

“The Zone & the Box”

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LAPL 2009 Spring Educational Seminar

Friday, May 15, 2009

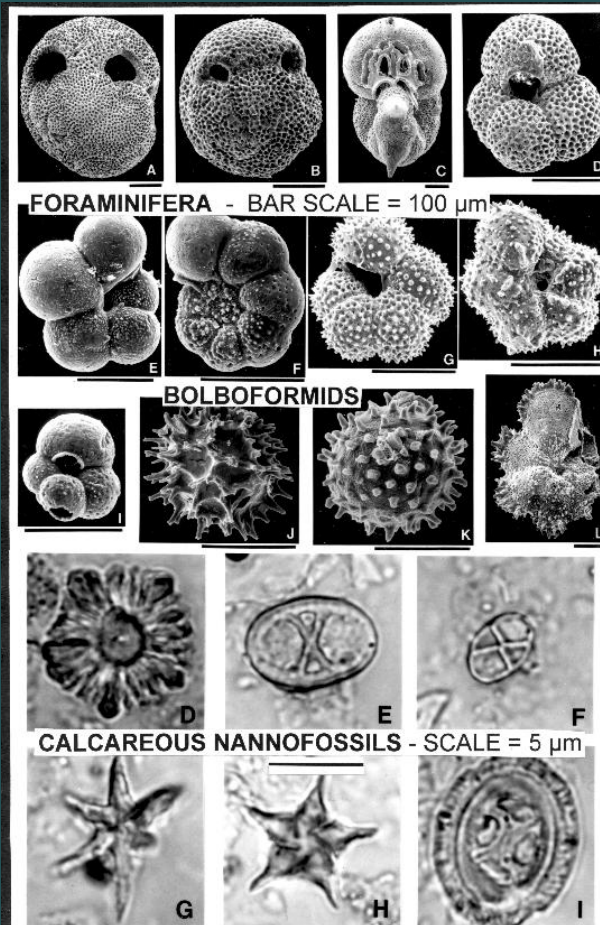
“The Zone & the Box”

OUTLINE

- Oil & gas geology 101
- Overview of unit types
- Unitization process
- Overview of interval definition types
- Sample case
- Conclusions
- Legal lagniappe

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GEOLOGY 101, MICROFOSSILS (NAMES)



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GEOLOGY 101, STRATIGRAPHY (names)

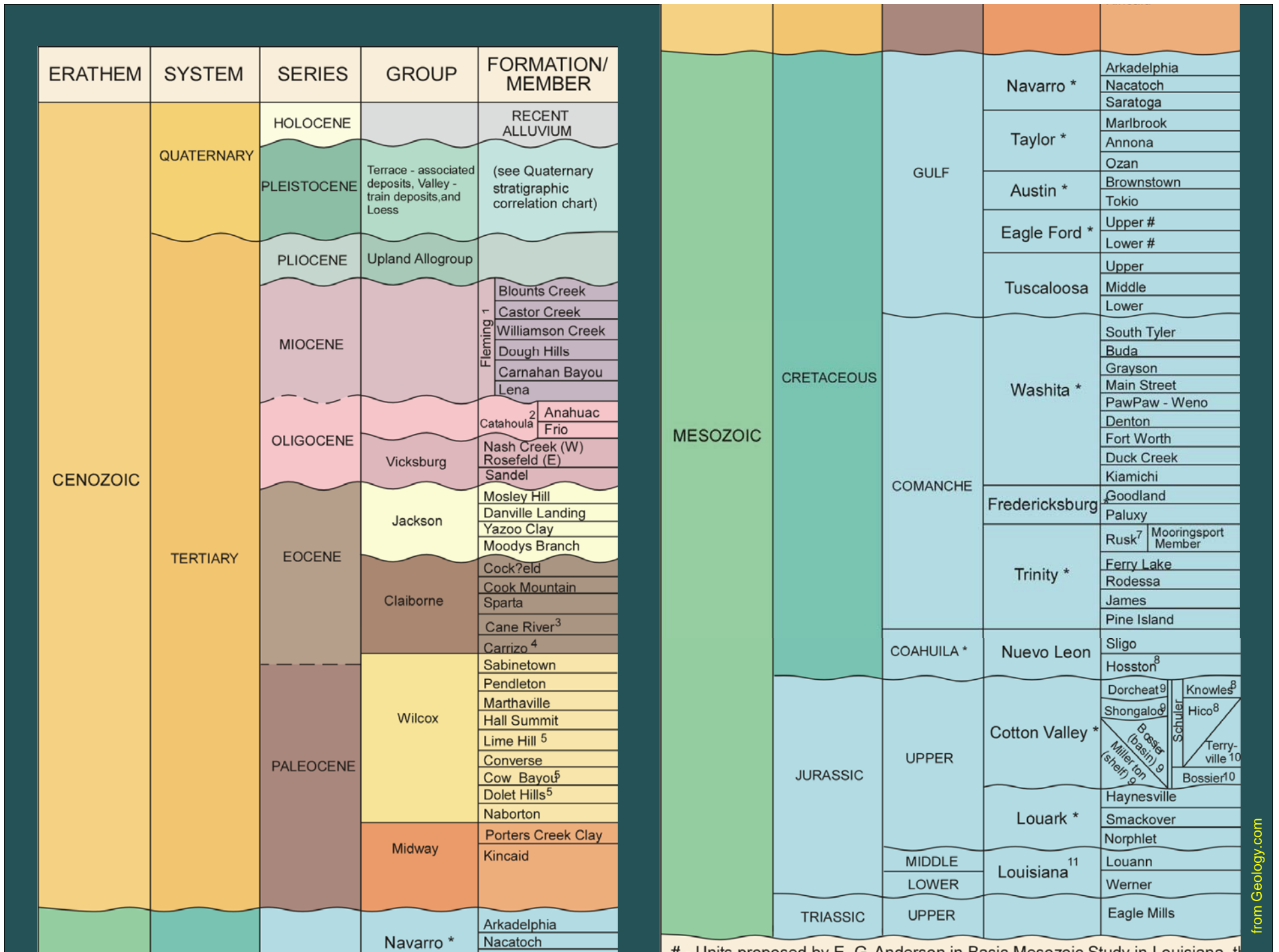
COMPOSITE SURFACE AND SUBSURFACE COLUMNAR SECTION OF LOUISIANA							
ERATHEM	SYSTEM	SERIES	GROUP	FORMATION MEMBER	REMARKS		
CENOZOIC	QUATERNARY	HOLOCENE		RECENT ALLUVIUM	Lenses thin or occur in terraced localities. Fluvial and non-fluvial surface, subsurface units recognized. Shallowly buried, extensive (where generally accepted) Holocene deposits.		
		PLEISTOCENE		(See Quaternary stratigraphic correlation chart)			
	TERTIARY	Pliocene				Zoned in marine subsurface on paleontology.	
		MIOCENE				1) Subsurface marine beds zoned, whether only upper, middle, and lower. 2) Catahoula may be Miocene in part in subsurface.	
		OLIGOCENE				For and Anahuac are wedges recognized in subsurface only. These are surface units, not subdivided in the subsurface.	
		Eocene					Most of these are recognized both at the surface and in the subsurface.
PALEOCENE					These are surface units, generally undifferentiated in the subsurface.		
MESOZOIC	CRETACEOUS	GULF	NAVATO *			The unit Navato units in upper Cretaceous; not here identified at the surface are those in the parent and some in the surface part of the sea.	
			Taylor *				
			Austin *				
	Eagle Ford *						
	Tulacosa					6) Equivalent to the Woodbine of Texas.	
	COMMANCHE	Washita *				Washita units are present primarily within the salt-dome basins of the interior Salt Basin (subsurface only).	
OGANULA *	Nuevo Leon				Frederickburg and upper parts of the Trinity are not present over highest elevations of the area also absent over highest elevations of the Monroe Basin.		
JURASSIC	UPPER	Cotton Valley			7) Equivalent to Upper Glen Rose of Ark-La-Tex area.		
	Lower				8) Some of Houston Formation may belong in Cotton Valley.		
MIDDLE LOWER	Louisiana *				9) Unconformity, bounded units proposed by Seaton and Anderson (1973) and in part by Anderson (1973). See also AAPG, Canada Gulf Coast Region Correlation Chart (1988).		
TRIASSIC	UPPER	Eagle Mile			10) Lithofacies units commonly recognized by industry geologists in the Ark-La-Tex area.		
					11) Equivalent to Louren Group in other wells.		

+/- 5 million years ago

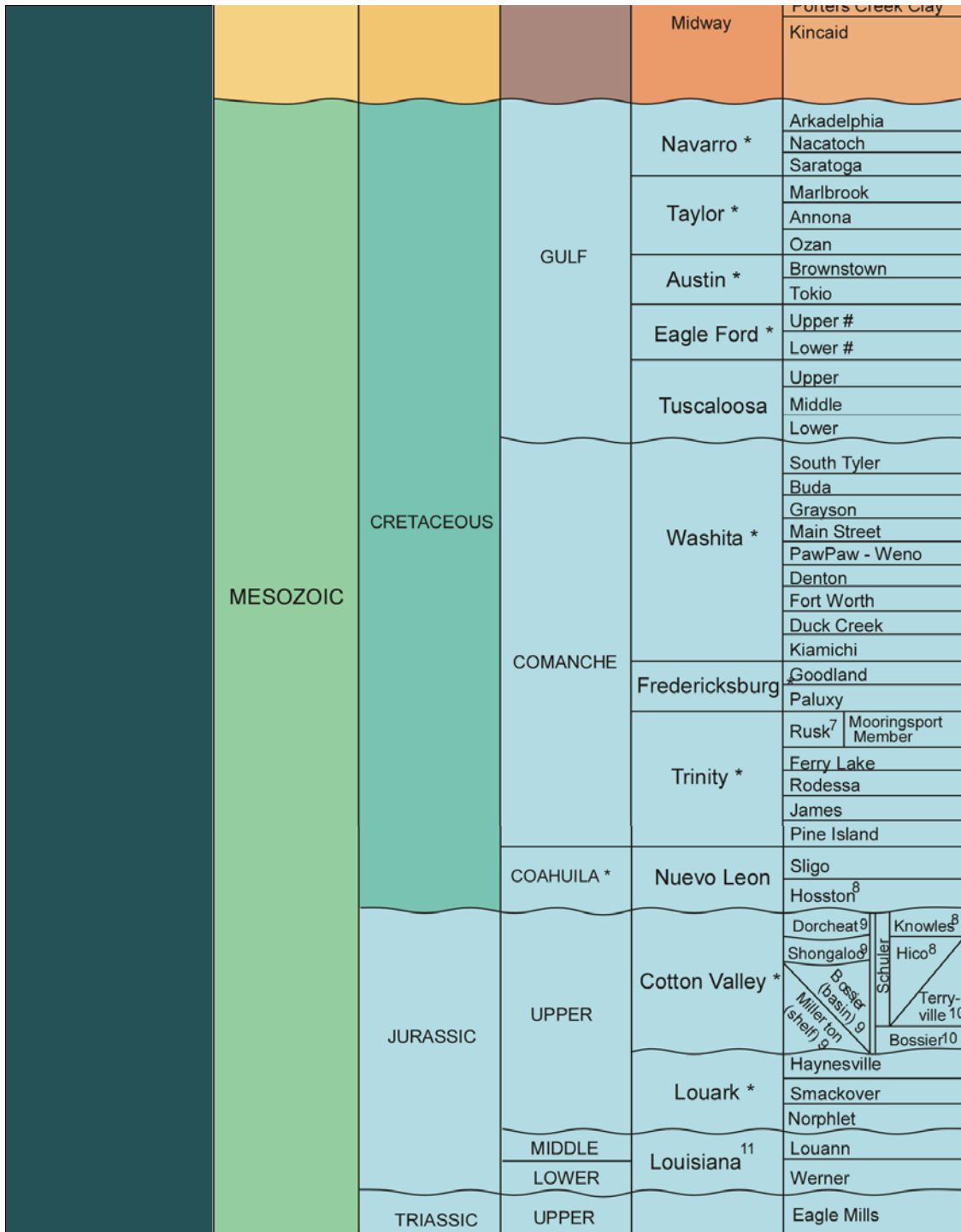
+/- 62 million years ago

+/- 135 million years ago





- Units proposed by F. G. Anderson in Basic Mesozoic Study in Louisiana, 1950



NORTH LOUISIANA

Austin (chalk)

Tuscaloosa

Paluxy

Rodessa

Sligo

Hosston

Cotton Valley

Haynesville

Smackover

ERATHEM	SYSTEM	SERIES	GROUP	FORMATION/ MEMBER
CENOZOIC	QUATERNARY	HOLOCENE		RECENT ALLUVIUM
		PLEISTOCENE	Terrace - associated deposits, Valley - train deposits, and Loess	(see Quaternary stratigraphic correlation chart)
		PLIOCENE	Upland Allogroup	
		MIOCENE		Fleming 1 Blounts Creek Castor Creek Williamson Creek Dough Hills Carnahan Bayou Lena
	OLIGOCENE		Catahoula 2 Anahuac Frio	
		Vicksburg	Nash Creek (W) Rosefeld (E) Sandel	
	EOCENE	Jackson	Mosley Hill Danville Landing Yazoo Clay Moodys Branch	
		Claiborne	Cock?eld Cook Mountain Sparta Cane River ³ Carrizo ⁴	
	PALEOCENE	Wilcox	Sabinetown Pendleton Marthaville Hall Summit Lime Hill ⁵ Converse Cow Bayou ⁵ Dolet Hills ⁵ Naborton	
		Midway	Porters Creek Clay Kincaid	
		Navarro *	Arkadelphia Nacatoch	

SOUTH LOUISIANA

Anahuac (fm.)

Frio (fm.)

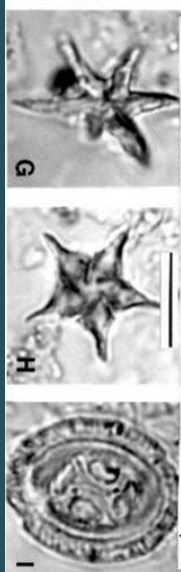
Vicksburg

Jackson

Wilcox

ERATHEM	SYSTEM	SERIES	GROUP	FORMATION/ MEMBER				
CENOZOIC	QUATERNARY	HOLOCENE		RECENT ALLUVIUM	SOUTH LOUISIANA			
		PLEISTOCENE	Terrace - associated deposits, Valley - train deposits, and Loess	(see Quaternary stratigraphic correlation chart)				
		PLIOCENE	Upland Allogroup					
	TERTIARY		MIOCENE		Fleming 1	Miocene		
					Blounts Creek			
					Castor Creek			
					Williamson Creek			
					Dough Hills			
					Carnahan Bayou			
			Lena					
			OLIGOCENE				Catahoula ²	Oligocene
							Anahuac	
			EOCENE				Jackson	Frio
Nash Creek (W)								
Rosefeld (E)								
Sandel								
				Mosley Hill				
				Danville Landing				
				Yazoo Clay				
				Moodys Branch				
				Cock?eld				
				Cock Mountain				

Microfossils



REGIONAL FOSSIL ZONES IN GULF COAST TERTIARY

— CONFIDENTIAL —

AGE		TEXAS GULF COAST AND OFFSHORE	SW LOUISIANA AND OFFSHORE	SE LOUISIANA AND OFFSHORE
MIOCENE	UPPER MIOCENE	Cristellaria (M) Bigenerina (A) Discorbis (12) Textularia (L) Bigenerina (2)/Cibicides carstensi	Cristellaria (M) Bigenerina (A) Bigenerina (B)/Discorbis (12) Textularia (L) Bigenerina (2)/Cibicides carstensi	Cristellaria (M) = Robulid Bigenerina (A) Amphistegina (E)/Cristellaria (K) Timbalier Bay fauna Bigenerina (B)/Discorbis (12) Textularia (L) Bigenerina (2)/Cibicides carstensi
	MIDDLE MIOCENE	Textularia (W) Bigenerina (3) Discorbis sp. (Onshore) Bigenerina (4) (Onshore) Cibicides opima Harang fauna Amphistegina (B) (Onshore)/ Robulus (L)	Textularia (W) Bigenerina (3) Cristellaria (I) Planulina (D) Cibicides opima Harang fauna Amphistegina (B)/Robulus (L)	Textularia (W) Bigenerina (3) Cristellaria (I) Planulina (D) Cibicides opima Harang fauna Amphistegina (B)/Robulus (L)
	LOWER MIOCENE	Discorbis bolivarensis Siphonina davisi Planulina palmerae	Eponides (E) Gyroidina sp. (ornate) Cristellaria cf. (A) Discorbis bolivarensis Lower Discorbis (B) fauna Basal Freshwater Bayou fauna Siphonina davisi Planulina palmerae Caldwell fauna Broussard fauna Abbeville assemblage	Camerina (1) Discorbis bolivarensis Lower Discorbis (B) fauna Siphonina davisi Planulina palmerae Caldwell fauna Abbeville assemblage
OLIGOCENE	UPPER OLIGOCENE	Discorbis nomada Discorbis restricted Heterostegina sp. Marginulina idiomorpha Marginulina vaginata Marginulina howei	Discorbis nomada Discorbis restricted Heterostegina sp. Bolivina perca Marginulina idiomorpha Marginulina vaginata Marginulina howei Miogypsinoides (A)	Discorbis restricted Bolivina perca Marginulina idiomorpha Marginulina vaginata Marginulina howei Miogypsinoides (A)
	ANAHUAC	Cibicides hazzardi	Cibicides hazzardi	Cibicides hazzardi
	MIDDLE OLIGOCENE	Marginulina texana Bolivina (A) Hackberry assemblage Bolivina alazanensis Nonion struma Nodosaria blanpiedi Discorbis (D) Textularia seligi Anomalina bilateralis Cibicides (10) Textularia (2) Nonion (4) Discorbis (6)	Cristellaria (H) Marginulina texana Bolivina (A) Hackberry assemblage Bolivina alazanensis Nonion struma Nodosaria blanpiedi Discorbis (D)	Marginulina texana Bolivina (A) Hackberry assemblage Nonion struma Nodosaria blanpiedi Discorbis (D)
	FRIO	Textularia warreni or Vicksburg assemblage or Loxostoma (B) (downdip)	Vicksburg assemblage or Loxostoma (B) (downdip)	Vicksburg assemblage
LOWER OLIGOCENE	Textularia warreni or Vicksburg assemblage or Loxostoma (B) (downdip)	Vicksburg assemblage or Loxostoma (B) (downdip)	Vicksburg assemblage	
JACKSON	Discorbis cocoaensis Uvigerina cocoaensis or	Discorbis cocoaensis Uvigerina cocoaensis or	Discorbis cocoaensis Uvigerina cocoaensis or	

Tex "L"
Amph. B
Siph. dav.
Planulina
Het.
Marg. howei
Cib. hazz.
Marg. tex.
Bol. mex.
N. s.
Nod. blan.

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GEOLOGY 101, STRATIGRAPHY (STRATA)



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GEOLOGY 101, STRATA



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from Lock

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GEOLOGY 101, ORIGIN OF FAULTS



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GEOLOGY 101, ORIGIN OF FAULTS



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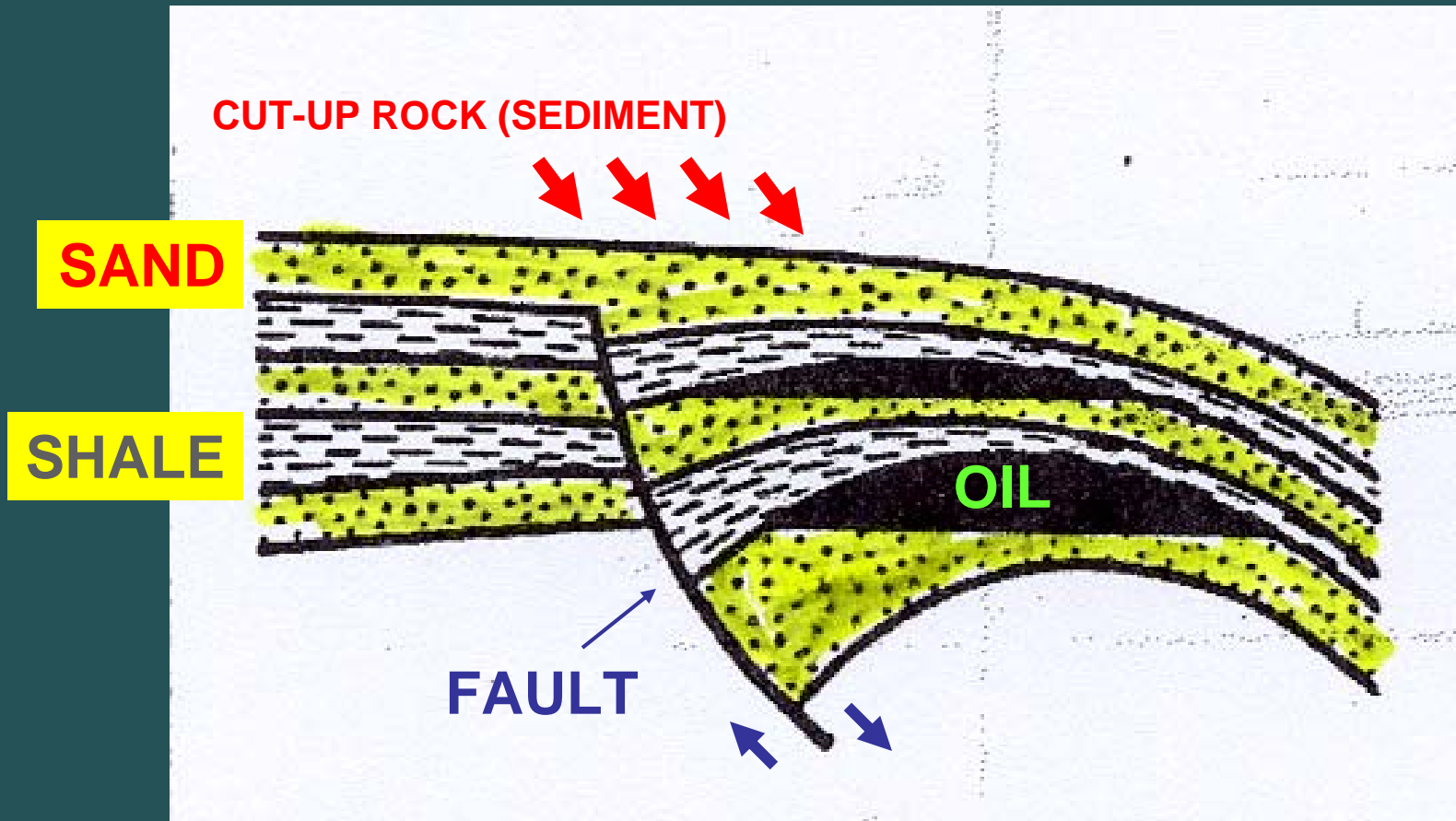
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GEOLOGY 101, ORIGIN OF FAULTS



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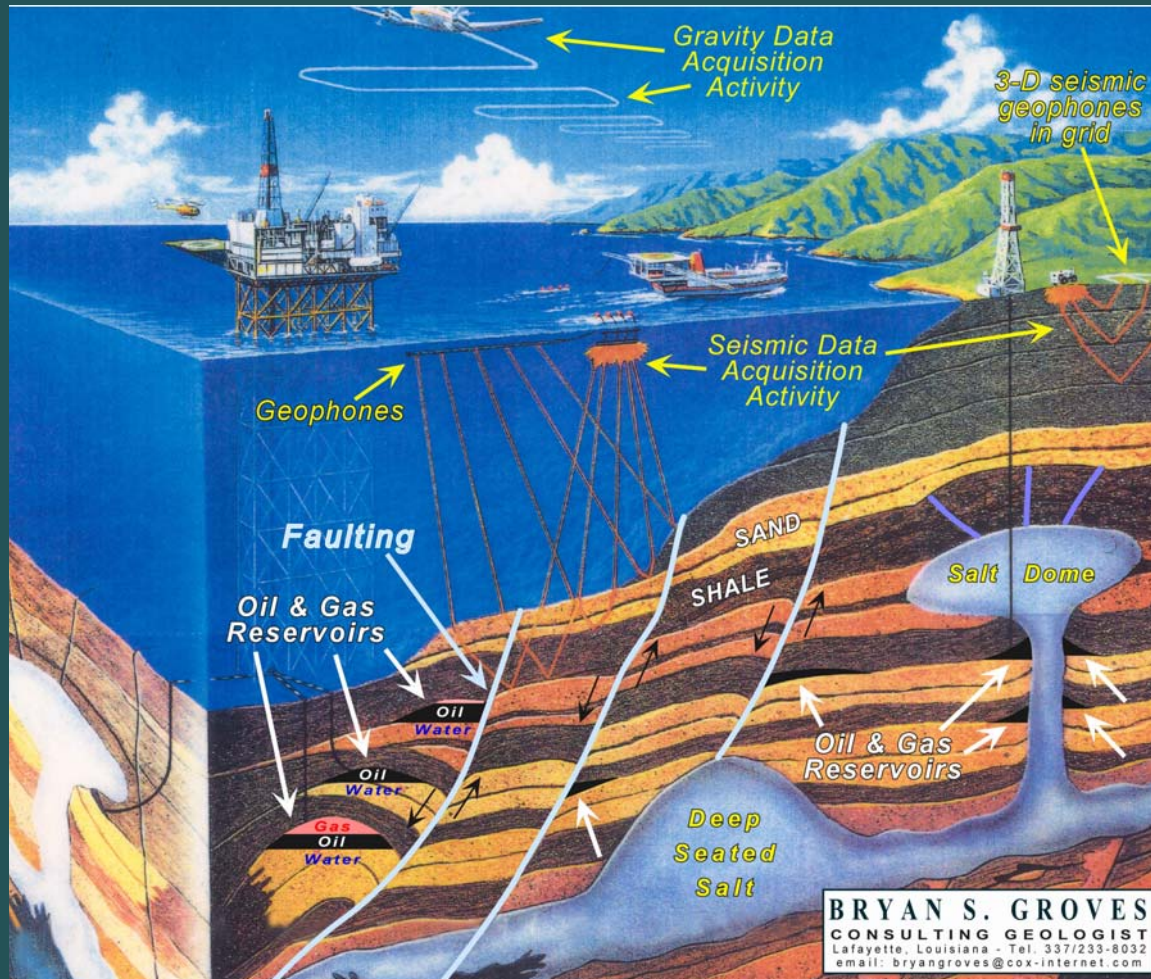
from Lock

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GEOLOGY 101, FAULTING



"The Zone & the Box"

GEOLOGY 101, STRATA & FAULTS, ETC.

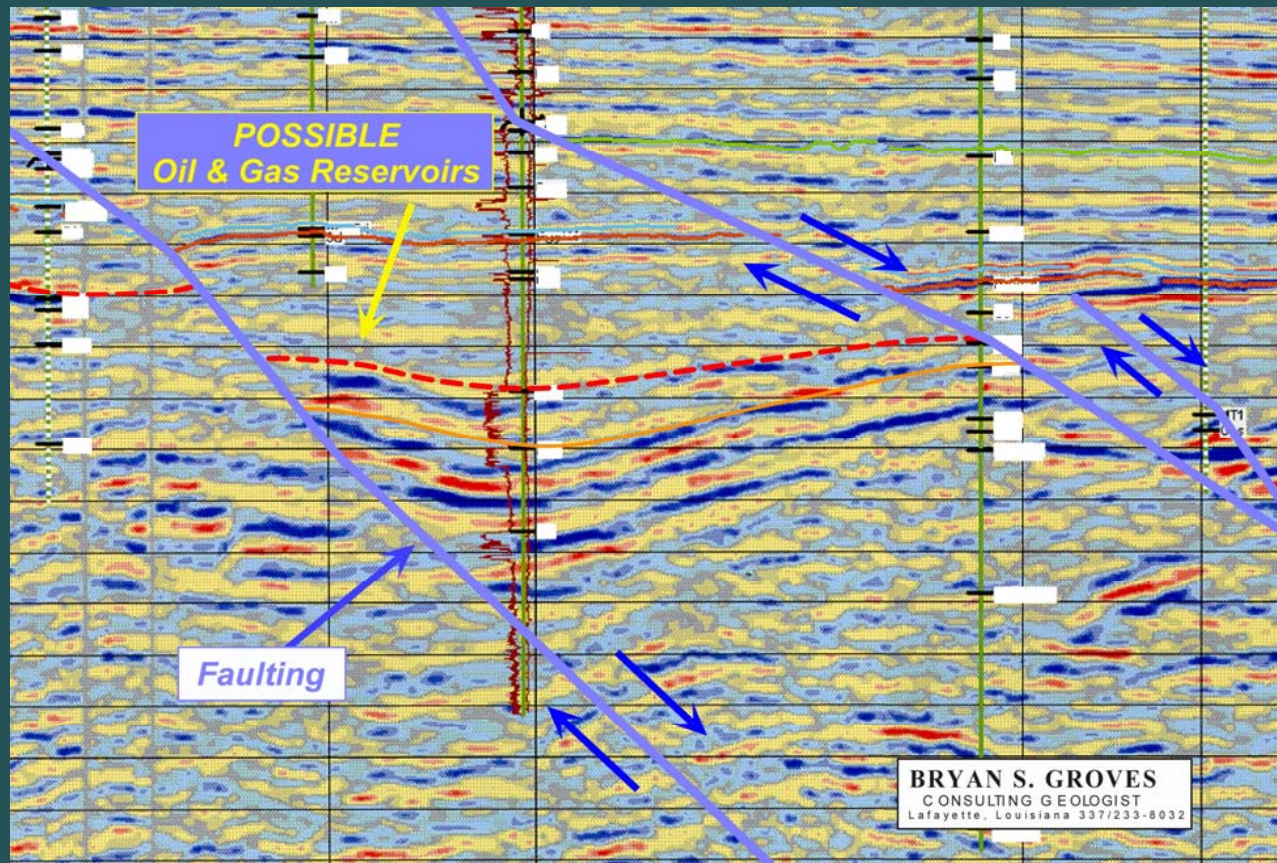


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SEISMIC DATA - VERTICAL SLICE



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WHERE IS THE OIL?



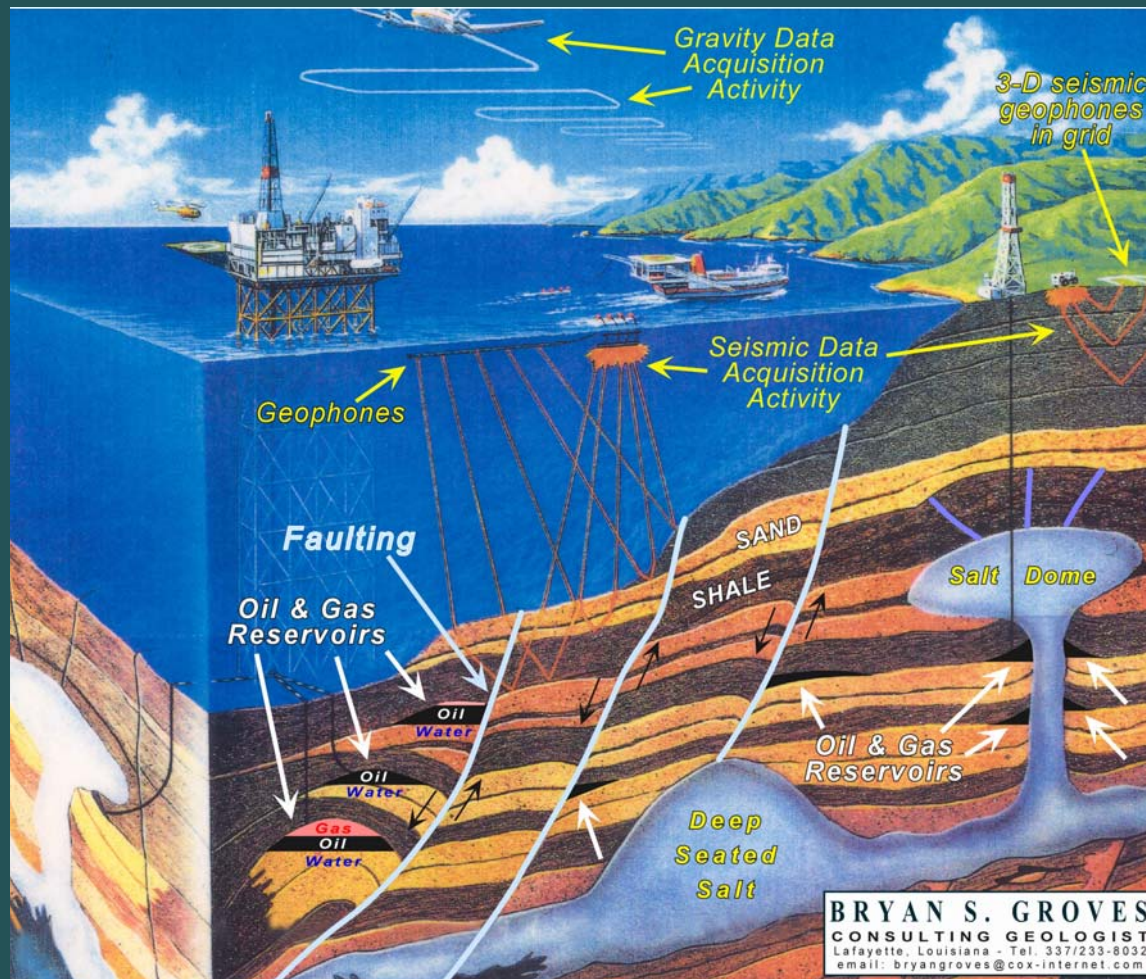
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OIL AND GAS FLOAT ON WATER



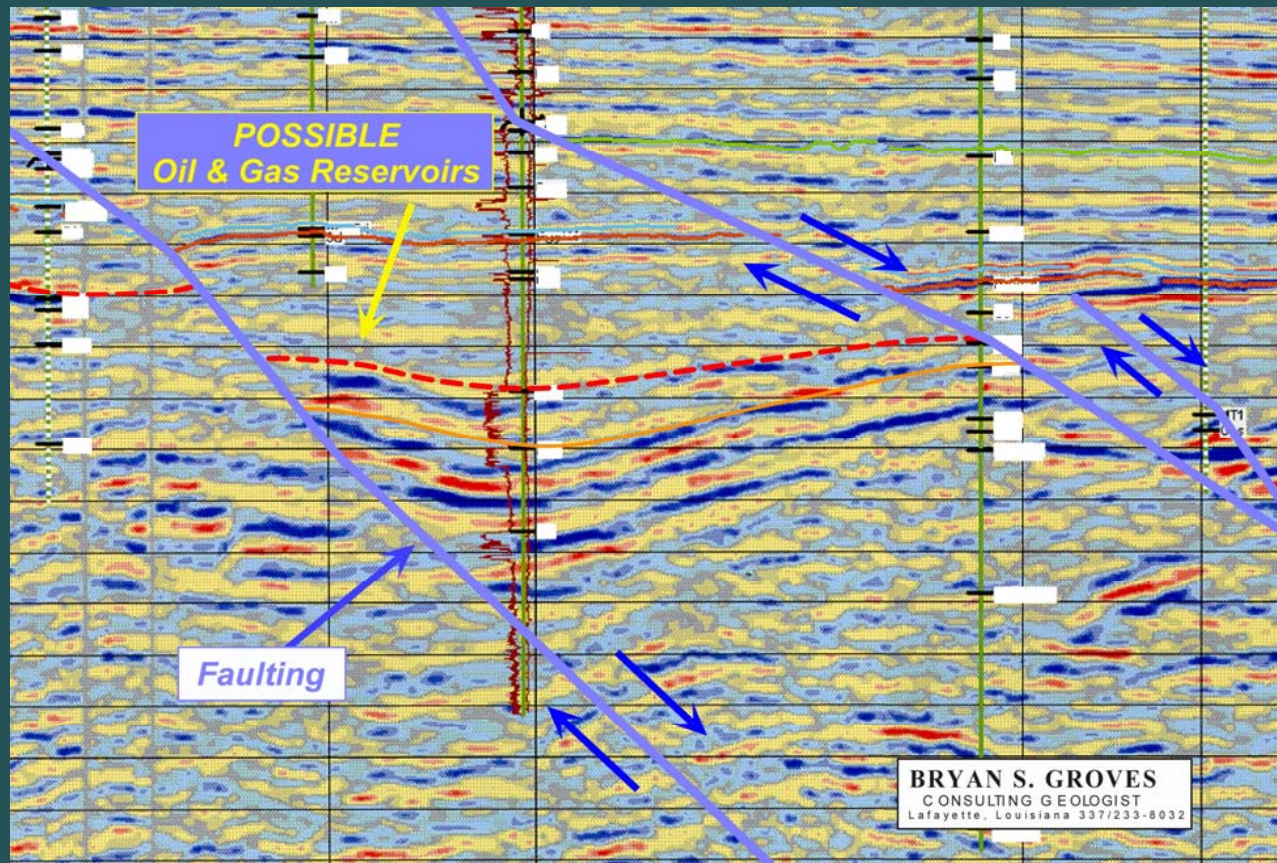
“The Zone & the Box” RESERVOIR LIMITS



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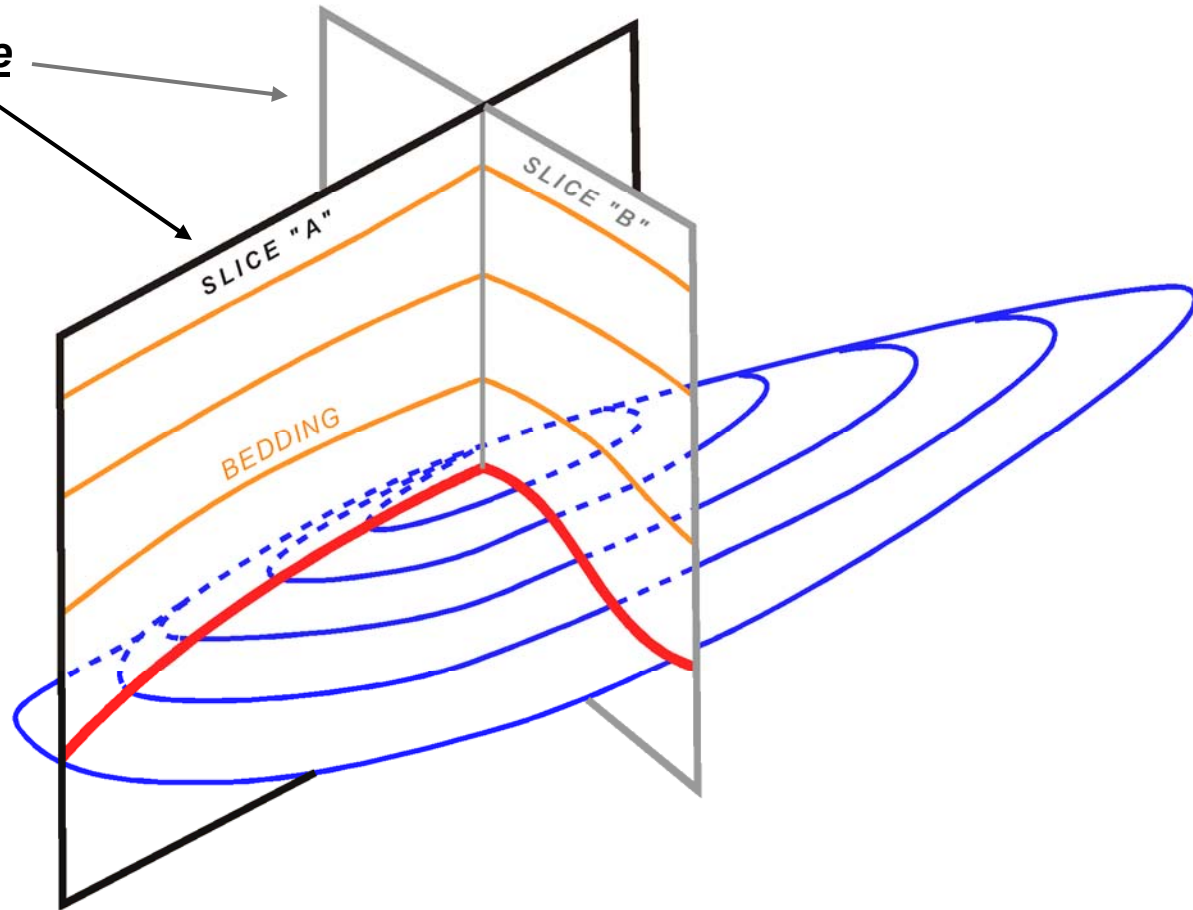
“The Zone & the Box”

SEISMIC DATA - VERTICAL SLICE

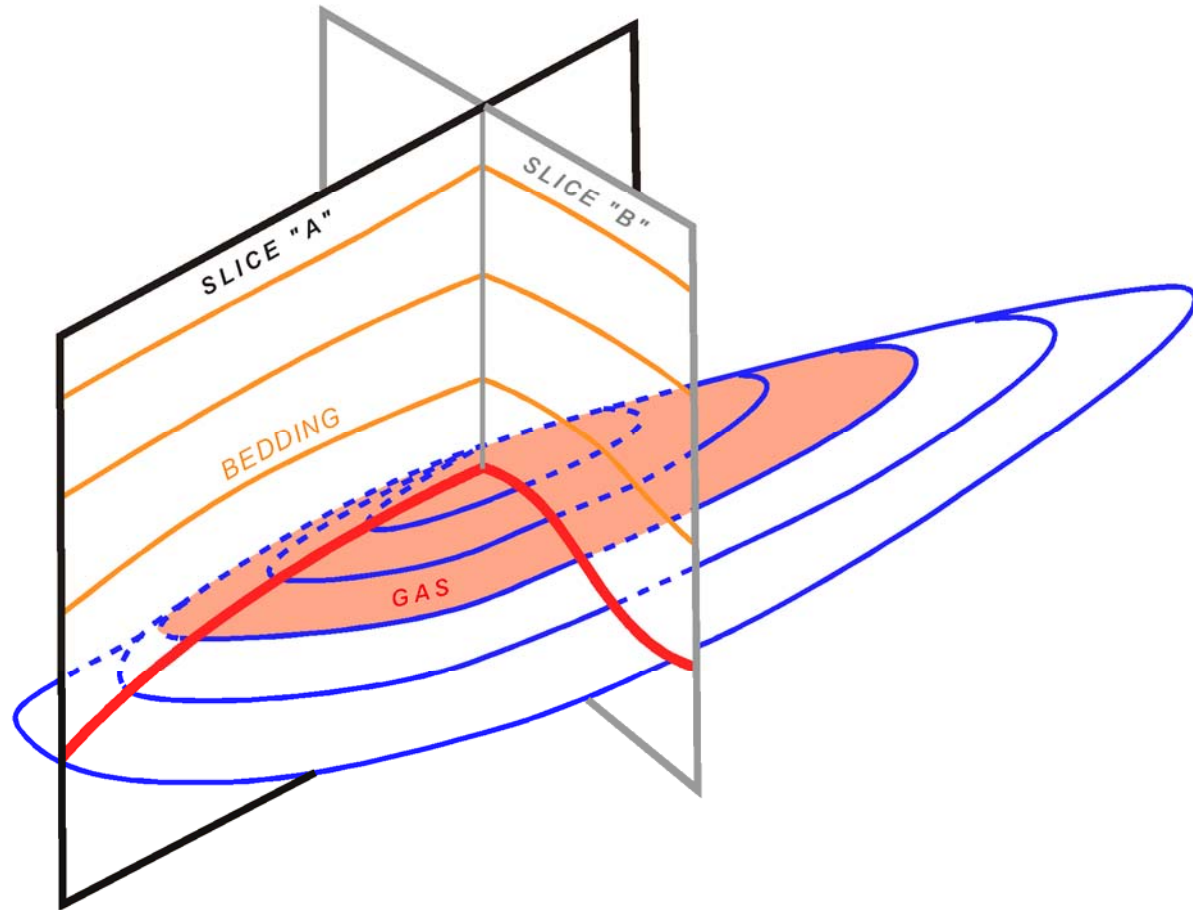


“The Zone & the Box” RESERVOIR LIMITS

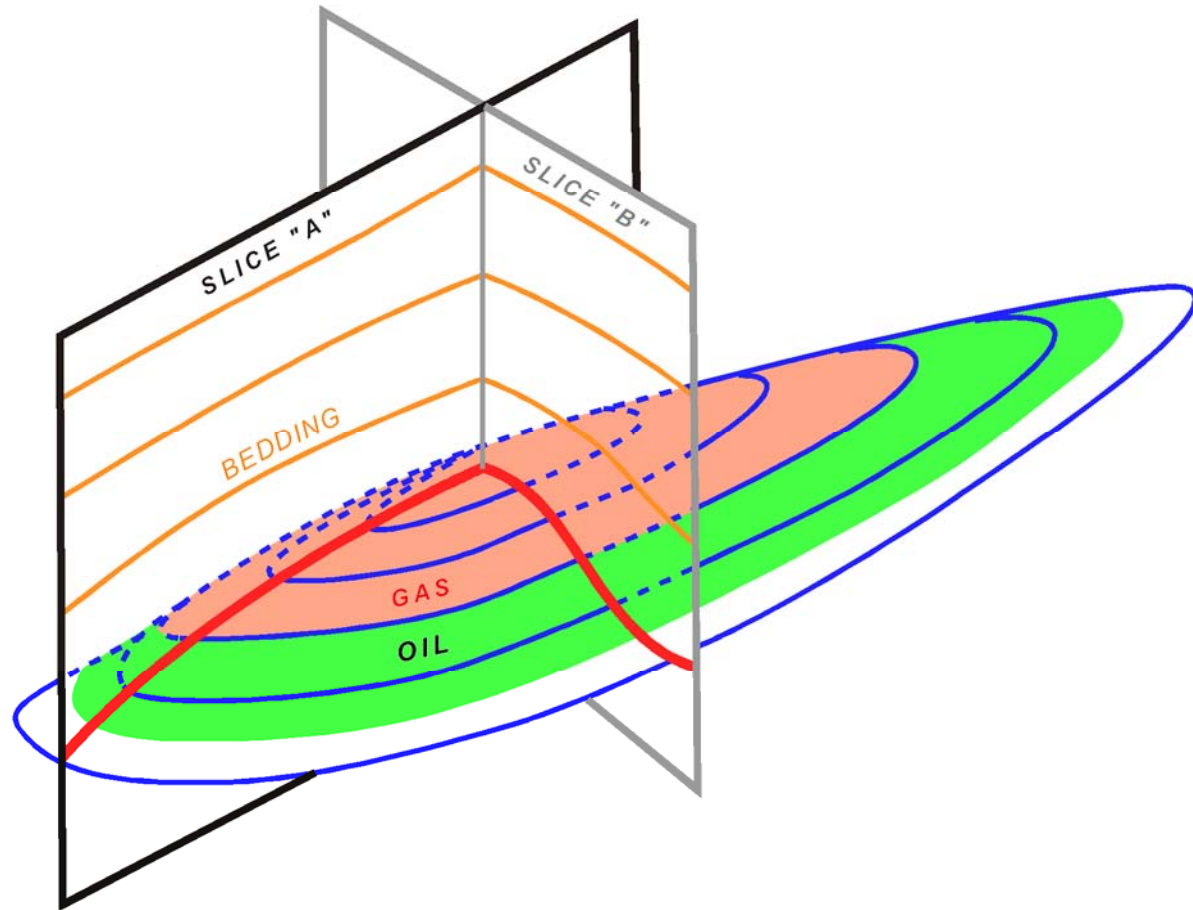
... the vertical slice
is the
seismic line ...



“The Zone & the Box” RESERVOIR LIMITS

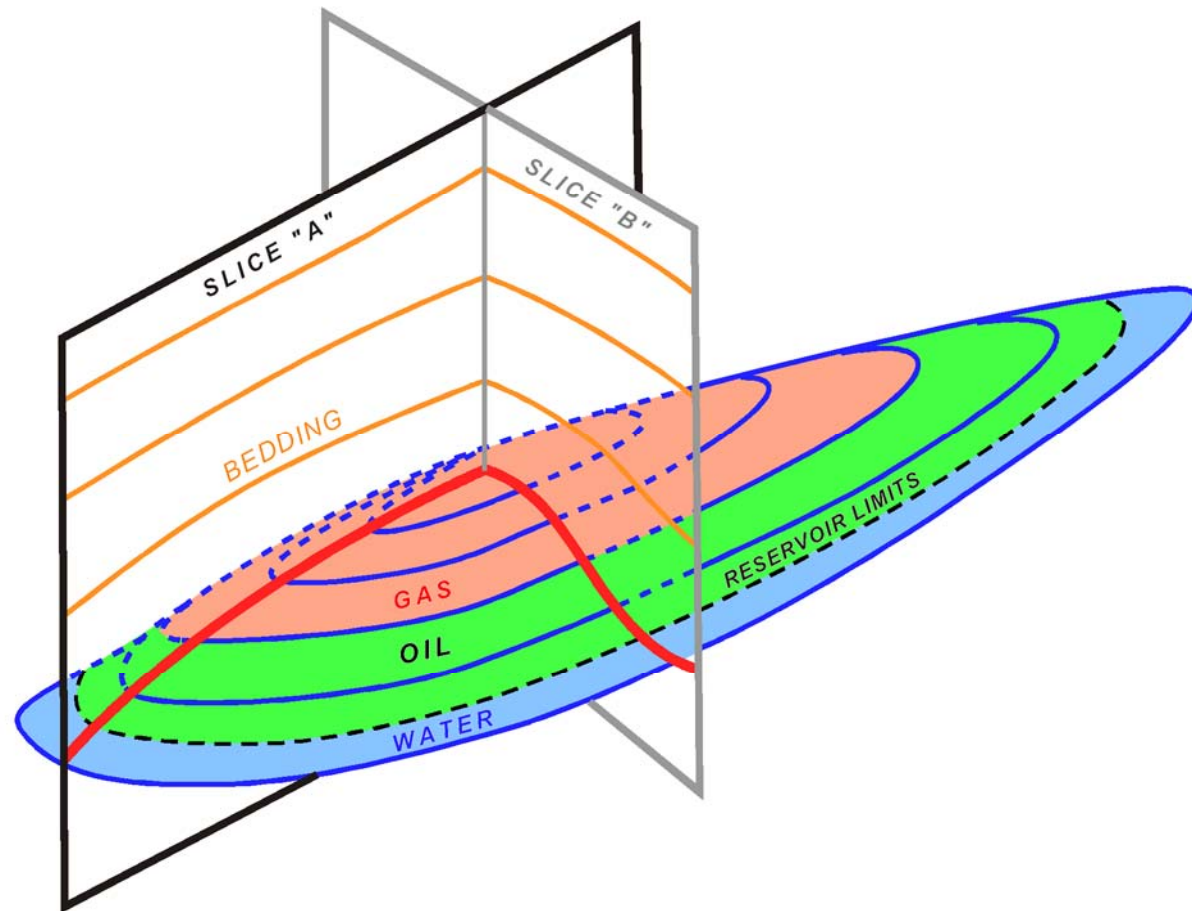


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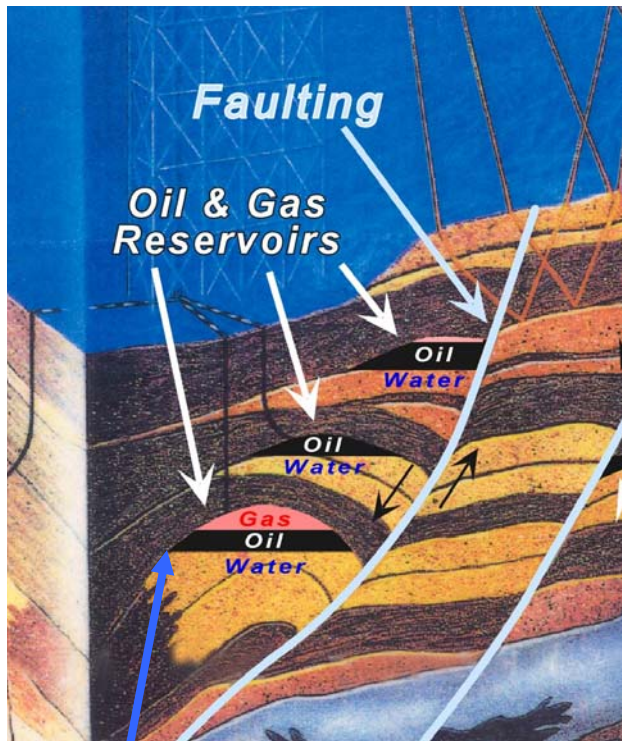


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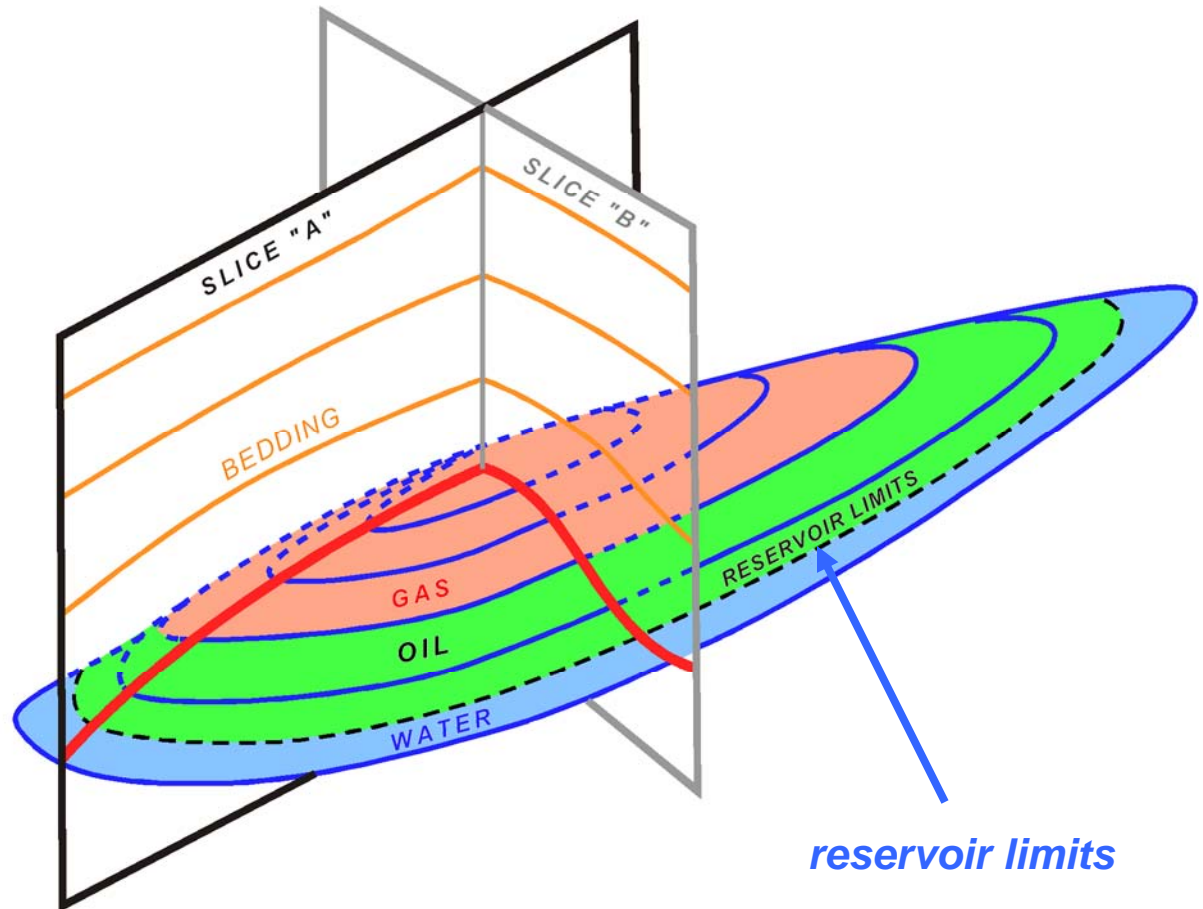
RESERVOIR LIMITS



“The Zone & the Box” RESERVOIR LIMITS

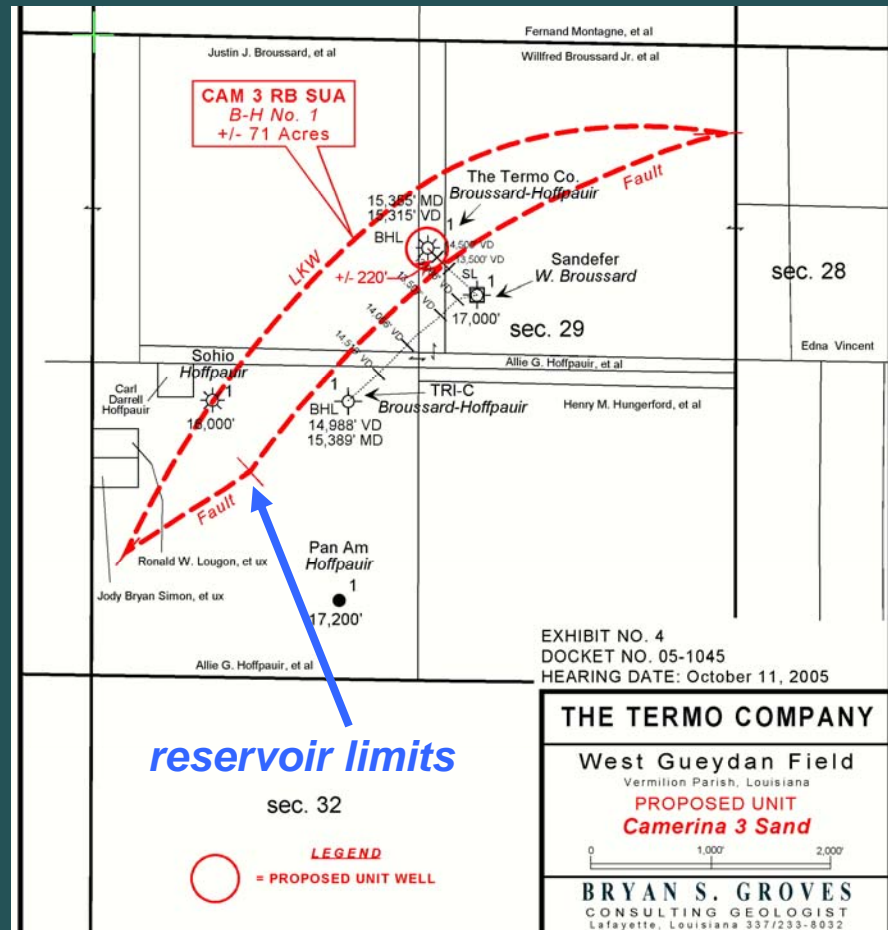


reservoir limits



reservoir limits

“The Zone & the Box” RESERVOIR LIMITS



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Types of Units



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TYPES OF UNITS

- Voluntary: geographic per agreement
- Declared: per lease provisions
- Conservation: geologic or geographic per State

“The Zone & the Box”

TYPES OF UNITS

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PRE-DRILL

Unitization Process



“The Zone & the Box”
UNITIZATION PROCESS, LDNR
(Rules of Procedure)

- Pre-Application Conference **Notice Letter**
- Pre-Application **Conference** (informal meeting to discuss proposed unit plans)
- **Application Letter** (docketed for hearing)
- **Hearing** (in Baton Rouge, LA)
- **Unit Order** signed by Commissioner of Conservation

“The Zone & the Box”
UNITIZATION PROCESS, LDNR

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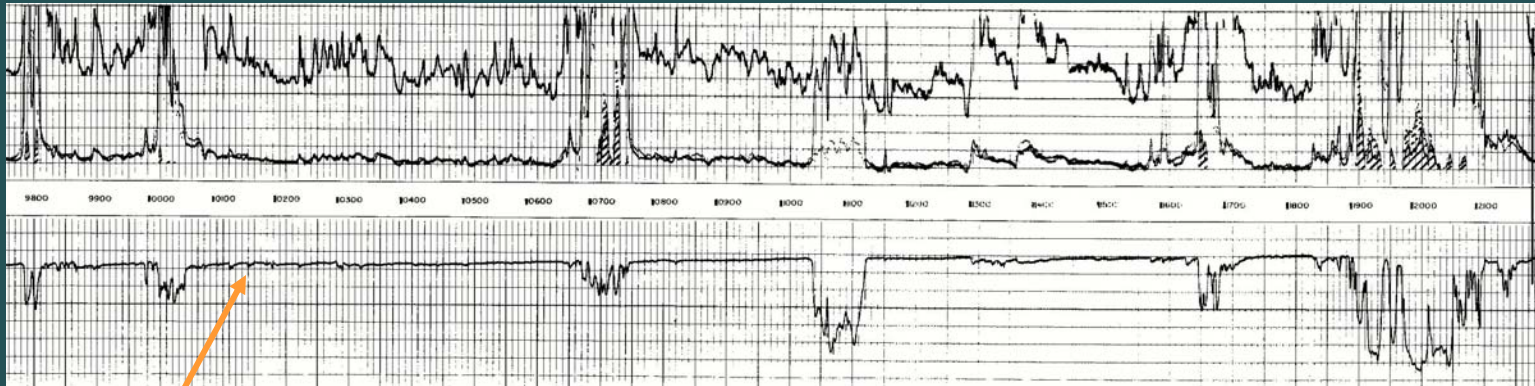
ENTIRE PROCESS TAKES APPROXIMATELY 90-120 DAYS

Logs



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ELECTRIC LOGS 101



SP CURVE
exhibits sand & shale

Sand
SP CURVE ↓

Shale
SP CURVE ↑

Types of Interval Definitions



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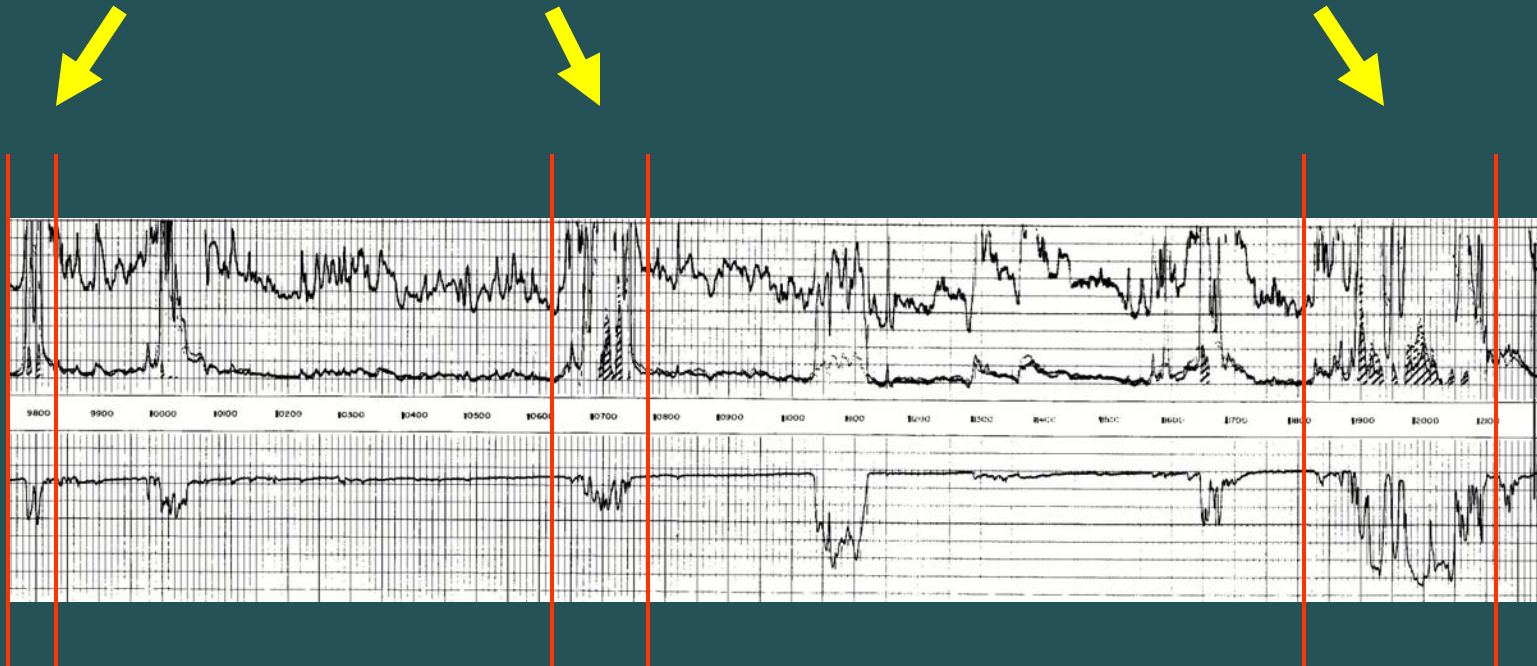
UNITIZATION, INTERVAL DEFINITION TYPES

- Sand definition: includes one sand body
- Zone definition: includes more than one sand body

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UNITIZATION, INTERVAL DEFINITION TYPES

Sand definition: includes one sand body



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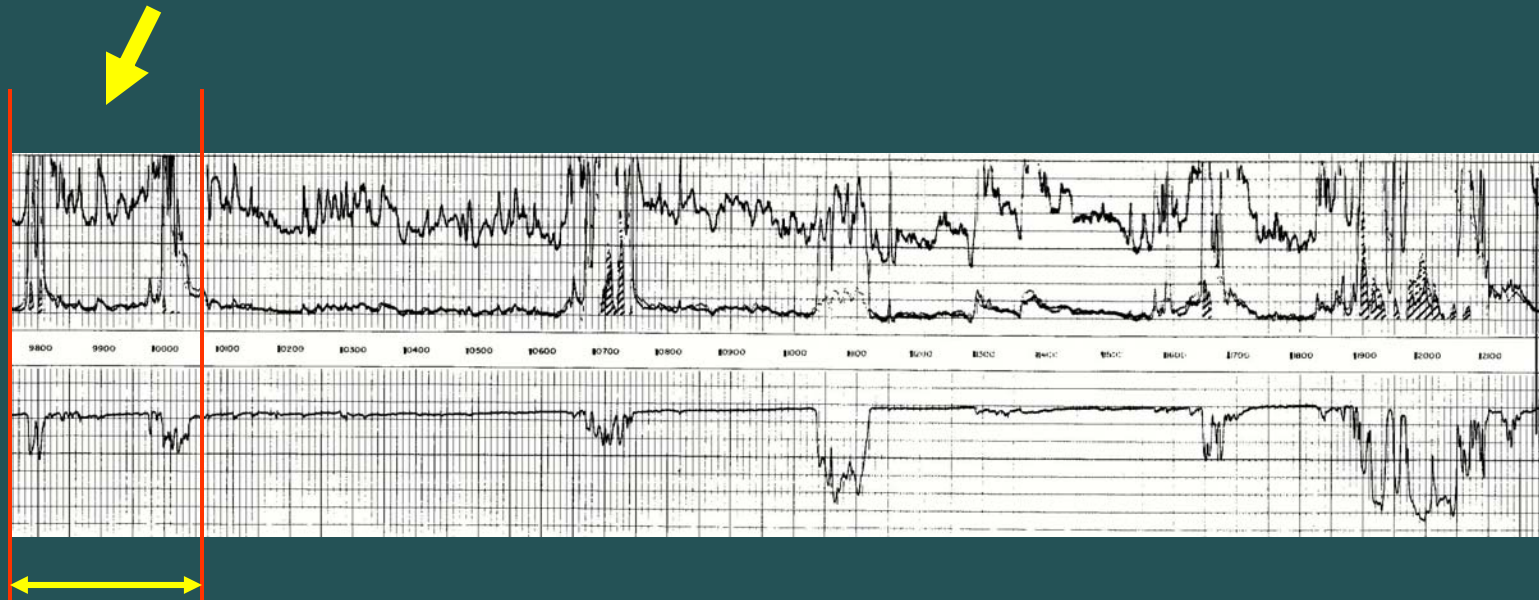
UNITIZATION, INTERVAL DEFINITION TYPES

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UNITIZATION, INTERVAL DEFINITION TYPES

Zone definition: includes more than one sand body

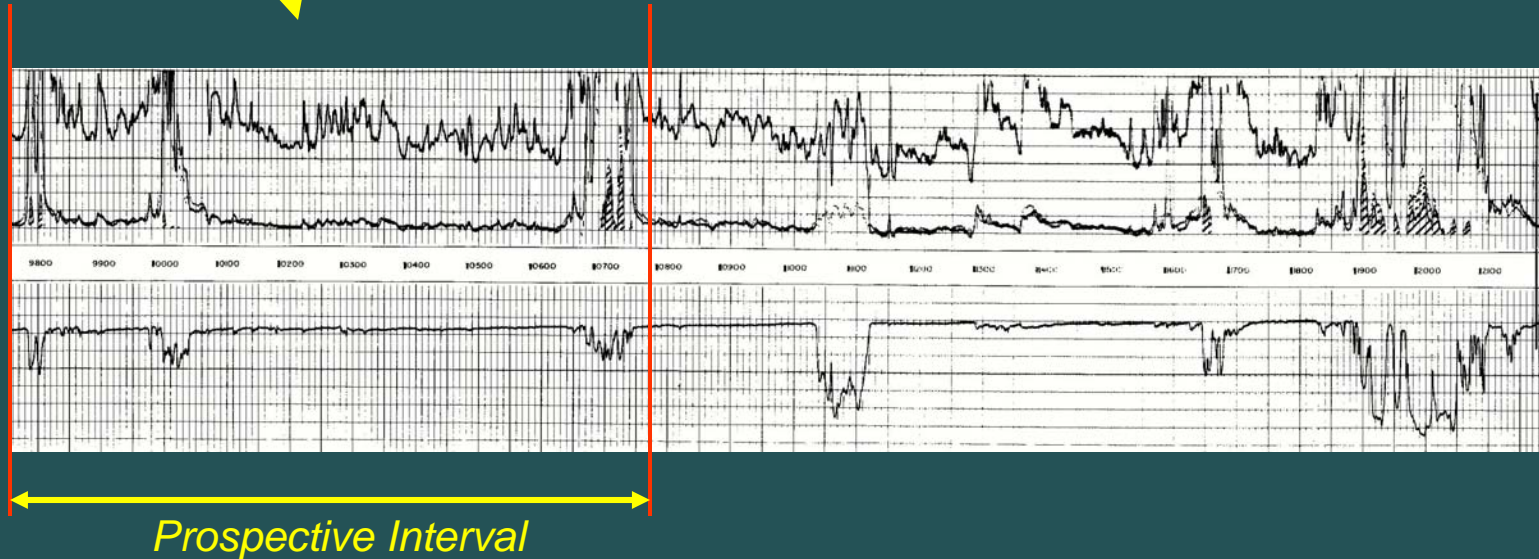


Prospective Interval

“The Zone & the Box”

UNITIZATION, INTERVAL DEFINITION TYPES

Zone definition: includes more than one sand body



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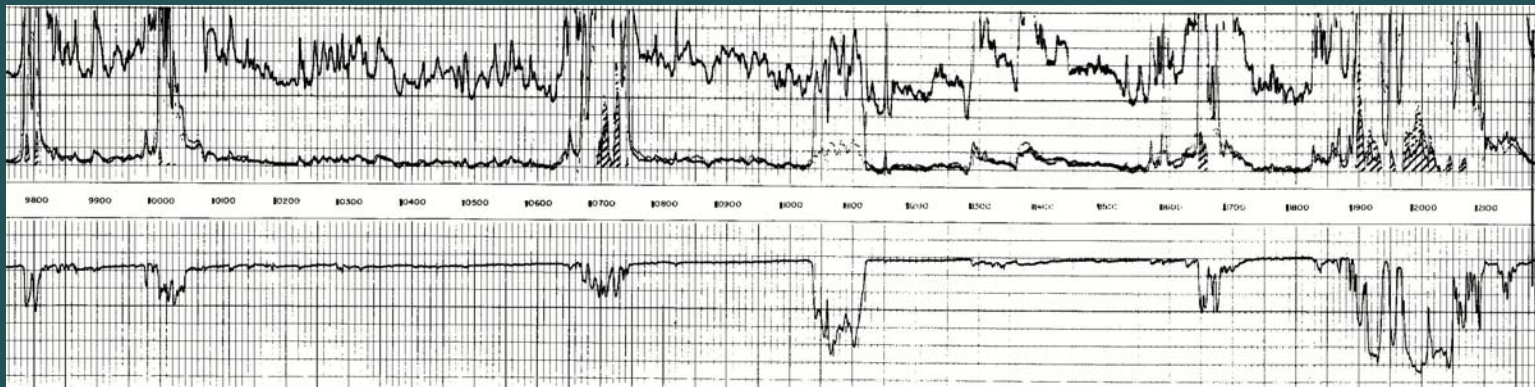
UNITIZATION, INTERVAL DEFINITION TYPES

Zone definition: includes more than one sand body



Prospective Interval

“The Zone & the Box”
UNITIZATION, ZONE DEFINITION
SAMPLE CASE

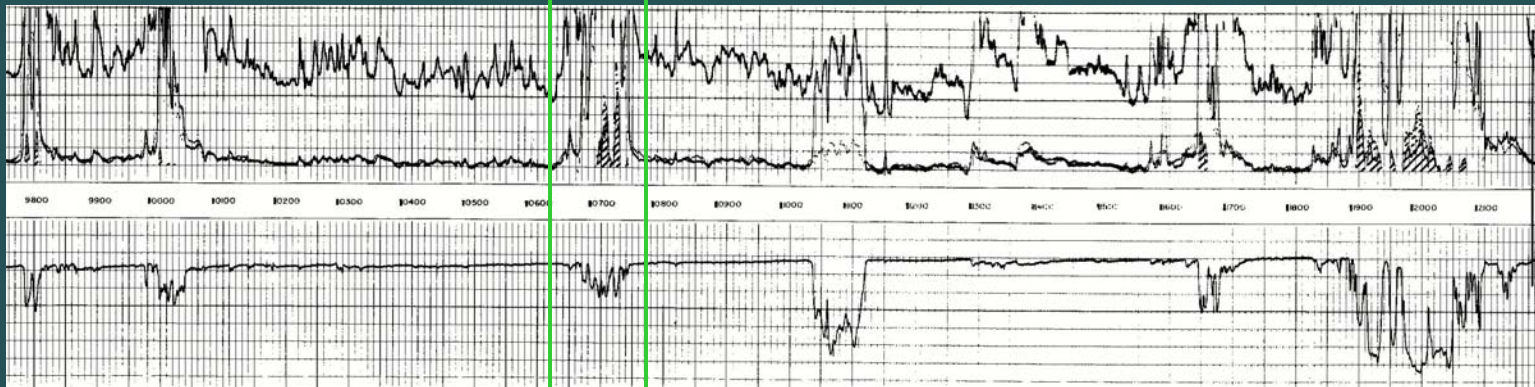


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UNITIZATION, ZONE DEFINITION

SAMPLE CASE

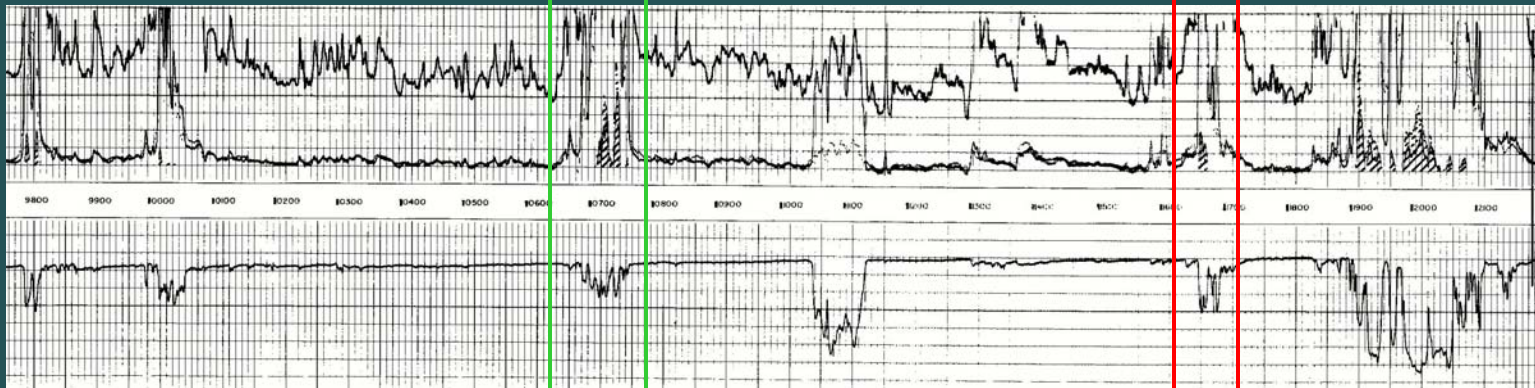
shallow



“The Zone & the Box”
UNITIZATION, ZONE DEFINITION
SAMPLE CASE

shallow

mid



“The Zone & the Box”

UNITIZATION, ZONE DEFINITION

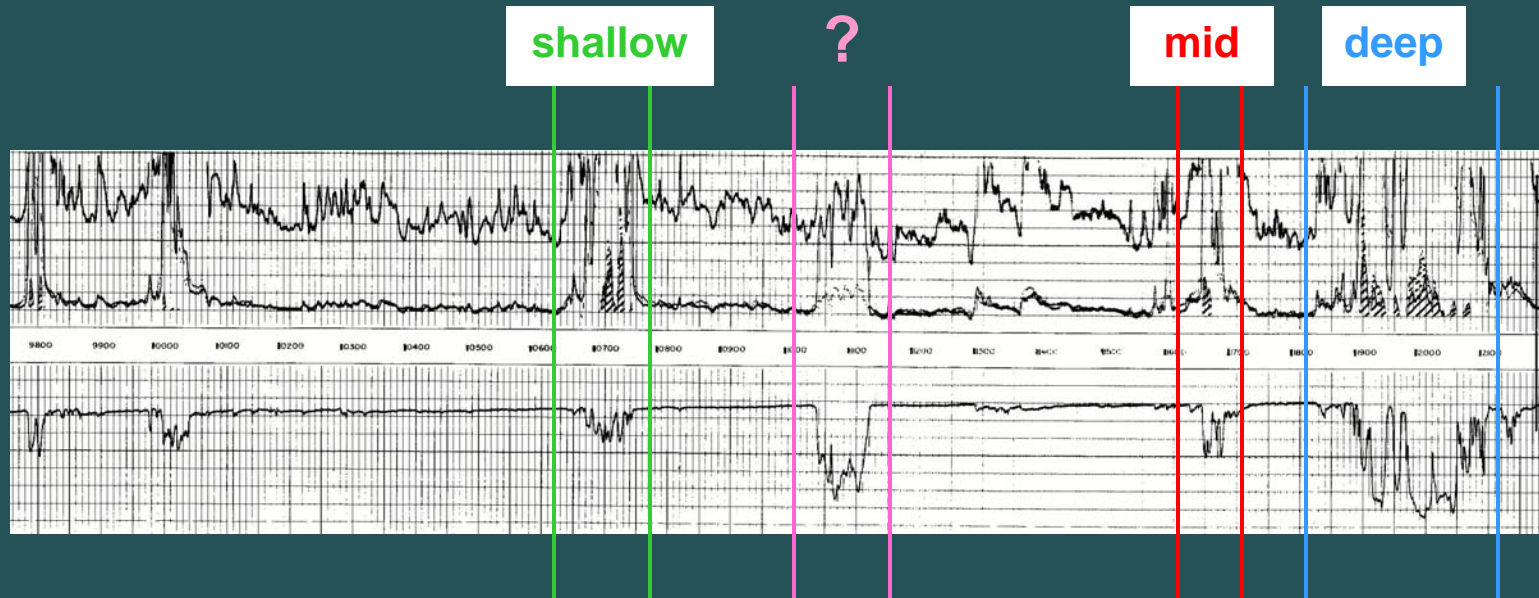
SAMPLE CASE



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UNITIZATION, ZONE DEFINITION

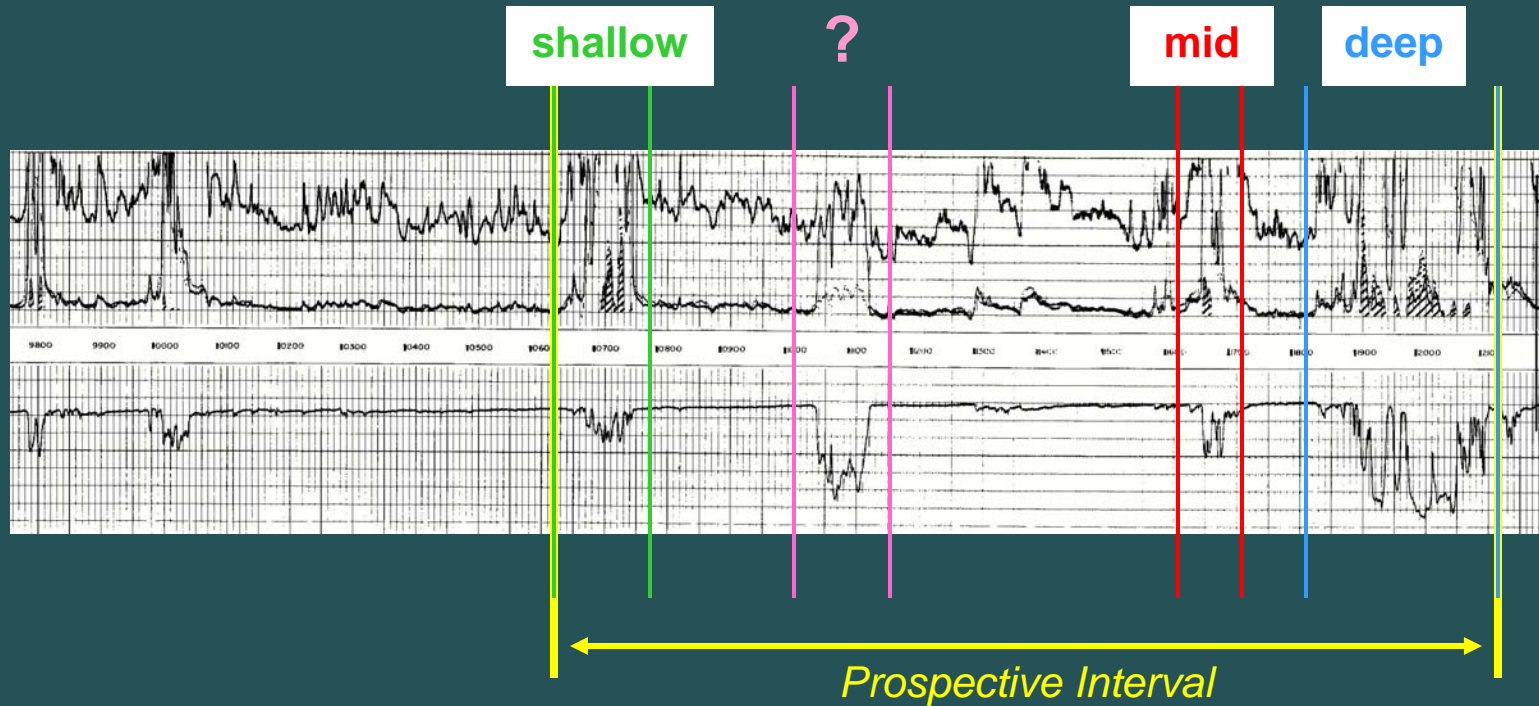
SAMPLE CASE



“The Zone & the Box”

UNITIZATION, ZONE DEFINITION

SAMPLE CASE



"The Zone & the Box"
UNITIZATION, ZONE DEFINITION
SAMPLE CASE

"THE ZONE"

1

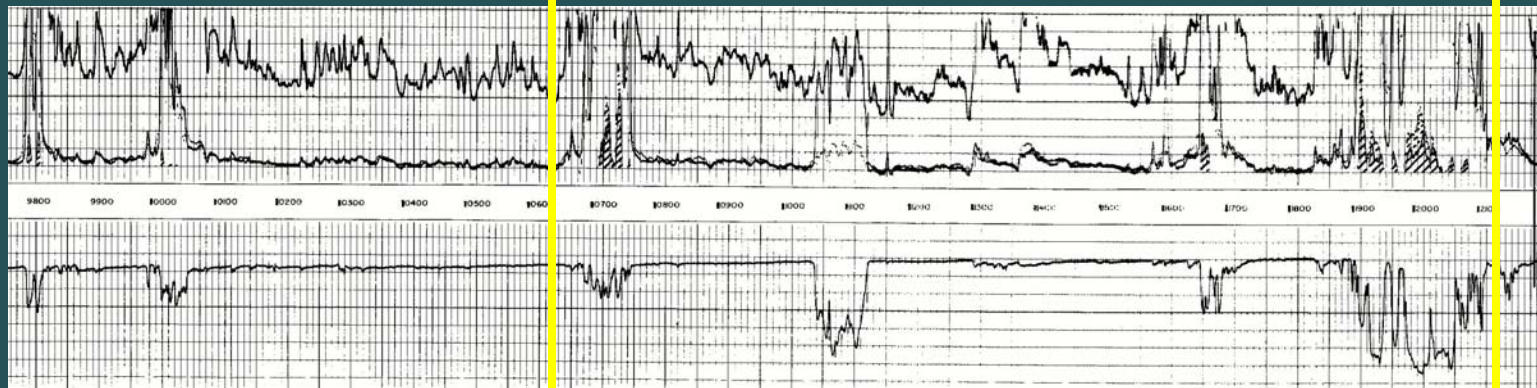
shallow

2

mid

3

deep

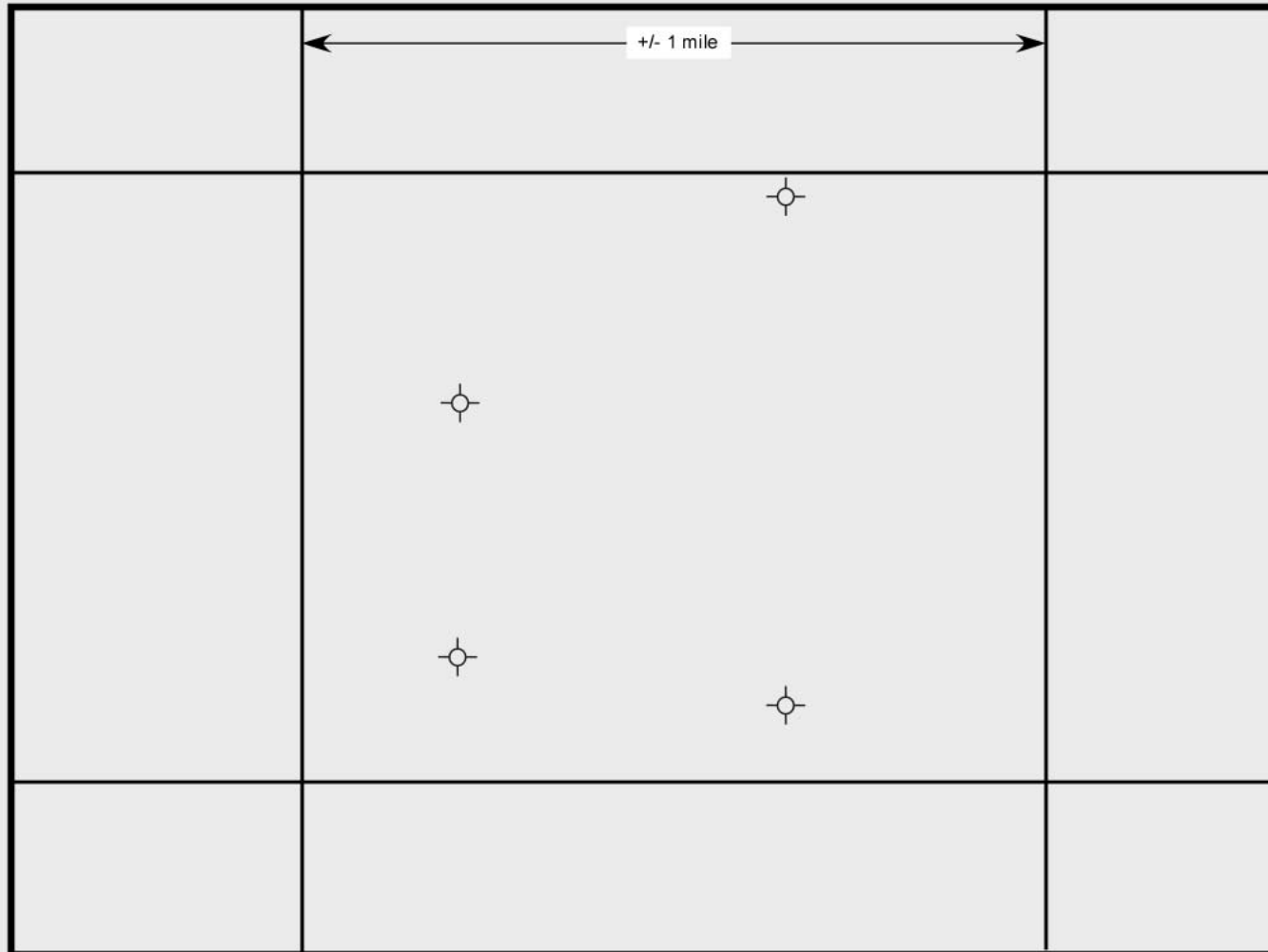


PROPOSED 1-3 Zone

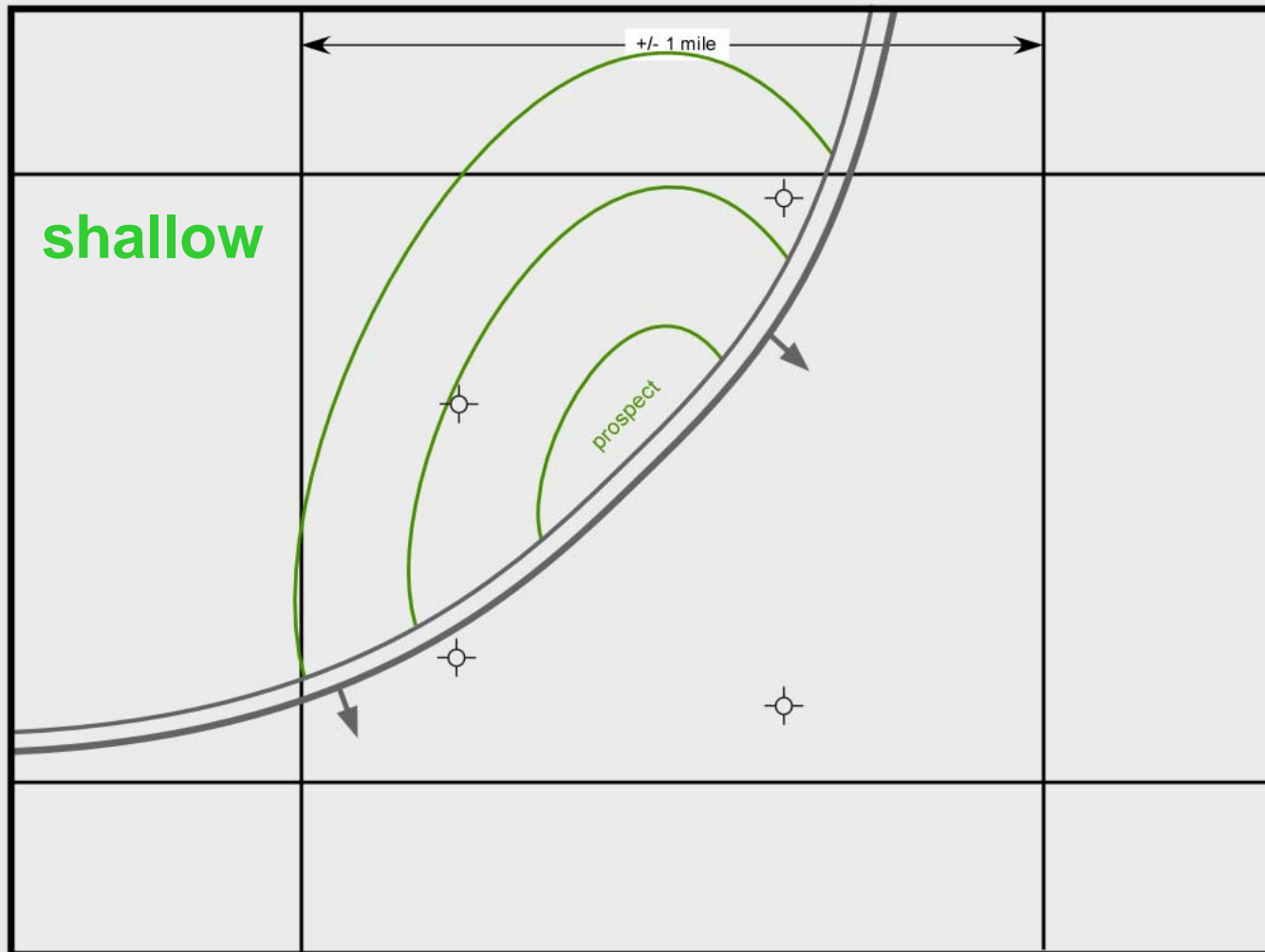
Sample case, map view



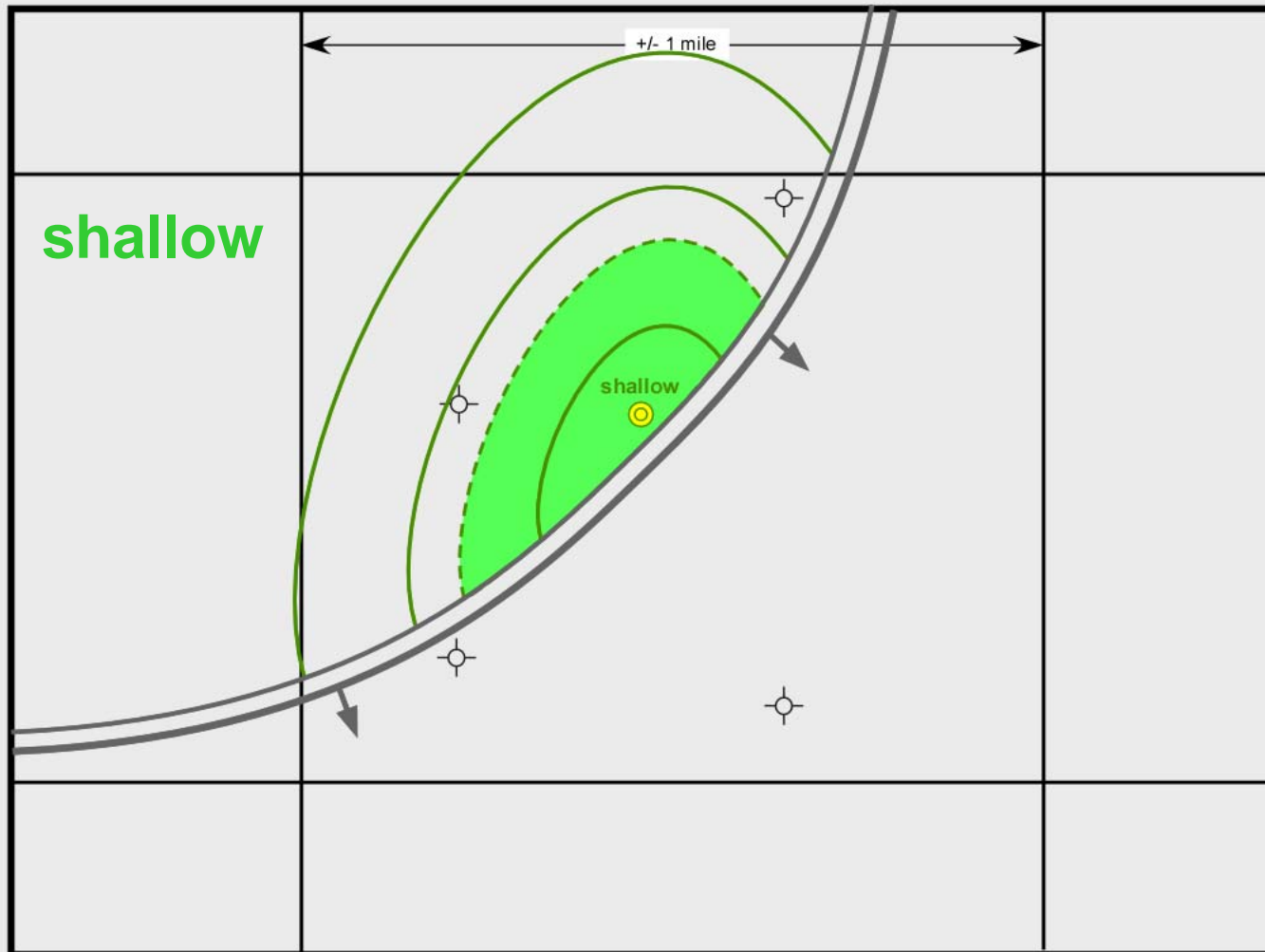
Sample Case



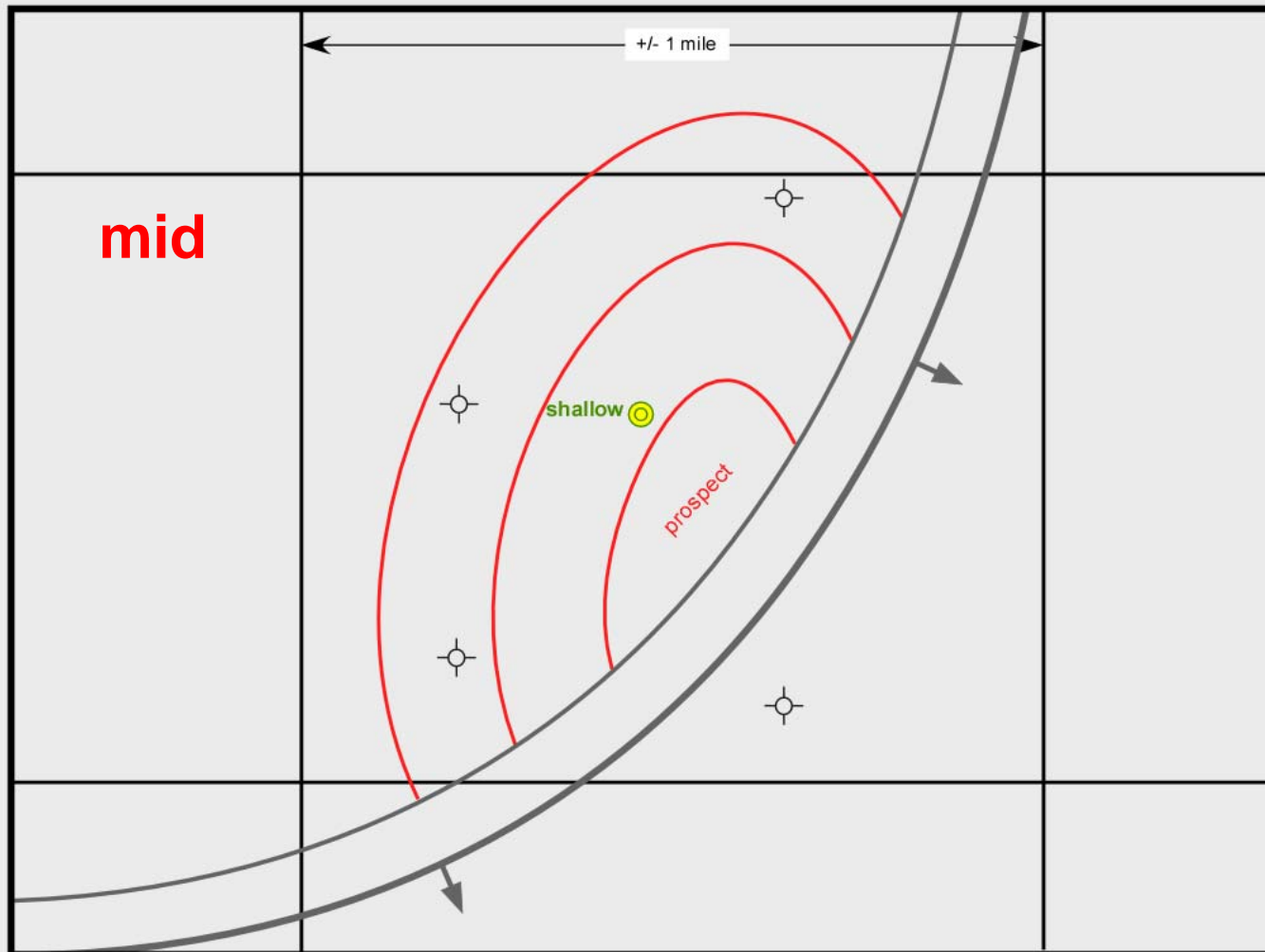
Sample Case



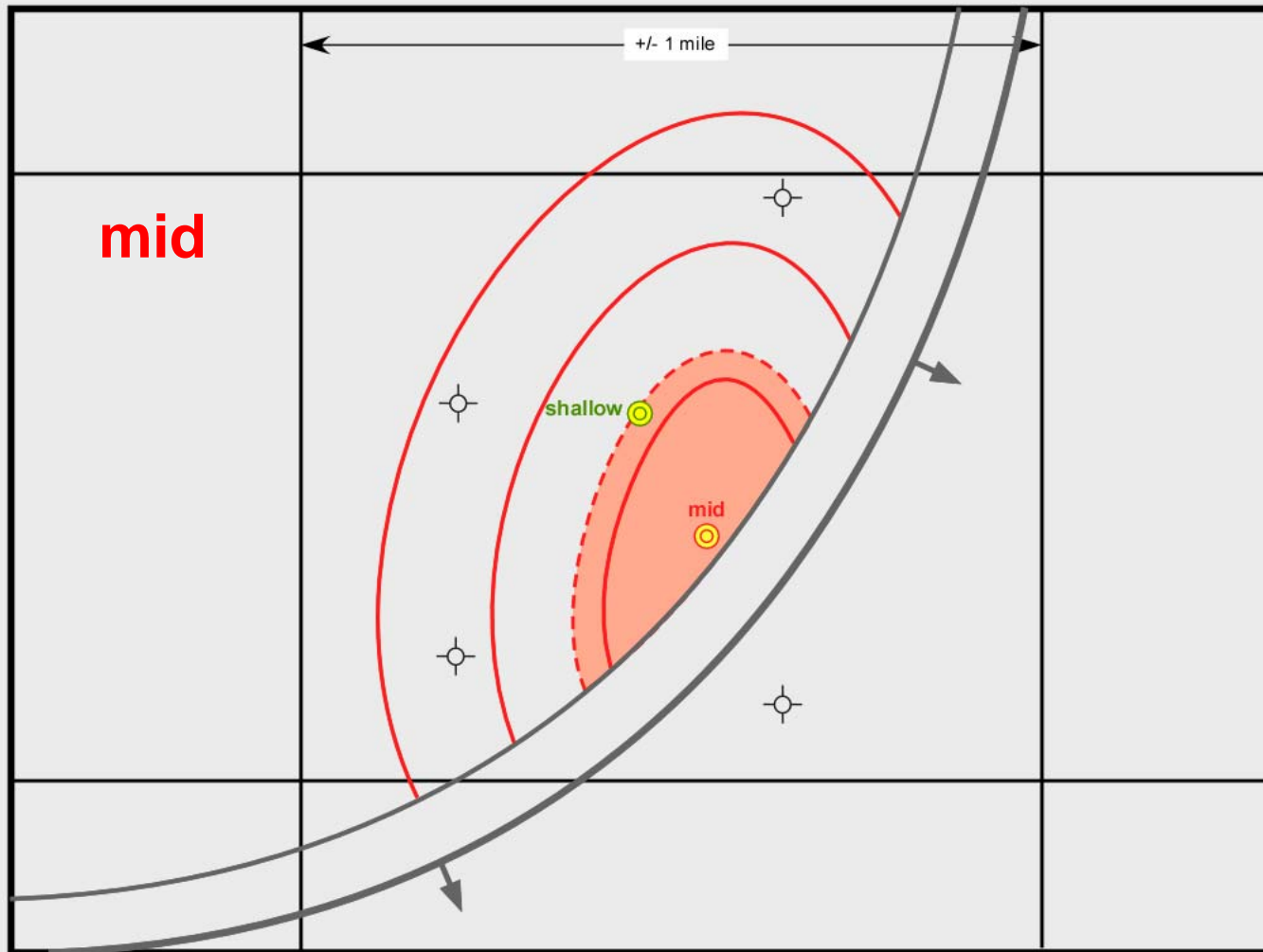
Sample Case



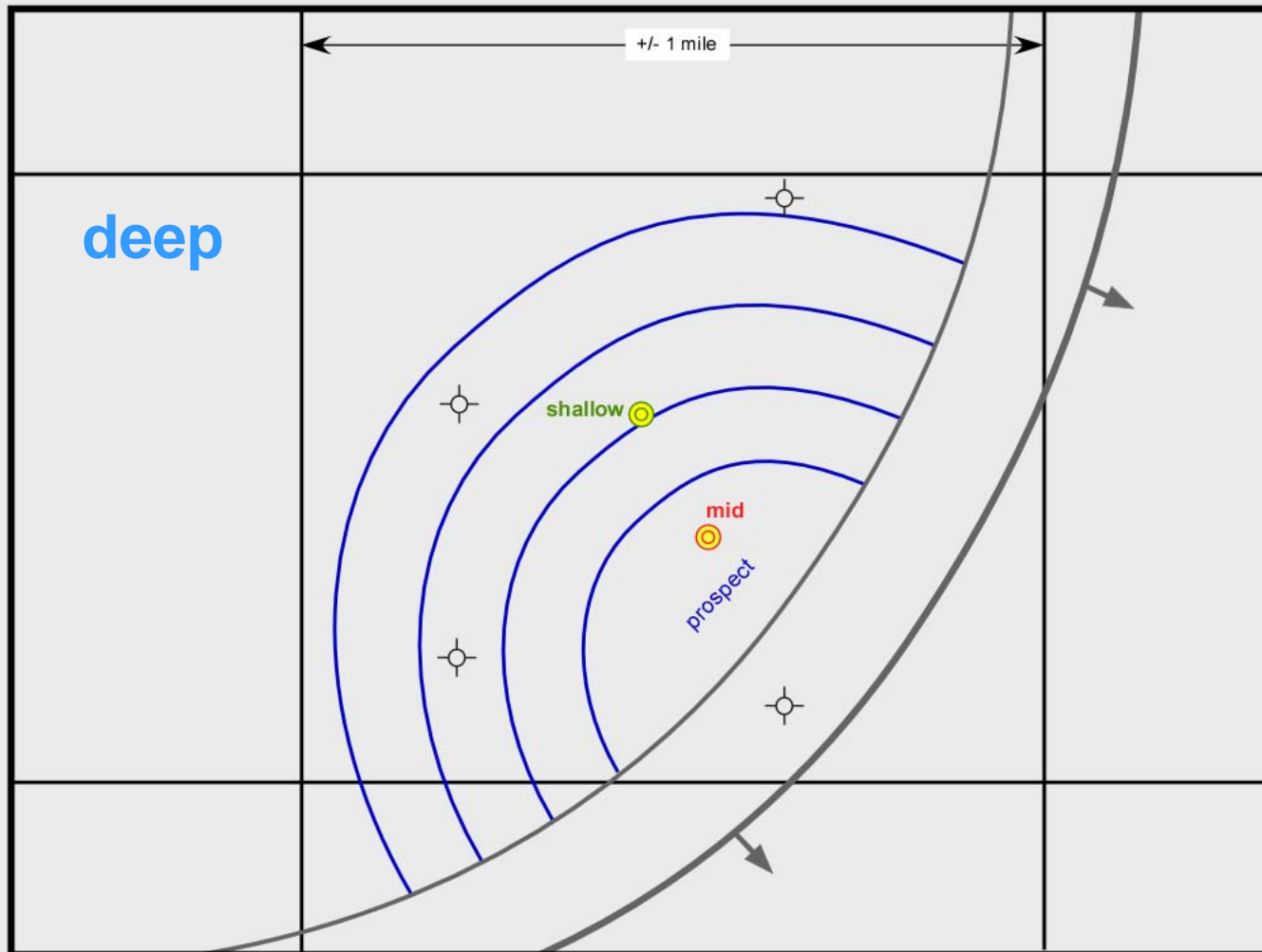
Sample Case



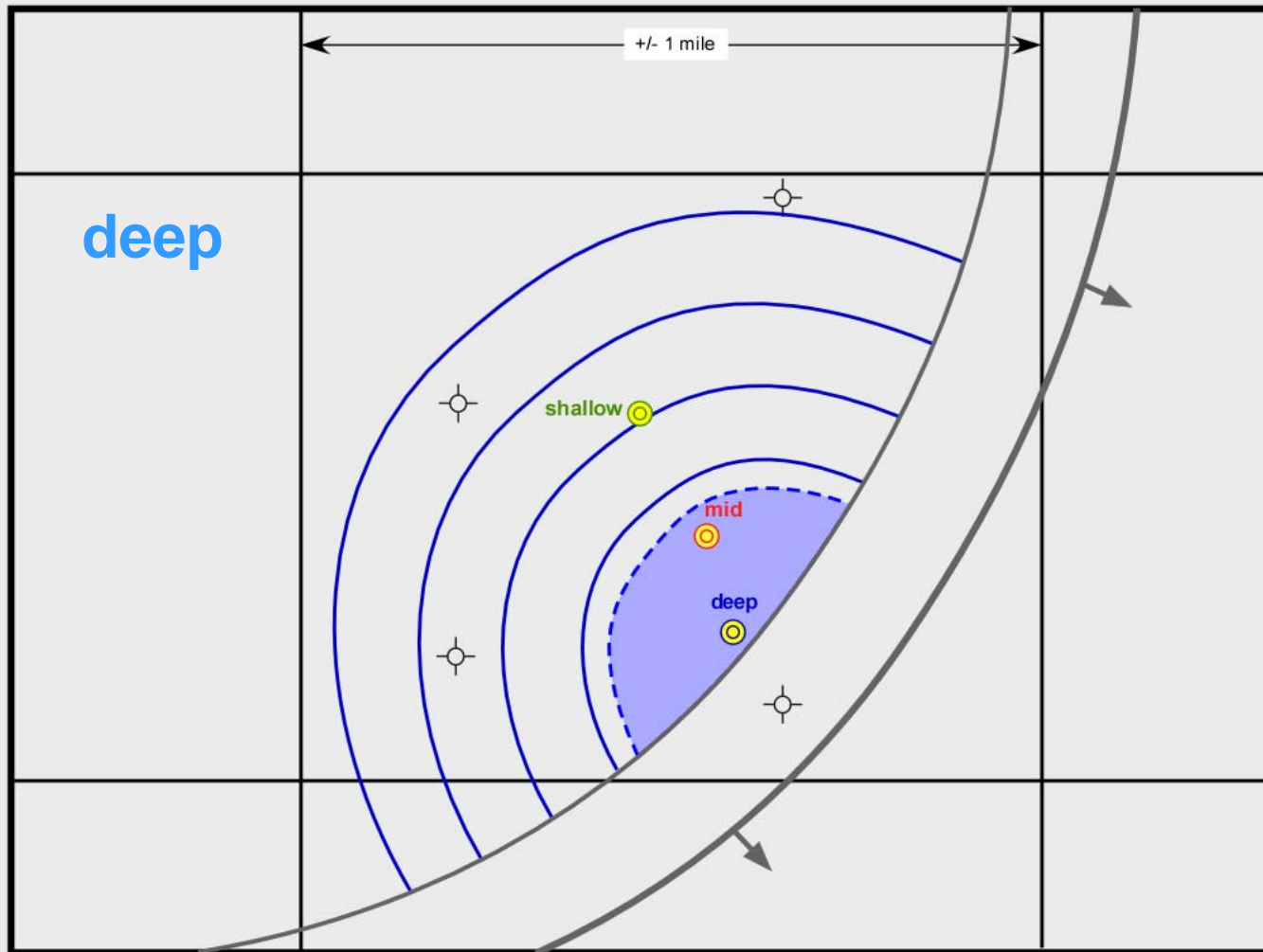
Sample Case



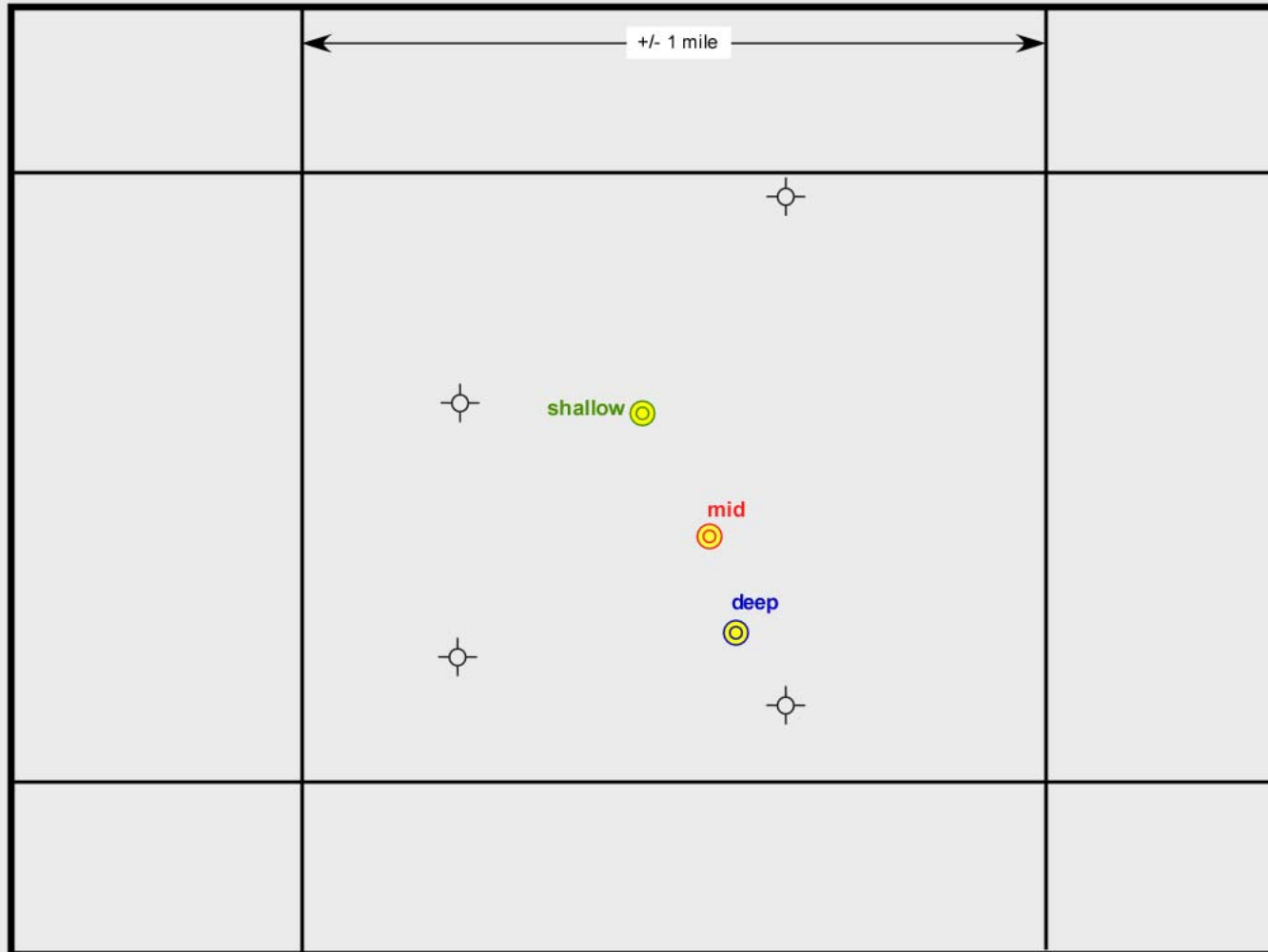
Sample Case



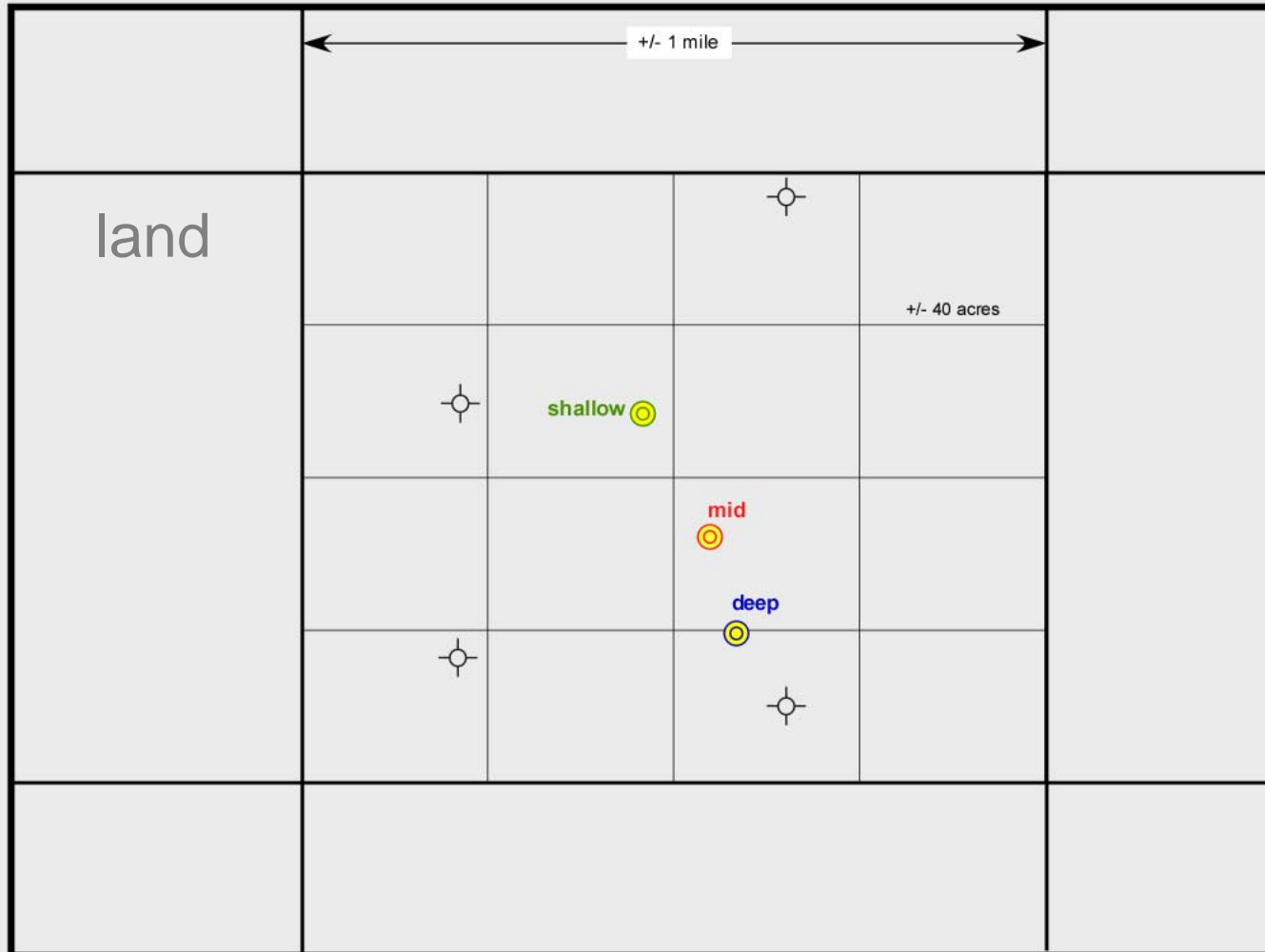
Sample Case



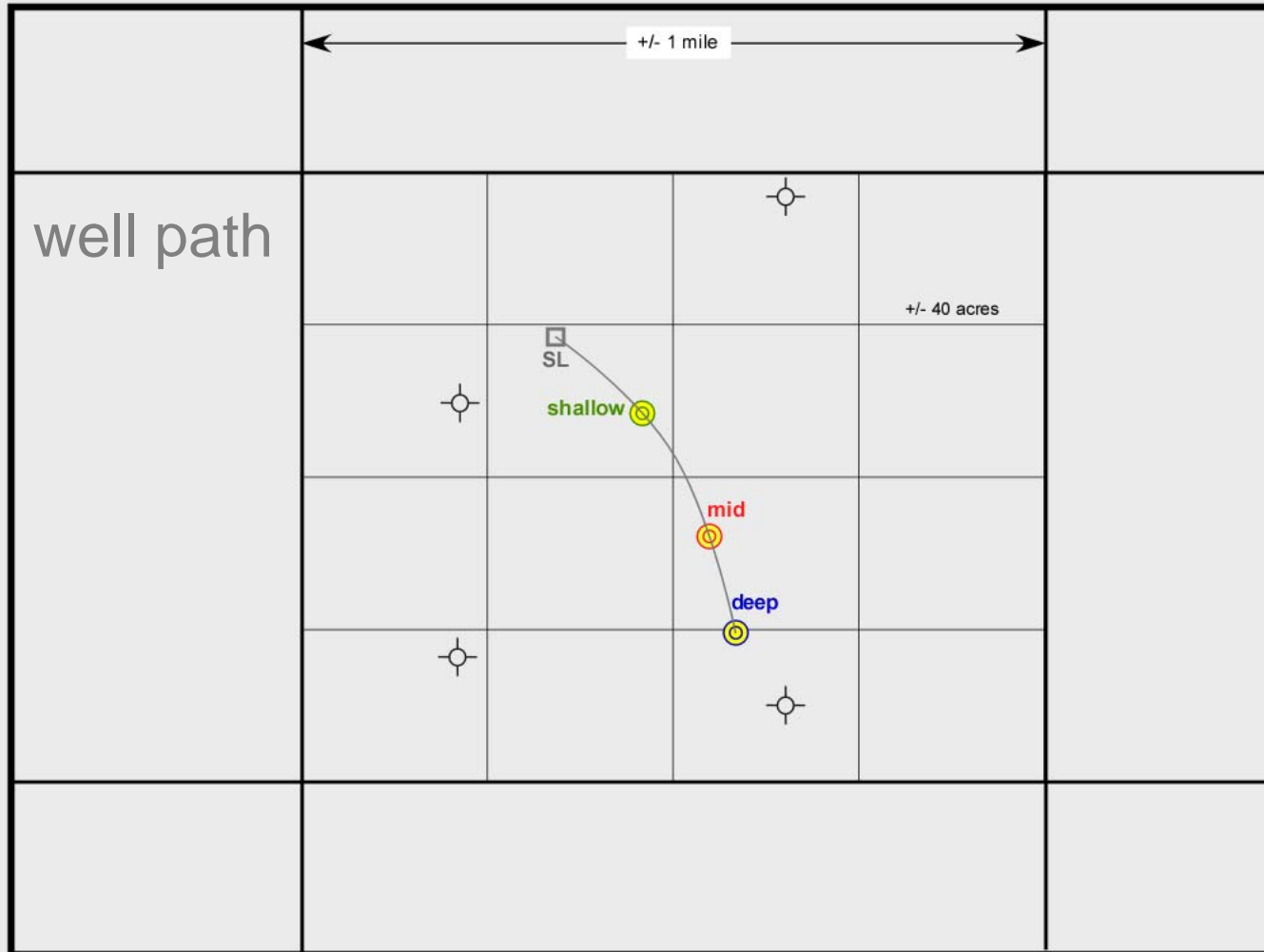
Sample Case



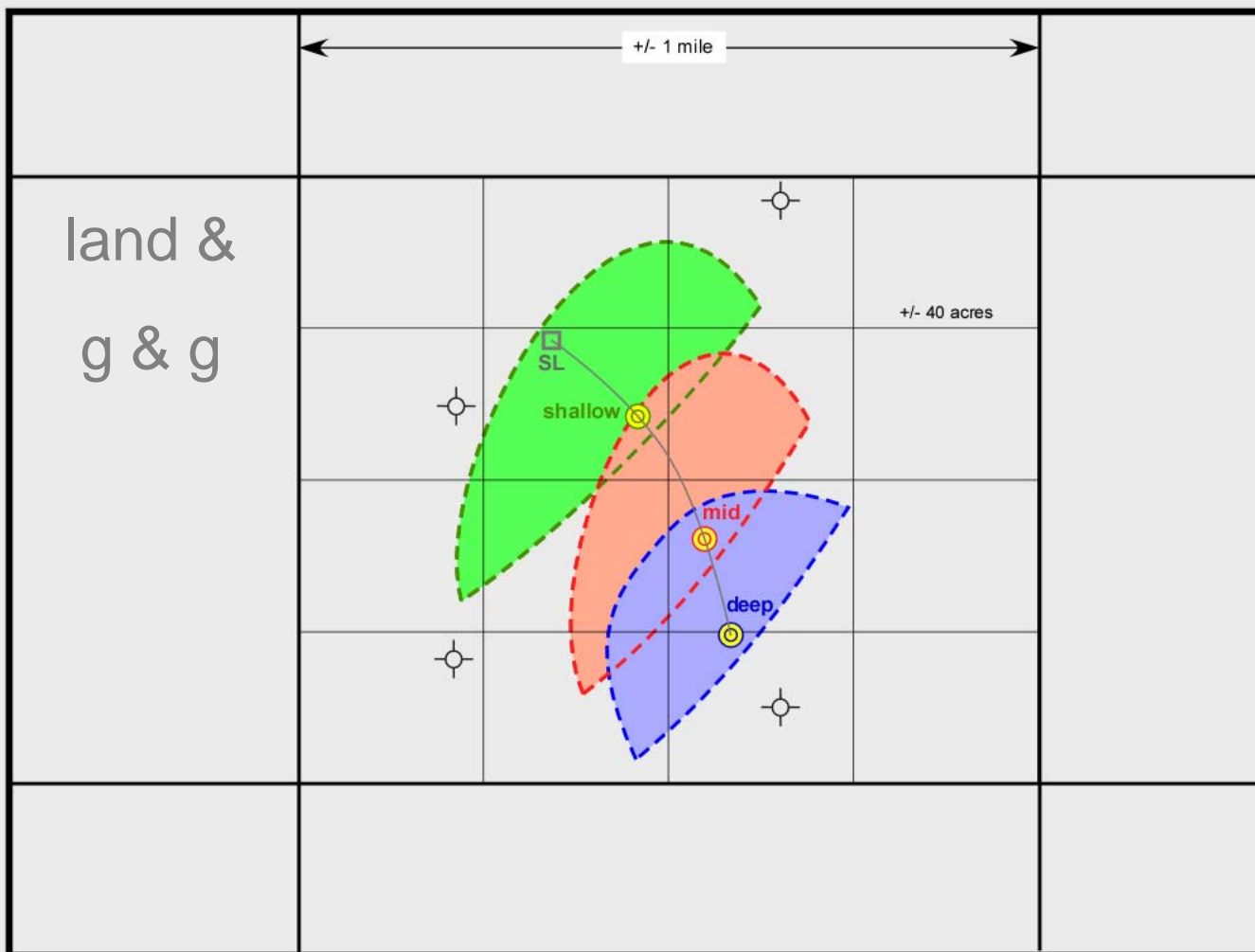
Sample Case



Sample Case



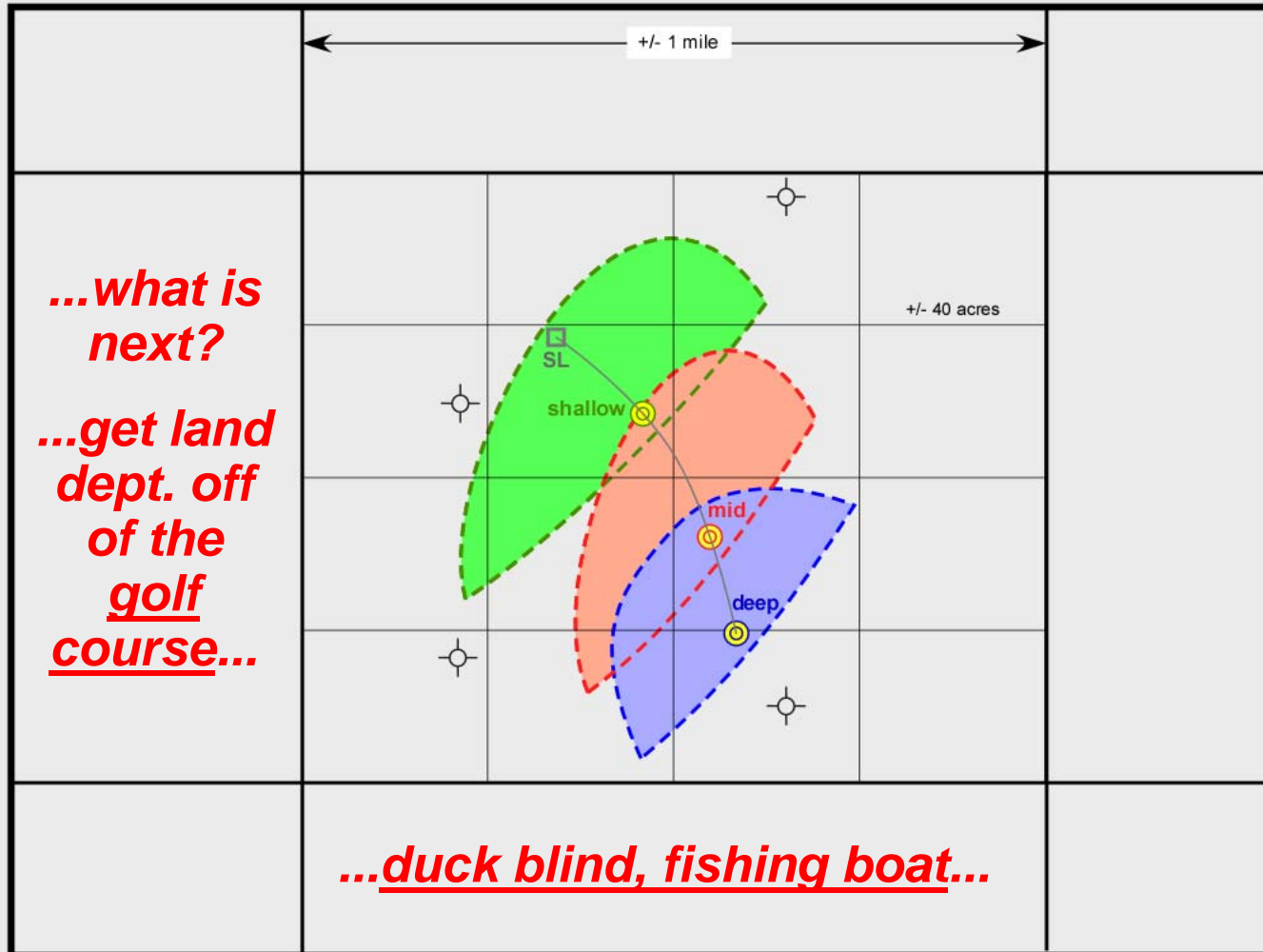
Sample Case



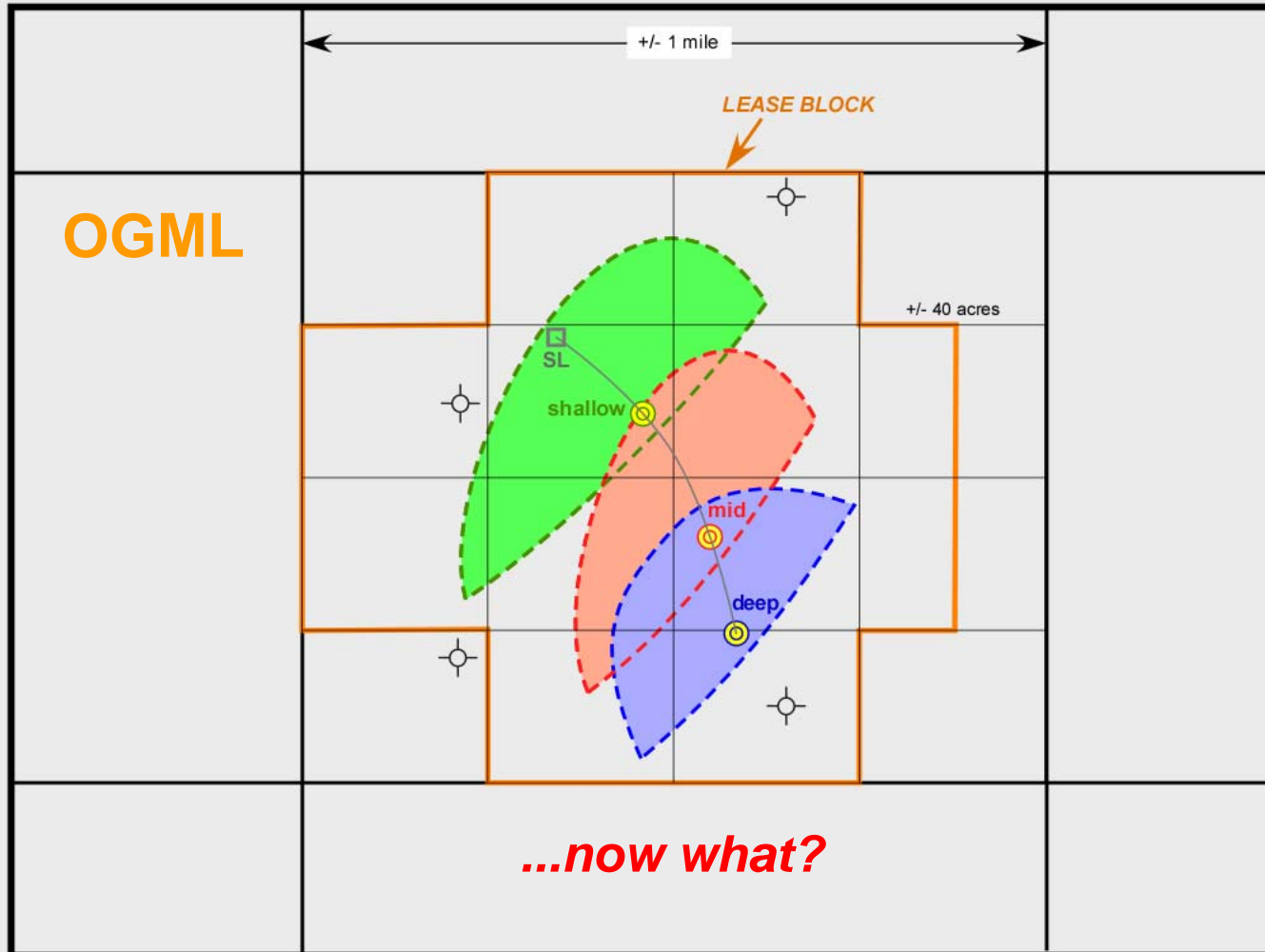
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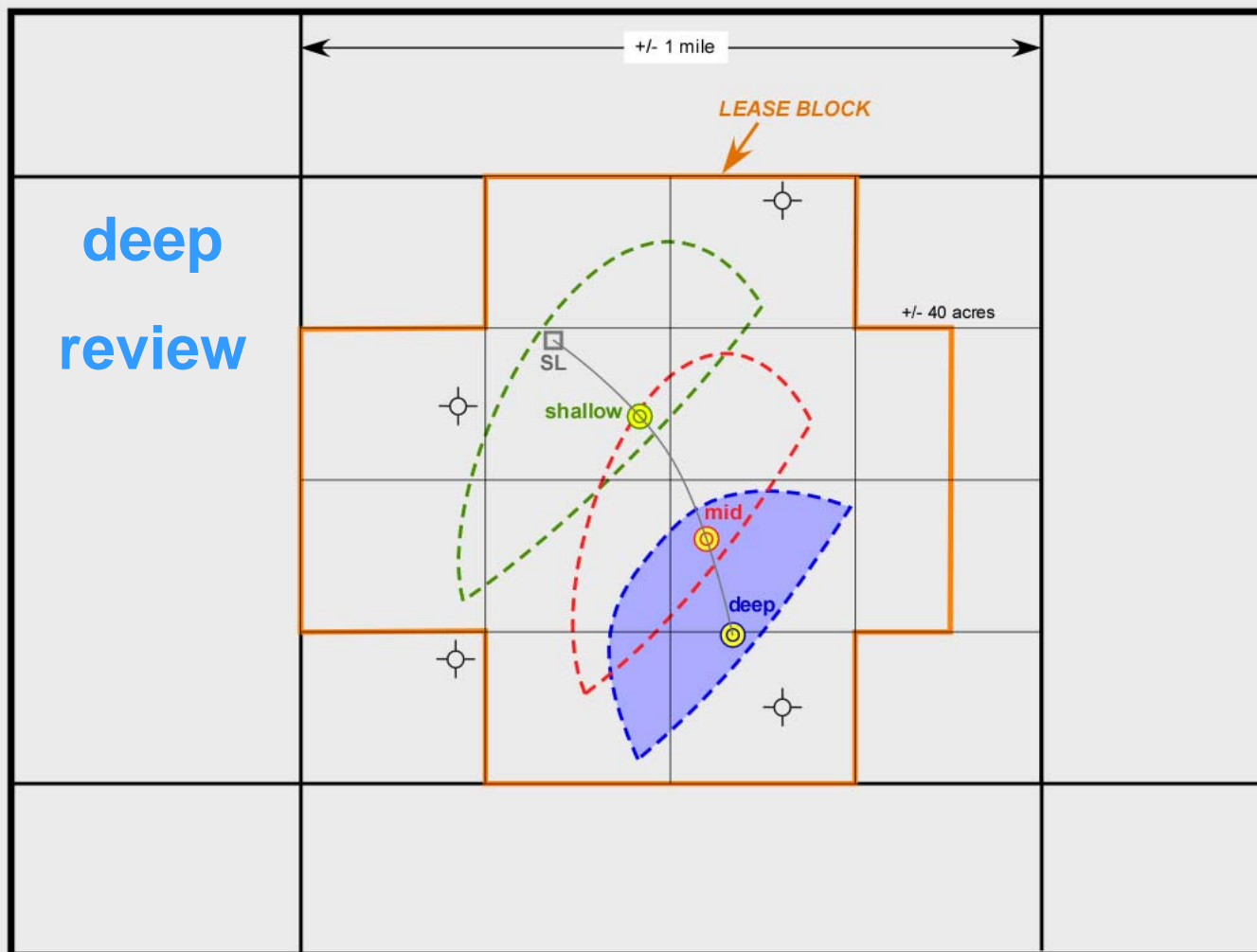
Sample Case



Sample Case



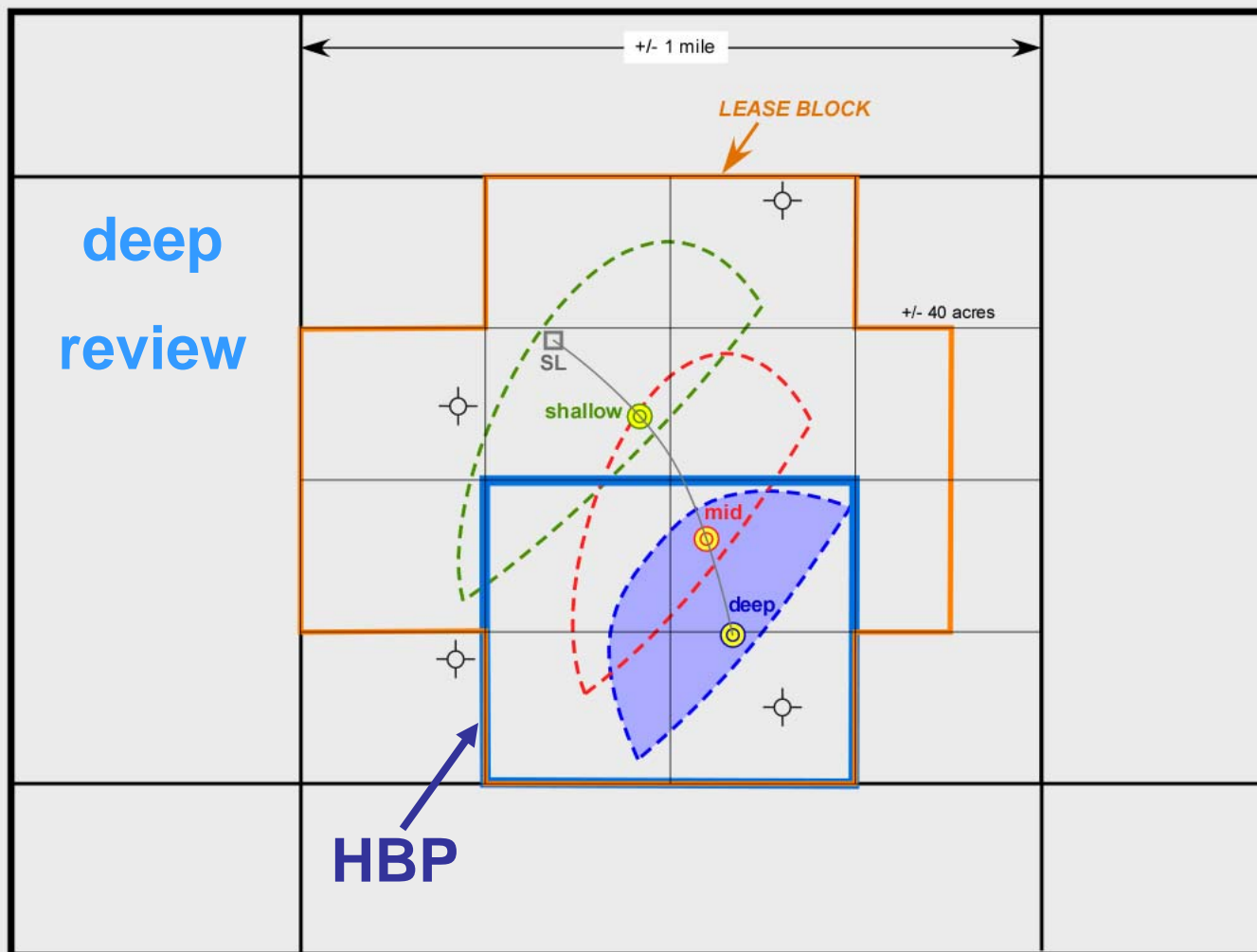
Sample Case



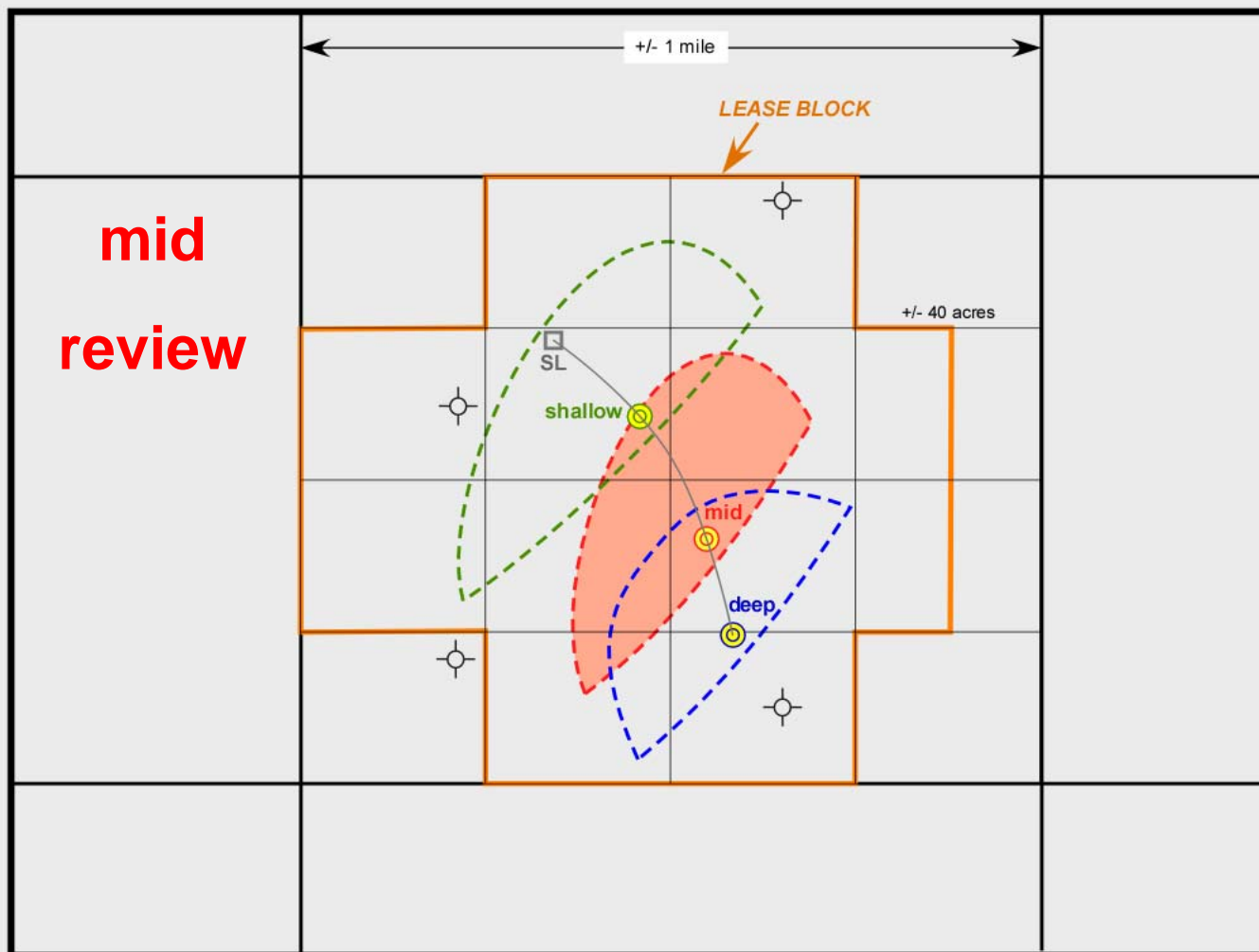
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Sample Case



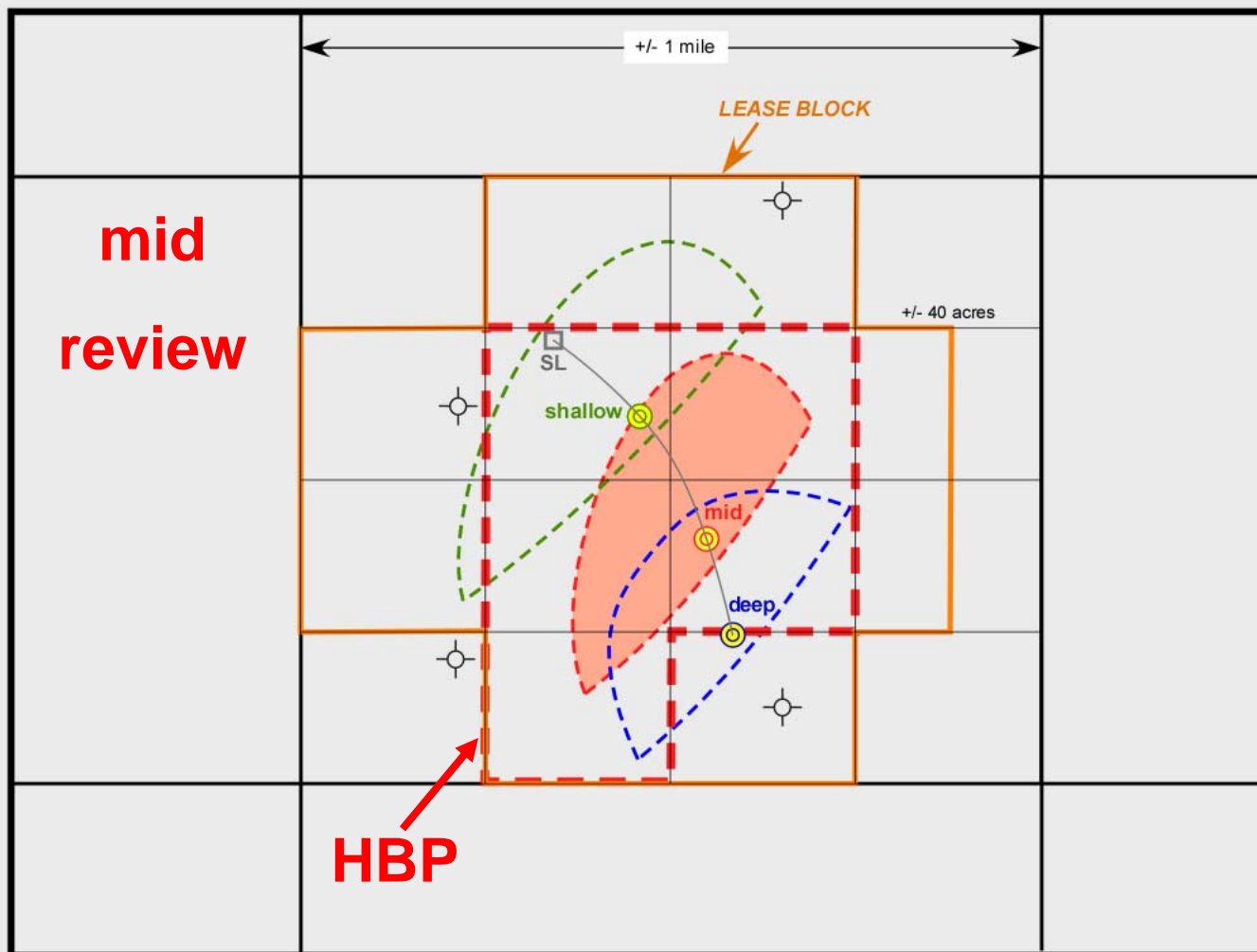
Sample Case



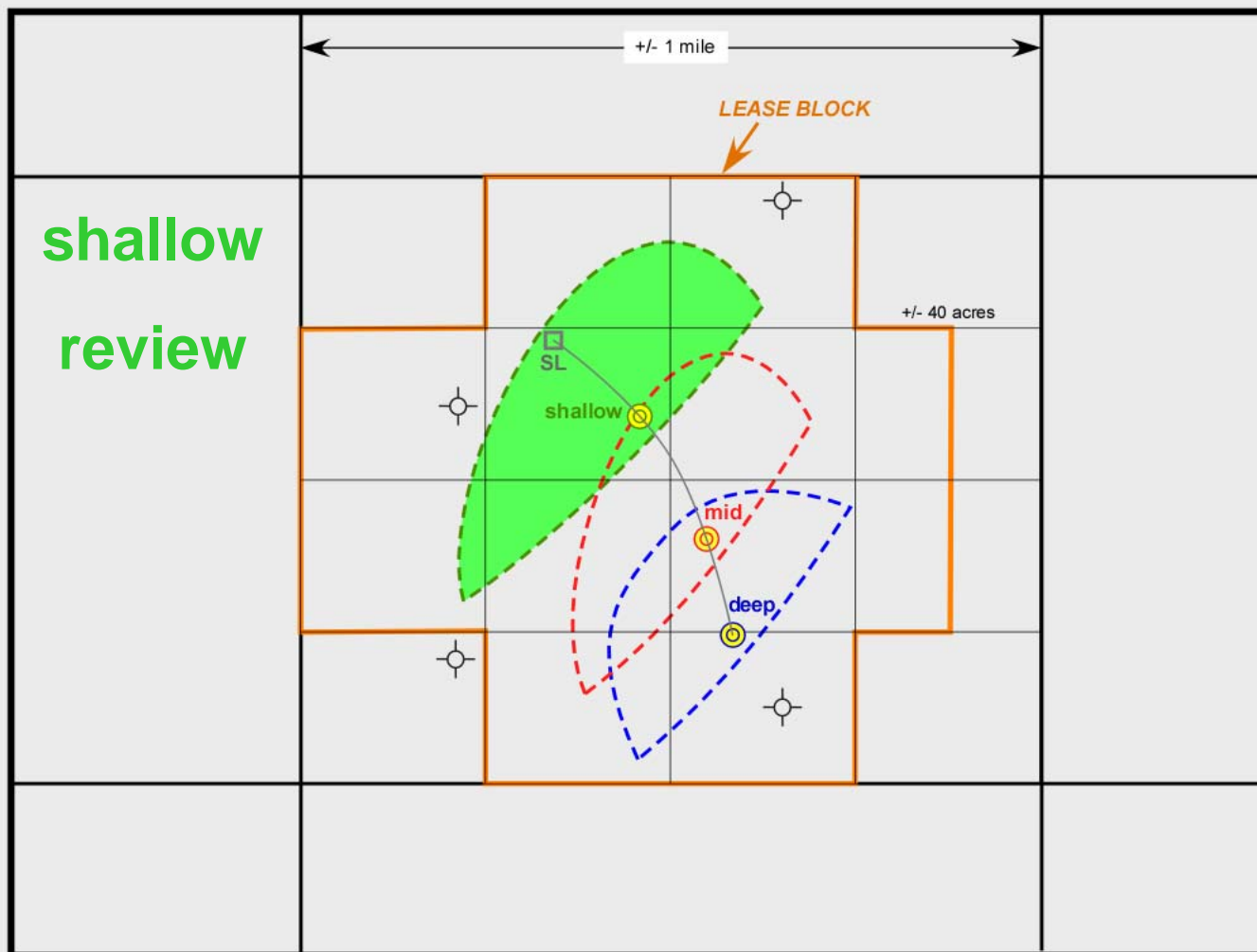
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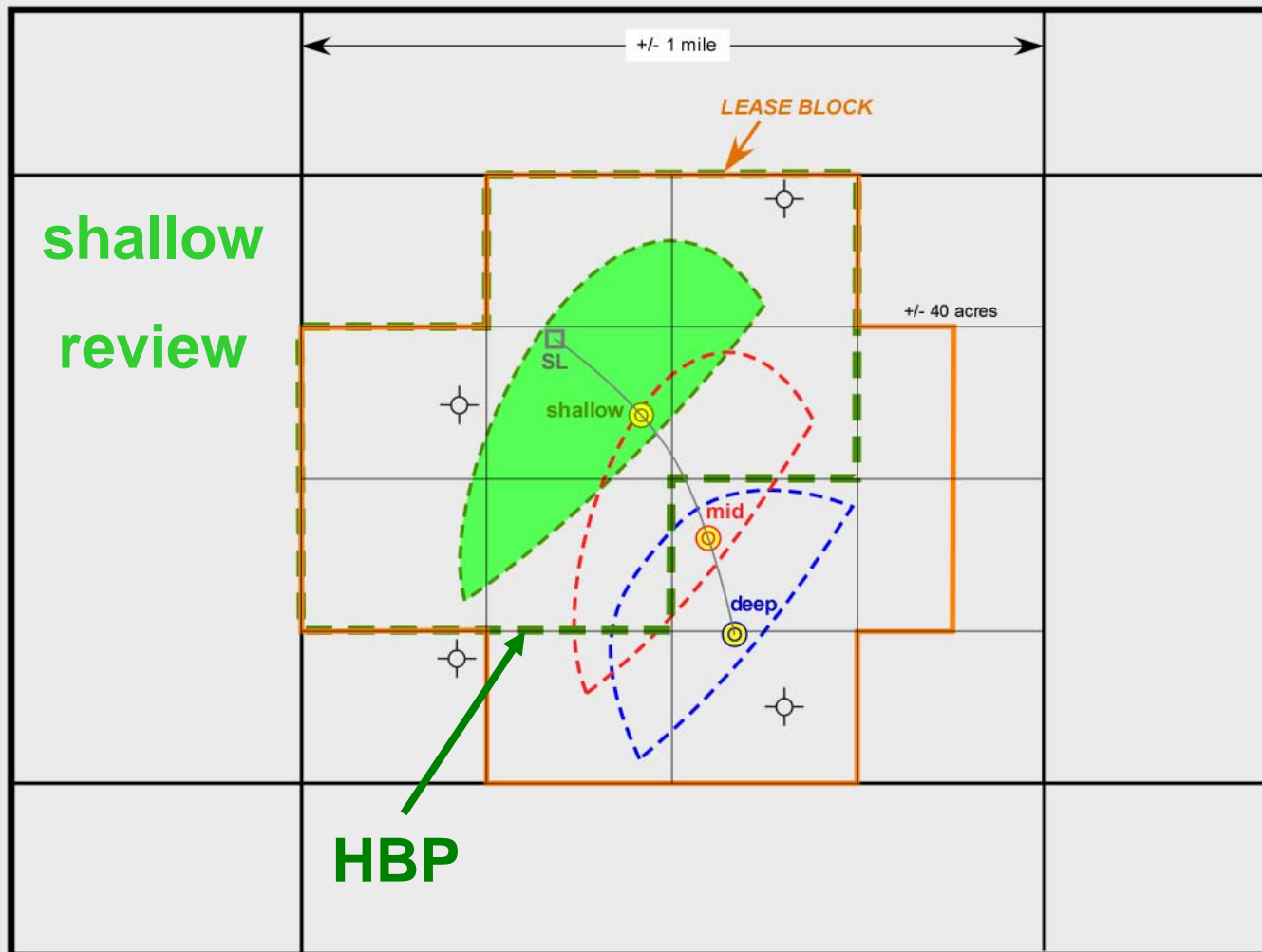
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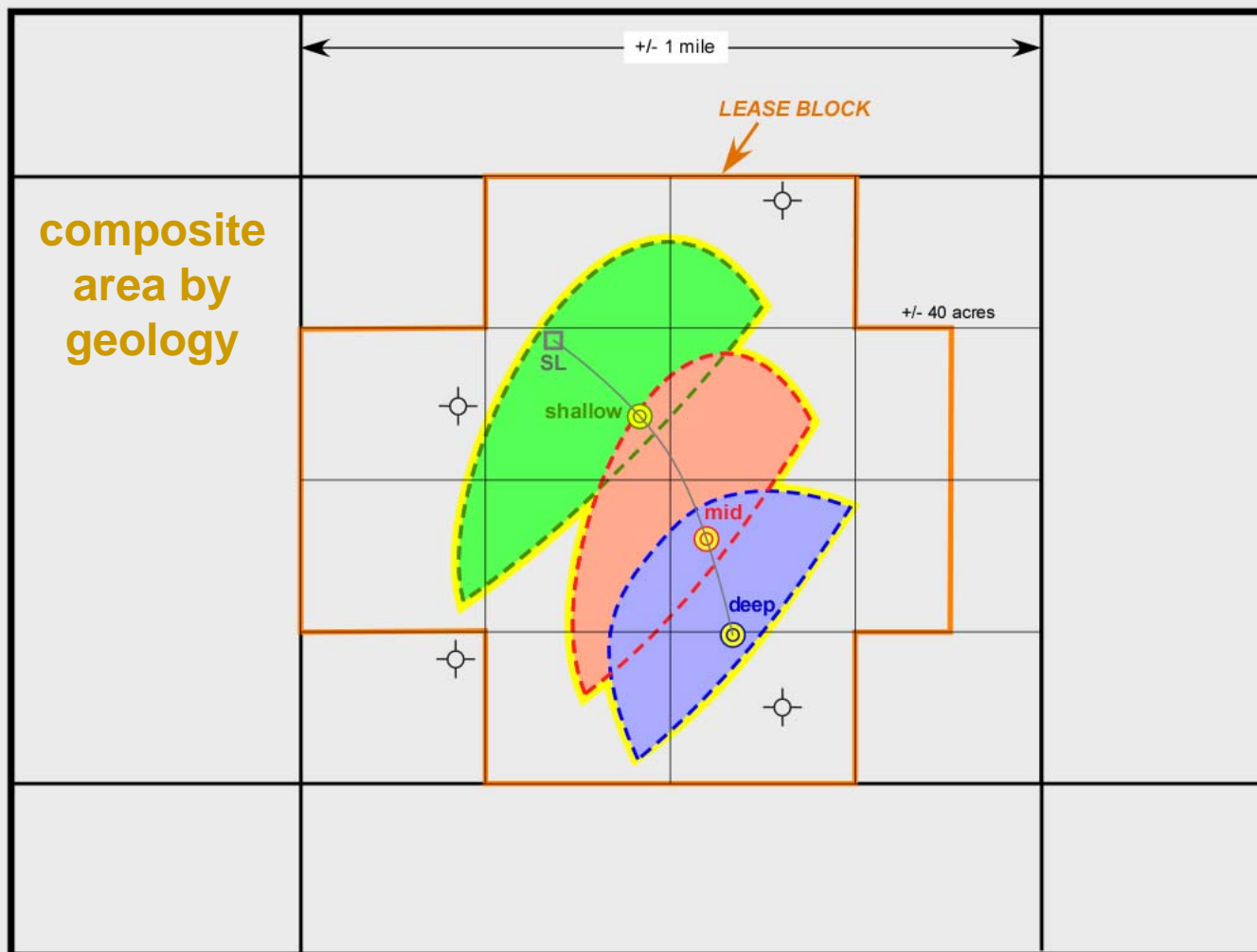
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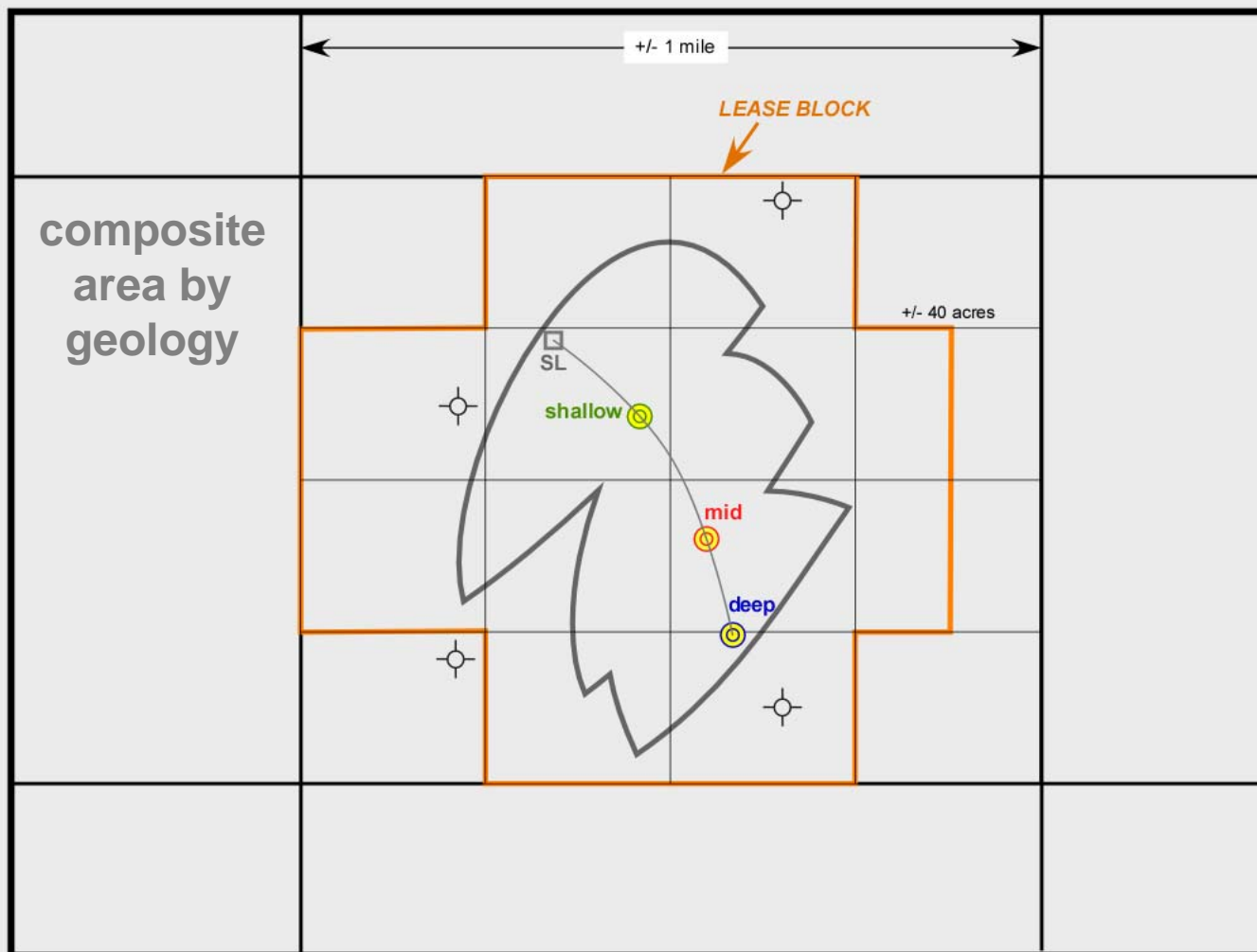
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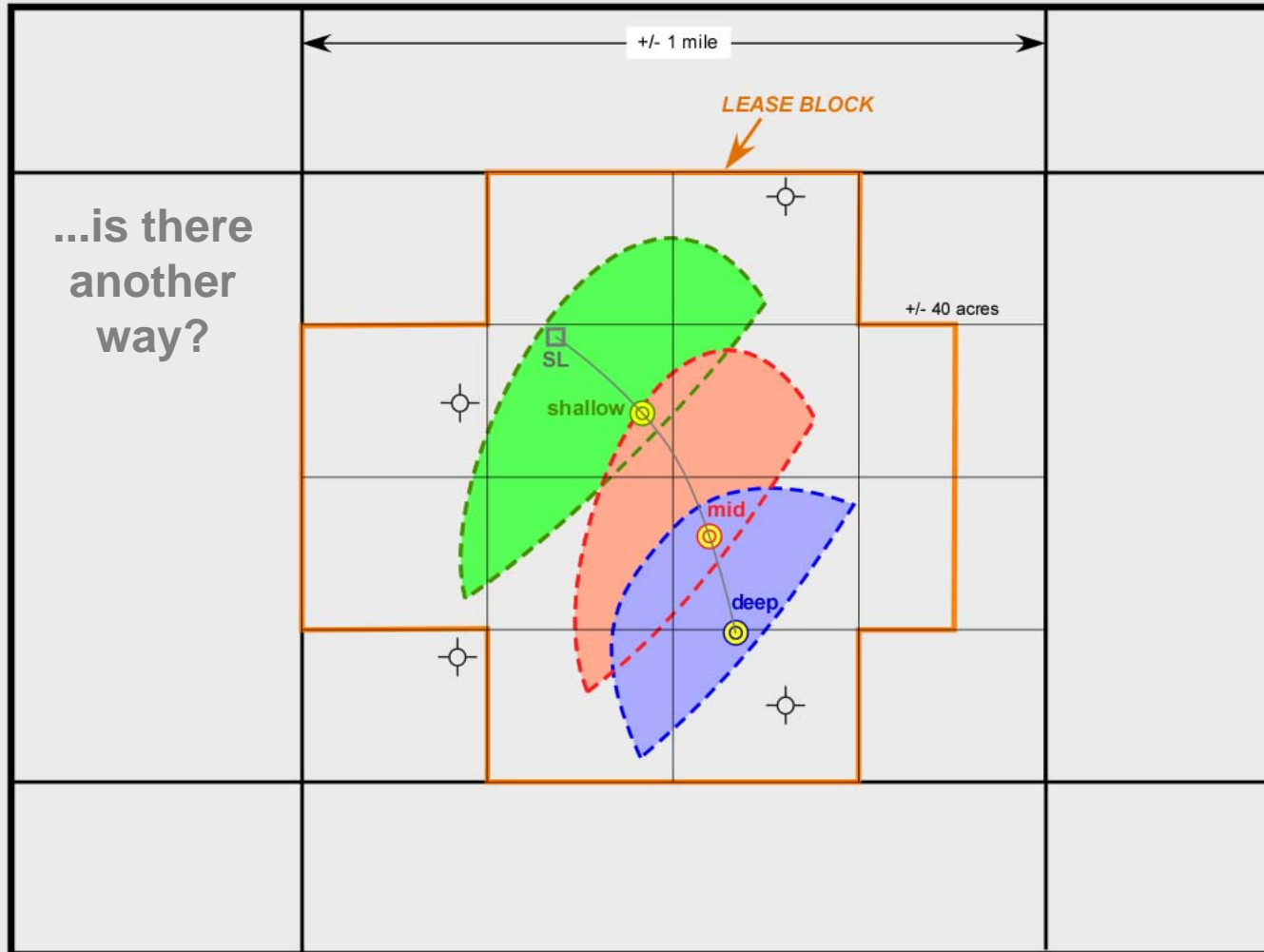
Sample Case



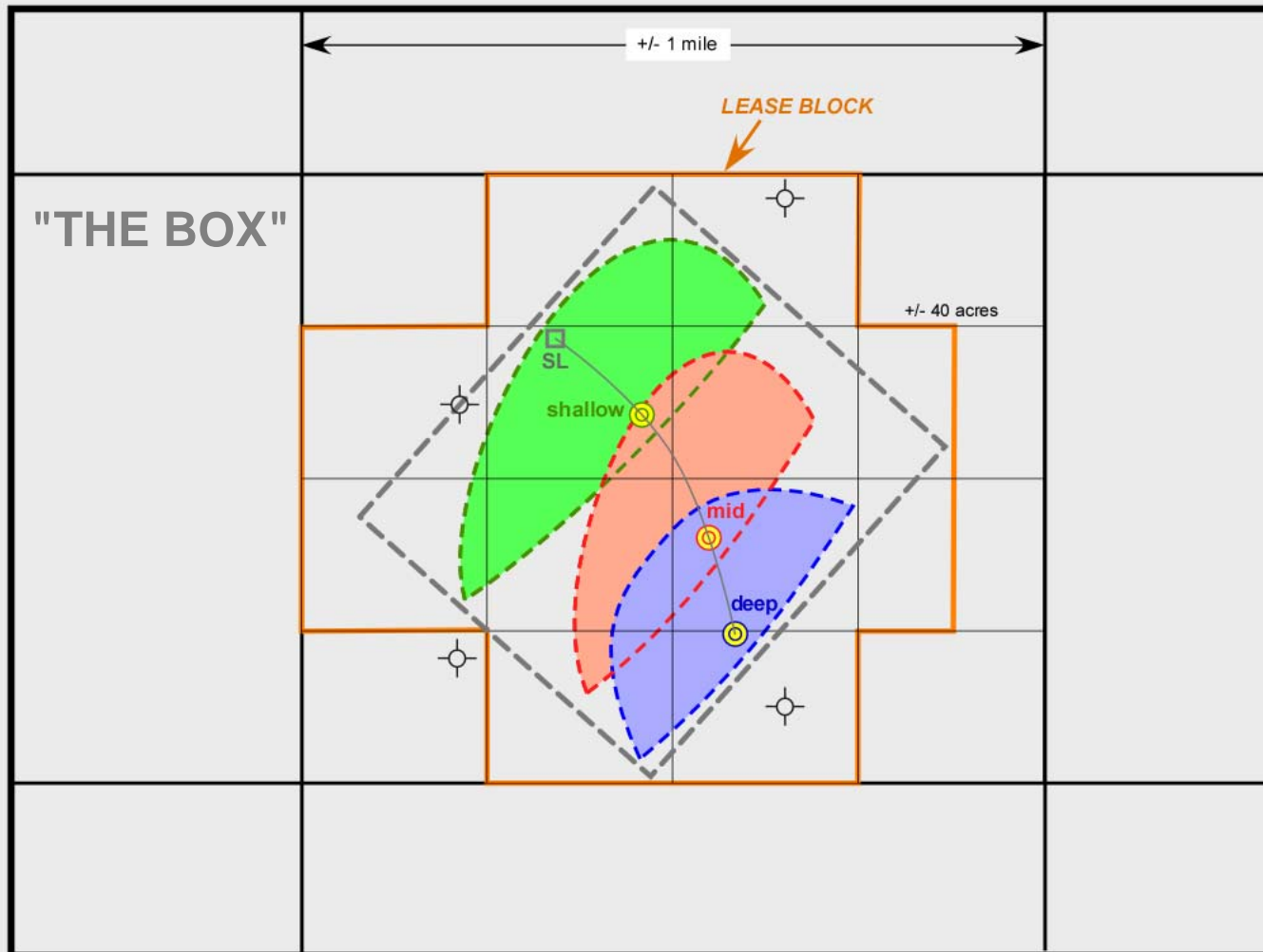
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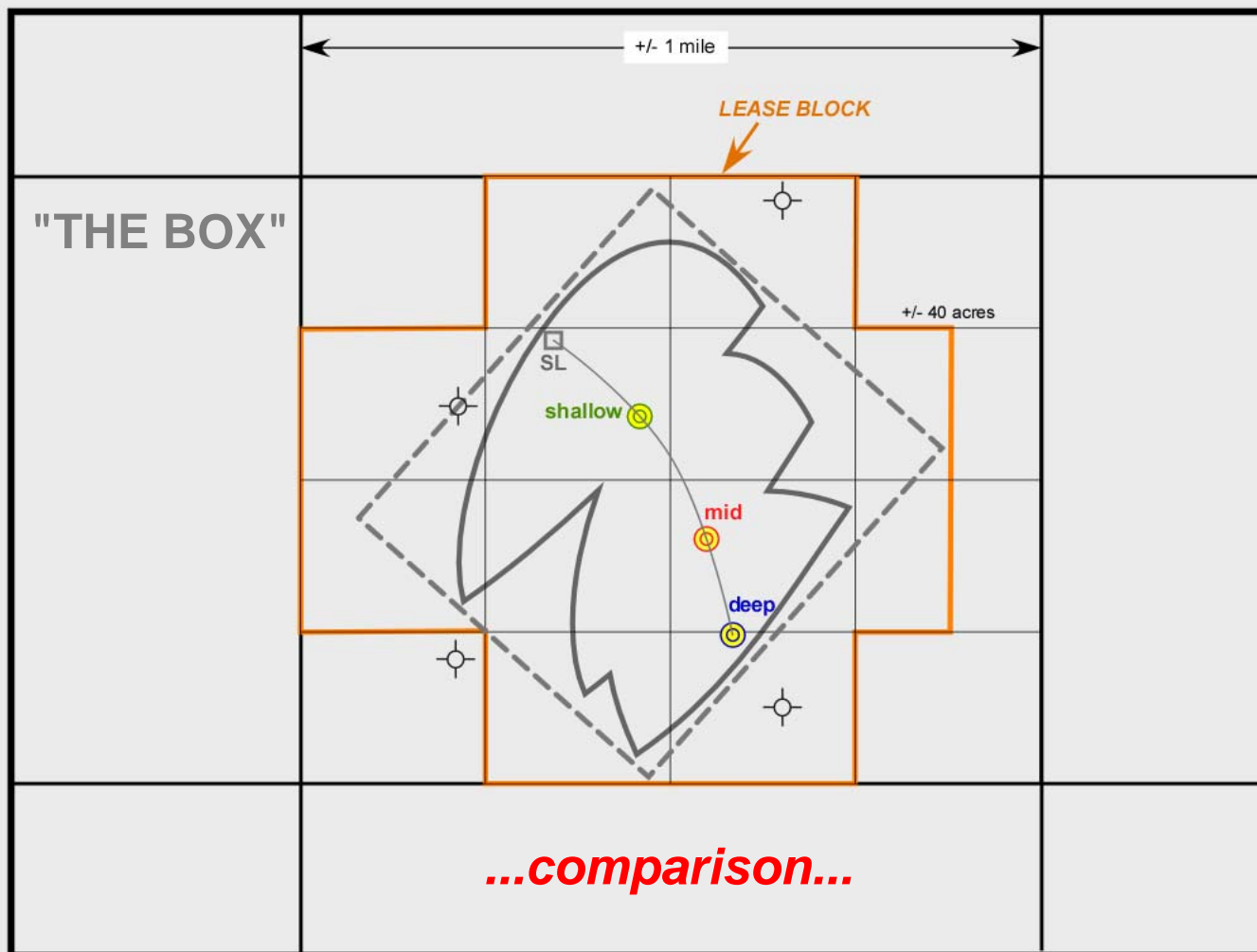
Sample Case



Sample Case

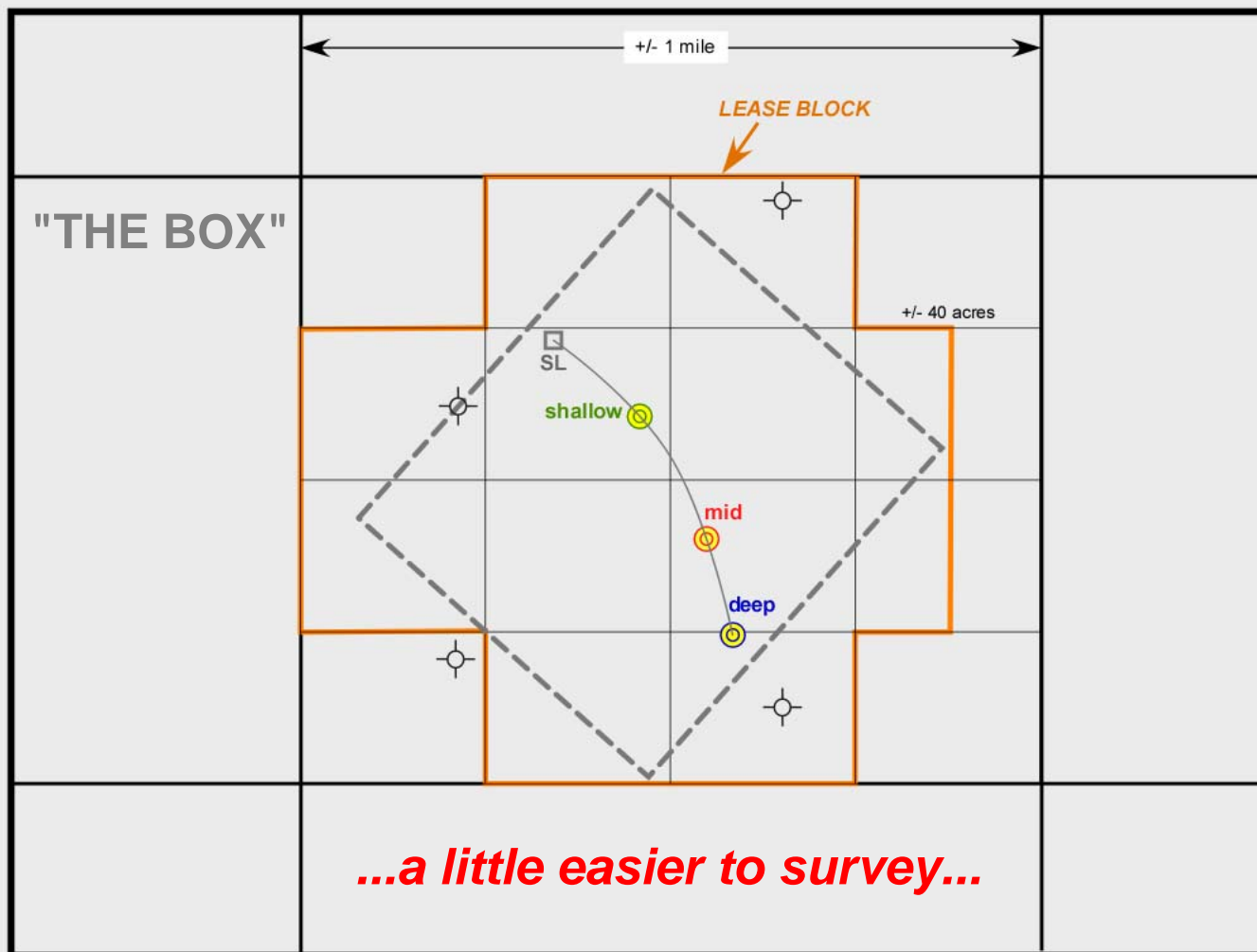


Sample Case



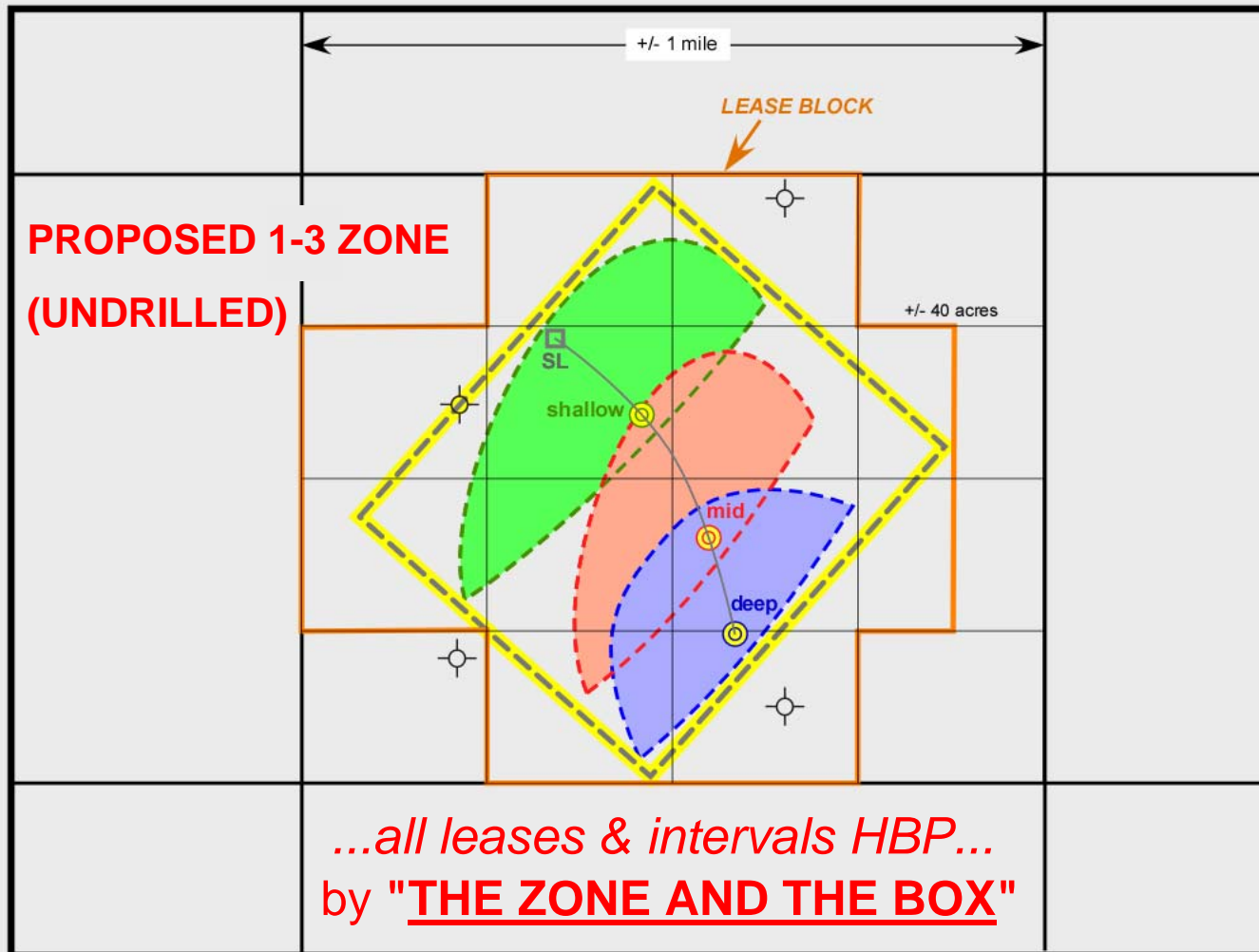
...comparison...

Sample Case



...a little easier to survey...

Sample Case



Conclusions



“The Zone & the Box”

CONCLUSIONS

- Geographical holds more acreage than geological
- Accommodates multiple horizons and tracts
- "Lock-in" N.R.I. on prospect lease block
- "Risk fee" non-operator lessees
- Can dilute non-operator held interests
- Simplifies land issues in regards to future operations
- Save costs on unitization, surveying and legal
- Protects entire unitized leasehold

“The Zone & the Box”

...IS A TOTAL PACKAGE!

James L. Bullen, Attorney

Bryan S. Groves, Geologist

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LEGAL LAGNIAPPE

- Bath form 14-BRI 2A pooling clause comments
- Article 75 of the mineral code
- Article 11 of the mineral code
- Mineral Code table of contents

LOUISIANA MINERAL CODE

TABLE OF CONTENTS

CHAPTER

1. Preliminary Provisions
2. The Landowner's Rights in Minerals
3. The Nature of Mineral Rights and the Capacity, Authority and Formalities Necessary to Their Creation
4. The Mineral Servitude
5. The Mineral Royalty
6. Executive Rights
7. The Mineral Lease
8. Mineral Rights in Land Acquired or Expropriated by Governments or Governmental Agencies
9. Acquisitive Prescription
10. Co-Ownership
11. Rights of Usufructuaries in Minerals
12. Secured Rights in Mineral Rights
13. Miscellaneous Provisions and Definitions
14. Forms from LA Dept. of Natural Resources

(The Louisiana Mineral Code contains a total of 217 Articles.)

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Acknowledgements

OUR THANKS TO THE

L. A. P. L.

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The background of the entire page is a photograph of an oil drilling rig at sunset. The sun is a bright orange circle on the horizon, casting a warm glow across the sky. The rig's derrick and various structures are silhouetted against the colorful sky. A vertical yellow line is positioned to the right of the text on the left side of the page.

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