



# Mexico's Experience Reducing Barriers and Developing New CMM Recovery and Use Projects



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Unidad MIMOSA.

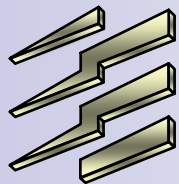
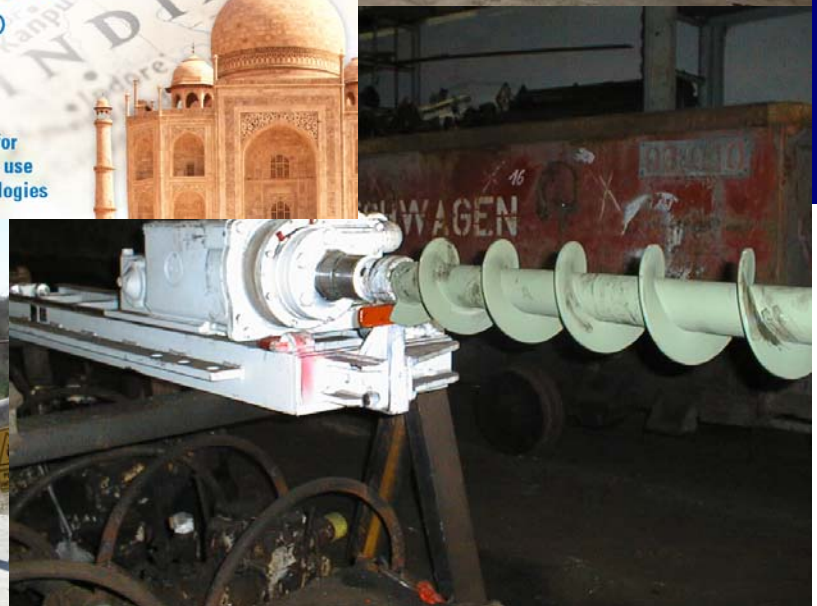
 **Coal Sector**

 **Methane to Markets**  
Partnership Expo  
New Delhi, India  
2-5 March 2010

The premier international forum for promoting methane recovery and use project opportunities and technologies



Mario Santillán – Minosa

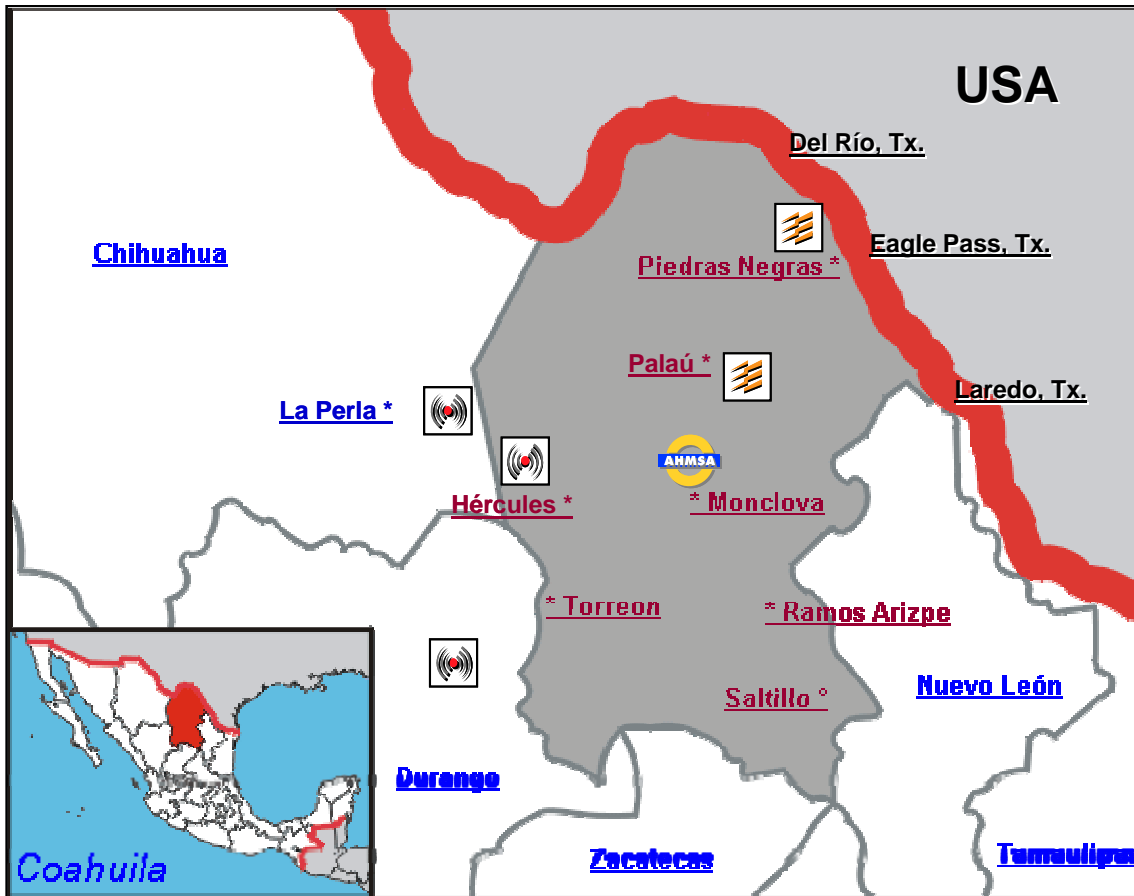




# Operation Sites



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### Distances in Miles:

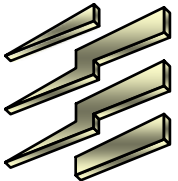
Monclova – Eagle Pass, TX: 150

Monclova – Laredo, TX: 160

Monclova – Palau: 60

Monclova – Hércules: 150

Nava – Eagle Pass: 20



AHMSA

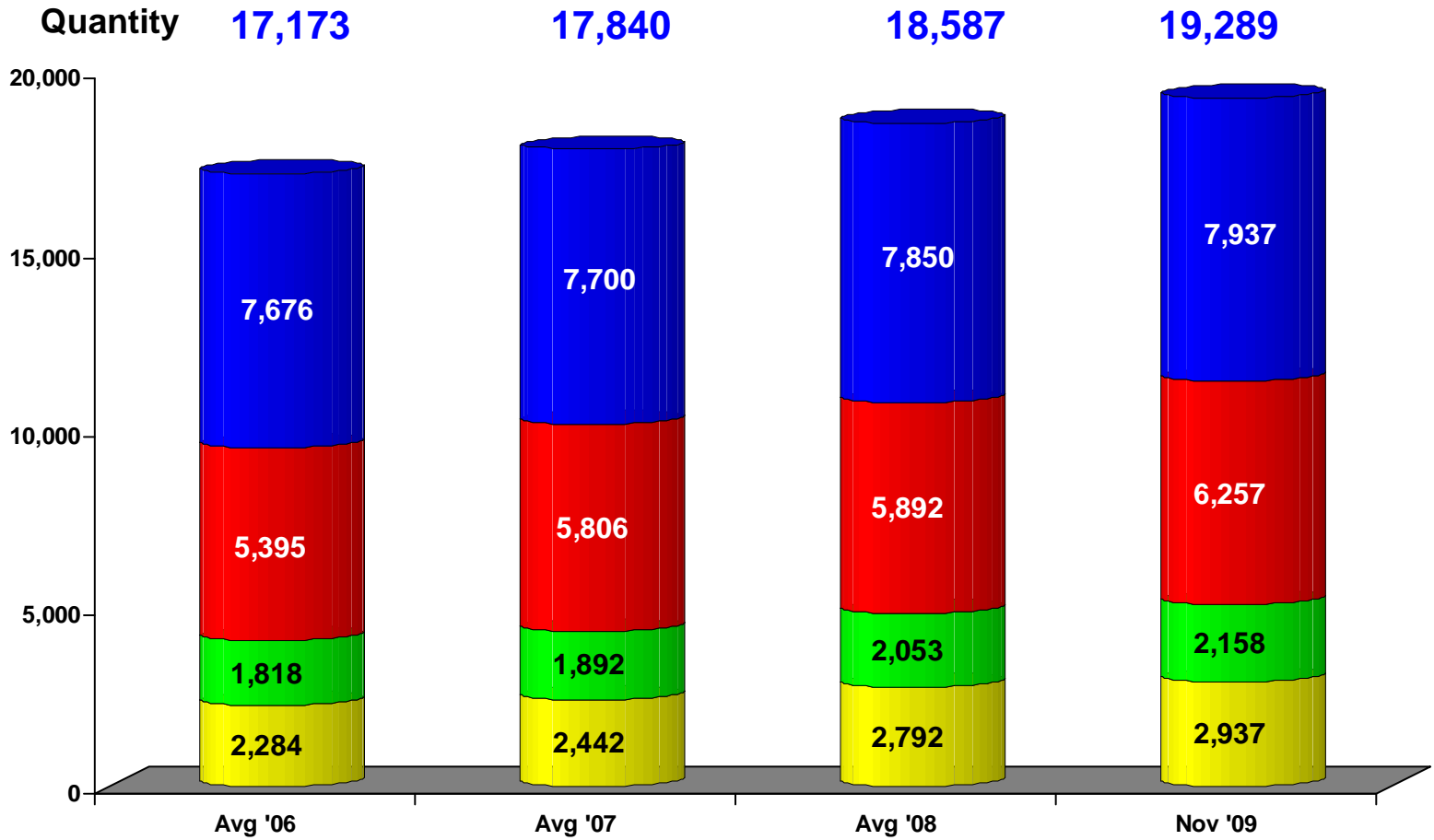


Coal Mines

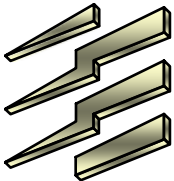


Iron ore Mines

# Work Force



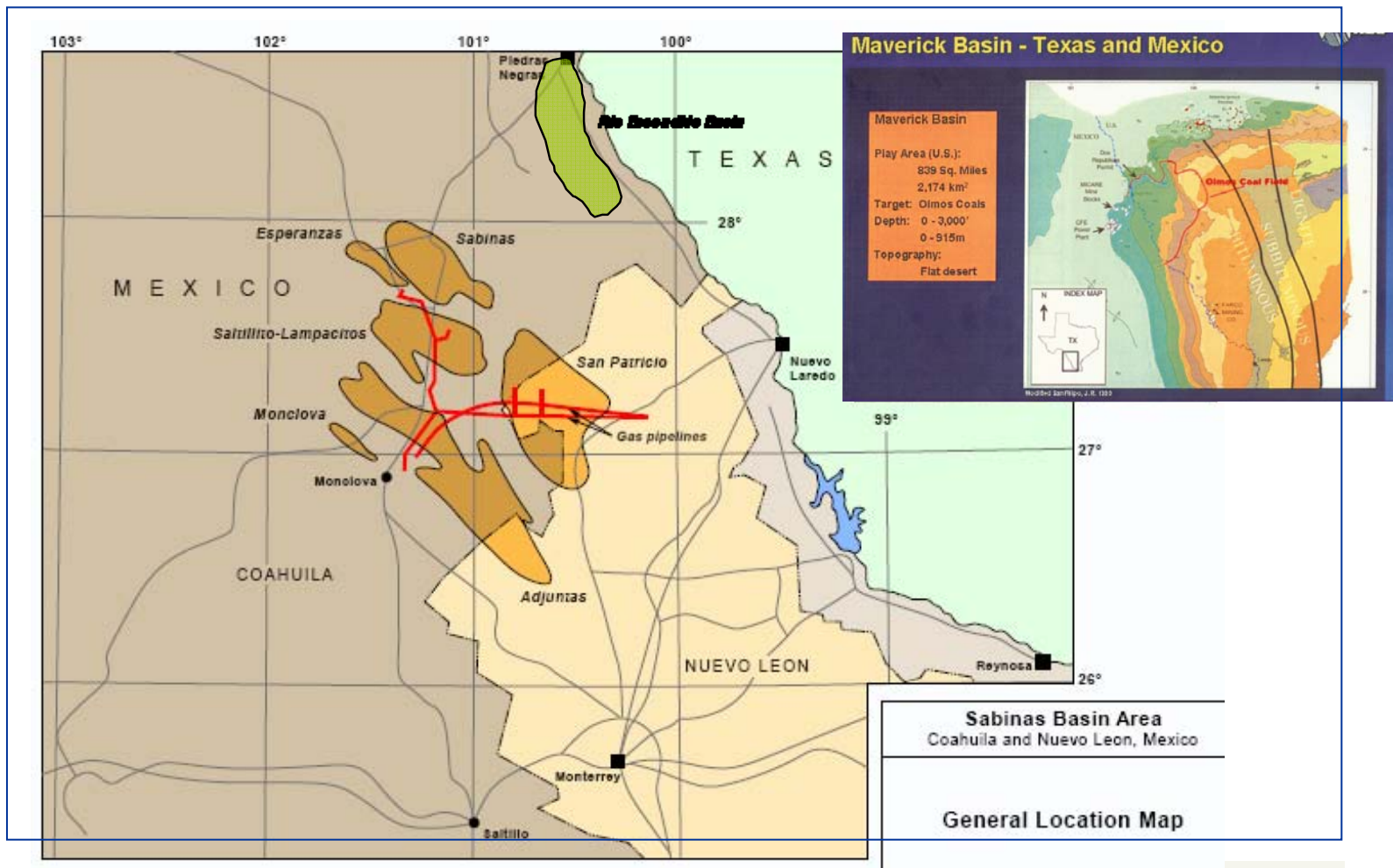
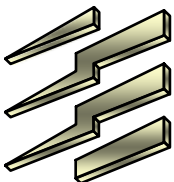
■ Services     
 ■ Iron Area     
 ■ Coal Area     
 ■ AHMSA



# Coal Deposits

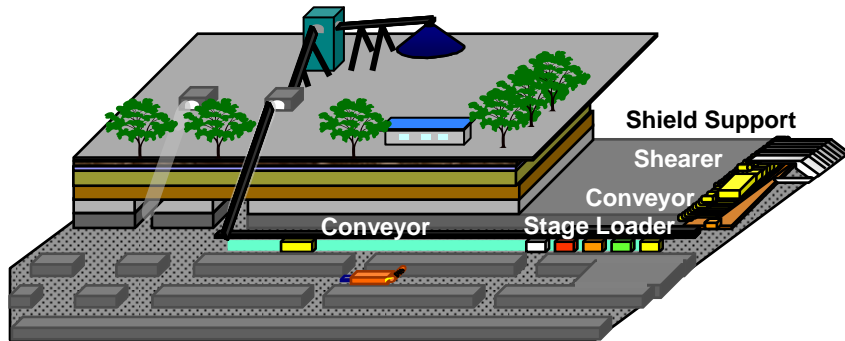


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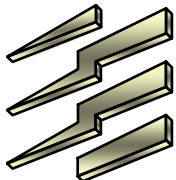


# Mining Method



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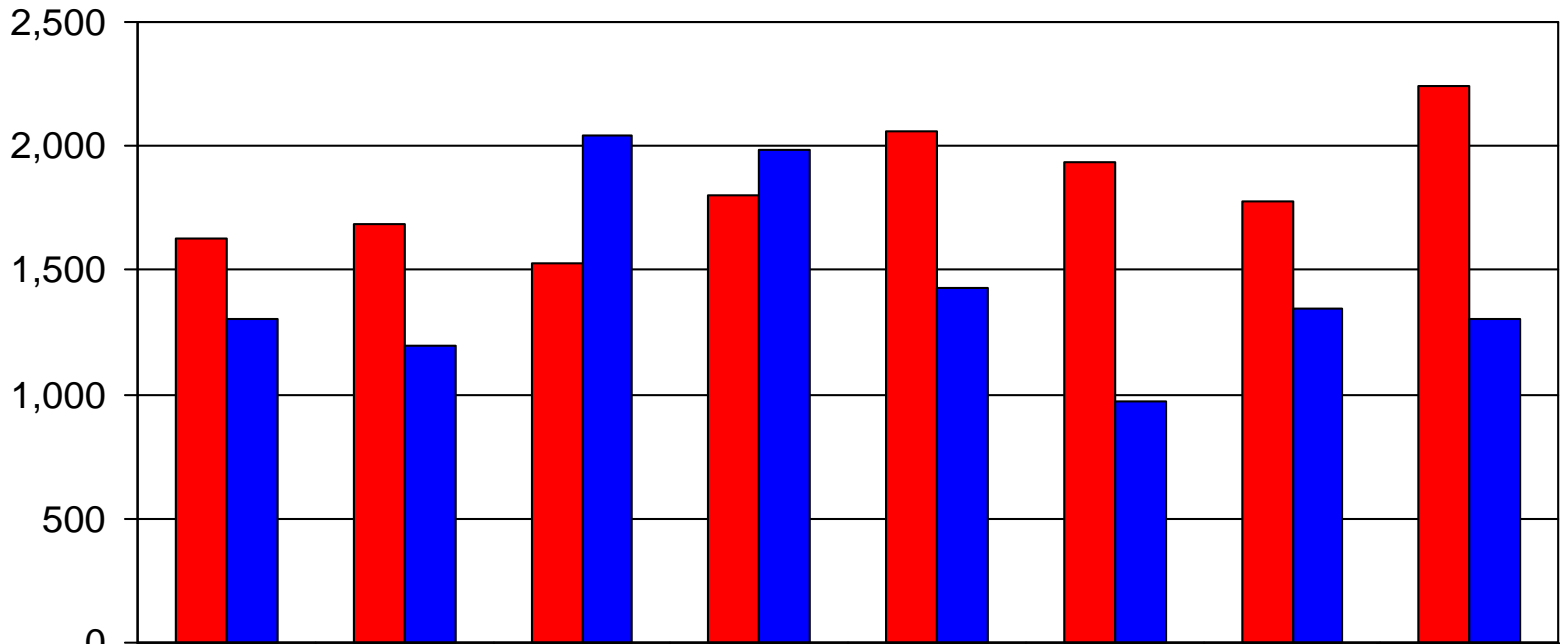
Concept	Units	MIMOSA
Mine System		Long Wall
LW: Long	m	800-2800
LW: Wide	m	200-300
Depth of coal	m	150-360
Gas	m <sup>3</sup> /ton	5-18
Coal seam thickness	m	1.4-3.5
Development System		Road Header
Type of Coal		Bituminous Medium Volatile Coking



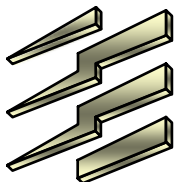


# Coal Sales

**BUDGET**



	2003	2004	2005	2006	2007	2008	2009	2010
<b>MET</b>	1,626	1,683	1,526	1,803	2,060	1,937	1,779	2,244
<b>THERMIC</b>	1,305	1,193	2,047	1,986	1,430	975	1,343	1,307

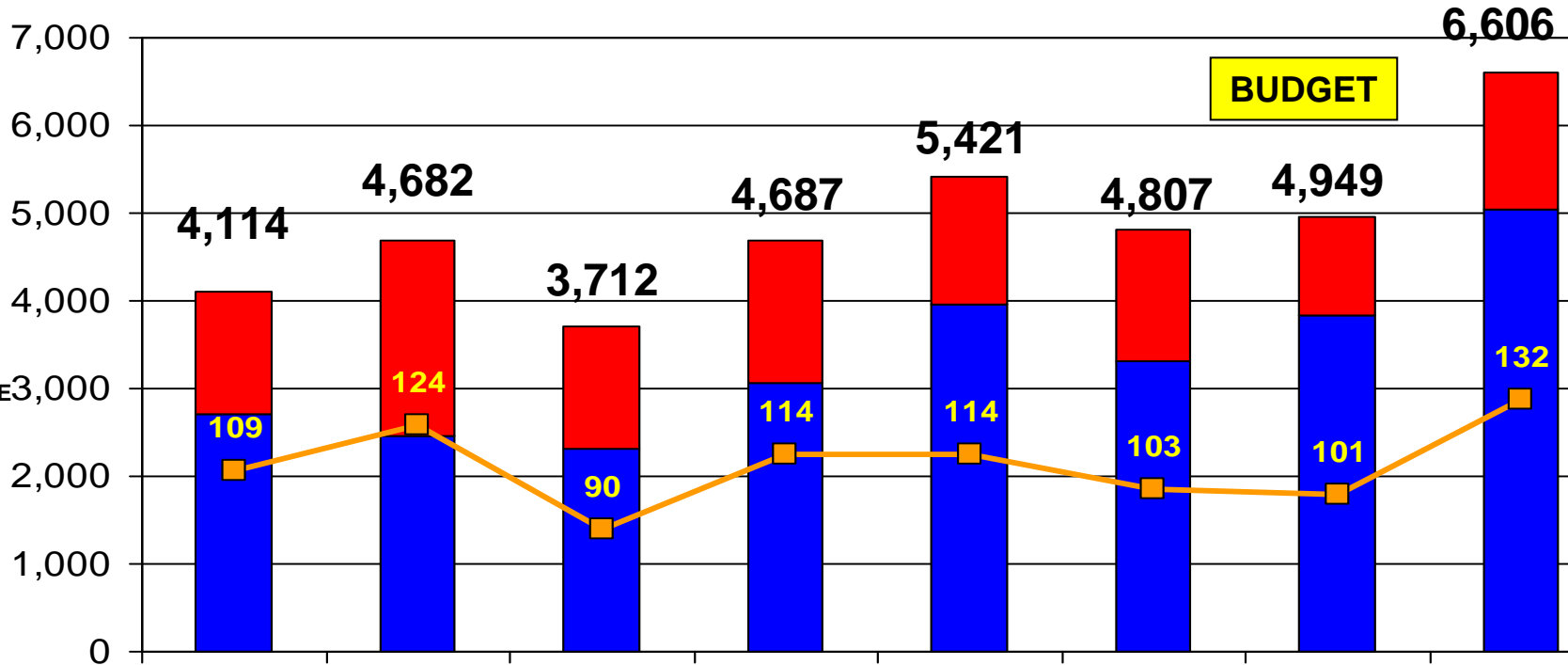


# ROM Coal Production

Monthly Metric Tons per Man



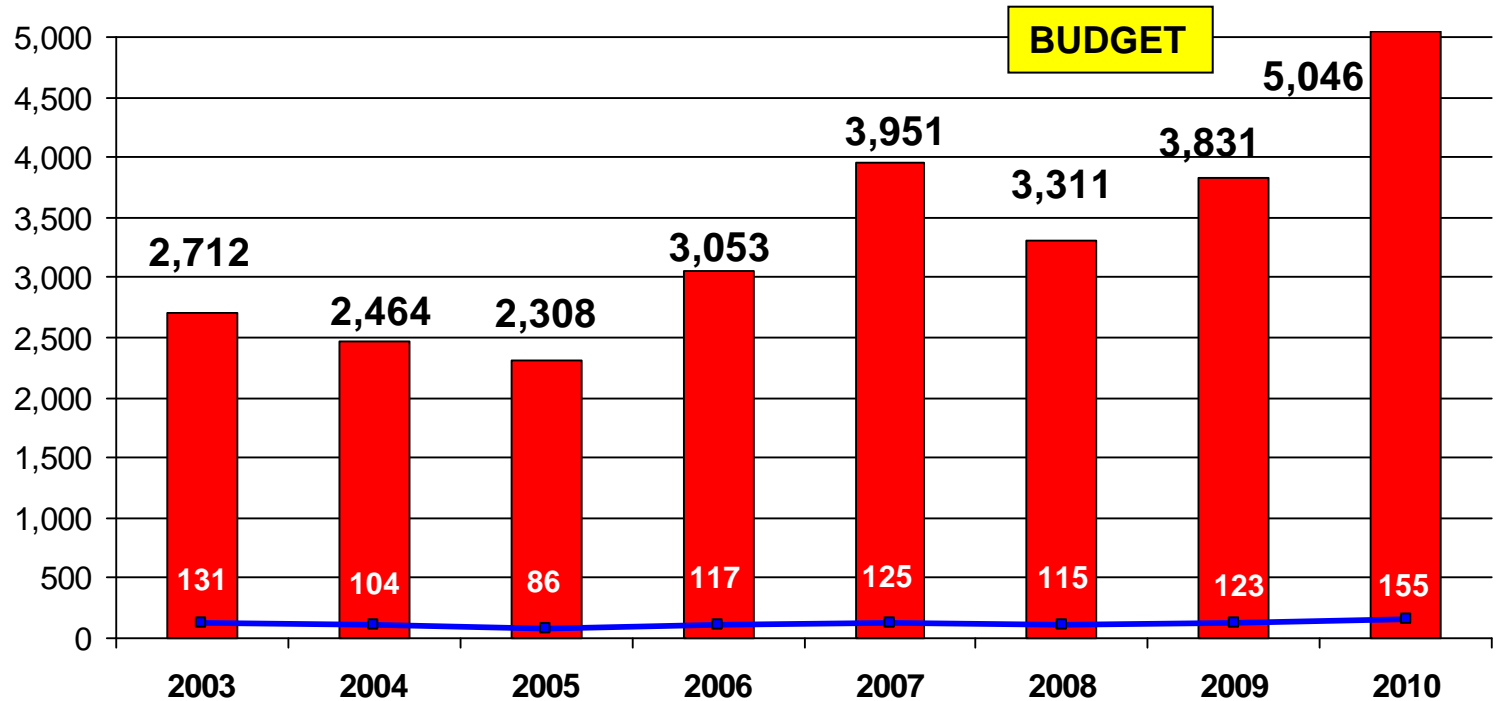
■ Mines  
■ O. Pit  
**Total**



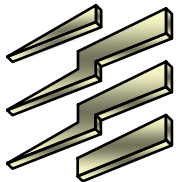
	2003	2004	2005	2006	2007	2008	2009	2010
Mines	2,712	2,464	2,308	3,053	3,951	3,311	3,831	5,046
O. Pit	1,402	2,217	1,404	1,634	1,470	1,496	1,118	1,559
<b>Total</b>	<b>4,114</b>	<b>4,682</b>	<b>3,712</b>	<b>4,687</b>	<b>5,421</b>	<b>4,807</b>	<b>4,949</b>	<b>6,606</b>

# Underground Mines Production

Monthly Metric Tons per Man



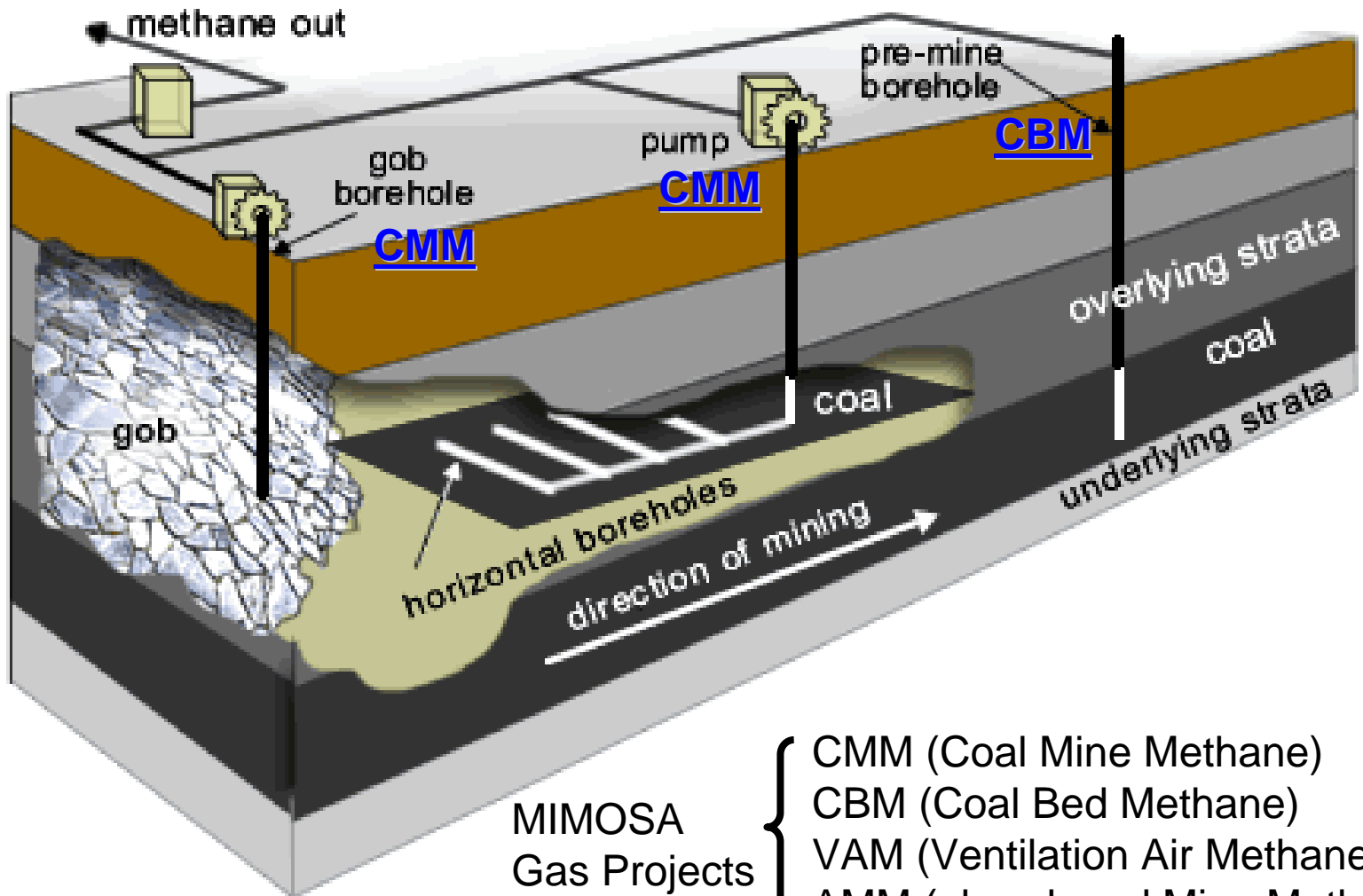
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Mine II	355	-	-	-	-	-	-	-
Mine III	1,038	650	666	376	638	281	-	-
Mine Esm	1,002	740	510	1,399	1,527	1,203	1,009	1,348
Mine VI	290	911	778	981	659	711	613	1,041
Mine VII	27	163	354	297	1,127	1,117	2,209	2,657
<b>Total</b>	<b>2,712</b>	<b>2,464</b>	<b>2,308</b>	<b>3,053</b>	<b>3,951</b>	<b>3,311</b>	<b>3,831</b>	<b>5,046</b>



# Methane Gas Drainage Systems

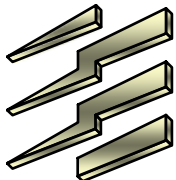


MIMOSA  
Gas Projects

- CMM (Coal Mine Methane)
- CBM (Coal Bed Methane)
- VAM (Ventilation Air Methane)
- AMM (abandoned Mine Methane)



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# Sources of Methane Gas



Mina Pasta de Conchos

Mina 3

Mina 2

Mina 4

Mina 1

Mina Esmeralda

Mina 5

Mina 7

CMM Horizontal Drilling  
Quality (%) = 78%  
Flow (lps) = 258

CMM Horizontal Drilling  
Quality (%) = 80%  
Flow (lps) = 385

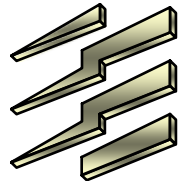
CMM Horizontal Drilling  
Quality (%) = 78%  
Flow (lps) = 258

CMM Horizontal Drilling  
Quality (%) = 80%  
Flow (lps) = 325

VAM Vent Shaft  
Air (m<sup>3</sup>/sec) = 262.5  
Quality (%) = 0.60  
Flow (lps) = 1,575

VAM Vent Shaft  
Air (m<sup>3</sup>/sec) = 138.15  
Quality (%) = 0.83  
Flow (lps) = 1,141

VAM Vent Shaft  
Air (m<sup>3</sup>/sec) = 169.55  
Quality (%) = 1.13  
Flow (lps) = 1,923



N 3.082.000

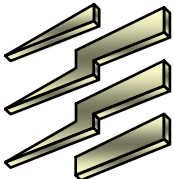
# Gas Quality

## Chromatograph analysis

Component	Mol%
Nitrogen	0.059
Carbon Dioxide	0.500
<b>Methane</b>	<b>97.967</b>
Ethane	0.699
Propane	0.349
Isobutane	0.125
n- Butane	0.114
Isopentane	0.056
n- Pentane	0.033
Hexanes Plus	0.098
<b>Totals</b>	<b>100.000</b>

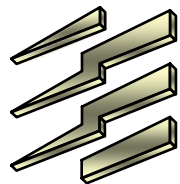
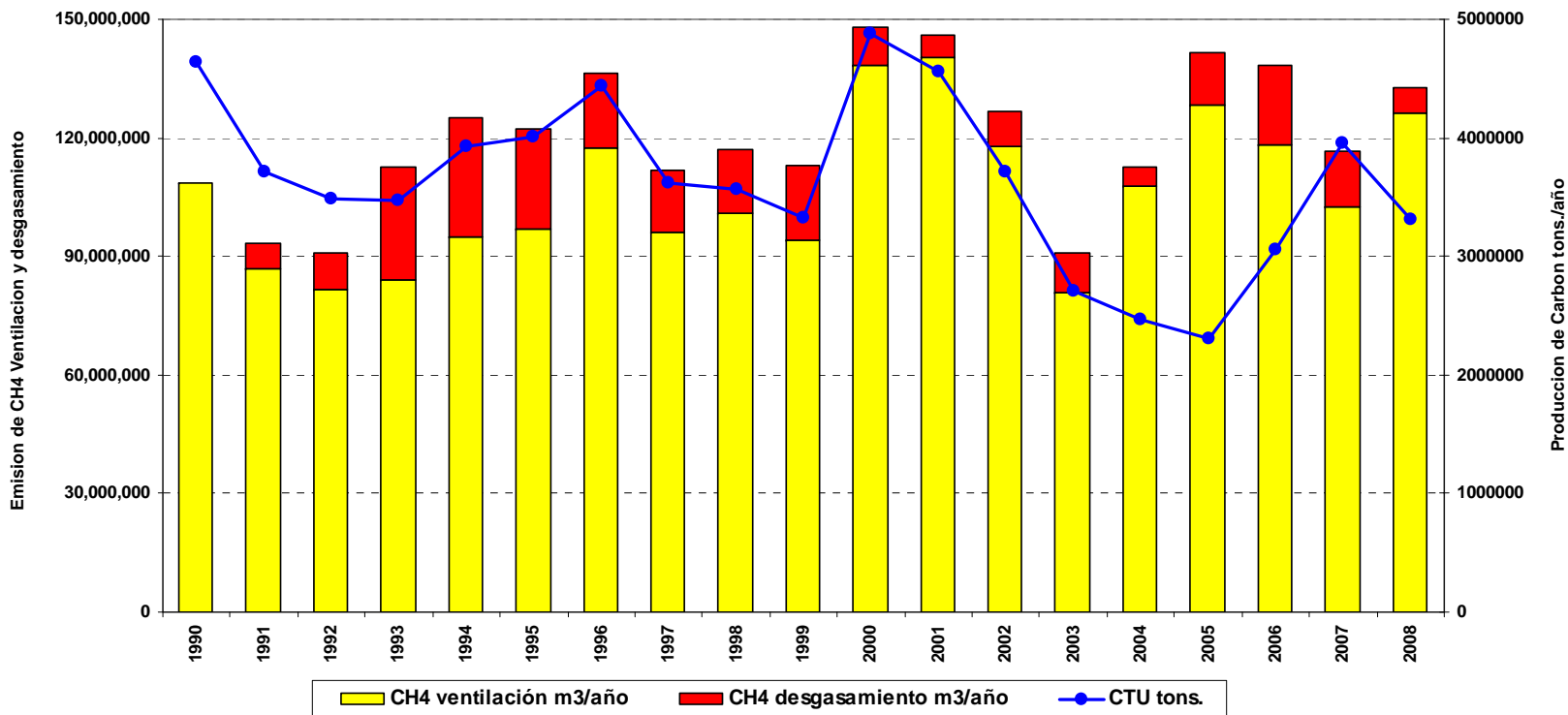
## Computed Real Properties:

Specific Gravity	0.575 (Air =1)
Compressibility	0.9979
Gross Heating Value @ 14.65 psia & 60 Degree F	
<b>Dry Basis</b>	<b>1,026 BTU/CF</b>
Saturated Basis	1,009 BTU/CF



# Gas emission 1990 to 2008

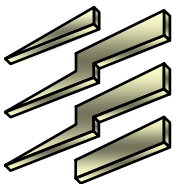
## M<sup>3</sup> Coal mine Methane Vented to Atmosphere

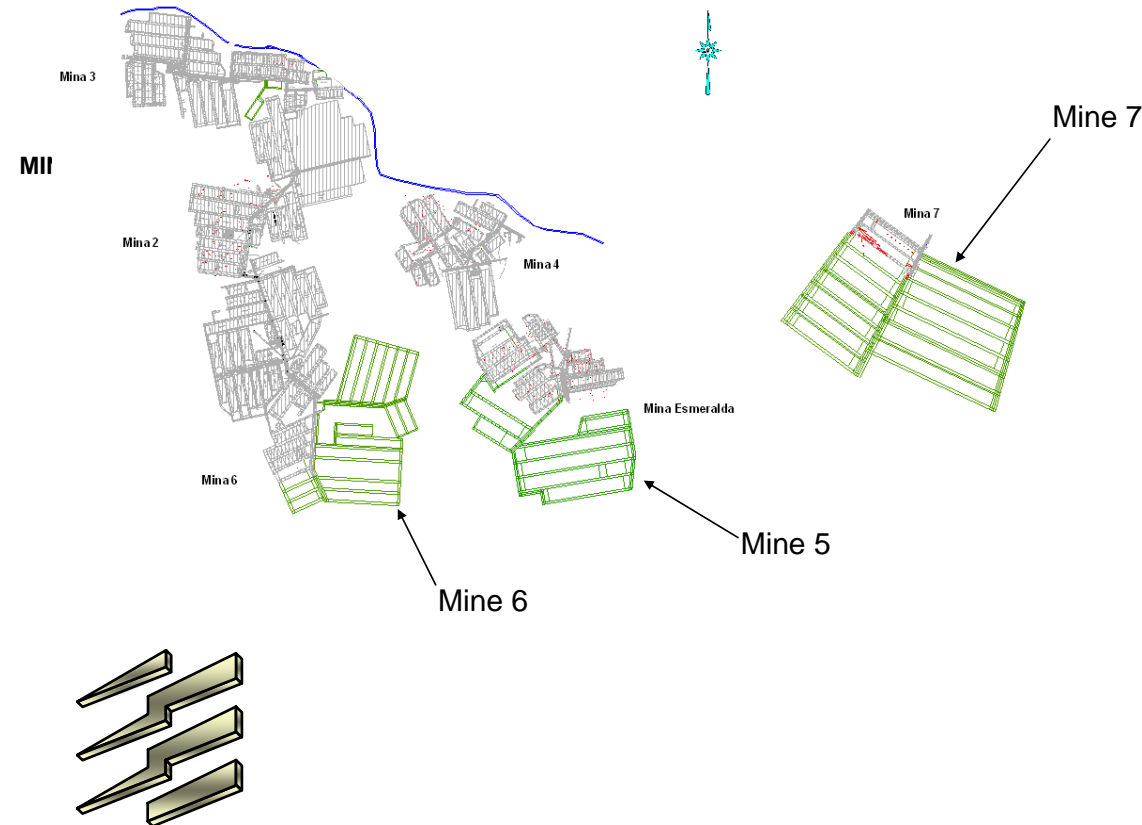


Ventilation (m<sup>3</sup>) = 106,524,937  
 Methane Drainage (m<sup>3</sup>) = 14,554,752  
 Coal Production (Tons) = 3,638,682

# 2009 Total Direct Cost Horizontal Drilling

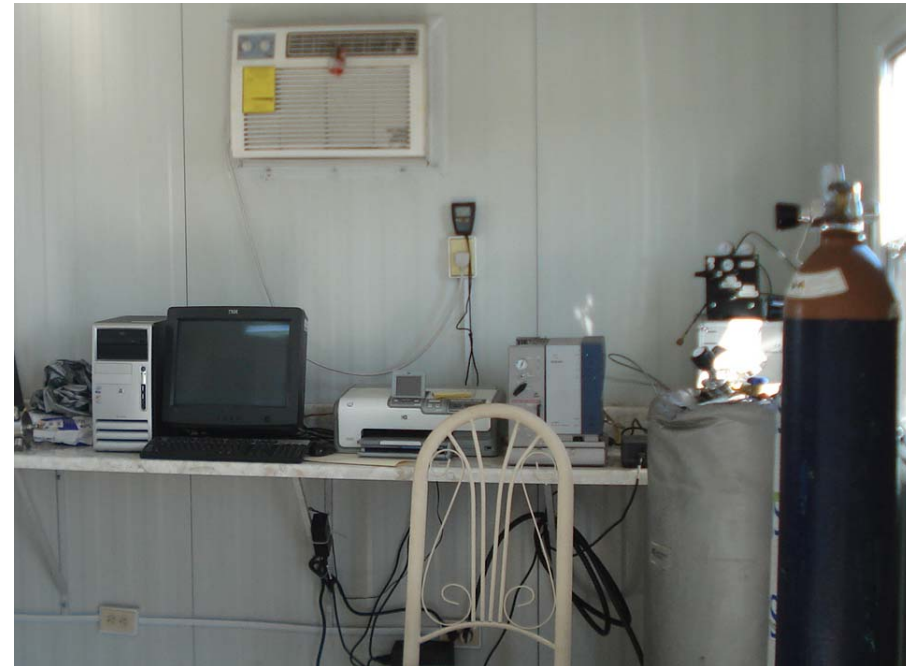
Equipment	Drilling performance		Cost		Real cost	
	(Meters)	(ft.)	(\$mx.)	(\$usd.)	(meter)	(ft.)
Acker Big John 290116	1,551	5,087	\$93,752	\$6,997	\$60.45	\$1.38
Acker Mid John 290121	1,298	4,257	\$121,456	\$9,064	\$93.57	\$2.13
Fletcher 290131	3,404	11,165	\$140,758	\$10,505	\$41.35	\$0.94
Fasing/Turmag 290133	15,604	51,181	\$47,742	\$3,563	\$3.06	\$0.07
<b>Total</b>	<b>21,857</b>	<b>71,691</b>	<b>\$403,708</b>	<b>\$30,128</b>	<b>\$18.47</b>	<b>\$0.42</b>



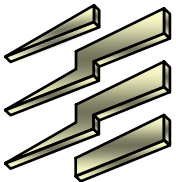


- PDD under validation by DNV.
- Registration at UNFCCC.
- 3 mines Considerer.
- CER's equivalent to 549,922 tons CO<sub>2</sub> per year
- 2,000 m<sup>3</sup>/per hour flares capacity.
- 7.0 MW of electricity production.

# Recent Developments (Lab facilities)



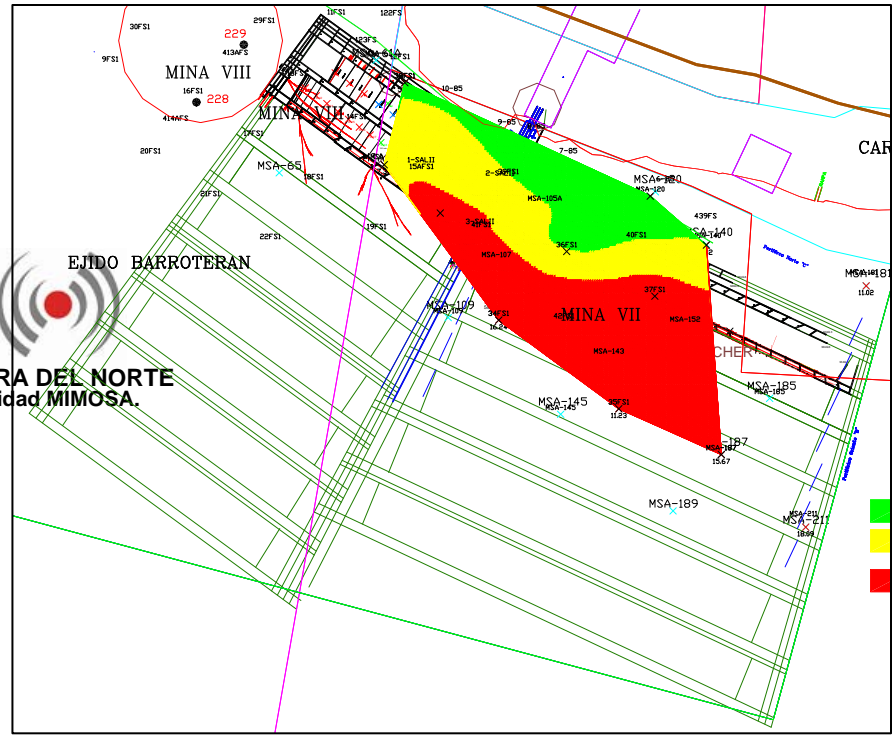
- Gas desorption Test.
- Gas outburst prevention.
- Gas Chromatograph analysis



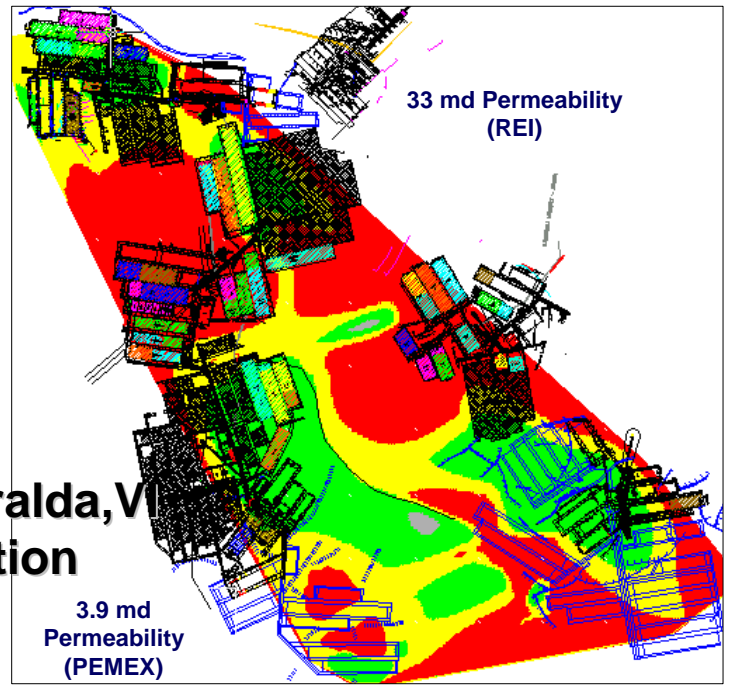


# Gas Content Grids

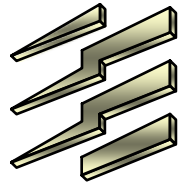
- Mine VII
- Saltillito Area



- 0 a 6 M<sup>3</sup>/Ton.
- 6 a 9 M<sup>3</sup>/Ton.
- > a 9 M<sup>3</sup>/Ton.



- Mines III, Esmeralda, VI
- Sabinas Operation





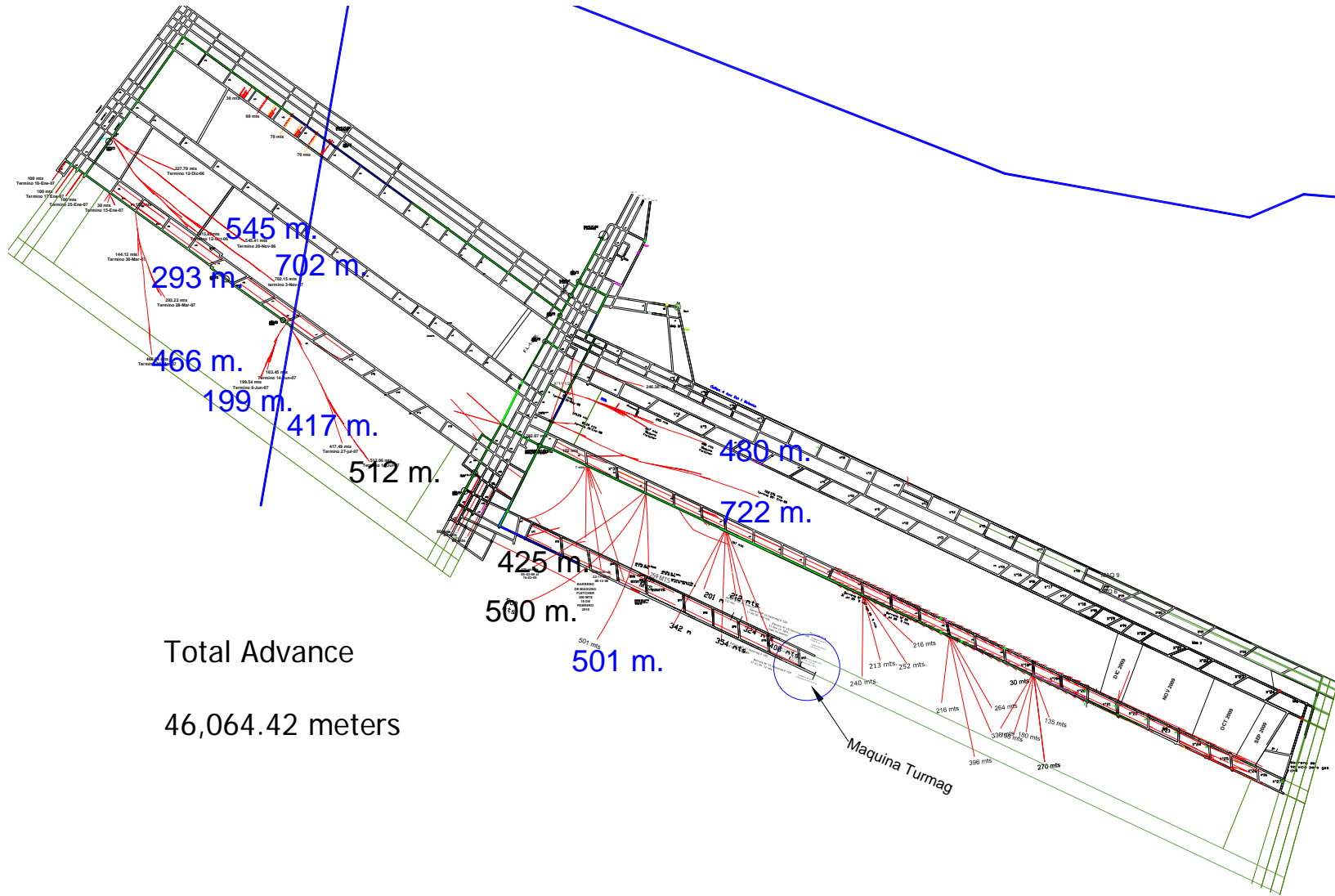




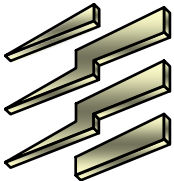
# Horizontal Drilling Mine VII



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Total Advance  
46,064.42 meters

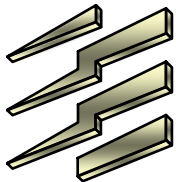




# Gob Wells Mine VI



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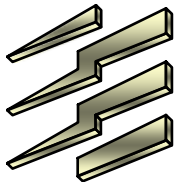
# Recent Developments



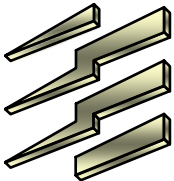
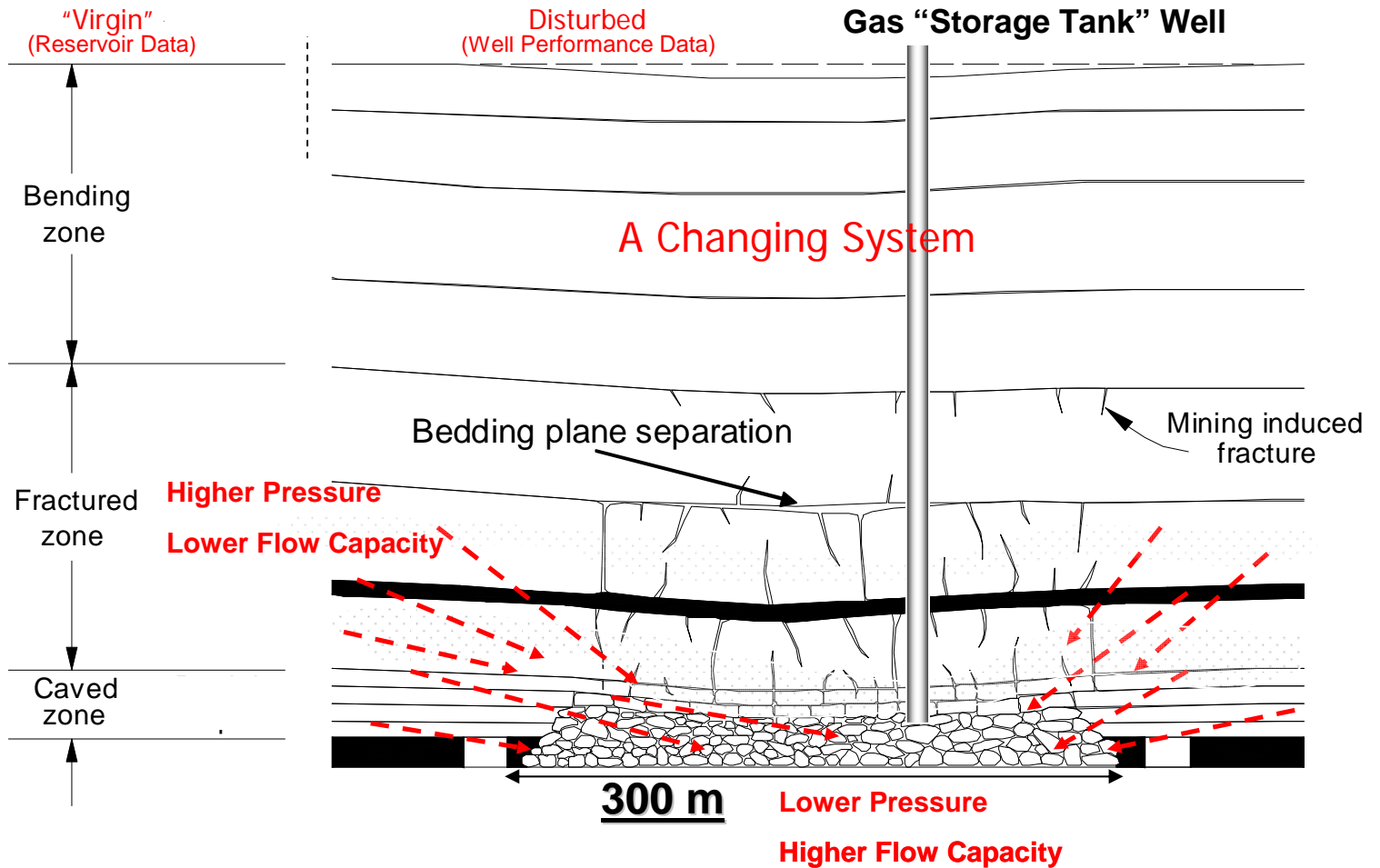
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- 1.- Fletcher Machine
- 2.- KSD Pumps running with methane
- 3.- KSD pumps series installation



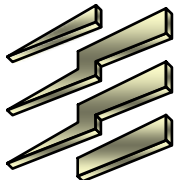
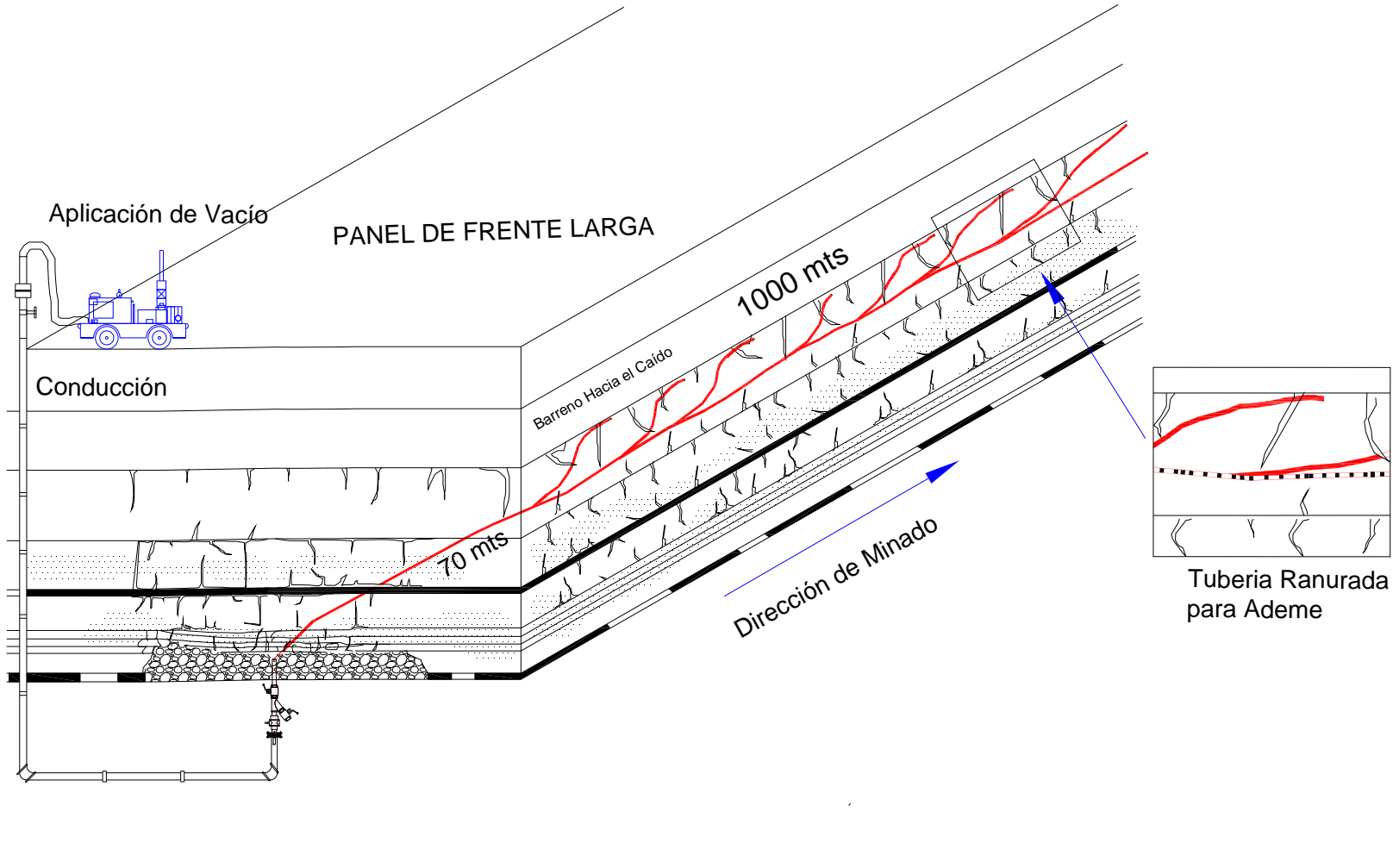
# Recent Developments



# Recent Developments



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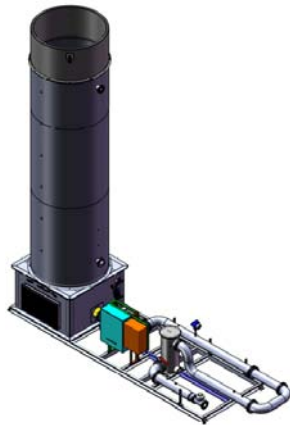
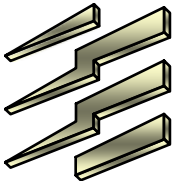




# Project Secuence



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Flares 2,000 m3/hour capacity, to adjust the volumen of methane gas form the sources.



ICE electricity production of 7 MW elect according with the PDD



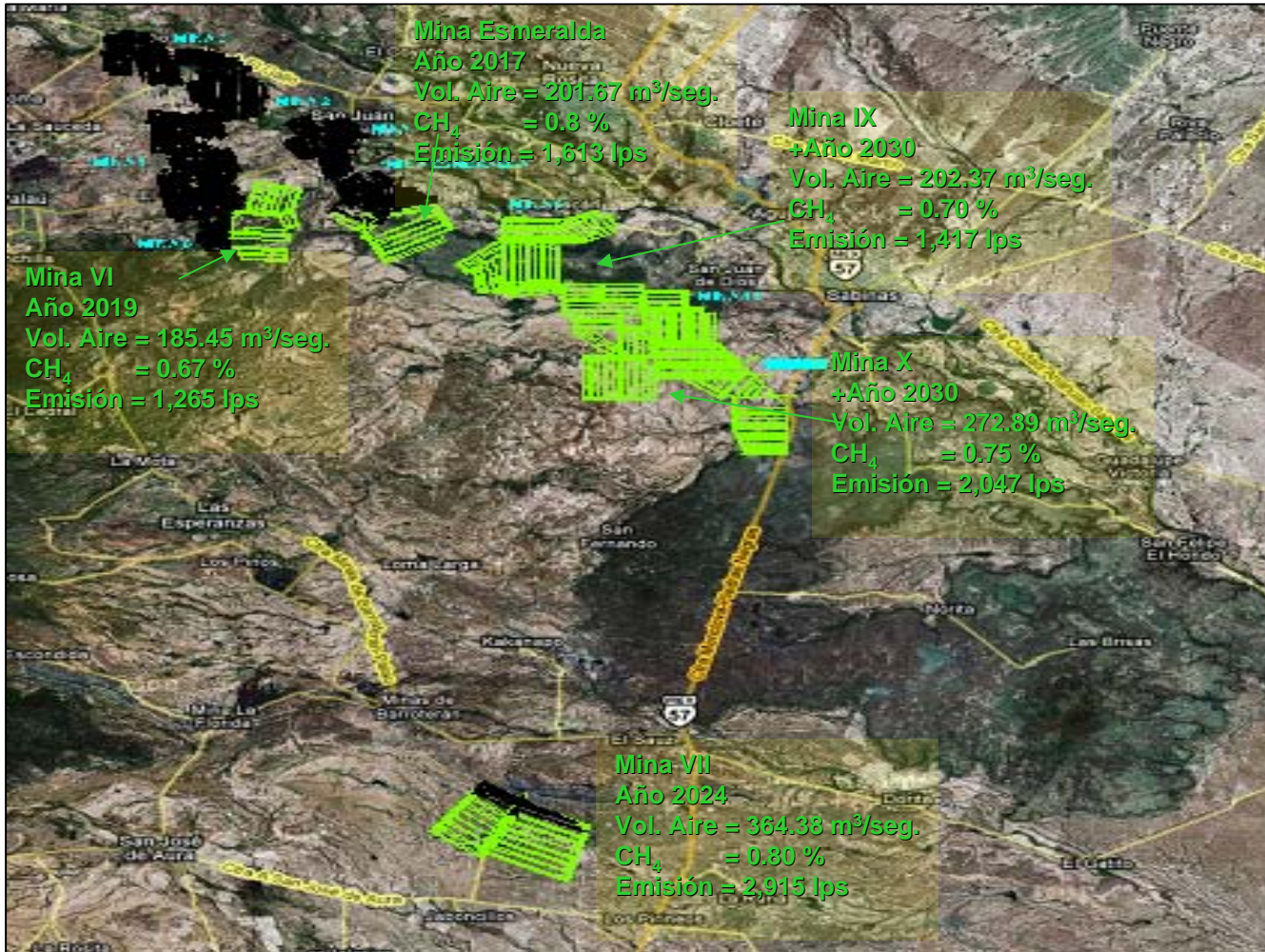
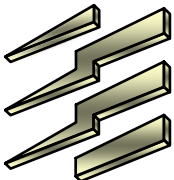
Horizontal & Gob Wells gas destruction (2,000 lps) in the three mines.



Mines grids to utilize the electricity production.

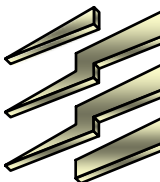
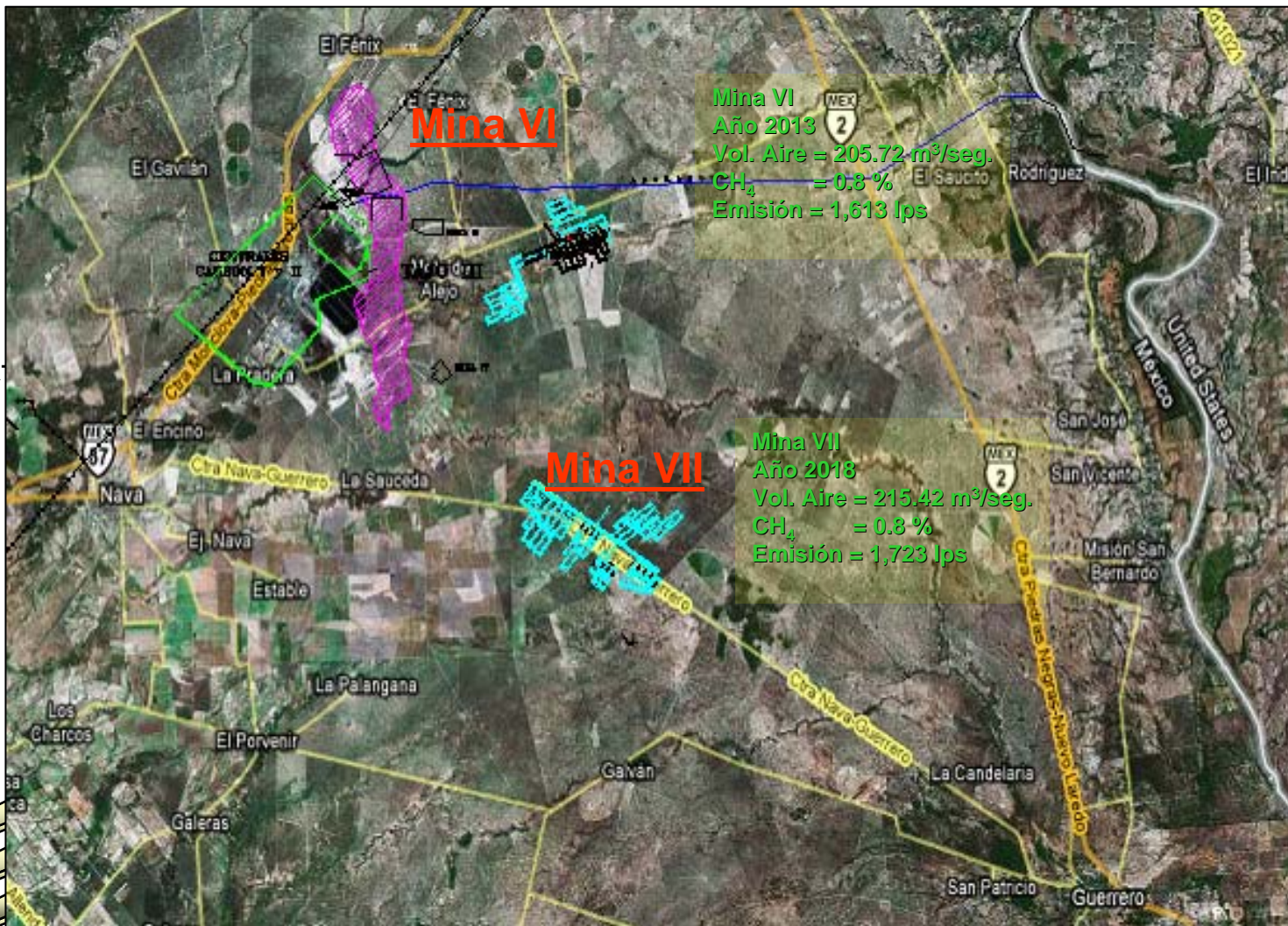


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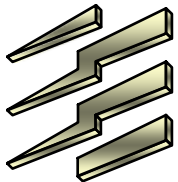




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# Megtec First Industrial Application



**4 Vocsidizers**  
**6MW Turbines**  
**2 150,000 cfm fans**



# Project AMM

**Gas Colection**



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Uni

**Methane Gas  
Mine II  
Quality 100 %  
Volumen @ 131 Ips**

**ICE Rental or Buy**



**Power Generation  
4,160 Volts**

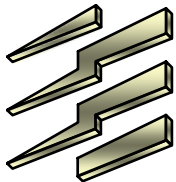
**Electrical Substation**



**Transformers  
of 4,160 to 34,000 Volts**



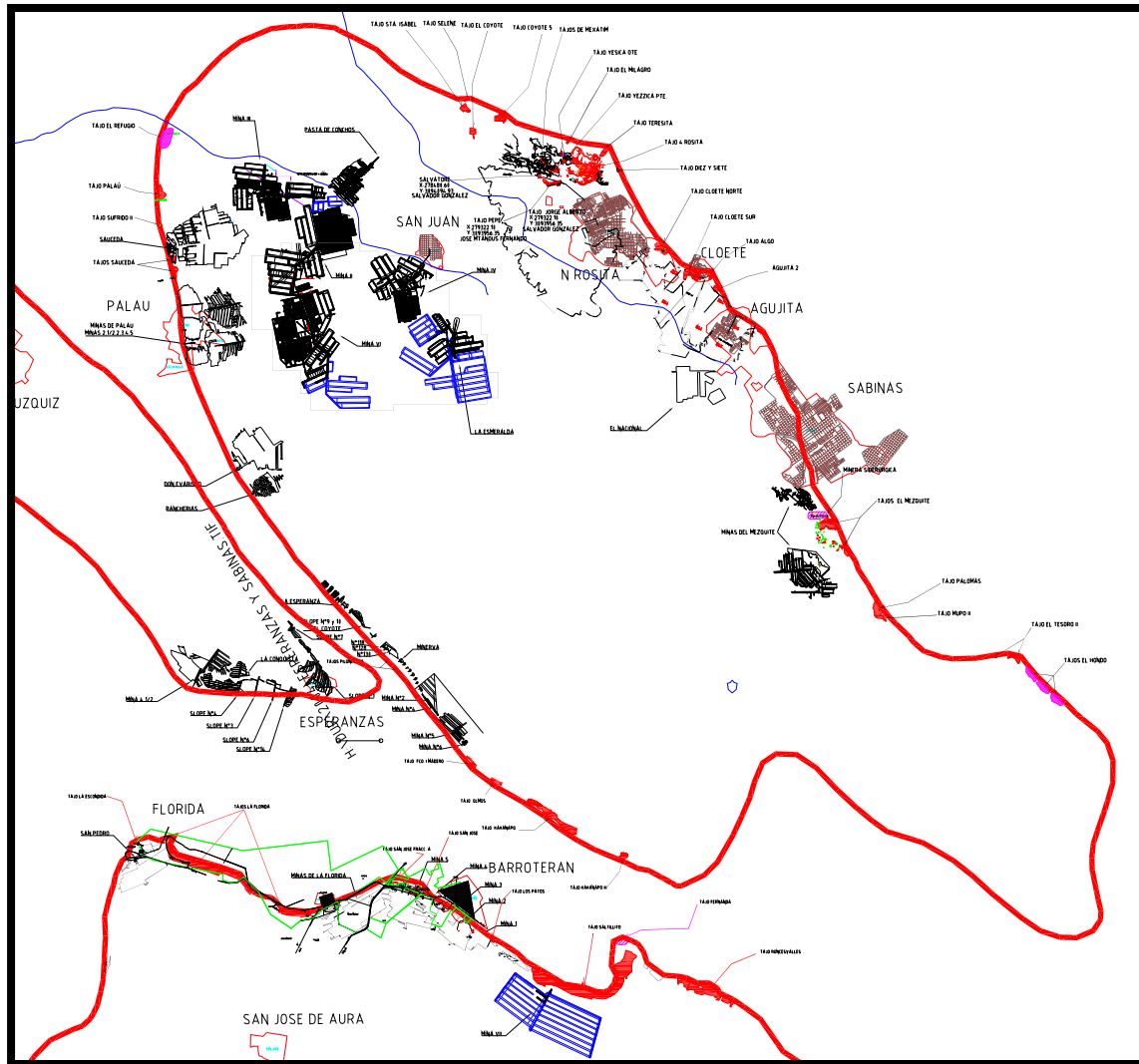
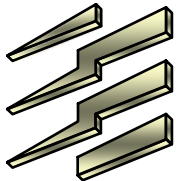
**Maintanance Shops**



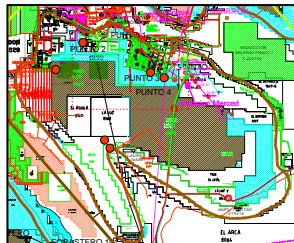
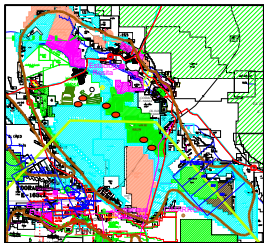
# Remaining Gas Reserves



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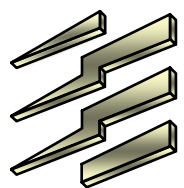
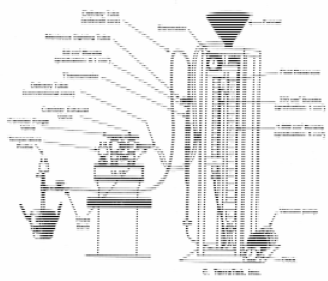
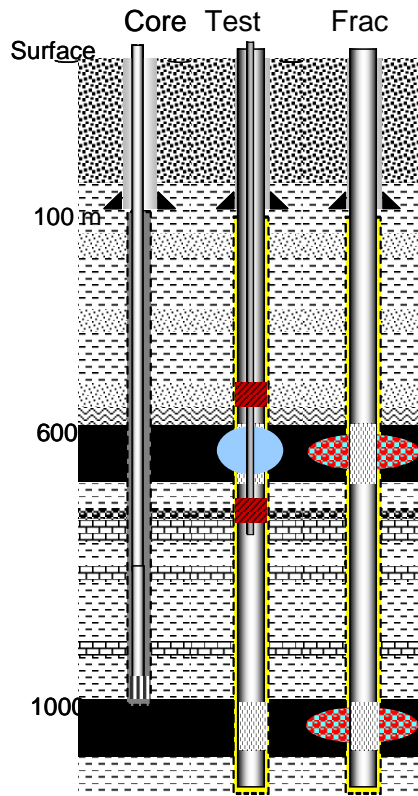
# Exploration Testing Pilot Holes



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Basic Test Design requirements:

- Field core collection
- Laboratory Analyses
- Injection testing
- Simple clean well completion
- Six to twelve month period of uninterrupted production





AHMSA



# Thank you!



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# Gracias!

