

How Leviathan Was Born and What Next

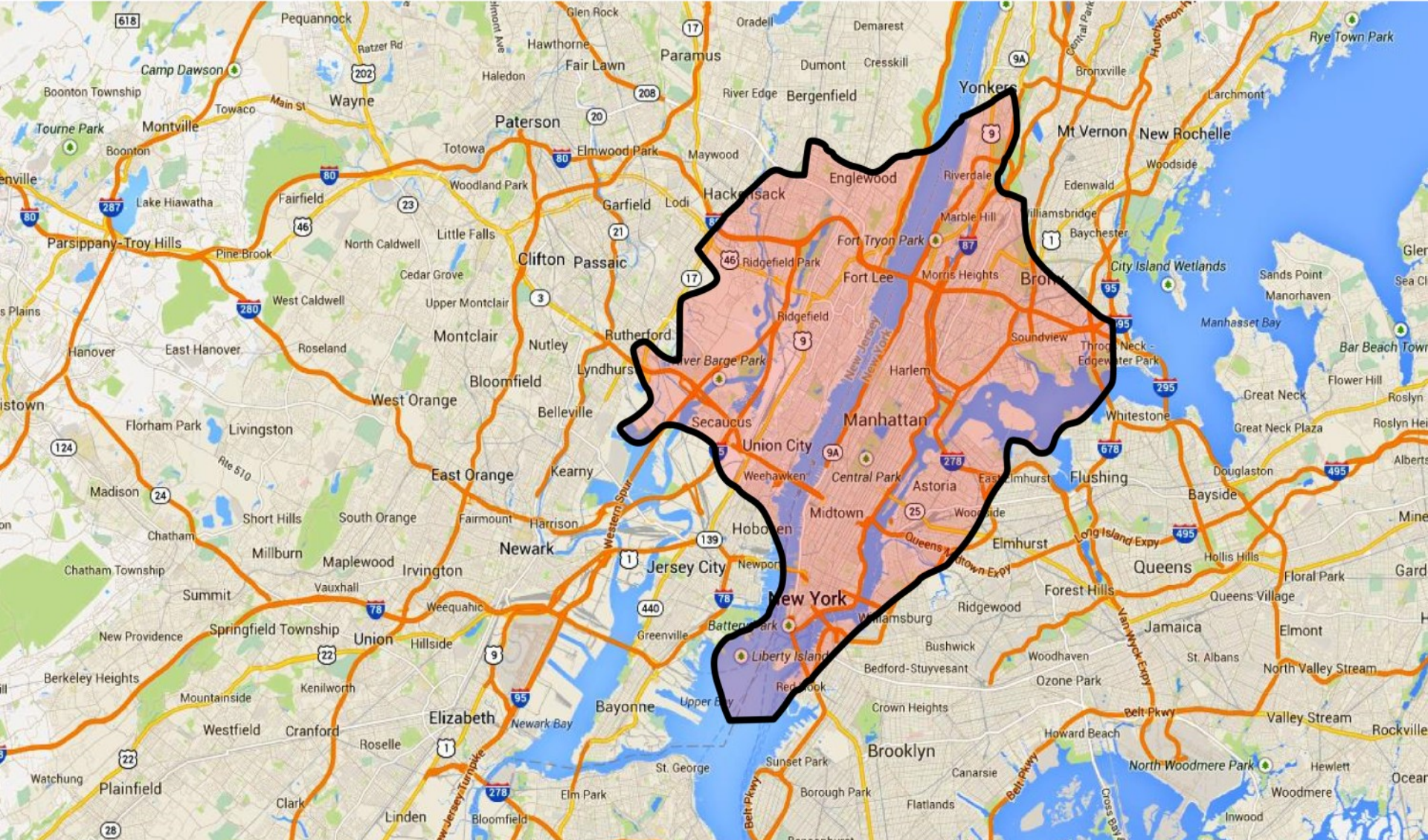
November 2013

December 2010

It was announced:

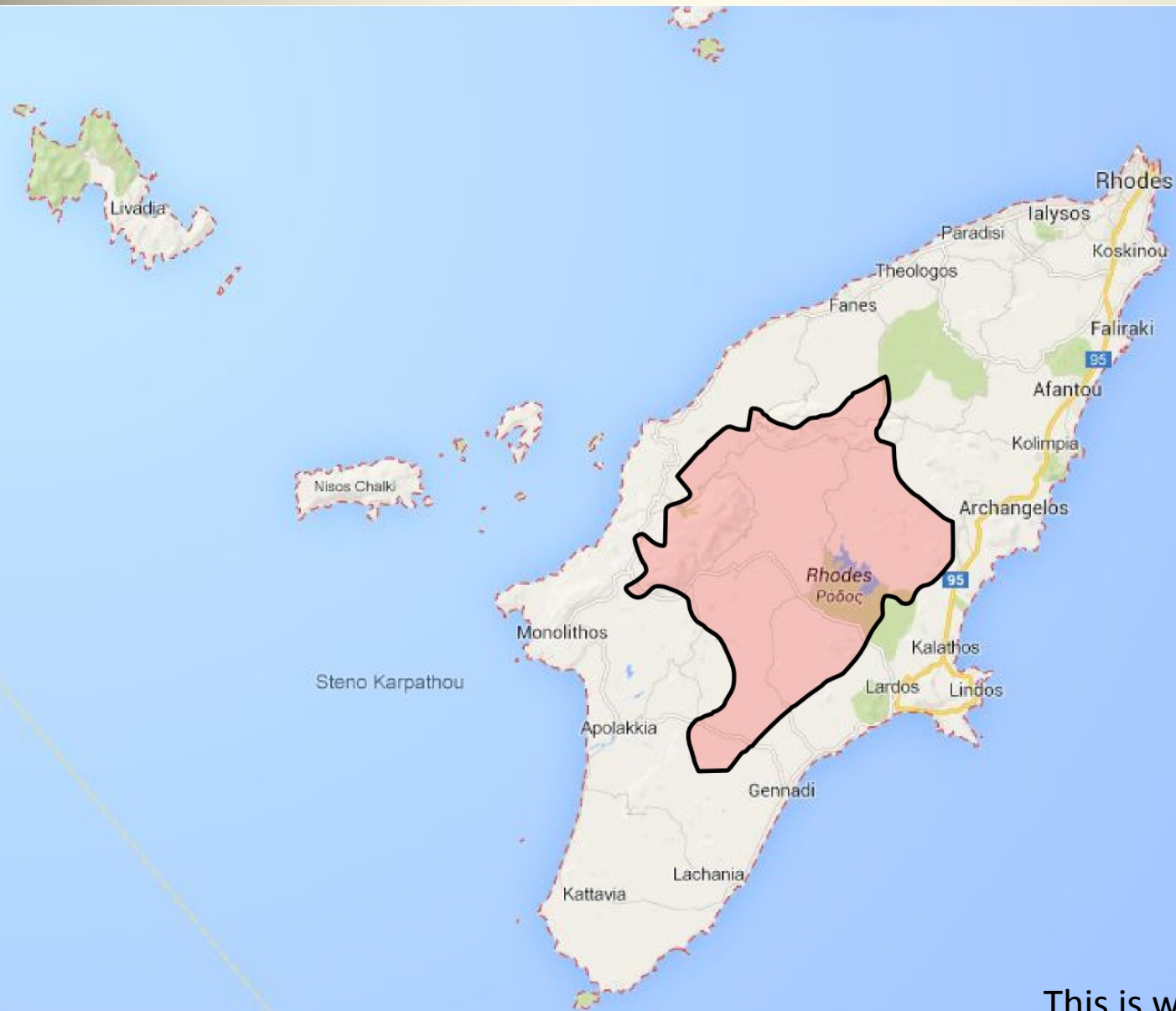
“ Leviathan Field Was Discovered , contain 16 TCF Gas “

“ Leviathan is the biggest gas field found in this decade “.



Area of = 325 km^2
Gross thickness = 140 m

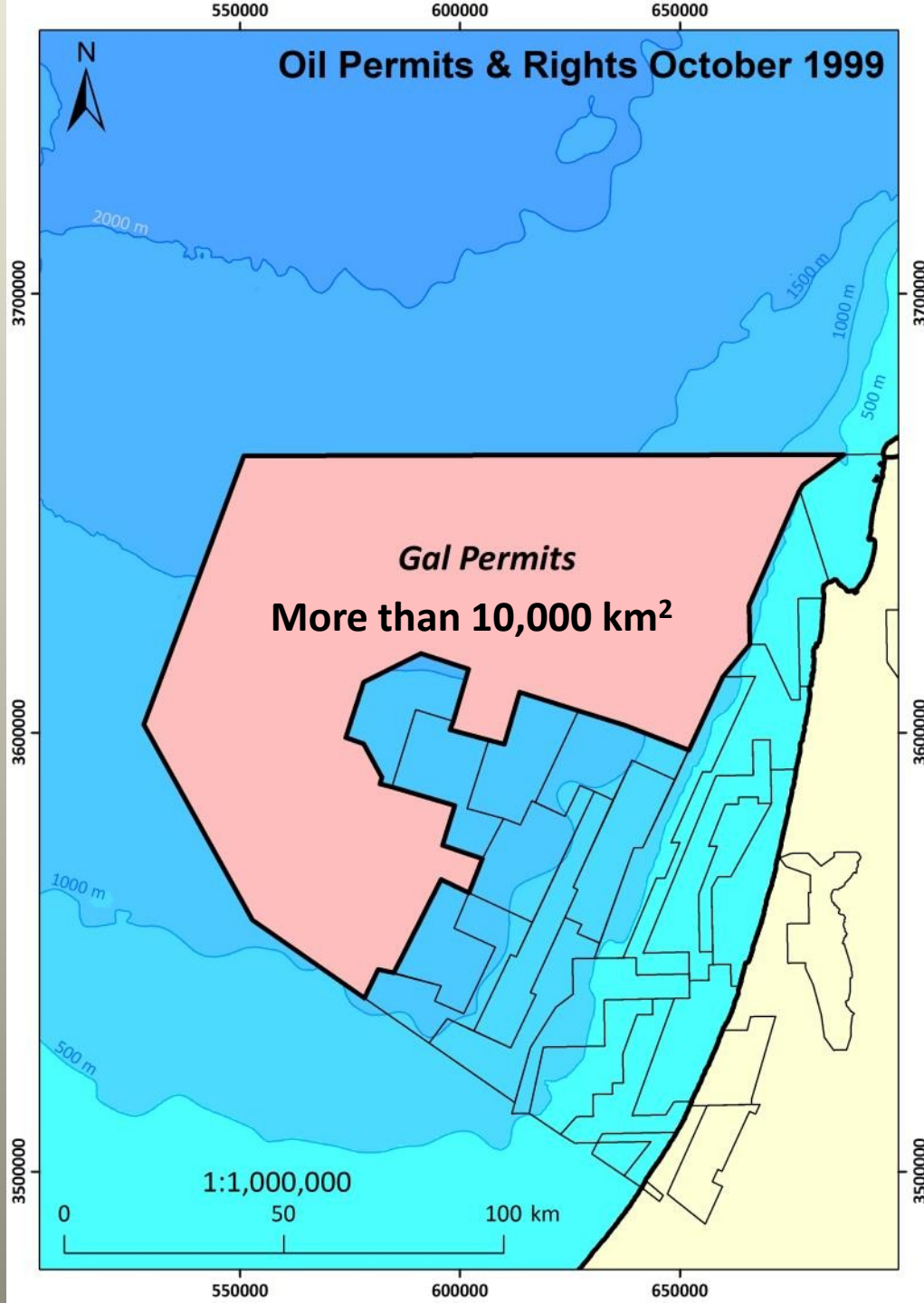
Rodos



This is why it was called
Leviathan = a Big fish.

I am going to tell you a story about :

- Government Behavior
- Miserable and troubled geologist.
- Poor and good Decisions.
- Determination and luck.



More Profitable
To be a
promoter
Than
a professional

July 2000

The Sea Was Closed For
Newcomers Till 2006

I call it “The BG Period”

The BG Periods

- Developed Two Interesting Prospects:
Tamar
Dalit
- BG Left The Area At 2004-5 Without Drilling
The Prospects That They Developed.

The Big Mistake Most Governments Do

Both prospects were drilled by Noble at 2009 Completed as Gas Discoveries.

BG Did Not See Leviathan !!!

Not even the empty glass

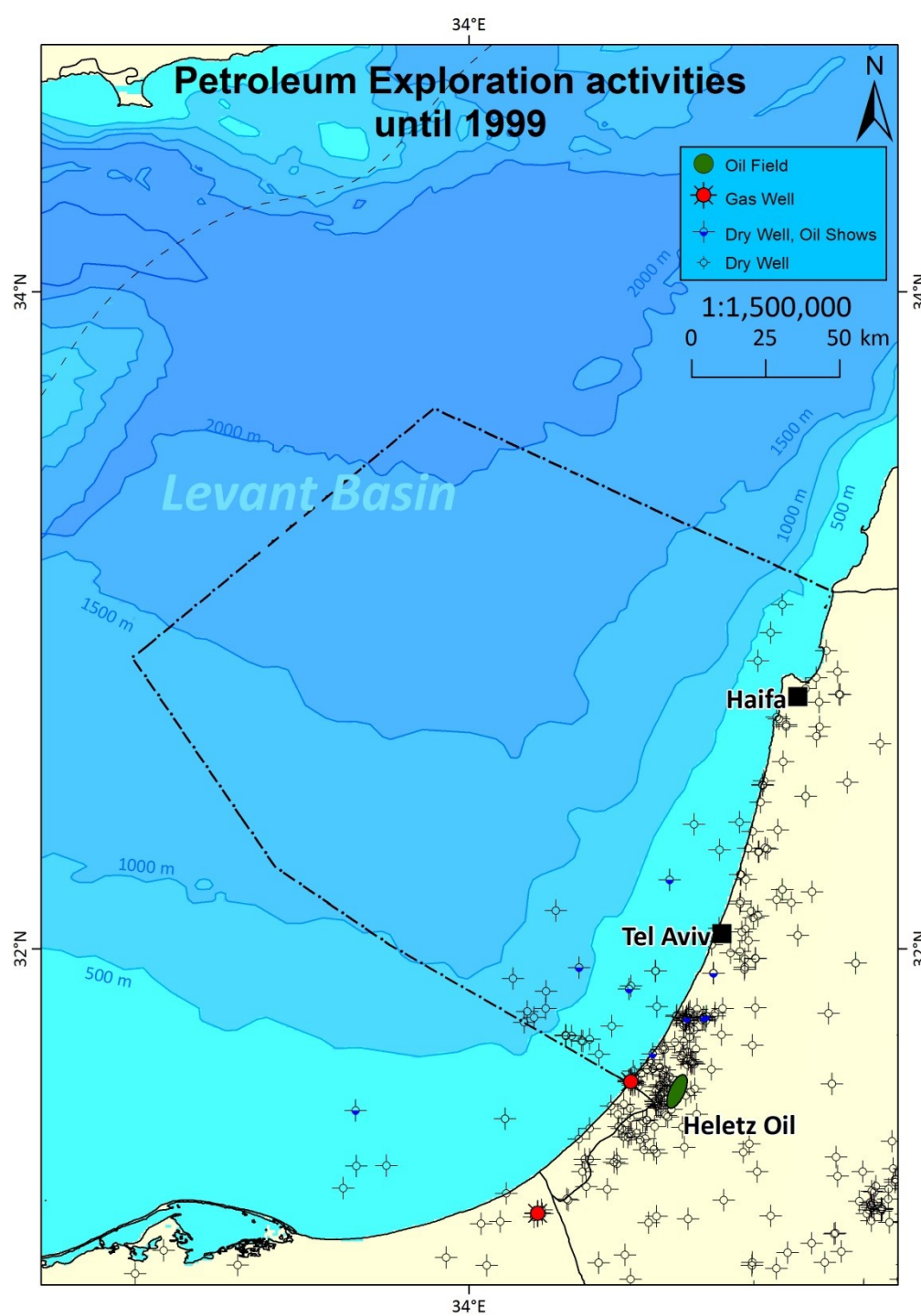
My Luck

Why BG Left ?

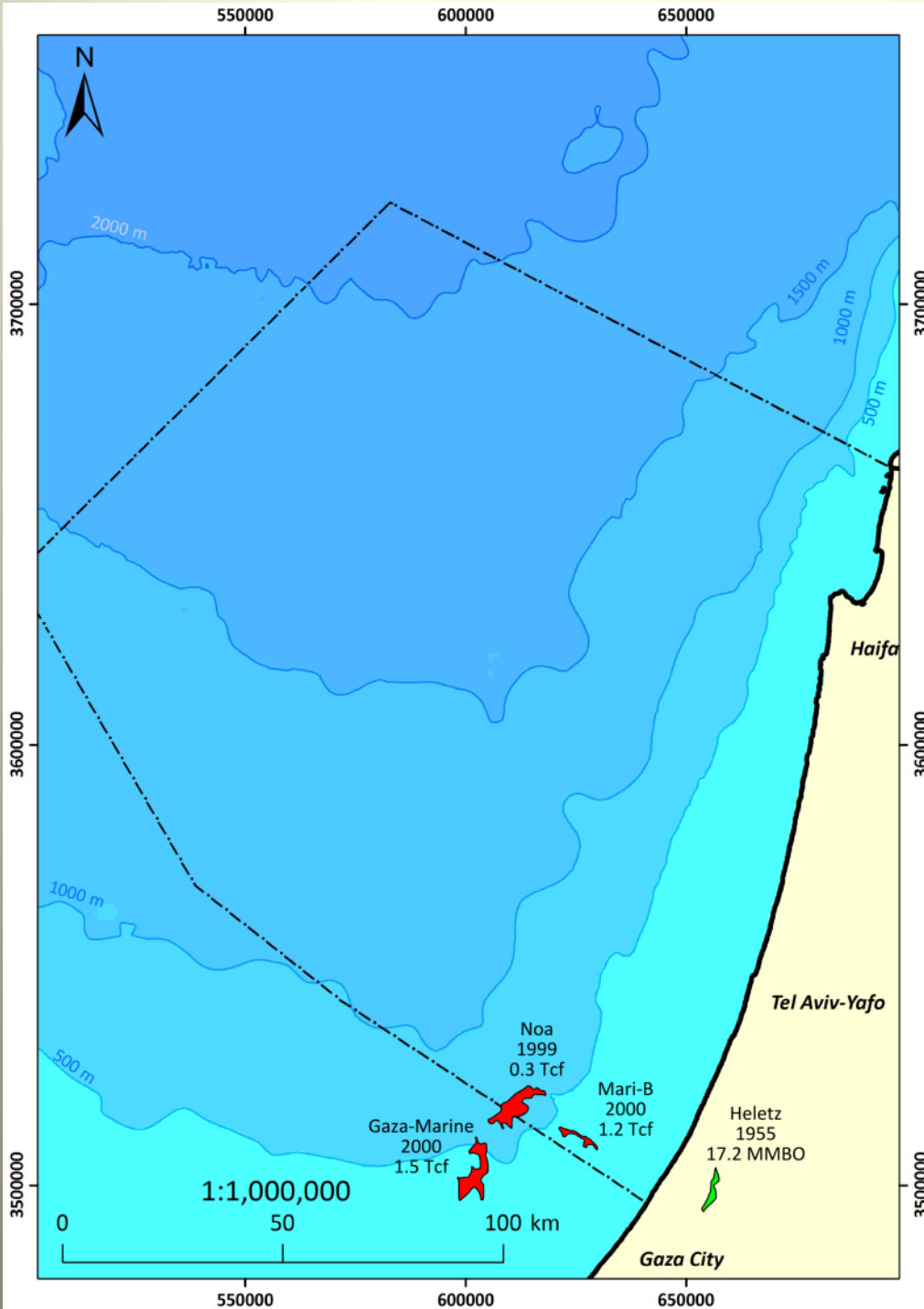
Later if we have time

The BG Period Cost Israel About 8 Years Delay

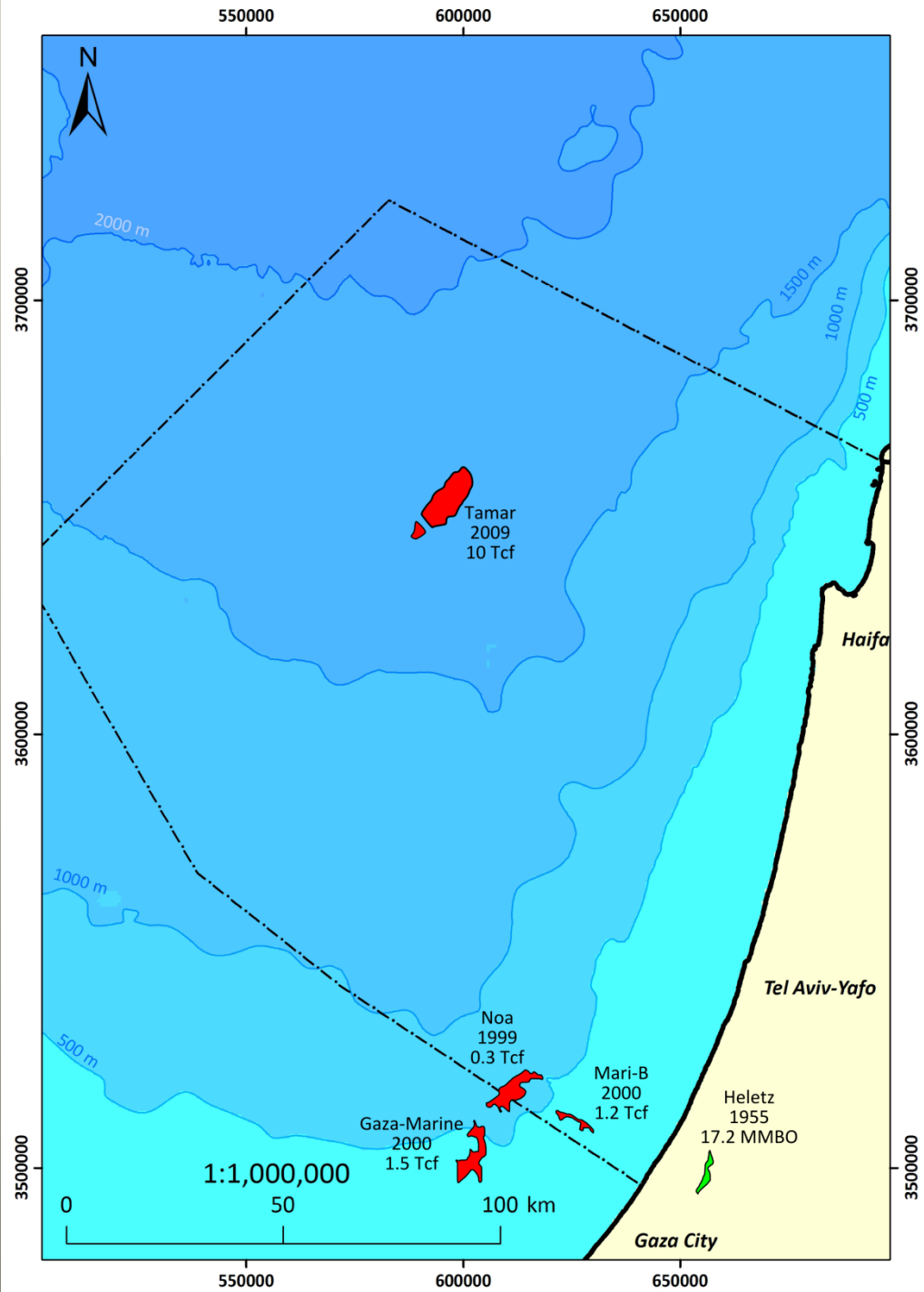
Finding Substantial Gas Reserves

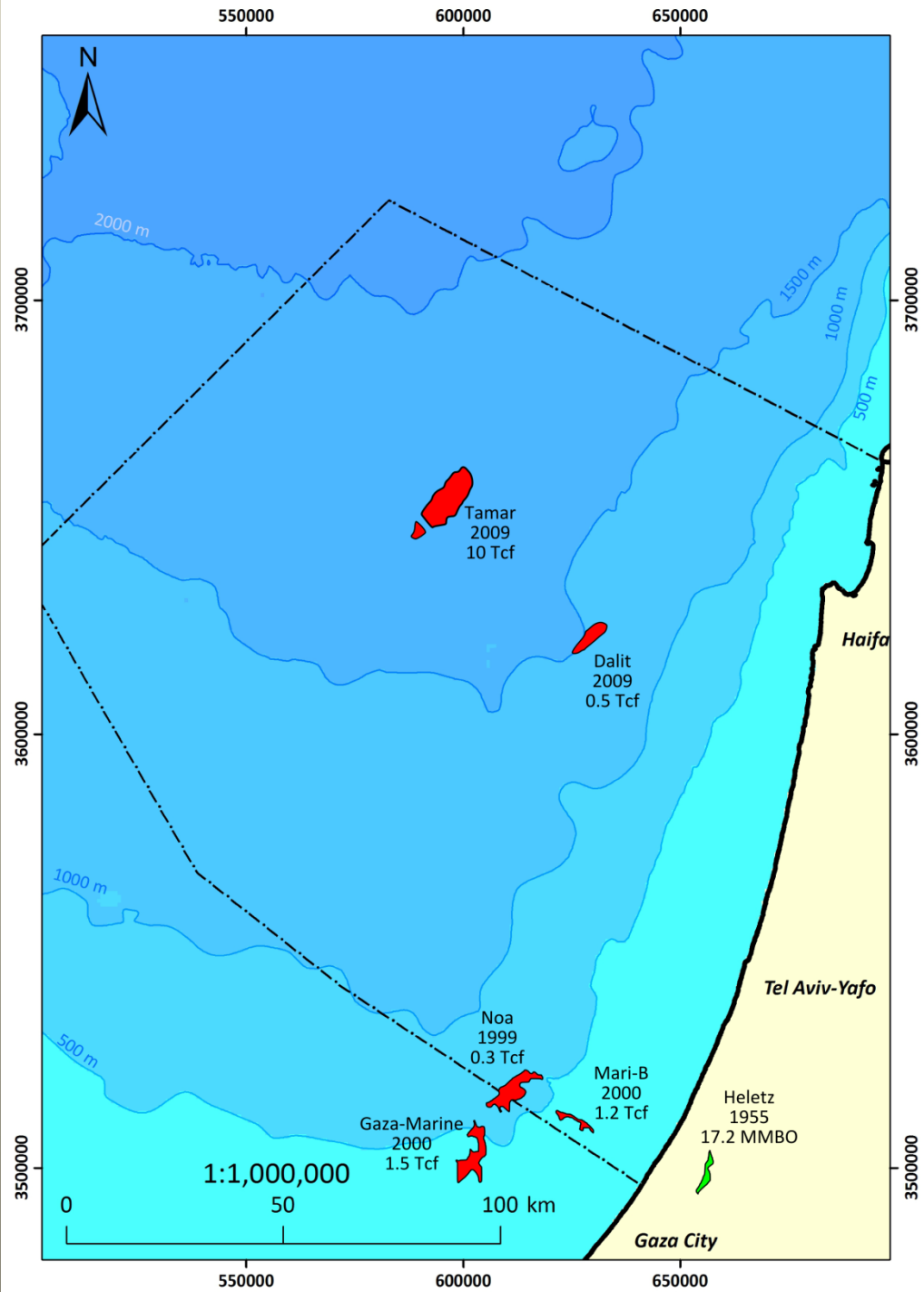


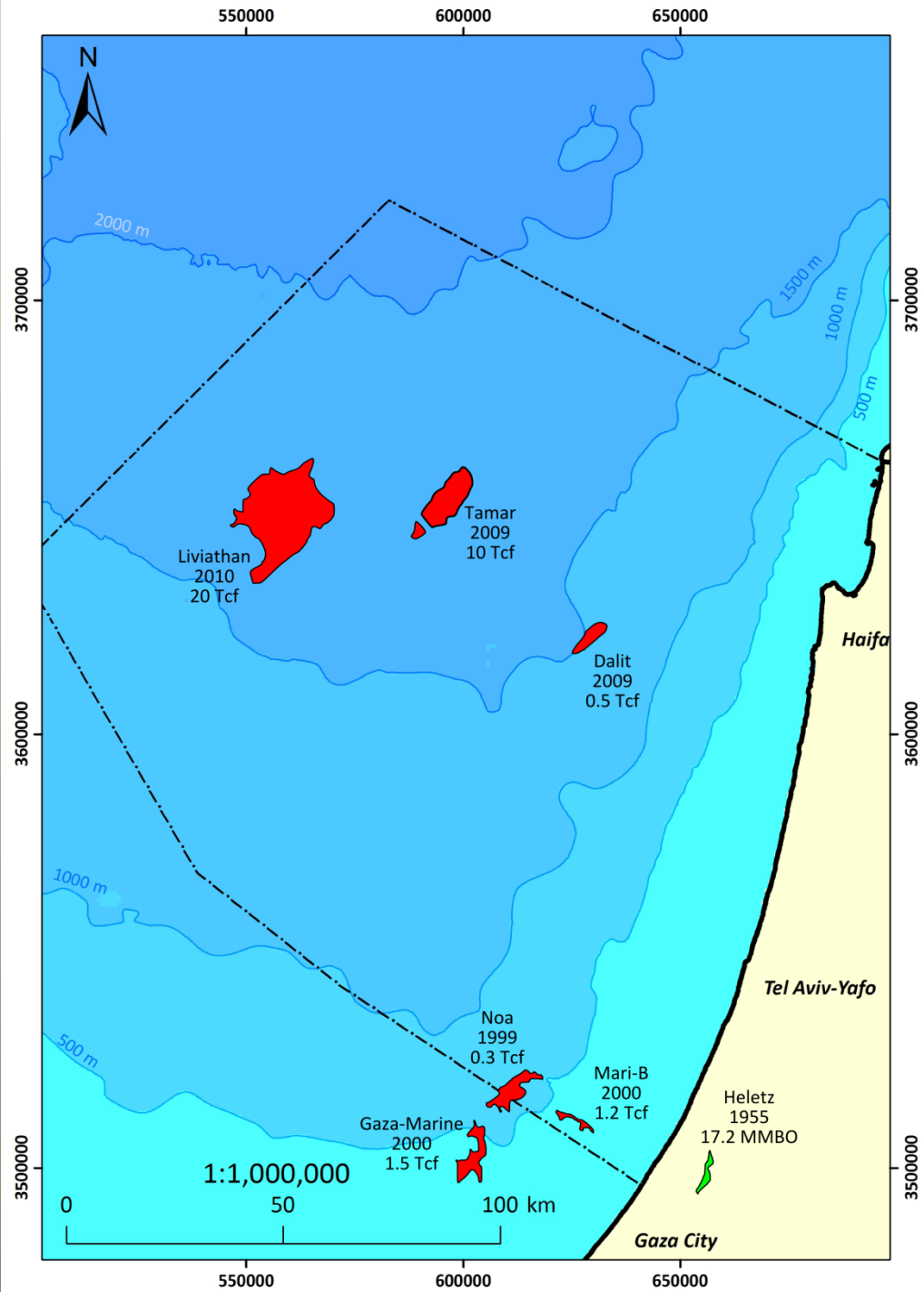
28 Offshore Dry Wells

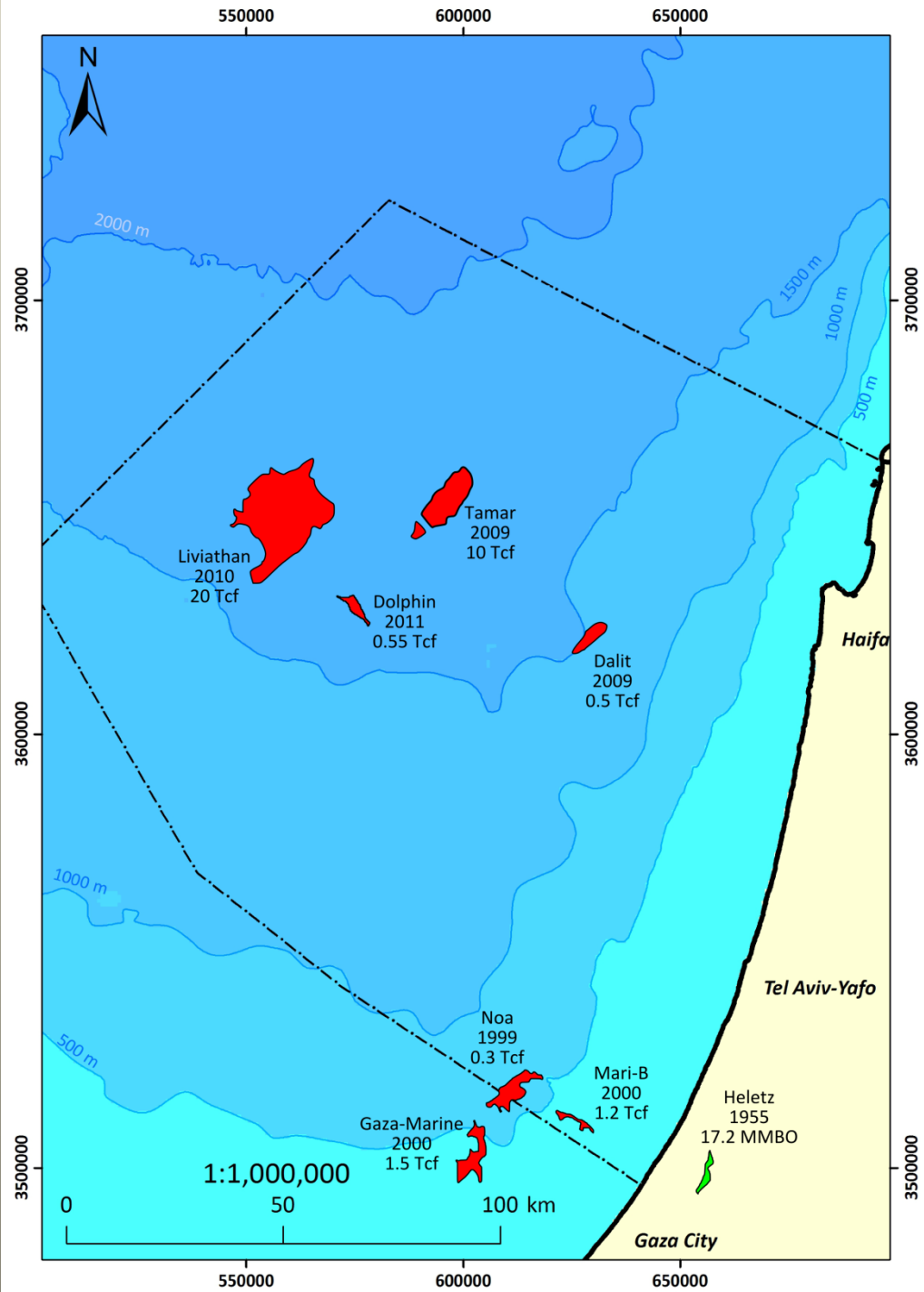


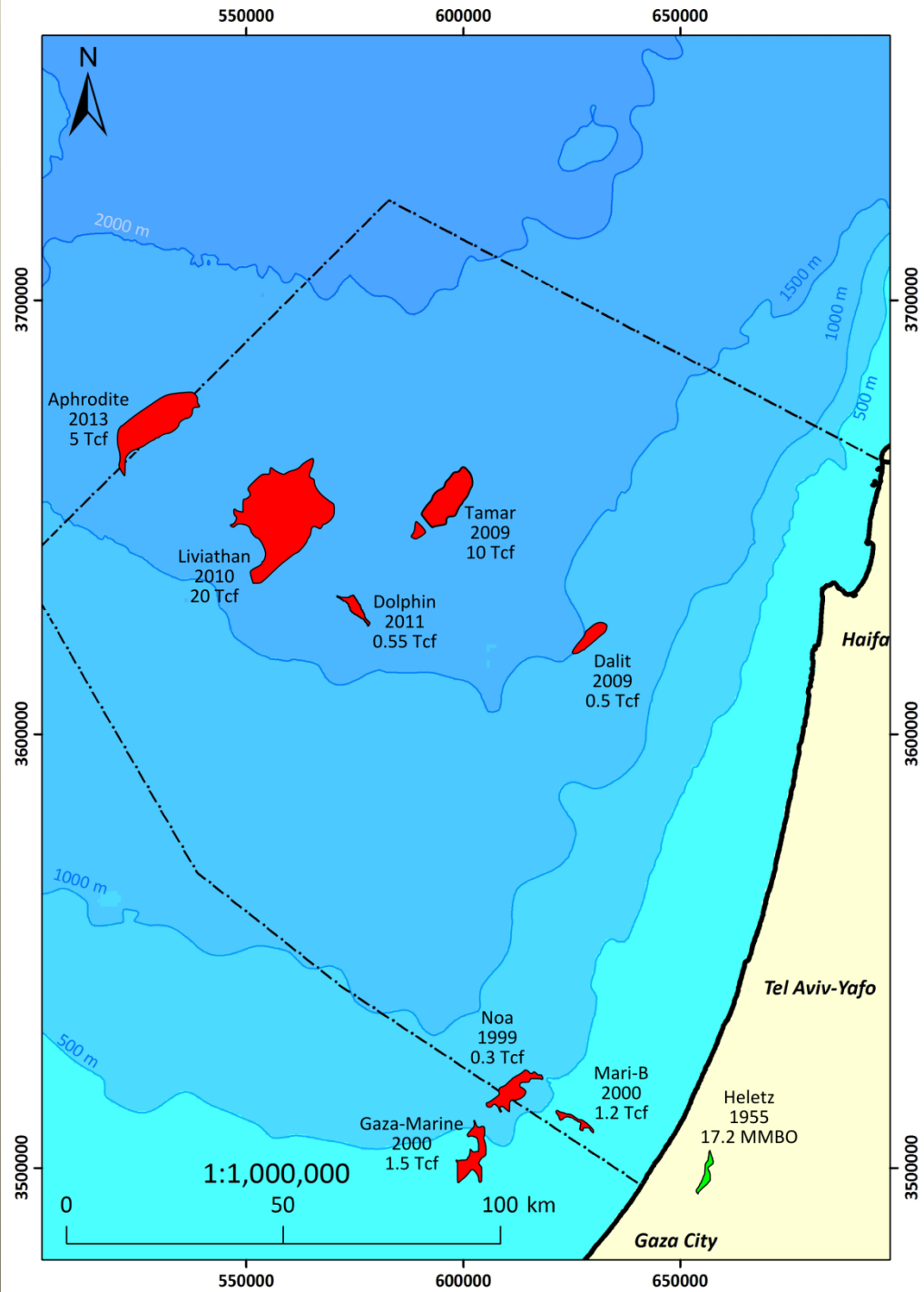
1999 - 2000
Mary B
Gaza Marine
Commercial Discoveries

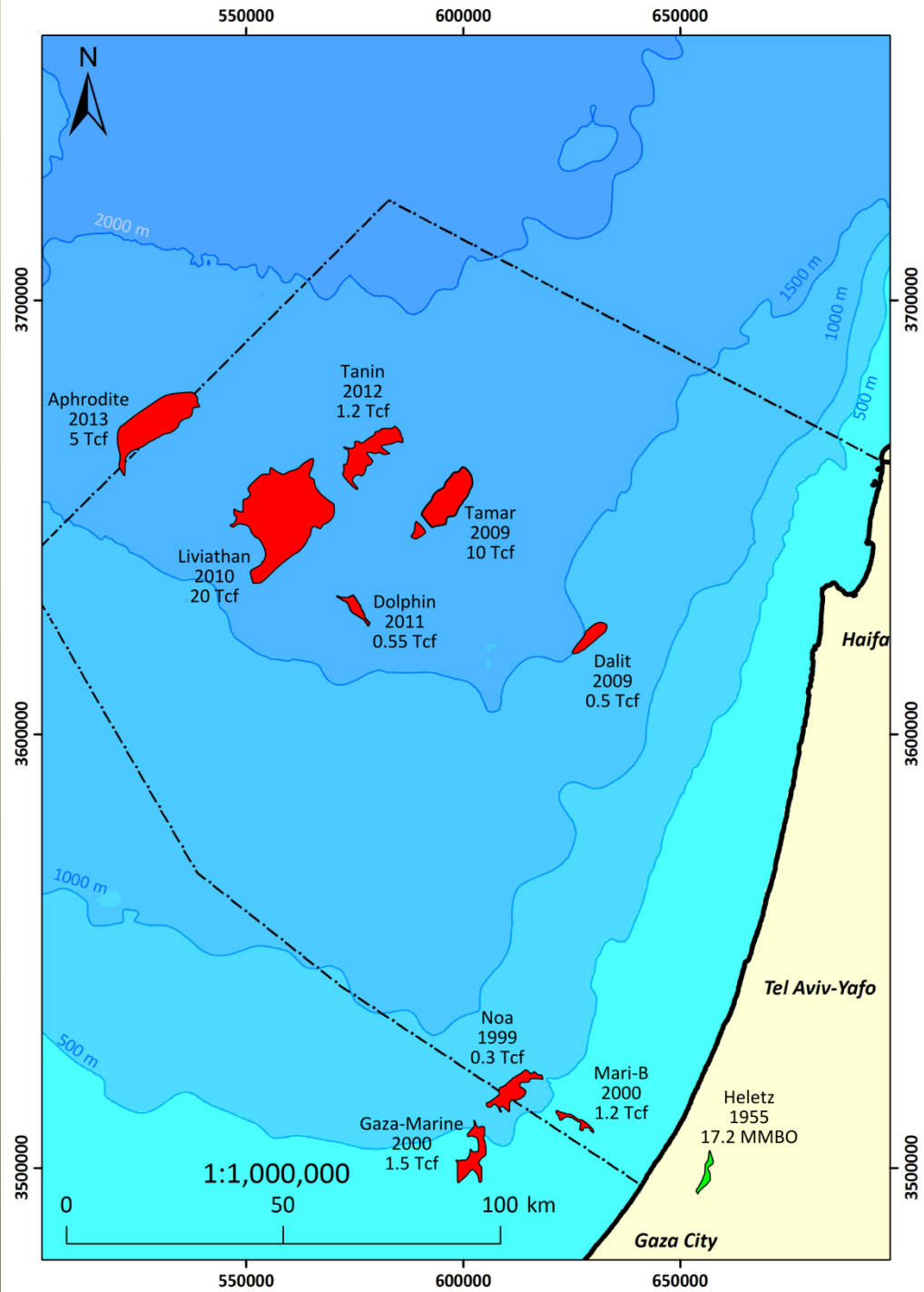


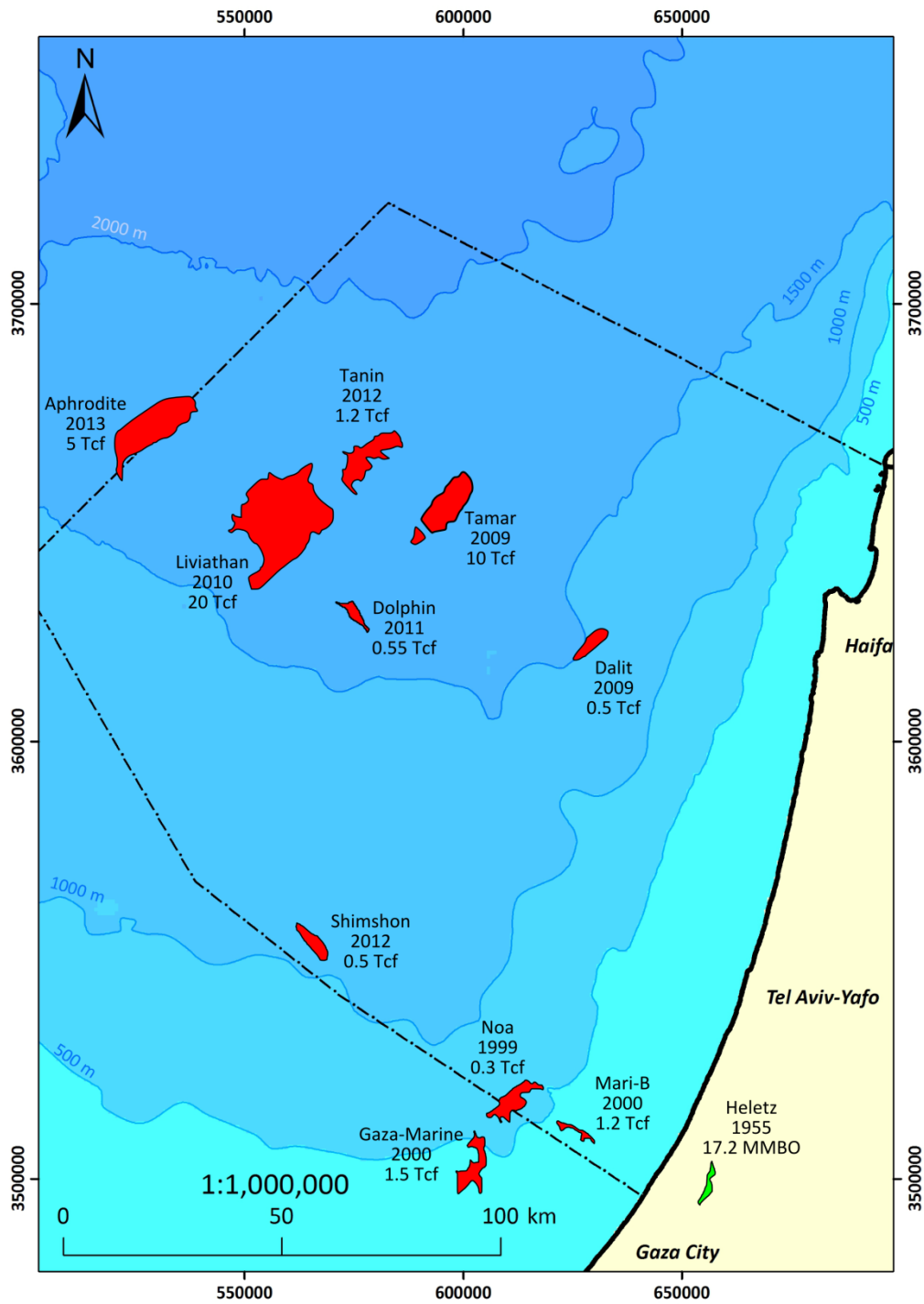


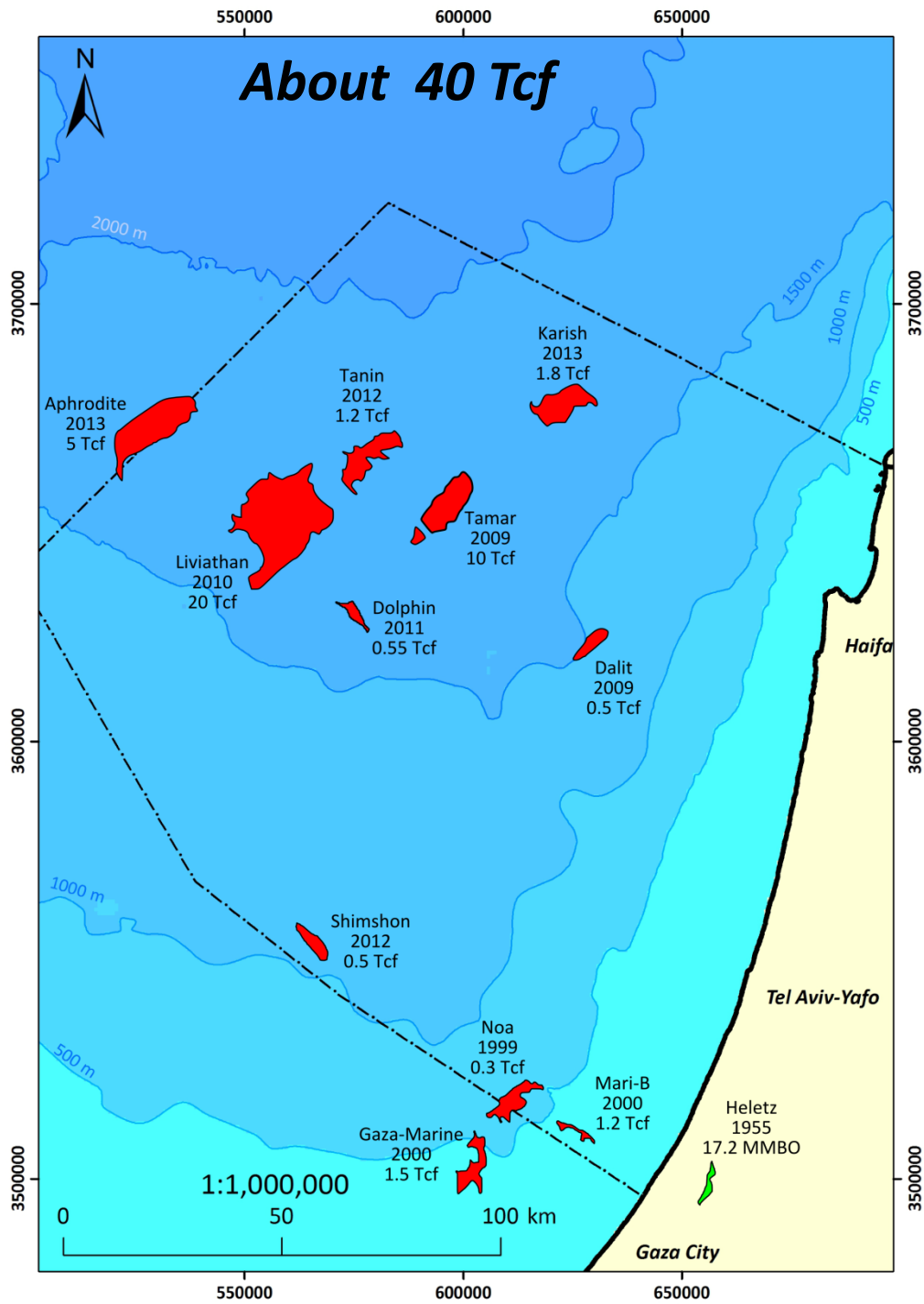


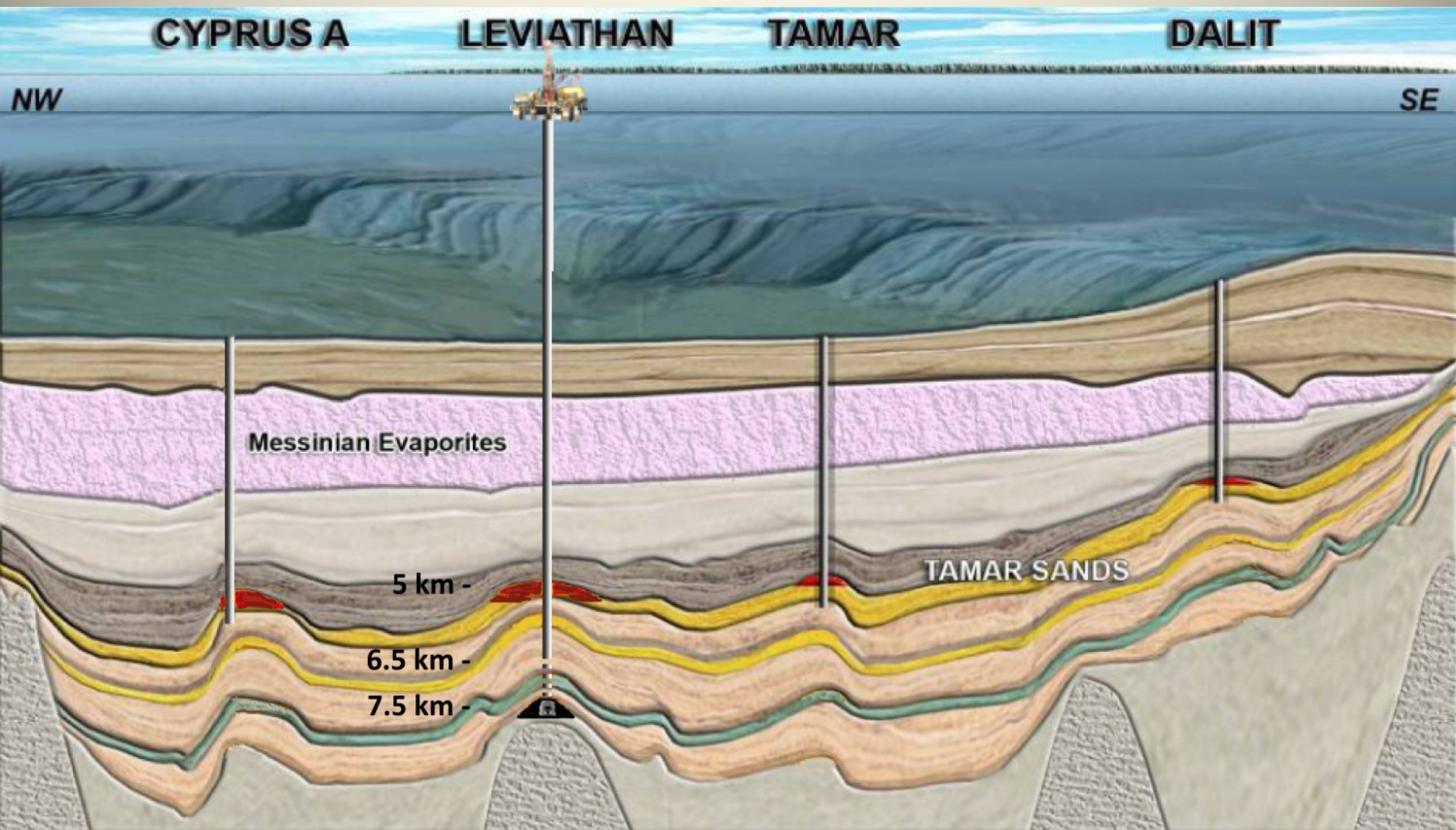












The gas fields are not immediately below the salt complex

Ratio Story

(Ratio = Two Managers plus one slave)

- Established - End 1992. Investing Mainly Onshore.
- In 1999 , after the discovery of Noah , decided to invest in the Mediterranean.
- Till 2010 , Ratio participated in 4 offshore dry wildcats plus one uneconomical discovery.

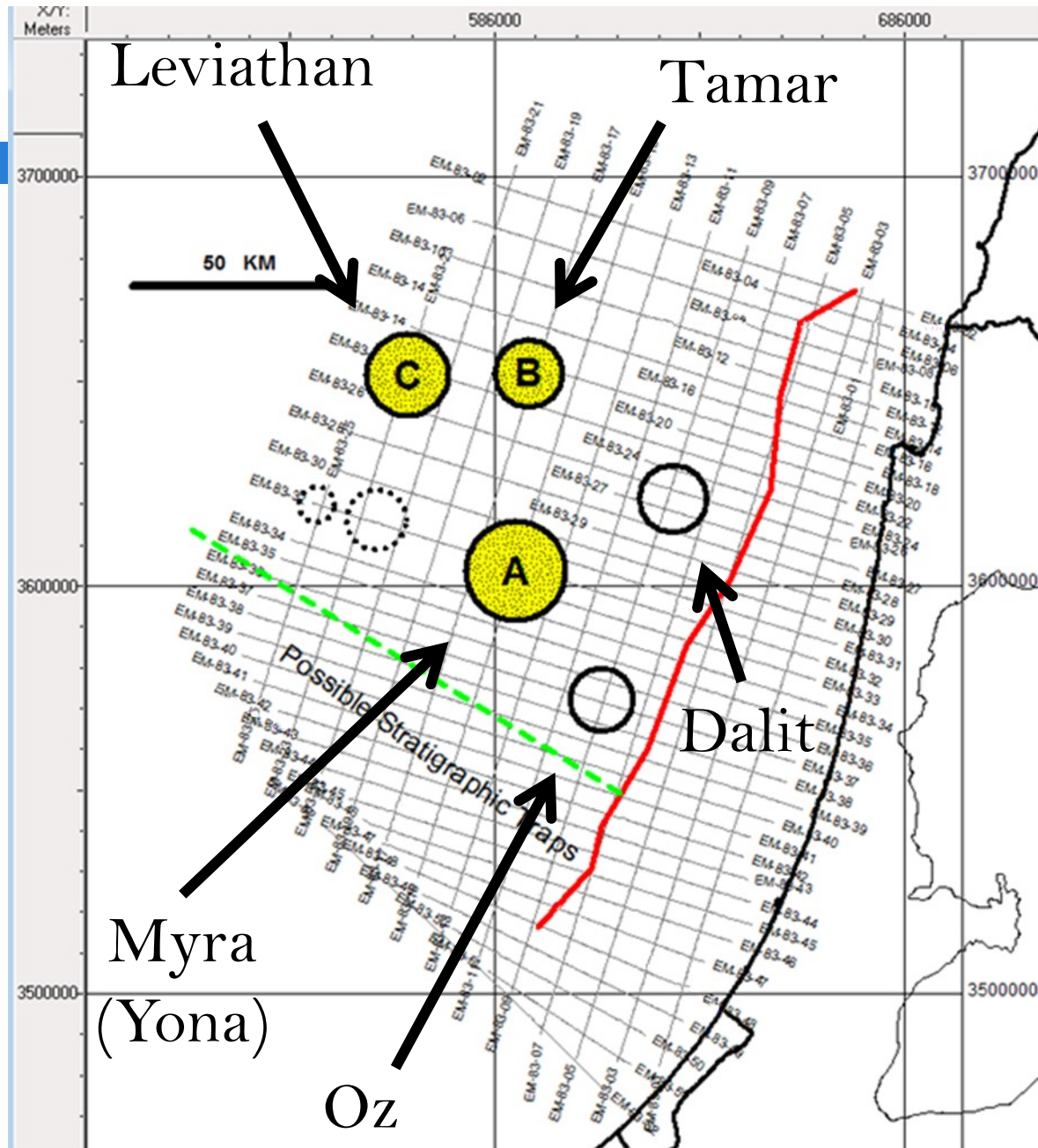
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- In 2000 we bought a Work Station
and S.M.T Kingdom software for seismic
interpretation.

Insights and Concepts In 2002

- Source - ? Most probable the interbedded shales.
- Structure – The data in hand = 1983 survey.
- Maturity
- Cap
- Reservoir

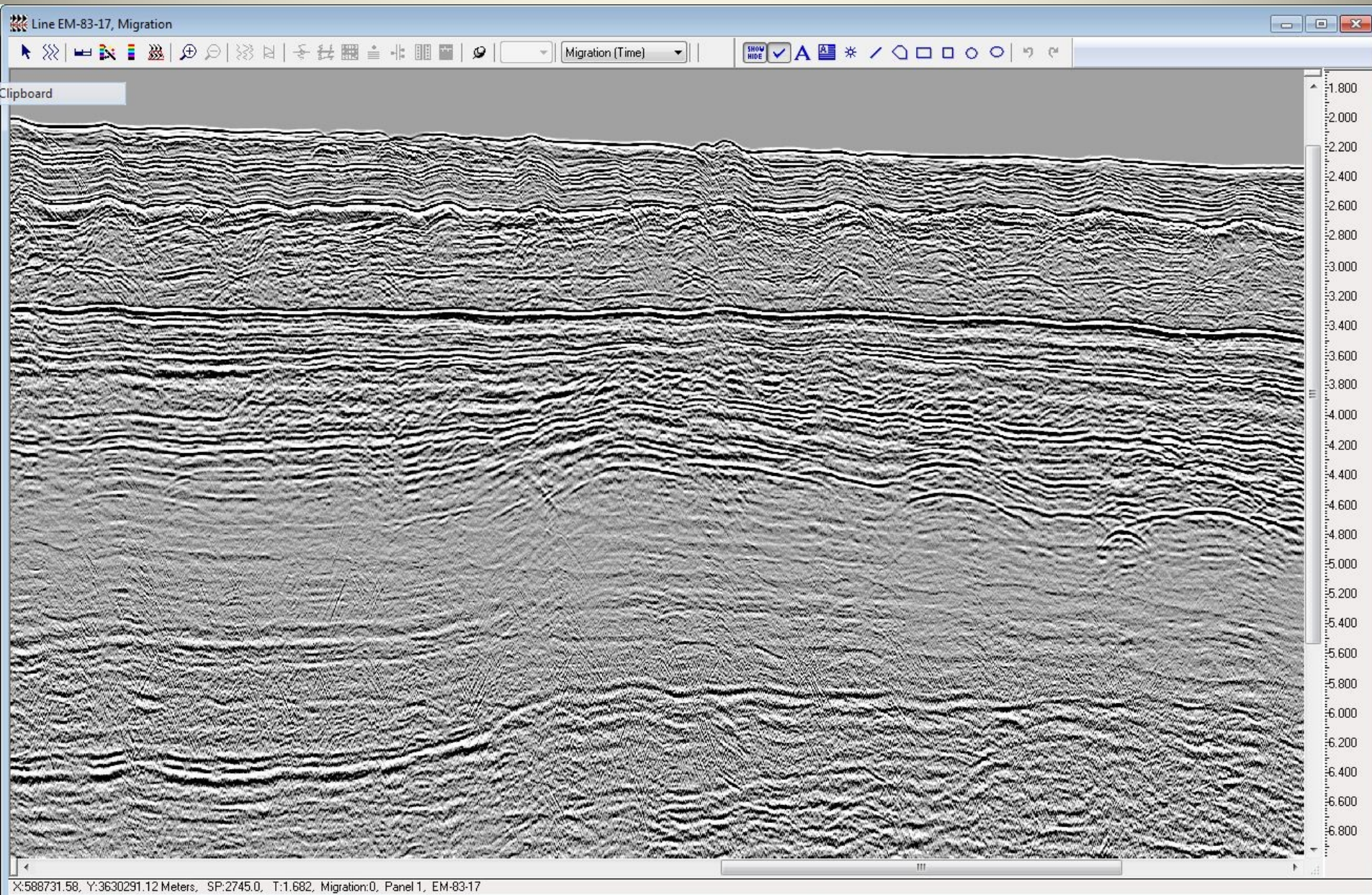
A map from an
internal memo to
Ratio' managers

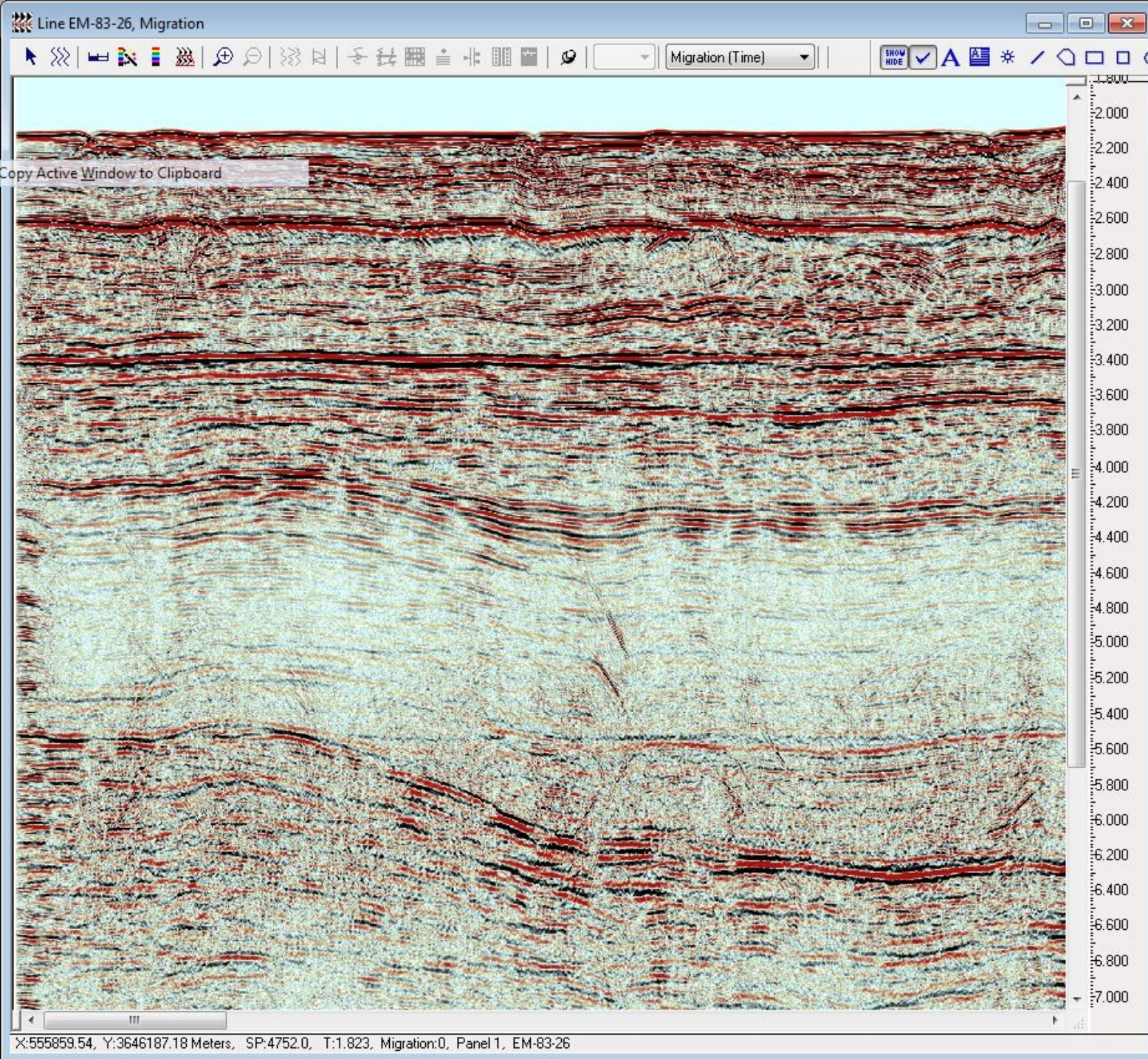


November 2002

A map from an internal memo to Ratio' managers

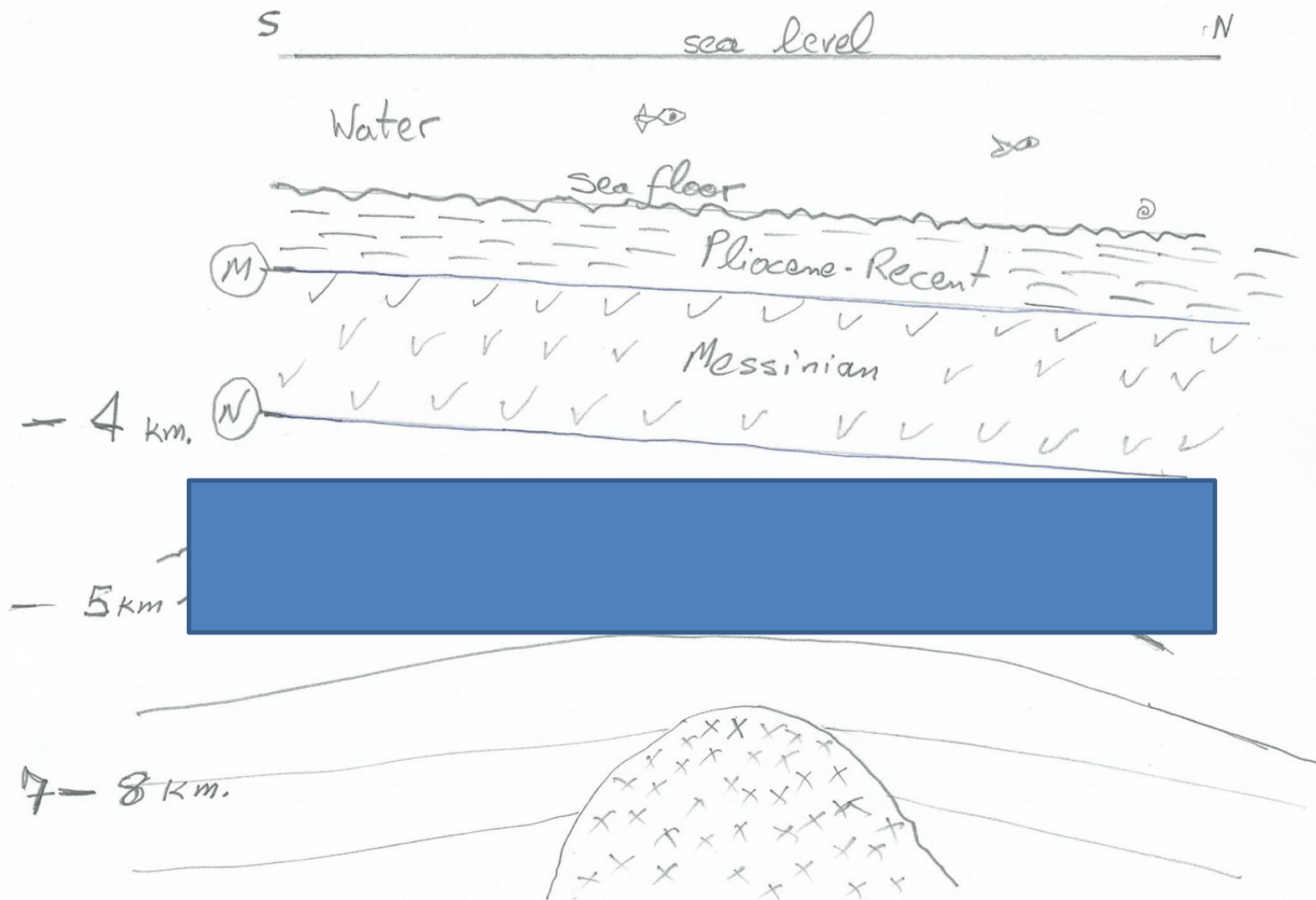
EM – 83 = Leviathan Crest Line





EM – 83
Leviathan
Dip Line

The Deep Leviathan Prospect Came First



Maturity In The Deep Levant Basin

Is it a valid prospect ?

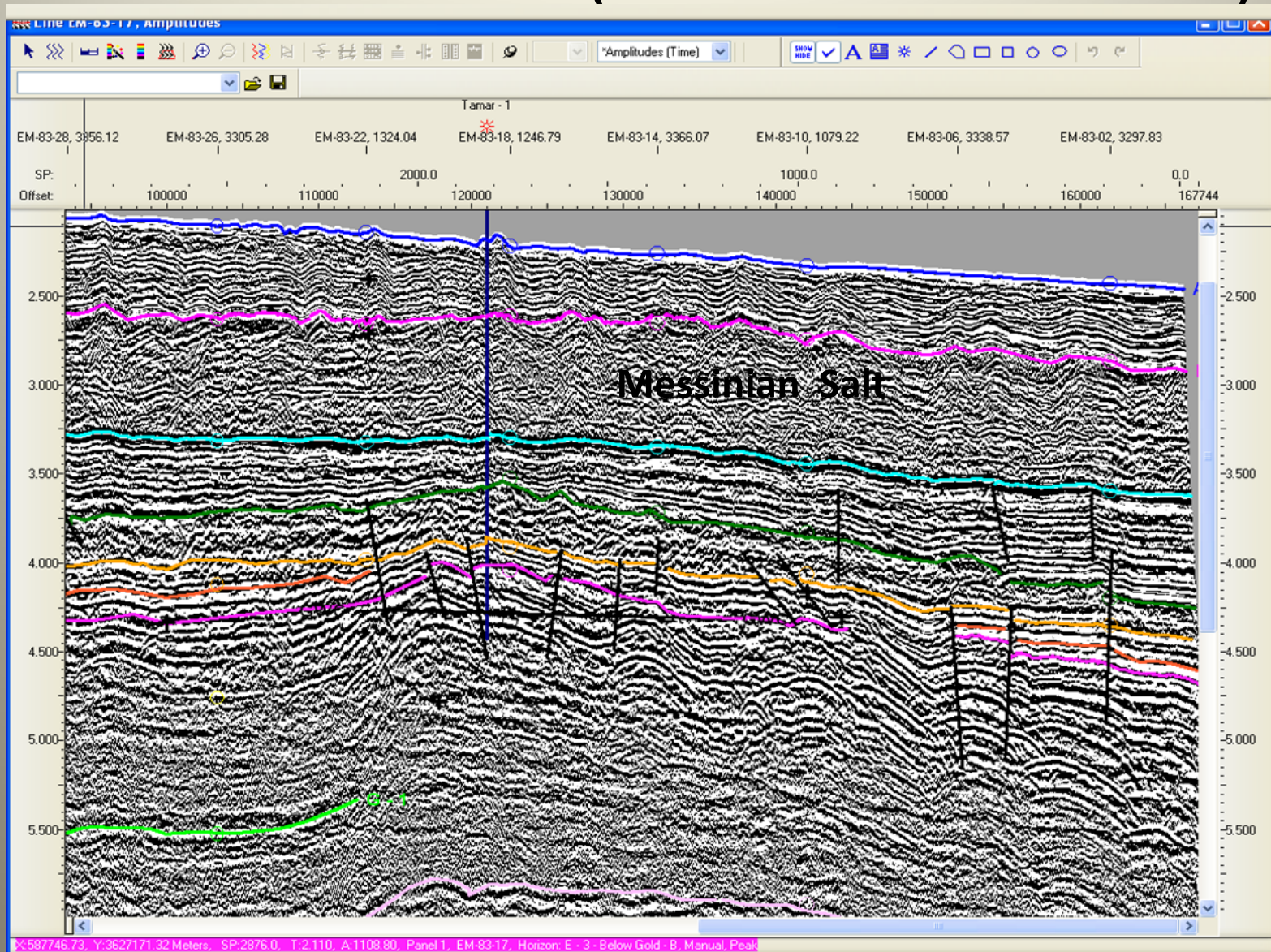
Where is the oil window ? Normally 3-5 Km.

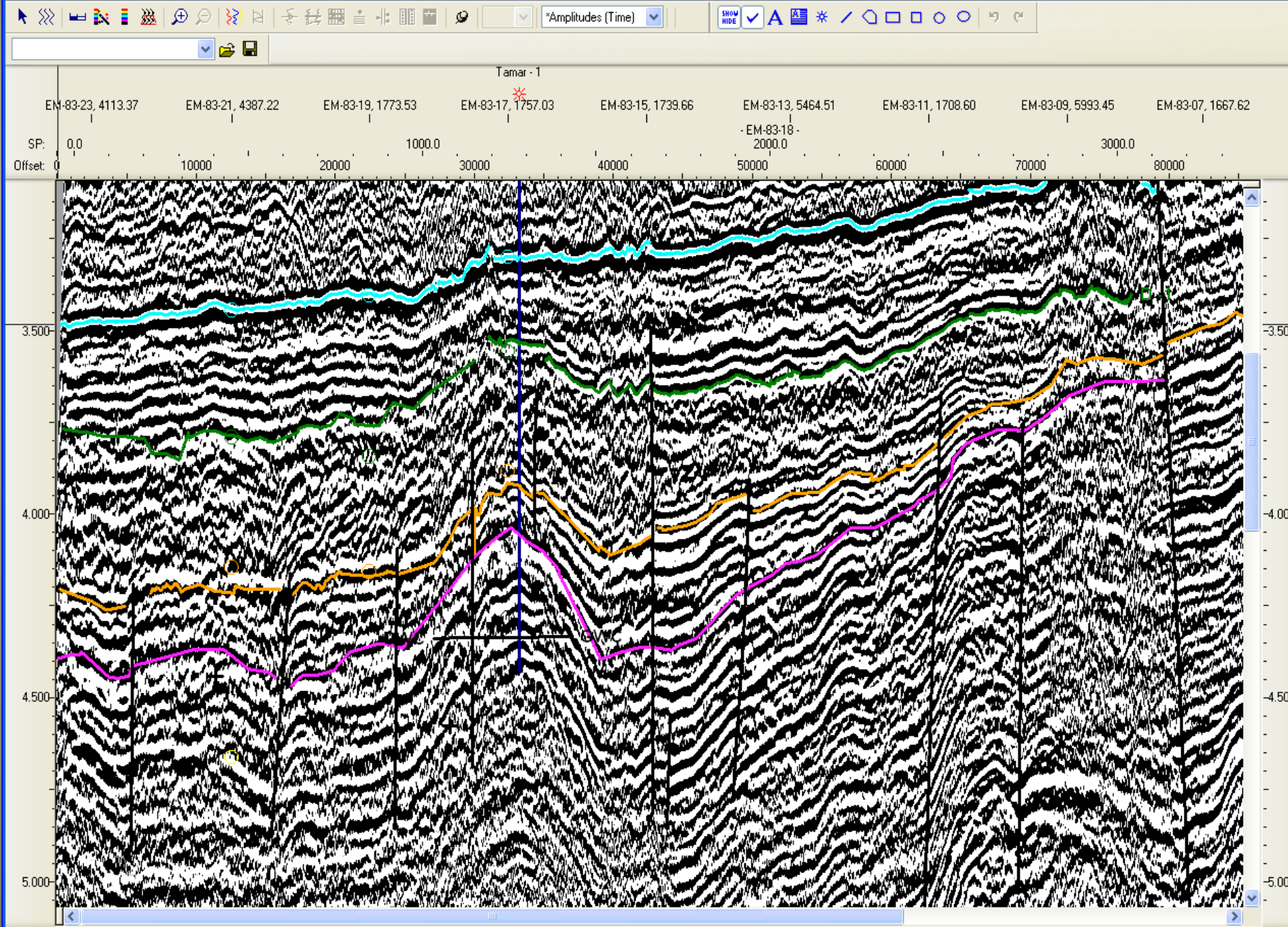
Can I justify a 3D ?

Insight : The Levant Basin is relatively
a “cold basin”.

The oil window is around 6-7 km.

The Most Conspicuous phenomenon The Tamar DHI (= Gas water contact)





S sea level N

Water



20

Sea floor

(M)

Pliocene-Recent

Messinian

- 4 km.

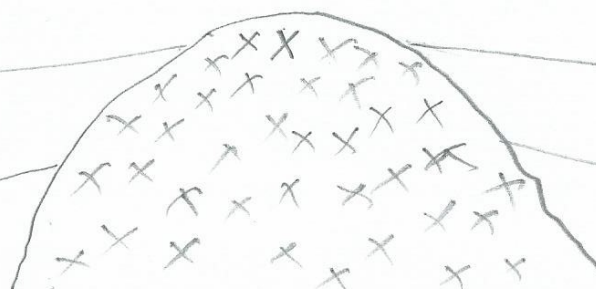
(N)

Cap Rock

DHI ↗

- 5 km

7-8 km.



Direct Hydrocarbon Indications

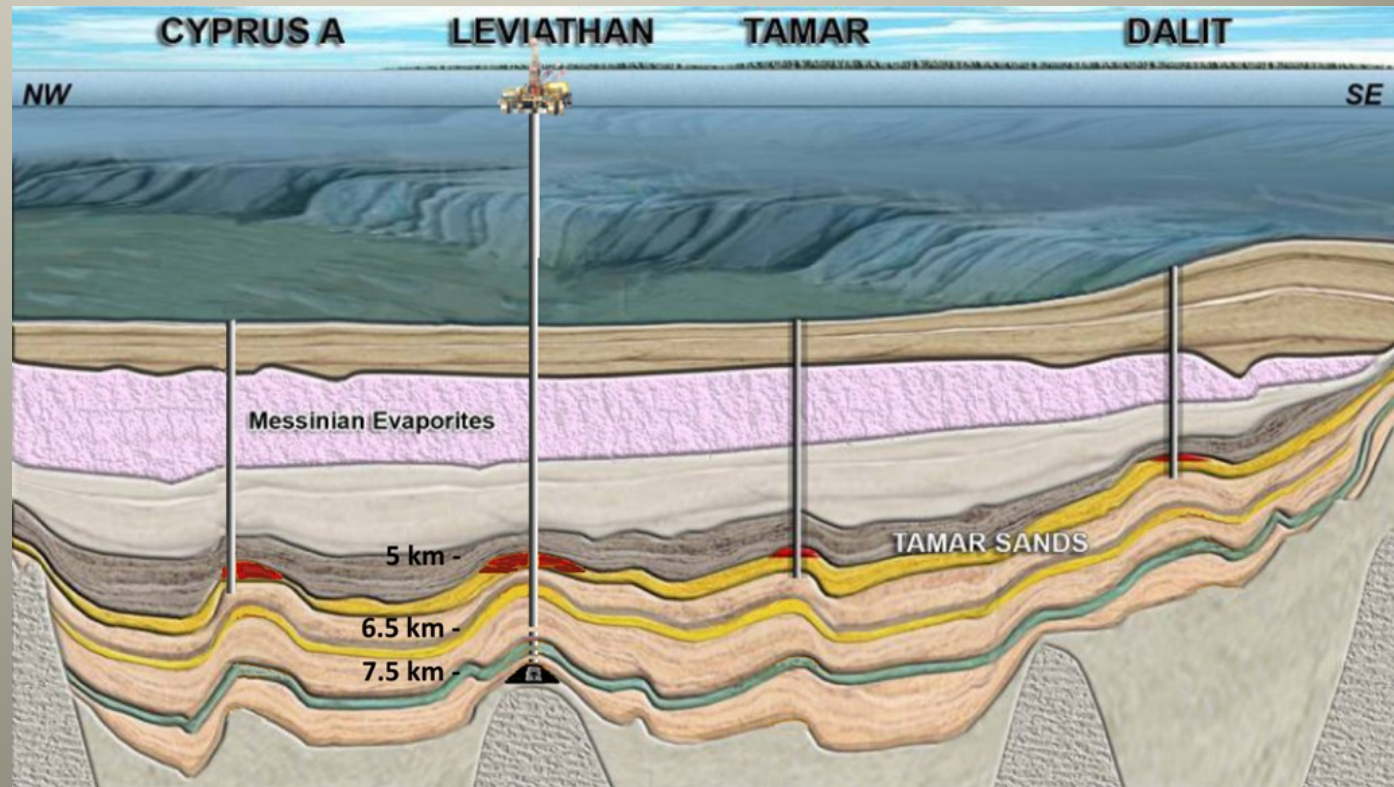
During my work , I marked 6 DHI (Gas Water Contacts).

1. Tamar
2. Dalit
3. Leviathan
4. Karris
5. Wrong (according to 3D)
6. Was not drilled yet.

All in the same stratigraphic formation.

Insights and Concepts In 2000 compares to 2002

- Source
- Structure
- Maturity
- Cap
- Reservoir



Conclusions (2002)

- There is a cap rock about 1 Km. below the base of the Messenian Salt.
- The reservoirs are all in the same stratigraphic section.
- The reservoirs are most probable biogenic gas.

Back to Ratio Story

Finally the oil commissioner
was changed

Ratio Oil got a chance to show
its capabilities

In 05/04/2006 The sea was reopened for new operators

- In 13/07/2006 Ratio applied for a preliminary permit with option.
- 19/02/2007 The government granted Ratio the rights for the “Ratio Marine” permit for a period of 18 months.

Another mistake of governments – Later

Ratio Marine Permit

WI

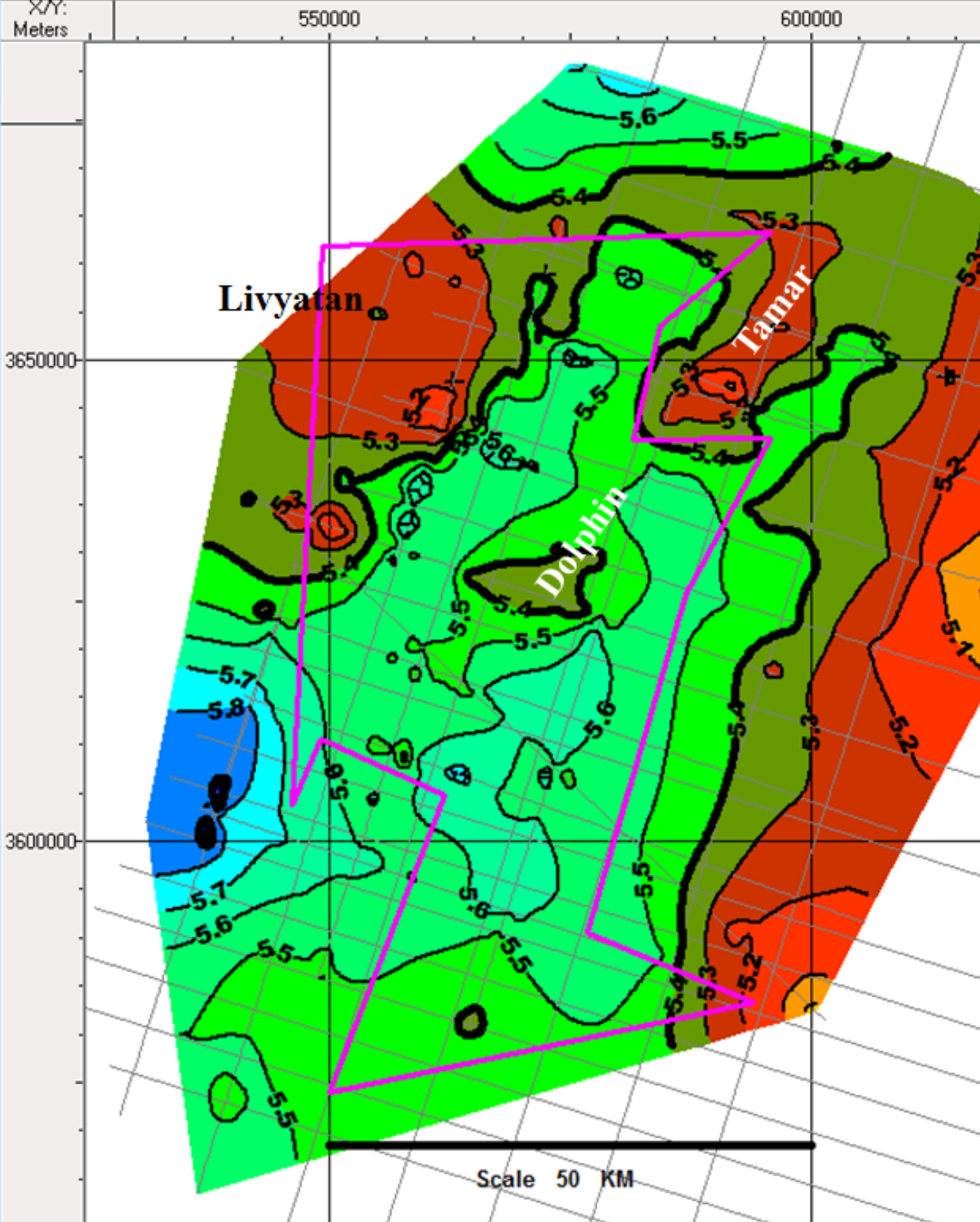
Needed Investment More than \$100 M

- Work Program = A contract with a seismic contractor within 8 months.

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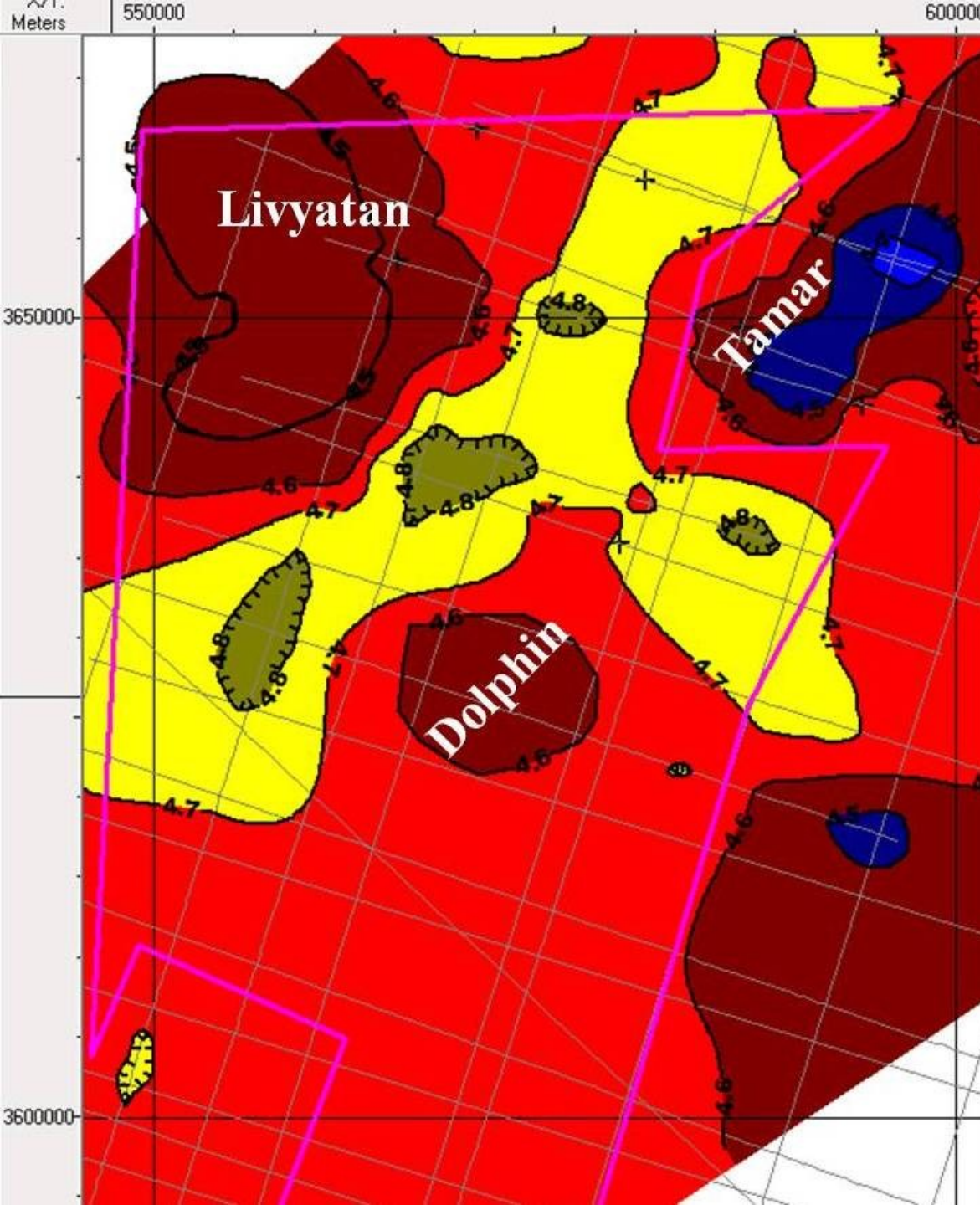
The Frenzy 8 Months:

1. Prepare a prospect. (Mike Burnett).
2. Prepare a presentation for investors.
3. Sale the Prospect.
4. Sign with a marine seismic contractor.



Bought more 2D lines
from Spectrum

**Figure 5 : Dark – Green
– Top Eocene ?**



**Figure 6 : Cyan –
Top Oligocene ??**

Desperate and frustrated geologist

(the professional world did not believe in the Levant basin)

The good advise of Kenn Hall.

The Deep Levant
Basin Was Not
Drilled Yet !!!

Farmin to :

Delek

Noble (became the operator).

2010

The discovery well

Leviathan – 1



And The Rest Is History

Today

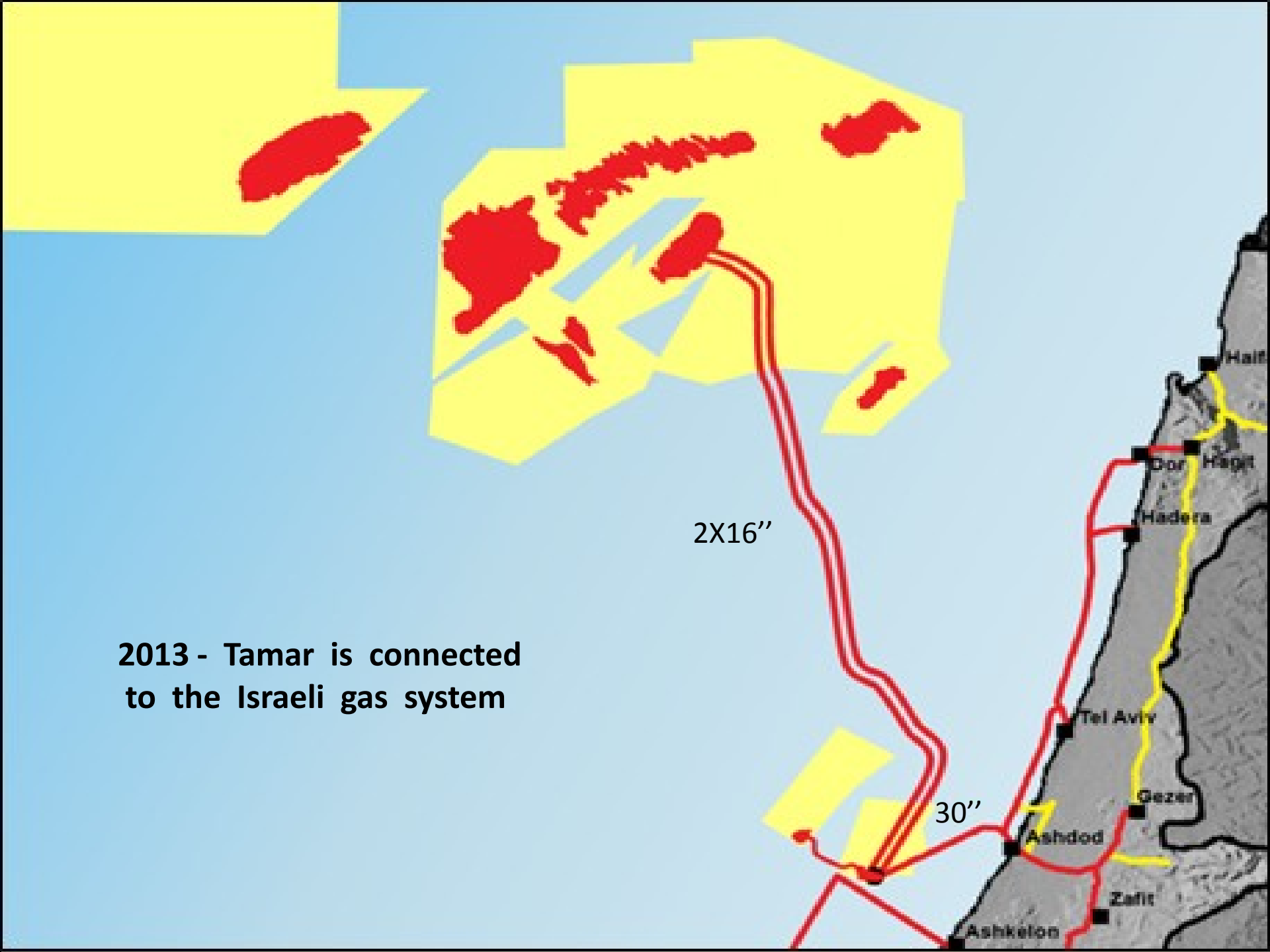
**The Government of Israel Decides that
70% of its electricity will
come from burning gas**

And Ratio Oil became a strong and
significant oil and gas company in
Israel with other valuable assets

2013 - Tamar is connected
to the Israeli gas system

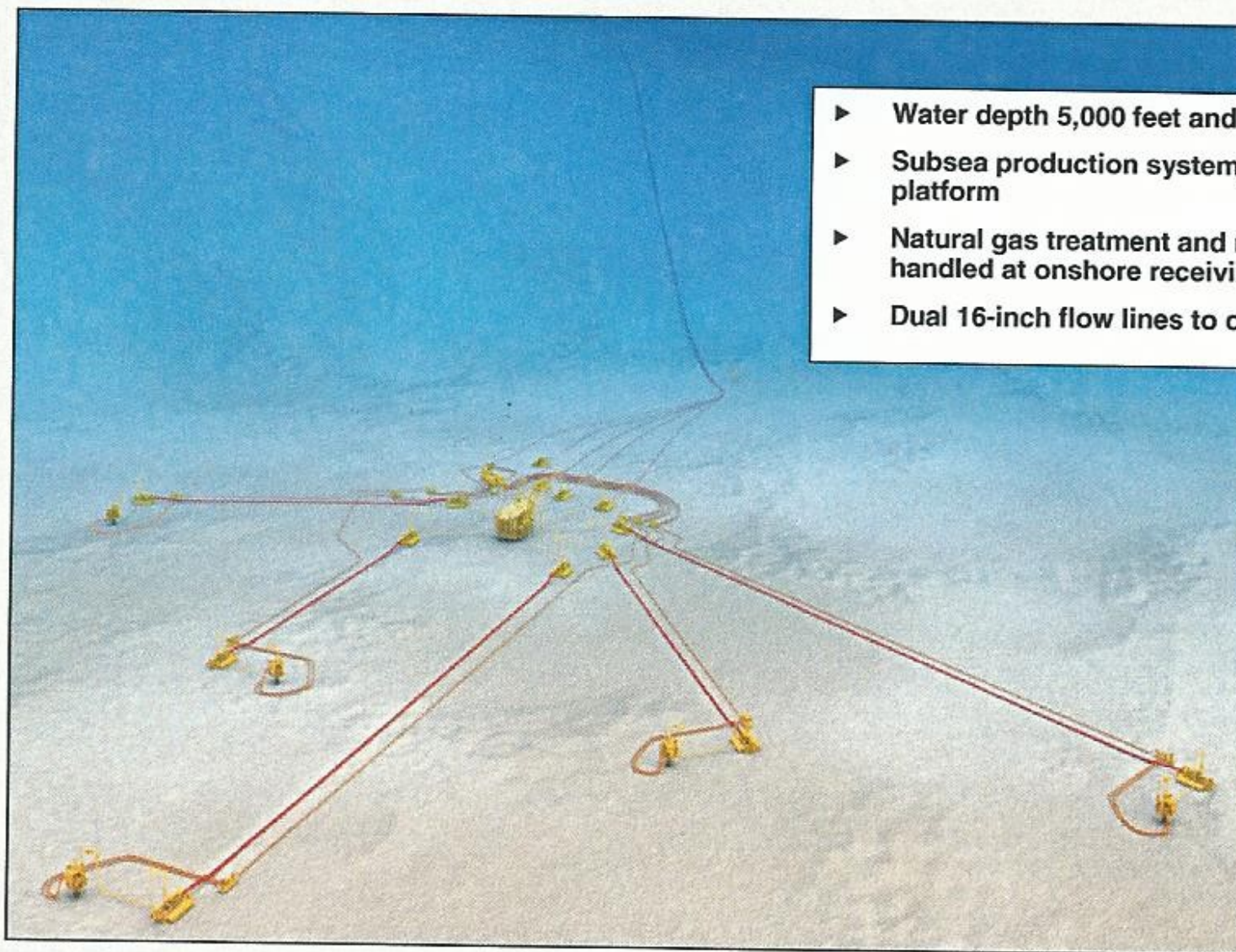
2X16"

30"



Tamar Field Layout

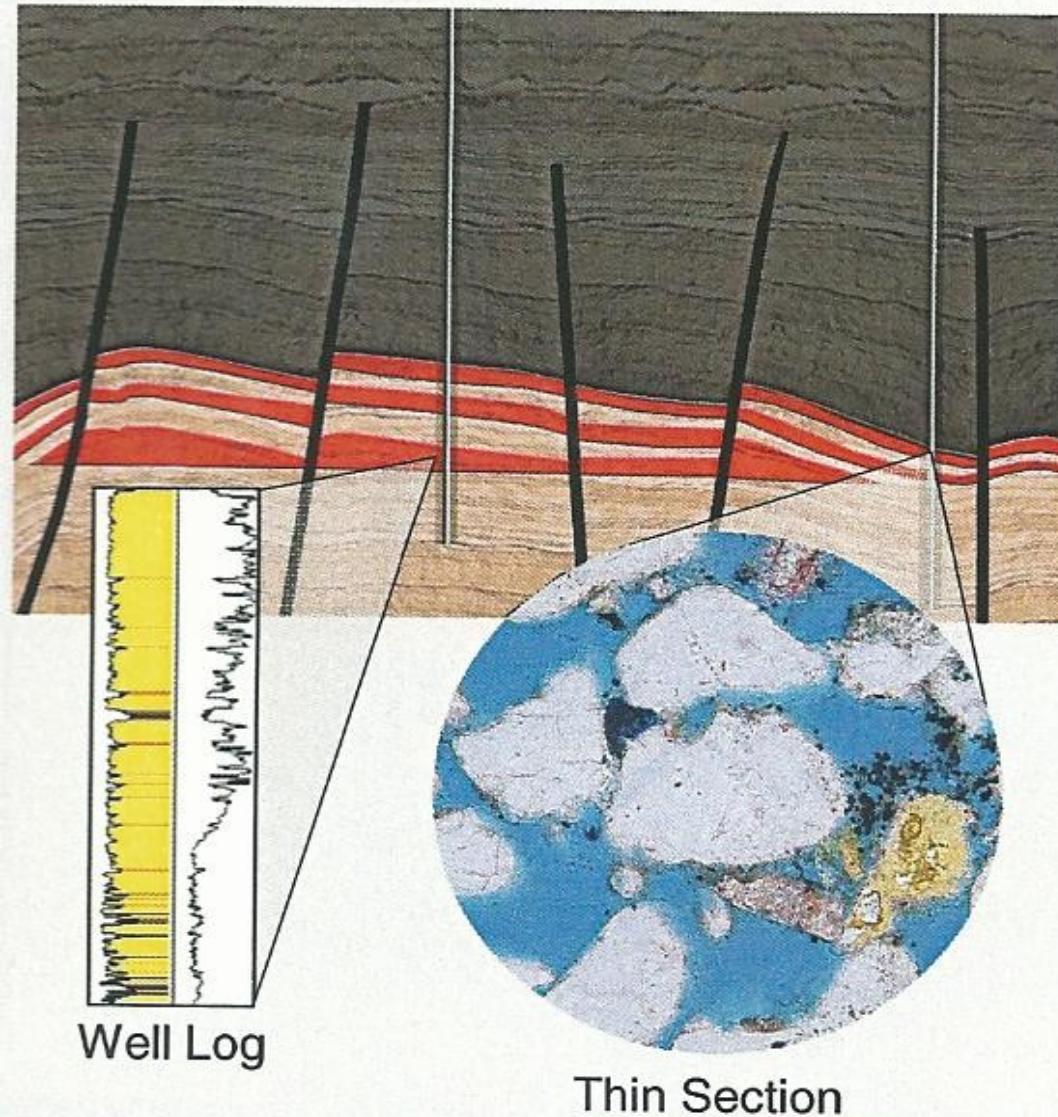
Phase 1 with 850 MMcf/d deliverability



- ▶ Water depth 5,000 feet and 60 miles offshore
- ▶ Subsea production system, no production platform
- ▶ Natural gas treatment and measurement handled at onshore receiving terminal
- ▶ Dual 16-inch flow lines to onshore terminal

Tamar Reservoir

Superior quality and connectivity



► Excellent Properties

- ▲ Clean sand with permeability one darcy and porosity 25%
- ▲ Natural gas >99% methane

► Excellent Lateral and Vertical Connectivity

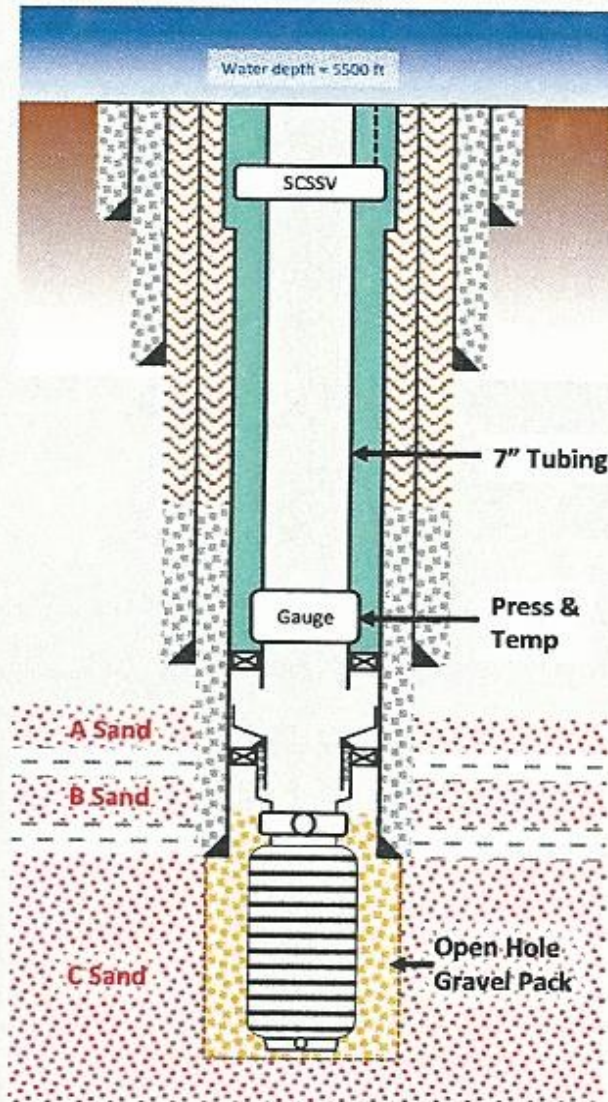
- ▲ Similar sand units between wells can be traced on seismic
- ▲ Extensive sand/sand contact across faults
- ▲ Identical contacts and gas/water pressure gradients in both the discovery well and the 3.4 mile offset appraisal well

Tamar Well Completions

Off the shelf, proven technology

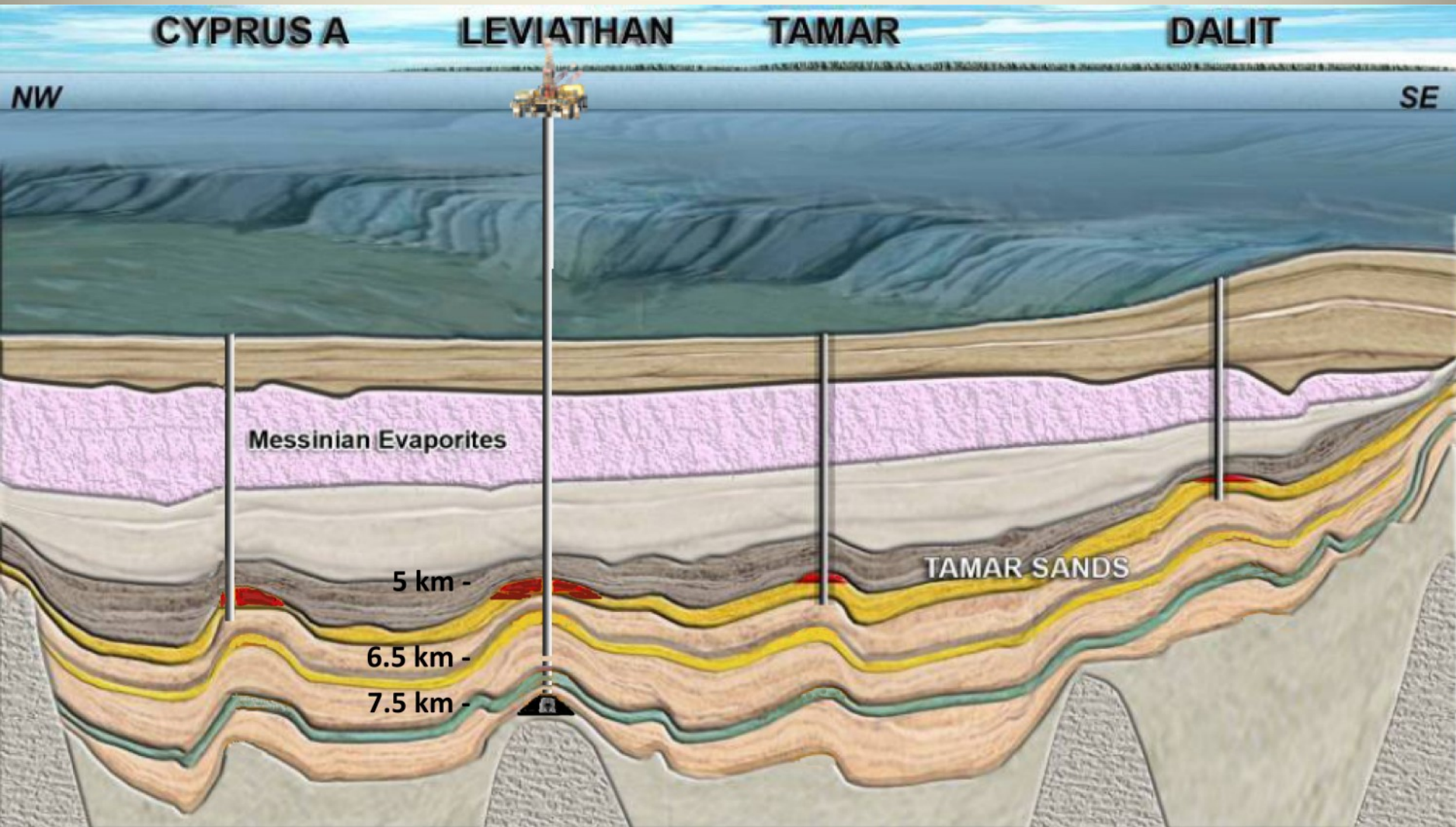
250 MMcf/d
World Record

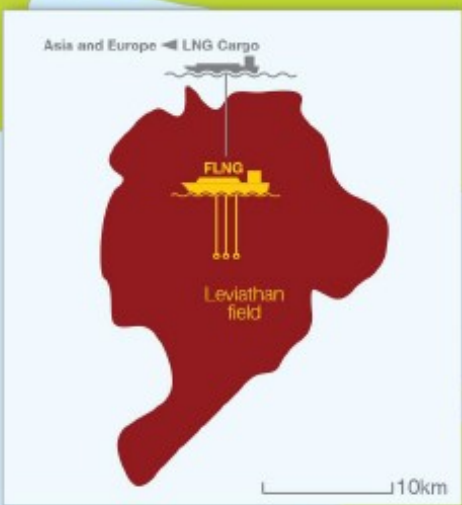
- ▶ **Completions Designed to Flow 250 MMcf/d**
 - ▲ Among the highest natural gas well rates in the world
- ▶ **Open-hole Gravel Pack Lowers Screen Erosion Risk**
- ▶ **Tubing and Wellhead Built for 30-year Life**



What Next ?

Leviathan Deep = To be drilled in 2014





Leviathan Production Options

Options

First Connection
2016

Leviathan Production Options

Prime Minister
Samaras Visit

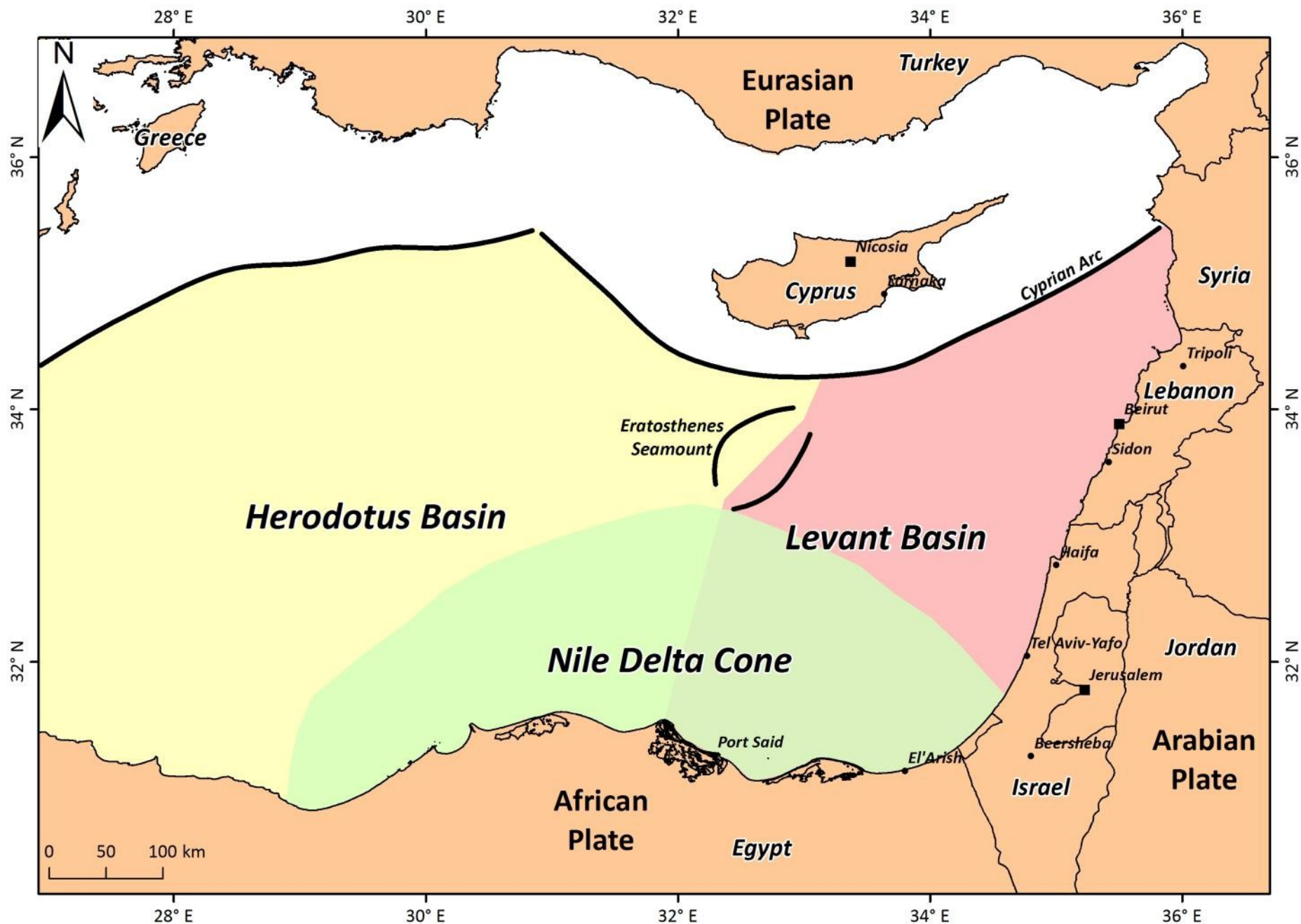


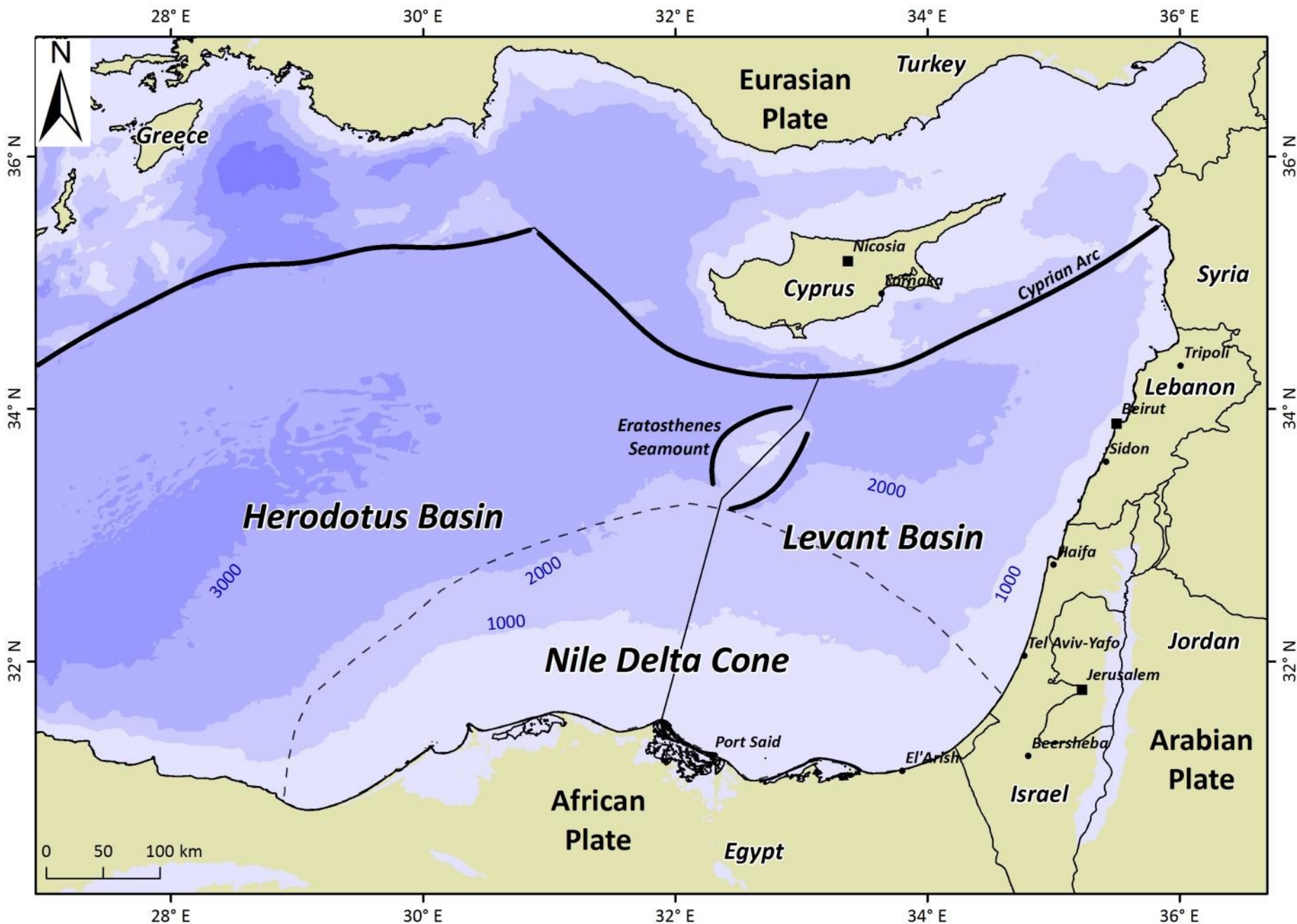
Lebanon

Drilling within 3 years



Israel – Lebanon Border Dispute





Atwood Advantage

- NBL 3-Year drilling services contract
- Delivery scheduled for Q1 2014
- Daily Rig Rate \$584,000
- Rated for 3,600m water depth
- Rated for 12,000m drill depth
- Dual blowout preventer stacks
- Construction at DSME in South Korea



**My Pray Is
That the solutions for the
Leviathan production will
bring nations together**

Thank You

Ratio Yam Rights up to two weeks Before Tamar Discovery

Group	%
Delek	45.34
Noble	39.66
Ratio	25

Noble is the Operator

Delek = 5 minutes

Noble = 5 months

Ratio Yam Rights - Today

Group	%
Delek	45.34
Noble	39.66
Ratio	15

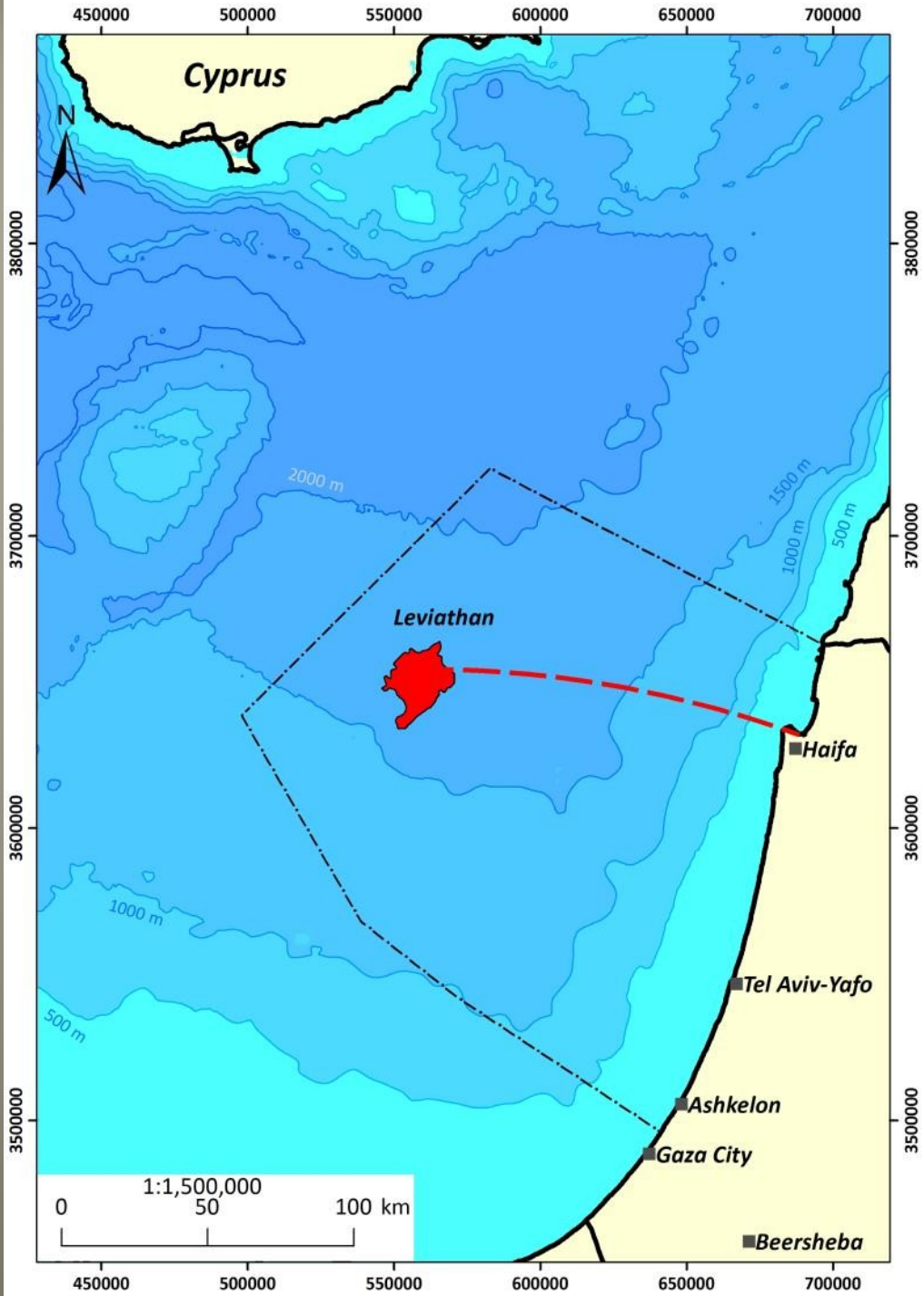
Noble is the Operator

Ratio Yam Rights - Woodside Deal

Group	%
Delek	30
Noble	30
Woodside	30
Ratio	10

Woodside will be the LNG operator
Noble is the Production Operator

Trip to Leviathan 1



Visit [The Discovery Well](#)











**Emsco
Dynamically-Positioned
Semisubmersible Rig**

Attwood Southern Cross - 10 years Before

