Baker Engineering and Risk Consultants, Inc.

Risk Analysis Report

Pluspetrol Peru Norte

Block 8, Peru

Prepared for:

pluspetrol

Final Report

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1 INTRODUCTION

This report pertains to a document review by BakerRisk of the Pluspetrol Norte Block 8 operations located in Peru. The purpose of the review was to gather information and to develop a report to assist in the placement of property damage and business interruption insurance.

This Risk Analysis Report has been prepared to assist underwriters in evaluating the exposures, operations, and loss prevention activities of the Block 8 operations. The report is based on information obtained in 2019 and observations made during previous site visits.

No site survey was conducted for this effort. No Pluspetrol Norte personnel were interviewed to prepare this update. This update is based on the previous BakerRisk Survey[1] conducted in 2013 with replacement cost values provided by Pluspetrol in 2019.

[1] Cizek, J. G, *"Risk Analysis Report-Pluspetrol Norte – Block 8,"* prepared for Pluspetrol Norte. BakerRisk Project No. 01-01943-013-13, June 10, 2013.

2 SUMMARY

2.1 Description

Block 8 has six oilfields and eight production batteries generally grouped into north and south zones as follows:

South Zone:	Corrientes	Batteries 1 and 2
	Chambira	Battery 8
	Yanayacu	Battery 3
North Zone:	Pavayacu	Batteries 5 (Inactive) and 9
	Capirona	Battery 4 - Inactive
	Nueva Esperanza	Battery 7 - Inactive

Current production is approximately 10,970 barrels oil per day (BOPD).

A Topping Plant and a Central Electric Plant (CE II) started operation at Corrientes in 2008.

2.2 Values and Loss Estimate Summary

The replacement cost values used in this analysis are based on the information provided by Pluspetrol for the major areas of Block 8. The total replacement cost value of the Block 8 Operations, including inventories, is reported to be about US$ 257.5 million as of July 1, 2019, as depicted in Table 1.

Table 1. Replacement Costs by Major Oilfield for Block 8 Operations

Oilfield	Value (US $)
Corrientes	208,265,584
Chambira	11,485,852
Yanayacu	11,780,478
Pavayacu	14,918,914
Capirona	10,971,629
Nueva Esperanza	35,000
Total Replacement Cost	**257,457,457**

Table 2, below, depicts the replacement costs for the major areas of the Block 8 Operations.

Table 2. Replacement Costs for the Major Areas of Block 8 Operations

Unit Description	Value (US $)
Plantas de tratamiento de crudo	7,480,000
Plantas de tratamiento de gas	644,464
Plantas de tratamiento de agua	150,000
Plantas de Inyección de Agua	24,448,900
Otras plantas	26,507,460
Oleoductos	47,142,423
Centrales Eléctricas	62,477,801
Subestaciones eléctricas	8,591,000
Transformadores	10,761,958
Estaciones de bombeo	720,000
Estaciones de Carga	1,235,441
Baterías	9,266,260
Parque de Tanques de Almacenamiento	3,690,000
Crudo en Stock	15,692,640
Bienes en almacenes	23,170,000
Otras Instalaciones	1,176,219
Total Replacement Cost	**243,154,566**

A summary of the loss estimates for the Block 8 Operations is shown in Table 3.

Table 3. Loss Estimates for the Block 8 Operations

Loss Event	Process Unit/Area	Loss Estimate (US $ MM)			
		PD	BI	EE	TOTAL
EML: Fire	Corrientes Topping Plant	$2.5	$12.0	$10.0	**$24.50**
EML: Fire	Corrientes Central Electrical Plant (CE II)	$60.0	$36.3	$14.4	**$110.70**
EML: Well Blowout	N / A	$20.0	$1.75	$0	**$21.75**
Machinery Breakdown	Corrientes Central Electrical Plant	$25.0	$36.3	$14.4	**$75.70**

PD=Property Damage BI=Business Interruption EE=Extra Expense

2.3 Risk Ranking

Throughout this report we have expressed our opinion with regard to the quality of risk on a worldwide industry basis. These opinions are based on the following definitions:

Good	The very best of current day practice in the industry; an industry leader.
Above Average	Exemplifies some of the best practices in the industry.
Average	Acceptable standards exhibited, but with room for improvement.
Below Average	Some areas are below the standard of current day practice, with considerable potential for improvement.
Poor	Embodies few or none of the standards expected of current day practice, with major improvements required.

A major recommendation had previoiusly been submitted for management's consideration (see "Risk Improvement Recommendations") to improve the fire protection for the Central Electric II Power Plant (CE II) at Corrientes.

Additional medium recommendations from the previous BakerRisk survey,[1] are summarized below:

- Improving firewalls for transformers
- Cable penetration seals for the Switchgear Area beneath the Central Generation Plant (CEI) Control Room at Corrientes
- Firewater monitor nozzle protection for Caterpillar and Cummins Generators or portable firewalls at the Central Generation Plant (CEI) Control Room at Corrientes
- No windows or fire-rated windows in Control Room at the Central Generation Plant (CEI) Control Room at Corrientes

The recommendation to improve firewalls for transformers remains open. The remaining recommendations relate to the original Corrientes Central Electric Plant (CE I), which started operation in 2008 and is now in standby mode.

Major risks at the Pluspetrol Norte Block 8 Operations are typical of oil and gas production operations; namely, large flammable and combustible material releases. The Pluspetrol Norte Block 8 Operations has addressed, and is continuing to address these risks through both preventive measures (e.g., equipment design/layout, maintenance, and inspection, etc.) and protective features (e.g., emergency shutdown and isolation systems, fire protection systems, etc.).

Spacing is considered to be *Average to Above Average* on a worldwide basis.

The risk-rating summary for the Pluspetrol Norte Block 8 Operations is included in Table 4.

Table 4. Risk Rating Summary for Pluspetrol Norte Block 8 Operations

Category	BakerRisk Rating
Plant Design and Layout	*Average to Above Average*
Process and Controls	*Average to Above Average*
Major Hazard Risks	*Average*
Fire Protection	*Below Average to Average*
Management Programs	*Above Average*
Loss Estimates / Business Interruption	*Average*
Overall Facility	***Average***

External exposures are considered to be *Good* and security arrangements are *Good*.

Overall, we consider the Pluspetrol Norte Block 8 Operations to be an *Average* risk.

3 General Information

3.1 Company Background

Pluspetrol Norte S.A. is a subsidiary of Pluspetrol Resources Corporation (PRC) N.V., a privately held integrated energy group involved mainly in upstream oil and gas operations and power generation activities in South America. The corporate structure is depicted in Figure 1.

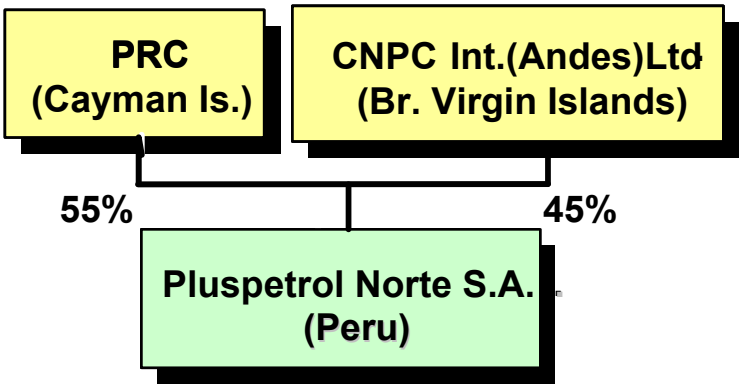


Figure 1. Pluspetrol Norte Corporate Structure

3.2 Block 8

Block 8 was acquired in July 1996 following the part privatization of the state oil company, Petroperu. The following depicts the current ownership structure for Block 8:

Pluspetrol Norte S.A.	60.0 percent
Korea National Oil Company (KNOC)	20.0 percent
Daewoo International Corporation Sucursal Peruana	11.7 percent
SK Energy, Sucursal Peruana	8.3 percent

The oilfields are located in jungle territory in northeastern Peru in the Amazon Basin. Current production is 10,970 BOPD from Block 8. Approximately 60 percent of the production from Block 8 is exported across the Andes through the 850 kilometer Petroperu pipeline system to the Bayova marine terminal on the Pacific coast, 850 kilometers north of Lima. The remaining production from Block 8 is shipped by barge down the Marañon River to the Petroperu refinery at Iquitos.

3.3 Site Location and Third Party Exposures

The oilfield region is generally very flat and is densely covered with rainforest. The climate is tropical with high rainfall and little seasonal variation. Electrical storms are frequent. The high water table is drained by a number of large meandering tributaries of the Amazon River.

Block 8 oilfield operations are run from the central base at Trompeteros, 200 kilometers (124 miles) south of Andoas on the Corrientes River and some 250 kilometers (155 miles) from Iquitos, the nearest major town.

The concession runs essentially north-south over a distance of 200 kilometers (124 miles), as depicted in Figure 2, below. Site access from Lima is by helicopter, road, or river to the local Trompeteros airstrip, and inter-field transport is by helicopter, road, or river.

The site areas are remote and there are no adjacent third party properties.

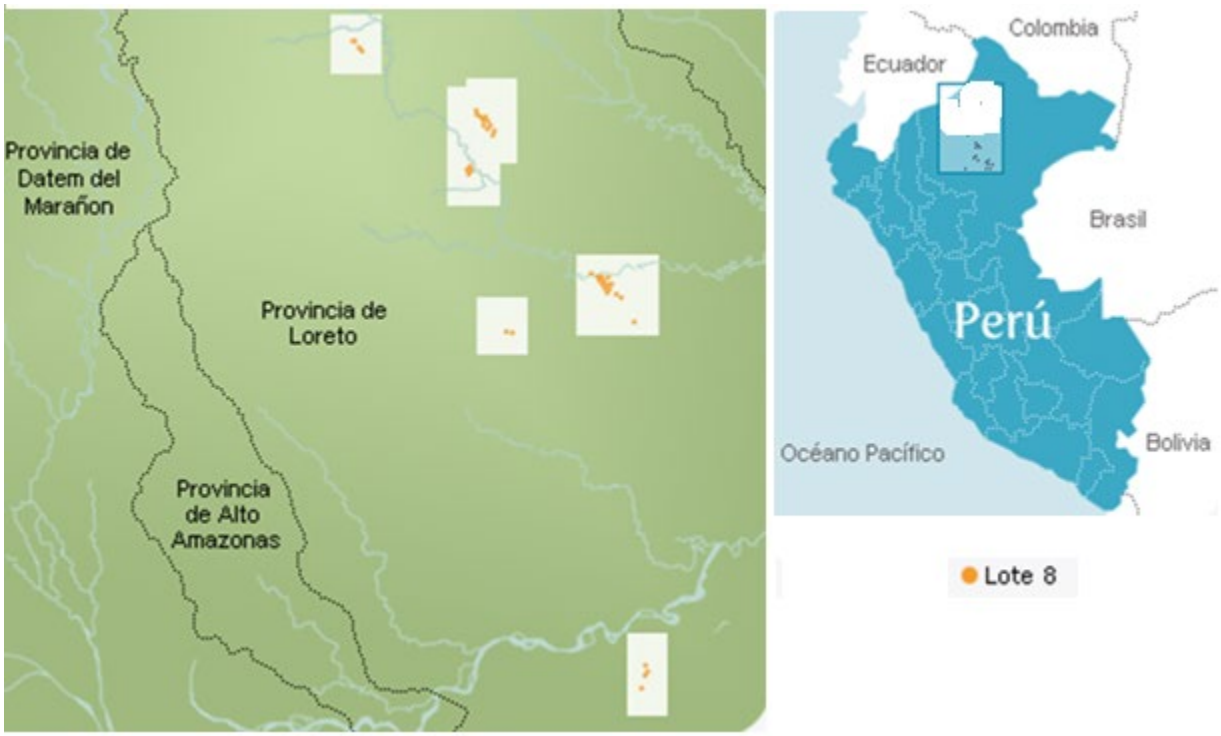


Figure 2. Block 8 Locator Map

BakerRisk's rating for Site Location/3rd Party Exposures: Good

3.4 Consideration of Major Hazards

3.4.1 Fire and Explosion

Downhole pumps are used to produce most of the oil and there is some associated gas. Operating conditions are not considered to be high pressure.

The risk of fire is *Below Average* for the typical crude oil production facility, which means that the relative risk is lower than average. There is an *Average* risk of a gas, fire or explosion in one or two of the lighter oil operations associated with gas lift or fuel gas systems.

Pluspetrol has addressed these exposures through spacing, design, management, inspection and maintenance programs as well as relief valve installations on piping systems and vessels. The exposure to fire and explosion is considered *Average.*

3.4.2 Machinery Breakdown

Machinery breakdown is also a typical exposure for this type of facility where various pumps and compressors are used. Examples of larger/critical rotating equipment associated with the Block 8 Operations are shown below in Table 5.

Table 5. Block 8 Equipment over 500 Horsepower

Generator Number	Manufacturer	Model	Horsepower	Location	Pump Manufacturer
GE-96	Fuji	6LG27.5X	938	Pavayacu	-
GE-97	Fuji	6LG27.5X	938	Pavayacu	-
GE-99	Fuji	6LG27.5X	938	Pavayacu	-
GE-106	Caterpillar	D-399	1,072	Pavayacu	-
GE-107	Fuji	8LG27.5X	1,340	Corrientes	-
GE-108	Fuji	8LG27.5X	1,340	Corrientes	-
GE-113	Caterpillar	D-399	1,072	Chambira	
GE-116	Caterpillar	D-399	1,072	Pavayacu	
GE-126	CKD	DA 6-27,5 B8DG	1,641	Pavayacu	-
GE-127	CKD	DA 6-27,5 B8DG	1,641	Pavayacu	-
GE-134	Caterpillar	3508	536	Chambira	-
GE-135	Caterpillar	3508	536	Chambira	-
GE-136	Caterpillar	3508	536	Chambira	-
GE-144	MAN	9L 32/40 DG	4,477	Corrientes	-
GE-145	MAN	9L 32/40 DG	4,477	Corrientes	-
GE-151	CKD	12C28GSW	3,399	Corrientes	-
GE-152	CKD	12C28GSW	3,399	Corrientes	-
GE-153	CKD	12C28GSW	3,399	Corrientes	-
GE-154	Caterpillar	3516B	2,145	Pavayacu	-
GE-155	Caterpillar	3516B	2,145	Pavayacu	-

Generator Number	Manufacturer	Model	Horsepower	Location	Pump Manufacturer
GE-156	Caterpillar	3516B	2,145	Pavayacu	-
GE-157	Caterpillar	3516B	2,145	Corrientes	-
GE-158	Caterpillar	3516B	2,145	Corrientes	-
GE-164	Caterpillar	3516B	2,145	Pavayacu	-
GE-166	Caterpillar	3516B	2,145	Pavayacu	-
GE-167 (CKD-4)	CKD	12C28GSW	3,399	Corrientes	-
GE-175 (CKD-4)	CKD	12C28GSW	3,399	Corrientes	-
GE-177	Caterpillar	3516B	2,145	Pavayacu	-
GE-178	Caterpillar	3516B	2,145	Pavayacu	-
Diesel Engine Number	**Manufacturer**	**Model**	**Horsepower**	**Location**	**Pump Manufacturer**
MB-01	Caterpillar	4HMTA-8	750	Corrientes	Ingersoll Rand
MB-02	Caterpillar	4HMTA-8	750	Corrientes	Ingersoll Rand
MB-03	Caterpillar	4HMTA-8	750	Corrientes	Ingersoll Rand
MB-55	Caterpillar	4x11DA-6	750	Corrientes	Ingersoll Rand
Electric Motor Number	**Manufacturer**	**Model**	**Horsepower**	**Location**	**Pump Model**
EBB-INYC-001	Reliance	VSM6469036-A1-LF	1000	Pavayacu	HPXMTARCS5
EBB-INYC-002	Siemens	E17967-01-1	1000	Pavayacu	HPXMTARCS5
EBB-INYC-003	Siemens	HM416850	400	Pavayacu	HPXMTARCS3
EBB-INYC-004	Siemens	E181519-01-1	1000	Pavayacu	HPXMTARCS5
EBB-INYC-005	Siemens	0159370-003-2	1000	Pavayacu	HPXMTARCS5
EBB-INYC-006	Siemens	E18514-01-2	1000	Corrientes	HPXMTARCS5
EBB-INYC-007	Siemens	E18812-10-2	1000	Corrientes	HPXMTARCS5
EBB-INYC-008	Siemens	E18518-01-1	1000	Corrientes	HPXMTARCS5
EBB-INYC-009	Siemens	0159370-004-2	1000	Corrientes	HPMXTARCS5

Electric Motor Number	Manufacturer	Model	Horsepower	Location	Pump Model
EBB-INYC-012	Siemens	0386343-020-2	1000	Corrientes	HPMXARCS5
EBB-INYC-013	Siemens	0386343-020-3	1000	Corrientes	HPMXARCS5
EBB-INYC-014	Siemens	0386343-030-2	1000	Corrientes	HPMXARCS5
EBB-INYC-010	Siemens	E18814-01-1	1000	Yanayacu	HPMXTARCS5
EBB-INYC-011	Siemens	0159370-003-1	1000	Yanayacu	HPXMTARCS5
Electric Motor Booster Pumps	**Manufacturer**	**Model**	**Horsepower**	**Location**	**Pump Model**
EB-192	General Electric	5KAF68114344201	700	Corrientes (Battery 1)	3409 / 8x12-22L
Booster 2	Reliance Electric	30BG5012Z	700	Corrientes (Battery 1)	3409 / 8x12-22L
Booster 3	Reliance Electric	30BG5012Z	700	Corrientes (Battery 1)	3409 / 8x12-22L
Booster 4	Reliance Electric	30BG5012Z	700	Corrientes (Battery 2)	3409 / 8x12-22L
Electric Motor Booster Pumps	**Manufacturer**	**Model**	**Horsepower**	**Location**	**Pump Model**
Booster 5	Reliance Electric	30BG5012Z	700	Corrientes (Battery 2)	3409 / 8x12-22L

For most smaller, critical rotating equipment (e.g., pumps), an installed spare has been provided. Other fixed process equipment having long replacement times include the compressors and columns.

Considering the business interruption potential, the most significant machinery breakdown exposure at this facility is believed to be associated with one of the generators (see the "Machinery Breakdown" section for further details).

3.4.3 Flood

The exposure to flooding due to the site topography is minimal. Access to the site by road can be restricted by high water levels at river crossings during the rainy season. Air access by the Block 8 field helicopter service is available.

3.4.4 Windstorm, Hurricane & Tornado

The exposure to windstorm damage in this part of the country, particularly from possible tornados, is considered to be *Average to Above Average.*

On the Munich Re World Map of Natural Hazards, the Block 8 Operations are located in a low hazard area for tornados and a medium hazard area for hailstorms. The Block 8 Operations are located within a Lightning Zone 1, which equates to two to six strokes per square kilometer per year.

3.4.5 Earthquake

The risk from earthquakes is considered medium. In the Munich Re World Map of Natural Hazards, the Block 8 Operations are located in a Zone 2 area corresponding to a Modified Mercalli (MM) index rating of VII or below (see Figure 3). The probable maximum intensity has an exceedance probability of 10 percent in 50 years (equivalent to a return period of 475 years) for medium subsoil conditions.

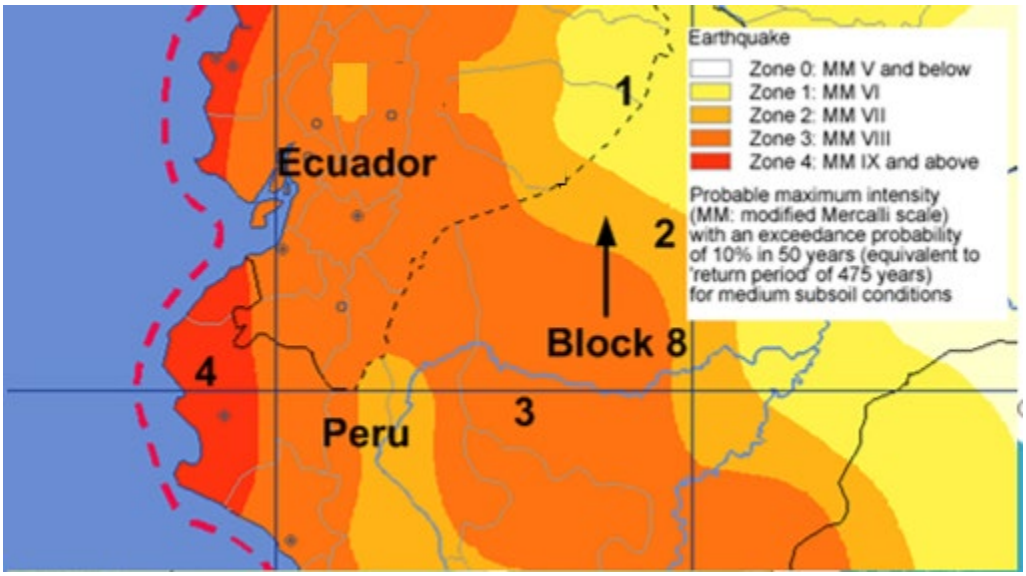


Figure 3. Munich Re Earthquake Hazard Map for Block 8

The following listing depicts the earthquake history for Peru from the United States Geological Survey (USGS).

1619 02 14 - Trujillo, Peru - M 7.7 Fatalities 350
1664 05 12 - Ica, Peru - M 7.3 Fatalities 400
1687 10 20 - Lima, Peru - M 8.5 Fatalities 600
1746 10 28 - Lima, Peru Fatalities 5,000
1821 07 10 - Camana, Peru - M 8.2 Fatalities 162
1868 08 13 - Arica, Peru (now Chile) - M 9.0 Fatalities 25,000
1908 12 12 - Off the Coast of Central Peru - M 8.2
1913 11 04 - Abancay, Peru Fatalities 150
1940 05 24 - Callao, Peru - M 8.2 Fatalities 249
1942 08 24 - Off the coast of central Peru - M 8.2 Fatalities 30
1943 01 30 - Yanaoca, Peru Fatalities 200
1946 11 10 - Ancash, Peru - M 7.3 Fatalities 1,400
1947 11 01 - Satipo, Peru - M 7.3 Fatalities 233
1948 05 11 - Moquegua, Peru - M 7.4 Fatalities 70
1950 05 21 - Cusco, Peru - M 6.0 Fatalities 83

1953 12 12 - Tumbes, Peru - M 7.4 Fatalities 7
1958 01 15 - Arequipa, Peru - M 7.3 Fatalities 28
1960 01 13 - Arequipa, Peru - M 7.5 Fatalities 57
1966 10 17 - Near the Coast of Peru - M 8.1 Fatalities 125
1968 06 19 - Moyobamba, Peru - M 6.9 Fatalities 46
1969 10 01 - Comas region, Chile - M 6.4 Fatalities 136
1970 05 31 - Chimbote, Peru - M 7.9 Fatalities 66,000
1974 10 03 - Near the Coast of Central Peru - M 8.1
2001 06 23 - Near the Coast of Peru - M 8.4 Fatalities 138
2001 07 07 - Near the Coast of Peru - M 7.6 Fatalities 1
2002 10 12 - Peru-Brazil border region - M 6.9
2005 09 26 - Northern Peru - M 7.5 Fatalities 5
2006 10 20 - Near the Coast of Central Peru - M 6.7
2007 08 15 - Near the Coast of Central Peru - M 8.0 Fatalities 514
2007 11 16 - Peru-Ecuador border region - M 6.8

MM is the ground shaking severity index on a scale from 1 to 12, where MM = 12 is the highest. MM is a subjective scale assigned to areas surrounding the epicenter of an earthquake by surveying the extent of damage observed.

The magnitude of most earthquakes is measured on the **Richter scale**, invented by Charles F. Richter in 1934. The Richter magnitude is calculated from the amplitude of the largest seismic wave recorded for the earthquake, no matter what type of wave was the strongest.

The Richter magnitudes are based on a logarithmic scale (base 10). What this means is that for each whole number you go up on the Richter scale, the amplitude of the ground motion recorded by a seismograph goes up ten times. Using this scale, a magnitude 5 earthquake would result in ten times the level of ground shaking as a magnitude 4 earthquake (and 32 times as much energy would be released).

FM Global classifies the Block 8 Area of Peru as a Zone 50. This Zone # represents the average frequency in years of moderate-to-severe earthquakes (Richter M7). The FM Global Earthquake Map of South America in included in Figure 4.

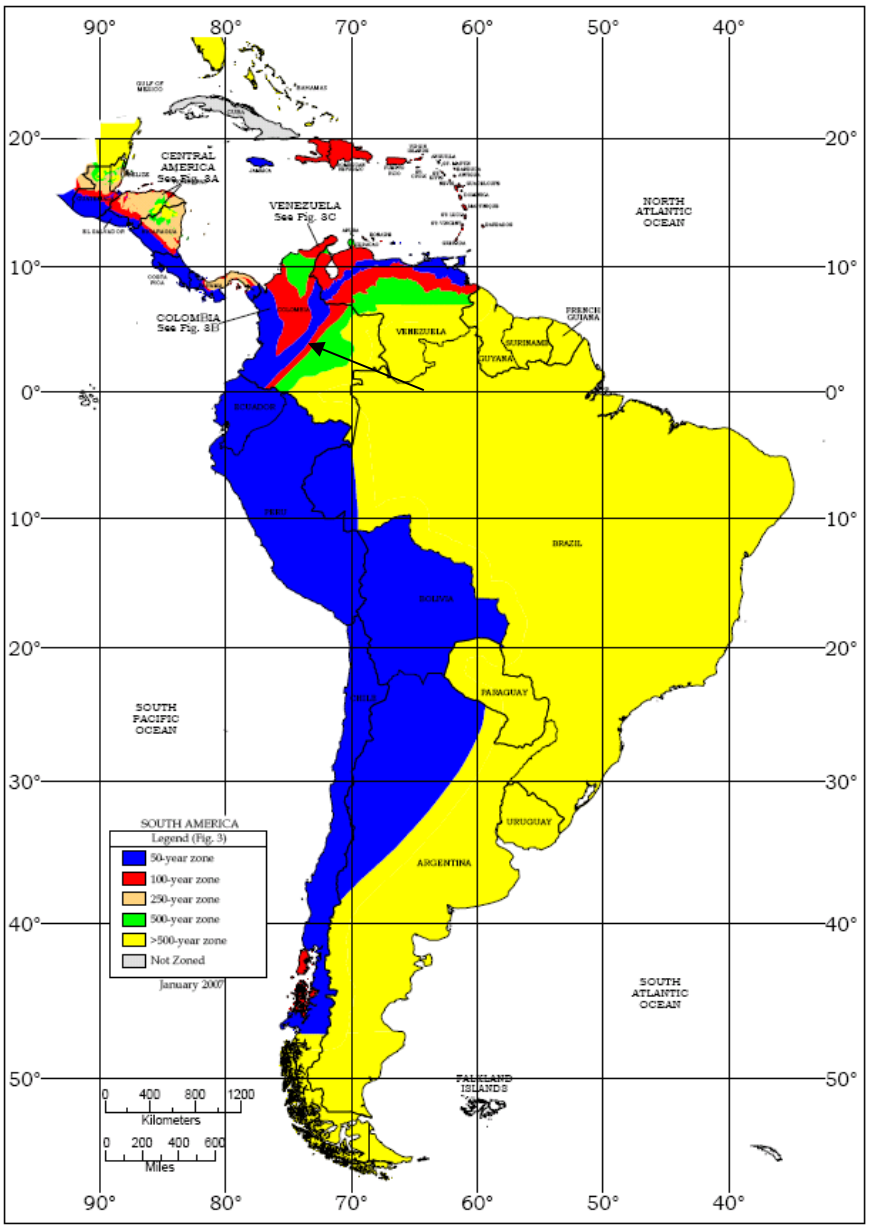


Figure 4. FM Global Earthquake Map for South America

3.4.6 Climate

Block 8 is located in the montaña region of Peru, which is extremely hot and humid, although at higher elevations it is less so. The prevailing easterly winds blowing across the region gather moisture that is later deposited on the eastern Andean slopes. Annual rainfall in some districts averages as much as 3,810 millimeters (150 inches). Most of this rain, which principally falls from November through April, eventually drains back to the montaña.

3.4.7 Marine

Approximately 40 percent of Block 8 production is exported from Saramuro by river barge to the Iquitos Refinery. Crude can also be delivered by barge to the Pucallpa Refinery, which is about 400 kilometers to the south. Following the major pollution incident at the Marañon River, barges are now required to be dry dock inspected and formally certified. Spill booms were reported to be deployed during loading operations.

3.4.8 Riot, Vandalism & Malicious Mischief

There has been no history of riots, terrorism or extreme vandalism at this location. Although such occurrences are possible, they are not considered highly probable.

3.4.9 Aircraft

The Trompeteros Airport is located next to the operations at Trompeteros. Flights to and from this airport support the Block 8 operations.

The exposure from falling aircraft is considered to be Average to Above Average.

3.4.10 Pollution and Contamination

There is no polychlorinated biphenyl (PCB) filled electrical equipment and there is no asbestos at the Block 8 Operations.

The Block 8 Operations have Waste Water Treatment facilities as these are not "zero discharge" facilities. Produced water is re-injected into the formation.

The exposure to pollution and contamination is considered to be *Above Average.*

3.4.11 Subsidence

The Block 8 Operations is located in an area with stable soils. This is considered to be *Average*.

BakerRisk's rating for "Consideration of Major Hazards": Average to Above Average

3.5 Loss History

On May 26, 2019, at 2:41 hours, the Seismological Center of the Instituto Geofisico del Peru (IGP), recorded a 8.0 Mw Earthquake at 60 kilometers (about 37 miles) south of Lagunas and 64 kilometers (about 40 miles) east of Yurimaguas, Alto Amazonas, in the Loreto Region at 135 kilometers (about 84 miles) of depth, with VI-VII Mercalli Scale intensities in the epicenter area.

The damage at Pluspetrol facilities were mostly minor. The earthquake caused damage to the steel flanges of the hydrocarbon tank bases, as well as cracks on the concrete foundation ring. The major

damage was a leak from one of the 19 affected tanks.

The repair procedure for the tank base metallic plate required removal of the floor plate, elimination and replacement of granular material, and installation of new floor plate. The work included testing both prior to the repair and afterwards.

The effects on a tank from an earthquake produces movement of the stored fluids that generate diverse base stress and deformations (see illustration in Figure 5). Such stress may generate damage to the tank depending on the conditions of the tank material before the earthquake. Concrete rings that form part of the tank foundation are also subject to earthquake damage by crushing from falling debris.

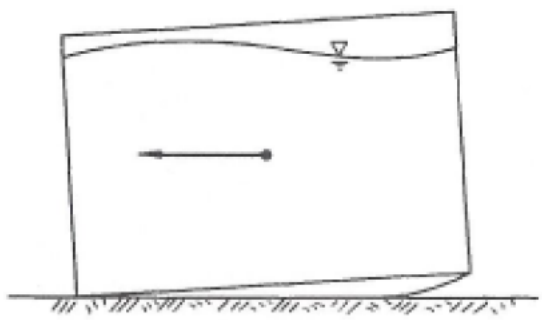


Fig. 2.1. Peek, R. y Jennings, P.C. "Simplified Analysis of Unanchored Tanks". Earhquake Engineering and Structural Dynamics, Vol.16, 1073-1085. John Wiley & Sons, Ltd. Estados Unidos de Norteamérica. 1988.

Figure 5. Earthquake Effects on Unanchored Tanks[2]

Pluspetrol indicated that this type of failure on the tank base could also have occurred in the other 18 tanks to a lesser degree. Under the worst scenario, the other tanks could have minor leaks that will be detected over time and would require repair. Because of this, Pluspetrol will schedule the inspection of the 18 tanks to determine their interior condition.

The loss is estimated to be between US$1 million and US$5 million.

BakerRisk's rating for "Losses": Average

[2] Earthquake Engineering and Structural Dynamics, vol 16, 1073-1085. John Wiley & Sons, Ltd. 1988.

4 Risk Improvement Recommendations

To facilitate management's response to these recommendations, the items on the following pages have been arranged in descending order of importance within three categories, Major, Medium, and Minor.

An update to the recommendations was provided and reviewed.

4.1 Completed Recommendations

The following recommendations have been completed since the previous BakerRisk survey in 2013.

08-2 Safety Bypass Log and Procedure

A Safety Bypass Log and Procedure to authorize and control the use of the operational and maintenance trip by-pass systems has been developed and implemented for the Block 8 Operations. A control sheet to register the authorization, dates and reasons for the by-pass, as well as the reinstatement date has also been developed.

08-4 Provide Smoke Detection System for the Switchgear Area beneath the Central Generation Plant (CEI) Control Room at Corrientes

This facility is currently being used as standby only and not operated on a regular basis. If the facilities are returned to regular operation, the smoke detection system is to be provided.

13-1 Fire Protection for the Wartsila Central Electric II (CE II) Power Plant at Corrientes, Part b and c only

The fire brigade for the Wartsila Central Electric II Power Plant has been properly trained for interior structural firefighting and equipped to combat a fire inside the power plant. The initial training was completed in July 2013 and refresher training is provided on an annual basis.

Currently, two sets of bunker gear (firefighting protective clothing) are provided just outside one of the doors to the power plant. Two SCBAs have been provided for the fire brigade (currently two contract operators) to combat a fire inside the power plant.

4.2 New Recommendations

There are no new recommendations.

4.3 Previously Submitted Recommendations

4.3.1 Major Recommendations

13-1 Fire Protection for the Wartsila Central Electric II (CE II) Power Plant at Corrientes

The Wartsila Central Electric Plant II (CE II) is critical to the water re-injection operations at Corrientes. Without power, production will have to be greatly reduced or stopped completely. In order to properly protect and be able to combat a fire in the Wartsila Central Electric II (CE II) Power Plant, the following actions should be implemented:

a. An automatic sprinkler system should be provided throughout the Wartsila Central Electrical Plant (CE II) Building that houses the heavy fuel oil fired generators to protect this critical asset. The wet pipe sprinkler system should be hydraulically designed to provide a density of 13 liters per minute/square meter (0.30 gpm/square foot) over the most remote 465 square meters (5,000 square feet). An allowance of 1893 liters per minute (500 gpm) should be made in the hydraulic calculations for hose stream allowance.

   A row of sprinklers should also be provided over the lube oil systems for the three Wartsila heavy fuel oil fired generators, as existing equipment would block the ceiling sprinkler system discharge to this critical area.

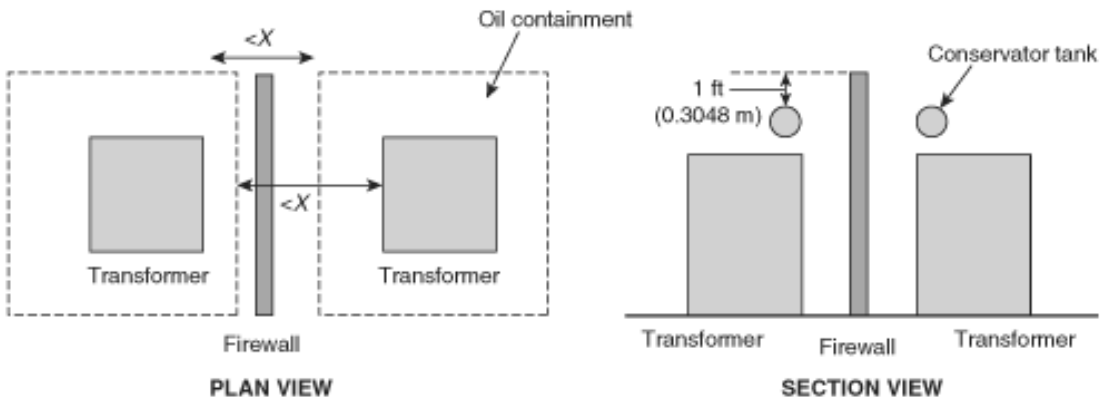
   Since the fire pumps for the Wartsila Central Electric II (CE II) Power Plant are rated at 120 cubic meters/hour at 106 meters (528 gpm at 347 feet head or 150 psi), the recommended sprinkler protection cannot be adequately supplied by this equipment. These fire pumps should be replaced with fire pumps (one diesel and one electric) that are rated at 450 cubic meters/hour at 106 meters (2,000 gpm at 347 feet head or 150 psi). This may also mean increasing the size of the suction tank at the Wartsila Central Electric Plant (CE II) to 900 cubic meters from 250 cubic meters, as was designed by Wartsila (their design does not meet NFPA 850 requirements, even though they say it does).

Block 8 Response: Pluspetrol Norte has evaluated the fire protection for the Wartsila Central Electric II Power Plant and no additional protection is to be provided at this time. If the CEII Power Plant begins operating on a full time basis, this recommendation will be re-evaluated.

4.3.2 Medium Recommendations

08-3 Improve Firewalls for Transformers

The firewalls for the transformers throughout the Block 8 Operations should be extended to at least 1 foot (0.31 meters) above the top of the transformer casing and oil conservator tank and at least 2 feet (0.61 meters) beyond the width of the transformer and cooling radiators as indicated in Figure 5 below.



X: Minimum separation distance from Table 5.2.4.3.

Figure 6. Transformer Fire Wall Height and Separation Criteria

Block 8 Response: The existing operations will be reviewed and firewall improvements will be made. An estimation of the costs was been completed by June 30, 2013.
BakerRisk Comment: No progress on completing this recommendation.

08-5 Cable Penetration Seals for the Switchgear Area beneath the Central Generation Plant (CEI) Control Room at Corrientes

Two-hour fire resistance rated cable tray penetration seals are needed for the Switchgear Area beneath the Central Generation Plant Control Room at Corrientes to reduce the possibility of fire spread from one area to another causing significant property damage and down time. A removable pillow system would allow easy maintenance in this area.

Block 8 Response: International Fire Safety Training (IFST) is conducting a study for the protection of the power plants, as well as the rest of the operations, for Block 8. The study covers the evaluation and a draft of the protection system needed for both the external and internal operations based on the National Fire Protection Association standards.
BakerRisk Comment: This facility is currently being used as standby only and not operated on a regular basis.

08-6 Firewater Monitor Nozzle Protection for Caterpillar and Cummins Generators or Portable Firewalls at the Central Generation Plant (CEI) Control Room at Corrientes

Firewater monitor nozzle protection should be provided for the Caterpillar and Cummins Generators or Portable Firewalls at the Central Generation Plant Control Room at Corrientes to combat a fire in this area. A single incident could shut down the power generation to several parts of the operation until portable equipment could be brought to the site and temporarily provide power until the existing equipment could be repaired and/or replaced.

Another alternative would be to provide a portable fire wall with a fire resistance rating of two hours, if current equipment would allow this installation. The fire wall should extend at least one foot (0.31 meters) above the engine driven generator and two feet (0.61 meters) beyond the end of the equipment.

Block 8 Response: International Fire Safety Training (IFST) is conducting a study for the protection of the power plants, as well as the rest of the operations, for Block 8. The study covers the evaluation and a draft of the protection system needed for both the external and internal operations based on the National Fire Protection Association standards.
BakerRisk Comment: This facility is currently being used as standby only and not operated on a regular basis.

08-7 No Windows or Fire Rated Windows in Control Room at the Central Generation Plant (CEI) Control Room at Corrientes

In order to protect the Control Room from a fire or explosion in the generating area, the windows should be removed and replaced with the same materials as the existing walls for the Control Room. An alternative would be to replace the existing windows in the Control Room with two-hour fire rated windows.

Block 8 Response: The alternatives will be evaluated and the protection will be installed for the Control Room.
BakerRisk Comment: This facility is currently being used as standby only and not operated on a regular basis.

4.3.3 Minor Recommendations

There are no previous minor recommendations

5 Values And Loss Estimates

5.1 Property Values

The replacement cost values used in this analysis are based on the information provided by Pluspetrol for the major areas of Block 8. The total replacement cost value of the Block 8 Operations, including inventories, is reported to be about US$ 257.5 million as of July 1, 2019.

In the following EML loss estimates, the cost of debris removal and other miscellaneous expenses (e.g., inventories, piperacks/utilities between unit battery limits, firewater systems outside of battery limits, etc.) have been added to the property damage loss estimate as a fixed percentage. Replacement costs for the major areas of Block 8 Operations are enumerated in Table 6, below.

Table 6. Replacement Costs by Major Oilfield for Block 8 Operations

Oilfield	Value (US $)
Corrientes	208,265,584
Chambira	11,485,852
Yanayacu	11,780,478
Pavayacu	14,918,914
Capirona	10,971,629
Nueva Esperanza	35,000
Total Replacement Cost	**257,457,457**

Table 7, below, depicts the replacement costs for the major areas of the Block 8 Operations.

Table 7. Replacement Costs for the Major Areas of Block 8 Operations

Unit Description	Value (US $)
Plantas de tratamiento de crudo	7,480,000
Plantas de tratamiento de gas	644,464
Plantas de tratamiento de agua	150,000
Plantas de Inyección de Agua	24,448,900
Otras plantas	26,507,460
Oleoductos	47,142,423
Centrales Eléctricas	62,477,801
Subestaciones eléctricas	8,591,000
Transformadores	10,761,958

Unit Description	Value (US $)
Estaciones de bombeo	720,000
Estaciones de Carga	1,235,441
Baterías	9,266,260
Parque de Tanques de Almacenamiento	3,690,000
Crudo en Stock	15,692,640
Bienes en almacenes	23,170,000
Otras Instalaciones	1,176,219
Total Replacement Cost	**243,154,566**

5.2 Business Interruption Values and Discussion

The annual Business Interruption Value (gross profit basis) for the Block 8 Operations is US$ 144.6 million.

The **Business Interruption** (BI) exposures at the Block 8 Operations are associated with a catastrophic loss in the Corrientes Central Electrical Plant, which is addressed in the EML scenario further in Section 5.5.1 of the report.

Business Interruption exposure involves the loss in revenue from the oil sales to the PetroPeru pipeline system.

The **Business Interruption Interdependency** exposures for the Block 8 Operations are as follows:

5.2.1 Topping Plant at Corrientes

A Topping Plant has been constructed at Corrientes in 2008. The plant is similar in size and operation to the existing plant at Shiviyacu. The loss of the Corrientes Topping Plant would result in considerable extra expense in securing an alternative supply of diesel for power generation and could result in production cut backs.

5.2.2 Central Electrical Plant at Corrientes

A Central Electrical Plant (CE II) was been constructed at Corrientes in 2008. The plant has a net output of 17.2 megawatts. The loss of the Central Electrical Plant would result in considerable downtime until power could be restored to the Corrientes Operations, as the major power user is the water re-injection pumps.

5.2.3 Crude Flow Lines

Oil produced from the northern oilfields is normally transported by pipeline to a pump station near the Capirona Battery and delivered through a 62 kilometer, 10-inch pipeline to the main storage and production center at Corrientes. The oil produced in the northern fields was transported by pipeline, but was out of service at the time of this report. The oil from Pavayacu was transported by barge from the Capirona Battery to Corrientes. The segregated crudes, one is considered to be heavy oil (24°API) and the other light oil (35°API), are dispatched by the main pump station at Corrientes to the Petroperu export terminal and pump station at Saramuro, 108 kilometers to the south, via one 10-inch pipeline. The Saramuro Station is on the north bank of the Marañon River.

Typically, repairs can be made to pipelines in less than 14 days, except for road or water crossings. Failures in the pipeline under roads and waterways may require horizontal drilling of a new route next to the existing pipeline and this could take up to six weeks.

BakerRisk's rating for Business Interruption: Average

5.3 Contingent Business Interruption

The following is a summary of the **Contingent Business Interruption** exposures for the Block 8 Operations:

5.3.1 Sales Pipelines

There is one 24-inch oil export pipeline, owned and operated by PetroPeru, which starts at Saramuro (Pump Station No. 1), near Yanayacu. The Norperuvian Pipeline starts at Saramuro and increases to a 36-inch pipe at Pump Station No. 5 near Saramiriza, then continues to the west coast of Peru at the Bayovar Terminal, as depicted in Figure 7.

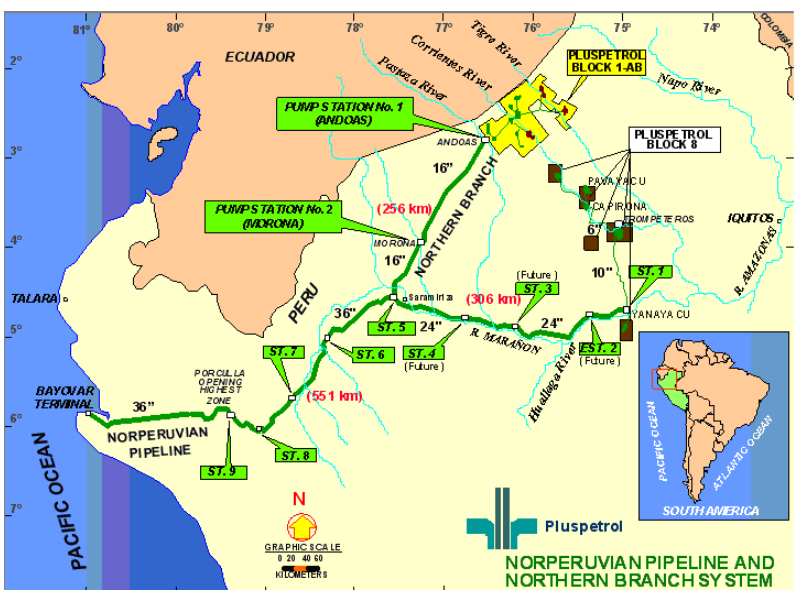


Figure 7. Norperuvian Pipeline System

Typically, repairs can be made to pipelines in less than 14 days, except for road or water crossings. Failures in the pipeline under roads and waterways may require horizontal drilling of a new route next to the existing pipeline and this could take up to six weeks.

The associated loss with such an event is estimated to be about **US$ 16.7 million** for a pipeline repair/replacement under a road or waterway.

5.3.2 Barge Operations

The Yanayacu Field, which is the most southern oilfield, is located south of the Marañon River. Production from the Yanayacu Field is transferred by barge across the 750-meter wide river crossing to the export station. Barge oil supply operations to the Iquitos refinery are conducted from a local loading station.

BakerRisk's rating for this section: Average

5.4 Loss Definition and Methodology

For the purpose of this study, the following loss definition is used:

Estimated Maximum Loss (EML): Combined property damage and business interruption estimate which assumes extensive damage from extraordinary perils, such as earthquake, tidal wave, hurricane, tornado, or the release of massive quantities of flammable vapors, which consequently results in a very widespread and destructive force. Damage is limited only by adequate spacing between major facilities and other passive protective features.

Methodology: In determining the Estimated Maximum Loss, the International Oil Insurer's (IOI) EML Methodology has been used. Although it is conceded that a catastrophic vessel failure, such as a pressurized or refrigerated LPG sphere/drum, would result in a much greater destructive force and corresponding damage, we have excluded such events from this estimate due to their extremely low probability of occurrence. The loss history within the petroleum and petrochemical industries has shown that failure of piping systems (e.g. - expansion joints, pipe, flanges, drain and sample lines, hoses, etc.) are more frequently involved in the release of a material which subsequently results in an explosion and/or fire, than any other equipment item. Consequently, partial failures of piping systems have been considered in each of the various scenarios evaluated in this study. Causes of piping system failures could be attributed to mechanical damage, accelerated corrosion (brittle fracture), improper welding techniques, improper metallurgy, excessive vibration, improper maintenance practices, etc.

In an attempt to estimate the maximum possible loss, scenarios involving equipment failure and subsequent product release have been considered for the Tank Batteries, Topping Plant, and the Central Electrical Plants. Pool Fire Events postulated as the possibility of an explosion from the fired heaters for the material and equipment used at the Block 8 Operations is extremely remote. These areas have been considered because of the concentration of assets in the exposed areas, and/or the liquid holdup volumes in these units, and/or potential business interruption impact, and in consultation with the Block 8 operations staff.

5.5 EML Loss Estimate

The most significant EML scenarios, which have been analyzed in detail, involve a fire at the Corrientes Topping Plant.

In this scenario, a seal oil leak on a pump near the separation column ignites and causes a major fire in this area, severely damaging the heat exchangers and other critical equipment needed to operate this unit. The property damage is estimated at **US$ 2.5 million.**

For the purposes of this analysis, the loss is assumed to occur on July 1, 2019.

The Business Interruption would be for a period of 12 months for the Corrientes Topping Plant. Diesel fuel would have to be imported to this facility in order to operate the power generation and vehicles in Block 8. It is estimated that it would require one month to re-supply diesel fuel to the operations until the Topping Unit was replaced.

Diesel fuel could be supplied to the Block 8 operations via barge from the Iquitos Refinery. Arrangements could be made to resupply the Block 8 operations in the event of a loss at the Corrientes Topping Plant.

The Business Interruption loss associated with this event is estimated to be **US$ 12 million** for Block 8 for the first month, and 11 months' supply of diesel from the Iquitos Refinery. The extra expense for supplying the diesel from the Iquitos Refinery is estimated to be **US$ 10 million.**

Based on previous experience, the first month of the overall downtime would involve incident investigations, oversight and intervention from governmental agencies, preliminary design engineering, and reconstruction planning. After the initial month, site cleanup and reconstruction would commence and continue over the next 11 months. The business interruption loss estimates that follow assume that reconstruction would be carried out on an expedited basis.

Another significant EML scenario, which would have a major impact on the Block 8 Operations, is a fire at the Corrientes Central Electrical (CE II) Plant. It is postulated that a fire severely damages one of the generators and also severely damages the generators on either side. The generators at the Corrientes Central Electrical II Plant provide power for the Corrientes Operations.

The resultant EML Property Damage is estimated to be **US$ 60 million**. The Corrientes Operations would be partially shut down until rental equipment could be brought to the site to generate power. Some of the existing power generating equipment at the existing Corrientes Central Electrical Plant may be able to be used to reduce the severity of this loss.

It is estimated that coordinating rental equipment would take three months, and that the replacement of the generators may take up to two years.

For the purposes of this analysis, the loss is assumed to occur on July 1, 2019.

The Business Interruption loss associated with this event is estimated to be about **US$ 36.3 million** for the first three months. Generators would need to be rented for 21 months to supply power to the Corrientes Operations.

The extra expense for supplying the power from rental generators is estimated to be about **US$ 14.4 million.** The cost of renting generators is estimated to be **US$ 40,000** per megawatt per month. The Corrientes Power Plant is to supply 17.2 megawatts of power.

The Business Interruption Interdependencies resulting from this postulated loss is that the Corrientes Production field would have to be shut down until rental equipment has been installed and is operational.

5.6 Machinery Breakdown Loss Estimate

The following definition of machinery breakdown has been assumed:

The sudden and unforeseen physical loss or damage of equipment necessitating repair or replacement due to one of the following causes:

- Faulty design, or defects in materials design, construction, erection or assembly.
- Fortuitous working accidents such as vibration, maladjustment, loosening of parts, defective or accidental lack of lubrication, water hammer or local overheating.
- Excessive or insufficient electrical voltage, failure of insulation, short circuits, open circuits, or arcing from the effects of static electricity.
- Overheating of boiler/fired heater tubes due to shortage of water or circulation.
- Physical explosion (or implosion) of a vessel containing gas, steam or liquid involving rupture of the vessel without a chemical reaction having occurred. Explosions involving a chemical reaction are not normally covered, with the exception of boiler flue gas explosions.

Machinery Breakdown Loss Estimate:

The Block 8 Operations maintain an excellent supply of critical spare parts (e.g., motors, couplings, bearings, seals, etc.) in on-site warehouses. In this scenario, a sudden and unforeseen failure of the lube oil system on one of the largest power generators is presumed, which severely damages the unit as well as causing damage to the units on both sides of the generator.

The resultant EML Machinery Breakdown is estimated to be **US$ 25 million.** The Corrientes Operations would be partially shut down until rental equipment could be brought to the site to generate power. Some of the existing power generating equipment at the existing Corrientes Central Electrical Plant may be able to reduce the severity of this loss.

The Business Interruption loss associated with this event is estimated to be **US$ 36.3 million** for the first three months and 21 months of renting generators to supply power to the Corrientes Operations. The extra expense for supplying the power from rental generators is estimated to be about **US$ 14.4 million.** The cost of renting generators is estimated to be **US$ 40,000** per megawatt per month. The Corrientes Power Plant is to supply 17.2 megawatts of power.

The Business Interruption Interdependencies resulting from this postulated loss is that the Corrientes Production field would have to be shut down until rental equipment has been installed and is operational.

Assuming this event occurs on July 1, 2019, the loss would be as shown in Table 8.

Table 8. Machinery Breakdown Loss Estimate for the Block 8 Operations

Loss	Value (MM)
Property Damage	$25.0
Business Interruption	$36.3
Extra Expense	$14.4
TOTAL MACHINERY BREAKDOWN	**$75.7**

5.7 Well Control

The Estimated Maximum Loss (EML) exposure for the well control would be from a blowout from one of the Block 8 Wells oil-bearing zone at the total measured depth of about 4,000 meters (13,120 feet) which would require well capping operations, redrilling of a separate replacement well, and pollution cleanup and containment. The EML is as follows:

Care, Custody and Control:	US$ 4,000,000
Control of Well Operations:	US$ 6,000,000
Redrilling of Well:	US$ 5,000,000
Pollution Containment and Cleanup:	US$ 5,000,000
Estimated Maximum Loss Exposure:	**US$ 20,000,000**

It is estimated that it would take approximately 3 months to drill a separate replacement well and the business interruption associated with this event is **US$ 1.75 million.**

5.8 Summary of Loss Estimates

Table 9 summarizes the loss estimates for the Block 8 Operations.

Table 9. Summary of Loss Estimates for the Block 8 Operations

Loss Event	Process Unit/Area	Loss Estimate (US $ MM)			
		PD	BI	EE	TOTAL
EML: Fire	Corrientes Topping Plant	$2.5	$12.0	$10.0	**$24.50**
EML: Fire	Corrientes Central Electrical Plant (CE II)	$60.0	$36.3	$14.4	**$110.70**
EML: Well Blowout	N / A	$20.0	$1.75	$0	**$21.75**
Machinery Breakdown	Corrientes Central Electrical Plant	$25.0	$36.3	$14.4	**$75.70**

PD = Property Damage BI = Business Interruption EE = Extra Expense

6 SITE FACILITIES

6.1 Process Description

Block 8 has six oilfields and eight production batteries generally grouped into north and south zones, as outlined below and shown in Figure 7, below.

South Zone:	Corrientes	Batteries 1 and 2
	Chambira	Battery 8
	Yanayacu	Battery 3
North Zone:	Pavayacu	Batteries 5 (Inactive) and 9
	Capirona	Battery 4 - Inactive
	Nueva Esperanza	Battery 7 - Inactive

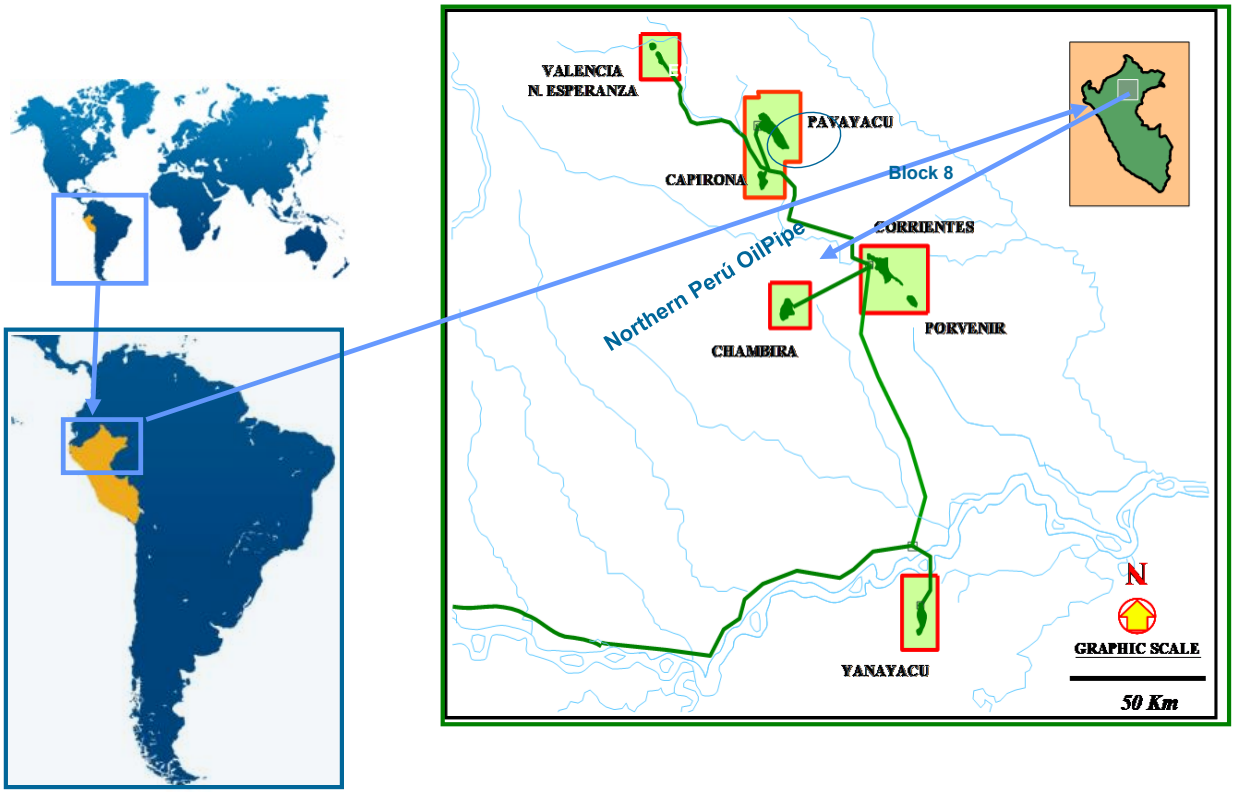


Figure 8. Block 8 Field Locations

The oilfields are aligned north to south over a total distance of some 200 kilometers, as shown in the field map in Figure 9. The figures in green are the approximate thousand barrels per day of production and the figures in white are the API gravity for the oil produced.

A general plot of Block 8 is included in Appendix A.

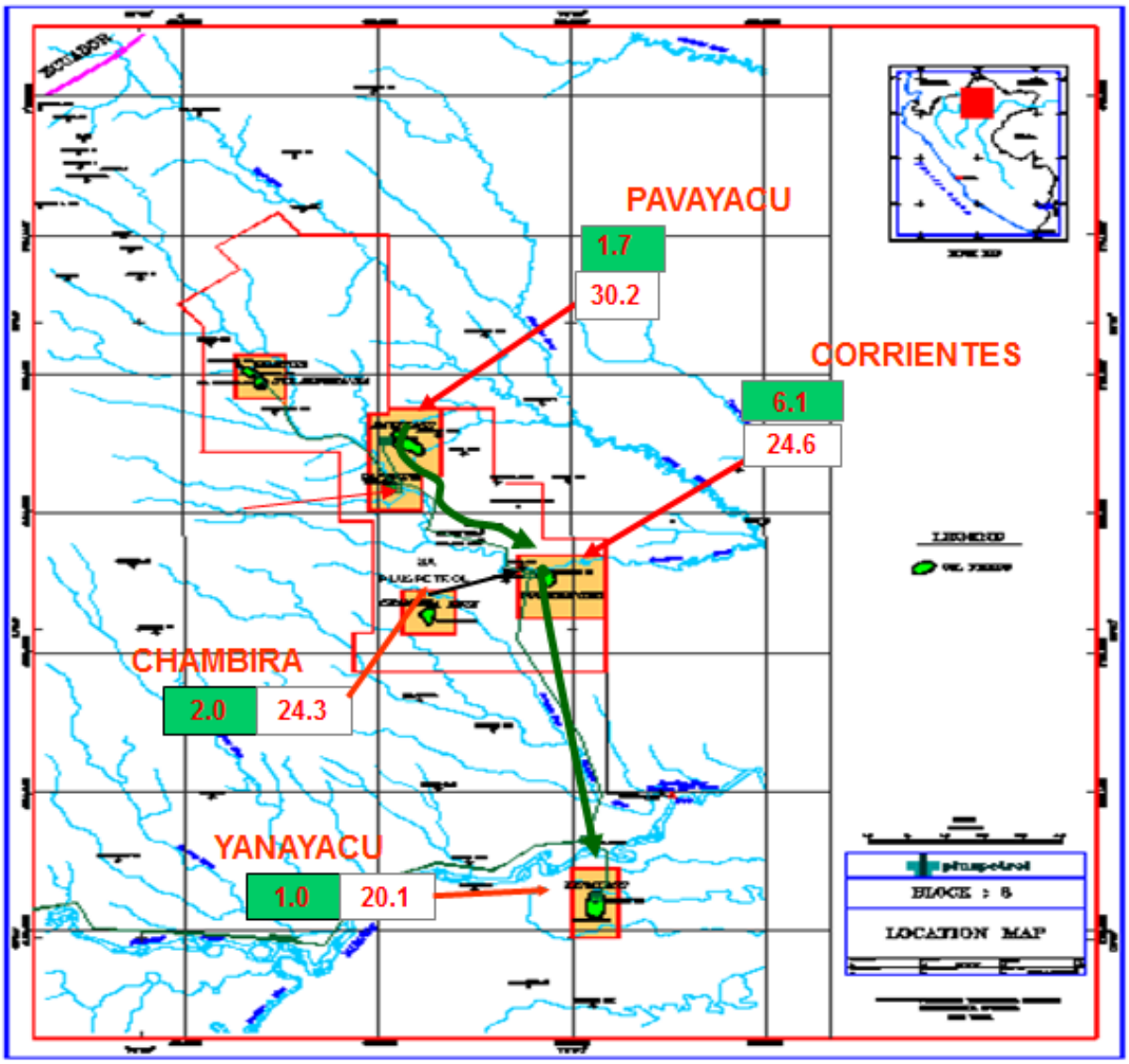


Figure 9. Block 8 Field Map

Table 10 depicts the Block 8 production by field.

Table 10. Block 8 Field Production Data

Field	Barrels Oil Per Day (BOPD)	Produced Water (BWPD)	Number of Production Wells	Number of Injection Wells	Number of High Pressure Pumps
Corrientes and Chambira - Battery 1	3,286	81,340	14	3	7
Corrientes - Battery 2	4,961	236,661	34	5	15
Yanayacu – Battery 3	988	22,018	4	1	2
Pavayacu – Battery 9	1,735	61,391	19	2	4
Total	10,970	401,410	71	11	26

Oil produced from the northern oilfields is transported by pipeline to a pump station near the Capirona Battery and delivered through a 62 kilometer, 10-inch pipeline to the main storage and production center at Corrientes. At Corrientes, production from the north zone fields is combined with the Corrientes and Chambira field production. Due to the differences in API gravity, the crudes are segregated into heavy oil (24°API) and lighter oil (30°API) and stored in separate tankage. There are two 30,000-barrel tanks for each grade at Corrientes, Battery 1.

The segregated crudes are dispatched by the main pump station at Corrientes to the Petroperu export terminal at Saramuro (Pump Station 1), near Yanayacu, 108 kilometers to the south, through two 10-inch pipelines.

The most southern field, Yanayacu, is located south of the Marañon River. Production from the field is transferred by barge across the 750 meter wide river crossing to the export station. Barge oil supply operations to the Iquitos refinery are conducted from a local loading station.

The Block 8 oil production of 10,970 BOPD is provided from a total of 71 active wells. Block 8 has standardized on the Centrilift electric submersible pump units for production wells. Well configuration varies from single vertical wells to multiple deviated wells from wellhead platforms.

Figure 11 depicts the artificial lift configuration used for most of the wells. A development improvement over the last several years has been the upgrading of wellhead platforms from wooden structures to concrete. Well depths are 3,500 to 4,000 meters (11,480 to 13,120 feet). Average production per well is 154 barrels oil per day.

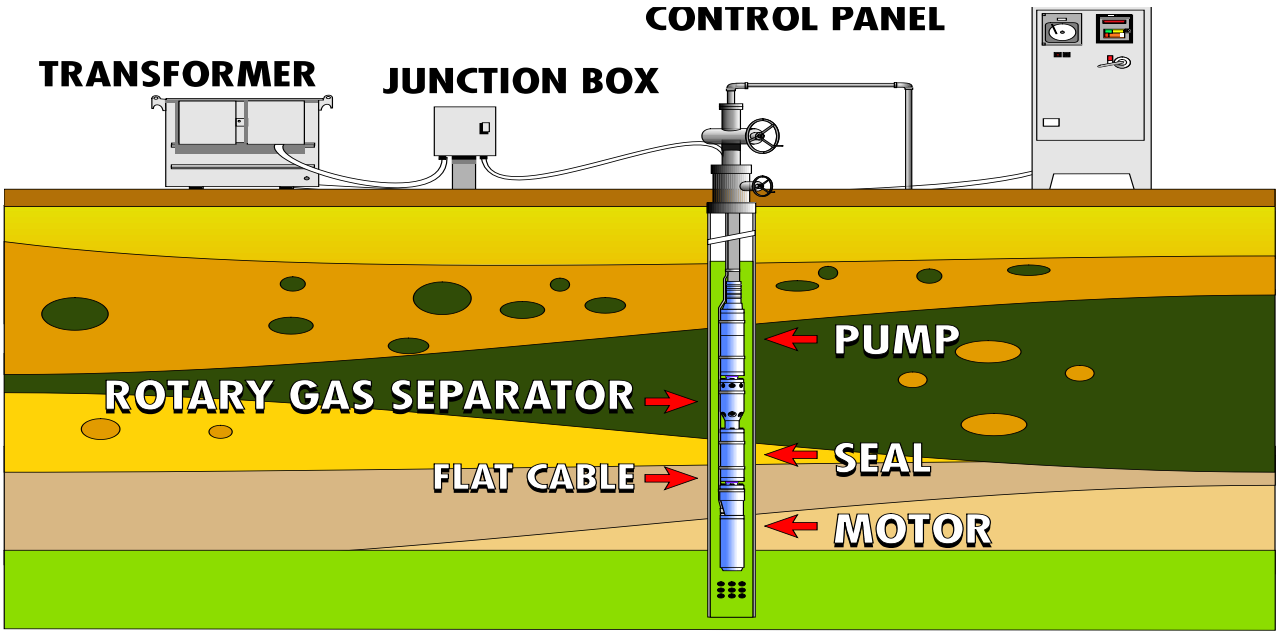


Figure 10.Artificial Lift Basic Configuration for Wells

A key feature of the operation is the very high level of produced water, totaling some 401,410 BPD or about 97.3 percent of total well fluids.

The typical production process at the batteries involves 3-phase separation, gravity settling of separated oil and water in tankage, the transfer of de-watered oil to shipping tanks, and delivery by pump to the collection system. Separated water is drained to API separators and the treated water discharged to local streams. Produced water re-injection facilities are currently returning 100 percent of the produced water to the formation, as required by the Peruvian government.

Separated gas is treated in Freon refrigerant chilling plants prior to distribution as fuel to power plants. The recovered condensate is returned to the shipping tanks. Operating pressures and temperatures are low, and steady production rates are provided by the downhole pumps. Figure 11 on the following page depicts the simplified process flow diagram for the reinjection process.

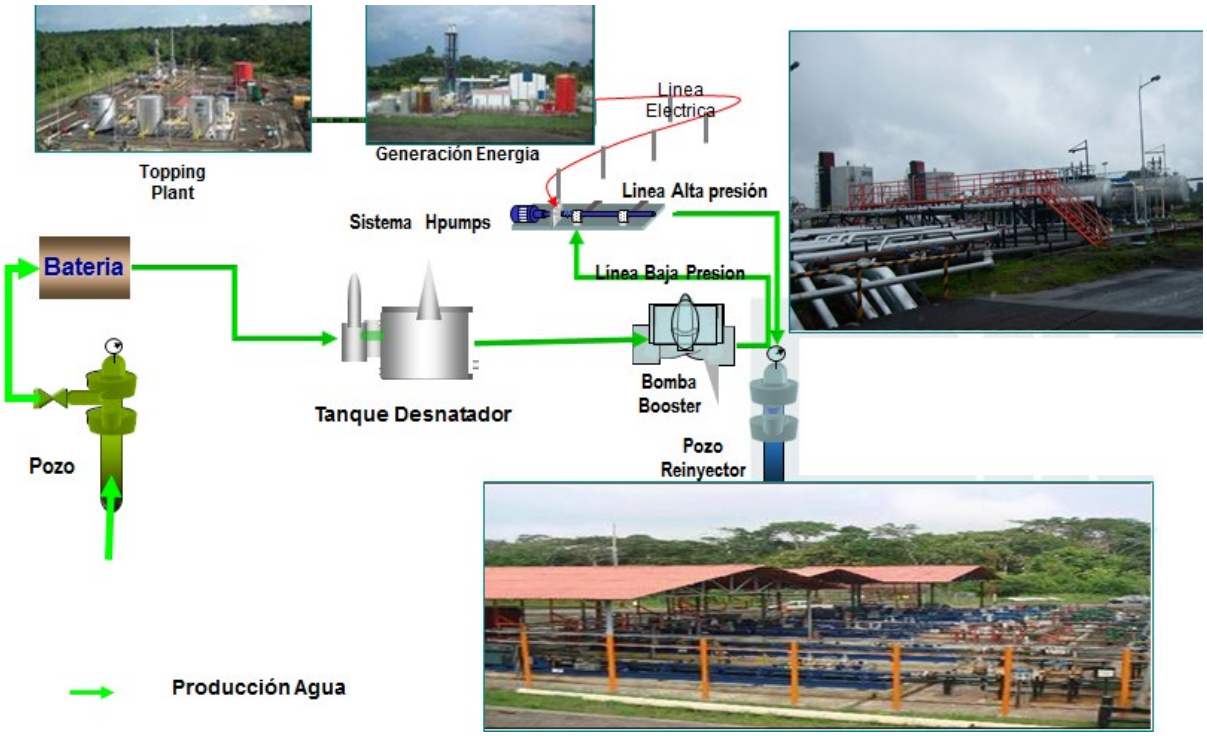


Figure 11. Reinjection Flow Diagram

Electrostatic desalters are installed at the Corrientes Battery 1 and at the Yanayacu Battery 3 for emulsion breaking if this is necessary to meet export crude water/salt content specification.

The Block 8 water injection of 401,410 BWPD is provided from a total of seven active disposal wells. The wells are injected by surface pumps, and Block 8 has standardized on the Centrilift electric horizontal pump systems.

Access to the batteries within the fields is by unpaved roads that can support large loads. The roads are continuously maintained and are reported to be in good condition.

A 3,000-barrel-per-day Topping Plant is located near the Corrientes Batteries (see Figure 12, on the following page). The daily production is 1,020 BPD – Diesel, 600 BPD Heavy Fuel Oil (HFO), and 1,380 BPD Residual and Naphtha.

The process flow diagram for the Topping Plant is included in Appendix B.

A 50.78-megawatt Central Electric Plant (CE II) is also located near the Topping Plant at Corrientes.

Figure 12. Corrientes Topping Plant

6.1.1 Control Systems

Basic oilfield technology is employed and most of the battery production operations are manual. Supervisory Control and Data Acquisition (SCADA) systems are installed throughout Block 8.

BakerRisk's rating for Facilities: Average to Above Average

6.1.2 Operational Status

The Block 8 Operations run 24 hours/day, seven days/week, 365 days/year. Operating personnel work a 14-days-on and 14-days-off schedule.

Camps are located in each of the fields for Block 8.

6.2 Storage and Loading

There are a total of seven main flowlines as follows:

- Two pipelines from Trompeteros to Saramuro (Light and Heavy Oil), near Yanayacu;
- One pipeline Pavayacu - Capirona Pump Station;
- One pipeline Capirona Pump Station – Trompeteros;
- One pipeline Chambira – Trompeteros;
- One pipeline Yanayacu – Barge;
- One pipeline Corrientes 2 - Corrientes 1.

A map showing the block valve stations for the above flowlines is included in Appendix C.

There are three pumping stations as follows:

- Capirona Pump Station - Trompeteros;
- Trompeteros – Saramuro;
- Battery 3 –Yanayacu Freight Station.

There are four Tank Batteries with a total of 20 Storage Tanks (total capacity 230,000 barrels). The Corrientes Battery 1 Tank Farm has the four largest crude oil storage tanks for Block 8. Each of the tanks at this facility has a capacity of 30,000 barrels.

Oil is transferred to Petroperu at Pump Station 1, near Yanayacu as shown in Figure 7 on page 22. Crude is also delivered from the pipeline to the Petroperu El Milargo Refinery at Pump Station 7. The 500,000-barrel-per-day capacity of the pipeline greatly exceeds current production, and was designed initially on the prospect of significantly higher production levels.

A tank list for all of the tank batteries is included in Appendix D.

BakerRisk's rating for this section: Average to Above Average

6.3 Layout and Construction

The production facilities at the Corrientes field are well laid out on open sites as depicted in Figure 13 and Figure 14 on the following page.

Figure 13. Aerial Photo - Corrientes Battery 1

Figure 14. Aerial Photo - Corrientes Battery 2

The Pavayacu batteries are installed on elevated sites of restricted size, and the plant layouts are more congested, as depicted in Figure 15.

Figure 15. Aerial Photo - Pavayacu Battery 9

Tank Battery Plot Plans are included in Appendix E.

There are no buildings associated with the Topping Plant, only process structures, as seen previously in Figure 12.

The Central Electric II Plant Building measures 39.6 meters by 29.6 meters (130 feet by 97 feet) and is equipped with concrete walls and a steel deck roof. Small hose stations are the only fire protection installed in this facility. The Corrientes Central Electrical (CE II) Plant plot plan is included in Appendix F.

BakerRisk's rating for this section: Average to Above Average

6.4 Utilities

6.4.1 Drainage

General drainage is away from equipment, but the sites are relatively level.

6.4.2 Flares

Small flares are provided at each battery to protect the gas plant operations in the event of upset conditions.

6.4.3 Electricity

Power for wells, batteries and camp sites is generated at two main area power stations, one 300 meters west of the Corrientes Battery 1 and the other near the Pavayacu Battery 9. The north zone system also has a number of satellite generator units. Distribution from the main stations is at 10 kilovolt through overhead lines.

The Corrientes Central Electric II Plant Building is equipped with four Wartsila 18V38 heavy fuel-oil-fired generators, rated at 12.695 megawatts each, for a total site-rated power of 50.78 megawatts. About 2,000 gallons of lube oil is associated with each engine-driven generator. The normal load demand is currently about 31,500 kilowatts.

The old Corrientes Central Electrical Plant is equipped with a total of 22 generator units with a total site-rated power of 26,900 kilowatts and is currently in standby mode. There are a range of different generating sets comprising a 2,100 kilowatt Deutz unit, two 700 kilowatt Fuji sets, four 1,800 kilowatt CKD sets, an 1,800 kilowatt MAN unit, two 450 kilowatt Caterpillar sets, three 1,200 kilowatt Cummins, five 1,100 kilowatt Caterpillar sets, and six 1,100 kilowatt electro power trailers. The machines are housed in a sheet metal covered steel-framed building. About 55 percent of the units are fueled by gas, 25 percent are fueled by crude oil, and the remainder by diesel. In June 2008, the installation of an 1,800 kilowatt MAN generator set and an 1,800 kilowatt CKD generator set was completed. The total site rated power was increased to 30,500 kilowatts. Power distribution is a closed loop system. The old Corrientes Central Electrical Plant plot plan is also included in Appendix F.

The Pavayacu main power plant has a total generator site rating of 6,550 kilowatts and a peak load of 4,750 kilowatts. The main plant consists of two 900 kilowatt CKD generators, three 500 kilowatt Fuji generators, two 1,200 kilowatt CAT sets, and two Detroit 800 kilowatt sets. As at the Corrientes plant, the units are installed in a sheet metal steel-framed building. Treated production gas is the main fuel. In April 2008, the installation of two 1,100 kilowatts CAT units was completed. At that time, the total side rated power increased to 8,750 kilowatts with a normal load demand of 6,000 kilowatts. The satellite plant consists of two additional CE generators for the Pavayacu field and single CE generator at the Capirona field.

The Yanayacu main power plant has a total generator site rating of 2,400 kilowatts and a peak load of 1,600 kilowatts. The main plant consists of one 900 kilowatt Caterpillar generator and two 750 kilowatt Caterpillar generators.

There are three 750 kilowatt generators for the Chambira field.

One Line Electrical Diagrams are included in Appendix G.

6.4.4 Heating Systems

Fired heaters are only used at the Corrientes Battery 1 Desalters. These oil heaters are equipped with the following combustion safeguards, as depicted in Figure 16, below:

- Two safety shut off valves with vent in between;
- High and low gas pressure switches;
- Combustion air flow switch;
- Flame scanner;
- Combustion Safeguard Unit, which sequences the purge timer and trial for ignition.

There are no other heating systems associated with the Block 8 operations.

Figure 16. Combustion Safeguards for Oil Heaters

6.4.5 Fuel Gas

Fuel gas is taken from the natural gas product stream for the natural gas fired equipment at Corrientes or other batteries.

6.4.6 Inert Gas

There is no inert gas system at the Block 8 operations.

6.4.7 Process Water

Water is supplied to the site from a pumping station at the Corrientes River next to Battery 1.

6.4.8 Instrument Air

Instrument air is provided by electric motor driven compressors.

BakerRisk's rating for "Utilities": Above Average

6.5 Projects

There are currently two projects underway at the facility:

1. **Network Interconnection Fire Batteries 1 and 2 with the network of Fire Batteries at the Topping Plant in Corrientes.**

   This project involves the interconnection of the firewater systems of Corrientes Batteries 1 and 2 with the firewater system of the Corrientes Topping Plant with a 10-inch diameter high density polyethylene (HDPE) firewater line. This project should maintain a continuous supply of firewater from Corrientes Batteries 1 and 2 or the Topping Plant and vice versa in case of failure of the fire pumps.

Status: Project is in execution phase.

2. **Firewater System improvements for Block 8.**

   This project involves changing fire pumps in:

   - Corrientes Batteries 1 and 2 (two diesel motor-driven 4,000 gpm at 140 psi fire pumps),
   - Battery 3 (Yanayacu: one diesel motor-driven 2,000 gpm at 140 psi fire pump),
   - Battery 9 (Pavayacu: one diesel motor-driven 2,000 gpm at 140 psi fire pump),
   - Battery 8 (Chambira: one diesel motor-driven 2,000 gpm at 140 psi fire pump),
   - Station Pump (Capirona: one diesel motor-driven 2,000 gpm at 140 psi fire pump), and

- Platform 123 (one pump).

The project involves the exchange of fire pumps, modification and replacement of parts of the network against fire, equipment and accessories listed (UL and FM).

Status: Pending installation.

7 MANAGEMENT

7.1 Organization

Management for the Block 8 Operations is controlled by the site-based management team headed by the Block 8 Superintendent, who reports to the Operations Manager of Pluspetrol Norte in Lima, Peru. The General Manager of the Pluspetrol Norte reports to the Pluspetrol headquarters in Buenos Aires.

An organization chart of the Pluspetrol Norte Operations is shown in Appendix H. This is a self-sufficient in-house team covering process operations, maintenance and inspection, reservoir engineering, drilling, projects and administration. The total full-time complement of Pluspetrol management and staff is about 120, with 29 contractor personnel on a daily basis.

Site maintenance works the day shift only. Shift operators work a 14-days-on / 14-days-off, 12-hour shift system and are accommodated at the various field sites.

7.2 Operations

Production operations are manned on 12-hour shifts by four shift teams, two teams on site on the 14-day rotation. Each shift is headed by a supervisor, and one to seven operators per field. An organization chart of the Block 8 Production Operations is also provided in Appendix H.

Operating procedures have been standardized to fit Pluspetrol format and are on an annual review schedule and updated as necessary. Control of future changes will be subject to strict management approval and regular formal reviews are to be introduced.

7.2.1 Experience and Training

Operating staff are given annual training. New recruits undergo a six-month training program and are required to pass written tests prior to becoming an operator. Students from technical colleges are sponsored by Pluspetrol Norte. Average operator experience is 10+ years.

7.2.2 Safe Work Practices

A work permit system is in place. A copy of the permits is included in Appendix I. A Risk Analysis is performed with every work permit that is issued and a copy of the Risk Analysis Form is included in Appendix J.

BakerRisk's rating for "Operations": Above Average

7.3 Maintenance

A comprehensive maintenance and inspection program is in place based on plant criticality and reliability. The computerized maintenance management system in use is the company-wide adopted SAP. An organization chart of the Block 8 Maintenance Group is also provided in Appendix H.

Preventive maintenance is essentially based on running hours, manufacturer's recommendations and experience. Predictive maintenance is based on regular vibration monitoring and smart analysis, infrared thermography and oil analysis.

At the Corrientes Central Electrical II Plant, condition monitoring including vibration and oil analysis is in active use. Excellent online engine performance is achieved. SBS performs the oil analysis every 100 hours for the generators.

There are five levels of work orders, as follows:

- Emergency
- Predictive
- Corrective
- Improvement
- Engineering

Key Performance Indicators (Mean Time Between Failures, Mean Time Between Repairs and Completed Preventive Maintenance Tasks are tracked on a monthly basis.

BakerRisk's rating for "Maintenance": Above Average

7.4 Inspection

Relief valves and tank pressure vacuum (PV) valves are tested at six-month intervals.

Plant inspection for tanks, pressure vessels and piping is also criticality-based in accordance with API guidelines.

Welders are certified annually to ASME standards. Welds on high pressure lines are subject to 100 percent X-ray examination.

Maintenance spares are replenished through the SAP Maintenance Management System. Inspections are up-to-date.

BakerRisk's rating for "Inspection": Average

7.5 Fire, Safety & Security

7.5.1 Fire & Safety

The Lima office organization includes a senior Environmental, Health, and Safety (EHS) manager, who reports to the General Manager. He has a local support staff of three and coordinates the EHS activity throughout Block 8 with the four site-based field EHS supervisors in Block 8. The EHS Manager is responsible for coordinating the Pluspetrol Resource Corporation safety policy within Peru and in this respect has a reporting link to the Senior Corporate EHS Manager in Buenos Aires. EHS activity in Peru is monitored by the State Regulator, OSSINERG (Organisacion Supervisor Industria Energia).

EHS management is conducted in line with the Corporate Policy Statement (Appendix K). Safety is a line function.

The staff receives safety training every six months and this includes refresher training on the STOP safety behavioral process. In addition, weekly safety meetings are held by supervisors on current safety topics.

Pluspetrol has developed an online site for regulatory documents based on Recognized and Generally Accepted Good Engineering Practices (RAGAGEPs) as shown in Figure 17, below.

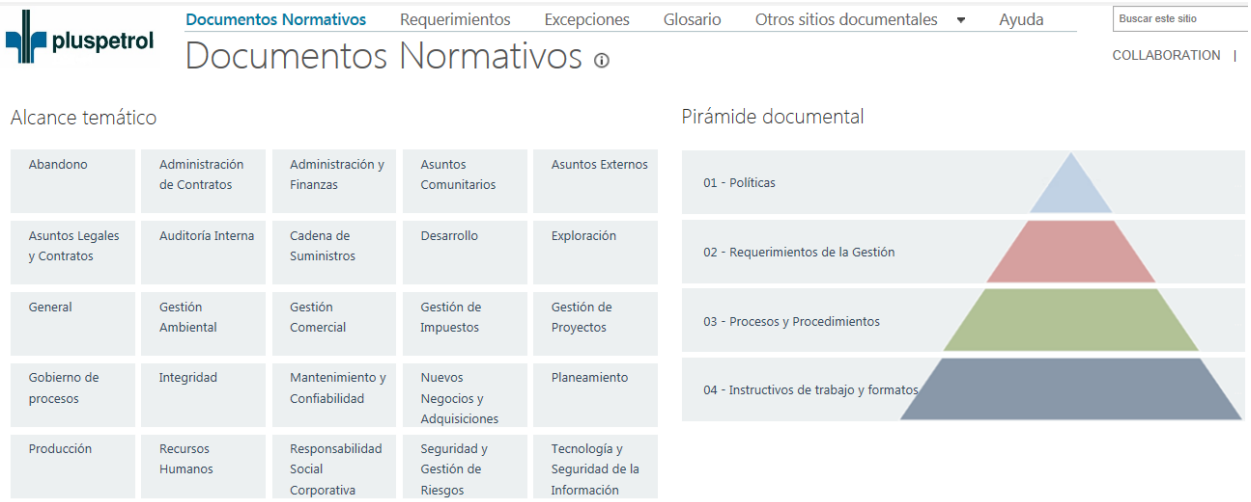


Figure 17. Pluspetrol RAGAGEP Site

A philosophy of line management being responsible for plant safety has been adopted with the safety personnel providing training, auditing, and acting in an advisory role.

This is based on Pluspetrol safety manuals and other related documentation, which have been developed at their operations in Argentina.

Applicable detailed safety procedures have been developed and include an incident investigation procedure (see Figure 18, below). Every employee on site has the capacity to access these procedures.

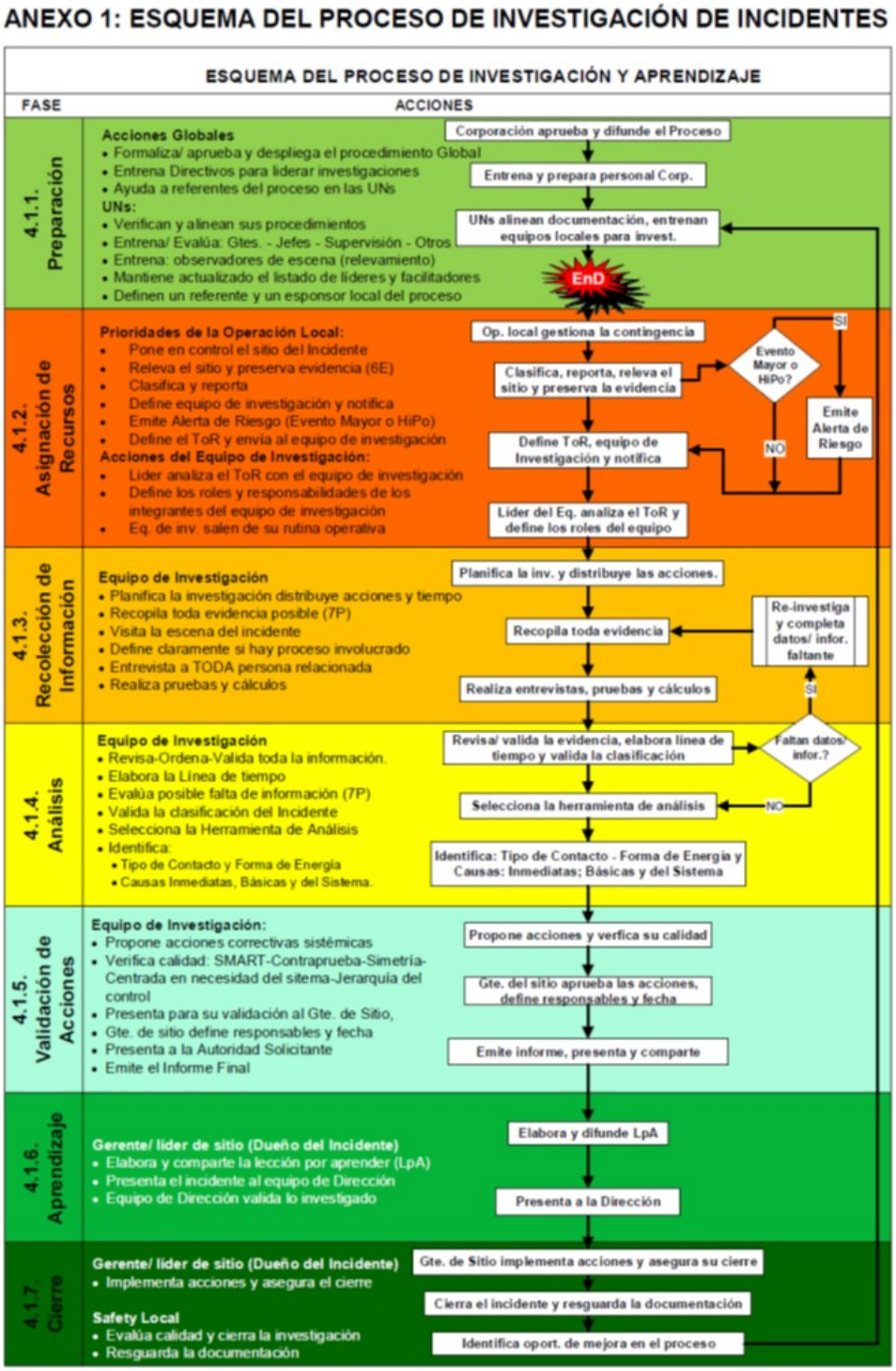


Figure 18. Incident Investigation Process

A safety guide is provided to personnel working at Block 8. Clearly defined safety objectives have been set out for each location which includes audits, housekeeping, simulations, safety competitions, TOP objectives, etc. Indicators are tracked monthly against objectives.

Tarjeta de Observacion Preventiva (TOP) was implemented in November 2015 (Figure 19). It is similar to the Safety Training Observation Program (STOP) card, but designed by Pluspetrol personnel. Its main focus is on operational safety and elements of process safety. These TOP cards are provided to each of the facilities' area authorities.

Figure 19. TOP Card

Pluspetrol has also implemented a central database for action item tracking called SIGA (Sistema Integrado de Gestion de Acciones).

A Corporate Pluspetrol HSE committee meets every six months to review performance in operational areas, including Argentina, Peru, Angola and Bolivia. It also approves training plans and sets out the corporate safety objectives. Lessons learned are shared with the entire corporation.

Monthly meetings are also held with all contractors to review safety performance and a site safety committee also meets monthly together with a number of sub-committees dealing with specific safety issues.

Senior management conduct site audits every two months. Audit results and non-conformities are loaded into a database for tracking.

The permanent maintenance contractors are evaluated on a monthly basis and safety performance indicators generated. These indicators form part of the maintenance contract.

There is also an annual risk review process that is used to evaluate the various operations of Pluspetrol. This process is shown in Figure 20, below.

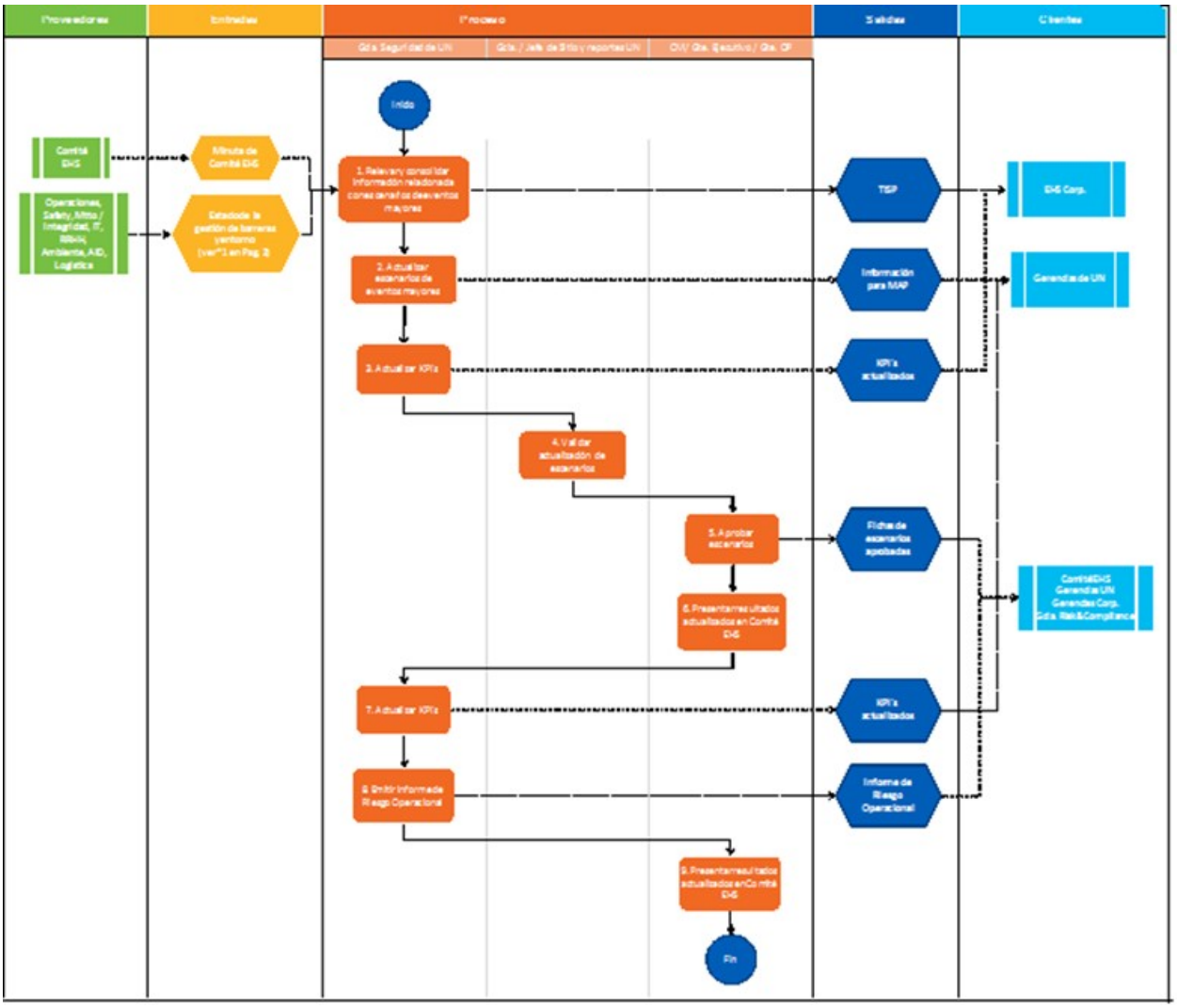


Figure 20. Annual Risk Review Process

An intensive safety training program has been developed and is ongoing for the Camisea Operations personnel, which includes personal safety equipment, first aid, fire protection equipment, permit to work and equipment isolation. This includes the maintenance contract personnel who also have their own safety personnel and training program, which is monitored by Pluspetrol.

New employees and contractors have a 60-minute basic induction training course covering the Pluspetrol HSE policy, followed by more specialized training as follows:

- Basic HSE rules — 60 minutes
- Contingency plans — 60 minutes
- TOP observation program — 8 hours, plus 4 hours every month refresher
- Drug and alcohol policy — 60 minutes
- Work suspension policy — 60 minutes
- Accident investigation procedure — 4 hours every three months

Computer-based training is also provided once a year for basic safety, work permit process.

Training is documented and includes a test. A full safety training matrix has been developed to monitor training activity. Accidents and incidents are formally investigated and corrective action taken.

7.5.2 Process Safety Management

At the corporate level, Pluspetrol has started several projects to improve its overall Safety and Operations integrity. Pluspetrol is committed to improve its performance in Process Safety by adhering to the most recognized industry practices. As a member of the CCPS (Center for Chemical Process Safety), the risk based process safety framework is adopted to guide several initiatives to develop or enhance current company standards and procedures, some of them are depicted in Figure 21, on the following page. The areas shown in green have been implemented and validated. The areas shown in yellow are in progress. This entire process will take several years to fully implement and goals have been established to implement several additional areas over the next two years.

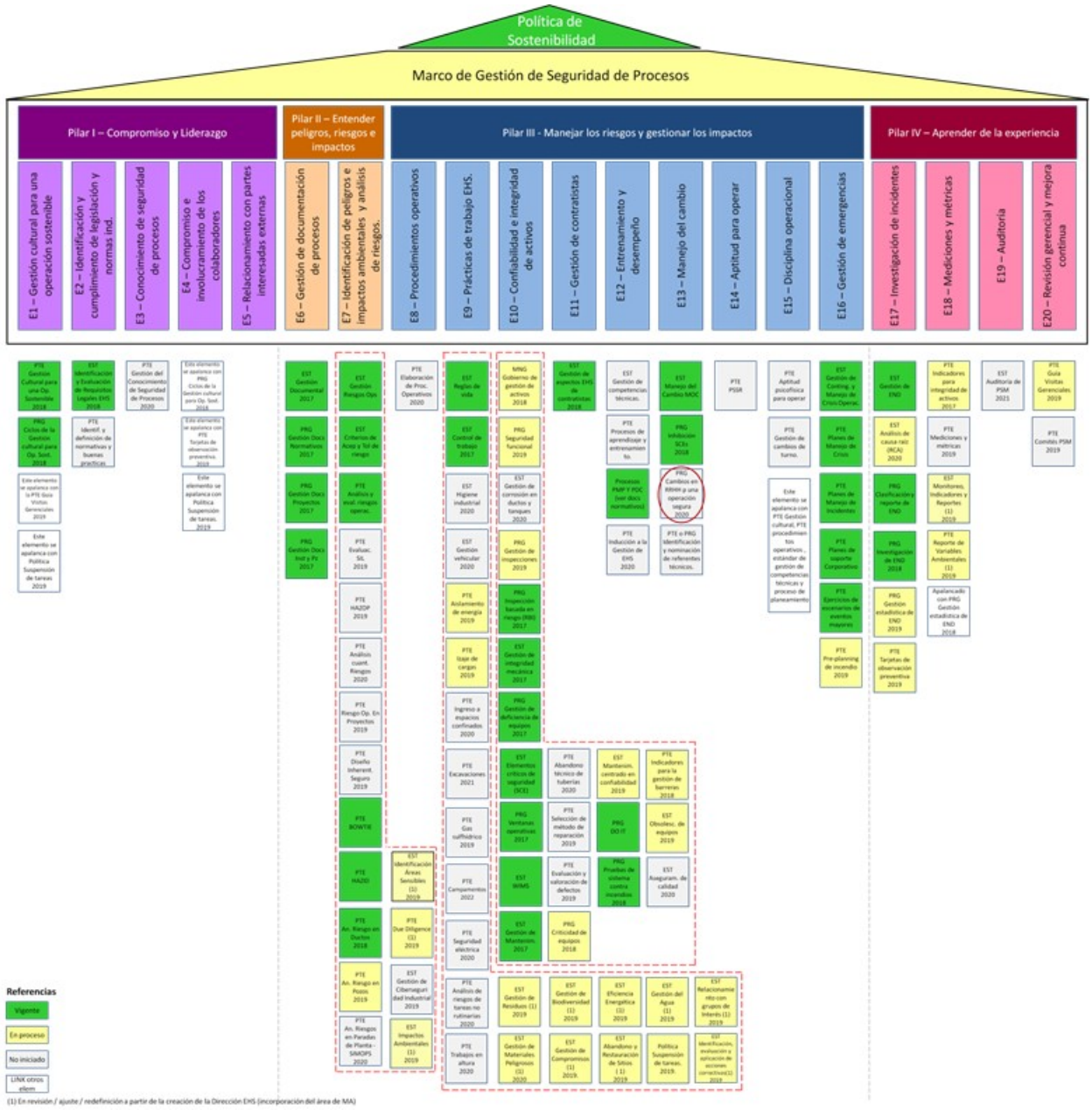


Figure 21. Pluspetrol Process Safety Management Process

From 2014 to 2018, several Process Safety Training (4-days) Bootcamps were held at different locations with CCPS personnel as coaches to educate personnel on the key concepts of process safety management. A summary of the number of personnel who attended this training is shown in Table 11.

Table 11. Process Safety Training Attendance Summary

PROCESS SAFETY	N ° DE PARTICIPANTES
CCPS COURSE	82
2014	26
2015	27
2016	26
2017	2
2018	1
CONFERENCE	38
2014	7
2015	1
2016	22
2018	8
Grand Total	120

7.5.2.1 Management of Change:

A management of change procedure is in place, which clearly defines a modification and the authorization/approval routing. A temporary change can only last for up to 10 months. There is a requirement for a hazard analysis included in the procedure, which is determined by the Safety Superintendent. A report is prepared every week listing the active MOCs for review and follow-up by the technical committee and documents the actions required.

Pluspetrol corporate team developed a Corporate Standard for MOC processes at the beginning of 2016. This standard contains a minimum list of what type of temporary and permanent changes should be evaluated with this process and these include organizational, operational, equipment, planning, contractual/suppliers, and projects. This standard has now been implemented.

7.5.2.2 Facility Siting:

No facility siting studies have been completed for the Block 8 Operations.

7.5.2.3 Process Hazard Analyses:

A Hazard and Operabilities (HAZOP) Study was performed for the Topping Plant.

7.5.3 Emergency Response Team

Shift operators and maintenance staff man the first-line emergency response team in the event of a fire. Drills are conducted on a monthly basis. The Corrientes Central Electric (CE II) Plant has a fire brigade with bunker gear for two people, which is the total number of people on duty. In the event of a fire, additional resources are available at Corrientes.

There are three levels of an emergency:

1. Level 1 – Relatively small incident, which can be quickly controlled.
2. Level 2 – An event that can be handled by local emergency response team. A local Crisis Committee would be activated to help coordinate local resources needed to respond to the emergency.
3. Level 3 – An event that needs outside assistance. A Crisis Committee in Lima would be activated to help coordinate external resources needed to respond to the emergency.

The Communication Flow Diagram for emergencies is provided as Figure 22 below.

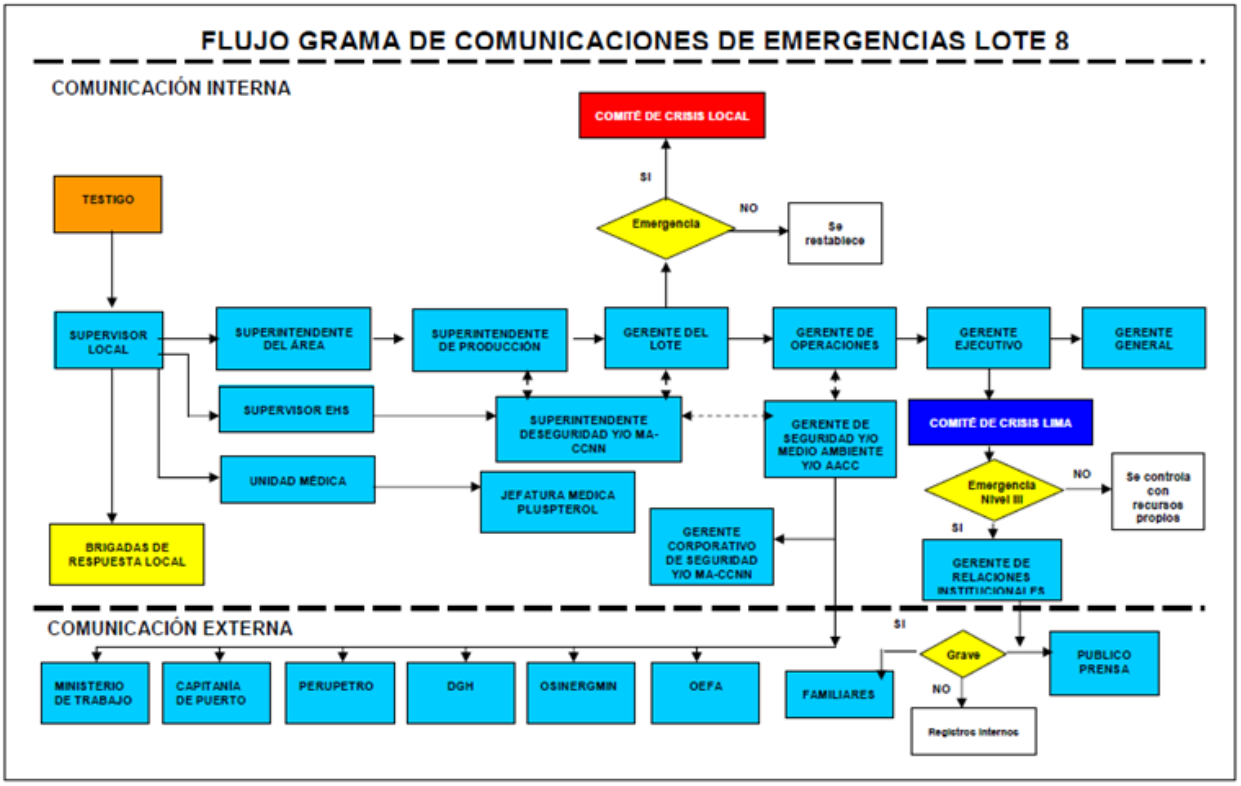


Figure 22. Communication Flow Diagram for Emergencies for Block 8

The Emergency Response Team Organization Chart is included in Appendix L.

7.5.4 Emergency Preparedness Program

Detailed Contingency Plans are in place and regular emergency drills are conducted on a monthly basis.

A fire training grounds has been constructed and is being used by Block 8 personnel for training in emergency response, as depicted in Figure 23 and Figure 24.

Figure 23. Block 8 Fire Training Grounds

Figure 24. Block 8 Fire Training

7.5.5 Outside Protection

Outside protection is very limited and a response would take over two hours to arrive at the site.

7.5.6 Loss Prevention Self-Inspections

The Block 8 Operations have responsibility for the fire protection equipment. Operations personnel conduct periodic inspections of the "initial response" type equipment in their respective areas.

Inspection frequencies and responsibilities are depicted in Table 12, below.

Table 12. Inspection Frequencies and Responsibilities

Fire Protection Equipment	Operations' Responsibility	EHS' Responsibility
Fixed Firewater Pumps	Weekly test run/inspection	Annual performance tests
Fixed Water Spray and Deluge Systems	Weekly inspection	Annual Tests
Firewater System, including Monitors & Valves	Weekly inspection	Annual Maintenance
FM 200 System		Semi-annual inspection
Smoke Detection System	Quarterly Inspection	Annual Test
Hydrocarbon Detection Systems	Quarterly Inspection	Annual Test
Fire Extinguishers	Monthly inspection	Annual inspection
Foam		Annual inspection/test

BakerRisk's rating for "Fire, Safety & PSM": Average to Above Average

7.5.7 Security

These are remote facilities and the major tank batteries are fenced and lighted.

BakerRisk's rating for "Security": Average

8 PLANT PROTECTION FACILITIES

8.1 Firefighting Facilities (Fixed & Mobile)

8.1.1 Firewater System

Fire mains are provided around the production plant and storage areas. Generally single fire water pumps, diesel driven, are provided with no jockey pump. The firewater pumps are manually started. There is a current project to install eight new UL listed fire pumps and several new foam systems in Block 8. This project should be complete by mid-year 2014 – was this completed and if so, please provide details.

The two fire pumps (one electric and one diesel) for the Wartsila Central Electric II (CE II) Power Plant are rated at 120 cubic meters/hour at 106 meters (528 gpm at 347 feet head or 150 psi) and take suction from a 700 cubic meter tank (about 185,000 gallons) with 600 cubic meters (about 158,000 gallons) reserved for firewater. A previous recommendation has been made to replace these fire pumps with fire pumps (one diesel and one electric) that have the following rating: 450 cubic meters/hour at 106 meters (2,000 gpm at 347 feet head or 150 psi). And, also increasing the size of the suction tank at the Wartsila Central Electric Plant (CE II) to 950 cubic meters (about 250,000 gallons) from the existing 600 cubic meters (about 158,000 gallons).

The two fire pumps (one electric and one diesel) for the Topping Plant at Corrientes are rated at 1,500 gpm at 347 feet head or 150 psi, and take suction from a 500,000 gallon tank.

At Corrientes, there are two diesel engine-driven fire pumps, each rated at 2,400 gpm at 150 psi that take suction from the Corrientes River as depicted in Figure 25, below. Fire pump data is included in Appendix M for the remaining Block 8 operations.

Figure 25. Corrientes Battery 1 and 2 Fire Pumps

Firewater drawings are included in Appendix N.

There are an adequate number of hydrants and monitor nozzles installed in the process areas. Monitor nozzle protection is provided at some of the Electrical Plants, as shown in Figure 26, below, and is considered to be adequate.

Figure 26. Monitor Nozzle Protection (with a radiant heat shield) at the Pavayacu Electrical Plant

8.1.2 Water Deluge Systems

There are water deluge systems for two sets of crude oil pumps in the Topping Plant for Block 8 operations, which are actuated by hydrocarbon detectors. Water spray systems have been installed over Crude Oil Pump Nos. P-1101 A/B and Residue / Naphtha Pump Nos. P1104 A/B. The water spray system is designed to provide a density of 0.50 gpm over the entire surface area of the pumps. This results in a flow of approximately 57 gpm for each pump.

Exposure protection has been provided for each of the storage tanks and is designed to provide a density of 0.15 gpm/square foot on the surface area exposed to radiant heat from a fire in another tank.

8.1.3 Automatic Sprinkler Systems.

An automatic sprinkler system is provided over Residue Oil Pumps Nos. P-1102 A/B, Product Pump Nos. P-1103 A/B, Diesel Column Reflux Pump Nos. P-1105 A/B, Crude Column T-1101 and Diesel Tank No. TK-1101 for the Topping Unit, as depicted in Figure 27 and Figure 28, on the following page. The system also covers the Crude Column up to 20 feet. The 24 sprinklers are supplied via a 3-inch connection controlled by an outside screw and yoke (O.S.&Y.) valve from the 10-inch water main. The sprinkler system for the pumps are designed to provide a density of 0.50 gpm over the entire surface area of the pumps and the sprinklers for the Diesel Tank, as well the columns are designed to provide a density of 0.30 gpm over the entire surface of the container or area.

Figure 27. Automatic Sprinkler Protection for Diesel Fuel Tank in Topping Unit

Figure 28. Automatic Sprinkler Protection for Pumps in the Topping Unit

8.1.4 Fixed & Semi-Fixed Foam System

Fixed foam (AFFF – 3 percent) systems are provided at the storage areas, some for direct subsurface injection to the tanks, and others for application by monitors as depicted in Figure 29 and Figure 30 below. Foam System Drawings for the Batteries are included in Appendix O.

Figure 29. Corrientes Fixed Foam Tank and Proportioning System

Figure 30. Fixed Foam Lines (yellow) Feeding Crude Oil Storage Tanks at Corrientes Battery 2

Fixed foam and semi-fixed foam systems have been provided for oil storage tanks at the Topping Unit. The AFFF tank has a capacity of 500 gpm and the pressure supply system is designed to deliver 3 percent foam solution at design rates to each of the storage tanks. The foam is to be supplied subsurface into the tanks. The design density foam system for storage tanks is 0.10 gpm / square foot of surface area for 55 minutes according to Regulation Peruvian "Safety Regulations for the Storage of Hydrocarbons" DS No. 052-93-EM. The foam system is also designed to provide a density of 0.16 gpm /square foot in the dike area for 30 minutes from the foam monitor nozzles in accordance with Regulation Peruvian "Safety Regulations for the Storage of Hydrocarbons" DS No. 052-93 - EM. The systems are also designed in accordance with NFPA 11 - Standard for Low, Medium and High Expansion Foam.

8.1.5 Mobile Firewater and Foam Systems

There is no mobile firewater equipment associated with the Block 8 operations. Foam drums are stationed next to monitor nozzles and can be used to combat a fire. Two small foam carts (four 5-gallon foam totes and several lengths of 1½-inch hose) are provided in the Wartsila Central Electric II Power Plant.

8.1.6 Fixed Gaseous and Water Mist Extinguishing Systems

An FM 200 gaseous extinguishing system is provided in the Switchgear Room, immediately adjacent to the Control Room for the Topping Plant. There are no other fixed gaseous or water mist extinguishing systems associated with the Block 8 operations.

8.1.7 Fire Hose

There are small hose stations in the Wartsila Central Electric II Power Plant, which provide the only protection for this key equipment. Small hose stations are also provided at the Chambira, Pavayacu, and Yanayacu Electric Plants. There are no other fire hoses associated with the Block 8 operations, as monitor nozzles are provided in the process areas.

8.1.8 Hand & Wheeled Extinguishers

Hand and wheeled extinguishers are strategically located throughout the Block 8 operations. Inspection of this equipment is conducted on a monthly and annual basis.

BakerRisk's rating for "Fire Fighting Facilities": Average

8.2 Fireproofing

Limited fireproofing is provided in the process areas for the Block 8 operations. Fireproofing is considered to be "Good" at the Corrientes Topping Plant.

BakerRisk's rating for "Fireproofing": Average

8.3 Fire and Gas Detection

A Smoke Detection System is provided in the Camp areas.

Smoke detectors are tested quarterly and calibrated annually to assure they function properly.

Hydrocarbon detectors are provided in the Topping Plant to actuate deluge systems over two sets of crude oil pumps that feed the plant.

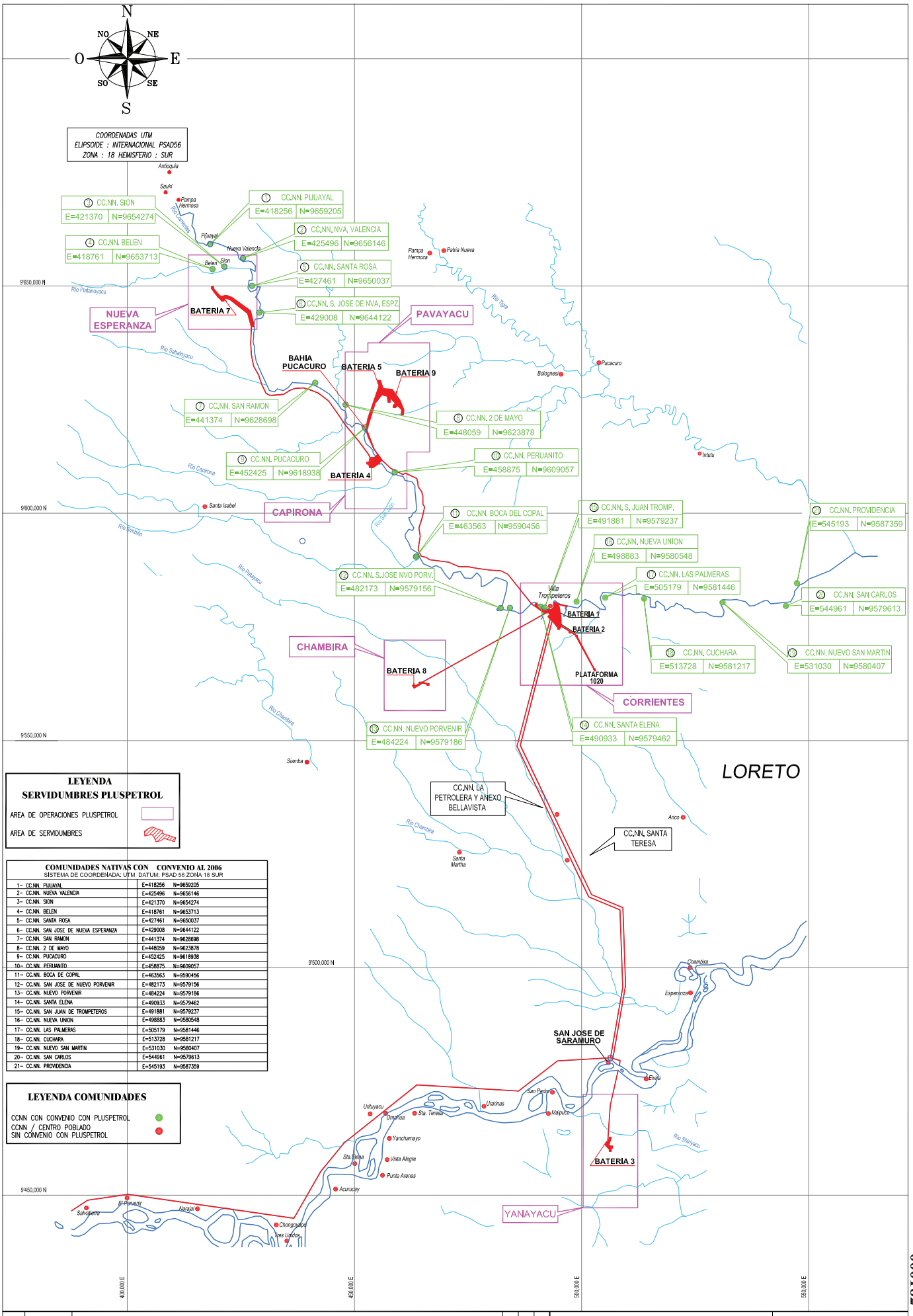
BakerRisk's rating for "Fire and Gas Detection": Average

8.4 Emergency Shutdown (ESD) Systems

ESD systems are provided for plant protection in emergencies. Over-pressure protection of the separators is provided by single relief valves and bursting discs. Generally the relief valves vent to atmosphere locally, and only the relief valves on the larger separators (Corrientes - Battery 2) are connected to remote containment pits.

BakerRisk's rating for "Emergency Shutdown Systems": Average

APPENDIX A. BLOCK 8 PLOT PLAN



Nº	FECHA	REVISADO	POR	REV	APR
0	14.12.06	EMITIDO PARA INFORMACION	M.R.	R.M.	V.Q.

LOTE 8
AREA DE OPERACIONES PLUSPETROL
UBICACION GENERAL

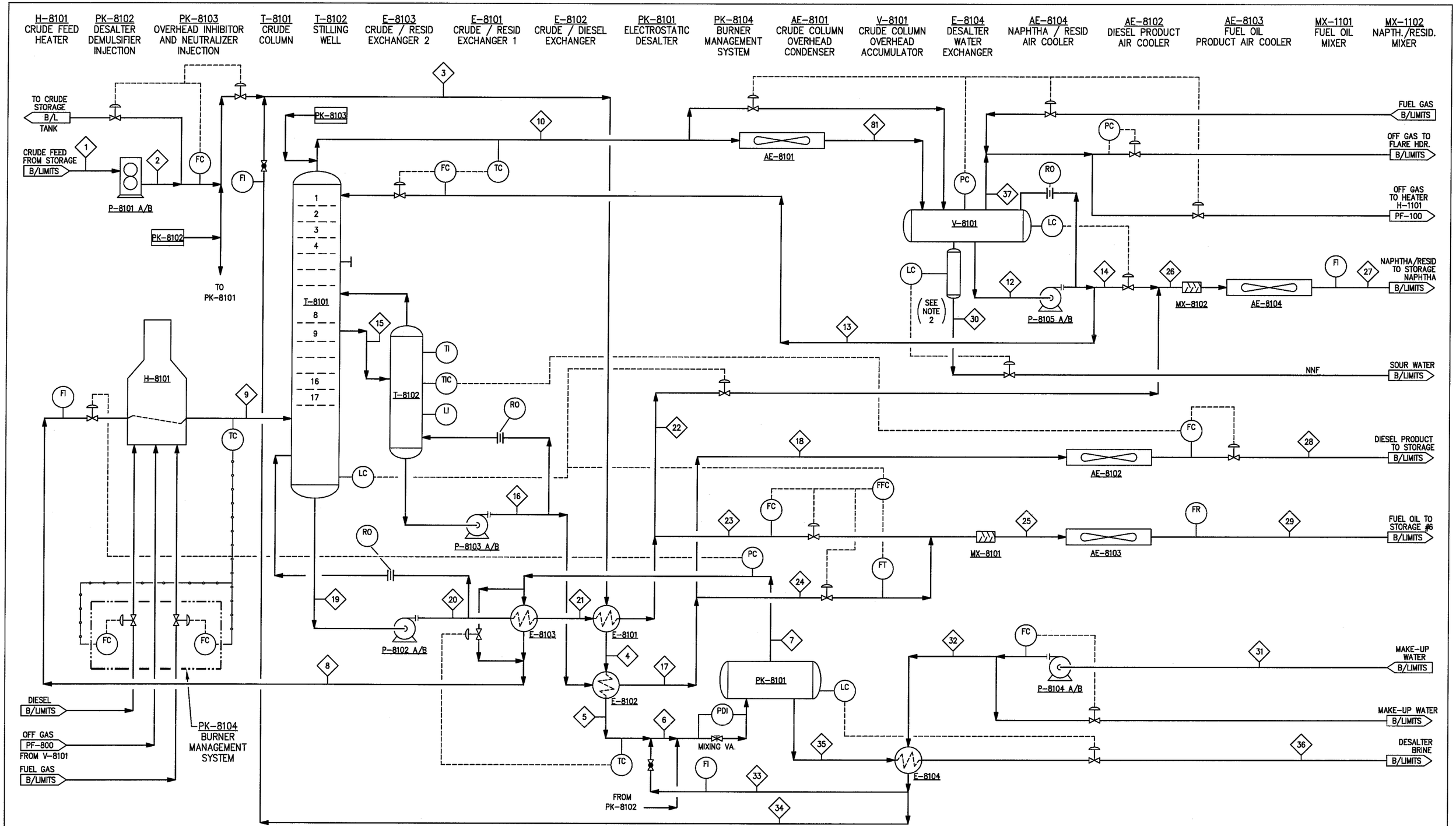
Pluspetrol Norte S.A.
DEPARTAMENTO DE CONSTRUCCIONES
AREA DE PROYECTOS

DIGITALIZADO:	DISEÑADO:	REVISADO:
M. RIOS	PROYECTOS	R. MARIN
FECHA: 14.12.06	FECHA: 14.12.06	APROBADO: V. QUEZADA

ESCALA: 1/750,000 | ARCHIVO: 061210-1-L8 | REV.:
PLANO Nº: 061210-1-L8 P00 | PLANO Nº: 1/1 | FORMATO: A3

000182

APPENDIX B. PROCESS FLOW DIAGRAM TOPPING PLANT



NOTES:

1. SEE MATERIAL BALANCE FOR VALUES ON STREAMS
2. LOCATE BOOT AT GRADE FOR EASY VIEWING.
3. MECHANICAL DEPT. TO FINALIZE PUMP TYPE FOR P-8101 A/B.

REVISION DESCRIPTION AREA

NO	BY	CHK	APP	DATE	DESCRIPTION
C	TC	MWH		11/28/07	ISSUED FOR DESIGN
B4	TC	JDS		10/31/07	RE-ISSUED FOR APPROVAL

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	SIGNATURE	DATE
DRAWN	SB	05/30/07
CHECKED		
APPROVED		
APPROVED		
APPROVED		

PLUSPETROL NORTE S. A.
TROMPETEROS TOPPING PLANT BLK. 8

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REVISION DESCRIPTION
A = PRELIMINARY B = CLIENT APPROVAL
C = APPROVED FOR DESIGN
D = APPROVED FOR CONSTRUCTION

SCALE: NONE

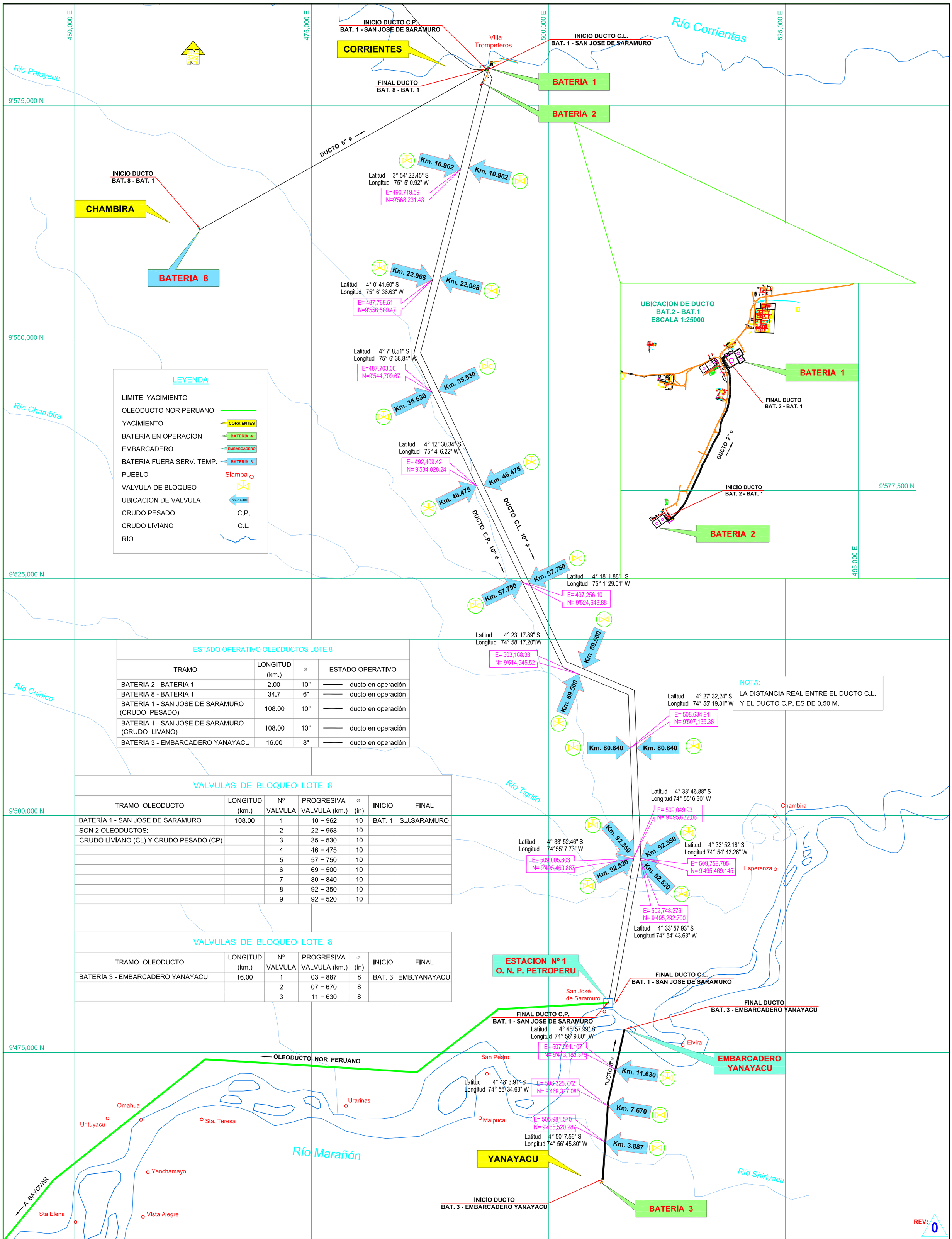
VENTECH ENGINEERS INTERNATIONAL CORP.
PASADENA, TEXAS 77502 P.O. BOX 4261

PL08-0210-PL-Y-800 REV. C

4000 BPSD DIESEL TOPPING UNIT
CORRIENTES CRUDE
PROCESS FLOW DIAGRAM

JOB NUMBER	DRAWING NUMBER		REV.
4664-012	PF-800		C

APPENDIX C. FLOWLINE BLOCK VALVE LOCATIONS



ESTADO OPERATIVO OLEODUCTOS LOTE 8

TRAMO	LONGITUD (km.)	⌀	ESTADO OPERATIVO
BATERIA 2 - BATERIA 1	2.00	10"	——— ducto en operación
BATERIA 8 - BATERIA 1	34.7	6"	——— ducto en operación
BATERIA 1 - SAN JOSE DE SARAMURO (CRUDO PESADO)	108.00	10"	——— ducto en operación
BATERIA 1 - SAN JOSE DE SARAMURO (CRUDO LIVANO)	108.00	10"	——— ducto en operación
BATERIA 3 - EMBARCADERO YANAYACU	16.00	8"	——— ducto en operación

VALVULAS DE BLOQUEO LOTE 8

TRAMO OLEODUCTO	LONGITUD (km.)	Nº VALVULA	PROGRESIVA VALVULA (km.)	⌀ (in)	INICIO	FINAL
BATERIA 1 - SAN JOSE DE SARAMURO	108.00	1	10 + 962	10	BAT. 1	S.J.SARAMURO
SON 2 OLEODUCTOS:		2	22 + 968	10		
CRUDO LIVIANO (CL) Y CRUDO PESADO (CP)		3	35 + 530	10		
		4	46 + 475	10		
		5	57 + 750	10		
		6	69 + 500	10		
		7	80 + 840	10		
		8	92 + 350	10		
		9	92 + 520	10		

VALVULAS DE BLOQUEO LOTE 8

TRAMO OLEODUCTO	LONGITUD (km.)	Nº VALVULA	PROGRESIVA VALVULA (km.)	⌀ (in)	INICIO	FINAL
BATERIA 3 - EMBARCADERO YANAYACU	16.00	1	03 + 887	8	BAT. 3	EMB.YANAYACU
		2	07 + 670	8		
		3	11 + 630	8		

No	DATE	REVISION	BY	CHKD	APP

LOTE 8
VALVULAS DE BLOQUEO
DUCTOS PRINCIPALES - ZONA SUR
UBICACION

ESCALA : 1:250,000	DIBUJO : OTTO SCIPION	REVISADO : COA / ARR
FECHA : FEBRERO 2004	AUTOR : EHS	APROBADO : MMC

Pluspetrol Norte S.A.

LAMINA : HOJA 8/11
DUC-VB3
ARCHIVO : DUCTOS4.DWG

TOP CAD
TOPOGRAFIA COMPUTARIZADA E.I.R.L
Edo. del Castillo 2451 - Lima 1 - Perú
Tlf. 425-8019 / 337-7239 Fax 425-9320
E-mail : otto_scipion@yahoo.com

APPENDIX D. TANK LIST – ALL BATTERIES

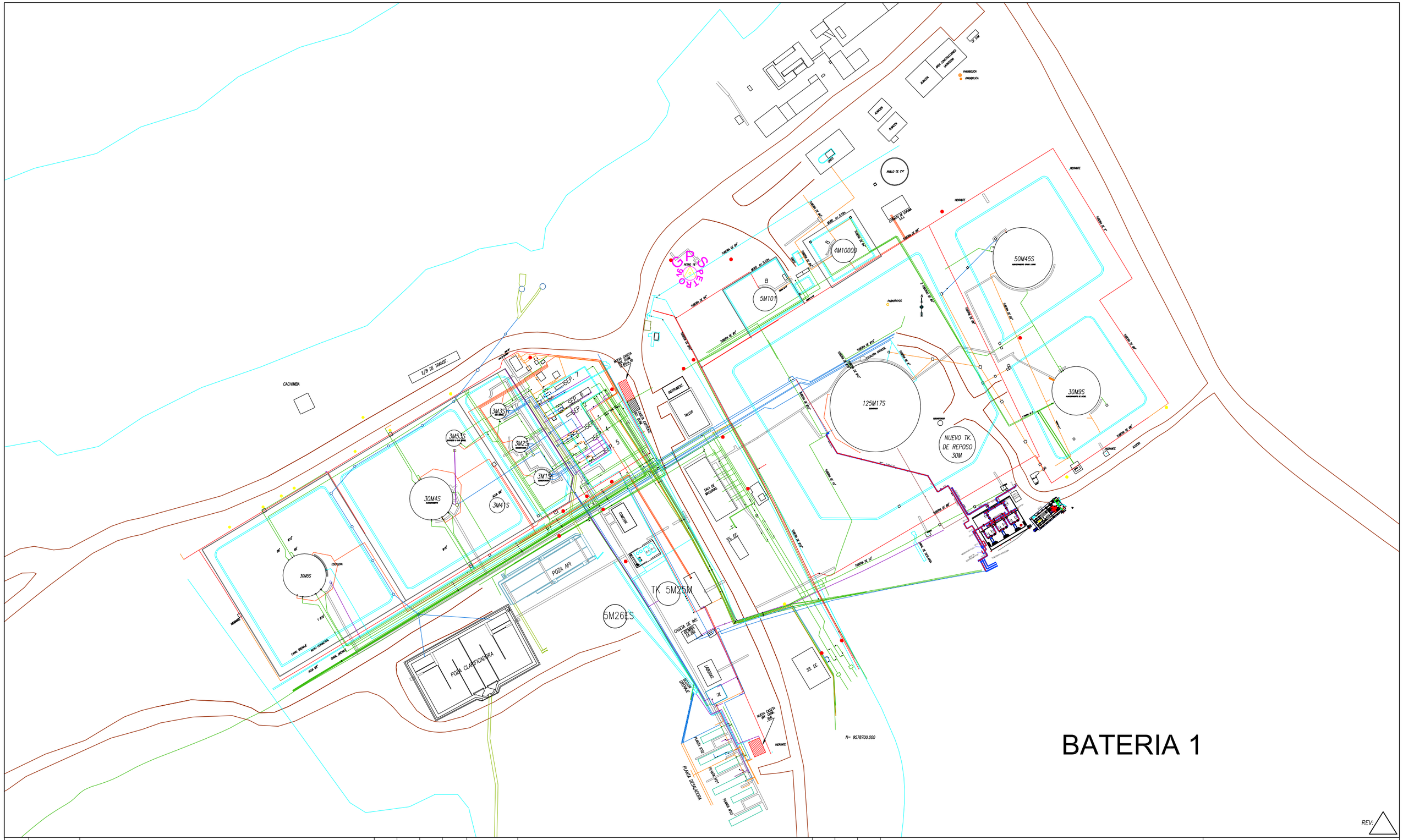
CCTQ - Pluspetrol
Lote-8

LISTADO DE TANQUES DE PRODUCCION , LOTE-8

LOCACION	ITEM	TANQUE NUMERO	AÑO FABRICAC.	DIAMETRO (m)	ALTURA (m)	CAPACIDAD (m3)	CAPACIDAD BBLS
BAT 1	1	3M1S	1974	8.10	9.16	472	2,969
	2	3M2S	1974	8.10	9.16	472	2,969
	3	3M3S	1974	8.10	9.16	472	2,969
	4	3M53S	1998	8.10	9.16	472	2,969
	5	3M41S	1983	7.88	9.79	477	3,002
	6	30M4S	1974	21.66	12.72	4687	29,481
	7	30M5S	1976	21.66	12.72	4687	29,481
	8	10M6S	2008	16.70	7.50	1643	10,333
	9	50M45S	1988	30.60	10.80	7942	49,958
	10	125M17S	1978	45.50	12.00	19512	122,728
	11	5M25E FW	1977	11.82	7.80	856	5,384
	12	5M24 E FW	1976	11.82	7.80	856	5,384
	12	30M9S DIES	1976	24.39	10.97	5125	32,238
	13	4M100E DIES	1977	9.36	9.20	633	3,982
	14	5M101E DIES	1977	11.82	7.80	856	5,384
BAT 2	15	3M11S	1976	8.10	9.16	472	2,969
	16	3M12S	1976	8.10	9.16	472	2,969
	17	3M13S	1976	2.40	2.80	13	80
	18	3M14S	1976	8.10	9.16	472	2,969
	19	3M15S	1976	8.10	9.16	472	2,969
	20	3M16S	1976	8.10	9.16	472	2,969
	21	10M35S	2004	16.60	7.38	1597	10,046
	22	30M10S	1976	24.38	10.80	5042	31,713
	23	30M37S	2008	24.39	11.45	5349	33,643
	24	30M46S	1987	24.38	10.80	5042	31,713
BAT 3	25	3M19S/E	1977	9.04	7.35	472	2,967
	26	3M20S/E	1977	9.04	7.35	472	2,967
	27	3M21S	1977	9.04	7.35	472	2,967
	28	3M22S	1986	8.00	9.68	487	3,061
	29	5M26E	1977	11.82	7.80	856	5,384
	30	5M29E	1998	11.77	7.35	800	5,030
	31	10M57S	2001	16.98	7.02	1590	10,000
	32	30M18S	1977	24.32	11.00	5110	32,141
	33	1M407E FW	2006	6.50	4.88	162	1,019
	34	8M3S FW	2007	13.00	8.70	1155	7,264
	35	3M42S DIES	2007	8.10	9.16	472	2,969
BAT 4	36	3M27E	1978	9.04	7.35	472	2,967
	37	3M28E	1978	9.04	7.35	472	2,967
	38	5M30E	1978	11.77	7.35	800	5,030
E.B.C.	39	30M31S	1976	24.39	11.00	5139	32,326
	40	20M32S	1976	24.39	7.30	3411	21,453
	41	30M33S DIES	1983	22.15	12.63	4867	30,612
BAT 9	42	3M38S	1982	8.10	9.16	472	2,969
	43	3M39S	1982	7.90	9.72	476	2,997
	44	5M54E(*)	2000	11.82	7.80	856	5,384
	45	1M58E	1978	6.50	4.88	162	1,019
	46	0.5MxxE	1978	4.50	5.00	80	500
	47	10M44S	1982	14.78	9.75	1673	10,522
	48	10M43S	1982	14.78	9.75	1673	10,522
	49	8M56S	1998	13.03	9.75	1301	8,180
	50	TK-H-1 SUM	2003	2.00	17.50	55	346
	51	TK-H-2 SUM	2003	2.00	17.50	55	346
BAT 8	53	3M47S	1994	10.50	5.50	476	2,996
	54	3M48S	1994	10.50	5.50	476	2,996
	55	5M49S	1995	13.50	5.50	787	4,952
	56	3M51S	1994	10.50	5.50	476	2,996
	57	3M52S	1994	10.50	5.50	476	2,996
Topping Plant	1	5M1S			8.94		4,941
	2	5M2S			8.94		4,941
	3	5M3S			8.94		4,941
	4	1M4S		6.10	5.49	160	1,009
	5	1M5S		6.10	5.49	160	1,009

MDQ / BVF / OG

APPENDIX E. TANK BATTERY PLOT PLANS



N°	FECHA	REVISION	POR	REV	APR	No	FECHA	REVISION	POR	REV	APR

LOTE 8

CORRIENTES

LAY OUT GENERAL BATERIA 1

DIGITALIZADO:	DISEÑADO:	REVISADO:
FECHA: 26.09.07	FECHA: 26.07.09	APROBADO:

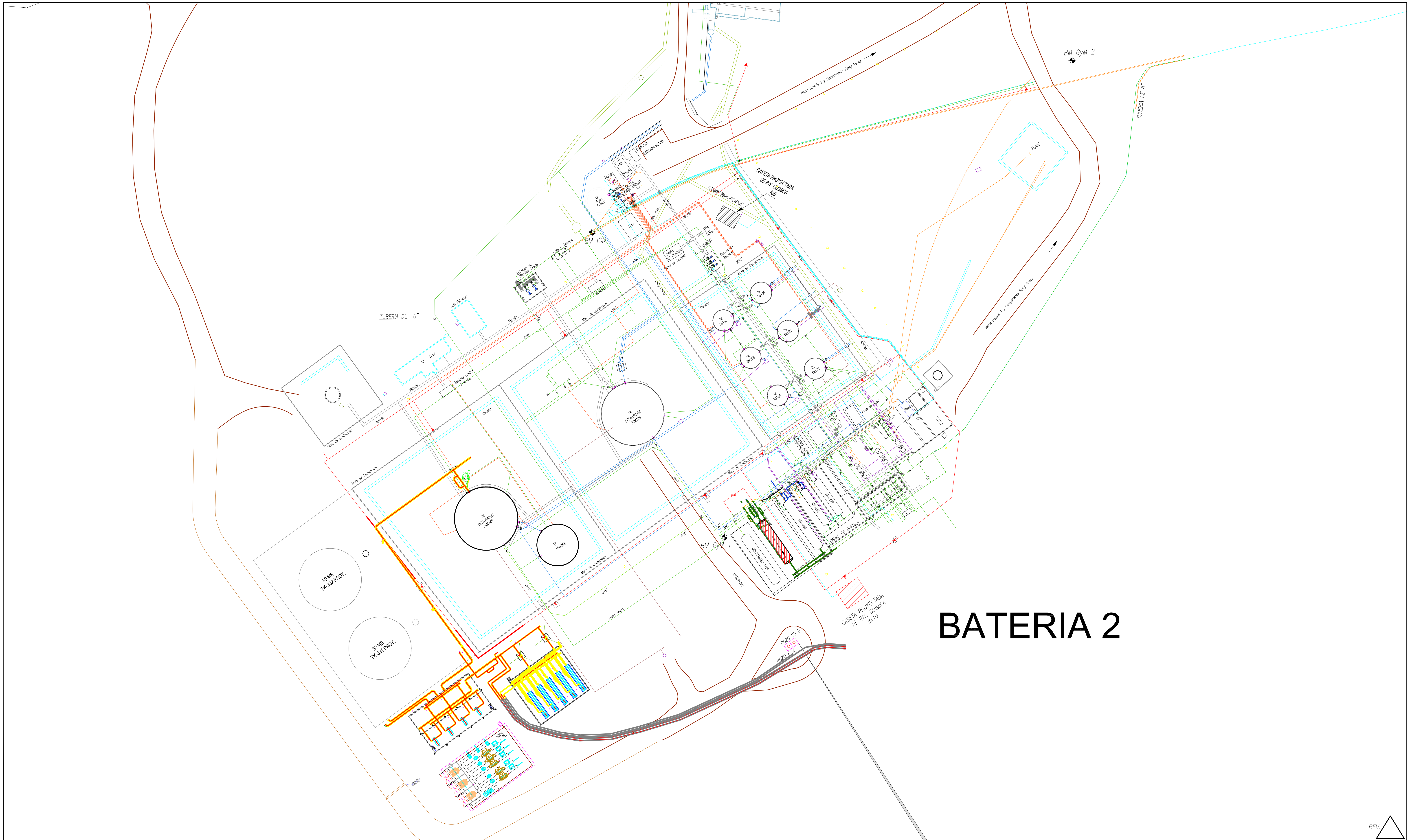
Pluspetrol Norte S.A.
DEPARTAMENTO DE CONSTRUCCIONES
AREA DE PROYECTOS

ESCALA: S/E

ARCHIVO:

PLANO No:

PLANO: 1 DE 1



REV:

Nº	FECHA	REVISION	POR	REV	APR	No	FECHA	REVISION	POR	REV	APR

LOTE 8

CORRIENTES

LAY OUT GENERAL BATERIA 2

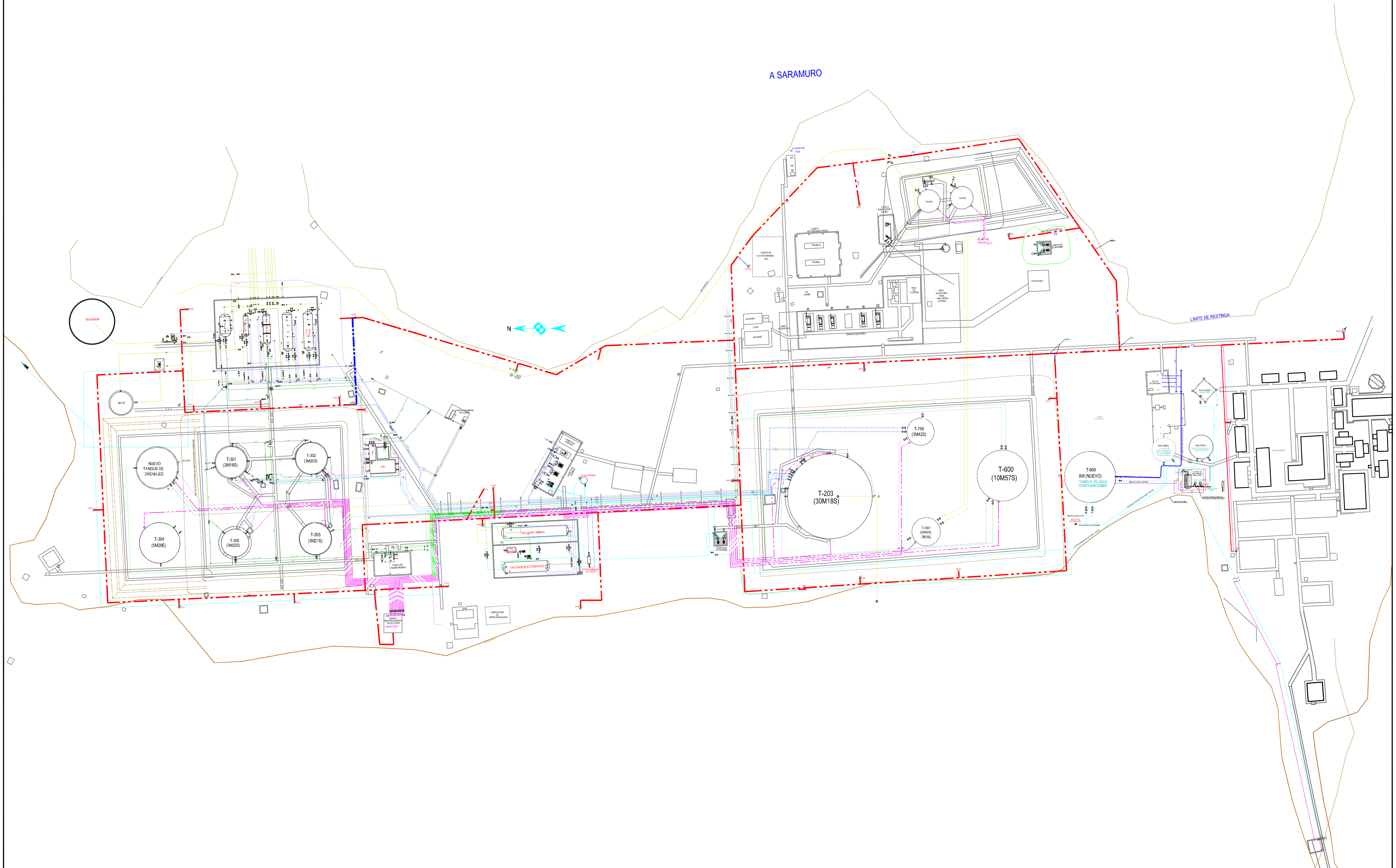
DIGITALIZADO:
FECHA: 26.09.07

DISEÑADO: PROYECTOS
FECHA: 26.07.09

REVISADO:
APROBADO:

Pluspetrol Norte S.A.
DEPARTAMENTO DE CONSTRUCCIONES
AREA DE PROYECTOS

ESCALA: S/E
ARCHIVO:
PLANO No:
PLANO: 1
DE 1



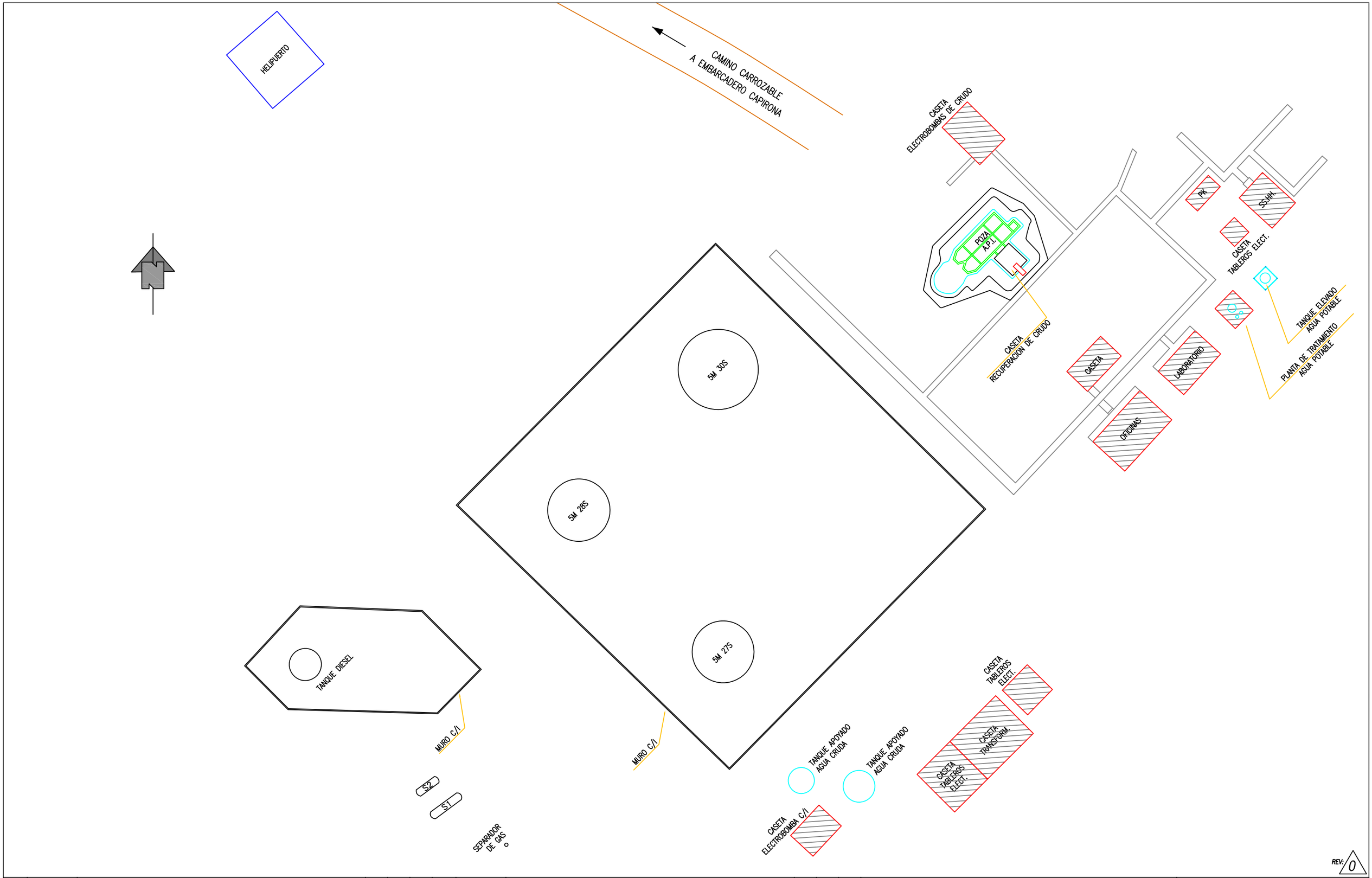
No	FECHA	REVISADO	POR	REV	APR	No	FECHA	REVISADO	POR	REV	APR
								EMITIDO PAR INFORMACION			

LOTE 8
MEJORA BATERIA 3
SISTEMA CONTRAINCENDIO
PLANO GENERAL

DIGITALIZADO: J. HUAMANI — FECHA: 12.07.06
DISEÑADO: PLUSPETROL — FECHA: 12.07.06
REVISADO: C.HARO — APROBADO: R. CASTILLO

Pluspetrol Norte S.A.
DEPARTAMENTO DE CONSTRUCCIONES
AREA DE PROYECTOS

ESCALA: 1/500 — ARCHIVO: 060712-1-L8
PLANO Nº: 061004-2-L8 P01
PLANO: 1 DE 7



REV: 0

N°	FECHA	REVISION	POR	REV	APR	No	FECHA	REVISION	POR	REV	APR
						0	21.02.06	EMITIDO PARA INFORMACION	M.R.	C.H.	R.C.

LOTE 8
CAPIRONA
AUTOVALUO IMPUESTO PREDIAL
BATERIA 4 PLANTA GENERAL

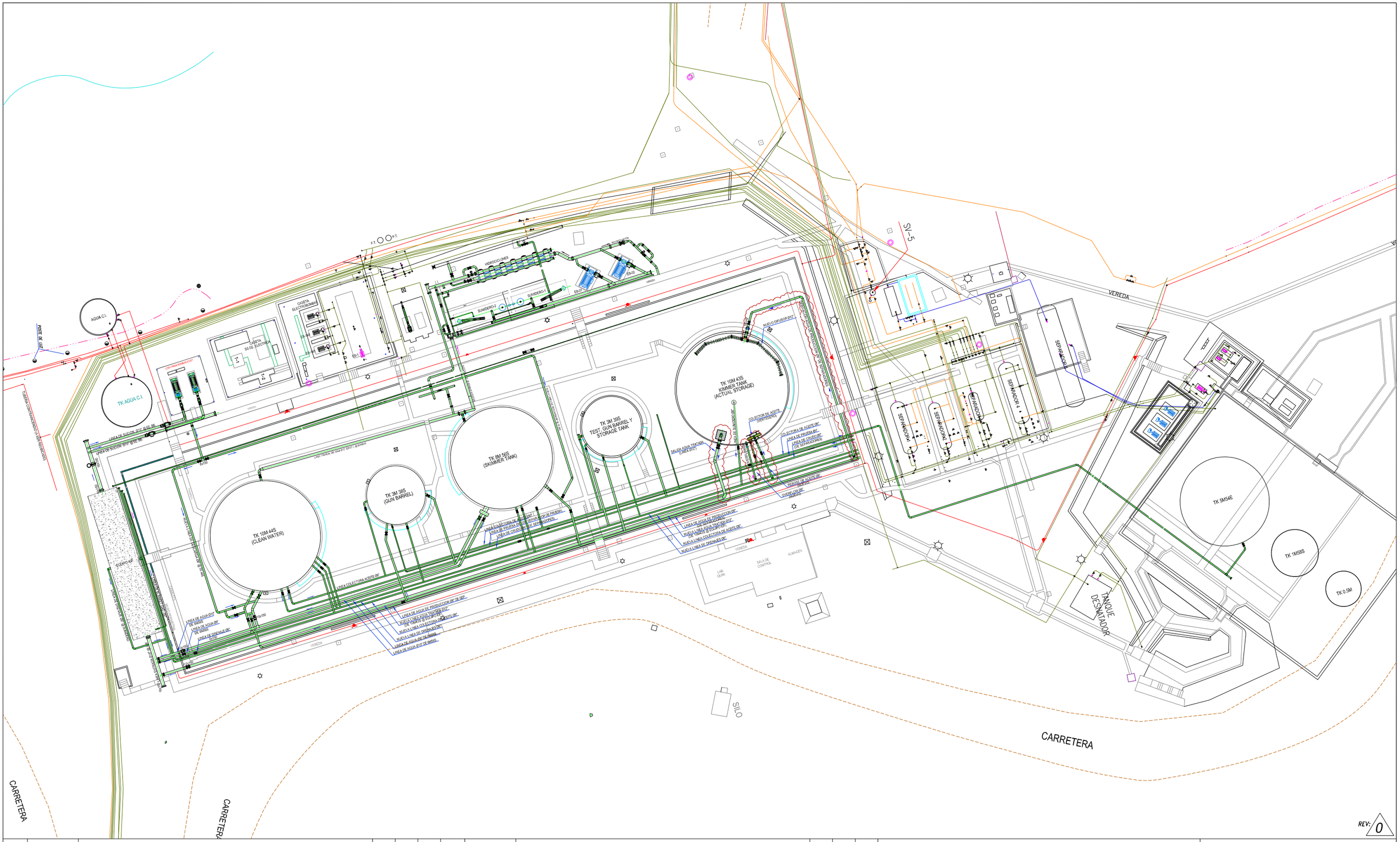
DIGITALIZADO: M. RIOS	DISEÑADO: E. PON	REVISADO: C. HARO
FECHA: 13.02.06	FECHA: 13.02.06	APROBADO: R. CASTILLO

Pluspetrol Norte S.A.
DEPARTAMENTO DE CONSTRUCCIONES
AREA DE PROYECTOS

ESCALA: 1:500 | ARCHIVO: 060224-1-L8

PLANO No: 060224-1-L8-P12

PLANO: 1 DE 1



REV: 0

N°	FECHA	REVISION	POR	REV	APR	No	FECHA	REVISION	POR	REV	APR

LOTE 8
PAVAYACU
BATERIA 9
LAYOUT

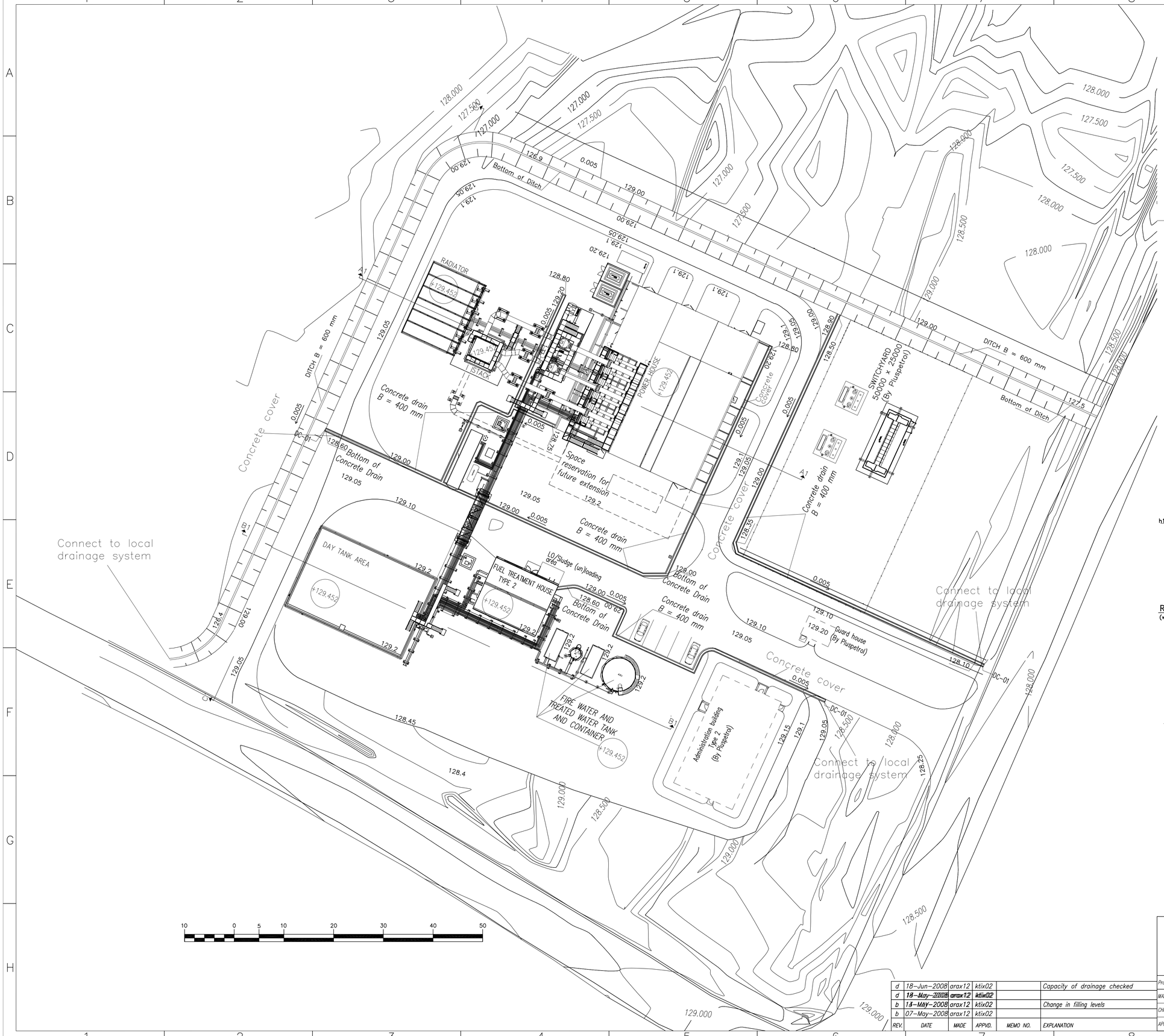
DIGITALIZADO: F. MEJIA	DISEÑADO: PLUSPETROL	REVISADO: C. HARO
FECHA: 02.12.07	FECHA: 02.12.07	APROBADO: R. CASTILLO

Pluspetrol Norte S.A.
DEPARTAMENTO DE CONSTRUCCIONES
AREA DE PROYECTOS

ESCALA: 1:500 | ARCHIVO: 060222-5-L8

PLANO No: 060222-5-L8-P01 | PLANO: 1 DE 2

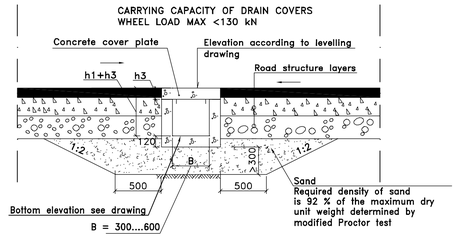
APPENDIX F. CE II PLANT PLOT PLANS



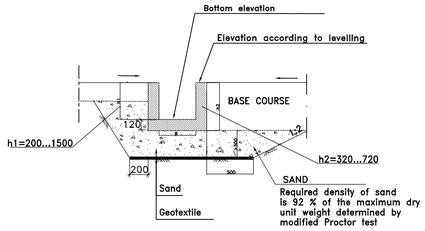
LEGEND:

+129.452	Floor level
	Open ditch
	Concrete drain
	Concrete cover
+128.10	Designed surface level
DC-01	Drainage

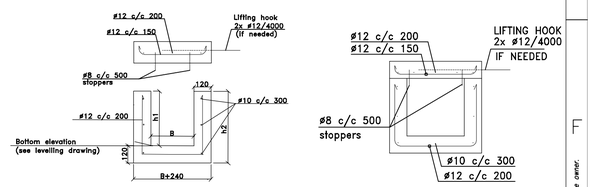
OPEN DRAIN WITH COVER 1:20
(road areas)



OPEN DRAIN



REINFORCEMENT OF OPEN DRAIN AND COVER
(when B <600 mm)



CONCRETE:
f'c=250 kg/cm2
AT 28 DAYS AGE, TEST SPECIMEN CUBE 150x150x150 mm3
f'c=207 kg/cm2
AT 28 DAYS AGE, TEST SPECIMEN CYLINDER dia. 6" x 12"

REINFORCEMENT:
DEFORMED REINFORCING BARS fy= 4000 kg/cm2
CONCRETE COVER FOR AGAINST SOIL C=50 mm
ELSEWHERE CONCRETE COVER C=35 mm.

DRAINAGE:
RAINFALL RAINY SEASON = 21 MM/DAY
CAPACITY OF THE CONCRETE DRAINS DC-01 = 0.268 m3/sec

CATCHMENT AREA
GRASS AREA = 3734.305 mm2
GRAVEL AREA = 1504.94 mm2
ROAD AREA = 71768 mm2

REV.	DATE	MADE	APPVD.	MEMO NO.	EXPLANATION
d	18-Jun-2008	arax12	ktix02		Capacity of drainage checked
~~d~~	~~18-May-2008~~	~~arax12~~	~~ktix02~~		
b	13-May-2008	arax12	ktix02		Change in filling levels
b	07-May-2008	arax12	ktix02		

WÄRTSILÄ

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Power Plants

Drawing
LEVELLING & DRAINAGE

Pluspetrol Norte Lote 8

Proj. no. P/07103

Product:	ACA	ASLY DRC:
MADE	19-Dec-2007	Aschalew Abebe
CHKD	11-Feb-2008	Kristian Tiihonen
APPD	11-Feb-2008	Mats Soderlund

Units:
Page No. 1

Based on Document:
Customer Document:

Scale: 1:250 1:1
Size: A1
Doc. ID: DBAA403599 d Rev.

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Internal

				0	10.10.07	EMITIDO PARA REVISION	M.R.	L.S.	M.A.	M.R.	R.C.			

LOTE 8
CORRIENTES
CENTRAL ELECTRICA CORRIENTES
PLANTA GENERAL

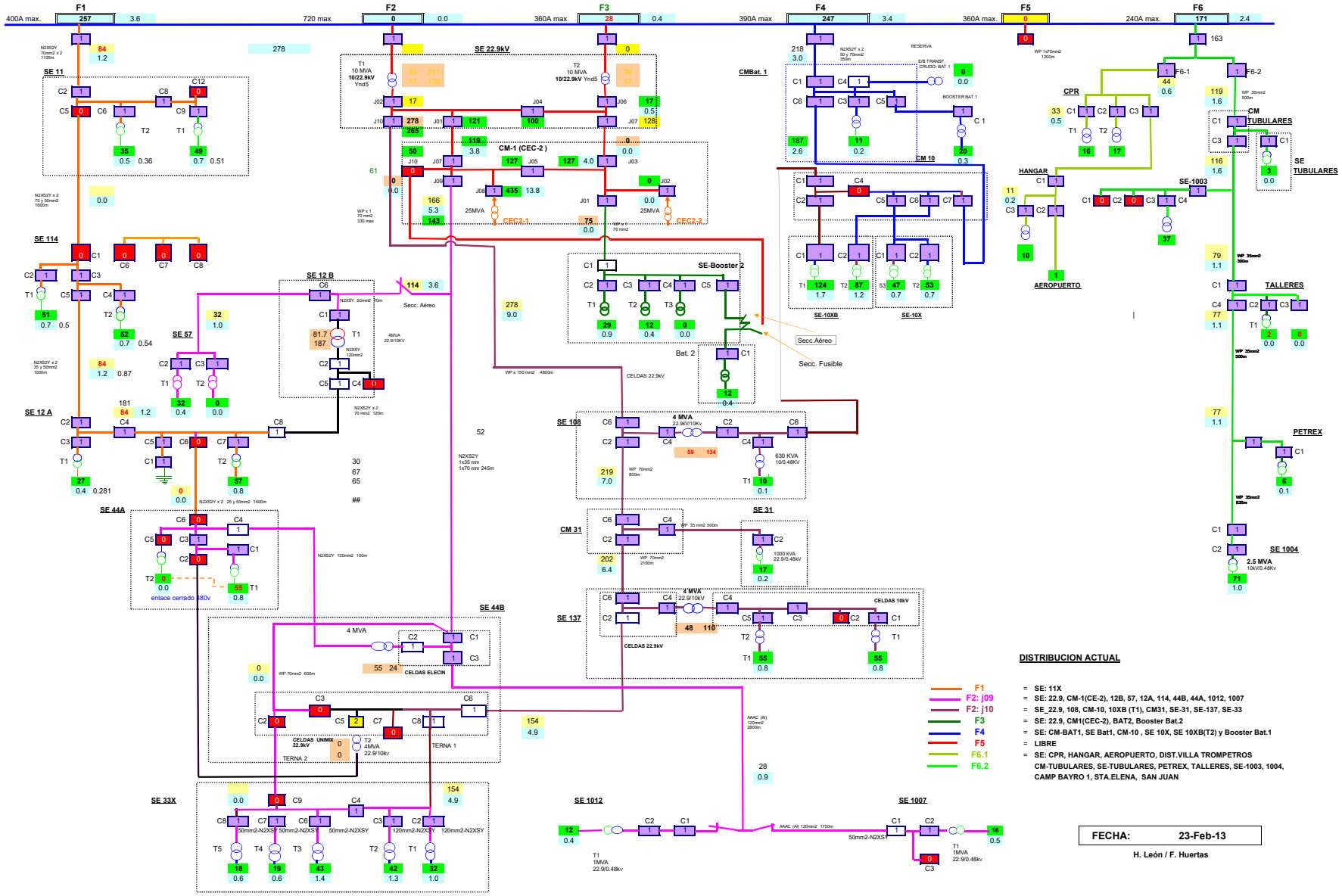
DIGITALIZADO: M. RIOS | DISEÑADO: PROYECTOS | REVISADO: M. RZEWUSKI

Pluspetrol Norte S.A.
DEPARTAMENTO DE CONSTRUCCIONES
AREA DE PROYECTOS

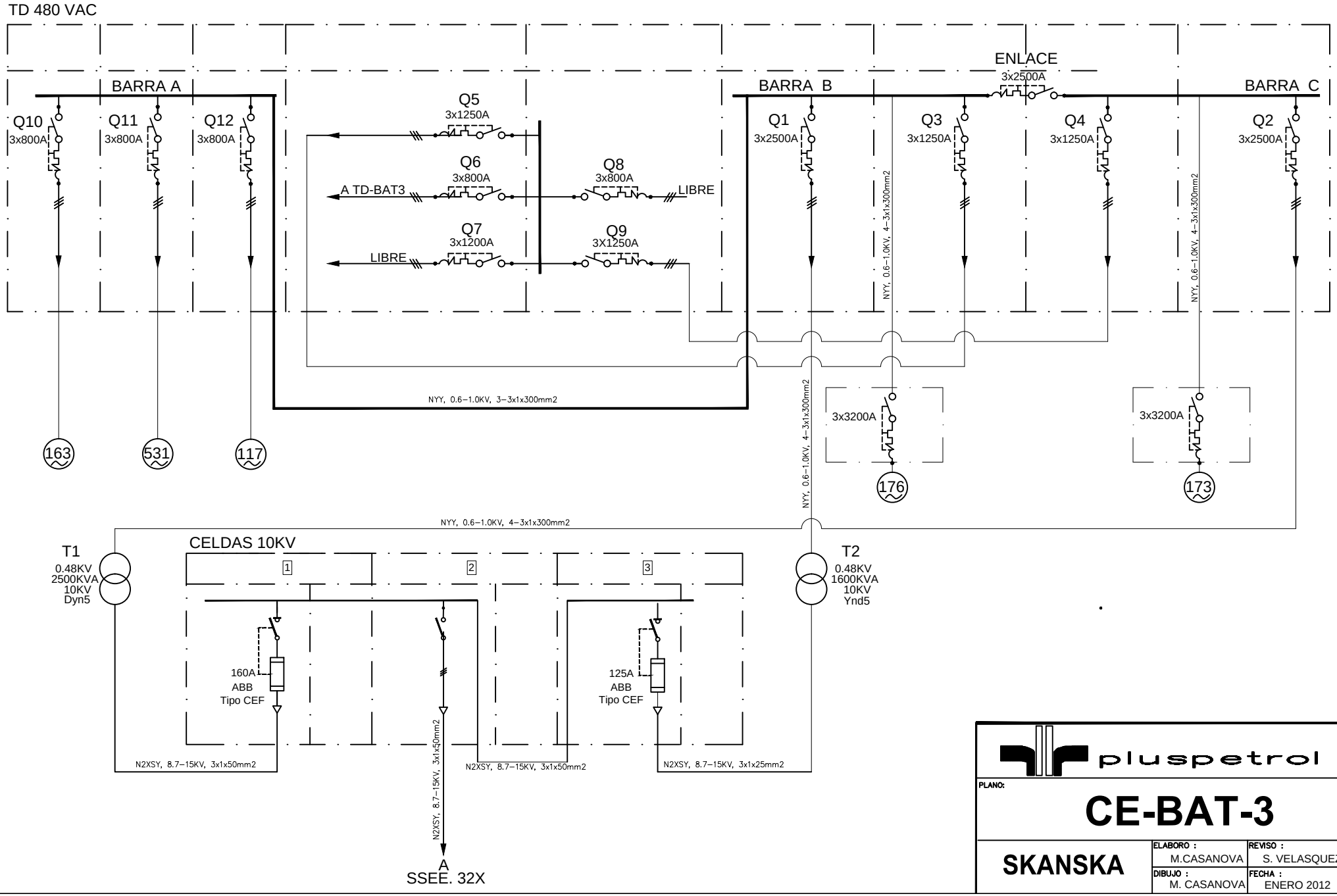
ESCALA: 1/750 | ARCHIVO: 071010-1-L8

PLANO No: 071010-1-L8-R00 | PLANO: 1

APPENDIX G. ELECTRICAL ONE-LINE DIAGRAMS


F1
400A max.
F2
720 max
F3
360A max
F4
390A max
F5
360A max.
F6
240A max.
SE 22.9kV
CMBat. 1
CM-1 (CEC-2)
SE 11
SE 114
SE 12 B
SE 57
SE 12 A
SE 44A
SE 44B
SE 33X
SE 108
CM 31
SE 31
SE 137
SE 1012
SE 1007
SE-Booster 2
Bat. 2
CM 10
SE-10XB
SE-10X
CPR
HANGAR
AEROPUERTO
SE-1003
CM TUBULARES
SE TUBULARES
TALLERES
PETREX
SE 1004
Secc.Aéreo
Secc. Fusible
CELDAS 22.9kV
CELDAS 10kV
CELDAS ELECN
CELDAS UNIMIX
TERNA 1
TERNA 2
enlace cerrado 380v
DISTRIBUCION ACTUAL
F1 = SE: 11X
F2: j09 = SE: 22.9, CM-1(CE-2), 12B, 57, 12A, 114, 44B, 44A, 1012, 1007
F2: j10 = SE_22.9, 108, CM-10, 10XB (T1), CM31, SE-31, SE-137, SE-33
F3 = SE: 22.9, CM1(CEC-2), BAT2, Booster Bat.2
F4 = SE: CM-BAT1, SE Bat1, CM-10 , SE 10X, SE 10XB(T2) y Booster Bat.1
F5 = LIBRE
F6.1 = SE: CPR, HANGAR, AEROPUERTO, DIST.VILLA TROMPETROS
F6.2 = CM-TUBULARES, SE-TUBULARES, PETREX, TALLERES, SE-1003, 1004, CAMP BAYRO 1, STA.ELENA, SAN JUAN
FECHA: 23-Feb-13
H. León / F. Huertas

CE-BAT3 480VAC, 60 HZ

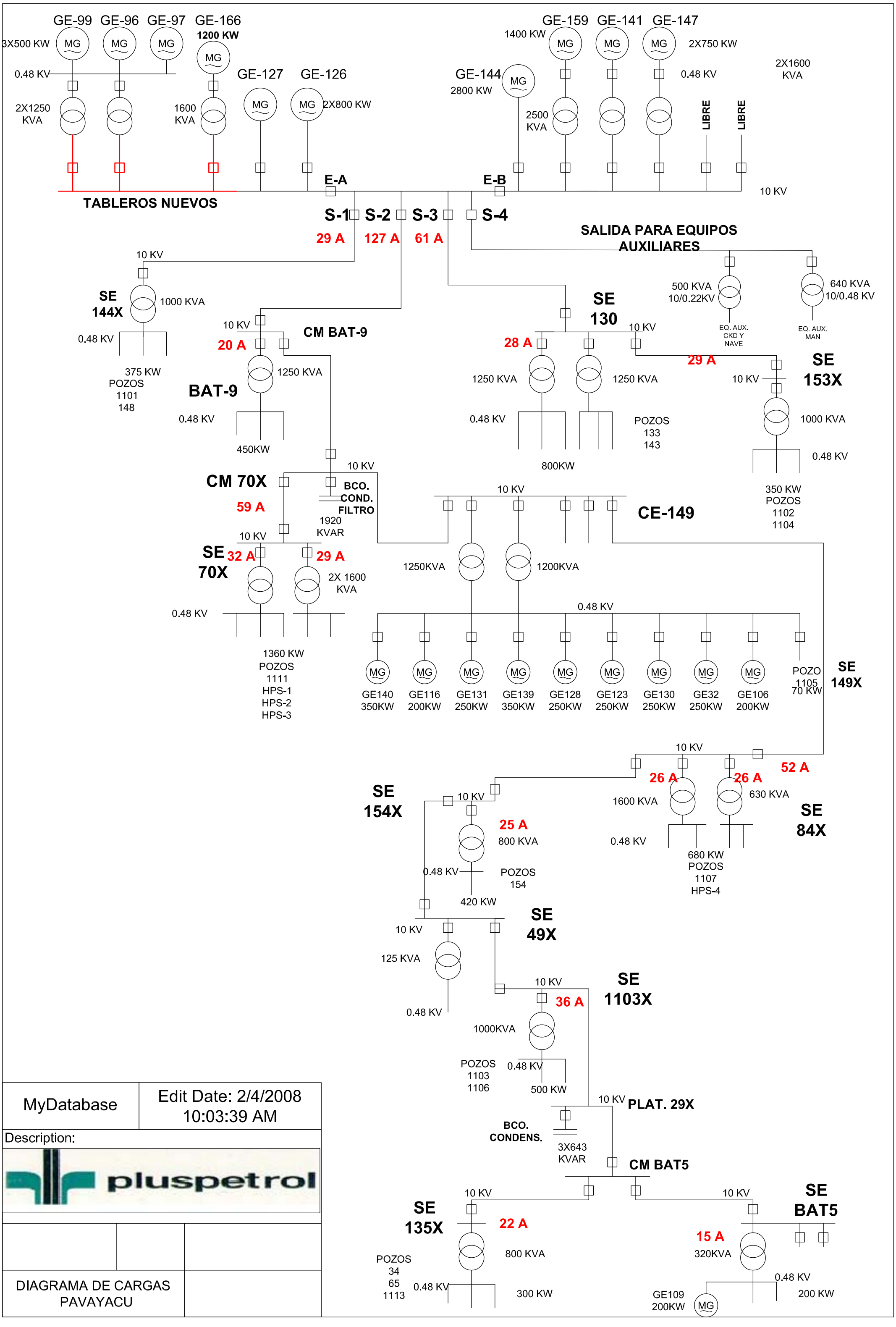


pluspetrol

PLANO:

CE-BAT-3

SKANSKA	ELABORO : M.CASANOVA	REVISO : S. VELASQUEZ
	DIBUJO : M. CASANOVA	FECHA : ENERO 2012

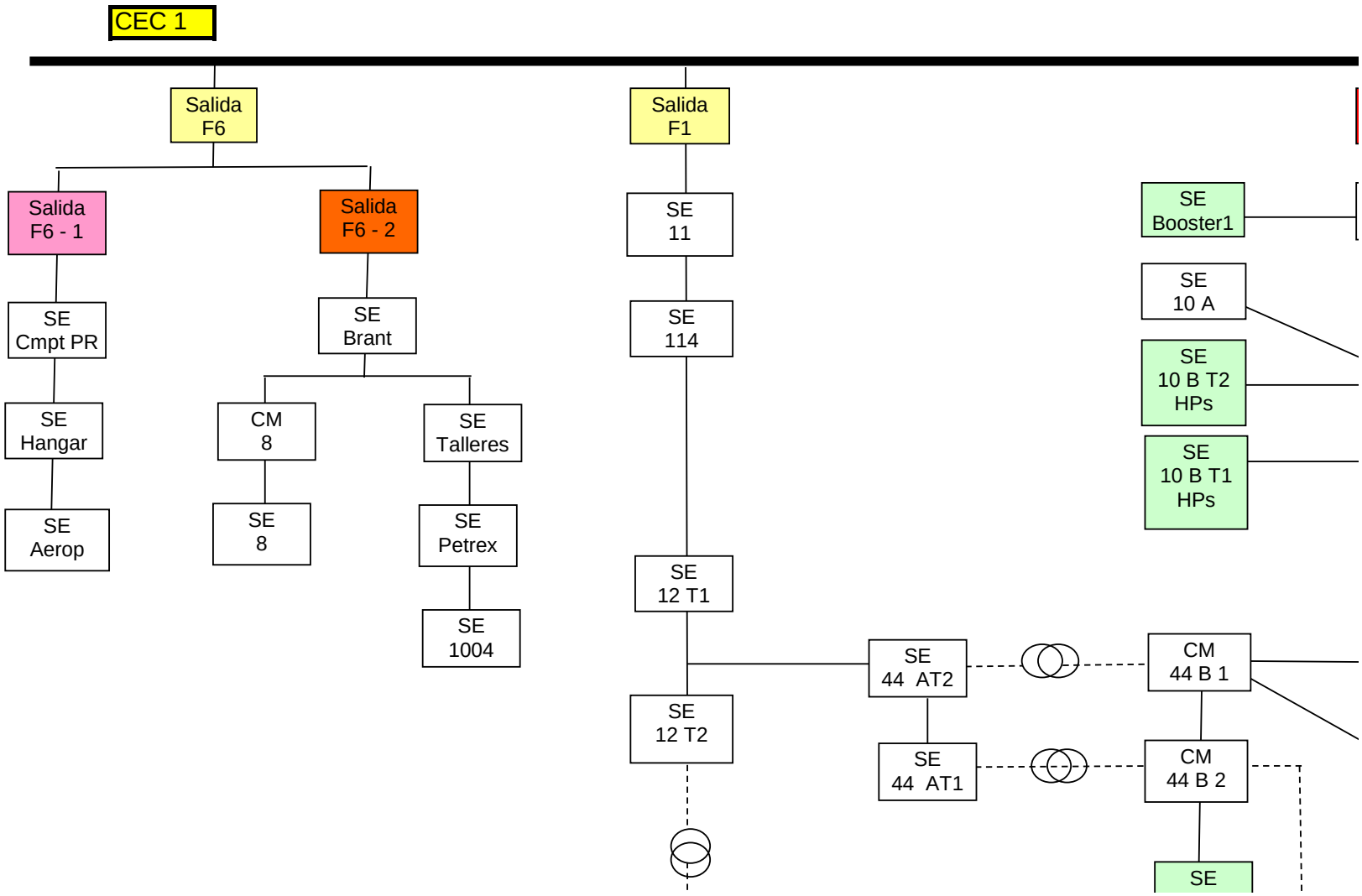


MyDatabase	Edit Date: 2/4/2008 10:03:39 AM

Description:

pluspetrol

DIAGRAMA DE CARGAS PAVAYACU


CEC 1
Salida F6
Salida F1
Salida F6 - 1
Salida F6 - 2
SE Cmpt PR
SE Hangar
SE Aerop
SE Brant
CM 8
SE 8
SE Talleres
SE Petrex
SE 1004
SE 11
SE 114
SE 12 T1
SE 12 T2
SE 44 AT2
SE 44 AT1
CM 44 B 1
CM 44 B 2
SE
SE Booster1
SE 10 A
SE 10 B T2 HPs
SE 10 B T1 HPs

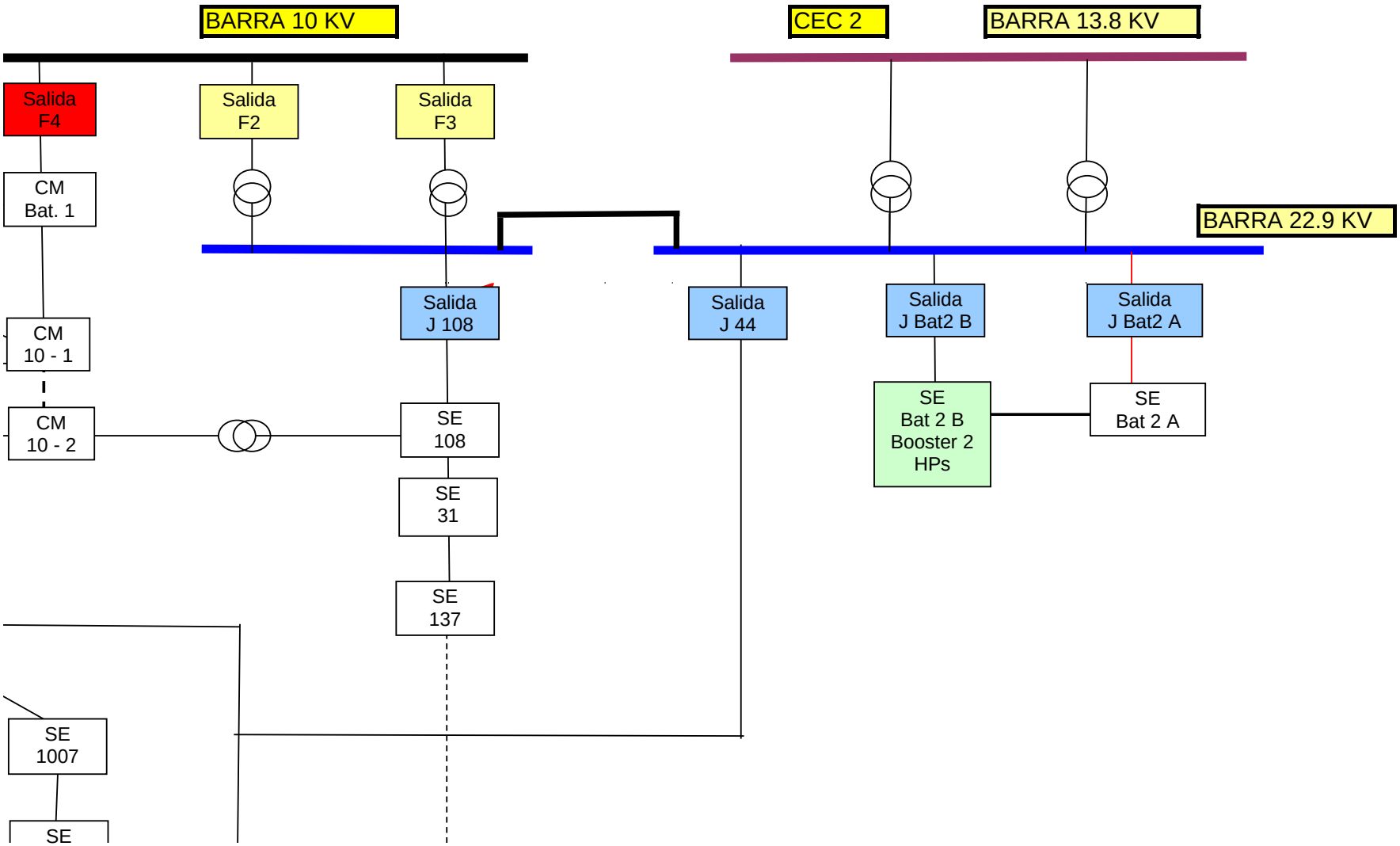
ALIVIO DE CARGA	
F6-1	PRIMER ALIVIO
F6-2	SEGUNDO ALIVIO
F4	TERCER ALIVIO

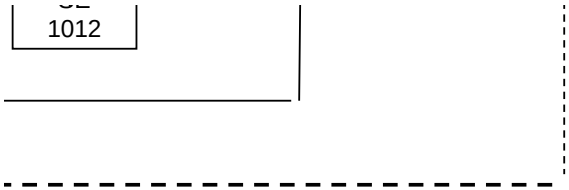
EN VERDE SISTEMA DE REINYECCION

LINEAS PUNTEADAS PARA MANIOBRAS

LINEA EN ROJO EN IMPLEMENTACION

TRANSFORMADOR 22.9 KV / 10 KV


BARRA 10 KV
CEC 2
BARRA 13.8 KV
Salida F4
Salida F2
Salida F3
CM Bat. 1
BARRA 22.9 KV
Salida J 108
Salida J 44
Salida J Bat2 B
Salida J Bat2 A
CM 10 - 1
CM 10 - 2
SE 108
SE Bat 2 B Booster 2 HPs
SE Bat 2 A
SE 31
SE 137
SE 1007
SE


1012

APPENDIX H. ORGANIZATION CHARTS

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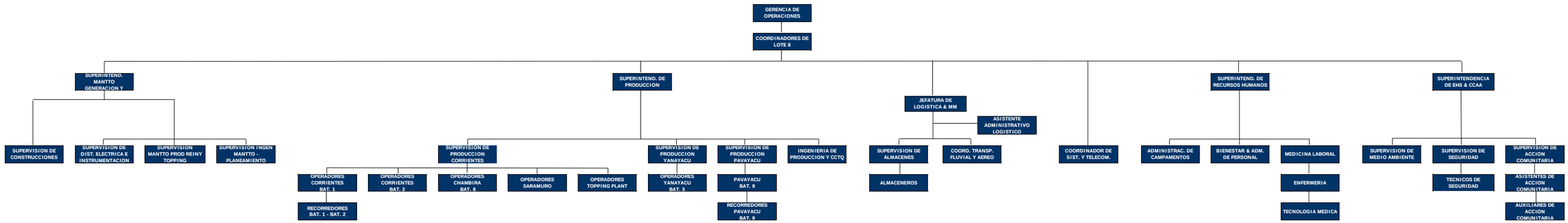
LOTE 8

Actualizado al 17/03/2019



APPENDIX I. WORK PERMITS

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Formulario de Permiso para Trabajo en Caliente Nº 5083513

1. Datos Generales	Permiso de Trabajo / OT:
Lugar:	Indice LOTO
Fecha:	Sistema o Equipo :
Sector Solicitante:	Duración: Desde Hasta
	Contratista/Ejecutante:

2. Tarea a realizar

3. Requerimiento de Formularios Complementarios según punto 11

Se cumplieron los procedimientos asociados al trabajo y quedaron documentados SI ☐ NO ☐

Procedimiento complementario:

4. Cantidad de Personal afectado a las tareas según ASL ☐

5. Requerimientos para el Trabajo

Protección contra incendio requerida: Extintor ☐ Espuma ☐ Manguera CI ☐ Manta Ignífuga ☐ Gas inerte ☐ Cortina de agua ☐ Primeros Auxilios ☐ Ambulancia ☐

otros:

Equipos de protección personal requeridos: Casco ☐ Guantes ☐ Respiradores ☐ Lentes ☐ SCBA ☐ Línea de aire ☐

otros:

6. Control de Condiciones de Seguridad CHECK-LIST

	SI	NO	NA
Se realizó reunión de seguridad previa al trabajo y se explicó los riesgos			
Deberá estar presente el responsable del área durante el trabajo			
Deberá estar presente el responsable del trabajo durante toda la jornada			
Está la supeficie libre de combustibles			
Es necesario evacuar/desplazar gases combustibles mediante otro fluido inerte			
Colocar Tarjetas de Peligro y/o Bloqueo			
Señalizar el Área de Trabajo con cadenas, cintas, vallas, luminosas, etc			
Inundar zonas bajas, canales, drenajes de acceso con espuma / agua			
Se usará sierra o cortacaños para efectuar cortes de cañería			
Se deberá disponer de zona de escape para emergencias			
Instalar sopladores o extractores en el lugar de trabajo			
Usar tapones expansibles o vejigas inflables			
Se dispondrá (Operario) para desconexión rápida de línea eléctrica			
Áreas cercanas y/o equipos adyacentes sin riesgo			
Ausencia de pérdidas de producto en bombas, equipos, cañerías y bridas			
Equipos y herramientas revisadas y en buenas condiciones			
Factores metereológicos (verificación de viento, lluvias, tormentas eléctricas)			
El acceso a los Elementos de Seguridad es libre y sin obstrucciones			
Se efectúo el control de ingreso / vehículos / grúas			
Carteles de señalización colocados			
Se cumplió con el procedimiento para trabajo en altura			
Se cumplió con el procedimiento de ingreso a espacio confinado			

7. Comprobaciones del responsable del área

Prueba de Gas (El resultado debe ser 0%)

Hora	Resultado	Firma	Hora	Resultado	Firma

El equipo ha sido	SI	NO	NA
Purgado y Drenado			
Lavado e Inertizado			
Ventilado y Enfriado			
Aislado con bridas o platos ciegos			
Desconectado de todo Circuito Eléctrico			

8. Visto Bueno/Toma de conocimiento

Supervisor Sala de Control/ zona o área de trabajo	Apellido y Nombre	Firma	Observaciones

9. Responsables	Nombre	Firma
Supervisor Solicitante		
Supervisor Autorizante		
Supervisor Ejecutante		
Supervisor de área colindante (si existe)		

10. Cierre de Permiso: Se verificó que área queda ordenada y limpia y en condiciones óptimas

Responsables	Nombre	Firma
Supervisor Solicitante		
Supervisor Autorizante		
Supervisor Ejecutante		

(Sólo para Trabajo CANCELADO)

no iniciado ☐ sin terminar ☐ suspendido ☐
acto Inseguro ☐ condición Insegura ☐ otro ☐

Cancelado por: Firma:

Detalle:

11. Requerimiento de Procedimiento Complementarios INDICAR

	SI	NO
Procedimiento de Trabajo en Espacios Confinados		
Procedimiento de Trabajo Eléctrico (Liberación Eléctrica)		
Procedimiento de Trabajo de Movimiento de Suelos y Zanjeo		
Procedimiento de Utilización Equipos de Izaje		
Procedimiento de Obstrucción de Caminos		
Procedimiento de Trabajo en Tareas de Radiografiado		
Procedimiento LOTO (Bloqueo y Rotulado)		
Procedimiento de Trabajo en Altura		

12. Observaciones y Recomendaciones

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Formulario de Permiso para Trabajo en Frío Nº 5197447

1. Datos Generales

Lugar :	Sistema o Equipo :
Fecha :	Duración: Desde Hasta
Sector Solicitante:	Contratista/Ejecutante:

2. Tarea a realizar

3. Requerimiento de Formularios Complementarios según punto 11

Se cumplieron los procedimientos asociados al trabajo y quedaron documentados SI ☐ NO ☐

Procedimiento complementario:

4. Cantidad de Personal afectado a las tareas según ASL

5. Requerimientos para el Trabajo

Equipos de protección personal requeridos: Casco ☐ Guantes ☐ Respiradores ☐ Lentes ☐ SCBA ☐ Linea de aire ☐ Primeros Auxilios ☐ Ambulancia ☐

Otros:

6. Control de Condiciones de Seguridad CHECK-LIST

	SI	NO	NA
Se realizó reunión de seguridad previa al trabajo y se explicó los riesgos	☐	☐	☐
Deberá estar presente el responsable del área durante el trabajo	☐	☐	☐
Deberá estar presente el responsable del trabajo durante toda la jornada	☐	☐	☐
Está la supeficie libre de combustibles	☐	☐	☐
Colocar Tarjetas de Peligro y/o Bloqueo	☐	☐	☐
Señalizar el Área de Trabajo con cadenas, cintas, vallas, luminosas, etc	☐	☐	☐
Se deberá disponer de zona de escape en tareas soterradas	☐	☐	☐
Instalar sopladores o extractores en el lugar de trabajo	☐	☐	☐
Se dispondrá (Operario) para desconexión rápida de línea eléctrica	☐	☐	☐
Áreas cercanas y/o equipos adyacentes sin riesgo	☐	☐	☐
Ausencia de pérdidas de producto en bombas, equipos, cañerías y bridas	☐	☐	☐
Equipos y herramientas revisadas y en buenas condiciones	☐	☐	☐
Factores meteorológicos (verificación de viento,lluvias, tormentas eléctricas)	☐	☐	☐
El acceso a los Elementos de Seguridad es libre y sin obstrucciones	☐	☐	☐
Se efectúo el control de ingreso / vehículos / grúas	☐	☐	☐
Carteles de señalización colocadas	☐	☐	☐
Se cumplió con el procedimiento de ingreso a espacio confinado	☐	☐	☐
Se cumplió con el procedimiento para trabajo en altura	☐	☐	☐

7. Comprobaciones del responsable del área

Prueba de Gas opcional

Solicitado por	Efectuado por	Hora	Resultado	Firma

El equipo ha sido	SI	NO	NA
Purgado y Drenado	☐	☐	☐
Lavado e Inertizado	☐	☐	☐
Ventilado y Enfriado	☐	☐	☐
Aislado con bridas o platos ciegos	☐	☐	☐
Desconectado de todo Circuito Eléctrico	☐	☐	☐

8. Visto Bueno/Toma de conocimiento

Supervisor Sala de Control/ zona o área de trabajo	Apellido y Nombre	Firma	Observaciones

9. Responsables

	Nombre	Firma
Supervisor Solicitante		
Supervisor Autorizante		
Supervisor Ejecutante		
Supervisor de área colindante (si existe)		

10. Cierre de Permiso:

Se verificó que área queda ordenada y limpia y en condiciones óptimas

Responsables	Nombre	Firma
Supervisor Solicitante		
Supervisor Autorizante		
Supervisor Ejecutante		

(Sólo para Trabajo CANCELADO)

no iniciado ☐ sin terminar ☐ suspendido ☐
acto Inseguro ☐ condición Insegura ☐ otro ☐

Cancelado por: Firma:

Detalle:

11. Requerimiento de Procedimiento Complementarios INDICAR

	SI	NO
Procedimiento de Trabajo en Espacios Confinados	☐	☐
Procedimiento de Trabajo Eléctrico (Liberación Eléctrica)	☐	☐
Procedimiento de Trabajo de Movimiento de Suelos y Zanjeo	☐	☐
Procedimiento de Utilización Equipos de Izaje	☐	☐
Procedimiento de Obstrucción de Caminos	☐	☐
Procedimiento de Trabajo en Tareas de Radiografiado	☐	☐
Procedimiento LOTO (Bloqueo y Rotulado)	☐	☐
Procedimiento de Trabajo en Altura	☐	☐

12. Observaciones y Recomendaciones

APPENDIX J. RISK ANALYSIS FORM

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ANALISIS DE RIESGO

Lugar:		Fecha:		Permiso de Trabajo Nª:	
Tarea a realizar:					

PERSONAL EJECUTANTE		Apellidos y Nombres	Firma		Apellidos y Nombres	Firma		Apellidos y Nombres	Firma
	1			6			11		
	2			7			12		
	3			8			13		
	4			9			14		
	5			10			15		

Etapas	Peligros/Riesgos	S	P	Riesgo		Acciones Preventivas/Controles de Riesgo
				ASL	ARA	

EQUIPO DE ANALISIS DE RIESGO				
Identificación	Ejecutante	Solicitante	Autorizante	Otros
Firma				
Apellido y Nombre				

MATRIZ DE CLASIFICACION DE RIESGO

	PROBABILIDAD							
SEVERIDAD	Improbable (1)		Poco Probable (2)		Probable (3)		Muy probable (4)	
Leve (1)	Tolerable	1	Tolerable	2	Poco significativo	3	Poco significativo	4
Moderado (2)	Tolerable	2	Poco significativo	4	Poco significativo	6	Significativo	8
Grave (3)	Poco significativo	3	Poco significativo	6	Significativo	9	Intolerable	12
Catastrófico (4)	Poco significativo	4	Significativo	8	Intolerable	12	Intolerable	16

APPENDIX K. CORPORATE POLICY STATEMENT

Nuestra Política Corporativa de EHS

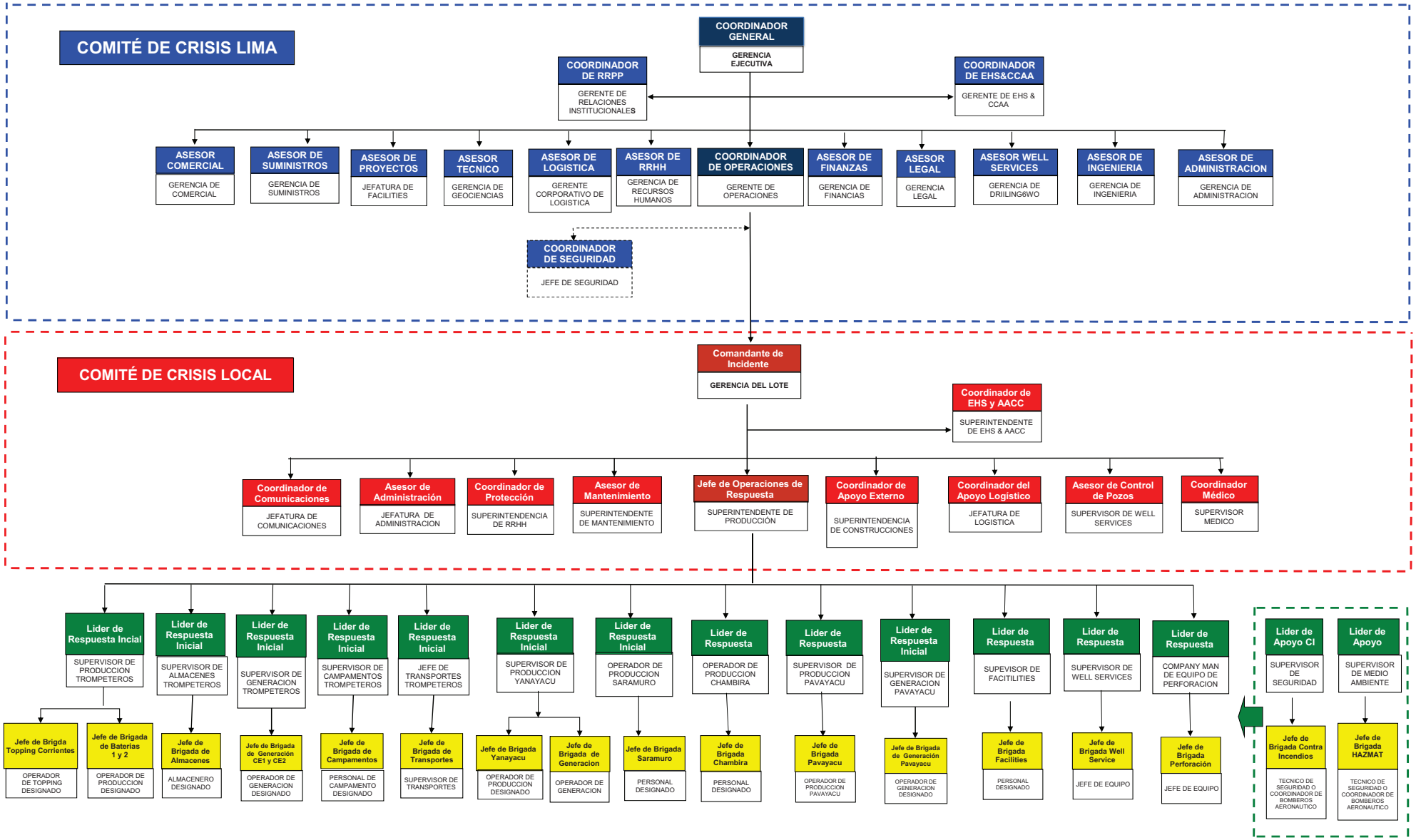
1. *Cumplir con la legislación aplicable y otros requisitos a los cuales la Compañía adhiera.*
2. *Considerar la gestión de EHS como una prioridad de la Compañía.*
3. *Proveer condiciones de trabajo seguras, saludables y ambientalmente amigables a sus empleados.*
4. *Prevenir enfermedades ocupacionales y todo tipo de accidentes, contaminación e impactos adversos al medio ambiente y comunidades.*
5. *Operar haciendo un uso racional de la energía y de los recursos naturales.*
6. *Llevar adelante la gestión de EHS mediante programas de mejora continua, capacitando y motivando al personal propio y contratado respecto a EHS.*
7. *Promover esta política a la comunidad y a partes interesadas.*

Steve Crowell
CEO Pluspetrol

pluspetrol

APPENDIX L. RESPONSE TEAM ORGANIZATION

ORGANIGRAMA DEL EQUIPO DE RESPUESTA DE EMERGENCIAS - LOTE 8



APPENDIX M. BLOCK 8 FIRE PUMP DATA

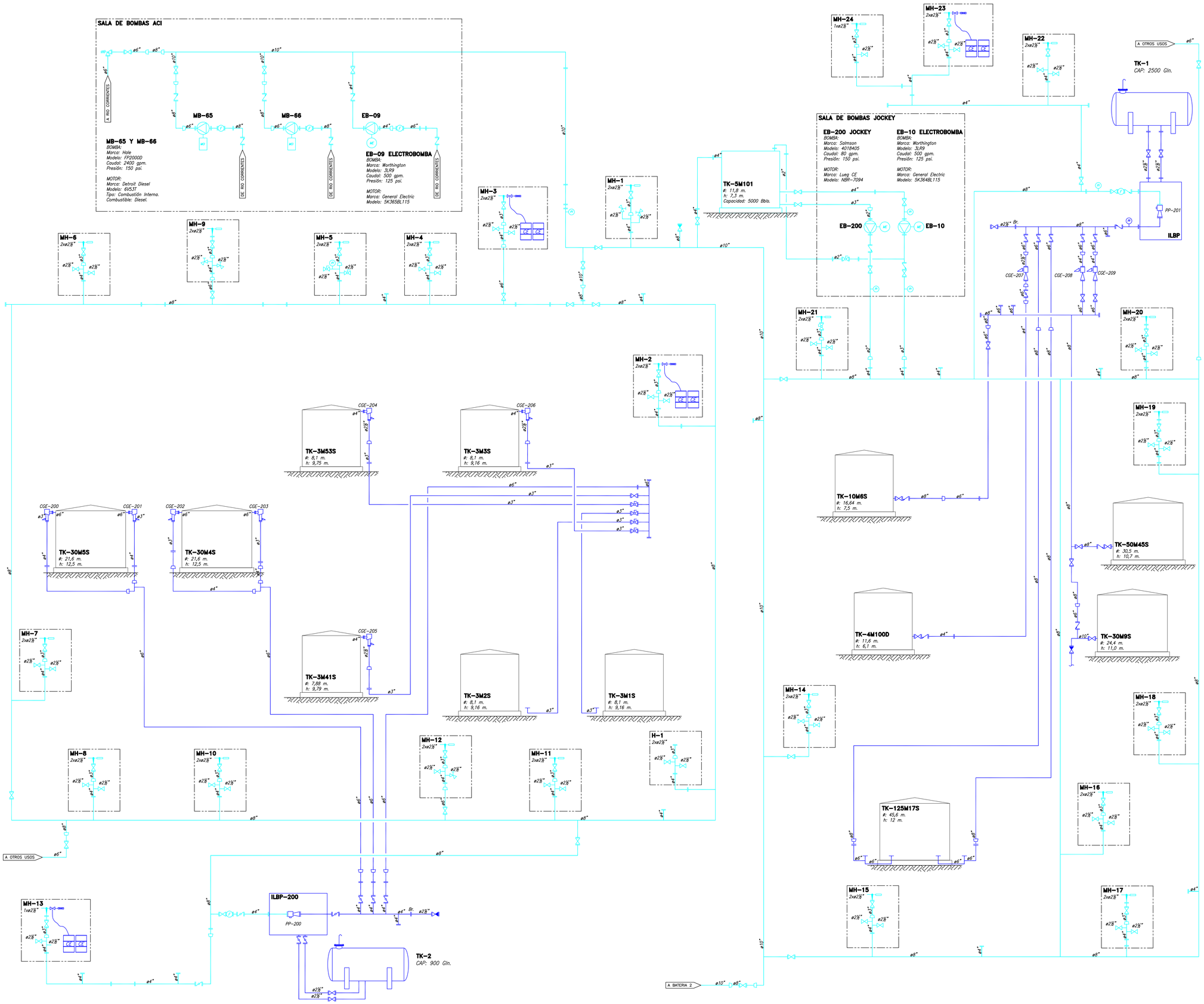
Table M-1. Block 8 Fire Pump Data

Equipment No.	Pump Manufacturer	Pump Model	Rating (gpm)	Pressure (psi)	Motor Manufacturer	Motor Model	Location	Field	Suction Source
M/B 65	Hale	FP2000D	2,400	150	Detroit Diesel	6V53T	Batería 1	Corrientes	Rio Corrientes
M/B 66	Hale	FP2000D	2,400	150	Detroit Diesel	6V53T	Batería 1	Corrientes	Rio Corrientes
E/B 09	Worthington	3LR 9	500	125	General Electric	5K365BL115	Batería 1	Corrientes	Rio Corrientes
E/B 10	Worthington	3LR 9	500	125	General Electric	5K364BL115	Batería 1	Corrientes	Tank 5,000 bbls.
Jockey Pump	SALMSON	4018405	80	150	Lueg CE	NBR-7094	Batería 1	Corrientes	Tank 5,000 bbls.
DO1	KSB		528	150	Electric Motor		CE II	Corrientes	Tank 600 cubic meters
DO2	KSB		528	150	Diesel Engine		CE II	Corrientes	Tank 600 cubic meters
			1,500	150	Electric Motor		Topping Plant	Corrientes	Tank 500,000 gallons
			1,500	150	Diesel Engine		Topping Plant	Corrientes	Tank 500,000 gallons
M/B 38	Worthington	LR-204	1,500	150	Detroit Diesel	7484- 7010	Batería 3	Yanayacu	Laguna Guayabal 3,000 cubic meters

Equipment No.	Pump Manufacturer	Pump Model	Rating (gpm)	Pressure (psi)	Motor Manufacturer	Motor Model	Location	Field	Suction Source
M/B 43	Worthington	NE SHE BH 241	500	120	Cummins	V-378-F2	Batería 3	Yanayacu	Tank 1,000 bbls.
M/B 71	Reddy Buffaloes	6 x 6 LDF PUMP	1,500	150	Caterpillar	3126	Batería 3	Yanayacu	Laguna Guayabal 3,000 cubic meters
Jockey Pump			80	150			Batería 3	Yanayacu	Laguna Guayabal 3,000 cubic meters
M/B 36	Worthington	LR			Detroit Allison	1064110	Batería 8	Chambira	Laguna 2,500 cubic meters
M/B	Perkins	4.236.L	500	125	Hidrostal	P-1100	Central Eléctrica 130	Pavayacu	Tank 1,000 bbls.
M/B 44	Cummins	V-378-F2	500	125	Worthington	4LR11A	Campamento Batería 5	Pavayacu	Tank 1,000 bbls.
M/B 37	Worthington	LR 6LRG18D	750	150	DETROIT	10647110	Estación de Bombas - Capirona	Pavayacu	Two Tanks - 2,000 bbls
M/B 41	Worthington	LR11A	500	125	Cummins	MN 241	Batería 4	Pavayacu	
MB-67	HALE	FP2000D	2400	150	Detroit Diesel	08VA455279	Batería 9	Pavayacu	Laguna 52,000 cubic meters

Equipment No.	Pump Manufacturer	Pump Model	Rating (gpm)	Pressure (psi)	Motor Manufacturer	Motor Model	Location	Field	Suction Source
MB-68	HALE	FP2000D	2400	150	Detroit Diesel	08VA455298	Batería 9	Pavayacu	Laguna 52,000 cubic meters
E/B 09	Worthington	--------	500	125	General electric	5K364BL115	Batería 9	Pavayacu	Laguna 52,000 cubic meters
M/B 69	-------	--------	500	125	Perkins	5K364BL115	Terminal Yanayacu	Yanayacu	Rio Marañón

APPENDIX N. FIREWATER DRAWINGS FOR BATTERIES AND ELECTRICAL PLANTS



NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Septiembre de 2009.
2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.

REFERENCIAS

SIMBOLOGÍA :

SIM-IN-101	SIMBOLOGÍA – EQUIPOS PARA AGUA Y/O ESPUMA.
SIM-IN-151	SIMBOLOGÍA – CAÑERÍAS, VÁLVULAS Y ACCESORIOS.
SIM-IN-201	SIMBOLOGÍA – INSTRUMENTACIÓN.

COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)

COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)

Pluspetrol Norte S.A.

PLUSPETROL PERÚ
BATERÍA 1

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica

SISTEMA DE AGUA CONTRA INCENDIO
INSTALACIÓN EXISTENTE

DIAGRAMA

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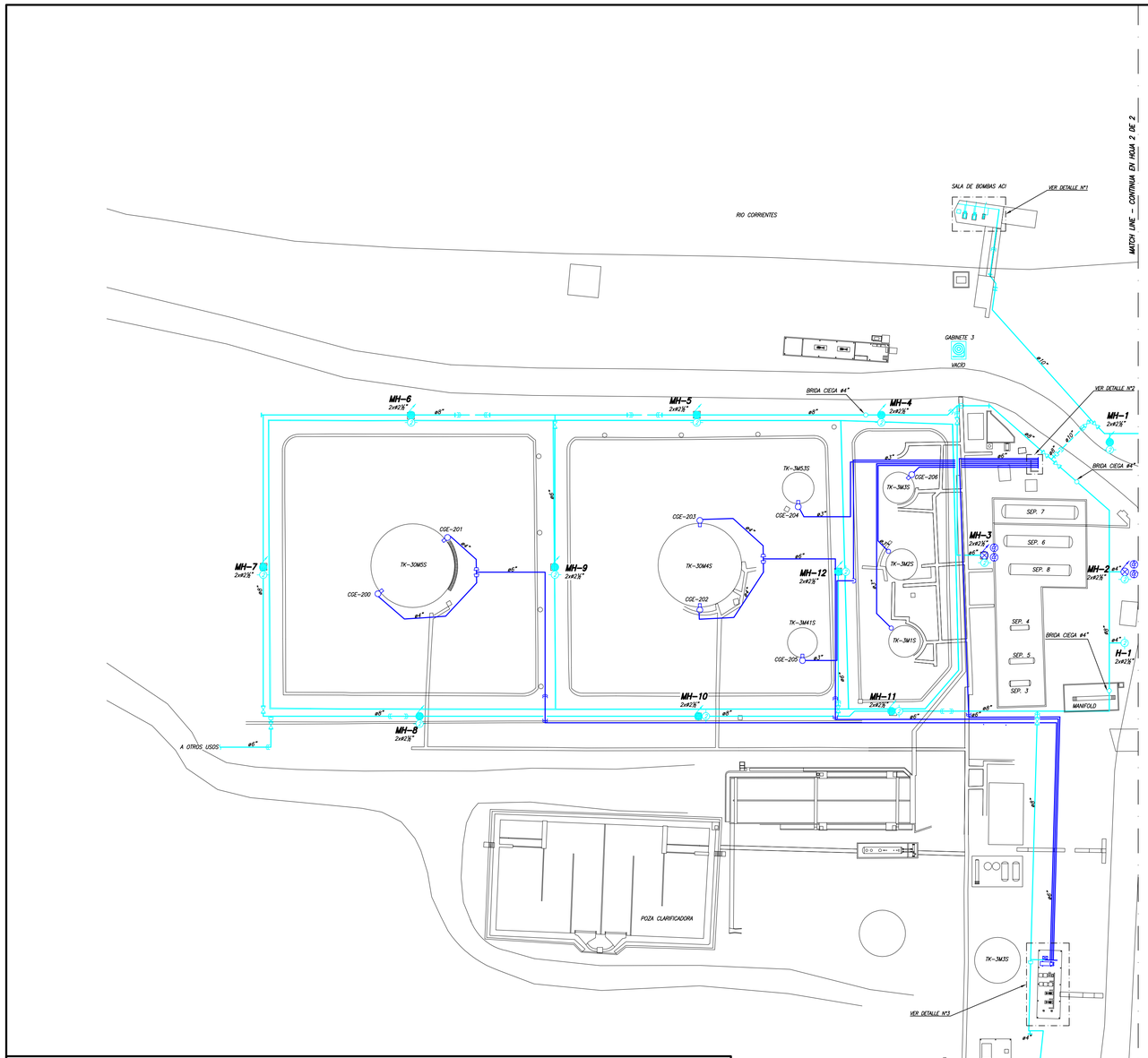
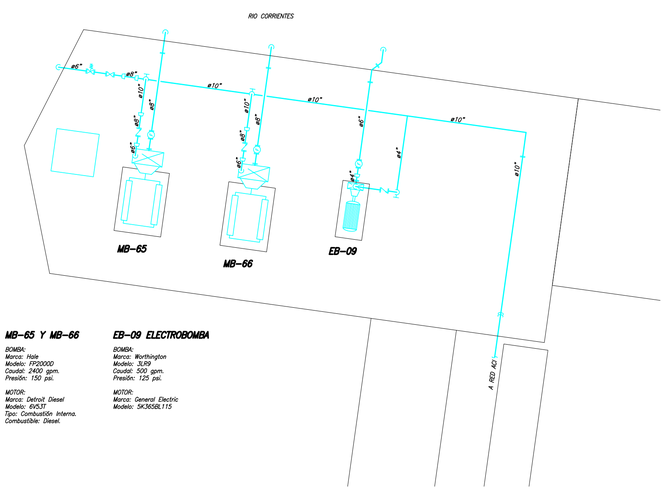
REVISION 0	CODIGO BT1-IN-001



DETALLE N°1 – SALA DE BOMBAS ACI

ESCALA 1:50



MB-65 Y MB-66

BOMBA:
Marca: Hale
Modelo: FP20000D
Caudal: 2400 gpm.
Presión: 150 psi.

MOTOR:
Marca: Detroit Diesel
Modelo: 6V53T
Tipo: Combustión Interna.
Combustible: Diesel.

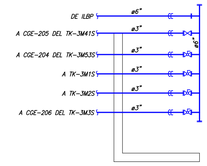
EB-09 ELECTROBOMBA

BOMBA:
Marca: Worthington
Modelo: 3LR9
Caudal: 500 gpm.
Presión: 125 psi.

MOTOR:
Marca: General Electric
Modelo: 5K365BL115

DETALLE N°2 – MANIFOLD DE ESPUMA

ESCALA 1:50



DETALLE N°3 – SISTEMA ILBP Y MANIFOLD DE ESPUMA

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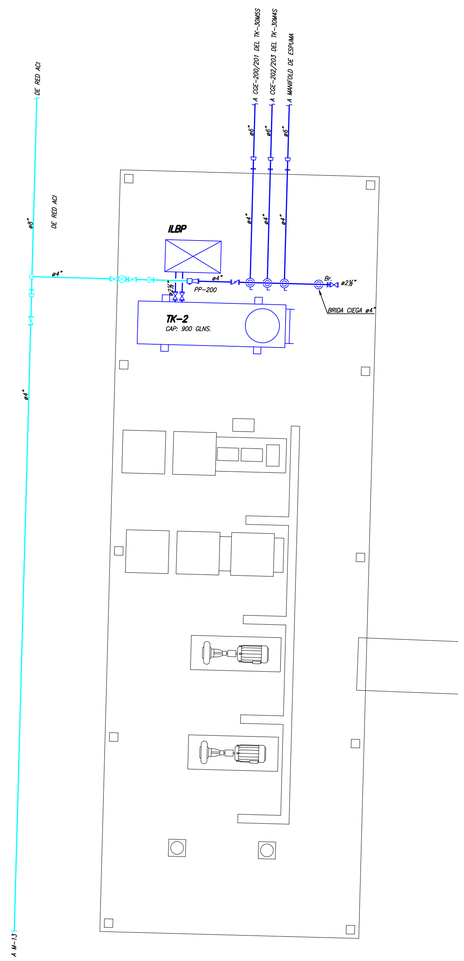

NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Septiembre de 2009.
2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.

REFERENCIAS

SIMBOLOGÍA :

SIM-IN-101	SIMBOLOGÍA – EQUIPOS PARA AGUA Y/O ESPUMA.
SIM-IN-151	SIMBOLOGÍA – CAÑERÍAS, VÁLVULAS Y ACCESORIOS.
SIM-IN-201	SIMBOLOGÍA – INSTRUMENTACIÓN.

COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)
COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)
CAÑERÍA DE AGUA AÉREA
CAÑERÍA DE AGUA SOTERRADA

Pluspetrol Norte S.A.

PLUSPETROL PERÚ
BATERÍA 1

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica
SISTEMA DE AGUA CONTRA INCENDIO
INSTALACIÓN EXISTENTE
PLANTA – Hoja 1 de 2

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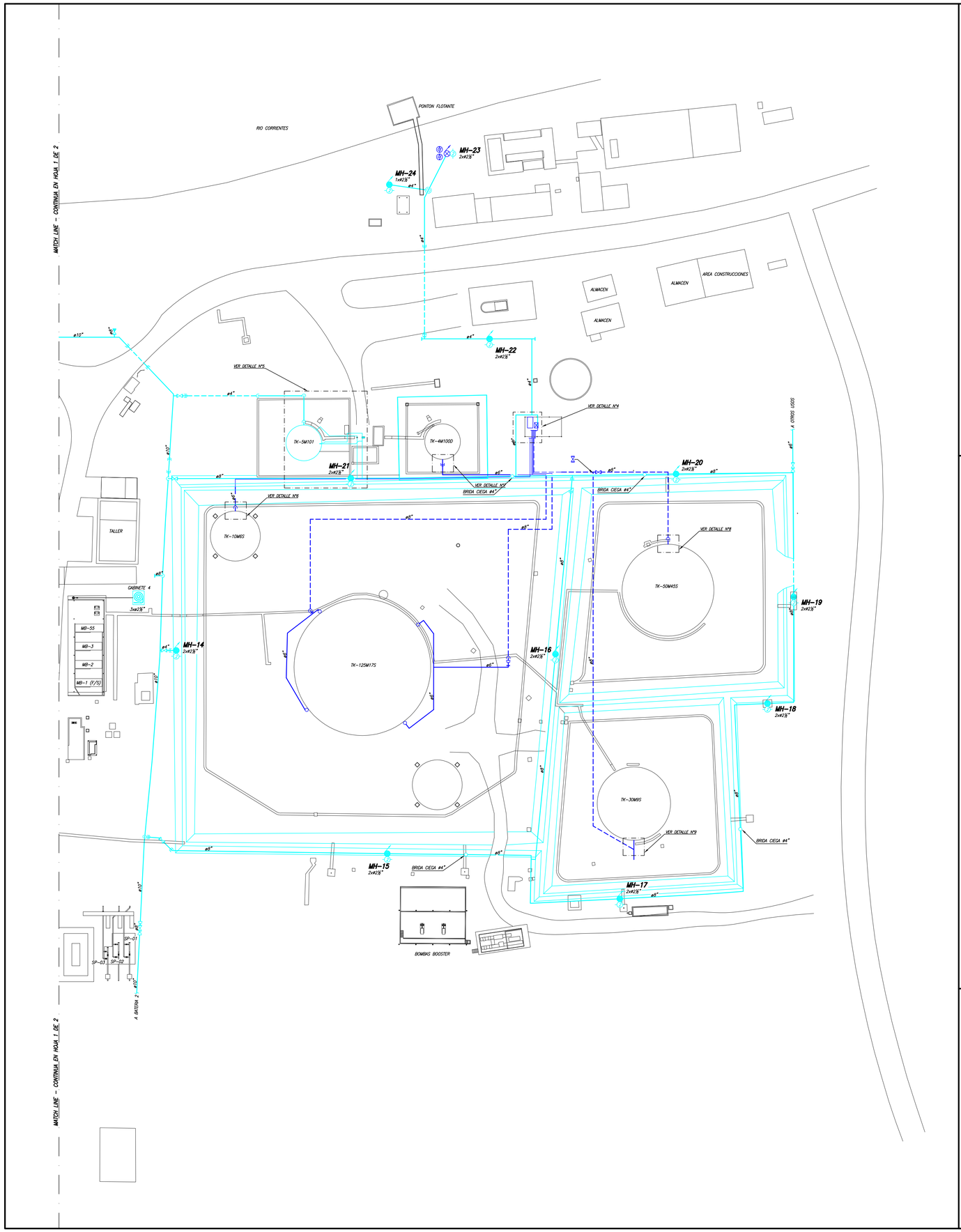

DETALLE N°4 – SISTEMA ILBP Y MANIFOLD DE ESPUMA

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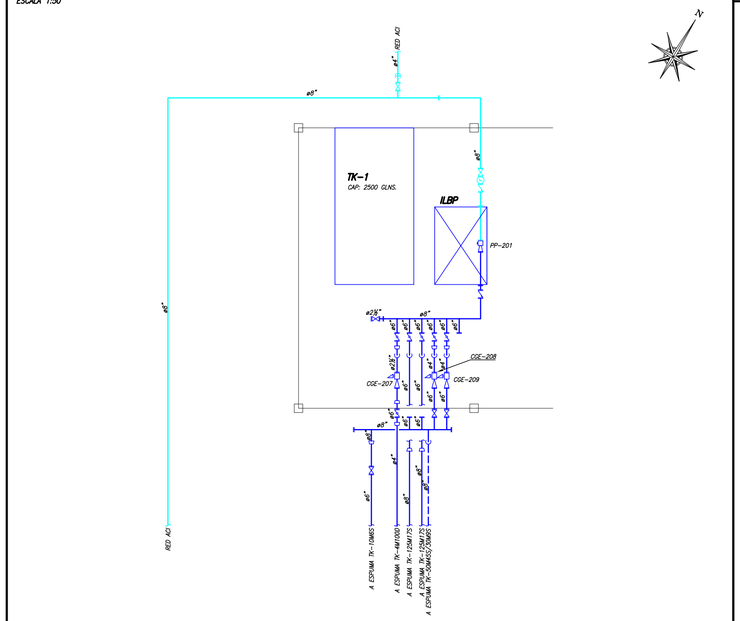
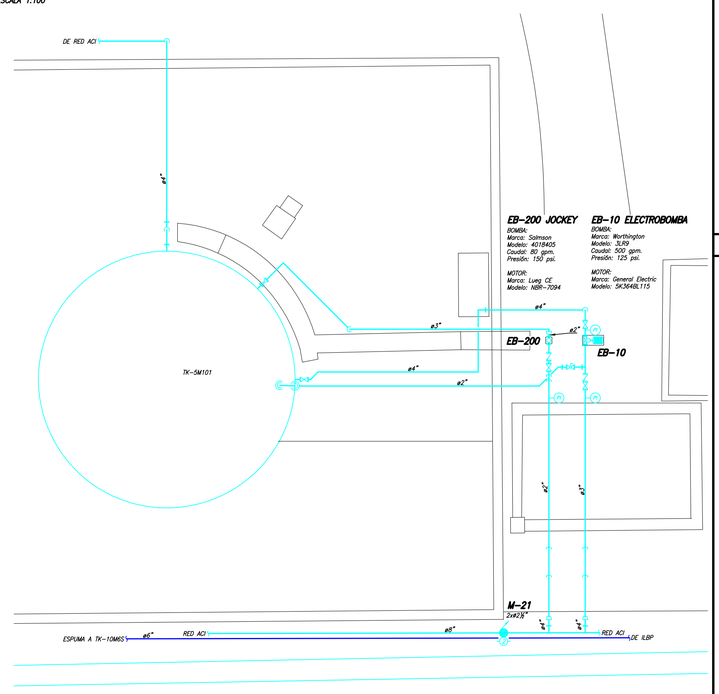


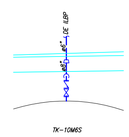
DETALLE N°5 – SALA DE BOMBAS JOCKEY

ESCALA 1:100



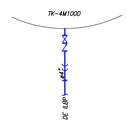
DETALLE N°6

ESCALA 1:100



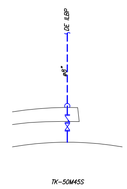
DETALLE N°7

ESCALA 1:100



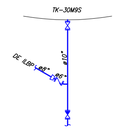
DETALLE N°8

ESCALA 1:100



DETALLE N°9

ESCALA 1:100



NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Septiembre de 2009.
2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.
3. El recorrido de las cañerías soterradas es tentativo.

REFERENCIAS

SIMBOLOGÍA :

SIM-IN-101	SIMBOLOGÍA – EQUIPOS PARA AGUA Y/O ESPUMA.
SIM-IN-151	SIMBOLOGÍA – CAÑERÍAS, VÁLVULAS Y ACCESORIOS.
SIM-IN-201	SIMBOLOGÍA – INSTRUMENTACIÓN.

COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)
COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)
CAÑERÍA DE AGUA AÉREA
CAÑERÍA DE AGUA SOTERRADA

Pluspetrol Norte S.A.

PLUSPETROL PERÚ
BATERÍA 1

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica
SISTEMA DE AGUA CONTRA INCENDIO
INSTALACIÓN EXISTENTE
PLANTA – Hoja 2 de 2

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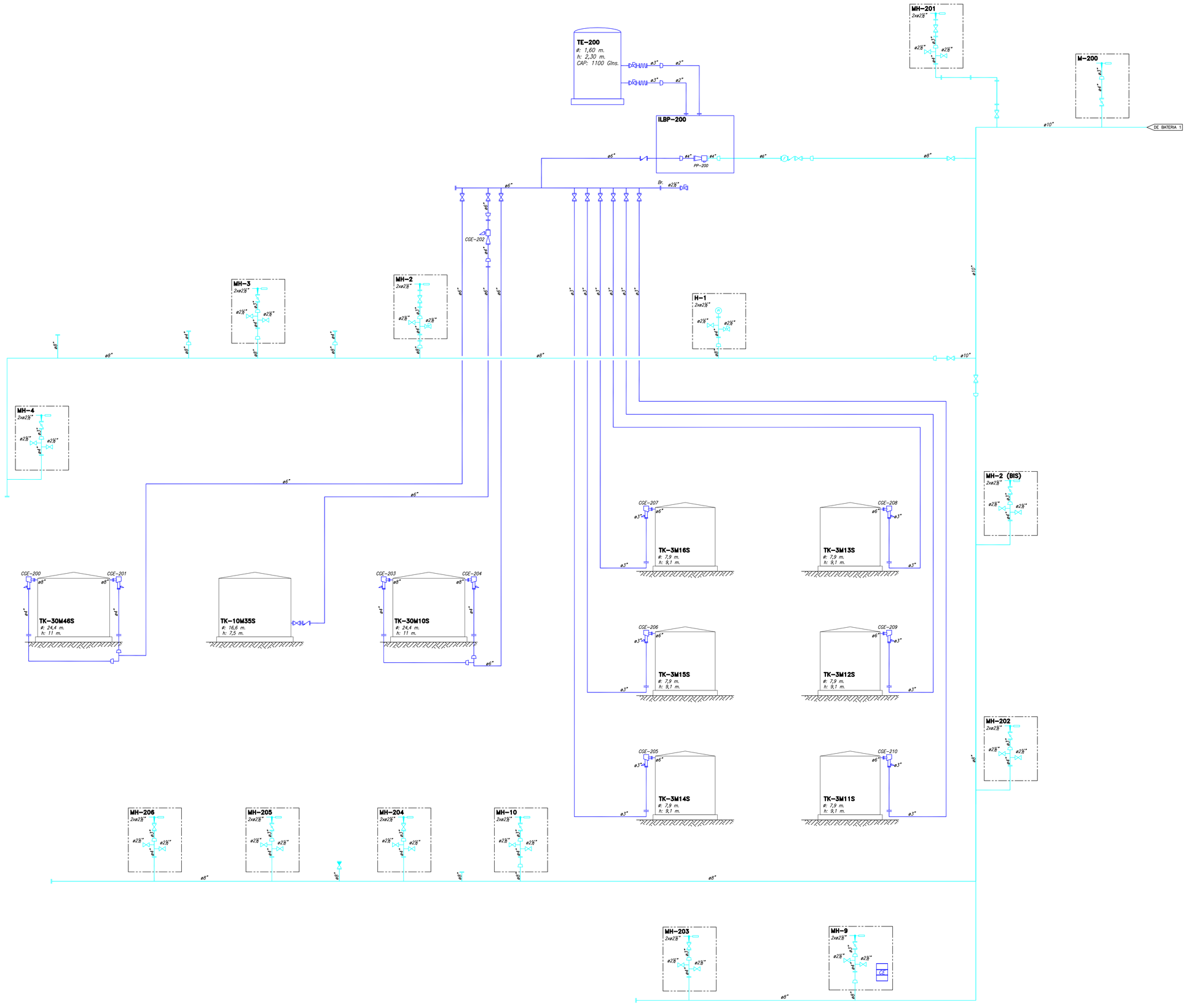
REVISION 0	CODIGO BT1-IN-002



NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Septiembre de 2009.
2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.

REFERENCIAS

SIMBOLOGÍA :

SIM-IN-101	SIMBOLOGÍA – EQUIPOS PARA AGUA Y/O ESPUMA.
SIM-IN-151	SIMBOLOGÍA – CAÑERÍAS, VÁLVULAS Y ACCESORIOS.
SIM-IN-201	SIMBOLOGÍA – INSTRUMENTACIÓN.

COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)

COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)

Pluspetrol Norte S.A.

PLUSPETROL PERÚ
BATERÍA 2

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica

SISTEMA DE AGUA CONTRA INCENDIO
INSTALACIÓN EXISTENTE

DIAGRAMA

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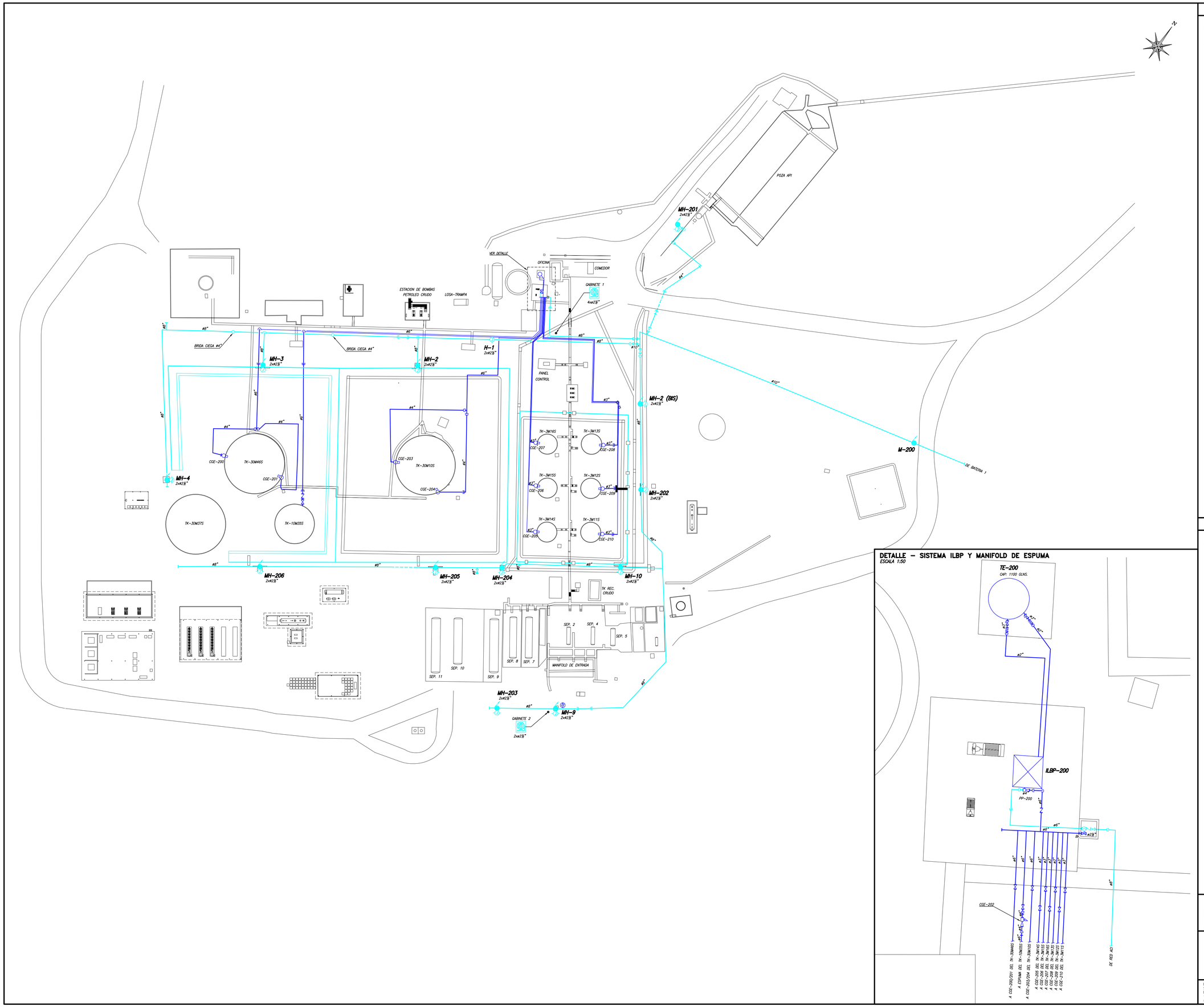

NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Septiembre de 2009.
2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.

REFERENCIAS

SIMBOLOGÍA :

SIM-IN-101	SIMBOLOGÍA – EQUIPOS PARA AGUA Y/O ESPUMA.
SIM-IN-151	SIMBOLOGÍA – CAÑERÍAS, VÁLVULAS Y ACCESORIOS.
SIM-IN-201	SIMBOLOGÍA – INSTRUMENTACIÓN.

COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)
COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)
CAÑERÍA DE AGUA AÉREA
CAÑERÍA DE AGUA SOTERRADA

Pluspetrol Norte S.A.

PLUSPETROL PERÚ
BATERÍA 2

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica

SISTEMA DE AGUA CONTRA INCENDIO
INSTALACIÓN EXISTENTE

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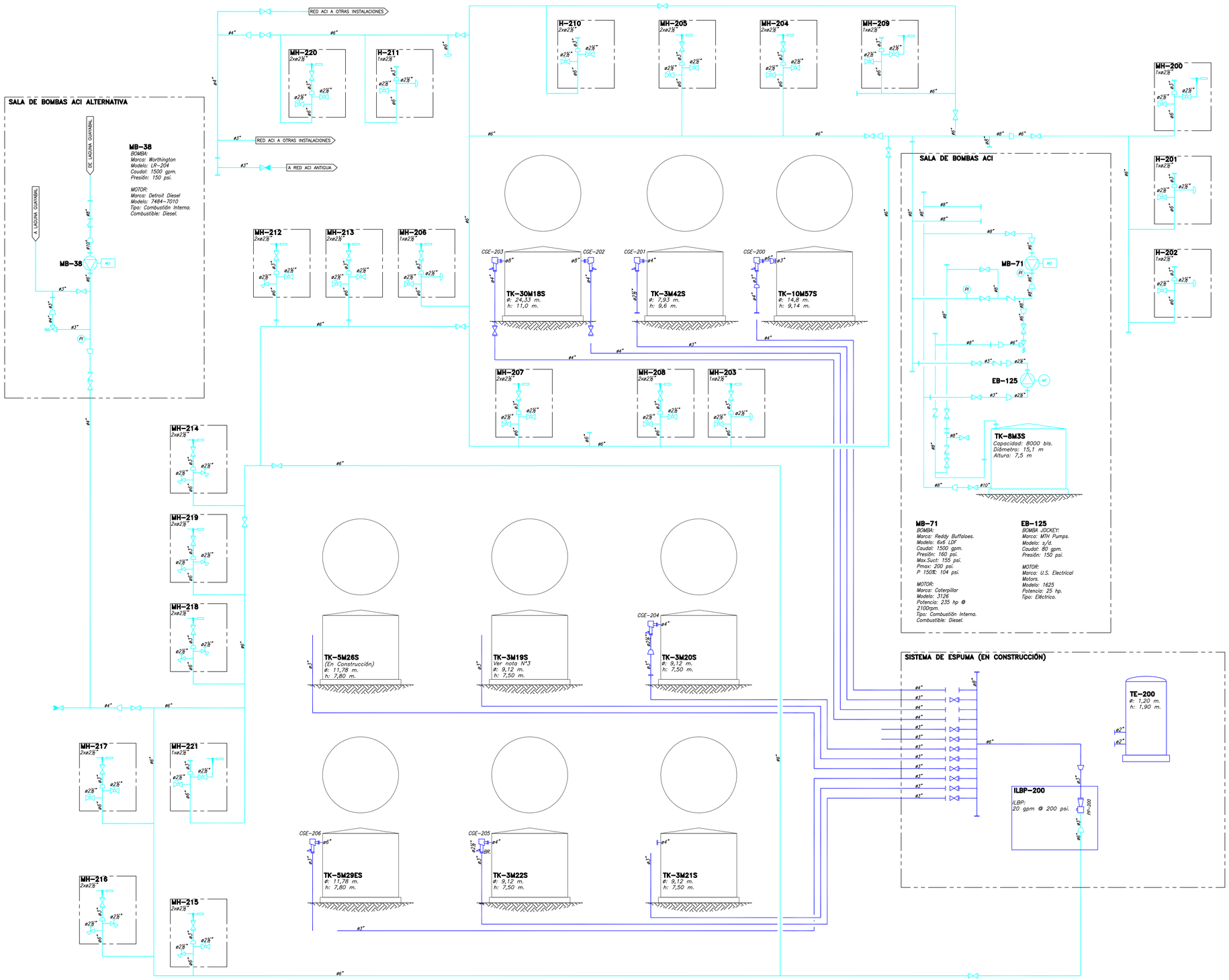
ESCALA	FECHA
1:500	27/12/2010
REVISION 0	CODIGO BT2-IN-002



NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Septiembre de 2009.
2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.
3. Al momento del relevamiento, este tanque se encontraba desmontado en proceso de reparación.

REFERENCIAS

SIMBOLOGÍA :

SIM-IN-101	SIMBOLOGÍA – EQUIPOS PARA AGUA Y/O ESPUMA.
SIM-IN-151	SIMBOLOGÍA – CAÑERÍAS, VÁLVULAS Y ACCESORIOS.
SIM-IN-201	SIMBOLOGÍA – INSTRUMENTACIÓN.

COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)

COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)

Pluspetrol Norte S.A.

PLUSPETROL PERÚ
BATERÍA 3 – YANAYACU

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica

SISTEMA DE AGUA CONTRA INCENDIO
INSTALACIÓN EXISTENTE

DIAGRAMA

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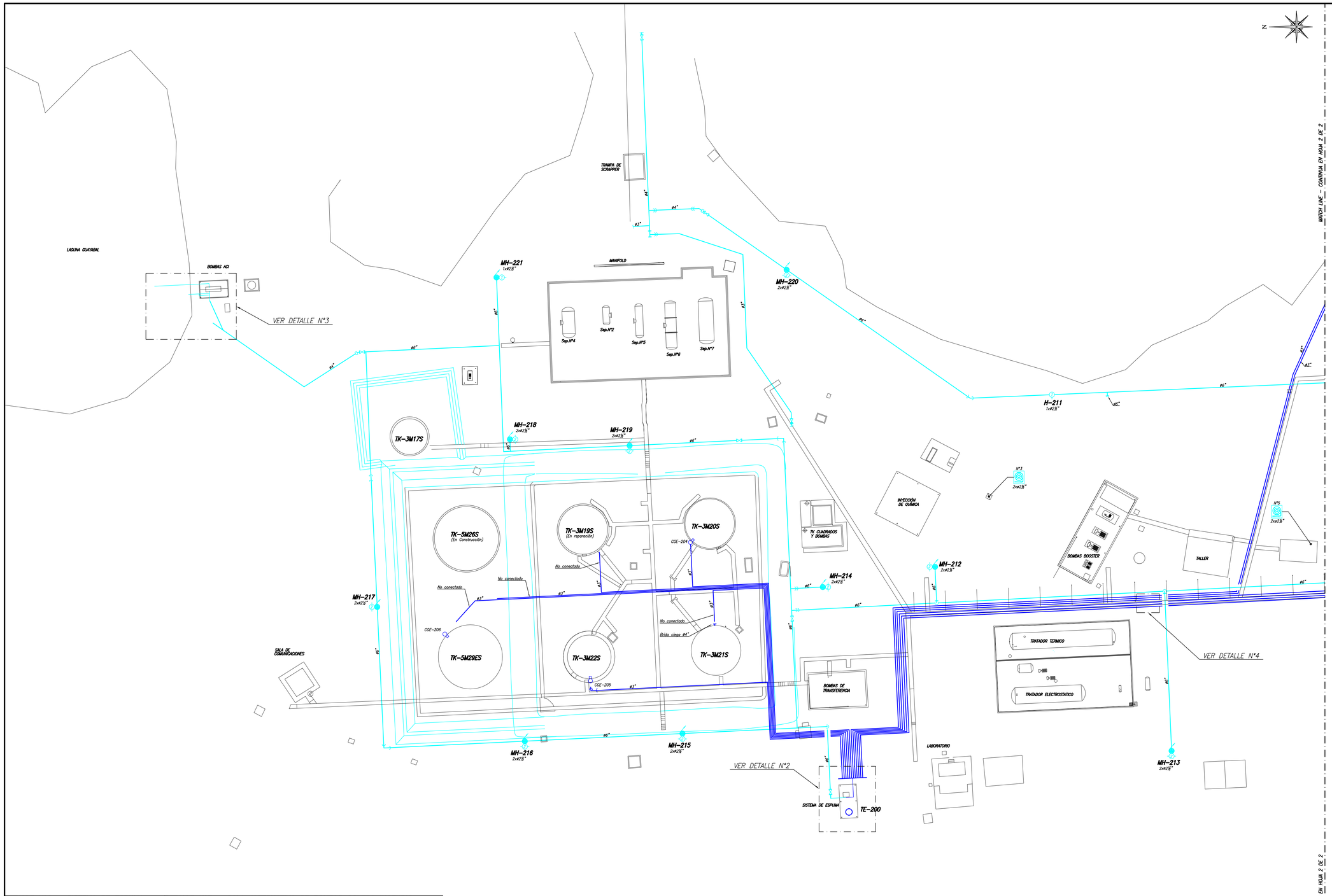
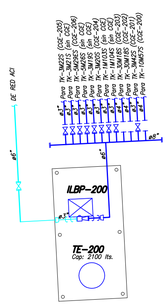
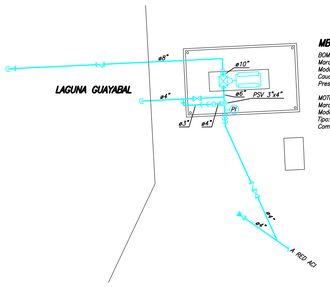
REVISION 0	CODIGO BT3-IN-001



DETALLE N°2 – SISTEMA DE ESPUMA
ESCALA 1 : 100



DETALLE N°3 – SALA ALTERNATIVA DE BOMBAS CONTRA INCENDIO
ESCALA 1 : 100



DETALLE N°4 – LINEAS DE ESPUMA
ESCALA 1 : 100

NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Septiembre de 2009.
2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.

REFERENCIAS

SIMBOLOGÍA :

SIM-IN-101	SIMBOLOGÍA – EQUIPOS PARA AGUA Y/O ESPUMA.
SIM-IN-151	SIMBOLOGÍA – CAÑERÍAS, VÁLVULAS Y ACCESORIOS.
SIM-IN-201	SIMBOLOGÍA – INSTRUMENTACIÓN.

COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)
COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)
CAÑERÍA DE AGUA AÉREA
CAÑERÍA DE AGUA SOTERRADA

Pluspetrol Norte S.A.

PLUSPETROL PERÚ
BATERÍA 3 – YANAYACU

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica
SISTEMA DE AGUA CONTRA INCENDIO
INSTALACIÓN EXISTENTE
PLANTA – Hoja 1 de 2

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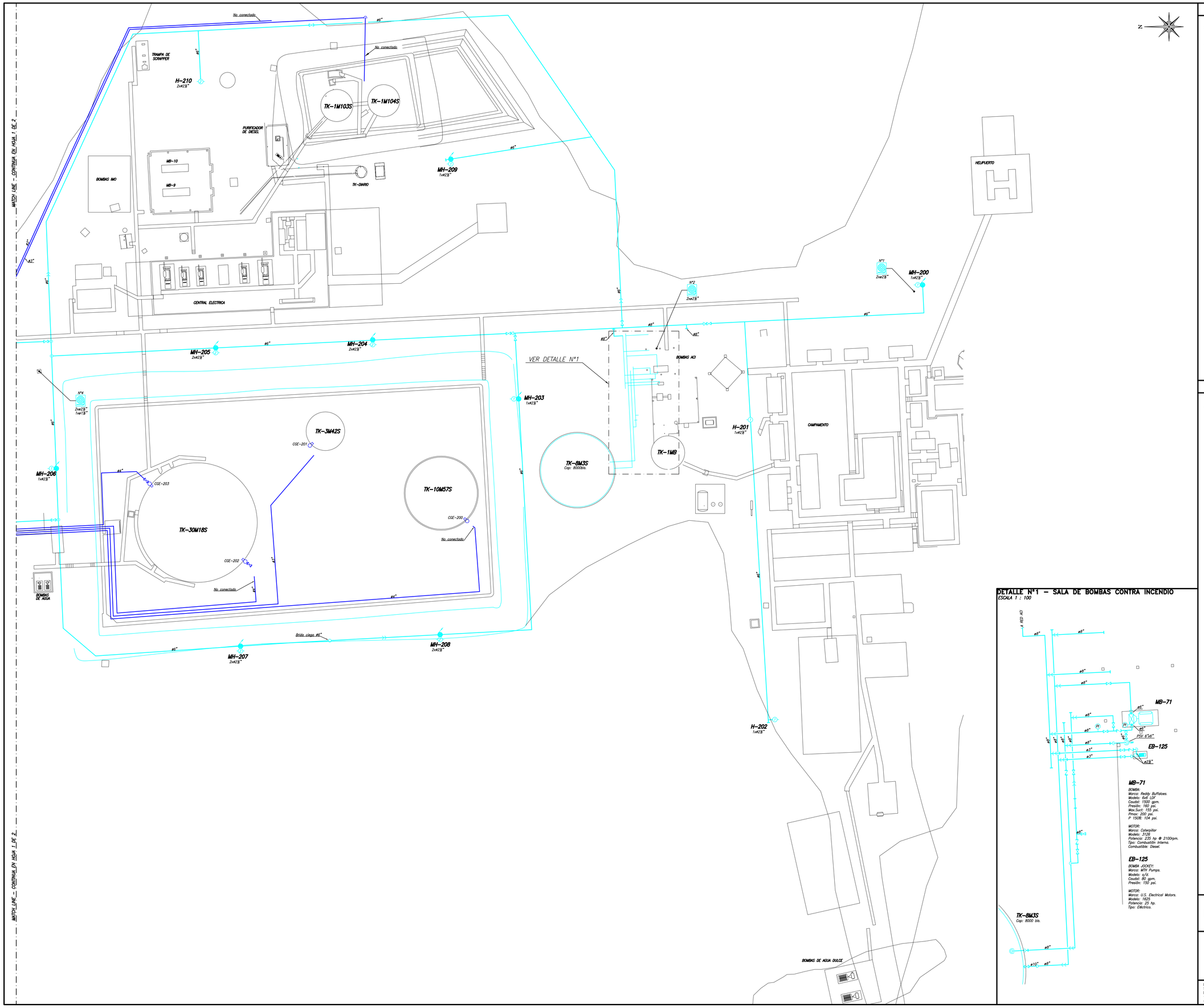
REVISION 0	CODIGO BT3-IN-002



DETALLE N°1 – SALA DE BOMBAS CONTRA INCENDIO

ESCALA 1 : 100

MB-71

BOMBA:
Marca: Reddy Buffaloes.
Modelo: 6x6 LDF.
Caudal: 1500 gpm.
Presión: 160 psi.
Max.Succ: 155 psi.
Pmax: 200 psi.
P 150B: 104 psi.

MOTOR:
Marca: Caterpillar
Modelo: 3126
Potencia: 235 hp @ 2100rpm.
Tipo: Combustión Interna.
Combustible: Diesel.

EB-125

BOMBA JOCKEY:
Marca: MTH Pumps.
Modelo: s/d.
Caudal: 80 gpm.
Presión: 150 psi.

MOTOR:
Marca: U.S. Electrical Motors.
Modelo: 1625
Potencia: 25 hp.
Tipo: Eléctrico.

NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Septiembre de 2009.
2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.

REFERENCIAS

SIMBOLOGÍA :

SIM–IN–101	SIMBOLOGÍA – EQUIPOS PARA AGUA Y/O ESPUMA.
SIM–IN–151	SIMBOLOGÍA – CAÑERÍAS, VÁLVULAS Y ACCESORIOS.
SIM–IN–201	SIMBOLOGÍA – INSTRUMENTACIÓN.

- COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)
- COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)
- CAÑERÍA DE AGUA AÉREA
- CAÑERÍA DE AGUA SOTERRADA

Pluspetrol Norte S.A.

PLUSPETROL PERU
BATERÍA 3 – YANAYACU

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica

SISTEMA DE AGUA CONTRA INCENDIO
INSTALACIÓN EXISTENTE

PLANTA – Hoja 2 de 2

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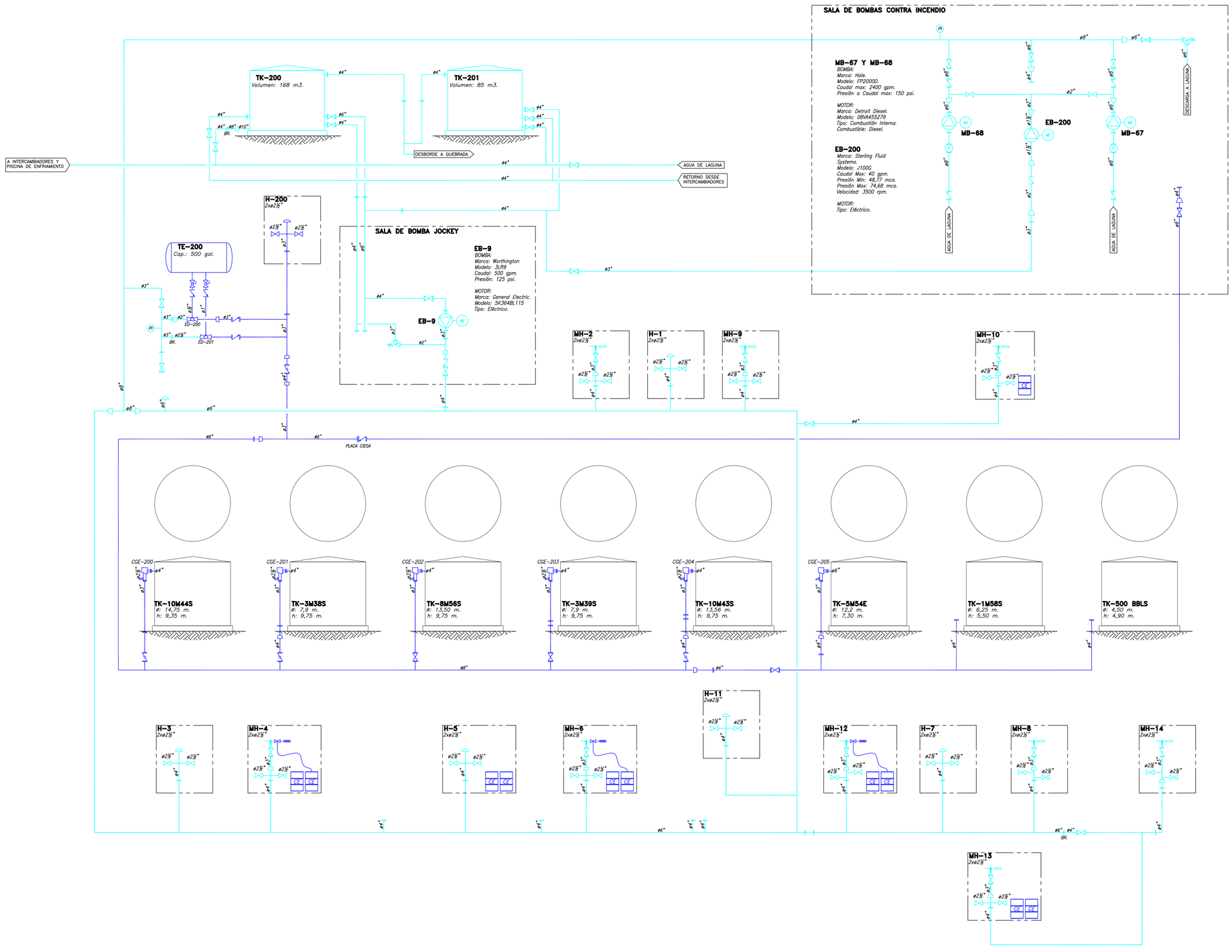
REVISION	CODIGO
0	BT3–IN–002



NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Septiembre de 2009.
2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.

REFERENCIAS

SIMBOLOGÍA :

SIM-IN-101	SIMBOLOGÍA – EQUIPOS PARA AGUA Y/O ESPUMA.
SIM-IN-151	SIMBOLOGÍA – CAÑERÍAS, VÁLVULAS Y ACCESORIOS.
SIM-IN-201	SIMBOLOGÍA – INSTRUMENTACIÓN.

COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)

COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)

Pluspetrol Norte S.A.

PLUSPETROL PERÚ
BATERÍA 9 – PAVAYACU

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica
SISTEMA DE AGUA CONTRA INCENDIO
INSTALACIÓN EXISTENTE
DIAGRAMA

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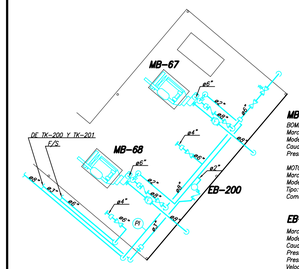
ESCALA	FECHA
SIN ESCALA	27/12/2010
REVISION 0	CODIGO BT9-IN-001

DETALLE N°1 – SALA DE BOMBAS CONTRA INCENDIO
ESCALA 1 : 100



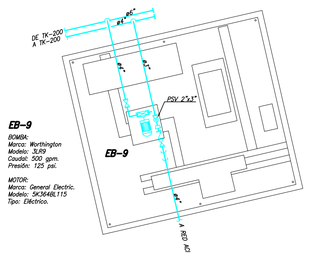
MB-67 Y MB-68
BOMBA:
Marca: Hale.
Modelo: FF2000D.
Caudal max: 2400 gpm.
Presión a Caudal max: 150 psi.

MOTOR:
Marca: Detroit Diesel.
Modelo: 08V455279
Tipo: Combustión Interna.
Combustible: Diesel.

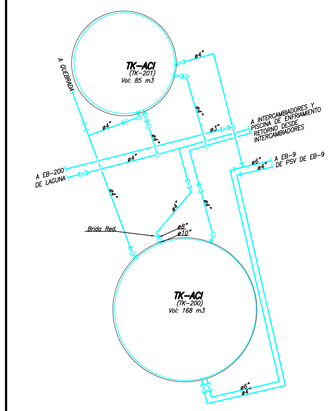
EB-200
Marca: Sterling Fluid Systems.
Modelo: J100G.
Caudal Max: 40 gpm.
Presión Min: 48,77 mca.
Presión Max: 74,68 mca.
Velocidad: 3500 rpm.

MOTOR:
Tipo: Eléctrico.

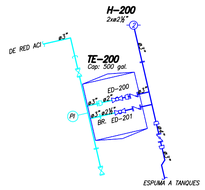
DETALLE N°2 – SALA DE BOMBAS CONTRA INCENDIO
ESCALA 1 : 100



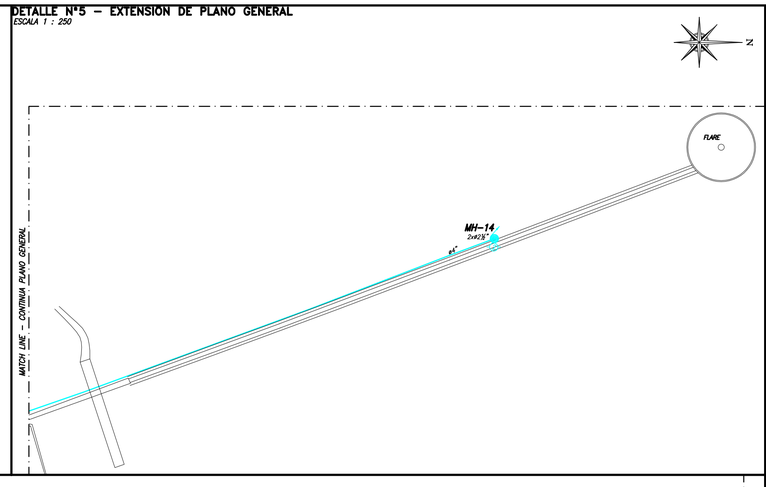
DETALLE N°3 – TANQUES DE AGUA CONTRA INCENDIO
ESCALA 1 : 100



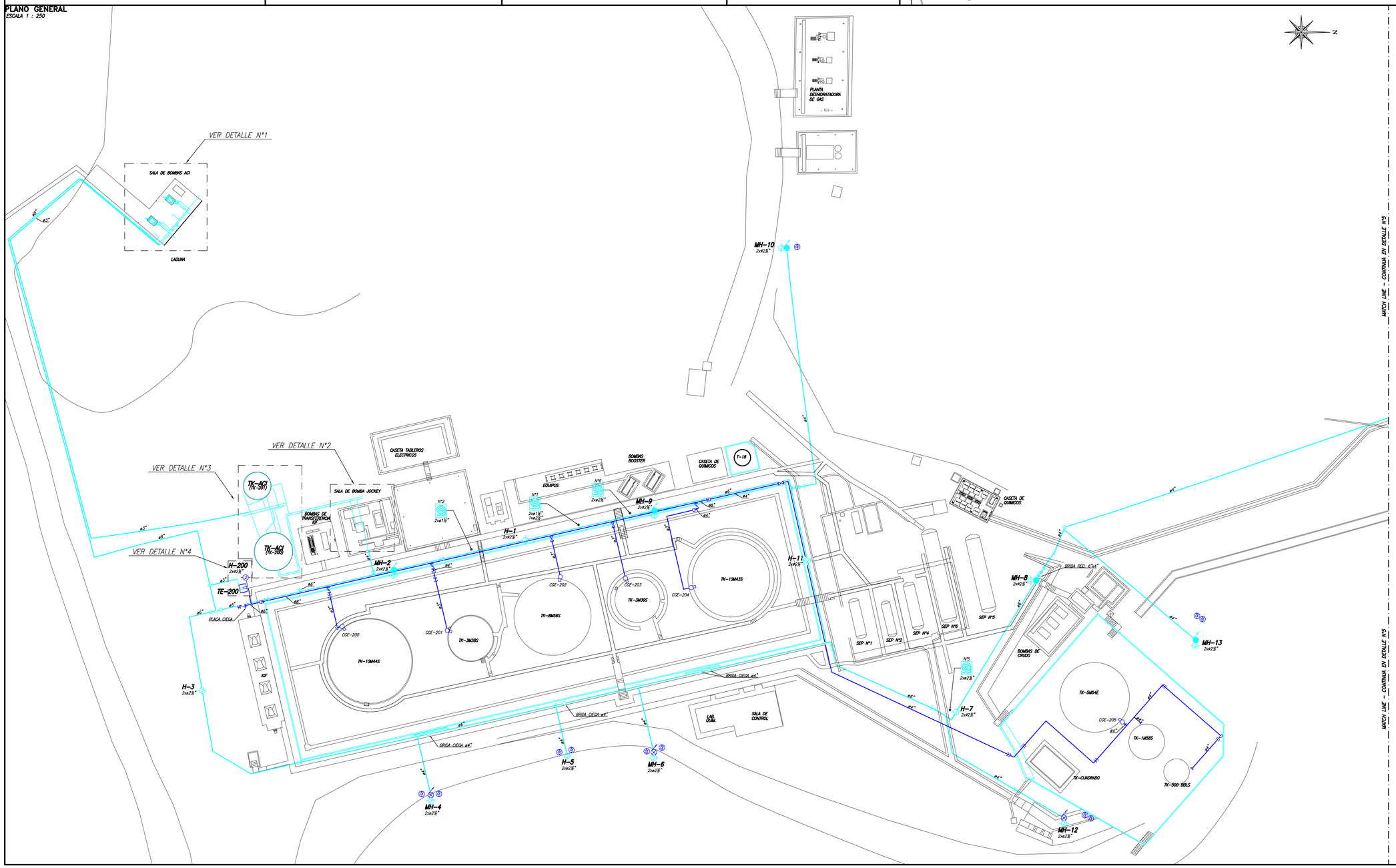
DETALLE N°4 – SISTEMA DE ESPUMA
ESCALA 1 : 50



DETALLE N°5 – EXTENSION DE PLANO GENERAL
ESCALA 1 : 250



PLANO GENERAL
ESCALA 1 : 250



NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Septiembre de 2009.
2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.

REFERENCIAS

SIMBOLOGÍA :

SIM–IN–101	SIMBOLOGÍA – EQUIPOS PARA AGUA Y/O ESPUMA.
SIM–IN–151	SIMBOLOGÍA – CAÑERÍAS, VÁLVULAS Y ACCESORIOS.
SIM–IN–201	SIMBOLOGÍA – INSTRUMENTACIÓN.

- COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)
- COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)
- CAÑERÍA DE AGUA AÉREA
- CAÑERÍA DE AGUA SOTERRADA

Pluspetrol Norte S.A.

PLUSPETROL PERÚ
BATERÍA 9 – PAVAYACU

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica

SISTEMA DE AGUA CONTRA INCENDIO
INSTALACIÓN EXISTENTE

PLANTA

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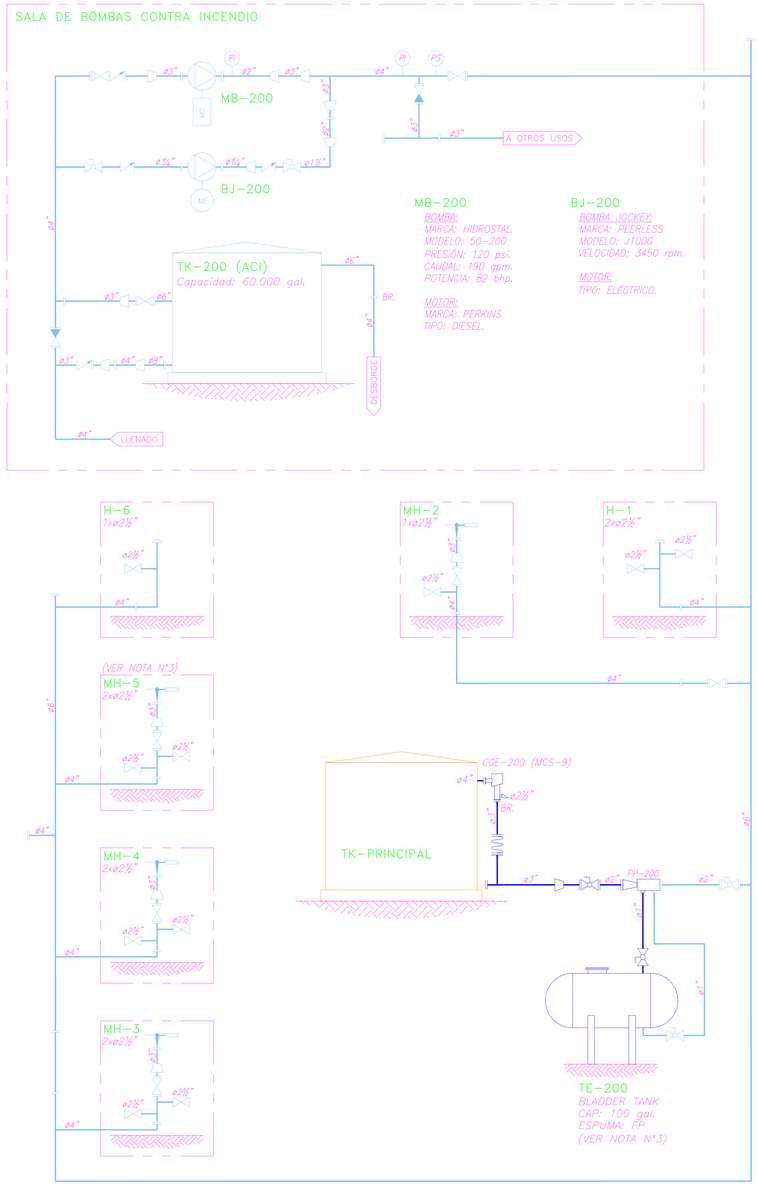
ESCALA	FECHA
1:250	27/12/2010
REVISION 0	CODIGO BT9–IN–002



NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Noviembre de 2010.
2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.
3. Junto al equipo hay dos bidones de concentrado espumígeno a base de fluoro-proteínico para 3%, de 20 lts. cada uno.

REFERENCIAS

SIMBOLOGIA :

SIM-IN-101	SIMBOLOGÍA – EQUIPOS PARA AGUA Y/O ESPUMA.
SIM-IN-151	SIMBOLOGÍA – CAÑERÍAS, VÁLVULAS Y ACCESORIOS.
SIM-IN-201	SIMBOLOGÍA – INSTRUMENTACIÓN.

PLANOS DE REFERENCIA:

130-IN-002	SISTEMA DE AGUA CONTRA INCENDIO – INSTALACIÓN EXISTENTE PLANTA.

COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)

COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)

Pluspetrol Norte S.A.

CENTRAL ELÉCTRICA
PAVAYACU CE-130

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica

SISTEMA DE AGUA CONTRA INCENDIO
INSTALACIÓN PROPUESTA

PLANTA

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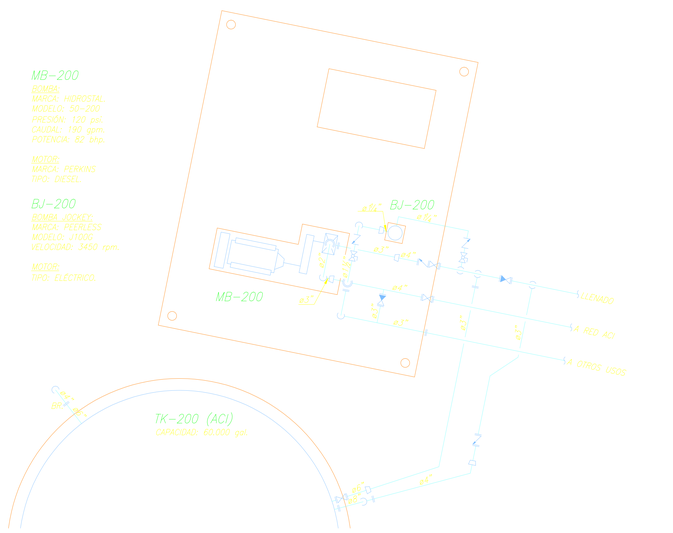
SIN ESCALA	16/12/2011
REVISION 0	CODIGO 130-IN-001

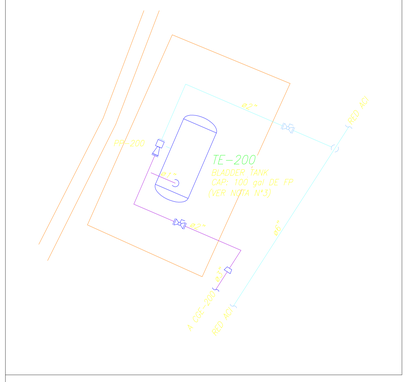
DETALLE N°1 – SALA DE BOMBAS CONTRA INCENDIO

ESCALA 1:50



DETALLE N°2 – BLADDER TANK DE ESPUMA

ESCALA 1:50



NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Noviembre de 2010.
2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.
3. Dos bidones de concentrado espumígeno a base de fluoro-proteínico para 3%, de 20 lts. cada uno.
4. No se pudo acceder al interior del gabinete por estar precintado o bloqueado.

REFERENCIAS

SIMBOLOGIA :

SIM-IN-101	SIMBOLOGÍA – EQUIPOS PARA AGUA Y/O ESPUMA.
SIM-IN-151	SIMBOLOGÍA – CAÑERÍAS, VÁLVULAS Y ACCESORIOS.
SIM-IN-201	SIMBOLOGÍA – INSTRUMENTACIÓN.

PLANOS DE REFERENCIA:

130-IN-001	SISTEMA DE AGUA CONTRA INCENDIO – INSTALACIÓN EXISTENTE DIAGRAMA.

COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)
COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)
CAÑERÍA AÉREA
CAÑERÍA SOTERRADA

Pluspetrol Norte S.A.

CENTRAL ELÉCTRICA
PAVAYACU CE-130

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica

SISTEMA DE AGUA CONTRA INCENDIO
INSTALACIÓN PROPUESTA

PLANTA

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ESCALA	FECHA
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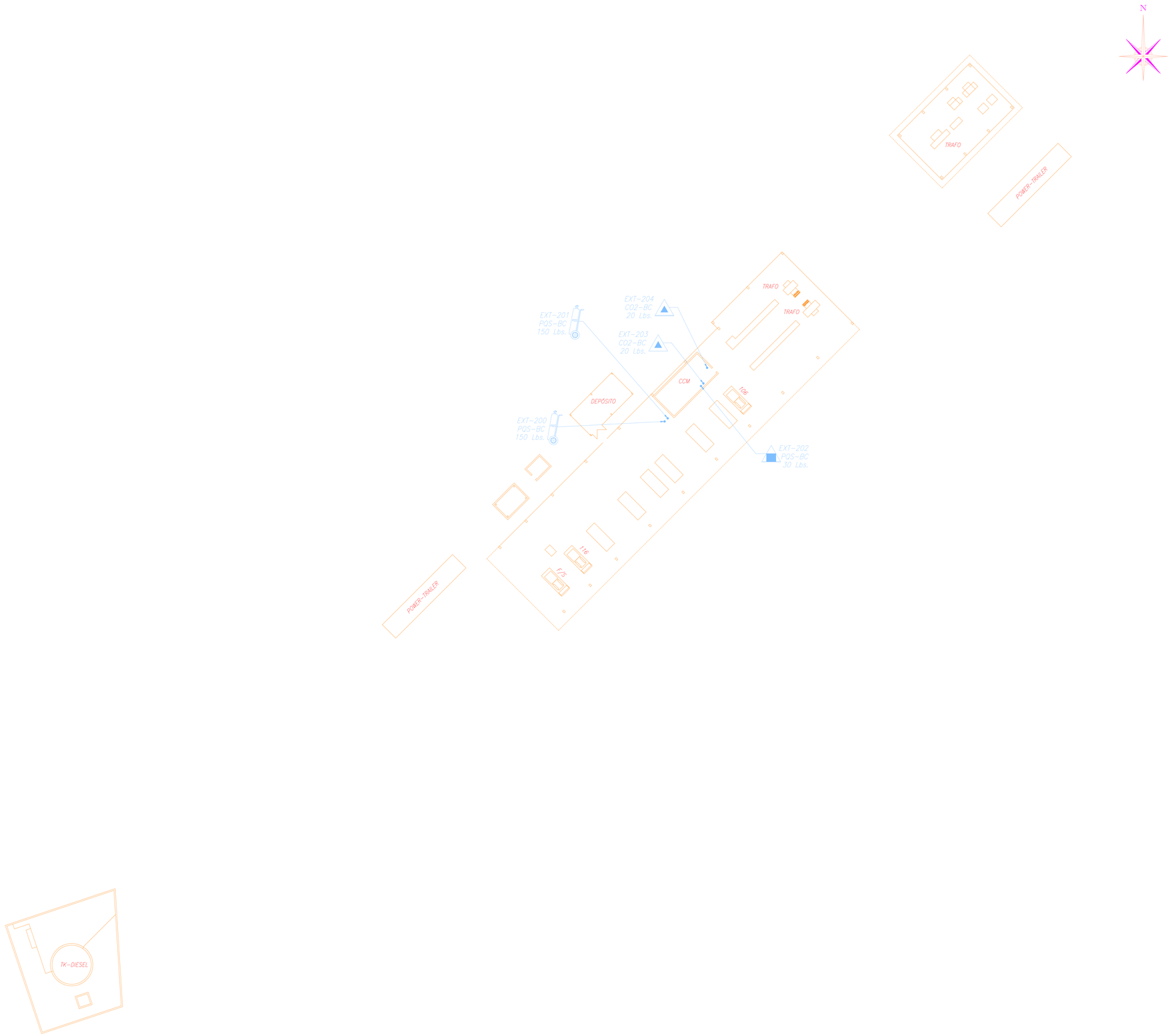
REVISIÓN	CÓDIGO
0	130-IN-002



NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Noviembre de 2010.
2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.

REFERENCIAS

SIMBOLOGÍA :

SIM-IN-001 Rev.0 SIMBOLOGÍA – EXTINTORES.

COLOR DE INSTALACIÓN EXISTENTE (CIAN)

Pluspetrol Norte S.A.

CENTRAL ELÉCTRICA
PAVAYACU 149

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica

UBICACIÓN DE EXTINTORES
INSTALACIÓN EXISTENTE

PLANTA

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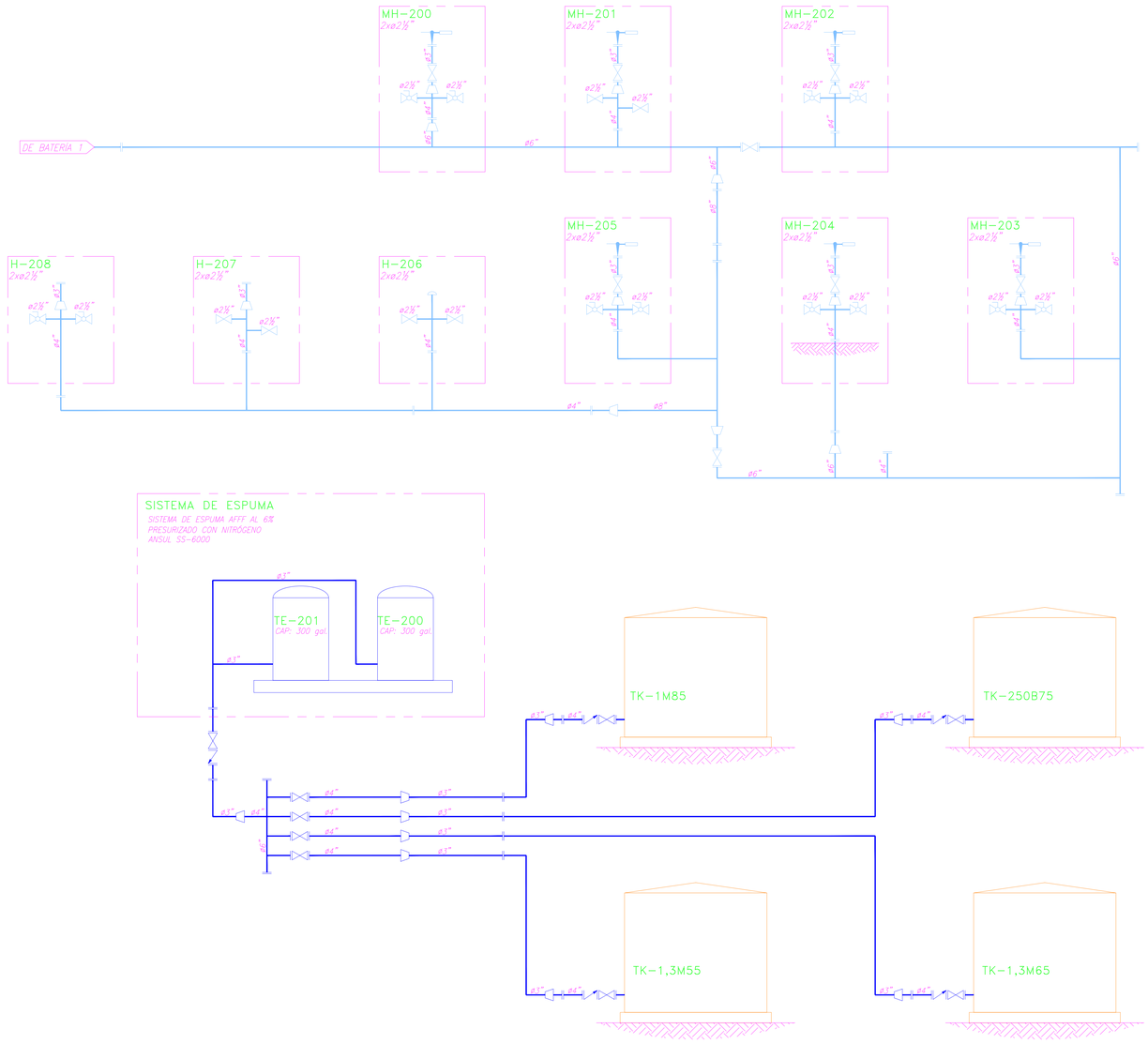
REVISIÓN	CÓDIGO
0	149-IN-001



NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Noviembre de 2010.
2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.

REFERENCIAS

SIMBOLOGIA :

SIM-IN-101	SIMBOLOGÍA – EQUIPOS PARA AGUA Y/O ESPUMA.
SIM-IN-151	SIMBOLOGÍA – CAÑERÍAS, VÁLVULAS Y ACCESORIOS.
SIM-IN-201	SIMBOLOGÍA – INSTRUMENTACIÓN.

PLANOS DE REFERENCIA:

CEC-IN-002	SISTEMA DE AGUA CONTRA INCENDIO – INSTALACIÓN EXISTENTE PLANTA.

COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)

COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)

Pluspetrol Norte S.A.

CENTRAL ELÉCTRICA
CORRIENTES 1

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica

SISTEMA DE AGUA CONTRA INCENDIO
INSTALACIÓN EXISTENTE

DIAGRAMA

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ESCALA	FECHA
SIN ESCALA	16/12/2011
REVISION	CODIGO
0	CEC-IN-001

NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Noviembre de 2010.

2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.

REFERENCIAS

SIMBOLOGIA :

SIM–N–101 : SIMBOLOGIA – EQUIPOS PARA AGUA Y/O ESPUMA.
SIM–N–151 : SIMBOLOGIA – CAÑERIAS, VÁLVULAS Y ACCESORIOS.
SIM–N–201 : SIMBOLOGIA – INSTRUMENTACIÓN.

PLANOS DE REFERENCIA:

CEC–IN–001 : SISTEMA DE AGUA CONTRA INCENDIO – INSTALACIÓN EXISTENTE DIAGRAMA.

COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)
COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)
CAÑERIA AÉREA
CAÑERIA SOTERRADA

Pluspetrol Norte S.A.

CENTRAL ELÉCTRICA
CORRIENTES 1

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica

SISTEMA DE AGUA CONTRA INCENDIO
INSTALACIÓN EXISTENTE

PLANTA

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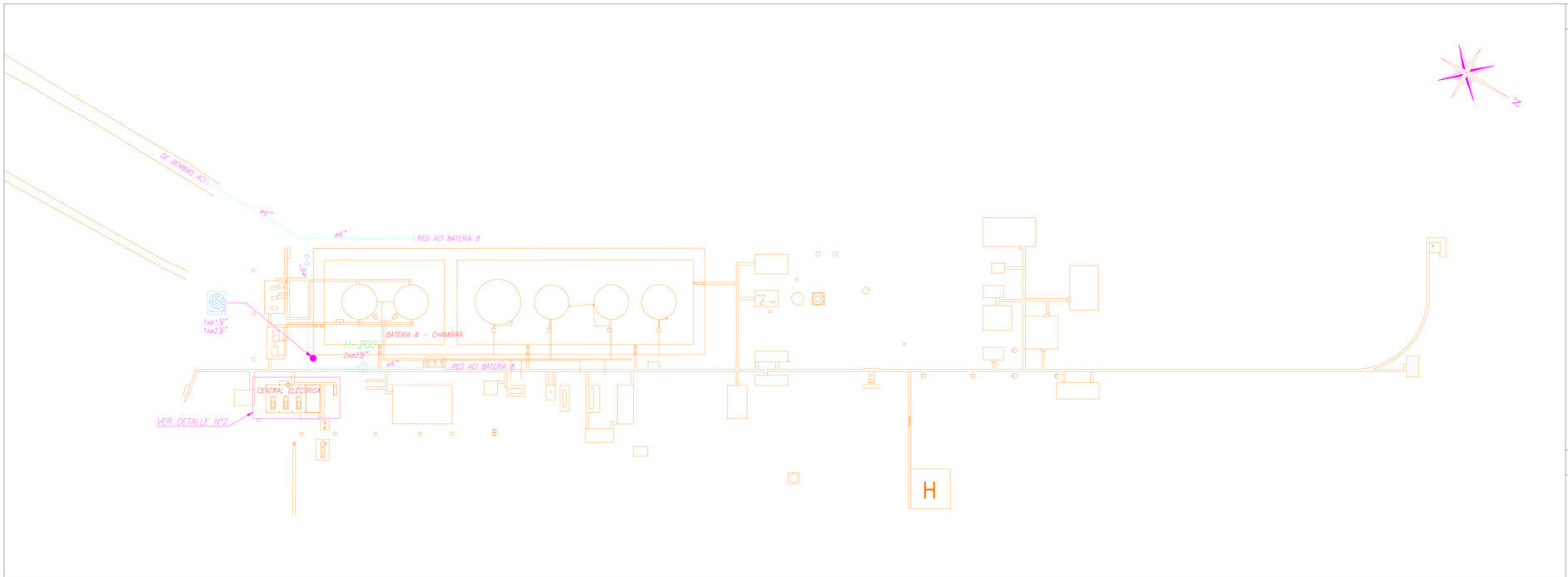
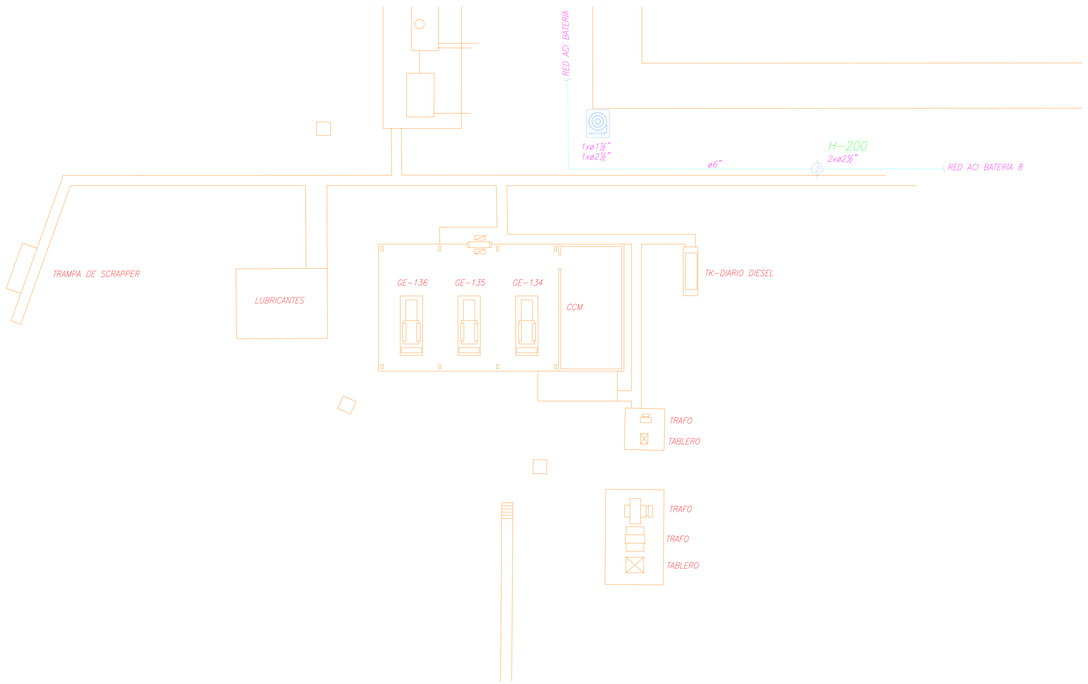
ESCALA	FECHA
1:250	16/12/2011
REVISION	CODIGO
0	CEC–IN–002



DETALLE N°1 – CENTRAL ELECTRICA CHAMBIRA

ESCALA 1:100



NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Noviembre de 2010.
2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.
3. Dos bidones de concentrado espumígeno a base de fluoro-proteínico para 3%, de 20 lts. cada uno.

REFERENCIAS

SIMBOLOGIA :

SIM-IN-101	SIMBOLOGÍA – EQUIPOS PARA AGUA Y/O ESPUMA.
SIM-IN-151	SIMBOLOGÍA – CAÑERÍAS, VÁLVULAS Y ACCESORIOS.
SIM-IN-201	SIMBOLOGÍA – INSTRUMENTACIÓN.

COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)

COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)

CAÑERÍA AÉREA

CAÑERÍA SOTERRADA

Pluspetrol Norte S.A.

CENTRAL ELÉCTRICA CHAMBIRA

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO

Ingeniería Básica

SISTEMA DE AGUA CONTRA INCENDIO INSTALACIÓN EXISTENTE

PLANTA

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ESCALA	FECHA
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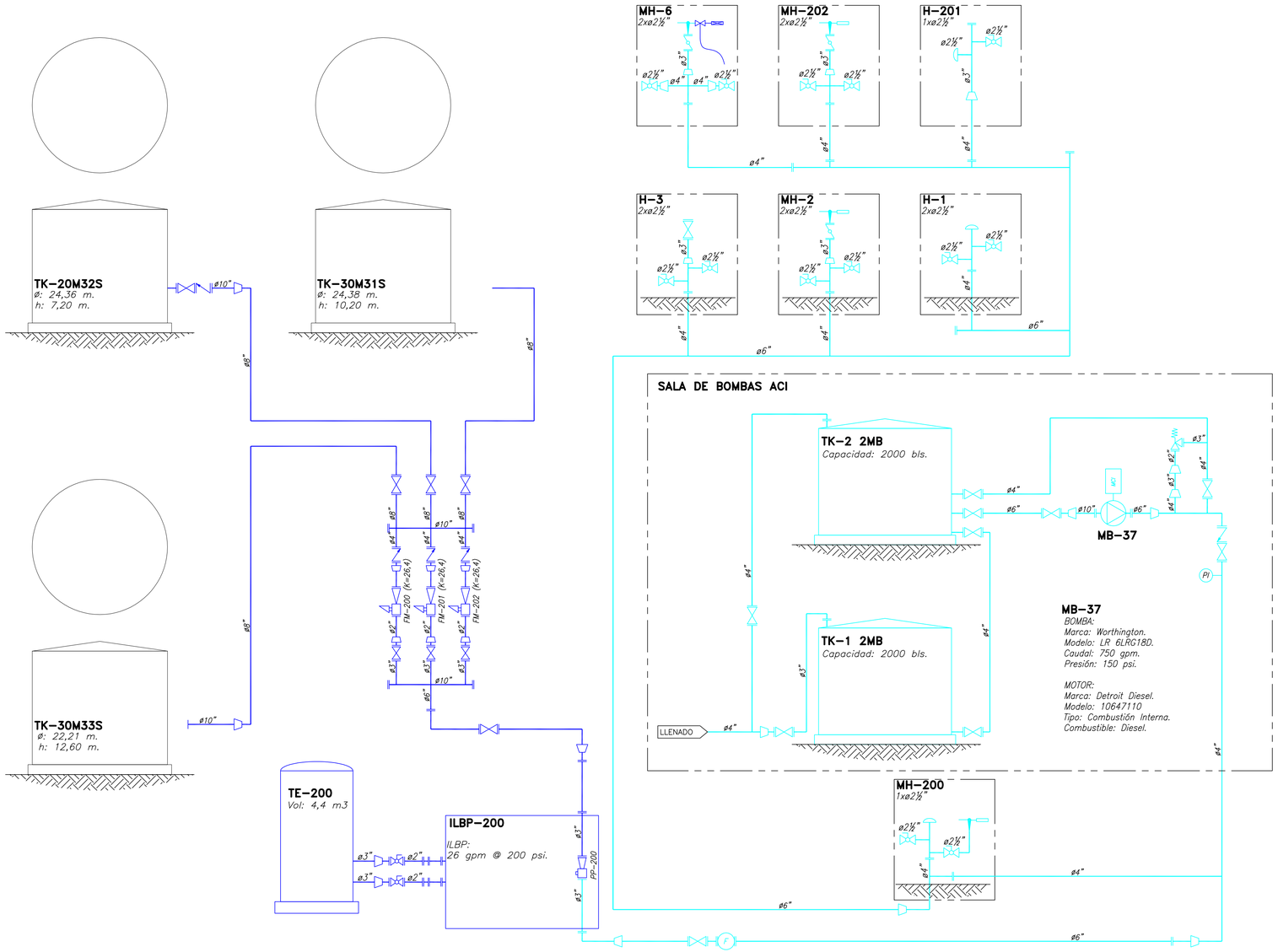
REVISION 0	CODIGO CCH-IN-001



NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Septiembre de 2009.

2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.

REFERENCIAS

SIMBOLOGÍA :

SIM-IN-101	SIMBOLOGÍA – EQUIPOS PARA AGUA Y/O ESPUMA.
SIM-IN-151	SIMBOLOGÍA – CAÑERÍAS, VÁLVULAS Y ACCESORIOS.
SIM-IN-201	SIMBOLOGÍA – INSTRUMENTACIÓN.

COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)

COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)

Pluspetrol Norte S.A.

PLUSPETROL PERÚ
ESTACIÓN DE BOMBEO CAPIRONA

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica

SISTEMA DE AGUA CONTRA INCENDIO
INSTALACIÓN EXISTENTE

DIAGRAMA

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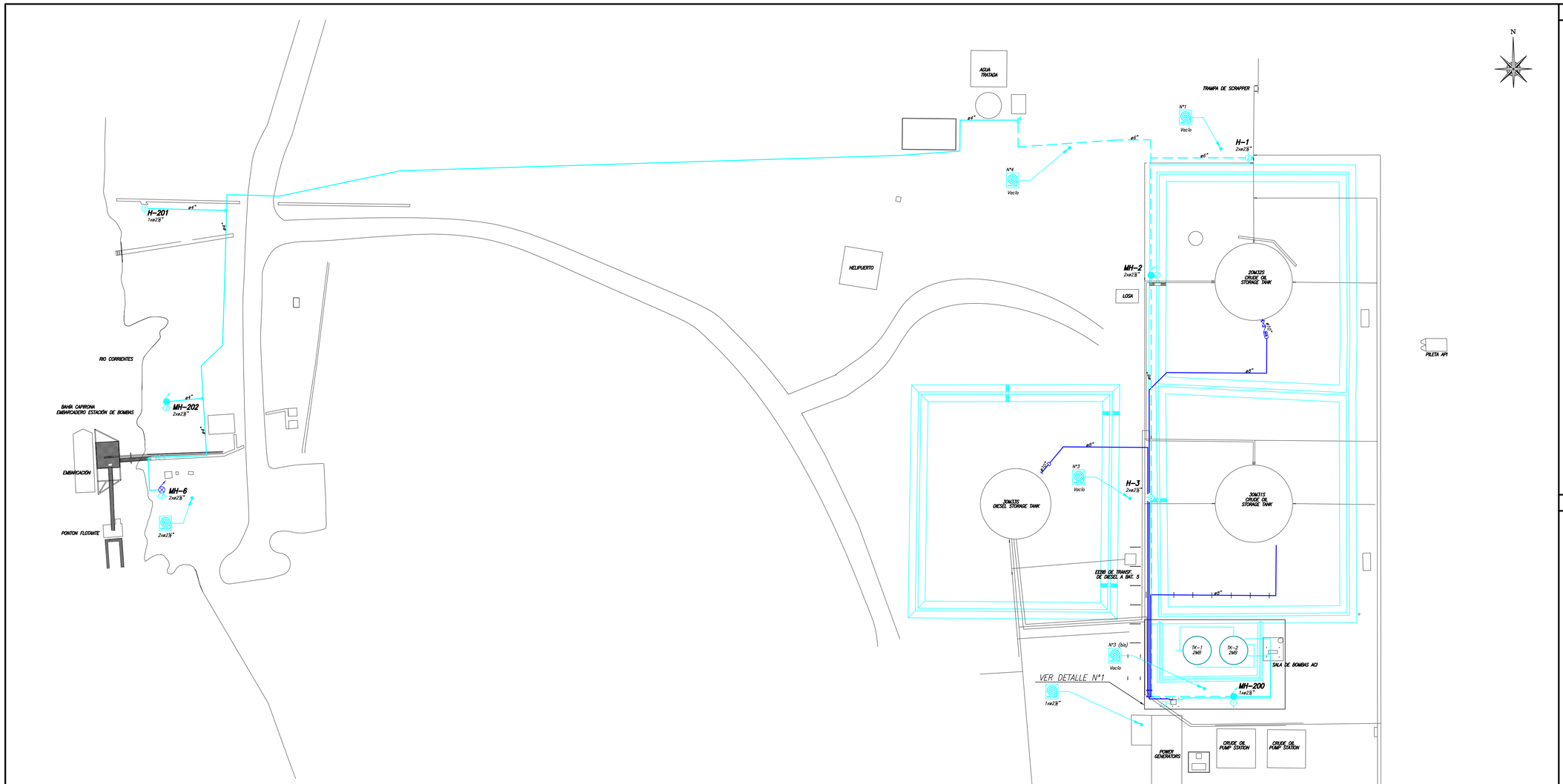
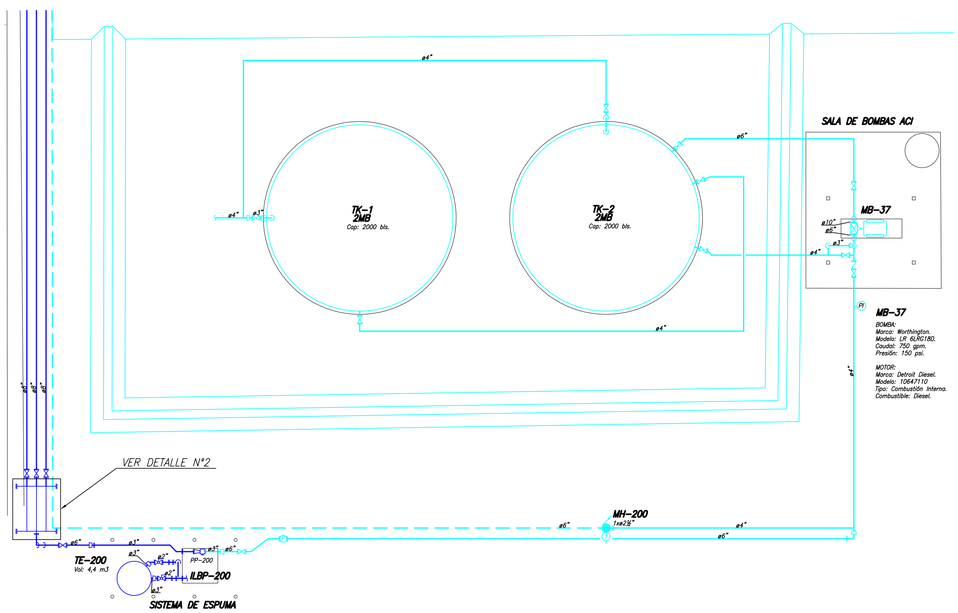
SIN ESCALA	27/12/2010
REVISION: 0	CODIGO: EBC-IN-001



DETALLE N°1 – SALA DE BOMBAS CONTRA INCENDIO Y SISTEMA DE ESPUMA

ESCALA 1 : 100



DETALLE N°2 – CAMARAS DE ESPUMA

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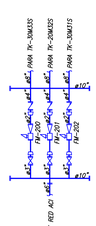

NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Septiembre de 2009.
2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.

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SIM-IN-101	SIMBOLOGÍA – EQUIPOS PARA AGUA Y/O ESPUMA.
SIM-IN-151	SIMBOLOGÍA – CAÑERÍAS, VÁLVULAS Y ACCESORIOS.
SIM-IN-201	SIMBOLOGÍA – INSTRUMENTACIÓN.

COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)
COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)
CAÑERÍA DE AGUA AÉREA
CAÑERÍA DE AGUA SOTERRADA

Pluspetrol Norte S.A.

PLUSPETROL PERÚ
ESTACIÓN DE BOMBEO CAPIRONA

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica

SISTEMA DE AGUA CONTRA INCENDIO
INSTALACIÓN EXISTENTE

PLANTA

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ESCALA	FECHA
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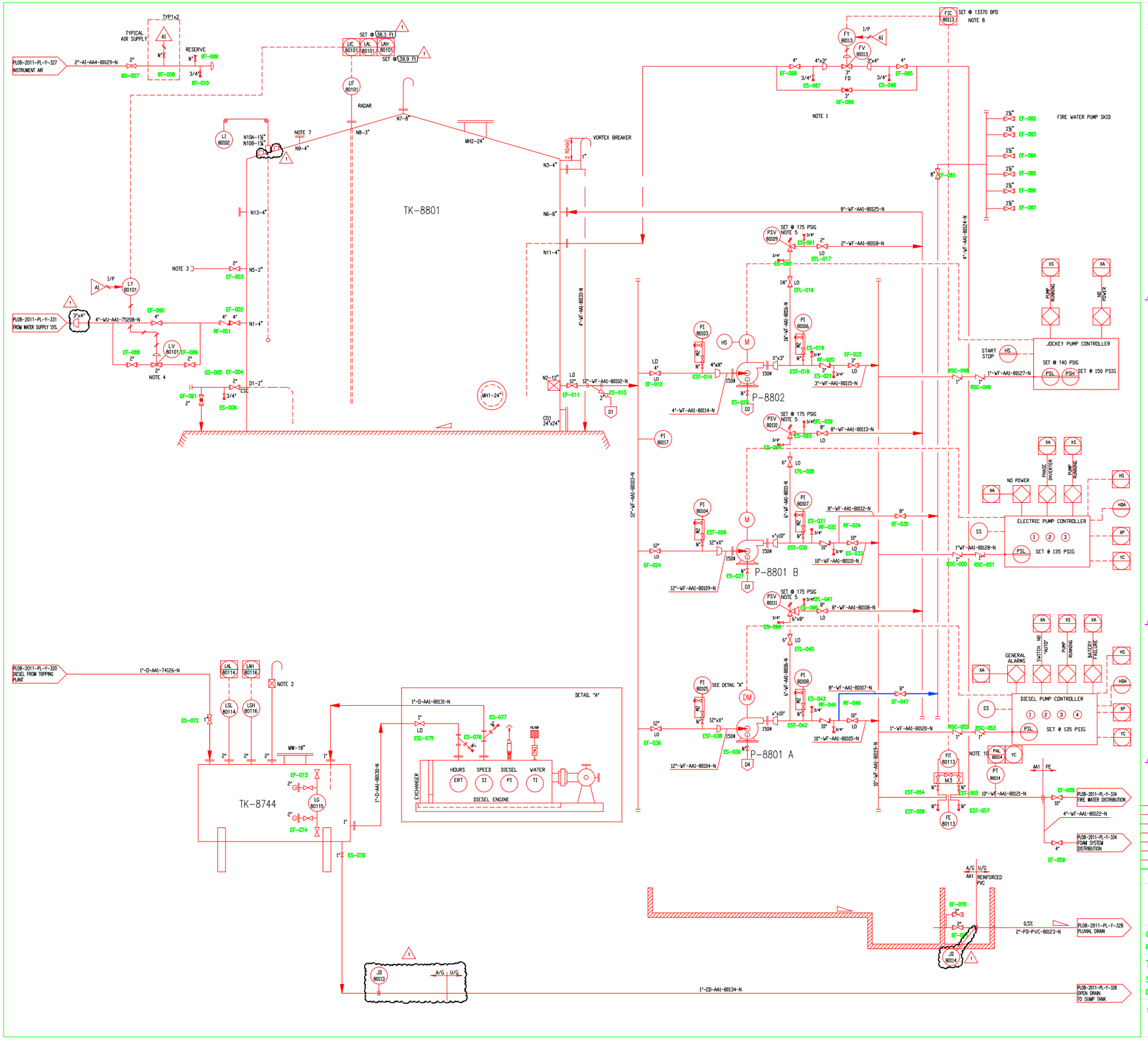
REVISION 0	CODIGO EBC-IN-002



EQUIPMENT LIST:

TK-8801
FIRE WATER TANK
V= 9400 Bbls
D=40ft x H=42ft
Pd: Atm

P-8801 A
FIRE WATER PUMP (DIESEL)
Qn: 51430 BPD
DP: 150 psi

P-8801 B
FIRE WATER PUMP (ELECTRICAL)
Qn: 51430 BPD
DP: 150 psi
MOTOR: BY VENDOR

P-8802
JOCKEY PUMP
Qn: 3430 BPD
DP: 150 psi
MOTOR: BY VENDOR

TK-8744
DIESEL DAILY TANK
V=12.6 Bbls
D=3ft x H=10ft
Pd: Atm

SYMBOLS

- HS — LOGIC CONTROL START / STOP (ON HMI)
- HDA — SELECTOR SWITCH HAND-OFF-AUTO (ON MCC)
- XP — PERMISS
- YC — LOGIC
- SS — PUSH BOTTOM START / STOP (ON FIELD)

NOTES:

1- FIRE WATER PUMP SKID AND INSTRUMENTS MUST BE CONFIRMED BY VENDOR
2- FLAME ARRESTOR
3- CONNECTION FOR TRUCK
4- ON/OFF AUTOMATIC VALVE
5- DIMENSIONS BY VENDOR
6- FINAL DESING AND DIMENSIONS OF FIRE WATER EQUIPMENTS WILL BE DEFINED BY VENDOR ACCORDING TO NFPA REQUIREMENTS
7- SPARE W/BLIND
8- TO BE DEFINED BY PUMP'S VENDOR
9- TYPE AND NUMERATION OF ALL VALVES ARE INCORPORATED IN REVISION D
10- SET TO BE DEFINED

REFERENCES:

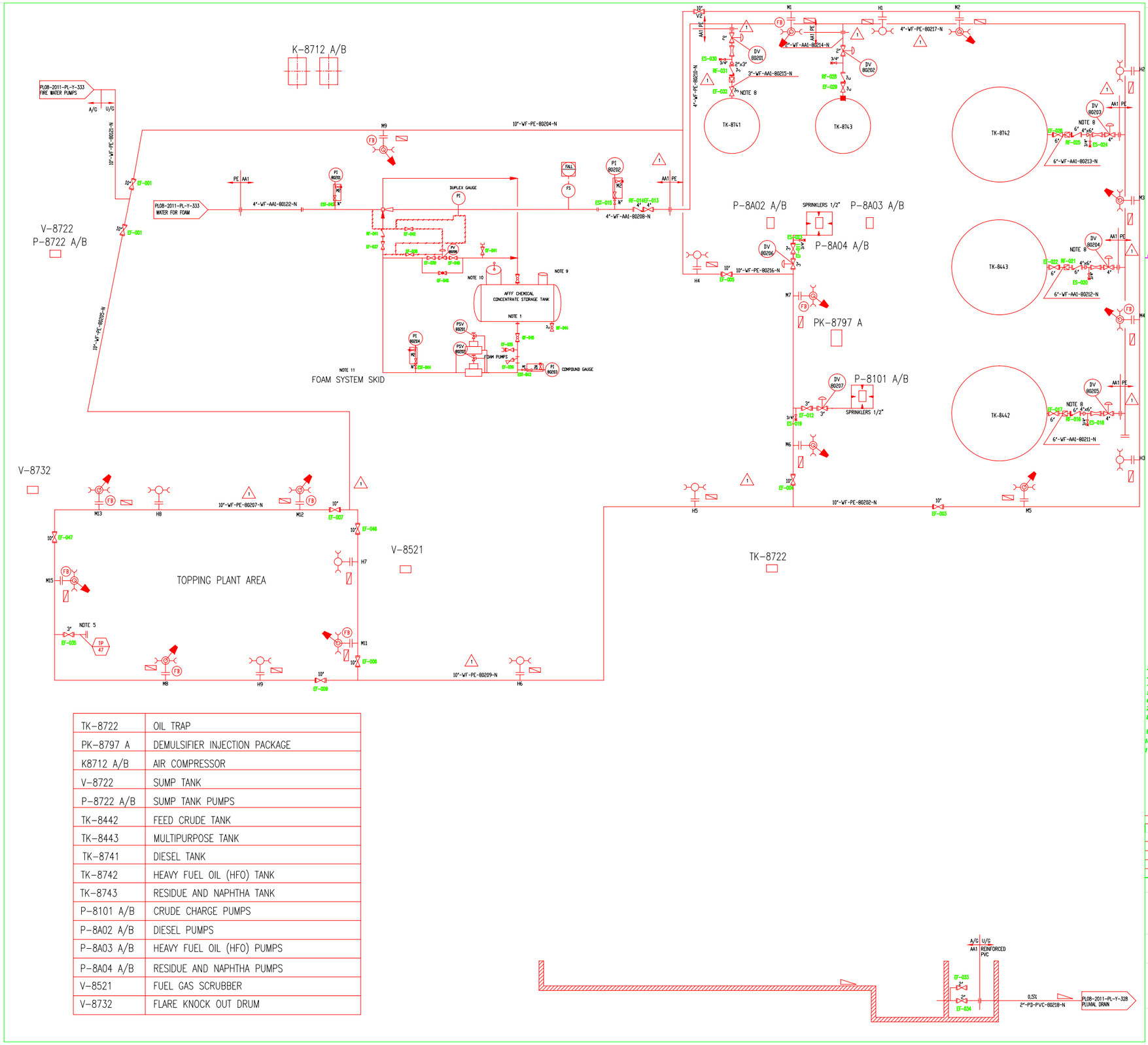
REV	DATE	DESCRIPTION	BY	CHECKED	APPROVED
1	26-Ago-08	FOR CONSTRUCTION	LDA	NLP	MCL
0	11-Jul-08	FOR CONSTRUCTION	LDA	NLP	MCL
E	13-Jun-08	FOR APPROVAL	MAN	NLP	MCL
D	21-May-08	FOR APPROVAL	HRD	NLP	MCL
C	13-May-08	FOR APPROVAL	HRD	NLP	MCL
B	30-Nov-07	ISSUED FOR BID	SIZ	EMO	VQU
A	15-Nov-07	FOR APPROVAL	JMM	EMO	CSA

GyM AESA GMI pluspetrol

CLIENT: PLUSPETROL NORTE S.A.
PROJECT: BALANCE OF PLANT BATERIA 1 CRUDE TOPPING UNIT - LOTE 8

TITLE: FIRE WATER SYSTEM I
SUBTITLE: (TOPPING PLANT)
DOCUMENT TYPE: PIPING AND INSTRUMENT DIAGRAM

SCALE		SHEET: 1	REV.
S/E	PL08-2011-PL-Y-333-1	OF: 1	1

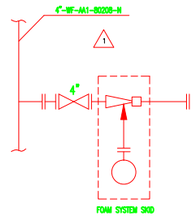


TK-8722	OIL TRAP
PK-8797 A	DEMULSIFIER INJECTION PACKAGE
K8712 A/B	AIR COMPRESSOR
V-8722	SUMP TANK
P-8722 A/B	SUMP TANK PUMPS
TK-8442	FEED CRUDE TANK
TK-8443	MULTIPURPOSE TANK
TK-8741	DIESEL TANK
TK-8742	HEAVY FUEL OIL (HFO) TANK
TK-8743	RESIDUE AND NAPHTHA TANK
P-8101 A/B	CRUDE CHARGE PUMPS
P-8A02 A/B	DIESEL PUMPS
P-8A03 A/B	HEAVY FUEL OIL (HFO) PUMPS
P-8A04 A/B	RESIDUE AND NAPHTHA PUMPS
V-8521	FUEL GAS SCRUBBER
V-8732	FLARE KNOCK OUT DRUM

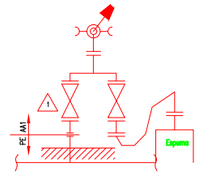
EQUIPMENT LIST:

TIPICOS:

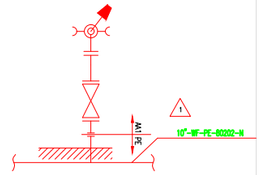
INYECCION DE ESPUMA:



MONITOR AGUA-ESPUMA:



HIDRANTE Y MONITOR:



SPECIAL SYMBOLS:

- WATER / FOAM DUAL MONITOR
- HYDRANT
- MONITOR - HYDRANT
- DELUGE VALVE
- RATIO CONTROLLER
- HOSE CABINET
- HIGH PRESSURE FOAM MAKER
- FOAM CHAMBER
- VALVED FLUSH IN/OUT CONNECTION (FLUSHING)
- RUPTURE DISC

NOTES:

1- FOAM TANK CAPACITY IS 500 GAL ACCORDING TO REQUIREMENTS. BALANCED PRESSURE PROPORTIONING
2- VALVES FOR SELECTION OF THE NETWORK WILL BE OUTSIDE SCREW AND YOKE (OS & Y) TYPE
3- DRAINS WILL BE LOCATED IN THE LOWEST POINTS OF THE NETWORK
4- DELUGE VALVES SHOULD BE PLACED IN AN ACCESSIBLE WAY WITH A MINIMUM DISTANCE OF 15 M TO THE RISK TO BE PROTECTED
5- CONNECTION BY SPRINKLERS OF TOPPING PLANT AREA
6- THIS DRAWING IS NOT TO SCALE. USE FIGURE DIMENSIONS ONLY
7- TYPE AND NUMERATION OF ALL VALVES ARE INCORPORATED IN REVISION D
8-FOAM INJECTION PIPING (15 MINIMUM LENGH OF 15 PIPE DIAMETER). VELOCITY CANNOT EXCEED 10 ft/sec WHEN ENTERS THE PRODUCT.
9-FILL CONNECTION WITH FILL FUNNEL
10-PRESSURE VACUUM VENT
11-DIMENSIONS TO BE DEFINED BY VENDOR

REFERENCES:

REV	DATE	DESCRIPTION	BY	CHECKED	APPROVED
1	16-Jul-08	FOR CONSTRUCTION	LDA	NLP	MCL
0	07-Jul-08	FOR CONSTRUCTION	LDA	NLP	MCL
E	13-Jun-08	FOR APPROVAL	HRD	NLP	MCL
D	21-May-08	FOR APPROVAL	HRD	NLP	MCL
C	13-May-08	FOR APPROVAL	HRD	NLP	MCL
B	30-Nov-07	ISSUED FOR BID	LAC	EMO	VQU
A	15-Nov-07	FOR APPROVAL	PCS	EMO	CSA

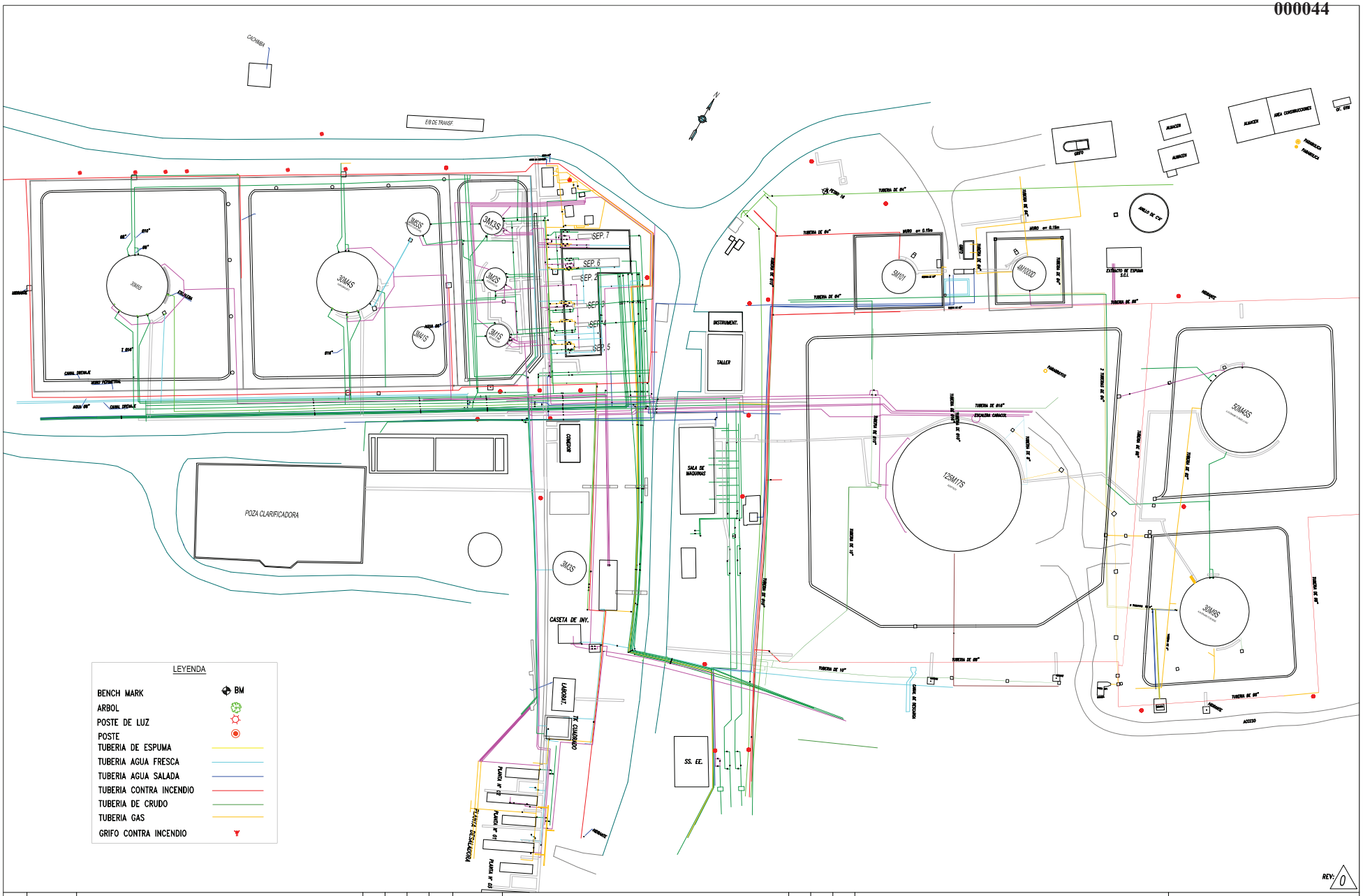
GyM AESA GMI pluspetrol

CLIENT: PLUSPETROL NORTE S.A.
PROJECT: BALANCE OF PLANT BATERIA 1 CRUDE TOPPING UNIT - LOTE 8

TITLE: FIRE WATER SYSTEM II
SUBTITLE: (TOPPING PLANT)
DOCUMENT TYPE: PIPING AND INSTRUMENT DIAGRAM

SCALE		SHEET: 1 OF: 1	REV.
S/E	PL08-2011-PL-Y-334-1		1

Anexo IV
Planos del Sistema Contra incendios Lote 8



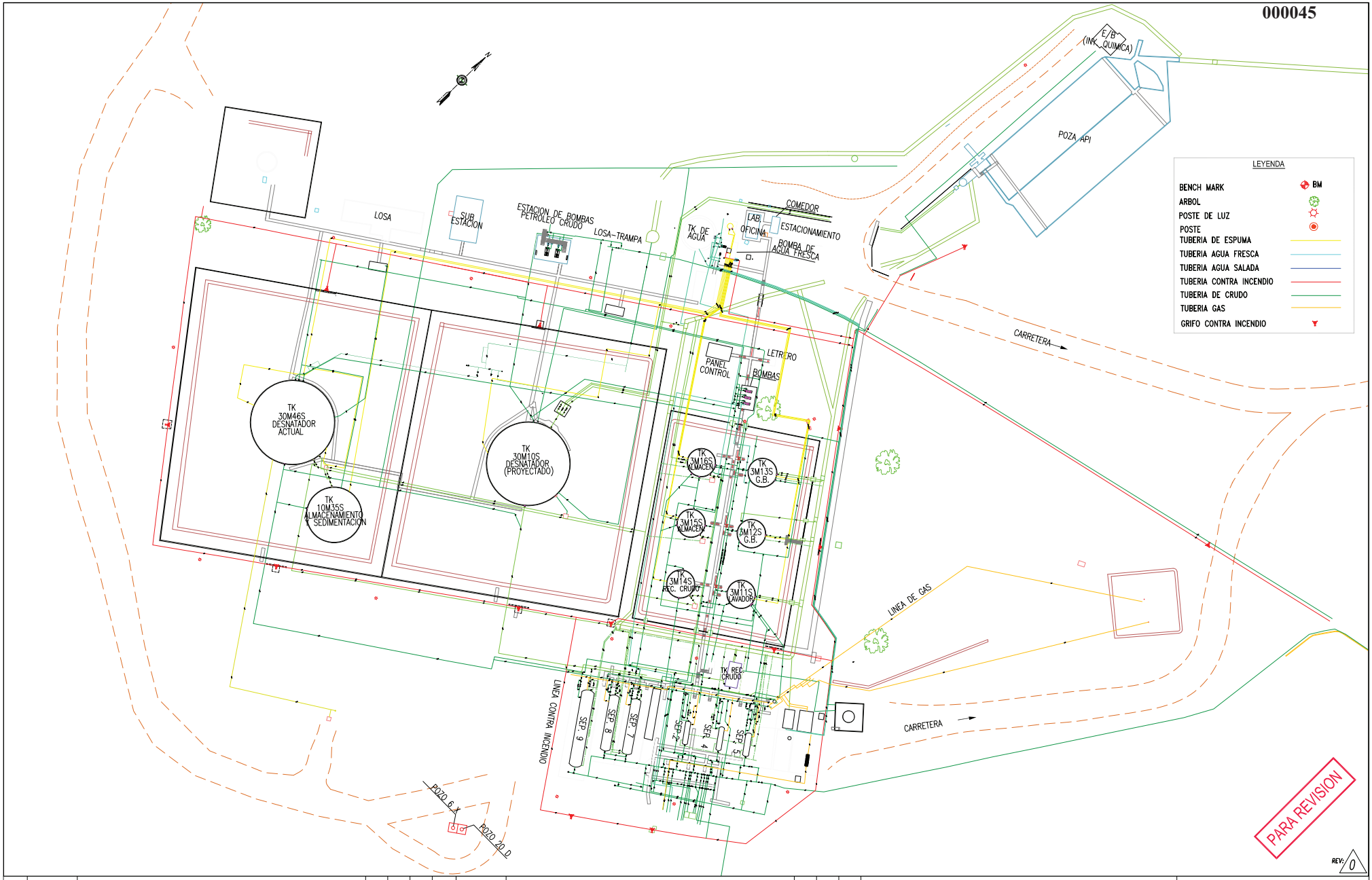
N°	FECHA	REVISION	POR	REV	APR	No	FECHA	REVISION	POR	REV	APR

LOTE 8
CORRIENTES
ACTUALIZACION LINEAS E INSTALACIONES BATERIA 1
LAYOUT GANERAL

Pluspetrol Norte S.A.
DEPARTAMENTO DE CONSTRUCCIONES
AREA DE PROYECTOS

DIGITALIZADO: M. LOVERA/F. MEJIA	DISEÑADO: PLUSPETROL NORTE	REVISADO: R. CHAPILLIQUEN	ESCALA: 1:1,250
FECHA: 19.05.06	FECHA: 19.05.06	APROBADO: R. CASTILLO	ARCHIVO: 061001-1-L8
PLANO No: 061001-1-L8 P01	PLANO: 1 DE 1		

000045



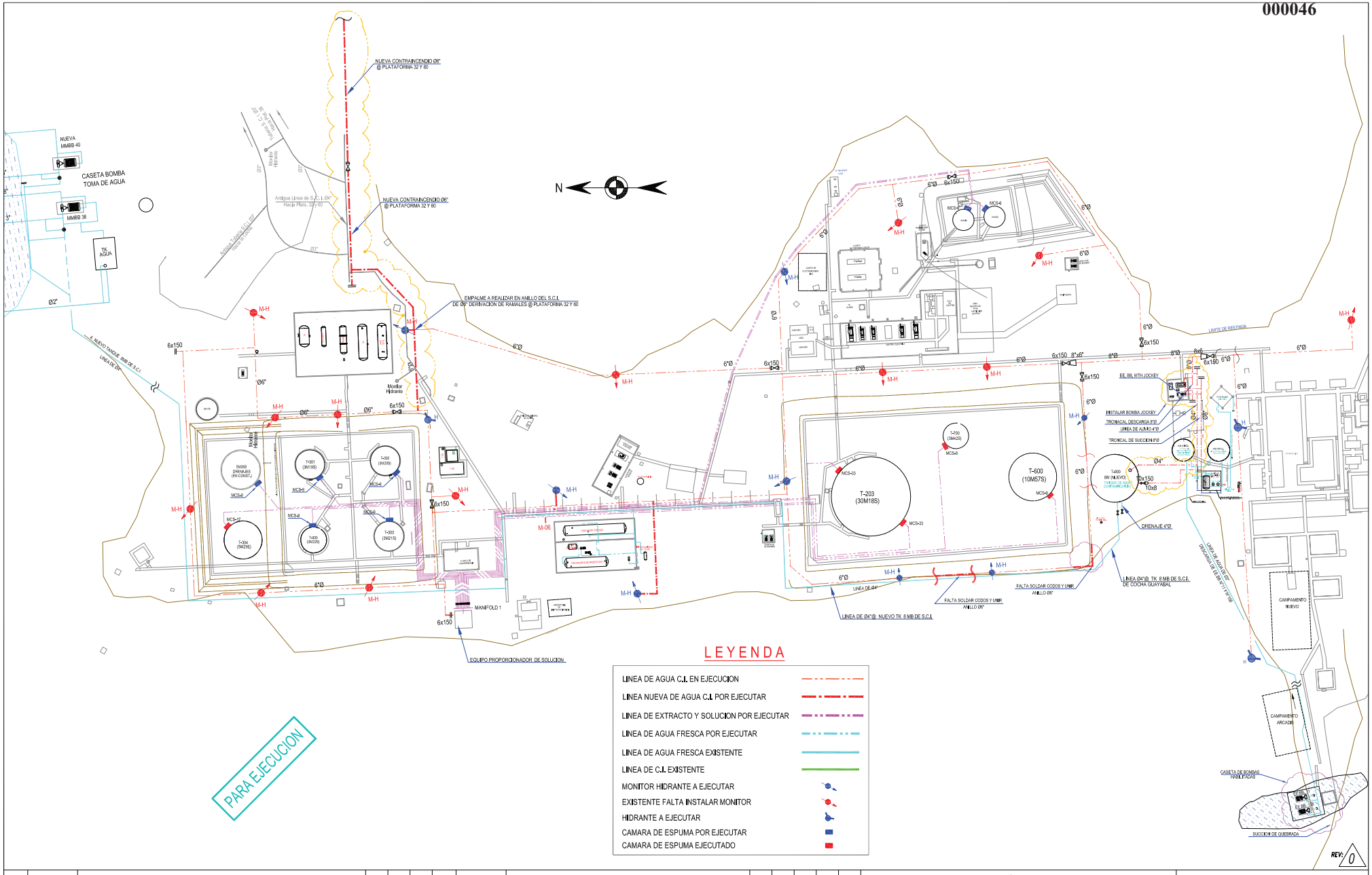
N°	FECHA	REVISION	POR	REV	APR	No	FECHA	REVISION	POR	REV	APR
						0	19.05.06	EMITIDO PARA INFORMACION	M.L.G.	R.CH	V.Q.

LOTE 8
CORRIENTES
ACTUALIZACION LINEAS E INSTALACIONES BATERIA 2
LAYOUT GENERAL

DIGITALIZADO: M. LOVERA — FECHA: 19.05.06
DISEÑADO: PLUSPETROL NORTE — FECHA: 19.05.06
REVISADO: R. CHAPILLIQUEN
APROBADO: R. CASTILLO

Pluspetrol Norte S.A.
DEPARTAMENTO DE CONSTRUCCIONES
AREA DE PROYECTOS

ESCALA: 1:1000
ARCHIVO: 061001-1-L8
PLANO No: 061001-1-L8 P01
PLANO: 1 DE 1



LEYENDA

- LINEA DE AGUA C.I. EN EJECUCION
- LINEA NUEVA DE AGUA C.I. POR EJECUTAR
- LINEA DE EXTRACTO Y SOLUCION POR EJECUTAR
- LINEA DE AGUA FRESCA POR EJECUTAR
- LINEA DE AGUA FRESCA EXISTENTE
- LINEA DE C.I. EXISTENTE
- MONITOR HIDRANTE A EJECUTAR
- EXISTENTE FALTA INSTALAR MONITOR
- HIDRANTE A EJECUTAR
- CAMARA DE ESPUMA POR EJECUTAR
- CAMARA DE ESPUMA EJECUTADO

REV: 0

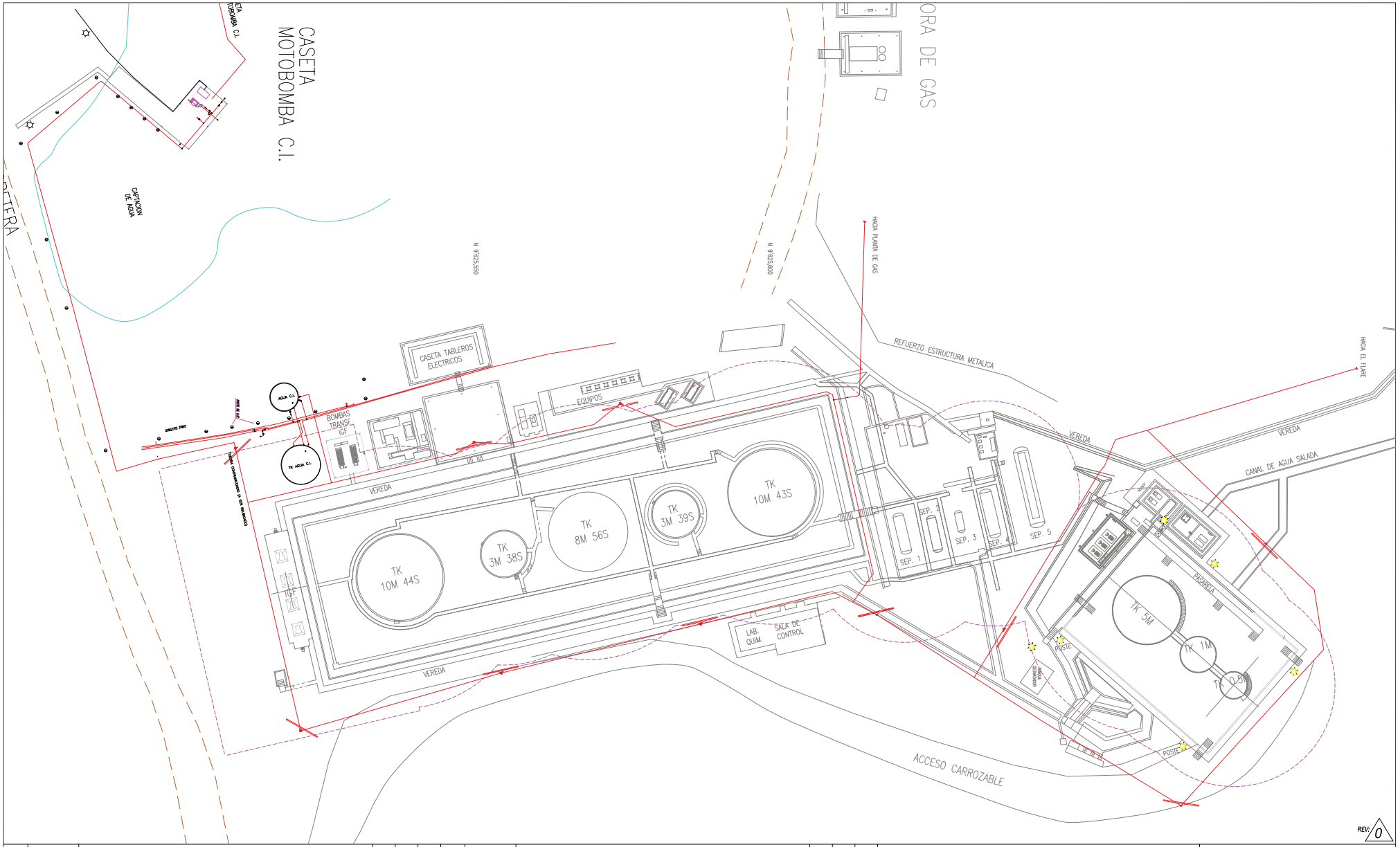
N°	FECHA	REVISION	POR	REV	APR	No	FECHA	REVISION	POR	REV	APR
						0	10.08.07	EMITIDO PARA EJECUCION	M.R. L.S. M.A.	C.H.	R.C.

LOTE 8
YANAYACU
SISTEMA CONTRA INCENDIO
PLANTA GENERAL BATERIA 3

DIGITALIZADO: M. RIOS — FECHA: 10.08.07
DISEÑADO: PROYECTOS — FECHA: 10.08.07
REVISADO: C. HARO
APROBADO: R. CASTILLO

Pluspetrol Norte S.A.
DEPARTAMENTO DE CONSTRUCCIONES
AREA DE PROYECTOS

ESCALA: S/E
ARCHIVO: 070810-1-L8
PLANO No: 070810-1-L8 P05
PLANO: 1 DE 1



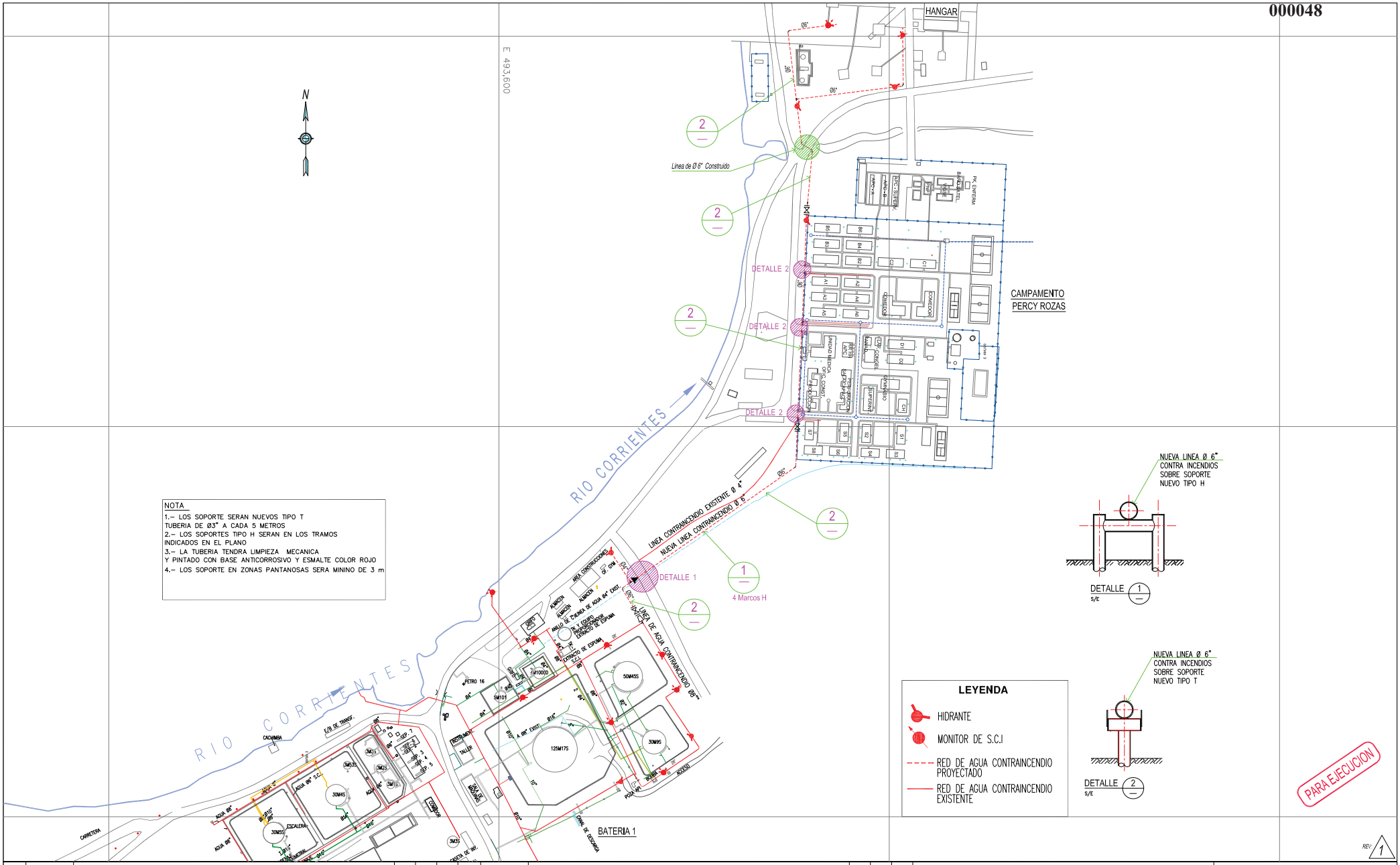
N°	FECHA	REVISION	POR	REV	APR	No	FECHA	REVISION	POR	REV	APR
						0	21.02.06	EMITIDO PARA INFORMACION	M.R.	C.H.	R.C.

LOTE 8
BATERIA 9 - PAVAYACU
OBRAS CIVILES MEJORAS
LAYOUT GENERAL

DIGITALIZADO: M. RIOS — FECHA: 13.02.06
DISEÑADO: E. PON — FECHA: 13.02.06
REVISADO: C. HARO
APROBADO: R. CASTILLO

Pluspetrol Norte S.A.
DEPARTAMENTO DE CONSTRUCCIONES
AREA DE PROYECTOS

ESCALA: 1:500
ARCHIVO: 060227-1-L8
PLANO No: 060227-1-L8 P01
PLANO: 1 DE 1



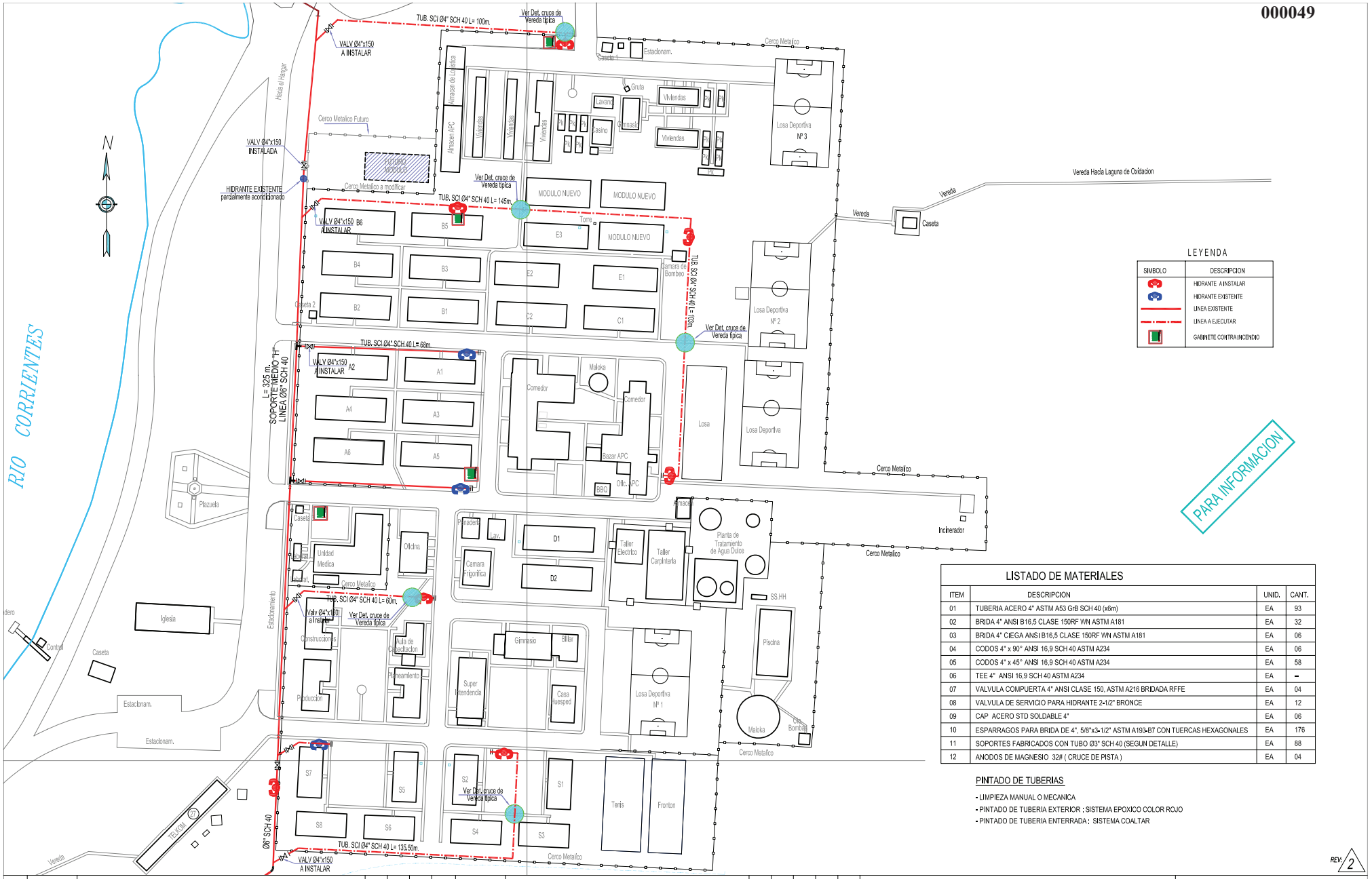
No	FECHA	REVISION	POR	REV	APR	No	FECHA	REVISION	POR	REV	APR
						1	08.01.06	EMITIDO PARA REVISION	J.H.	C.H.	R.C.
						0	07.06.06	EMITIDO PARA REVISION	F.M.	R.CH.	R.C.

LOTE 8
CORRIENTES
MEJORA RED CONTRAINCENDIO CAMPAMENTO PERCY ROZAS - HANGAR
PLANTA GENERAL

DIGITALIZADO: F. MEJIA/J.HUAMANI — FECHA: 26.12.05
DISEÑADO: PROYECTOS — FECHA: 26.12.05
REVISADO: C. HARO
APROBADO: R. CASTILLO

Pluspetrol Norte S.A.
DEPARTAMENTO DE CONSTRUCCIONES
AREA DE PROYECTOS

ESCALA: 1:5,000
ARCHIVO: 051226-1-L8
PLANO No: 051226-1-L8 P02
PLANO: 1 DE 1



LEYENDA

SIMBOLO	DESCRIPCION
	HIDRANTE A INSTALAR
	HIDRANTE EXISTENTE
	LINEA EXISTENTE
	LINEA A EJECUTAR
	GABINETE CONTRA INCENDIO

PARA INFORMACION

LISTADO DE MATERIALES

ITEM	DESCRIPCION	UNID.	CANT.
01	TUBERIA ACERO 4" ASTM A53 GrB SCH 40 (x6m)	EA	93
02	BRIDA 4" ANSI B16,5 CLASE 150RF WN ASTM A181	EA	32
03	BRIDA 4" CIEGA ANSI B16,5 CLASE 150RF WN ASTM A181	EA	06
04	CODOS 4" x 90° ANSI 16,9 SCH 40 ASTM A234	EA	06
05	CODOS 4" x 45° ANSI 16,9 SCH 40 ASTM A234	EA	58
06	TEE 4" ANSI 16,9 SCH 40 ASTM A234	EA	–
07	VALVULA COMPUERTA 4" ANSI CLASE 150, ASTM A216 BRIDADA RFFE	EA	04
08	VALVULA DE SERVICIO PARA HIDRANTE 2-1/2" BRONCE	EA	12
09	CAP ACERO STD SOLDABLE 4"	EA	06
10	ESPARRAGOS PARA BRIDA DE 4", 5/8"x3-1/2" ASTM A193-B7 CON TUERCAS HEXAGONALES	EA	176
11	SOPORTES FABRICADOS CON TUBO Ø3" SCH 40 (SEGUN DETALLE)	EA	88
12	ANODOS DE MAGNESIO 32# (CRUCE DE PISTA)	EA	04

PINTADO DE TUBERIAS

- LIMPIEZA MANUAL O MECANICA
- PINTADO DE TUBERIA EXTERIOR ; SISTEMA EPOXICO COLOR ROJO
- PINTADO DE TUBERIA ENTERRADA ; SISTEMA COALTAR

REV: 2

Nº	FECHA	REVISION	POR	REV	APR
2	09.07.08	REUBICACION DE LINEAS Y EQUIPOS A SOLICITUD DE PLUSPETROL	A.R.	F.M.	E.R. R.M.
1	19.05.08	EMITIDO PARA INFORMACION	E.B.	L.S.	E.R. R.M.
0	08.02.08	EMITIDO PARA CONSTRUCCION	E.B.	L.S. M.A.	C.H. R.C.

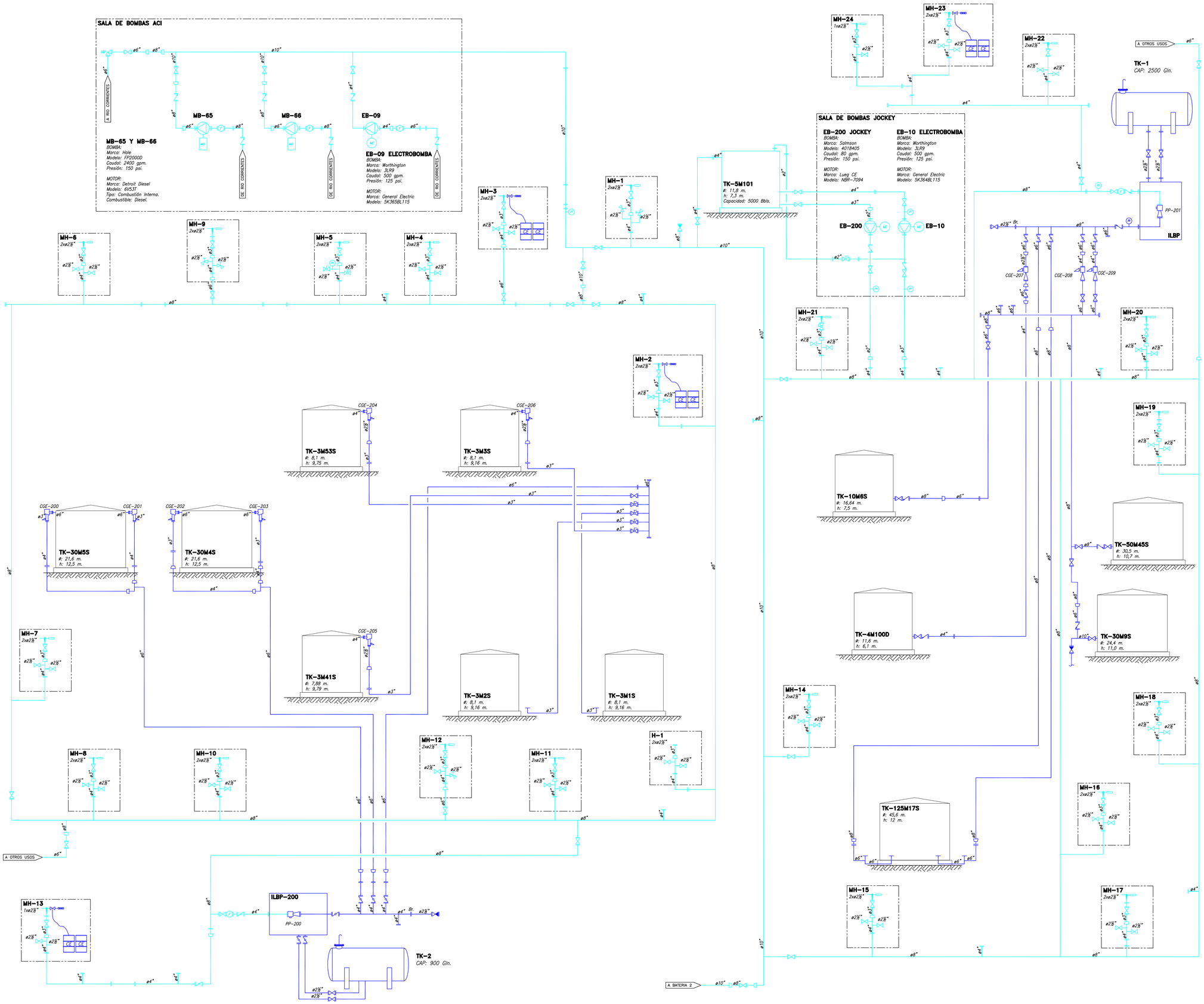
LOTE 8
CORRIENTES
S.C.I. EN CAMPAMENTO PERCY ROZAS
PLANTA GENERAL

DIGITALIZADO: E. BAUTISTA — FECHA: 02.02.08
DISEÑADO: PROYECTOS — FECHA: 02.02.08
REVISADO: E. RICRA — APROBADO: R. MARIN

Pluspetrol Norte S.A.
DEPARTAMENTO DE CONSTRUCCIONES
AREA DE PROYECTOS

ESCALA: 1:1,250 — ARCHIVO: 080202-2-L8
PLANO No: 080202-2-L8 P02 — PLANO: 1 DE 1

APPENDIX O. FOAM SYSTEM DRAWINGS FOR THE BATTERIES



NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Septiembre de 2009.
2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.

REFERENCIAS

SIMBOLOGÍA :

SIM-IN-101	SIMBOLOGÍA – EQUIPOS PARA AGUA Y/O ESPUMA.
SIM-IN-151	SIMBOLOGÍA – CAÑERÍAS, VÁLVULAS Y ACCESORIOS.
SIM-IN-201	SIMBOLOGÍA – INSTRUMENTACIÓN.

COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)

COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)

Pluspetrol Norte S.A.

PLUSPETROL PERÚ
BATERÍA 1

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica

SISTEMA DE AGUA CONTRA INCENDIO
INSTALACIÓN EXISTENTE

DIAGRAMA

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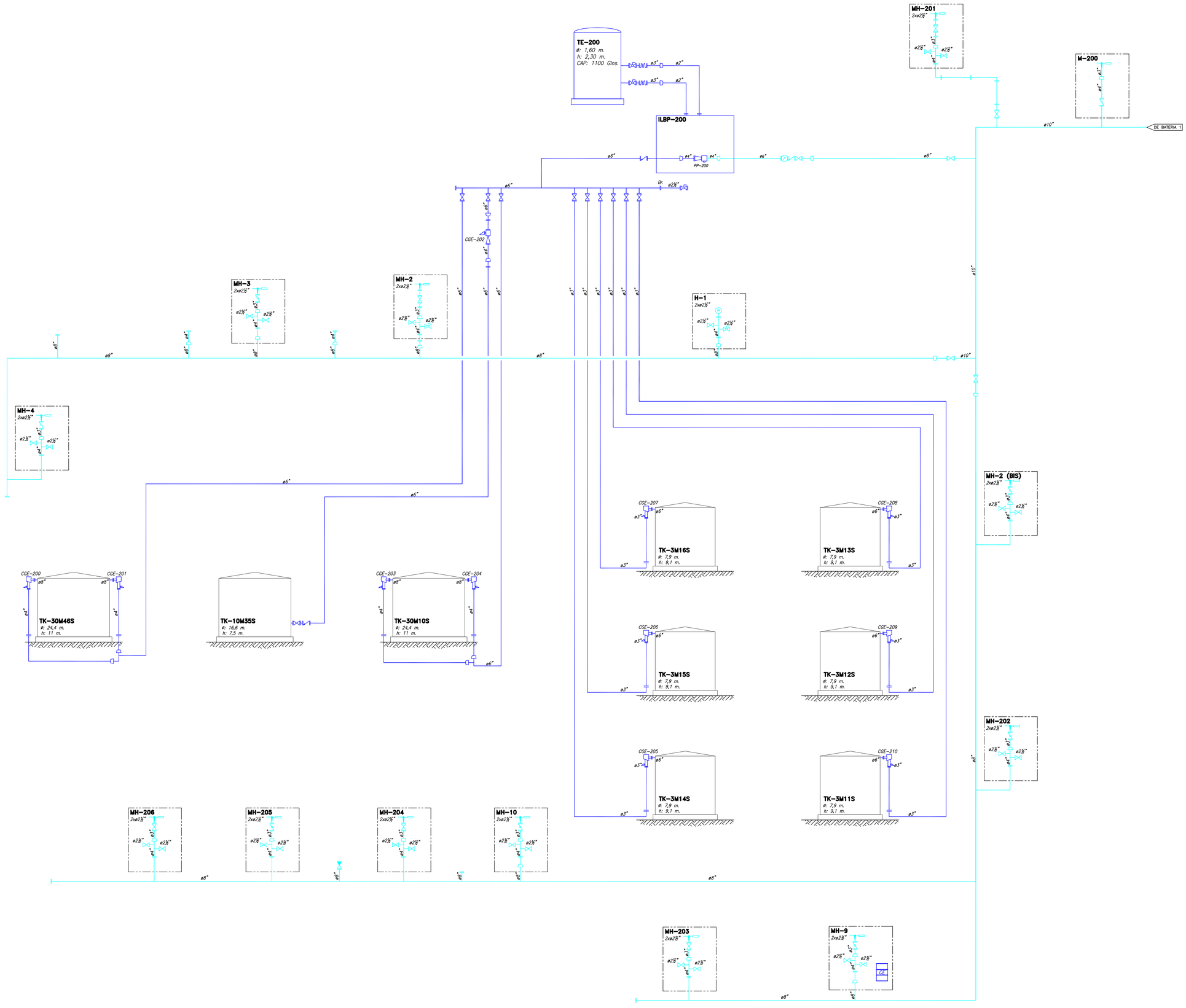
ESCALA	FECHA
SIN ESCALA	27/12/2010
REVISION 0	CODIGO BT1-IN-001



NOTAS

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REFERENCIAS

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SIM-IN-151	SIMBOLOGÍA – CAÑERÍAS, VÁLVULAS Y ACCESORIOS.
SIM-IN-201	SIMBOLOGÍA – INSTRUMENTACIÓN.

COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)

COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)

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PLUSPETROL PERÚ
BATERÍA 2

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica

SISTEMA DE AGUA CONTRA INCENDIO
INSTALACIÓN EXISTENTE

DIAGRAMA

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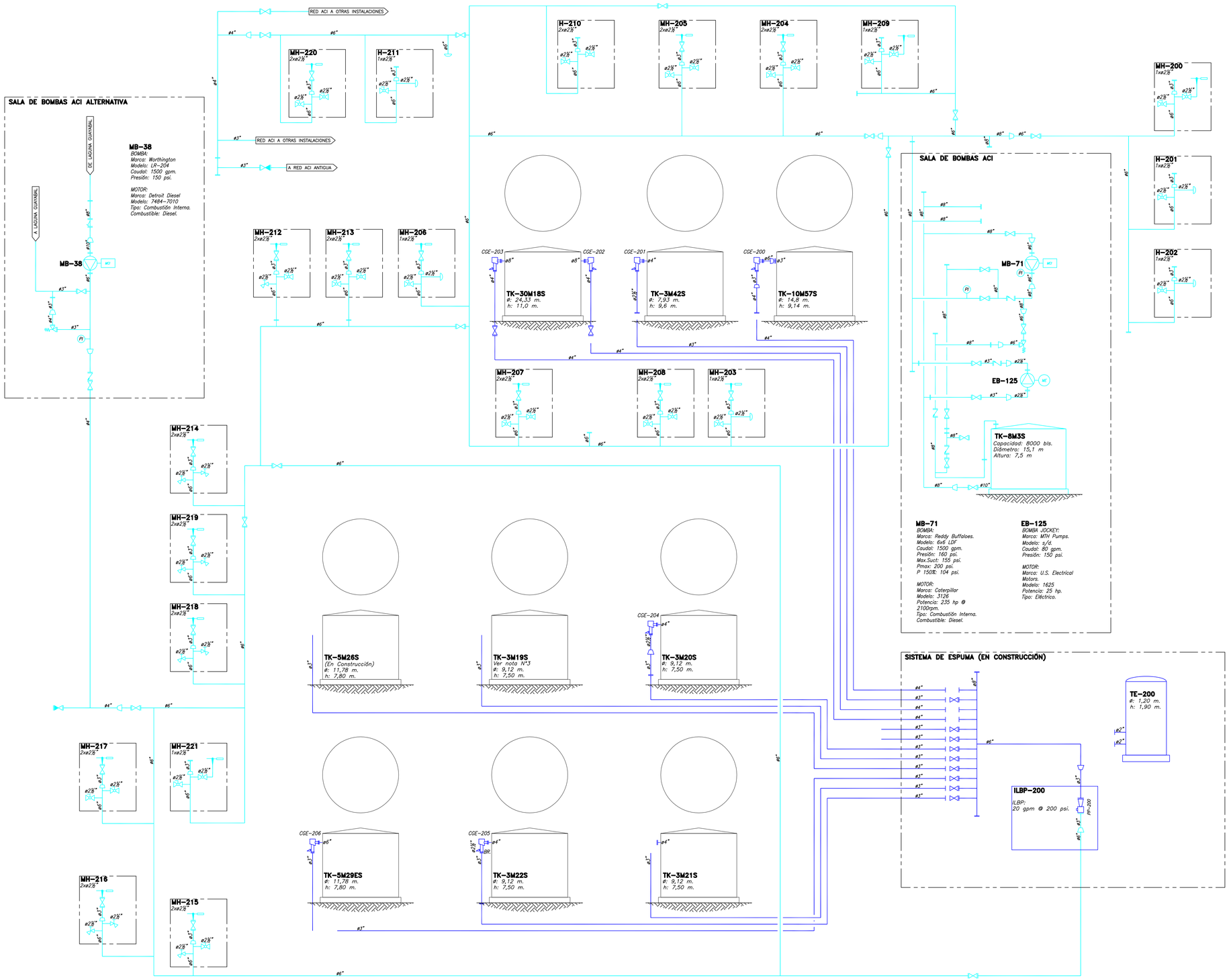

NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Septiembre de 2009.
2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.
3. Al momento del relevamiento, este tanque se encontraba desmontado en proceso de reparación.

REFERENCIAS

SIMBOLOGÍA :

SIM-IN-101	SIMBOLOGÍA – EQUIPOS PARA AGUA Y/O ESPUMA.
SIM-IN-151	SIMBOLOGÍA – CAÑERÍAS, VÁLVULAS Y ACCESORIOS.
SIM-IN-201	SIMBOLOGÍA – INSTRUMENTACIÓN.

COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)

COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)

Pluspetrol Norte S.A.

PLUSPETROL PERÚ
BATERÍA 3 – YANAYACU

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica

SISTEMA DE AGUA CONTRA INCENDIO
INSTALACIÓN EXISTENTE

DIAGRAMA

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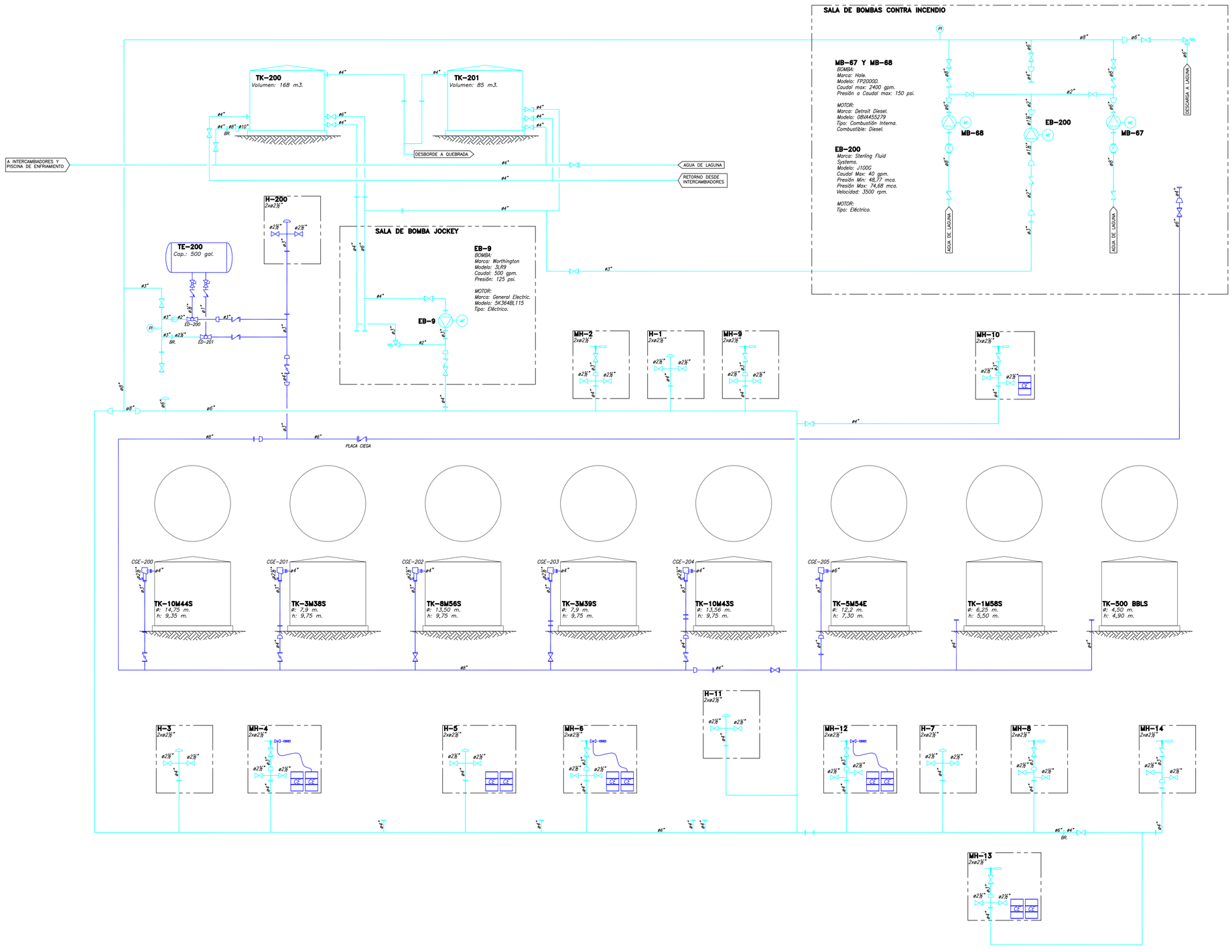

NOTAS

1. La instalación existente representada en este plano corresponde al relevamiento finalizado en Septiembre de 2009.
2. Los equipos cuyo número de identificación interno (TAG) no fue posible determinar o no cuentan con el mismo, fueron numerados a partir del N°200.

REFERENCIAS

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SIM-IN-151	SIMBOLOGÍA – CAÑERÍAS, VÁLVULAS Y ACCESORIOS.
SIM-IN-201	SIMBOLOGÍA – INSTRUMENTACIÓN.

COLOR DE INSTALACIÓN DE AGUA EXISTENTE (CIAN)

COLOR DE INSTALACIÓN DE ESPUMA EXISTENTE (AZUL)

Pluspetrol Norte S.A.

PLUSPETROL PERÚ
BATERÍA 9 – PAVAYACU

ESTUDIO SOLANO

SISTEMAS DE PREVENCIÓN Y PROTECCIÓN CONTRA INCENDIO
Ingeniería Básica
SISTEMA DE AGUA CONTRA INCENDIO
INSTALACIÓN EXISTENTE
DIAGRAMA

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