

**IVORY COAST REPUBLIC
TRAFIGURA BEHEER BV**

ABIDJAN

**Environmental Audit pursuant to
clause 2.2 of Heads of Agreement
signed on 13/02/07 between the
Parties, the Ivory Coast State and
Trafigura**

Audit Report – phase 1

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		d						

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1 Aim of the Audit

Slops were dumped in Abidjan, Ivory Coast, on several different sites on 18 – 19 August 2006; these wastes (hereinafter the "Slops") originated from the vessel "PROBO KOALA" and amounted to around 538 m³ in volume.

A clean-up of the dumping sites was conducted and carried out by the company "TREDI", which declares that it sent to France 9322.237 tonnes of liquid and solid products for disposal (hereinafter referred to as the "Wastes").

Following the clean-up work, TRAFIGURA BEHEER B.V. requested BURGEAP to conduct an Audit based on an environmental analysis of the residual pollution connected with the dumping of these Slops.

The aim of this task is to check the current status, the conditions of implementation and the results of this initial clean-up operation, and then to assess the level of residual pollution and, if necessary, propose the implementation of precautionary measures.

This Audit consists in collecting information on the following points from the organizations named in the Heads of Agreement, CIAPOL, BNETD and TRAFIGURA:

- the development of the case;
- the properties of the Slops dumped (quantity, nature, etc.);
- a list of the sites used for the dumping of Slops;
- an analysis of the contract and its application between the Ivory Coast Government and Tredi;
- an analysis of the results of the works performed by Tredi (according to the contractual clauses set out in Annex 1);
- a preliminary inspection of the sites identified in May 2007;
- a list of any other sites affected by the dumpings;
- the preparation of an additional clean-up plan connected with the Slops and any additional remedial measures.

NB: The terms of reference, attached to this report, form an integral part of the methodology proposed by Burgéap.

2. Technical description of services

2.1 General plan of the Audit

Each phase of the Audit will be drawn up in a summary technical report submitted for the approval of Trafigura's representatives and experts representing the Ivory Coast State (CIAPOL and BNETD).

The plan and procedural content of the Audit have been prepared following the various discussions with the representatives of the Parties, Trafigura and the Ivory Coast State, drawn up in a document attached as Annex 1 and entitled:

"Terms of Reference pursuant to §2.2 of the Heads of Agreement signed on 13 February 2007 by the Ivory Coast State and Trafigura, as adopted by all the parties during the meetings between 24 and 27 April 2007 in Paris"

The content of the audit will endeavour to observe the requirements of the Ivory Coast State Environmental Code and its implementing decrees.

In the absence of any domestic Ivory Coast reference system regarding investigation of contaminated sites, we adopted the current French methodology on the subject as defined in the procedural guides of the Ministry of the Environment / BRGM for the "Management of (potentially) polluted sites", version 2 of March 2000 and partially updated on 9 December 2002 and therefore according to the specifications of standard NF X 31-620 on the provision of services on polluted sites and soils (studies, engineering, restoration of polluted sites and clean-up work).

We also adopted the procedural approach for environmental due diligence operations in order to make an initial appraisal of the quality of the environment. These standardized ASTM 1577 procedures involve minor investigations to establish the presence or absence of pollution that may subsequently lead to further investigations if necessary.

To conduct the audit properly with the following aims:

- + Identification of sites
- + Appraisal of clean-up operations

it was divided into 3 phases:

- Phase 1: Collection of existing data and preparation of additional investigations plan
- Phase 2: Additional site investigations
- Phase 3: Definition of additional clean-up works

This report presents the results of the first phase of the Audit. It was prepared after data was collected by Fadi MERHEB in Abidjan between 7 and 16 May 2007.

2.2 Phase one: collection of existing data

This involves collecting existing information from the following organizations: CIAPOL, BNETD and TRAFIGURA. Where appropriate, these organizations undertook responsibility for contacting, retrieving and supplying useful data to the team responsible for the Audit.

The investigations in this first phase of the Audit are strictly documentary. They will be based on observations made during a preliminary visit to the sites identified, from which Wastes were removed by TREDI.

They aim to try to identify the nature of the Slops and Wastes based on existing analyses, the state of knowledge on sites known or likely to be at risk, and to assess the vulnerability of the environment (ground water, surface water, sensitive populations, etc.).

A working meeting held on 09/05/07 at CIAPOL, with all the Parties' representatives, enabled the auditor to list the useful technical documents and to fix a schedule for their collection and submission to the audit team:

Définition des tâches à effectuer au cours de la mission de Fadi MERHEB à Abidjan de phase 1 de collecte et analyse des données - inventaire des sites de déversements.
La durée de la première phase pour la fourniture du rapport est fixée à 4 semaines, à partir du 07/05/07

Tâche	du 07 au 16 mai 2007									Observation
	Lu	Ma	Me	Je	Ve	Lu	Ma	Me		
Collecte et analyse documentaire										
liste des camions										avec l'appui du Commissaire Baro Société TOMMY/WAIRS/PUMA
cartes des sites identifiés										
marché TREDI avec les avenants										auprès de la cellule opérationnelle/Ministère de l'économie et des finances
données sur les prélèvements et analyses										SGS/TREDI/cellule opérationnelle
bordereaux de suivi des travaux et de la facturation dumarché TREDI										à partir des rapports journaliers de suivi de chantier et des bordereaux de pesage servant à la facturation
caractérisation des "déchets"										Burgeap tentera de récupérer les analyses réalisées par la Sécurité civile française. Trafigura fournira une description des process de fabrication des déchets, et se renseignera sur l'existence éventuelle d'échantillons conservés par PETROCI. Le CIAPOL et le BNETD fourniront les résultats d'analyses effectuées par les laboratoires internationaux (Antéa, Wessling,...)
prélèvements et analyses des sols et des eaux (avant et pendant les travaux d'enlèvement des déchets)										
listing des puits privés ayant fait l'objet d'analyses d'eau										liste communiquée au BNETD pour un report carto à partir des Coord. GPS
listing des puits AEP et des piézomètres de surveillance										à partir des données SODECI
données sur la pluviométrie d'août 2006 à avril 2007										auprès de SODEXAM
plans des réseaux AEP, assainissement et eaux pluviales										dans un premier temps, à partir des éléments disponibles au BNETD
DVD (déroulement des opérations)										
Inventaires des sites										
cartes des sites identifiés/voirie/topo										
préparation de la liste des sites "suspects" où des réclamations ont été déposées										avec l'appui de l'ONPC qui centralise les appels téléphoniques et les plaintes des riverains pour les sites douteux non investigués
Visite préliminaire des sites										avec l'appui du CIAPOL et du BNETD
Éléments disponibles chez TREDI										à organiser avec l'appui des M. Tapé et Faye

Il a été convenu que les visites des sites identifiés et douteux se fera avec la participation des intervenants, notamment les personnes qui ont été présentes lors des opérations de terrain.

Intervenants

CIAPOL	
BNETD	
TRAFIGURA/PUMA	
TREDI	
CIAPOL/BNETD/PUMA/BURGEAP/TERRABO	

BNETD/PUMA	
CIAPOL/BNETD	

The schedule was approved by all the Parties.

The list of documents collected is attached.

The site plans to project scale could not be produced while working in Abidjan. They will need to be produced during phase 2.

Direct contact was made in Paris with the TREDI representatives. However, no document could be obtained as the authorization of the orderer (the Crisis Operating Unit) had not been requested. TREDI informed us that a summary report on the works carried out on the dumping sites has been submitted to the Crisis Unit, with a copy for BNETD.

Similarly, an appointment in Paris with the officers of the French Civil Safety Authority was cancelled at the last minute owing to the lack of authorization to access the information classified as confidential by the Ivory State.

2.2.1. Contractual status of the works contract between the Ivory Coast State and TREDI

Main contract: signed on (date not given on the document provided to Burgeap), "The purpose of this Contract is to establish, on the one hand, the terms and conditions of supply of services by TREDI from the Sites to the centres of Treatment and Disposal of Polluted Soils and Wastes, and, on the other, the obligations cast upon the Parties"...the State entrusts to TREDI exclusivity for the implementation of the project comprising analysis of the risks, Excavation, Packaging, carriage and Treatment of Polluted Soils and Wastes originating from the sites, for a quantity estimated at 2,500 tonnes at the time of the signing of this Contract"...the services provided by TREDI under this Contract cover only Wastes and Polluted Soils and exclude all other wastes or material not contaminated by the pollution, the subject of this Contract, located at the Sites".

"This Contract takes effect retroactively with effect from the starting date of the services on Sunday 17 September 2006 by TREDI and shall remain valid until its completion fixed for 30 June 2007, according to the times for completion fixed below...." *It is therefore understood that, on the specified date, the certificates of destruction of the polluted wastes and soils shall be supplied.*

Annex 6 to the Contract: "the price is a firm and unreviewable, all-inclusive unit price, incorporating all of the services as described in Annex 1. Price: € 3600/tonne excluding tax. This price quoted is for the performance of the services described in Annex 5, any discovery of a new site, similar to those listed in Annex 3, during the performance of the Contract, is to be the subject, on the State's request, of identical services which are to be invoiced at the same unit price as above".

Article 7.2.2: "the 15% balance shall be invoiced as and when Certificates of Destruction of the Wastes and Polluted Soils originating from these Wastes".

Rider No. 1: signed on 06 October 2006, "the estimate of the Wastes and polluted Soils to be treated under the Contract showed a quantity estimated at 2,500 tonnes or thereabouts". "As performance of the services shows a volume of Wastes and Polluted Soils exceeding this quantity, it appeared necessary to the Parties to approach each other in order to put in place a rider to the Contract in accordance with Article 18 of said Contract". "The additional quantities are estimated at 3,000 tonnes +/- 10% as at the date of signing the Rider". "The price of the services carried out pursuant to Article 2 is fixed at 3,100 Euros tax-exclusive/tonne".

Article 4.2.2: "the balance of 15% of the Rider value shall be invoiced as and when Certificates of Destruction of the Wastes and Polluted Soils are issued".

Rider no. 2: signed on 20 October 2006, on the progress of the works, this Rider alters the procedures for the payment of the sums invoiced within the scope of Articles 7.2.2 of the main Contract and 4.2.2 of Rider no. 1 by 27 October 2006 at the latest against remittance of a guarantee of return of the advance payment of the same amount valid until 30 June 2007.

Rider no. 3: signed on 20 October 2006, "the continued clean-up operations indicate that the volumes to be treated exceed the volumes agreed between the Parties in the main Contract and Rider no. 1 thereto. Consequently, by means of this Rider no. 3, the Parties wish to take into account the new additional volumes to be treated". "...the Parties agree that an additional 1000 tonnes have been identified as falling within the scope of the main Contract and having to be treated by TREDI". "the price applicable to the additional 1000 tonnes referred to in this Rider no. 3 is € 3100/tonne excluding tax".

Rider no. 4: signed on 02 November 2006, "the continued clean-up operations indicate that the volumes to be treated exceed the volumes agreed between the Parties in the main Contract and Riders nos. 1, 2 and 3 thereto. Consequently, by means of this Rider no. 4, the Parties wish to take into account the new additional volumes to be treated". "... the Parties agree that an additional 1500 (+/- 10%) tonnes have been identified as falling within the scope of the main Contract and having to be treated by TREDI. With regard to the excavation and packaging of these additional tonnes while awaiting transportation thereof for treatment, the Parties agree to conclude these services within a period of 10 days, as from the date of signature of this Rider". The price applicable to the additional 1500 (+/- 10%) tonnes referred to in this Rider no. 4 is € 3100/tonne excluding tax".

Rider no. 5: signed on 09 November 2006, "the continued clean-up operations indicate that the volumes to be treated exceed the volumes agreed between the Parties in the main Contract and Riders nos. 1, 2, 3 and 4 thereto. Consequently, by means of this Rider no. 5, the Parties wish to take into account the new additional volumes to be treated". "By means of this Rider no. 5, the Parties agree that an additional 1000 tonnes have been identified as falling within the scope of the main Contract and having to be treated by TREDI". "the price applicable to the additional 1,000 tonnes referred to in this Rider no. 5 is € 3100/tonne excluding tax".

Rider no. 6: the letter dated 09 March 2007, sent by the Ministry delegated to the Prime Minister responsible for Economic Affairs and Finance to the Chairman of the Cellule Opérationnelle de Coordination du Plan Nationale de Lutte contre les Déchets Toxiques [*Operating Unit for the Coordination of the National Plan to Combat Toxic Wastes*] states the following: "Taking into account the developments recorded in the management of the toxic wastes case, I confirm that it does not appear advisable to me to approve the new riders with TREDI". "In fact, under the terms of the latest negotiations conducted by the President of the Republic, the company TRAFIGURA undertook, among other things, to bear the costs of cleaning up any new sites and consolidating the sites already treated". "Under

these conditions, it seems advisable to me to define the practical procedures of implementation of this new plan". "I have therefore delayed approval of Rider no. 6 until the new measure is implemented".

In short, the main Contract and Riders nos. 1 to 5, concern the following volumes of Wastes:

Contract	Date of signature	Volumes concerned (tonnes)	Price € excluding tax
Main Contract	-	2,500	3,600
Rider no. 1	06 October 2006	3,000 (+/- 10%)	3,100
Rider no. 2	20 October 2006	-	-
Rider no. 3	20 October 2006	1,000	3,100
Rider no. 4	02 November 2006	1,500 (+/- 10%)	3,100
Rider no. 5	09 November 2006	1,000	3,100
Total		9,000	29,150,000
Total +10% (riders 1 and 4)		9,450	

Tonnage removed and approved at BNETD	11/05/07	9,322.237	30,448,934.70
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Table x: contractual summary of tonnages of Wastes between the Ivory Coast State and TREDI

On the request submitted by TREDI on 06/11/06, Prefectoral Order (Prefecture of Isère in France) No. 2006-10305 dated 22/11/2006 concerning the import of Wastes was issued. It notes the following:

- The additional provisions attached to be observed, relating to the conditions of treatment [of wastes] originating from the Ivory Coast on the site of its Salaise-sur-Sanne incineration plant;
- The authorization to start up new installations (an additional storage installation on the "Salaise 1" unit and an installation feeding the furnace in the "Salaise 2" unit, solely for these wastes and under the conditions described in the application file.

The additional technical provisions state the following:

- 2 representative samples of the contents of each of the packs present in the container shall be taken from each of the containers placed in the storage area;
- Admission to the furnace is conditional on the results of the analyses;
- For solid wastes, each individual pack shall be removed from the container, a sample shall be taken and the pack shall immediately be protected with an additional cover and band prior to transportation to the furnace;
- For liquid wastes, only one sample shall be authorized.

On the conditions of disposal, Annex 3 to the "File on the import of water containing hydrocarbons no. FR078013" contains an analytical supplement to the description of the Wastes: *"In the absence of quantitative analyses, the Salaise incineration plant undertakes to carry out analyses of conformity as from the first receipt. In particular, depending on the values obtained, the following three parameters will enable the deliveries to be sent to the authorized units (PCB – chlorine – sulphur). Maximum permitted value of PCB: 50 ppm. If this value is exceeded, deliveries will be sent to a unit approved for the treatment of wastes with PCB>50 ppm. Chlorine and sulphur: if chlorine > 1% and/or sulphur > 4%, the dedicated unit will be*

the Salaise 2 unit. For other parameters, if necessary the dedicated unit will receive all the equipment required allowing introduction without causing a nuisance."

According to the information supplied by TREDI to the Local Information and Monitoring Commission (27/02/07):

Date	Containers including isotanks	Liquids (tonnes)	Solids (tonnes)
07/11/06	141/48	801.381	1254.230
20/11/06	131/-		2037.852
27/11/06	103/-		1618.770
01/12/06	145/-		2340.716
22/12/06	94/6	75.620	1140.142
Total	614/54	877.001	8391.710

Table of maritime movements supplied by TREDI to the Local Information and Monitoring Commission (27/02/07)

The difference in tonnage (9322.237 tonnes) packed on site in Abidjan is: 53.526 tonnes which would then be stored in Abidjan on the Aléotec site.

2.2.2. Description of the Slops and Wastes and study of their potential impact on the environment

2.2.2.1 Analytical data

The following analytical data has been collected:

- Analysis of a sample ① entitled "**liquid wastes comprising ship slops**" taken on 21/08/06 at 12:30 from the Akouédo dump by CIAPOL, analysed on 21/08/06 by the central environmental laboratory/CIAPOL (this sample was the object of 2 records of results bearing different times and dates – see Annex 6).
- Analysis of a sample ② of **SLOPS** (or **crude wastes**) taken on 21/08/06 "from the vessel Probo Koala"¹ by CIAPOL, analysed on 22/08/06 by the SIR laboratory (notified by the CIAPOL).
- Analysis made by the French Civil Safety Authority of a sample ③ (point 1) taken on 09/09/06 from "a ditch at the Akouedo dump by a pool of Waste" within the scope of its task with the BRGM (?), an analysis conducted by chromatography in the gaseous phase coupled with a portable mass spectrometer (some of the results were supplied by CIAPOL, the chromatogram was supplied by Trafigura with a copy of the main service contract between the Ivory Coast State and TREDI).
- Data sheet ④ provided by Jorge Luis Marrero, Trafigura Ltd, dated **17/08/06** (the day before the dumpings), informing Capt. Kablan by email of his desire to discharge around 528 m³ of "slops from the Probo Koala" (provided by CIAPOL).
- Laboratory analysis ⑤ entitled "report of **main components found in the Waste (or Slops)** originating from the Probo Koala" provided by the National Forensic Institute (Netherlands), dated 08/09/06 (provided by CIAPOL).
- Message from Trafigura to the Prime Minister's Cabinet, Ivory Coast Republic, dated 16/01/07 with:
 - A copy of a fax dated 11/09/06 from AVR (analysis ⑥ made on 03/07/06 of a sample entitled "**WW caustic/benzene**");

¹ According to the BANY national commission report, this sample had been taken from the jetty from Slop residue dumped on the soil, and not from the ship.

- A copy of an email dated 25/09/06 from SAYBOLT Netherlands/SGS (analysis dated 11/09/06 of a sample ⑦ entitled "Sample received from Intertek West Africa ex Abidjan Ivory Coast"),
- 1-page "description of caustic washing process".

(These documents were supplied by Trafigura).

In order to observe the meaning of the original text, a description of the caustic washing process is reproduced below in English:

"

- 1- Finished gasoline in a blend of a variety of blendstocks coming from different refining processes to make finished gasoline specifications which are specific to the requirements of particular countries.
- 2- Refineries sell blendstocks with characteristics that allow blenders to produce to these various specifications. There are some blendstocks that, because of their high thiol content ("mercaptan sulphur") levels, may need to be treated before they can economically be blended into gasoline. In high concentrations, thiols affect the odour of the gasoline.
- 3- In order to upgrade the blendstocks, it is necessary to "extract the thiols" from them. In simple terms, the extraction process involves the addition of caustic soda. (the sodium hydroxide aqueous reacts with the mercaptan sulphur in the blendstock thereby forming sediments).
- 4- Caustic soda treatment is an established means of removing thiols from blendstocks.
- 5- The *Probo Koala* took on board three gasoline blendstock cargoes.
- 6- An amount of caustic soda was added to each of these gasoline blendstock cargoes together with a chemical additive which acted as a catalyst. After each operation, the added caustic soda after the treatment operation would have settled to the bottom of the vessel's tank saturated with the mercaptan sulphur which it had removed from the gasoline blendstock cargoes.
- 7- This saturated caustic soda and a proportion of the gasoline was then drained from the cargo tanks to the *Probo Koala's* on-board "slops tanks". As a result, the slops tanks contained a mixture of gasoline and saturated caustic soda.

"

Description of the Slops

The sheets describing the samples taken indicate the following:

- Samples numbered ①, ②, ④, ⑤, ⑥ and ⑦ correspond to a waste we can describe as crude or Slops;
- Sample ③ corresponds to a sample taken from a ditch; it has undergone alteration (contact with soil or leachate on discharge, degradation connected with exposure to the open air at high temperatures);
- According to the CIAPOL and BNETD representatives present during the preliminary visit to the sites, the second sample taken by the French Civil Safety Authority (leak from a tank at Akouédo) did not correspond to Slops originating directly from the Probo Koala boat but from a recovery made from pumping of Wastes effected at another dumping point;
- The two liquid samples taken from the ship Probo Koala by the expert Mr Eberentz (refer to the list of samples taken and provided by CIAPOL), the outcome of which is not yet known by the Ivory Coast State authorities;
- A sample of Slops currently sealed under the authority of the Public Prosecutor of Abidjan.

Slops (or Crude wastes): According to the data sheets supplied by Trafigura (⑥ and ⑦), the appearance is light and bright. The colour may be described as "dark tea" and the smell is quite strong; it is composed of 380 mg/kg of Mercaptan Sulphur and 450 mg/kg of water, with less than 1 mg/kg de H₂S. The total chloride content by volume is 0.09% and sulphur (zwavel) 1.31%. It has a pH of 12.9.

The description ④ of the cargo indicates that the cargo of the vessel Probo Koala comprised "chemical slops" and not "marpol slops" as its DCO content is greater than 2000 mg/l. The wastes (Slops) are described as having a strong odour.

The analysis provided by Trafigura (sample ⑤) indicates "the presence of FCC-Naphtha in combination with (methyl)phenols and mercaptans, and NaOH (spend caustic), a strong indication that it involves slops, which originate from rinsing with a soda lye from a fraction of distillation resulting from the refining of crude oil and coal (tar)." The FCC-Naphtha is a mix of hydrocarbons C5-C11, and therefore light compounds. The analysed indicated the presence of H₂S at 0.23% in particular.

According to the additional information requested of Trafigura to indicate the exact nature of the chemical additive used as a catalyst mentioned in point 6 above, it was ARI-100 EXL (cobalt catalyst); cobalt will therefore be used in the analyses as a tracer element of the slop used.

A comparison between the analysis made by the SIR laboratory ② and the National Forensic Institute ⑤ is shown in the following table:

	SIR ② (CIAPOL)	NFI Netherlands ⑤ (Trafigura)
H ₂ S content	6,129 mg/kg ^(*)	0.23%
Olefins	2.5% volume	36.2%
Paraffins	51.4% volume	46.3%
Aromatics	46.1% volume	6.2%
Mercaptan sulphur	1,287 mg/kg	3.72% (mercaptans)

(*) This value seems to be inconsistent with the other analysis results and calls into question the objectivity and representative nature of the result supplied.

We note a very marked discrepancy in the results of the first two analyses, particularly with regard to the H₂S content (which is important in the classification of toxicity of the product in the event of inhalation; however, it is recognized that it is similar to an oil cut close to petrol (light cut).

According to the BNETD daily monitoring reports on the clean-up works, the analyses carried out on the samples of polluted soils from the Akouedo 3 dumping site (by BNETD/TREDI/SGS) showed H₂S content between 10 and 20 ppm.

Altered wastes (whether or not containing Slops): The alteration of these Wastes taken from the sites is mainly connected with the presence of volatile light compounds identified in the original mixture (C5 to C11); in contact with the air, and a fortiori under temperatures exceeding 30°C, volatilization is highly accelerated. This alteration largely explains the heterogeneous nature of the results of the analyses conducted *in situ* and in the laboratory on H₂S and volatile and organic compounds.

The CIAPOL liquid sample ① taken from the Akouédo dump shows a sulphur content >10,000 mg/l and organochlorinated compounds of 250 mg/l. The contents of H₂S, olefins, paraffins, aromatics and mercaptans were not sought. CIAPOL notes as follows: "In view of the strong irritating odour released, this liquid waste should not be discharged into nature without prior specific treatment".

Liquid sample ③ taken by the Civil Safety Authority from the Akouédo dump ditch made it possible to list 37 molecules with their probability of detection on chromatography carried out in Abidjan. No presence of H₂S was reported.

TREDI also conducted analyses in France on samples of solids and liquids taken from the sites of the works (but not Slops from the ship) with a view to confirming the statutory conditions of acceptability of the Wastes in France. The information provided by TREDI for the Local Information and Monitoring Commission (27/02/07) indicates the following results:

Compound or element	CERFA FR078013	CERFA FR078066	CERFA FR078069		
	Liquids	solids	Solid sample 1	Solid sample 2	Solid sample 3
PCS cal/g	11000	700	<3000	<3000	<3000
PH	7	7	7	7	7
Flash point	<-25°	<56°			
PCB ppm	<1	<1	<1 ppm	<1 ppm	<1 ppm
Radioactivity	No	No	No	No	No
Hydrocarbons	91.5%	0.48%	1000 ppm	1000 ppm	220 ppm
Benzene	0.4%	6 ppm	<50 mg/kg	<50 mg/kg	<50 mg/kg
Toluene	1.2%	195 ppm			
Xylenes	2.5%	682 ppm			
Chlorine equivalent	0.006%	0.05 %	0.14%	0.22%	0.09%
Sulphur equivalent	2.76%	0.56%	0.08%	0.08%	0.04%
Fluorine	absence	Absence	0.05%	0.03%	Absence
Cd			6 ppm	10 ppm	1 ppm
Hg			<0.1 ppm	<0.1 ppm	3.5 ppm
Fe		0.92%			
Zn		0.02%			
Ba		0.22%			

Results of analyses conducted by TREDI on the imported samples (Local Information and Monitoring Commission (27/02/07)

These analyses on 3 samples sorted from several tens of samples with no justified criteria do not allow them to be accepted objectively, to determine the traceability of Wastes and Slops from Probo Koala.

An analysis made by Séché Eco Industrie on 3 soil samples taken from Coco Service, Akouedo b and Akouedo marked Coco, AK3B and AK3A (on 02/12/2006) indicates the following:

	Coco service	Akouedo b	Akouedo
Hydrocarbons (mg/kg)	217 (C20 to C36)	1210 (C14 to C24)	1128 (C14 to C24)
PCB (mg/kg)	<1	<1	<1

Results of the 3 analyses conducted by TREDI on the Coco service and Akouedo soil samples.

These analyses contradict the first analyses of Slops which indicate an exclusive presence of carbon below C20.

Based on the conditions of sampling with analyses and the contradictions noted in the analytical results made available to us, it is therefore impossible to match the different samples of Wastes taken from the sites with the Slops directly.

In short, the analyses conducted on the SLOPS samples indicate that:

- Their composition is very close to a light oil cut such as "Petrol", volatile components are predominant (olefins, paraffins and aromatics) and its pH is greater than 12. Once exposed to the open air, the volatile compounds will be the first to be dispersed.
- The result of the sulphur or H₂S content is different and it is difficult to correlate the samples analysed (different sampling and analysis conditions).
- We were not able to find any traces of analyses of heavy metals, such as Lead.
- We were not able to find any traces of analyses of total hydrocarbon indices, or of PAHs (polycyclical aromatic hydrocarbons) or quantification of BTEXs (benzene, toluene, ethylbenzene and xylenes), apart from the analyses conducted by TREDI in France on the BTEXs (on samples whose origin cannot be determined).
- During our visit to the dumping sites from where the polluted soils were removed, the only persistent index noted was the smell of garlic still present. No colour or visual appearance indicated any traces of remains of Slops potentially present on the surface of the soil (we note that the statements made by the TREDI site managers indicated a blackish or greenish appearance of the soils affected by the dumpings).

Finally, we note that a consultation of the press articles on Tuesday 06 March 2007 (L'intelligent d'Abidjan) provided the following information: "...In order to fully release it from liability, the District will also have to prove that the mosquito removal operations it carried out on Saturday 19 August are not connected with the toxic liquid issue. In fact, on Monday 21 August, when searching for the origin of the odour that had spread across the town of Abidjan, we heard from the District Environmental Department that it could be that of an insecticide sprayed that Saturday against the mosquitoes". We recall that the phytosanitary products used for treatment with insecticides contain organochlorinated compounds that give off a strong, unpleasant and even toxic odour, and that these same compounds had been detected in certain Waste analyses.

In view of these doubts, the only means still available today to scientifically identify the Slops is to use any sample of Slops existing, in particular the sample still sealed in Abidjan, provided it is kept under satisfactory storage conditions. Depending on the quantities of this sample kept (which we were unable to check in Abidjan), several types of analyses may be conducted:

- 1- Carburane analysis requiring 10 to 20 ml of product.
- 2- Chromatography coupled with mass spectrometry in order to make a blind identification (mirroring the analysis made by the Civil Safety Authority, but with a sample that definitely comes from the ship without any alteration). This analysis requires around 50 ml of product.
- 3- A water exchange test allowing the potential to dissolve and remove Slops by rain leaching and runoff to the receiving environment from a soil source to be defined. This test requires around 10 to 50 ml of product.
- 4- A gas exchange test allowing the potential volatilization of Slops into the atmospheric air from a soil source to be defined. This test requires around 10 to 50 ml of product.
- 5- Dose of the tracer identified (cobalt) in the description of the Slop production process.

If the quantity is sufficient, these analyses will enable the compounds constituting the Slops to be identified and quantified, with the following dual purpose:

- Establishment of toxicity

- Identification of tracers allowing the original Slops from the Probo Koala to be linked to the remainder in the Wastes still present on the sites identified or doubtful, and the receiving environment affected (by leaching of the soil source). In fact, the BNETD site works inspectors, representing the Ivory Coast State, pointed out that certain sites had already been used for the unauthorized dumping of hydrocarbons and other wastes before Probo Koala, particularly the Akouedo dump.

2.2.2.2 Toxicity of the Slops

This task was conducted based on the following information:

1. Safety data sheets provided by the Centre National d'Informations sur l'Intoxication [*National Centre for Information on Toxicity*] at the request of the Amsterdam Police, on the "components of the Probo Koala mixture" (notified by CIAPOL)
2. Specific search in the following specialist databases.

The analyses available on the Probo Koala Slops indicate several families of substances. The lack of sufficient values and analyses makes it impossible to establish a toxicological profile of the slops dumped. The different families of substances were therefore dealt with according to a radical plan. A summary of the toxicological and carcinogenicity data is provided in Annex 7.

According to the information provided by TRAFIGURA on the Slops from the Probo Koala, 2 phases were highlighted (aqueous and oily). The different substances or families of substances detected in these Slops are mainly:

- Sodium hydroxide;
- Mercaptans or thiols;
- Phenols and phenol derivatives (alkylphenols and thiophenols);
- Hydrogen sulphide (H₂S);
- Volatile hydrocarbons (C5-C11) including monoaromatic hydrocarbons;
- And disulphides;
- To which the cobalt catalyst is added.

Sodium hydroxide is a highly corrosive compound causing serious burns in the event of skin contact (projections, spillage, etc.) and accidental ingestion. Several cases of cancer of the oesophagus have been reported several years after the ingestion of sodium hydroxide.

Mercaptans or **alkanethiols** are compounds harmful by inhalation and are readily flammable. The main routes of exposure to alkanethiols are inhalation and ingestion. The main manifestations of intoxication are connected with the irritating effect of the products on the skin and ocular and respiratory mucosa. Many experiments have been conducted on chronic exposure and have not indicated that any dose has no effect. In all cases, signs are minor and affect the blood and cardiovascular vessels.

Phenol and its derivatives are compounds that are toxic on inhalation, on contact with the skin, on ingestion, harmful on inhalation and ingestion and corrosive (causing burns). These substances penetrate the body quickly by all routes, mainly via the skin. The seriousness of skin intoxication depends on the period of contact, the extent of the area exposed and the concentration of the solution. The symptoms of intoxication appear quickly in the form of headaches and even death caused by respiratory failure. Locally, phenol and its derivatives (cresols, etc.) have a caustic action on the skin and mucosa and may result in necrosis.

According to current knowledge, phenol is not considered to have carcinogenic and reprotoxic effects by the EU (no classification). Several studies conducted in the professional environment report cases of chronic intoxication by phenol known as phenol marasmus. In severe cases, the liver and kidneys are affected and death may result. Phenol derivatives are classified by the US-EPA as possible carcinogens but they have not been classified by the European Union, or by the WHO which considers there is insufficient data to judge their carcinogenic potential.

Hydrogen sulphide (H₂S) is a highly toxic gas, extremely flammable and dangerous to the environment. It is mainly absorbed by inhalation. The effects observed following acute exposure are essentially connected with the irritating and anoxiant properties of the gas ranging from irritation of the mucous membrane and the respiratory system from 5 ppm to death over 500 ppm. No study has shown any carcinogenic or genotoxic effect attributable to hydrogen sulphide. Hydrogen sulphide is not classified by the EU for its reprotoxic effects. In general, the long-term effects due to exposure to low concentrations have not been studied in depth. The nervous system remains the main target organ.

According to the analyses at our disposal, several types of fairly complex **hydrocarbons** were established, which are fairly light (C5-C11). The main routes of exposure vary depending on the class of hydrocarbons in question. In the case of the analyses obtained, these hydrocarbons are fairly volatile (C5-C11) and the main route is inhalation. Hydrocarbons such as white spirit, special petrols, light aromatic solvents and lamp oils (kerosene) are harmful on inhalation and ingestion and are readily flammable for petrols. Different hydrocarbons produce more or less reversible different types of effects on human beings, including eye, skin and respiratory irritation but also symptoms such as headache, nausea, loss of appetite, etc. and neurological effects. Several cases of cancers and effects on reproduction have been established for certain hydrocarbons. However, none of these studies indicated any direct relationship between exposure to the hydrocarbons alone and the effects observed.

Monoaromatic hydrocarbons, including benzene, toluene and xylene, were indicated. The main route of exposure to monoaromatic hydrocarbons is inhalation, followed to a lesser extent by ingestion and skin contact. They are readily flammable and toxic in the event of prolonged exposure, by skin contact and by ingestion. These compounds share the same acute toxicity of all hydrocarbon solvents. Their ingestion causes digestive and neurological problems and inhalation pneumopathy. Skin contact causes irritation and ocular projection into the eye causes corneo-conjunctival irritation. Benzene is currently the only monocyclic aromatic hydrocarbon (MAH) considered to be carcinogenic to human beings.

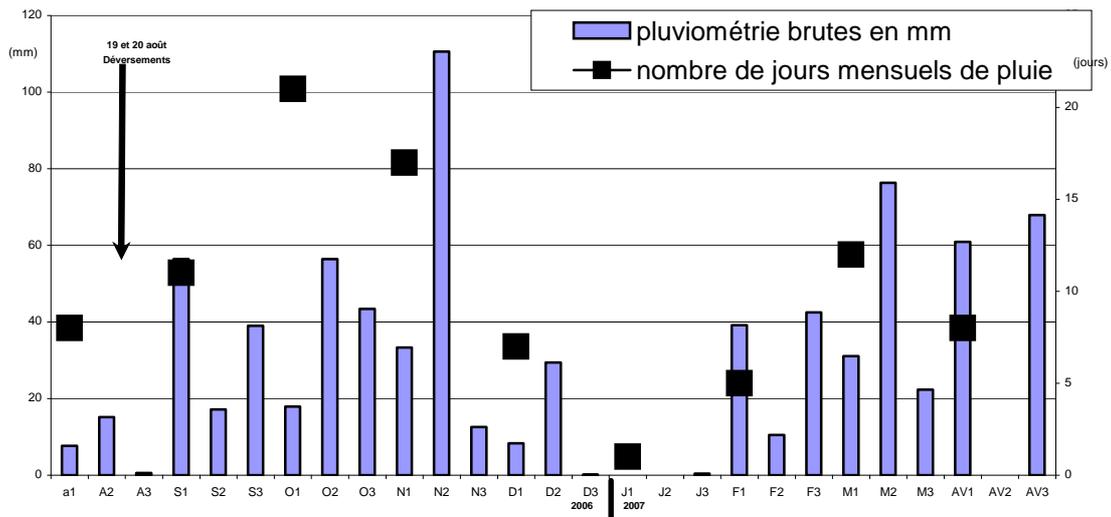
No toxicological data has been obtained at this stage on sulphides (disulphides and derivatives) or on the additional compounds detected during the analyses (alcohol derivatives: 2-methoxyethanol, methylenecyclopentanemethanol, dimethylcetamide, dimethylthiophene, etc.).

2.2.2.3 Potential impact of the Wastes

1- Pluviometry

The days of the dumping, 19 and 20 August, were followed by a period of several days of rain shown on the chart below, with the height of rain in mm and the number of days of rain in the month.

This resulted in leaching of the soils where the dumpings had occurred, thus causing the soluble compounds to spread into the water, partly seeping into the soils, and partly towards hydraulic and topographical routes (pits, ditches, drainage systems, etc.).



Graph showing pluviometry in (mm) and number of days of rain per month between August 2006 and April 2007

[Legend:]

19 and 20 August

Gross rain in mm

Dumpings

Number of days of rain per month

2- Potential impact on the population

The main means of exposure identified in relation to the description of the Wastes originating from the Slops available are as follows:

- Inhalation of volatile compounds. The odour, which is considered to be a nuisance, may also be included in this means,
- Direct ingestion of compounds, from potentially polluted water pumped into the private wells for domestic use, from polluted soils when people exposed do not take care to wash their hands, or from polluted water from the drinking water supply network. SODECI informed us that type C3 sampling and analysis campaigns have been conducted on two occasions since last summer, on the untreated water collected for the water supply; these analyses, made at SAUR in France, did not indicate the presence of micro-pollutants. Two other laboratories appointed by the Ministry have also conducted a statutory control analysis, once a year. SODECI took samples from 20 points on the AEP supply network with analyses of H₂S, Pb, HAP, COHV and heavy metals. The 2 campaigns carried out would have shown an absence of the compounds sought.
- Skin contact with the soils or liquids affected by the Slops or Wastes, during the excavation or labouring works on the crop soils.

3- Potential impact on the receiving environment

- Ground water resources: in the area of Abidjan, the geology of the subsoil can be simplified by describing the strata found from top to bottom:
 - Reddish sandy-clayey formations on the surface with a maximum thickness, on the high plateaux, of more than 50 m. It disappears at the southern limits of the area of Abidjan.
 - Fine and semi-coarse sands with an average thickness of around 30 m, with clayey channels in places that may exceed around ten metres.

- Coarse sands that may be more than 50 m thick, with a few clayey channels, then a second formation of semi-coarse and fine sands constituting the basis of the sedimentary series.
- Maestrichtian Cretaceous formations found at a depth of some 125 m. They are formed of alternations of limestones and sandstone limestones with an average thickness of around 40 m.
- The old substratum of the platform composed of Birimian shales and graywacks.

The series known as the Continental Terminal (CT) comprises the first three series. According to the measurements of the depths of the static levels of the aquifers, it would appear that the first two summital formations are very often outside the water table. The use of the CT water table is shown in the following table:

	SODECI	Industrial uses	Village hydraulics	Semi-urban hydraulics	Private structures
Volume collected in m ³ /year	80,000,000 (9 harnessing fields)	Between 1,000,000 and 1,500,000	220,000	880,000	132,000

Table of withdrawals identified in the aquifers (according to SODECI-SOGREAH report, April 1996)

The situation of the SODECI catchment fields is shown in figure 1.

There are also many private structures bored into the surface formations for domestic use but these are difficult to list in full. CIAPOL drew up a list of these catchment points for the purposes of its monitoring campaigns conducted since the dumpings.

These structures harness small local water tables completely disconnected from the drinking water resource harnessed at depth, which is isolated from the surface by several protective clayey formations.

The shallow private wells situated in the area affected by the dumpings are thus vulnerable. A cartographic report on these structures was requested of BNETD on a topographical base.

According to the topography of the natural terrain, the water courses are positioned as a drain for the accompanying water table. The lagoon constitutes an outlet for the Continental Terminal water table.

The overall piezometry (according to the SODECI-Sogreah report) is attached. It shows the overall runoff from the north towards the south, with local deviations created by the draining along the main river courses.

Several piezometers exist in the area of Abidjan and are regularly monitored by SODECI.

- Several receiving canals connected with the runoff of surface water are identified. These are rainwater and waste water collection pits, the Djibi water course (downstream from the Alépé road site) runs eastwards into the Adjin lagoon to the north of Bingerville, the rainwater reservoir on the Dokui plateau downstream from the Coco Service site (Abobo) that runs into the Cocody lagoon which is also an outlet for a group of sewage drains. The surface water network is dry in the dry season, apart from Djibi, mentioned here, and the downstream stretch of the Banco.

Downstream from the surface runoffs from Alépé road site 2, there is a fish farm that has been closed owing to the death of the fish noted after the dumpings, without any causal connection being established. This farm uses a branch and pools of the Djibi, which collect the surface and sub-surface runoff water that may be affected by the leaching of soils polluted by the dumping. Water analyses will be planned on this farm specifically.

We also noted the existence of several dumpings of various wastes and unauthorized dumping, particularly in the sector running from Cocody to Abobo (see photo). The leaching of these wastes

by the rain contributes towards polluting the rainwater drainage network, making it even more difficult to identify traceability between the Slops, the Wastes and the receiving environments.



[View of a waste dump along the roads and neighbouring houses](#)

A simplified diagram of the main sewage discharge identified in the lagoon is provided in Annex 8. There are few samplings and analyses to monitor the quality of the receiving canals outside the lagoon. A Burgeap report financed by SODECY in 2002 on the study of the environmental impact of sewage in Abidjan allows an initial point to be made (before the dumpings of slops from the Probo Koala) on the quality of this lagoon. It was drawn up based on campaigns in January 1983, and then completed in January/February 2002; with regard to the micro-pollutants, the following is noted (pages 29, 30, 77 and 78):

"The chemical pollution of the lagoon by organic and mineral micro-pollutants may have originated from industrial wastes containing toxic substances (soda, acid, mineral oils, pigments from textiles industries, heavy metals from metallurgy workshops, glycerines from soap factories, arsenic from hide tanning workshops, etc.), agricultural pollutants (pesticides) used on the agro-industrial crops in the basin and port activities (hydrocarbons and heavy metals)...

the sediments of the Banco, Cocody, Marcory and Biétry bays contain more than 1000 µg/g (or mg/Kg) of total hydrocarbons of anthropic origin ... by contrast, no contamination by hydrocarbons in the rural areas of the lagoon is noted...

significant concentrations of organochlorides (DDT and its metabolites, lindane, PCB) were measured...

In the urban area, the concentrations of heavy metals are significantly higher than those observed in the rural environment...

In 2002, in general, the results of the analyses indicate a certain level of contamination of sediments, both by heavy metals (particularly Cd, Cu, Cr, Pb and Zn) and by organic micro-pollutants (hydrocarbons, PCB, organochloride pesticides)...

For the organic micro-pollutants, the analyses show several molecules of hydrocarbons and organochlorides for which the concentrations are higher than the detection threshold of 0.01 µg/g (or mg/Kg)...the concentrations of DTT (0.4 µg/g) are higher than those of 1983 (0.12 µg/g)..."

2.2.3. Identification of areas at risk

2.2.3.1 List of sites identified

The sites identified are the object of summary data sheets attached. Certain sites identified were not used for the direct dumping of Slops but were affected by another point, mainly by the runoff into a pit or rainwater collection network (Akouedo 3, Okui plateau, Koumassi purification canal and Vridi 2 canal).

Several sources of information were collected:

- A list from BNETD with the 15 sites from which the Wastes were removed and possible restoration works undertaken.
- A map produced by UNOSAT on 18 September 2006 referring to 17 sites.
- A list drawn up by CIAPOL referring to 18 sites and dumping points.

The following table provides a comparison between these lists:

Sites	UNOSAT	BNETD	CIAPOL	Observation
ABOBO ²		AB07 (VII.1)	Plate 1 Bakery, underground tank?	
	2.2, 2.3 and 2.5	ABO2 (VII.2 and VII.2 b)	Coco Service galley 1 and 2	
	3.1	ABO3 (VII.3)	Behind railway: waste land and forest	
		ABO5 (VI.1?)		
	4.1 and 4.2	ABO1 (III.1) (Alépé road zone 1?)		
	5.1	ABO4 (III.2) (Alépé road zone 4 thalweg?)		
AKOUEDO	1.1	AK1 (I.1)	Bottom of dump	
	1.2	AK2 (I.2)	Tanker lorry	
	1.3	AK3 (I.3)	Leachate pond	This is a point of impact and not of dumping
KOUMASSI	Discharge into tank and purification channel 10.1	KOUM1	Tanker for transportation of HCs or drainage products	
			Purification channel, outlet for pit at point	This is a point of impact and not of dumping
MACA	7.1	MACA1 (II.1)	Tarmac road corridor point	
	6.2	MACA2 (II.2)	1,000m corridor point	
	6.1	MACA3 (II.2)	1,050m corridor point on pit at roadside	

² The Abobo sites are difficult to define according to the names given by the 3 Ivory Coast organizations. There may still be confusion in the interpretation of the daily works monitoring reports, which do not specifically distinguish sites AB01, AB2, AB3, AB4, ABO5 and ABO7.

		MACA4 (II.3)	1,500m corridor point on pit at roadside and forest	
		(II.3)	1,500m corridor point on pit at roadside and verge	
VRIDI	Vridi postal sorting office .81	VRIDI (IV.1)	Cap Logistique, concrete rainwater channel	
	Canal site no. 2 – 9.1	(IV.2)	Collecting channel close to only office	This is a point of impact and not of dumping
ALÉPÉ ROAD	Abattoir 4.1	See Abobo	Point at 500m from Abobo municipal abattoir	BNETD classified these sites with Abobo
	Abattoir 4.2	See Abobo	Point at 900m from municipal abattoir	
	Alépé road 5.1	See Abobo		
DOKUI PLATEAU	Abobo 2.1	Abobo (VI.1)	Water retention point downstream of Coco Service	This is a point of impact and not of dumping ⁽¹⁾
Total	17	15	18	

List of sites with probable correspondence according to the different documentary sources

A table summarizing the sites on which intervention has been carried out by TREDI is provided in section 2.2.4. It should be noted that it is difficult to match the names of the sites between BNETD (between the list of tonnages and daily control reports), CIAPOL and UNOSAT, which adopted different, variable numbering depending on the people in those departments.

2.2.3.2 Approach to identification of doubtful sites to be confirmed

To identify the existence of other possible dumping sites, we have gathered together several sources which, at one time or another, have centralized complaints from residents or information concerning them:

- Civil Protection, which was responsible for centralizing calls from people disturbed by the nuisance connected with the dumpings.
- Information retrieved on a SODECI map prepared internally, to locate the points of spillage on the same map as the drinking water points and the water quality surveillance piezometer network.
- The list of lorries from the Barro agent responsible for the inquiry into the discharge and spillage of the contents of the ship Probo Koala.
- The observations made by the BNETD and CIAPOL technical teams during the works involved in removing the Wastes.

The following points arise:

- Water retention on the Dokui plateau: the report presented by the BNETD representative on 10 October 2006 in the presence of the Chairman of the Youth of the Dokui Plateau states "Inspection of the water retention basin, the tank and the water course did not indicate the presence of any toxic wastes". However, BNETD and CIAPOL informed us of complaints from residents in connection with characteristic odours.

³ The report presented by the BNETD representative on 10 October 2006 in the presence of the Chairman of the Youth of the Dokui Plateau states "Inspection of the water retention basin, tank and water course did not indicate the presence of any toxic wastes"

- A point used by lorries for dumping waste from septic pits on the Abobo road suspected of being used for emptying a tanker of Slops.
- The Cocody Bay waste water and rainwater outlet. It should be noted that the initial statement presented on page 15 records the badly degraded quality of this receiving environment, where it is almost impossible to attribute a specific impact connected with the dumpings, the hydrocarbon and organochloride load is so high in the sediments analysed before the dumpings.
- The Civil Protection Authority identified an area around the Police School where several complaints were identified. The olfactory nuisance was connected with the rising of odours from the sewage network that presented several faults in the area (Burgeap report for SIDE CY 2002, page 55), and the presence of several household waste depots.
- The map consulted at SODECI which identified 3 sites on a map showing the establishment of the catchment fields. These are the GESCO Corridor, N'DOTRE and the Police School (Riviera 2).
- MACA 2bis, reported by the BNETD/CIAPOL team, during the works carried out to restore the grass verge of the road along the MACA2 dumping site.

2.2.4 Analysis of actions taken in the areas at risk identified

Site	Identification	Waste removal works (expressed in tonnes)				Samples taken (SGS)	Analyses made forwarded
		Big bags	Bins	Isotanks	Drums		
Abobo	ABO1	1670.766				X	
	ABO2	233.439				X	TREDI
	ABO3	209.191				X	
	ABO7	249.959	1.155	11.64	276.389		
Alépé road	ABO5	21.547				X	
	ABO7	249.959	1.155	11.64	276.389	X	
Akouedo	AK1			34.24	43.013	X	TREDI
	AK2	341.125	10.712	77.08	45.849	X	
	AK3	894.371	626.189	655.441	68.753	X	
KOUMASSI	KOUM1	123.988			2.018	X	
MACA	MACA1	55.756				X	
	MACA2	18.843				X	
	MACA3	50.424				X	
	MACA4	613.272					
VRIDI	VRIDI	121.53	2.408	157.81	73.809	X	

Total	6762.507	763.807	936.211	859.712
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Grand total: 9322.237 tonnes

Summary table of Waste removal works from the sites investigated by TREDI. In general, drums and "bins" were used to recover the Wastes in the form of sludge, Isotanks to recover the liquid Wastes and big bags to store the solid Wastes (soils).

It should be noted that the works carried out on the Alépé road sites are classified by BNETD in Abobo.

The Oléatech site, used for the temporary storage of containers, Isotanks and lorries requisitioned by the Public Prosecutor of Abidjan, accommodates (at the time of our visit at the beginning of May) several containers and 3 isotanks whose exact content was unable to be revealed to us.

Liquid and soil samples were taken by an expert, Mr Eberentz, and by CIAPOL and BNETD, on the ship and on the various sites identified, before and after removal of the Wastes dumped by TREDI. According to the Banny national commission report, the CIAPOL samples of Slops were "products dumped on the quay during pumping" and not from the Probo Koala ship directly.

With regard to the dumping sites, we were able to identify (particularly during our meeting with the TREDI representatives in Paris on 29/05/07) several series and batches of samples:

- A control batch taken by BNETD;
- A third party control batch taken by SGS;
- An internal control batch taken by TREDI;
- A series taken by the expert Mr Eberentz;
- A series taken and analysed by the French Civil Protection Authority.

On the date of preparing this report (31/05/07), only the results of the analyses conducted by CIAPOL, SIR, the French Civil Protection Authority and those available from the Prefecture of Isère had been provided. The latter were provided within the scope of the application of the statutory provisions of the licence to import these Wastes into France.

To date, the following series of analyses have not been notified to us:

- A series of sealed soil and liquid Waste samples (SLOPS)
- A series of soil and liquid Waste samples at SGS and BNETD
- A series of soil and liquid Waste samples at TREDI (other than the results provided by the Prefecture of Isère)
- A series of samples of Slops and soil and liquid Wastes held by the expert, Mr Eberentz

as well as the sample of Slops taken by CIAPOL "from the ship" and placed under seal.

2.3 Proposed field investigation plan – Phase 2

2.3.1 Topographical survey of the storage sites

This action is contemplated on those sites on which additional work will be recommended. The aim is to draw up a current list of places with an estimate of the amount of soils to be disposed of.

2.3.2. Additional identification proposed for all identified and doubtful sites

Site	Designation	Samples to be taken					
		solids	liquids	Sludges/sediments	Ground waters	Surface waters	Atm air / soils
IDENTIFIED SITES							
Abobo	ABO1	-	-	-		-	
	ABO2 (Coco service)	3	-	3		3 (water courses)	1/5
	ABO3	-	-	-		-	
	ABO7	-	-	-		-	
Alépé road	ABO5	3 (bottom)	-	-	-	-	
	ABO4	10	-	2	2 (fish farm)	2 (fish farm)	1/15
Akouedo	AK1	-	-	-		-	
	AK2	-	-	-		-	
	AK3	5	2	2		-	1/10
KOUMASSI	KOUM1	-	-	-		-	
MACA	MACA1	-	-	-		-	
	MACA2	-	-	-		-	
	MACA2bis	3	-	-		-	
	MACA3	-	-	-		-	
	MACA4	-	-	-		-	
VRIDI	VRIDI	-	-	-		-	
DOUBTFUL SITES TO BE CHECKED							
MACA2 b		5	-	-	-	-	-/10
Dokui plateau		-	-	2	-	2 (retention_	
Cocody lagoon		-	5	5	-	-	
Abobo waste water discharge						-	
Police School		-	-	3	-	-	
GESCO		5				-	-/10
N'DOTRE		5				-	-/10
Sewage network leading to the Cocody lagoon		-	-	10	-	-	
Total		41	7	27	Supply of 15 samples	7	3/60

The soil samples will be taken from the borings made by hand auger or from the borings made by power shovel, depending on the nature of the terrain, the accessibility and the depth to be reached. Each sampling point will be the object of 3 lots packed and labelled as follows:

- lot 1: an in situ analysis in the head space of the soil gases (see following paragraph). This same lot will also be used to detect any olfactory traces in separate premises from the sampling site;
- lot 2: a first laboratory analysis (mercaptan, hydrocarbons, BTEX, HAP, heavy metals, COHV, total sulphur, Cobalt (catalyst used for the slop));
- lot 3: if the sample presents interesting analysis results, a second more detailed analysis will be made of lot 3.

We have planned 41 soil analyses in the laboratory.

The semi-quantitative analyses of the soil gases will be carried out in situ with the head space method with Drager colorimetric tubes (Mercaptan, H₂S, petrol hydrocarbons). We have planned to conduct **85 in situ analyses**, to be able to select the soil samples to be analysed in the laboratory.

The atmospheric gas samples will be taken on establishing the site of the soil samplings on the sites considered. A rod fitted with a pump will take air samples for a whole day on an activated carbon tube. The air flow will be measured and the analysis will be made following extraction over the activated carbon. The same gases will be dosed: mercaptan, H₂S, total hydrocarbons. We have planned **3 samplings** with analyses.

The samples of the surface waters and ground waters will be taken from the streams potentially affected by the dumping sites, from the private wells identified by CIAPOL or from certain piezometers accessible to SODECI. We have planned to take **15 samples** which will be taken on representative structures according to reliable documentary information.

Sediment samplings are planned:

- in certain pits or water courses (Coco service) affected by the dumpings;
- in certain manholes of the sewage network (Police School);
- on the Dokui retention;
- at the outlet to the Cocody lagoon;
- in a pond on the fish farm (Alépé road);
- in the sludge of the Akouedo dump pond.

27 analyses are planned.

2.4 Reminder of the general plan of the Audit

BURGÉAP's service will cover 14 weeks. The estimated plan is shown below, the starting date being fixed at 07/05/2007.

Weeks	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Phase 1 : documentary study	■	■	■											
phase 1 report				■										
Phase 2 : field investigation					■	■	■	■	■	■	■			
Topography					■	■	■							
Samples						■	■	■						
analyses							■	■	■	■				
report											■			
phase 3 : definition of aims to be achieved												■	■	
final report and non-technical summary														■
Presentation meeting				▲			▲				▲			▲

The duration of phase 2 of the field investigations is given by way of indication as it may vary depending on the number of sites to be investigated.

This duration only takes into account the services fully managed by BURGÉAP. Any consequences connected with other participants must be added.

ANNEXES

Annex 1:

Terms of reference pursuant to section 2.2 of the Heads of Agreement signed on 13/02/07 by the Ivory Coast State and TRAFIGURA parties

Annex 2:

Schedule of the documents to be collected for phase 1 of the audit

Annex 3:

Reproduction of the site plan documented by the UNDAC field team dated 12 to 17 September 2006

Annex 4:

Data summary sheets on the dumping sites or sites affected by the dumpings inspected

Annex 5:

List of documents collected from the organizations involved in the dumping sites

Annex 6:

Analysis of a sample of liquid waste taken from the Akouedo dump, the 2 analysis result forms including the different titles, times and dates.

Annex 7:

Toxicological data on the compounds identified in the various Slops and Wastes characterisation analyses.

Annex 8:

Plan of the Abidjan sewage network - Diagrams of the main collector and main dumpings into the lagoon, as well as the results of analyses of the lagoon sediments taken from the Burgeap – SODECI report, Environmental impact study on the Abidjan sewage – April 2002

Annex 9:

Copy of the analyses supplied by Trafigura and by the French Civil Safety Authority – list of samples taken by Mr Eberentz and by sealed samples

Annex 10:

Extract from the newspaper "L'intelligent d'Abidjan" dated 06/03/2007.