

FOROIL

SUCCESS STORY

SAN FRANCISCO FIELD

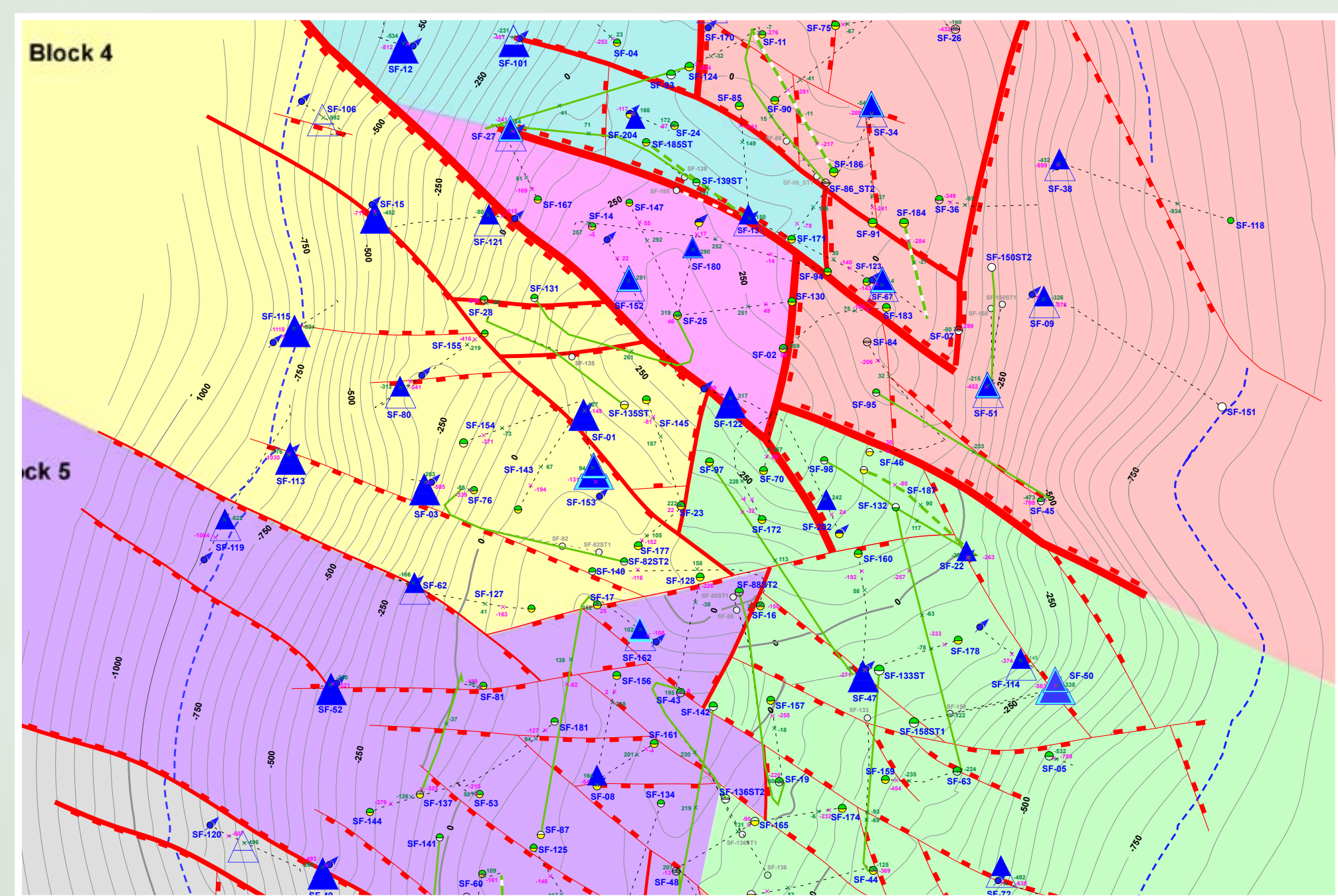
COMPLEX MATURE FIELD

The field

- ▶ Operated by HOCOL (ECOPETROL)
- ▶ 8,000 bopd, 97% water cut
- ▶ 99 producers, 69 injectors

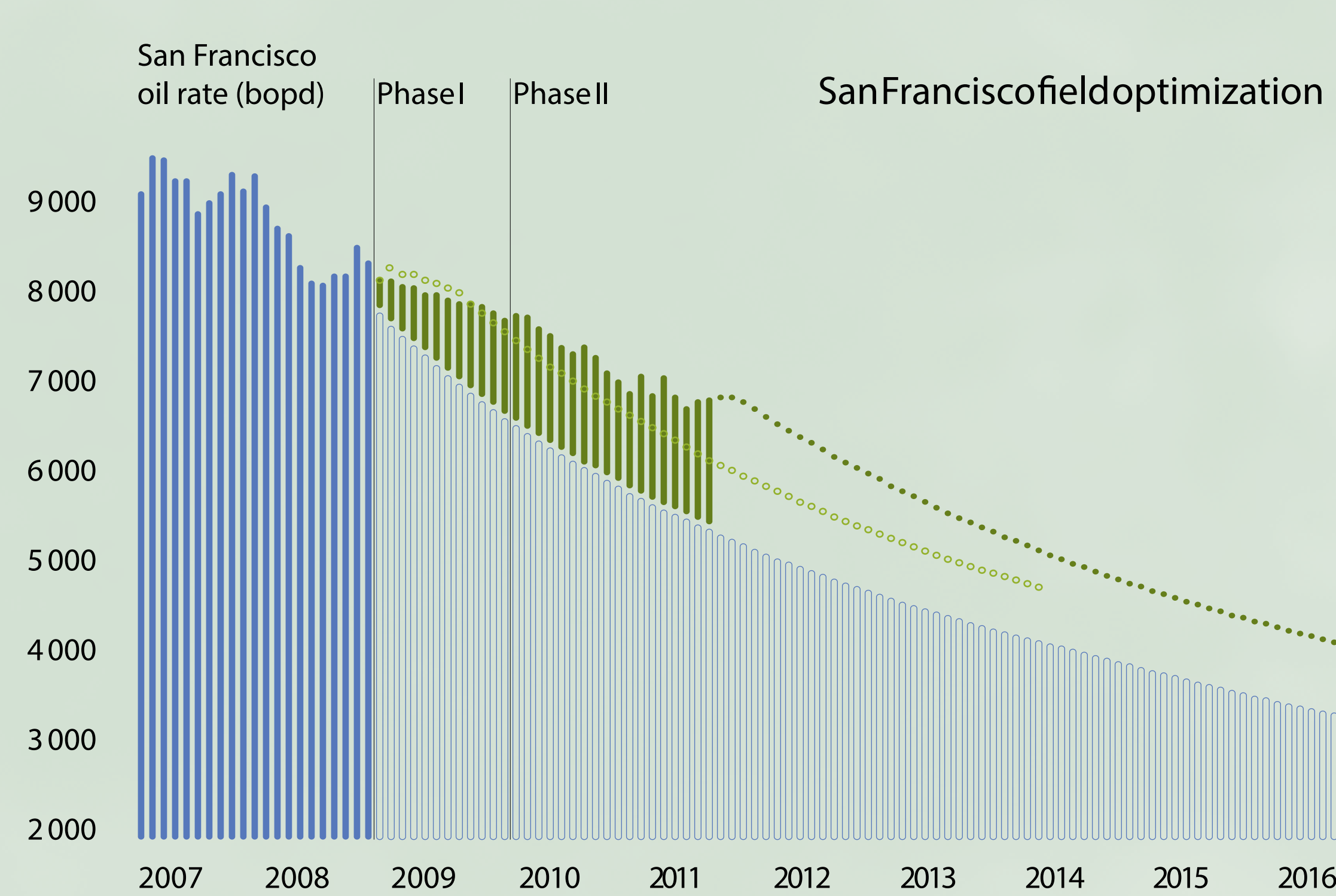
Challenges

- ▶ Identify the right conversion and injection plan
- ▶ Improve recovery from contrasted layered sands



San Francisco field, 20 km northwest of Neiva, Colombia.

RESULTS : 20% PRODUCTION INCREASE



Historical production (blue bars), realized production increase (green bars), baseline (hollow bars), optimized scenarios (dots). Ref. SPE paper 138979.

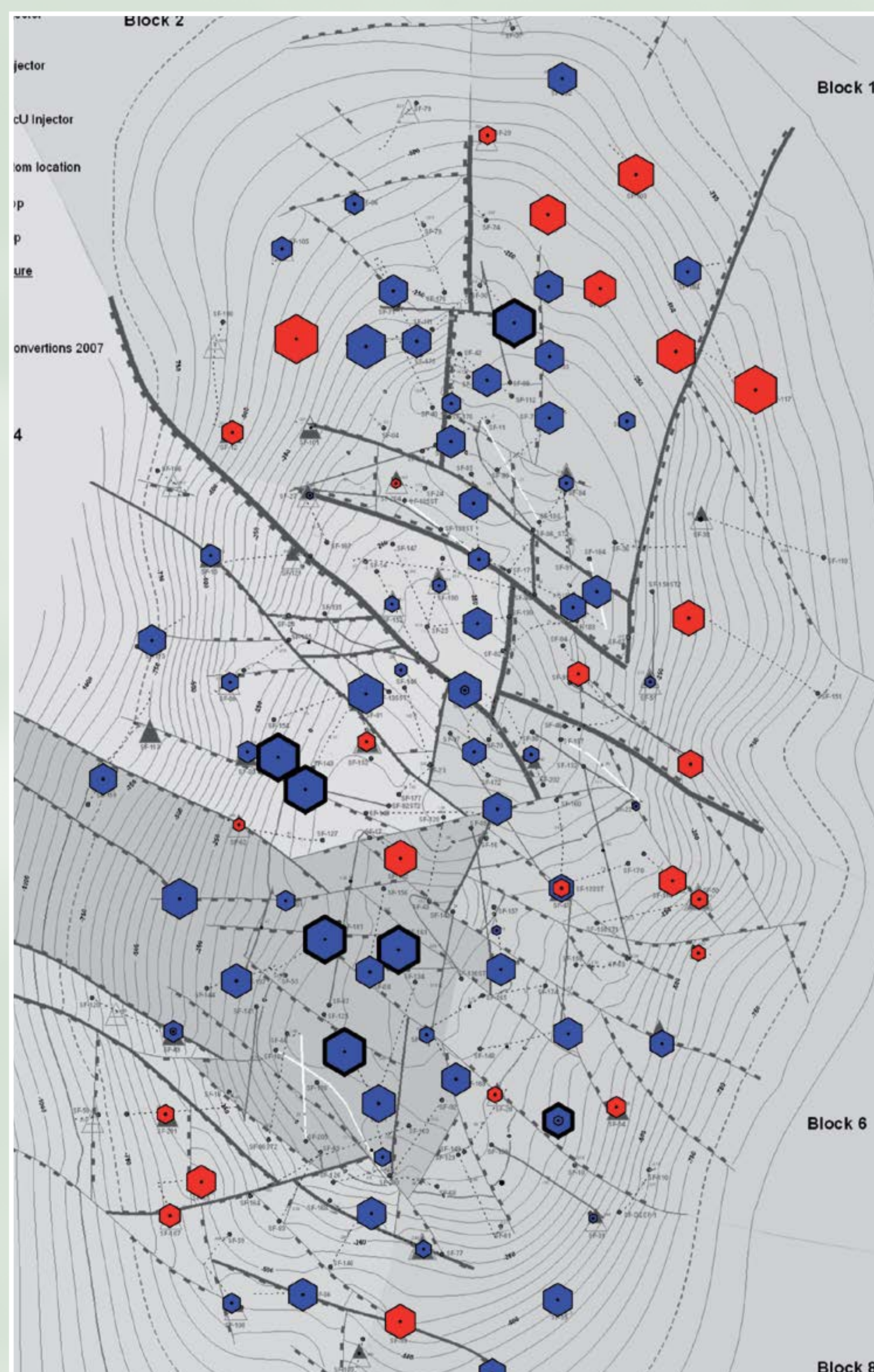
Phased Implementation

- ▶ Phase I:
Conversions and reshuffled injection
- ▶ Phase II:
Sand-selective injection

Demonstrated Upside

- ▶ +1,000,000 bbl in two years
- ▶ Production increase as per forecast
- ▶ Additional reserves certified

NEW INJECTION PLAN (I)



- ▶ Pilot wells for sand-selective stimulation
- ▶ Finer field model
- ▶ Water allocation re-optimized accordingly
- ▶ New additional production

Measured versus forecasted oil production demonstrating (i) model accuracy (97% over 10 months), and (ii) upside for pilot wells (in red).

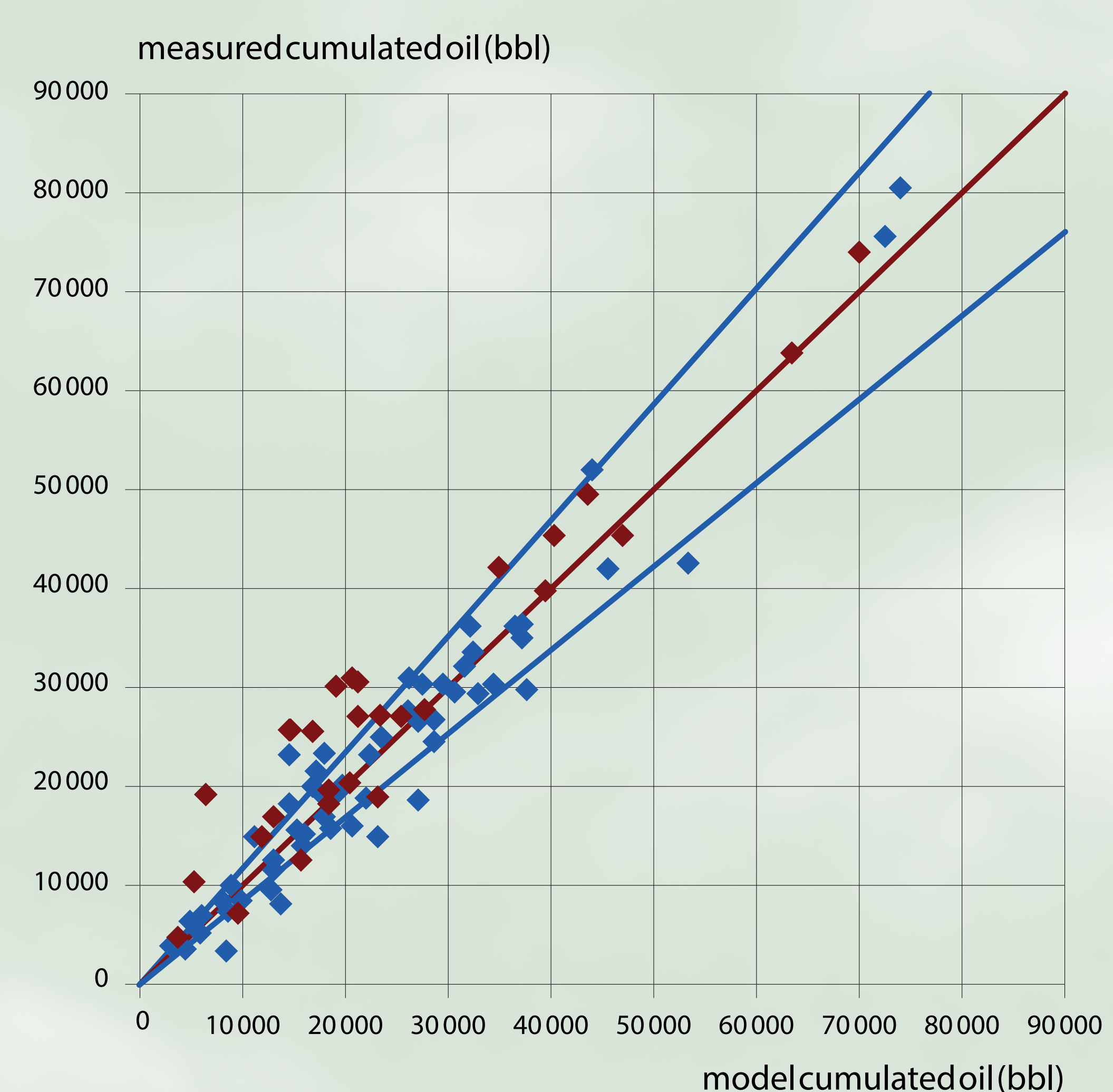
Optimization Study

- ▶ Dynamic field model
- ▶ Massive optimization :
400,000 scenarios per run

Recommendations

- ▶ Best number & locations of conversions
- ▶ Individual injection rates, constrained by total capacity
- ▶ New water injection plan: 7 conversions (bold contoured hexagons) and water allocation to every injector (blue = increase, red = decrease).

SELECTIVE INJECTION (II)



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FOROIL delivers field studies using in-house developed tools (Production Forecaster™ and Field Development Engine™).

Study results are delivered within three months and subsequent assistance to implementation ensures actual realization of the upside.



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