

# Melbana Energy in Cuba

An exploration success in the Caribbean



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**Prospective Resources Cautionary Statement (PRCS):** The estimated quantities of petroleum that may potentially be recovered by the application of a future development project(s) relate to undiscovered accumulations. These estimates have both an associated risk of discovery and a risk of development. Future exploration appraisal and evaluation is required to determine the existence of a significant quantity of potentially moveable hydrocarbons.

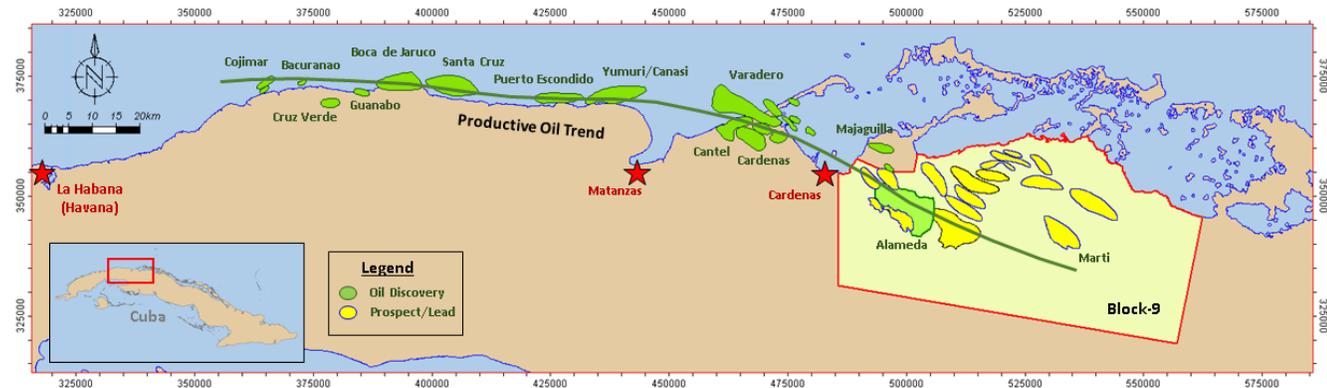
## Executive summary – Melbana Activities to Date

- Block 9 covers 2,344 km<sup>2</sup> in northern Cuba, on trend with the 11 billion barrels OOIP Varadero field that has produced 200 mmbbl to date.
- The Block 9 production sharing contract (“PSC”) is valid until 2040.
- The JV has drilled four wells: Alameda-1 and Zapato-1 in 2022; Amistad-1 (Alameda-2) in 2023; and is drilling Alameda-3, spud on Dec. 15, 2023.
- Alameda-1 discovered three vertically stacked reservoir systems (Amistad, Alameda and Marti): the shallowest horizon alone has a 1,439 m gross oil column.
- Based on the results of Amistad-1, McDaniel & Associates have estimated a best-case Unit 1B contingent resource (2C) of 46 mmbbls and an incremental best case prospective resource (2U) of 90 mmbbls in the up-dip western portion of the structure.
- Melbana has designed a “Phase 1” development plan for the Amistad Unit 1B comprising 7 new Unit 1B wells and acquire 3D seismic.
- Further development to be planned post-3D.

# Melbana journey from data interpretation to drilling a success

**Block 9 PSC (2,344 km<sup>2</sup> or 588,000 acres) located onshore and close to infrastructure along structural strike from the Play that works in the leading edge of the Cuban Fold Belt – a string of big fields exist from Havana to Varadero**

- Alameda-1 encountered oil at all 3 objectives.
- Amistad-1 recovered oil from 3 separate reservoirs and flowed >1900bopd from Unit 1B.
- Based on these results, an economic project has been defined within Unit 1B.



## Timeline

### 2013

- Prequalified as Operator.
- Identified Block 9 as preferred opportunity.

### 2016

- Opened the Havana office.
- Appointed experienced ex-Cupet Cuba Representative.
- Full technical financial team in Cuba.

### 2015

- Melbana Energy awarded Block 9 PSC.

### 2017

- Geological data aggregation and integration work provided a block-wide structural/stratigraphic interpretation.
- Prospective resource certification by McDaniels of 15 Billion barrels in place.

### 2020

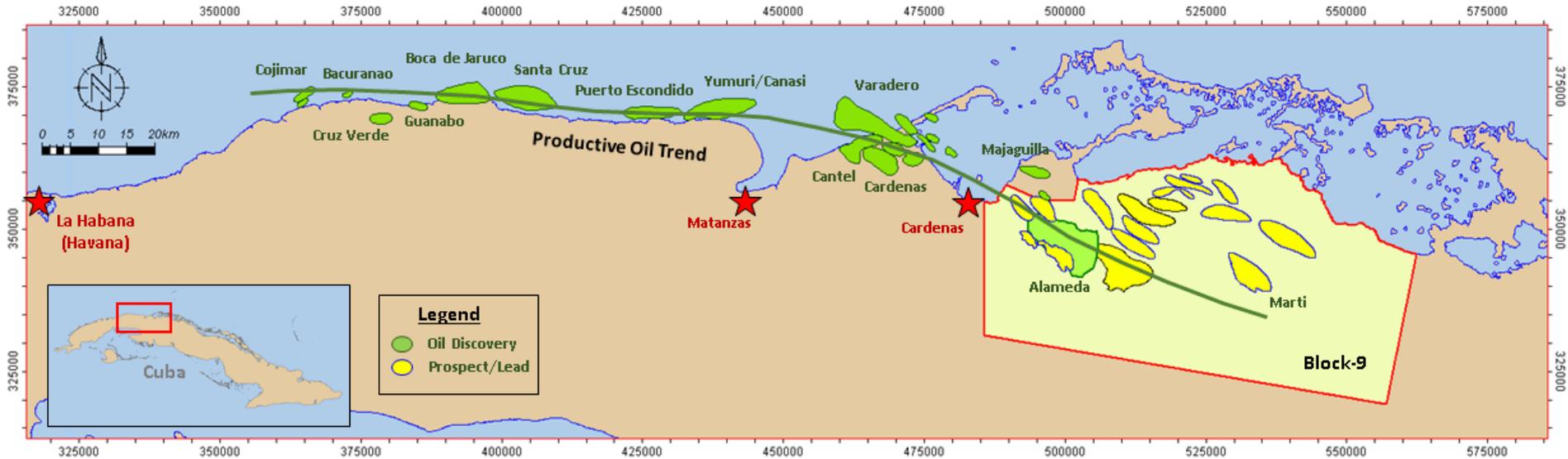
- Preparations for drilling, including permitting for Alameda-1 and Zapato-1 wells, civil works tenders.
- Angolan National Oil Company, Sonangol, became the Joint Venture partner.

### 2021 / 2023

- Drilled 3 wells: Alameda-1, Zapato-1, and Amistad-1.
- Alameda-1 encountered oil in 5 zones.
- Amistad-1 confirmed shallow oil development.

(\*) Source: Sherritt International Corporation Year End 2017 Results.

# Cuba has all the key geoscience play elements covered



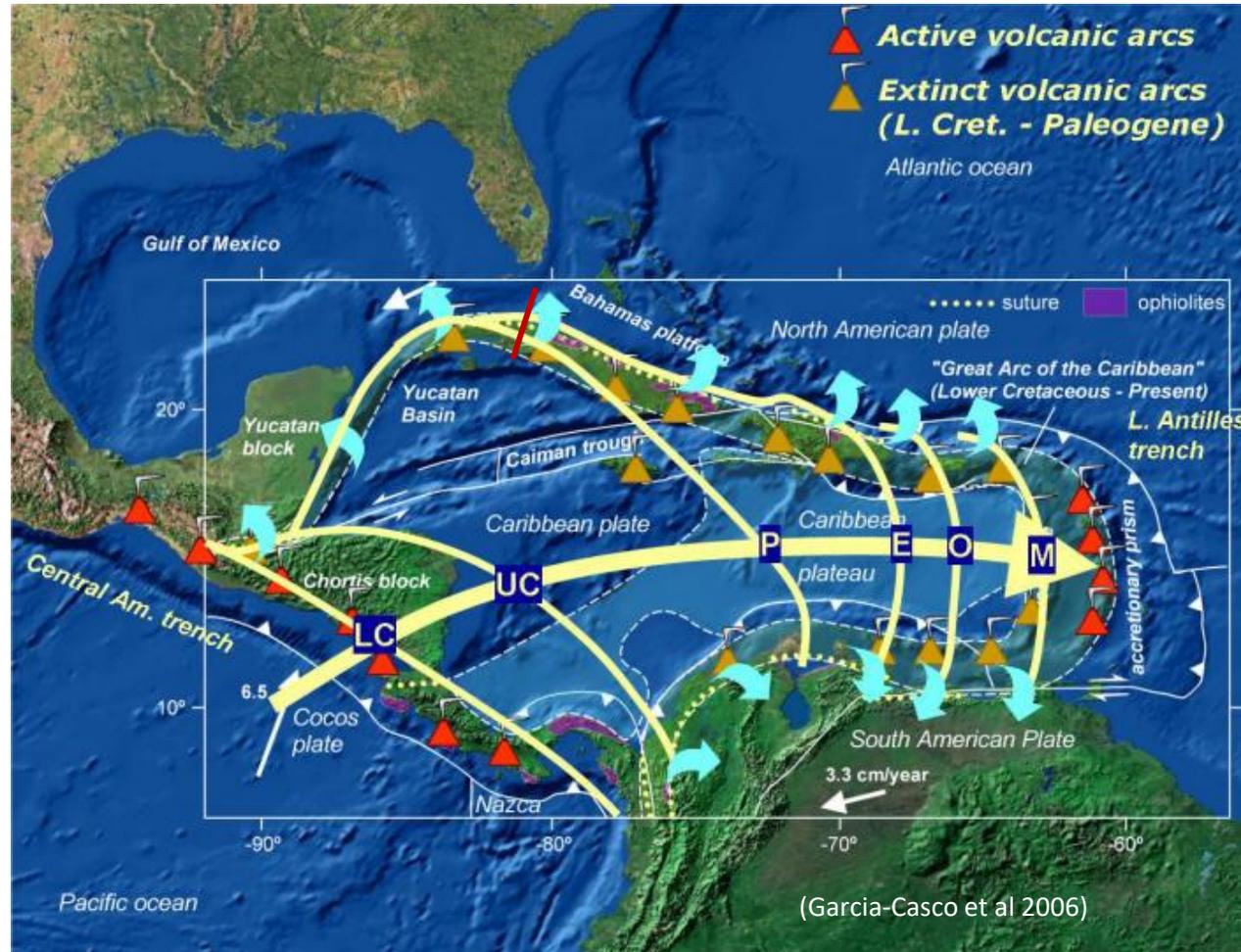
## Existing Exploration Paradigms and what Melbana do differently

- **Source Rocks:** Cuba has a world class, working hydrocarbon system with many fields discovered along the north coast of Cuba. Southern GOM source rocks are prolific - sourcing Billions of barrels of oil from high TOC/HI (up to 10% TOC and 400-700 HI's) within anoxic flooding events contained within the carbonate succession in each thrust sheet...Historically, oil found was mostly 9-12 API.
- **Reservoir:** Fine grained carbonates with some dissolution enhancement evident, heavily fractured.... productivity has been an issue. Exploiting the fracture systems, an exploration paradigm developed to drill deviated /horizontal wells planned to intersect the maximum number of sheets and fractures at the top carbonate(above)....this was done without understanding the deeper structural architecture.
- **Traps/Seals:** The play that works....Thrust hanging wall wedges and duplexed thrust stacks along the leading edge of the North Cuban Fold Thrust Belt (FTB).
- Melbana interprets the frontal fold train to extend along strike through Block 9. ....and that we can interpret a detailed subsurface structural architecture that describes multiple, deeper detachments sealing new thrust sheet targets. We think that better reservoir quality will be achieved in these deeper sheets with more proximal reservoir facies. We think that lighter hydrocarbons will exist in these deeper, more loaded and matured sheets in the fold stack.

# North Cuba Tectonics - Structural Kinematic Model

**What is the driving mechanism/timing for the foldbelt structures being interpreted - Regional consistency**

- Cuban foldbelt is created by an Island Arc/Continental Margin Collision

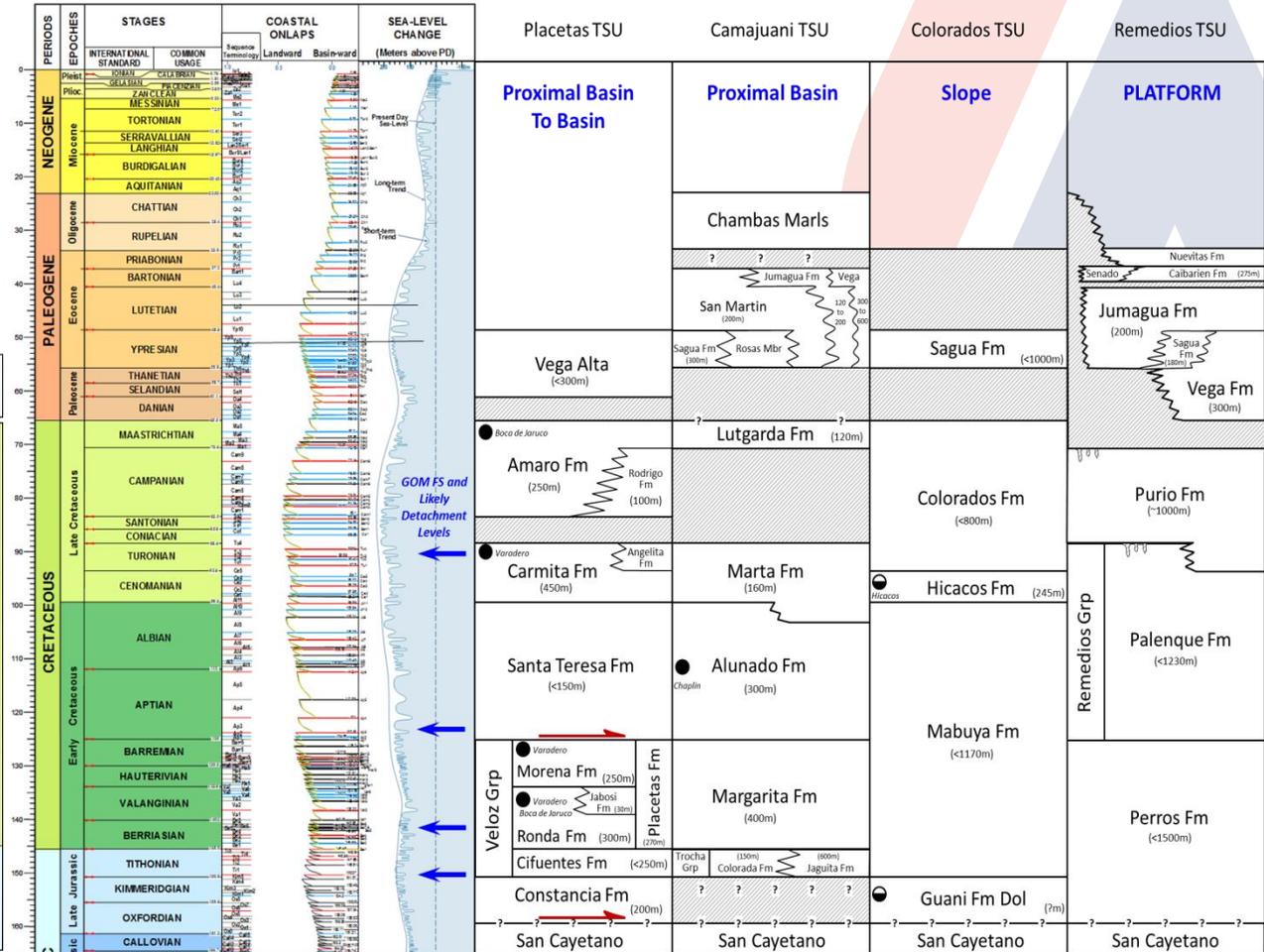
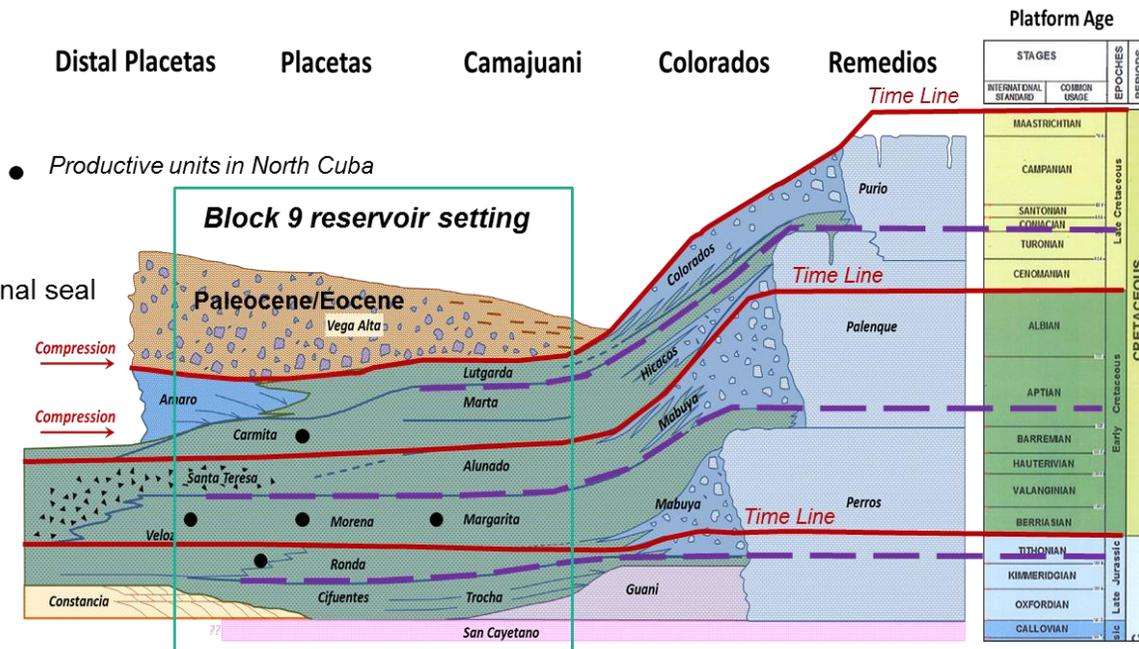


- Much debate about Caribbean plate origins *Pacific v insitu*
- The greater Antilles Arc system is clearly rolling back towards the NE and East
- For our analyses, assume that a lower Plate proto GOM Jurassic crust is subducted beneath the converging upper plate Central American Arc system
- This Arc system contains Ophiolites with SSZ style fore-arc affinities
- NE directed compression creates the Cuban fold belt from Campanian through Eocene until the Bahamas banks chokes the south dipping subduction zone
- Transcurrent fault at the Caiman Trough breaks through and rollback continues to the East
- The contemporary Arc follows the rollback progressively from the Paleocene – Eocene – Miocene to present position at the Lesser Antilles Arc of the West Indies

# Block 9 : Litho-Stratigraphy / Chronostratigraphy

- Reservoir Interval in Block 9 composed largely of distal to foreereef environments
- Mixture of fractured micrites, chalks and carbonate slope breccias
- Thickness and Facies change evident back toward the shelf
- Ultimate top seal provided by Tertiary Clastics sourced from the colliding arc to the South
- Internal seals associated with flooding surfaces and detachments are also likely

Block 9 stratigraphy on a chrono-stratigraphic basis to assist correlations and structural restoration efforts



Large second order flooding events = regional structural detachments

# Well Results – Alameda-1 Drilled Section & Reservoir Intervals

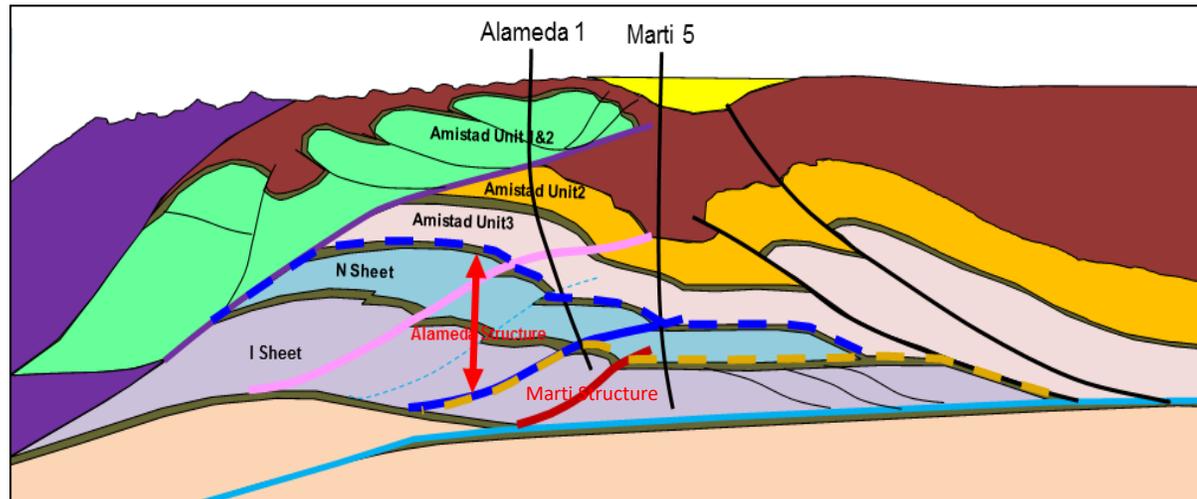
Alameda-1 drilled an imbricated duplex containing a series of stacked distal carbonate reservoirs separated by thrust faults and Vega Alta Serpentinitic Shales. Mapping has broken the drilled section out into the following units:

- A shallow interval containing three Units.
- Units 1 and 2 similarly pressured but interpreted to be separated by a detachment fault. Unit 1 is further subdivided into Units 1A and 1B based on data and show quality
- Unit 3 is below the first serpentinitic shale and has higher pore pressure

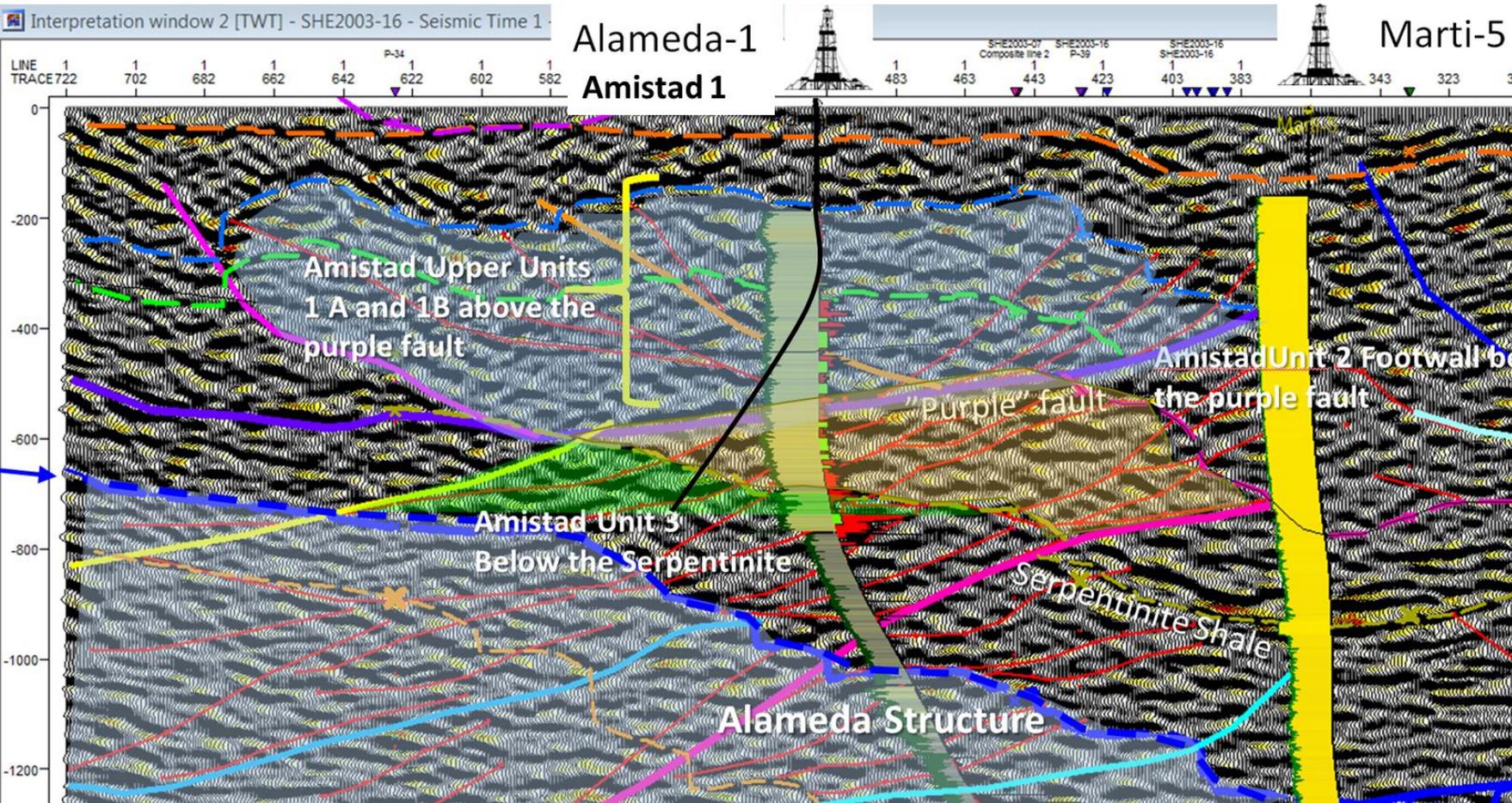
Alameda N Unit is part of the deeper units below repeats of the Vega Alta. No indications of water were seen while drilling

Marti I Unit is the deepest unit penetrated below another Vega Alta repeat. It is also high pressured with influxes at TD of the order of 18ppg. It is interpreted to be fault separated from the Marti I lower pressure portion of the structure

*A total 272m of net log pay was interpreted*



# Amistad 1: Pre-Drill Plan - Deviate updip to intersect Unit 3 higher



- Amistad-1 appraisal well was designed to test oil bearing Units 1, 2 and 3 identified in Alameda-1.
- Amistad-1 was directionally drilled from the same surface location but to the southwest to intersect Unit-3 updip of the original penetration.
- A slimmer well design using 8-1/2" and 6" hole within objective units.
- 3 cores were planned for petrophysical and reservoir description.
- Flow testing of each unit was planned, with the most successful to be completed for later production.

# Amistad-1 key highlights and learnings

- **Commercial oil flows from Unit-1B:**
  - Test #4 flowed oil at an average rate of 1235 BOPD (36/64" choke).
  - Sampled oil was lighter (~19°API ) and higher quality than typically produced in Cuban Fields.
  - Gross column >710m indicated in ALM-1 now higher confidence (higher if Unit-2 is connected).
  - **Provides the basis for an initial cashflow generating development that can commence near-term**, whilst continuing to appraise deeper and nearby targets.
- **Moveable extra-heavy crude in Unit-1A:**
  - Full tubing string of oil (8°API) – artificial lift required to flow.
  - Open hole test only accessed half the interval available for production.
  - Gross column of 141m indicated on logs.
  - **Provides a secondary development opportunity** with shallow sub-horizontal wells.
- **Net pay increase, moveable oil and no water observed:**
  - Better log quality provided an increase in net pay from both U-1A and 1B, delivering an increased resource estimate.
  - Moveable oil demonstrated in Unit 3 equivalents – Additional potential to the south.
  - No significant water was observed from testing – all porous rocks appear oil filled.
- **Structural model was generally consistent with the results:**
  - Minor variance due to fault proximity.
  - Tight limestone sections act as a barrier between some sections with changing pore pressure and oil type noted.
  - Thicker Unit-1B/2 section seen in Alameda-1 likely due to fault repetition.
  - Complexity associated with Vega Alta Fault repetition at the SW extent of these sheets.



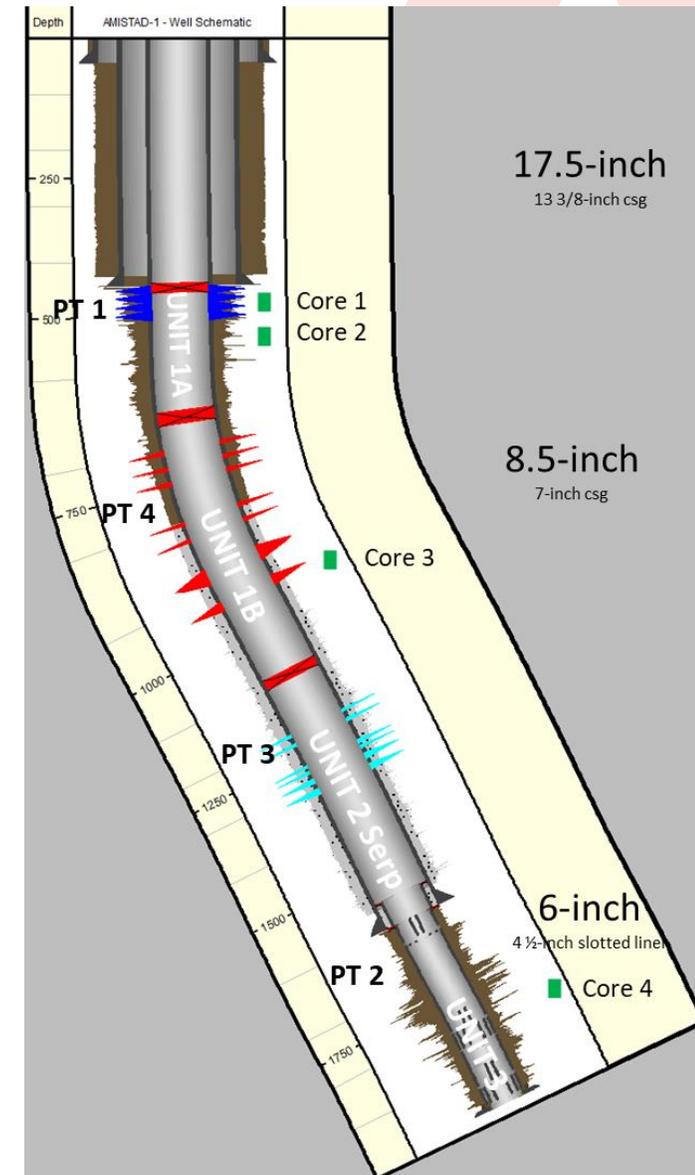
# Amistad-1 Drill Stem Testing

A Total of 4 flow Tests were conducted to investigate reservoir productivity and fluid type

- Test-1 :
  - Off-bottom open hole test of Unit-1A with packer set in the 13-3/8" casing.
  - Tested only the upper 64m (gross) of the reservoir.
  - Full tubing string of oil recovered.
  - Column of extra-heavy oil in the tubing was enough to kill the well.
  - Good permeability interpreted but artificial lift is required to produce.
  - Fluid recovered was heavy oil - ~8°API.
  - Reservoir pressure was close to XPT.
  - Additional (untested) Unit-1A reservoir later encountered below the test interval.

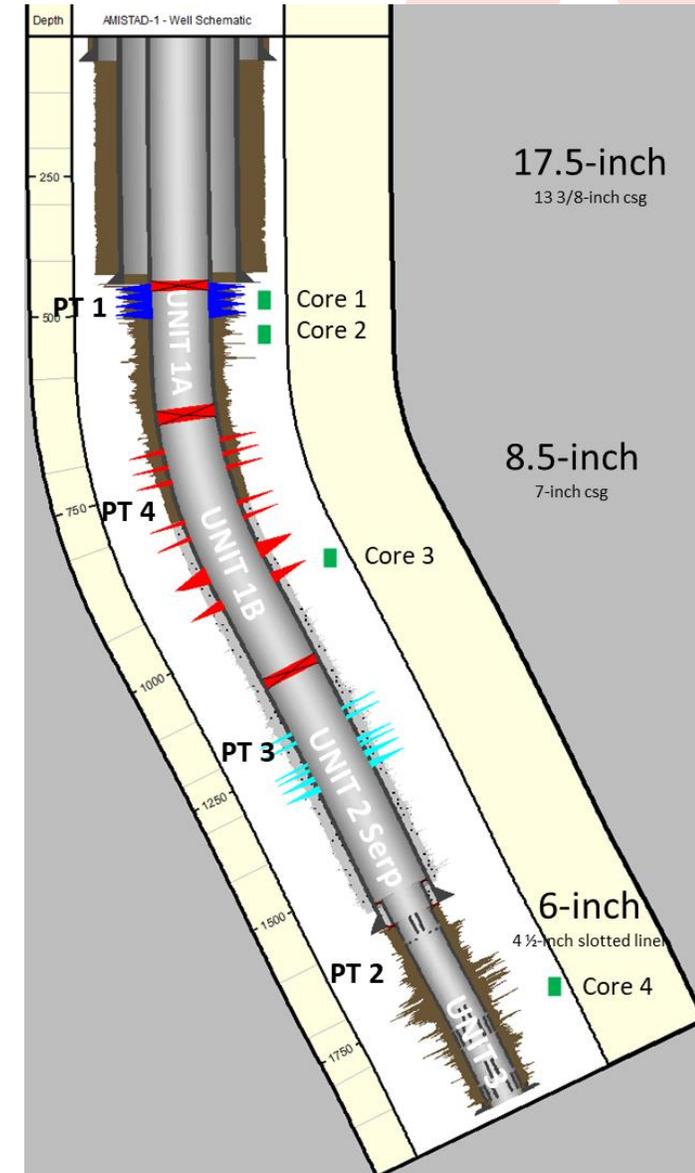
A 7" liner run with ECP's placed in annulus to provide zonal isolation above Unit-3.

- Test-2
  - 4-1/2" slotted liner was run to TD in Unit-3 below the 7" casing shoe, with blanks placed over unstable shale intervals.
  - No flow to surface was achieved, but initial flow demonstrated movable heavy oil.
  - Displacement of the brine cushion during this period equated to a calculated inflow rate of ~750 bpd
  - Lab analysis of samples indicated a heavy 10°API oil.
  - Pressure build up during the main shut-in period suggested a potential mechanical problem during the test.



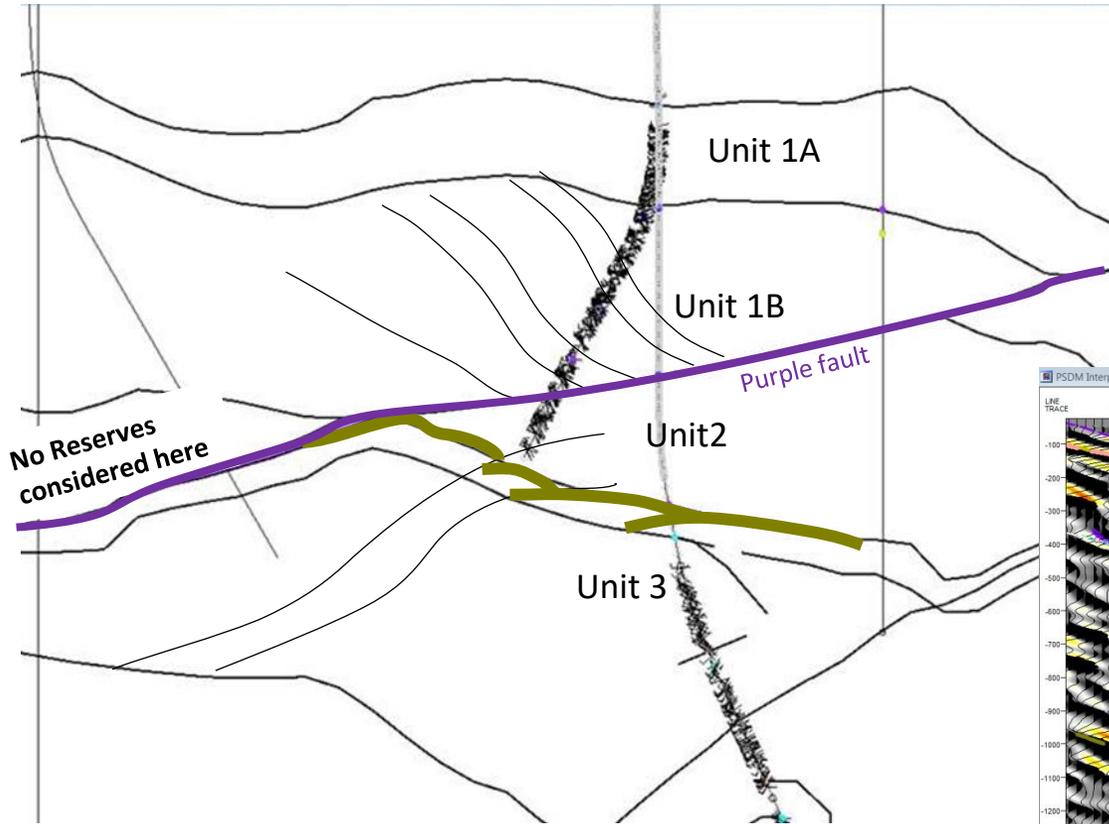
# Amistad-1 Drill Stem Testing (cont.)

- Test-3 :
  - Cased hole test of Unit-2 limestones.
  - Perforated casing over multiple intervals @ 5spf.
  - Total shot length ~50m.
  - No flow from reservoir.
  - USIT/CBL logs indicate cement behind 7" liner.
  - Lack of flow likely due to (cement) damage.
- Test-4
  - Cased hole test of Unit-1B limestones.
  - Perforated casing over multiple intervals @ 6spf.
  - Total shot length of ~76m over a gross interval of 443m (17%).
  - Upper section dominated by porosity/matrix while lower portion dominated by fractures.
  - Multi flow test conducted on a variety of chokes over 24 hours with a 48 hour shut in. Additional flow for further sampling conducted after shut in.
  - Average stabilised flow rate of 1235bopd achieved through a 36/64" choke over 12 hrs.
  - Lab analysis of samples indicate a lighter, higher mobility oil of ~19°API.
  - Reservoir pressure built up quickly indicating good permeability with no depletion observed.
  - Interpretation indicates a minimum 16 mmbbls STOIIP observed during the DST.
  - Established column of 344mTVD tested in the well
  - Cement indicated over basal perforation zone. Hence some uncertainty of how uniform was the contribution to flow.



**Well completed as a Unit-1B Oil Producer**

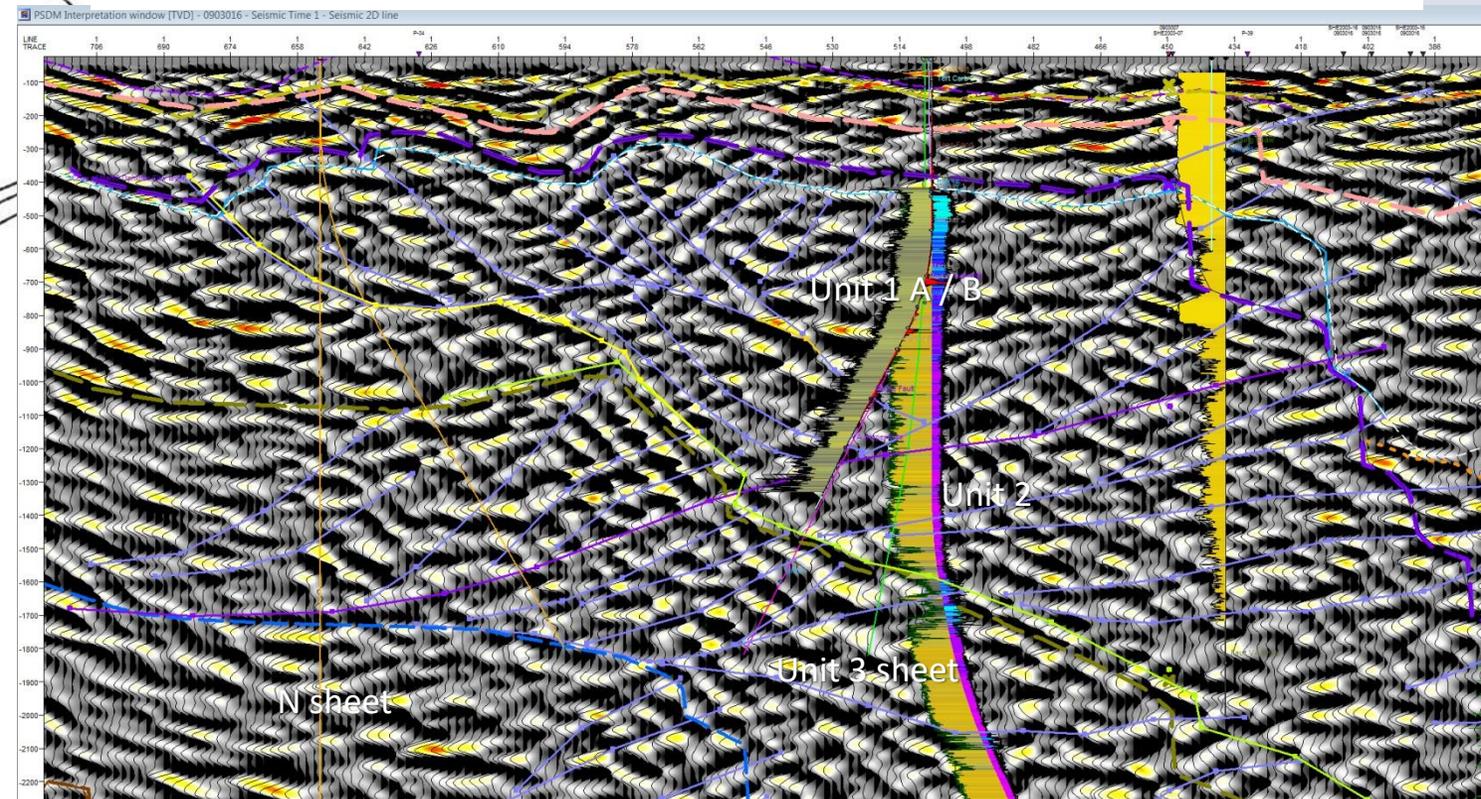
# Pre Drill: Line Drawing of the depth maps...with stylized VA



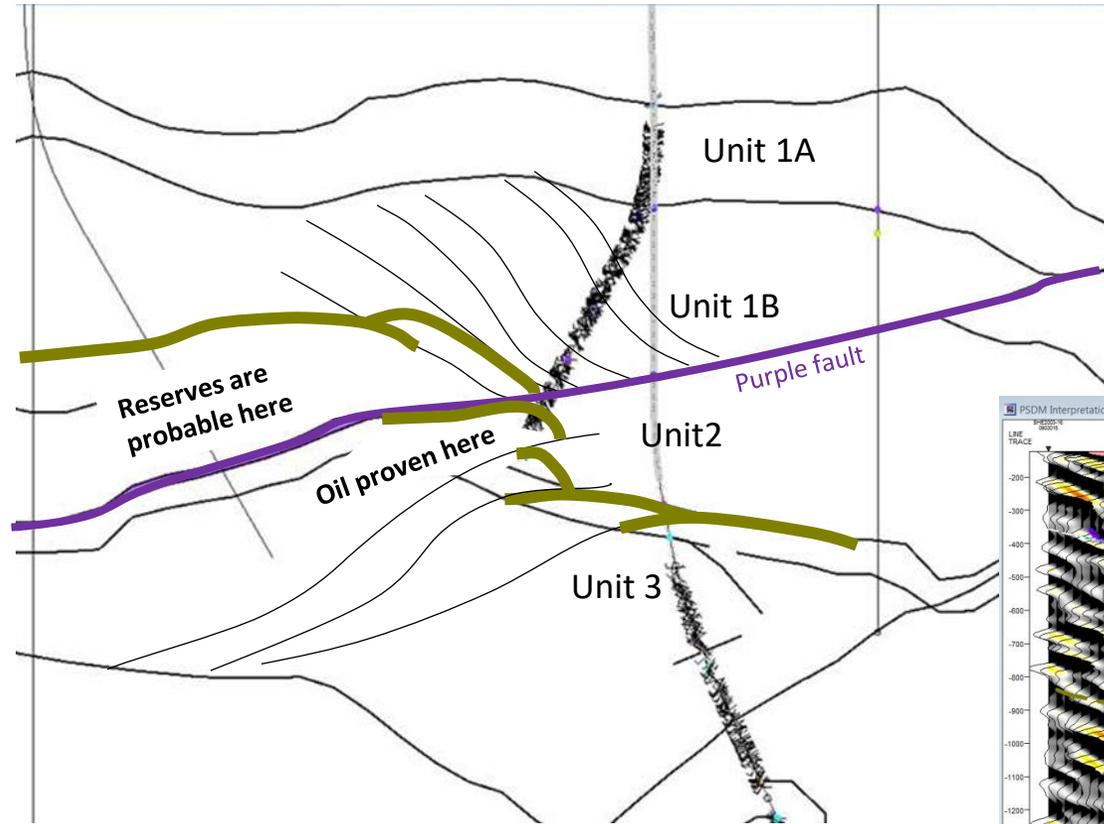
The pre-drill interpretation of Alameda 2 expected a tapering wedge of Unit 2 under the purple fault and a faulted/imbricated Unit 3 --- updip and 500m south from Alameda 1.

## Amistad-1 ..... Early learnings

- Dips change across an U/C in the upper section
- Heavily imbricated / back-thrusted sheet is implied by the dips seen so far in Unit 1B
- Several faults seen ....which one is most important??
- The purple fault may need to be repositioned slightly
- As the steep dips and repeated pieces were seen in the Unit 2 space, its likely this is a heavily faulted segment beneath the purple fault.
- Unlikely to be Unit2, maybe a faulted horse from the unit 3 duplex
- Several repeats of VA have been seen... implying an imbricated series of forelimbs of Unit3 .  
The actual Unit 3 from Alameda 1 may still be deeper at Amistad 1

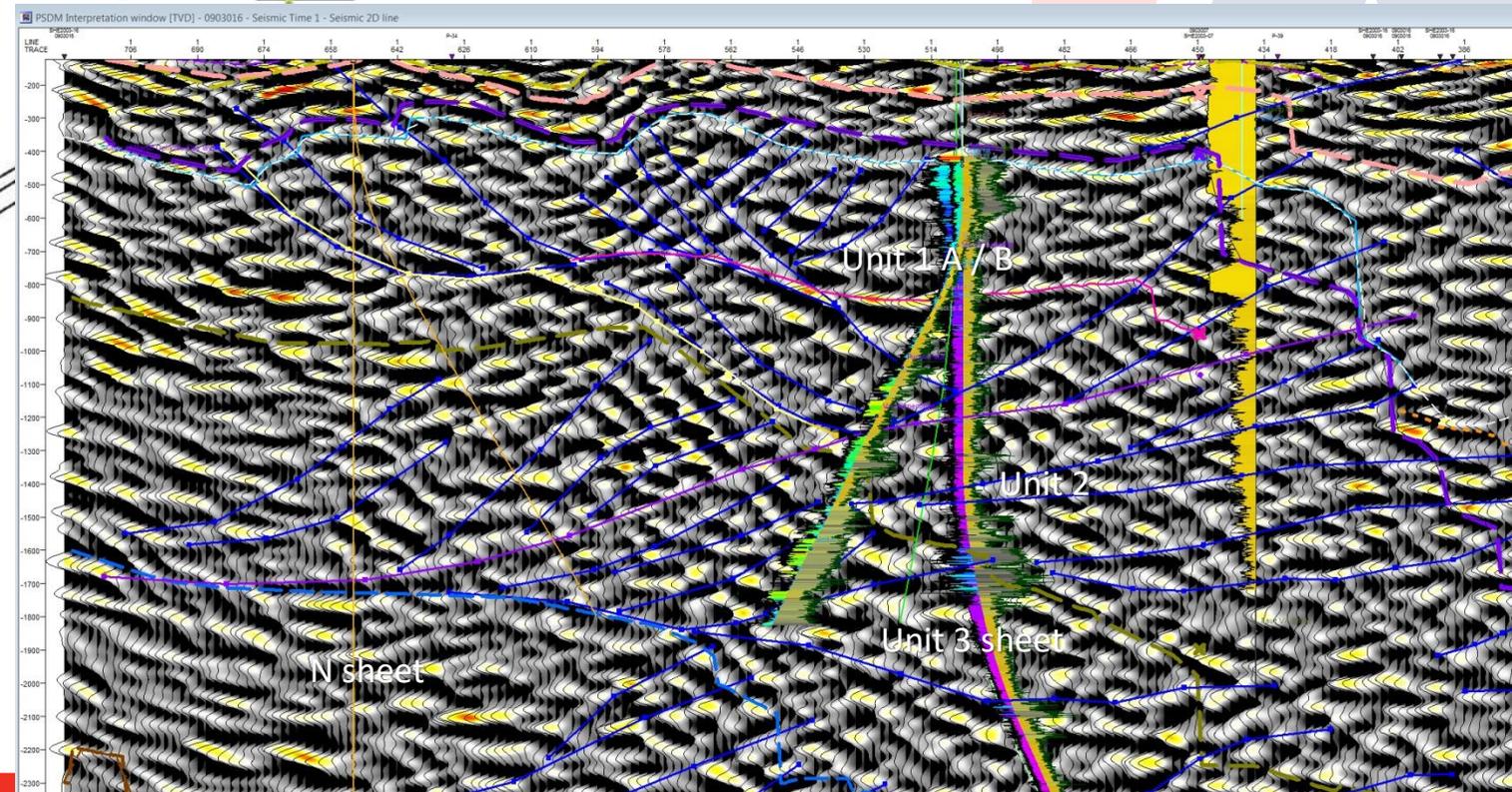


# Post Drill: Line Drawing of the depth maps...with stylized findings



## Amistad-1 ..... Early learnings

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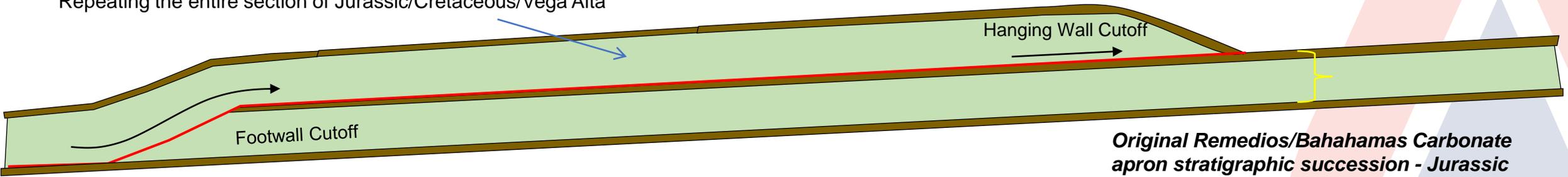


The post drill interpretation of what Alameda 2 found:

- Unit 2 had wedged out/terminated before the wellbore
- a faulted/imbricated unit 3 had more displacement
- forelimbs are out over the wellpath – are oil bearing
- Unit 3 equivalent section was encountered 200m updip and 500m south from Alameda 1.

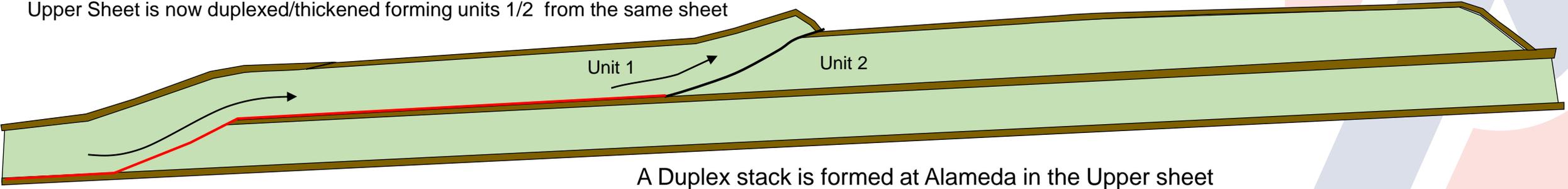
# Upper Sheets formed by imbrication, backthrusting then duplexing

Upper Sheet is emplaced over the red detachment fault  
Repeating the entire section of Jurassic/Cretaceous/Vega Alta



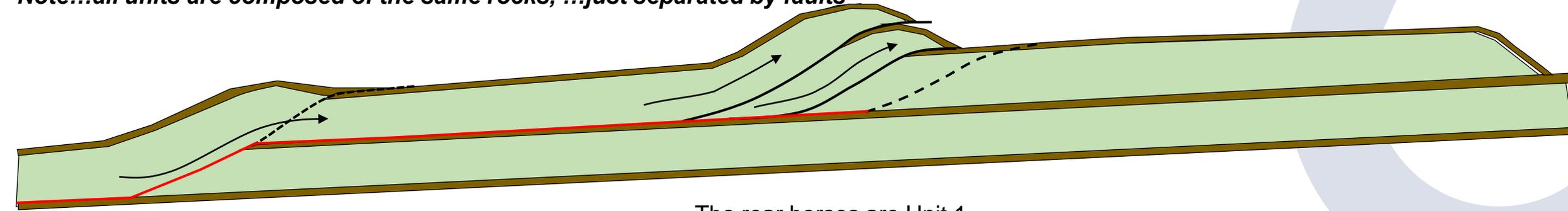
*Original Remedios/Bahamas Carbonate apron stratigraphic succession - Jurassic through Cretaceous carbonates capped by the Paleocene VA*

Upper Sheet is now duplexed/thickened forming units 1/2 from the same sheet



A Duplex stack is formed at Alameda in the Upper sheet

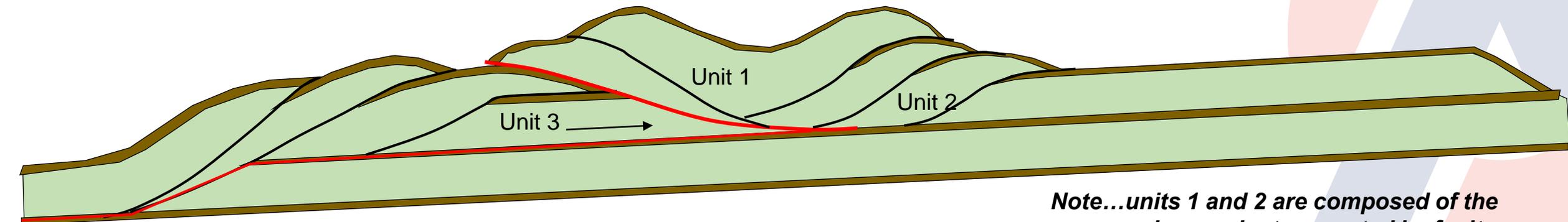
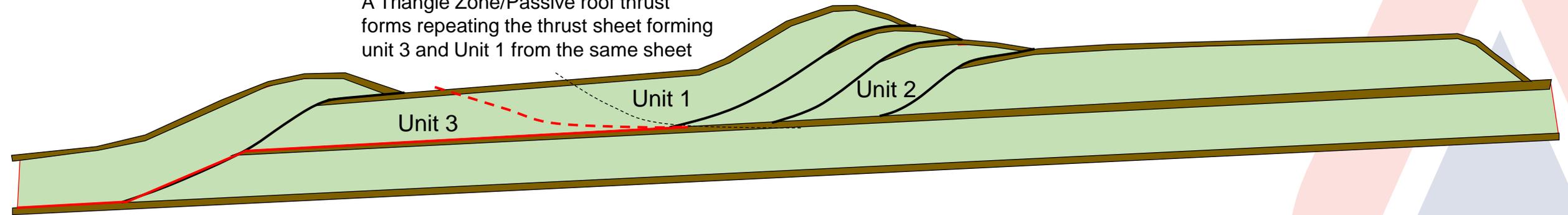
**Note...all units are composed of the same rocks, ...just separated by faults**



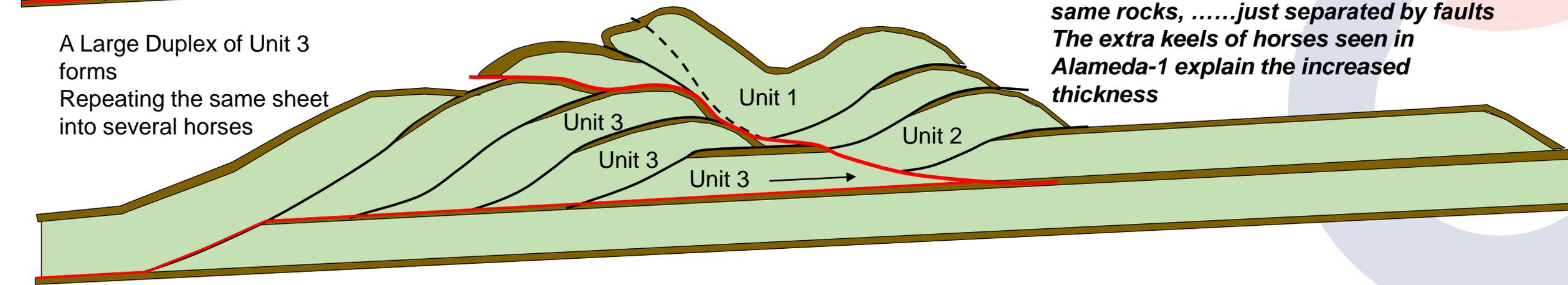
The rear horses are Unit 1  
The front horses are Unit 2

# Passive roof thrust / triangle zone forms – forming Unit 3 & Unit 1

A Triangle Zone/Passive roof thrust forms repeating the thrust sheet forming unit 3 and Unit 1 from the same sheet

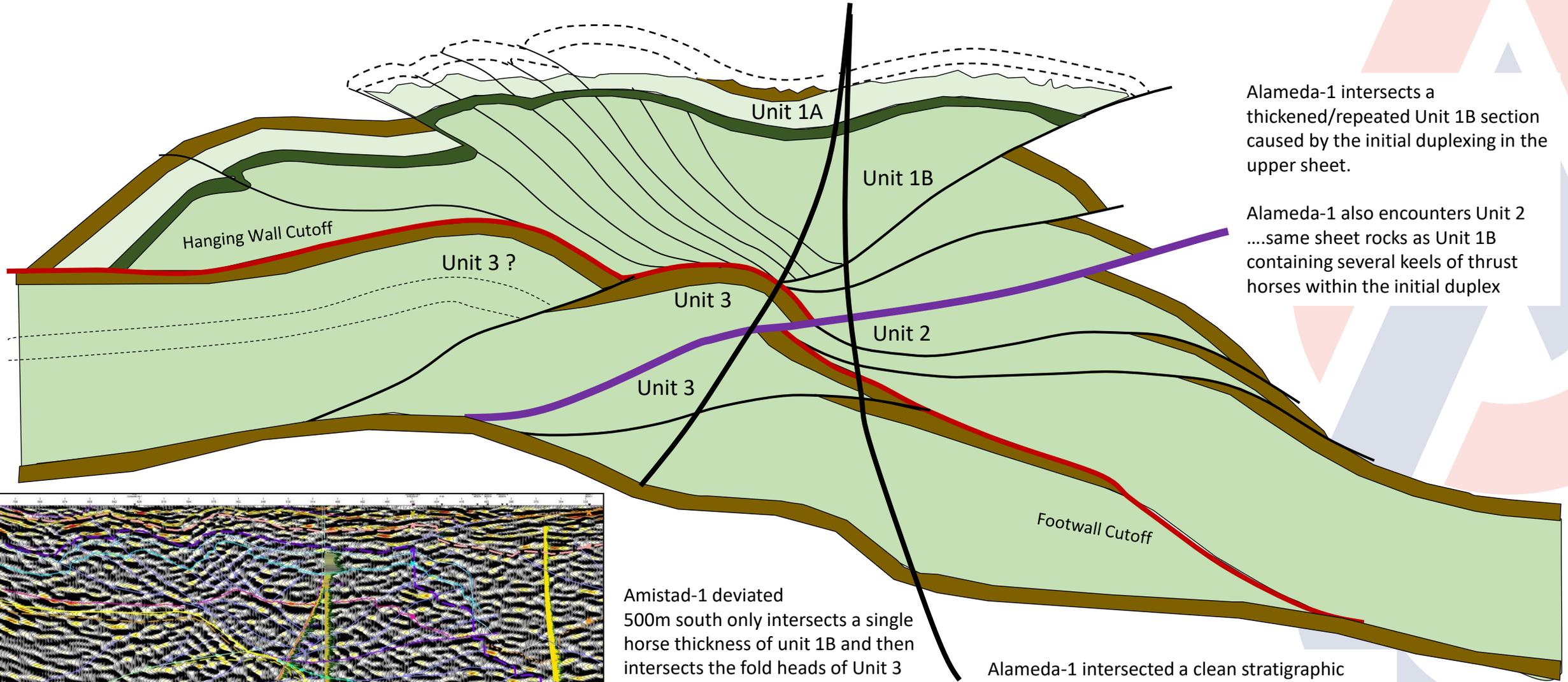


A Large Duplex of Unit 3 forms Repeating the same sheet into several horses



**Note...units 1 and 2 are composed of the same rocks, .....just separated by faults  
The extra keels of horses seen in Alameda-1 explain the increased thickness**

# Result: current structural model for the Upper Sheet Units 1,2 and 3

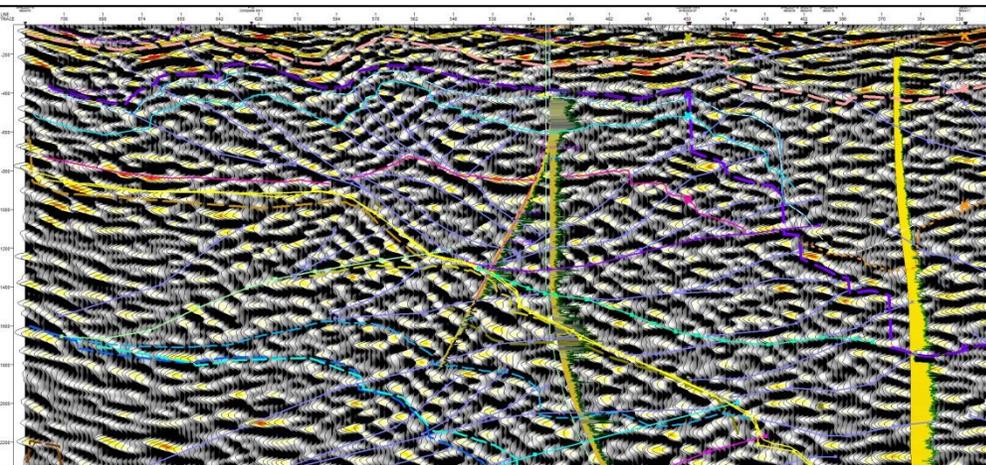


Alameda-1 intersects a thickened/repeated Unit 1B section caused by the initial duplexing in the upper sheet.

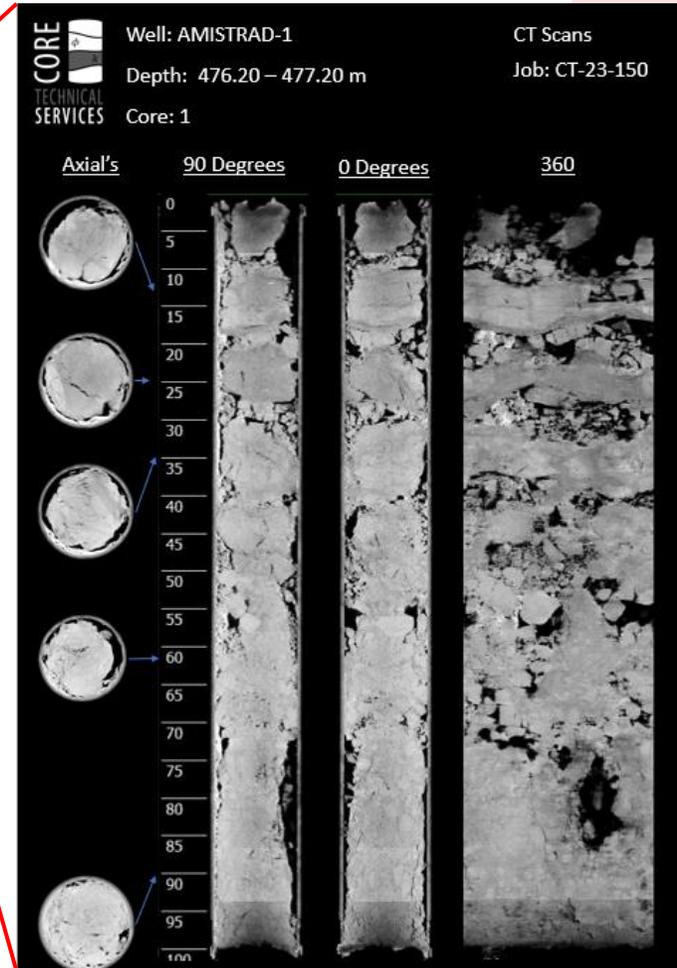
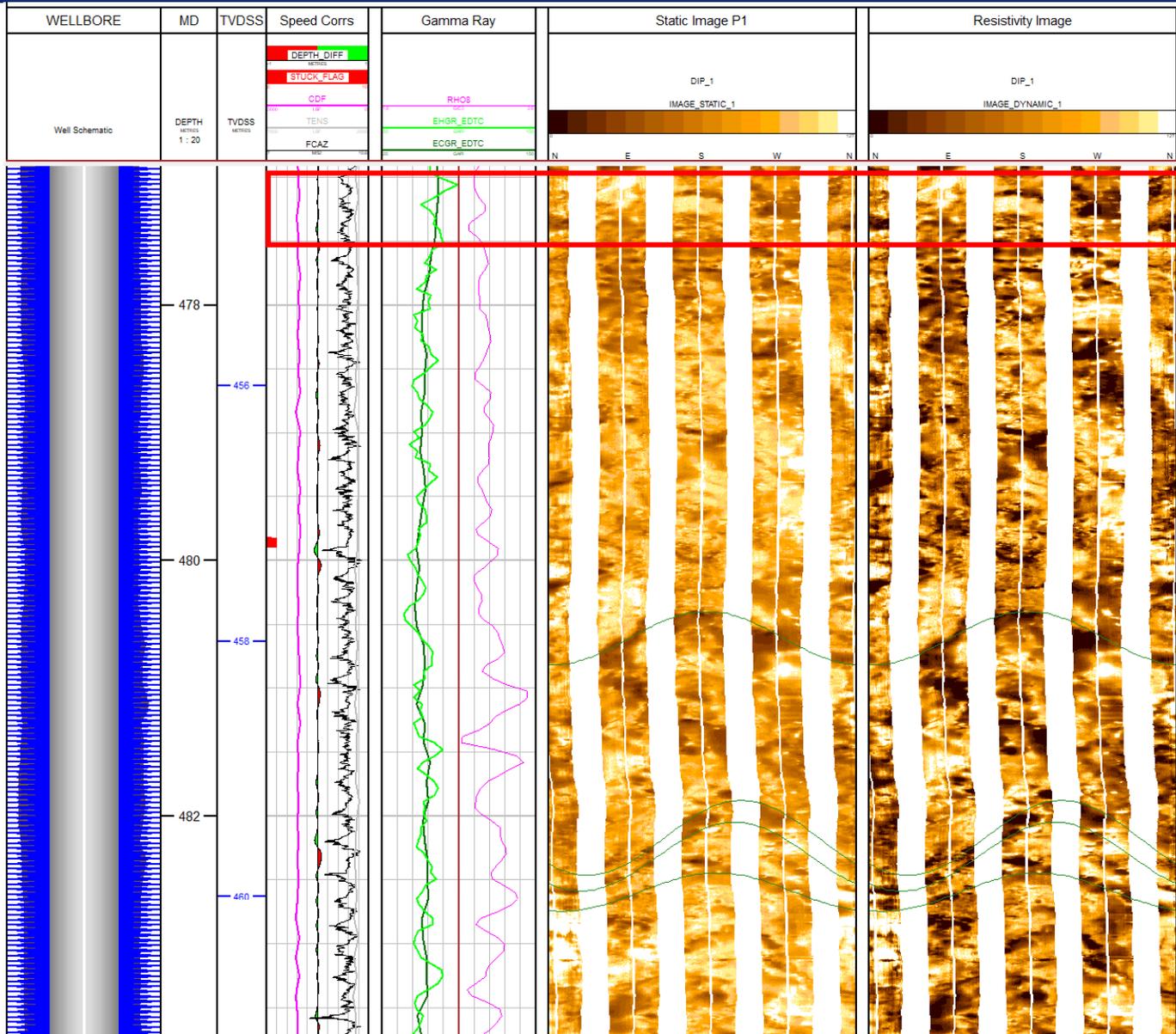
Alameda-1 also encounters Unit 2 ....same sheet rocks as Unit 1B containing several keels of thrust horses within the initial duplex

Amistad-1 deviated 500m south only intersects a single horse thickness of unit 1B and then intersects the fold heads of Unit 3 repeats from behind.

Alameda-1 intersected a clean stratigraphic section of Unit 3 ...shales seen in A2 may represent another level of complexity or stratigraphic changes.

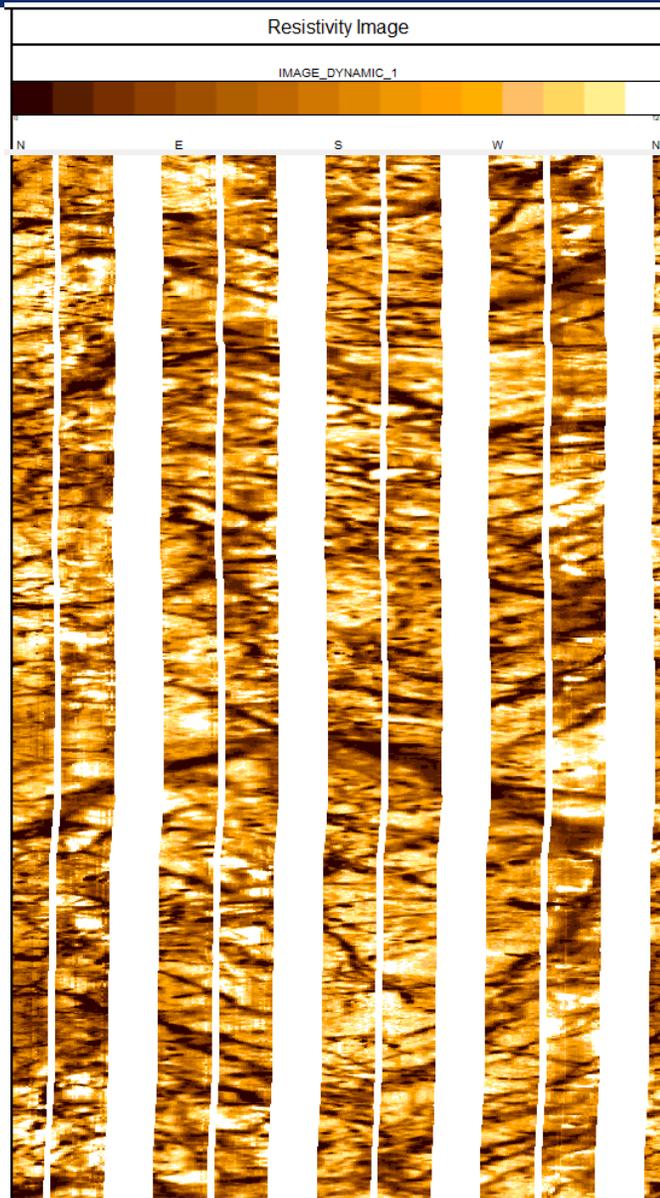


# Unit 1A FMI IMAGE of secondary vug/dissolution porosity

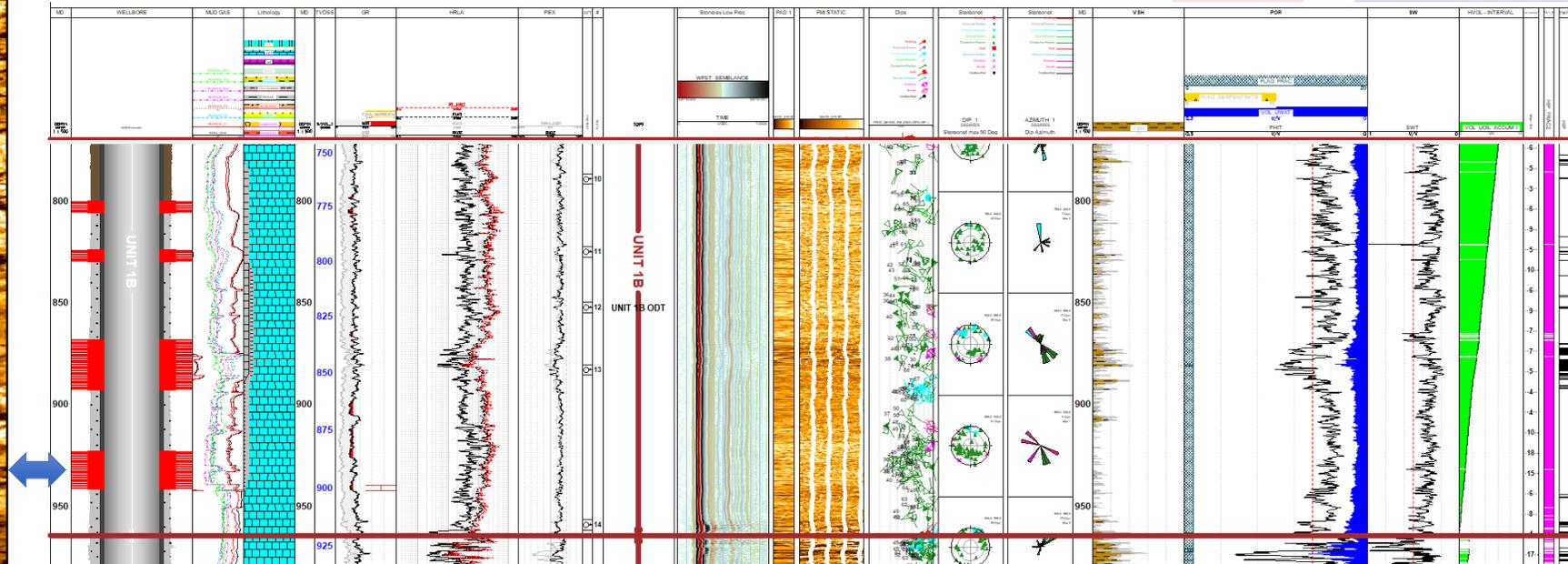


- Vuggy textures interpreted as secondary dissolution porosity observed on FMI Images in Units 1A and 1B.
- Initial CT Scans of Core confirm presence of Vugs and Fractures.

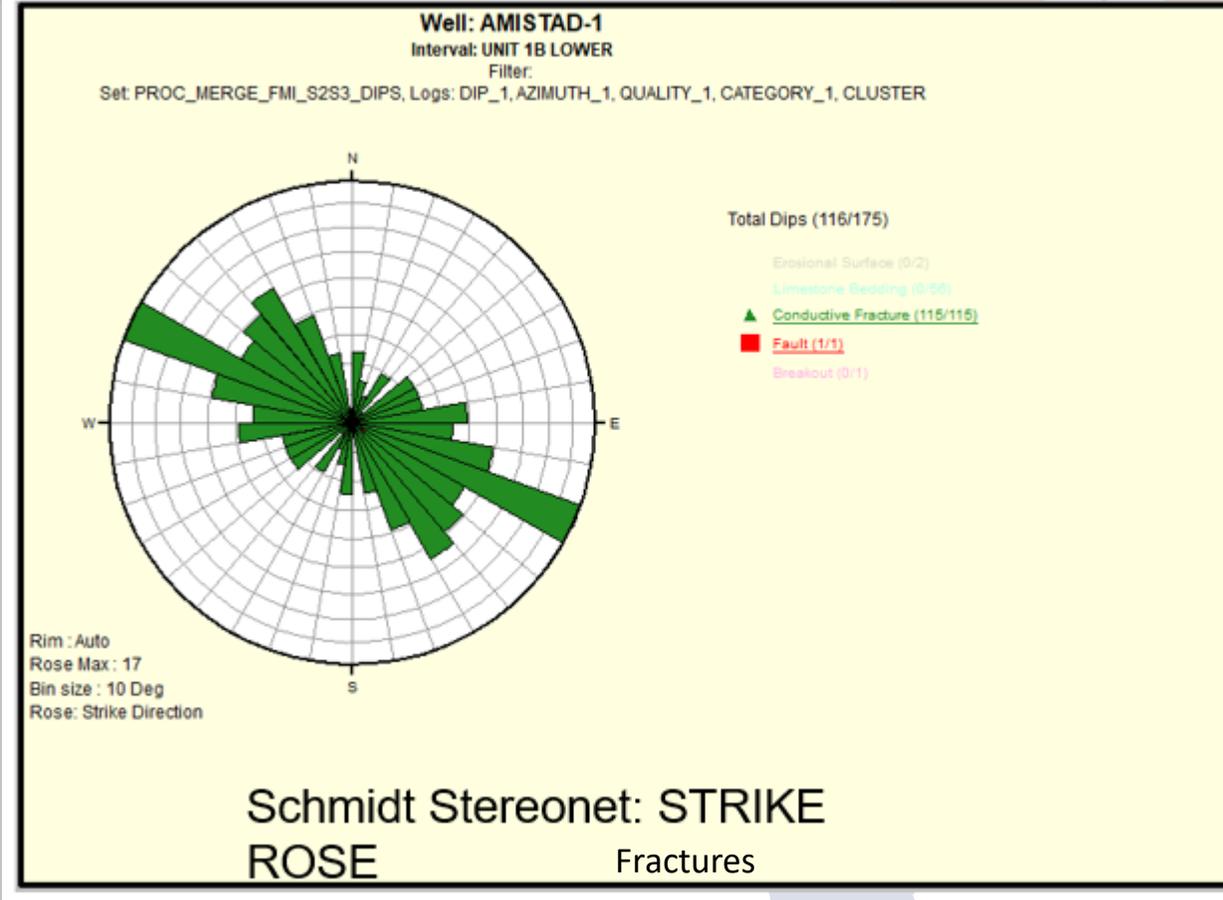
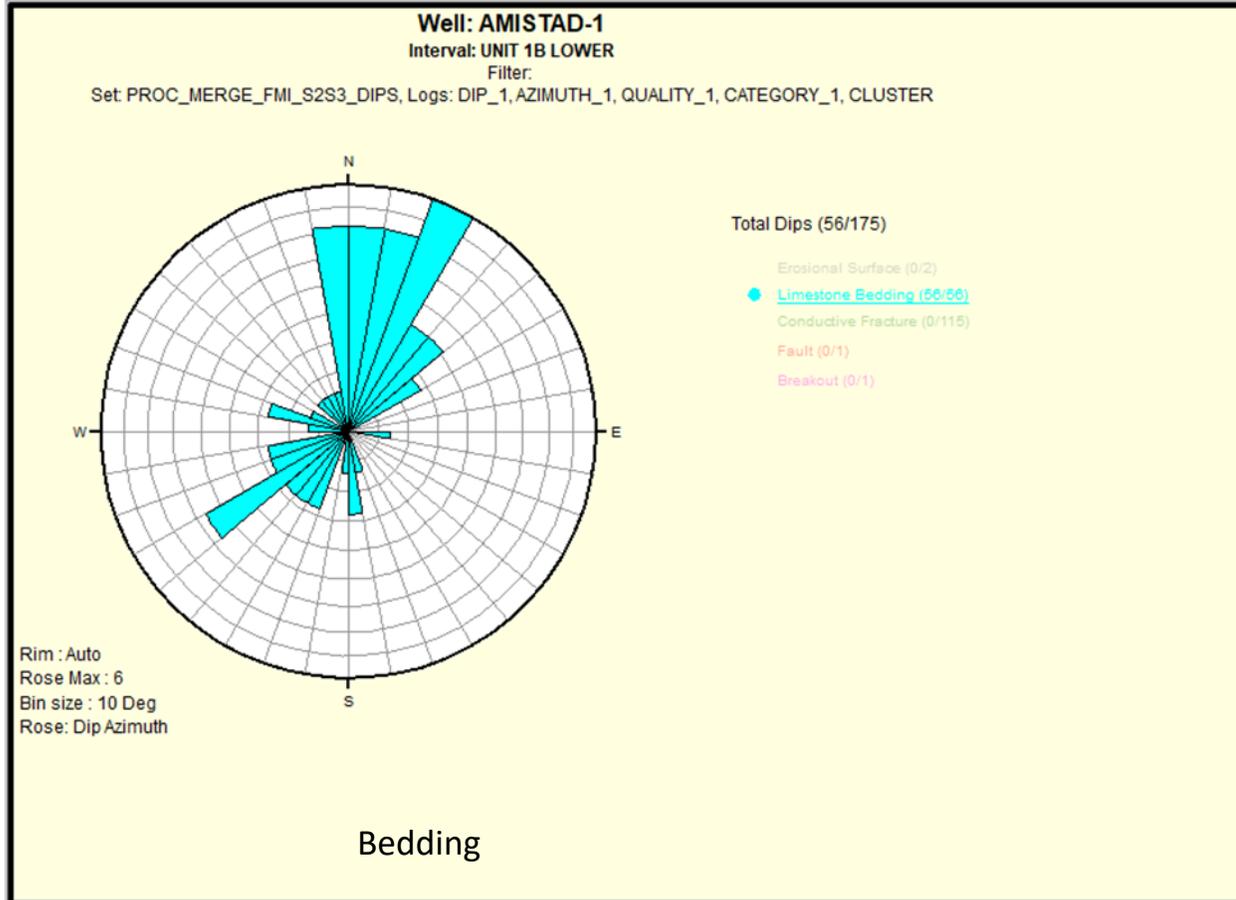
# UNIT 1B natural fractures in an interval below porosity cutoff



- Resistivity borehole image located directly opposite the Unit 1B perforations at 930 metres.
- High density of natural fractures are the contributing factor to high oil flow rate.
- Justification for including fractured carbonate intervals below conventional net pay cutoff.



# FMI Analysis – Unit 1B Lower Fracture Orientation

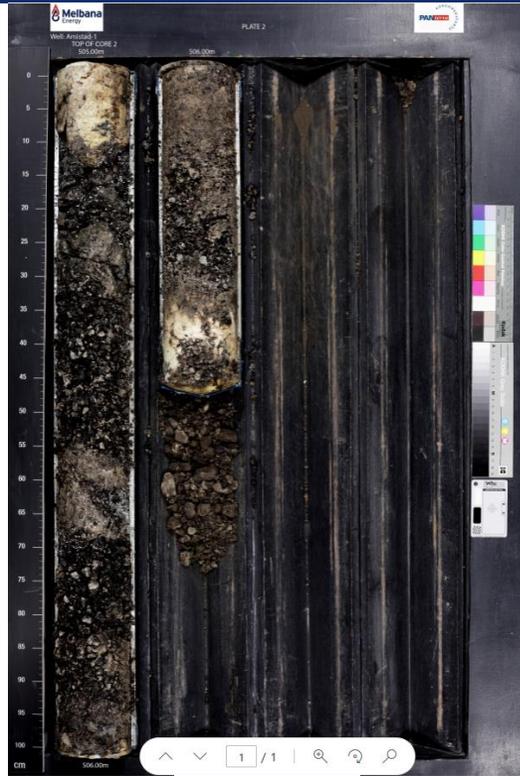


# Core Photos – Amistad-1



Unit 1A

- Excellent vuggy porosity development within fine grained limestone with major oil staining throughout



Unit 1A

- Excellent vuggy porosity development within fine grained limestone with major oil staining throughout



Unit 1B

- Highly fractured interval with oil staining within predominantly limestone.
- Matrix supported breccia seen within the core may be indicative of debris flows off and adjacent carbonate platform



Unit 3

- Highly fractured interval with oil staining within predominantly limestone.
- Unit 1B

# Amistad-1 Unit 1B EPT

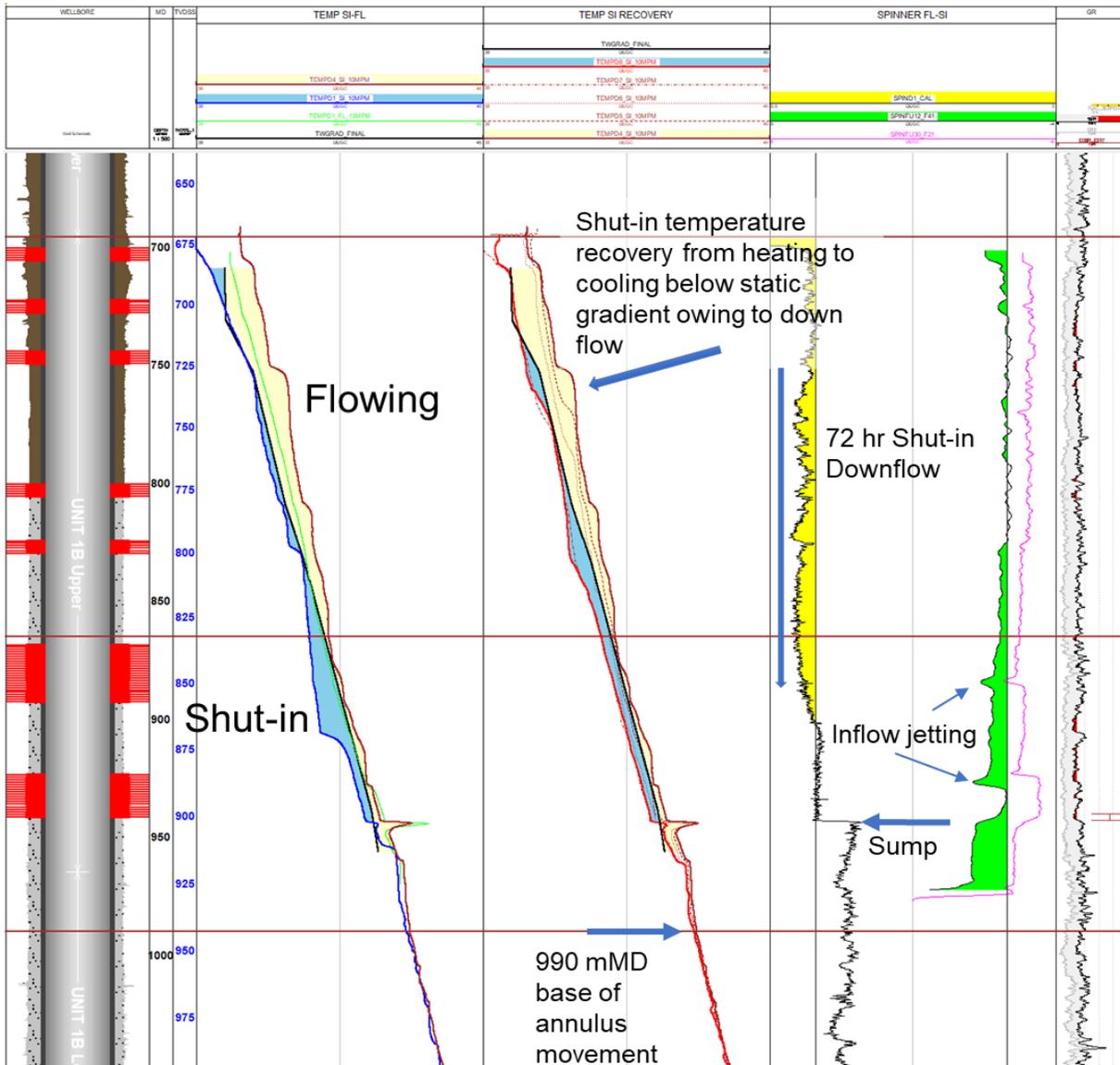
## Goals:

- Reservoir properties / performance
- Assess connected volume
- Max and sustained flow rates
- Determine contributing intervals
- Iron out production logistics
- Input to develop commercial contracts

## Findings:

- Produced for a total of 10 days.
- Average rate ~300 bopd.
- Minimum 18 mmbbls OIIP observed.
- Pressure build-up shows typical dual-porosity characteristics.
- Reduction in well performance compared to DST.
  - Completion brine was bullheaded in after DST.
  - Well was not opened till EPT ~2 months later.
- MPLT shows:
  - Majority of production from deeper fractured intervals.
  - Deepest contribution ~990 m.MD.
- Undertaking fluid compatibility work to determine best course of remedial action.

# Amistad-1 MPLT – petrophysics integrated summary

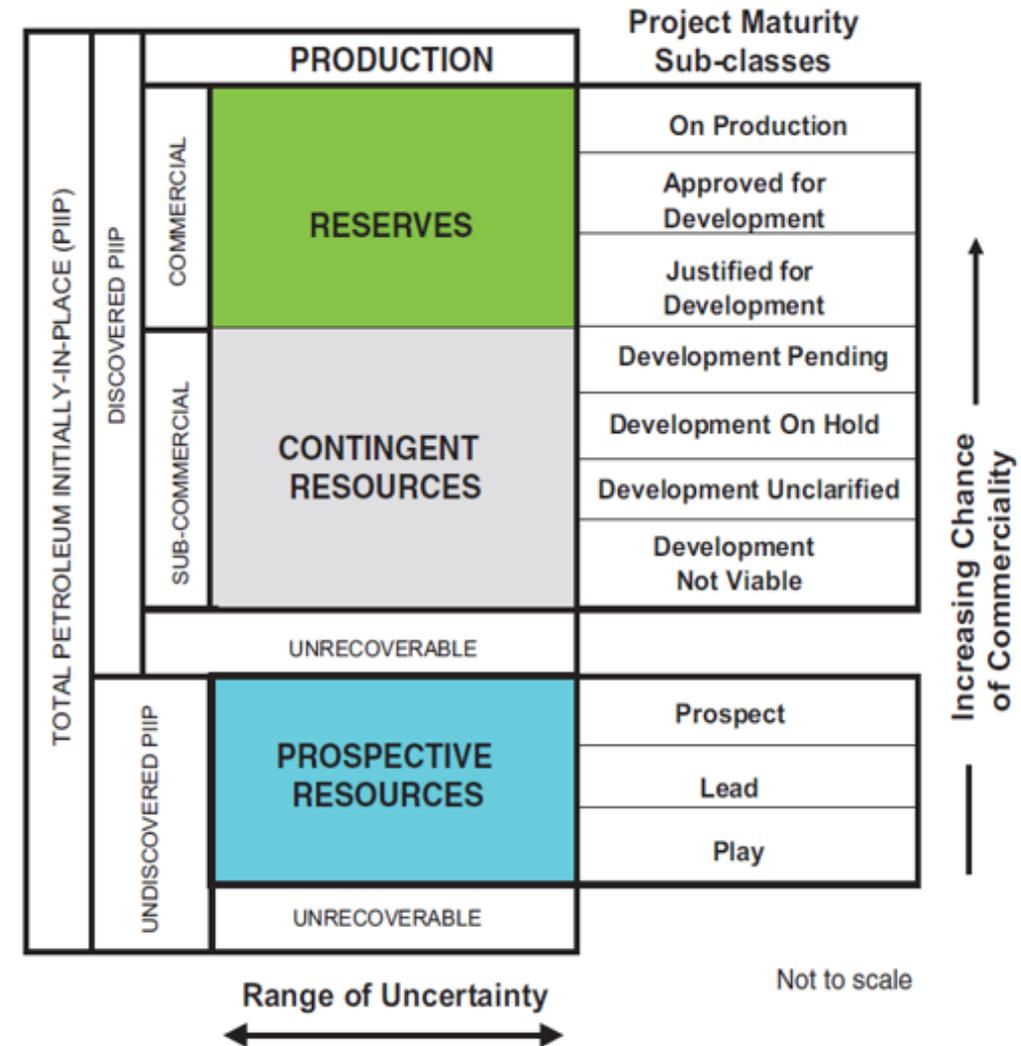
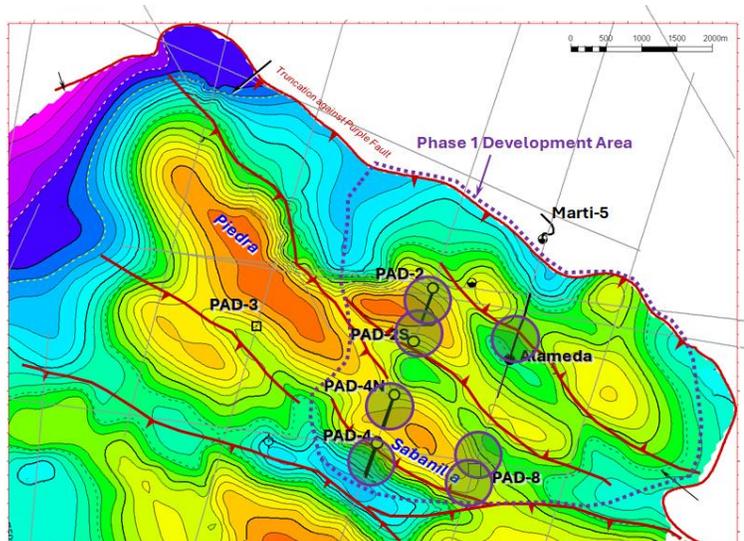


## Amistad-1 MPLT Key Observations:

- Majority of production from the deepest perforations.
  - Spinner indicates no flow but inflow jetting is observed.
  - Additional minor production sources above.
- Downflow occurs during 72-hour SI and re-circulation downflow observed during flow period on temperature and spinner.
  - Shut-in temperature shows crossflow from upper perms to deepest perms.
- Oil/Brine wellbore contact inside casing at the base of deepest perforations on all passes.
- Deepest source of flow is behind un-cemented casing as deep as 990 metres (temperature logs).

# McDaniel Resource Certification – Unit 1B

- McDaniel have assigned **46 MMbbls (P50) as Contingent Resources – Development Pending** to the eastern section of the overall Alameda field in the vicinity of the existing wells.
- **Prospective Resources of 90 MMbbls (P50)** have been assigned to the western part of the overall field to reflect the uncertainty associated with being away from the existing wells
- They have assigned a **70% chance of discovery to the prospective resource area** to reflect the low- risk nature of this area (given it is updip from the existing discoveries). The risk associated with this area is based on reservoir deliverability
- Unit 1A is currently under assessment with McDaniel in Calgary



# McDaniel Volumetric Certification OIIP

**Melbana Energy Ltd.**  
**Summary of OIIP Estimates - Property Gross Values**  
**Forecast Prices and Costs as of December 31, 2023**

Table 1

**Amistad Unit 1b - Cuba**

**OIIP - Crude Oil**

	Maturity	OIIP - Unrisked <sup>(1)(3)</sup>			High (P10) MMbbl	Chance of Discovery <sup>(2)</sup> %
		Low (P90) MMbbl	P50 MMbbl	Mean MMbbl		
<b>Contingent Resources</b>						
Amistad Unit 1b East	Development Pending	130	331	508	909	100%
<b>Prospective Resources</b>						
Amistad Unit 1b West	Prospect	229	656	1,013	1,831	70%

(1) There is no certainty that any portion of the prospective resources will be discovered. If discovered, there is no certainty that it will be economically viable or technically feasible to produce any portion of the resources.

(2) The chance of discovery does not include the chance of development. The chance of development is defined as the probability of a project being commercially viable. Quantifying the chance of development requires consideration of both economic contingencies and other contingencies, such as legal, regulatory, market access, political, social licence, internal and external approvals and commitment to project finance and development timing. As many of these factors are extremely difficult to quantify, the chance of development is uncertain and must be used with caution. The chance of development was estimated to be 80 percent.

(3) Volumes listed are in-place estimates and the recoverable estimates are shown on a separate table.

# McDaniel Volumetric Certification Recoverable

**Melbana Energy Ltd.**  
**Summary of Resources Estimates - Property Gross Values**  
**Forecast Prices and Costs as of December 31, 2023**

Table 2

**Amistad Unit 1b - Cuba**

**Resources - Crude Oil**

	Maturity	Resources - Unrisked <sup>(1)(3)</sup>				Chance of Discovery <sup>(2)</sup> %
		Low (P90) MMbbl	P50 MMbbl	Mean MMbbl	High (P10) MMbbl	
<b>Contingent Resources</b>						
Amistad Unit 1b East	Development Pending	16	46	62	129	100%
<b>Prospective Resources</b>						
Amistad Unit 1b West	Prospect	29	90	125	264	70%

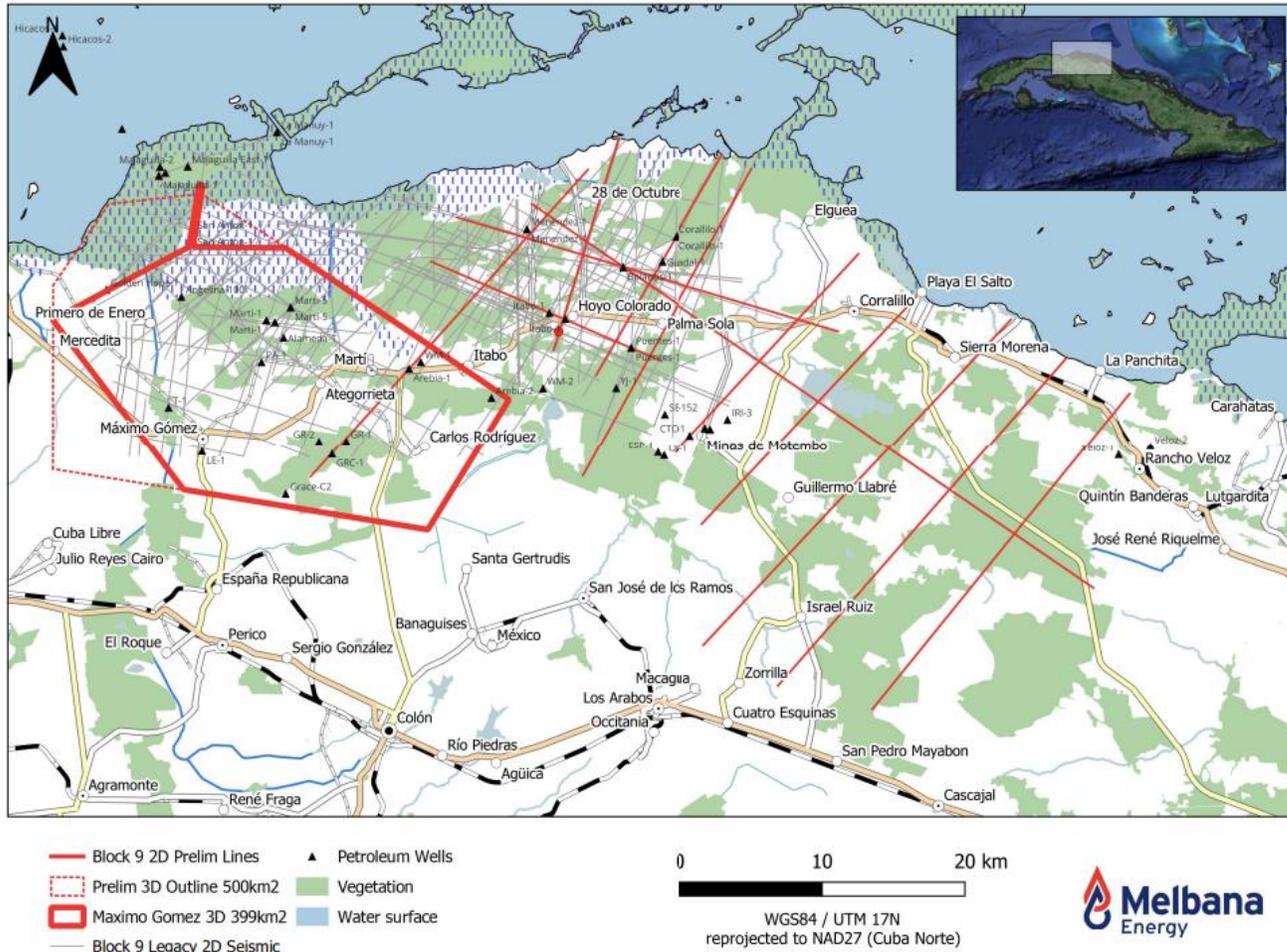
(1) There is no certainty that any portion of the prospective resources will be discovered. If discovered, there is no certainty that it will be economically viable or technically feasible to produce any portion of the resources.

(2) The chance of discovery does not include the chance of development. The chance of development is defined as the probability of a project being commercially viable. Quantifying the chance of development requires consideration of both economic contingencies and other contingencies, such as legal, regulatory, market access, political, social licence, internal and external approvals and commitment to project finance and development timing. As many of these factors are extremely difficult to quantify, the chance of development is uncertain and must be used with caution. The chance of development was estimated to be 80 percent.

(3) Volumes listed are full life volumes, prior to any cutoffs due to economics.

# Seismic planning – considering a 3D area ~400km<sup>2</sup>, 2D 310 km

## Melbana Energy Block 9 Planned 3D and 2D Seismic



**Option 2 – Moderate density**  
 – Moderate Channel/SP count  
**Target TWT's** = 172 – 272ms, 697-734ms, 1172-1780ms

<b>Maximum offset required</b>	= Up to 5200m
<b>Migration Apron required</b>	= approx. 1900m
<b>Inline &amp; Xline distance to Full fold</b>	= 1700m
<b>Total Roll on/Migration Fringe</b>	= <b>3600m</b>
<b>Estimated polygon size supplied</b>	= 500 Km <sup>2</sup> (Not a rectangle)
Length E-W	= approx. 34Km
Width N-S.	= approx. 15 Km

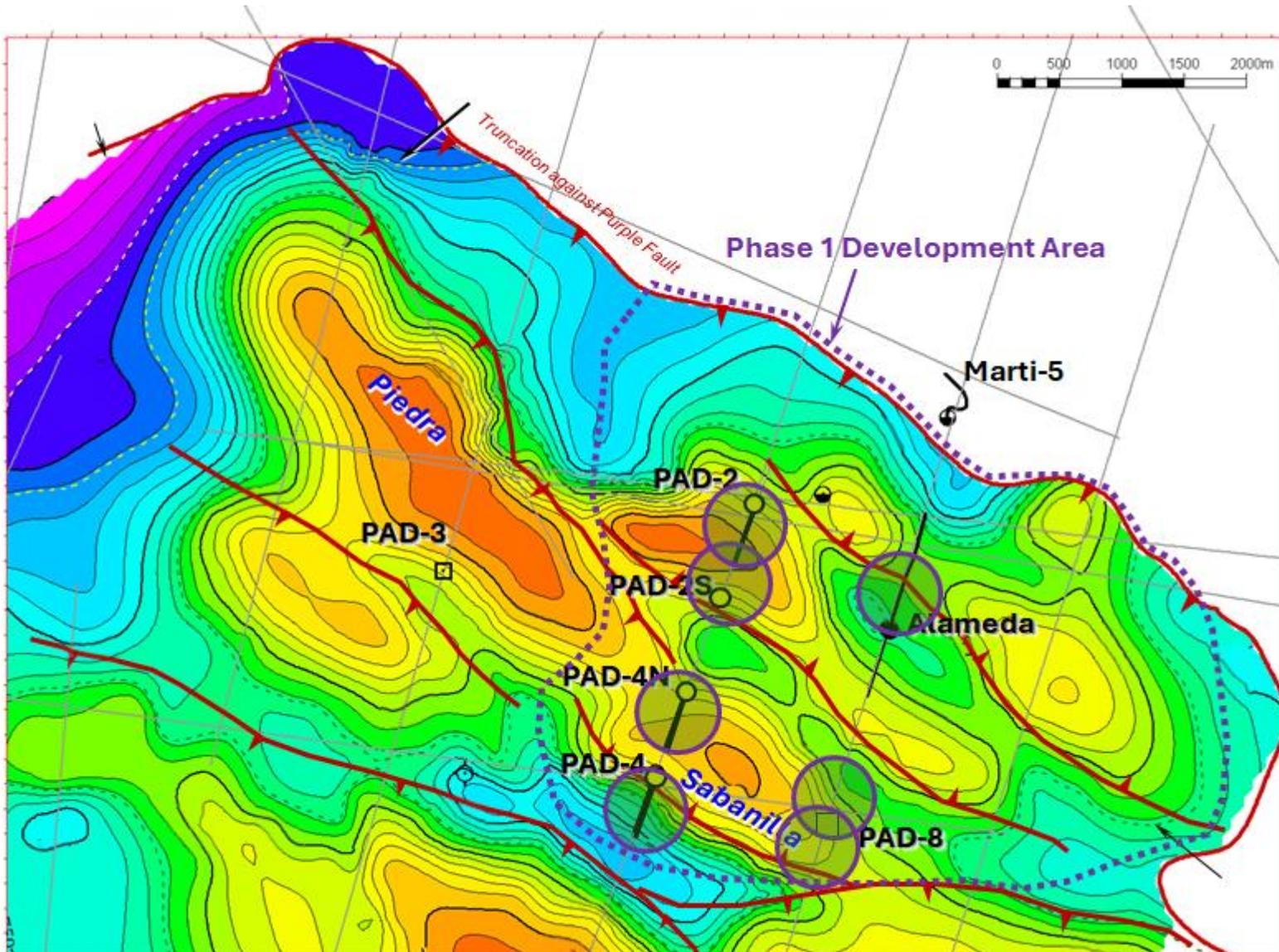
Receiver station spacing	= 40m
Source station spacing	= 40m
Line spacing (source and Receiver)	= 200m
Live stations per line	= 180
No of Lines live	= 36
Total Station in live patch	= 6480
Aspect Ratio	= 1
Source points in Salvo	= 5
Line Roll	= 1
Nearest offset	= 28.28m
Maximum Offset	= 5091m
Max No of Receiver lines (Estimate)	= 170
Max No of Source lines (Estimate)	= 75

**2D Option**

<b>Survey Option</b>	2D
<b>Total Line Length</b>	310 km
<b>Receiver Spacing</b>	20m
<b>Source Spacing</b>	20m
<b>Total Receiver Points</b>	15,500
<b>Total Source Points</b>	15,500
<b>Source Array</b>	2 vibe (min 50,000lb), 1 x 8-90 Hz sweep, 5s listen
<b>Spread</b>	6000m-10m-x-10m-6000m
<b>Live Channels</b>	600 Ch.

In addition to the near field opportunities in the shallow Amistad sheet, the survey is designed to encompass the deeper Alameda and Marti sheets, these sheets have massive upside potential and are most likely to contain lighter crudes than the upper sheet based on results to date from Marti-5 and Alameda-1.

# Phase 1 – New Unit 1B Wells



## Goals:

- Rapidly bring the Alameda field to production.
- Continue to appraise and de-risk contingent and prospective resources.

## Unit-1B Resource overview:

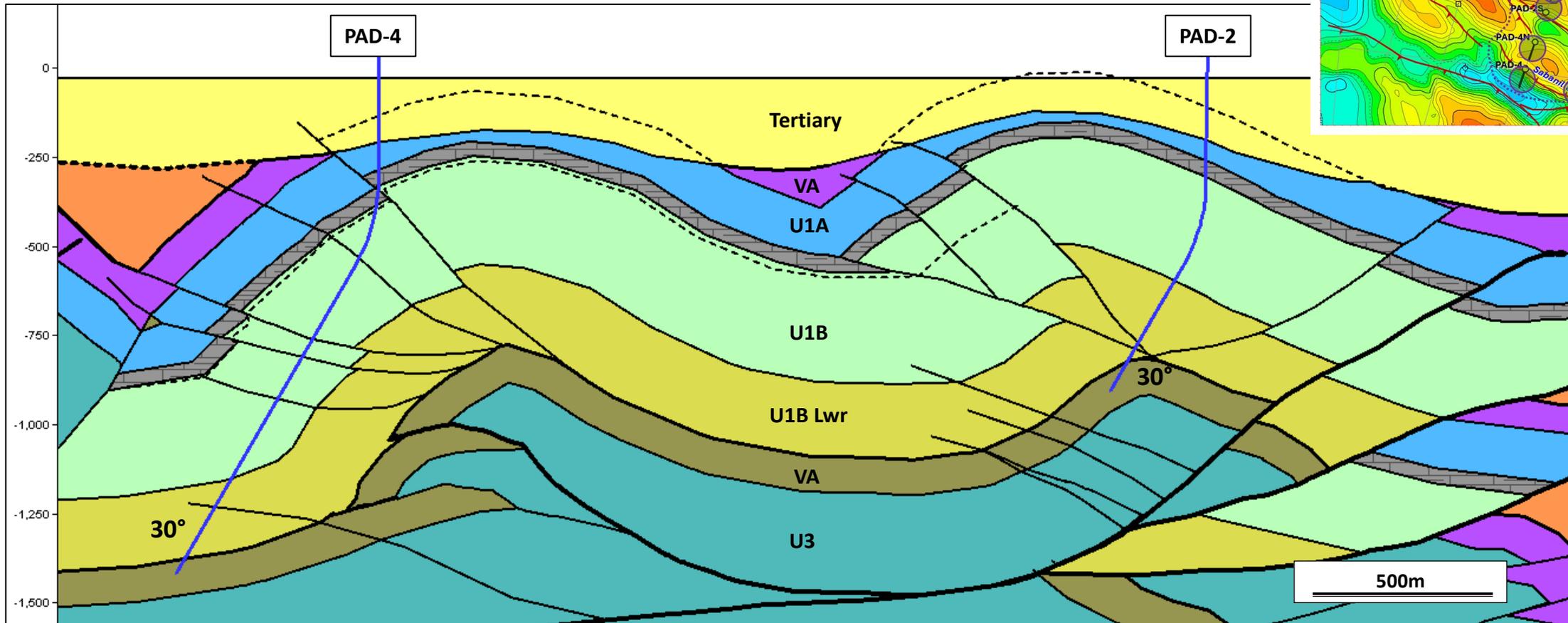
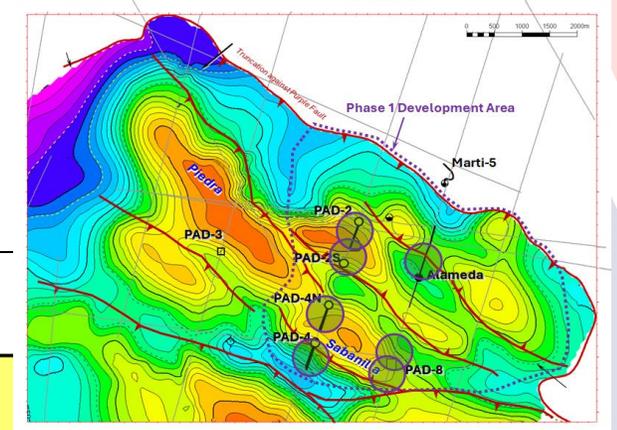
- Post Amistad-1 certified 46 mmbbls 2C resource.
- An additional 2U resource of 90 mmbbls located updip to the west.

## Development concept:

- New Unit 1B wells based on existing 2D seismic.
- Transport crude from field to Matanzas supertanker port for export.
- Target first crude export by year end 2024.
- Acquire 3D seismic to optimize subsequent shallow and deeper field appraisal and development.

# Phase 1 – New Unit 1B Wells

- Most likely interpretation driven by Unit-1B seismic.
- Structural position impacts productivity (fractures) and section penetrated by each well path.
- Wells to TD in VA.
- Higher deviation wells give greater length in reservoir and greater productivity.



# Phase 1 Export Route Options



# Summary

- Melbana has successfully discovered a large economic onshore oil field in Cuba with a maiden contingent resource of 46 MMbbls (P50) and a further 90 MMbbls of prospective resource updip in Unit 1B (70% Chance of Discovery).
- Unit 1B has produced a high quality 19°API crude with low viscosity that flowed at a maximum of 1900 bopd on test.
- Planning is well underway for the acquisition of a ~400km<sup>2</sup> 3D survey with an additional 300 km of 2D.
- Planning is advanced for an initial phase of development to drill and produce additional Unit 1B wells.
- Our goal is to be producing 5000 bopd from Block 9 by year end.
- Export routes for the high-quality refinable oil from Unit 1B are under investigation.
- The Cuban regulator is supportive of exporting the crude.
- A substantial resource of heavy 9° API oil also has been proven in Unit 1A (it flowed to surface but will require pumping in development), this resource is more similar to the typical Cuban crudes used locally for power generation.
- A major resource of heavy (17°API on dehydration) moveable oil has also been confirmed in Unit 3 and is under assessment.
- Alameda 3 is currently drilling to test the deep sheets.

Thank You

