Use of state-of-the-art technology for jungle hydrocarbon projects

Lima, Peru, May 24, 2010

P.E. Bill Powers, E-Tech International

Ideally – jungle operations should resemble offshore platform operations

- The drilling rig and production platform is an “island”.
- There are no roads between these drilling islands.
- The distance between these islands can be up to 20 km. using advanced drilling technology.
- There is no contact with the local indigenous population.

History of E-Tech in Peru

- First reconnaissance trip, Camisea Project – 2004
- EIA comments on Block 67 – 2005, insist on use ERD (extended reach drilling)
- EIA comments for Block 56 – 2005, insist on use of ERD
- Visit to Corrientes region, Block 1AB and 8 – 2005, insist on reinjection of 1 million barrels per day of produced water
- Analysis of deficiencies in design of the Camisea pipelines– 2005/2006/2007
- Meetings with the Inter-American Development Bank and oil companies advocating for the use of ERD in Blocks 56 and 88 – 2005

History of E-Tech in Peru (continued)

- Inspection of reinjection systems under construction, Block 1AB/8 – 2007
- Inspection of reinjection systems in operation, Block 1AB/8 – 2008
- Evaluation of remediation projects of contaminated sites, Block 1AB – 2008
- Co-organizer of the first forum on independent monitoring, Cusco – 2009
- Co-organizer of the second forum on independent monitoring, Cusco – 2010

- Webpage: www.etechinternational.org

Principal physical impacts of hydrocarbon projects in the rain forest

- Construction of roads that provide access to settlers
- Cutting down trees to create space for roads, camps, helipads, flow lines, and oil/gas pipelines
- Contamination by spills and discharges
- Erosion that pollutes streams and rivers
- Machine and helicopter noise
- Congestion of marine tariff on rivers

Environmental protection requirements for hydrocarbon activities – 2006

[D.S. 015-2006-EM]

- Article 40º(a). Preference should be given to aerial and river access.
- Article 40º(c). In order to proceed with the construction of roads, it is necessary to demonstrate that it is not possible to use river or aerial access.
- Article 55º. When a project may affect native or rural communities, necessary measures to prevent, eliminate or minimize negative environmental impacts should be included in the EIA.

Environmental protection requirements for hydrocarbon activities – 2006

- Article 83º(c). [Pipelines] The operator should design the installation of the pipelines considering **the best technology** possible.

- Supplementary Provision - Second. In the elaboration of the EIA, procedures and methodologies updated and internationally accepted in the hydrocarbon industry will be used, compatible with the environmental protection and in **accordance with the best recognized techniques** of environmental management.

Oil industry operating guideline for tropical rain forests – 1991 (London)

- Prepared by the oil industry- Shell, Texaco, BP, Conoco, and Total – for the oil industry
- p. 3. “The rights of indigenous populations must be identified and respected during the entire duration of the project. The villages should not be exposed to anything that would put their health, safety, or well being at risk. The integrity of traditional customs and ancestral territories must be maintained.”

Oil industry operating guideline for tropical rain forests – 1991 (continued)

- p. 6. “The construction of roads should be avoided when feasible.”

- p.7. “For the majority of oil projects in tropical forests, construction of access roads is a major cause of environmental impact. The impacts include forest clearing, diversion of water flow, soil erosion, and more access roads for settlers. The alternative is the use of helicopters.”

Oil industry operating guideline for tropical rain forests – 1991 (continued)

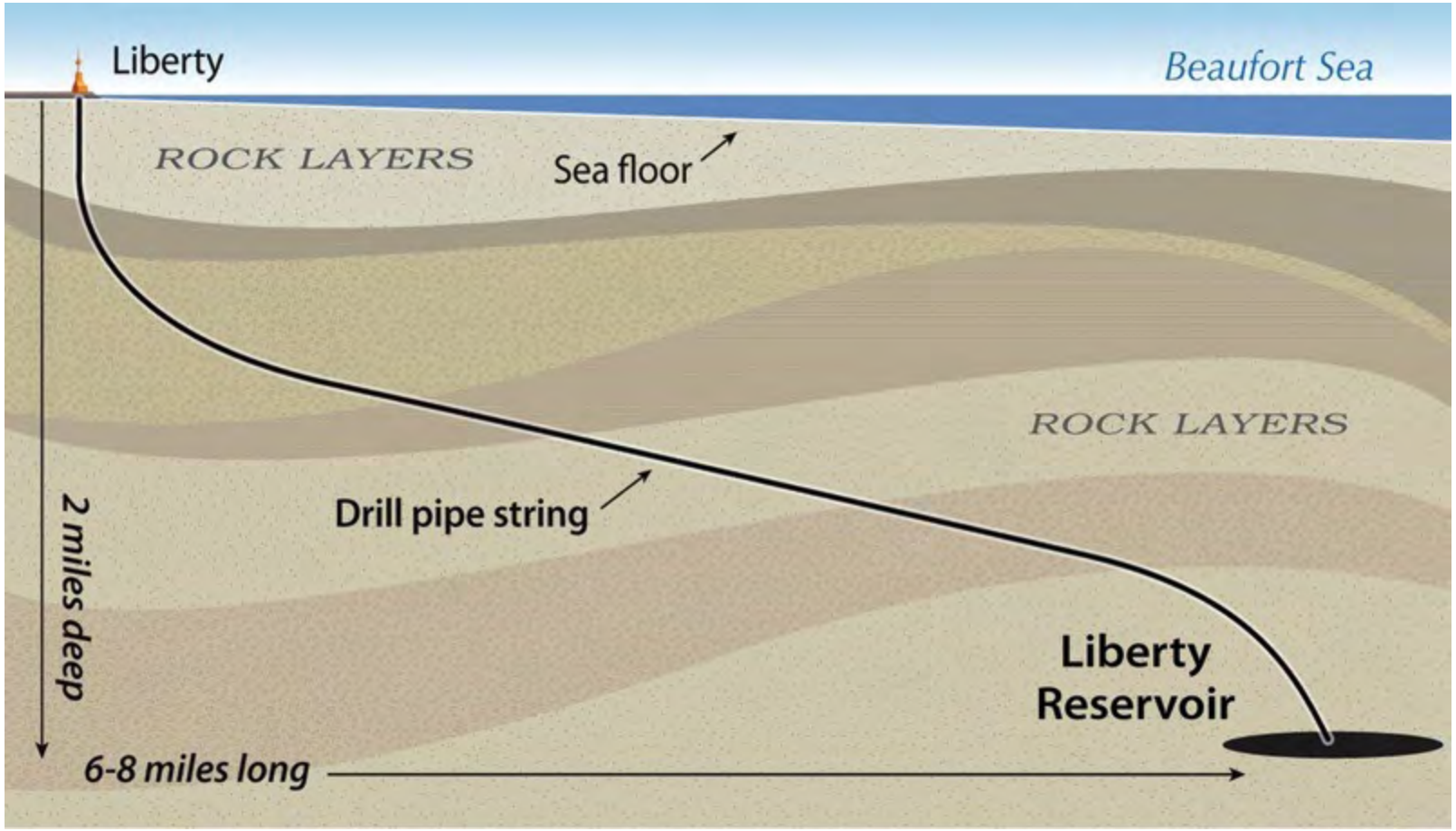
- p. 8. “The use of helicopters for the transportation of personnel and equipment is preferred from an environmental perspective to the construction of roads or excavation of rivers. The benefits include: 1) less forest destruction, 2) reduced access to site.”

- p.12. “The oil/gas well development plan must employ directional drilling techniques when feasible to locate multiple wells in one place and thereby minimize the number of drilling platforms.”

Advances in directional drilling technology

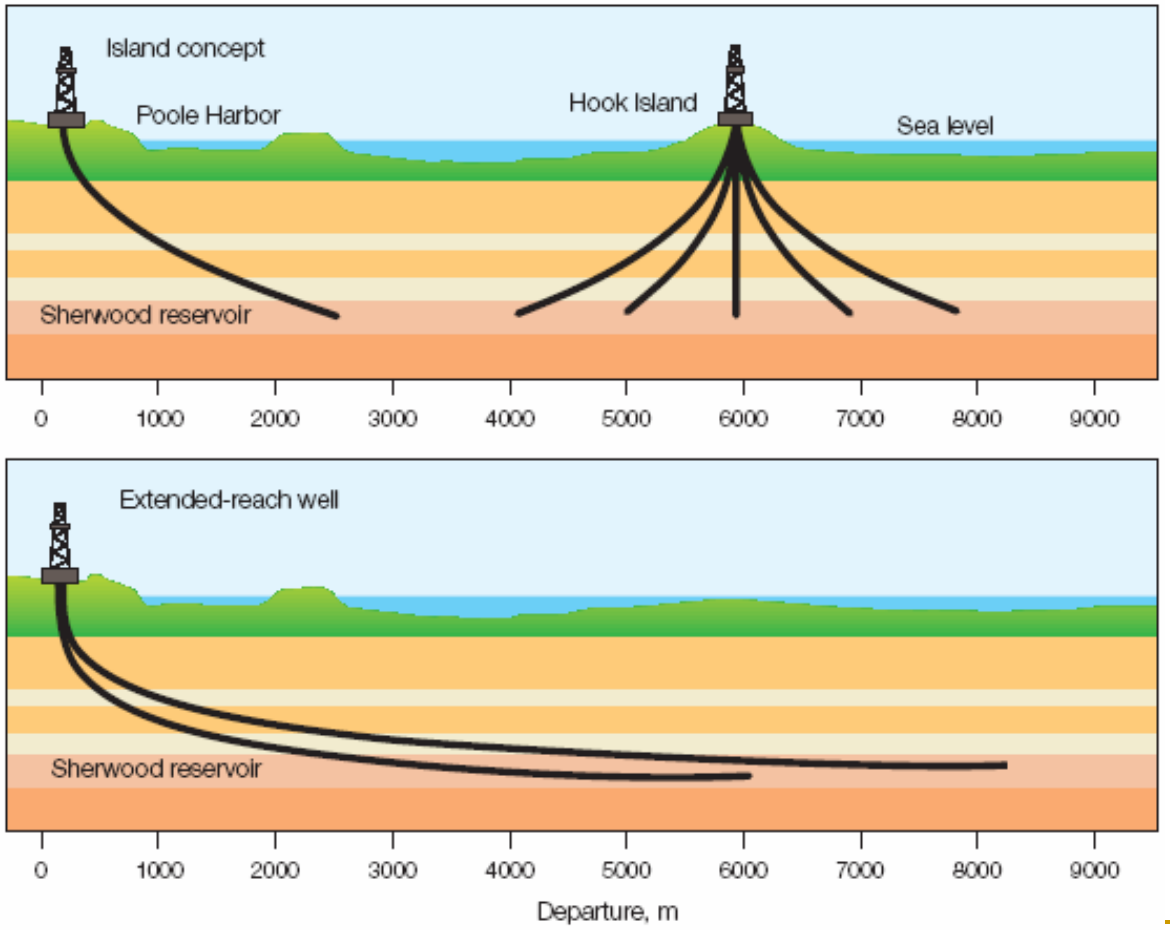
Improvements in drilling technology on the North Slope over the past 30 years have significantly reduced the surface footprint while expanding the subsurface drillable area, as shown in these illustrations.

Extended Reach Drilling (ERD) – reaching up to 12 km from the drilling platform



ERD – how it works

Source: www.schlumberger.com "*Extending Reach Drilling: Breaking the 10-km Barrier*"



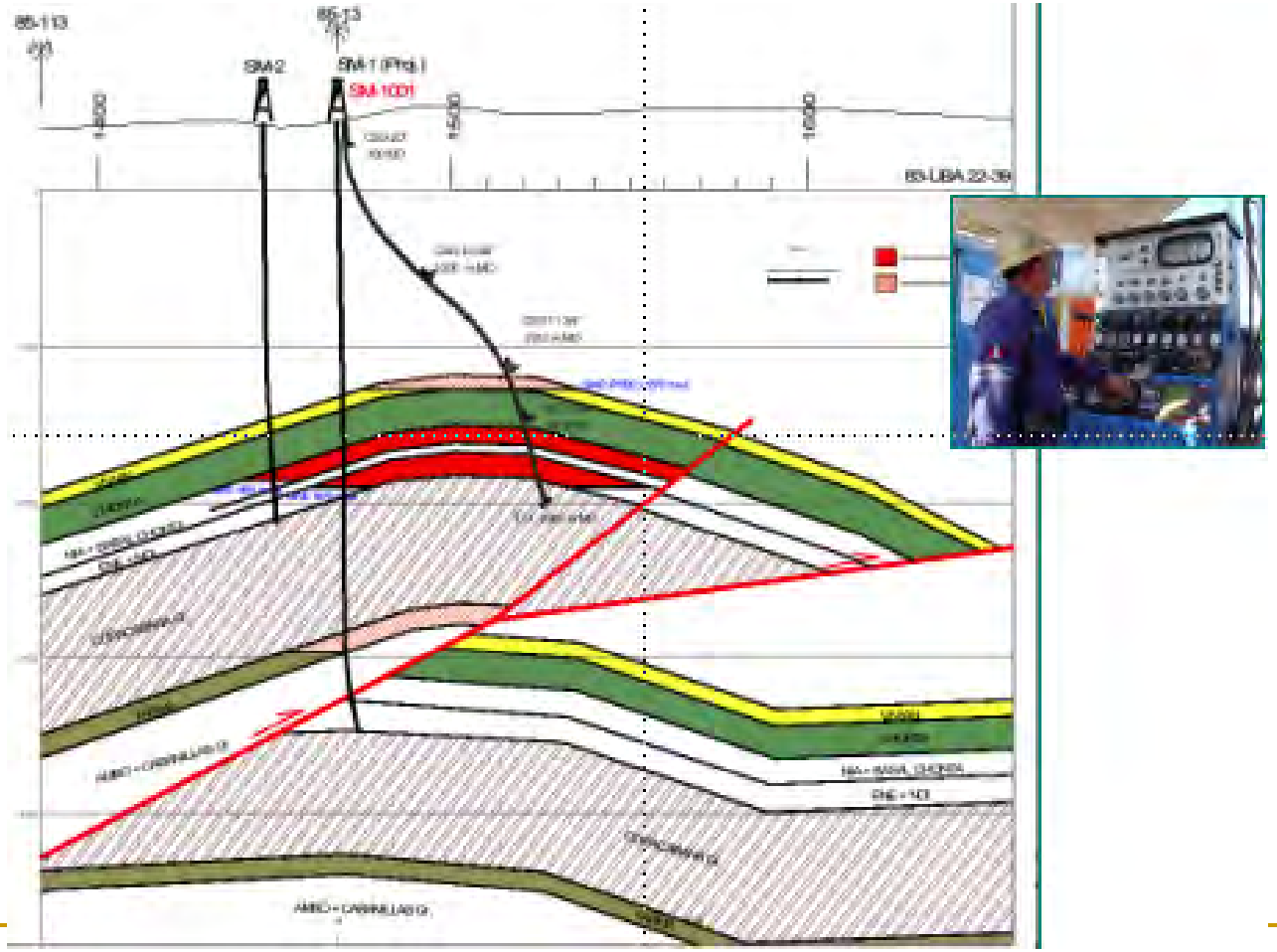
Schlumberger comments in 2008 - ERD reduces cost and environmental impacts

source: Rigzone, *Schlumberger Technology Breaks World Record for Extended Reach Drilling* , September 16, 2008

"ERD is a natural application of our technology, high performance drilling, "said Mike Williams, Sales Manager, Drilling & Measurements, Schlumberger. "This will help our customers access more reservoir volumes from a single drill site, which reduces overall costs and environmental impact."

Directional well SM-1001 – depth 2,325 m.,1,570 m. horizontal (from well SM-1)

source: A. Moon - PlusPetrol, Camisea: Key Project for Peruvian Economy, May 2003.



The price of oil is established by the global market. However, there are ERD projects all over the world that compete successfully in the market.

- The most well known projects that use ERD drilling, reaching deposits of oil 10 km. or more from the drilling platform, are found in:
  - Argentina, Qatar, Russia
  - China (up to 8 km.),
  - England
  - United States
- ERD is used in new and mature fields.

Purpose of E-Tech in 2010 – To revise and update the *Oil Industry Operating Guideline for Tropical Rain Forests* specifically for the project in Peru

- Provide civil society, lending institutions, the government, and the oil industry with a clear understanding of the state-of-the-art so these entities know what the best technology is and insist on its use.

Table of contents for the revised guide

- Introduction/background
- Laws/national relevant regulations
- Relevant international agreements
- Rights of indigenous populations
- Description of zones that should not be developed
- Role of audits – baseline and periodic audits
- Role of panel of experts

Table of contents for the revised guide (continued)

- Best practices – production fields/land
- Best practices – oil pipelines and gas pipelines/land
- Marine loading facilities – spill control
- Requirements presented in the Environmental Impact Assessment (EIA)
- Monitoring – company, government, banks, civil society
- Best practices – project abandonment

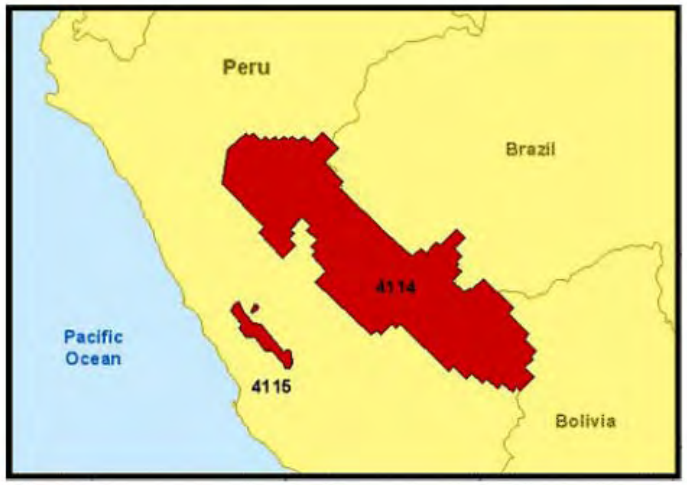
Example: Best practices – production fields on land

- Exploration Phase – discovery/definition of deposits
  - Remote sensors – plane and helicopter
  - Minimal seismic use
  - Spill control
- Production Phase – processing network of wells and batteries
  - ERD (“extended reach drilling”)
  - Minimum number of drilling platforms
  - Absence of roads between production platforms
  - zero discharge of produced water and/or waste
  - Controlled river transport
  - Contingency program against spills

Mapping of hydrocarbon deposits by aerial methods – method to limit the use of seismic to true deposits

Source: Fugro Airborne Surveys, website

- Aerial methods with sensors can identify with confidence zones within a block that do not have oil/gas.
- For example, there is already a commercial database on subsoil characteristics for the entire Peruvian jungle south of the Marañón River Basin (Fugro).
- Advantage of aerial methods – avoid the cost of seismic in areas where there is no oil/gas.



Lessons learned from the two technical audits – by the BID and that of the government of Peru – of the Camisea I pipelines

- Insufficient geotechnical studies before initiating work.
- Inadequate erosion control of right-of-way during construction phase.
- Insufficient thickness of the liquid pipeline to withstand the unstable soil conditions.

Lessons learned from the two technical audits – by the BID and that of the government of Peru – of the Camisea I pipelines (continued)

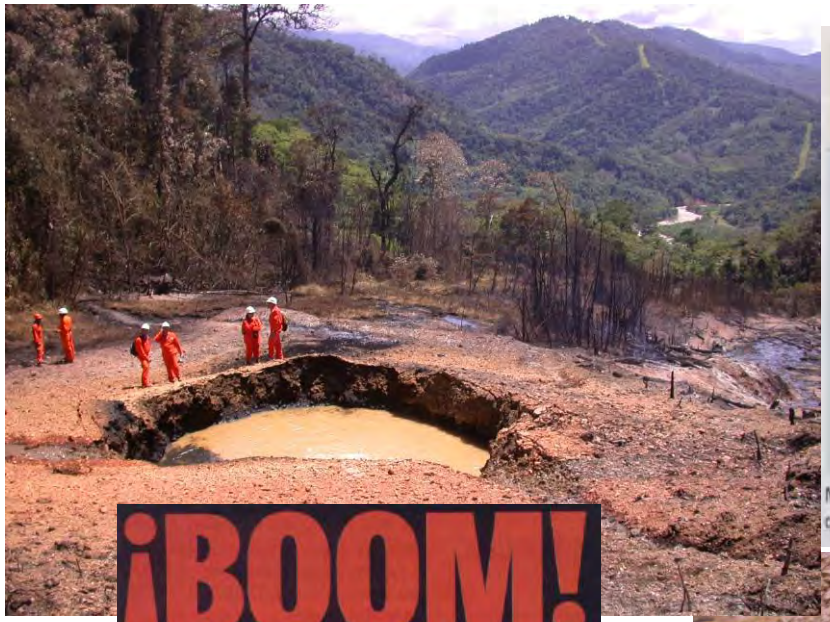
- TGP did not establish a Quality Management Program to oversee, monitor, and audit the activities related to the design, engineering, procurement, construction, operation and maintenance [of pipelines].
- Lack of an efficient Third Party Authority, with international experience and independent of TGP or Peruvian authorities, responsible each phase of the Camisea Project. Such Third Party Authority could, regardless of external pressures, identify, report, and support in solving engineering problems and findings in design, procurement, construction and/or other areas.

Camisea I and conditions in the right-of-way

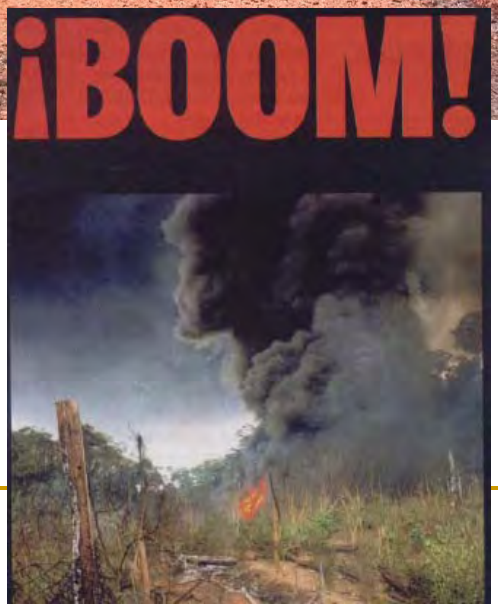
Traditional and "green" pipeline right-of-way – up to 25 m. in width (l) or 13 m. in width (r)

Source: Eng. G. Amores – INMAC PERU SAC, *Comparaciones de calidad y costo entre un Gasoducto Verde y una construcción tradicional El Control de la Erosión como medida de Protección Ambiental*, May 2010.

5th rupture Camisea liquids pipeline, March 4, 2006, km. 126: loss of 4,700 barrels (200,000 gallons)

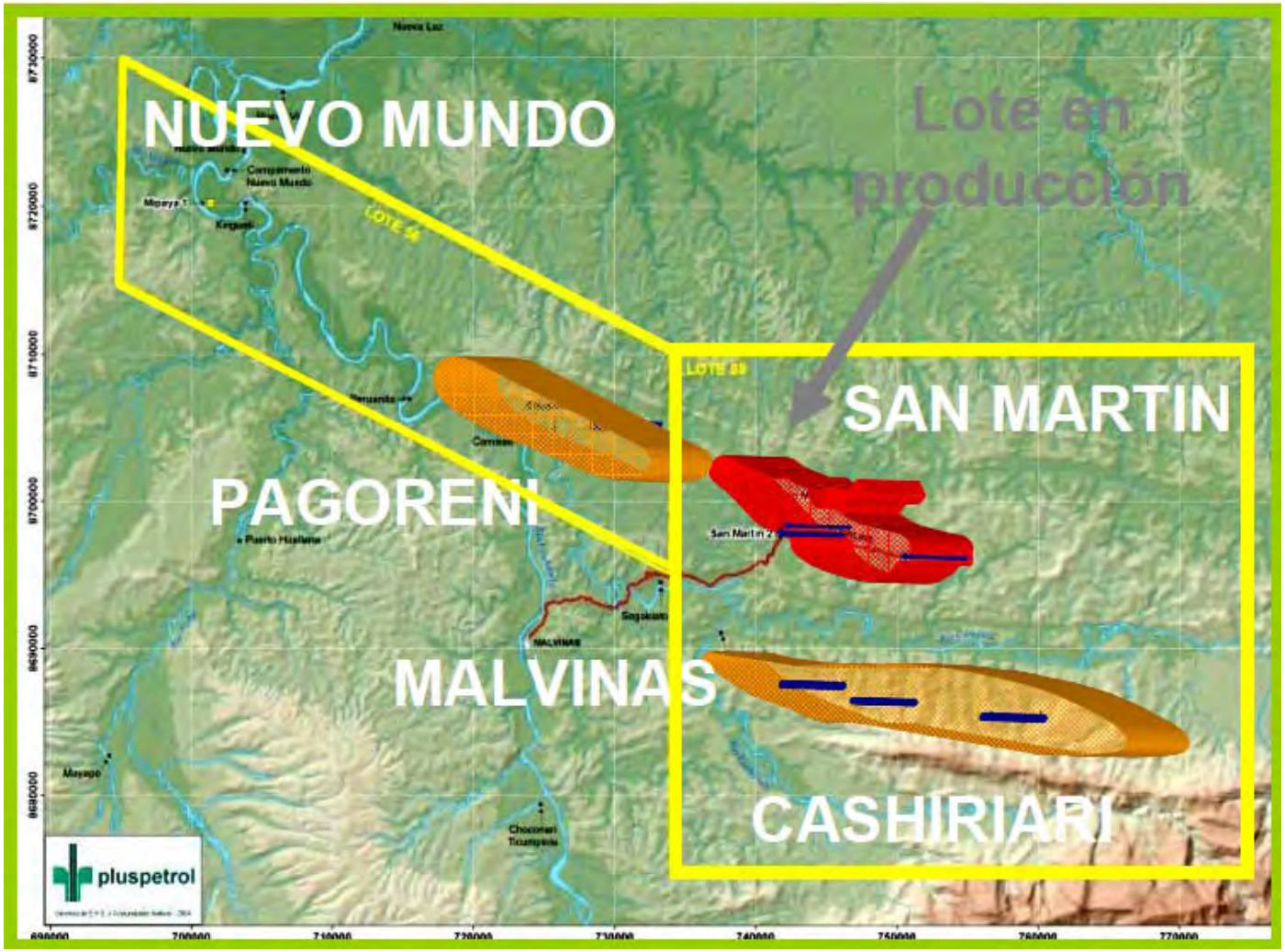


Mapa de puntos presuntamente vulnerables del gasoducto, según E-Tech. Es la quinta vez que se quiebra en 18 meses de operaciones.

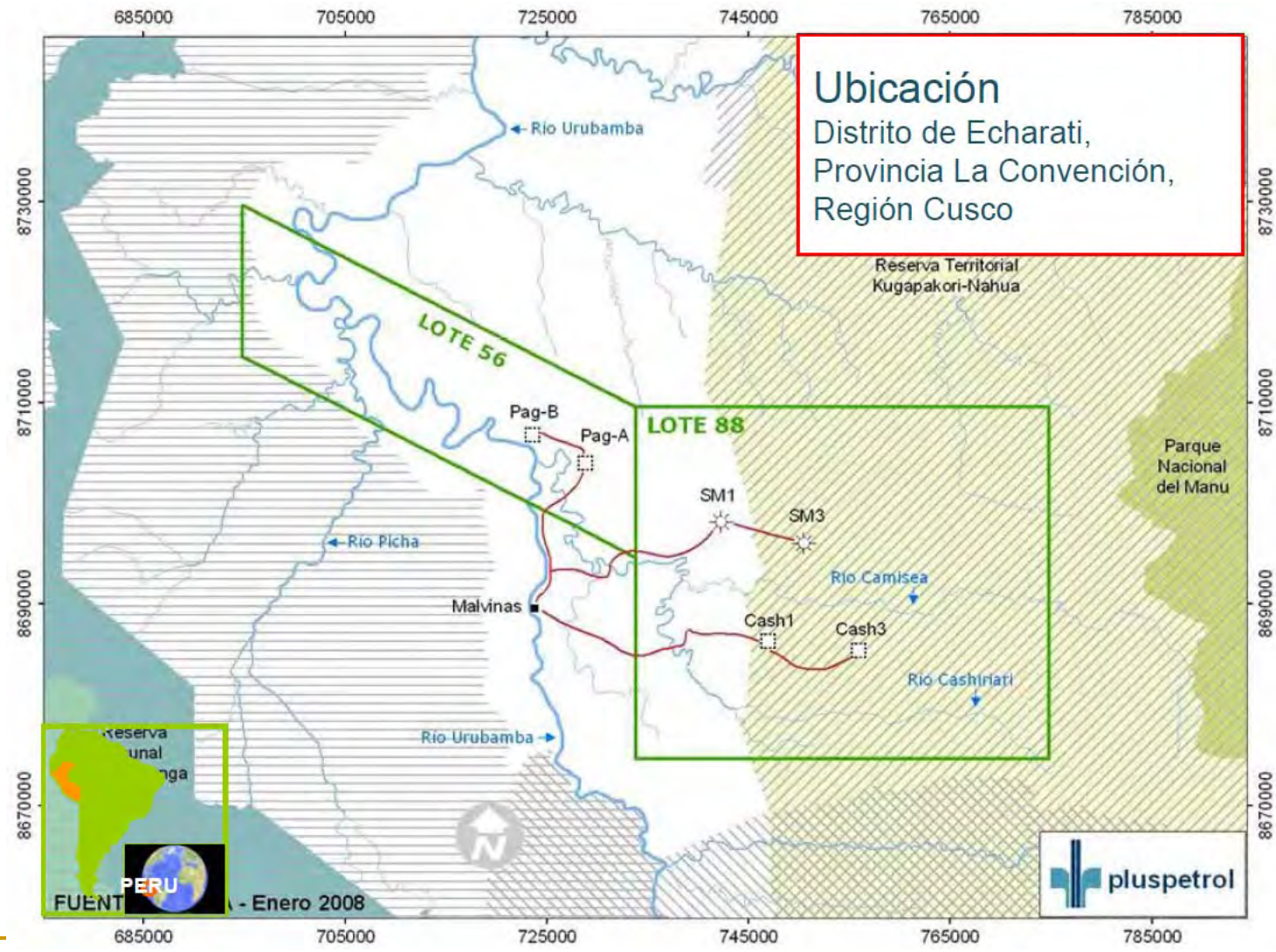


Drilling projects, Blocks 56 and 88

source: presentation PlusPetrol, 1st forum Cusco, 2009

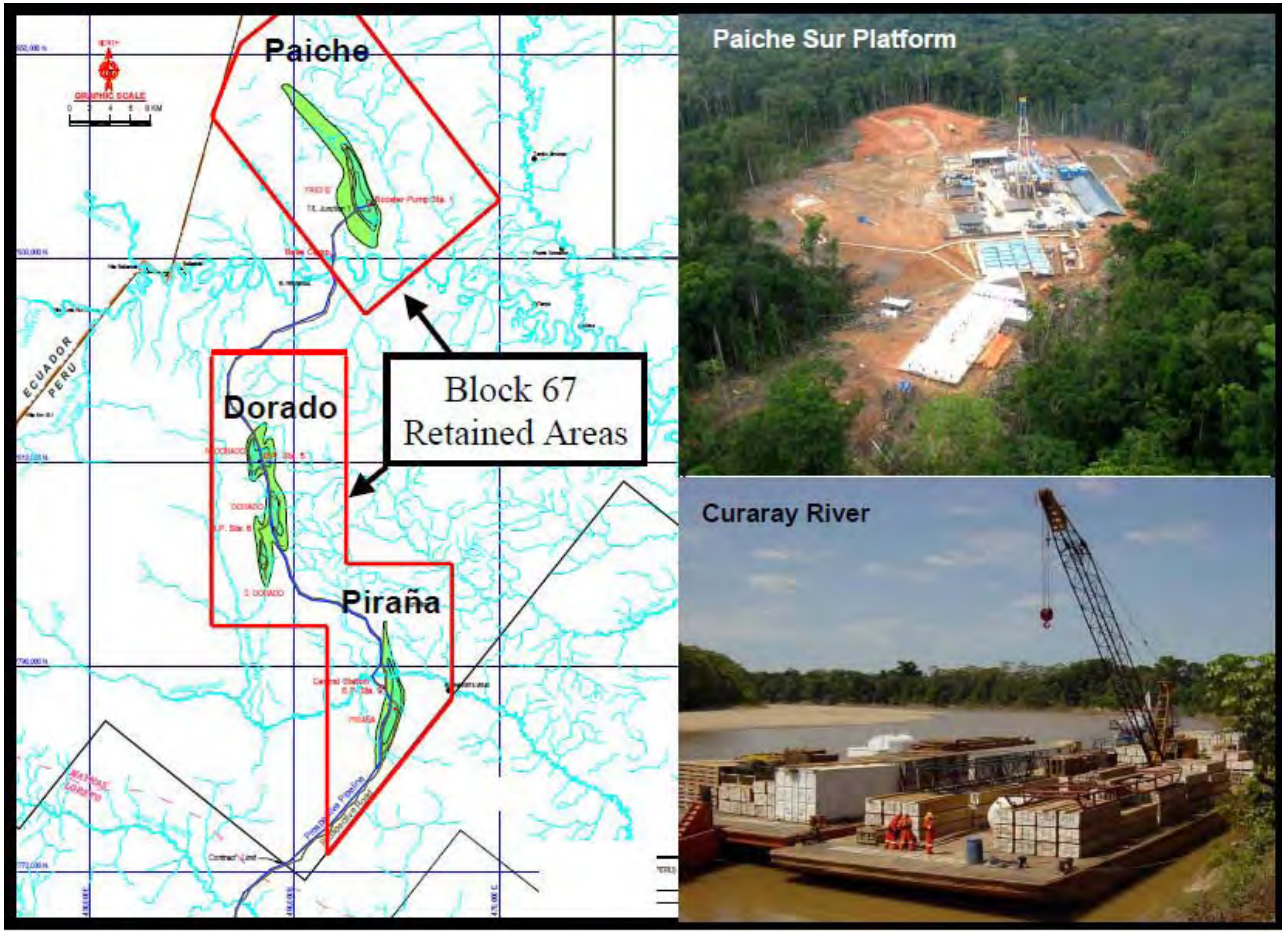


Location of drilling platforms



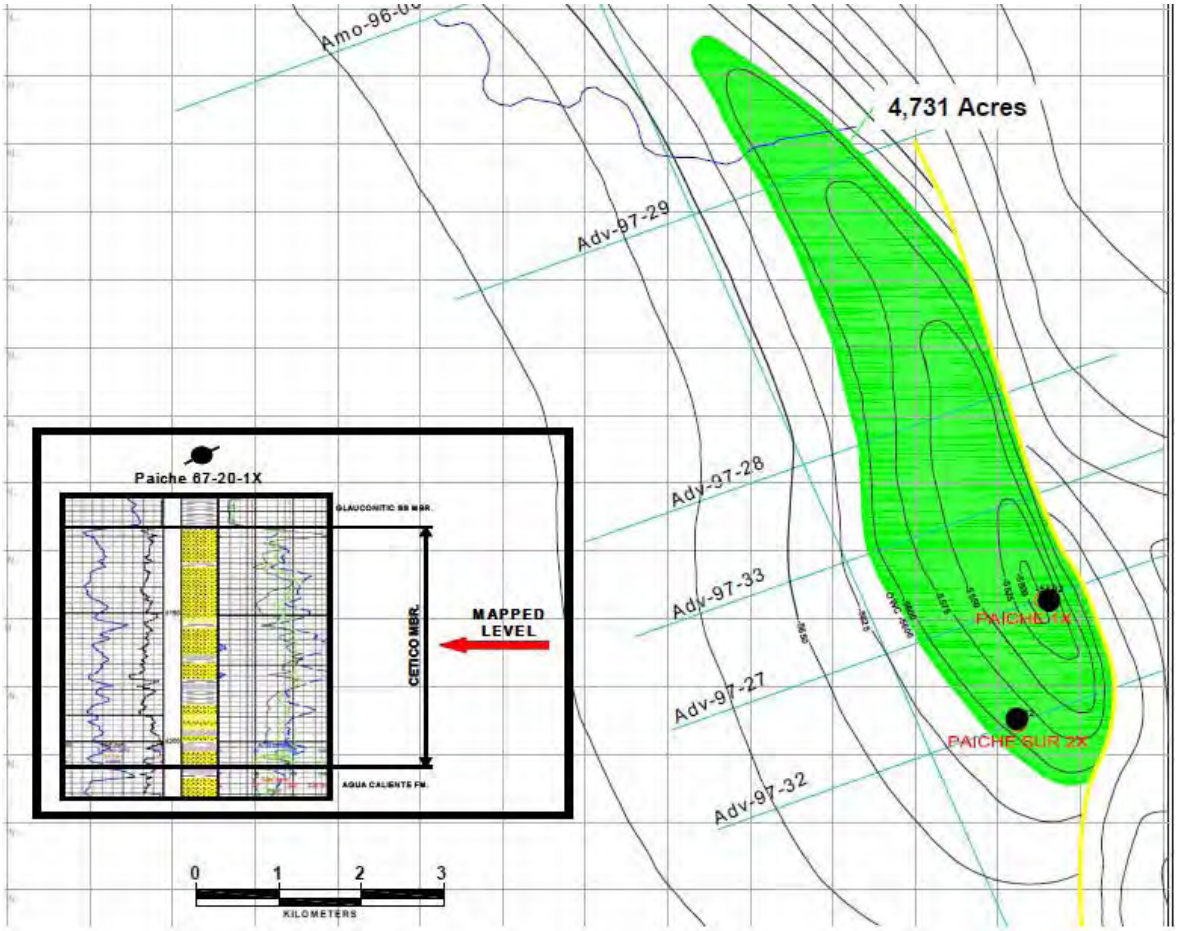
Block 67 – three separate deposits with a distance of 15-20 km. between deposits

Source: Barrett Resources, EIA Sismica 3D – Lot 67, 2006



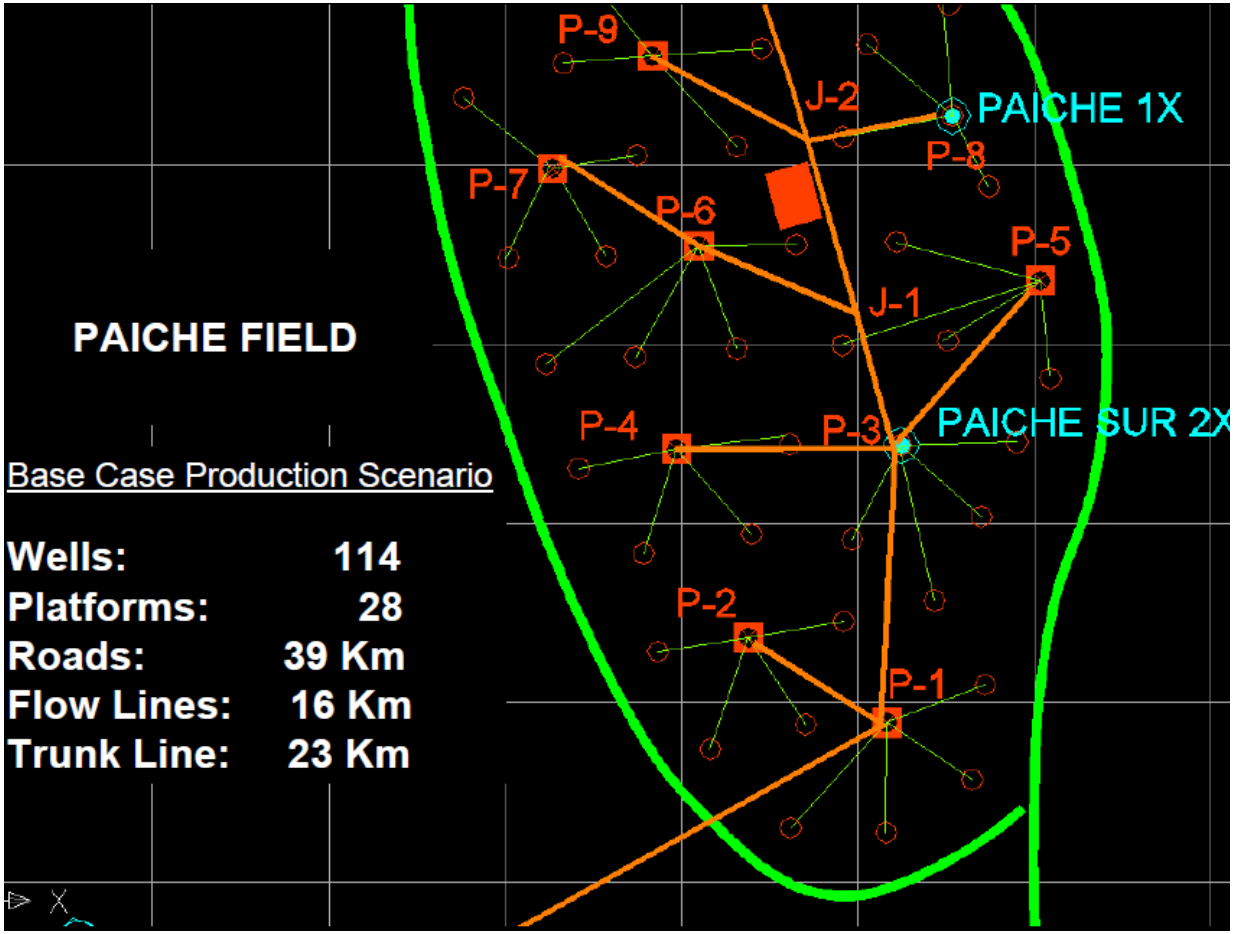
Paiche Deposit, ~10 km. in length, ~ 3 km. in width

Source: Barrett Resources, EIA Sismica 3D – Lot 67, 2006



Paiche – 9 drilling platforms in an area that measures 3 km. by 2 km.

Source: Barrett Resources, EIA Sismica 3D – Lot 67, 2006



EIA for seismic Lot 67: comments by E-Tech, April 15, 2007

Source: Barrett Resources, EIA Sismica 3D – Lot 67, 2006

- E-Tech – a single ERD platform could reach the entire Paiche deposit.
- Barrett Resources/Perenco are proposing the construction of 28 platforms over the Paiche deposit, with 39 km of roads and 39 km of flow lines and main pipeline.
- E-Tech recommended a study by Barrett of ERD of a single platform in Paiche as an alternative to the proposed plan.
- There was no response, perhaps due to the fact that the EIA was limited to the seismic component of a broader project.

Additional cost of ERD for Lot 67

Source: Parker Drilling (cost of drilling equipment) , K&M Technology (extras drilling days with ERD)

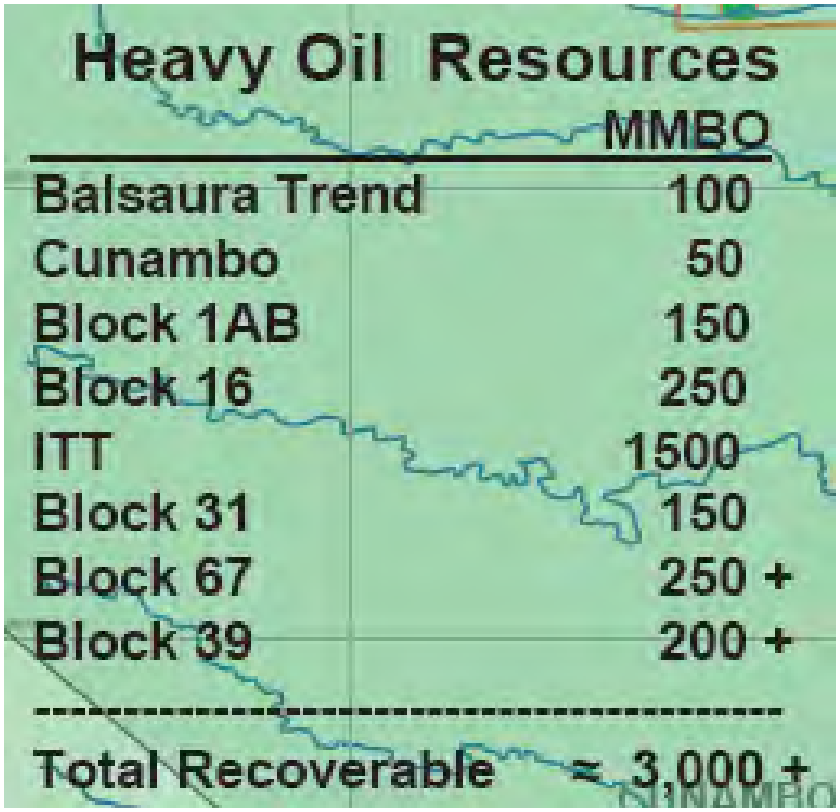
- Special drilling rig, up to $30 million.
- Additional drilling time for wells, up to 60 days each.
- Cost for additional day of drilling, $30,000 to $50,000 per day (on top of cost of drilling equipment).
- Additional cost for ERD well, $2 to $3 million.
- Up to $120 million in additional cost if there are 40 ERD wells, among all the wells drilled, over the life of the project.
- Total ERD additional cost would be $30 million + $120 million = $150 million (actual net value).
- The use of ERD brings the advantage of eliminating: additional drilling platforms, flow lines of these platforms to battery production center, roads, et cetera. The additional cost of $150 million does not reflect the economic value of these benefits.

Estimated extra cost per barrel that ERD would impose in Block 67 - less than 1%

Source of the table: Barrett Resources Peru, Block 67 Overview – Unlocking the Potential of the Heavy Oil Belt Marañon Basin, Peru, 2006

Cost per barrel of ERD in Lot 67:

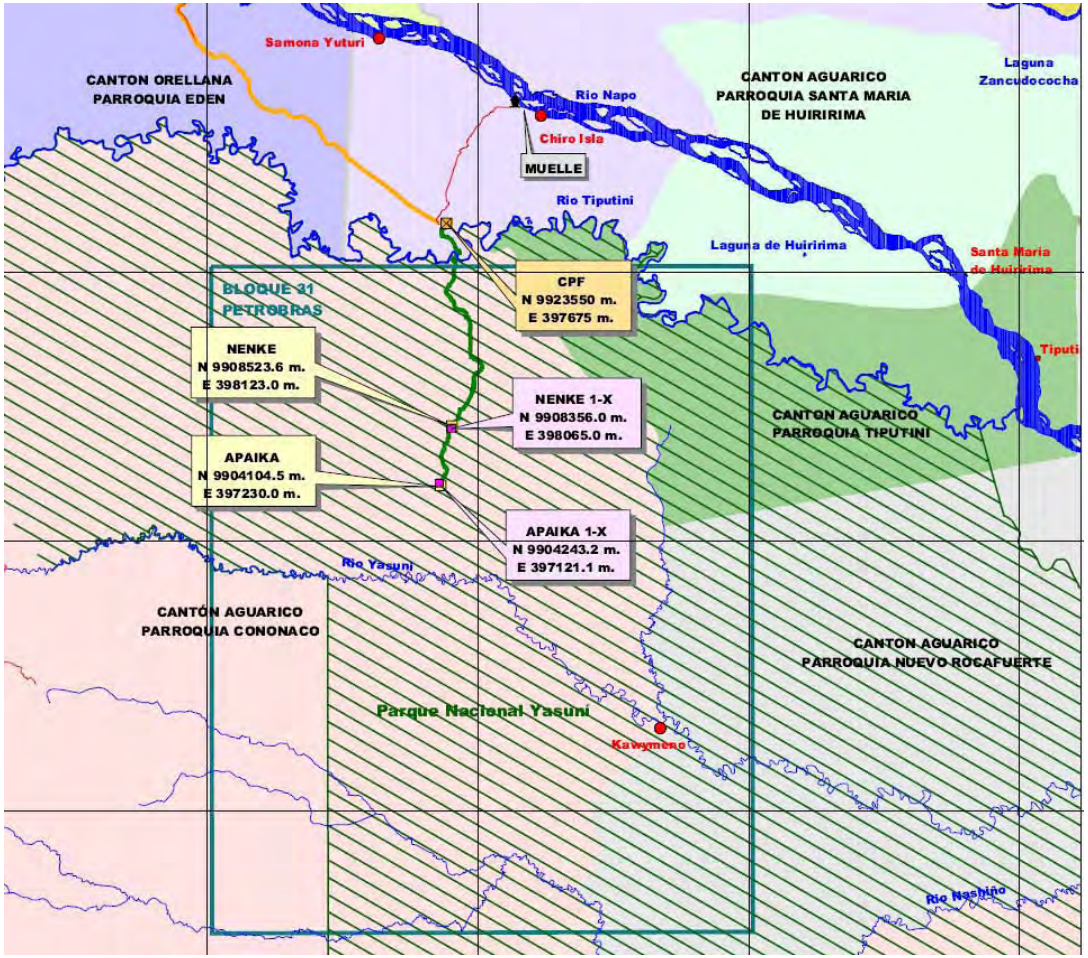
- Extra cost of ERD ÷ recoverable barrels = cost of ERD per barrel.
- $150 million ÷ 250 million barrels = **$0.60/bbl.**
- A barrel of oil costs around $80/bbl and has reached up to $150/bbl;
- The extra cost of ERD would be less than 1% of the current value of a barrel of oil;
- Lack detailed study of ERD cost increment.



Heavy Oil Resources	MMBO
Balsaura Trend	100
Cunambo	50
Block 1AB	150
Block 16	250
ITT	1500
Block 31	150
Block 67	250 +
Block 39	200 +
Total Recoverable	≈ 3,000 +

Lot 31 Ecuador – use of ERD would avoid entering the Yasuní National Park

Source: Petrobras, EIA For the Forest 31, 2006



EIA for Block 31 Ecuador (Petrobras), 2007 - the MEM of Ecuador supportive of ERD

Source: MEM Ecuador, MEMORANDUM No. 405 – DINAPA – EEA-2007, June 20, 2007.

- MEM (Ministry of Energy and Mines) – Petrobras did not analyze alternatives to the proposed project.
- The proposed drilling site is not the most adequate from an environmental and geologic point-of-view.
- ERD allows wells to be drilled from a single site and minimizes the number of drilling platforms.
- Petrobras has no experience with ERD.
- Recommendation – technical analysis of ERD in w/objective of minimizing affected area.

Ministerio de
Energía y Minas
República del Ecuador

Oficio 0740 DM-2007 0708619

Quito 13 JUN. 2007

Economista
Rafael Correa Delgado
PRESIDENTE CONSTITUCIONAL DE LA REPÚBLICA DEL ECUADOR
Presente

De mi consideración:

Adjunto al presente, sírvase encontrar, el Informe de la Subsecretaría de Protección Ambiental de esta Cartera de Estado, referente al **"ANÁLISIS BIOLÓGICO Y AMBIENTAL DE LA PROPUESTA DE LA FUNDACIÓN SAVE AMERICA'S FOREST CON RESPECTO A LA CONSTRUCCIÓN DE LA CARRETERA, CPF Y POZO APAIKA EN EL BLOQUE 31 (PETROBRAS)"**, para su conocimiento y análisis petinente.

Atentamente,

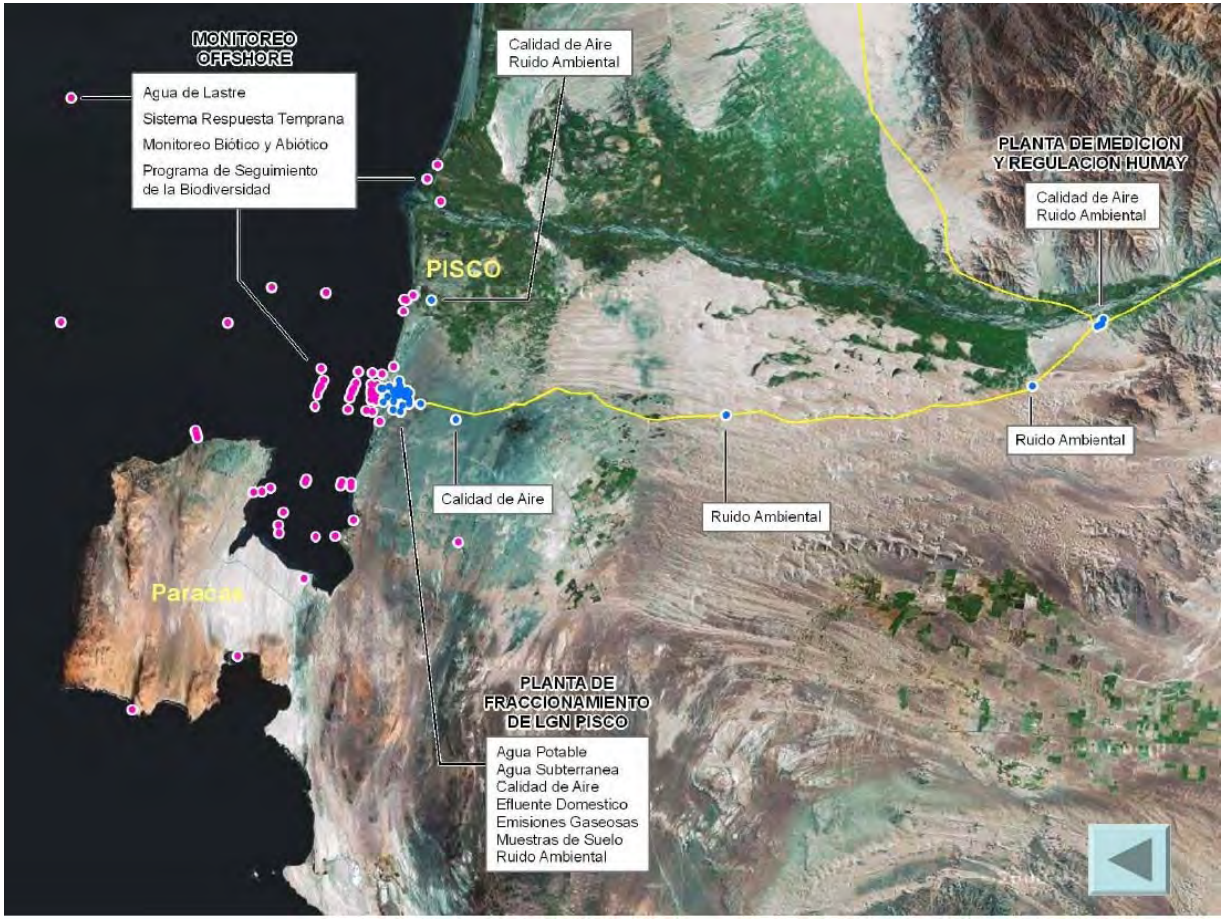
Alberto Acosta
MINISTRO DE ENERGÍA Y MINAS

C.C. **Anita Albán**
MINISTRA DEL AMBIENTE

Map of Camisea Project

Map of monitoring sites around PlusPetrol fractionation plant in Pisco

source: presentation PlusPetrol, 1st forum Cusco, 2009



Marine Terminal Pisco Camisea

source: PlusPetrol, Oil Spill Response Marine Terminal Pisco Camisea, PowerPoint, May, 2010

Spill equipment available at the Marine Terminal Pisco Camisea

source: PlusPetrol, Oil Spill Response Marine Terminal Pisco Camisea, PowerPoint, May, 2010

7. ACTIVATION OF LOCAL CONTINGENCY PLAN FOR OIL SPILLS

source: PlusPetrol, Oil Spill Response Terminal Marino Pisco Camisea, May 2010

- ✓On 06/05/08, the Captain of the Port of Pisco activated the local contingency plan for fuel spills (marine diesel) from the ship "CAPE KNOX" which was anchored at the ENAPU pier of Puerto San Martín.
- ✓PlusPetrol proceeded to mobilize equipment and personnel in accordance with our emergency plan to support this contingency.
- ✓It is estimated that approximately 17,000 gallons of diesel/sea water mixture was collected.

Photos of tanker waiting its turn with the Ballestras Islands in the background

source: photo by B. Powers, May 16, 2010

For larger scale spills, the Marine Terminal Pisco Camisea depends on a team in England

- For large-scale spills, PlusPetrol has a contract with Oil Spill Response Ltd. (OSRL) of England to provide spill control.
- OSRL has two Hercules propeller planes ready at all times to send equipment and personnel at the site of a spill.
- However, there is no equipment or personnel in Pisco capable of containing a large-scale spill.
- This is very similar in some respects to the situation in the Gulf of Mexico prior to the BP oil spill.

Conclusions – Technology

- Drilling: A single production drilling platform should serve an area of at least 200 km^2 (This is equivalent to a circle with a radius of 8 km).
- Access: Roads between production platforms should be prohibited. Access should be by boat and helicopter only.
- Pipelines: The maximum right-of-way width for a pipeline should be 13 m or less.
- Marine terminals: Terminals have enough equipment and trained staff on site to contain large-scale with spills quickly (“larger scale "is defined as the loss of the entire load of a tanker ship).

Conclusions - General

- It is imperative that civil society, government, lending institutions, and the oil industry understand what the current state-of-the-art is for oil & gas exploration and production operations.
- The use of state-of-the-art technology has the potential to substantially reduce the environmental and social impacts of oil projects in the jungle compared to current practices.