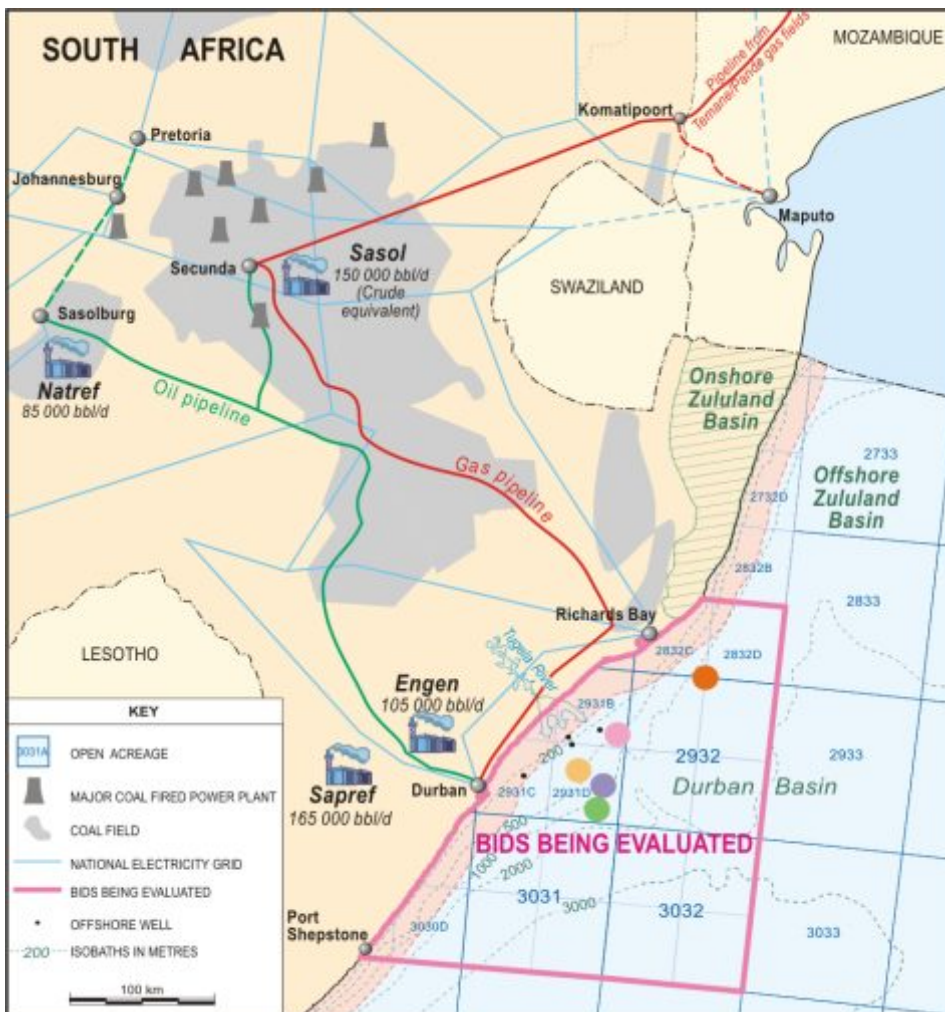


# REPUBLIC OF SOUTH AFRICA EAST COAST



The Tugela study area, comprising 48798 km<sup>2</sup>, contains 14 exploration licence blocks 2500 km<sup>2</sup> in areal extent, and 8 partial blocks.

The area is situated in the Durban Basin and southern part of the Zululand Basin, offshore from the South African east coast at the Tugela River mouth and the ports of Richards Bay, Durban and Port Shepstone.

It extends from the shoreline in the west to more than 3000 m in the south east. With sparse seismic coverage of 7000 km and only four wells, the numerous leads that have been identified make this an exciting, under-explored frontier area easily accessible to oil refineries at Durban, and oil and gas pipelines connecting to an existing market centred in Johannesburg, Africa's largest industrial centre.

Tugela study area off the east coast of South Africa showing the following leads:

- Dolphin Lead
- Tiger Lead
- Camel Lead
- Lion Lead
- Oligocene Lead

The Durban and Zululand basins, located on the eastern continental margin of South Africa, developed during the Jurassic to early Cretaceous break-up of Gondwana.

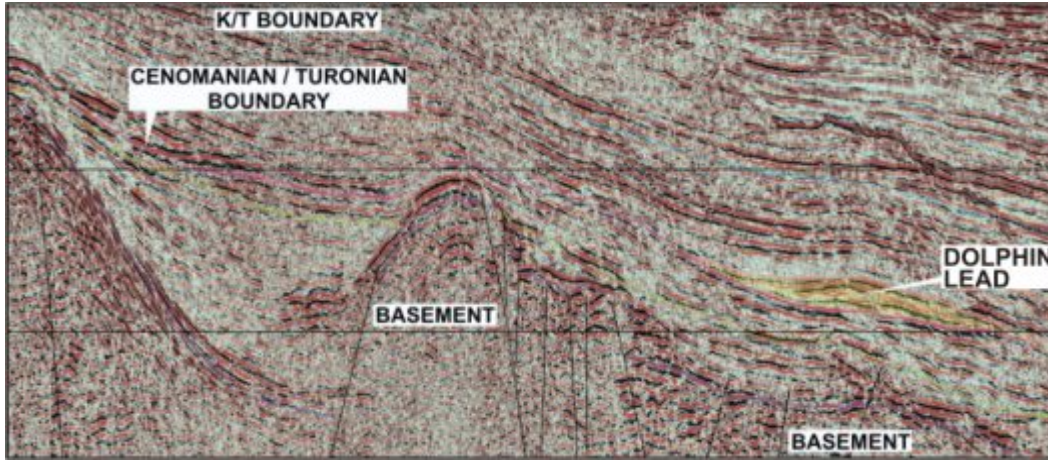
The geology of the Durban Basin is dominated by the Tugela Cone, a large constructional delta that extends across the shelf to water depths of 3000 m. Two sediment growth phases are present, one related to synrift and early drift sediment supply, the other to a renewal of progradation in the Tertiary. Prospective structures, leads and play concepts associated with the Tugela Cone are clearly evident on sparse seismic data. Some examples are illustrated in this brochure.

The hydrocarbon potential of the offshore Durban and Zululand basins has been tested by only four wells. Jc-B1 (1989) exhibited a minor gas show and Jc-D1 (Phillips, 2000), although classified as a dry well has provided the first evidence for an active petroleum system.

Fluid inclusion studies of Jc-D1 samples provide evidence for the presence of seeping light hydrocarbons. An extract from the same interval yielded lightly biodegraded oil. Fluorescence was also observed. The basal section of the well is characterised by bitumen staining and fluorescence. An extract from this interval yielded light oil apparently derived from a distal marine source rock of Kimmeridgian age.

# The Dolphin Lead

S74-007



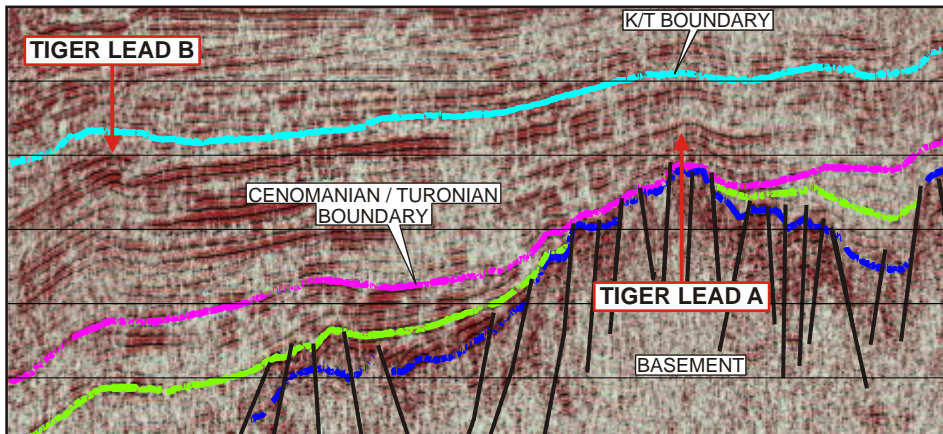
The Dolphin Lead is a basin floor fan complex overlying the Cenomanian/Turonian boundary.

It extends for 12 km along the only seismic line covering the fan.

<b>Geologic setting:</b>	Basin floor fan situated on Cenomanian/Turonian boundary
<b>Seismic control:</b>	Single seismic line
<b>Prospect type:</b>	Basin floor fan pinching out against basin slope.
<b>Water depth:</b>	1050 m.
<b>Area of closure:</b>	100 km <sup>2</sup>
<b>Depth below mudline:</b>	2600 m
<b>Potential thickness:</b>	350 m gross at centre; thins to zero at edges.
<b>Maximum potential:</b>	Approximately 1500 MMBO if filled, assuming 50% net/gross
<b>Source rock:</b>	Probable shale of Late Jurassic Early Cretaceous age, beneath and to the south.
<b>Reservoir rock:</b>	Turbidite sandstones
<b>Trap type:</b>	Basin floor fan pinchout against shale slope facies
<b>Timing:</b>	Deposition and stratigraphic trap formation precedes source rock maturity and hydrocarbon expulsion

# The Tiger Lead

S76-159



**Tiger Lead A** is situated above an upthrown basement block.

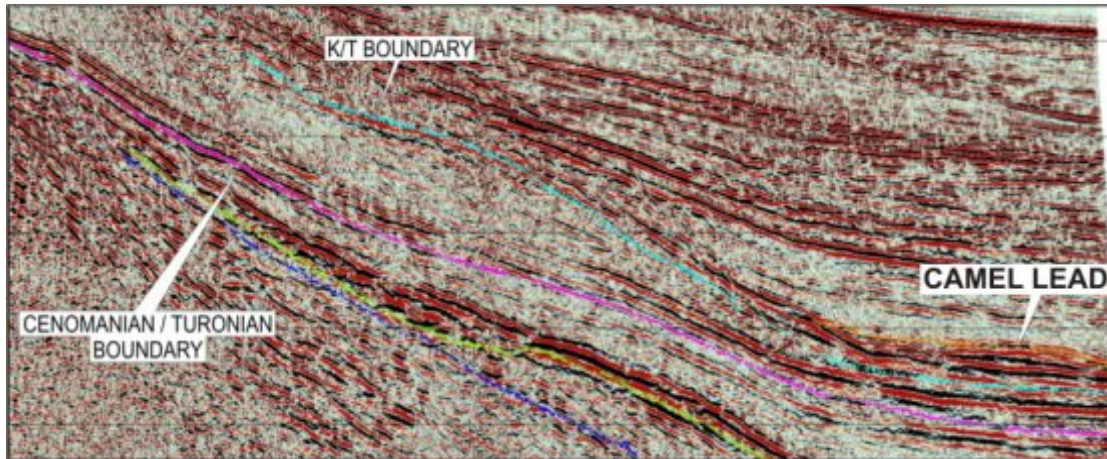
The target intervals range from the Cretaceous to the Tertiary and represent more than 1000 m of section draped over the basement block. The lead, defined by two seismic lines, exhibits four-way closure.

**Tiger lead B** comprises a stacked roll-over into a fault.

<b>Geologic setting:</b>	Situated on a basement ridge horst on the northern flank of the basin.
<b>Prospect type:</b>	Drape over a horst block with an apparent 4-way dip closure.
<b>Water depth:</b>	860 m
<b>Area of closure:</b>	84 km <sup>2</sup> at top pre-Cretaceous. 40 - 50 km <sup>2</sup> at shallower horizons.
<b>Hydrocarbon potential:</b>	800 MMBO.
<b>Source rock:</b>	Shales of Late Jurassic - Early Cretaceous age are expected to be present, immediately to the south where this section is thick and mature.
<b>Reservoir rock:</b>	Marine sandstones or sands associated with the Tugela River may be present. Additional reservoir possibilities include turbidite sandstones in the section draped over the horst.
<b>Trap types:</b>	Interbedded turbidite sandstones and bathyal shales, with differential compaction drape over the horst block comprising combined structural-stratigraphic traps.

# The Camel Lead

T74-005

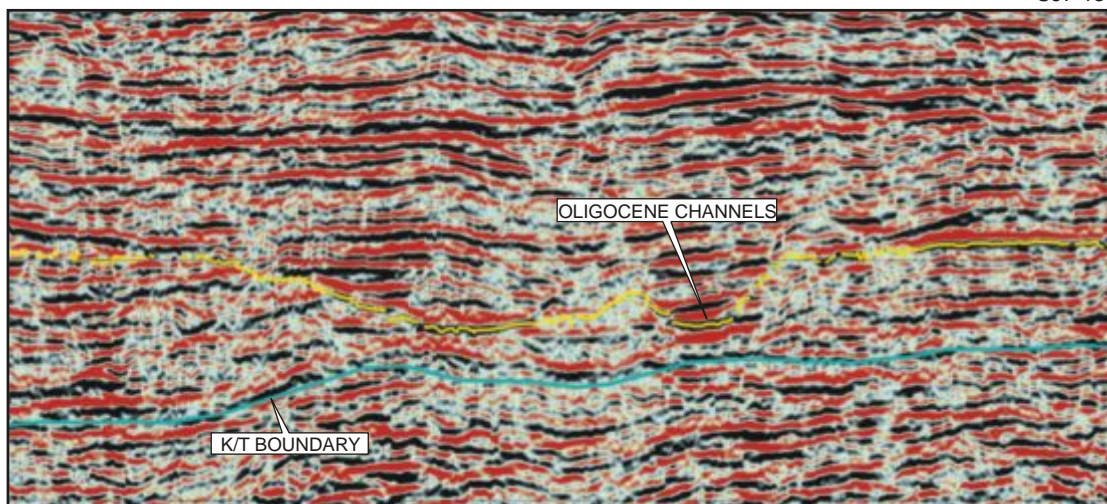


The Camel Lead is interpreted as a basin floor fan situated on the flank of a source rock basin that thickens toward the south-east. It is visible for 10 km on a single seismic line, but may extend to a basin floor fan observed on an adjacent parallel line 14 km to the NE.

<b>Geologic setting:</b>	Basin floor fan situated on the Cretaceous /Tertiary unconformity
<b>Seismic control:</b>	Single seismic line
<b>Prospect type:</b>	Basin floor fan pinching out against basin slope.
<b>Water depth:</b>	1400 m
<b>Area of closure:</b>	80 km <sup>2</sup>
<b>Depth below mudline:</b>	1900 m
<b>Potential thickness:</b>	300 m gross at centre; thins to zero at edges.
<b>Maximum potential:</b>	Approximately 1000 MMBO, assuming 50% net / gross
<b>Source rock:</b>	Probable shale of Late Jurassic Early Cretaceous age.
<b>Reservoir rock:</b>	Turbidite sandstones
<b>Trap type:</b>	Basin floor fan pinchout against shale slope facies
<b>Timing:</b>	Deposition and stratigraphic trap formation precedes source rock maturity and hydrocarbon expulsion

# The Oligocene Channel Lead

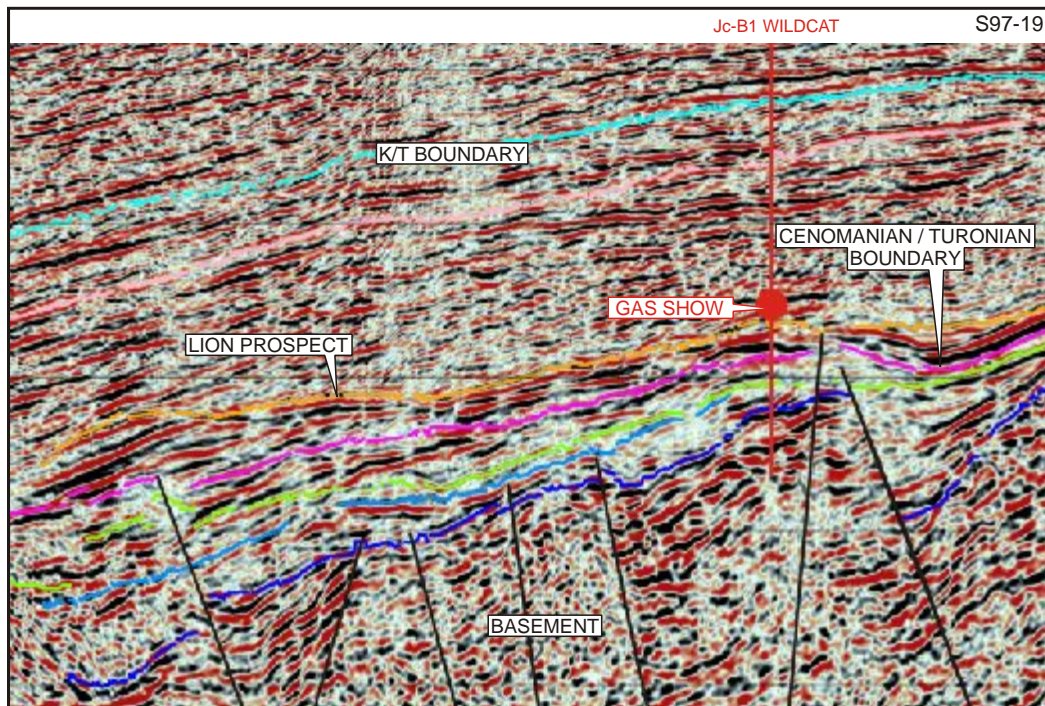
S97-130



The Oligocene channels developed during regional uplift of the African craton. Amplitude anomalies are associated with the base of the channels, which suggest a sandy channel fill. Downdip, the channel fill develops a mounded character which indicates the beginning of a basin floor fan. A lowstand fan wedge is expected to occur in the depocentre.

<b>Geologic setting:</b>	Tertiary channels on shelf, extending downdip into a basinal depocenter.
<b>Seismic control:</b>	Extensive seismic control of channels - sparse seismic data over depocenter.
<b>Water depth :</b>	147 m to depocenter
<b>Source rock:</b>	Mature mid - late Cretaceous source rocks are expected to lie deeply buried in the depocentre area.
<b>Reservoir rock:</b>	The conduits exhibit a bright seismic character closely associated with the base of the channels, suggesting the presence of a lag deposit.

# The Lion Lead



The Lion lead is a stratigraphic trap consisting of an extensive late Cretaceous basin floor fan complex that has been tilted to the east. Well and seismic data suggest the Lion basin floor fan complex is sand prone, and lies above the Cenomanian unconformity.

The Jc-B1 well drilled 1.5 km updip intersected 17 m of sandstone at this stratigraphic level, which exhibited a minor gas show.

<b>Geologic setting:</b>	Lowstand basin floor fan complex, above the Cenomanian / Turonian boundary.
<b>Prospect type:</b>	Basin floor fan pinching out against basin slope
<b>Water depth:</b>	75-200 m
<b>Area of closure:</b>	300 km <sup>2</sup>
<b>Potential thickness:</b>	325 m
<b>Hydrocarbon potential:</b>	Approximately 3000 MMBO in place if filled, assuming 50% net /gross.
<b>Source rocks:</b>	Probable source rock of Late Jurassic - Early Cretaceous age, below and to the south. Regional faults provide good migration pathways.
<b>Reservoir rock:</b>	Well and seismic data suggest the Lion basin floor fan complex is sand prone. The Jc-B1 well drilled 1.5 km up-dip intersected 17 m of sandstone which exhibited a minor gas show.
<b>Trap type:</b>	Stratigraphic
<b>Timing:</b>	Reservoir deposition and stratigraphic trap formation preceded source rock maturation and hydrocarbon expulsion.

## Conclusion

The Tugela study area comprises a large under-explored area off the east coast of South Africa which exhibits promising exploration potential. Existing identified leads, play concepts and prospective structures with a total hydrocarbon potential in the multi-billion barrel range, make further exploration of these blocks imperative.

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