelletal material; others have a well defined radial texture and are probably recrystallised psuedomorphs after original ooliths. Some of the latter show the effects of pressure solution. Dolomite is present in this part of the rock solely as authigenic material commonly forming rhombs. Some of these are completely enclosed in gypsum.

The gypsum itself occurs between the aggregates of calcite and commonly forms large crystals showing a common extinction position over areas of the section of more than 1 sq. mm. There are small amounts of granular anhydrite and one or two crystals of quartz which could well be of secondary origin. This part of the rock therefore appears to be essentially a carbonate rock consisting principally of ooliths and pellets within which coarse grained gypsum has been deposited. Other secondary minerals include dolomite, quartz and anhydrite.

Sample: RS52; TSC20822

025

Location:
Wilkinson No.1; 307 to 307.18 metres

Rock Name:
Dolomitic limestone (micrite)

Thin Section:
An optical estimate of the constituents gives the following:

	%
Calcite	60
Dolomite	35-40
Quartz	2
Gypsum	<1
Mica	Trace

The bulk of this rock is a fine-grained aggregate of dolomite and calcite having an average crystal size of less than 0.01 mm. This material is homogeneous and consists principally of calcite with, generally, slightly better formed dolomite crystals. In some places there are dolomite rhombs up to about 0.1 mm in size. The most characteristic feature of this rock is the presence of sub-circular aggregates of both calcite and dolomite. The aggregates of dolomite tend to be relatively coarse-grained and contain equant crystals up to about 0.1 mm in size, but the calcite aggregates generally have a radial texture and individual aggregates are about 0.3 mm in diameter. The origin of these aggregates cannot be distinguished unequivocally but it is possible that the calcite aggregates are derived from original ooliths, whereas the coarser-grained dolomite aggregates may be some kind of secondary cavity filling. Identifiable circular structures such as these occupy no more than about 3-5% of the total area of the thin section.

Detrital silicate grains are present only to a very small extent and form equant, angular grains commonly not more than 0.1 mm in size. The angularity of many of these grains is clearly due to corrosion by the adjacent carbonates. As in other rocks, biotite is present as fresh, small flakes showing pleochroism in shades of brown.

It is difficult to estimate the amount of gypsum in this sample and it is possible that some has been removed during separation of the thin section. There are one or two rather coarse-grained aggregates of this mineral (tentatively identified) but there are also numerous cavities in the rock which may well originally have contained some gypsum.

The sample is a dolomitic limestone with an essentially fine-grained texture. There are spherical aggregates of both carbonates possibly related to recrystallized ooliths, concretions or cavity fillings. Detrital silicates are present to only a very small extent but it is possible that the rock contains a significant amount of gypsum dispersed in irregular, small cavities.

Sample: RS53; TSC20823

026

Location:
Wilkinson No. 1; 311.13 to 311.27 metres

Rock name:
Dolomitic limestone with gypsum

Thin Section:
An optical estimate of the constituents gives the following:

	%
Calcite	40-45
Dolomite	40
Gypsum	10
Quartz	3
Mica	Trace

Apart from the presence of a few large aggregates of gypsum this is a fairly homogeneous sample consisting of subequal amounts of calcite and dolomite and a minor to accessory amount of quartz. The carbonate minerals generally form a homogeneous micritic mosaic in which dolomite and calcite form approximately equal proportions. Much of this material is turbid and the crystals are probably less than 0.01 mm in size. There are, however, considerable variations in the texture in detail and these involve both the calcite and the dolomite. Both minerals in fact form single crystals or aggregates of the order of 0.1 to 0.15 mm in size and in the case of dolomite certainly, and possibly also that of calcite, these are clearly relatively late minerals which have grown within the micritic carbonate. Both calcite and dolomite also form more-or-less round structures of the order of 0.2 mm in size. These do not generally have a well defined internal structure but their shape is consistent with these being psuedomorphs after original ooliths or pellets. Some of the rounded aggregates of dolomite, particularly, are dark and turbid and these appear more likely to be pellets. In some places the sample has a texture approaching a grumose texture but this is rarely well defined.

The sample contains aggregates of gypsum commonly several millimetres in size. The gypsum is itself rather fine grained but there are patches showing common extinction position. The aggregates of gypsum generally have sharp contact against the carbonate and in some places the gypsum appears to be rimmed by an irregular mantle of fine grained dolomite. Quartz in the rock is interpreted as being principally of secondary origin rather than relict detrital material . This is particularly the case where quartz forms aggregates of several crystals crowded with inclusions of carbonate. Elsewhere the quartz forms subhedral to euhedral crystals rather than the corroded remnants of detrital grains. It is possible that some of the quartz is of detrital origin and this certainly applies to the whole of the rather small amount of mica widely disseminated in the rock.

Sample: RS54; TSC20824

027

Location:
Wilkinson No. 1; 319.04 to 319.20 metres

Rock Name:
Dolomitic, micritic limestone

Thin Section:
An optical estimate of the constituents gives the following:

	%
Calcite	80
Dolomite	10
Gypsum	3-5
Quartz	2-3
Mica	1
Feldspar	Trace

This is a somewhat heterogeneous rock containing patches having a somewhat different grain size. The coarsest material in the rock is an aggregate of calcite with minor dolomite containing crystals up to approximately 0.08 mm in size. Crystals as large as these generally occur in a distinctly finer-grained matrix of calcite and dolomite. The large crystals of calcite are generally equant anhedra but those of dolomite tend to show rhombic outlines and are interpreted as being later than the calcite. The mosaic of calcite shows gradations in grain size down to patches which are virtually sub-microscopic. There is no specific bedding identifiable in the rock although some grain size variations are associated with an irregular system of fine, narrow veinlets. Some of these veinlets are also associated with elongate patches of gypsum apparently present as relatively large, elongate crystals. Some gypsum patches are as much as 1 mm in size. Quartz occurs as subround to angular crystals up to approximately 0.1 mm in size. Some crystals show rational crystal faces and these may well be secondary quartz which has grown in a sedimentary environment, possibly on original grains. Throughout the rock there are much smaller crystals of quartz with angular shapes interpreted as being derived from a detrital grain now essentially largely resorbed by the carbonates. There are traces of fresh, small crystals of potassium feldspar and flakes of mica. The proportions of all these silicates vary considerably from place to place in the section but not in any systematic way.

The sample is therefore a rather heterogeneous limestone consisting essentially of micritic calcite within which are later rhombs of dolomite and possibly some later development of quartz. There are remnants of detrital silicate grains and patches of relatively coarse-grained gypsum. In much of the thin section there is a pattern of variations in the grain size of the calcite associated with a system of narrow ?veins and the rock may have a complex history with several periods of crystallization of the carbonate minerals.

Sample: RS55; TSC20825

028

Location:
Wilkinson No.1; 320.0 to 320.14 metres

Rock Name:
Dolomitic limestone with gypsum

Thin Section:
An optical estimate of the constituents gives the following:

	%
Calcite	60
Dolomite	10-20
Quartz	15
Gypsum	7-10
Feldspar	1
Mica	Trace

This is a micritic limestone consisting principally of a mosaic of very fine-grained calcite. Within this there are rhombs of authigenic dolomite and some larger, equant dolomite patches which are probably pseudomorphs of original detrital grains. Calcite also forms similar pseudomorphs but these are not abundant. The fine-grained patches of carbonate range in size up to about 1 mm and they are generally structureless, although some of those containing calcite have a faint radial texture. It is possible, but unlikely, that some, at least, of these round structures are recrystallized ooliths. Apart from these structures and the small rhombs of authigenic dolomite the carbonate is present as fine-grained and granular material which is essentially featureless and homogeneous.

Most of the quartz in the rock is clearly derived from detrital grains and it is now present as equant, angular crystals commonly up to 0.1 mm in size and generally within the silt-grade range. There are one or two aggregates of quartz exceptionally up to about 2 mm in size. These are rather difficult to interpret and it is thought that some are probably subround, polycrystalline, detrital grains whereas others may be quartz which has grown in situ in the limestone and now forms rather small aggregates of inclusion-laden crystals. There is a little fine-grained fresh microcline and occasional flakes of mica.

The thin section contains aggregates of a mineral tentatively identified as gypsum. These aggregates are commonly several tenths of a millimetre in size and range up to about 2 mm. They contain a pale brown, stained mineral which is dark between crossed nicols. The patches are commonly rather irregular in shape and some are elongate. These patches are not interconnected and do not appear to be associated with, for example, any system of veins.

The sample is, therefore, a micritic limestone with remnants of original clasts of carbonate as well as silt-grade silicate minerals. The rock appears to contain a little authigenic dolomite and large aggregates of late gypsum.

Sample: RS56; TSC20826

Location:
Wilkinson No.1; 330.38 to 330.48 metres

029

Rock Name:
Dolomitic limestone

Thin Section:
An optical estimate of the constituents gives the following:

	%
Calcite	75
Dolomite	20
Quartz	3
Gypsum	1-2
Mica	Trace

The rock is a fine-grained micritic limestone consisting of irregularly distributed patches of calcite and dolomite. In general, the two minerals appear to occur separately from each other rather than in homogeneous intergrowths. The dolomite forms somewhat elongate patches as much as several millimetres in length and about 1 mm in width. These patches of dolomite have diffuse margins against the calcite and appear to contain a rather larger proportion of quartz. Superficially, therefore, these patches may well be relicts of originally deposited silty dolomite subsequently incorporated in a micritic limestone. Other features of the rock are sub-spherical aggregates within the limestone which are interpreted as being either detrital fragments or cross-sections of fossils. These features are commonly not more than about 0.1 mm in size.

Quartz is present largely as small, silt-grade grains which are angular in shape and have probably been partly corroded by the carbonate. The rock does contain, however, a few larger aggregates of quartz and one or two of these have a radial texture and are therefore probably of secondary origin, having been deposited within the rock after the formation of the micrite. Mica is present as rather rare detrital flakes and in one place there is a small knot of unusually green biotite (??glauconite) present as contorted flakes up to about 2 mm in length. In one place in the thin section there is an aggregate of a mineral interpreted as being gypsum and this is about 0.6 mm in length and consists of oriented, fibrous crystals closely intergrown with the adjacent dolomite. Gypsum is present, also, as dispersed, elongate crystals not more than about 0.05 mm in length. These occur largely in the calcite part of the rock rather than in the dolomitic part.

Sample: RS57; TSC20827

030

Location:
Wilkinson No.1; 333.73 to 333.96 metres

Rock Name:
Limestone with secondary silica

Thin Section:
For the most part the thin section consists of a monomineralic mosaic of calcite but within this are veinlets of secondary silica and a few thin beds of somewhat silty limestone.

The bulk of the rock is a micritic limestone consisting of a granular mosaic of anhedral calcite crystals generally not more than 0.02 mm in size. There are rare grains/crystals of quartz within this material but these comprise less than 1% and are generally not more than 0.04 mm in diameter. In two or three places in the thin section there are thin beds not more than 0.3 mm in width. These contain a matrix of fine-grained calcite like that in the bulk of the rock but there are small flakes of mica and grains of quartz. Together, these ferruginous components comprise about 25-35% of these beds but they are present as grains commonly less than 0.005 mm in size. The mica flakes have a well defined preferred orientation parallel to the bedding.

The thin section contains part of a wide band of rather contorted secondary silica. Altogether this band is about 8 mm in width and it consists of coarse-grained silica. In some places this shows numerous inclusions and a radial texture clearly indicating that it is a cavity-filling low temperature quartz/chalcedony. In some places the material is coarsely granular and there are individual crystals of quartz/chalcedony of the order of 0.2 to 0.3 mm in size. The quartz generally has sharp but irregular boundaries against the adjacent carbonate and in some places the two minerals are intergrown together.

The sample is, therefore,a micritic limestone with silty and ferruginous thin beds. The rock shows evidence of the authigenic development of quartz/chalcedony in specific bands/veins.

Sample: RS58; TSC20828

031

Location:
Wilkinson No.1; 342.1 to 342.25 metres

Rock Name:
Micritic limestone with secondary quartz, gypsum and calcite

Thin Section:
The mineral proportions in the rock as a whole depend upon the amount of secondary material intersected during preparation of the thin section; in essence, the sample consists of a micritic limestone within which are broad and complex bands containing coarse-grained secondary gypsum, quartz and calcite and a micritic dolomite probably of secondary origin.

The bulk of the rock consists very largely of calcite with widely dispersed and accessory silt-grade detrital quartz. Although the calcite is essentially fine-grained there is a considerable amount of texture due to the presence of poorly-formed subspherical aggregates of particularly fine-grained material which are cemented by slightly coarser-grained calcite. In most of the thin section the small aggregates of submicroscopic calcite are generally about 0.2 mm in size but there is one elongate but well-rounded body about 12 mm in length. In some places cementation has clearly occurred by the development of relatively coarse-grained calcite and there are crystals up to about 0.005 mm in size. Elsewhere, cementation has occurred partly by the development of gypsum(?) in original cavities. These aggregates of gypsum are generally not more than 0.1 mm in size and commonly much smaller.

About one-quarter to one-third of the area of the thin section is occupied by a more complex lithology, including abundant secondary minerals. Quartz is present as crystals commonly ranging in size from 0.1 to 0.5 mm and some crystals show the development of rational crystal faces. The quartz outlines are sharp, straight and well-defined against the fine-grained calcite. In some places the quartz shows typical radiating habits and the presence of aligned inclusions, indicating the development of the quartz into a cavity. There is coarse-grained calcite and large veinlets of relatively coarse-grained gypsum also. Both these minerals are interpreted as being of secondary origin. The coarse-grained secondary minerals described briefly above occur in an homogeneous aggregate of extremely fine-grained dolomite. This is particularly closely intergrown with the coarse-grained patches and veins of gypsum. The origin of this dolomite is a little difficult to distinguish and it is possible that the secondary minerals have been concentrated in dolomitic (as opposed to limestone) beds. Alternatively, the dolomite may itself be a secondary mineral, although this is less likely in view of the very small grain size of the dolomite compared to that of, for example, secondary calcite.

The sample is a micritic limestone probably recrystallized after a limestone containing both detrital limestone fragments and ooliths. The origin of the small, equant concentrations of very fine calcite could not be determined from the thin section. Within this limestone are veins and patches of secondary minerals including gypsum, quartz and calcite.

Sample: RS59; TSC20829

032

Location:
Wilkinson No. 1; 344.0 to 344.13 metres

Rock Name:
Dolomite with secondary quartz, calcite and gypsum

Thin Section:
An optical estimate of the constituents gives the following:

	%
Dolomite	65-70
Calcite	20
Gypsum	5-10
Quartz	5
Opaques	1

This is a banded rock consisting essentially of a micritic dolomite within which are zones containing concentrations of coarse-grained secondary minerals as enumerated above. The dolomite itself shows variations in the amount of terrigenous silty material and ferruginous staining but is, in essence, a homogeneous matrix within which are the coarse-grained bands.

In some places the dolomite forms a mosaic of crystals as much as 0.02 mm in size and some of the larger crystals have a tendency towards rhombic outlines. In most places in the thin section, however, dolomite crystals are virtually sub-microscopic and form a monomineralic, featureless mosaic. Crystals of quartz (commonly not more than 0.01 mm in size) are widely dispersed and there are rare flakes of detrital mica.

The banding in the rock can be seen clearly in the hand specimen and the bands are due to the concentration of secondary minerals in particular zones. Within these zones the secondary minerals comprise of the order of 50% of the rock and the dolomite is present as a'matrix'. Secondary calcite occurs as individual crystals or aggregates of crystals commonly ranging in size from 0.1 to 0.4 mm. The crystals have sharp edges against the dolomite although there is only a small development of rhombic outlines. Quartz occurs both as single crystals and as rather complex aggregates, some of which show a radial texture. In most parts of the section the aggregates of quartz are 0.2 to 0.4 mm in size but in some places they are much larger than this and form a virtually contiguous mosaic. Discolouration and growth patterns can be seen in the quartz in some places. It appears that the third phase, gypsum, is later than the quartz and calcite and it tends to occur in veinlets. Some of these veins are as much as about 0.6 mm in width and the gypsum tends to grow as fine flakes across the length of the vein. Elsewhere the gypsum forms irregular patches but the vein-habit is predominant.

The sample is, therefore, a micritic dolomite containing coarse secondary minerals concentrated in bands.

Sample: RS60; TSC20830

Location:
Wilkinson No. 1; 390.32 to 390.4 metres

033

Rock name:
Banded dolomite and limestone

Thin Section:
The thin section contains several different lithologies varying from an apparently monominerallic dolomite to beds containing a little calcite and a considerable amount of gypsum. The rock also contains subconcordant veins of secondary quartz with which gypsum is associated.

The most abundant lithology is a micritic dolomite which is dark and turbid in plane polarised light. The crystal size of the dolomite is probably less than 0.005 mm in many parts of the rock and few crystals are as much as 0.02 mm in size. In many places the dolomite occurs with dispersed opaque and semi opaque material and varying proportions of this define a laminar bedding often on a scale of only 0.1 mm. There is a small amount of detrital quartz generally forming silt-grade angular chips.

This material grades into micritic dolomite within which is a network of veins of gypsum. In many fields of view gypsum occupies possibly as much as 30 to 40% of the volume of the rock. The gypsum crystals within the veins show orientation but the veins themselves are essentially randomly dispersed and form, as mentioned above, a network. Elsewhere gypsum is present either as coherent aggregates within the dolomite (up to 1 mm in size) or it occurs closely associated with veinlets of secondary quartz. In the latter position the gypsum characteristically forms in the centre of the vein and quartz forms fairly large crystals marginally arranged.

Individual quartz crystals are as much as 0.4 mm in size and most are equant anhedra and they show no arrangement with respect to the overall disposition of the vein. Some of the quartz veins show apparent pinch and swell structures in accordance with variations in the otherwise laminar bedding in the dolomitic material.

The sample is a thinly bedded micritic dolomite with which fairly fine grained gypsum is associated in veins in some places. Secondary gypsum and quartz are also coarse grained and are associated with specific subconcordant veins.

Sample: RS61; TSC20831

Location:
Wilkinson No. 1; 439.8 to 439.9 metres

034

Rock name:
Dolomitic and gypsiferous limestone

Thin Section:
An optical estimate of the constituents gives the following:

	%
Calcite	75-80
Dolomite	10
Gypsum	7-10
Quartz	5
Anhydrite	1
Feldspar	Trace
Mica	Trace

This is a micritic limestone containing patches of secondary dolomite and gypsum. Some of the quartz is probably of detrital origin but there is evidence of some secondary quartz also.

The bulk of the sample is a more-or-less turbid fine grained limestone showing some rather indefinite textural features. These are delineated mainly by variations in the crystal size of the calcite and there are relatively coarse patches (crystal size approximately 0.02 mm) up to 1.5 mm in size. Some of these patches are subcircular in outline and may be psuedomorphs after original ooliths but others are more irregular and have a more complex internal texture. Most of the calcite is granular but in places there are small curved structures of fine grained calcite in aligned crystals. Despite these textural variations the sample does not have a grumose texture since small similar-sized patches are not developed.

Within this fine grained calcite there are crystals of quartz; some are filled with inclusions and are thought to be of secondary origin but others are silt-grade chips probably of original detrital material. There is a small amount of potasisum feldspar and rare flakes of mica.

Dolomite occurs in the rock essentially as well defined patches within the calcite. These patches are up to about 1.5 mm in size and although they are equant they are somewhat irregular in detail so that they do not appear to be psuedomorphs after original carbonate clasts. Dolomite generally has a relatively coarse grained and granular texture with a few oval patches of extremely fine grained material. Gypsum occurs as rather irregular patches particularly in one part of the thin section. Here the gypsum forms an almost continuous mosaic of cuspate and irregular areas commonly more than 1 mm in size. Fine grained anhydrite speckles the gypsum in some places. The anhydrite probably developed by dehydration of the gypsum during burial of the rock. Rare anhydrite crystals are as much as 0.3 mm in length and occupy as much as 50% of the gypsiferous areas.

The sample is a micritic limestone with a small terrigenous component. There are coarse grained patches of dolomite and gypsum and some of the latter has been converted to anhydrite.

Sample: RS62; TSC20832

035

Location:
Wilkinson No. 1; 461.0 to 461.09 metres

Rock name:
Limestone

Thin Section:
An optical estimate of the constituents gives the following:

	%
Calcite	90
Dolomite	5
Quartz	3-5
Mica	Trace-1
Feldspar	Trace
Opaques	Trace

This is a micritic limestone showing some slight variations in the texture of the micrite but by no means as marked as in many other samples of this collection. In addition to the original micrite there are a few aggregates of coarser grained secondary calcite and there are widely dispersed rhombs of dolomite.

Most of this rock consists of a turbid aggregate of extremely fine grained calcite. The material shows indefinite banding due to variations in the crystal size of this material and slight variations in the amount of very diffuse and indefinite ?ferruginous matter. The coarsest original calcite commonly present forms crystals no more than about 0.03 mm in size and such material occurs in rather narrow bands generally not more than 0.2 mm in width. A little calcite is present, however, as clearly secondary material forming distinctly coarse grained patches. These comprise about 10% of the rock and contain crystals up to 0.2 mm in size. Most of these secondary patches of calcite are elongate and have an alignment parallel to the overall bedding of the sample. Few of the patches are more than about 0.6 mm in length.

Dolomite is present as widely dispersed small rhombs and there may also be a little dolomite intergrown with the micritic calcite.

Terrigenous silicate detritus is present as silt-grade material forming angular but equant crystals of quartz and feldspar (both potassic and sodic varieties were identified) and small flakes of both muscovite and biotite. Some plagioclase shows sericitisation but the other silicate minerals are perfectly fresh.

This sample is therefore a fairly simple micritic limestone with secondary calcite and dolomite. The sample consists essentially of these carbonate minerals and there is only a minor amount of terrigenous material.

Sample: RS63; TSC20833

036

Location:
Wilkinson No. 1; 462.86 to 463.0 metres

Rock Name:
Micritic limestone

Thin Section:
The thin sections contains possibly 2-5% of dispersed goethitic material but otherwise consists entirely of a homogeneous aggregate of calcite.

There are some variations in the crystal size of calcite from place to place but there are few crystals more than about 0.1 mm in size and most of the rock is finer-grained than about 0.05 mm. In general the calcite occurs in granular mosaics and the crystals tend to be a similar size within any one field of view. The crystals are equant anhedra and there is considerable interlocking and apparently no development of crystal faces. In some places the calcite is slightly obscured by brown, ferruginous material, probably goethite or limonite. Such material is concentrated in particular parts of the thin section rather than being widely distributed evenly throughout the calcite. In one place in the thin section the iron oxides are concentrated in a well defined, micro-stylolitic feature showing columnar structures.

The rock contains about 2-3% of quartz present as three or four aggregates within the thin section. These aggregates are of the order of 0.4 to 1 mm in size and generally consist of a few crystals 0.1 to 0.3 mm in diameter. By analogy with other samples in this collection, it appears more likely that this quartz is of secondary origin than being detrital. Certainly the quartz shows smooth boundaries against the adjacent calcite and, such features are not generally characteristic of detrital quartz.

The rock is, therefore, a slightly variable, micritic limestone containing patches and veins of goethitic material and one or two small aggregates of secondary silica which has clearly grown within the calcite mosaic.

Sample: RS64; TSC20834

Location:
Wilkinson No. 1; 493.06 to 493.25 metres

037

Rock name:
Dolomite

Thin Section:
This is a laminar-banded dolomite which has a micritic texture. Banding is shown by slight variations in the amount of staining on the dolomite crystals but, more particularly, by slight variations in the crystal size. The coarsest dolomite in the sample is generally present as equant anhedral crystals about 0.06 mm in size but such coarse grained material generally forms thin specific beds whereas in most of the thin section the dolomite is distinctly finer grained than this. As far as can be determined the dolomite forms simply a granular, interlocked mosaic with no psuedomorphous or other textural features.

There is a little calcite intergrown with the dolomite and this can most readily be identified in the coarser beds. It is unlikely that the calcite comprises more than 10% of the volume of the rock as a whole. No textural relationships between the two minerals can be seen and there is no evidence to indicate that one crystallised significantly earlier than the other.

Silicate minerals are apparently randomly distributed throughout the sample and generally occur as angular grains in the medium to fine silt-grade. Feldspar could be specifically identified in many places and there are parallel-aligned flakes of mica. In one part of the thin section there is an aggregate of quartz forming an irregular patch about 2 mm in size. This is interpreted as being secondary quartz which has probably filled a cavity in the original dolomitic material.

The sample is a finely banded micritic dolomite with a very sparse and fine grained silicate detrital component.

Sample: RS65; TSC20835

Location:
Wilkinson No. 1; 516.12 to 516.27 metres

038

Rock name:
Limestone

Thin Section:
An optical estimate of the constituents gives the following:

	%
Calcite	90
Dolomite	<5
Quartz	2
Anhydrite	2
Gypsum	<1
Feldspar	Trace

The rock is a fine grained limestone which has, in many parts, a grumose texture. There are patches of secondary anhydrite and a small amount of detrital silicate material also.

The calcite which comprises the bulk of the rock is generally fine grained and micritic but it is organised in many places into more-or-less circular patches which give the rock a grumose appearance. Many of the round patches are of the order of 0.1 to 0.4 mm in diameter and consist either of finely granular calcite or fine grained calcite with a radial texture. There are, in addition, larger 'grains' (up to 1 mm in size) which themselves have a spotted and grumose texture. These large aggregates are cemented by either massive fine grained calcite or finer grumose material. These textures therefore suggest that the rock has had somewhat complex history probably involving more than one stage of the growth of calcite crystals. The origin of the smaller grains is difficult to determine but it seems likely that some, at least, are derived from ooliths and/or pellets. Some of these structures appear to have been broken during agitation or transport before being finally cemented by micritic calcite.

There are rare detrital grains of both quartz and feldspar as much as 0.8 mm in diameter but most of the material is of fine sand or silt-grade. The grains are equant but are generally angular probably due largely to corrosion by the carbonate. As far as can be determined most of the feldspar is microcline and it is generally fairly fresh.

Anhydrite was specifically identified in some places in the section where it forms relatively large subhedral crystals (up to 1 mm in length). Also present is a phase which is probably gypsum. These minerals have clearly developed in the limestone after deposition.

The sample is a fine grained limestone containing a small amount of secondary dolomite, gypsum and anhydrite and a rather varied group of detrital silicate grains. The limestone shows complex textures indicating more than one period of calcite precipitation and probably some agitation of ooliths before final cementation.

DEPARTMENT OF MINES AND ENERGY - SOUTH AUSTRALIA

APPLICATION FOR EXAMINATION OF SPECIMENS OR SAMPLES

UNIT NUMBER			Applicant's Number	Descriptive Information; Drillhole, Survey etc.	Details of work required	Estimated Cost
1:100,000 SHEET	RS	Number				
5438	RS	34	210·12 - 210·20	WILKINSON No 1	TS + ROUTINE PETROGRAPHIC	
"	"	35	222·00 - 222·04	"	" DESCRIPTIONS	
"	"	36	224·24 - 224·30	"	"	
"	"	37	228·48 - 228·58	"	"	
"	"	38	237·16 - 237·20	"	"	
"	"	39	242·11 - 242·16	"	"	
"	"	40	250·60 - 250·66	"	"	
"	"	41	254·35 - 254·41	"	"	
"	"	42	274·60 - 274·52	"	"	
"	"	43	280·40 - 280·50	"	"	
"	"	44	282·00 - 282·10	"	"	
"	"	45	299·56 - 299·70	"	"	
"	"	46	338·35 - 338·40	"	"	
					Total	351

Type of Samples DRILL-HOLE

Disposal of Samples RETURN SAMPLES AND THIN SECTIONS

Name of Applicant C. G. GATEHOUSE

Address SADME

Signed Colin G Gatehouse Date 26/10/78

OFFICE USE ONLY

Submitted to AMDEL for - Analytical, Petrological, Other Examination

Firm/Estimated Price $351

Charge against Project No. 11·06·0512

Approved _____
Director General

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DEPARTMENT OF MINES AND ENERGY - SOUTH AUSTRALIA

APPLICATION FOR EXAMINATION OF SPECIMENS OR SAMPLES

UNIT NUMBER			Applicant's Number	Descriptive Information; Drillhole, Survey etc.	Details of work required	Estimated Cost
1:100,000 SHEET	RS	Number				
5438	RS	47	356·23 - 356·34			
		48	448·18 - 448·29			
		49	449·29 - 449·39			
					Total	$81

Type of Samples: DRILL HOLE CORE

Disposal of Samples: RETURN SAMPLES AND THIN SECTIONS

Name of Applicant: C. G. GATEHOUSE

Address: SADME

Signed: Colin G Gatehouse Date: 26/10/78

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Firm/Estimated Price $81 [TOTAL $432]

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APPLICATION FOR EXAMINATION OF SPECIMENS OR SAMPLES

UNIT NUMBER			Applicant's Number	Descriptive Information; Drillhole, Survey etc.	Details of work required	Estimated Cost
1:100,000 SHEET	RS	Number				
5438	RS	50	276·53-276·68	WILKINSON No 1	T.S. & DETAILED PETROGRAPHY	
"	"	51	304·85-305·00	"	"	
"	"	52	307·08-307·18	"	"	
"	"	53	311·13-311·27	"	"	
"	"	54	319·04-319·20	"	"	
"	"	55	320·00-320·14	"	"	
"	"	56	330·38-330·68	"	"	
"	"	57	333·13-333·96	"	"	
"	"	58	342·10-342·25	"	"	
"	"	59	364·00-364·13	"	"	
"	"	60	390·32-390·40	"	"	
"	"	61	439·80-439·90	"	"	
"	"	62	461·00-461·09	"	"	
					Total	351

APPROXIMATE SAMPLE POSITIONS AS INDICATED

Type of Samples DRILL CORE

Disposal of Samples RETURN SAMPLES + T.S.

Name of Applicant C. G. GATEHOUSE

Address SADME

Signed C. G. Gatehouse Date 26/10/78

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Submitted to AMDEL for - Analytical, Petrological, Other Examination

Firm/Estimated Price $351

Charge against Project No. 11·06·0512

Approved J. Keely A
Director General

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DEPARTMENT OF MINES AND ENERGY - SOUTH AUSTRALIA

APPLICATION FOR EXAMINATION OF SPECIMENS OR SAMPLES

UNIT NUMBER			Applicant's Number	Descriptive Information; Drillhole, Survey etc.	Details of work required	Estimated Cost
1:100,000 SHEET	RS	Number				
5438	RJ	63	462·86-463·00	WILKINSON N°1	TS + DETAILED PETROGRAPHY	
		64	493·06-493·25			
		65	516·12-516·27			
					Total	$81

Type of Samples DRILL CORE

Disposal of Samples RETURN SAMPLES + T.S.

Name of Applicant C. GATEHOUSE

Address SADME

Signed Colin G Gatehouse Date 26/10/78

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Submitted to AMDEL for - Analytical, ~~Petrological, Other Examination~~

Firm/Estimated Price $81 TOTAL $432

Charge against Project No. 11·06·0512

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Director General

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STRATIGRAPHIC DRILLING

Department of Mines & Energy

PR No. 5

GS 1/1/232 January 1979

amdel
The Australian Mineral Development Laboratories
Flemington Street, Frewville, South Australia 5063
Phone Adelaide 79 1662, telex AA 82520

040

Pilot Plant: Osman Place, Thebarton, Sth. Aust.
Phone Adelaide 43 8053
Branch Offices: Perth and Sydney
Associated with: Professional Consultants Australia Pty. Ltd.

Please address all correspondence to Frewville.
In reply quote: GS1.1.232

24 January 1979

Director-General,
Department of Mines & Energy,
Post Office Box 151,
EASTWOOD, 5063.

STRATIGRAPHIC DRILLING

PROGRESS REPORT NO. 5

Investigation and Report by: Dr Brian G. Steveson

Manager, Geological Services Division: Dr Keith J. Henley

Brian G Steveson.

for Norton Jackson,
Managing Director.

meo/7

STRATIGRAPHIC DRILLING

041

1. INTRODUCTION

This report contains results on two sets of samples from Wilkinson No. 1. Samples RS81-86 were submitted for emission spectrographic analysis (codes A1 and A2) and samples RS87-91 were submitted for petrography and mineragraphy. Some time was spent in discussing the latter results with the client.

2. ANALYSES

The spectrography results are shown in Table 1.

Sample	Depth
RS 81	273.43 — 273.68 .
82	344.54 — 344.66
83	461.42 — 461.59
84	527.60 — 527.79
85	288.52 — 288.64 m
86.	656.32 — 656.44

See R.B. 79/88.

TAHLARINGA 1:250 000.

5438

3. PETROGRAPHY AND MINERAGRAPHY

042

Sample: RS87; TS41294

Location:
Wilkinson No. 1; 210 metres

Rock Name:
Silty limestone

Hand Specimen:
This is a rather pale, buff-coloured rock with greenish indefinite patches. The sample is fine-grained and has a rather mottled appearance. There are one or two places where there are small, irregular patches of dark material (?pyrite).

Thin Section:
An optical estimate of the constituents gives the following:

	%
Calcite	90
Quartz	5
Opaques	2-3
Dolomite	1
Chlorite	<1
Feldspar	Trace
Tourmaline	Trace

This is a recrystallized limestone containing generally silt-grade silicate debris. There are places where the recrystallized calcite has a texture indicating that it was probably derived from shell debris of some kind.

There are a few places where late-crystallized calcite is present as equant, anhedral crystals more than 0.2 mm in size, but in general the calcite is distinctly finer-grained than this and forms a rather turbid, heterogeneous mosaic. In many places the crystal size of the calcite is, in fact, less than 0.005 mm and the material has the aspect of a micritic mosaic. Elsewhere, there is a rather characteristic texture in which the calcite forms irregular and cuspate crystals of the order of 0.1 to 0.25 mm in size. There are also thin, elongate crystals or aggregates of calcite and these, and the cuspate crystals, occur together in places where the texture of the calcite suggests that the material originally consisted of broken shell fragments. The material has now been completely recrystallized and has been welded into a solid rock.

The rock contains small amounts of both plagioclase and microcline but feldspar is generally present as only a very few grains commonly not more than 0.1 mm in size. Quartz, on the other hand, comprises about 5% of the volume of the rock and there are a few grains about 1.5 mm in size although most are distinctly of silt grade. There are rare grains of green tourmaline and a few, somewhat stubby aggregates of chlorite probably derived from original detrital biotite. In one or two places there are small, dark aggregates of calcite which are probably pellets, and there is one, relatively large, circular aggregate of granular dolomite which is probably a recrystallized detrital grain.

Opaques occur in patches commonly more than 1 mm in size. They are rather ragged and irregular in appearance.

Sample: RS88; TS41295; PS27098

043

Location:
Wilkinson No.1; 242 metres

Rock Name:
Silty, calcareous dolomite

Hand Specimen:
The sample is a grey, slightly mottled rock which, in places, has a somewhat sandy appearance. There are patches of ?pyrite up to about 1 cm in length. Some of the smaller patches have a sub-spherical outline but the largest patch in the hand specimen has an elongate and irregular appearance.

Thin Section:
An optical estimate of the constituents gives the following:

	%
Dolomite	80
Calcite	10
Quartz	7-10
Opaques	2
Mica	Trace-1
Tourmaline	Trace
Green clay	Trace

The sample consists essentially of micritic dolomite, mottled with abundant silt-grade quartz. Calcite occurs widely disseminated as fine-grained, irregular patches.

Most of the dolomite in the rock is distinctly micritic and single crystals can barely be identified. There are, in places, subround patches of dolomite which have a granular texture and consist of dolomite crystals up to about 0.1 mm in size. These are well defined and probably represent recrystallized original grains of some kind.

The detrital silicates are fairly well sorted and have a size range which is about 0.03 mm to 0.06 mm. The grains are equant but angular in shape. There are one or two feldspar grains only and the bulk of the silicate material is quartz. Other detrital components of the rock are minute flakes of both muscovite and fresh biotite, and one or two rather angular, equant grains of tourmaline. None of these is generally larger than about 0.04 mm.

Calcite is widely but not randomly distributed throughout the rock, showing concentrations in some areas. The calcite commonly forms polycrystalline patches not more than 0.3 mm in size and these are closely intergrown with dolomite. Elsewhere there are single crystals of calcite distributed amongst the dolomite. It seems likely that the calcite crystallised after the dolomite.

Polished Section:
The polished section contains three or four relatively large aggregates of opaque material and these consist entirely of marcasite. The largest of these aggregates is about 5 mm in diameter and the marcasite clearly

forms in the interstices between quartz and feldspar grains. In some places it appears that the sulphide has penetrated fractures within these grains and this is clear evidence of the relatively late crystallisation of the sulphide. Elsewhere the marcasite forms patches and aggregates with only a relatively small number of included grains of silicate. In one place there are single marcasite crystals of the order of 0.5 mm in diameter. Crystals such as these generally include 10-20 small grains and fragments of silicate.

The sulphide is, therefore, a late, authigenic phase, probably deposited from circulating waters.

Sample: RS89; PS27099

Location:
Wilkinson No. 1; 254 metres

045

Polished Section:
The polished section contains minute specks of widely disseminated pyrite/marcasite. These comprise only a small fraction of 1% of the sample. The grains are less than 0.005 mm in size and it is not possible to determine whether they consist of pyrite or marcasite. These grains are completely randomly distributed throughout the area of the polished section.

Sample: RS90; PS27100

Location:
Wilkinson No. 1; 254.72 metres

Polished Section

The only opaque phase identified in the polished section is marcasite which occurs in a similar way to the marcasite in the sample from 242 metres. The aggregates of marcasite are less well developed and the marcasite tends to occur in a band across the section. In detail, it can be seen that the marcasite occurs in the interstices between the silicate grains and it clearly has a similar genesis to the marcasite in the sample referred to above. Apart from this bed rich in marcasite, the sulphide also occurs in widely distributed patches and small crystals throughout the carbonate. Many of these are very small and although it seems likely that they are marcasite by analogy with the coarser-grained material, a specific optical distinction from the pyrite could not be made.

Sample: RS91; PS27101

047

Location:
Wilkinson No. 1; 458.25 metres

Polished Section:
The polished section contains no opaque minerals.

After discussion with the client a further polished briquette was prepared from a specified part of the hand specimen. This briquette contains marcasite which forms small polycrystalline aggregates similar to those in the samples described above. No other opaque phases are present.

048 PR No. 5

Job: 2363/79 Amdel Analytical Service Batch:

Form 60 RS A1.2 mi-Quan ative Spectrographic nalysis hemes A1, A2, A3, A4, A5, A7, A8, A9

Results in ppm unless othe.. se state . Detection limits in brackets

	Sample No.	81	82	83	84	85	86
A1	Ba (200)	X	X	X	200	X	400
	Be (1)	X	X	X	X	X	X
	Ce (300)	X	X	X	X	X	X
	Co (5)	X	X	X	X	X	5
	Cr (20)	50	40	40	40	40	70
	La (50)	X	X	X	X	X	X
	Mn (10)	100	100	60	100	200	100
	Mo (3)	X	10	X	X	10	X
	Nb (20)	X	X	X	X	X	X
	Ni (5)	50	70	100	100	100	250
	Sc (3)	X	3	X	3	X	4
	Sr (50)	200	100	200	1000	100	250
	Ta (100)	X	X	X	X	X	X
	Th (100)	X	X	X	X	X	X
	Ti (100)	300	250	250	500	300	800
	V (10)	50	40	40	40	30	50
	W (50)	X	X	X	X	X	X
	Y (10)	10	10	10	20	10	30
	Yb (1)	X	X	X	X	X	X
	Zr (10)	10	10	10	20	10	40
A2	Ag (0.1)	X	0.2	0.1	0.1	X	X
	As (50)	X	X	X	X	X	X
	Bi (1)	X	X	X	X	X	X
	Cd (3)	X	X	X	X	X	X
	Cu (1)	5	30	10	5	70	7
	Ga (1)	3	4	2	3	1	4
	Ge (1)	X	X	X	X	X	X

	Sample No.	81	82	83	84	85	86
A2	In (10)	X	X	X	X	X	X
	Pb (1)	20	80	60	50	30	20
	Sb (30)	X	X	X	X	X	X
	Sn (1)	X	X	X	X	X	X
	Zn (20)	X	X	X	X	X	X
A3	Au (3)						
	P (100)						
	Te (20)						
	Tl (1)						
A4	Li (1)						
	Na (50)						
A5	Cs (30)						
	K (5)						
	Rb (10)						
A7	Hg (0.15)						
A8	B (3)						
A9	Al (100)						
	Ca (100)						
	Fe (100)						
	Mg (100)						
	Si (100)						

Results are semi-quantitative. Elements apparently present in concentrations of economic interest should be redetermined by an appropriate accurate analytical technique. X = Not detected at limit quoted.

DEPARTMENT OF MINES AND ENERGY - SOUTH AUSTRALIA

APPLICATION FOR EXAMINATION OF SPECIMENS OR SAMPLES

UNIT NUMBER			Applicant's Number	Descriptive Information; Drillhole, Survey etc.	Details of work required	Estimated Cost
1:100,000 SHEET	RS	Number				
5438	RS	81	23852-23864	WILKINSON Nº 1	ANALYSE A1/A2	
5438	RS	82	34454-34466		30 ELEMENTS	
5438	RS	83	46142-46159		COST $18 1st SAMPLE	
5438	RS	84	52760-52779		$7.40 EACH REST	
5438	RS	85	56821-56841		+ $1.60 SAMPLE PREP. EACH	
5438	RS	86				
					AS DISCUSSED WITH K ROWLEY.	
					REQUIRED BY DEC. 6TH	
						$55.00
					Total	~~$64.60~~

Type of Samples: DRILL HOLE CORE

Disposal of Samples: RETURN TO C.G. GATEHOUSE

Name of Applicant: C G GATEHOUSE

Address: SADME

Signed: C G Gatehouse Date: 24/11/78

OFFICE USE ONLY

Submitted to AMDEL for - Analytical, Petrological, Other Examination

Firm/Estimated Price ~~$64.60~~ $55.00

Charge against Project No. 11.06.0512

Approved: J K Edwards
pp Director General

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DH725/78
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24 May 1979

Director-General,
Department of Mines & Energy,
EASTWOOD, 5063.

Attention: N. Tucker

STRATIGRAPHIC DRILLING

PROGRESS REPORT NO. 7

5438 RS 76-80

Investigation and Report by: M. Hanckel

Manager, Geological Services Division: Dr Keith J. Henley

Keith Henley

for Norton Jackson,
Managing Director.

meo/1

STRATIGRAPHIC DRILLING - WILKINSON NO. 1

This progress report gives analyses of salts obtained from the halite section in Wilkinson No. 1. As can be seen, the samples consist almost entirely of sodium chloride.

ANALYSES OF SALT SAMPLES FROM WILKINSON NO. 1

Sample	% Cl, expressed as NaCl	Br, ppm	K, ppm
RS 76	97.3	145	88
77	97.8	120	60
78	97.8	115	98
79	97.8	120	84
80	97.8	115	75

F11/1

DEPARTMENT OF MINES AND ENERGY - SOUTH AUSTRALIA

APPLICATION FOR EXAMINATION OF SPECIMENS OR SAMPLES

UNIT NUMBER			Applicant's Number	Descriptive Information; Drillhole, Survey etc.	Details of work required	Estimated Cost
1:100,000 SHEET	RS	Number				
5438	RJ	76	598.06-598.12	WILKINSON No 1		
"	"	77	604.16-604.20	"	CHEMICAL ANALYSIS	
"	"	78	624.19-624.21	"		
"	"	79	630.25-630.29	"	Marine as NaCl	
"	"	80	668.45-668.51	"	also Br	
					K^+	
					Total	189

Type of Samples: CORE.

Disposal of Samples:

Name of Applicant: C. G. GATEHOUSE

Address: SADME

Signed: Colin G Gatehouse Date: 30/10/78

OFFICE USE ONLY

Submitted to AMDEL for Analytical, Petrological, Other Examination

Firm/Estimated Price: $189

Charge against Project No. 406.0512

Approved: [signature] for Director General

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