SICCAR POINT ENERGY

The Cambo Field
Reservoir Surveillance Plans

Jon Ashdown
Siccar Point Energy Limited

Siccar Point Energy gratefully acknowledges PGS and TGS for permission to show seismic data

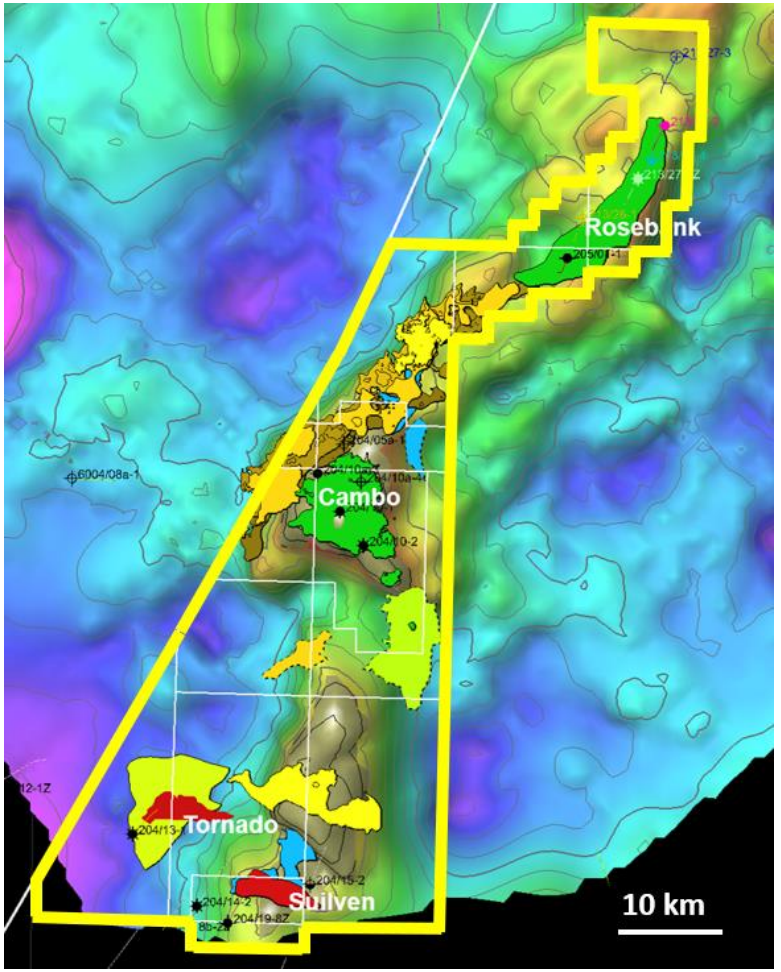
Cambo Field Summary

Corona Ridge – West of Shetland

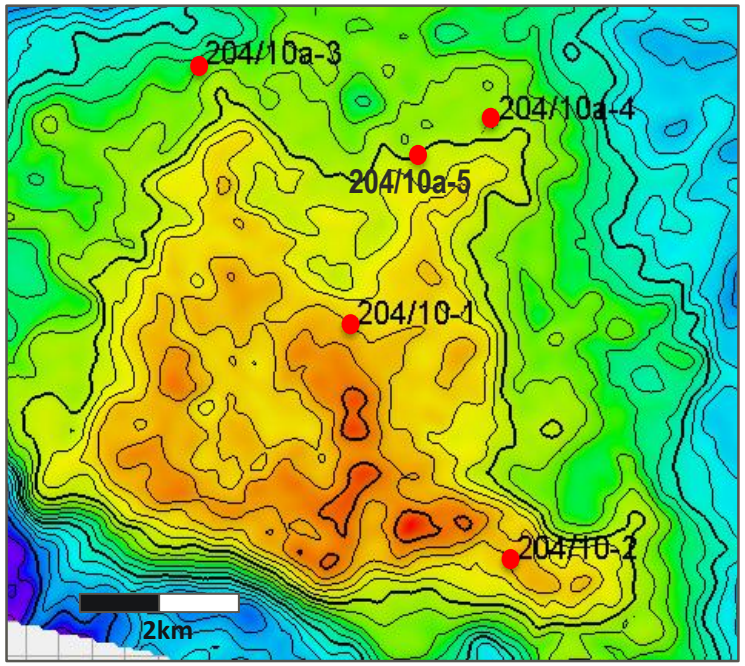
Cambo Field Summary

- 140 km west of Shetland, 70 km N of Schiehallion
- 1000 m water depth / harsh water environment
- Fully appraised by 6 wells with SPE drilling and testing 204/10a-5/5Y in 2018 and excellent quality seismic
- Palaeocene sands, Hildasay reservoir units
- Excellent quality Darcy permeability sands, 5Y test > 2000 mD
- Good quality, low sulphur content oil
  - 23 - 25 ˚API oil
  - 4 to 7 cP at reservoir conditions
- Normally (low) pressure regime
  - Gas lift for artificial lift
  - Water injection to sustain pressures and improve sweep
- Phased development
  - First phase 9P + 4I
  - Second phase +5P+1I
  - Follow-on development of H70, H20/H10 and other reservoir units
- Project entering FEED, planned project sanction 2020, first oil 2023/2024
  - SPE engaged with OGA and other authorities to deliver project, draft FDP submitted July 2019
  - Key contractors including BHGE, KBR and Genesis progressing engineering work

Cambo Location



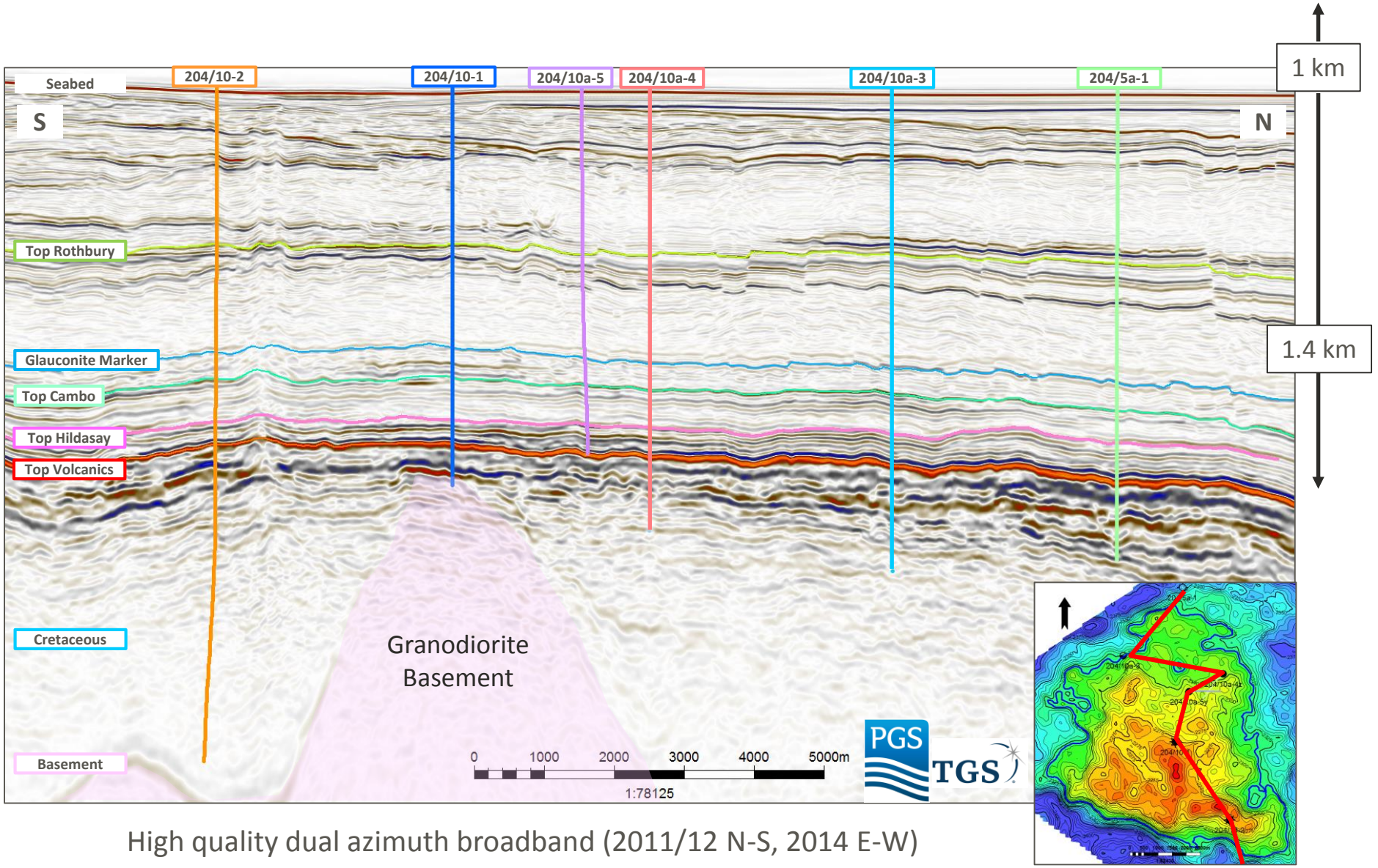
Exploration and Appraisal History



- **204/10-1** (2002) encountered 8.9m oil and 3.4m gas in the Hildasay reservoir units. The oil was moderately biodegraded. The well was not tested.
- **204/10-2** (2004) penetrated a similar section with slightly thicker hydrocarbon column (11.1m oil, 3.4m gas). Was drilled to test the deeper Lindisfarne prospect.
- **204/10a-3** (2009) encountered a thicker reservoir interval, but was water-bearing.
- **204/10a-4** (2011) was drilled as a pilot hole to the horizontal -4z well. The pilot hole encountered 19.5m oil in the Hildasay units H70 to H40. The well was side-tracked and completed ready for testing, but weather prevented the well being flowed.
- **204/10a-5/5Y** (2018) drilled by SPEL to test the H50. Core and fluid samples taken from pilot hole (-5) drilled into deepest Hildasay units H20/H10. Sidetracked to 5Y well in H50 which was then gravel packed and flow tested. Suspended as future producer.

Cambo Geology

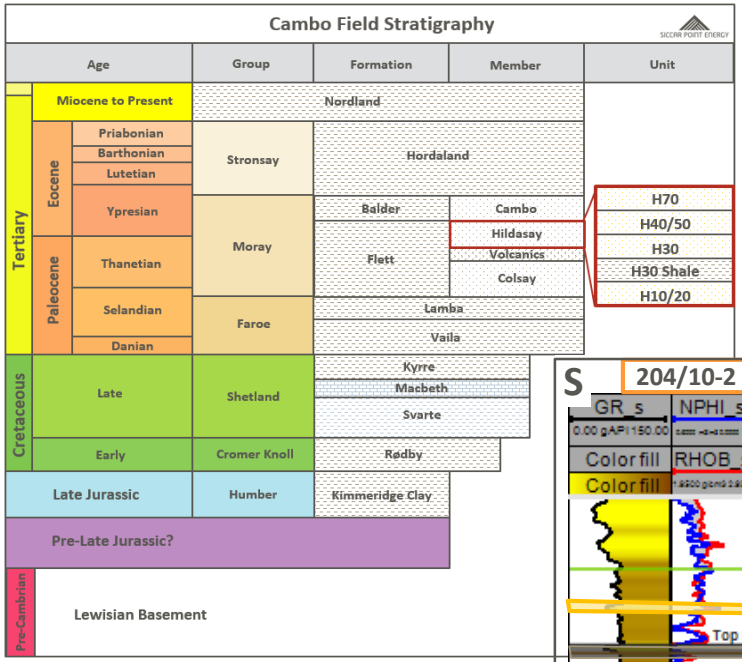
SICCAR POINT ENERGY



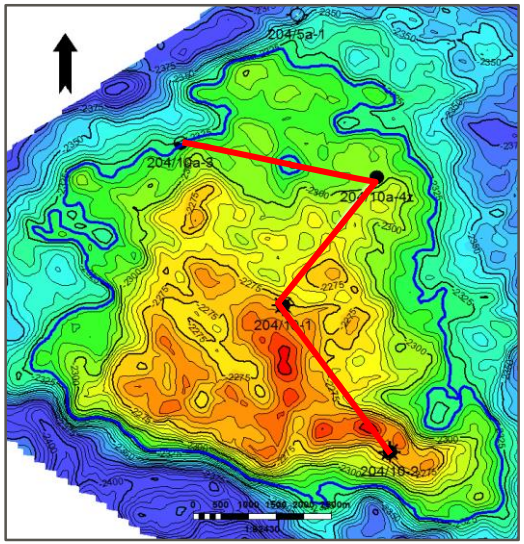
High quality dual azimuth broadband (2011/12 N-S, 2014 E-W)

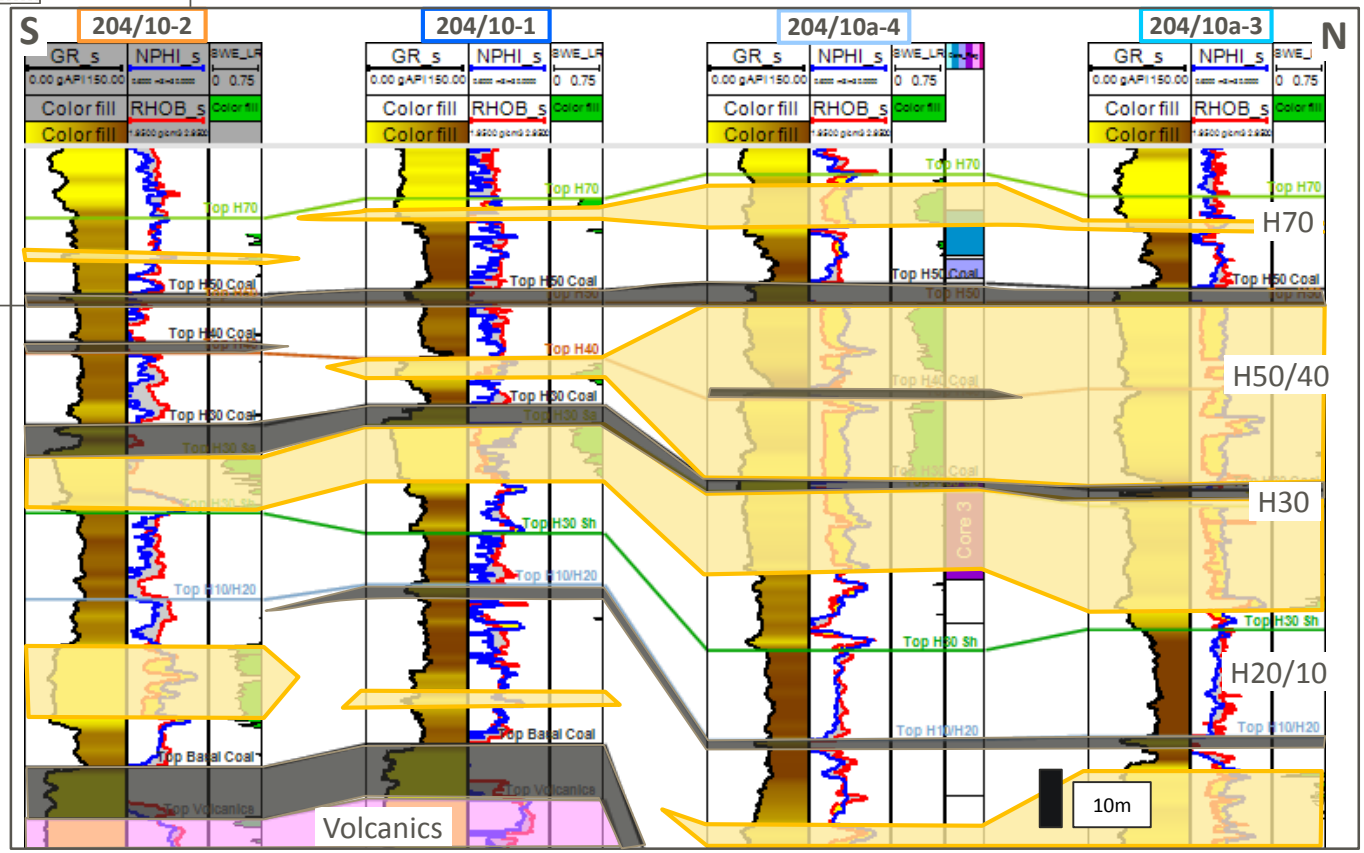
Stratigraphy and Sedimentology

SICCAR POINT ENERGY

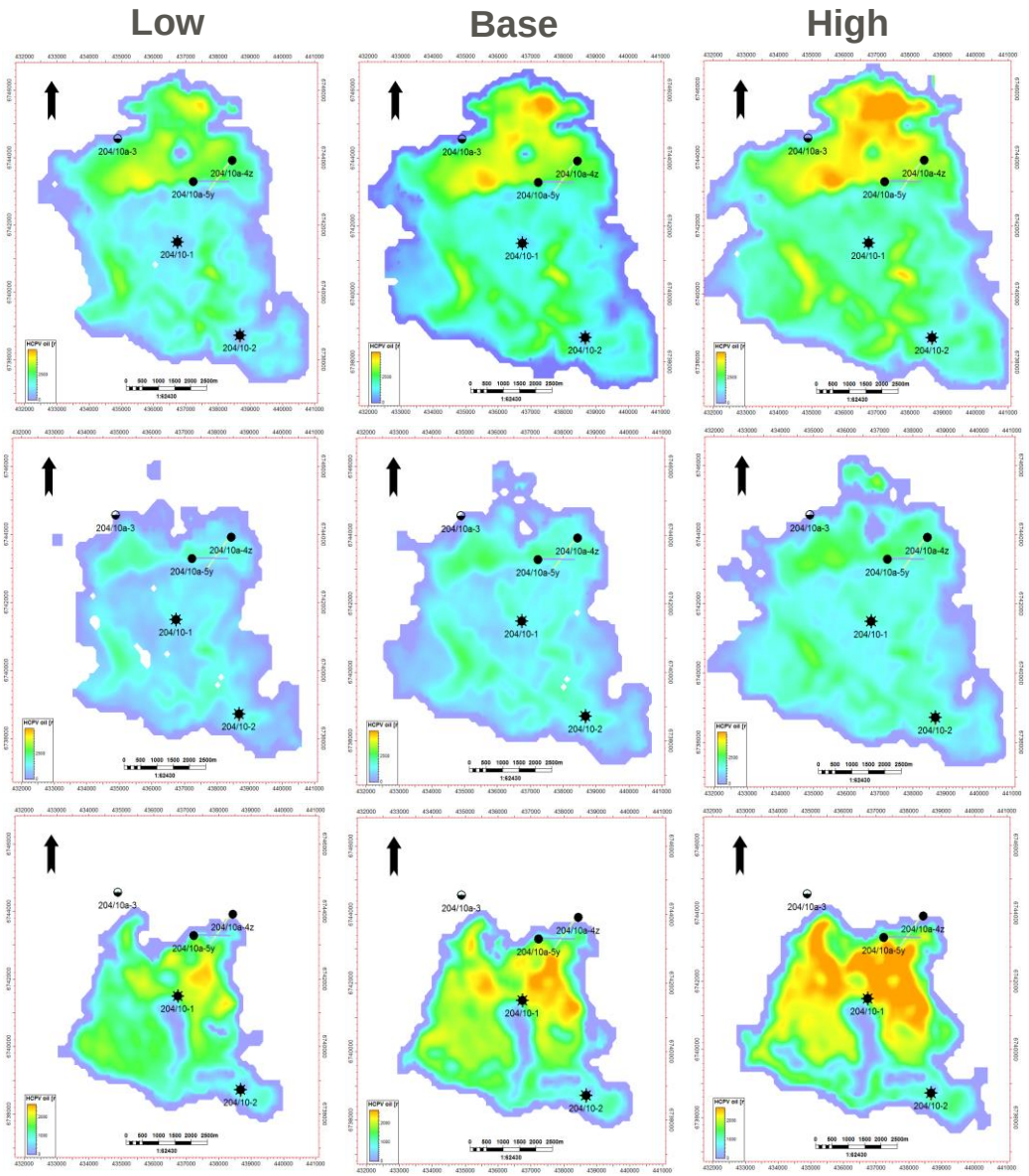


- Layer cake paralic reservoirs
- Reservoir thick in the north
- Variable oil quality

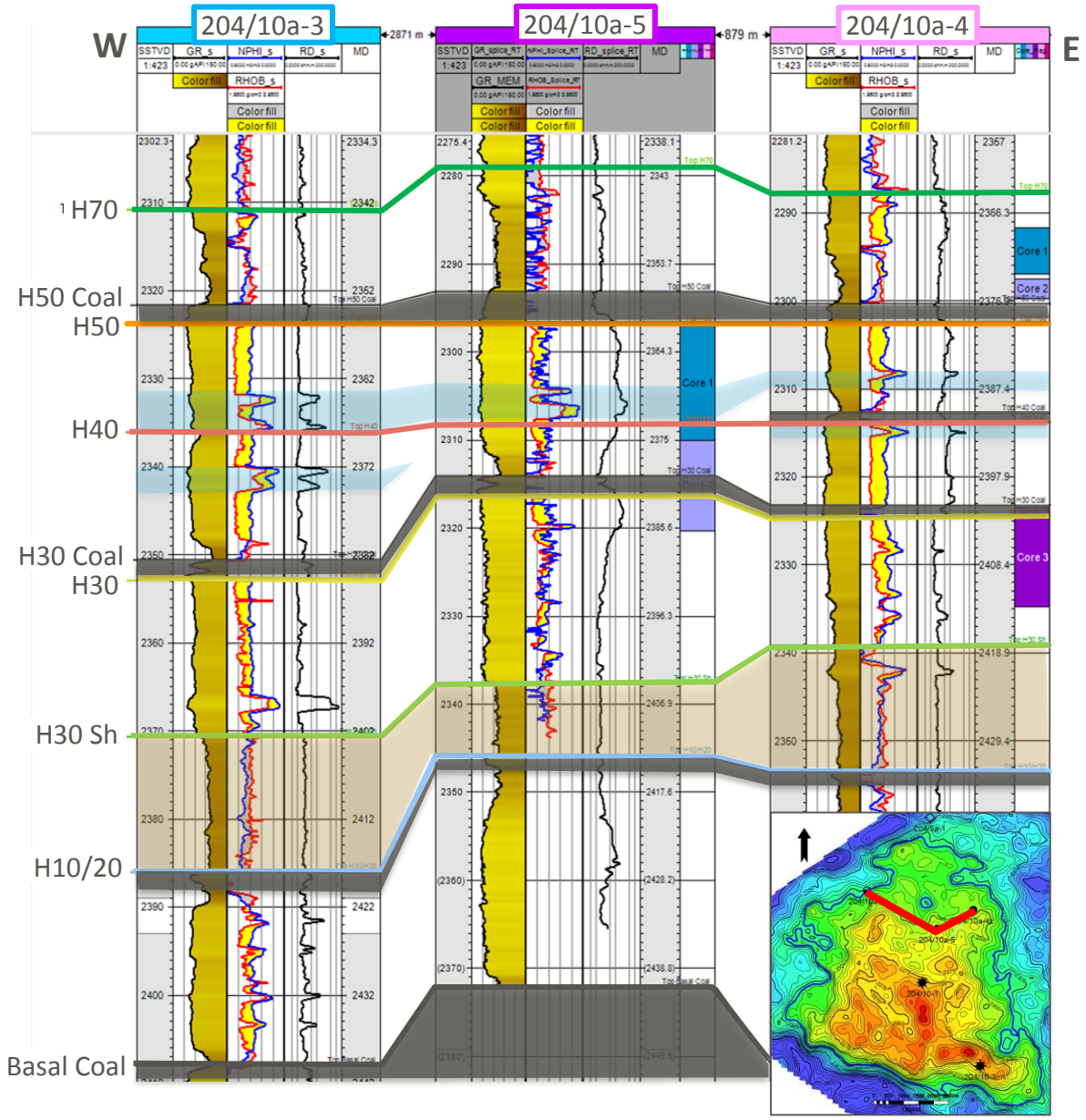




Cambo STOIIP Distribution

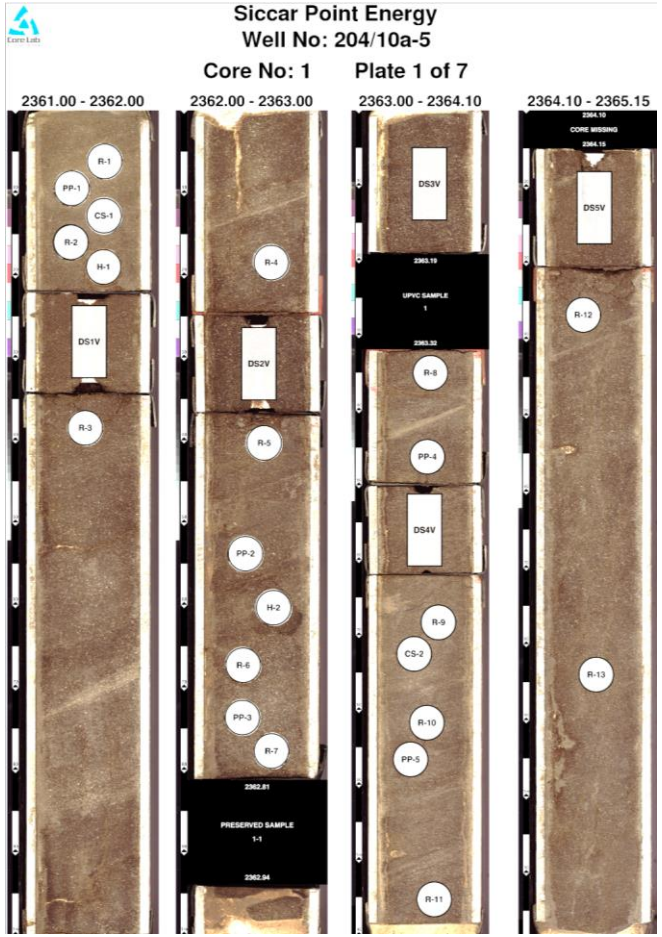


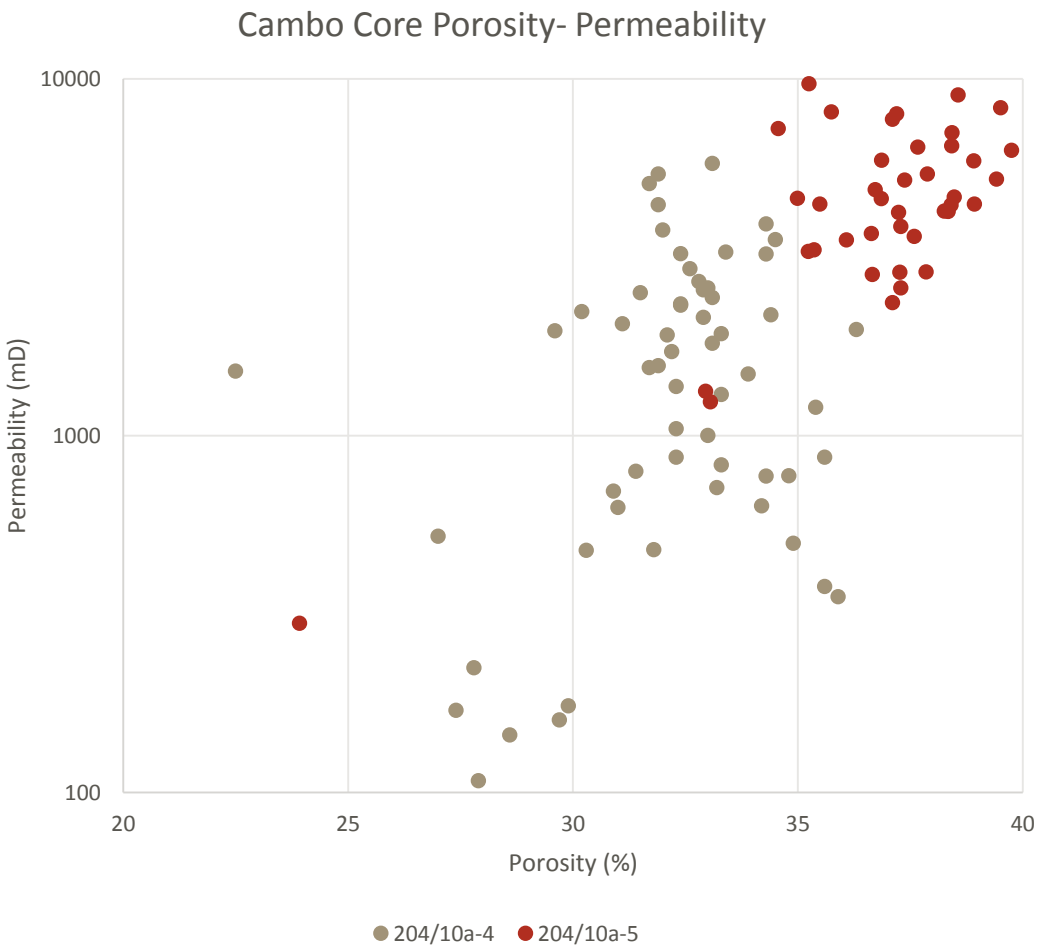
2018 Pilot Hole -5 Well Results



- Top H50 reservoir came in on prognosis (+/-)
- Poorly consolidated and high permeability sands cored in the H50/H40/H30
- Increased thickness in the H30
- Hydrocarbons (gas) encountered in H20/H10
- H70 sands poorly developed

Well Results -5 Rock Quality





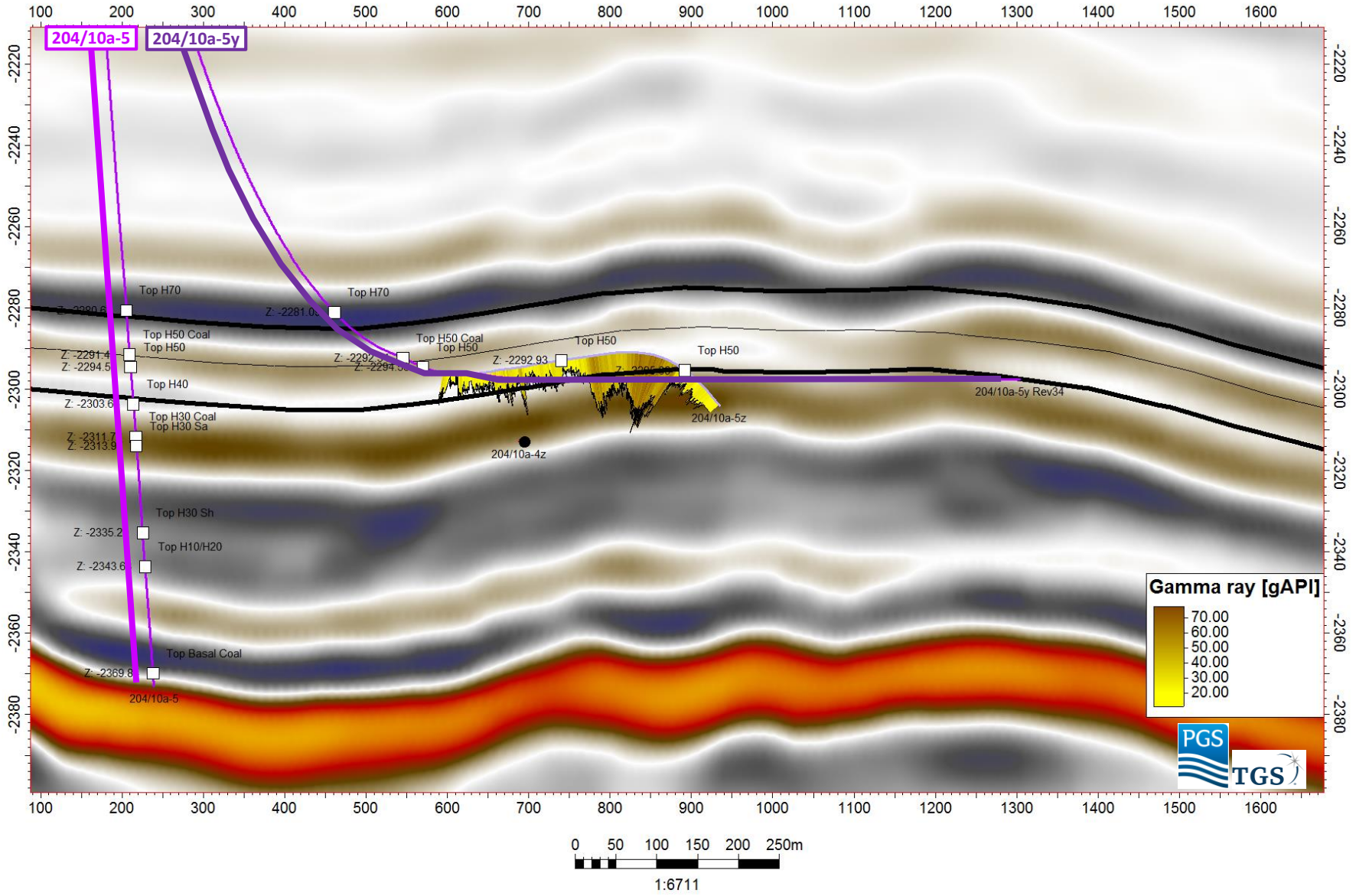
Well Results -5 Oil Properties

SICCAR POINT ENERGY

Property	H50/H40	H30
Stock tank oil gravity [deg API]	22.8	24.6
Stock tank oil density [kg/m3]	916	905
GOR [scf/stb]	345	393
Saturation pressure, Pb [psia]	2845	3127
Oil viscosity @ Pi [cP]	6.6	4.1
Oil viscosity @ Pb [cP]	6.2	4.0
Oil formation volume factor @ Pi, Boi [rb/stb]	1.16	1.17
Reservoir pressure, Pi [psia]	3363	3415
Reservoir temperature [°C]	61	61

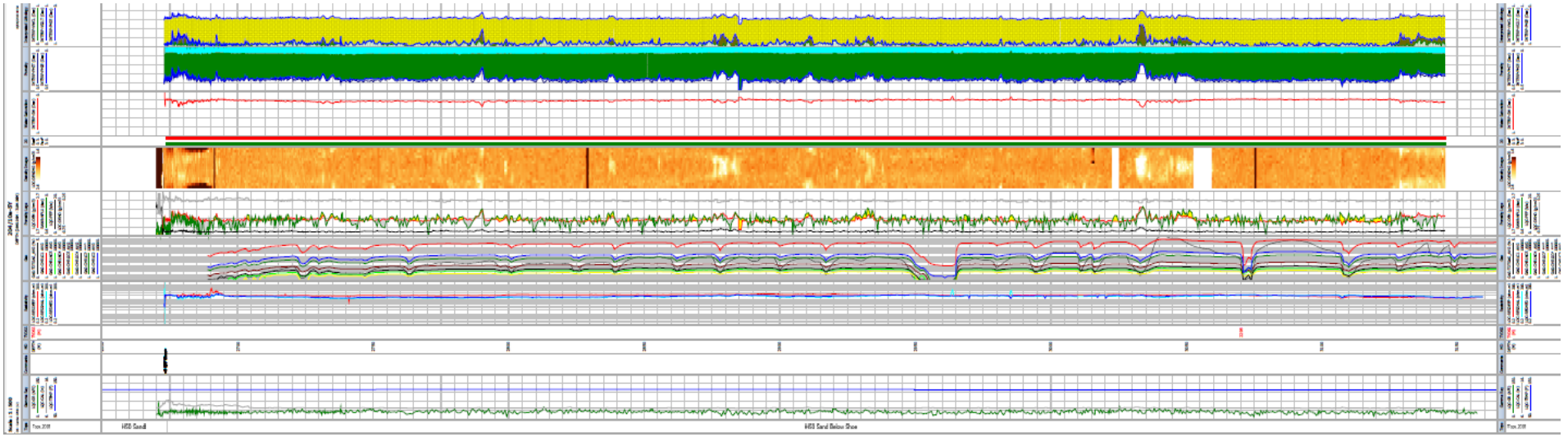
Well Results -5Y Sidetrack

SICCAR POINT ENERGY



Well Results -5Y Sidetrack

SICCAR POINT ENERGY

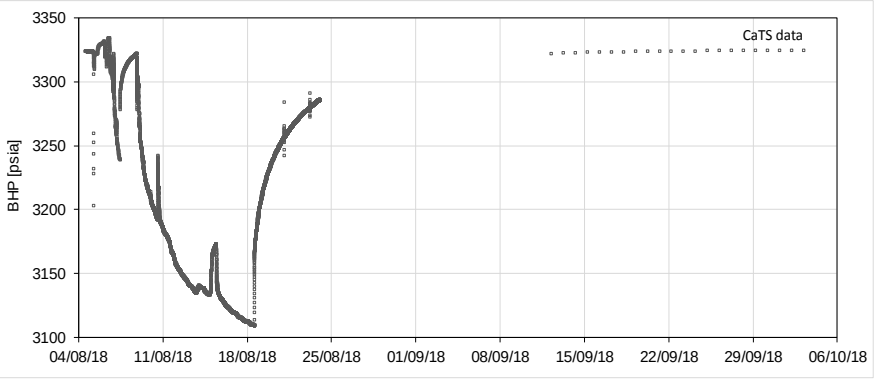


Reservoir Summary

Zone Name		Top	Bottom	Gross	Net	N/G	Av Phi	Av Sw	Av Vcl	Phi*H	PhiSo*H
		TVDSS	TVDSS	TVDSS	TVDSS	TVDSS			Ari	TVDSS	TVDSS
H50 Sand Below Shoe	MD	2673.8	3165.0	491.2	$$471.68	0.96	0.355	0.216	0.060	0.81	0.63
	TVDSS	2296.1	2298.1	*2.30	$$2.27	0.99					

2018 -5Y Well Test

- Successful EWT completed over 11 days, recovering c. 47,000 bbls oil
- Sustained natural flow rates of up to 5000 bbls/d dry oil
  - Stable WHPs at each choke setting
  - Constant GOR of c. 300 scf/bbl
  - Dry production after clean-up with only trace brine production
  - No solids production – gravel or formation sand
- Full suite of wellsite chemistry / surface / downhole sampling
- High productivity > 24 stb/d/psi from the full horizontal section
  - Permeability ~2300 mD
  - Low skin ~0.1
- Memory and CaTS gauge data retrieved successfully
- Minimal depletion – large connected volume > 300 MMbbls



Cambo Dynamic Factors

- Relatively thin sands
  - Penetrate H50/H40/H30 units to maximise recovery
- Higher oil viscosity mitigated by excellent sand quality
  - Low well productivity from vertical producers
  - High angle/horizontal producers to maximise productivity
  - Longer sections vs drilling/completion risks – want to avoid long sections of shales in high angle wells
  - Weak sands – need for sand control
- Normal (low) pressure regime - P/T: +/- 3400 psia, +/-60 degC
  - Need for artificial lift – gas lift
- Low structural relief
  - Limited scope to maximise offset from OWC and/or GOC
- Gas cap (H30)
  - High GORs in some wells
- Presumption that water injection needed
  - Desulphanated seawater

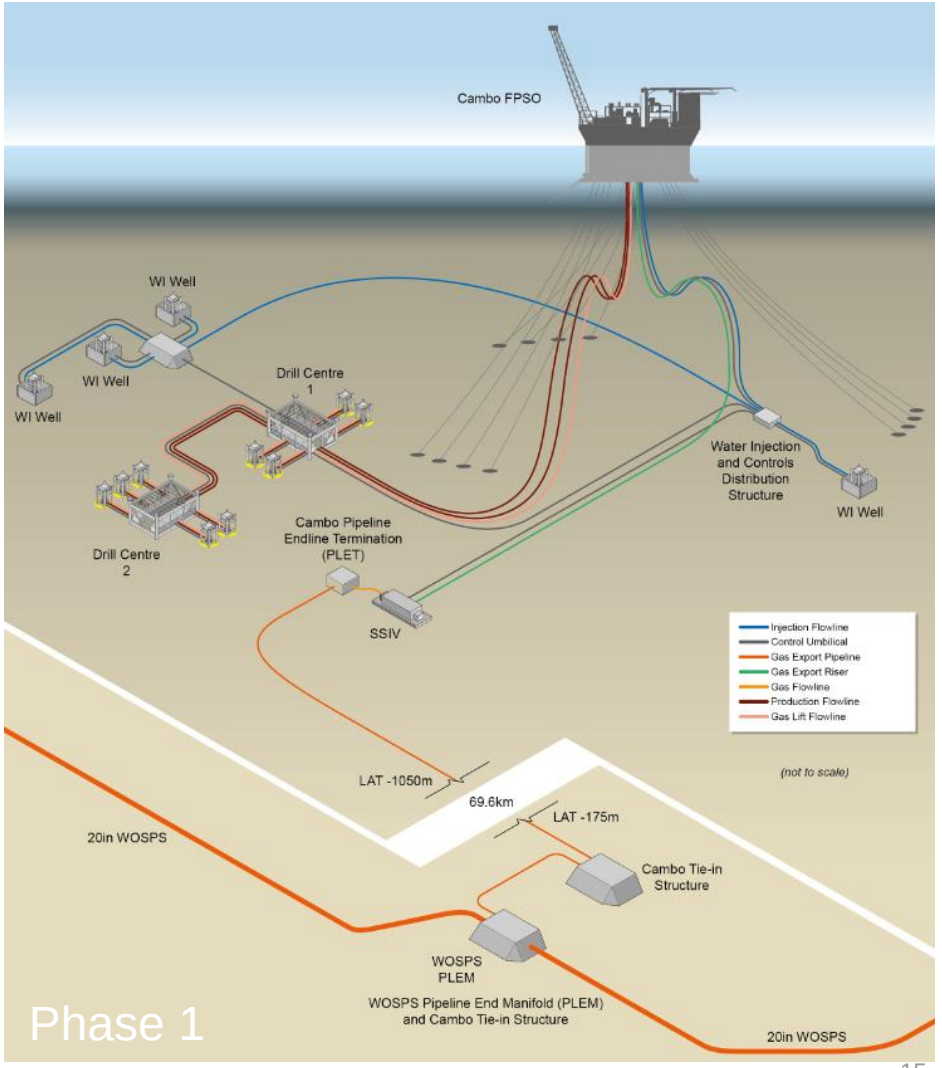
SICCAR POINT ENERGY

Current Development Scenario

- Nine development producers with up to four water injectors, 9P+4I, in first phase of development
- Current assumption of phased drilling
  - 5P+2I for first oil, 3P – a year after production and 1P+2I – after 2 years from first oil
  - Phased drilling allows for assessment of well, especially injector performance over time
- Second phase of development has additional wells in H50/H40/H30 reservoir units from third drill centre DC3, total 14P+5I
- Producers and injectors dedicated to H50/H40 or H30
  - High angle gas lift producers with sand control
  - High angle injectors with sand screens
  - Possible permeability impairment points to requirement for additional water injectors (also mitigating against risk of possible reservoir compartmentalisation) – likelihood of significant injectivity impairment reduced by seawater injection and fine filtration for SRU
- Wells can target drilling radius of about 3 km
  - 500 m reservoir sections

Cambo Development Concept

- Sevan – round hull vessel
- Subsea tie-back from two production manifolds via 2 x 10 “flowlines
  - DC1 to vessel 1 ~ 2 km, DC2 to DC1 ~1+ km
  - No dedicated test line
- First two injectors from single subsea location, additional injectors located peripherally around field at some distance
- Oil export by tanker
- Excess gas exported by pipeline (allowing possible future gas import)
- Desulphanated, treated sea water injection
- Ongoing discussion around surveillance plans, use of multiphase flow meters, test separator and other metering



Cambo Delivers Plateau ~60,000 bbls/d Oil

- Individual wells deliver up to c. 15,000 bbls/d liquids
- Current design process capacity:

Oil [bbls/d]	60,000
Produced water [bbls/d]	80,000
Total liquids [bbls/d]	100,000
Gas compression [MMscf/d]	60*
Gas lift [MMscf/d]	2 per well**
Water injection [bbls/d]	100,000

* Gas compression for gas export and lift gas, peak gas production > 30 MMscf/d
** With flexibility to increase to 5 MMscf/d

PT / Completion Design

SICCAR POINT ENERGY

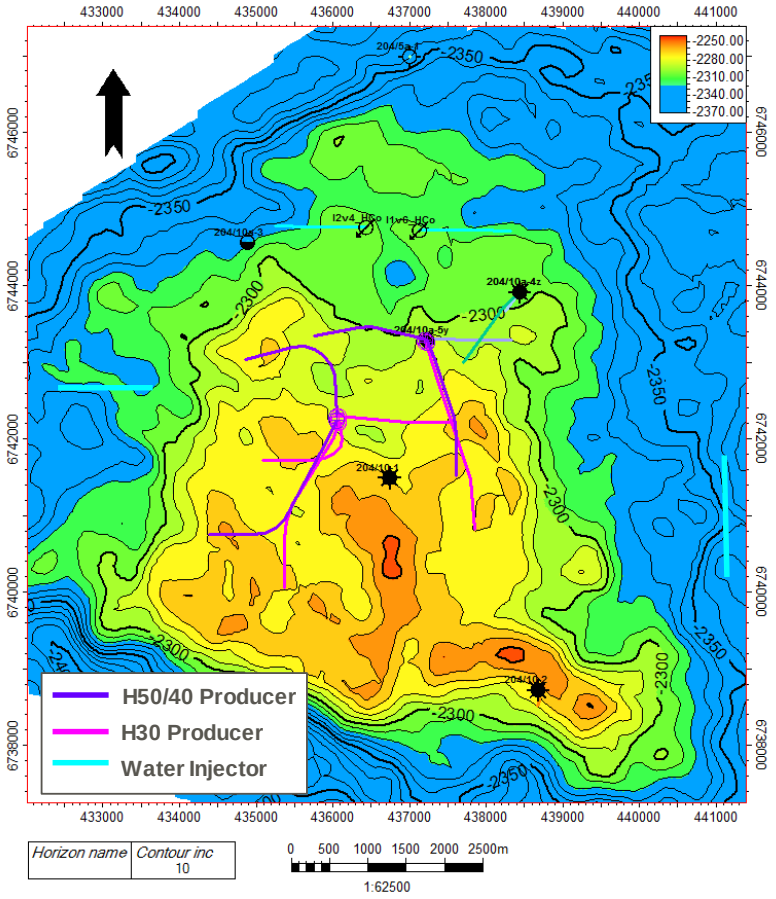
- High angle / horizontal simple single bore producers and injectors
- Gas lift
  - Gas lift adopted owing to reliability and track record in deep water subsea environment, simpler subsea infrastructure, no power at turret, robust to sand production and/or free gas breakthrough and avoidance of ESP replacement workovers
- Well completion sizing
  - Producers – 5.5 inch tbg, water injectors – 5.5 inch tbg
- Sand control
  - Producers – alternate path OHGP current plan, but consideration being given to alpha/beta OHGP, SAS and GeoForm
  - Water injectors – screens
  - Ongoing screen testing
- Materials selection dictated by CO2/H2S content
- No extraordinary flow assurance / production chemistry issues
  - Waxing during turndowns – owing to wax content and low seabed temps
  - Hydrates – low seabed temps
  - Reservoir souring – low reservoir temperature and propensity for souring

Field Layout (H50/H40/H30 Development)

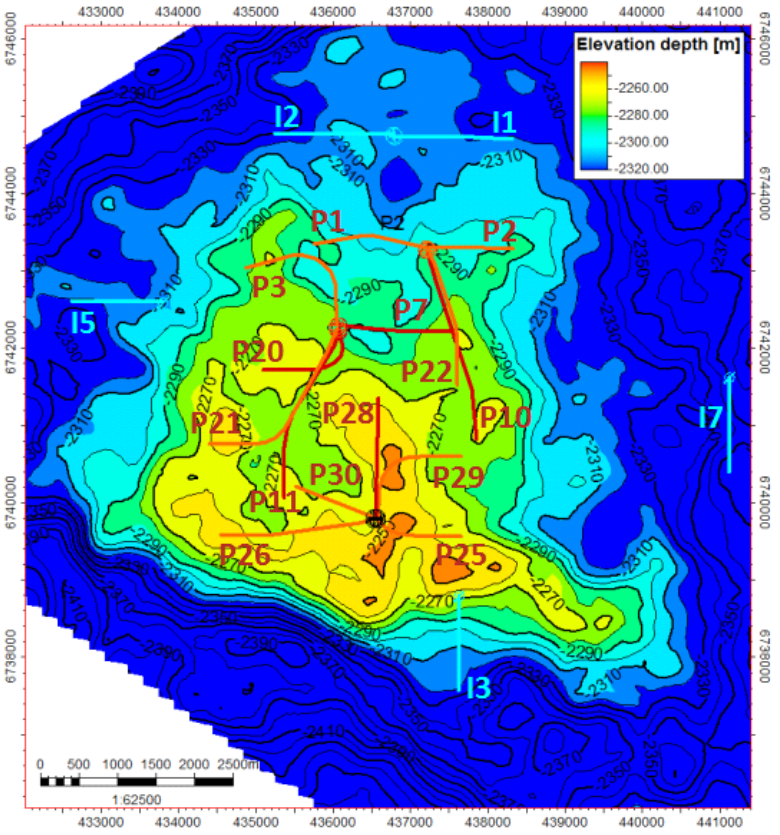
Phase 1 and later Phase 2 addition of third drill centre

SICCAR POINT ENERGY

Phase 1 (2 DCs, 9P+4I)



Phase 2 (third DC, 14P+5I)



SICCAR POINT ENERGY

Cambo Surveillance Plans

- Want to optimise development and maximise economic recovery
- Want ability to optimise production, model field, pursue follow-on development activity
  - Improve operational day to day decisions / production and injection optmisation, e.g. gas lift, how to flow weaker wells
  - Identification of problems, e.g. possible wax build-up, sand production, scale formation and provide data for formulating remedial actions
  - Input to subsurface models to better forecast production (for planning and other business purposes) and identify workover or infill opportunities, integration with 4D seismic

Versus:

- Desire to minimise capex

Questions:

- What data are really needed and will make a difference to any decisions, production optimisation and recovery ? Are data “just nice to have” ?
- What reservoir surveillance should be put in place as a minimum ?
- What other surveillance should be considered ?
- Type of flow metering / well testing ?
- How accurately do we need to know anything ?
- Importance over field life ?