MINISTERIO
DE ENERGÍA Y MINAS
REPÚBLICA DOMINICANA

DOMINICAN REPUBLIC
1st LICENSING ROUND

Exploration Opportunities

Ruben Arismendy, Managing Partner Neoil Exploration

July 10, 2019

MINISTERIO
DE ENERGÍA Y MINAS
REPÚBLICA DOMINICANA

AGENDA

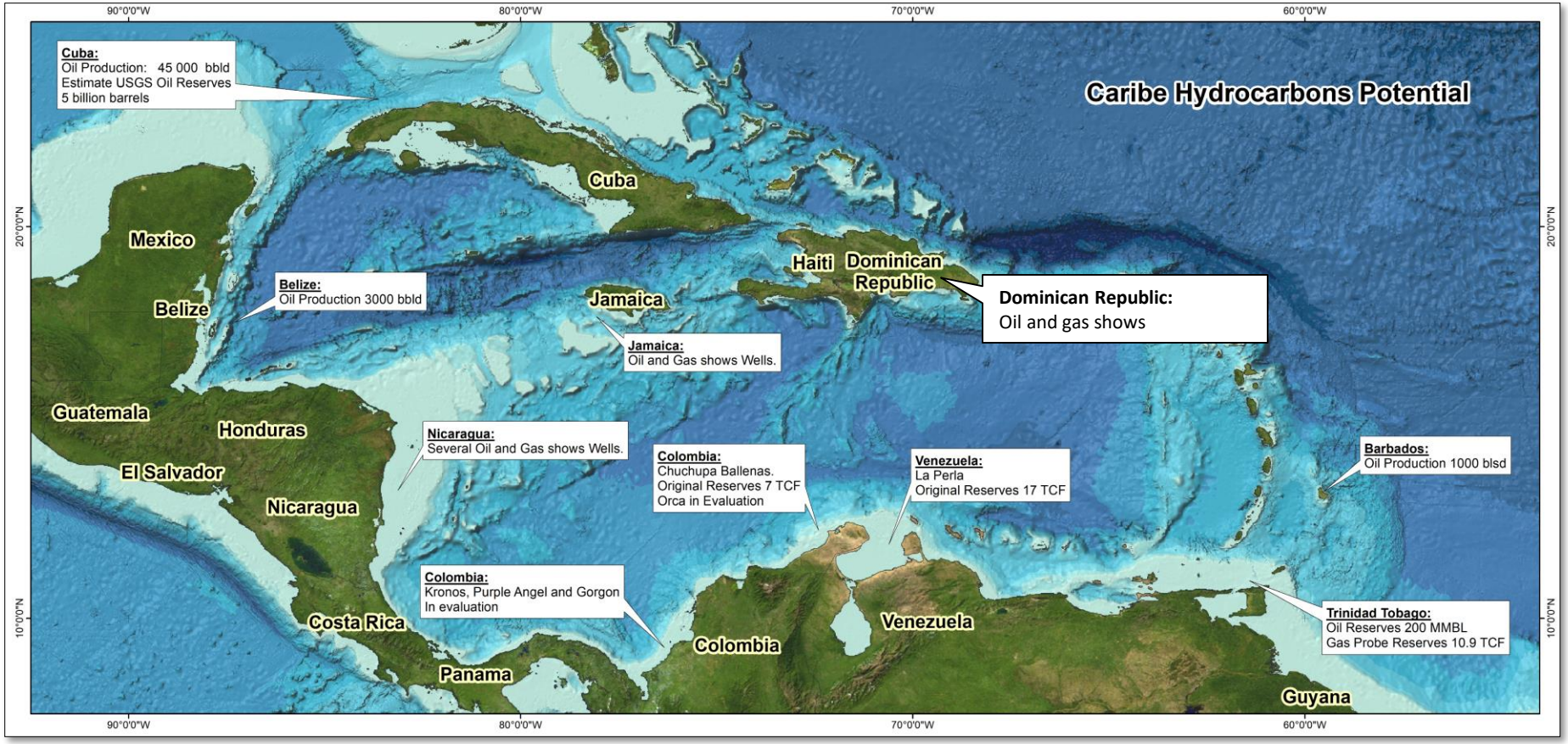
1. INTRODUCTION

2. EXPLORATION OPPORTUNITIES

- » CIBAO BASIN
- » ENRIQUILLO BASIN
- » AZUA BASIN
- » SAN PEDRO DE MACORIS

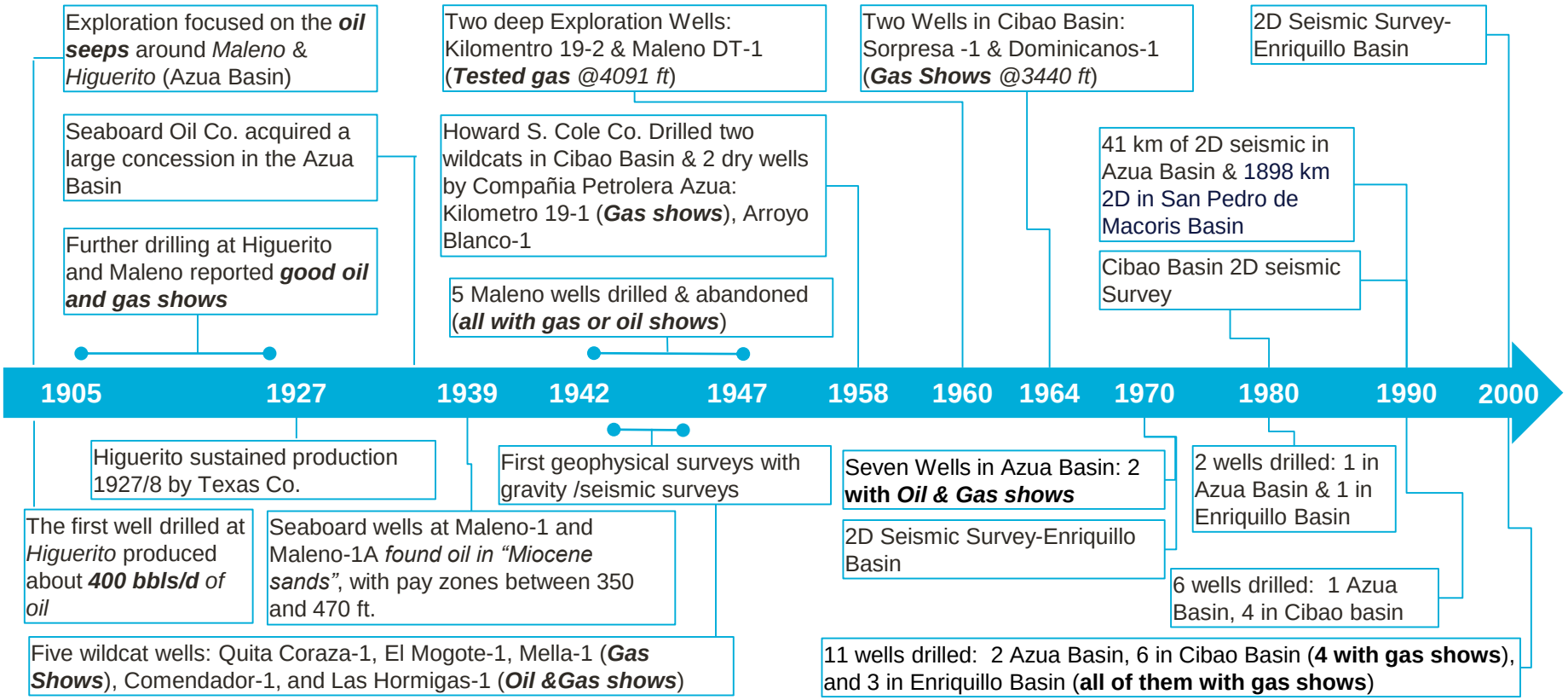
3. SUMMARY AND DATA PACK

Several important fields and working petroleum systems have been identified across the Caribbean



Source: Neoil Exploration

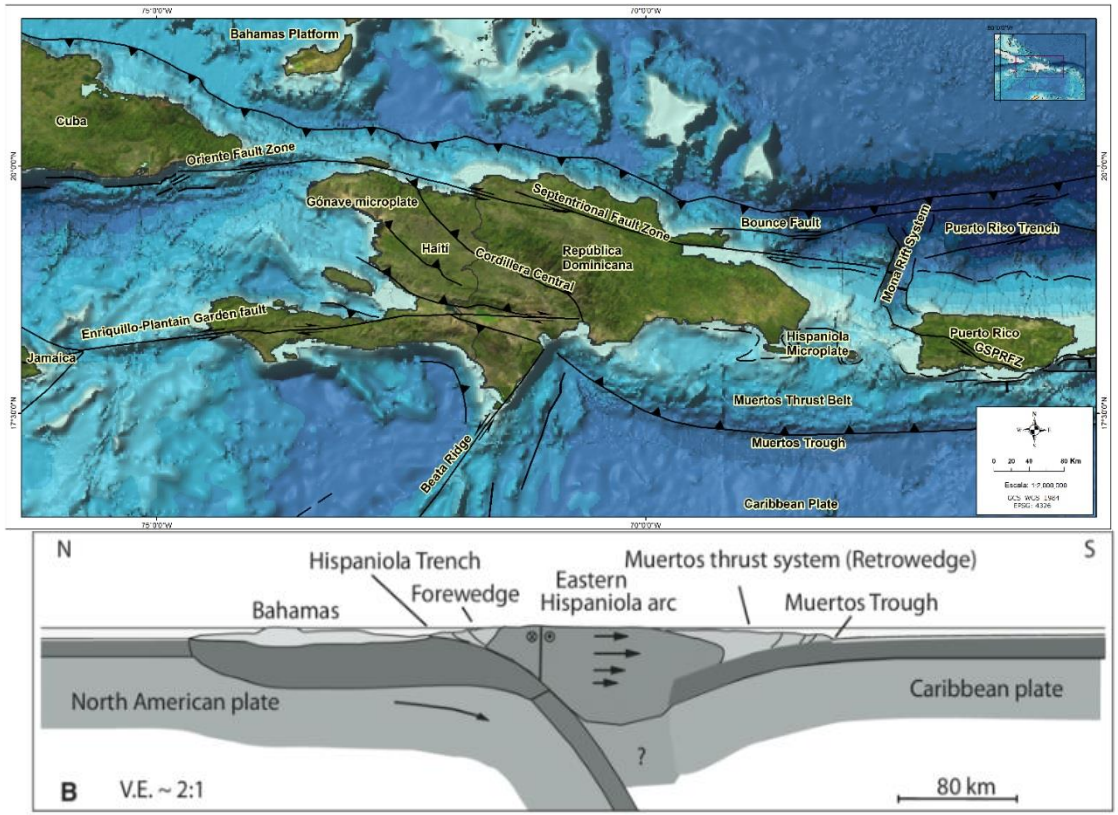
Dominican Republic is under explored and activities done since early 1900s prove the existence of a working petroleum system



Note: Modified from Mann & Lawrence, 1991

Source: Neoil Exploration

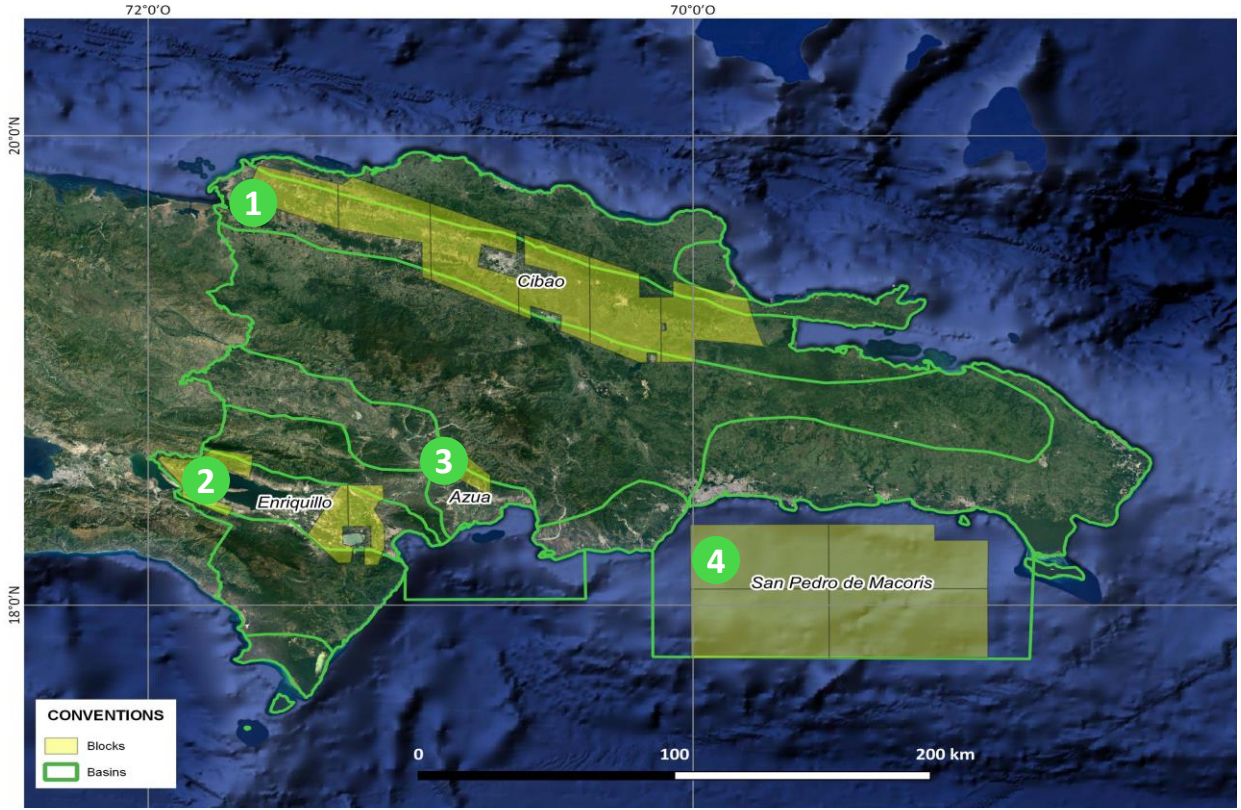
Dominic Republic Tectonic setting



- Subduction of N. America plate below Caribbean Plate
- Strike-slip, convergent structures produced by displacements and transpressional accretion of crustal fragments (Mann & Lawrence, 1991)
- Thrust belts developed on both sides of oceanic island arcs
- North-verging accretionary prism lies to the north of the Eastern Greater Antilles Arc

Note: From: Ten Brink, 2011
Source: Neoil Exploration

Dominican Republic offers an attractive portfolio of investment projects



Blocks on Offer per Basin	
Onshore	**Offshore**
1 Cibao – 6 blocks	4 San Pedro – 4 blocks
2 Enriquillo – 3 blocks	
3 Azua – 1 block	

- **14 blocks total –** Max. size/block of 500 km2 onshore , 2,500 km2 offshore

Source: Wood Mackenzie, MEM, Neoil Exploration

DOMINICAN REPUBLIC LICENSING ROUND
MINISTERIO DE ENERGÍA Y MINAS REPÚBLICA DOMINICANA

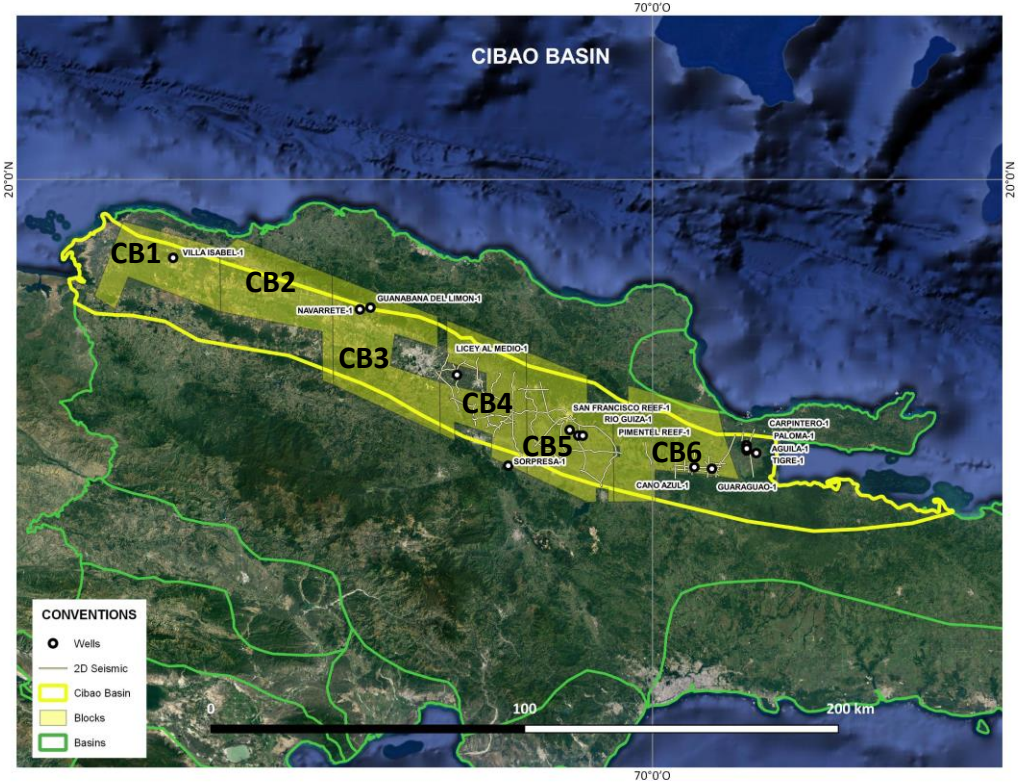
MINISTERIO
DE ENERGÍA Y MINAS
REPÚBLICA DOMINICANA

AGENDA

1. INTRODUCTION
2. **EXPLORATION OPPORTUNITIES**
   - » **CIBAO BASIN**
   - » ENRIQUILLO BASIN
   - » AZUA BASIN
   - » SAN PEDRO DE MACORIS
3. SUMMARY AND DATA PACK

Six onshore blocks have been delineated in the Cibao basin

Cibao Basin



Blocks

- CB1, CB2, CB3, CB4, CB5, CB6

Basin Area

- ~7000 km2

Tectonics

- Asymmetrical Strike-slip basin

Seismic

- ~630km 2D
- ~ 23% of 2D seismic coverage

Wells Drilled

- 16 wells
- MD 1,000 ft - 12,000 ft
- ~ 70% of the wells < 6k ft

Source: Neoil Exploration

Cibao basin highlights

	POSITIVES	POTENTIALS
Basin	• Frontier basin • Max sediment thickness to the north of ~18K ft	• Depocenter in the norther central part of the basin with potential HC generation

G&G Data	• 2D seismic data available (~630 km)
	• 16 wells drilled
		• Only ~20% seismic coverage
		  • Provides ~80% addt'l to test
		  • Modern tech can improve dated info

Petroleum System	• Type III gas- prone Kerogen (Tillman, 2015) • Pseudo well shows Tabera Group entering in oil window	• Potential source rock have subsided to depths of 18k ft • Marine sediments (Tabera fm) may have kerogen Type II
Prospectivity	• 16 wells, 4 of them with gas shows • At least 3 plays in the basin • Several potential prospects	• High-angle transpressive faults, positive flower structures, anticlines identified in 2D – potential structural traps

Source: Neoil Exploration

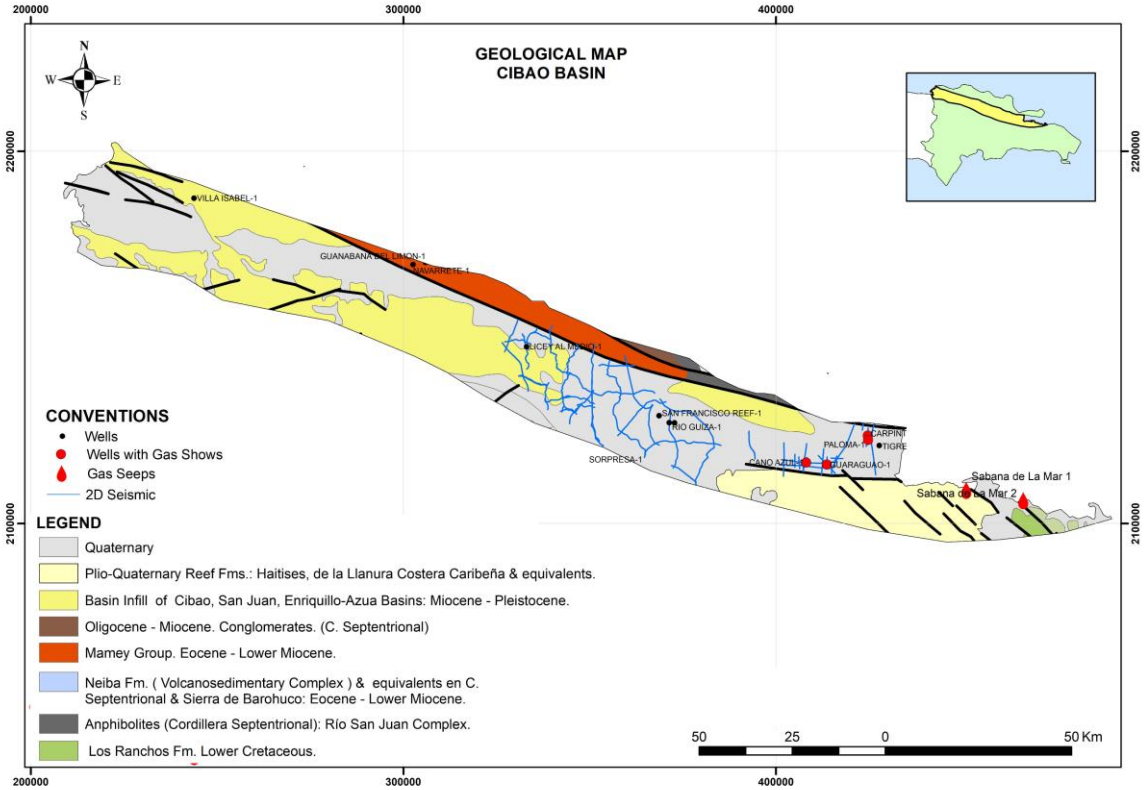
Stratigraphic column of Cibao Basin shows tectonic events and petroleum systems

PERIOD	EPOCH	LITHOLOGY	FORMATIONS	SOURCE ROCK	RESERVOIR	SEAL	TRAPS FORM.	GEN/MIGR/ACC.	TECTONIC EVENT	PLAY 1	PLAY 2	PLAY 3
QUATERNARY	Holocene	Siliciclastic & Limestone	Alluvium									
	Pleistocene											
TERTIARY – NEOGENE	Pliocene	Siltstone & Clay	Mao Fm.									
		Siltstone	Gurabo Fm.						Continued Ramp Basin development-Basin Filled by Shallowing-Upward clastic sequences & evaporites			
	Miocene	Conglomerate & Sandstone	Cercado Fm.						Initial Ramp Basin Formation-basin act as conduits for clastic sedimentation derived from North and Northwest			
		Siliciclastic & Limestone	Baitoa Fm.						Collision **of** northern and southern Hispaniola-SW- verging folds and thrust faults			
TERTIARY – PALEOGENE	Oligocene	Submarine Fan Deposits	Tabera Group	?					Underthrusting/accretion in transpressional environment			
	Eocene	Arc Basement	Basement									
	Paleocene											
CRETACEOUS	LATE											

Note: Modified from Tillman, 1991- Mann & Lawrence, 1991

Source: Neoil Exploration

Geological map shows presence of hydrocarbons

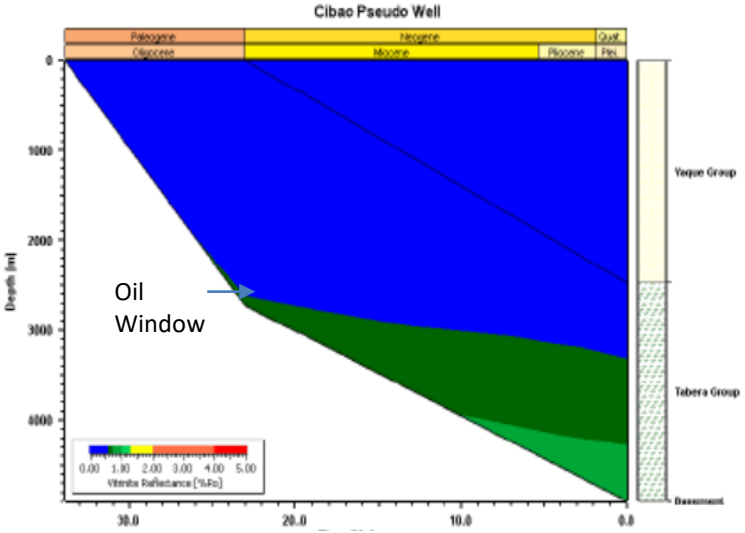


Presence of Hydrocarbons

- 4 Wells with gas shows
- 2 oil seeps

Note: Modified from Tillman, 1991- Mann & Lawrence, 1991
Source: Neoill Exploration

Cibao Basin shows potential source rocks in several formations



- **Source Rock:** Tabera Group is a hypothetical source rock, in oil window since late Oligocene, based on TOC Logs (San Francisco-1 well); shows potential Source rocks in Guarabo fm
- **Reservoir Rock:** SF–1 well and outcrops show good reservoirs along Miocene and Pliocene
- **Seal Rock:** Several siltstone & clay from Oligocene & Pliocene
- **Trap:** Seismic shows a highly deformed basin with high angle transpressive faults, positive flower structures and anticlines – All potential HC traps
- **Timing**: Potential deeper source rock (Tabera Group) would have reached max peak of generation during Miocene

Note: From Well San Francisco-1, showing potential Source Rock (SR) from log analysis; Cibao Basin pseudo well, from Tillman, 1991
Source: Neoil Exploration

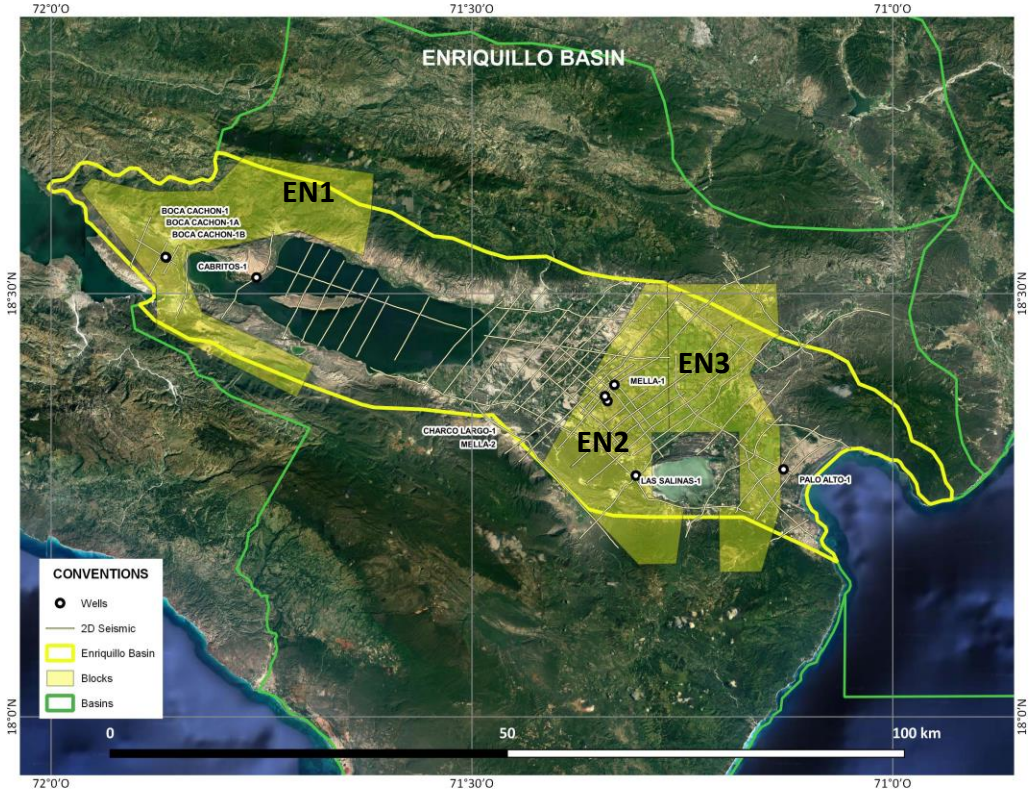
MINISTERIO
DE ENERGÍA Y MINAS
REPÚBLICA DOMINICANA

AGENDA

1. INTRODUCTION
2. **EXPLORATION OPPORTUNITIES**
   - » CIBAO BASIN
   - » **ENRIQUILLO BASIN**
   - » AZUA BASIN
   - » SAN PEDRO DE MACORIS
3. SUMMARY AND DATA PACK

Three onshore blocks have been delineated in the Enriquillo basin

Enriquillo Basin



Blocks

- EN1, EN2 and EN3

Basin Area

- 3,100 km2

Tectonic

- Synclinal, Upper Miocene to recent sedimentary ramp basin

Seismic

- ~1,000 km 2D
- ~90% of 2D seismic coverage

Wells Drilled

- 9 wells
- MD 500 ft-15,800 ft.
- ~ 80% of the Wells < 9k Ft

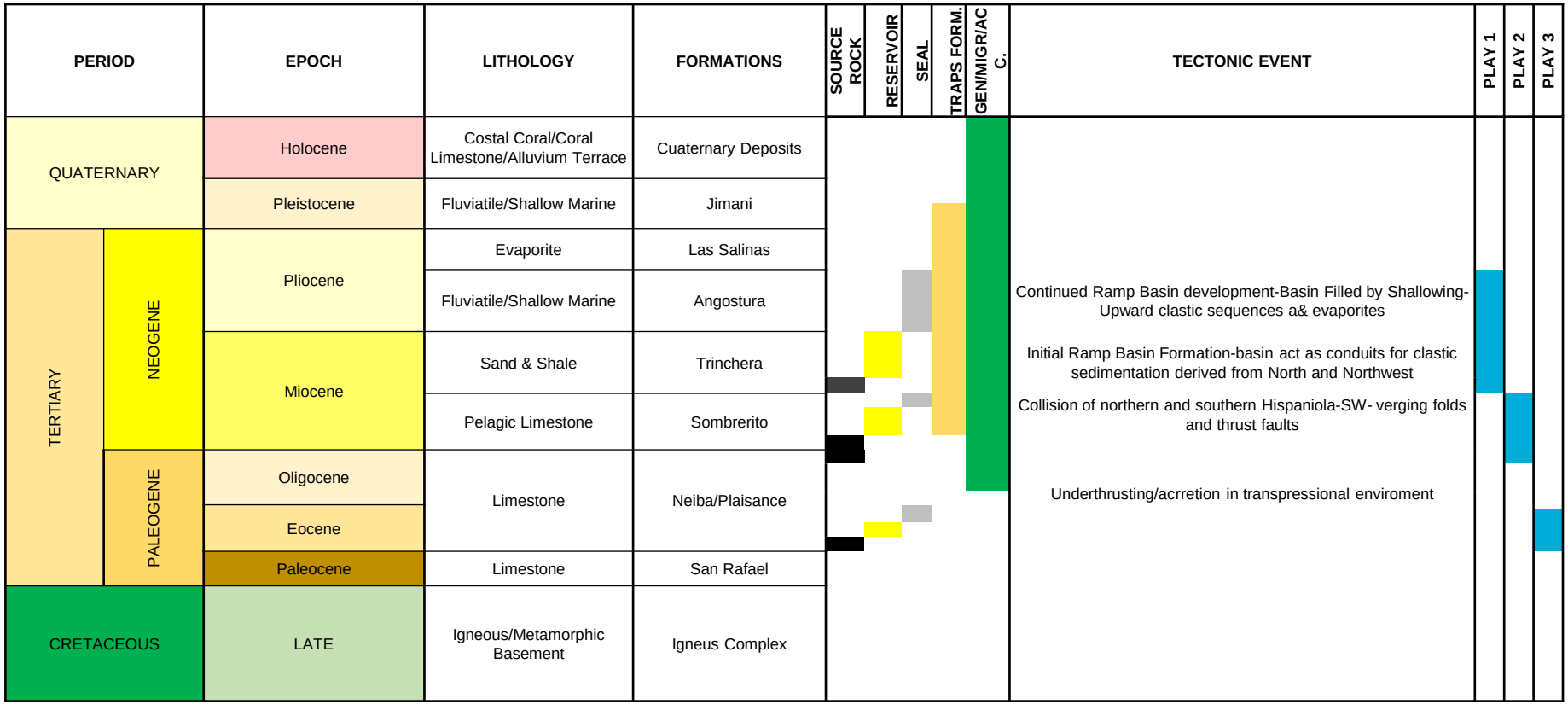
Note: From Mann et al., 1991
Source: Neoil Exploration

Enriquillo basin highlights

	POSITIVES	POTENTIALS
Basin	• Frontier basin • Max sediment thickness is over ~18K ft	• Depocenter in the Central part of the basin with proved HC generation
G&G Data	• 2D seismic data available (~1,000km) • 9 wells drilled • Basin w/ most seismic coverage on the island	• ~90% seismic coverage • Modern tech can improve dated info
Petroleum System	• HC generation proved by oil & gas seeps • 3 source rocks (Trinchera, Sombrerito & Plaisance Fm.)	• Potential for biogenic & thermogenic gas (Trinchera Fm.)
Prospectivity	• At least 3 plays in the basin • 4 Wells with gas shows • Several undrilled prospects identified	• Traps: Thrust structures, salt related structures, potential in carbonate and reef associated deposits

Source: Neoil Exploration

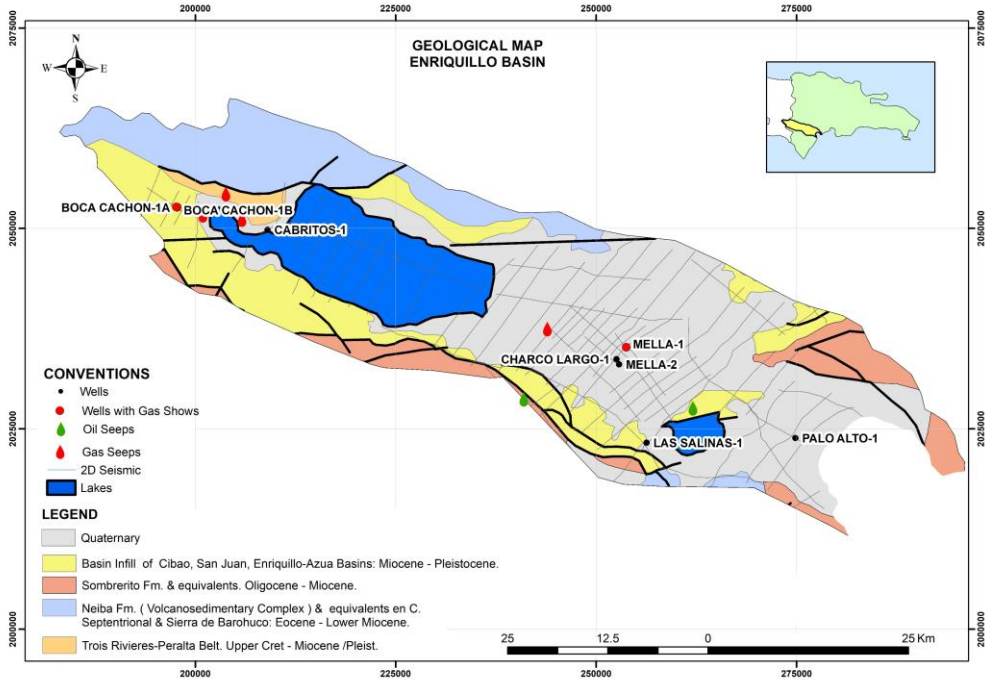
Stratigraphic column of the Enriquillo basin shows tectonic events and petroleum systems



Note: Modified from Tillman, 1991- Mann & Lawrence, 1991

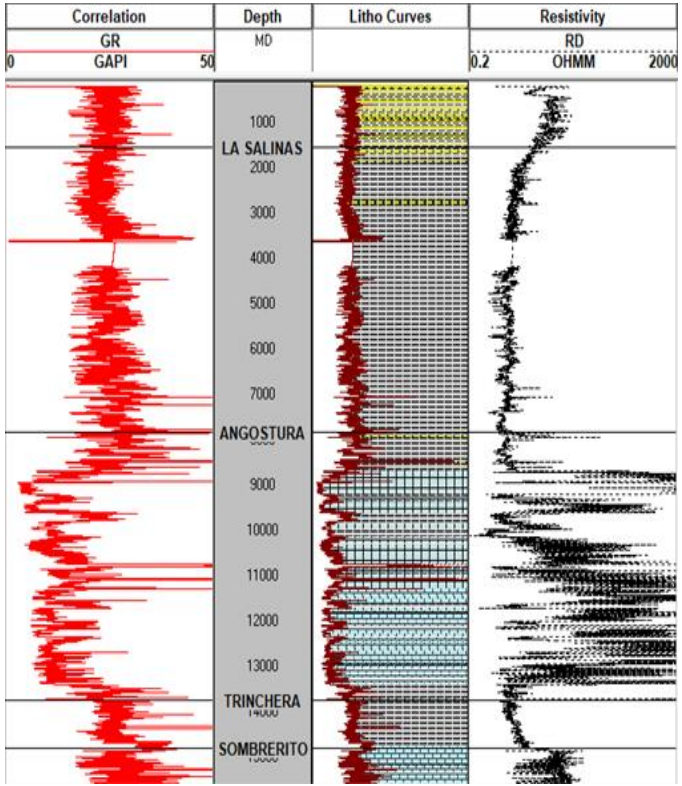
Source: Neoil Exploration

Enriquillo geological map shows presence of hydrocarbons from wells drilled



Presence of Hydrocarbons

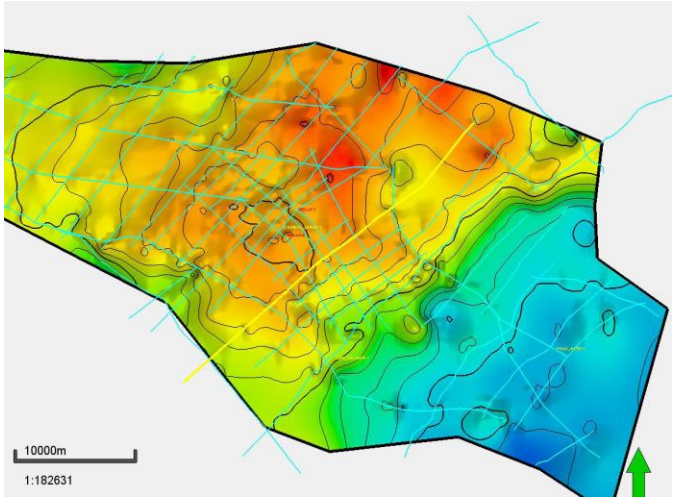
- 4 wells with gas shows, 2 oil seeps and 1 gas seep



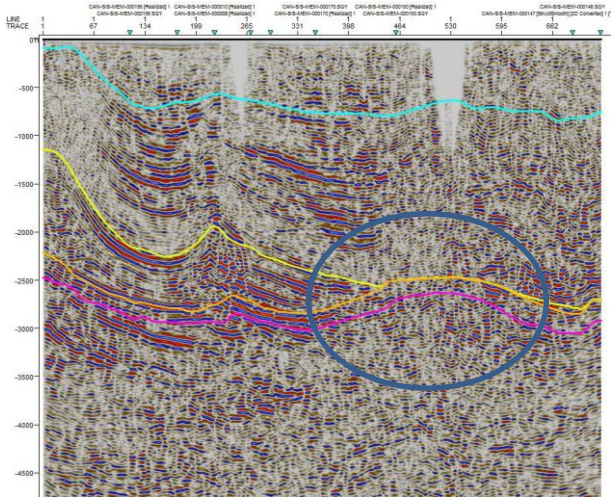
Charco Largo-1 Well

Source: Neoil Exploration

Enriquillo petroleum system shows three defined source rocks



Potential prospects In the southern part of the basin



Potential prospects in southern part of basin

- **Source Rock:** Three source rocks were defined – **Trinchera Fm** in early oil window towards central part; **Sombrerito Fm** in early-mid oil window; **Plaisance Fm** in late oil window and early gas window
- **Reservoir Rock:** Outcrops and wells have showed several Eocene, Oligocene and Miocene reservoirs levels
- **Seal Rock:** Several shales levels from Eocene to Pliocene
- **Trap:** Highly deformed w/ high angle transpressive faults, thrust and salt related structures, and fracture limestone
- **Timing:** Early stage of generation during Eocene which continue during Neogene

Source: Neoil Exploration

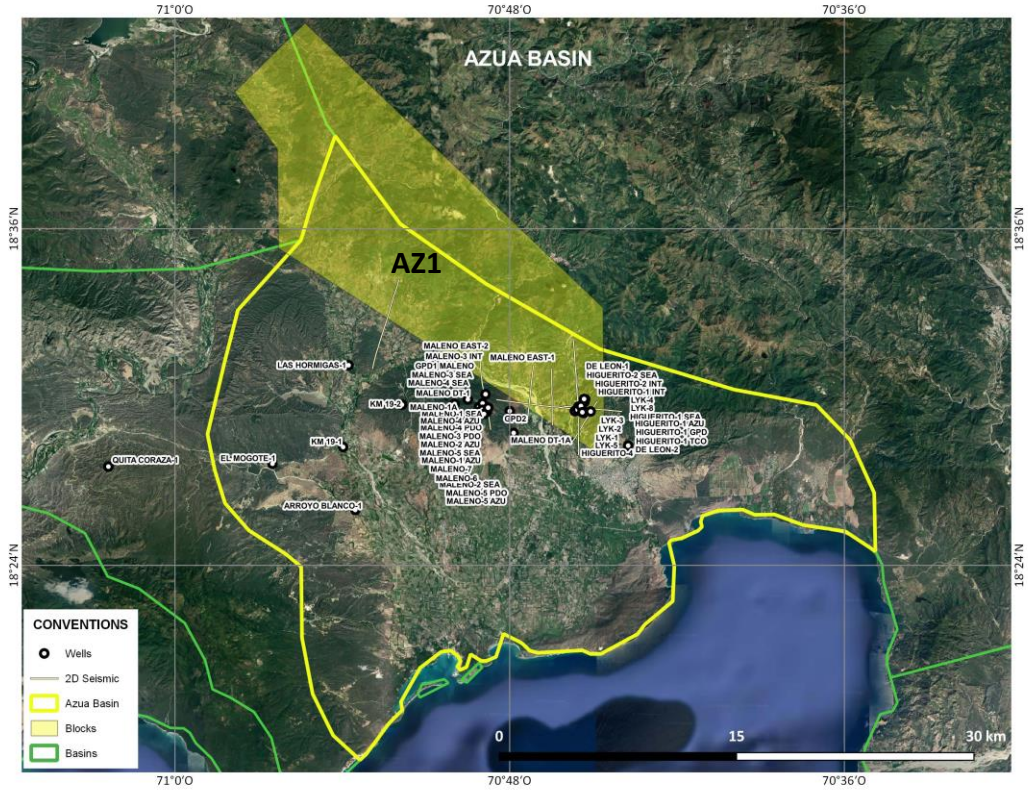
MINISTERIO
DE ENERGÍA Y MINAS
REPÚBLICA DOMINICANA

AGENDA

1. INTRODUCTION
2. **EXPLORATION OPPORTUNITIES**
    - » CIBAO BASIN
    - » ENRIQUILLO BASIN
    - » **AZUA BASIN**
    - » SAN PEDRO DE MACORIS
3. SUMMARY AND DATA PACK

One onshore block has been delineated in the Azua basin

Azua Basin



Block

- AZ1

Basin Area

- ~800 km^2

Tectonic

- Synclinal, Upper Miocene to Recent sedimentary ramp basin

Seismic

- ~40 km 2D
- 10% of 2D seismic coverage

Wells Drilled

- 58 wells
- MD 300 ft-13,000 ft
- ~ 60% of the Wells < 3k ft

Note: From Mann et al., 1991
Source: Neoil Exploration

Azua basin highlights

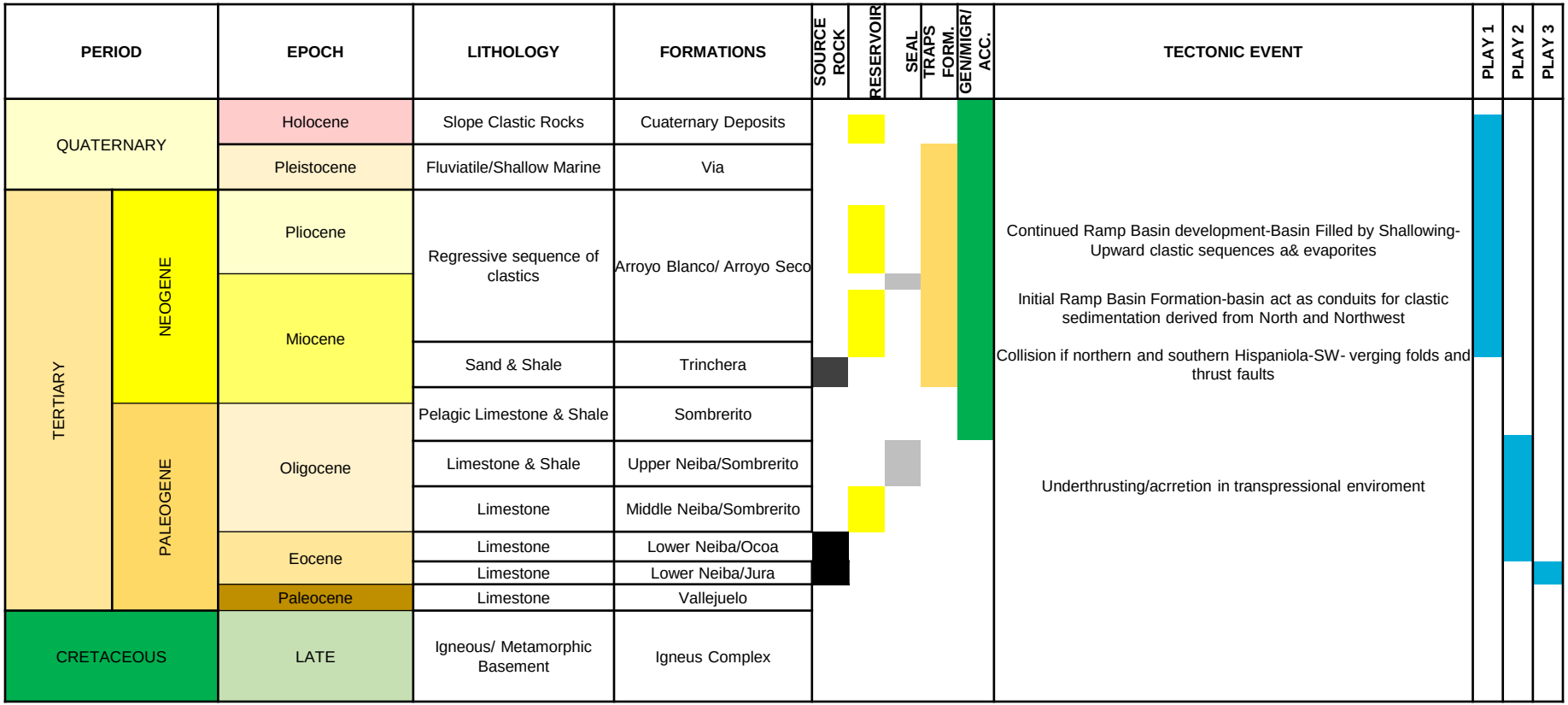
	POSITIVES	POTENTIALS
Basin	• Frontier basin • Max sediment Thickness of ~14K ft.	• Depocenter in the Northeast part of the basin with HC generation

G&G Data	• 2D seismic data available (42 km)
	• 58 wells drilled
		• Only 10% seismic coverage
		  • Provides 90% addt'l to test
		  • Modern tech can improve dated info

Petroleum System	• Proved petroleum system with 2 existing fields • Several oil seeps in the central part of the basin • Arroyo Blanco Fm (Miocene) has produced Oil (20° API)	• Most wells drilled planned on oil seeps • Outcrop samples with kerogene Type II/III &TOC ›1 • Sulphurous content of gas encountered in Azua wells would suggest a contribution from a limestone source rock
Prospectivity	• At least 3 plays in the basin • Oil production achieved (Maleno & Higuerito fields) • Maleno-1 SEA produced 13K bbl of oil • Maleno-1A produced 5K bbl of oil • LYK wells produced 5K bbl	• High angle transpressive faults, positive flower structures and anticlines identified in 2D seismic-as potential structural traps

Source: Neoil Exploration

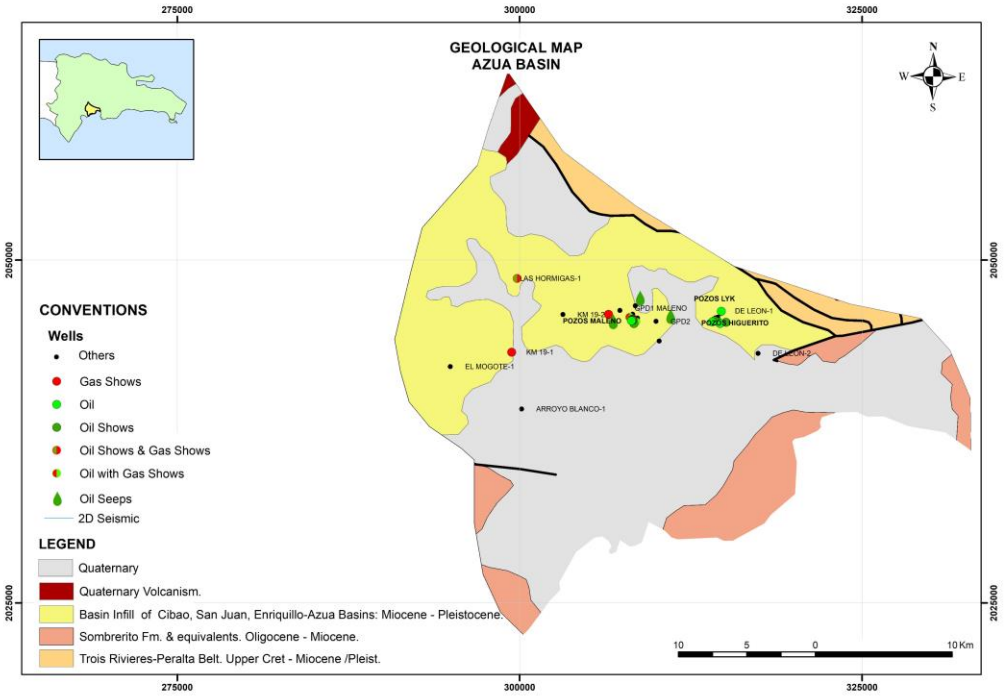
Stratigraphic column of Azua basin shows tectonic events and petroleum systems

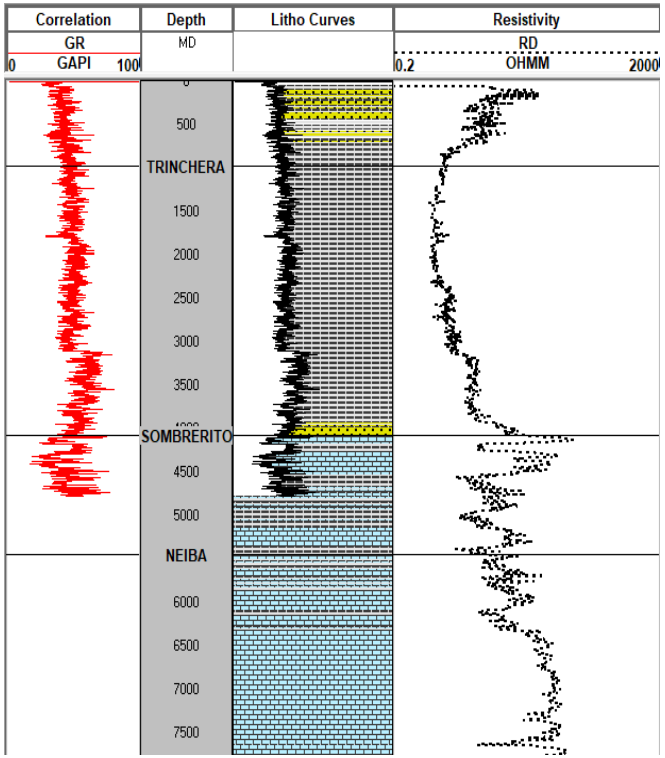


Note: Modified from Tillman, 1991- Mann & Lawrence, 1991

Source: Neoil Exploration

Azua geological map shows presence of hydrocarbons from wells drilled





Maleno Dt-1 Well

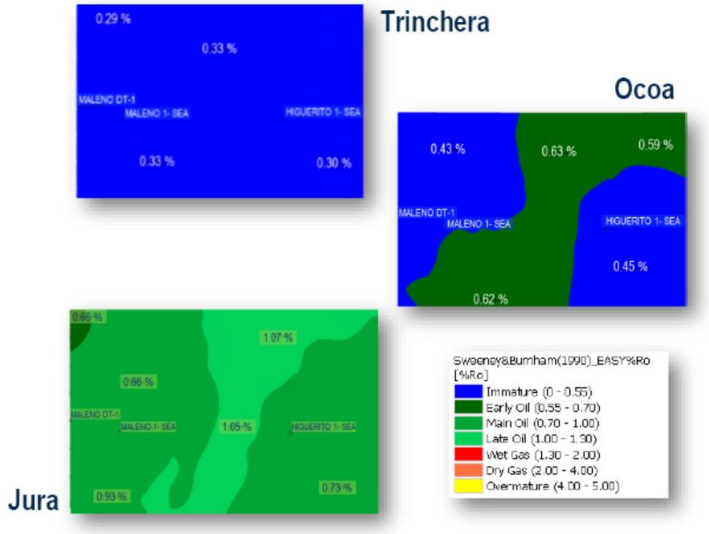
Presence of Hydrocarbons

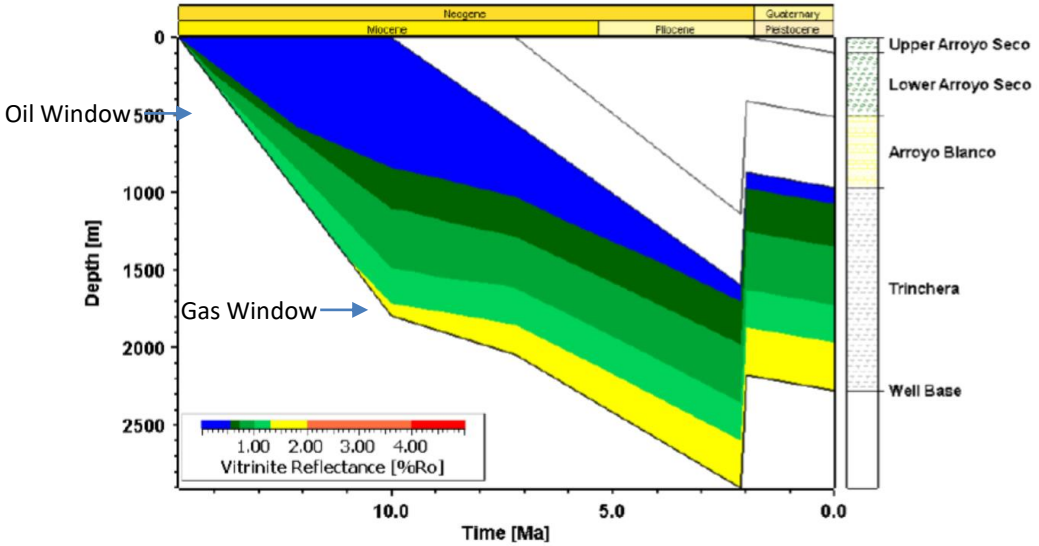
- 4 with production, 14 with oil and/or gas shows and 3 oil seeps

Source: Neoil Exploration

Azua petroleum system shows potential source rocks in the Jura formation

Current maturity of main Source Rocks in basin





- **Source Rock:** Shales from Neiba & Trinchera Fm, hypothetical source rock from Jura Fm
- **Reservoir Rock:** Conglomerate facies from Ocoa Fm, sandstones from Trinchera/Arroyo Blanco Fm
- **Seal Rock:** Marls from Sombrerito Fm & shales from Arroyo Blanco Fm
- **Trap:** Seismic shows a highly deformed basin with high angle transpressive faults, positive flower structures and anticlines – All potential HC traps
- **Timing:** Potential deeper source rock (Jura Fm) would be maximum peak of generation

Note: Burial History of the El Mogote-1 entering into oil window (Early Miocene) & Gas windon (Middle Miocene), from Tillman, 1991
Source: Neoil Exploration

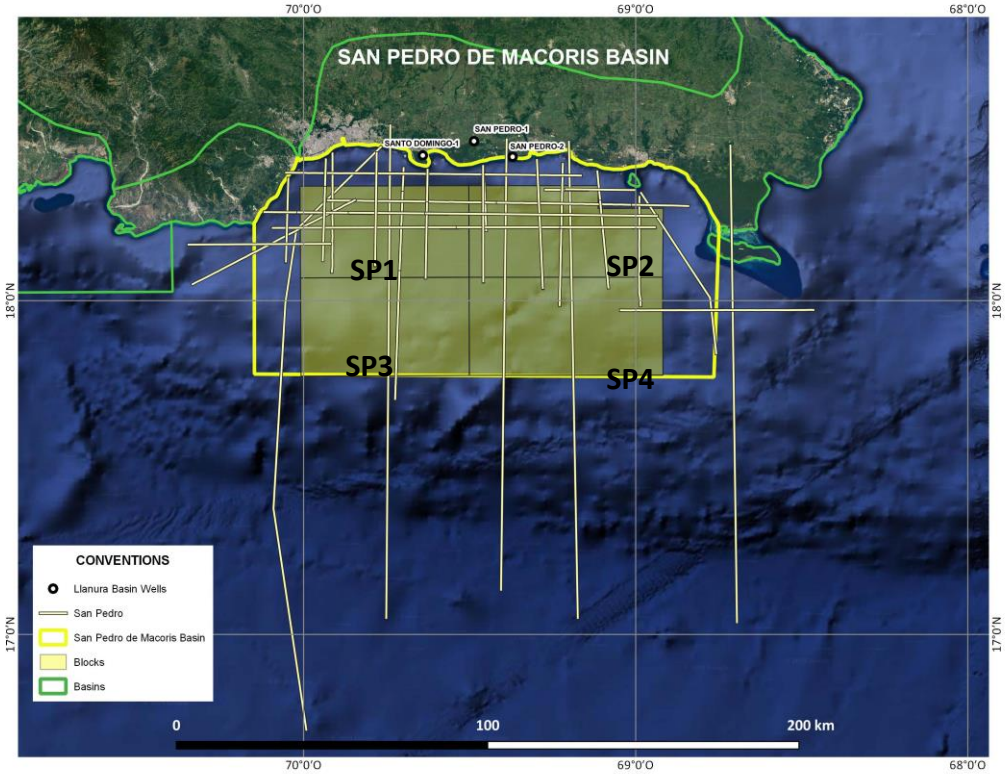
MINISTERIO
DE ENERGÍA Y MINAS
REPÚBLICA DOMINICANA

AGENDA

1. INTRODUCTION
2. **EXPLORATION OPPORTUNITIES**
    - » CIBAO BASIN
    - » ENRIQUILLO BASIN
    - » AZUA BASIN
    - » **SAN PEDRO DE MACORIS**
3. SUMMARY AND DATA PACK

Four offshore blocks have been delineated in the San Pedro De Macoris basin

San Pedro de Macoris Basin



Blocks

- SP1, SP2, SP3 and SP4

Basin Area

- ~10,000 km2

Tectonic

- Forearc basin

Seismic

- ~1900 km 2D
- ~70% of 2D seismic coverage

Wells Drilled

- 3 wells on the onshore part of basin (Llanura Oriental basin)

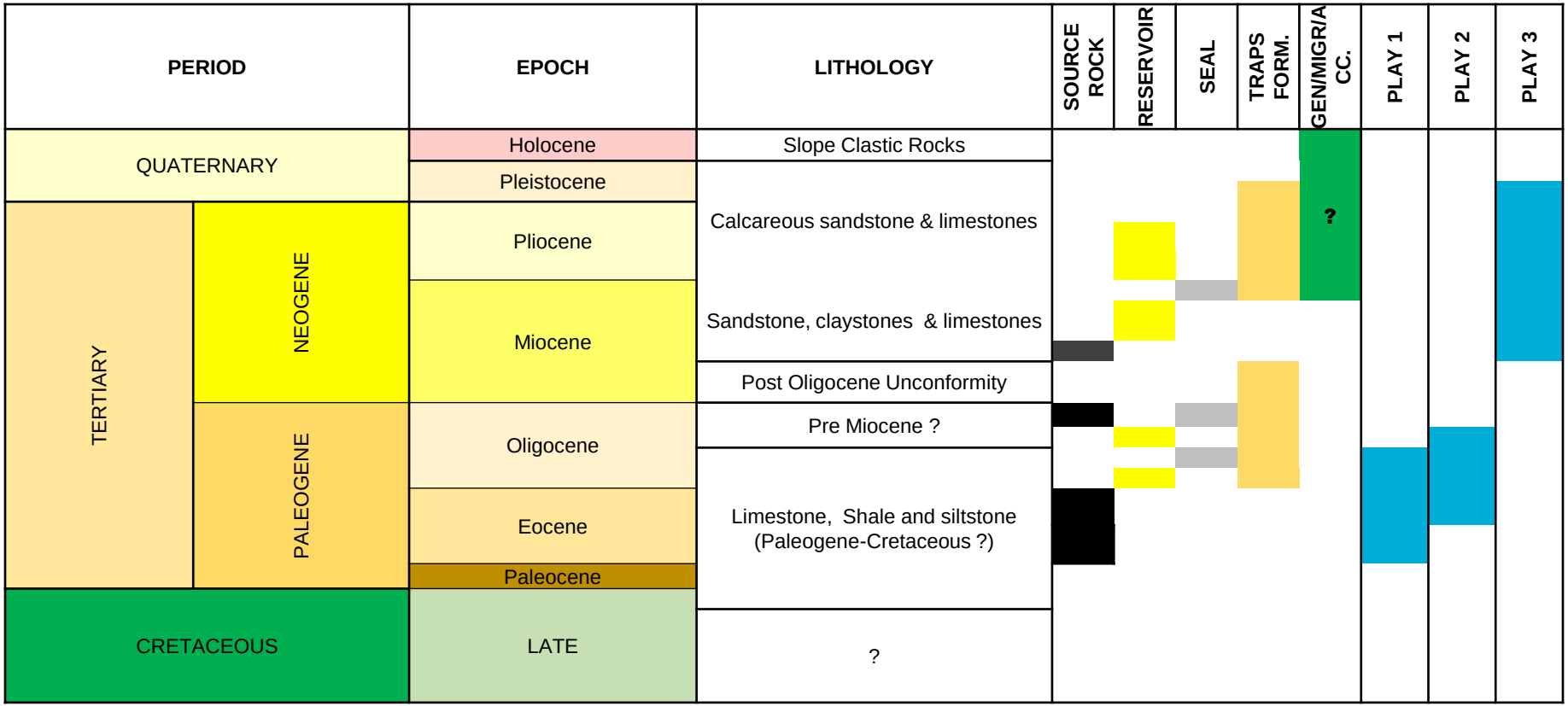
Source: Neoil Exploration

San Pedro basin highlights

	POSITIVES	POTENTIALS
Basin	• Frontier basin • Sediment thickness ~14K ft	• Depocenter in the southern part of the basin with HC generation
G&G Data	• 2D seismic data available (~1900 km) • 3 wells on the onshore part of the basin (Llanura Oriental basin)	• 67% seismic coverage • Modern tech can improve dated info
Petroleum System	• San Pedro-1, showed paraffin & light oil with 30° API • Proved petroleum system with oil shows in the onshore part of the basin	• Potential source rock in the oil window in the deepest depocenter of the basin
Prospectivity	• At least 3 plays in the basin	• Seismic shows potential structural traps, and also stratigraphic traps (Pinch outs & Turbidite fans)

Source: Neoil Exploration

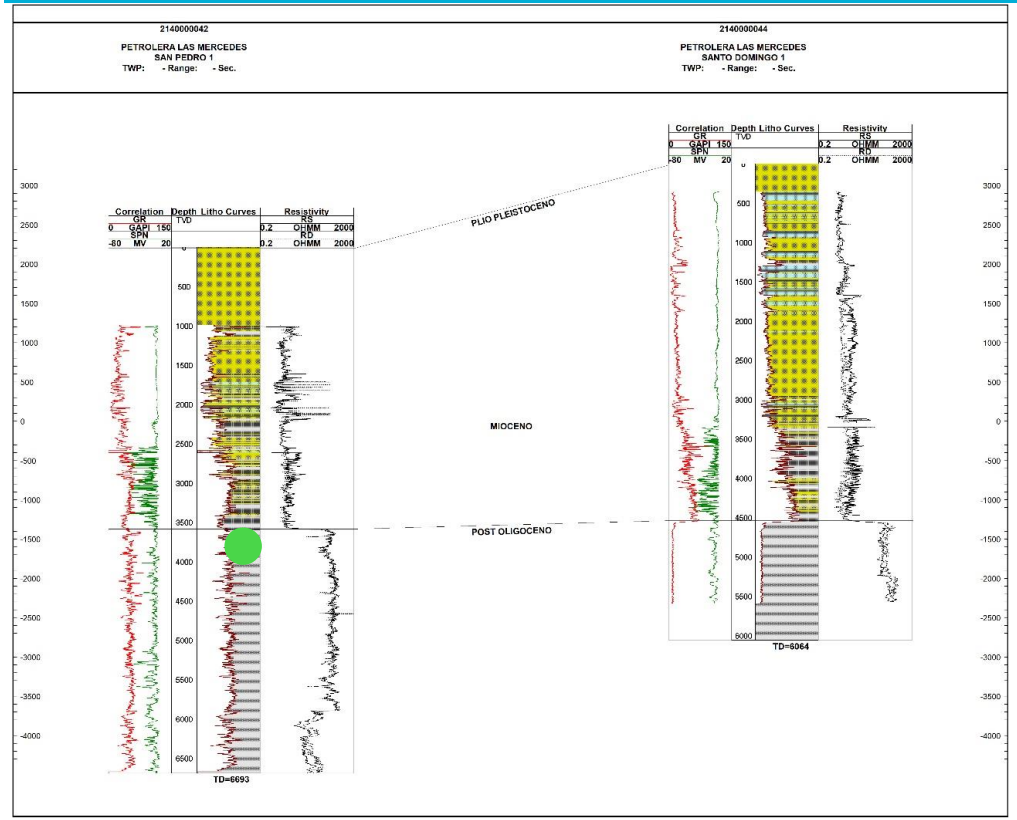
Stratigraphic column of San Pedro basin shows tectonic events and petroleum systems



Note: Based on Santo Domingo-1, San Pedro-1 wells and seismic interpretation (Neoil Exploration, 2019)
Source: Neoil Exploration

Wells correlation San Pedro – 1 & Santo Domingo -1 indicate oil shows during drilling

San Pedro de Macoris Basin

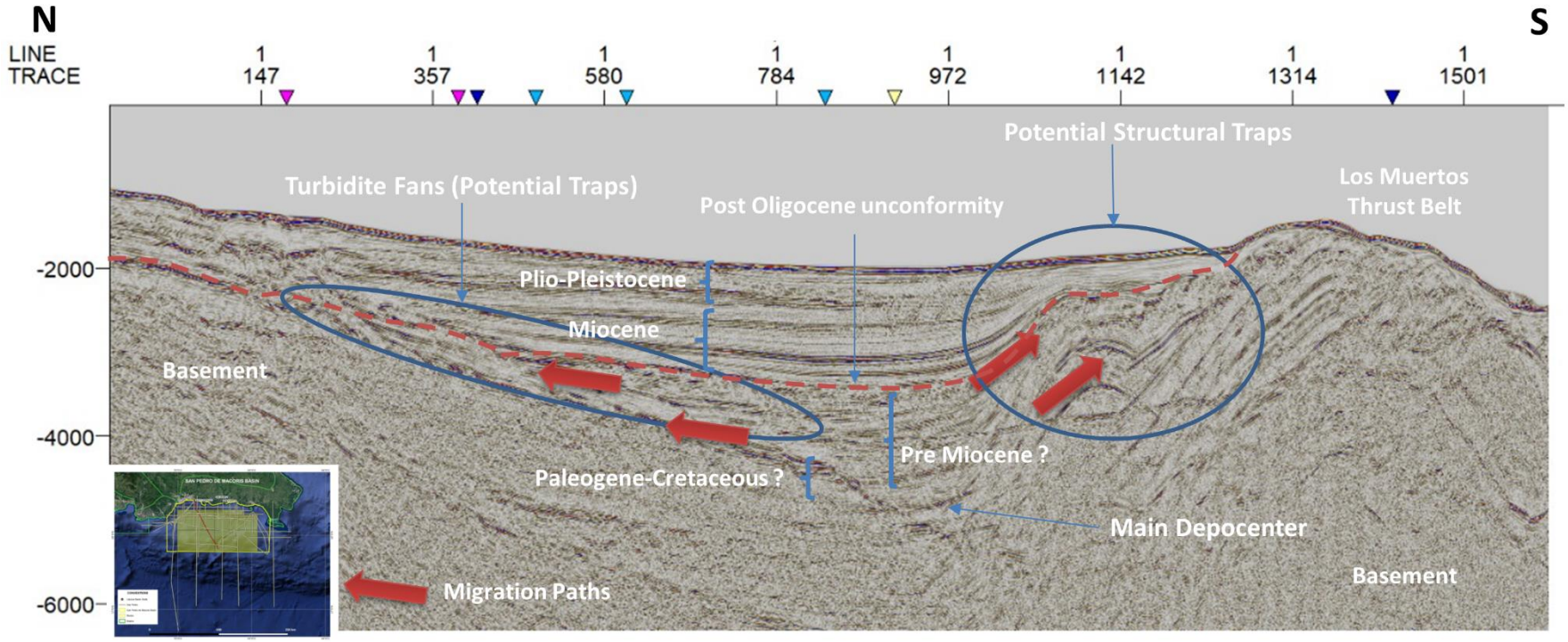


Onshore Wells:

- 7 oil shows (●)during drilling (San Pedro-1 well)
- @ 3686 ft: Paraffinic oil with 30° API in a natural fracture zone
- Mud weight was increased to control high pressure

Source: Neoil Exploration

Geological maps shows a depocenter with hydrocarbon generation



- **Seismic:** 127 seismic lines with a total of ~1900 km
- **Well Activity:** 3 onshore wells
- **Bouger Anomaly:** Shows a depocenter in the southern part of the basin; depocenter with HC generation

Source: Neoil Exploration

MINISTERIO
DE ENERGÍA Y MINAS
REPÚBLICA DOMINICANA

AGENDA

1. INTRODUCTION
2. EXPLORATION OPPORTUNITIES
    - » CIBAO BASIN
    - » ENRIQUILLO BASIN
    - » AZUA BASIN
    - » SAN PEDRO DE MACORIS
3. **SUMMARY AND DATA PACK**

In summary…

- All basins with available G&G data to start the exploration process
- Petroleum system working in all basins on offer
- All basins have at least 3 plays
- Seismic shows highly deformed basins with potential structural traps
- Most wells drilled haven’t reached the deepest reservoirs and source rock and have been drilled using surface geology and oil seeps

The website containing all technical data is made publicly available

Information Available

The National Database of Hydrocarbons (BNDH) is a **free compendium** and digital file – in the standard oil industry format – of **all the geological, geophysical and seismic information** collected through exploration and prospection activities of hydrocarbons in Dominican soil and sea since 1904

Steps:

1. Go to https://bndh.gob.do/en/
2. Login: visitante
3. Password: visitante

MINISTERIO
DE ENERGÍA Y MINAS
REPÚBLICA DOMINICANA

Thank you!