The Ten Habits of Highly Successful Oil Finders*

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Search and Discovery Article #110178 (2015)**
Posted June 11, 2015

*Adapted from presentation at the first AAPG DPA Playmaker Forum, "From Prospect to Discovery," January 24, 2013, Houston, Texas.

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Abstract

Approximately 15% of the world's geoscientists are highly successful explorationists, that being that they have exploration drilling success rates between 25-50%. Company studies combined with years of observation have shown that those highly successful geoscientists share ten habits. The focus of this presentation is on those ten habits and how they contribute to an individual's success.

The Ten Habits of Highly Successful Oil Finders

D. J. Tearpock and R. C. Shoup

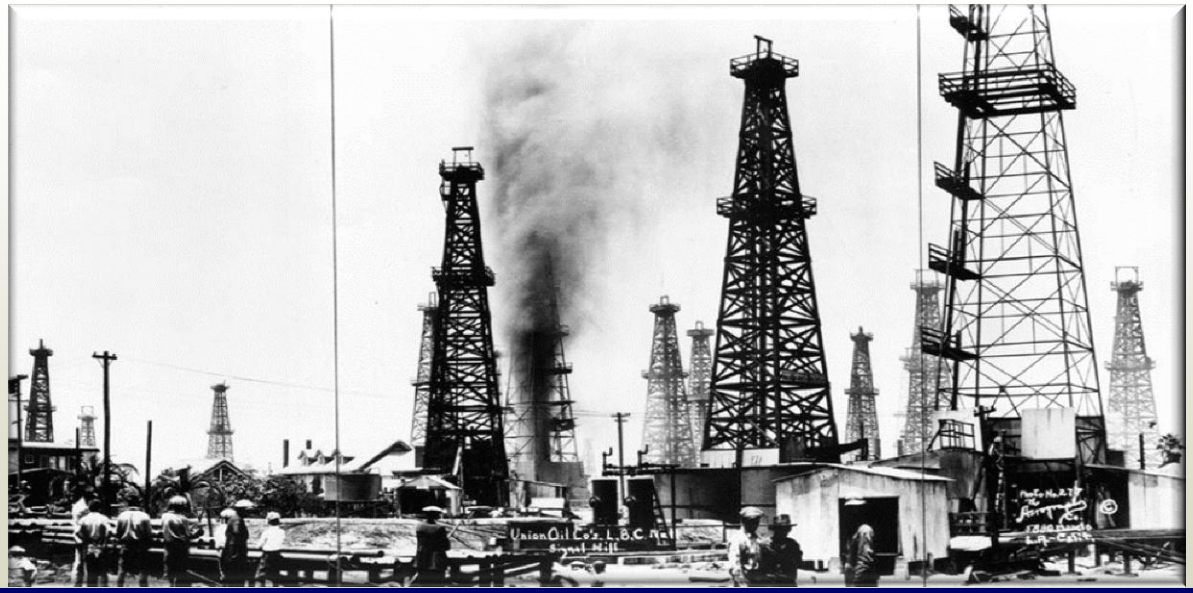
2013 AAPG Playmaker Forum

Organized by the Division of Professional Affairs

January 24, 2013

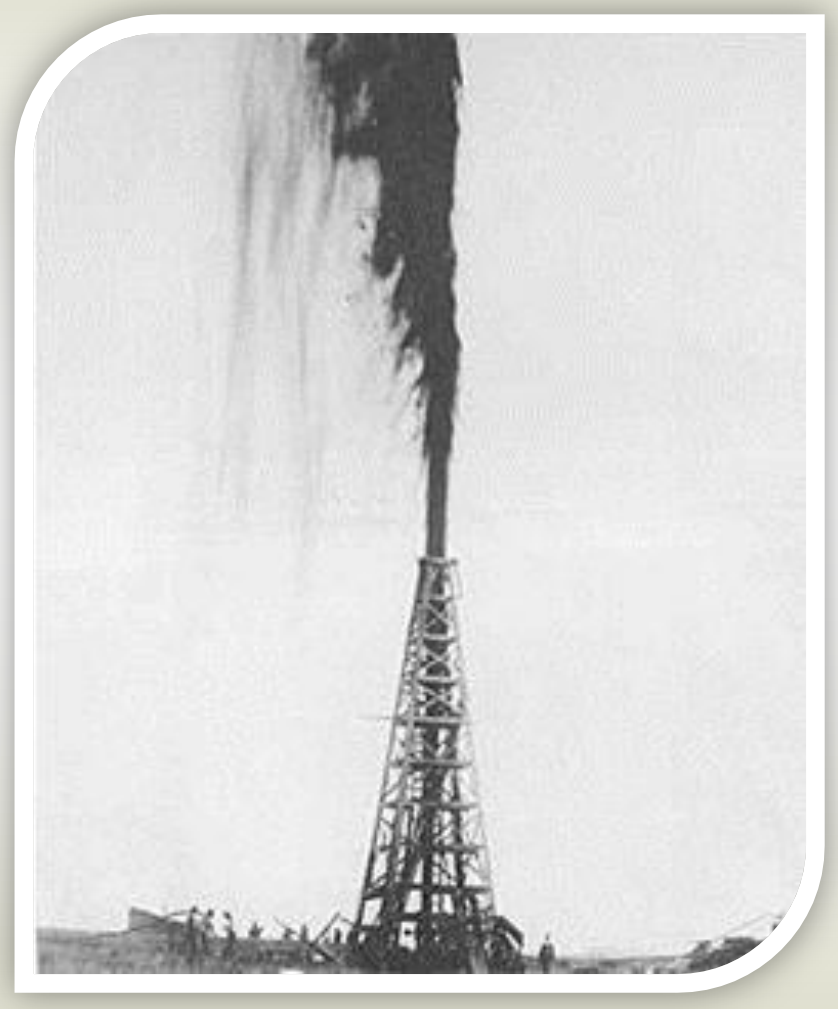
The primary objective of petroleum geoscientists and engineers is to discover and develop oil and gas resources and reserves.

AND WE MUST DO SO PROFITABLY



Successful Oil Finders

- Generate accurate subsurface interpretations and maps
- Make accurate resource and reserve estimates
- Increase our drilling success rates



Shared 10 Habits

A SUCCESSFUL / PROVEN EXPLORATION, DEVELOPMENT AND PRODUCTION PHILOSOPHICAL DOCTRINE

Exploration, Development and Production Success is a direct result of the application of 10 Key Geoscience and Engineering habits.

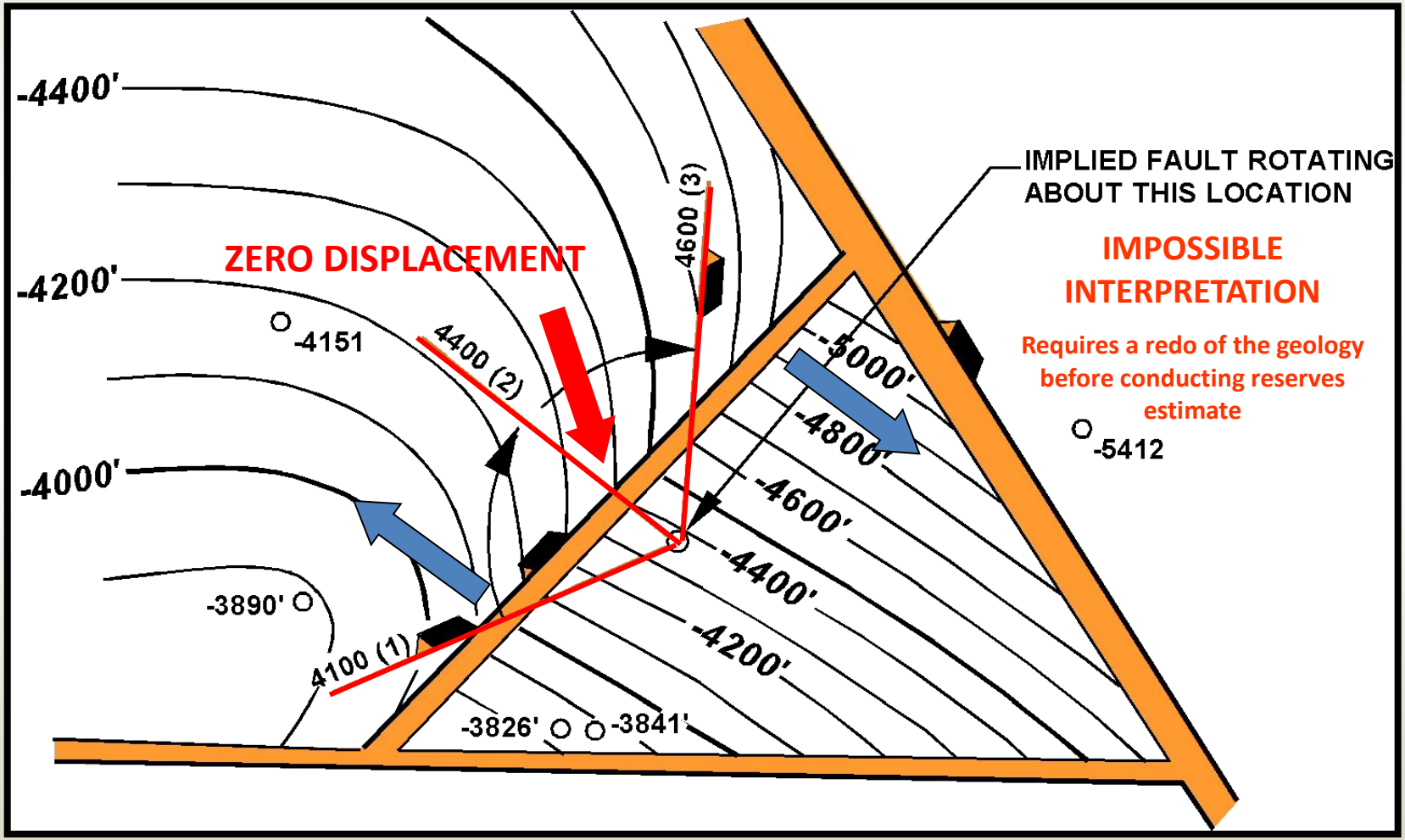
The 10 habits can be utilized by individuals, by integrated teams, by divisions and by companies to improve their exploration and development success rates, as well as more accurate resource and reserves estimates.

1st HABIT

Successful oil finders ensure that their interpretations are geologically and geometrically valid in three dimensions.

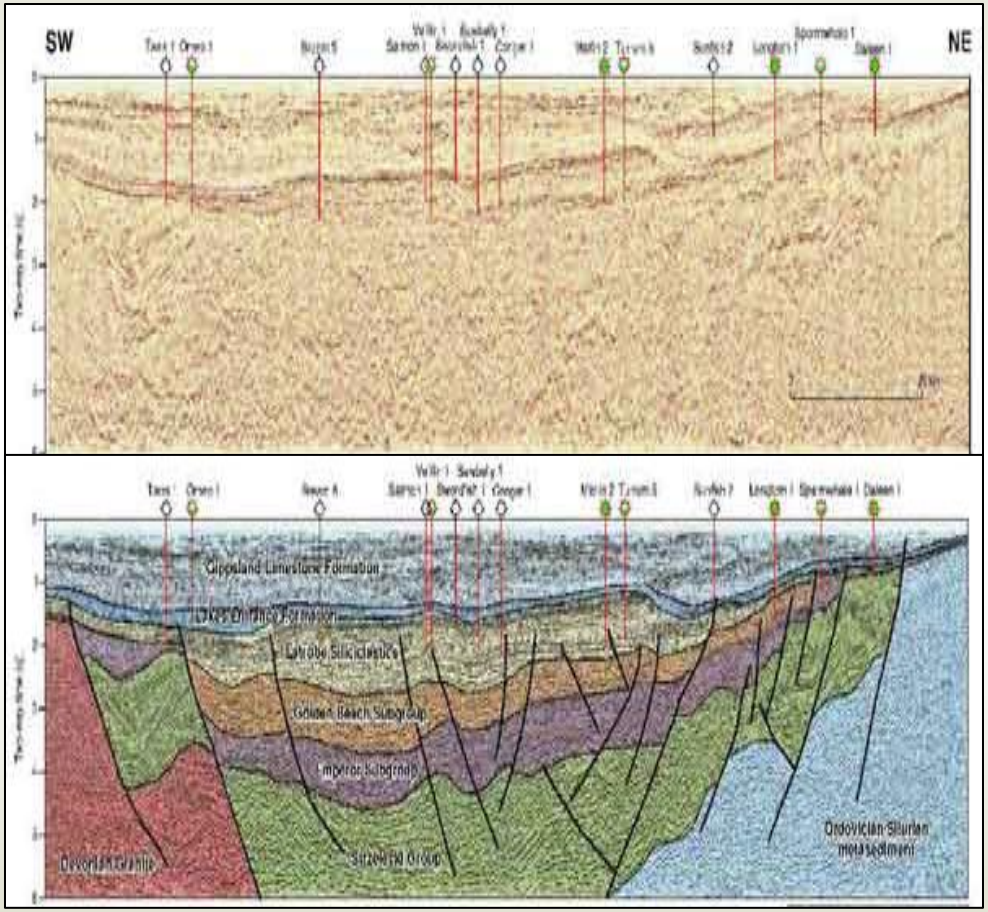
M.C. Escher (used with permission)

APPLICATION OF IMPLIED FAULT STRIKE IN A PRODUCING FIELD TO FIND A SCREW FAULT ON A MAP



2nd HABIT

Successful oil finders must have a classic background in geology, and thorough knowledge of the tectonic setting (structural geology) and depositional environments for the area in which they are working.



PROPOSED LOCATION

HANGING WALL & FOOTWALL PLAYS FOR A FAULT PROPAGATION FOLD AND TURNED UP FOOTWALL

HANGING WALL:

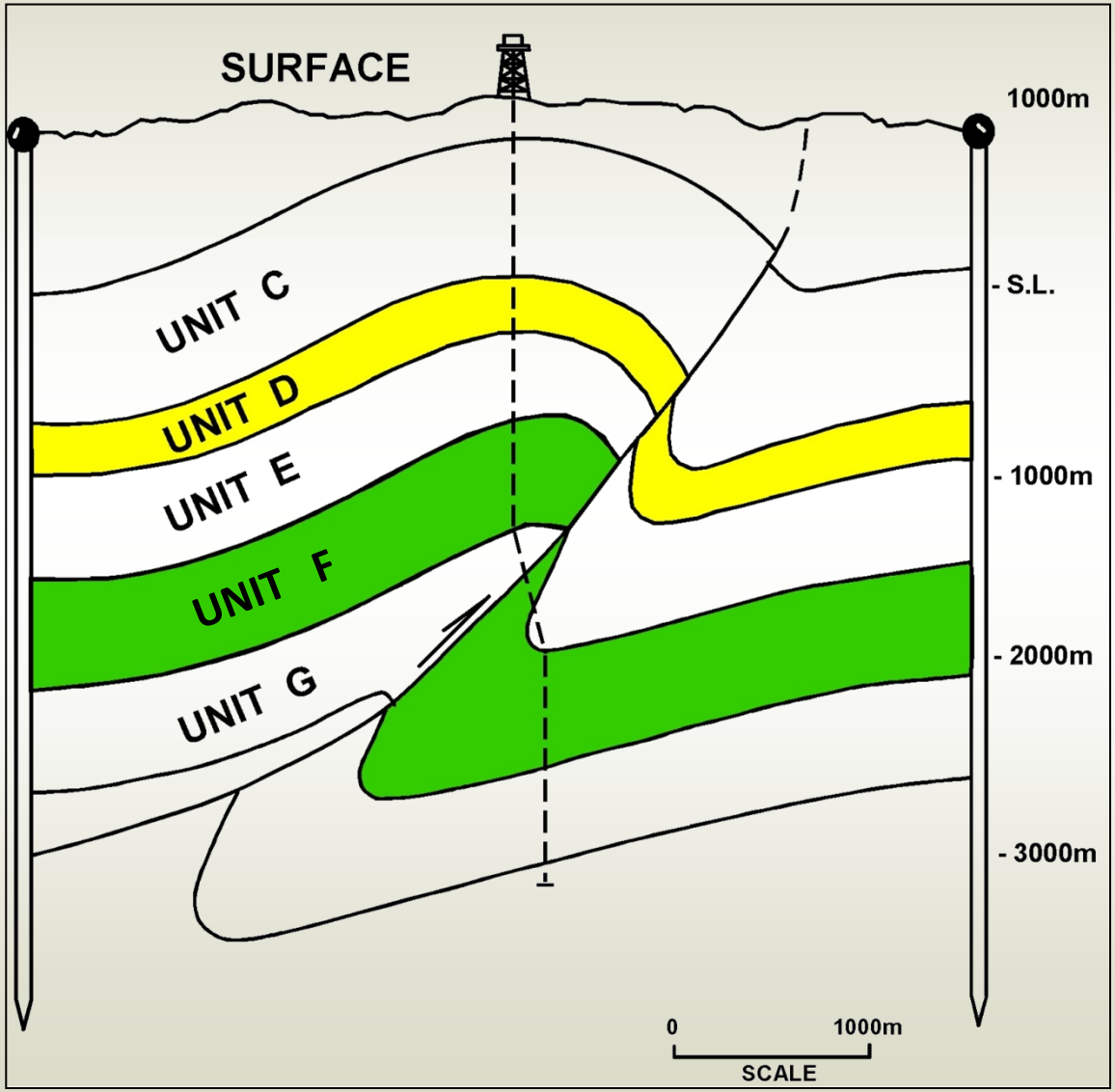
A discovery has been made in various zones including the UNIT F

PROPOSED WELL:

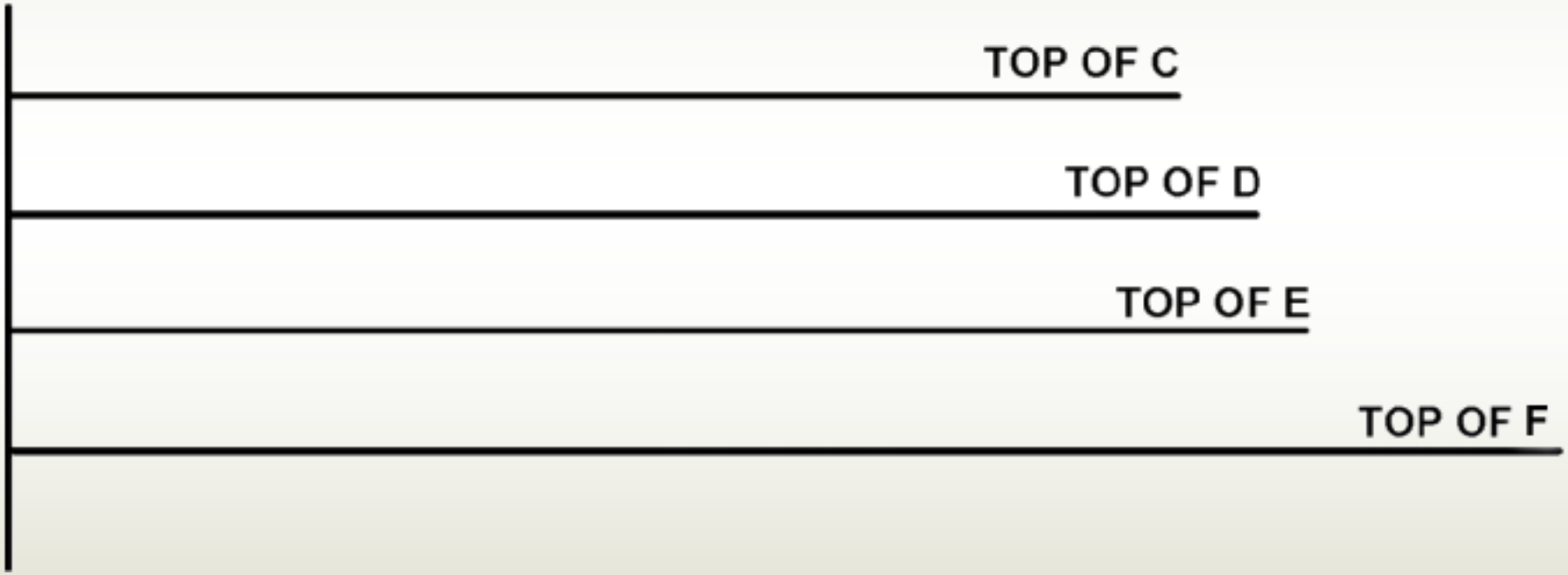
Designed to provide more drainage for the hanging wall zones and to penetrate the upturned footwall play.

QUESTIONS:

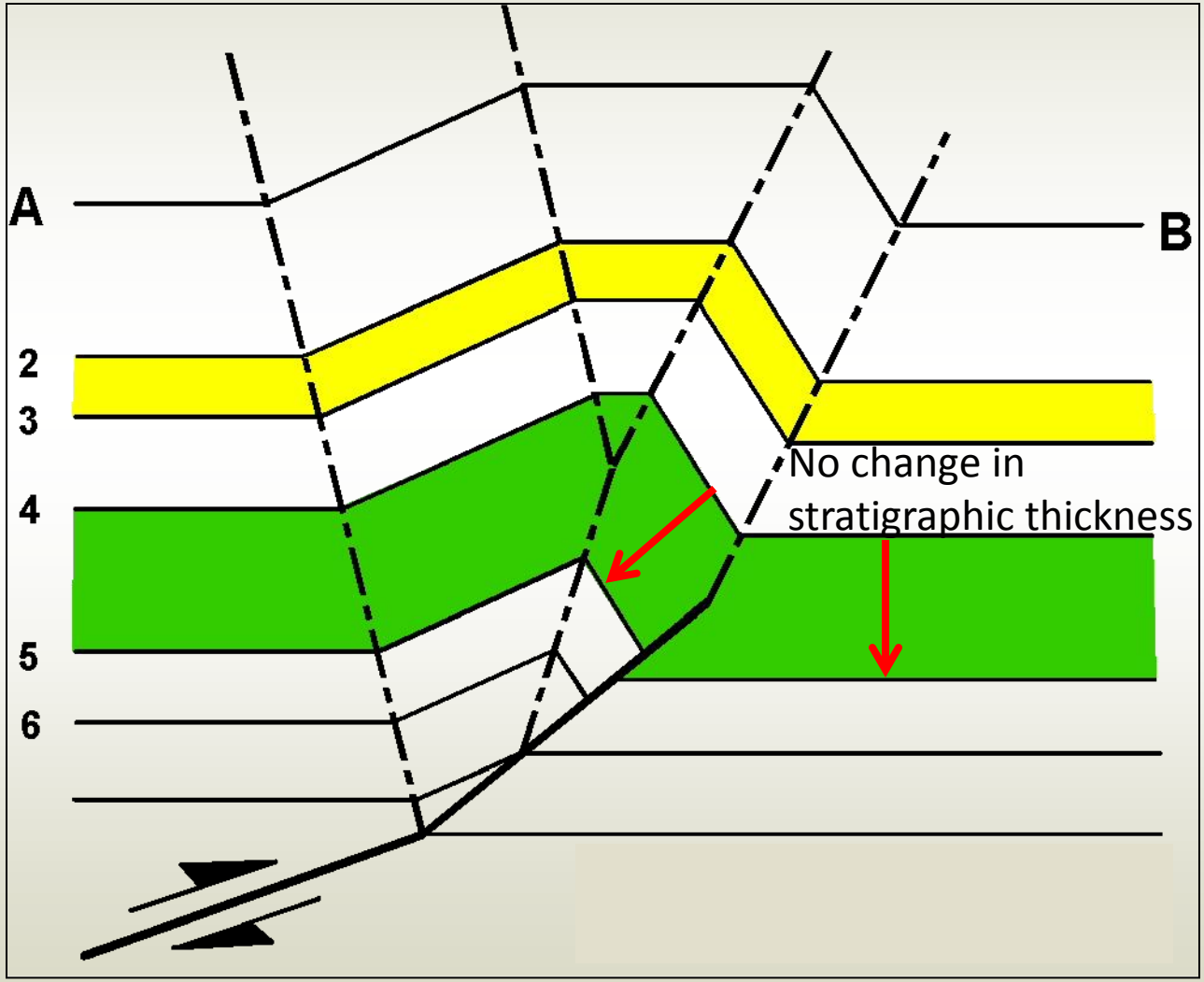
1. Is the geological interpretation valid?
2. What would be the most likely result of the footwall UNIT F?



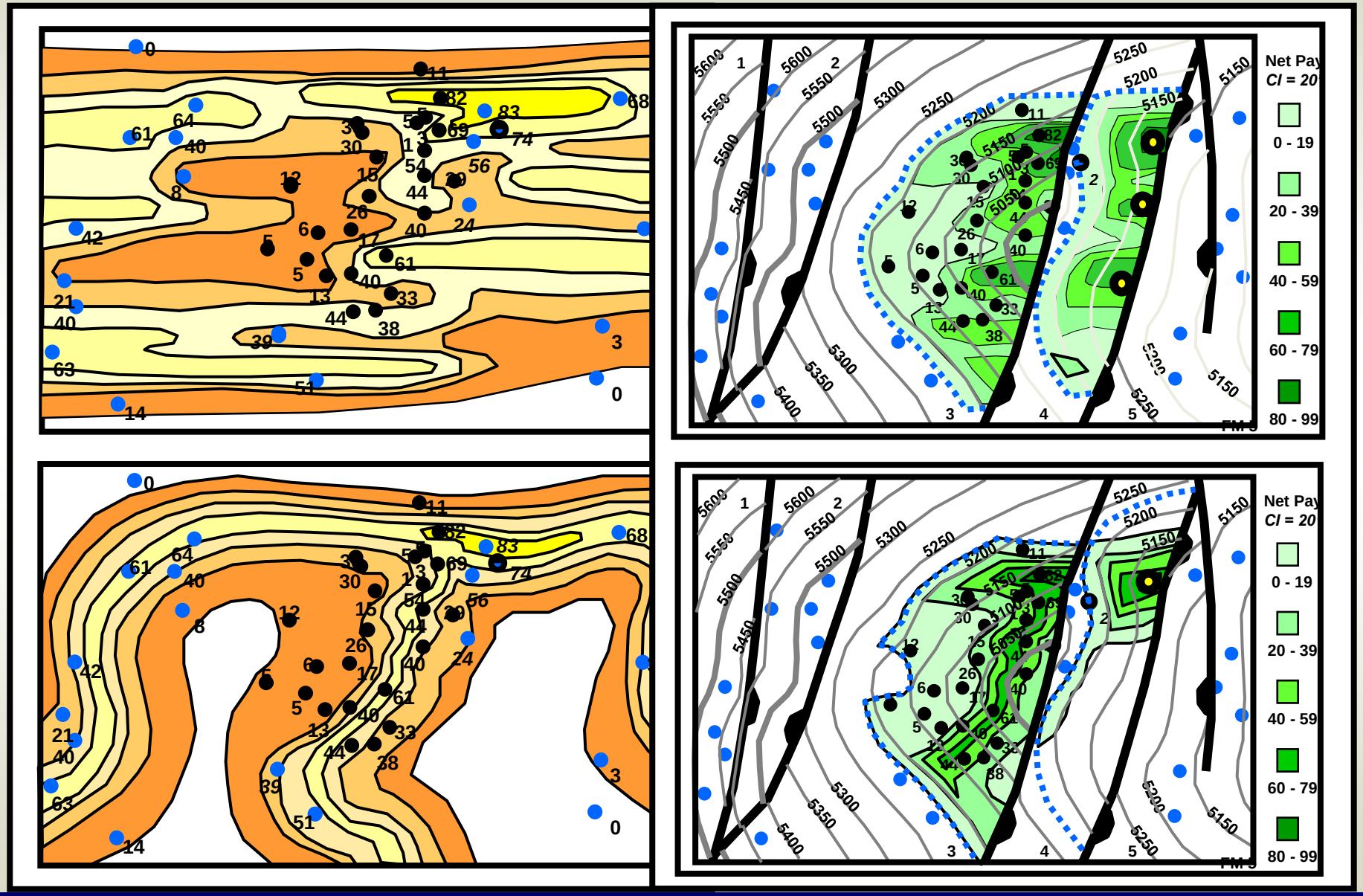
LINE LENGTHS OF DIFFERENT UNIT TOPS



GEOLOGICALLY AND GEOMETRICALLY BALANCED CROSS SECTION-FPF (Line Length and Bed Thickness Balanced -Constant Bed Thickness)

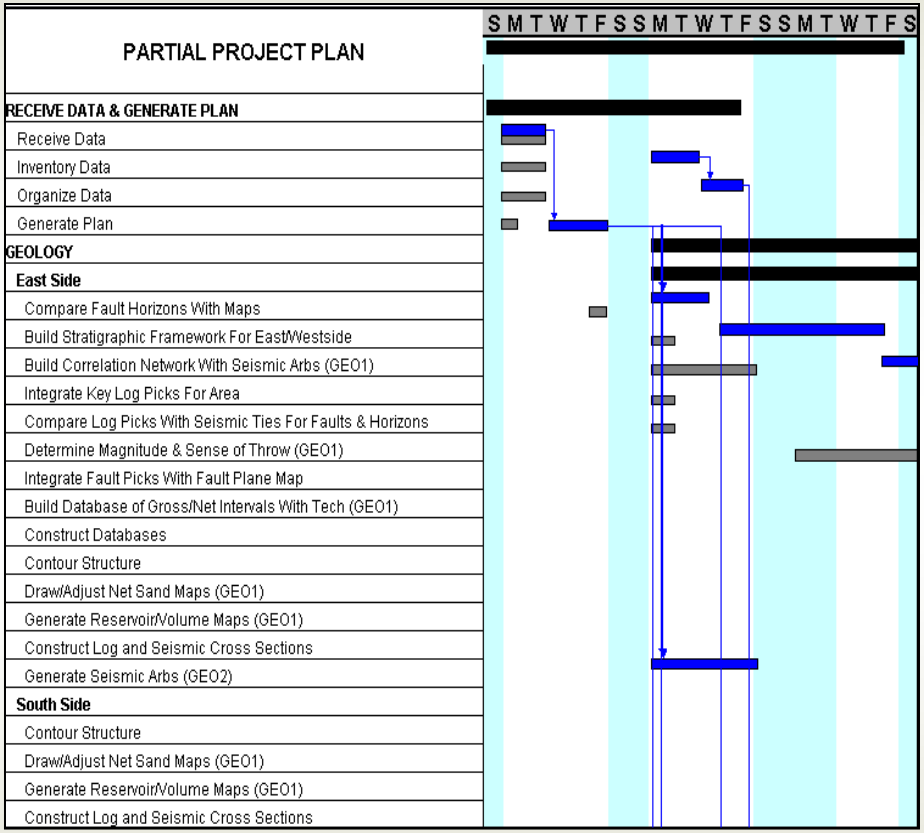


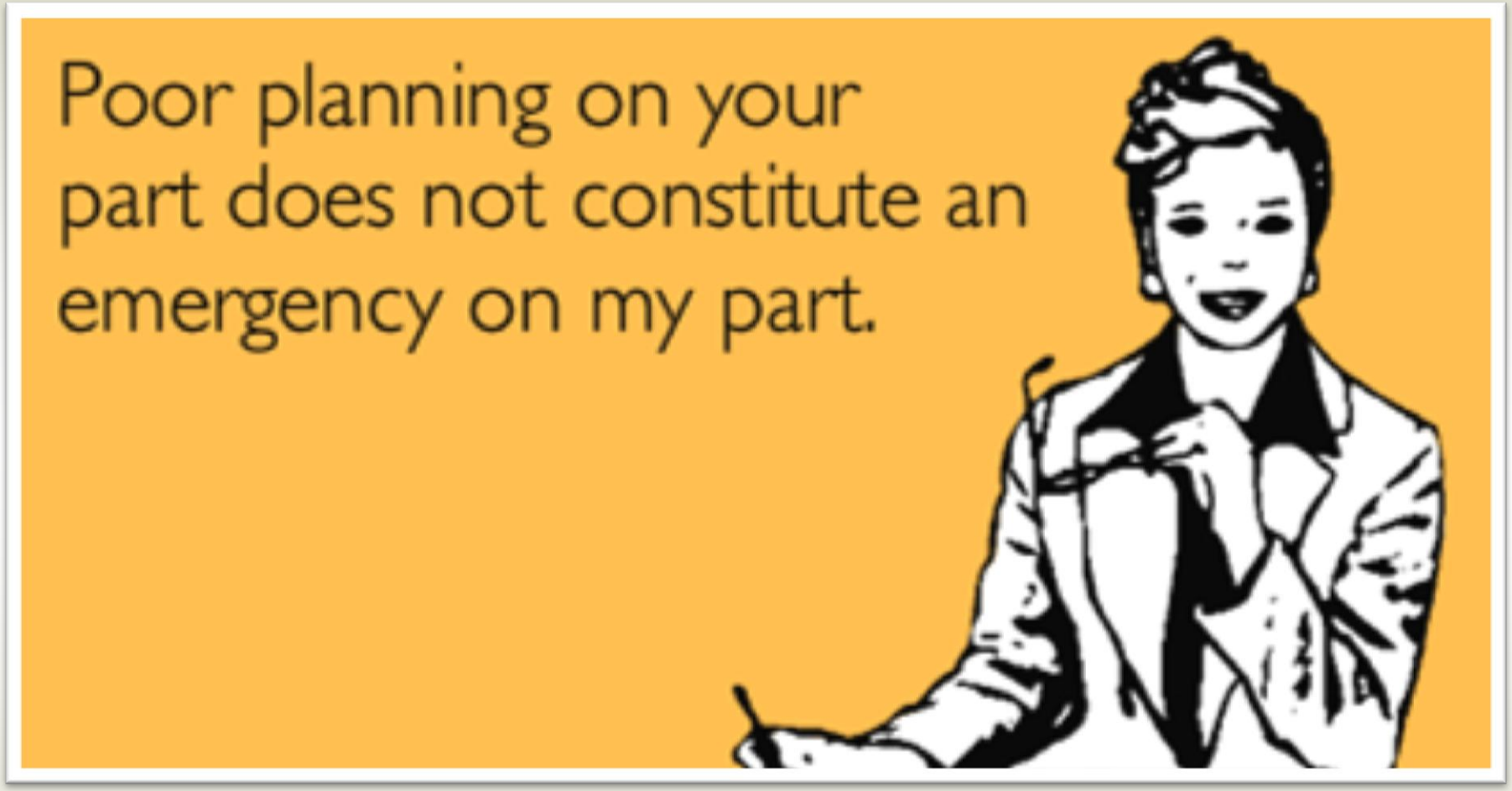
THOROUGH KNOWLEDGE OF THE DEPOSITIONAL ENVIRONMENT



3rd HABIT

Successful oil finders plan their time and their work in order to ensure accurate interpretations and maps.





POOR PLANNING DOES RESULT IN DRY HOLES

LOTS OF THEM

PLAN AND PRIORITIZE YOUR WORK

Begin with the end in mind. What information is needed for the decision?

How much data needs to be evaluated?

What type and quality of data are available?

How complex is the geology?

When is the decision due?

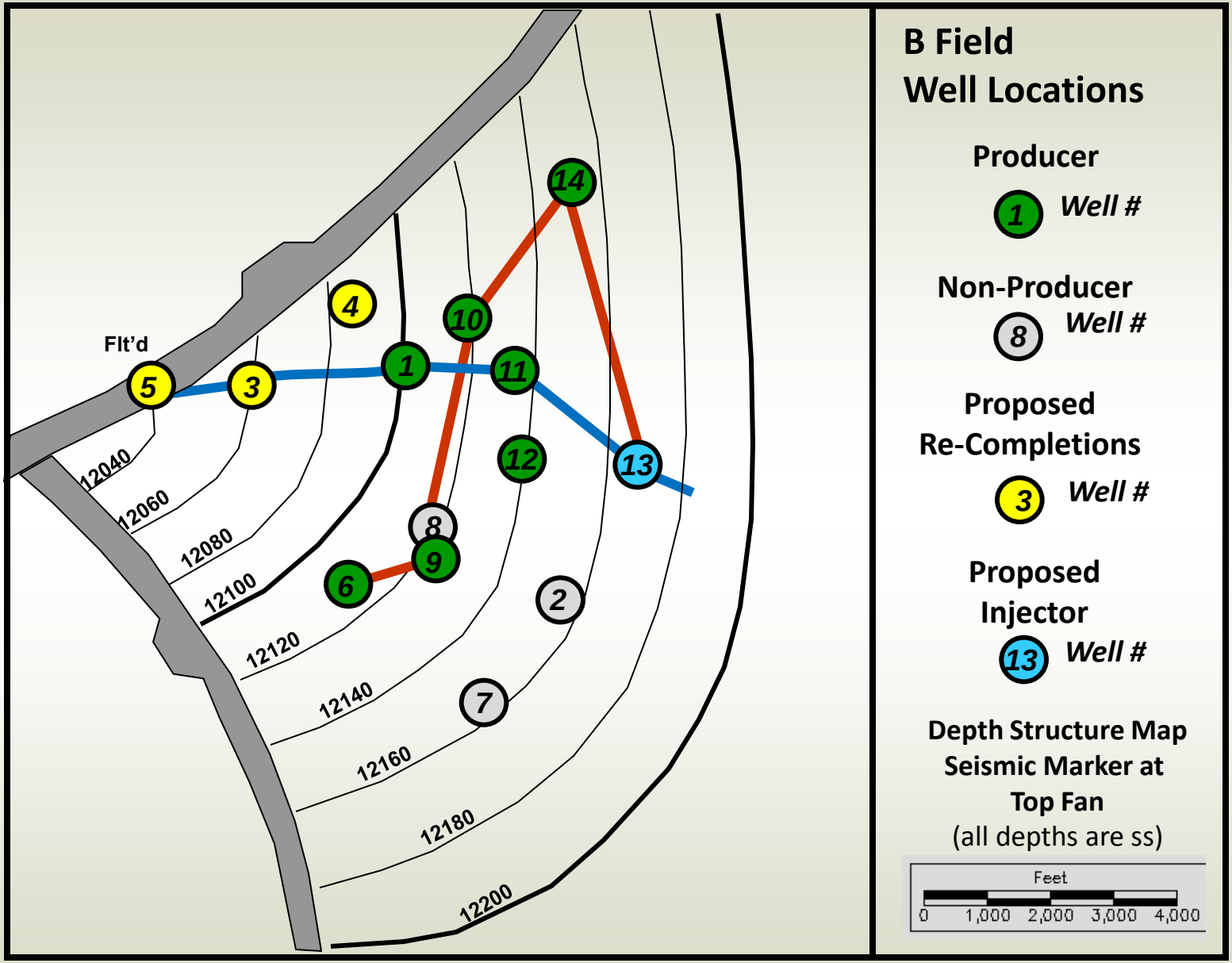
What is the impact of the decision?

4th HABIT

Successful oil finders use all of the data to ensure that they have a 3 dimensionally valid subsurface geological interpretation and accurate subsurface maps.

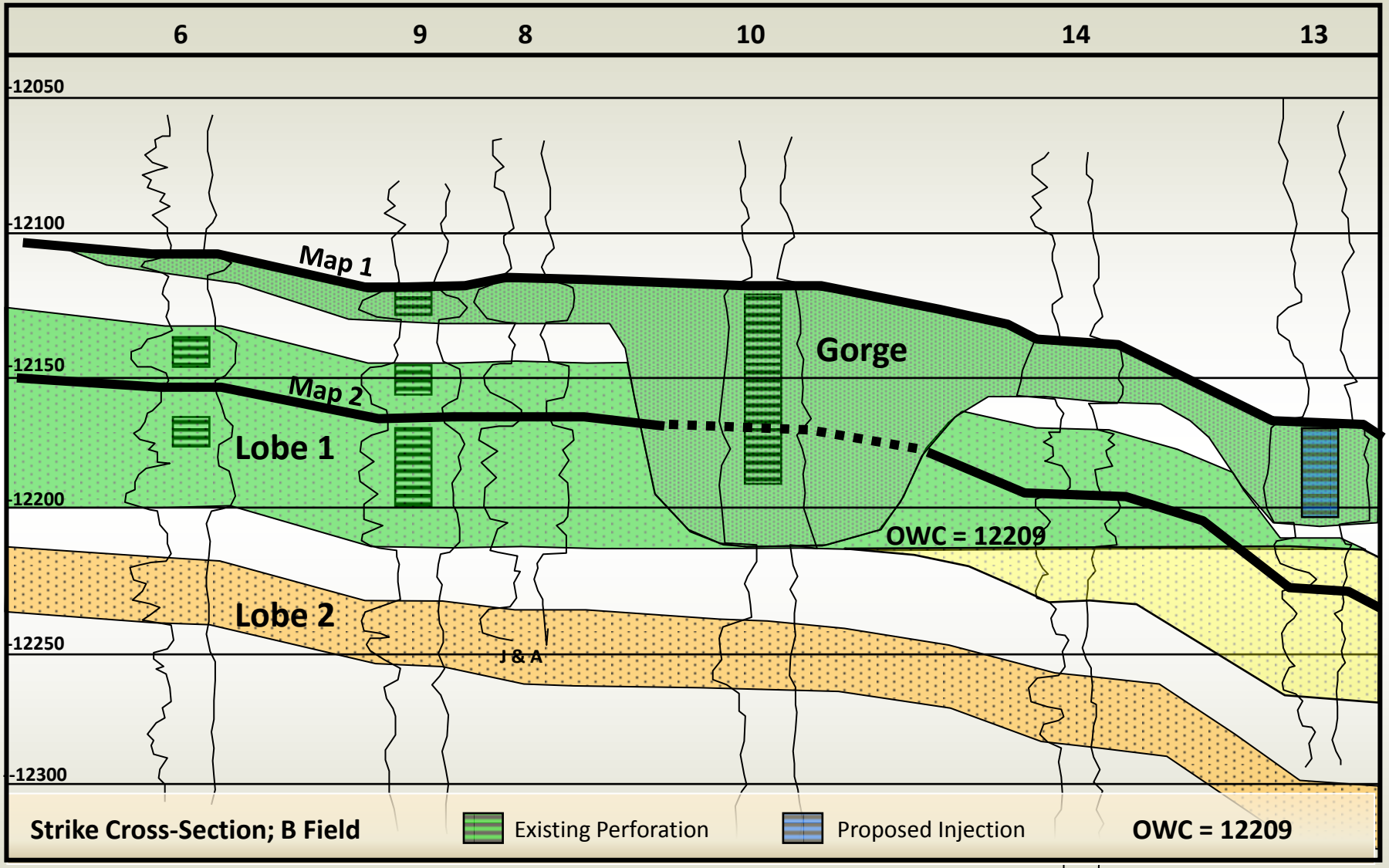
The two most common causes of dry holes are the failure to use all the data and the failure to use the data correctly!

PROPOSED WATER FLOOD



Submarine Fan Water Flood

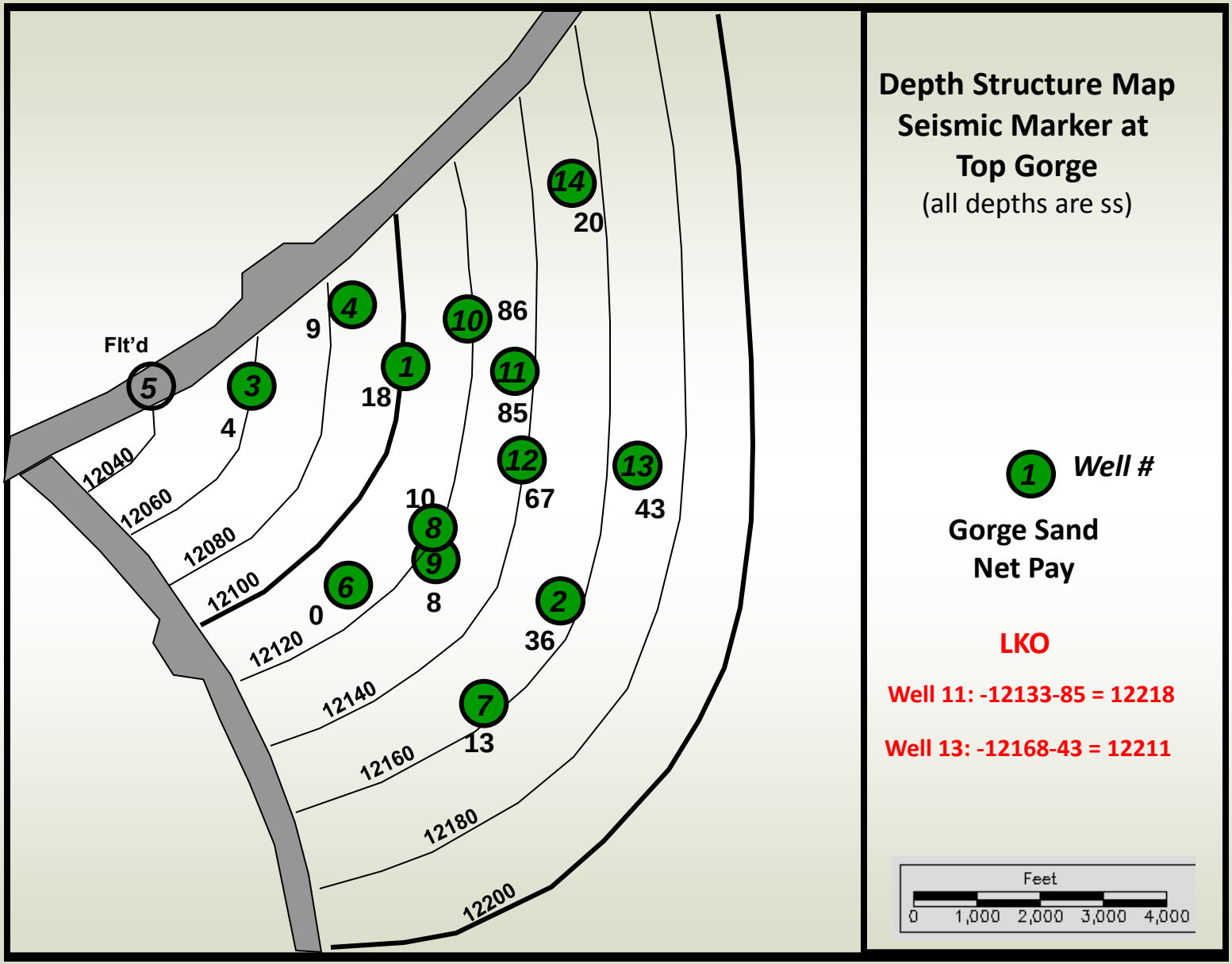
PROPOSED WATER FLOOD



Channel Sand actually a Gorge or Submarine Canyon

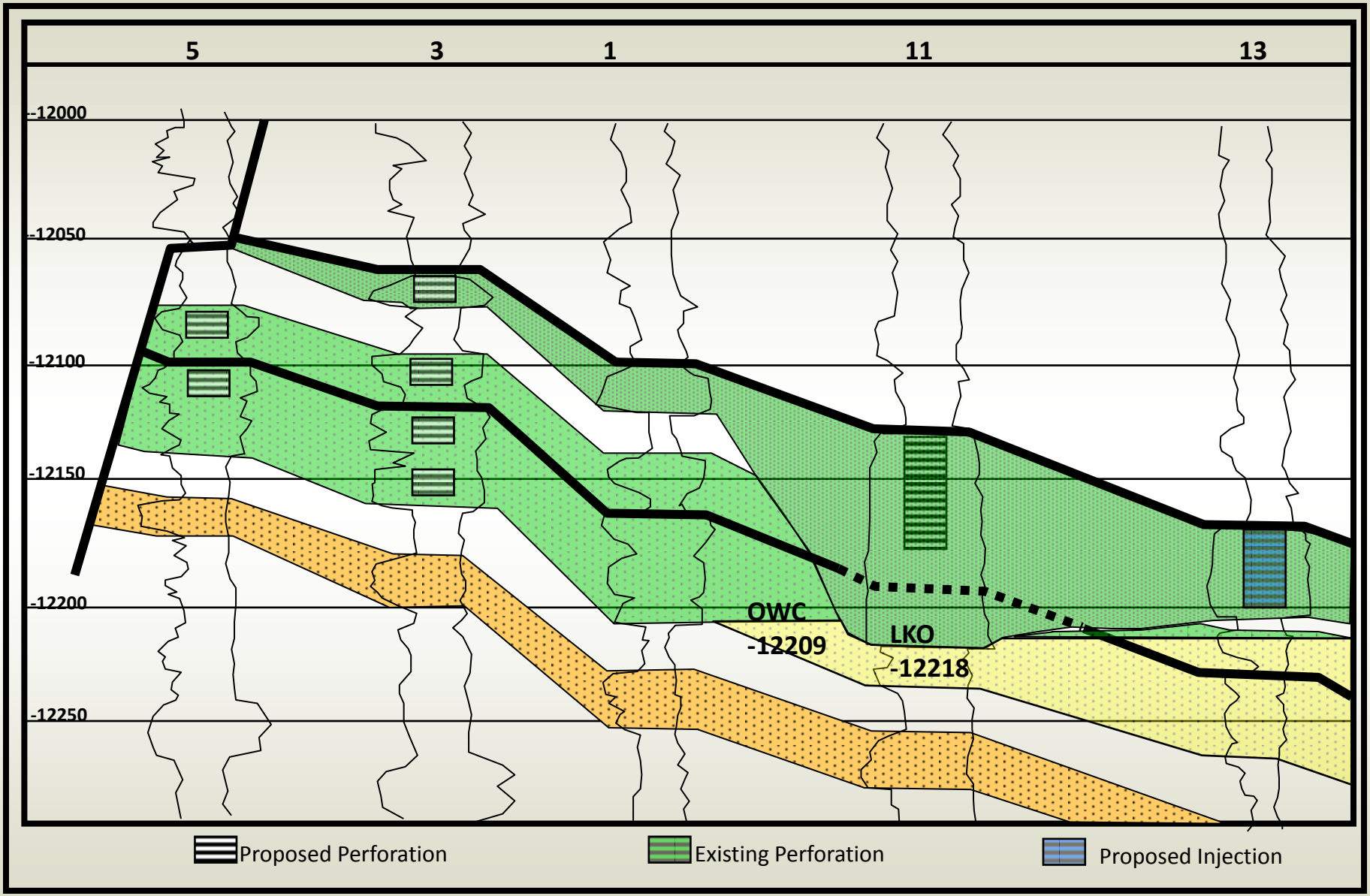
Is it in Communication with the Lobe?

PROPOSED WATER FLOOD



Interrogate the Data

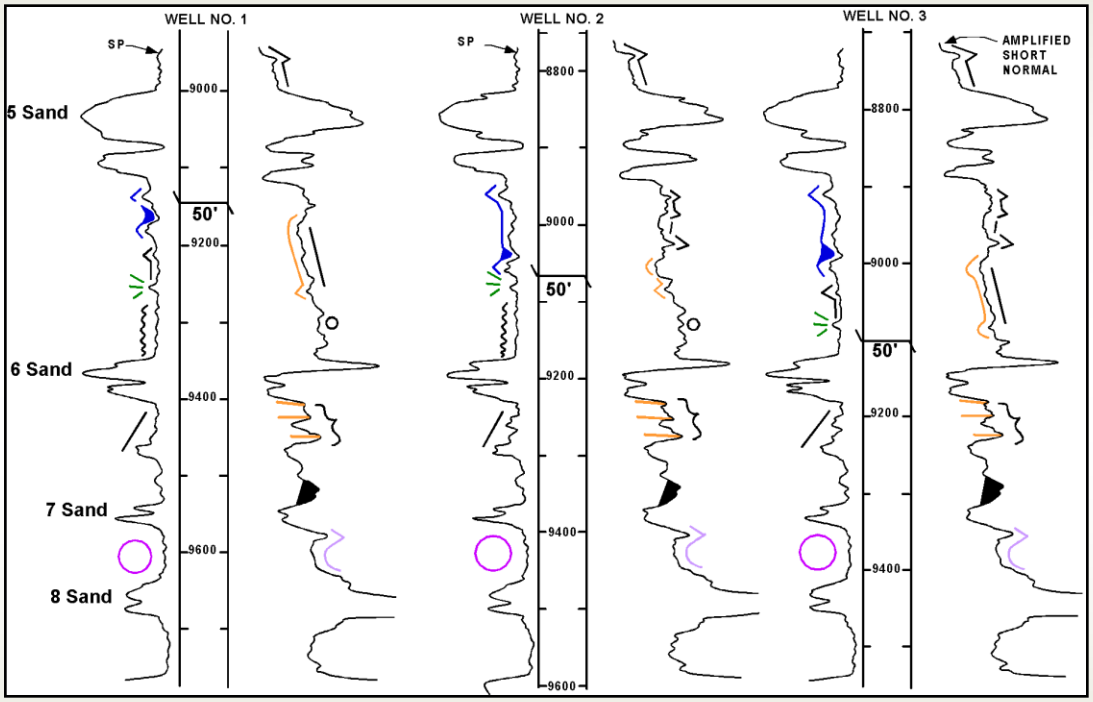
PROPOSED WATER FLOOD



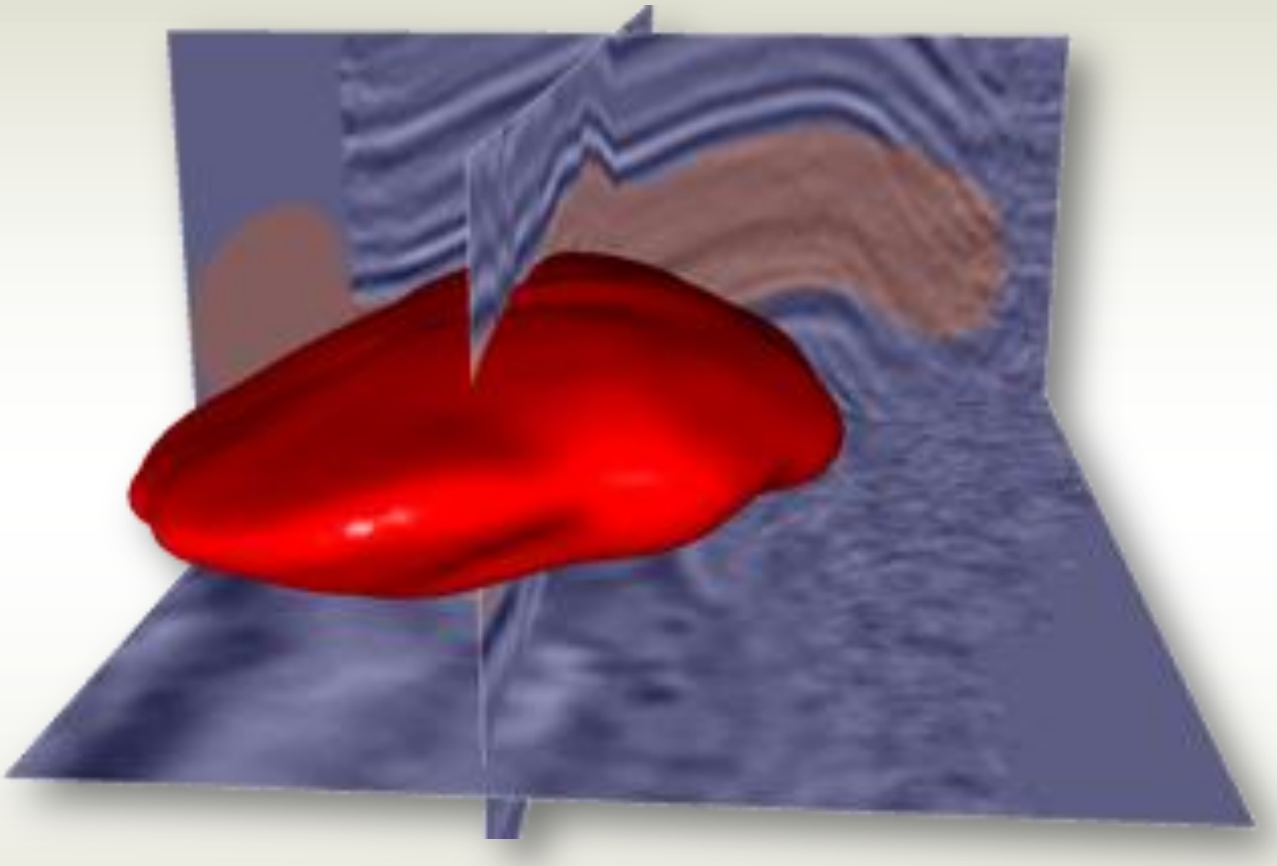
Dip cross-section shows LKO for Gorge Sand is -12218

5th HABIT

Successful oil finders ensure that their seismic and well correlations are *loop-tied* and accurate. This means correlating shales, sands, carbonates, faults, unconformities, etc.



CORRELATE and LOOP TIE ALL SEISMIC DATA



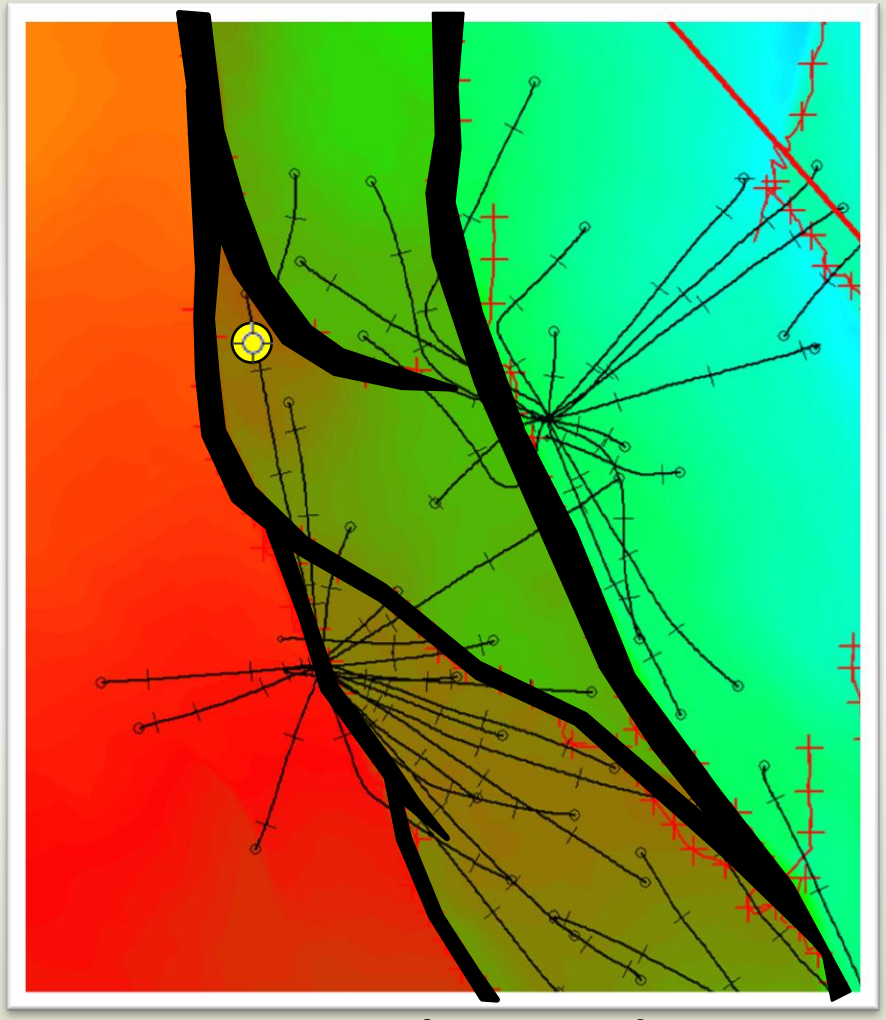
Auto-picking delegates the interpretation to the workstation.

"It is people, not workstations that find oil and gas,"

quoted by Mr. Dan Tearpock

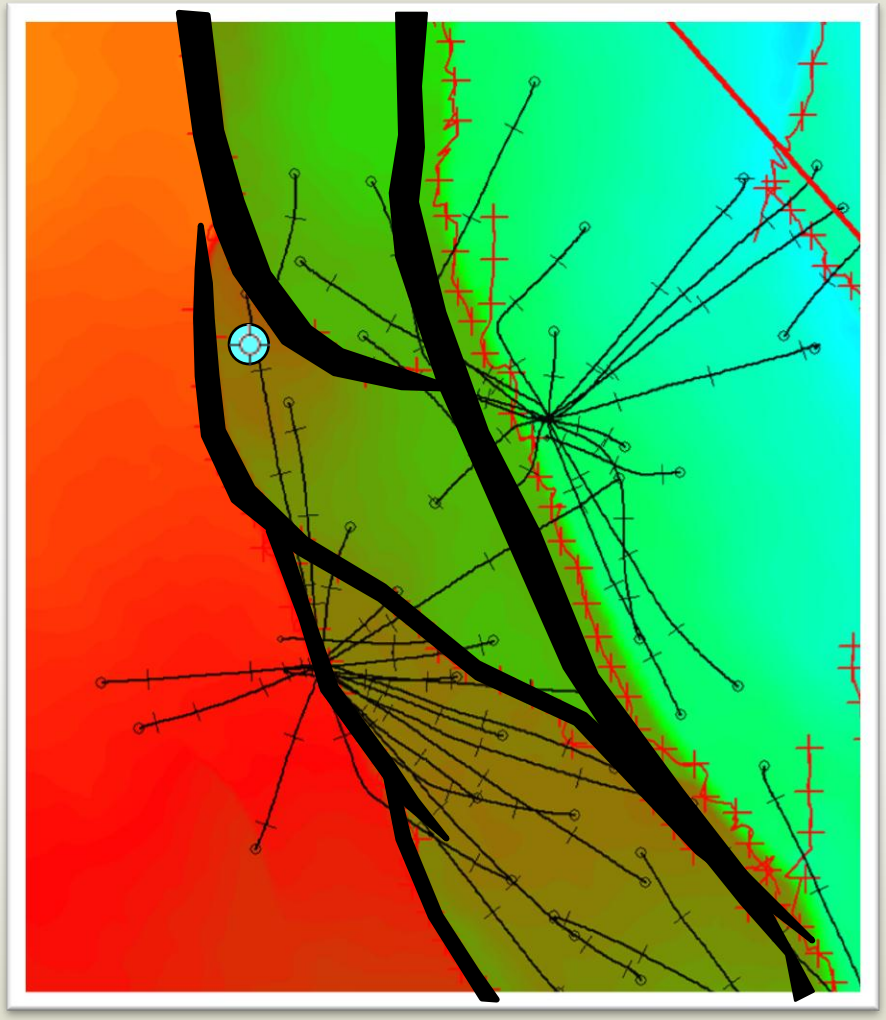
LOOP TYING

Not Loop Tied



Main Fault mapped as a Bifurcating Fault trap

Loop Tied



Main Fault mapped as 2 *En Echelon* Faults

6th HABIT

Successful oil finders know which methods, tools, and techniques are needed to accurately interpret and map the subsurface and accurately estimate the resources or reserves.

Wharton Method

Illustrative Aid

Cross-sections

Fault / Structural Integration

Restored Tops

ΔD/D

COMPLETE, SELL OR PLUG

You are drilling a critical well. The required pay for an economic reservoir is 153 ft. The well is being drilled directionally into a dipping structure. The data for the well and structure are provided below.

Data:

Wellbore Angle	=	35°
Borehole Compass Direction	=	N 80° E
Formation Dip	=	42°
Formation Dip Compass Direction	=	N 80° W
Measured Log Thickness of Pay	=	142 ft

Question: Is the well an economic success or do we sell the discovery or P&A the well?

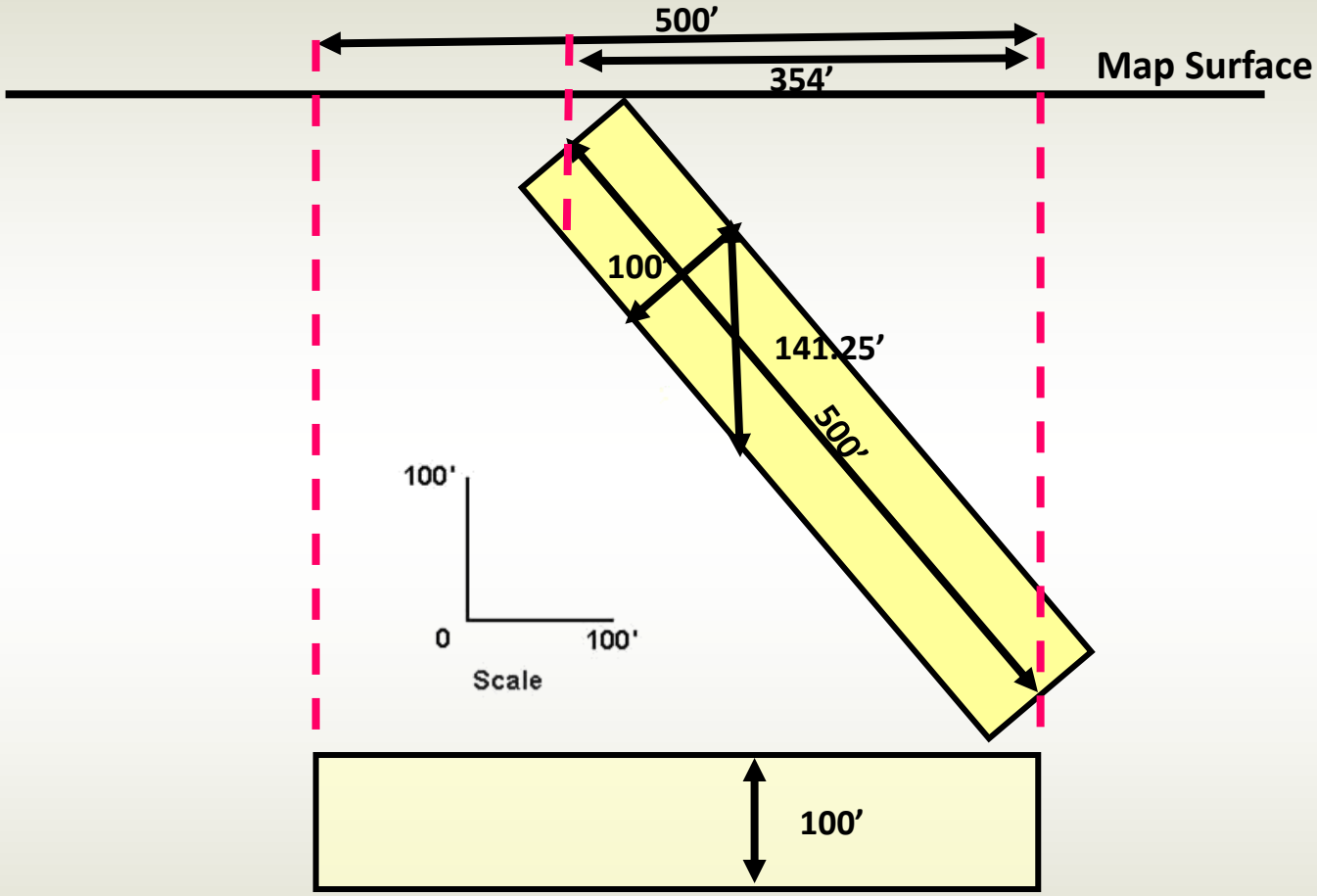
COMPLETE OR PLUG

Which Value Do I use to Make My Decision?

1. MLT = No Correction Factor = 142’
2. TVDT = Corrected Thickness = 116’
3. TVT = Corrected Thickness = 185’ CORRECT
4. TST = Corrected Thickness = 137’

WHY MUST WE USE TRUE VERTICAL THICKNESS?

Mapped Extent of Reservoir

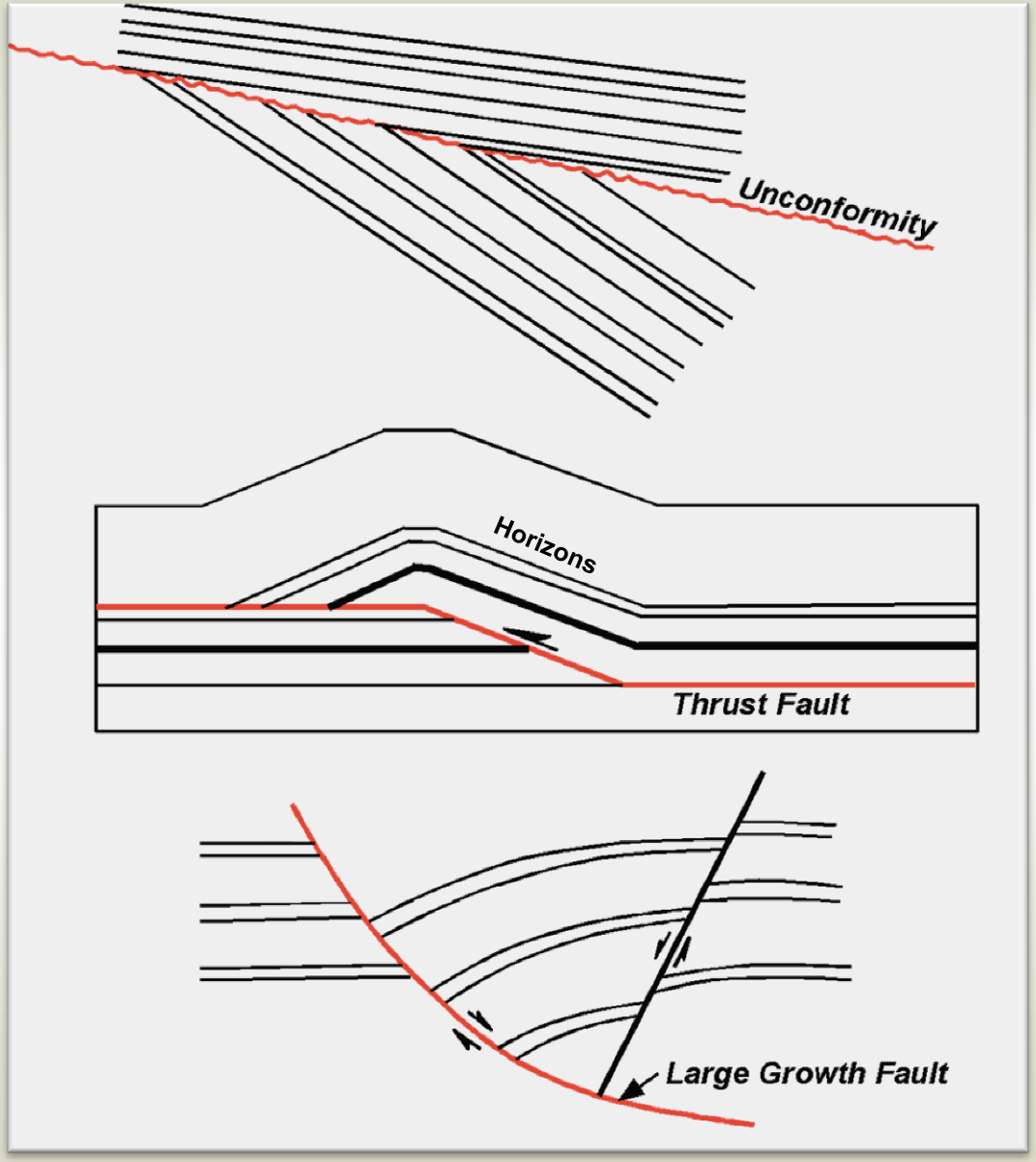


Area = 100' X 500' = 50,000 sqft
Area = 100' X 354' = 35,400 sqft
Area = 141.25' X 354' = 50,000 sqft

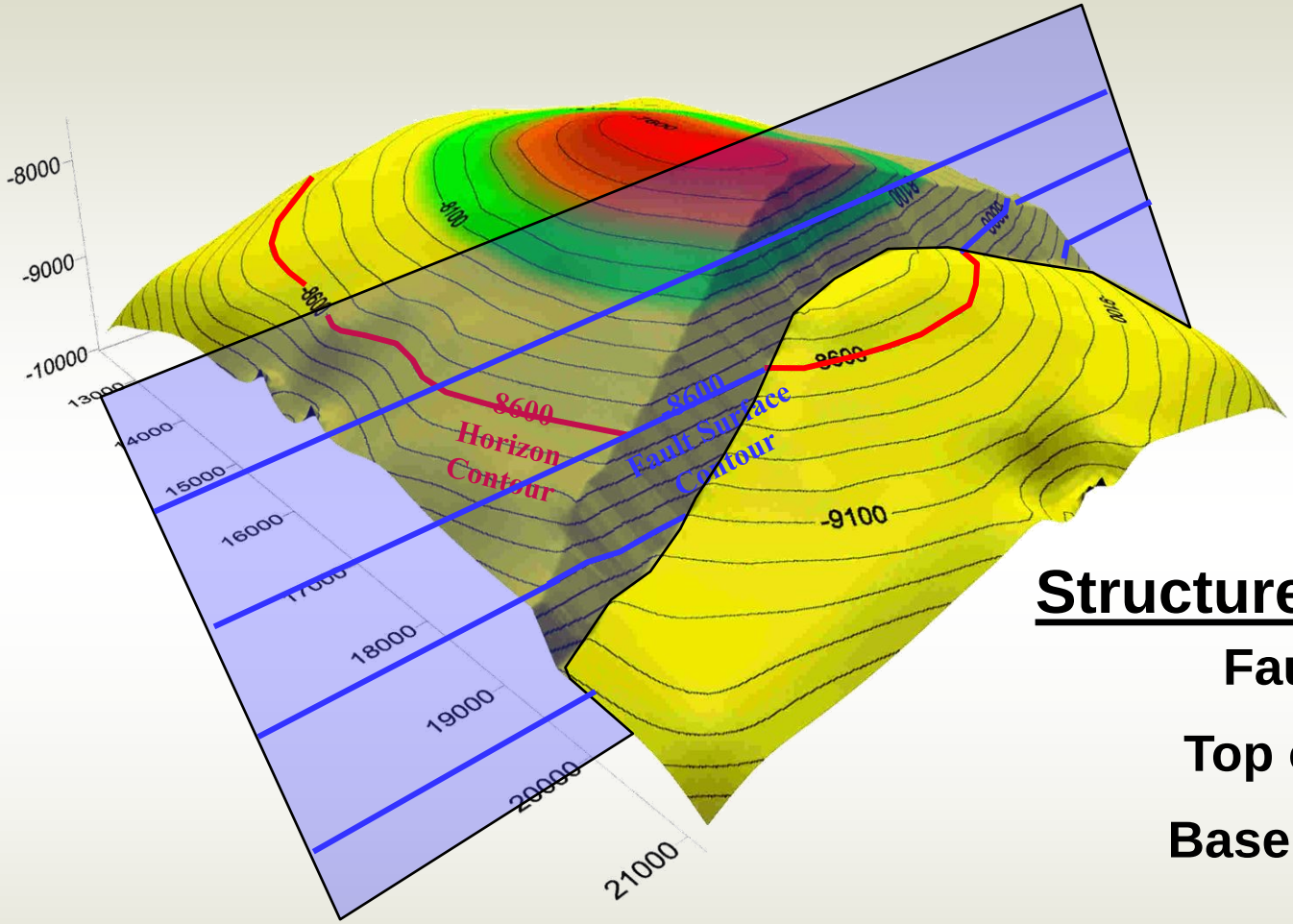
7th HABIT

Successful oil finders map all relevant geological surfaces including:

- Faults
- Horizons
- Unconformities
- Sequence Boundaries
- Salt
- other



WHAT IS NEEDED TO MAP FAULT TRAPS?



Structure Maps needed:

Fault Surface

Top of Reservoir

Base of Reservoir

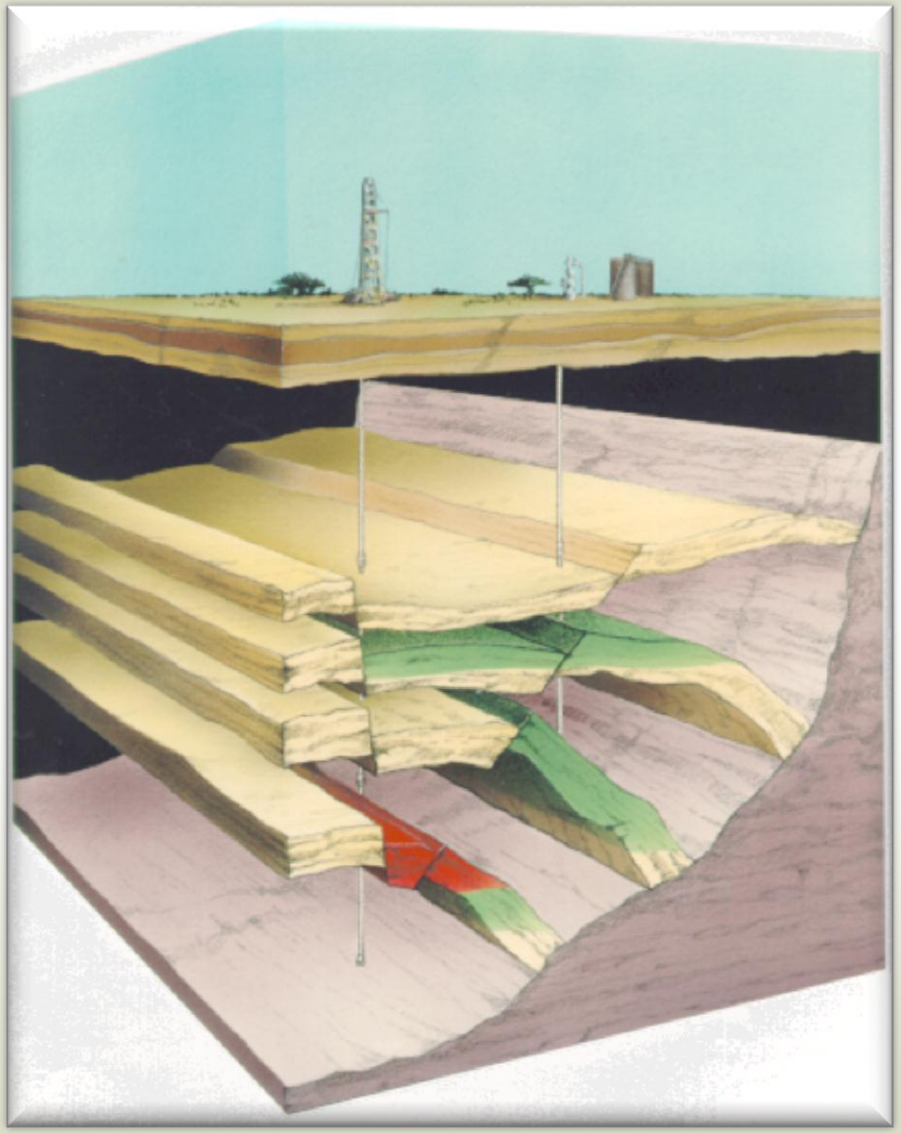
Isochore Maps needed:

Net Sand

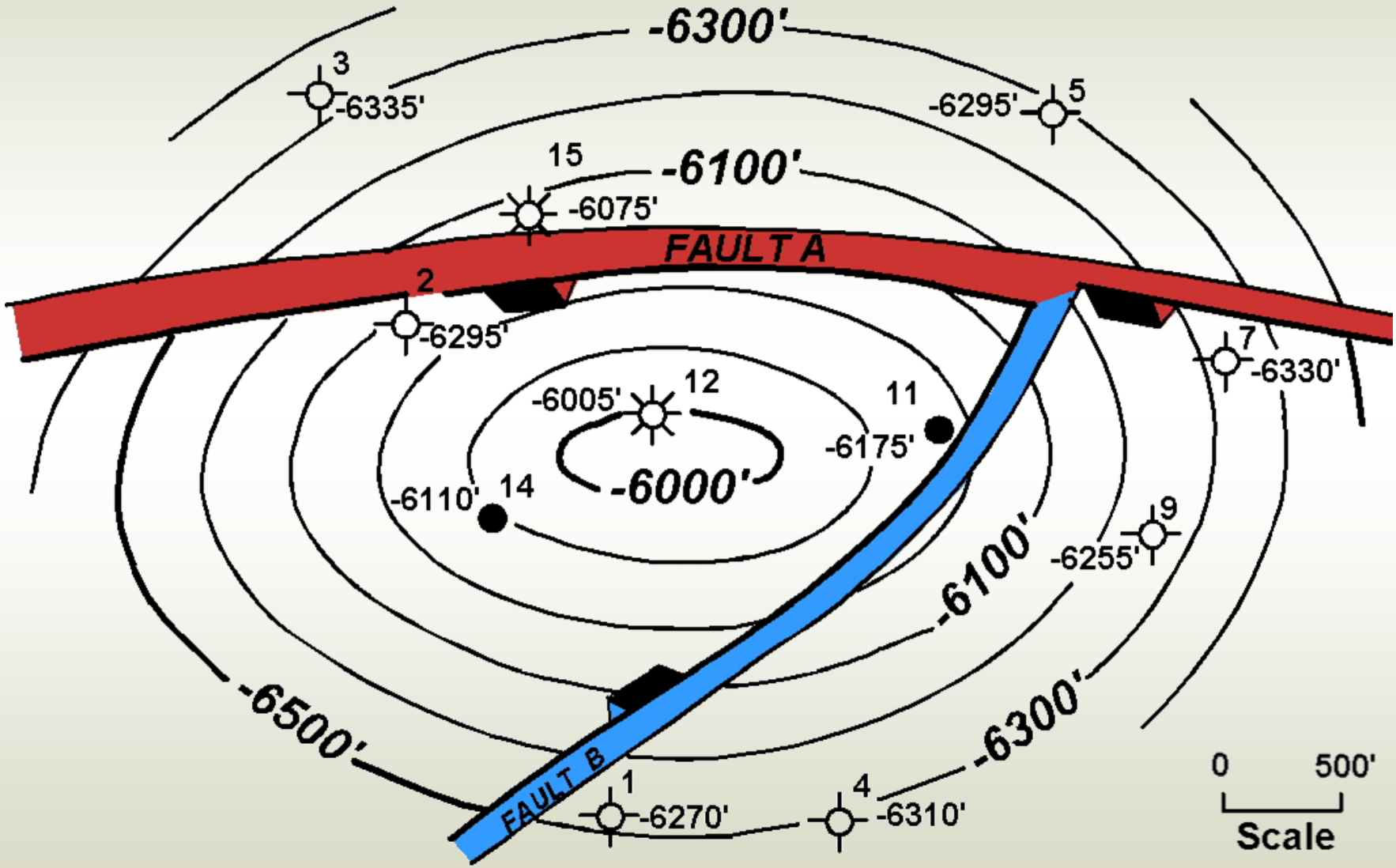
Net Pay

8th HABIT

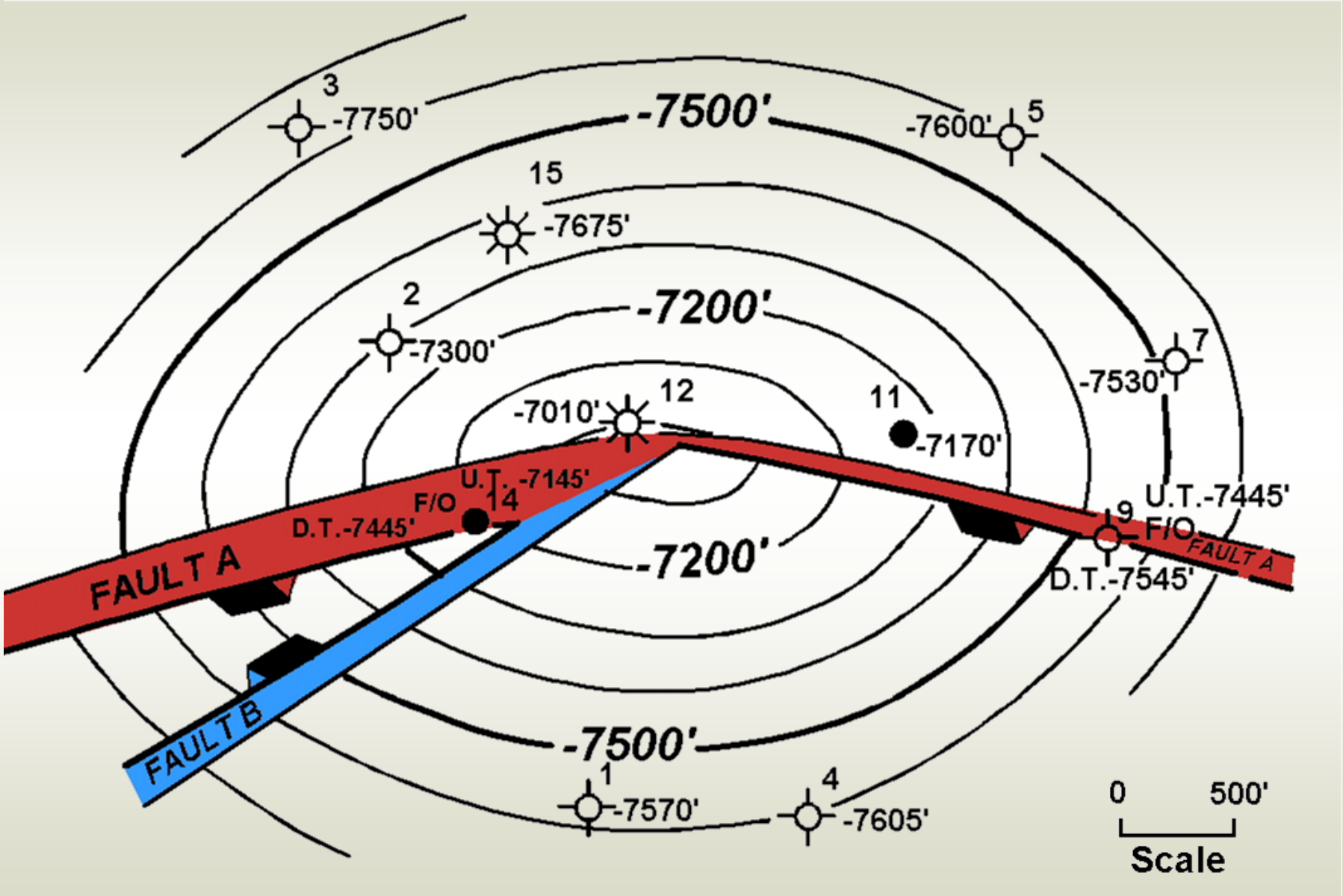
Successful oil finders map multiple horizons to develop reasonably correct, three-dimensional interpretations.



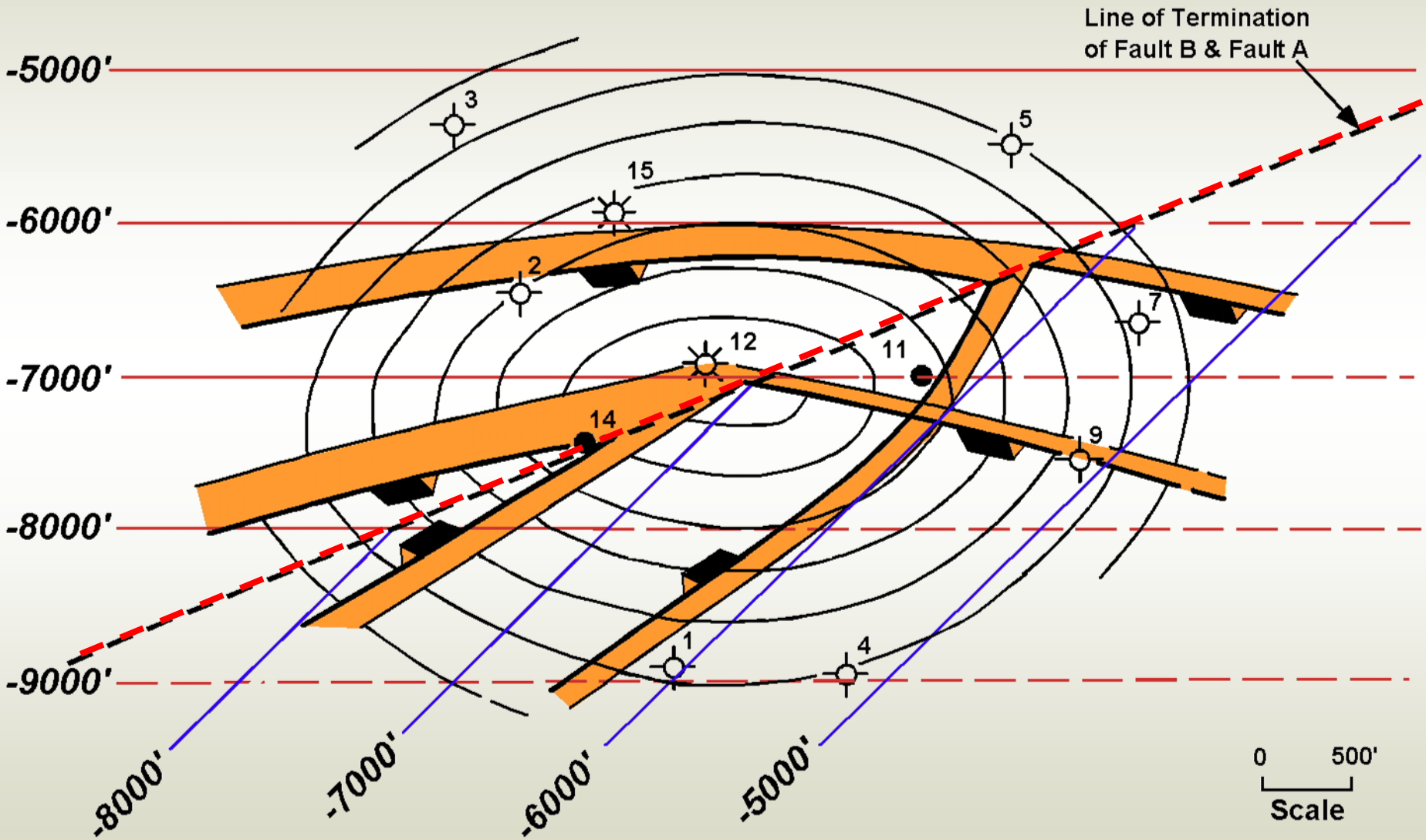
STRUCTURE MAP – 6000' SAND



STRUCTURE MAP – 7000' SAND



OVERLAY OF FAULT MAP AND STRUCTURE MAPS



9th HABIT

Successful oil finders document their work

SAND MARKER TOPS & CORRELATION DEPTH DIFFERENCES
DELTA D VS. DEPTH - SUBSEA DEPTHS

SAND	M#1	P#2	U#1	P#1	A#1	T#1	L#1	S#7
UV-1A	9062	9172	9233	9344	9341	9343	9364	
UV-2	9312	9439	9485	9594	9611	9661	9608	9109
UV-3	9492	9611	9679	9792	9811	9802	9816	9266
MIRE A	9642	9741	9834	9962	9951	9949	9974	9371
LYRIC	10132	10221	10310	10422	10466	10459	10480	9781
PURE	10438	10481	10625	10742		10769	10804	10021
CYPRESS	10522	10532	10707	10822	10536	10866	10894	
MID	10752	10841		11117	10832	11159	11204	10331
UL-5		11143	11225	11432	11103	11549	11550	10581
UL-6	10950		11420	11670	11296		11772	10779
CIB OP	11042	11301	11524	11787	11390		11884	10881
ROB 1	11642	12196	12650	12972	12271	12449		11421
ROB 4	12012	12486		13372	12640	12647		11689
ROB 5	12174	12591		13477	12751	12779		11811
CAM I 1	12734		13287	14102	13378	13431		12411
CAM I 2	12972		13585	14462	13705	13769		12661
CAM I 3	13210		13937		14052	14119		12816

DOCUMENTATION OF GEOSCIENCE WORK

In generating geoscience interpretation and maps, along with estimating resources and reserves, significant amounts of data are collected and evaluated by both geoscientists and engineers.

Good, accurate recording of data and descriptions of procedures and methods make the work more efficient and more accurate.

Thorough documentation of all your work will hold up to any reviews or audits.

10th HABIT

Successful oil finders seek out mentors and experienced individuals with knowledge and expertise who serve as mentors to those seeking experience.

FINDING MENTORS

Sources

- Your Company
- Professional Associations
  - Join
  - Be Active
- Consulting Companies

Ask

Most professionals are happy to mentor individuals who want to learn and improve

FINDING MENTORS

BEING A MENTOR

Know your Expertise

- Regional Expertise
- Skills
  - Subsurface Discipline (e.g., Structure, sequence strat, etc.)
  - Technical Skills

Offer

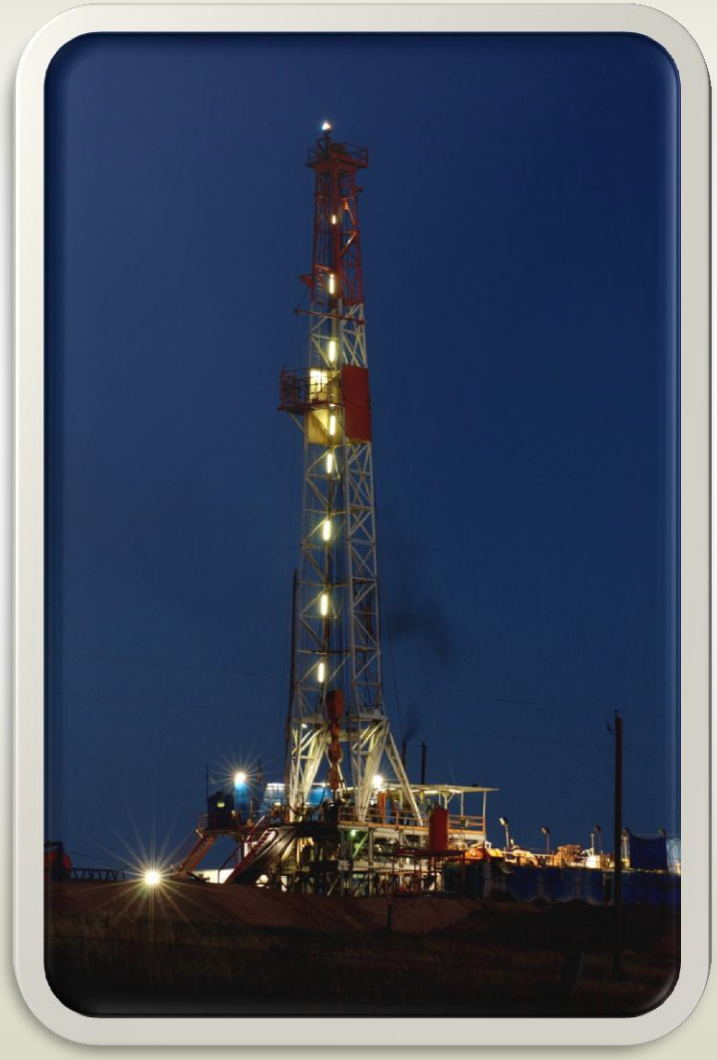
- If you see someone struggling, offer to help
- Give talks or lunch and learns

BENEFITS OF ADOPTING THESE 10 HABITS OF HIGHLY SUCCESSFUL OIL FINDERS

1. Generate viable, high-quality, three dimensionally valid subsurface interpretations, maps and prospects.
2. Provide more accurate estimates of resources and reserves.
3. Reduce cycle time.
4. Increase the effectiveness of the integrated process.
5. Find more than the average amount of oil and gas found by individuals, thereby adding value to the bottom-line of an exploration or development program.

THE BOTTOM LINE – *FEWER DRY HOLES/MORE SUCCESS*

EXCELLENCE THAT RUNS DEEP



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&

ENDS WITH YOU!

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