

Compartment Analysis of Reservoir X Uses Dynamic Data and Geology Data in ND Structure, South Sumatera

(Analisis Kompartemen Menggunakan Data Dinamis dan Data Geologi pada Struktur ND, Sumatera Selatan)

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Abstract

The ND Structure is located in the South Sumatra Basin, which is located in the ND Block. The ND Structure is located in the South Sumatra Basin, South Sumatra Province. This Structure is the southern part of the South Sumatra Basin onshore. The reservoir x compartmentalization analysis is carried out using the fault seal analysis method, mapping the reservoir x property combined with the analysis of pressure data between compartments. Combining the method between fault seal analysis, history of pressure trend analysis and mapping of subsurface properties can be used as a method to explain and describe reservoir compartment. Reservoir connectivity of Reservoir X separated by faults and property barriers in ND Structure, so from the analysis that reservoir X is divided into 4 (four) compartments.

Keywords: Reservoir Compartment, Fault Analysis, Shale Gouge Ratios, Pressure Trends, Property Differences

Sari

Struktur ND terletak di Cekungan Sumatra Selatan, yang terletak di Blok ND. Struktur ND terletak di Cekungan Sumatra Selatan, Provinsi Sumatra Selatan. Struktur ini adalah bagian selatan Cekungan Sumatra Selatan di daratan. Analisis kompartementalisasi reservoir x dilakukan dengan menggunakan metode analisis seal kesalahan, pemetaan properti reservoir x dikombinasikan dengan analisis data tekanan antar kompartemen. Untuk metode kombinasi antara Fault seal analysis, analisis tren tekanan, dan pemetaan properti bawah permukaan dapat digunakan sebagai metode untuk menjelaskan dan menggambarkan kompartemen reservoir. Konektivitas reservoir Reservoir X dipisahkan oleh patahan dan hambatan properti dalam Struktur ND, sehingga dari analisis bahwa reservoir X dibagi menjadi 4 (empat) kompartemen.

Kata-kata kunci: Kompartemen Reservoir, Analisis Patahan, Perbandingan Shale Gouge, Kecenderungan Tekanan, Perbedaan Sifat

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I. INTRODUCTION

The ND Structure is located in the South Sumatra Basin, which is located in the ND Block. The ND Structure is located in the South Sumatra Basin, South Sumatra Province (Figure 1). This Structure is the southern part of the South Sumatra Basin onshore.

The ND structure is on the eastern flank of Palembang's regional height. During the Plio-Pleistocene period, compression tectonics formed faults northeast and northwest, forming a catching structure of the type that is fault dependent closure.

The reservoir X is a part of stratigraphic interval Telisa Sandstone Formation of Middle Miocene - Late Miocene which was deposited during regional transgression with the depositional environment is shallow-open marine (Figure 2). Telisa's sandstone is fine-grained, calcareous, highly argillaceous and glauconitic.

II. METHOD

Compartment analysis uses the method of fault seal analysis using data such as log wells and mud-log well, analysis from historical reservoir pressure trends, and analysis of the geological subsurface to see the possibility of compartments due to properties [3, 7].

Shale Gouge Ratio (SGR) is a predictor of the fault zone composition, a high SGR value is expected to be associated with many phyllosilicates in the fault zone, then high capillary pressure values and low permeability. SGR calculation as follows [6]:

$$SGR = \frac{\sum(V_{sh} \times \Delta Z)}{Throw} \times 100\% \quad (1)$$

In Figure 4 below shows the prediction of the

fault zone composition using the SGR calculation algorithm and its analogy with field outcrops and core data [4].

III. RESULTS AND DISCUSSION

Compartment analysis uses the method of fault seal analysis using data such as log wells and mud-log wells. The lithology composition of reservoir X is based on the interpretation of drilling mud-log data consisting of sand and clay components. Based on the Shale Gouge Ratio (SGR) method, the composition of the two materials if there is a fracture will form a byproduct that is the fault gouge zone. In addition, if the gouge zone is formed intensively, it will also be formed phyllosilicate component (clay). This material will produce a low permeability zone. This can cause reservoir X to become disconnected from each other (sealing) [2].

Based on Telisa's top sand reservoir structure map (Figure 5) obtained from the results of seismic interpretation, it can be concluded that there are 3 (three) major faults that cut reservoir X, namely North Fault, Middle Fault, and South Fault. SGR calculation of 3 (three) faults results in values greater than 15% so that it can be stated that each fault zone is a fluid sealing zone (Table 1).

Analysis of 2 (two) wells that have been produced from historical reservoir pressure trends taken from the SBHP recording data. From the graph between the reservoir pressure X with the time shown in Figure 6, there are differences in reservoir pressure trends between ND-1A and ND-33. This illustrates that there are compartments in reservoir X.

In this study, an analysis of the geological subsurface was also conducted to see the possibility of compartments due to properties. The geological subsurface map in Figure 7 (Vsh, porosity, and permeability) shows that there is a property barrier between the western and eastern areas, which is shown with a property value that is smaller than the surrounding area.

Based on the analysis of the property map from the subsurface and the SGR analysis above, reservoir X has compartmentalization due to sealing faults and different reservoir properties (property barrier). The division of compartments based on these two things, reservoir X is divided into 4 (four) compartments as in Figure 8. The compartmentalization condition of reservoir X certainly causes reservoir connectivity that does not communicate with each other between the 4 (four) compartments.

IV. CONCLUSIONS

The conclusions of the research are as follows:

1. Fault seal analysis, analysis history pressure trend and mapping subsurface property can be

used as a method to explain and describe the compartment reservoir.

2. Reservoir connectivity of Reservoir X separated by faults and property barriers in ND Structure, so from the analysis that reservoir X is divided into 4 (four) compartments

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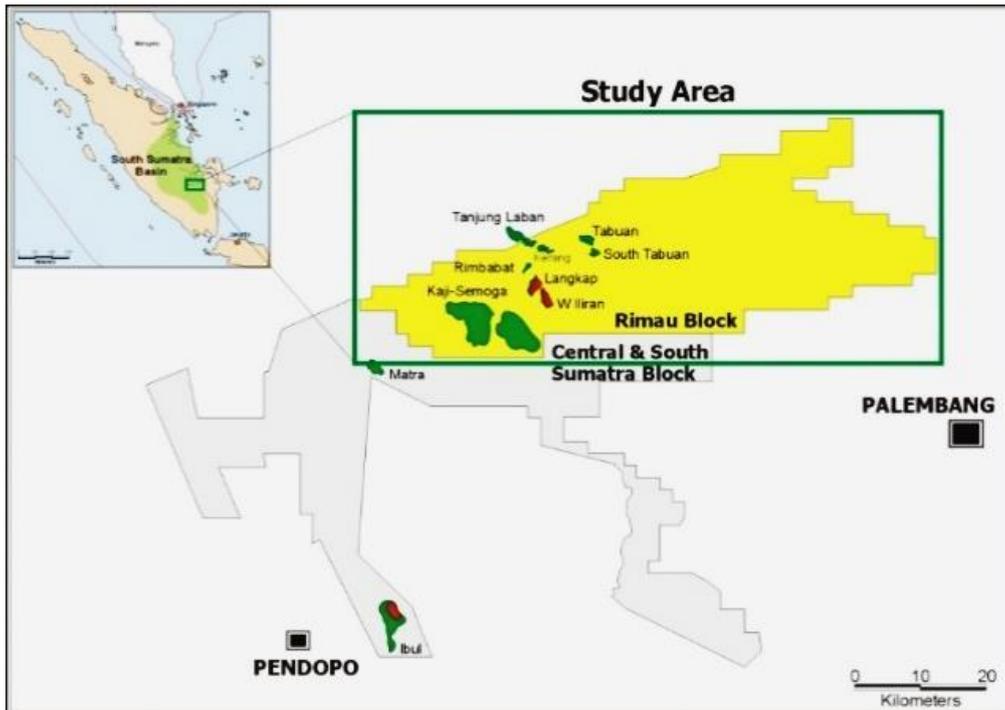


Figure 1. ND Field Locations [5]

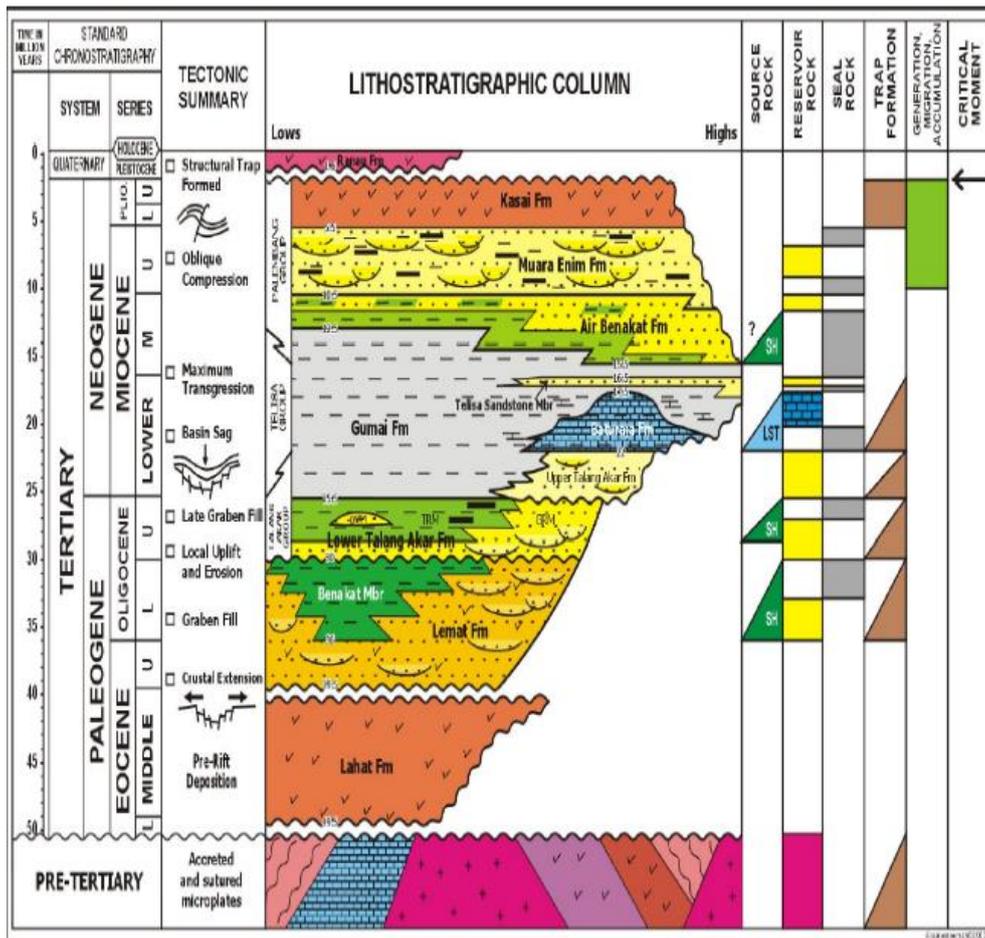


Figure 2. Stratigraphy of the South Sumatra Basin (Kamal et al, 2005 [5])

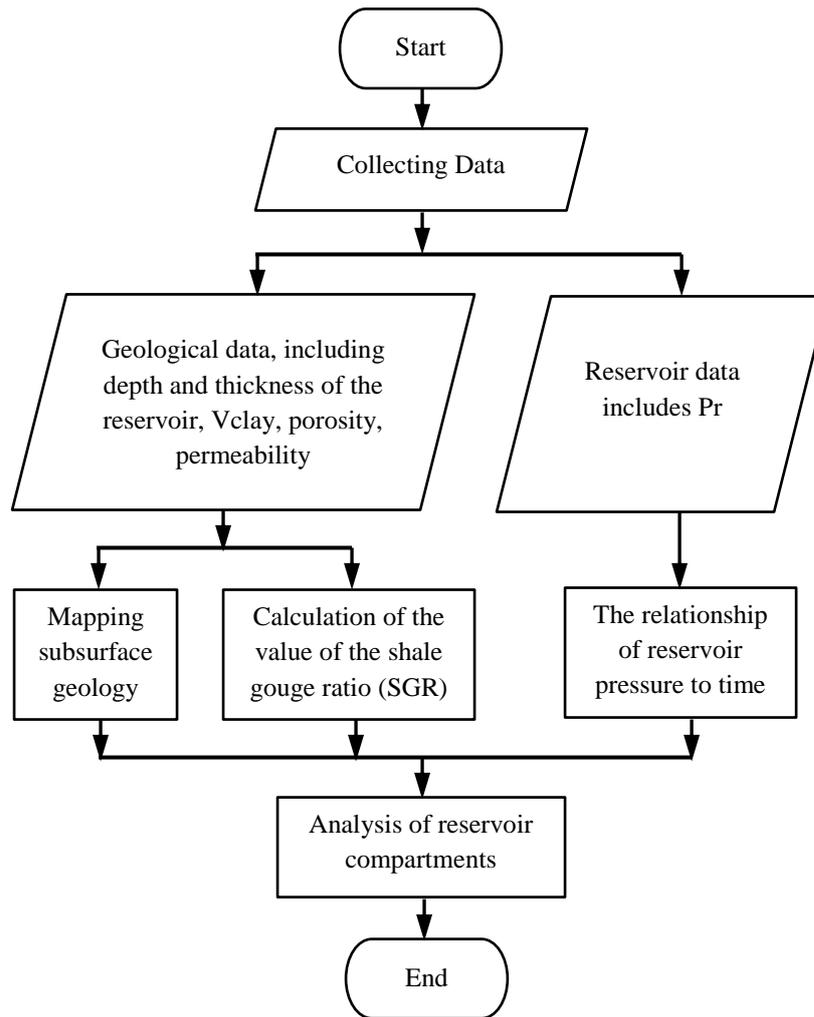


Figure 3. Procedure of the Research

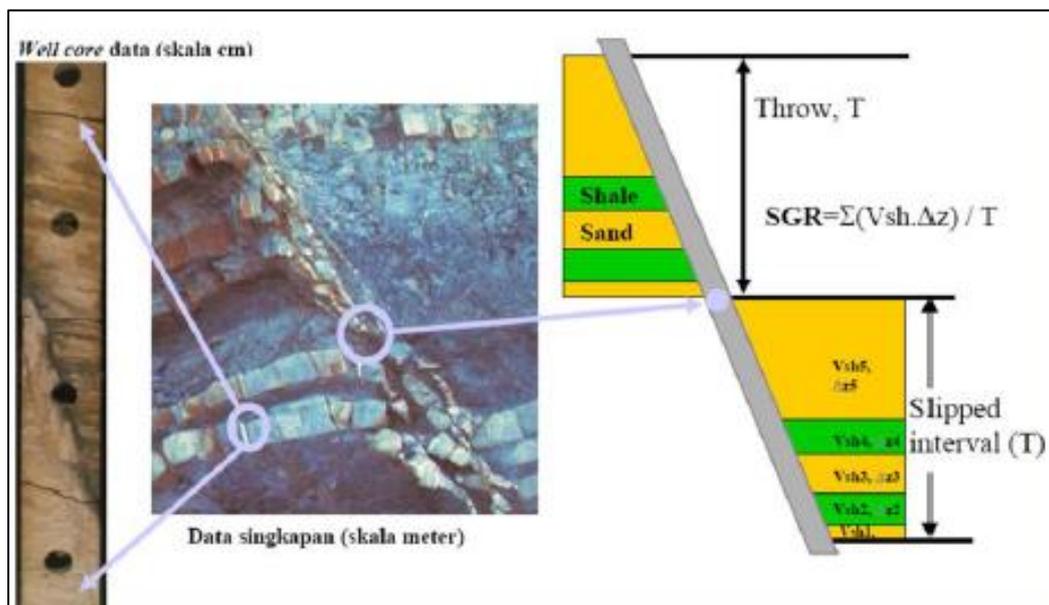


Figure 4. Prediction of Fault Zone Composition with SGR Calculation Algorithm and Analogy with Field Outcrop and Core Data [1]

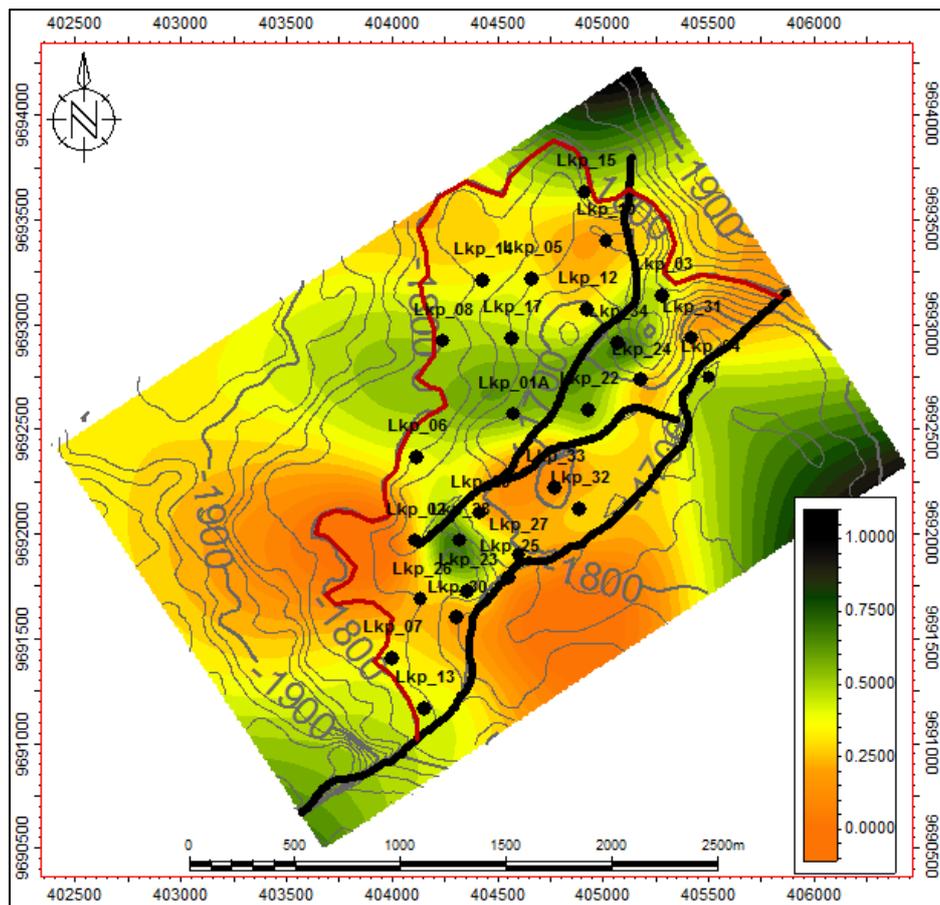


Figure 5. Structural Map Describes Reservoir Fault Conditions X

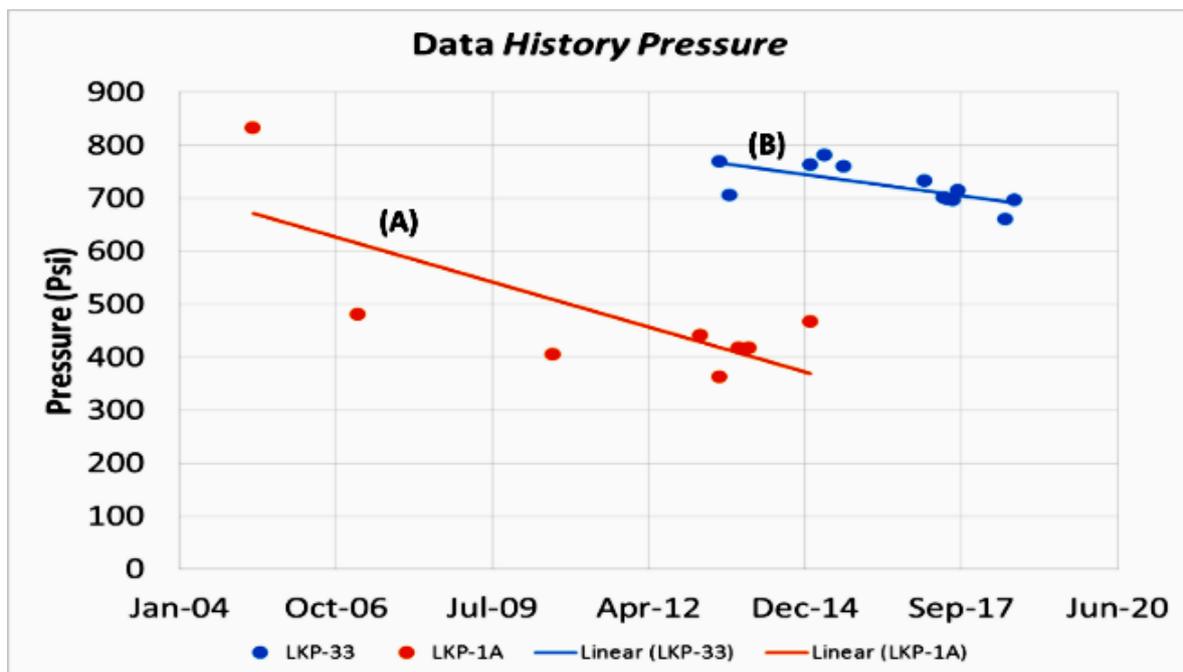


Figure 6. Comparison of Reservoir Pressure History between Pressure in Well ND-33 (B) and Pressure in Well ND-1A (A)

Table 1. Calculation of Shale Gouge Ratio (SGR) Reservoir X

Well	Vcl	Depth (Z)		Throw		SGR
LKP-4 and LKP-31 (South Fault)	0.4	-1672.1	45.2	-1672.1	110.7	16%
		-1717.3		-1782.8		
LKP-1A and LKP-22 (North Fault)	0.52	-1686.2	44.5	-1686.2	29.7	78%
		-1730.7		-1715.9		
LKP-1A and LKP-33 (Middle Fault)	0.52	-1672.1	45.2	-1672.1	43.8	54%
		-1717.3		-1715.9		

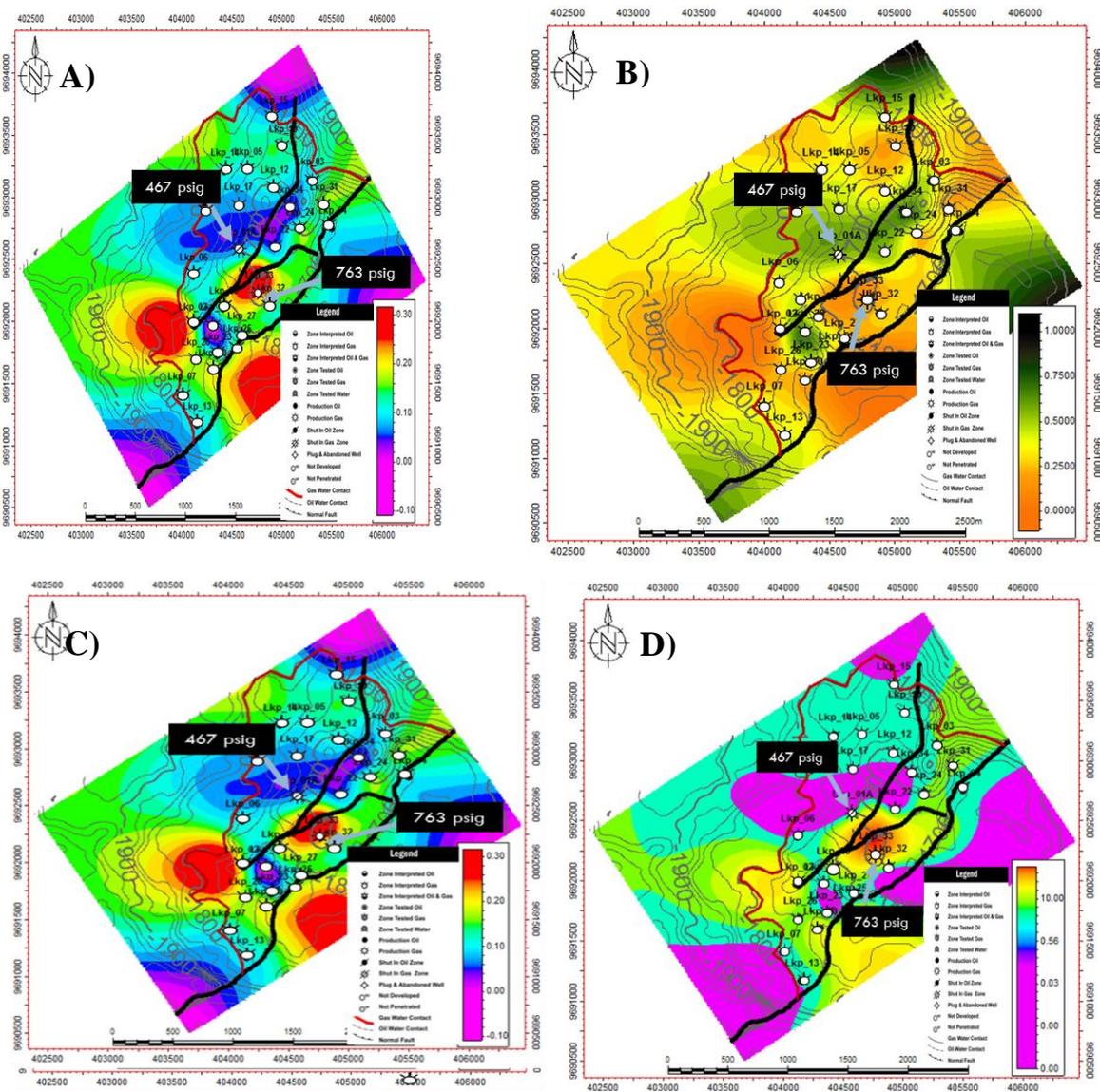


Figure 7. Geological Subsurface Reservoir Map X. A), B), Comparison of Porosity Maps and Volume of Shale Maps. C), D), Comparison of Porosity Maps and Permeability Maps

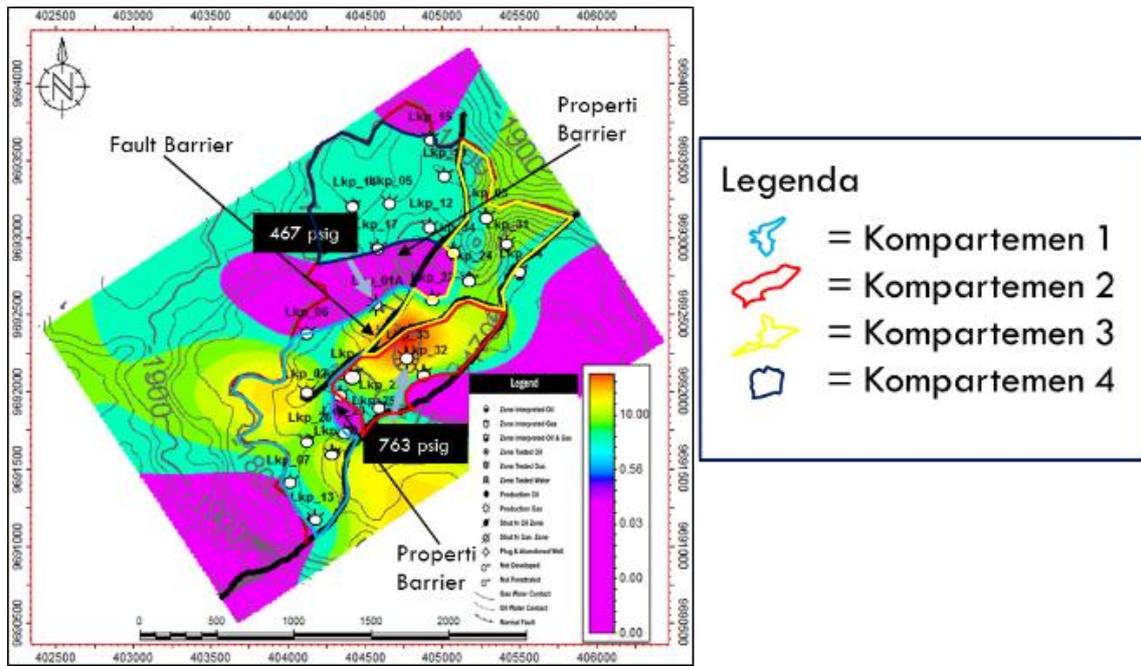


Figure 8. Reservoir X Compartment from a Combination of Structural Maps and Permeability Maps