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ENVIRONMENTAL SOLUTIONS

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OIL SPILL RESPONSE SERVICES
in PERU
2014 – 2016 Projects

2017

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CONTINGENCIES

OIL SPILL RESPONSE SERVICES in PERU

2014	PETROPERÚ PIPELINE – KM 41	**Finalized**
2016	PETROPERÚ PIPELINE – KM 440	**Finalized**
	PETROPERÚ PIPELINE – KM 67	**Finalized**
	PETROPERÚ PIPELINE – KM 55&54	**Finalized**
	PETROPERÚ PIPELINE – KM 53	**Finalized**
	PETROPERÚ PIPELINE – KM 364	**Finalized**
	PETROPERÚ PIPELINE – KM 206	**In progress**
	PETROPERÚ PIPELINE – KM 213	**In progress**
	PETROPERÚ PIPELINE – KM 103	**In progress**

TECHNIQUES

- Due to the difficulties to access to the affected sites, all LAMOR equipment is mobilized by river or helicopter

CONTAIMENT

OIL RECOVERY & TEMPORARY STORAGE

- Using rapid storage tanks, oil spilled is recovered for its later disposal

- Using high pressure pumps (125 PSI) and hot washers, all the affected areas are remediated

SPECIALIZED CLEANING

WASTE MANAGEMENT

- Vegetal material is treated onsite through biological enhanced process.

Based on:
American Petroleum Institute (API): Report on options to minimize environmental impact in response to land spills.
International Petroleum Industry Environmental Conservation Association (IPIECA): Development of response strategies using the Net Environmental Benefit Analysis – NEBA.
Federal Remediation Technologies Roundtable (FRTR) remediation technology matrix.

CONTAIMENT

OIL RECOVERY

TEMPORARY STORAGE

SPECIALIZED CLEANING

WASTE MANAGEMENT

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EXPERIENCES

CONTINGENCIES

BEFORE

AFTER

PETROPERU PIPELINE KM 41

Year 2014. Spilled volume: 2.000 Bbls
Time of work: 119 days
Remediated area: 86,500m²
Status: finalized

LAMOR technicians: 35

Local personnel: 400

Specialized equipment: LAMOR skimmers, solid pumps, hot washers, booms

CONTINGENCIES

BEFORE

AFTER

PETROPERU PIPELINE KM 440

Year 2016. Spilled volume: 4.000 Bbls
Time of work: 112 days
Remediated area: 32,500m²
Status: finalized

LAMOR technicians: 15

Local personnel: 400

Specialized equipment: LAMOR skimmers, solid pumps, hot washers, booms

CONTINGENCIES

BEFORE

AFTER

PETROPERU PIPELINE KM 364

Year 2016. Spilled volume: 52000 Gal
Time of work: 40 days
Remediated area: 12.000m²
Status: finalized

LAMOR technicians: 16

Local personnel: 155 approx.

Specialized equipment: LAMOR skimmers, solid pumps, hot washers, booms

CONTINGENCIES

BEFORE




AFTER


PETROPERU PIPELINE KM 54 & 55

Year 2016.
Time of work: 98 days
Remediated area: 41.000m²
Status: finalized

LAMOR technicians: 16

Local personnel: 300 approx.

Specialized equipment: LAMOR skimmers, solid pumps, hot washers, booms

CONTINGENCIES

BEFORE




AFTER




PETROPERU PIPELINE KM 53

Year 2016.
Time of work: 45 days
Remediated area: 32.000m²
Status: finalized

LAMOR technicians: 15

Local personnel: 85.

Specialized equipment: LAMOR skimmers, solid pumps, hot washers, booms

CONTINGENCIES

BEFORE




AFTER




PETROPERU PIPELINE KM 82

Year 2016.
Time of work: 45 days
Remediated area: 5.500m²
Status: finalized

LAMOR technicians: 14

Local personnel: 120

Specialized equipment: LAMOR skimmers, solid pumps, hot washers, booms

CONTINGENCIES

BEFORE




AFTER




PETROPERU PIPELINE KM 67

Year 2016.
Time of work: 70 days
Remediated area: 9.100m²
Status: finalized

LAMOR technicians: 24

Local personnel: 136

Specialized equipment: LAMOR skimmers, solid pumps, hot washers, booms

CONTINGENCIES

BEFORE

AFTER

PETROPERU PIPELINE KM 206

Year 2016. Spilled volume: 2.000 Bbls
Time of work: 426 days
Remediated area: 1’240.000m²
Status: in progress

LAMOR technicians: 45

Local personnel: 2000 approx.

Specialized equipment: LAMOR skimmers, solid pumps, hot washers, booms

CONTINGENCIES

BEFORE




AFTER


PETROPERU PIPELINE KM 213

Year 2016. Spilled volume: 903 Bbls
Time of work: 260 days
Remediated area: 30.000m²
Status: in progress

LAMOR technicians: 16

Local personnel: 155 approx.

Specialized equipment: LAMOR skimmers, solid pumps, hot washers, booms

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CONTINGENCIES

BEFORE




AFTER




PETROPERU PIPELINE KM 103

Year 2016. Spilled volume: N/D Bbls
Time of work: 165 days
Remediated area: 240.000m²
Status: in progress

LAMOR technicians: 22

Local personnel: 410

Specialized equipment: LAMOR skimmers, solid pumps, hot washers, booms

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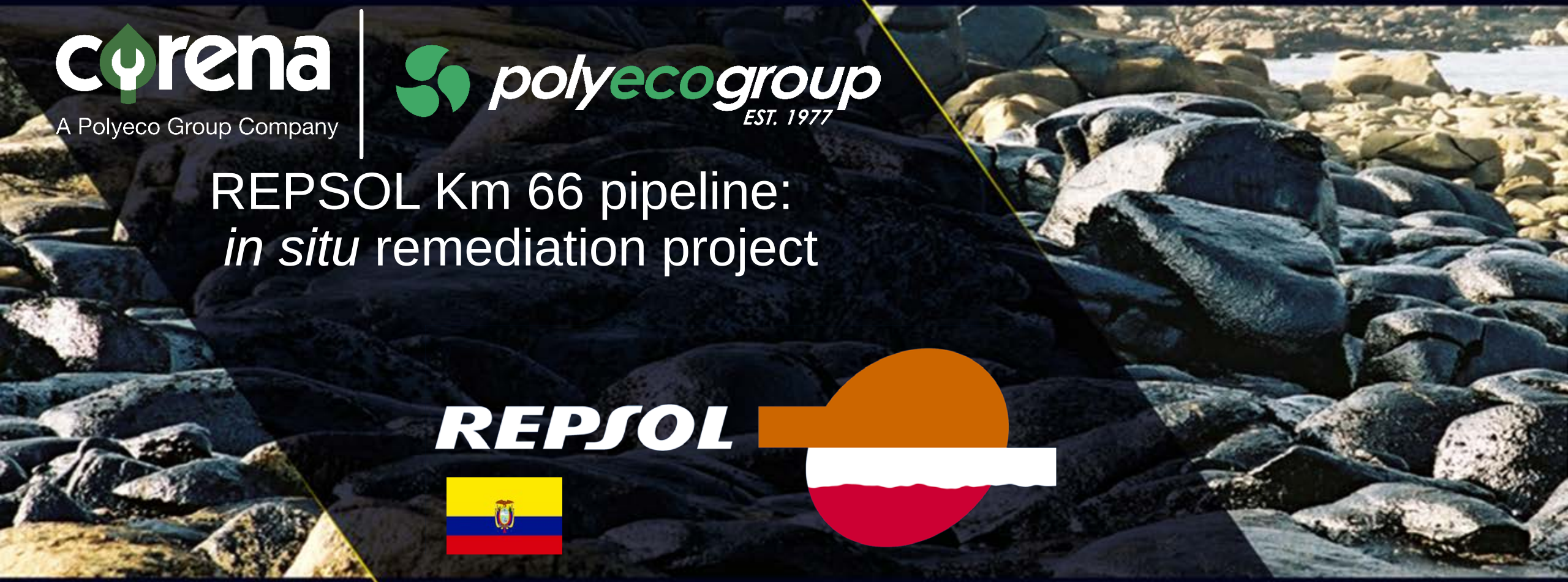
REPSOL Km 66 pipeline: *in situ* remediation project



REPSOL

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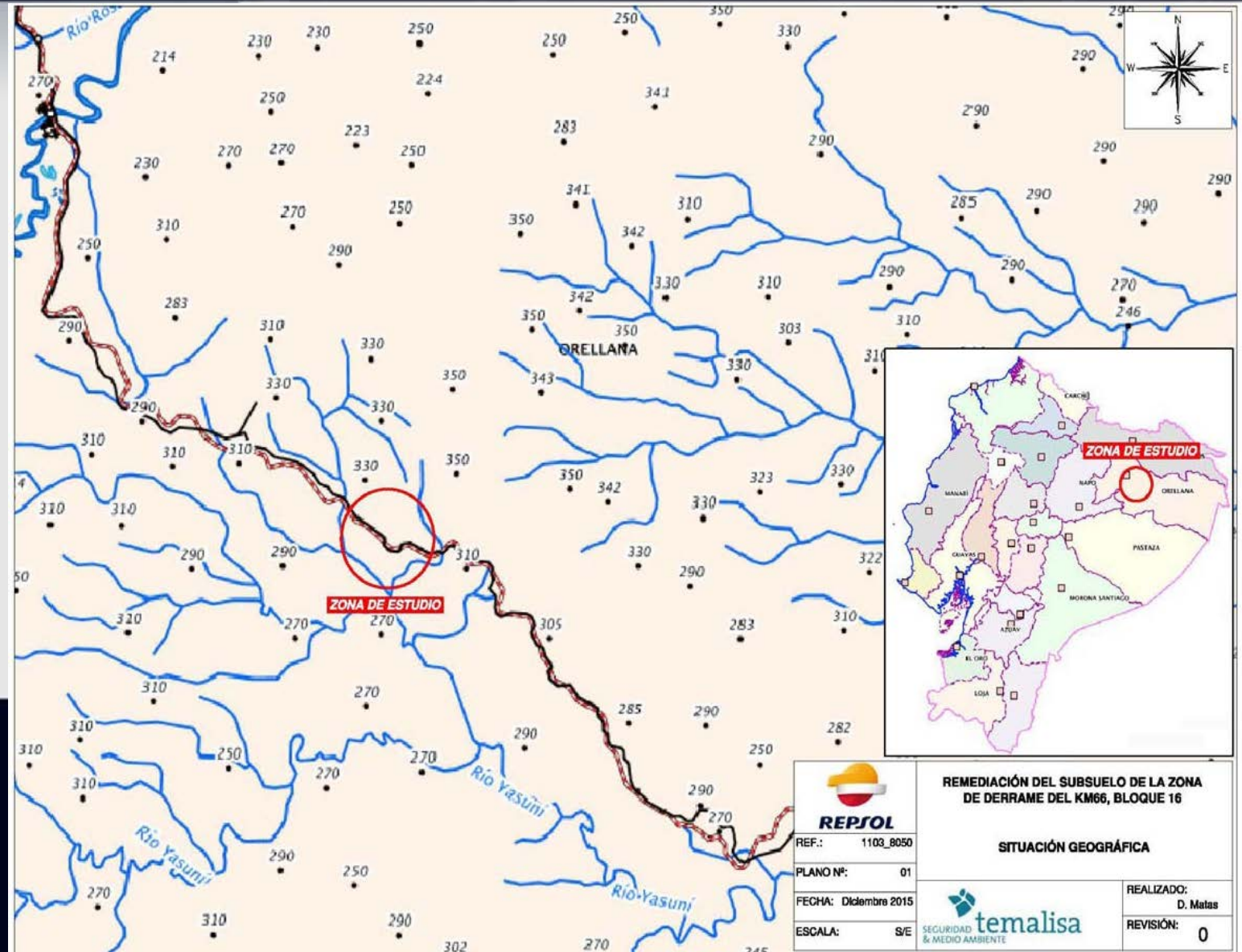
BACKGROUND:

- In August 2014 REPSOL ECUADOR identified a diesel spill in the km66 of their pipeline inside Block 16.
- In march 2015, TEMALISA developed the delimitation of the affected area.
- In July 2016, CORENA and TEMALISA began the remediation activities of the affected area.



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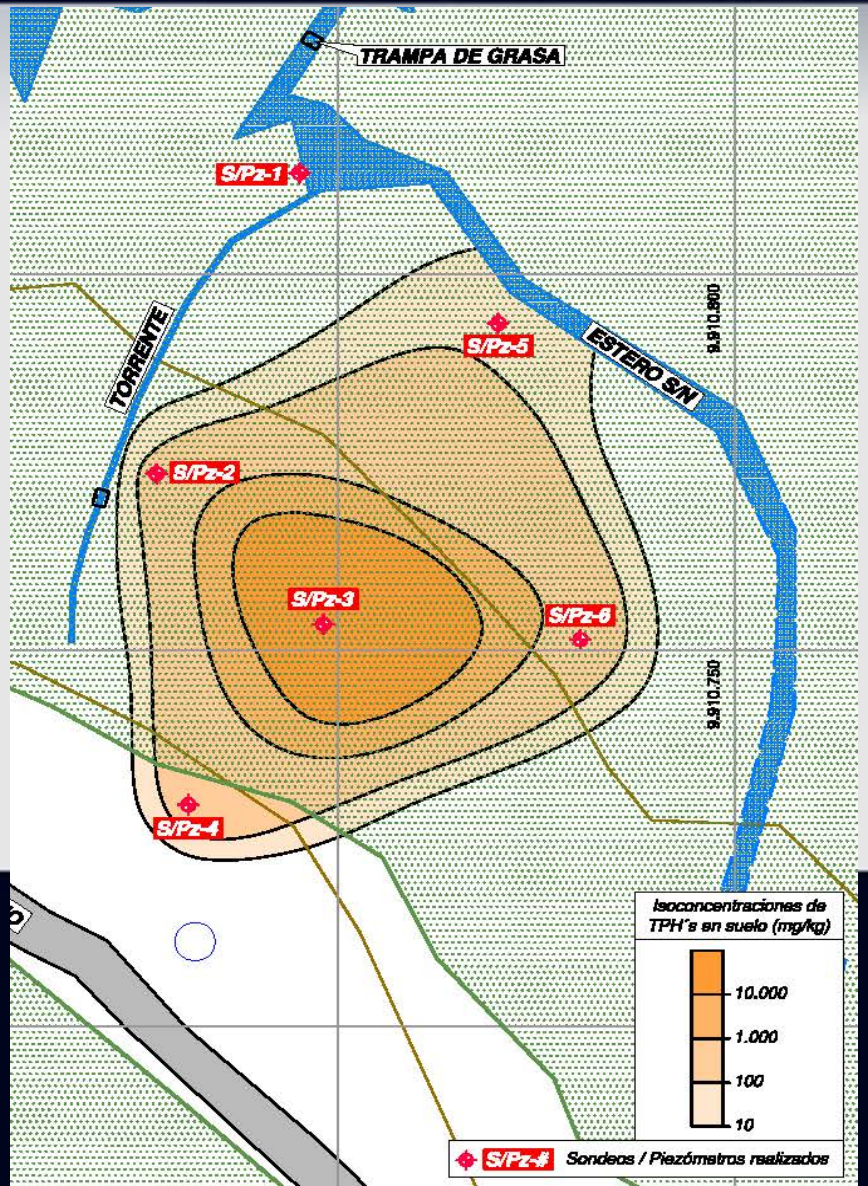
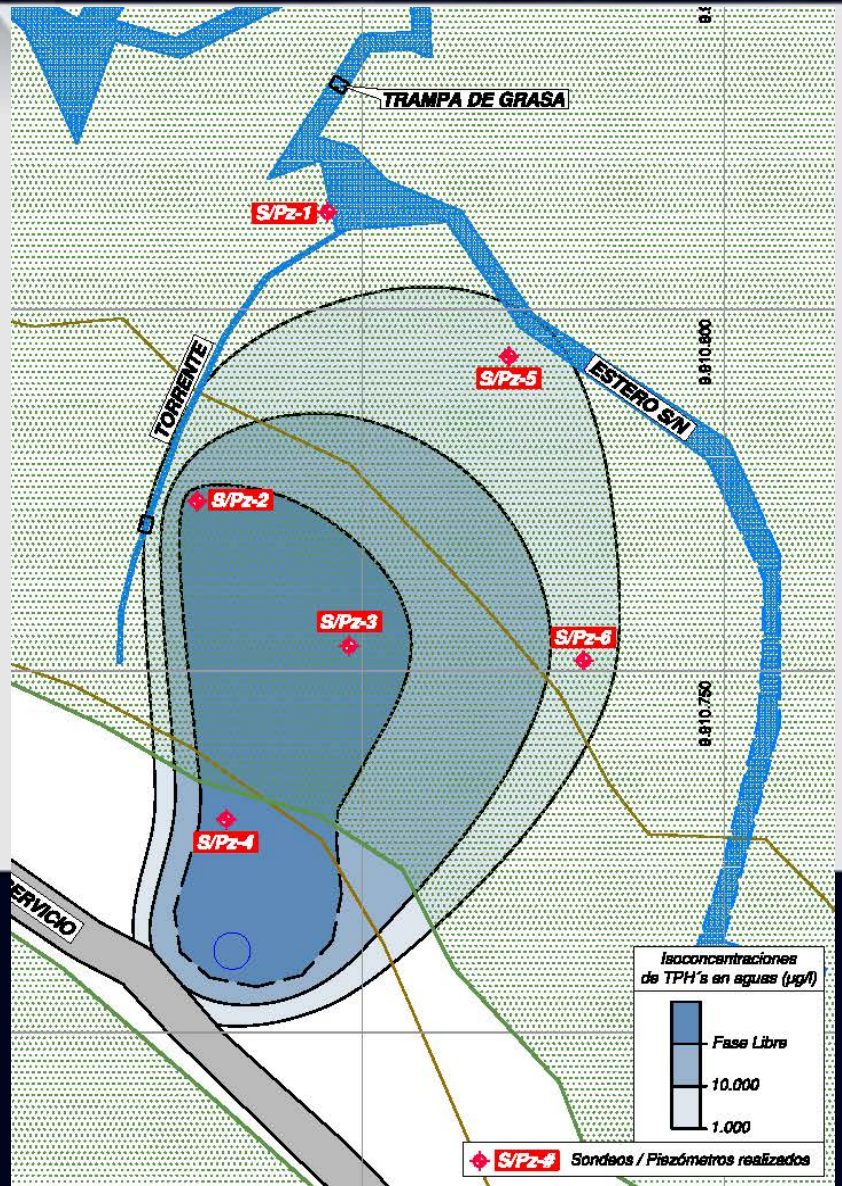
SOIL CONTAMINATION BASE LINE

Highest contamination: 13.000 mg/Kg



WATER CONTAMINATION BASE LINE

Highest contamination: 1.370 mg/mL



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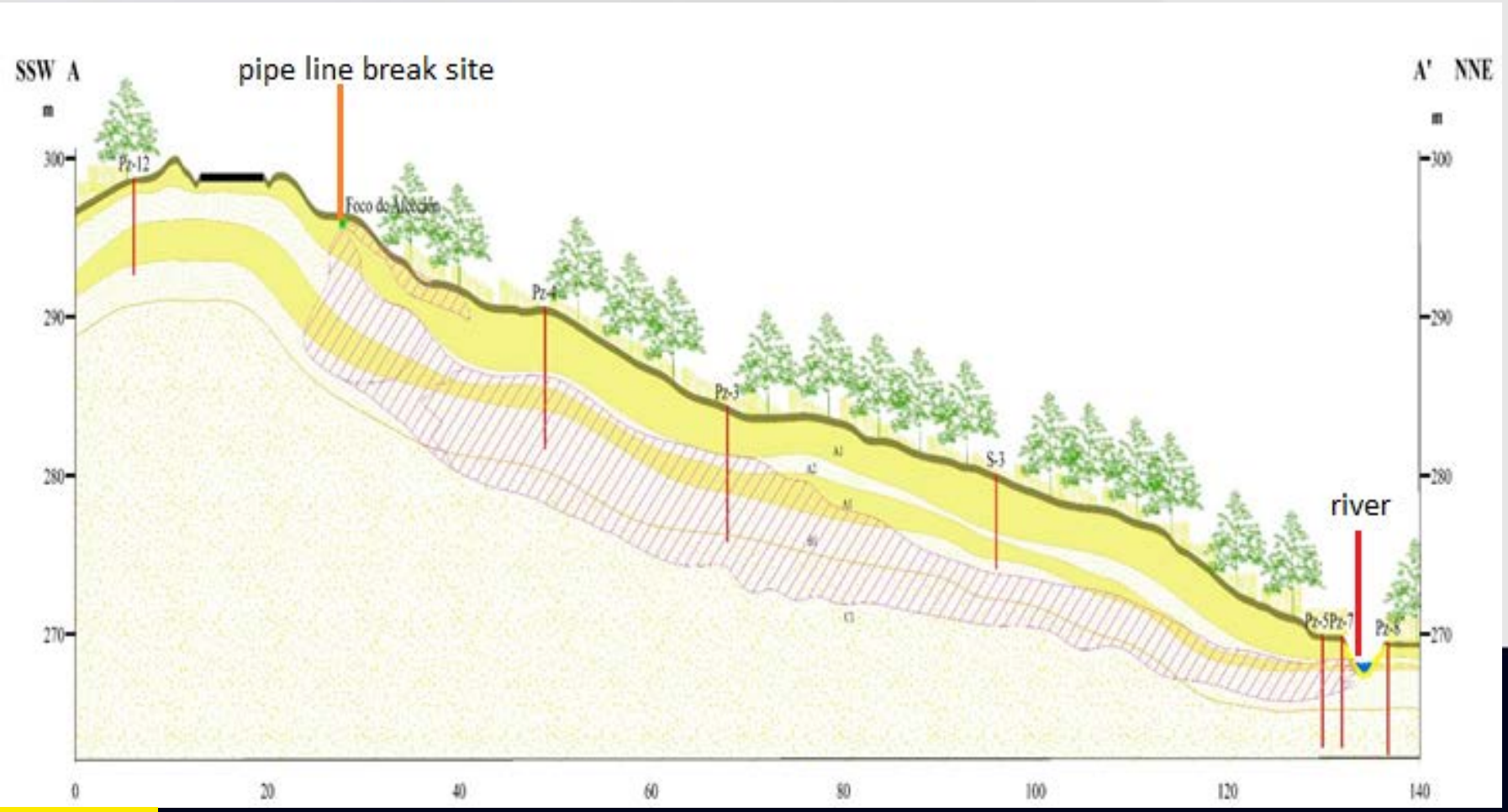
CROSS-SECTION

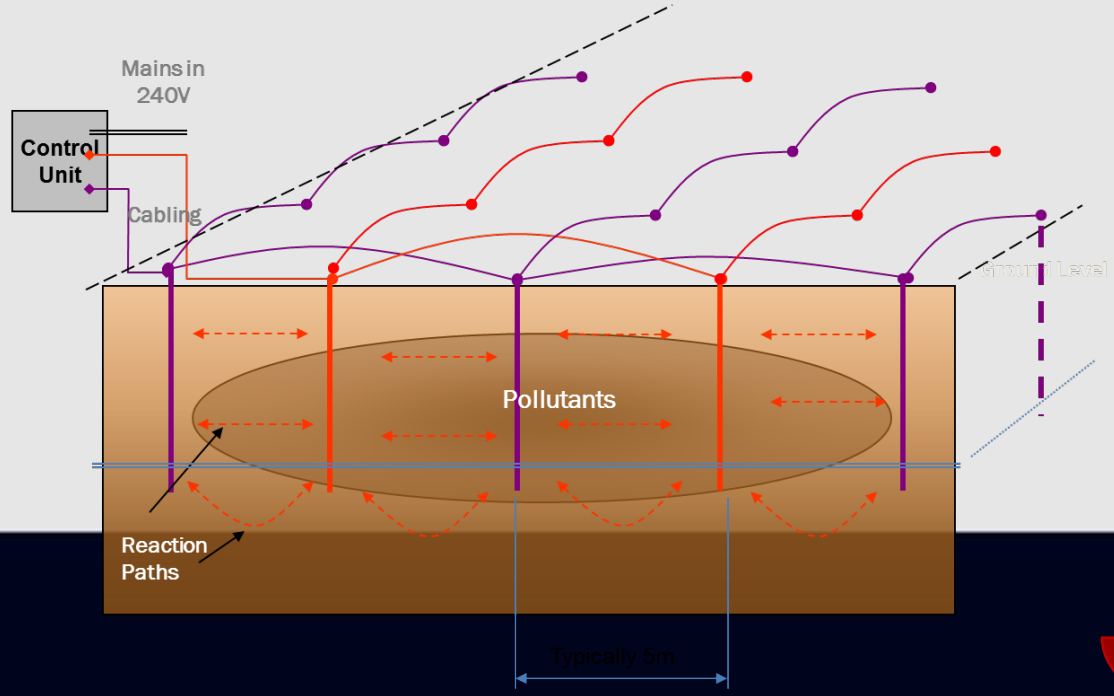


SCOPE OF WORK:

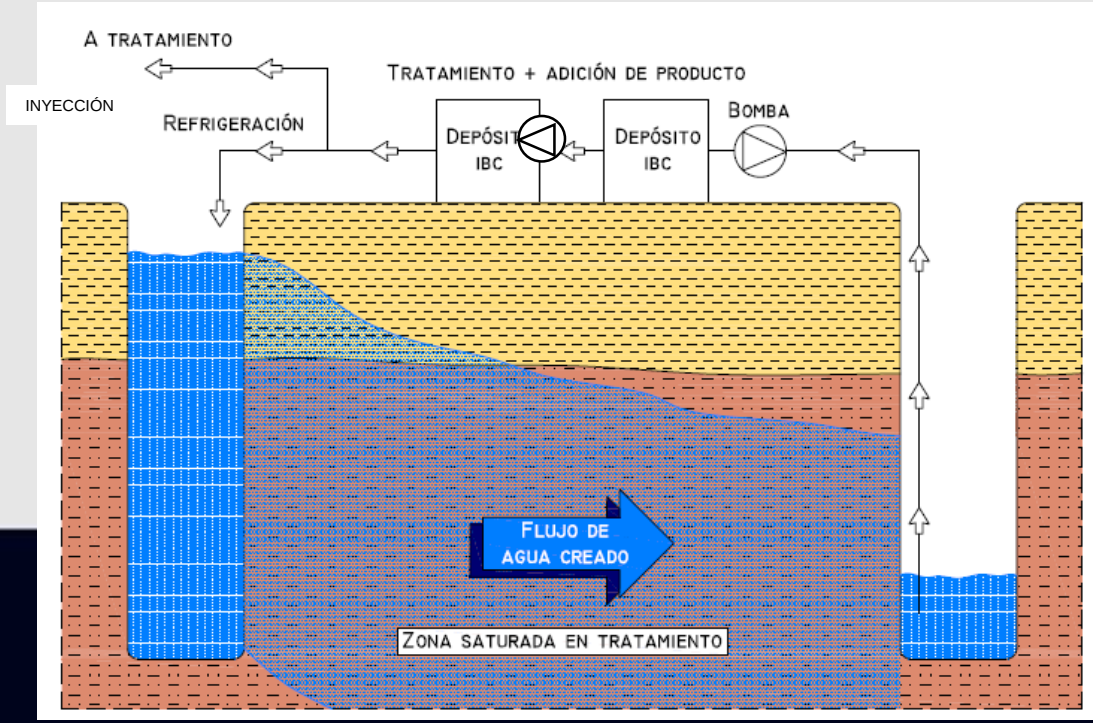
- Recovery of the non-aqueous free phase (diesel) from the affected area.
- Remediation of the subsoil, from the pipeline break site, through the hill and to the river at the end of the hill

REMEDIATION METHOD: ELECTROKINETIC ENHANCED BIOREMEDIATION

Electrokinetic reactions (EKO GRID®)



Microbiological augmentation



Supply of O_2

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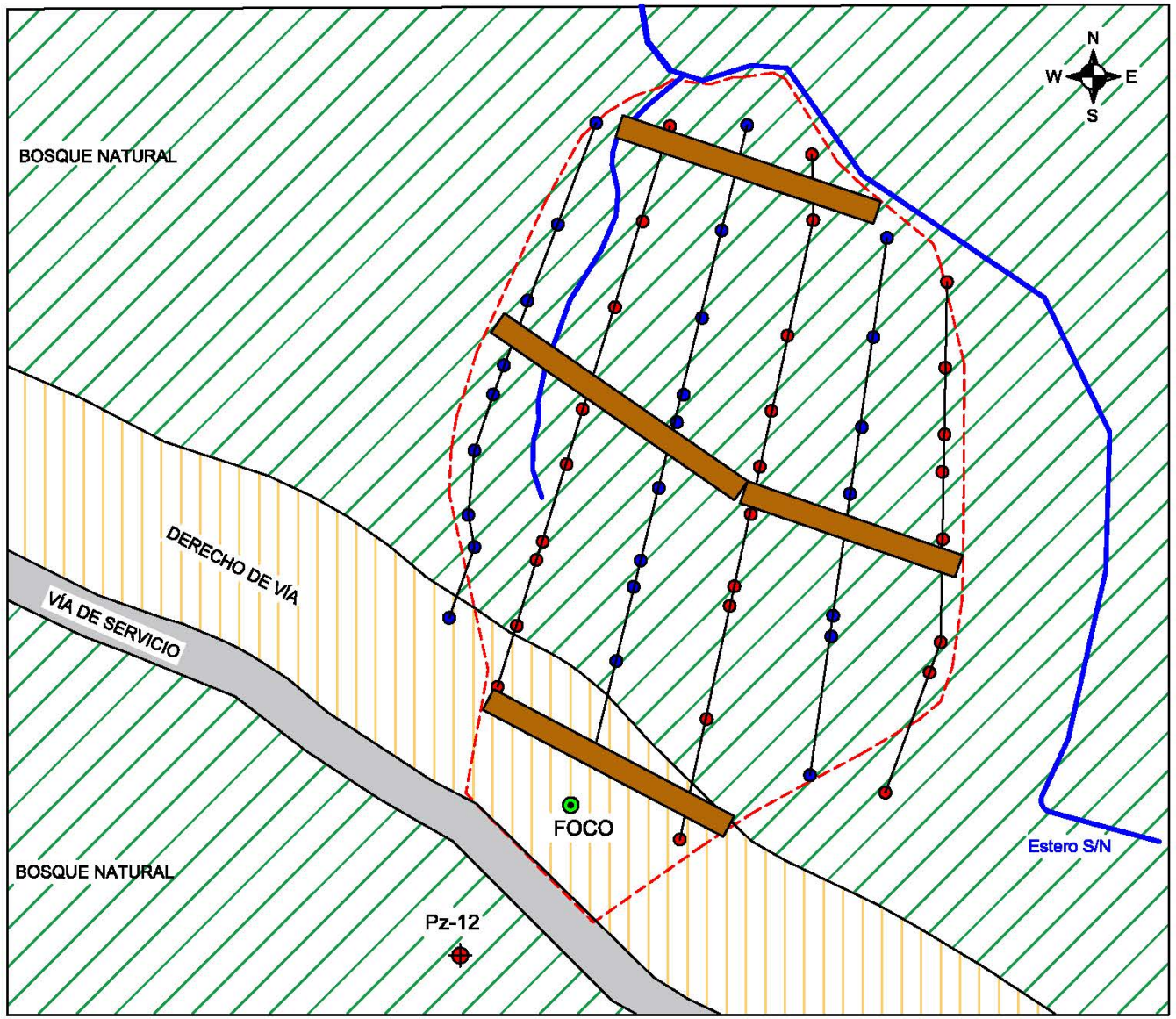

GRID AND TRENCHES DESIGN

LEGEND

- Pipeline break
- Permanent sampling point
- EKO GRID Anode
- EKO GRID Catode
- National Park
- Pipeline
- Road
- Trenches
- River
- Contamination perimeter

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RESULTS MARCH 2017: 2nd month of operation

Water samples results

Nº.	Código	Fecha	Resultado	
			TPH (mg/l)	HAP (mg/l)
1	A-PZ-3	01/02/2017	4,80	0,0013
2	A-PZ-6	01/02/2017	7,75	0,0014
3	A-PZ-7	01/02/2017	14,39	<0,0003
4	A-PZ-9	01/02/2017	<0,25	-
5	A-PZ-10	01/02/2017	0,73	-
6	A-PZ-15	01/02/2017	<0,25	

Soil samples results

Nº.	Código	Fecha	Resultado		LMP (Tabla 6 RAOHE. Eco. Sensibles)	
			TPH (mg/l)	HAP (mg/l)	TPH (mg/l)	HAP (mg/l)
1	S1-KM66-01	28/01/2017	276,99	-	< 1000	< 1
2	S2-KM66-01	28/01/2017	81,28	< 0,3	< 1000	< 1
3	S3-KM66-01	28/01/2017	447,66	-	< 1000	< 1
4	S4-KM66-01	28/01/2017	< 70	< 0,3	< 1000	< 1
5	S5-KM66-01	28/01/2017	367,88	-	< 1000	< 1
6	S6-KM66-01	28/01/2017	< 70	-	< 1000	< 1
7	S7-KM66-01	28/01/2017	< 70	< 0,3	< 1000	< 1
8	S8-KM66-01	28/01/2017	< 70	< 0,3	< 1000	< 1

Even though first results show values under the accepted limit (soil 1.000 mg/kg) at 3m of depth, the second sampling tasks (at the end of April 2017) will cover a depth between 3 and 5m to evaluate the behavior of the system. Regarding to water, the target limit is not achieved yet (<20 mg/L), which shows that the remediation process should continue. A 12-month remediation period is estimated.

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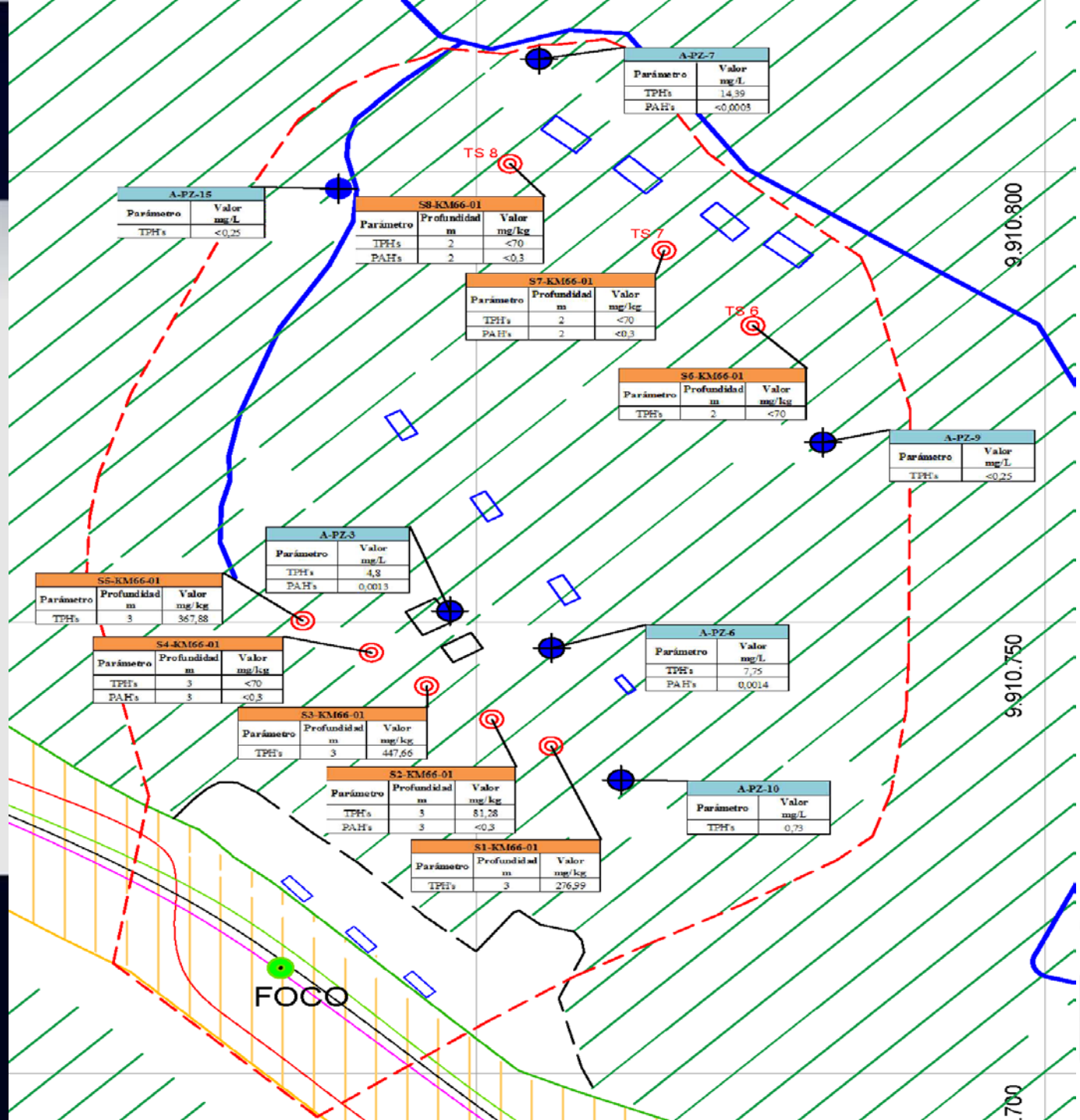

SYMBOLS

- Perimeter of contamination
- River
- Pipeline perimeter
- Road
- National Park
- Diesel pipelina
- Oil pipeline
- Optical fiber
- Power cable

LEGEND

- Soil sample
- Water sample

GRAPHIC SCALE

0 5 10 15 20 25 m

REPSOL		TEMALISA S.A.
PROYECTO :	TRABAJOS DE REMEDIACION DERRAME KM 66 ID 43664	
CONTENIDO :	RESULTADOS DE ANALISIS DE MUESTRAS DE SUELO Y AGUA	
Ref: 8250	Realizado por: NC	Fecha: Feb, 2016
Plano: Nº 2	Escala: Gráfica	Revisión: 0