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MET Survey Technology

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- **The MET Process**

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The MET Process

- MET – Microbial Exploration Technology.
- Proprietary method used by EBT to identify hydrocarbon (HC) gas microseepages.
- Accurately measures levels of bacteria in soil that metabolize HC gas.
- Can identify extremely low levels of HC gases in soil.
- Quantifying the samples collected allows EBT to generate detailed maps that can identify geochemical anomalies within the survey area.

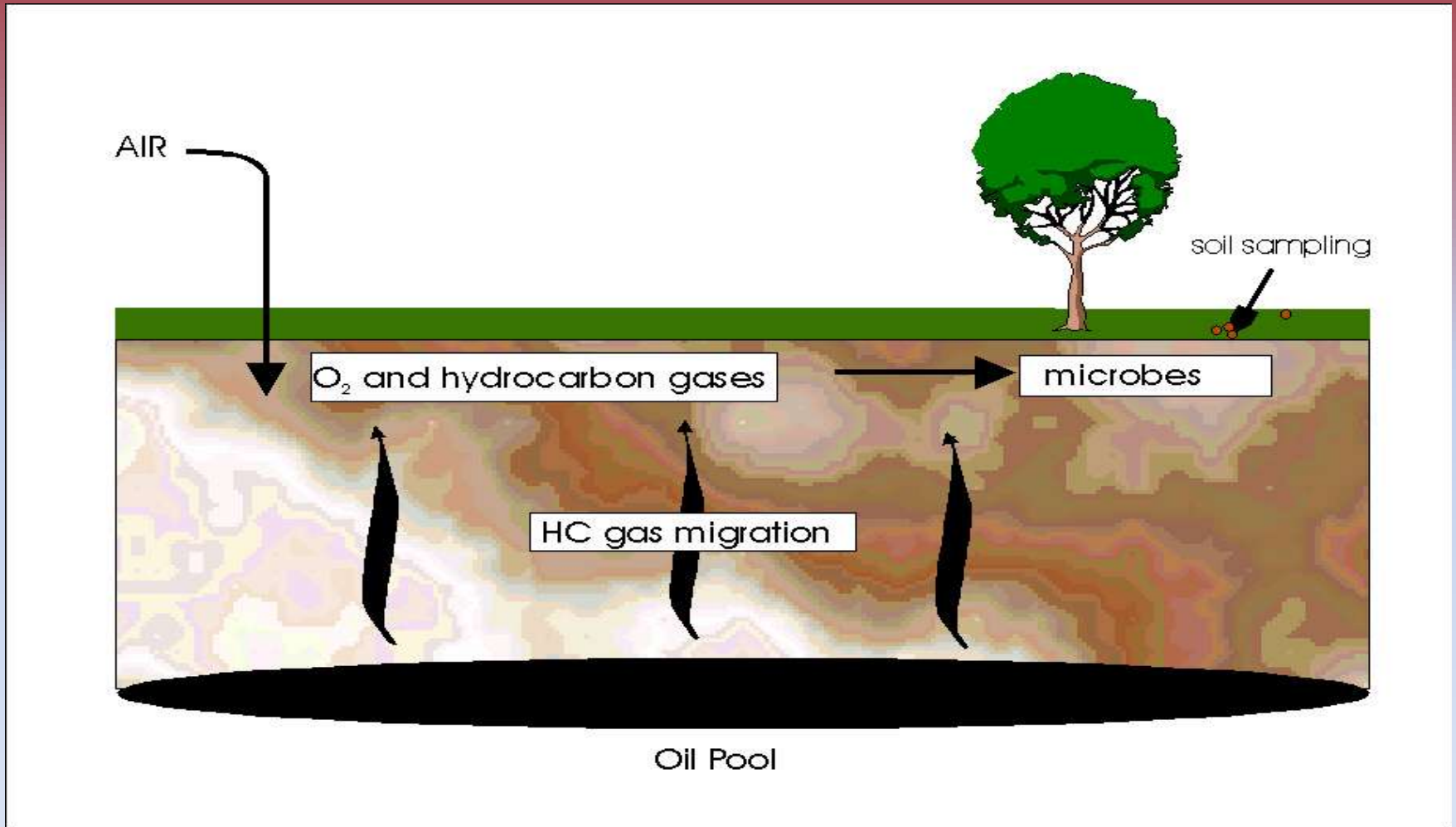


Principles of the MET Process

- Oil and gas accumulations leak hydrocarbons.
- Leakage (or microseepage) has a vertical migration to surface.
- Bacteria can utilize the hydrocarbon gas from a microseepage as a nutrient source.
- Identifying and measuring the bacterial population can identify subsurface hydrocarbon accumulations.



The MET Process





Examples of MET Survey Maps

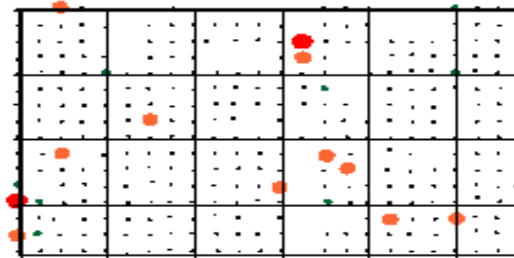
MET Survey Map

MET values presented in a contour map format.



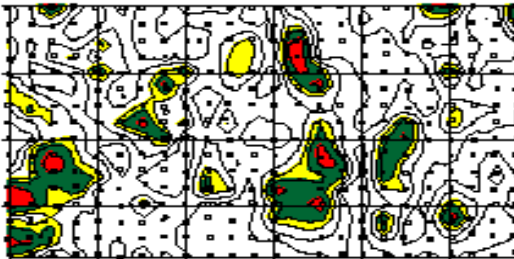
Dot Matrix Map

Highlights sample points of high values.



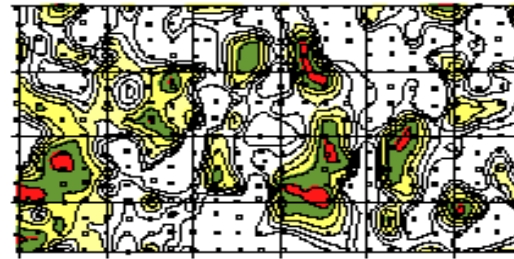
Percent Probability of Success Map

This map correlates MET survey results with drilling results from over 1,000 wells.



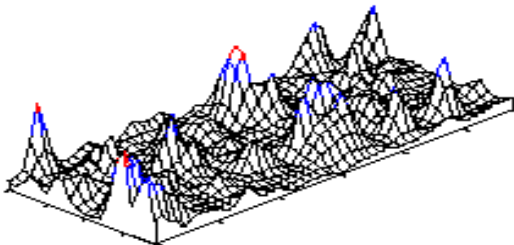
Percentile Rank Map

Contour format for ranking of all sample points in survey area.



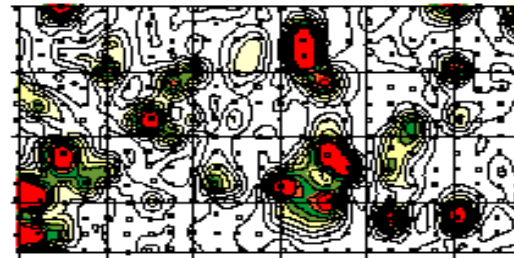
3D Survey Map

MET values presented in 3D format.



Relative Average Map

Indicates strength of deviation from average MET value.





Percent Probability of Drilling Success - %PS

- Exclusive technique developed by EBT.
- %PS is an average of three linear correlations.
- Correlates how MET values, % Rank, and Relative Averages relate to completion rates of pre and post survey wells.
- For exploration locations, EBT recommends a location when % PS is > 45 ; for development step-out locations EBT recommends a location when % PS is > 25 .
- MET data is generally the average of four corners of an LSD.
- Thus, a well is judged based on four samples, 400 meters away.



World Wide Correlation of Oil and Gas Drilling With MET Data

Correlation of Pre and Post Drilling Results with MET Survey Data

		Pre MET Survey Drilling			Post MET Survey Drilling					
Country	Acres MET	Total Dry	Dry Wells	% MET	Total		Completed %		Oil	Industry
		Wells	Rec by MET	Correct	Wells	MET Rec	MET Rec	MET	Industry	%Completed
United States	343,072	285	16	94.4%	13	0	0	na	0	0.0%
Manitoba	420,480	165	15	90.9%	57	11	9	81.8%	17	29.8%
Saskatchewan	2,838,666	909	71	92.2%	629	221	174	78.7%	368	58.5%
Alberta	329,780	253	17	93.3%	14	3	2	66.7%	10	71.4%
BC, Ontario, Yukon,	78,860	5	0	100.0%	0	0	0	0.0%	0	0.0%
Albania	241,280	0	0	0.0%	0	0	0	0.0%	0	0.0%
Argentina	10,335	1	0	100.0%	8	5	4	80.0%	4	50.0%
Brazil offshore	5,162,172	0	0	0.0%	0	0	0	0.0%	0	0.0%
Columbia onshore	904,157	0	0	0.0%	0	0	0	0.0%	0	0.0%
Columbia offshore	3,350,000	0	0	0.0%	0	0	0	0.0%	0	0.0%
Ecuador	457,000	5	0	100.0%	44	19	19	100.0%	4	100.0%
Greenland	1,000	0	0	0.0%	0	0	0	0.0%	0	0.0%
Uruguay	1,927,421	0	0	0.0%	0	0	0	0.0%	0	0.0%
Paraguay	50,000	0	0	0.0%	0	0	0	0.0%	0	0.0%
Peru	1,074,060	69	3	95.7%	9	8	8	100.0%	8	100.0%
Total	17,188,283	1,692	122	92.8%	774	267	216	80.9%	411	53.1%

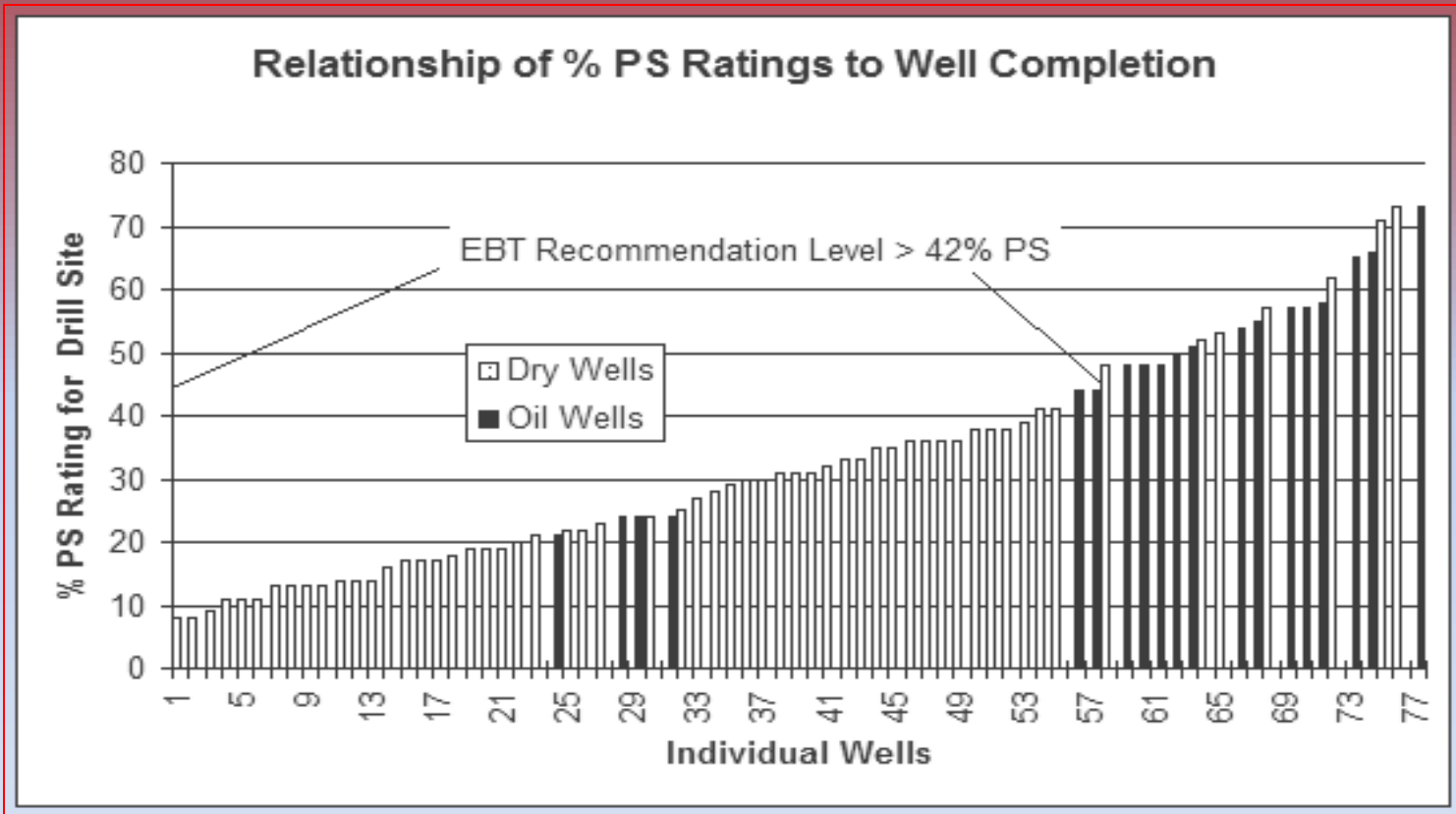


Correlation of Drilling Results with MET Survey Data

- Over the past 14 years, industry has drilled over 1,000 post survey wells in our coverage area in Canada, a recent review in 2011 of 629 wells in the focus area has shown a strong correlation, 78.7%, with MET data and drilling success.
- EBT converts laboratory results into a Percent Probability of Drilling Success (%PS) value based on drilling correlation with our MET data, 2,500 wells and 12 million acres of survey data.
- For 468 exploration wells in Canada, we see a direct correlation of drilling success and increased production with the %PS ratings for those locations. The same is found for development wells.

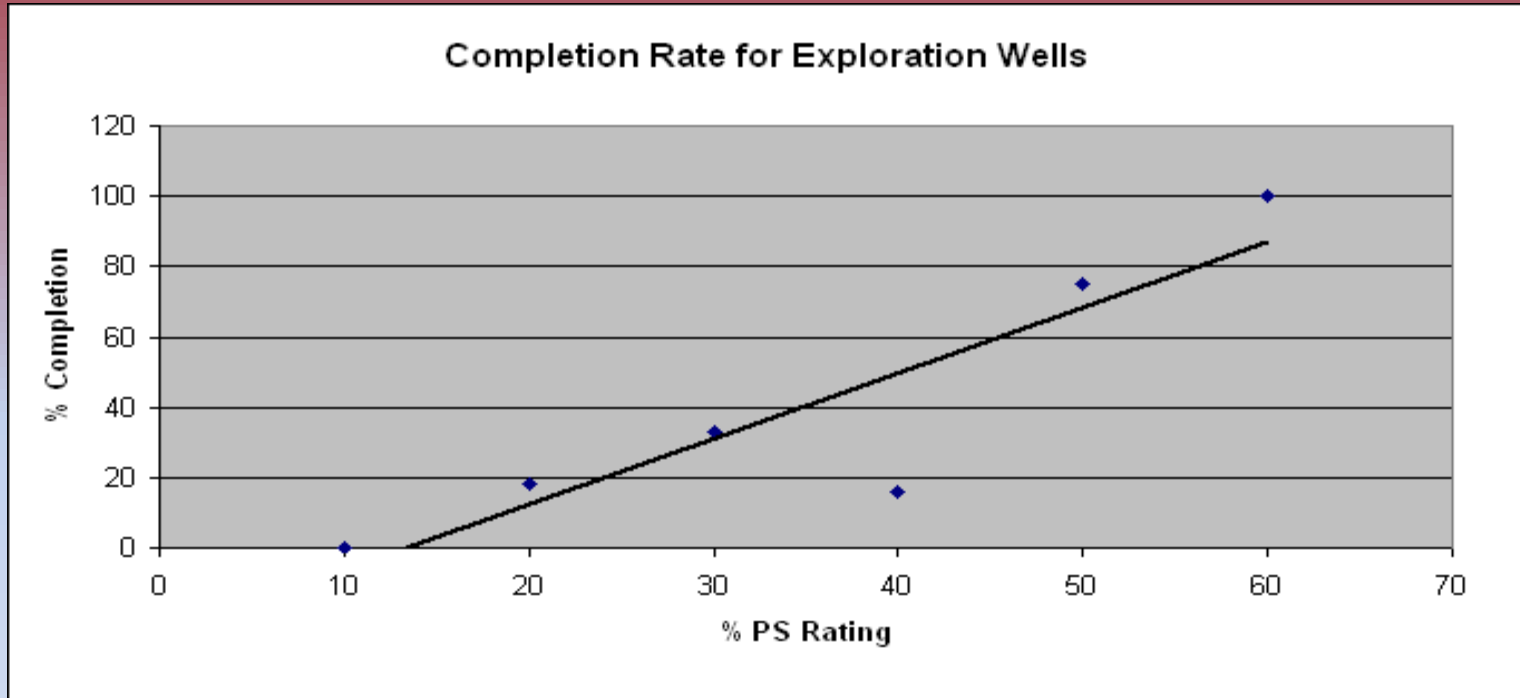


Drilling Results for T1-2 R1-3 W2 Canada





Completion Rate Versus the % PS Rating

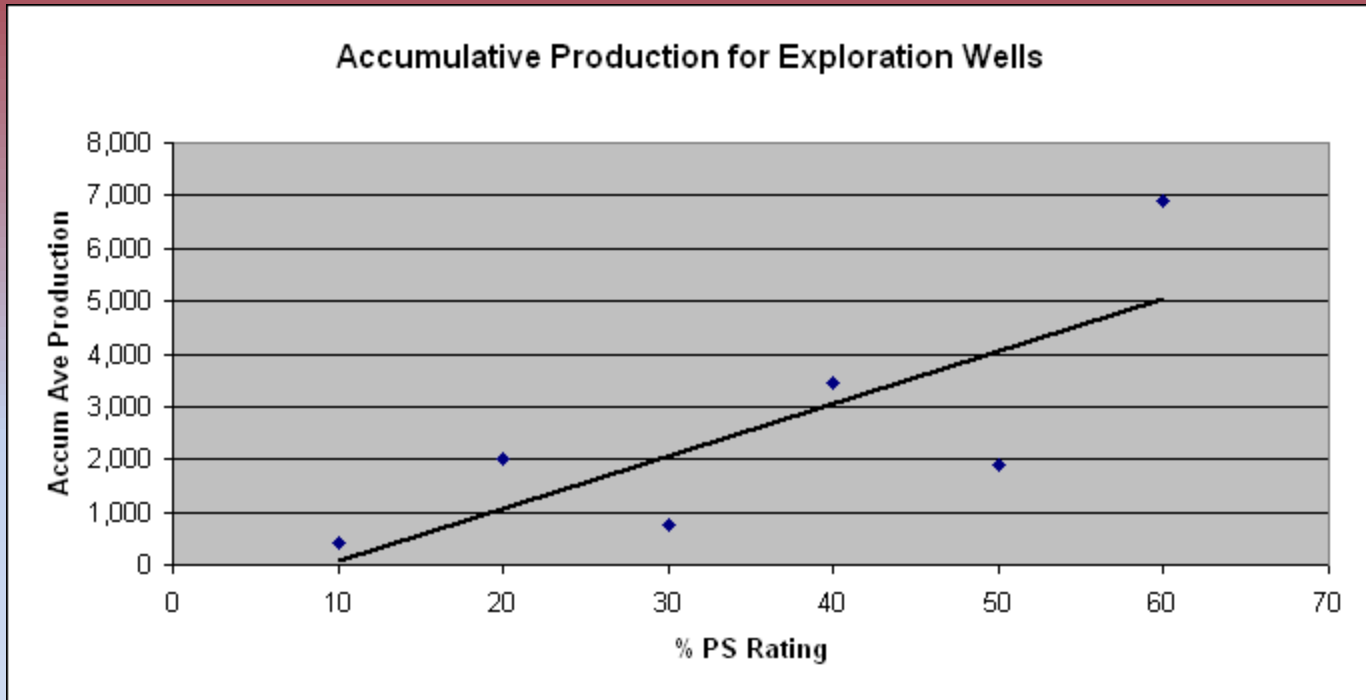


Exploration wells (468 wells) in Canada.

This graph indicates there is a direct correlation of higher %PS ratings and higher % completion rates.



Cumulative Production Versus the %PS Rating



Exploration wells in Canada.

This graph indicates there is a direct correlation between a higher %PS rating and a higher accumulative production (cubic meters of oil).



Summary of Drilling Correlation with MET Survey Data

Completion Rates			
	Exploration Wells	Development Wells	Total Wells
MET Recommended wells	70/95 = 73.6%	104/126 = 82.5%	174/221 = 78.7%
Non MET recommended	172/373 = 46.1%	22/35 = 62.8%	194/408 = 47.5%
Overall	242/468 = 51.7%	120/161 = 78%	368/629 = 58.5%
MET Improvement	59% greater	31% greater	65% greater

Average Cumulative Production		
	Exploration Wells	Development Wells
MET Recommended	28,480 BO	36,571 BO
Non MET Recommended	16,950 BO	21,366 BO
MET Recommended Versus Non Recommended	68% greater	71% greater



Applications of MET

- Oil and gas exploration using MET:
 - On-Shore
 - Off-Shore
- Hydrocarbon prospect / play confirmation.
- Oil and gas field assessment for development.
- Uranium exploration.



- **MET Survey Example for Exploration**

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Exploration Example Maps

- The following maps demonstrate how a MET survey can identify exploration well locations.
- The Canadian township example had limited drilling at the time of the survey (1997).
- Please note that industry drilled these locations **WITHOUT** knowledge or use of MET data.
- Conversely, MET recommendations were based **ONLY** on MET data.
- In principle, MET data should be used in conjunction with other available survey data such as seismic, etc.



Exploration Example Maps

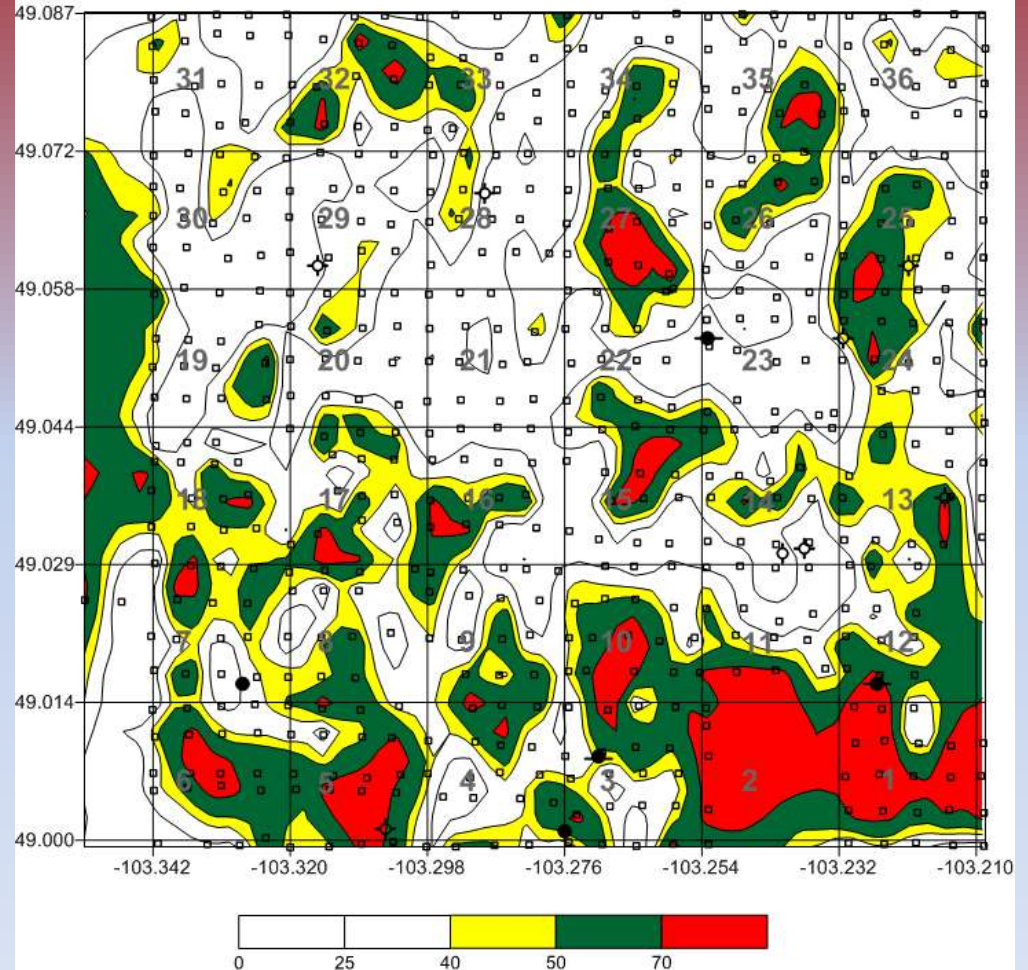
- The following three maps show different views of the Canadian township, T1-R10-W2.
- The First map is our original survey map produced in 1997. It shows our MET survey data and pre-survey wells.
- The Second map shows our MET data and up-to-date drilling results as of 2012.
- The Third map shows our MET data and up-to-date drilling with the production bubbled to scale. The map is color coded to show pre-drilling, MET recommended drilling and Non-MET recommended drilling.



Field Location: T1 R10 W2
Sample Date: 1997



% Probability of Drilling Success Map



Original %PS Survey Map

This map shows the results from the MET survey completed in 1997.

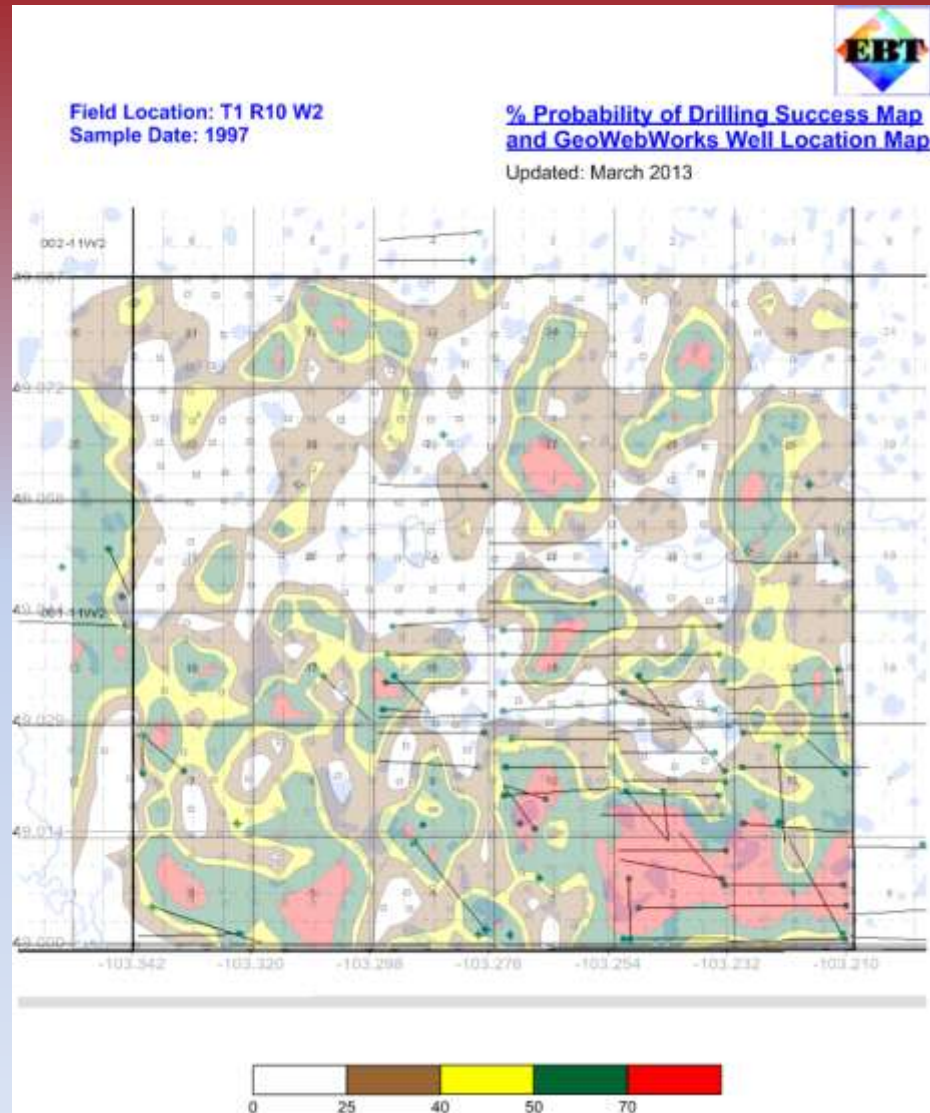
Areas in red have the highest MET values, and are considered areas of interest.



Survey Area with Updated Wells

This map shows the survey area with updated drilling (2012).

Notice the drilling in the southeast corner is also where we have the highest %PS values.

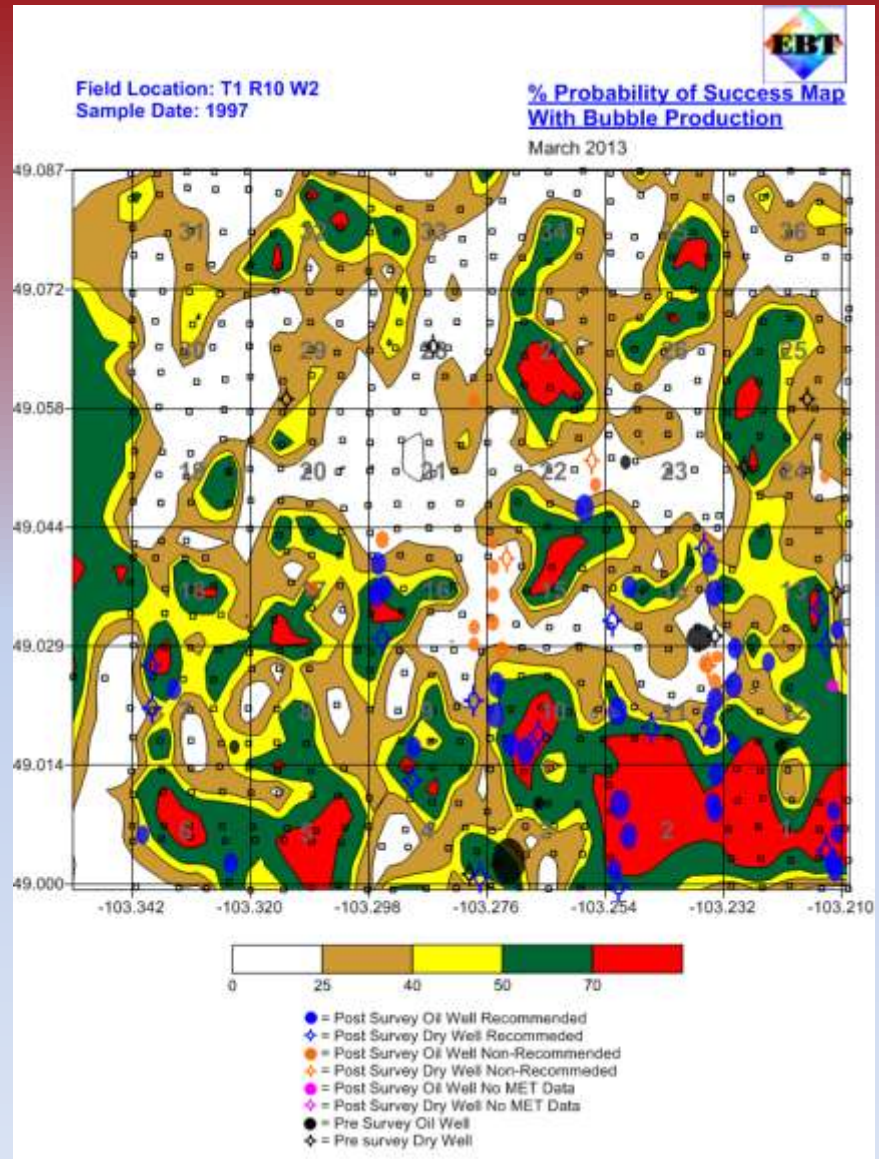




Survey Area with Production Bubble

This map shows the survey area with production bubbled to scale.

This map is color coded to represent recommended and non-recommended locations. Blue wells are recommended.





Summary of T1 R10 W2 Township Survey

- The areas of highest MET Values were in sections 1-3 and 10-12. These sections produced 65% of the oil from the township.
- IOP of **MET recommended locations was 200 BOPD** while IOP from **non recommended locations was 131 BOPD (52% greater)**.
- Of the top 10 producing wells, 9 were at MET recommended locations.
- 8 of the 9 wells with IOP greater than 200 BOPD were MET recommended locations while only 2 of 6 wells with less than IOP of 100 BOPD were MET recommended.



- **MET Survey Example
for Field Development**

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Development Example Maps

- The following three maps show different views of the Canadian township T11-R6-W2.
- The first map is our original survey map conducted in 1995. It shows our MET survey data and pre-survey wells.
- The second map shows our MET survey data and up-to-date drilling, as of 2012.
- The third map shows our MET survey data and up-to-date drilling with the production bubbled to scale. The map is color coded to show pre-drilling, MET recommended drilling and Non-MET recommended drilling.



% Probability of Success

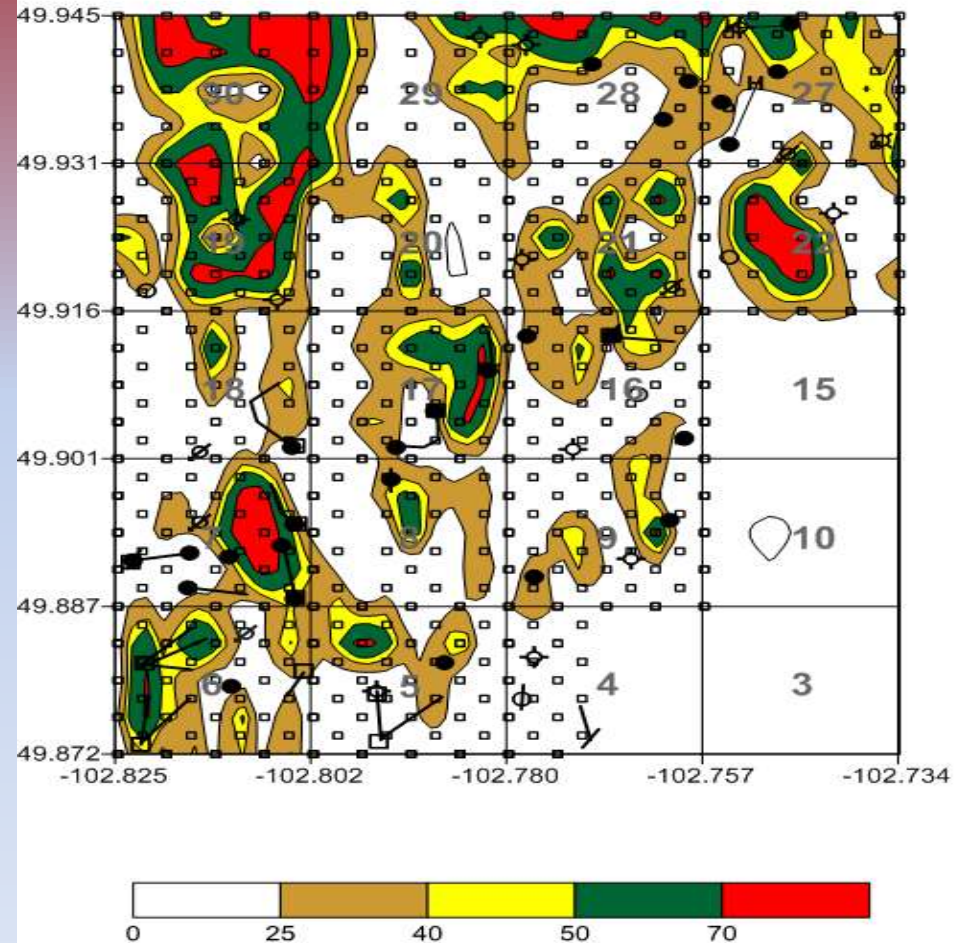
Survey: Flinton
Field Location: T11 R6 W2
Sample Date: 1995

Original %PS Survey Map

This map shows the results from the MET survey completed in 1995.

Areas in red have the highest MET values, and are considered areas of interest.

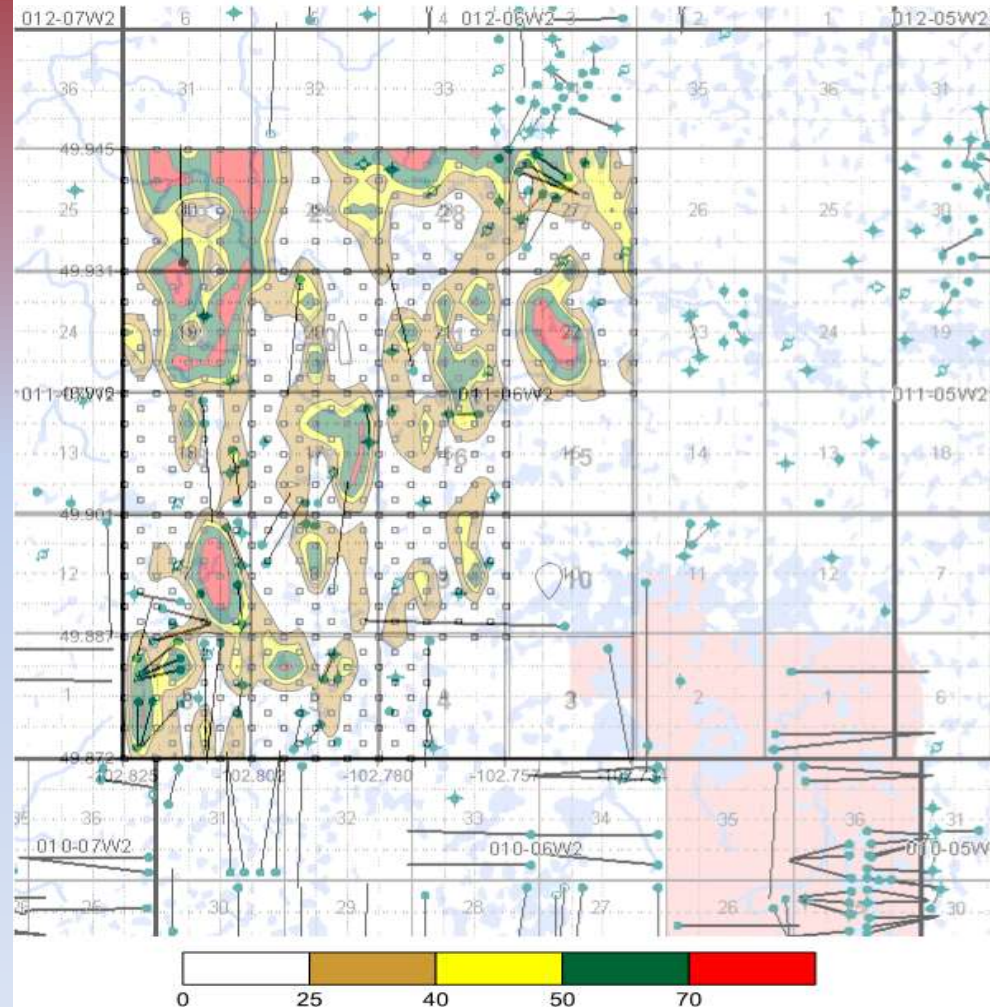
There was significant drilling in the coverage area at time of survey.





Survey: Flinton
Field Location: T11 R6 W2
Sample Date: 1995

**% Probability of Drilling Success
With GeoWebWorks Well Location Map**
Updated: March 2013



Survey Area with Updated Wells

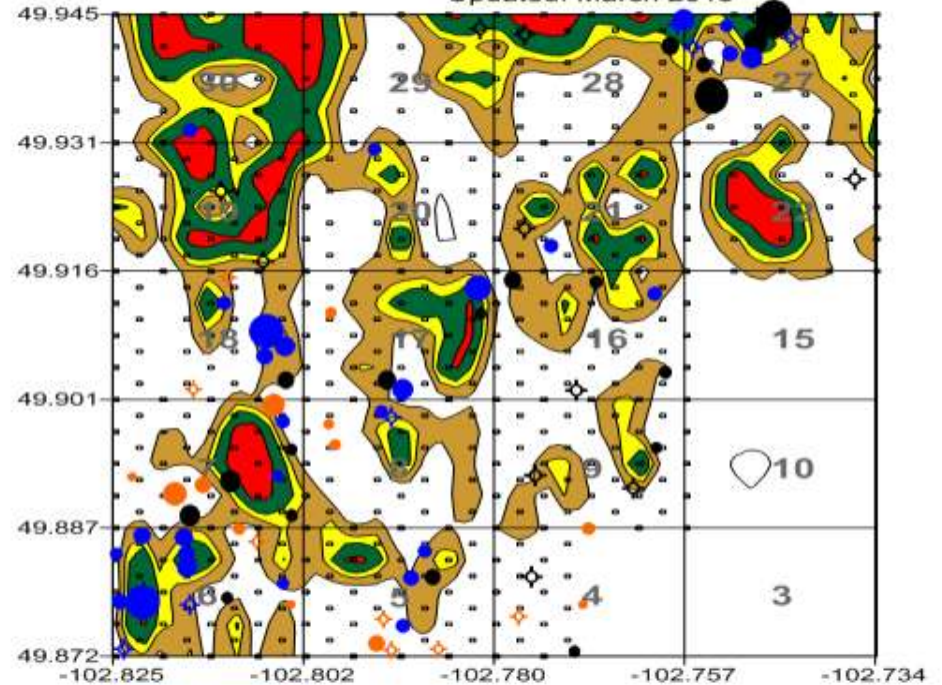
This map shows the survey area with updated drilling (2012).

Notice all the drilling in the survey area. In this developed field there is still a strong MET signal detected in the coverage area.



Survey: Flinton
Field Location: T11 R6 W2
Sample Date: 1995

% Probability of Drilling Success
With Updated Drilling and
Bubble Production
Updated: March 2013



Survey Area with Production Bubble

This map shows the survey area with production bubbled to scale.

This map is color coded to represent recommended and non-recommended locations. Blue wells are recommended.



- **MET Survey in Ecuador**

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Introduction

- This presentation is comparing 14 years of drilling data in Ecuador's Block 15 with EBT's MET survey data that was generated in 1999.
- PetroAmazonas (PAM) now owns and operates Block 15. EBT completed 7 subsequent surveys for PAM in Ecuador.
- PAM after reviewing EBT's Microbial Exploration Technology (MET) survey data from 1999 sent well data on 48 wells that were drilled in the MET coverage area.



Overall Results of Block 15

- There are 48 wells reviewed.
- Five of these wells were drilled pre-survey (1999) and all five were dry wells in non recommended locations.
- All 43 wells that were drilled post-survey were successfully completed and brought on production.
- EBT would have recommended 18 of these wells. The 18 recommended wells have an average cumulative production of **1,470,000 BO**.
- 25 wells were in non-recommended locations and have an average cumulative production of **213,000 BO**.

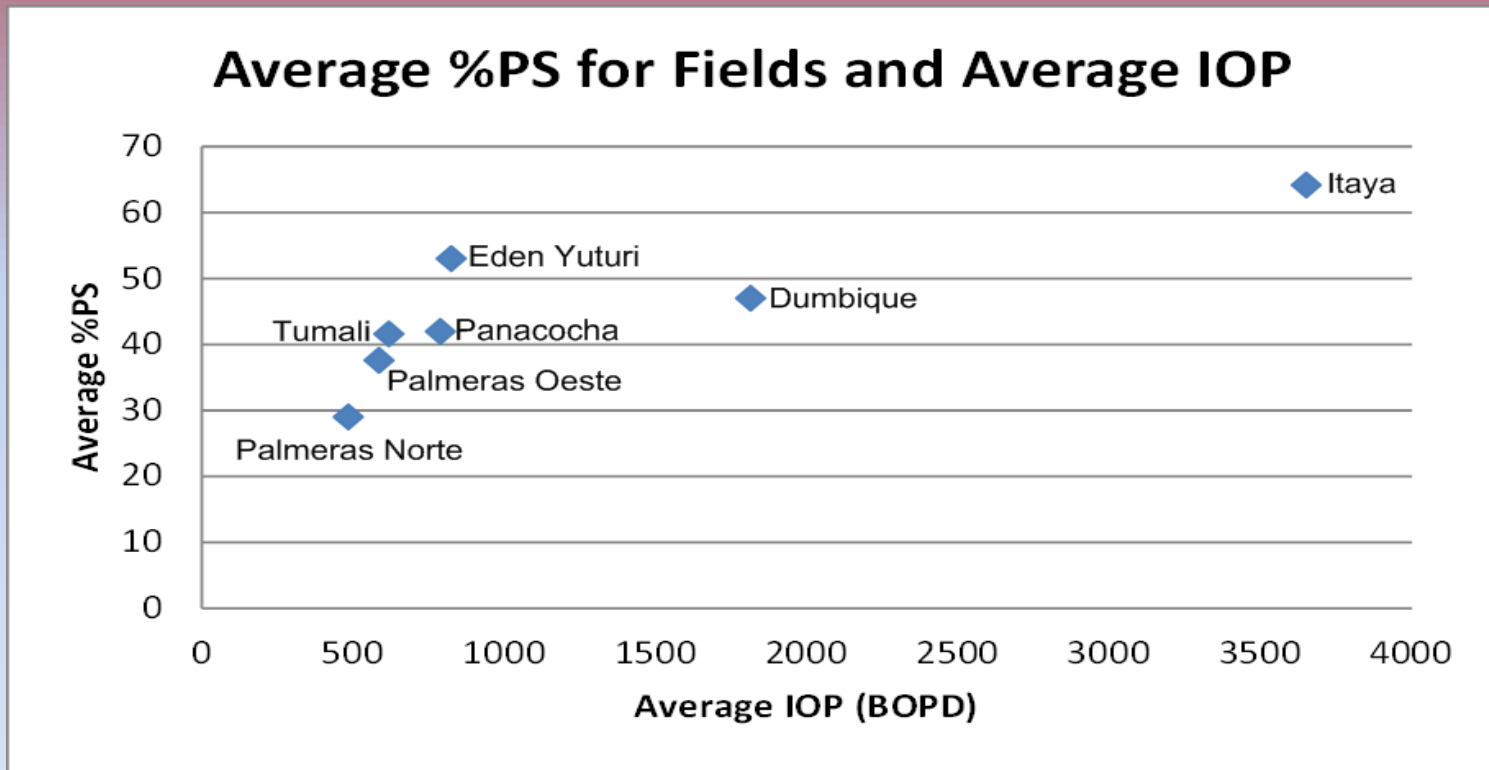


Recommended Locations Vs. Non Recommended Locations

- The Itaya field was the best field reviewed, which has an average %PS value of 64% and has an average IOP of 3,650 BOPD.
- The second best field is the Dumbique field which has an average %PS value of 47% and an average IOP of 1,840 BOPD.
- The least productive field is the Palmeras Norte field, which has an average %PS value of 29% and an average IOP of 486 BOPD.



Ranking of Fields by % PS Values





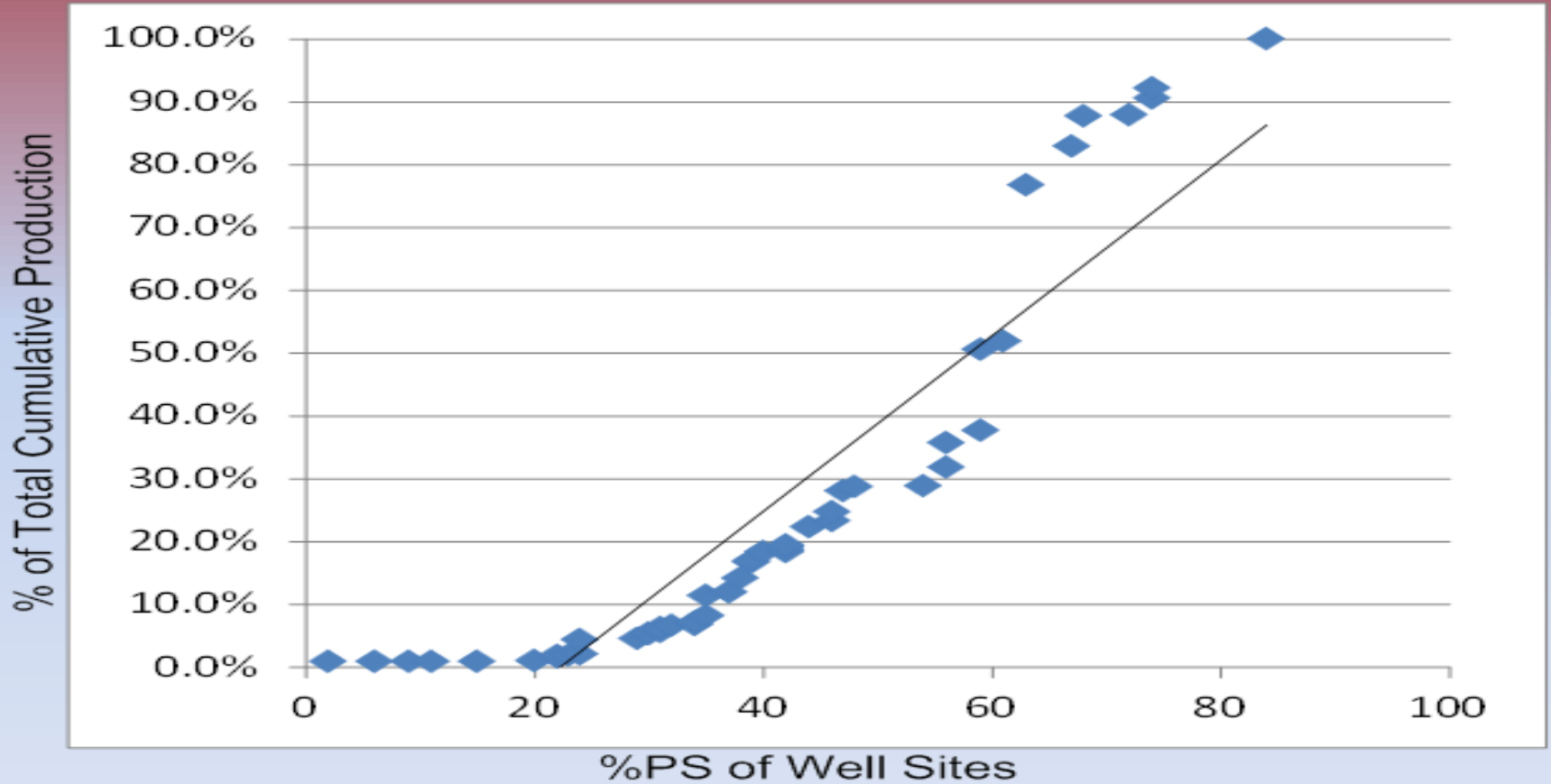
Total Production and Recommendations

- Total cumulative oil production of the reviewed wells is **32.9 million BO**, to date.
- The 30 non recommended wells accounted for 19.4% of the total production, or **6.4 million BO**.
- That means that the 18 recommended post survey wells accounted for 80.6% of the total production, or **26.5 million BO**.



Total Production and Recommendations

Cumulative Production of Block 15 and %PS





Economics of MET Ecuador Survey

- Current pricing is \$275,000 for the Block 15 MET survey, 4% of one well drilling costs.
- Individual wells costs \$6-7 million to drilling.
- Total drilling program was \$312 million.
- Recommended well sites (18) at \$117 million have produced 26.5 million BO. **Cost/BO produced is \$4.42/BO.**
- Non recommended well sites(30) at \$195 million have produced 6.4 million BO. **Cost/BO is \$30.46/BO, 6.9 times higher.**

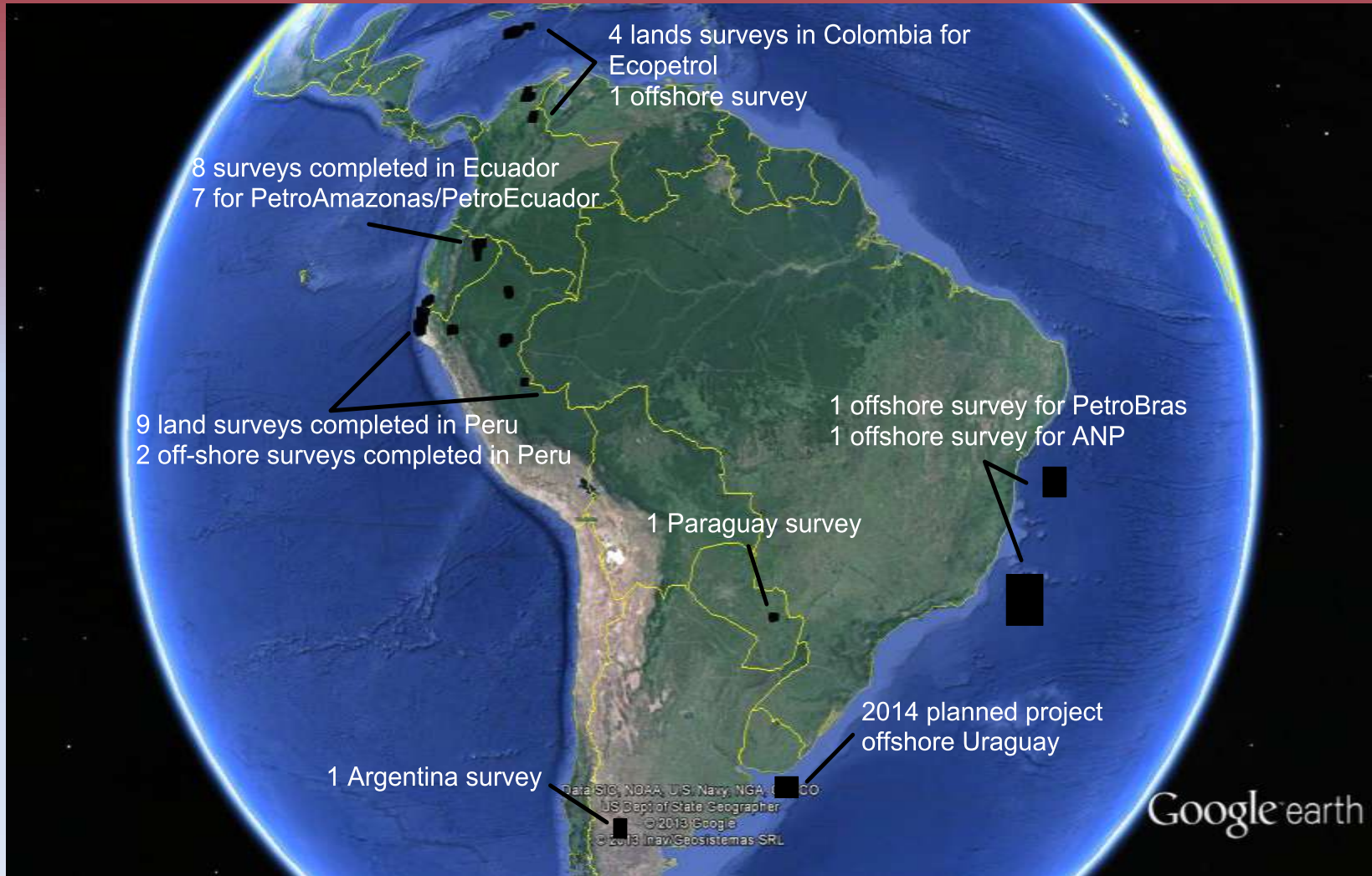


- **MET Surveys for Off-Shore Exploration**

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MET Survey Projects in S. America



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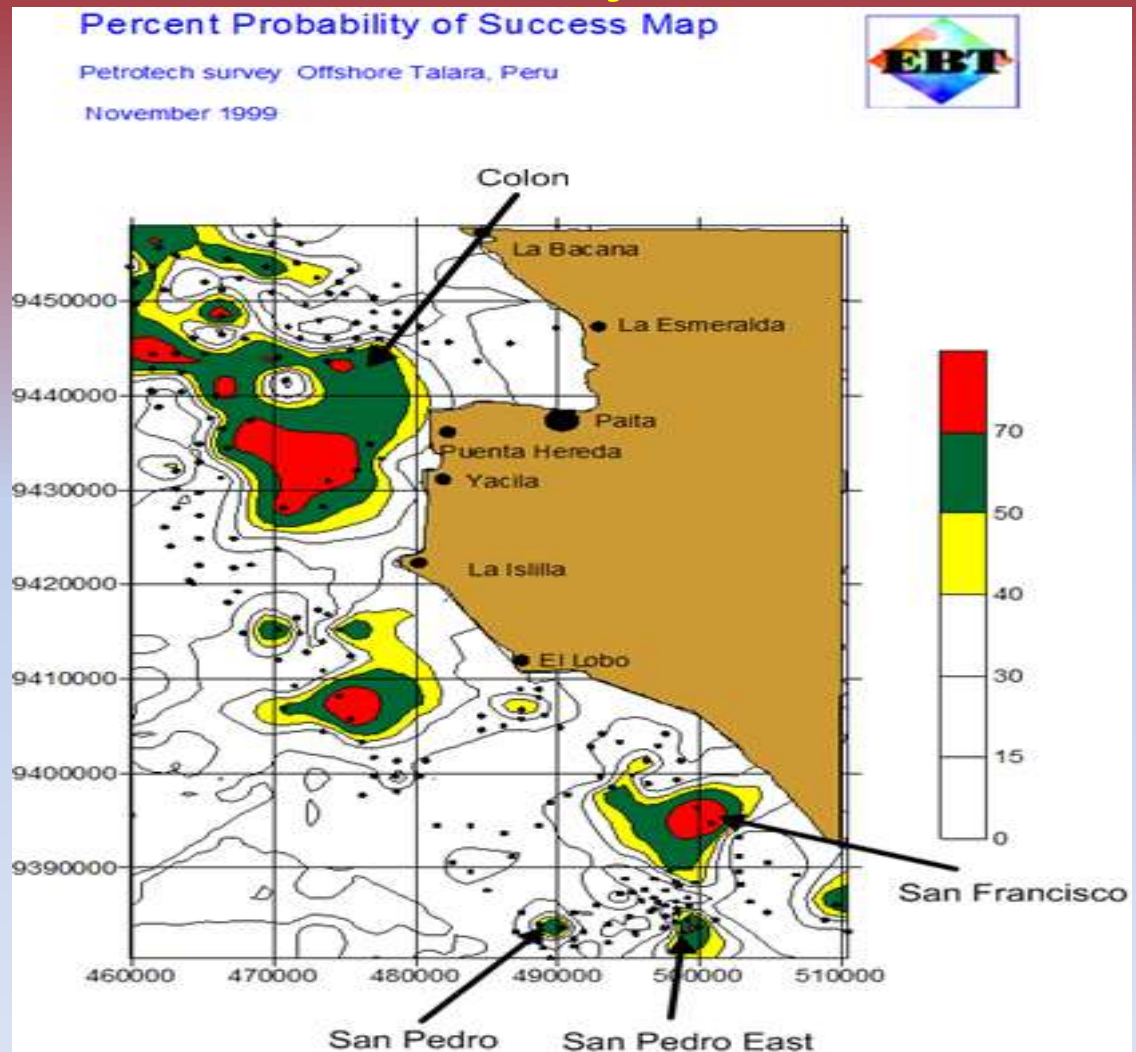


Offshore MET Survey Locations

- Offshore Peru – 1999, for Petrotech (now Savia)
- Offshore Brazil – 1999, for Petrobras
- Offshore Peru – 2004, for Petrotech (now Savia)
- Offshore Colombia – 2009, for Ecopetrol
- Offshore Brazil – 2013-2014, TDI Brooks and ANP
- Offshore Uruguay – 2014, TDI Brooks



Offshore Peru – 1999, Talara



The MET data supported the drilling from all 4 successful platforms located on this map.

The San Pedro platform spudded one well that had an IOP over 5,000 BOPD



- **EBTs' Drilling Programs**

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Canadian Drilling Program

- Over past 14 years, industry has drilled 232 MET recommended locations and completed 79% of these wells (183).
- Approximately \$1 billion of drilling costs have been spent by industry in drilling in our MET coverage areas which has helped confirm our MET survey data.
- EBT MET database of 3.4 million acres in Canada contains an additional 150 plus locations.
- These locations are for vertical wells with an ROI greater than 4, and initial payback within first year of production.
- EBT is seeking investors for this program, at \$1 million per well for 10 to 150 well program.



EBT Investment in Second Party Drilling Programs

- EBT reviews investment opportunities in drilling programs marketed by other companies.
- If the economics and other details look excellent, EBT conducts a MET survey over prospect site.
- If MET data supports well location then we ask to invest in drilling prospect. If MET data is not supportive of site, we will not invest.
- **Results to date:**
Has reviewed 20 prospects, conducted three MET surveys, and has not participated in any program.



General Conclusions

- **Experience** – Over 17 million acres of MET surveys around the world both on shore and offshore in 11 countries.
- **Accuracy** – MET recommended drilling results of 81% completion and were 65% greater than non-recommended locations.
- **Production** - MET supported wells have produced 71%-350% more oil than non recommended well locations.
- **Timely Results** – MET surveys typically have a turnaround time of two weeks once the soils have been received in our lab.



CHE- Marketing

Let us know how we can best assist you

- Phone: 1-877-778-8279
- Email: info@christohoustonenergy.com
- Website: www.christohoustonenergy.com
- Thank you for your time.