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OEL 20 AND OEL 21, PEL 5 AND PEL 6

REGIONAL GEOLOGICAL STUDIES

TECHNICAL REPORTS AND DATA

Submitted by

Delhi International Oil Corp., Delhi Petroleum Pty Ltd and Santos Ltd
1993

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THE STRUCTURAL FRAMEWORK OF THE COOPER/EROMANGA BASINS

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KKS/111/60k1i

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SUMMARY

The main characteristics of this set of maps are summarized in the following point form.

THESE MAPS SATISFY THE FOLLOWING CONSTRAINTS:

- Fault alignments and orientations, shape and orientation of anticlines and synclines conform with the structural history and styles model as developed previously and the stress-strain ellipsoid.
- Structural trend map alignments and orientations incorporating Landsat and aeromagnetic studies.
- Contours satisfy 'all' the wells Tops (est. 500).
- Contours conform with the six composite regional framework seismic/ geological lines.
- Key seismic lines have been used to check the main synclines, complex structures, and the zero edges.
- Contours of different formations are compatible with the overlying and underlying formations, and the Isopach maps.
- The top of a younger formation is not allowed to be deeper than that of an older formation.
- The Top Toolachee and Top Patchawarra depth maps are essentially seismically derived time maps based on good continuous reflectors. They have been converted to depth maps via well control.

On the other hand, the Top Nappamerri, Daralingie and Tirrawarra-Patchawarra maps were derived by phantoming from the Top Toolachee and Top Patchawarra depth maps with the respective Isopach maps.

THE USEFULNESS OF THESE MAPS IS:

- They provide correlatable perspective for most of the structures in the Cooper Basin.
- A correlatable perspective for the hydrocarbon occurrences became apparent on some of these maps eg. Gussow's principle.
- These maps will be useful as a guide for the orientation and alignment of faults and anticlines in prospect generation.
- These maps can also be used to classify structural and hydrocarbon trends. In that process some new prospects and plays will probably emerge.
- In conjunction with Isopach maps, appropriate cross-sections and well data they provide the framework for geological studies e.g. paleo-environmental, reservoir development, sedimentological and source rock studies.

- Gussow's principle apparently applies for the hydrocarbons trapped in Toolachee and Patchawarra Formations and ought to be exploited to assist in production, appraisal, and exploration efforts.

- They also resulted in defining clearly the associated hydrocarbon plays.

THE LIMITATIONS OF THESE MAPS ARE:

- The zero boundaries are poorly defined especially at the Basin edges where most of these formations onlap disconformably and gradually fall beneath seismic resolution. Besides, the basement normally corresponds to a very strong seismic reflection below which the rocks are (semi-) metamorphosed. Seismically, this is an ideal environment for peg leg multiples, best illustrated by the fact that more than 70% of our exploration wells are unable to predict basement to ±70' or ±15msec.

- The contour interval of 250' masks the presence of the low relief structures. However, in complex areas supporting maps of 1:100,000 have been produced with 100' contour interval, and in the case of producing fields larger scale maps with smaller intervals have also been produced eg. Toolachee, 1:50,000(50'), Jackson, 1:10,000 (10').

- Since most of the remaining undrilled prospects have relief of less than 100' these regional maps do not provide the resolution required for prospect generation at this stage of exploration in Cooper/ Eromanga Basins, but they will help in the alignment and orientation of faults and structures.

- Due to the Pepita-Wackett-Nockatunga trend being an effective hinge line with a very thin Permian section in the Northern Cooper, only the Top Toolachee and 'Top Patchawarra' depth-structure maps were produced for this region.

- The large amount of data handling will result in some local unavoidable wrong posting of values and fault locations.

ANALYSIS METHODOLOGY

The analysis methodology used here in general parallels the classical sparsely drilled basin analysis approach. However, the Cooper-Eromanga Basins being mature basins with more than 500 wells and 70,000kms of good quality seismic allow one to develop some innovative and effective short cuts. These include the creation of geological cross-sections with fault interpretations, Isopach-Subcrop and Structural maps to clarify the tectonic mechanisms and effects associated with key unconformities as well as detailed field studies exploiting the precision that high well density can provide for some of the key parameters of Basin analysis.

Analysis of Cooper-Eromanga Basins began with identifying the best possible fence diagram linking up all the critical wells drilled in the Basins. This was followed by the study of the relevant stratigraphic and seismic cross-sections. The stratigraphy, being the 'frame of reference' is extremely important for any subsurface study. To familiarise himself, the geologist initially correlates these wells without the aid of seismic. Seismic is also very important since it is the tool that tells us precisely what happens in between wells. Considerable effort was directed into improving the quality of the seismic. It turned out that some reprocessing, migration, and squeezed sections improved the quality of the seismic significantly.

Faults and unconformities are equivalent to lateral and vertical breaks in the continuity of subsurface stratigraphy. A clear three dimensional picture of the subsurface stratigraphical relationships can only be envisaged and clearly understood, if it is well defined on cross-sections and maps. Tools critical for improving fault definitions are seismic migration, and understanding of structural styles. Similarly, the geological cross- sections, and Isopach-Subcrop maps are the main tools used for defining the unconformities.

Once the seismic lines were of satisfactory quality, interpretation of them commence interactively with creation of new geological cross-sections incorporating the faults. This process improves the reliability of stratigraphic correlation. Concurrently, Isopach and Isopach-Subcrop maps were also created to further improve our stratigraphic correlations, and our understanding of the structural history and styles. In areas where ambiguities existed, larger scale mapping and detailed field correlation were carried out to further improve control. Certain key fields recognised to be representative of certain structural styles were also analysed in detail.

The preceding work provided the framework from which a reliable model of the stratigraphical, tectonic history and structural style of the basin was recreated (Ref. 1&2). They in turn provided a firm basis for the creation of this set of high quality regional depth structure maps.

REGIONAL FAULT DEFINITION MAPS

Regional fault definition maps corresponding to the Top Toolachee and Top Patchawarra Formations were generated with the guide provided by the History and Styles of the Cooper-Eromanga Basin structural model, major lineaments defined by a Landsat Study, and the stress strain ellipsoid (Maps 1 & 2).
Four main fault systems have been identified:

NE-SW FAULT SYSTEM:-

This is the most dominant fault system in the southern Cooper Basin. It was active during the basin inception and again at the Daralingie unconformity time. They are reactivated thrust faults with a right lateral strike-slip movement (Map 2). The structures associated with this fault system are parallel to the faults, and elongated along their strikes.

WNW-ESE FAULT SYSTEM:-

These faults are the second most important set of faults in the Cooper Basin. They were active during the basin inception and are characterized by high angle basement involved wrench movements. Structures associated with these fault systems are sub- parallel to the strikes of these faults (Map 2).

NW-SE FAULT SYSTEM:-

These faults were generated by the coupling effects of the wrench movements of the ENE-WSW fault system at the end of Triassic time. They are classical en-echelon wrench structures and faults, and are best expressed in northern Cooper Basin, where the Permian section is thin (Map 2).

N-S FAULT SYSTEM:-

In general this fault system reflects the compressional tectonics of the Winton unconformity time. The structures are parallel to the often 'pair' faults and in seismic they are high-angle faults which normally cut right up to surface.

In areas where several of these fault systems interact strongly, very complex fault patterns are created, e.g. Innamincka-Pepita-Candra area.

TOP TOOLACHEE DEPTH-STRUCTURE MAP (MAP 3)

The top of the Toolachee Formation, often a coal marker, corresponds to the end of the last extensive lower delta plain environment cycle within the Cooper Basin. The coal marker is an excellent regional seismic marker from which a time structure map was created. With the aid provided by the structural history and style model, the fault alignments and orientations as well as the shapes and orientations of the anticlines were determined. The constraints of numerous well data, key seismic lines, isopach maps and geological cross-sections superimposed onto the time map, resulted in the generation of a high quality regional Top Toolachee depth structure map.

THE MAIN CONCLUSIONS OF THE TOP TOOLACHEE DEPTH-STRUCTURE MAP ARE:

- The structures of the southern Cooper Basin are dominated by i) the large reactivated NE-SW thrust faults; ii) the WNW-ESE tear faults associated with the reactivated thrust faults, and iii) the wrench structures generated by the coupling effects of the strike-slip components of the reactivated thrust faults and the tear faults. (Ref. 1 & 2). The areas corresponding to the intersection of the reactivated thrust and tear faults are complexly faulted.

- The structures of northern Cooper Basin are controlled by three sets of faults, namely;

  i) The two WNW-ESE 'P' fracture systems and the Pepita-Wackett-Nockatunga tear fault. The first 'P' fracture cuts roughly from Hooley and Kercummurra to just north of Cook.

  The second 'P' fracture cuts from just north of Wilson and north of Keilor to south of Doonmulla well.

  Coupling between these three right-lateral wrench faults resulted in the NW-SE trending 'en echelon' structures and fault systems.

  ii) The second set of faults trending NWN-SES is associated to the Triassic Nappamerri unconformity and represents the synthetic faults generated by the tear faults and the P fractures.

  iii) The third set is approximately N-S orientated. They correspond to the Winton unconformity compressional tectonic event.

- General Comments:

  The zero edge on the NW section of northern Cooper Basin differs significantly from the Queensland teams' mapping. The Queensland teams zero edge ends perpendicular to the NWN-SES system which at Permian Toolachee time has yet to exist, and as such will not control the sedimentation distribution as implied by their mapping. Instead, sedimentation is probably more controlled by the NE-SW semi-dormant reactivated thrust system of Curalle and Morney. On this map, the NW zero edge as mapped does not cut perpendicularly across the main Basin synclines axis. If it did, then northern Cooper Basin must have been actively wedging into the Pepita-Wackett-Nocktunga trend during Toolachee time. A map with the isopach values posted on the wells of northern Cooper shows no such tilting (Fig. 1).

Hydrocarbons occur within a central core area surrounding the Nappamerri Trough. The gas trapped in the central deeper part of the basin is generally tight gas, with dry gas trapped intermediately and wet gas at the edge of this core area. Available data indicate that nearly all the structures except those at the edges are filled to spill. We presume therefore that the classical Gussow's principle applies, which will be of considerable value in assisting production, appraisal and exploration efforts (Fig. 2).

The absence of Toolachee Formation on the Merrimelia, Packsaddle and Innamincka highs suggest that the Daralingie reactivation was fairly severe.

NAPPAMERRI DEPTH-STRUCTURE MAP (MAP 4)

The Nappamerri depth structure map was only created for the southern Cooper Basin where most of the hydrocarbons occur. It was derived from cross-contouring the Nappamerri Isopach map with the Top Toolachee depth i.e. adding the thickness of Nappamerri Formation to get the Top Nappamerri depth maps.

This map shows a severe uplift of the south western portion of southern Cooper. It is postulated to be caused by the wrenching of a major transform fault. A less severe north eastern tilt is also recognised from the migration of south eastern zero edge of this formation when compared with the Top Toolchee Formation depth map (Maps 3 & 4). A fairly severe uplift is also noted around Chookoo-Jackson area which is probably due to the concurrent wrenching of the Pepita-Wackett-Nockatanga tear fault. These uplifts probably cause the migration of Nappamerri sedimentation over the Toolachee zero edge in the northern Cooper. Other smaller WNW-ESE fault systems are probably also concurrently wrenched.

Commercial hydrocarbon distribution is known along the main reactivated thrust system of the Merrimelia-Bookabourdie-Packsaddle trend (Fig. 3). This is probably related to the relaxation phase of the reactivated thrust faults which allows palaeo rivers to flow along this structural trend, i.e. reservoir development.

The hydrocarbons discovered in Moorari, Epsilon and Burke could again be due to reservoir development of some poorly understood palaeo-rivers system.

DARALINGIE DEPTH STRUCTURE MAP (MAP 5)

The Daralingie depth structure map was derived from the Top Toolachee depth map minus the Isopach of the Toolachee Formation. Due to the inability to subdivide the Permian stratigraphy below the Toolachee Formation north of the Pepita-Wackett-Nockatunga hinge line, the creation of this map was restricted to the southern Cooper Basin.

This map shows very clearly the reactivation of the major NE-SW reactivated thrust fault system if one compares this map with the Roseneath Shale Isopach map (Fig. 4). The preceding statement is well supported by the absence of this formation on the structural highs associated with the NE-SW reactivated thrust fault system, as well as north-west of the Gidgealpa-Merrimelia-Yanpurra system.

The amount of commercial hydrocarbons found within this formation is fairly significant and is concentrated around two areas, namely; Big Lake-Moomba and Dullingari-Burke areas. These areas appear in the Toolachee Isopach map to be adjacent to probable delta systems, and as expected, reservoir development has been observed to be rather erratic (ref. 3).

The Daralingie unconformity probably forms an important conduit for hydrocarbon migration. This point is best illustrated by overlaying the transparent Top Daralingie depth map with hydrocarbon distribution over the same Top Toolachee map. Note, most of the hydrocarbons found in Toolachee Formation are located in areas where Daralingie Formation subcrops and where most of the Daralingie hydrocarbons were discovered.

"TOP PATCHAWARRA" DEPTH STRUCTURE MAP (MAP 6)

Due to the Pepita-Wackett-Nockatunga trend being an effective hinge line for the Early Permian sedimentation, the stratigraphy of northern Cooper is remarkably different from that of southern Cooper Basin. In general, the lacustrine environment of Roseneath and Murteree is replaced by lower delta plain environment. The "Top Patchawarra" Formation in northern Cooper Basin is less definitive and in general corresponds closer to Top Early Permian sequences. The methodology used in creating this map is similiar to that of Top Toolachee depth map, the latter also strongly guiding it.

THE MAIN CHARACTERISTICS OF THE TOP PATCHAWARRA MAP

- The main characteristics of the "Top Patchawarra" map are in general similar to those of the Top Toolachee depth map.
- It shows the basin to be actively growing (note the density of contours), and with a clearer structural style.
- Gussow's principle probably again applied but over a much larger area with proportionally larger area of tight gas (Fig. 5).
- It shows the presence of a second closed boundary (north west of the Gidgealpa-Merrimelia-Yanpurra trend) within which the reservoirs are in general saturated with hydrocarbons.
- Better reservoir preservation with respect to depth of burial is observed in Patchawarra Southwest area. This is probably partly caused by the lower geothermal gradient of that area.
- Due to the Patchawarra being thin in northen Cooper and directly overlying the basement, the wrench nature of the northern Cooper Basin structures becomes more distinct.
- The presence of Roseneath Shale around Jackson area makes the correct pick of "Top Patchawarra" suspect (Fig. 4).

TOP TIRRAWARRA/BASE PATCHAWARRA DEPTH STRUCTURE MAP OF SOUTHERN COOPER (MAP 7)

This map was created because of the presence of significant oil in the Patchawarra central area, and to show more clearly the structural styles of the southern Cooper Basin.

The main characteristics of this map are:

- At Tirrawarra time, the Patchawarra Trough is nearly as dominant as the Nappamerri Trough, but by Patchawarra time the Nappamerri Trough becomes the main depo-centre (Refs. 1 & 2).
  This point is illustrated by comparing the Tirrawarra and Patchawarra zero edge positions on the map.

- The structures along the NE-SW fault are controlled by reactivated thrust faulting while the structures in between are caused by wrench coupling. The structures on the eastern side are dominated by tear faults, and intrusion (due to divergent wrenching) while structures on the extreme western side shows characteristics of convergent wrenching. In summary the structures are nearly all basement-involved and therefore a map at this level provides the best insights.

- So far, commercial oil within this formation has been restricted to the Tirrawarra-Moorari-Fly Lake area (Fig. 6).

STRUCTURAL TRENDS MAP (MAP 8)

With a comprehensive tectonic model, fault alignment maps, Isopach maps, structural maps, Landsat lineaments map and aeromagnetic contour maps, we now have all the essential components for generating a good structural trend map.

The structural trend map is generated by making sure that all the above maps are consistent with one another, and that the trends are associated to the main tectonic events. They must also satisfy the constraints of being relatively straight and that trends generated by the same tectonic events are parallel to sub-parallel.

The different structural trends are summarised in the attached map.

References:-

Reference 1: K.S. Kuang 1985, History and style of Cooper/Eromanga Basin structures.

Reference 2: K.S. Kuang, F. Ariesen and C. Castro, April 1986, Basic support data of the preceding report as presented in the 1986 APEA Conference in Adelaide.

Reference 3: Detailed field studies
F. Ariesen, Feb. 1986, Study of Hutton Sandstone and Birkhead Formation.
C. Castro (in prep.) Moomba, Big Lake, Tirrawarra field studies.

Reference 4: F. Ariesen, Dec. 1985, Description of the Cooper Basin Basement and its structural consequences.

Acknowledgements: The Author is grateful for the contribution of James Small, other members of the regional team and its supervisor.

ALL THE MAPS SHOWN HERE ARE ORIGINALLY DONE ON A 1:250,000 SCALE.

KOONCHERA

PATCHAWARRA EAST

PATCHAWARRA CENTRAL

PATCHAWARRA SOUTHWEST

MOOMBA

NAPPACOONGEE - MURTEREE

MURTA

TOOLACHEE

TINGA - TINGANA

LAKE HOPE

SOUTH AUSTRALIA / QUEENSLAND

SOUTH AUSTRALIA / NEW SOUTH WALES

INNAMINCKA

HINGELIA - INNAMINCKA

AQUITAINE 'A'

THICK

TOTAL 1966

50/40/10

ATP 259P
ATP 267P

P.E.L. 186
ATP 259P

WARREENA

ALKINA

NACCOWLAH

ATP 305P (R)

ATP 259P
ATP 267P

100

200

Fig. 4

QUEENSLAND
ATP 259P
P.E.L. 186
SOUTH AUSTRALIA
NEW SOUTH WALES

THE FAULTS USED ON THIS MAP ARE BASED ON 1984 WORK. (by K.S. KUANG)

8126-1

LEGEND

- WELL SITE
- OIL WELL
- GAS WELL
- OIL SHOW
- GAS SHOW
- DRY WELL

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ROSENEATH SHALE
ISOPACH

COOPER SOUTH

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REGIONAL
TOP TOOLACHEE FAULT DEFINITION

Scale 1:750,000

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Checked: N/A | Chief Draftsman:
Date: N/A | Date: April 1986

LEGEND
- WELL SITE
- OIL WELL
- GAS WELL
- OIL SHOW
- GAS SHOW
- DRY WELL

QUEENSLAND
ATP 259P
PEL 586
SOUTH AUSTRALIA
NEW SOUTH WALES

WILPAROO
CLIFTON
MADDON
MORNEY
GALWAY
YAMMA - YAMMA
AQUITAINE 'C'
WAREENA
ALKINA
KOONCHERA
PATCHAWARRA CENTRAL
PATCHAWARRA EAST
AQUITAINE 'B'
WINAMINCKA
AQUITAINE 'A'
PATCHAWARRA SOUTHWEST
MOOMBA
NACCOWLAH
MERRIMELIA - INNAMINCKA
MAPPACOORINNA - MURTEREE
TOTAL 1966
LAKE HOPE
MURTA
TOOLACHEE
50/40/10
TINNA - TINBARRA

ATP 259P
ATP 340P
ATP 350P
ATP 370P
ATP 382P
ATP 389P
ATP 399P
ATP 407P
ATP 409P
ATP 427P
ATP 429P
ATP 431P
ATP 432P
ATP 433P
ATP 434P
ATP 435P
ATP 436P
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ATP 999P
ATP 1000P

MAP 1

FAULT DEFINITION MAP as interpreted by K.KUHNS, April 1986

8126-2

LEGEND
- WELL SITE
- OIL WELL
- GAS WELL
- OIL SHOW
- GAS SHOW
- DRY WELL
- NORMAL FAULT
- REVERSE FAULT
- WRENCH STRIKE SLIP MOVEMENTS
- THRUST MOVEMENTS
- COMPRESSIONAL MOVEMENTS

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REGIONAL
TOP TOOLACHEE FAULT DEFINITION

SCALE 1:750,000

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Date: N/A | Date: April 1986

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REGIONAL
TOP PATCHAWARRA FAULT DEFINITION

Scale 1:250,000

Projection: AUSTRALIAN MAP GRID	Drafted	Date	
Control: Seismic	S.A.	4/86	
Datum	S.A.	Chief Draftsman	
Source map			
Interpretation K. Kuang	Date April 86		

LEGEND

- WELL SITE
- OIL WELL
- GAS WELL
- OIL SHOW
- GAS SHOW
- DRY WELL

No.	Date	Authority	Comment

QUEENSLAND / SOUTH AUSTRALIA / NEW SOUTH WALES — PEL 5&6, ATP 259P

MORNEY · YAMMA YAMMA · AQUITAINE 'C' · WAREENA · ALKINA · GALWAY · WILPAROO · CLIFTON · HADDON · KOONCHERA · PATCHAWARRA CENTRAL · PATCHAWARRA EAST · AQUITAINE 'B' · INNAMINCKA · AQUITAINE 'D' · AQUITAINE 'A' · PATCHAWARRA SOUTHWEST · MOOMBA · NAPPACOONEE MURTEREE · TOOLACHEE · NACCOWLAH · LAKE HOPE · MURTA · TOTAL 1966 · 50/40/10 · TINNA - TINBANA · MERRIMELIA - INNAMINCKA

PEDIRKA SECTOR / COOPER SECTOR

ATP 259P / PEL 5&6 — QUEENSLAND / SOUTH AUSTRALIA

ATP 240P · ATP 259P · ATP 267P · ATP 309P · ATP 313P · ATP 337P · ATP 341P · ATP 357P · ATP 359P · ATP 363P · ATP 365P · ATP 367P

MAP 2

FAULT DEFINITION MAP as interpreted by K KUANG, April 1986

8126-3

LEGEND

- WELL SITE
- OIL WELL
- GAS WELL
- OIL SHOW
- GAS SHOW
- DRY WELL
- NORMAL FAULT
- REVERSE FAULT
- WRENCH STRIKE SLIP MOVEMENT
- THRUST MOVEMENT
- COMPRESSIONAL MOVEMENTS

DELHI PETROLEUM PTY. LTD.

SOUTHERN COOPER BASIN
P.E.L. 5&6-S.A., A.T.P. 259P-QLD.

REGIONAL
TOP PATCHAWARRA FAULT DEFINITION

SCALE 1:750,000

Projection: AUSTRALIAN MAP GRID	Drafted	Date	
Control: Seismic	S.A.	5/86	
Datum	S.A.	Chief Draftsman	
Source map			
Interpretation K. Kuang	Date April 86		

Dwg. No. 86XG-7354 S File No. SJ-46

Dwg. No. 85XG-6718AS File No. SJ-46

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NORTHERN COOPER BASIN

P.E.L. 586-S.A., A.T.P. 259P-QLD.

TOP TOOLACHEE

DEPTH STRUCTURE

SCALE 1:750,000

Projection: AUSTRALIAN MAP GRID | Drafted: Date: FEB 1985
Datum: M.S.L. FT BELOW | Chief Draftsman:
Origin of data: DELHI | Surveyed:
Interpretation: K. KUANG | Date: FEB 1985

COOPER NORTH

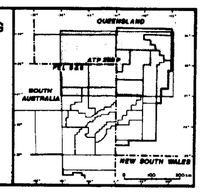
LEGEND

- WELL SITE
- OIL WELL
- GAS WELL
- OIL SHOW
- GAS SHOW
- DRY WELL

REVISIONS

No.	Date	Authority	Comment

STRUCTURE INTERPRETATION, K. KUANG



LIMIT OF TOOLACHEE

ZERO EDGE TOOLACHEE

WILPAROO

MORNEY

YAMMA - YAMMA

AQUITAINE 'C'

AQUITAINE 'B'

WAREENA

ALKINA

INNAMINCKA

PATCHAWARRA CENTRAL

PATCHAWARRA EAST

PATCHAWARRA SOUTHWEST

MOOMBA

KOONCHERA

BIRDSVILLE TRACK RIDGE

CLIFTON

HADDON

MERRIMELIA - INNAMINCKA

MAPPACOONGEE - MURTEREE

NACCOWLAH

TOTAL 1966

50/40/10

LAKE HOPE

MURTA

TOOLACHEE

TINGA - TINGANA

PEDIRKA SECTOR COOPER BASIN

PEDIRKA

SOUTH AUSTRALIA QUEENSLAND

SOUTH AUSTRALIA NEW SOUTH WALES

ATP 259P PEL 586

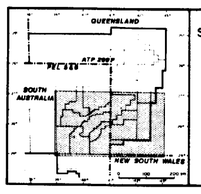
ATP 259P ATP 267P

ATP 259P ATP 297P

ATP 259P ATP 267P

ATP 259P

Fig. 2 MAP 3



STRUCTURE INTERPRETATION, K. KUANG

8126-4

LEGEND

- WELL SITE
- OIL WELL
- GAS WELL
- OIL SHOW
- GAS SHOW
- DRY WELL
- TOOLACHEE ABSENT

REVISIONS

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1	7-FEB-86	K.K.KUANG	SOUTH-EAST NORTH-WEST FAULTING ON TREND

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SOUTHERN COOPER BASIN

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TOP TOOLACHEE

DEPTH STRUCTURE

SCALE 1:750,000

Projection: AUSTRALIAN MAP GRID | Drafted: Date: FEB 1986
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Origin of data: DELHI | Surveyed:
Interpretation: K. KUANG | Date: FEB 1985

Dwg. No. 85XP-4535BS File No. SJ-46

KOONCHERA

PATCHAWARRA EAST

PATCHAWARRA CENTRAL

PATCHAWARRA SOUTHWEST

INNAMINCKA

AQUITAINE

WAREENA

ALKINA

NACCOWLAN

MOOMBA

MERRIMELIA - INNAMINCKA

NAPPACOONGEE - MURTEREE

TOOLACHEE

MURTA

LAKE HOPE

TINGA - TINGANA

HINGE LINE

SOUTH AUSTRALIA / NEW SOUTH WALES

LIMIT OF NAPPAMERRI

LIMIT OF NAPPAMERRI

LIMIT OF NAPPAMERRI

LIMIT OF NAPPAMERRI

P.E.L. 596

ATP 259P

ATP 303P (Q)

ATP 259P

ATP 267P

30/40/10

TOTAL 1966

Fig.3 MAP 4

QUEENSLAND

P.E.L. 596

ATP 259P

SOUTH AUSTRALIA

NEW SOUTH WALES

8126-5

REVISION

No.	Date	Authority	Comment

LEGEND

- WELL SITE
- OIL WELL
- GAS WELL
- OIL SHOW
- GAS SHOW
- DRY WELL
- NORMAL FAULT
- REVERSE FAULT

DELHI PETROLEUM PTY. LTD.

SOUTHERN COOPER BASIN

P.E.L. 596-S.A., A.T.P. 259P-QLD.

TOP DEPTH STRUCTURE

TOP NAPPAMERRI

SCALE 1:750,000

Projection: AUSTRALIAN MAP GRID	Drafted, Date
Control: Mineral 250 /1	J.S. SEP. 1986
Datum: CITY WELL PORT ADELAIDE	Chief Draftsman
Interpretation: J. SMALL	Date

Dwg. No. 86XG-7367S File No. SJ-46

KOONCHERA
PATCHAWARRA EAST
PATCHAWARRA CENTRAL
PATCHAWARRA SOUTHWEST
INNAMINCKA
AQUITAINE 'A'
WAREENA
ALKINA
HINGE LINE
SOUTH AUSTRALIA QUEENSLAND
MERRIMELIA - INNAMINCKA
LIMIT OF DARALINGIE
AQUITAINE-'A'
MOOMBA
NACCOWLAH
JACKSON
MAPPACOONEE - MURTEE
TOTAL 1966
LAKE HOPE
MURTA
TOOLACHEE
50/40/10
ATP 259P
ATP 267P
TINGA - TINGANA
SOUTH AUSTRALIA NEW SOUTH WALES
P.E.L. 586
ATP 259P
ATP 303P (D)
ATP 267P

MAP 5

QUEENSLAND
ATP 259P
P.E.L. 586
SOUTH AUSTRALIA
NEW SOUTH WALES

8126-6

LEGEND

- WELL SITE
- OIL WELL
- GAS WELL
- OIL SHOW
- GAS SHOW
- DRY WELL
- NORMAL FAULT
- REVERSE FAULT

DELHI PETROLEUM PTY. LTD.

SOUTHERN COOPER BASIN
P.E.L. 586-S.A., A.T.P. 259P-QLD.

TOP DEPTH STRUCTURE
TOP DARALINGIE

SCALE 1:750,000

Projection: AUSTRALIAN MAP GRID
Central Meridian: 140° 0'
Datum: CPT 1966, PORT ALBUCKIE
Interpretation: J. SMALL
Drafted: DMH
J.S. Apr. 1966
Chief Draftsman
Date:
Authority
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V DEPTH STRUCTURE

TOP PATCHAWARRA

SCALE 1:750,000

LEGEND

- WELL SITE
- OIL WELL
- GAS WELL
- OIL SHOW
- GAS SHOW
- DRY WELL

QUEENSLAND
SOUTH AUSTRALIA
NEW SOUTH WALES
ATP 259P
PEL 586
ATP 282P
PEL 526

MORNEY
GALWAY
WILPAROO
YAMMA YAMMA
LIMIT OF PATCHAWARRA
AQUITAINE 'C'
AQUITAINE 'B'
AQUITAINE 'A'
WAREENA
ALKINA
CLIFTON
HADDON
KOONCHERA
PATCHAWARRA CENTRAL
PATCHAWARRA EAST
PATCHAWARRA SOUTHWEST
BIROSVILLE TRACK RIDGE
INNAMINCKA
MOOMBA
TOTAL 1965
MACDOWLAN
LAKE HOPE
MURTA
TOOLACHEE
50/40/10
TINGA TINGANA
PEDIRKA SECTOR
COOPER SECTOR

Fig.5/ MAP 6

8126-7

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V DEPTH STRUCTURE
TOP PATCHAWARRA
SCALE 1:750,000

Dwg. No. 85XP-4665S File No. SJ-46

~~Fig 6~~ MAP 7

QUEENSLAND
PEL 586
ATP 259P
SOUTH AUSTRALIA
NEW SOUTH WALES

8126-8

No.	Date	Authority	Comment

REVISION

LEGEND

- WELL SITE
- OIL WELL
- GAS WELL
- OIL SHOW
- GAS SHOW
- DRY WELL
- NORMAL FAULT
- REVERSE FAULT
- TIRRAWARRA ZERO EDGE
- PATCHAWARRA ZERO EDGE
- BASEMENT

DELHI PETROLEUM PTY. LTD.

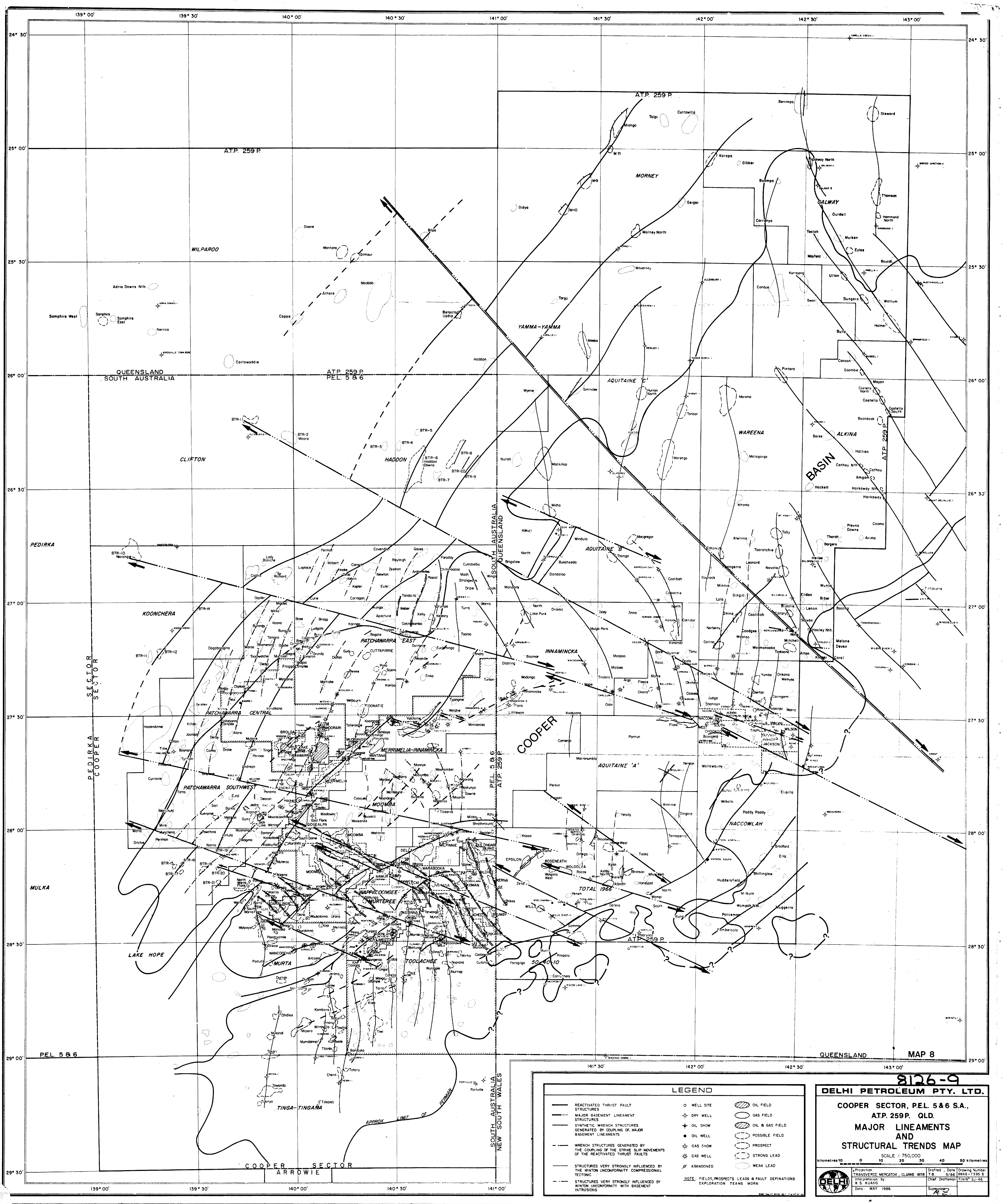
SOUTHERN COOPER BASIN
P.E.L. 586-S.A., A.T.P. 259P-QLD.

TOP TIRRAWARRA & BASE PATCHAWARRA
DEPTH STRUCTURE

SCALE 1:750,000

Projection: AUSTRALIAN MAP GRID		Drafted	Date
Control: Seismic	Zone: 54	G.J.K.	1/86
Datum: A.G.D. Ph. A.M.G.66		Chief Draftsman	
Origin of Grid:			
Interpretation: J. Direct		Date: 4/86	

Dwg No. 86XG-7376 S File No. SJ-46



MAP 8
8126-9
DELHI PETROLEUM PTY. LTD.
COOPER SECTOR, P.E.L. 5 & 6 S.A.,
A.T.P. 259 P. QLD.
MAJOR LINEAMENTS
AND
STRUCTURAL TRENDS MAP
SCALE 1:750,000
kilometres 10 0 10 20 30 40 50 kilometres
Projection
TRANSVERSE MERCATOR, CLARKE 1858
Interpretation by:
K. S. KUANG
Date: MAY 1986
Drafted, Date
T.B. 5/86
Chief Draftsman
Supervisor
Drawing Number
86XG-7395 S
File N° SJ-46
LEGEND
REACTIVATED THRUST FAULT STRUCTURES
MAJOR BASEMENT LINEAMENT STRUCTURES
SYNTHETIC WRENCH STRUCTURES GENERATED BY COUPLING OF, MAJOR BASEMENT LINEAMENTS
WRENCH STRUCTURES GENERATED BY THE COUPLING OF THE STRIKE SLIP MOVEMENTS OF THE REACTIVATED THRUST FAULTS
STRUCTURES VERY STRONGLY INFLUENCED BY THE WINTON UNCONFORMITY COMPRESSIONAL TECTONIC
STRUCTURES VERY STRONGLY INFLUENCED BY WINTON UNCONFORMITY WITH BASEMENT INTRUSIONS
WELL SITE
DRY WELL
OIL SHOW
OIL WELL
GAS SHOW
GAS WELL
ABANDONED
OIL FIELD
GAS FIELD
OIL & GAS FIELD
POSSIBLE FIELD
PROSPECT
STRONG LEAD
WEAK LEAD
NOTE: FIELDS, PROSPECTS LEADS & FAULT DEFINATIONS EXPLORATION TEAMS WORK
QUEENSLAND
SOUTH AUSTRALIA
NEW SOUTH WALES
A.T.P. 259 P.
P.E.L. 5 & 6
PEDIRKA SECTOR
COOPER SECTOR
ARROWIE
COOPER
BASIN
WILPAROO
CLIFTON
KOONCHERA
PEDIRKA
MULKA
LAKE HOPE
MURTA
TINGA-TINGANA
HADDON
YAMMA-YAMMA
MORNEY
GALWAY
ALKINA
WAREENA
AQUITAINE 'C'
AQUITAINE 'B'
AQUITAINE 'A'
INNAMINCKA
NACCOWLAH
PATCHAWARRA CENTRAL
PATCHAWARRA EAST
PATCHAWARRA SOUTHWEST
MERRIMELIA-INNAMINCKA
MOOMBA
NAPPACOONGEE-MURTEREE
TOOLACHEE
TOTAL 1966
50-40-10
APPROX LIMIT OF PERMIAN
139° 00'
139° 30'
140° 00'
140° 30'
141° 00'
141° 30'
142° 00'
142° 30'
143° 00'
24° 30'
25° 00'
25° 30'
26° 00'
26° 30'
27° 00'
27° 30'
28° 00'
28° 30'
29° 00'
29° 30'