Performance of European cross-country oil pipelines
Details of spillage incidents from 2005

This report has been published yearly by CONCAWE since 1971. Until 2004, the yearly report only dealt with detailed information on the spillages having occurred during the year. Every so often an overview report was published analysing the whole database from 1971. From the 2005 reporting year, the format and content of the report was changed to include not only the yearly performance, but also a full historical analysis since 1971, effectively creating an evergreen document updated every year. All previous reports are now obsolete.

In the single annual integrated report, it was, however, not considered practical to include the full narrative description of the circumstances and consequences of each past spillage.

Up till 1993 reports were only published on paper and are mostly out of print. Reported details of the spillage incidents have been compiled in two separate appendices.

Information from the 1994 reporting year, when electronic archiving first started, through to 2004 is provided in a third appendix.

This appendix provides the information for the 2005 reporting year, when the format was modified, and all subsequent years up to the year preceding the current report.

2005 SPILLAGE INCIDENTS

A total of 11 spillage incidents were recorded in 2005. The table below gives a summary of the main causes and spilled volumes and environmental impact. For definition of categories of causes and gross/net spilled volume, see **Appendix 1** in the main report.

Summary of causes and spilled volumes for 2005 incidents

Event [1]	Location	Line size (")	Product spilled	Injury Fatality [2]	Fire	Spilled volume Gross (m^3)	Spilled volume Net loss (m^3)	Contamination Ground area m^2	Contamination Water [3]
Mechanical failure									
426	Pump station	12	Diesel fuel	-	-	18.7	18.7	NA	
427	Line	12	Jet fuel	-	-	NA	NA	NA	G
428	Line	20	Crude oil	-	-	350.0	10.0	15000	G
429	Line	6	Jet fuel	-	-	20.0	0.0	58	S
430	Line	6	Jet fuel	-	-	38.0	0.0	42	S
Operational									
431	Line	10	Crude oil	-	-	30.0	4.2	1000	G
432	Line	8	Jet fuel	-	-	15.0	0.0	1000	
Corrosion									
433	Line	10	Jet fuel	-	-	3.0	0.6	50	S
434	Line	24	Crude oil	-	-	64.0	63.0	150	G
Third party activity									
435	Line	8	Jet fuel	-	-	15.0	8.0	1000	G
436	Line	24	White prod.	-	-	0.5	0.0	3000	S G
Total						554.2	104.5		

[1] Spillage events are numbered from the beginning of the survey in 1971

[2] I = Injury, F = Fatality

[3] S = Surface water, G = Groundwater, P = Potable water

The circumstances of each spill including information on consequences remediation and cost are described in the next section according to cause.

Mechanical Failure

There were five incidents resulting from mechanical failure, two caused by a construction fault and three resulting from materials faults.

Construction Fault

Event 426:

A branch leading to a pressure relief valve on a 12” diesel fuel pipeline in a pump station fractured although this piece of pipe was only one and a half years old. The fracture was caused by vibration in a section of pipe which was not adequately supported. Some 18.7 m^3 of diesel fuel was spilled in an area of vines and orchards. The leak was detected almost immediately by the pipeline operator and the pipeline shut in. The spilled oil was absorbed using sepiolite so that the final state of the ground was similar to that before the failure. Some 1500 € damage was caused to nearby vines. The costs of repairs and clean-up were minimal at only 2000 €.

Event 427:

A 12” pipeline transporting jet fuel was exposed by a third party for them to carry out construction work in an industrial area. They reported that the pipeline was leaking and it was immediately shut in. The leak was found to be in a welded joint and was caused by a defective weld. The length of time that the pipeline had been leaking is unknown as is the volume of oil spilled although it is believed to be more than 1 m^3. The pipeline was shut in for 2 days while repairs were carried out and discussions are ongoing as to the best way to clean up the pollution caused including to groundwater.

Materials Fault

Event 428:
During normal operation of a 20” pipeline transporting crude oil, a sudden pressure drop was observed. The automatic leak detection system reacted within three minutes and a full manual shutdown was performed 22 minutes later. By the time the system had de-pressured, some 350 m^3 of oil had been spilled in a corn field. The failed section of pipe was excavated, removed and replaced. Subsequent investigation revealed a crack of 36 mm by 1 mm caused by a hidden metallurgical defect from the pipe manufacture. To clean up the site, pits were dug down to the groundwater table and crude oil collected from the water surface. In all, some 15,000 m^2 of ground was affected. 220 m^3 of oil was collected as liquid and it is estimated that a further 120 m^3 of oil was removed with contaminated soil leaving about 10 m^3 net loss. Clean-up took one year and a cost of 2,800,000 €, most of which (2,500,000 €) was for the disposal of contaminated soil. The repairs to the pipeline cost 200,000 € and took 6 days.

Events 429/430:
Two leaks occurred in the same pipeline, 7 km apart, within 3 months of each other. Both incidents were caused by cracks forming in the defective pipe. In the first, the leak was detected by routine monitoring by the operator and the line rapidly shutdown. A crack 12 mm long was found and it was estimated that 20 m^3 of diesel had leaked into arable land and contaminated about 60 m^2 of land. The clean up involved the removal of nearly 4000 tonne of soil and took 75 days at a cost of 420,000 €. Repairs to the pipeline cost a further 7,500 €. There was slight contamination of surface water. In the second incident, diesel oil was reported by a third party to be leaking into a meadow, a ditch and two ponds. On investigation, a crack 7 mm long was found and it was estimated that 38 m^3 had leaked out and contaminated some 42 m^2 of land. The clean up involved the removal and disposal of 2200 tonne of soil, took 21 days at a cost of 160,000 €. Repairs to the pipeline cost 6,000 €. The pipeline had been inspected by a metal loss pig a month before the first incident. This had revealed a large number of anomalies and a programme to remediate these is under way.

Operational

There were two incidents caused by operational factors, both attributable to human factors.

Systems Malfunction

There were no incidents in this category in 2005.

Human Factors

Event 431:
A 10” crude oil pipeline was shut in for maintenance operations. The pipeline was not completely emptied of crude oil so that when work was being carried out on a valve, oil spilled out. This came out of the valve pit through the concrete walls surrounding the valve. Around 15 m^3 of oil was spilled of which 10 m^3 was recovered as liquid, the remaining 5 m^3 being removed with contaminated soil for disposal. Around 1000 m^2 of ground was affected. Repairs to the pipeline were not necessary. Clean-up took nearly four months at a cost of 150,000 € with a further 400,000 € for disposal of contaminated soil.

Event 432:
A trench was being dug to access an 8.5” pipeline transporting jet fuel for maintenance purposes. The site was near a road crossing where the pipeline was at 5 m below ground. So as to make the excavation safe, sheet steel piling was being driven to support the trench. The position and depth of the pipeline had been identified and the equipment operator had also been made aware of these and measures had been agreed to protect the pipe. Nevertheless, the pipeline was holed by the sheet piling. The incident occurred in agricultural land and the piling made a 350 mm x 2 mm gash in the pipe. The incident was detected by the automatic detection system but by the time the pipeline had been shut in, some 30 m^3 of oil had been spilled. This impacted groundwater but not surface or drinking water supplies and some 1000 m^2 of soil was contaminated. As well as removal of contaminated soil, wells have been drilled and pumping undertaken to depress the groundwater surface so that oil can be recovered. This process was still in operation after 6 months, by which time the majority of the oil had been recovered, i.e. 25 m^3 by pumping, and 0.8 m^3 in contaminated soil. The net loss is thus some 4.2 m^3. Costs so far have been 10,000 € for repairs to the pipeline, 50,000 € for the bore hole pumping and 940,000 € for disposal of contaminated soil making a total cost of 1,000,000 €.

Corrosion

There were two incidents resulting from corrosion, one each from internal and external corrosion.

External Corrosion

Event 433:
While pressure testing a 10” pipeline with jet fuel, a flange blew out in a depot and this was presumed to be the cause of the pressure drop. The line was depressured to repair the flange but 10 days later, a third party reported oil coming to the surface in a derelict oil depot. It was estimated that approximately 3 m^3 of oil was spilt. The area of ground affected by oil was about 50 m^2 and some 15 m^3 of oily soil was removed for disposal. Ten days after the spill, oil was observed on the surface of water in a ditch adjacent to the pipeline and this was reported to the authorities. Absorbents were used in the ditch and drainage sumps were dug between the pipeline and ditch and oil was collected from these by vacuum tanker. By these means, about 2.4 m^3 was recovered as liquid leaving a net loss of 0.6 m^3. Excavation revealed a 3mm by 3mm hole caused by external corrosion under the coal tar coating. A clamp has been fitted to the pipeline as a temporary repair but full replacement of the defective section is planned. The temporary repair cost 100,000 €, the clean-up cost 120,000 € and took three and a half months; disposal of contaminated soil cost 5,000 € giving a total cost of 225,000 €.

Internal Corrosion

Event 434:
A leak of crude oil from a pipeline in a terminal was discovered by the pipeline staff when oil appeared on the surface of the ground. The leak was on a length of 24" pipe connecting two main pipelines. However, it had been out of service since 1986 when one of the main pipelines had been mothballed. The routine annual pressure testing of the whole system the day before the leak was detected presumably caused the failure of a corrosion defect which had been forming for some time. In the area of the leak, the pipeline is actually lying in the water table. Therefore, the oil could not soak down into the ground. As a result, almost all of the 64 m^3 spilled could be recovered by pumping and 62.5 m^3 was collected in this way. It is estimated that a further 0.5 m^3 was disposed of with contaminated soil leaving perhaps only 1 m^3 lost to the ground, all within the confines of the terminal. About 150 m^2 of ground was affected. Repairs to the pipeline cost 120,000 € and took one day. The clean-up cost 50,000 € with a further 200,000 € for disposal of contaminated soil. Total costs were 370,000 €.

Third party activity

There were two incidents resulting from third party activity, one in the accidental damage category and the other in the incidental damage category.

Direct Damage - Accidental

Event 436:
An excavator operating without authority over the route of an 8" pipeline, and despite near-by pipeline markers, dug a trench just over the pipeline. The blade carved a gouge 10 cm long by 1 cm wide in the top of the pipe. The pipeline immediately ruptured, but fortunately, the point of impact was only 100 m upstream of a non-return valve. The automatic oil spill protection system immediately shut down the pipeline thus limiting the spillage to 15 m^3 of jet fuel. However, the spillage was in a very sensitive area inside a National Park. Of the spilled oil, 7 m^3 was recovered giving a net loss of 8 m^3 to soil and groundwater. The area of ground affected was 1000 m^2. The pipeline was repaired and returned to service within one day. This cost 200,000 €, the initial clean-up cost 1,850,000 €, disposal of contaminated soil cost 406,000 € giving a total cost of 2,456,000 €. However, the final clean-up remains to be done and the plans for this have to be approved by the Authorities. It is proposed that this will include a skimmer system and "bio-sparging" to recover pollution from the water table and further removal of contaminated soil.

Direct Damage - Malicious

There were no incidents in this category in 2005.

Direct Damage - Incidental

Event 437:
A landowner observed oil in a meadow and reported this to the pipeline operator. The pipeline was shut in and the pipeline exposed when it was found that there was a drain which had been installed crossing over the pipeline. The drain laying machine had cut a notch in the pipe and this had developed into a crack some 800 mm long. It was estimated that only 0.45 m^3 of product had escaped. This would normally not be included in the CONCAWE statistics but in this case, there were significant environmental impacts. Because of the high water table, both ground and surface water were affected and some 3000 m^2 of ground contaminated. 1600 tonnes of soil were removed and 300 tonnes of water removed and a further 4400 m^3 of water treated in an oil water separator. As a result, all traces of oil were removed. Repairs to the pipeline took 35 hours and cost 120,000 €. The clean-up cost 170,000 € and took 80 days.

2006 SPILLAGE INCIDENTS

A total of 12 spillage incidents were recorded in 2006. The table below gives a summary of the main causes and spilled volumes and environmental impact. For definition of categories of causes and gross/net spilled volume, see **Appendix 1** in the main report.

Summary of causes and spilled volumes for 2006 incidents

Event (1)	Facility	Line size (")	Product spilled	Injury Fatality (2)	Fire	Spilled volume Gross (m^3)	Spilled volume Net loss (m^3)	Contamination Ground area m^2	Contamination Water (3)
Mechanical failure									
Construction									
439	Above ground pipe	9	Gasoline	-	-	5.4	0.0	0	
442	Above ground pipe	11	Diesel or heating oil	1(I)	-	37.0	0.0	0	
Design & Materials									
437	Underground pipe	12	Diesel or heating oil	-	-	75.0	0.0	50	
438	Underground pipe	8	Naphtha	-	-	5.8	5.8	60	
440	Above ground pipe	14	Diesel or heating oil	-	-	5.1	0.0	0	
444	Above ground pipe	13	Diesel or heating oil	-	-	4.0	0.0	0	
Corrosion									
Internal									
445	Underground pipe	20	Jet fuel	-	-	2.0	0.0	0	S G
446	Underground pipe	12	Crude	-	-	10.0	3.0	50	
Third party activity									
Accidental									
441	Underground pipe	11	Diesel or heating oil	-	-	245.0	0.0	Not reported	
443	Underground pipe	11	Diesel or heating oil	-	-	223.1	0.0	Not reported	
Intentional									
447	Underground pipe	6	Gasoline	-	-	23.0	0.0	100	G
448	Underground pipe	6	Gasoline	-	-	16.0	0.0	80	G

(1) Spillage events are numbered from the beginning of the survey in 1971

(2) I = Injury, F = Fatality

(3) S = Surface water, G = Groundwater, P = Potable water

The circumstances of each spill including information on consequences remediation and cost are described in the next section according to cause.

Mechanical Failure

There were 6 incidents resulting from mechanical failure, 2 caused by a construction fault and 4 resulting from design or materials faults.

Construction

Event 439:
The leak was situated at an in-line densitometer located 1.5 km from a storage facility. The leak was caused by failure of the densitometer seal. Product (gasoline) collected inside the densitometer chamber and did not reach the ground. There was no environmental damage. The leak was detected by personnel doing routine maintenance tasks.

Event 442:
The leak took place at a manifold. It occurred during a pressure surge although the maximum allowable pressure was not exceeded. It is believed that there was defect dating back to the manufacturing of the pipe. The leak was detected by a maintenance contractor.

Design & Materials

Event 437:

A gasket failed in a valve pit. The leak was discovered by staff from another company during routine surveillance. The product collected in the pit and removed within a few hours.

Event 438:
Naphtha leaked from a valve located underground. The contaminated soil was excavated. Clean up was effected by a proprietary method used in combination with enhanced natural attenuation.

Event 440:
A pressure relief valve in a pump station was damaged by overpressure in the line, produced following emergency shutdown of another pump station. The leak was contained inside the building so there was no environmental damage. The product was collected in the oily water well and pumped into a tanker.

Event 444:
The leak occurred in an auxiliary pipe connecting a pressure relief valve to a tank pipe. It was caused by overpressure in the tank pipe, incorrect manufacture and assembly of the auxiliary pipe and incorrect (too low) set point of the pressure relief valve. It was detected by personnel in the facility. As the tank was inside a containment bund, the leak did not contaminate any soil. The bund was cleaned with water and the mixture was sent to the water treatment plant.

Operational

There were no spillages in this category in 2006.

Corrosion

There were 2 spillages resulting from internal corrosion.

Event 445:
A leak was detected through a measurable drop in static pressure in a main line. The cause was identified as internal corrosion. Contaminated soil was dug up and disposed of for treatment.

Event 446:
A leak in a 12" crude oil pipe line close to a crude oil tank farm / pump station was discovered by a third party. The pipeline was not pumping at the time and was immediately shut down. Approximately 10 m^3 of crude oil were spilled, of which 7 m^3 were recovered as oil. Excavation revealed a 4 mm diameter hole caused by internal corrosion. This section of the line had been inspected by a magnetic inspection pig in 2004. No problems were detected at the time and the inspection report did not indicate critical internal metal loss. A 1 m long pipeline section was replaced. Repairs to the pipeline were completed within 3 months.

Natural causes

There were no spillages in this category in 2006.

Third party activity

There were 4 incidents resulting from third party activity, 2 in the accidental damage category and 2 in the intentional damage category.

Accidental

Event 441:
A digger, excavating to make an irrigation ditch, hit a gasoil pipeline causing a leak. It was detected by the dispatching centre. Contaminated soil had to be removed and replaced.

Event 443:
A digger, excavating to make an irrigation ditch, hit a gasoil pipeline causing a leak. It was detected by the person responsible for the breakage. Part of the product was recovered using suction pumps and tankers. The contaminated soil was removed for safe disposal.

Intentional

There were 2 attempted thefts on the same pipeline during 2006.

Event 447:
In the first attempt was detected by the Plant Supervising System. A hole was drilled into the line to steel gasoline, however at the same time a large amount of product was spilled. An area of about 100 m^2 was contaminated. Because the soil was sandy no oil could be recovered and all contaminated soil had to be removed and disposed of which took one month. The damaged pipe section was removed and replaced.

Event 448:
In the second attempt a large pressure loss was observed on both pumping and receiving sides. The automatic Pipeline Supervision System indicated confirmed a leak had occurred. After excavation it was found that a small bore connection had been added. A large amount of product spilled out contaminating an area of about 80 m^2. Because the soil was sandy no oil could be recovered and all contaminated soil had to be removed and disposed of which took one month. The damaged pipe section was removed and replaced.

2007 SPILLAGE INCIDENTS

A total of 9 spillage incidents were recorded in 2007. The table below gives a summary of the main causes and spilled volumes and environmental impact. For definition of categories of causes and gross/net spilled volume, see **Appendix 1** in the main report.

Summary of causes and spilled volumes for 2007 incidents

Event (1)	Facility	Line size (")	Product spilled	Injury Fatality (2)	Fire	Spilled volume (m^3) Gross	Net loss	Contamination Ground area m^2	Water (3)
Corrosion									
Internal									
457	Relief station	16	Crude	-	-	6.5	0.0	700	S G
External									
456	Underground pipe	12.75	Jet fuel	-	-	184.7	158.7	1200	
Third party activity									
Accidental									
450	Underground pipe	8	Naphtha	-	-	30.0	1.0	2000	
452	Underground pipe	13	Jet fuel	-	-	301.2	37.8	452	
453	Underground pipe	9	White product	-	-	116.8	53.8	120	
455	Underground pipe	11	Diesel or heating oil	-	-	181.5	132.9	500	S
Intentional									
451	Underground pipe	10.75	White product	-	-	11.7	9.7	1600	
454	Underground pipe	8.625	Diesel or heating oil	-	-	1.9	1.9	100	
Incidental									
449	Underground pipe	8	White product	-	-	150.0	70.0	400	

(1) Spillage events are numbered from the beginning of the survey in 1971

(2) I = Injury, F = Fatality

(3) S = Surface water, G = Groundwater, P = Potable water

The circumstances of each spill including information on consequences remediation and cost are described in the next section according to cause.

Mechanical Failure

There were no incident resulting from mechanical failure in 2007.

Operational

There were no spillages in this category in 2007.

Corrosion

There were 2 spillages resulting from corrosion, one internal and one external.

Internal corrosion

Event 457:
The leak was situated in a 16"-drain-line of a relief station, close to an insulation flange. It was caused by internal anodic corrosion in 6-o'clock position (approx. 1,5 mm² hole-area), due to bridging of the insulating flange by electrolytic conductive sludge, settled in the bottom of this low-throughput-line section. The spillage was detected by an oil-smell outside station by a third party, after onsite investigation oil was detected on surface of a small ditch carrying drainage water outside the relief-station. Investigations inside the station showed oil close to surface of a nearby main-line valve; by excavation of polluted soil the leak was found in the nearby 16"-drain line. Deeply frozen ground complicated detection and excavation works. The line section is unpiggable, but external Ultrasonic inspection of this pipe was done in 2002 showing no significant corrosion indications.

Site cleaning was done by excavation and disposal of polluted soil. Groundwater cleaning was done by sucking polluted water from the pits and cleaning it in an onsite oil-separator adjusted to meet authority requirements. To control rehabilitation measures several sensor pipes were set into the ground in the surrounding of the spillage area. Site was subsequently checked by authorities and declared to be fully rehabilitated.

External corrosion

Event 456:
The Dispatching Centre detected a spurious closing of a block valve and an increase of pressure in the line. The emergency shutdown of the pumping was immediately activated. At this point a leak was detected and the block valves were closed to control the spill took place. The emergency response plan was activated and the emergency team inspected the line to identify the point of failure which turned out to be a 25 cm hole. The investigation concluded that the pipeline failed because of a patch of external corrosion and that the rupture pressure was less than the one experienced in the last pressure test conducted in 2003. The last inline inspection (by Magnetic Flux) conducted in 2004 did not detect any defect in that area of the pipeline. The depth of the buried pipeline was about 50 cm. There were no water courses in the vicinity. No agricultural soil was affected. The incident was notified to the local authorities.

The chosen clean-up method is land farming. Authorisation from the Administration must still be obtained in order to carry out remediation.

Natural causes

There were no spillages in this category in 2007.

Third party activity

There were 6 incidents resulting from third party activity, 4 in the accidental damage category and 2 in the intentional damage category.

Accidental

Event 450:
A third party excavating in the vicinity hit the pipeline, causing the immediate area to be seriously polluted by spraying naphtha. Nobody was injured during the incident. The third party activity had not been announced. The leak was also detected in the control room (pressure drop).

The top layer of the soil has been replaced by clean soil. The deeper layer will be cleaned by a biological technique. The soil remediation will take 2 to 10 years.

Event 452:
A gas pipeline company had informed the Operator of the construction of a new line close to the Operator’s ROW. 32 crossings and several kilometres of parallel run had been identified. The Operator had marked the pipeline correctly with stakes to avoid problems. While digging a trench, a digging machine hit the pipeline resulting in a hole of about 15 cm and a subsequent spill. Pumping was stopped immediately, the affected zone was isolated and the emergency response plan was activated. The product was spilled in the trench that was being constructed. There were no water courses in the vicinity. The emergency brigade, local firemen and authorities were on the scene within a few minutes. Most of the product spilled was pumped into tank trucks and sent to the Operator’s facilities. It appeared that the contractor was working inside the ROW without supervision by the Operator and had not respected instructions provided by the Operator. After replacement of the affected section, pumping was restarted within 2 days.

The product sent to the Operator’s facilities was recovered. The contaminated soil was treated in an authorized dump. The clean-up process has been completed.

Event 453:
The spilled took place in the construction of a new pipeline in parallel with the existing one. The existing pipeline was properly marked with stakes and other preventive measures to avoid damage to the existing line had been taken. While digging a trench, a digging machine hit the pipeline and a spill took place resulting in a hole of about 50 cm. The contractor argued that the existing line was not properly marked. An immediate shutdown of the pumping took place and the affected zone was isolated. The emergency response plan was activated and the emergency brigade, local firemen and authorities were on the scene within a few minutes. A control point was installed in the river located 6 km away although it turned out to be unnecessary. Most of the product spilled was pumped into tank trucks and sent to the Operator's facilities. After replacement of the affected section, pumping was restarted on the same day.

Most of the contaminated soil was removed and treated in an authorised off-site facility while bio-stimulation was used for the remaining soil. The clean-up process has been completed.

Event 455:
The spill took place during the construction of the same new pipeline as for event 453 running parallel with the existing one. The existing pipeline was properly marked with stakes and meetings had been held between the Operator and contractors to discuss security and safety matters. While digging a trench, a digging machine hit the pipeline and a spill took place resulting in a hole of about 5 cm. The machine operator notified to Dispatching Centre, pumping was immediately stopped and the affected zone was isolated with block valves. The emergency plan was activated and the emergency brigade and local authorities were quickly on the scene. The product was spilled in the ditch that was being constructed. A nearby water stream was protected in order to avoid contamination with the spilled product. Most of the spilled product was pumped into tank trucks and sent to the Operator's facilities. After replacement of the affected pipe the pumping was restarted.

Most of the contaminated soil was removed and treated in an authorised off-site facility while bio-stimulation was used for the remaining soil. The spilled product was treated at the Operator's facilities. The clean-up process has been completed.

Intentional

Event 451:
For some days the Dispatching Centre had detected some losses in the product transported and had been able to pinpoint the extraction point, so the surveillance patrols were on alert.

When a loss of product was again detected by the Dispatching Centre, the patrol was dispatched and found a tank truck extracting product through a block valve and some product spilled in the ground. The thieves were able to escape.

The patrol called the local authorities and the operator's personnel. There was no damage to the installation and it went on working.

The cleaning-up method was land farming. No vegetation was affected and no water contaminated. The clean up process has been completed.

Event 454:
The spill was detected by a third party, who smelt the product. The area had been inspected the day before and no problems detected. The pumping was stopped and the pipeline emptied to repair the affected section. The spillage was caused by the failure of an illegal tapping connection installed to steal product and in which a flange had been incorrectly installed.

A small area was affected. The contaminated soil was treated in an authorized offsite facility. The clean-up process has been completed.

Incidental

Event 449:
A leak was detected by the pipeline panel operator. Operation was immediately stopped and the pipeline emergency response team called. The source of the leak was identified within 3 hours and a temporary repair effected within 7 hours. The leak was located in a new industrial area under construction and was caused by failure of a girth weld (bottom H 6 position). Although ageing may have played a role, it is believed that the primary cause was abnormal load on the pipeline due to excavation under the line caused by a leaking new sewer under construction in the area.

The product was mainly conveyed into a sewer system under construction, so recovered with vacuum truck. Sewer not being yet fully sealed caused some product escape to underground, very close to the recent sewer excavation soil.

The first steps in the environmental cleanup have been completed i.e. monitoring of the spilled area and analysis of soils. A proposal for clean up is under evaluation.

2008 SPILLAGE INCIDENTS

A total of 12 spillage incidents were recorded in 2008. The table below gives a summary of the main causes and spilled volumes and environmental impact. For definition of categories of causes and gross/net spilled volume, see **Appendix 1** in the main report.

Summary of causes and spilled volumes for 2008 incidents

Event (1)	Facility	Line size (")	Product spilled	Injury Fatality (2)	Fire	Spilled volume Gross (m^3)	Spilled volume Net loss (m^3)	Contamination Ground area (m^2)	Contamination Water (3)
Mechanical									
Construction									
458	Underground pipe	16	Diesel or heating oil	-	-	4.1	3.6	25	
462	Above ground pipe	11	Gasoline	-	-	12.0	0.0	0	
Design & Materials									
459	Above ground pipe	40	Crude	-	-	6.0	0.0	0	
460	Pump Station	10.75	Jet fuel	-	-	30.0	0.0	40	
461	Underground pipe	10.75	Jet fuel	-	-	52.0	36.8	50	
463	Underground pipe	10.75	Jet fuel	-	-	129.4	108.4	90000	
468	Underground pipe	16	Crude	-	-	328.0	0.0	3600	
Corrosion									
External									
469	Underground pipe	18	Crude	-	-	1.1	1.1	0	S
Third party activity									
Accidental									
464	Underground pipe	9	Diesel or heating oil	-	-	43.7	17.3	3600	
465	Underground pipe	6	Jet fuel	-	-	40.0	0.0	5000	
466	Underground pipe	4	Jet fuel	-	-	28.0	0.0	250	
467	Underground pipe	16	Crude	-	-	294.0	0.0	11000	

(1) Spillage events are numbered from the beginning of the survey in 1971

(2) I = Injury, F = Fatality

(3) S = Surface water, G = Groundwater, P = Potable water

The circumstances of each spill including information on consequences remediation and cost are described in the next section according to cause.

Mechanical Failure

There were 7 incidents resulting from mechanical failure in 2008. 2 were related to construction defects and 5 to design or materials faults.

Construction

Event 458:
An acoustic internal inspection gave an indication of a leak. Excavation confirmed a small intermittent leak at a girth weld. Contaminated soil was removed. Piezometers were installed to monitor the migration of hydrocarbons.

Event 462:
The spillage occurred during the launch of an inspection pig (Intelligence pig). The gasket, which had not been correctly installed was partially removed and dragged by the pig. Field operators alerted the dispatching centre immediately and pumping was stopped. The damaged gasket was replaced and pumping was resumed. The spilled product was confined in the concreted area of the pipeline facility and was recovered in drainage pits from where it was routed to the contaminated water tank.

Design & Materials

Event 459:

An oil contaminated area of about 50 m^2 was detected by the local fire brigade outside a pipeline pig trap station on a crude oil pipeline. The pipeline was stopped and depressurised. Containment barriers were installed in local ditches using bundles of straw while the risk of fire and explosion in the area was monitored by the fire brigade and pipeline operating staff.

Concrete drainage pits that are located underneath the pig traps collect the small amount of oil released when retrieving a pig. The pits are linked to a separator tank via an underground line and a further small concrete pit, this pit was found to be leaking. Following heavy rainfall, the leaked oil followed the underground water draining path and reappeared outside the premises.

Liquid oil was retrieved and 300 tonnes of contaminated soil was removed for biological clean up.

Event 460:
A leak occurred at the mechanical seal of a pump. The pump was immediately switched off. Oil collected in the concreted area around the pumps and from there most of it could be routed to the contaminated water tank via drainage pits. Some oil contaminated an adjacent gravel area (with a polythene underlay) affecting about 40 m^2. There was no further contamination.

Event 461:
The gasket of a flanged pipeline block valve failed allowing a leak. An alarm was raised by the leak detection system, pumping was stopped and the pipeline valves closed. The product spilled was confined to the valve pit and it was pumped into road tankers and returned to the company's facilities. There was a water channel near the valve, but no product reached the water. Piezometers were installed to monitor the migration of hydrocarbons.

Event 463:
A leak in the main pipeline was detected by the automatic leak detection system. Pumping was stopped and the section was isolated. The emergency response team had to track the route of the pipe line to find the exact location of the leak. Some 130 tonnes of product were spilled which contaminated a ground area of about 90,000 m^2. The cause of the failure was determined to be a delamination within the pipe material.

Some product was removed through draining ditches and piezometers were installed to monitor the migration of hydrocarbons.

Event 468:
This incident occurred in the aftermath of event 467 (below). The pipeline section damaged by third party action was repaired, backfilled and prepared for operational pressure testing. During the pressure test, at 43.6 bar pressure (MAOP=49 bar), the line failed about 20 m from the previous place of damage with a ca. 60 cm longitudinal split in the 12 o'clock position. The failure was attributed to metal fatigue.

3600 m^2 of ground were contaminated and the soil was removed for clean up.

Operational

There were no spillages in this category in 2008.

Corrosion

There was 1 spillage resulting from external pipeline corrosion.

Event 469:

The crude oil pipeline between the tank farm and the refinery runs mostly underground, crossing an approximately 6-7 m wide stream. A small leak occurred at that point. Investigation revealed that within this section the main crude oil pipeline was in direct contact with the protective sleeve (outer protection pipeline) and thus providing a location for external pipeline corrosion.

A containment barrier was deployed on the stream, downstream of the pipeline in order to stop the oil moving further. The oil was removed by vacuum tankers. Impacted soil was removed and disposed of safely. Three wells were build in which the oil is regularly removed by a vacuum truck. The water in the wells is analysed about every 1.5 months.

Natural causes

There were no spillages in this category in 2008.

Third party activity

There were 4 incidents resulting from third party activity, all in the accidental damage category.

Event 464:
During construction of a track in an agricultural area, the digging machine hit and ruptured the pipeline. The leak was detected by the leak detection system, pumping was stopped and the section isolated. The pipeline operator had not been notified of these activities and there was a lack of communication between the owner of the field (who was aware of the existence of the pipeline) and the operator of the digger.

There were no water courses in the vicinity. Ditches were excavated to recover the spilled material. Contaminated soil was removed for treatment.

Event 465:
A third party hit and ruptured the pipeline while bulldozing. The leak was detected by the panel operator and pumping was stopped immediately. About 40 m^3 of product were spilled affecting and area of about 5000 m^2. The pipeline operator was not aware of these activities and the contractor was not aware of the presence of the pipeline.

Approximately 12000 m^3 of contaminated soil were removed for clean up.

Event 466:
A farmer hit and ruptured the pipeline in agricultural area. The leak was immediately reported, pressure was relieved and manual section valves were closed. Unfortunately the damage was located at a low point so that 28 m^3 of product were spilled under gravity flow, affecting an area of about 250 m^2. The pipeline operator was not informed of these activities whereas the third party was aware of the presence of the pipeline.

Event 467:
The incident occurred in an industrial area under development. The landowner knew of the pipeline right of way across his land and the need to apply for permission before carrying out groundwork. The pipeline was shown by permanent markers, the owner's contractor was aware of the presence of the pipeline and knew that were restrictions on excavations in the area. Despite these facts the groundwork was started without any permission and the bulldozer which was levelling the ground hit the pipeline and carved with his blade a 15x12x10 cm large triangular gouge. The event was detected immediately by the automatic spillage detection system, but the hilly nature of the terrain provided enough hydrostatic head to cause a large spill of about 300 m^3 of crude oil. Some 11,000 m^2 of land were contaminated.

Contaminated soil was removed for clean up and replaced.

2009 SPILLAGE INCIDENTS

A total of 5 spillage incidents were recorded in 2009. The table below gives a summary of the main causes and spilled volumes and environmental impact. For definition of categories of causes and gross/net spilled volume, see **Appendix 1** in the main report.

Summary of causes and spilled volumes for 2009 incidents

Event (1)	Facility	Line size (")	Product spilled	Injury Fatality (2)	Fire	Spilled volume Gross (m^3)	Spilled volume Net loss (m^3)	Contamination Ground area (m^2)	Contamination Water (3)
Mechanical									
Construction									
474	Above ground pipe	10	Jet fuel	-	-	25.0	12.0	Not reported	
Design & Materials									
470	Above ground pipe	20	Crude	-	-	30.0	0.0	Not reported	
472	Underground pipe	40	Crude	-	-	5401.0	811.0	50000	G
473	Pump Station	24	Diesel or heating oil	-	-	10.0	0.0	50	G
Third party activity									
Incidental									
471	Underground pipe	34	Crude	-	-	10.0	10.0	Not reported	S

(1) Spillage events are numbered from the beginning of the survey in 1971

(2) I = Injury, F = Fatality

(3) S = Surface water, G = Groundwater, P = Potable water

The circumstances of each spill including information on consequences remediation and cost are described in the next section according to cause.

Mechanical Failure

There were 4 incidents resulting from mechanical failure in 2009. 1 was related to construction defects and 3 to design or materials faults.

Construction

Event 474:
A leak developed at a flange between a valve and the pipeline on the depot manifold. The leaking jet fuel was collected in the manifold pit. An alarm signal was sent to the dispatching centre by the automatic fluid detection system that immediately stopped pumping activities. Some product overflowed and migrated to the sewerage system, terrain and open water within the boundaries of the compound.

The contaminated section of the sewerage system was emptied and the water/product mixture was removed as waste. Some product was skimmed off surface water. Land clean-up is still to be completed.

Design & Materials

Event 470:
During pumping crude oil from a crude oil tank to the harbour, high pressure in the line caused a defective isolation valve adjacent to the safety relief valve to fail, resulting in a spillage inside the crude oil storage terminal.

Surface water with an oil film was collected from the ground surface and the contaminated soil was removed. Samples from soil were analysed and boreholes drilled towards the groundwater. Because of the cold winter 2009 - 2010 only three holes could be drilled. Two more are planned and it is envisaged that the clean up will be concluded in May 2010.

Event 472:

A crude oil pipeline ruptured 8 km downstream of the first pumping station in a nature reserve. The origin of the rupture was considered to be a fatigue crack on a non-expanded pipe with a roofing effect of 4.1mm. The crack started internally at the base of the seam weld in the thermally affected zone and grew through pressure cycles. The crack was between 3 and 4 mm deep and about 90 mm long. The breach was approximately 2.7m long parallel with the seam weld.

60,000 tons of polluted soil were excavated and sent directly to a biological treatment centre. 27 piezometers were installed as well as a hydraulic confinement system in order to stop further migration of the pollution.

Event 473:
A leak developed at the gasket of the blind flange joint used in absence of the quick closure door of the new sphere launcher. This caused a heating oil spill. The volume spilled was approximately 10.000 litres. The majority of the spill was captured by the concrete pit underneath the sphere launcher. As a result of the high operating pressure (ca. 58 bar) some of the product (approx. 100-200 litres) spilled onto the concrete edges of the pit and was sprayed over the property.

Investigations revealed that the blind flange was had been specified at an incorrect rating (ANSI300# instead of ANSI400#). In addition, operationally the blind flange was removed and re-installed every 2 weeks which had resulted in some deformation (of the blind flange) in such a way that the gasket was only making contact on the outside surface of the raised face of the flanges. There was also a height difference of 1mm between the blind flange and the raised face of the slip on flange.

Approximately 35 m^3 of polluted soil had to be removed and replaced by clean soil.

Operational

There were no spillages in this category in 2009.

Corrosion

There were no spillages in this category in 2009.

Natural causes

There were no spillages in this category in 2009.

Third party activity

There was 1 incident resulting from third party incidental activity i.e. related to undetected third party activity at an unknown time in the past.

Event 471:
A concrete casing had been installed around the pipeline probably by the local Port Authorities some 40 years ago. This was not known to the operator. Contact between the pipeline and a concrete reinforcement steel rod caused external galvanic corrosion resulting in a pinhole and a leak of crude oil.

Contaminated soil was removed for clean up and replaced.

Note: although in this event the immediate cause of the leak was external corrosion, this was not the result of faulty design, construction or operation. The primary cause was clearly undetected third party intervention, hence the classification in this category.

2010 SPILLAGE INCIDENTS

A total of 4 spillage incidents were recorded in 2010. The table below gives a summary of the main causes and spilled volumes and environmental impact. For definition of categories of causes and gross/net spilled volume, see **Appendix 1** in the main report.

Summary of causes and spilled volumes for 2010 incidents

Event	Facility	Line size	Product	Injury	Fire	Spilled volume		Contamination	
		(")	spilled	Fatality		Gross	Net loss	Ground area	Water
(1)				(2)		(m^3)		(m^2)	(3)
Mechanical									
Design & Materials									
475	Pump Station	2	Crude	-	-	125.0	0.0	200	
477	Pump Station	8.6	Gasoil	-	-	10.0	0.2	0	
Corrosion									
External									
476	Underground pipe	12.75	Gasoil	-	-	1.0	1.0	Insignificant	S
Third party activity									
Accidental									
478	Underground pipe	24	Crude	-	-	200.0	0.0	21000	S G

(1) Spillage events are numbered from the beginning of the survey in 1971

(2) I = Injury, F = Fatality

(3) S = Surface water, G = Groundwater, P = Potable water

The circumstances of each spill, including information on consequences, remediation and cost are described in the next section according to cause.

Mechanical Failure

There were 2 incidents resulting from mechanical failure in 2010. Both occurred in pump stations and were related to design or materials faults.

Event 475:
The local police station informed the control room of a strong hydrocarbon smell at the pumping station. The leak was located at a spectacle blind (between 2 flanges) and was due to a damaged gasket.

125 m^3 of product leaked from the damaged gasket. Most of it was contained in the retention pits located within the site but about 5 m^3 overflowed into the rainwater collecting system and ended up in the deoiler for water treatment. The water in the deoiler was frozen and so was the hydrocarbon detector, so that the oil escaped outside the pumping station into a small dry ditch about 300 m away.

Soil samples were taken at 17 locations both inside and outside the station, and analysed to estimate the level of pollution in the ground. The pollution remained on the clay surface so that all the polluted soil could be easily excavated. 745 t of polluted soil were taken away and sent to an approved centre.

Event 477:
During a routine inspection by field operators in a pump station, an oil contaminated area around a flange was discovered. The flange is located downstream of the pumps and is partially embedded in concrete up to the gasket.

The operators alerted the dispatching centre and pumping was stopped. The leakage was due to failure of the gasket.

Approximately 10 m^3 of product were spilled, nearly all of which was confined in the concreted area of the pipeline facility and was recovered in drainage pits from where it was routed to the contaminated water tank. The concreted area was cleaned up with water.

Operational

There were no spillages in this category in 2010.

Corrosion

There was one incident resulting from external corrosion in 2010.

Event 476:
The land owner detected a hydrocarbon smell and alerted the dispatching centre. Pumping was stopped immediately and the emergency response team was activated.

Excavation confirmed a small intermittent leak. The external coating of the pipe was damaged and direct contact between the pipeline metal and the soil caused galvanic corrosion resulting in a pinhole.

A containment barrier was deployed on the nearby stream, in order to stop the oil moving further downstream. Some product was skimmed off the water surface and removed by vacuum trucks. The contaminated soil was removed and disposed of.

Piezometers were installed to monitor the migration of hydrocarbons.

Natural causes

There were no spillages in this category in 2010.

Third party activity

There was one incident resulting from third party activity at some point in the past ("incidental") in 2010.

Event 478:
During excavation work for drainage the pipeline was hit by the excavator causing failure of the pipeline. Pumping was stopped immediately and section valves were shut. The emergency team was activated to handle the situation, limit the impact and repair the pipeline.

Some 200 m^3 of crude oil leaked out. Oil was recovered from water-filled ditches with oil separators and vacuum trucks. The ditch walls were dug out and replaced and the polluted soil was removed in accordance with a remediation plan following local standards. Continuous monitoring of groundwater was maintained throughout the remediation process.

The pipeline was repaired and came back into operation within seven days. Remediation of polluted soil and ditches was completed within nine months.

2011 SPILLAGE INCIDENTS

A total of 7 spillage incidents were recorded in 2011. The table below gives a summary of the main causes and spilled volumes and environmental impact. For definition of categories of causes and gross/net spilled volume, see **Appendix 1** in the main report.

Summary of causes and spilled volumes for 2011 incidents

Event (1)	Facility	Line size (")	Product spilled	Injury Fatality (2)	Fire	Spilled volume Gross (m^3)	Spilled volume Net loss (m^3)	Contamination Ground area (m^2)	Contamination Water (3)
Mechanical									
Design & Materials									
480	Underground pipe	8	Jet fuel	-	-	0.3	0.3	1000	S
Operational									
Human									
479	Pump station	20	Crude oil	-	-	1.5	0.5	0	
483	Underground pipe (fitting)	12.75	Diesel	-	-	35.0	1.2	150	
Third party activity									
Accidental									
484	Underground pipe	28	Gasoline	-	-	99.0	99.0	1500	
Intentional/Malicious									
481	Underground pipe	16	Gasoline	-	-	30*	30.0	600	
482	Underground pipe	16	Gasoline	-	-	166*	166.0	250	G
485	Underground pipe	8	Jet fuel	-	-	11.8	11.8	5	

(1) Spillage events are numbered from the beginning of the survey in 1971

(2) I = Injury, F = Fatality

(3) S = Surface water, G = Groundwater, P = Potable water

* Total loss, including volume carried away by thieves

The circumstances of each spill, including information on consequences, remediation and cost are described in the next section according to cause.

Mechanical Failure

There was 1 incident resulting from mechanical failure in 2011. It was related to a material fault.

Event 480:
Pipeline surveillance personnel discovered the spill in an underground section of a jet fuel pipeline. A fissure was found in the pipe. Upon investigation it was established that this was due to a metal defect (hard spot) dating back to manufacture.

Although the estimated volume spilled was very low at 0.3 m^3 a relatively large rice field area was affected which required removal of 2650 tonnes of contaminated soil. For this reason, and although the spilled volume is under the reporting threshold, this incident has been included in the database.

Operational

There were 2 spillages in this category in 2011, both related to human error or incorrect procedure.

Event 479:
During repair work to an open pumping system, maintenance was being done to a valve at a different location. As the valve was being remotely tested, oil was released to the open system. Own staff on site detected the leak and immediately informed the control centre who stopped the test and closed the valve remotely.

The leaked oil was caught in the pump pit which was promptly emptied and cleaned.

Event 483:
Because of maintenance activities of the cathodic protection system, the pipeline was being uncovered just outside the fence of a pumping station. During the digging, the mechanical excavator hit a small bore connection causing a rupture in the pipe. This fitting was initially inside the pump station and was used as a point to connect different devices. In 2002 the facility was restructured and its limits redefined; after those changes the fitting, now outside the station, was buried and "forgotten" so that the operator had no knowledge of its existence.

The emergency shutdown was activated and pumping was stopped. Taking advantage of the presence of the backhoe, some dams were built in order to confine the spilled diesel in the trench. Also, the fence of the pump station was opened up to allow the product to enter the facility and be recovered in drainage pits from where it was routed to the contaminated water tank. Net product loss was limited to about 1 m^3.

Although the actual damage was caused by a third party, the latter was clearly under instruction and supervision of the pipeline operator. Hence this incident is classified as "operational" as it was clearly due to an incorrect recording procedure within the pipeline company.

Corrosion

There were no spillages in this category in 2011.

Natural causes

There were no spillages in this category in 2011.

Third party activity

There were 4 incidents in this category in 2011, 3 of which related to product theft attempts.

Event 484:
During repair work on the gas network, a neighbouring gasoline line was mistakenly drilled through with a 200 mm drill. Fortunately the line was under low pressure (4 bar) at the time, limiting the consequences (the incident occurred in a high population density residential area). Although detailed maps were available, the gas company was not aware of the oil line and the oil line operator had not been informed of the work. As a result it took half an hour before the gasoline flow could be stopped during which 99 m^3 escaped, contaminating an area of 1500 m^2. There was also some groundwater contamination. Some of the liquid was recovered by pumping.

The pipeline was out of action for 45 days. Contaminated soil was removed and disposed of.

Event 481/482:
In 2 separate incidents within 6 weeks, the same multiproduct pipeline was targeted by thieves who installed a small bore connection. In both cases the product theft was detected by the leak detection system. The pipeline was transporting gasoline as the time. Some spillage occurred as a result of the illegal connection being left open or being damaged. Total volumes of 30 and 166 m^3 were lost although it could not be accurately established what proportion was carried away by the thieves and how much was actually spilled on the ground.

2012 SPILLAGE INCIDENTS

A total of 12 spillage incidents were recorded in 2012. The table below gives a summary of the main causes and spilled volumes and environmental impact. For definition of categories of causes and gross/net spilled volume, see **Appendix 1** in the main report.

Summary of causes and spilled volumes for 2012 incidents

Event	Facility	Line size	Product	Injury	Fire	Spilled volume		Contamination	
Design and Materials									
495	Underground joint (flange)	16	Diesel	-	-	1.0	0.0	Insignificant	
Corrosion									
External									
493	Underground pipe	10	White product	-	-	1.0	0.0	Insignificant	
494	Underground pipe	10	White product	-	-	1.0	0.0	Insignificant	
Internal									
492	Underground pipe	10	Crude oil	-	-	2.5	0.0	150	
Third party activity									
Accidental									
488	Underground pipe	8.6	Jet fuel	-	-	1.0	1.0	200	
489	Underground pipe	24	Diesel	-	-	5.0	0.0	20	
497	Underground pipe	10	Diesel	-	-	20.0	0.0	Not reported	
Intentional/Malicious									
486	Underground pipe	10	Diesel	-	-	7.0	7.0	300	S
491	Underground pipe	20	Crude oil	-	-	37.0	12.0	10000	G
Incidental									
487*	Underground pipe	6	Diesel	-	-	15.0	15.0	10	G
490	Underground pipe	10	Gasoline	-	-	240.0	175.0	15000	
496	Underground pipe	10	Diesel	-	-	40.0	0.0	Not reported	

(1) Spillage events are numbered from the beginning of the survey in 1971

(2) I = Injury, F = Fatality

(3) S = Surface water, G = Groundwater, P = Potable water

** Tentative classification pending on-going investigation*

The circumstances of each spill, including information on consequences, remediation and cost are described in the next section according to cause.

Mechanical Failure

There were one spillage incident related to Design and Materials in 2012.

Event 495:
A small leak at a flanged joint in an underground section of a product line was discovered during routine monitoring. The leak was detected by the operator during routine surveillance and quickly brought under control. Although some soil was removed as a precaution, there was no significant environmental impact.

Operational activities

There were no spillages in this category in 2012.

Corrosion

There were 3 spillage incidents related to corrosion in 2012.

External corrosion

Event 493:

A small leak in a product line was discovered during routine monitoring. This was traced to external corrosion caused by an old wood spacer not removed after construction and which damaged the protective coating. Although some soil was removed as a precaution, there was no significant environmental impact.

Event 494:
A small leak in a product line was discovered during routine monitoring. This was traced to external corrosion caused by contact with an old piece of metal left in the ground probably during the construction. Although some soil was removed as a precaution, there was no significant environmental impact.

Internal corrosion

Event 492:
An oil leakage was reported on a private property. The source of the leak was determined to be the nearby buried crude pipeline. The incident was reported to the Authorities.

Initial activities focused on isolating the pipeline, minimizing the volume of leaked oil (diesel) and cleaning up this oil. The total volume of leaked oil was estimated at 2.5 m^3.

Upon investigation, a very small single penetrated defect (leak path) was identified. This defect had a very unusual morphology and destructive testing was unable to confirm the corrosion type with any degree of certainty. Additional, non-penetrating, defects from close to the penetrated defect site were also destructively tested. The morphology of these additional defects clearly showed oxygen corrosion. This conclusion was confirmed in reviews held with corrosion experts.

The size of the pinhole defects is below that of the detection specification of In Line Inspection pigs (both MFL and UT types). Tests are ongoing to determine whether UT pigs could detect this size of defect.

Natural causes

There were no spillages in this category in 2012.

Third party activity

There was 7 confirmed incidents in this category in 2012 plus one incident tentatively classified as “third party incidental”.

Accidental

Event 488:
A product pipeline was hit by a plough in a field. The machinery was operated by the landowner who was aware of the existence of the pipeline on his property. The impact caused a fissure in the pipe and some product appeared in the ground.

The landowner contacted the local authorities who alerted the Operator’s Dispatching Centre. The emergency plan was activated immediately (the pumps were stopped in that moment). The pipeline was uncovered and the leak brought under control. The next day the damaged pipe was replaced and the contaminated soil was removed.

The depth of cover was found to be less than expected. This is a 55 year old line and a programme is underway to restore the depth of cover to about 800 mm in areas where it has decreased. This particular section was not considered high priority as the land had not been under cultivation for many years.

Event 489:

In a section with two adjacent lines owned by different operators, one of the owners drilled into the wrong line. A crude oil leak ensued. Operation was immediately stopped and the leak brought under control.

The pipeline was repaired. Polluted soil was excavated and cleaned.

Event 497:
A third party excavator hit and ruptured the pipeline while cleaning an irrigation channel.

Intentional / Malicious

Event 486:
A leak from an underground section of a product pipeline was reported by a third party. It appeared that thieves had uncovered the pipeline and installed a small bore connection with a valve connected to a rubber pipe leading to a parking area in a small wood about 400 m away. Following a pressure surge during start-up, the rubber pipe ruptured causing pollution to the surroundings.

It is believed that the thieves were able to divert some product from the pipeline at low flow rate below the detection limit of the system.

A small stream and water meadow were contaminated and skimmers were installed to protect a larger stream nearby. Approximately 400 t of soil were removed.

Event 491:
The Environmental authorities were informed by a citizen of a strong smell coming from the retention pit for a manifold on a crude line. The pipeline control centre was alerted and pumping immediately stopped. A leak was discovered near a valve, caused by a drill hole. This was identified as vandalism rather than theft attempt.

The retention pit was emptied with a suction trunk and the soil around was removed and sent to waste treatment.

Incidental

Event 487:
An outside party reported a hydrocarbon leak in the vicinity of a product pipeline. A failure was detected in the line. Some groundwater was affected.

The failure mode is under investigation. Indications are that the root cause may have been some earlier damage to the line although this still has to be confirmed. Tentatively, we have classified this event as “Third party Incidental” although this may be reviewed when investigations are complete.

Environmental investigation and remediation are in progress.

Event 490:
A product pipeline failed as a result of a pressure surge following an emergency shutdown. The leak was detected by the automatic detection system.

Upon investigation, it appeared that the failure had occurred in an area that had been dented and scratched by third party activities at some point after the last in line Inspection pig (carried out in 2011). The defect created a zone of concentrated stress under higher than usual pressure (under normal circumstances the elasticity limit of the steel would be well above the maximum recorded pressure).

About 4 m^3 of hydrocarbons reached the groundwater. This was pumped out and monitoring put in place. The most polluted excavated soil (about 300 m^3) was biologically treated. The balance of polluted soil (1700 m^3) is being treated on site by sieving and land farming as required.

Event 496:
A double dent caused by a third party excavator at some point in the past caused a crack in the pipeline, releasing some diesel. An anomaly had indeed been detected by in-line inspection but classified as “ovality”, hence not further investigated.

2013 SPILLAGE INCIDENTS

26 spillage incidents were recorded in 2013, **18 of which were related to theft attempts**. The Table below gives a summary of the main causes and spilled volumes and environmental impact. For definition of categories of causes and gross/net spilled volume, see **Appendix 1** in the main report.

Theft attempt from pipelines has been a concern in recent years, causing a small number of spillages in 2011 and 2012. The total of 18 registered in 2013 is unprecedented. It also notable that, while theft tended in the past to be an issue in Southern and Eastern Europe, no areas are now immune to it.

The circumstances of each spill, including information on consequences and remediation actions are described in the next section according to cause.

Also included is a spill incurred in 2012 and belatedly reported.

Summary of causes and spilled volumes for 2013 incidents

Event	Facility	Line size	Product	Injury	Fire	Spilled volume		Contamination	
		(")	spilled	Fatality		Gross	Net loss	Ground area	Water
(1)				(2)		(m^3)		(m^2)	(3)
Mechanical									
Construction									
499	Underground pipe	28	Crude oil	-	-	2.3	0.1	100	
522	Valve	12	White product	-	-	2.0	2.0	3	
Design and Materials									
506	Above ground pipe	40	Crude oil	-	-	1.9	0.0	1000	
Operational									
Human									
*498**	*Pipe fitting*	*20*	*Crude oil*	-	-	*1.5*	*0.0*	*0*	
500	Pipe fitting	28	Crude oil	-	-	18.5	0.0	0	
Corrosion									
Internal									
505	Underground pipe	10	Crude oil	-	-	5.0	5.0	50	
Third party activity									
Accidental									
501	Underground pipe	8	Naphtha	-	-	88.0	88.0	50	
502	Underground pipe	8.0	Naphtha	-	-	11.8	11.8	Not reported	
Incidental									
524	Underground pipe	10	Diesel	-	-	0.1	0.0	Not reported	
Theft or theft attempt									
503	Underground pipe	10	Gasoline	-	-	10.3	9.5	40	
504	Underground pipe	12	Diesel	-	-	6.2	6.2	30	
507	Underground pipe	12	Jet fuel	-	-	7.0	4.0	150	
508	Underground pipe	10	Diesel	-	-	50.0	38.0	200	
509	Underground pipe	8	Jet fuel	-	-	10.0	2.0	Not reported	
510	Underground pipe	16	Gasoline	-	-	Not known		Not reported	
511	Underground pipe	16	Gasoline	-	-	Not known		Not reported	
512	Underground pipe	16	Gasoline	-	-	Not known		Not reported	
513	Underground pipe	16	Gasoline	-	-	Not known		Not reported	
514	Underground pipe	12	Naphtha	-	-	Not known		Not reported	
515	Underground pipe	12	Jet fuel	-	-	Not known		Not reported	
516	Underground pipe	12	Jet fuel	-	-	Not known		Not reported	
517	Underground pipe	22	Gasoline	-	-	Not known		Not reported	
518	Underground pipe	22	Gasoline	-	-	Not known		Not reported	
519	Underground pipe	22	Naphtha	-	-	Not known		Not reported	
520	Underground pipe	8	Gasoline	-	-	Not known		Not reported	
521	Underground pipe	8	Gasoline	-	-	Not known		Not reported	
523	Underground pipe	10	Diesel	-	-	30.0	30.0	3000	

(1) Spillage events are numbered from the beginning of the survey in 1971

(2) I = Injury, F = Fatality

(3) S = Surface water, G = Groundwater, P = Potable water

** Spillage incurred in 2012 and belatedly reported*

Mechanical Failure

There was one spillage incident related to Design and Materials and two incidents related to Construction in 2013.

Design and Materials

Event 506:
The mechanical pig signal device, mounted on a 4" weldolet on the 40" main line in a relief station failed to indicate the last pig passage. Therefore repair work was required in order to disassemble the installation's top part and to retract the inner parts using specific tapping/retracting equipment under full pipeline pressure (30 bars). When preparing the

inner part for retraction, the central 8mm stem was pushed outwards by the oil-pressure of the pipeline due to failure of the fixing device of the stem, resulting in oil spraying the surrounding area. Work was conducted in a 2m deep pit and the worker was able to get out of it quickly without receiving injuries. The oil flow was immediately stopped by emergency shut-down of pipeline and valve closure. Some 1.9 m^3 of oil were either kept within the pit or sprayed within the station ground.

All spilled material was recovered and clean up completed. Groundwater was not affected.

Construction

Event 499:
A pipeline leak occurred within the waste water treatment plant site. The loss of crude oil occurred through a crack caused by fatigue within a dent. The fatigue resulted from the removing of a dent constraint, a sleeper at the bottom of the pipeline left from construction in 1966 which was removed in May 2010 following a high resolution calliper pig inspection. The dent when inspected had no reported defects. The fatigue was exacerbated by operating pipeline from 2012 at high pressure ranges following changes to the pump operating regime.

The ground (clays) was scraped off and contaminated soil and water were removed.

Event 522:
The packing of the shaft of a remote controlled valve failed resulting in a leak in the area of the position indicator. The valve dates back to the construction of the pipeline in 1964. The packing on these (welded) valves cannot be maintained so that new valves must be installed.

Operational activities

There was one spillage in the “Human” category in 2013 as well as one in 2012, belatedly reported.

Event 498 (2012):
During maintenance of a pump a remote-controlled valve under testing was opened releasing crude into the open system. The personnel on site immediately alerted the control room and the valve was shut. Oil was collected in a pit, recovered and disposed of without any further consequences.

Event 500:
During verification of ILI results, an excavator operated by the pipeline operator’s contractor and under supervision of the operator’s staff, broke off a pipeline tapping (3''). This was the result of poor documentation of previous work when the tapping was installed. Fortunately the line was stopped at the time and the pressure was about 2 bars. Pollution was localized as crude oil leaked was contained into an excavated trench. Most of the oil was collected and returned into the system. Polluted soil was treated and cleaned. The damaged tapping was repaired by welding a weldolet and the pipeline returned into operation within 24 hours.

Corrosion

There was one spillage incidents related to internal corrosion in 2013.

Event 505:
Pollution was observed near a fence during a routine inspection. The location and cause of the leak could not be established until the next day when an internal corrosion hole next to a weld seam was found at 6 o’clock position.

Natural causes

There were no spillages in this category in 2013.

Third party activity

There were 21 spillage incidents in this category in 2013, 18 of which were the results of product thefts or theft attempts.

Accidental

Event 501:
An underground pipeline was punctured by a third party drilling activity. This was not notified using the “One Call Notification system" as required by National Law.

Remediation involved removing some contaminated soil and in-situ treatment.

Event 502:
An underground pipeline was damaged by a third party during excavations for road construction. These activities were notified using a pre-orientation notice in the “One call notification system” and work was discussed and when necessary supervised. The excavator was convinced that he was not excavating in the 5 meter corridor of the pipeline on the moment the pipeline was hit. The contractor did not attend the meeting appointment to discuss all necessary preparations in order to do these excavation activities.

Remediation involved removing some contaminated soil and in-situ treatment.

Incidental

Event 524:
A minor leak was detected by a third party. It was established that it was caused by previous undetected damage to the pipeline (dent with gouging).

Intentional

All incidents in this category were the result of thefts or theft attempts.

Event 503:
A product pipeline was drilled about 4.5km from the pig launcher in order to steal fuel. The pipeline aerial surveillance team reported the location and a small bore tapping was found with a plastic hose connected with ordinary collars. This could not withstand the pressure and gasoline leaked into the environment. The operating pipeline was immediately stopped and depressurised. After fitting a pipe clamp, diesel was pumped into the pipe section.

Next day the pipe was repaired with a patch, the final repair was done by replacing the damaged section of pipe at a later date. After soil aeration the pit was refilled with clean soil.

Event 504:
An unexpected pressure drop was noticed on a product pipeline. Theft attempt was suspected as similar events had previously occurred in that area. That day and the next day block valve stations and lines were checked. Eventually a diesel smell lead to the location of the leak, some 10 meters from the pipeline. The small hose leading from the illegal tapping to a shrubby area nearby was damaged.

The pipeline section was repaired. After soil aeration the pit was refilled with clean soil.

Event 507:
The Control Room was notified of a suspected spill from a pipeline by the local fire brigade. Pumping was stopped and block valves closed and the emergency plan was activated. A ditch had been dug around the pipeline which was uncovered and the coating had been

removed. A hole had been drilled in the pipeline and materials used for an illegal tapping were found.

The product spilled was confined in the ditch. It could be pumped into tank trucks and was sent to the operator's facility. The contaminated soil was removed and treated. Piezometers were put into place. A groundwater survey was carried out and no impact was found. Although there was a river in the vicinity, no product reached the water.

Event 508:
A pressure drop was detected in the pipeline. The emergency team immediately started the search for a leak. A ditch filled with product was located. Remediation equipment was sent to the location. As product was removed from the ditch it became apparent that the cause was a leaking illegal tapping in the pipeline.

The recovered product was sent to the operator's facility and the contaminated soil as well as the materials used for collection and absorption was sent for treatment. Piezometers were put into place. A groundwater survey was carried out and no impact was found. A barrier was also deployed to protect a nearby stream.

Event 509:
An illegal fitting welded to a pipeline was ruptured by a farmer's plough and some product appeared in the ground.

The landowner, who was aware of the presence of the pipeline on his land, informed the operator. Pumping was immediately stopped and the emergency plan activated. The pipeline was uncovered and the leak stopped. The illegal fitting was not in use and seems to be out of service.

Most of the product spilled was pumped into tank trucks and sent to the operator's facility. Contaminated soil was removed and sent for treatment. Piezometers were put into place. A groundwater survey was carried out and no impact was found.

Events510 to 521:
These 12 spillage events occurred on different product pipeline sections operated by the same company, all resulting from thefts attempts. We understand that other theft attempts were discovered that did not cause a spillage.

No further details are available.

Event 523:
A hole was drilled in a pipeline and left to leak when the thieves were apparently unable to complete the illegal tapping.

Contaminated soil was removed and sent for treatment.

2014 SPILLAGE INCIDENTS

58 spillage incidents were recorded in 2014, **54 of which were related to theft attempts** (third party intentional). The table below gives a summary of the main causes and spilled volumes and environmental impact. For definition of categories of causes and gross/net spilled volume, see **Appendix 1** in the main report.

Theft attempt from pipelines has been a concern in recent years, causing a small number of spillages in 2011 and 2012. The number jumped to 18 in 2013 and the 2014 figure of 54confirms that this is a fast increasing problem. While theft tended in the past to be an issue in Southern and Eastern Europe, it is also notable that no areas are now immune to it.

The circumstances of each spill, including information on consequences and remediation actions are described in the next section according to cause.

Summary of causes and spilled volumes for 2014 incidents

Event [1]	Facility	Line size (")	Product spilled	Injury Fatality [2]	Fire	Spilled volume Gross (m^3)	Spilled volume Net loss (m^3)	Contamination Ground area (m^2)	Contamination Water [3]
Mechanical									
Design and Materials									
532	Underground pipe	10.75	Crude oil	-	-	5.0	1.0	0	
Third party activity									
Accidental									
525	Pump station	24	Crude oil	-	-	3.0	3.0	200	
526	Underground pipe	6	Gasoline	-	-	10.0	0.0	100	
Incidental									
537	Underground pipe	20	Crude oil	-	-	500.0	0.0	64000	
Theft or theft attempt									
527	Underground pipe	14	Jet Fuel	-	-	Not known		1400	
528	Underground pipe	24	Crude oil	-	-	5.0	5.0	1500	
529	Underground pipe	20	Naphtha	-	-	1.0	0.0	0	
530	Underground pipe	8	Diesel	-	-	Not known		414	
531	Underground pipe	12	Diesel	-	-	Not known		1500	
533	Underground pipe	10	Jet Fuel	-	-	Not known		184	
534	Underground pipe	16	Diesel	-	-	15.0	9.0	250	
535	Underground pipe	10	Diesel	-	-	2.0	0.0	100	
536	Underground pipe	10	Diesel	-	-	2.0	0.0	0	
538	Underground pipe	14	White product	-	-	150.0	150.0	0	
539-55	Above ground	NA	White product	-	-	17 events, no details available			
556-82	Underground pipe	NA	White product	-	-	27 events, no details available			

[1] Spillage events are numbered from the beginning of the survey in 1971

[2] I = Injury, F = Fatality

[3] S = Surface water, G = Groundwater, P = Potable water

Mechanical Failure

There was one spillage incident related to Design and Materials in 2014.

Event 532:
Following a pressure surge, a relief valve opened and product was sent to the waste tank. The level detector of this waste tank did not work properly and the tank overflowed.

Most of the product was recovered from the facility. Some was recovered from contaminated soil with a small amount probably lost to air.

Operational activities

There were no spillages in this category in 2014.

Corrosion

There were no spillages in this category in 2014.

Natural causes

There were no spillages in this category in 2014.

Third party activity

There were 57 spillage incidents in this category in 2014, 54 of which were the result of product theft or theft attempts.

Accidental

Event 525:
During digging activities in a pumping station a 3/4" connection was damaged by either the excavation worker or through ground movement due to digging. This caused an initial leak. Due to the 50 bar pressure the pipe subsequently broke off completely. Contaminated soil was removed but none of the leaked oil could be recovered. The building and pump houses were cleaned.

Event 526:
A gasoline line was punctured by a third party contractor during excavation activities. About 5,000 tons of soil, mostly sand, were removed to clean up the area and virtually all leaked oil was recovered.

Incidental

Event 537:
A leak developed in an underground section of a crude oil pipeline. Upon investigation, significant mechanical damage was found in the upper part of the pipe most probably the result an external physical contact (heavy caterpillar, tractor, or equivalent) some years ago. This led to a progressive development of longitudinal stress corrosion cracks in the upper geometry of the pipe.

Intentional

All incidents in this category were the result of thefts or theft attempts.

Event 527:
Following a call from a third party reporting an oil smell a 5m hose was found near the pipeline with signs of a jet fuel leakage. Full emergency response procedures were implemented, the pipeline was shutdown, depressurised and drain down initiated. Excavation at the site revealed an illegal clamp fitted onto the pipeline and leaking. The clamp was removed and replaced by a temporary repair clamp (Plidco) and the pipeline returned to service. The actual date and time of failure is unknown.

Some surface water in drainage ditches was contaminated and cleaned up with absorbents. Contaminated soil was bio-remediated to "food" standards.

Event 528:
During maintenance activities on a crude pipeline, a leaking illegal tapping device was discovered. The damaged pipe section was replaced.

Change of soil.

Event 529:
While digging a trench in preparation for planned pipeline maintenance work the operator of the digging company registered a sudden release of product from the trench.

The spill was obviously caused by deliberate third party interference. Further details cannot yet be revealed due to ongoing authority investigations.

Event 530:
A passer-by reported hydrocarbon presence on the ground in a forested area. Pumping was stopped immediately and isolation valves were closed. Pipeline operator personnel as well as the local fire brigade attended the site. Excavation revealed a leaking illegal clamp installed on the line (of a type not suitable high pressure pipelines).

The clamp and tapping were removed and the pipeline repaired.

Barriers and means of hydrocarbons collection and absorption were installed in the area. The spilled product was contained in ditches, pumped into tank trucks and sent to the operator’s facilities. There were no rivers or lakes in the vicinity.

Contaminated soil was removed and treated. The oil was removed by vacuum tankers. Clean up is on-going. A groundwater quality survey was carried out and no contamination found.

Event 531:
The pipeline control centre detected a loss of pressure in the pipeline. Pumping was stopped, isolation valves closed and local residents were notified. A search party followed the route of the pipeline, identified the location of the leak and excavated. An illegal clamp fitted with a connection and a leaking valve was found. The spilled product was confined to a ditch. Tools, hoses and equipment for illegal tapping were found in a building nearby.

The clamp and tapping were removed and the pipeline repaired.

Contaminated soil was removed and treated. The oil was removed by vacuum tankers. A groundwater quality survey was carried out and no contamination found.

Event 533:
The pipeline control centre received a call from the local authorities reporting a hydrocarbon smell in the vicinity of the pipeline. Pumping was stopped, isolation valves closed and local residents were notified. A search party followed the route of the pipeline

and found an illegal connection point in a ditch. The valve had been broken, seemingly by some form of digging machine.

The tapping was removed and the pipeline repaired.

Contaminated soil was removed and treated. The oil was removed by vacuum tankers. A groundwater quality survey was carried out and no contamination found.

Event 534:
A member of the public called in to report the presence of hydrocarbons in the vicinity of the pipeline. The pipeline was immediately shutdown and emergency plans activated. The site was excavated and an illegal clamp and connection were found. The clamp failed under pressure leaking fuel to a ditch.

The clamp and tapping were removed and the pipeline repaired.

Contaminated soil was removed.

Event 535:
A leaking illegal connection fitted with a plastic hose was discovered and removed.

Contaminated soil was removed.

Event 536:
The leak detection system identified a possible leak in a certain area. The exact location was found, revealing an illegal excavation and a tapping into the pipeline.

The tapping was removed and the pipeline repaired.

Most of contaminated soil has been removed. The final cleaning plan has to be approved by public authority.

Event 538:
Ploughing equipment operating in a field damaged a hydraulic hose attached to an illegal tapping into a pipeline causing a leak.

The tapping was removed and the pipeline repaired.

Long term monitoring of groundwater contamination via an array of deep boreholes was put into place.

Events539 to 556:
17 theft attempts in above ground sections of pipelines, resulting in, mostly minor, spillages. No details available.

Event 557 to 582:
27 theft attempts in underground sections of pipelines, resulting in, mostly minor, spillages. No details available.

2015 SPILLAGE INCIDENTS

93 spillage incidents were recorded in 2015, **87 of which were related to theft attempts** (third party intentional). **Table 1** gives a summary of the main causes and spilled volumes and environmental impact. For definition of categories of causes and gross/net spilled volume, see **Appendix 1**.

Theft attempt from pipelines has been a concern in recent years, causing a small number of spillages in 2011 and 2012. The number jumped to 18 in 2013, 54 in 2014 and the 2015 figure confirms that this is an increasing challenge for operators. While theft tended in the past to be an issue in Southern and Eastern Europe, it is also notable that no areas of Europe are now immune to it.

The circumstances of each spill, including information on consequences and remediation actions are described in the next section according to cause. Further details are available in **Appendix 2** which covers all spillage events recorded since 1971.

Table 1 Summary of causes and spilled volumes for 2015 incidents

Event [(1)]	Facility	Line size (")	Product spilled	Injury Fatality [(2)]	Fire	Spilled volume Gross (m^3)	Spilled volume Net loss (m^3)	Contamination Ground area (m^2)	Contamination Water [(3)]
Mechanical									
Construction									
585	Above ground	20	Crude oil	-	-	0.0	0.0	0	
Design and Materials									
674	Above ground	12	Diesel	-	-	30.0	0.0	0	
675	Above ground	0.5	Diesel	-	-	1.9	0.0	5	
Corrosion									
External									
672	Underground pipe	8	Jet Fuel	-	-	15.0	15.0	200	
673	Underground pipe	8	Jet Fuel	-	-	13.4	3.4	200	
Internal									
671	Above ground	6	Crude oil	-	-	0.3	0.3	20	
Third party activity									
Theft or theft attempt									
583	Underground pipe	12	Jet Fuel	-	-	59.3	38.3	500	
584	Underground pipe	10	Diesel	-	-	3.2	2.4	50	
586	Underground pipe	12	Jet Fuel	-	-	1.5	0.1	50	
665	Underground pipe	8	Diesel	-	-	39.0	34.0	275	
666	Underground pipe	14	Jet Fuel	-	-	25.0	25.0	0	
667	Underground pipe	10	Jet Fuel	-	-	8.5	8.5	10	
668	Underground pipe	10	Jet Fuel	-	-	22.0	20.0	100	
669	Underground pipe	10	Gasoline	-	-	15.0	13.5	0	
670	Underground pipe	10	Gasoline	-	-	2.8	2.8	0	
587-664	Underground pipe		White product	78 events, no details available					

(1) Spillage events are numbered from the beginning of the survey in 1971

(2) I = Injury, F = Fatality

Mechanical Failure

There was three spillage incidents related Mechanical failure in 2015, one in the Construction and two in the Design and Materials category.

Event 585:
A leak developed in an expansion box releasing crude oil. No further details were available.

Event 674 & 675:
One flange gasket and one small bore tapping flange gasket failed in short succession on above ground sections of the main line.

In the first instance a power cut caused a pressure surge (within the design limits of the line) that triggered the failure. This was detected by the leak detection system. In the second instance the failure occurred in an idle but pressurised line. The spillage was reported by a security guard on patrol.

In the first instance the entire volume spilled was collected in a pit and recovered. In the second instance minor soil pollution occurred and appropriate remediation carried out.

Upon investigation it appeared that the gaskets had been recently replaced and were defective. 18 such gaskets were subsequently replaced.

Operational activities

There were no spillages in this category in 2015.

Corrosion

There were 3 spillages related to corrosion in 2015, 2 in the external corrosion and 1 in the internal corrosion category.

Event 672:
A pinhole leak developed near an old cathodic protection (CP) lug in spite of a new (live) CP connection being present less than one metre away.

The coating condition was satisfactory. AC voltage was high and DC voltage acceptable. The failure was attributed to AC corrosion caused by nearby HV power lines.

The spillage was discovered by a third party.

Bunding and booms were installed in local drainage ditches to catch any runoff. Boreholes were drilled around the leak point to identify spread of contamination in soil. Following initial cleanup including surface water, monitoring of local groundwater and soil did not identify any migration.

The operator has increased the focus on the risk of AC corrosion in the entire network.

Event 673:
A pinhole leak developed about 2 m upstream of the point where the pipeline enters the bunded pig receipt area. The affected section was found to be isolated from the pipeline CP system. It was in "made ground", with distinctly different local soil characteristics than the rest of the pipeline.

The spillage was contained within the pipeline operator's property, adjacent to the bunded area. Clean-up involved monitoring existing boreholes to ascertain there were no off-site effects.

The majority of the lost product found its way into site drains and was collected through the site interceptor.

The operator has designed and implemented a programme to identify and address a design fault that causes short sections to be unprotected by the CP system.

Event 671:
A pinhole leak developed in an above ground section of an idle crude oil line ahead of a pig receiver. This was traced back to internal corrosion.

The leakage was discovered by an operator and could be kept to a minimum. It was contained onto concrete surfaces and collected into existing drainage systems.

Natural causes

There were no spillages in this category in 2015.

Third party activity

There were 87 spillage incidents in this category in 2015 all of which were the results of product thefts or theft attempts. Not all events have been described in detail.

Event 583:
In the early hours of the morning there was an attempted theft where a pipeline exits the ground to cross over a canal. A clamp was installed and the pipeline drilled, however, the clamp fitting failed to seal correctly and there was a leak. The criminals immediately left the area. Product was sprayed from the pipeline directly onto the canal and thus was reported to the pipeline operator by the fire service.

Booms and vacuum tankers were used to remove product from the canal. Follow on monitoring and clean-up work is still in progress.

Event 584:
The control room dispatcher observed a small pressure drop (about 120 mb) in an idle product pipeline.

Inspection of the line revealed a 1m x 1.5m pit that had been dug at the foot of a marker post. The pipeline had been drilled in a non-professional manner. The pit was partly filled with diesel fuel. An estimated 3.2 m^3 of diesel fuel was spilled, and some stolen.

Contaminated soil was removed and new soil brought in.

Event 586:
A third party observed a spray of kerosene onto a road near a terminal. The sprayed mist affected both the roadway and part of the terminal. The suspected pipeline was idle but under pressure at the time. The controller immediately released the pressure and ascertained this was the case.

The cause was a failed attempt to drill through the line and connect a fitting to steal fuel. The line was plugged as soon as access was in place and it was safe to do so. The relevant Authorities were informed.

Remediation started immediately. Repair took 10 days. A small amount of contaminated soil was removed from site and replaced. Dip tubes were put in place locally and absorbents dropped in to collect any surface oil on the water table over a six month period to a point when no more oil was recovered.

Event 587 to 664:
78 theft attempts in underground sections of pipelines, resulting in, mostly minor, spillages. No details available.

Event 665:
When the control centre detected a loss of pressure in a pipeline the emergency plan was immediately activated, pumping stopped and isolation valves closed. Local people were notified. The emergency response team tracked the route of the pipe line and found and illegal connection point threaded onto the pipe in a forested area.

The spilled product could be confined to a ditch, was pumped into tank trucks and sent to the operator's facilities. There were no water bodies in the vicinity. Some 1100 m^3 of contaminated soil were removed.

Event 666:
Agricultural machinery hit and cut an unknown hose producing a small spill of oil product on the ground. The landowner confined the spilled product spilled in a ditch He did not immediately report the event to either the pipeline operator or the local authorities until the next day when he found the hose has disappeared.

The emergency plan was activated. An illegal valved connection threaded to the pipe was soon discovered. This was undamaged which prevented a larger leak. A 2.2 km hose was subsequently found starting close to the connection and, after some street crossings and running across an industrial area through the sewage.

Contaminated soil was removed and treated.

Event 667:
Theft was attempted where a pipeline was exposed. A low pressure plastic clamp fitting was installed and the pipeline drilled. As the plastic clamp did not provide a tight seal there was an immediate leak from around the clamp into the ground. The criminals left leaving the pipeline exposed. Initial response could not identify or recover spilled fuel.

Long term monitoring is in place.

E*vent 668:*
At a time unknown a fitting was installed on a pipeline for theft purposes. The pipeline was exposed and drilled, a hose connected and the pit backfilled. A third party reported product in the vicinity of the pipeline which was traced back to the fitting that was leaking. The underground spillage migrated into the ground.

Long term monitoring of the groundwater is in place.

Events 669 & 670:
Two attempts to install a tapping on a product pipeline failed and resulted into a spill. In the first instance a welded fitting was first installed but was not tight so a leak developed when drilling through the pipe was attempted. In the second instance a spike was used with no seal between spike and pipe. In both cases the thieves left the scene when the leak could not be controlled.

2016 SPILLAGE INCIDENTS

66 spillage incidents were recorded in 2016, **60 of which were related to theft attempts** (third party intentional). **Table 1** gives a summary of the main causes and spilled volumes and environmental impact. For definition of categories of causes and gross/net spilled volume, see **Appendix 1**.

Theft attempt from pipelines has been a concern in recent years, causing a small number of spillages in 2011 and 2012. The number jumped to 18 in 2013, 54 in 2014 and 87 in 2015. The 2016 figure appears to suggest that efforts by operators to frustrate theft attempts have borne fruit. This remains, however, a continuing challenge for operators. While theft tended in the past to be an issue in Southern and Eastern Europe, it is also notable that no areas of Europe are now immune to it.

The circumstances of each spill, including information on consequences and remediation actions are described in the next section according to cause. Further details are available in **Appendix 2** which covers all spillage events recorded since 1971.

Table 1 Summary of causes and spilled volumes for 2016 incidents

Event	Facility	Line size	Product	Injury	Fire	Spilled volume		Contamination	
		(")	spilled	Fatality		Gross	Net loss	Ground area	Water
(1)				(2)		(m^3)		(m^2)	(3)
Mechanical									
Construction									
676	Underground pipe	24	White product	-	-	11.0	1.0	200	S, G
Corrosion									
External									
689	Underground pipe	18	HFO (hot)	-	-	1.0	1.0	Not reported	
690	Underground pipe	16	White product	-	-	16.0	0.0	100	
691	Underground pipe	10.75	White product	-	-	200.0	200.0	Not reported	
Third party activity									
Accidental									
677	Underground pipe	16	White product	-	-	128.0	13.0	Not reported	
688	Underground pipe	12	White product	-	-	400.0	20.0	Not reported	
Theft or theft attempt									
678-681	Underground pipe	10	White product	4 events, no details available					
682	Underground pipe	12	White product	-	-	7.0	0.0	75	
683	Underground pipe	12	White product	-	-	0.0	0.0	100	
684	Underground pipe	14	White product	-	-	3.4	0.0	20	
685	Underground pipe	6	White product	-	-	12.6	10.1	50	
686	Underground pipe	12	White product	-	-	15.8	15.8	Not reported	S
687	Underground pipe	12	White product	-	-	9.0	9.0	Not reported	
692	Underground pipe	16	White product	-	-	97.0	70.0	850	
693-741	Underground pipe		White product	49 events, no details available					

(1) Spillage events are numbered from the beginning of the survey in 1971

(2) I = Injury, F = Fatality

(3) S = Surface water, G = Groundwater, P = Potable water

Mechanical Failure

There was one spillage incident related to Mechanical failure in the construction category in 2016.

Event 676:
During normal operation a pinhole leak in a girth weld developed at the 5 o'clock position. The spillage resulted in some surface and groundwater contamination.

Operational activities

There were no spillages in this category in 2016.

Corrosion

There were 3 spillages related to corrosion in 2016, all in the external corrosion category.

Event 689:
External corrosion occurred under the pipe insulation. This is one of the few remaining hot pipelines which as notorious for such corrosion problems.

Event 690:
Corrosion occurred at the above/underground interface in a line between a refinery and a pumping station.

Event 691:
Local corrosion occurred as a result of contact between the pipe and the cement protection. First detection was through a leak-detection pig which registered a suspect signal. No trace of oil could be found on the ground. Several inspection pigs were launched and the position of the leak was eventually determined although a significant volume of oil escaped into the ground in the meantime. The cathodic protection was operational.

Natural causes

There were no spillages in this category in 2016.

Third party activity

There were 62 spillage incidents in this category in 2016 of which two were in the "accidental" category and the balance the consequence of product thefts or theft attempts. Not all events have been described in detail.

Event 677:
A leak occurred whilst preparing for a visual verification of an anomaly highlighted by ILI. The leak was caused by third party contractor interaction. The anomaly was not deemed high risk and the pipe was repaired with a clamp.

Event 688:
While installing an underground power cable, a cutting tool hit the pipeline, opening a hole of 20 x 30 cm. An estimated 400 m^3 of diesel fuel escaped, most of which was recovered.

Events 678-681:
4 theft attempts in underground sections of pipelines with a similar modus operandi involving a small 10 mm line hammered into the line and resulting in, mostly minor, spillages. No further details available.

Event 682:
The alarm was raised as a result of a suspect line balance and the pipeline shutdown. On-site inspection confirmed a diesel leak. Line depressurised and emergency and response procedures were activated. A leaking hot tap fitting was found.

Event 683:
A landowner discovered a spill and informed the operator. An illegal connection point was found. 43 m^3 were recovered as oil but the total volume spilled is unknown.

Event 684:
A loss of pressure was detected by the leak detection. The pipeline route was tracked and an illegal connection point was found threaded into the pipe. 3 m^3 were recovered from soil but the total volume spilled is unknown.

Event 685:
The leak detection system registered a pressure drop and provided an accurate location for the leak. The pipeline pressure was around 40 bar. A freshly dug pit of ca. 1m x 2m was found, partially filled with diesel. The perpetrators fled the scene without extracting product.

Events 686 & 687:
Two product theft events with the usual modus operandi. One resulted in some surface water contamination.

Event 692:
A diesel leakage was reported by the police and eventually traced back to a theft attempt. The SCADA and leak detection system prove ineffectual, taking more than two hours to alarm.

Event 693-741:
49 theft attempts in underground sections of pipelines, resulting in, mostly minor, spillages. No details available.

2017 SPILLAGE INCIDENTS

13 spillage incidents were recorded in 2017, **11 of which were related to theft attempts** (third party intentional). **Table 1** gives a summary of the main causes and spilled volumes and environmental impact. For definition of categories of causes and gross/net spilled volume, see **Appendix 1**.

Theft attempt from pipelines has been a concern in recent years, causing a small number of spillages in 2011 and 2012. The number jumped to 18 in 2013, 54 in 2014, and 87 in 2015. The first sign of decline came in 2016 with 60 incidents. The 2017 figure strongly confirms that efforts by operators to frustrate theft attempts have borne fruit. This remains, however, a continuing challenge for operators. While theft tended in the past to be an issue in Southern and Eastern Europe it is now more widespread, affecting also central and North/ West Europe.

The circumstances of each spill, including information on consequences and remediation actions are described in the next section according to cause. Further details are available in **Appendix 2** which covers all spillage events recorded since 1971.

Table 1 Summary of causes and spilled volumes for 2017 incidents

Event	Facility	Line size	Product	Injury	Fire	Spilled volume		Contamination	
		(")	spilled	Fatality		Gross	Net loss	Ground area	Water
(1)				(2)		(m^3)		(m^2)	(3)
Operational									
Human									
754	Pump station	12.75	White product	-	-	1.0	0.0	0	
755	Above ground	16	White product	-	-	32.1	0.1	2000	
Third party activity									
Theft or theft attempt									
743	Underground pipe	10	White product	-	-	8.0	5.0	300	
744-753	Underground pipe		White product	9 events, no details available					
756	Underground pipe	8	White product	-	-	3.1	0.0	Not reported	

(1) Spillage events are numbered from the beginning of the survey in 1971

(2) I = Injury, F = Fatality

(3) S = Surface water, G = Groundwater, P = Potable water

Mechanical Failure

There were no spillages in this category in 2017.

Operational activities

There were two spillages in this category in 2017, both in the “human error” sub-category. This is somewhat unusual as these are relatively rare (see also **section 6**).

Event 754:
During repair work on a pipeline, a temporary pig launcher was installed in a pumping station. A spill was caused by the failure of a small seal on a decompression tap.

Event 755:
A pig trap door failed when the isolation valve was open while the trap door was not correctly secured.

Corrosion

There were no spillages in this category in 2017.

Natural causes

There were no spillages in this category in 2017.

Third party activity

There were 11 spillage incidents in this category in 2017 all theft-related.

Event 743:
Notification was received by the operator that a member of the public had reported a strong smell of kerosene. Upon investigation an illegal tapping that had been fitted to the pipe-line was found leaking, resulting in significant product release to the environment. The pipeline was depressurized and 3 m^3 (of a total of 8 m^3 spilled) were recovered with a vacuum tanker. A temporary clamp was bolted in place until a permanent repair could be carried out (subsequently completed). The immediate area was covered with concrete slabs to frustrate further theft attempts at this location.

Events 744-753:
No details available.

Event 756:
Illegal tapping detected during an in-line inspection. No further details available.

2018 SPILLAGE INCIDENTS

12 spillage incidents were recorded in 2018, **10 of which were related to theft attempts** (Third Party Intentional). **Table 1** gives a summary of the main causes and spilled volumes and environmental impact. For definition of categories of causes and gross/net spilled volume, see **Appendix 1**.

Theft attempt from pipelines has been a concern in recent years, causing a small number of spillages in 2011 and 2012. The number jumped to 18 in 2013, 54 in 2014, and 87 in 2015. The first sign of decline came in 2016 with 60 spillages followed by 11 in 2017. The 2018 figure strongly confirms that efforts by operators to reduce theft attempts have borne fruit. The problem still remains though, albeit at a low level, and continues to be a challenge for operators. While theft tended in the past to be an issue in Southern and Eastern Europe it is now more widespread, affecting also central and North/ West Europe.

The circumstances of each spill, including information on consequences and remediation actions are described in the next section according to cause. Further details are available in **Appendix 2** which covers all spillage events recorded since 1971.

Table 1 Summary of causes and spilled volumes for 2018 incidents

Event	Facility	Line size	Product	Injury	Fire	Spilled volume		Contamination	
		(")	spilled	Fatality		Gross	Net loss	Ground area	Water
(1)				(2)		(m^3)		(m^2)	(3)
Mechanical									
Construction									
768	Underground pipe	12	White product	-	-	9.1	1.4	240	S, G
Third party activity									
Accidental									
767	Underground pipe	6	White product	-	-	40.0	0.0	0	
Theft or theft attempt									
757-765	No details available								
766	Underground pipe	12	White product	-	-	12.0	0.0	80	

(1) Spillage events are numbered from the beginning of the survey in 1971

(2) I = Injury, F = Fatality

(3) S = Surface water, G = Groundwater, P = Potable water

Mechanical Failure

There was one spillage in this category in 2018, in the “Construction” sub-category.

Event 768:
A temporary repair clamp, which had been installed on an attempted theft point, developed a leak. The leak was identified, and permanently repaired, in March 2018. The clamp had been installed in December 2016.

Operational activities

There were no spillages in this category in 2018.

Corrosion

There were no spillages in this category in 2018.

Natural causes

There were no spillages in this category in 2018.

Third party activity

There were 11 spillage incidents in this category in 2018 all but one theft-related. One incident was in the “Third Party Accidental” category.

Accidental

Event 767:
An excavator hit and punctures the pipeline in an agricultural area. It appeared that the pipeline operator was not made aware of this activity being undertaken while the machinery operator was also unaware of the presence of the pipeline. Some 40 m^3 of gasoline were spilled, the bulk of which was recovered through the emergency response actions and subsequent soil cleaning.

Theft-related

Events 757-766:
No details available.

Event 767:
The pipeline control centre was alerted of a leak by a member of the public (who is believed to be the perpetrator of the theft attempt). This was confirmed by pressure monitoring. Pumping was stopped immediately and the relevant section shutoff while staff were sent to the presumed location where the leak was quickly located and dealt with.