Claim No: HQ09X02050

IN THE HIGH COURT OF JUSTICE

QUEEN'S BENCH DIVISION

BETWEEN:-

Trafigura Limited

Claimant

v

British Broadcasting Corporation

Defendant

REPLY

SERVED 20 NOVEMBER 2009

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Ref: AT/IH/dxm/13609.5

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B E T W E E N : -

TRAFIGURA LIMITED

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SUMMARY OF REPLY PURSUANT TO CPR 16 PD 1.4

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1. In its Reply, Trafigura disputes the BBC's case on meaning, which Trafigura submits is unsustainable.

2. The Reply sets out fully Trafigura's case that none of the chemical constituents of the Slops can have been released in quantities and in a manner sufficient to cause any toxicological injury.

3. By contrast, the case advanced by the BBC concerning the alleged health consequences of the dumping (including the BBC's allegations of deaths and miscarriages) is largely unparticularised. However, insofar as it is possible to discern, the BBC's case appears in large part to be dependent on the premise that the *Probo Koala* Slops contained large quantities of hydrogen sulphide, which was then released in lethally dangerous concentrations.

Hydrogen Sulphide

4. In support of the allegation that the Slops contained hydrogen sulphide, the BBC relies on an analysis of the composition of the Slops by the Nederlands Forensisch Insituut ("NFI"). However, the BBC's allegations – both in their Defence and in the broadcast complained of - are based on a fundamentally flawed reading of that analysis.

5. The NFI analysis (which Trafigura agrees is the best available evidence of the composition of the Slops) states that the Slops were highly alkaline, with a pH of 14. At such an alkalinity the Slops simply could not have contained hydrogen sulphide in its molecular form. Hydrogen sulphide could only have been released from the Slops following the addition of large quantities of concentrated acid. There is no evidence whatsoever of any such significant acidification event. On the contrary, contemporaneous testing in Abidjan

showed that the Slops remained alkaline during the relevant period. There was therefore no question of any release of hydrogen sulphide at levels posing any harm to human health.

Alleged Deaths

6. The BBC in its Defence alleges that sixteen individuals were killed by exposure to the Slops. In relation to four of those individuals, no particulars are given which could support a conclusion that their deaths were caused by exposure to the Slops.

7. In relation to the other twelve individuals, the only particulars relied on are purported post mortem test results, which are said to show the presence of hydrogen sulphide in samples taken from the bodies of the individuals. However, those test results, even if accurate, provide no support for the allegation that the cause of any of the deaths in question was hydrogen sulphide poisoning. The tests were carried out several months after death, when the bodies were in a state of decomposition. Decomposition produces hydrogen sulphide. The BBC have put forward no other particulars to support any conclusion that the individuals in question died as a result of exposure to hydrogen sulphide.

8. Even if the deaths referred to above *were* caused by hydrogen sulphide (and there is no proper evidence that they were), then it cannot have come from the Slops. The evidence-based approach set out in the Reply and summarised below demonstrates that hydrogen sulphide simply could not have been released from the Slops in harmful (let alone lethal) quantities.

9. The parties were agreed in the Group Litigation that the Slops could not have caused deaths, and indeed the solicitors for the claimants in the Group Litigation have withdrawn their earlier allegation to that effect.

10. Despite alleging in the broadcast complained of that the Slops had killed a 16 month-old child (Ama-Grace Kouadio), the BBC does not seek to justify this allegation, despite the fact that it is still being published on the BBC website.

Alleged Miscarriages/Intra-Uterine Deaths

11. No particulars are given by the BBC to support their assertion that the intra-uterine deaths alleged to have been suffered by the two women named in the Defence were caused by exposure to the Slops.

12. As set out in the Reply, vapours from the Slops were simply not sufficient to cause toxicological injuries, let alone miscarriages or intra-uterine deaths as the BBC allege.

13. The chronology and sequence of events stated by the BBC in the Defence in relation to the two women in question, even if established, does not support, or even lend any credence to, the conclusion that the deaths of their babies were caused by exposure to the Slops, rather than any of the many other potential causes of intra-uterine death.

Alleged Serious/Chronic injuries

14. The BBC does not name a single individual whom it alleges suffered a serious or chronic injury. It does not attempt to justify the allegation that the injuries of the severely disfigured woman whose photograph illustrated (and continues to illustrate) the Article complained of was injured by exposure to the Slops. The BBC relies for its case on serious and chronic injuries on a single epidemiological study which is, on its face, completely inadequate to justify the allegations made.

The Evidence-Based approach

15. The Reply provides an evidence-based approach to the question of causation, examining the detailed composition of the Slops, the quantities in which they were released at the three sites mentioned by the BBC, and the environmental and weather conditions at the time. Taking those factors into account, dispersion modelling demonstrates conclusively that the Slops could not have caused toxicological injuries, let alone the deaths, miscarriages and deaths of babies, disfigurement or serious and chronic injuries alleged by the BBC.

Other Matters

16. The BBC attempts to justify a number of allegations which are not even complained of in these proceedings. As a matter of law and proportionality, Trafigura disputes the BBC's entitlement to do so.

17. The criticisms of the Claimant's conduct before 19 August 2006 are denied. The Claimant acted responsibly and in good faith in entrusting the disposal of the Slops to a licensed sub-contractor in Abidjan which had been recommended to it by an experienced shipping agent.

18. The criticisms of the Claimant's conduct after 19 August 2006 are denied. The statements by or on behalf of the Claimant which are criticised by the Defendant were made in good faith and were in all material respects true. The Claimant has consistently stated, since as early as September 2006, that the Slops did not contain and cannot have released hydrogen sulphide in lethal or dangerous concentrations. That is based on contemporaneous independent testing and has been shown to be true.

20 November 2009

TRAFIGURA LTD
–and –
BRITISH BROADCASTING CORPORATION

INDEX TO REPLY

IN THE HIGH COURT OF JUSTICE **Claim no: HQ09X02050**

QUEEN'S BENCH DIVISION

B E T W E E N : -

TRAFIGURA LIMITED

Claimant

and

BRITISH BROADCASTING CORPORATION

Defendant

REPLY

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1. In this Reply, unless stated otherwise or apparent from the context:

   1.1. references to paragraph numbers are references to paragraph numbers in the Defence;

   1.2. abbreviations and definitions used in the Defence are adopted; and

   1.3. the Claimant is referred to as "Trafigura" and the Defendant as "the BBC" in order to avoid confusion with the parties in the Abidjan Personal Injury Group Litigation ("the Group Litigation").

SECTION A: MEANING AND CONTINUED PUBLICATION

2. Trafigura joins issue with the BBC on its untenable attempt in paragraphs 3, 4 and 7 of the Defence to diminish the gravity of the defamatory allegations of which Trafigura complains.

Miscarriages

3. The BBC denies in paragraph 3 that the Programme meant or was understood to mean that the material dumping by Compagnie Tommy sarl ("Tommy") caused *"numerous"* miscarriages. That denial is unsustainable, in light of the following:

3.1. Jean Francois Kouadio from Akouedo was the first resident of Abidjan interviewed by the BBC's journalist;

3.2. it was alleged that he and his wife had lost both of their babies as a result of the dumping;

3.3. no indication was given in the Programme that the experience of the Kouadios was an isolated occurrence or due to any particular susceptibility or special circumstances;

3.4. in relation to another village, Djibi, the allegation was made by the BBC that *"every last person"* fell ill and the head of village was reported as saying *"there were women who miscarried"*; and

3.5. John Hoskins, the chemist whose view was presented as being based on a true account of what was dumped in Abidjan, was reported as saying that the material dumped would cause *"mass sickness"* and that, in the more severely poisoned, *"It's not very hard to imagine that if a woman, a pregnant woman is poisoned that her body reacts by aborting the foetus"*.

4. The inference will be invited that the BBC seeks to play down the obvious meaning of the words complained of in relation to miscarriages because it cannot justify what was broadcast.

Deaths of babies

5. The BBC does not seek to justify the meaning complained of, and contained in the Programme, that the material dumped by Tommy caused the deaths of babies.

6. The Programme laid the death of the infant Ama Grace Kouadio in December 2007 squarely at the door of Trafigura. Her photograph was shown to viewers twice. Her death 16 months after the dumping was used to provide support for the Kouadios' fear that they *"may never become parents"*.

7. The Defence not only does not attempt to justify the allegation that the death of Ama Grace was caused by the dumping, but it does not even provide any basis to believe or suspect that that was the case. Despite that, the Programme containing the allegation continues to be published on the BBC's website.

8. The BBC's treatment of the case of Ama Grace reveals a continuing reckless disregard for the truth of its output and belies the moralising in paragraph 3 concerning the ethical significance of every death. It will be relied on in support of Trafigura's claim for an injunction, in order to restrain the continuing publication by the BBC of claims which it does not even purport to be able to justify.

Severe and chronic effects

9. The BBC denies in paragraph 3 that the Programme meant or was understood to mean that the dumping caused *"very severe illness with long term chronic effects in tens of thousands of people"*. In paragraph 7 the BBC refuses to admit that the website Article meant or was understood to mean that the dumping caused *"serious disfigurement, as well as severe and continuing illness in up to 100,000*

people". That denial and that non-admission are unsustainable, in light of the following:

9.1. the allegations in the Programme that the material contained in the slops tanks of the *Probo Koala* ("the Slops") was *"highly toxic"*, *"poisonous"* and *"very dangerous"*, and contained material which *"can kill on contact"*, was *"deadly"* and *"lethal"*;

9.2. the allegations in the Programme that *"tens of thousands became sick"*, that *"every last person"* in the village of Djibi fell ill and the speculation that the incident was the *"biggest incident of its kind since a cloud of gas escaped from the Union Carbide plant in Bhopal in India and killed thousands of men, women and children in its path"*;

9.3. the allegation in the Article that *"up to 100,000 people fell sick"*;

9.4. the allegations in the Programme that Ama Grace died as a result of exposure to the slops 16 months after the dumping, that the Kouadios feared they may never become parents and that *"over a long period there will be long term effects because these things are chronically damaging and once you damage maybe your lungs or your liver or your kidneys that damage will not recover"*;

9.5. the allegations in the Article that *"many are still suffering"* and *"still today people are sick"*; and

9.6. the photograph illustrating the Article of the severely disfigured woman with the caption *"Thousands of people say they were victims of the waste."*

10. As with miscarriages and deaths of babies, the inference will be invited that the BBC seeks to play down the obvious meaning of the words complained of in

relation to the extent, severity and chronic nature of the injuries alleged to have been caused because it cannot justify what was published.

11. The inference is unavoidable in relation to at least two aspects of the defamatory meaning complained of, namely:

    11.1. serious disfigurement, there being no attempt to justify the allegation that the woman in the photograph received her injuries from the Slops. In fact the condition which the woman in the photograph is highly likely to be suffering from is *lupus erythematosus*. This is an autoimmune condition. Severe cutaneous manifestations of the condition are a particular problem for Afro-Caribbeans. The condition is worsened by exposure to sunlight. The condition could not have been caused or aggravated by exposure to the Slops; and

    11.2. chronic injuries, no individual with such an injury being identified in the Defence and the high point of the BBC's case on injury being an epidemiological report for which data collection ended in January 2007.

12. Again the BBC continues to publish the allegations identified above, despite it not attempting in this litigation to maintain that they are true. Its conduct in this respect will be relied on in further support of the need for an injunction.

The settlement of the Group Litigation

13. The BBC's conduct in continuing to broadcast unjustifiable allegations is all the more reprehensible in light of the public recognition by the claimants, the claimants' solicitors and the Judge in the Group Litigation that the independent experts appointed for both sides in that litigation were unable to identify any link between the Slops unlawfully dumped by Tommy and miscarriages, serious or chronic injuries or deaths.

14. On compromising the Group Litigation the claimants in the Group Litigation, and their solicitors Leigh Day & Co, joined with Trafigura in making the following public joint statement:

> *The parties have since August 2006 expended considerable time and money investigating in detail the events in Abidjan in 2006. As part of that process, in excess of 20 independent experts in shipping, chemistry, modelling, toxicology, tropical medicine, veterinary science and psychiatry have been appointed to consider all the issues relating to those events.*
>
> *These independent experts are unable to identify a link between exposure to the chemicals released from the slops and deaths, miscarriages, still births, birth defects, loss of visual acuity or other serious or chronic injuries. Leigh Day and Co, in the light of the expert evidence, now acknowledge that the slops could at worst have caused a range of short term low level flu like symptoms and anxiety.*
>
> *From these investigations, it is also clear that there are many claims which have been made for symptoms, in some cases perhaps understandably, which are unconnected with any exposure to the slops.*
>
> *In light of the expert evidence, Leigh Day & Co withdraws the comments made on its website on 8 November 2006 and subsequently, which alleged, among other things, that the slops had caused a number of deaths and miscarriages. Trafigura and Leigh Day & Co have accordingly resolved the libel proceedings brought by Trafigura.*
>
> *Leigh Day & Co deny that any of their clients have made any deliberately false claims. In the light of assurances given to their senior leading counsel and in view of his advice, Leigh Day withdraw any allegation that there has been impropriety on the part of Trafigura or any of its legal advisors, (including Macfarlanes) in investigating the claims.*
>
> *Leigh Day & Co acknowledge the substantial assistance that Trafigura provided to the Government and people of the Côte d'Ivoire, including the provision of medical supplies and payments for de-contamination of dumpsites and the establishment of a compensation fund.*

It remains Trafigura's position that it did not foresee, and could not have foreseen, the reprehensible acts of Compagnie Tommy in dumping the slops in and around Abidjan in August and September 2006, and that Compagnie Tommy acted entirely independently of, and without any authority from, Trafigura. Nevertheless Trafigura regrets this incident and is pleased that the matter has now been resolved.

15. The Group Litigation lasted the best part of 3 years and involved an exhaustive analysis of the composition and potential and actual effects of the Slops. The trial of the Group Litigation was due to begin in October 2009 with a time estimate of 10 to 12 weeks. Mr Justice MacDuff, who was due to try the case, said the following on 23 September 2009 at a public hearing in which he endorsed the agreement settling the Group Litigation:

It will not come as a surprise to anybody to know that I have been following what has been happening in the media, both in the newspapers and on television and radio. I have myself witnessed how wildly inaccurate some of the statements have been. It can all be put right with the final joint statement. Speaking for myself I hope that the members of the press who have reported this hitherto and who have made statements which now turn out to be wrong will take note of the joint statement.

... my concern as I read the media reports in recent times was that I knew from my reading of the papers that the experts were quite clear. The slops could not give rise to the sort of symptoms and illness which was being claimed in some of the press reports. I hope that the media will take account of the joint statement and put things right and put things in perspective. I need say no more, except to underline that, from where I sit and from what I have seen of the papers, the joint statement is 100 per cent truthful.

16. The libel action brought by Trafigura against Leigh Day & Co over allegations made on the Leigh Day & Co website and elsewhere was settled by Order dated 23 September 2009 on terms which included Leigh Day & Co undertaking not to repeat the words complained of or any words or images containing the same or

similar allegations defamatory of Trafigura and to publish the joint statement, withdrawing those allegations, on its website for a number of weeks.

17. Inaccurate press reporting of the incident, particularly of the alleged toxic effects of the Slops and of the allegation that people had died as a result of exposure is recognised to have contributed to the fear and anxiety suffered by the population.

18. For example, the UNDAC report on their activities in Abidjan between 11 – 19 September 2006 ("the UNDAC Report") stated that *"local media fuelled public fear, including of UN and international staff, through alarmist claims of health effects."*

19. The BBC's Programme and Article, and their continuing publication in light of the above, are further examples of this alarmist reporting and as such are contrary not only to the public interest, but to the interests of the people of Abidjan.

SECTION B: JUSTIFICATION

Allegations concerning Trafigura's conduct

20. The BBC has chosen to justify allegations of which complaint has not been made in this action, namely criticisms of Trafigura's conduct before Tommy dumped material from the *Probo Koala* around Abidjan and criticisms of Trafigura's public response after that dumping.

21. Because very serious allegations against Trafigura, its employees and its representatives have been made in those parts of the plea of justification, they are answered below.

22. However those parts of the Reply are pleaded without prejudice to Trafigura's contention that the BBC is not entitled to seek in this way to justify allegations which are not complained of and which, even if proved, could not justify the central sting of the publications complained of, namely that Trafigura caused

multiple deaths (including the deaths of babies) and miscarriages, as well as serious and chronic injuries, including disfigurement, in up to 100,000 people. Such an approach is impermissible as a matter of law, and, in the context of these proceedings, vastly disproportionate.

23. This Reply will address first the BBC's case on the allegations complained of concerning the effects of the dumping on the people of Abidjan, then deal with the further allegations raised by the BBC concerning Trafigura's conduct before and after the dumping.

SECTION B1: CONSEQUENCES OF THE DUMPING

Comparative methodology

24. In order to assess whether the Slops caused the serious and chronic injuries, miscarriages and deaths alleged, the Court will have to assess what allegedly injured individuals were exposed to, in what amounts, for how long and with what likely effects. That approach is impossible on the basis of the facts and matters pleaded in the Defence, which are accordingly incapable of justifying the allegations made by the BBC. An approach based on the evidence as outlined below demonstrates that the allegations made by the BBC are unsustainable.

The BBC's approach

Deaths

25. The Defence alleges that 16 named individuals were killed by exposure to the Slops.

26. In relation to 4 of the individuals, no particulars whatsoever are given which could support a conclusion that their deaths were caused by exposure to the Slops.

27. In relation to 12 of the individuals, the only particulars relied on are test results said to show the presence of hydrogen sulphide in samples taken from the decomposing bodies of the individuals several months after death.

28. As explained below, those test results provide no support whatever for the allegation that the cause of any of the deaths in question was hydrogen sulphide poisoning, let alone that any such deaths were caused by exposure to the Slops.

29. Even if it was assumed that the deaths *were* caused by hydrogen sulphide, the evidence based approach set out below demonstrates that hydrogen sulphide could not have been released from the Slops in harmful (let alone lethal) quantities.

30. The parties were agreed in the Group Litigation that the Slops could not have caused deaths. The solicitors for the claimants in the Group Litigation have undertaken not to repeat the allegation that the Slops caused deaths.

Miscarriages

31. The Defence alleges that 2 named individuals suffered a "miscarriage" as a result of exposure to the Slops. This term is misused by the BBC; in fact the allegations are of intra-uterine or intra-partum death.

32. The Defence does not attempt to particularise what substance either woman was exposed to when in pregnancy, in what quantities, or for how long. Such information is necessary in order for the Court to determine whether the severe symptoms allegedly suffered by the women at the time (which are in turn not particularised) could or were likely to have been caused by exposure to the Slops.

33. The evidence based approach set out below demonstrates that exposure to the Slops could not have caused toxicological effects sufficient to induce miscarriage or the intra-uterine deaths alleged.

34. The parties were agreed in the Group Litigation that exposure to the Slops could not be linked to miscarriage. The claimants in the Group Litigation (who included the 2 women identified in the Defence) confirmed in early May 2009 that no claim based on miscarriages was any longer being made.

Injuries

35. The BBC has failed to identify any individual whom it alleges has suffered an injury short of miscarriage or death as a result of exposure to the Slops (despite the fact that BBC journalists visited Abidjan several times before publication and despite a BBC lawyer having visited Abidjan since publication in order to collect evidence[1]).

36. The BBC's case on causation of injuries is purely epidemiological, i.e. it relies on an alleged correlation between data said to have been provided by those who reported symptoms and the alleged potential toxic effects of the Slops, as set out in the Institut National d'Hygene Publique Epidemiological Report relied on in paragraphs 4.55 – 4.59 ("the INHP Report").

37. In the context of the events in Abidjan none of the available epidemiological analysis is of any assistance in determining whether the reported injuries were caused by exposure to the Slops.

38. The BBC's epidemiological case is unsustainable for a number of reasons explored further below.

39. The evidence based approach set out below demonstrates that exposure to the Slops is highly unlikely to have caused any toxicological effect or injury, let alone the serious and chronic injuries and facial disfigurement alleged by the BBC.

[1] In his witness statement of 27 July 2009 Mr Attfield of the BBC's legal department said it had been decided that a BBC lawyer should visit Côte d'Ivoire "in order to obtain the most comprehensive information".

40. The parties in the Group Litigation were agreed that no link could be identified between exposure to the Slops and any serious or chronic injury.

The evidence based approach

41. There were around 30,000 claimants in the Group Litigation. In order to facilitate a trial of the issue of causation 22 of those claimants were selected by the parties as Lead Claimants. The Lead Claimants lived and worked in a variety of different locations in and around Abidjan and claimed to have suffered from a variety of alleged symptoms.

42. The locations in and around Abidjan where the Lead Claimants lived and worked (and the distances from the locations where the Slops were dumped) could be identified with precision. That information, combined with information concerning the composition of the Slops, the estimated quantity and timing of Slops dumped at each location, the surface area, location and depth of the Slops after dumping, the pH of the Slops and how it changed over time and the environmental and weather conditions, especially wind speed and direction during the relevant periods, enables modelling by Trafigura of the likely concentrations, if any, of chemical compounds originating from the Slops to which each Lead Claimant was allegedly exposed.

43. Any uncertainties in the information listed in paragraph 42 above have the potential to cause uncertainties in the estimated concentrations of chemicals to which the Lead Claimants were allegedly exposed. However, the relevant data are sufficiently reliable that (i) certain of the variables in question can be specified with precision (location of dumpsites, quantities of Slops dumped, home and work locations), (ii) other variables can be specified by making assumptions that would tend to overestimate chemical concentrations and so, for the purposes of this analysis, err in favour of the allegation that the Slops caused injury (surface area of the Slops) and (iii) others can be specified such that any uncertainty can be assessed and bounded by sensitivity studies (timing of dumping, chemical

species in the Slops, pH, meteorology). A result can thereby be obtained which is both robust, and which also gives the benefit of any reasonable doubt to the allegation that the Slops caused injury.

44. It is therefore possible to assess whether any Lead Claimant was exposed to chemical compounds released from the Slops at concentrations likely to lead to any toxic effect.

45. That approach demonstrates that the Slops provide no toxicological explanation for any of the symptoms complained of by any of the Lead Claimants, including those who lived closest to the locations where the Slops were dumped.

46. That conclusion, coupled with the other available evidence outlined below, demonstrates conclusively that the Slops cannot have caused, and did not cause, the deaths (including deaths of babies), miscarriages, serious disfigurement and widespread serious and chronic injuries alleged by the BBC.

47. Without accepting any reversal of the burden of proof, which remains on the BBC, Trafigura outlines below the substance of the facts and methodology which lead to that conclusion, with particular emphasis on the only three locations of exposure specifically identified by the BBC in the publications complained of and/or the Defence, namely:

47.1. Akouedo (where Fidele Posson, the wife of Jean Francois Kouadio, lived);

47.2. Djibi (where it was alleged that all 2000 residents of the village fell sick, with 3 dying and women suffering miscarriages); and

47.3. Dokui (where Ahou Emie Martine Diby lived and where Dr Louya reported symptoms[2]).

[2] The Particulars of Claim at page 4 incorrectly transcribes Dokui as "Docuielle".

48. One or more of the Lead Claimants in the Group Litigation lived in each of those locations.

49. The likely level of exposure of the Lead Claimants who lived closest to and/or were most heavily exposed to vapours from dumpsites in each of those locations (using the figures, methods and assumptions described) is set out below.

50. At such levels of exposure the Slops could not have caused any toxicological effect, serious or chronic injuries, disfigurement, miscarriage (or intra-uterine death) or death.

Composition of the Slops

51. The best evidence available of the composition of the Slops is the analysis carried out by the Netherlands Forensic Institute ("NFI") in Amsterdam. That was common ground in the Group Litigation.

52. To the extent that the BBC relies in paragraphs 4.19 and 4.72 of the Defence on the accuracy of the NFI analysis (which was at the heart of the BBC's claim in the publications complained of to have uncovered *"just what was really dumped"*) those paragraphs are accordingly admitted and averred.

53. It is therefore unnecessary and would be disproportionate to examine the processes to which the coker naphtha bought by Trafigura in the USA was subjected on board the *Probo Koala* in order to determine what was dumped by the independent contractor Tommy in Abidjan. To the extent that such processes form part of the BBC's case on the conduct of Trafigura they are examined briefly below in paragraphs 298 – 313.

54. The Slops contained an aqueous phase and a hydrocarbon phase. The aqueous phase is the product of the caustic washing process, correctly described as

"spent caustic"[3]. The hydrocarbon phase is washed naphtha, a proportion of which was drawn off into the slops tanks with the aqueous phase to ensure that all of the aqueous phase was removed from beneath the naphtha in the cargo tanks.

55. The likely chemical composition of the aqueous and hydrocarbon phases of the Slops (drawn primarily from the NFI analysis) is set out in Appendix 1 (which is the same as the amended Appendix 13 to Trafigura's Defence in the Group Litigation referred to and relied on by the BBC at paragraph 4.72).

56. The claimants in the Group Litigation also based their case on the NFI analysis but drew somewhat different conclusions about the composition of the Slops. The major difference between the rival cases being the claimants' allegation that the Slops contained a further 45 tonnes of sulphur, thereby maximizing the quantity of materials in the Slops which could potentially cause injury.

57. The Group Litigation claimants' case on the composition of the Slops is set out as Appendix 2 to this Reply.

58. The Group Litigation claimants' results are disputed by Trafigura, for reasons which will be explained if necessary, if and when the BBC states a properly particularised case on the composition of the Slops. However, even on the Group Litigation claimants' case as to the composition of the Slops, any release of chemicals from the Slops was not such as to cause any toxicological injury at the levels to which the Lead Claimants were exposed, let alone the deaths, miscarriages, intra-uterine deaths, disfigurement or serious and chronic injuries alleged by the BBC.

[3] The use of the term *"spent caustic"* is acknowledged by NFI in their report of 29 January 2007 to be in accordance with international norms. The Dutch language report refers to the aqueous phase of the Slops by the English term 'spent caustic'. This is explained in a footnote to paragraph 2.1.3 thus (in translation): "*The English term is used here because this is used internationally for these waste streams* "

Hydrogen sulphide: presence in the Slops

59. The Slops did not contain any measurable amounts of hydrogen sulphide. This is demonstrated by the NFI analysis.

60. The NFI analysis recorded that the Slops were highly alkaline, with a pH of 14. The high alkalinity would be expected due to the presence of high concentrations of caustic soda (sodium hydroxide solution).

61. In an alkaline solution, at around pH 10, any dissolved hydrogen sulphide (if present) would dissociate into bisulphide ions (HS^-). At pH greater than 10, the bisulphide ions will begin to dissociate further into sulphide (S^{2-}) ions. In a highly alkaline solution (pH 14) no hydrogen sulphide would be expected to be present in its molecular form.

62. There is no justification for deducing from the section of the NFI analysis, which appears to show the hydrogen sulphide content of the Slops as 0.5%, that approximately 2 tonnes of hydrogen sulphide was disposed of on the streets of Abidjan. The NFI report, in addition to stating the high alkalinity, shows any such interpretation to be incorrect.

63. Qualitative analysis of the sample labelled "1.004" taken from the port slop tank of the *Probo Koala* was undertaken by NFI. The results are given in table 5 of the *"Analytical Chemical Investigation"* section of the report. That table states that headspace gas chromatography analysis showed the gas hydrogen sulphide. However, it is clear from the report that this only occurred following acidification of the sample (i.e. the addition of acid in the laboratory in order to change the pH from highly alkaline to highly acidic). The section of the report introducing table 5 states as much:

> *In the results in table 5 it should be noted that hydrogen sulphide, mercaptans, phenols and thiophenols were shown in the acidic extract in the form stated in table*

5. In the alkaline watery phase of the sample these components appear in the alkaline form, as sulphide, mercaptide, phenolate and thiophenolate.

64. Quantitative analysis of sample 1.004 was undertaken by Intertek Caleb Brett. Their results sheet (appended to the NFI report) states that the 0.5% hydrogen sulphide result was obtained by using test method UOP 163.

65. UOP 163 is a method of measuring the presence of sulphide in a liquid. The method requires all identified sulphide to be reported as hydrogen sulphide, whether originally present as sulphide or hydrogen sulphide.

66. The NFI analysis therefore indicated the presence of 0.5% sulphur as sodium sulphide and sodium bisulphide in solution within the aqueous Slops and, by reason of the pH results, ruled out the presence of hydrogen sulphide in the aqueous phase.

67. The NFI analysis did not record the presence of any hydrogen sulphide in the hydrocarbon phase of the Slops.

68. The NFI analysis is consistent with analysis of samples of the cargoes of coker naphtha from PMI loaded onto the vessels *Seapurha*, *Moselle* and *Seavinha*. Such samples were analysed by independent inspectors at the time of loading onto those vessels. The analyses showed that the naphtha did not contain measurable concentrations of hydrogen sulphide, which was reported as "<1ppm".

69. In paragraph 4.46 the BBC relies on the CIAPOL/SIR analysis as showing a *"very high"* content of hydrogen sulphide in the Slops. The CIAPOL/SIR results are not a reliable analysis, for the following reasons (in addition to those set out above):

69.1. the sample was taken from material said to have been dumped on the wharfside in Abidjan and not from the Slops tanks themselves, with an obvious potential for cross contamination;

69.2. there is no indication in the results about how the sample was collected or how it was stored between being collected and tested;

69.3. there is no indication in the results as to the method of testing, particularly whether the presence of hydrogen sulphide was recorded as a result of an acidification process or a process which required all sulphides to be measured as hydrogen sulphide;

69.4. the CIAPOL/SIR analysis is said to have contained 2.5% by volume of olefins and 46.1% by volume of aromatics. However the NFI analysis of the hydrocarbon phase of the Slops (sample 1.001 taken directly from the starboard slop tank of the *Probo Koala*) showed 36.4% by volume of olefins and 5.1% by volume of aromatics;

69.5. moreover, the CIAPOL/SIR results show hydrogen sulphide at 6129 mg/kg, or approximately 0.61%. That is approximately 22% higher than the 0.5% hydrogen sulphide stated on the face of the NFI report. The amount of mercaptan sulphur said to have been detected by CIAPOL/SIR was 1287mg/kg or around 0.13%. That is 27 times lower than the 3.5% of mercaptan sulphur identified by NFI; and

69.6. the CIAPOL/SIR sample was therefore either not from the Slops at all, or was heavily contaminated.

70. In paragraph 4.19.4 the BBC relies on an allegation that the *"hydrogen sulphide meters"* of the Dutch police investigation team were *"hit hard"* on 3 July 2006 in support of its case that the Slops contained hydrogen sulphide. Trafigura is not aware where the words quoted are taken from, and no document containing those words has been disclosed by the BBC, however:

70.1. The results which the BBC appears to be referring to were discounted by NFI, whose report stated the following:

According to the police investigation team, hydrogen sulphide "penetrated" only metres away from employees of APS on 3 July, which would have meant that the hydrogen sulphide concentrations were higher than 100ppm. Because there is no information about the meters what were used or the method of measurement, this figure was not used.

70.2. On 4 July 2006 the multi-component gas detection meter of police sergeant SH De Hahn did not sound an alarm until placed 10 cm directly above the open hatch of the port slop tank of the *Probo Koala*. The warning emitted by the meter was as a result of low oxygen, high carbon monoxide and high hydrocarbon levels (as to be expected immediately above a tank containing hydrocarbons). The hydrogen sulphide figure recorded was 9ppm. That result is most likely to have been caused by mercaptan interference. Cross sensitivity is well known in such detection meters. In any event at 9ppm hydrogen sulphide poses no threat to human health.

71. Further, an analysis commissioned by Trafigura by the independent Saybolt laboratory in Rotterdam on one of four samples apparently taken from the Slops at the Petroci jetty in Abidjan, returned the result that no measurable hydrogen sulphide was identified above 1 ppm.

72. As can be seen from Appendix 2, the Group Litigation claimants accepted that at pH 14 the chemical species which could form hydrogen sulphide under acidic conditions would be present as bisulphide.

73. The allegation in paragraph 4.72 of the Defence that the description in Appendix 13 of Trafigura's Defence in the Group Litigation was deliberately misleading in that it sought to *"draw attention away from hydrogen sulphide"*, is accordingly denied. The allegations in that paragraph are dealt with in more detail below at paragraphs 410 - 417.

74. In the premises, the BBC's complete misunderstanding of the chemical composition of the Slops, and hence their effect on the people of Abidjan, was a fundamental error vitiating the entire basis of its reports.

75. Not only did the Slops not contain hydrogen sulphide in its molecular form, but there is also no evidence to suggest that the conditions at any of the Abidjan dumpsites were sufficiently acidic at the time to generate hydrogen sulphide from the Slops at concentrations that could conceivably cause harm to human health. Any release of hydrogen sulphide would have been gradual and at low concentrations. Potential release of hydrogen sulphide from the Slops is considered below.

Properties of the constituents of the Slops

Levels of exposure: odour, toxicological effect and death

76. A summary of the concentrations at which the main relevant compounds or species of compound potentially hazardous to human health can begin to cause physiological and toxicological effects through atmospheric exposure, and the concentrations at which they can cause death through such exposure, is set out below.

Compound	**Lowest atmospheric concentration associated with demonstrable effect in man irrespective of duration of exposure**	**Atmospheric concentration associated with accidental death in man if exposure maintained**
Hydrogen sulphide	10+ ppm	500 – 700 ppm
Mercaptans	50+ ppm	Only one reported death. Animal data suggest hundreds of ppm.
Disulphides	125+ ppm	Hundreds of ppm
Naphthalene	10+ ppm	Oral lethality at 1,000 – 6,000 mg. No deaths recorded via

		inhalational exposure.
Benzene	100+ ppm (based on long term exposure)	7,500 ppm
Ethyl benzene	50 ppm	Hundreds of ppm
Toluene	50+ ppm	Thousands of ppm
Xylene	50+ ppm	Thousands of ppm
Phenol	60 ppm	250 ppm (IDHL LD_{50})
Hexane	500+ ppm (chronic study: peripheral neuropathy)	No deaths recorded.

77. The above compounds were released from the Slops well below levels at which it is conceivable that mixtures of the compounds would increase the individual effect of any one compound or have an overall increased effect.

78. Metabolism of the compounds in question at low levels of exposure is rapid and recovery from any physiological effect is also rapid. The compounds under consideration do not accumulate in the body and are thus not *"chronically damaging"* as alleged in the Programme.

79. It is the case that these compounds are detectable as odours at very low concentrations. The following table sets out, in relation to each potentially hazardous vapour, the concentration at which that vapour is detectable as an odour.

Chemical	**Approximate Odour Perception Threshold**
Hydrogen Sulphide	From 0.02 parts per billion (ppb, parts per thousand million) for the most sensitive. 60% of the population detects at 8 ppb.
Mercaptans	
Methyl Mercaptan	3 ppb
Ethyl Mercaptan	0.19 ppb
Propyl Mercaptan	0.75 ppb

Butyl Mercaptan	6 ppb
Sulphides	
Dimethyl Disulphide	8 ppb
Dimethyl Sulphide	1 ppb
Oxygenated Compounds	
Dimethyl Sulphone	10 ppb
Dimethyl Sulphoxide	100 ppb
Thiophenol	0.3 ppb
Phenol	50 – 5000 ppb
Hydrocarbons	
Naphthalene	0.3 – 0.9 ppm
Benzene	1.3 – 4.7 ppm
Ethyl benzene	2.3 ppm
Toluene	0.64 ppm
Xylene	0.06 ppm

80. As is obvious from the above, the statement in the United Nations OCHA Report 5 of 14 September 2006 that *"[t]he smell is already detected by the human nose at concentrations far below danger levels"*, was correct. In the same Report OCHA observed further *"[t]his may lead to a false impression of toxicity."*

The BBC's allegations of toxicity

81. In paragraph 4.11 of the Defence (and subparagraphs) the BBC alleges that the constituents of the Slops were, variously, *"toxic"*, *"highly toxic"* or *"highly toxic/hazardous"*. Elsewhere in the Defence allegations are made concerning the *"toxic"*, *"notoriously toxic"*, *"dangerous"*, *"lethal"*, *"deadly"* or *"damaging"* nature of the chemicals and compounds in question.

82. A description of a substance such as that quoted above has no useful content in the absence of an account of the route of exposure to the substance (inhalation, ingestion or skin contact) and the dose (particularly quantity, concentration and period of exposure).

83. Any substance is toxic when taken in sufficient dose and, even for compounds which have the potential to cause serious damage to human health, there is a dose below which there is no toxic effect (as set out above in the table under paragraph 76).

84. By way of example:

84.1. hydrogen sulphide occurs naturally in hot springs, is produced during the decay of organic materials and occurs naturally in the human body; and

84.2. mercaptans also occur during the decomposition of organic material and are added to odourless natural gas and bottled gas to give it a distinctive warning smell.

85. In the premises, each allegation in the Defence concerning the *"toxic"* nature of the Slops and their constituents, and each allegation to a similar effect, is denied.

86. In several of the subparagraphs under paragraph 4.11 it is alleged that the substance in question is hazardous to humans by direct skin contact or by ingestion. In paragraph 4.58 the BBC relies on symptoms reported in the INHP Report as being consistent with exposure by ingestion or direct contact.

87. Given the lack of particularity, it is not clear from the Defence whether the BBC alleges that in fact any individual in Abidjan was injured by ingestion of, or direct contact with, the Slops. It is notable that there is no attempt to allege that the woman whose badly disfigured face continues to illustrate the website Article was injured by contact with the Slops (or indeed by any other method of exposure). She was not, as explained above at paragraph 11.1.

88. If such a case is made (and proper particulars are given of it) it will be denied.

89. Any exposure route other than airborne exposure was abandoned by the claimants in the Group Litigation in January 2009.

90. Trafigura pleads as follows to the BBC's case on the constituents of the Slops and the potential outcomes of human exposure to the compounds identified (which, taken in isolation, for the reason given above, is no guide as to the potential effect of the Slops on human health).

91. Paragraph 4.11 is admitted, save as stated above at paragraphs 81 – 85, and;

91.1. the concentrations at which the primary hydrocarbon constituents of the Slops could begin to have toxicological effects through airborne exposure are set out above;

91.2. sodium hydroxide can only present a potential health hazard by direct contact. It has a high boiling point and low vapour pressure such that it would not be emitted from the Slops as a vapour; and

91.3. the unspent catalyst was present in the Slops in very low quantities and was not volatile. As such it presented no danger to human health.

92. Paragraphs 4.11.1 and 4.11.5 are admitted, save as stated above at paragraphs 81 – 85, and:

92.1. highly malodorous mercaptans were present in the naphtha, which was the reason for the caustic washing. Mercaptans only begin to cause toxicological effects in man through airborne exposure at the concentrations set out above. They are detectable as odours at much lower concentrations. There is only one recorded death worldwide in the scientific literature resulting from exposure to mercaptans;

92.2. the caustic washing process converted much, but not all, of the mercaptans in the naphtha into sodium salts of mercaptans, known as mercaptides or sodium alkanethiolates;

92.3. mercaptides are highly soluble in water and would have migrated from the hydrocarbon phase to the aqueous phase. Mercaptides are not volatile and would not have been released from the Slops as a vapour; and

92.4. as the Slops slowly became less strongly alkaline, through dilution and/or reaction with carbon dioxide in the atmosphere, the mercaptides would have converted back into mercaptans which would then have been released gradually as a malodourous gas.

93. Paragraphs 4.11.2 and 4.11.3 are admitted save as stated above at paragraphs 81 – 85. Sodium hydrosulphide is another name for sodium bisulphide. Sodium sulphide and sodium bisulphide were the compounds measured in the Slops by NFI using the UOP 163 test. They are solids which are soluble in water and non-volatile. They could not have been produced from the Slops as vapour save by slow conversion into hydrogen sulphide gas through a gradual decrease in alkalinity.

94. As to paragraph 4.11.4:

94.1. paragraphs 81 to 85 above are repeated;

94.2. it is admitted that the hydrocarbon phase of the Slops contained dialkyl disulphides;

94.3. the only disulphides found by NFI in significant proportions in the Slops were diethyl and methyl isopropropyl disulphide. Both can be used as food additives. Diethyl disulphide is a component of some pesticides and scents. It has a smell described as garlic or burnt rubber; and

94.4. it is denied that dimethyl disulphide was identified or contained in the Slops in any significant concentrations.

95. Paragraph 4.11.6 is denied. The Slops did not contain hydrogen sulphide in its molecular form, as explained above.

96. Paragraph 4.11.7 is admitted save as stated above at paragraphs 81 – 85. Phenols have low volatility and would only have been present as salts in the highly alkaline Slops.

97. As to the final unnumbered sub paragraph under paragraph 4.11:

97.1. the first sentence is denied. The sulphides such as those present in the Slops (sodium sulphide and sodium bisulphide) are not volatile. The potential for hydrogen sulphide to be generated from those compounds is dependent on the alkalinity of the solution. The Slops were highly alkaline. Hydrogen sulphide is only a *"breakdown compound"* in the sense that acidification of such sulphides can result in the release of hydrogen sulphide; and

97.2. the second, third and fourth sentences are admitted. The generic propositions advanced in those sentences are of no assistance in determining what was released from the Slops in what concentrations and at what rate. Release of vapours from the Slops is dealt with below.

The quantities of Slops dumped at each location

98. In the UNDAC Report, 18 potential or suspected dumpsites were identified, and marked on a map attached to the report headed *"Carte des sites contamines"*. This is included as Appendix 3 to the Reply and it is also accessible at http://unosat.web.cern.ch/unosat/freeproducts/cote_d_ivoire/UNOSAT_toxique_abidjan_02oct06_v1_4_lowres.jpg

99. By way of the *"Further Particulars of the Claimants' Case on Causation"* dated 30 January 2009 the claimants in the Group Litigation stated their case on the amounts dumped at each of the locations identified by UNDAC.

100. The Group Litigation claimants' case was that 16 truckloads of Slops had been dumped, each truck containing approximately 33 cubic metres per truck of Slops with a broad similarity of content. A table setting out their case as to what was dumped where is attached as Appendix 4 to this Reply.

101. The dumpsites relevant to Dokui are referred to in the Appendix by the name of the Abobo district in which the Dokui quarter is located.

102. The table at Appendix 5 sets out an analysis of the amount of each of the constituents of the Slops dumped in and around the only 3 locations specifically identified by the BBC in the publications complained of or in the Defence, namely Akouedo, Djibi and Dokui. That analysis is based on the Group Litigation claimants' case on the constituents of the Slops and the amounts dumped in each location, and assumes that the Slops in each tanker load were homogenous, as did the claimants in the Group Litigation.

103. The table at Appendix 5 includes amounts of sediment. It was the case of the Group Litigation claimants that the Slops included sediments, namely 45 tonnes of sour sulphur, 43 (+/- 2) tonnes) of sodium mercaptides and 2 (+/- 2) tonnes of sodium bisulphide, and that those sediments would have been found in the slops tanks of the *Probo Koala*, transferred from the *Probo Koala* to the tankers hired by Tommy and discharged from those tankers into the environment.

104. The assertion as to sediments was (and is) denied by Trafigura, for a number of reasons, including the fact that NFI did not report finding any mercaptide sediment (and carbonate sediment was identified only after refrigeration of the samples). Trafigura reserves the right to plead further on this point if and when the BBC sets out an adequately particularised case on the composition of the Slops. For the purpose of the modelling outlined below Trafigura uses the data relied on by the Group Litigation claimants as to the composition of the slops and the amounts and proportions dumped in the locations in question.

Characteristics of the disposal sites and the estimated spill area

105. Having estimated the amount deposited at each site of the aqueous and hydrocarbon phase of the Slops an analysis of the character and topography of the disposal sites enables conclusions to be drawn as to the spill area. The size and nature of the spill area affects the rate of release of chemical vapours from the site. Each of the 3 locations specifically identified by the BBC in either the publications complained of or the Defence is dealt with in turn below. Trafigura reserves the right to plead further in relation to other alleged disposal sites, should the BBC present a properly particularised case on that issue.

Akouedo

106. Akouedo is a district in the east of Abidjan. For many years there has been a waste reception facility for large scale waste dumping in Akouedo. The site extends over several square kilometres of open land.

107. The primary alleged Slops disposal site at Akouedo (UNDAC 1.1) was at a bridge over a ditch which led to a pond into which the Slops flowed.

108. Taking into account the character and topography of the site (predominantly flat, with an open aspect and heavily vegetated) the impacted area can best be estimated as a hydrocarbon spill area of 1,046m^2 (a thin layer, providing fastest release) and an aqueous surface area of 360m^2, at an average depth of 0.5m.

109. The secondary alleged Slops disposal site at Akouedo (UNDAC 1.3) was by a pond at the South West entrance to the waste tip. A small amount of the Slops is thought to have leaked from a tanker parked at the position identified by UNDAC as 1.2 and would have collected at the 1.3 site. As the 1.2 site is only a few metres from the 1.3 site they can be considered together for the purposes of calculating the release rate of the Slops.

110. The likely spill area of the Slops at the Akouedo 1.3 site is a pool of aqueous solution which occupied a surface area of 56m^2 to a depth of 0.5m, with a surface layer of hydrocarbons extending to a spread of 200m^2.

Abobo Anador – Coco Service Ravine and Dokui Plateau

111. Three tanker loads of Slops were discharged at a site known as the Coco Service Ravine (UNDAC 2.2), close to Dokui Plateau. The liquid would have flowed down a steep slope from the roadside into a stream which after about 750m, gradually slowed down into stagnant pools. Hydrocarbons would have quickly evaporated from the stream.

112. The likely affected area at UNDAC 2.2 site was 750m^2 with the water having an average depth of 13cm.

Djibi

113. The village of Djibi is located to the North East of Abidjan, approached by the Alepe Road.

114. At UNDAC site 4.1 a tanker released Slops at the roadside from where they would have flowed down a gentle vegetated incline into soft sandy soil, slowing and stopping after about 100m in marshy wet ground.

115. The area from which the Slops would have been released was a pool about 20m by 10m with a depth of 10cm. The hydrocarbon Slops would have evaporated from a larger area occupying around 500m^2.

116. UNDAC site 5.1 is around 100m to the North of the 4.1 site along the Alepe Road. The Slops were discharged from the roadside into a steep gulley parallel to the road which then ran into a gently sloping ditch.

117. The area impacted by the Slops is best represented by a gulley 250m long, 1m wide with a depth of 10cm. The hydrocarbons would have evaporated from an area around $500m^2$.

Release of chemicals from the Slops

118. In order to assess the likely level of the exposure of the residents of Abidjan to chemicals in the Slops, it is necessary to determine the likely rate and duration of the release of vapours from the various spill areas. Neither ingestion nor direct contact are plausible routes of exposure, and were not pursued in the Group Litigation (see paragraph 89 above).

119. The most significant chemical compounds presenting a potential health hazard in their gaseous form (as identified in the table under paragraph 76 above) were hydrogen sulphide, mercaptans, organic disulphides and volatile hydrocarbons (including aromatic hydrocarbons). Each is dealt with in turn below.

Hydrogen sulphide: release from the Slops

120. The (highly alkaline) Slops did not contain hydrogen sulphide, as explained above. In solutions with pH values higher than around 10 the sulphur which might form hydrogen sulphide is present in the form of either bisulphide or sulphide. The proportion of hydrogen sulphide available for release at pH 14 is effectively nil.

121. In order for the Slops to have emitted quantities of hydrogen sulphide sufficient to cause any injury to human health, a significant amount of strong acid would have to have been added.

122. Approximately 187 litres of concentrated hydrochloric acid would be required to neutralize $1m^3$ of 10% caustic solution, or 2,957 litres for each $33m^3$ tanker load of Slops.

123. There is no evidence whatsoever of any such significant acidification event.

124. Investigations in respect of conditions in Abidjan at the time of the dumping of the Slops reveal that the conditions remained alkaline during the period of potential significant release.

124.1. CIAPOL surveyed the dumpsite at Akouedo on 21 August 2006 (the third day after dumping took place). CIAPOL reported the pH value at that time to have reached 10.5.

124.2. The report prepared by the French Civil Protection Team dated 13 September 2006 showed the soil at Akouedo to be between pH 9 – pH 10 (this sample was taken after the heavy rains on the night of 3/4 September 2006). The same report from the French Civil Protection Team reported an *"absence of hydrogen sulphide"* in samples taken on 9 September 2006.

124.3. TREDI undertook remedial works at the affected sites from around 17 September 2006 to the end of December 2006. The pH levels of 52 aqueous samples were tested. The average pH was 9.53. The TREDI samples were taken after the period of heavy rain reported on the night of 3 / 4 September 2006.

125. Paragraph 4.64 of the Defence (which alleges that samples were taken from the dumpsites analysed and found to contain approximately 8mg/l of hydrogen sulphide) is denied.

125.1. This allegation is taken from the report of Dr Pierre Manda of the Laboratoire de Toxicologie et Hygiene Agro-Industrielle dated 29 March 2007 ("the Manda Report").

125.2. The Manda Report does not indicate the date on which the samples were taken. It was not commissioned until 15 September 2006, so the sampling took place at least one month after the dumping, and probably longer. By this time clean up and remedial works would have materially changed the nature of the sites. As stated above, a complete absence of hydrogen sulphide was reported by the French Civil Protection team's analysis of samples taken from the Akouedo dumpsite on 9 September 2006.

125.3. The Manda Report does not indicate other than in very general terms the locations from which the samples were taken, nor that any steps were taken to ensure that the samples were taken from the precise locations either where the Slops were dumped, or where they may have drained after they were dumped.

125.4. The Manda Report indicates that the samples were either in liquid form (composed of *"water and mud"*) or solid form (composed of *"soil; crushed concrete powder"*). As such the samples were largely, if not wholly, composed of material which cannot have originated from the *Probo Koala*.

125.5. The Manda Report indicates that the samples were tested for presence of hydrogen sulphide in *"a slightly acid environment (pH = 6.8)"*. As stated above, acidification is required for the generation of hydrogen sulphide. The Report does not indicate the pH of the samples themselves. The evidence shows that the dumpsites remained alkaline throughout the period of potential significant release.

125.6. If the samples do indicate the presence of hydrogen sulphide, or substances which can release hydrogen sulphide, they indicate the presence of such materials in and around Abidjan from a source unrelated to material originating from the *Probo Koala*.

126. Over time the concentrations of sulphides and bisulphides in the Slops would have been reduced by environmental degradation (including oxidation and combination with iron in the soil to produce iron sulphide) and the gradual release of low concentrations of hydrogen sulphide. Gradual low level release of hydrogen sulphide poses no threat to human health whatever.

127. The half-life of hydrogen sulphide in air is short, from 0.23 to 2.3 days.

128. In the premises, the rate of release of any hydrogen sulphide gas is so low that no useful information on plume vapour lengths can be calculated.

Mercaptans

129. Mercaptans (including thiophenol), in common with phenols, cresols and inorganic sulphides and bisulphides in the aqueous phase of the Slops react with the alkaline caustic soda to produce salts of the chemicals which are not volatile and will not be released from the solution.

130. At the pH of 14 measured by NFI, only about 0.04% of the mercaptan content of the Slops would be in its free state and available for release.

131. A rapid release of mercaptans from the aqueous phase of the Slops would and could only occur if the alkaline chemicals in the liquid were rapidly neutralised by the addition of a strong acid in order to produce a much larger proportion of free, volatile mercaptans. There is no evidence whatever that the addition of large quantities of acid ever took place. Nor is there any evidence that acid was present at any of the dumpsites in a form, concentration or quantity sufficient rapidly to neutralise the Slops.

132. Dilution would slowly reduce the pH of the Slops (by 1 pH unit for every 10-fold dilution). The caustic solution will also slowly absorb carbon dioxide from the air which would also reduce the pH of the Slops.

133. As the pH is reduced more volatile mercaptans would become available for release. Those free mercaptans would evaporate into the atmosphere at a rate depending on environmental conditions, particularly windspeed. The overall quantity of mercaptans available for release would thereby reduce.

134. Taking into account the conditions at the dumpsites in Abidjan and the contemporaneous reports of the pH levels, an estimate of the most rapid likely reduction in pH over time (i.e. an estimate resulting in maximum rate of release of mercaptans) is as follows:

134.1. initial dilution immediately after dumping would reduce the pH from 14 to 13 (representing a 10-fold dilution);

134.2. after 12 hours the pH would drop to 12;

134.3. after 48 hours the pH would drop to 11;

134.4. the pH would drop to 10.6 after 72 hours;

134.5. after around 7 days the pH would drop to 10; and

134.6. after around 22 days the pH would drop to 9.5.

135. The period of heavy rain reported on the night of 3/4 September 2006 would have slightly diluted the remaining pools of liquid Slops and may have triggered a minor release of chemicals which had been absorbed into soil particles. However, the effect would have been minor, potentially increasing the range of the odour of the remaining Slops. The pH of the residues would not have been significantly changed, as further indicated by the fact that the TREDI samples taken after the rains recorded an average pH of 9.53.

136. Although a number of different mercaptans were present in the Slops, for the purposes of modelling their release ethyl mercaptan has been used as

representative of its class because to do so is likely to result in the release of the highest (and thus potentially most hazardous) concentrations of mercaptans.

Thiophenol

137. Thiophenol behaves in a similar fashion to mercaptans and sulphides. At a pH of 10.6 the proportion of thiophenol that would be in the free state would be 0.01%. There would be no significant concentrations of free thiopenol available for release into the atmosphere.

Phenols and cresols

138. A slightly larger proportion of phenols and cresols would be present in their free state than would be mercaptans at a corresponding pH.

139. However phenols and cresols are considerably less volatile than mercaptans and have a very much lower release rate from water. As such the rate of release of phenols and cresols would be very small.

Hydrocarbons

140. The hydrocarbon layer included organic chemicals (the aromatics benzene, naphthalene and xylene) and disulphides.

141. The time taken for the hydrocarbon pools created by the release of the Slops to evaporate would have been a matter of hours. The hydrocarbon phase of the Slops is likely to have evaporated completely by early on 21 August 2006.

142. It was the claimants' case in the Group Litigation that *"most of the hydrocarbons emanating from the naphtha would have become gaseous within a short time of the waste being dumped, and that within two days of the waste being dumped, the majority of these gases would have become airborne"*

(Claimants' Further Response to the Defendant's General Requests for Further Information under CPR Part 18 dated 31.10.08 "Additional response to 11 and 12").

143. For the purposes of the modelling, diethyl disulphide is used as the class representative as it is more volatile and would therefore maximize the calculated release rate.

Generic release rate modelling assumptions

144. The release rate for the compounds in question is calculated using the Estimation Programmes Interface Suite developed by the US Environmental Protection Agency (version 3.20 released in February 2007) for the aqueous layer and the ADIOS2 model developed by the US National Oceanic and Atmospheric Administration for the hydrocarbon layer.

145. Although a proportion of the Slops would have percolated into the soil on and around the sites where they were dumped, and significant natural degradation of the chemicals in question would have reduced the amount available, those factors are not taken into account in the modelling outlined below, in order to produce a modelling scenario for the estimation of exposure which is most likely to maximise the release of high concentrations of chemical compounds, and which therefore errs on the side of favouring (for the purpose of this analysis) the allegation that the Slops caused injury. The calculated exposure would have been lower had those effects been taken into account.

146. The fact that the hydrocarbon layer resting on top of the aqueous layer would have reduced the rate of evaporation from the aqueous layer, and so the concentration of the chemicals being released, is also ignored, for the same reason.

147. Global standard METARS weather data taken from readings at Abidjan airport is used in the release rate modelling. This data is also used for the dispersion modelling set out below.

148. Even taking into account the approach outlined above which uses assumptions favourable to the allegation that the Slops caused injury, and using the data advanced by the Group Litigation claimants as to the composition of the Slops and the proportions dumped in the various locations, Trafigura's modelling demonstrates that the Lead Claimants were not exposed to vapours from the Slops at levels which could have caused any toxicological effect.

149. Appendix 6 sets out the rates of release of the compounds in question calculated on the above basis in relation to the Slops disposal sites identified in and around Akouedo, Dokui and Djibi.

Release rates at Akouedo

150. The results for Akouedo (which received the largest quantity of Slops) show, in summary, as follows:

Mercaptans

150.1. The release of mercaptans started slowly due to the high pH of the solution.

150.2. The rate of release increased with the wind speed and as the pH decreased, but it was not until after about 36 hours after the first truck discharged, from about 6am on the morning of 21 August 2006 that the rate of release exceeded 20kg/hour.

150.3. As the wind speed increased during the day the rate increased, decreasing again as the wind speed fell in the evening.

150.4. The diurnal pattern continued and the mercaptans on the site were gradually depleted.

150.5. The rate of release decreased below 2kg/hour after 100 hours and thereafter continued to decrease.

Organic chemicals (disulphides, aromatics etc)

150.6. The organic compounds in the hydrocarbons evaporated with the bulk of the hydrocarbons. This release commenced as soon as each of the tanker trucks was emptied, in four stages overnight.

150.7. 95% of the hydrocarbons evaporated within 16 hours and the evaporation of all the organic species was completed at the same time.

Dispersion of the compounds from their release sites

151. Dispersion modelling used in order to calculate the dispersion over time of the chemicals identified above from their release sites over time is summarised below.

152. That modelling uses input data concerning:

152.1. the chemical source (including source location, configuration and local environment and chemical emission rate);

152.2. the characteristics of the surface over which the chemical is to travel (including roughness, wetness and solar reflectivity); and

152.3. meteorological data (including wind speed and direction, temperature, cloud cover and date and hour of day).

153. Using that input data a series of model algorithms are run, primarily meteorological algorithms and dispersion algorithms

154. An advanced Gaussian-type plume dispersion model known as the Atmospheric Dispersion Modelling System (ADMS) 4.1, developed by Cambridge Environmental Research Consultants, is used to achieve the results summarised below.

155. The ADMS model has been widely used across the world for a number of years by hundreds of users, including the Environment Agency, DEFRA, the Health and Safety Executive, the French Environmental Agency and the Chinese Ministry of the Environment.

156. Although ADMS is an advanced model, as with all dispersion models, there are some uncertainties inherent in the model algorithms. The most significant of these arise in calm or low wind conditions when the movement of the dispersing plume cannot be predicted with accuracy. For such conditions (or where there was no data available) the modeling is set up to provide for the maximum potential exposure (to give the benefit of any doubt, for the purposes of this analysis, to the allegation that the Slops caused injury) by allowing the dispersing plume to travel in all directions.

157. The model is used to calculate the hourly average concentrations of the particular chemicals in question at the locations of the homes and workplaces of the Lead Claimants. 8 hour and 24 average concentrations are also produced.

Exposure of the Lead Claimants at the three locations

158. At the levels of concentration indicated by Trafigura's modelling process outlined above, none of the Lead Claimants in the Group Litigation was exposed to the chemicals released by the Slops at sufficient concentration for sufficient lengths of time to have any toxicological effect.

159. The modelled exposure levels for the Lead Claimants are in fact in each case a very small fraction of the concentration thresholds for demonstrable toxicological effects (as set out above in the table under paragraph 76 above).

160. As stated above, there are uncertainties associated with any modelling process. However, the modelling of a number of different scenarios has shown the sensitivity of model predictions to different model input parameters. This has confirmed that the difference in results produced by differing model parameters is a very small fraction of the difference between the chemical concentrations associated with toxicological effects and the modelled concentrations, and as such applying differing model parameters does not in any way materially affect the conclusion at paragraph 158 above.

161. Given the lack of particularity in the BBC's case, specifically the complete failure to name any individual who is alleged to have suffered an injury short of death or miscarriage, the failure to give any information on the basis of which the exposure of those alleged to have died could be assessed, and the non-specific information given in relation to Ms Posson and Ms Diby, it is not possible to conduct useful modelling on the information contained in the Defence.

162. In order to respond to the extent and gravity of the allegation which the BBC makes on the basis of such insubstantial material, Trafigura sets out below its modelled exposure of the Lead Claimants who lived closest to and/or were most heavily exposed to vapours from the dumpsites at each of the 3 locations specified by the BBC in the publications complained of or in the Defence.

163. The fact that those Lead Claimants were not exposed to vapours from the Slops at a level sufficient to cause any toxicological effect, demonstrates that the allegations made by the BBC are unfounded.

Akouedo

164. Lead Claimant 5 ("LC5") is the Lead Claimant who lived closest to the Akouedo dumpsites, and was the most heavily exposed of the Lead Claimants to chemical plumes from those sites. He lived 266m from the Akouedo 1.1 dumpsite, 745m from the Akouedo 1.2 dumpsite and 770m from the Akouedo 1.3 dumpsite.

165. The modelling process outlined above indicates that the hourly average exposure (in ppm) to chemicals from the Akouedo dumpsites over a period of 120 hours peaked at the home of LC5 at the following concentrations:

Chemical	**Concentration (ppm)**
Mercaptans	0.58
Disulphides	3.4
Hydrocarbons	
Benzene	0.35
Naphthalene	0.0077
Xylene	1.6
Hexane	1.4

166. A comparison between the table immediately above and those set out under paragraphs 76 and 79 above shows that whilst LC5 was exposed to some of the compounds at levels which reached their odour threshold, in no case did his exposure remotely approach levels associated with a toxicological effect.

167. On the basis of the modelled exposure LC5 could not have experienced any of the symptoms he complained of in the Group Litigation as a result of toxic

effects of the compounds and the Slops provided no toxicological explanation for his symptoms.

Abobo Anador – Coco Service and Dokui plateau

168. Lead Claimant 9 ("LC9") is the Lead Claimant who lived closest to the Dokui dumpsite, at a distance of 232m. The modelling suggests that her home was also exposed to a chemical plume from the MACA dumpsite (UNDAC 7.1), and that her place of work was exposed to a chemical plume from the Vridi Canal dumpsite (UNDAC 8.1).

169. The modelling indicates that the hourly average exposure (in ppm) at the home of LC9 to chemicals from the Coco Service Ravine and MACA dumpsites over a period of 120 hours peaked at the following concentrations:

Chemical	**Concentration (ppm)**
Mercaptans	0.24
Disulphides	0.0015
Hydrocarbons	
Benzene	0.00019
Naphthalene	0.000004
Xylene	0.0009
Hexane	0.00069

170. The modelling indicates that the hourly average exposure (in ppm) at the workplace of LC9 to chemicals from the Vridi Canal dumpsites over a period of 120 hours peaked at the following concentrations:

Chemical	**Concentration (ppm)**
Mercaptans	N/A[4]
Disulphides	0.00069

[4] The evidence suggests that only the hydrocarbon phase was released at this site, therefore Mercaptans are not modelled for.

Hydrocarbons	
Benzene	0.00078
Naphthalene	0.000018
Xylene	0.0037
Hexane	0.0032

171. A comparison between the tables immediately above and those set out under paragraphs 76 and 79 above shows that whilst LC9 was exposed to some of the compounds at levels which reached their odour threshold, in no case did her exposure remotely approach levels associated with a toxicological effect.

172. On the basis of the modelled exposure LC9 could not have experienced any of the symptoms she complained of in the Group Litigation as a result of toxic effects of the compounds and the Slops provided no toxicological explanation for her symptoms.

Djibi

173. Lead Claimant 7 ("LC7") was the Lead Claimant most heavily exposed to chemical plumes from the Djibi 4.1 dumpsite. His home was 588m from that site and 455m from the Djibi 5.1 site. The modelling suggests that his place of work was also exposed to the chemical plume from the Djibi dumpsites.

174. The modelling indicates that the hourly average exposure (in ppm) at the home of LC7 to chemicals from the Djibi dumpsites over a period of 120 hours peaked at the following concentrations:

Chemical	**Concentration (ppm)**
Mercaptans	0.32
Disulphides	0.00014
Hydrocarbons	
Benzene	0.00002
Naphthalene	0.00000037

Xylene	0.00007
Hexane	0.00006

175. The modelling indicates that the hourly average exposure (in ppm) at the workplace of LC7 to chemicals from the Djibi dumpsites over a period of 120 hours peaked at the following concentrations:

Chemical	**Concentration (ppm)**
Mercaptans	2.2
Disulphides	0.028
Hydrocarbons	
Benzene	0.0033
Naphthalene	0.000075
Xylene	0.016
Hexane	0.013

176. A comparison between the tables immediately above and those set out under paragraphs 76 and 79 above shows that whilst LC7 was exposed to some of the compounds at levels which reached their odour threshold, in no case did his exposure remotely approach levels associated with a toxicological effect.

177. On the basis of the modelled exposure LC7 could not have experienced any of the symptoms he complained of in the Group Litigation as a result of toxic effects of the compounds and the Slops provided no toxicological explanation for his symptoms.

Conclusions

178. Given that the said Lead Claimants were not exposed to chemical compounds originating from the Slops at levels remotely sufficient to cause any toxicological injury (even given the various assumptions favourable to the BBC explained above, which Trafigura contends are themselves improbable), it is highly improbable that:

178.1. any other resident of those areas was exposed to compounds originating from the Slops at levels to cause such injury;

178.2. any serious or chronic injuries were caused by exposure to the Slops;

178.3. any disfigurement was caused by exposure to the Slops;

178.4. Ms Posson's alleged miscarriage was caused by exposure to the Slops;

178.5. Ms Diby's alleged miscarriage was caused by exposure to the Slops; and

178.6. any of the deaths of the individuals named in paragraph 4.62 or 4.65 was caused by exposure to the Slops.

Response to the BBC's case on the consequences of the dumping

Conditions in Abidjan and the health of the people

179. The first sentence of paragraph 4.54 is admitted.

180. The claim in the second sentence of paragraph 4.54 that, prior to the dumping of the Slops, the health of the population of Abidjan was *"unremarkable"*, is denied. In light of the following, it is unsustainable.

181. According to UN figures[5], in 2006:

[5] World Population Prospects. The 2006 Revision, UN Department of Economic and Social Affairs, Population Division

181.1. infant mortality in Côte d'Ivoire ran at a rate of 116.9 per 1000 births (more than 1 in 10), compared with a world average of 49.4 and a rate in the UK of 4.8;

181.2. life expectancy of a newborn child was estimated at 48.3 years, compared with a world average of 67.2 and a figure in the UK of 79.4; and

181.3. the level of HIV infection was estimated to be 7%.

182. The Côte d'Ivoire also has high rates of malaria, typhoid, yellow fever, tuberculosis and other parasitic diseases (source: UNICEF).

183. Around the Akouedo dump the health of the population had been severely affected in advance of August 2006. According to the village's own census, from a population of about 5,000, Akouedo village had only one resident over the age of 70 and only 30 residents had survived into their 60s.

184. The residents of Akouedo village have themselves reported that they suffered a number of chronic symptoms before August 2006, namely skin and eye irritation, asthma, lung infections, gastro-intestinal diseases – which the residents attribute to the close proximity of the dump.

185. The residents of Akouedo themselves report that 80% of the population are orphans.

186. According to the INHP Report relied on by the BBC in paragraph 4.55 and elsewhere:

186.1. since 2002 Côte d'Ivoire has faced a major socio-political crisis with significant socio-economic consequences. People fleeing the conflict zones in the west and north of the country moved in large numbers to Abidjan, leading to an increase in poverty and instability;

186.2. the scarcity of government resources in Abidjan meant that the authorities were very often unable to assure the management of waste from households and industrial activities, resulting in an accumulation of refuse with an increased risk of diarrheal diseases;

186.3. discomfort caused to people living near the Akouedo dump very often caused the authorities to close the dump and to call for its permanent closure;

186.4. healthcare organisations were facing an ever growing demand for care in a population with an ever diminishing income; and

186.5. Abidjan contains districts comprising unsafe, unhealthy habitation where people live in overcrowded conditions leading to a risk of communicable diseases developing.

187. The environment in and around Abidjan is heavily contaminated by pollutants namely:

187.1. approximately 6,000 tons of pesticides including 4,380 tons of insecticides, 673 tons of herbicides, 274 tons of nematicides and 126 tons of fungicides are sold in the country a year. After use, these pesticides are discharged into rivers and lakes (see Japan International Cooperation Agency *Country Profile on Environment Côte d'Ivoire* November 1999 at paragraph 4.2);

187.2. Ebrié Lagoon near Abidjan is heavily polluted by industrial discharges. Food processing and textile production are dominant sources of industrial pollution accounting for 85% of industrial waste generation and 95% of pollution load (ibid paragraph 4.2). The UNDAC Report stated that existing pollution levels in the Ebrié Lagoon would have been too high to allow for any identification of the Slops in the water;

187.3. the amount of solid household and industrial waste is 949,000 tonnes a year (1997) and medical and healthcare waste 2,000 tonnes a year (1997) (ibid paragraph 4.4);

187.4. out of the 949,000 tonnes of waste, 802,000 tonnes were collected while 147,000 tons were not collected (ibid paragraph 4.4);

187.5. household waste has been disposed of at the Akouedo site without prior treatment since 1965 and from 2003 dumping occurred under Article 13.7 of Act no. 2003-208 of 7 July 2003;

187.6. abattoir, medical and human (including body parts) by-products and waste has been dumped at the Akouedo site since 1965 contaminating the site and the surrounding environment, including Akouedo village;

187.7. several companies apparently held licences permitting them to dump industrial waste at the Akouedo site and, as a result, dumped solid and liquid industrial waste at the Akouedo site before August 2006;

187.8. as a result of the above, the Akouedo site creates nuisance by way of rats, insects and sanitary problems. The Akouedo site also generates methane and other landfill gases (including, potentially and by reason of the materials dumped there, mercaptans) which have not, to date, been subject to monitoring and control;

187.9. the above nuisances have led the population around the Akouedo site to request that the site be closed on more than one occasion;

187.10. further, and as a result of the above, the Akouedo site and the surrounding environment including Akouedo village were, before August 2006 heavily contaminated with household chemical, medical and industrial waste;

187.11. as would appear to be the case given the facts pleaded at paragraph 220 – 225 below, hydrocarbon by-products and fractions were dumped by unknown third parties in Abidjan before August 2006. The site of the dumping would have been predominantly the Akouedo site;

187.12. in relation to the environment in and around Abidjan, it is averred that more than 60% of industries in Côte d'Ivoire are located in Abidjan and nearby. Industrial wastewater is discharged into Ebrié Lagoon. Not only organic wastewater but also waste water containing toxic chemicals is discharged. The quantity of the wastewater was estimated to be 12,000m³ in 1980 (ibid paragraph 4.7);

187.13. in further support of the plea that the environment in Abidjan is already heavily contaminated, Trafigura relies on paragraphs 220 - 225 below as to the composition of the Tredi samples; and

187.14. in particular, given the hydrocarbon chain lengths pleaded at paragraph 224 below, the environment in Abidjan must have been polluted (i) with hydrocarbon by-products and fractions other than naphtha and (ii) by as yet unidentified third parties working with hydrocarbons and/or working in the hydrocarbons industry in Abidjan.

188. Save that the Port of Abidjan had a sophisticated hydrocarbon industry the third sentence of paragraph 4.54 is admitted.

The INHP Epidemiological Report relied on by the BBC

189. It is admitted that the first sentence of paragraph 4.55 correctly summarises the account given in the introduction to the INHP Report of its genesis and preparation. Trafigura does not admit, because it does not know, whether that account is accurate, or whether the INHP Report correctly summarises the data which it purports to examine.

190. Save that it is admitted that the INHP Report is on matters of high public interest the second and third sentences of paragraph 4.55 are denied. The sources of the information in the INHP Report are not always clear and it does not contain sufficient detail to support its conclusions (which are inconsistent).

191. It is denied that the INHP Report provides any support for the allegations made by the BBC in the publications complained of or in the plea of justification. The design of the INHP study is inadequate to enable any conclusions as to causation to be drawn.

192. The conclusions of the INHP Report concerning the potential effects of exposure to the Slops are derived from a review of other published literature, including several studies on the potential effects of exposure to hydrogen sulphide.

193. As the INHP Report itself recognises, such studies are only of use in determining the effects of the dumping of the Slops when accompanied with exposure data, including the means of exposure, and the frequency, duration and intensity of the contact between the Slops and the population said to be at risk or said to have suffered injury.

194. The primary data on which the INHP Report is based consists predominantly of forms filled in by health professionals examining individuals who presented themselves at various public health care centres as victims of *"toxic waste poisoning"*.

195. There is nothing in the INHP Report to indicate the recorded clinical features were as a result of physical examination by the doctors.

196. Despite the fact that the forms prepared by the INHP included questions concerning exposure, data on exposure was available for only 0.6% of the individuals who had presented themselves as victims of toxic waste.

197. There was thus no significant data on the basis of which the INHP Report could draw a causal relationship between the Slops and the reported symptoms.

198. In describing the effects of *"poisoning by petroleum waste"* without evidence of any causative relationship between the Slops and the reported symptoms, the INHP Report does not establish, or even provide any support for, the proposition for which it is relied on in the Defence, but simply assumes it.

199. In addition to the fundamental methodological problem identified above there are number of other reasons why the INHP Report undermines, rather than supports, the allegations made by the BBC.

200. The INHP Report stated that less than 43% of patients presenting themselves as victims were confirmed cases.

201. Only very general information is given in the INHP Report concerning the location of those presenting themselves for treatment. The information which is given demonstrates the unreliability of the conclusions. For example, 279 patients presented themselves as victims of the toxic waste in the Commune of Alepe, 70 km from Abidjan, where it is not conceivable that any toxic effect of the waste could have occurred.

202. The dates on which patients presented themselves also indicate that in very many cases symptoms they reported were unlikely to have been caused by exposure to the Slops.

    202.1. At the Cocody hospital (which recorded the greatest number of patients of all the healthcare institutions) 128 cases were recorded on 22 August 2006, then no cases were recorded until 29 August. Treichville hospital did not record any case until 25 August. The other healthcare institutions did not begin recording patients until 3 September.

202.2. For the reasons given above any toxicological effect from exposure to the Slops could only have occurred when the concentrations of the substances being released from the Slops were strongest, in the days immediately following the dumping on 19 and 20 August.

202.3. The INHP Report states that

> *"after the first cases announced as from the day after the dumping of the toxic waste a "quiet" period was observed which lasted approximately two weeks. Then suddenly a significant rise in consultations was observed".*

202.4. The INHP Report records that the number of patients presenting themselves as victims of toxic waste exposure increased sharply on 5 September 2006 and reached a daily peak on 18 September, 4 weeks after the dumping.

202.5. The UN OCHA report dated 14 September 2006 stated

> *"At this time, however, direct exposure by inhalation is unlikely, given the time lapse since the dumping. This has been confirmed by the air and sampling analysis carried out by the French team of experts. None of the components were found in substantial concentrations in the ambient air close to the waste.*
>
> ...
>
> *The chemicals, especially mercaptans and phenols, have strong smells at low concentrations. The smell is already detected by the human nose at concentrations far below danger levels. This may lead to a false impression of toxicity."*

202.6. The INHP Report explains the rise in consultations at a time when direct exposure was unlikely as follows:

"At the beginning of September 2006, the announcement of the exemption from payment for treatment in public healthcare institutions by the health authorities triggered the rush."

202.7. Further, the INHP Report states

"The large number of suspect cases in all age groups is probably due to the exemption from payment for care which led to treatment of certain cases of illness other than poisoning."

202.8. The INHP Report also states that

"children were often taken for check-ups by the parents as a precaution especially since treatment was free."

203. The reported symptoms also indicate the unreliability of the INHP report as evidence of injury caused by exposure to the Slops.

203.1. 82% of those presenting themselves for treatment did not record any *"ocular"* symptoms. Since a sensation of irritation of the eyes is the first toxicological symptom of exposure to either hydrogen sulphide or mercaptans this indicates that these people were exposed to neither substance at levels sufficient to have a toxicological effect.

203.2. 29% of those presenting themselves for treatment recorded suffering *"cutaneous"* symptoms. Since skin injuries could only have been caused by direct contact with the Slops (a method of exposure very unlikely to have occurred given the circumstances of the dumping and the strong and unpleasant smell of the Slops, and abandoned as part of their case by the claimants in the Group Litigation on 9 January 2009) those persons were suffering from symptoms caused by a mechanism unrelated to the Slops.

203.3. Only 0.0008% of those presenting with symptoms were hospitalised, indicating the low severity of the symptoms.

203.4. The first recorded hospitalisation was not until 2 September 2006, some 12 days after the dumping.

203.5. The INHP Report records that the diagnoses made at the time of the hospitalisations *"are very varied and not specific"* and *"not specific to poisoning"*. It states, correctly, that certain diagnoses *"in no way suggest poisoning"*.

203.6. 4 of the patients hospitalised were diagnosed with malaria and 18 were diagnosed with gastroenteritis.

204. The first 2 sentences of paragraph 4.56 are admitted.

205. Save that many people presented themselves for treatment, particularly after the reports in the press describing the dumping of *"dangerous toxic waste"* and the announcement of free health care, the third sentence of paragraph 4.56 is denied.

206. The fourth sentence of paragraph 4.56, which is a misrepresentation of the conclusions of the INHP Report, is denied. The INHP Report states that until 4 September 2006 the number of patients reporting per day did not exceed 200. Analysis of other information in the INHP Report shows that the daily rate was much lower than 200 for this period.

207. The fifth sentence of paragraph 4.56 is admitted.

208. The sixth sentence of paragraph 4.56 (which repeats a sentence from the Report) is not admitted.

209. The seventh to tenth sentences of paragraph 4.56 are admitted.

210. It is admitted that the WHO made the announcement from which a section is quoted in paragraph 4.57. That fact is incapable of supporting the plea of justification.

211. The first sentence of paragraph 4.58 is denied. The Report drew no conclusions as to what the people attending for medical treatment were suffering from, but rather recorded the symptoms which they reported.

212. Save as set out above at paragraph 76 the second sentence of paragraph 4.58 is denied.

213. If and insofar as in the third sentence of paragraph 4.58 the BBC is making an allegation of fact, rather than merely describing the terms of the Report as it does elsewhere in this section of the Defence, that sentence is not admitted.

214. The first sentence of paragraph 4.59 is admitted.

215. The second sentence of paragraph 4.59 is denied. The report does not state that *"at least 82 patients affected by the pollution were admitted to hospital"*.

    215.1. The report states that *"a total"* of 82 patients were hospitalised.

    215.2. It does not state that these patients were *"affected by the pollution"*, but rather stated expressly that *"the diagnoses were not specific to poisoning"*. Paragraphs 203.3 – 203.6 above are repeated.

216. The third sentence of paragraph 4.59 is denied. The Compromise Agreement stated simply *"[d]eaths were reported"*. No information is given which could provide any evidential support for the BBC's case.

Environmental damage

217. The first sentence of paragraph 4.60 is, as the Defence recognises, wholly unparticularised. It is therefore impossible to plead to meaningfully.

218. If environmental damage is to remain part of the BBC's case, the BBC must provide proper particulars in order to enable Trafigura to understand what the case is against it. In its present form the sentence stands to be struck out.

219. The second and third sentences of paragraph 4.60 are admitted.

220. Analysis of the material removed by Tredi does not match an analysis of the Slops, demonstrating that the environment in Abidjan had suffered from extensive pollution before August 2006.

221. The removed Tredi material contained concentrations of heavy metals far in excess of those in the Slops, particularly Nickel, Copper, Mercury, Chromium and Zinc, as well as Cobalt and Manganese.

222. Such heavy metals can be found in wastes from sludges derived from water treatment and other activities commonly carried out in Côte d'Ivoire prior to August 2006.

223. Levels of barium detected in the materials removed by Tredi from Akouedo were 50,000 times more concentrated than any barium in the Slops. The barium contamination cannot have come from the Slops. The source is likely to have been waste associated with paints, chemicals and/or plastics.

224. Significant quantities of heavy hydrocarbons (C14 to C40) were also identified by Tredi. The hydrocarbon phase of the Slops would have fallen almost exclusively within the C5 to C11 range. Hydrocarbons falling within the C14 to C40 range include engine oil, fuel oil residues and refinery wastes.

225. The material removed by Tredi demonstrates that the locations in question had suffered for some time from significant levels of pollution that were unrelated to the Slops.

226. The Group Litigation claimants withdrew an allegation originally made that the Slops caused very considerable contamination of animals and agricultural land in the Re-Amended Particulars of Claim dated 23 December 2008.

227. The fact that no widespread death of land based small mammals (such as dogs and rats) was reported in Abidjan is a further indication of the low levels of exposure of the human population.

The Compromise Agreement

228. The relevance of the Compromise Agreement is denied. Neither its terms, nor the reliance which the BBC places on it in the Defence, provide any support for the allegations made in the publications complained of or those which the BBC seeks to justify. The following is pleaded without prejudice to that contention.

229. The first 2 sentences of paragraph 4.61 are admitted.

230. The third sentence of paragraph 4.61 is denied. Payments from the compensation fund were handled by the Ivorian government without any involvement from Trafigura.

230.1. In order to qualify for a payment under the scheme an applicant did not have to prove specific causation but merely that they were recorded as having reported to a hospital and having been given medicine.

230.2. There have been several indications that fraudulent and speculative claims have been made to the scheme.

230.2.1. On or around 13 June 2007 the Prime Minister of the Côte d'Ivoire recounted that due to an increasing level of claims by persons who were not victims, a list of all those entitled to compensation as derived from hospital admission lists had now been drawn up and finalised.

230.2.2. On 16 July 2007, Emmanuel Kalou, the administrator of the fund, stated to AFP (reported in *Le Monde* on 16 July 2007) that 95% of the claims being made each day were false.

231. The fourth sentence of paragraph 4.61 is denied.

Deaths

232. The cause of death identified by the BBC is poisoning by hydrogen sulphide. For the reasons given above hydrogen sulphide was not present in the Slops in its molecular form and could not have been released from the Slops in sufficient concentrations to cause any toxicological injury, let alone death.

233. The evidence relied on by the BBC has no probative value whatsoever in showing either that the individuals named by the BBC died from hydrogen sulphide poisoning or, if that were the case, that the hydrogen sulphide came from the Slops.

234. Death by hydrogen sulphide poisoning is effectively impossible to diagnose, even in relation to those who have very recently died, on the basis of tissue testing alone.

235. Fatalities from hydrogen sulphide inhalation have only been documented when exposure has taken place in confined spaces, such as mines, sewers or storage tanks in ships.

236. Invariably the diagnosis of hydrogen sulphide poisoning has been made by (i) taking into account the circumstances of presumed exposure, sometimes supported by measurement of the ambient air hydrogen sulphide concentration in the space where the victim was found, and (ii) by excluding other causes of death. This is because (i) there are no physical features diagnostic of hydrogen sulphide at post-mortem, and (ii) it is not possible to assess hydrogen sulphide exposure by measurement of blood or tissue hydrogen sulphide concentrations either in life, or after death.

237. No particulars are provided by the BBC which could enable the Court to assess either the circumstances of the alleged exposure of the named individuals, or to exclude other causes of death. Trafigura reserves the right to plead further should such necessary particulars be given.

238. The delay between the date of death of the individuals named by the BBC and the date on which their tissues were extracted and/or sampled (in the region of 3 to 5 months) deprives the results relied on by the BBC of any probative value whatsoever.

239. By far the most likely assessment of the results relied on by the BBC is that they are simply the result of post-mortem decomposition.

240. The first sentence of paragraph 4.62 is denied. The Laboratoire de Toxicologie et Hygiene Agro-Industrielle at the University of Cocody was not ordered (as alleged) to *"investigate the consequences"* of the dumping, but rather to perform an analysis of tissue samples resulting from autopsies on individuals whose deaths had been attributed to poisoning by the Slops.

241. Trafigura will rely in full on the *"Rapport d'expertise toxicologique"* from the Cocody laboratory dated 29 March 2007 (i.e. the Manda Report) for an analysis of its terms of reference, methodology and stated results.

242. The second sentence of paragraph 4.62 is denied. No samples were taken by the Cocody laboratory as part of its analysis, rather the Cocody laboratory received samples said to have been taken by Professor Helene Yapo-Etté, who had been asked by the Public Prosecutor's Office to conduct autopsies on the bodies of 12 individuals alleged to have died as a result of exposure to the Slops.

243. The extent and nature of the sampling said to have been done by Professor Yapo-Etté, and the identity and origin of the bodies from which the samples were said to have been taken, is not admitted.

244. On 8 October 2008 at the trial in Abidjan of Solomon Ugborugbo and others on charges related to the dumping by Tommy, Professor Yapo-Etté stated that:

244.1. she conducted the autopsies between 1 December 2006 and 24 January 2007;

244.2. the bodies were in a state of putrefaction; and

244.3. some of the bodies had been treated with formalin.

245. The observations of Professor Yapo-Etté concerning the state and colour of the bodies examined are entirely non-specific. The observations provide no evidence whatsoever that death was due to poisoning with hydrogen sulphide, particularly given their state of putrefaction.

246. The first two sentences of paragraph 4.63 (including the list of results) are not admitted.

247. The BBC is required to prove that the results reported in the Manda Report on which it relies are a reliable account of the levels of hydrogen sulphide in the brain and/or lung tissue of the persons named. The measurement of hydrogen sulphide in biological specimens (even those taken from living tissue or shortly

after death) is fraught with difficulty and the results are highly dependent on the analytical method used[6].

248. The method used to obtain the results stated in the Manda Report was a modification of the simple colorimetric method used to estimate sulphide in mud and soil samples, totally unsuited for use with tissues and complex biological specimens.

249. The third and fourth sentences of paragraph 4.63 are denied.

250. Sulphur containing compounds are essential elements of living tissues. For example liver tissue contains approximately 160 micrograms of glutathione sulphur per gram of tissue (160 µg/g).

251. After the death of an organism, from any cause, glutathione and other sulphur containing compounds begin to decompose. One product of this decomposition is the gas hydrogen sulphide.

252. The longer the delay between death and autopsy, and the higher the temperature at which the body has been stored, the greater the decomposition that will have taken place.

253. As it is a gas at room temperature, hydrogen sulphide tends to escape from dead organisms; so any remaining sulphide in the cadaver will be a balance between sulphide present at death, sulphide produced by putrefaction and loss of hydrogen sulphide by escape from the body.

254. Given the three to five month delay between the deaths of the individuals in question and Professor Yapo-Etté's autopsies, there is no way of ascertaining the source of the hydrogen sulphide said to have been reported, even if it has been accurately measured.

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[6] See e.g. Ago et al. *Two fatalities by hydrogen sulphide poisoning: Variation of pathological and toxicological findings.* Legal Medicine 10 (2008) 148-152.

255. The levels of sulphide found in the tissue samples are within the range to be expected from the decomposition of animal tissue[7], and provide no evidence that death was due to hydrogen sulphide poisoning.

256. The widely variable nature of the results itself indicates that they cannot support a hypothesis of common cause of death by hydrogen sulphide poisoning, for example:

256.1. no hydrogen sulphide was detected in 8 of the lung samples, whilst concentrations of 16.87 to 35.34 µg/g were reported in others; and

256.2. in the samples from Yao Bernard Tanoh although nothing was found in the lung sample, the concentration reported for the brain sample was the highest of all those reported at 11.58 µg/g.

The INHP Epidemiological Report and deaths

257. The INHP Report relied on by the BBC at paragraph 4.55 and elsewhere contains a list of 10 people alleged to have died as a result of *"toxic waste poisoning"*.

258. It is not possible to tell whether any of these 10 are the same as those identified by name in the Defence. Given that the deaths were reported by the 3 University Hospitals in Abidjan as resulting from toxic waste poisoning, and no other method for attributing death to exposure to the Slops has been identified, it is to be inferred that there was considerable overlap between the 2 groups.

259. The date of death in each case of the individuals referred to in the INHP Report indicates that death cannot have been caused by exposure to the Slops.

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[7] See e.g. Nagata et al. *Sulfide concentrations in post-mortem mammalian tissues.* J Forensic Sci 1990; 35: 706-12.

260. The first death did not occur until 9 days after the dumping. Death by hydrogen sulphide poisoning occurs rapidly as a result of high levels of exposure and not as a result of a build up in the tissues of the body, or of medium or long term low level exposure. The other reported deaths were between 19 and 35 days after the dumping.

261. The fact that the majority of the deaths attributed to exposure to the Slops occurred after the expiry of any potential acute exposure period (and therefore cannot have been caused by any such exposure) is also indicated by the dates on which deaths attributed to exposure to the Slops were reported in the press and by OCHA. Such reporting did not begin until 1 September 2006 (when 2 deaths were reported) and continued throughout mid and late September and October 2006, by which time the French Civil Defence team had reported a complete absence of hydrogen sulphide at the dumpsites.

262. Several of the deceased referred to in the INHP Report attended hospital with symptoms which could not have been caused by exposure to the constituents of the Slops, even at concentrations considerably higher than those likely to have been present in Abidjan.

263. Six of the deceased had been hospitalised for at least a day before death. Death by hydrogen sulphide poisoning occurs rapidly and only after high levels of exposure – if collapse occurs recovery is generally swift upon the individual being removed from the source of exposure. The history of a day in hospital before death is inconsistent with death as a result of hydrogen sulphide exposure. Moreover, because hydrogen sulphide is rapidly metabolised by the body, even if the patient's condition had been caused by hydrogen sulphide there would have been no hydrogen sulphide remaining in the body at the time of death. Any hydrogen sulphide showing up following an autopsy three or more months later must, therefore, have had a different source, probably tissue decomposition.

264. Paragraph 4.64 is denied for the reasons already stated.

265. The first sentence of paragraph 4.65 is not admitted.

266. The second sentence of paragraph 4.65 is denied. Trafigura repeats its reliance on the statement by Mr Kalou about the number of false claims being made on the compensation fund. As stated above, it is clear that the deaths reported cannot have been caused by exposure to the Slops.

267. In light of the complete lack of probative value of the evidence on which the BBC relies for this part of its case and the demonstrable incapacity of the Slops to release hydrogen sulphide (or any other chemical or compound) in concentrations even approaching a lethal dose, the BBC is invited to withdraw forthwith the allegation in the Defence that the Slops caused death, and to cease publishing and apologise for the allegation to that effect made in the Programme and Article complained of.

Miscarriages and infant deaths

Generic

268. For the reasons stated above the people of Abidjan were not exposed to vapours from the Slops at concentrations such as to cause toxicological injuries. *A fortiori,* vapours from the Slops were not sufficient to cause miscarriages, or the intra-uterine deaths alleged in the Defence.

269. No toxicological route has been advanced by the BBC for how the Slops might have caused miscarriage. Miscarriage is not one of the toxic effects of the constituents of the Slops identified by the BBC in paragraph 4.11.

270. The facts stated by the BBC in the Defence in relation to Ms Posson and Ms Diby, even if established, do not support, or even lend any credence to, the conclusion that the deaths of their babies were caused by exposure to the Slops, rather than any of the many other potential causes of intra-uterine death.

271. The claim initially made by the claimants in the Group Litigation that exposure to the Slops had caused miscarriages was withdrawn in early May 2009.

272. The BBC does not seek to justify, but continues to publish, the claim in the Programme that women in the village of Djibi suffered miscarriages as a result of exposure to the Slops.

273. In the light of the evidence which indicates that miscarriages were highly unlikely to be caused by exposure to the Slops, the lack of any case by the BBC that miscarriages caused by exposure to the Slops were widespread, the failure to justify the allegation concerning Ama Grace Akoudio, the specific problems with the allegations concerning Fidele Posson and Ahou Diby, and the recognition in the Group Litigation (after extensive investigation) that a case on miscarriages and infant deaths was not sustainable, the BBC is invited to withdraw this part of its Defence and apologise for the allegation made in the Programme concerning miscarriages and infant deaths.

Fidele Posson

274. The section of the Defence concerning Ms Posson does not allege that her "miscarriage" (which was, significantly, an intra-uterine death at 8 months) was caused by exposure to the Slops, but merely records certain conclusions stated in contemporaneous medical documents. The case as pleaded is as such incapable of justifying the allegation made in the Programme and the meaning which the BBC seeks to justify, and should be struck out. The following paragraphs are pleaded without prejudice to that contention.

275. The first sentence of paragraph 4.66 is not admitted.

276. As to the second sentence of paragraph 4.66:

276.1. it is not admitted that Ms Posson was living in the Akouedo village extension or if she was, how close she was living to the dumpsite in question;

276.2. the allegation that she was *"severely affected"* by inhaling toxic vapours is wholly unparticularised and is as such denied;.

276.3. further, it is denied that she was severely affected by inhaling toxic vapours originating from the Slops, which did not release vapours capable of causing severe effects on human health, for the reasons given above; and

276.4. it is not admitted that she attended the Cocody Hospital on 1 September 2006.

277. On the case pleaded by the BBC, it is not possible to assess to what, if any, concentrations of vapours released from the Slops at the Akouedo dumpsite Ms Posson may have been exposed. Trafigura will rely on the fact that the Lead Claimant living in Akouedo closest to the dumpsites was not exposed to concentrations of such vapours at levels such as to cause any toxicological injury. Trafigura reserves the right to plead further should the necessary particulars be provided by the BBC.

278. The third sentence, which places reliance on a medical report and a death certificate relating to Ms Posson, is denied.

278.1. Although both documents state as their conclusion that the still-birth or miscarriage was as a result of inhalation of *"organosulphurous products"*, neither gives any indication of any grounds to conclude that was the case other than the fact that Ms Posson had apparently reported inhaling such material.

278.2. The documents are inconsistent. The medical report states that the baby was still-born at 03.20hrs and was "macerated" (indicating he had been dead for some time before delivery). The death certificate states that the baby died at 03.00hrs immediately before or during delivery. This is not consistent nor does maceration accord with the allegation in the Programme which was that the baby *"died within a day"* of delivery.

278.3. Ms Posson did not suffer a miscarriage as that term is properly used. She suffered a late intra-uterine death or intra-partum death. Such late intra-uterine deaths are highly unlikely to be caused by sickness or injury to the mother.

278.4. There is no suggestion that a post-mortem was performed on the baby, or that any blood (or other) tests were performed on the mother. Nor is any weight recorded for the baby in those documents – as would normally be expected.

278.5. The documents provide no evidence to support the conclusion that the death of the baby was as a result of exposure to the Slops.

279. There are very good grounds to conclude the intra-uterine death cannot have been as a result of exposure to the Slops, because Ms Posson cannot have been exposed to the Slops in concentrations remotely high enough to cause such an event.

280. Trafigura will also rely on the fact that the intra-uterine death is alleged to have occurred on 15 September 2006, several weeks after the dumping after the time when an absence of hydrogen sulphide had been reported at the dumpsites.

281. As explained above, the chemicals in the Slops are, even in concentrations much higher than those in which they were released, not such as to build up in the body and cause cumulative or long lasting effects.

282. In the Group Litigation Ms Posson made no claim in respect of miscarriage.

Ahou Emie Martine Diby

283. The first sentence of paragraph 4.67 is not admitted.

284. The second sentence of paragraph 4.67 is not admitted, save that the wholly unparticularised allegation that Ms Diby was *"severely affected"* by inhaling toxic vapours is denied, and it is denied that any such vapours originated from the Slops.

285. On the case pleaded by the BBC, it is not possible to assess with precision to what, if any, concentrations of vapours released from the Slops at the Dokui dumpsite Ms Diby was exposed. Trafigura will rely on the fact that the Lead Claimant living in Dokui closest to the dumpsites was not exposed to concentrations of such vapours at levels such as to cause any toxicological injury. Trafigura reserves the right to plead further should the necessary particulars be provided by the BBC.

286. The third sentence of paragraph 4.67 is not admitted.

287. The fourth sentence of paragraph 4.67 is not admitted.

288. The fifth sentence of paragraph 4.67 is denied; such an inference is not supported by the facts relied on by the BBC, and is contradicted by the evidence outlined above, which indicates that Ms Diby was not exposed to vapours emitted from the Slops at levels which could have been remotely sufficient to cause toxicological injury, let alone the death of her baby.

289. As stated above Ms Diby expressly withdrew any claim in the Group Litigation based on miscarriage.

Further matters relied on by the BBC in relation to causation

290. Paragraph 4.68.1 is admitted.

290.1. Mixing the aqueous and hydrocarbon phase when discharging the Slops would not have made any difference to the release rate of chemicals from the Slops.

290.2. It is denied that acid was present at any of the dumpsites in a form or quantity anywhere near sufficient rapidly to neutralise the Slops in such a way as to lead to significant release of vapours at rates or concentrations which could cause the effects alleged by the BBC.

291. Paragraph 4.68.2 is denied.

291.1. The Slops would have separated into hydrocarbon and aqueous phases in the tankers, and would have been discharged by gravity feed from the bottom of the tankers. It is highly likely therefore that the aqueous phase would have been discharged first, followed by the hydrocarbon phase.

291.2. The likely spill area at each of the dumpsites in question, on the basis of the Group Litigation claimants' case as to the amounts dumped, has been set out above.

292. Paragraph 4.68.3 is admitted, save that:

292.1. The Slops dumped at Akouedo were not dumped at the active waste tip, but rather at an older part of the site, which had been capped, and some of which was being used as agricultural land.

292.2. Paragraph 290.2 above is repeated.

293. Paragraph 4.68.4 is admitted. Paragraph 290.2 above is repeated.

294. Paragraph 4.68.5 is admitted.

295. As to paragraph 4.68.6 paragraph 292.1 above is repeated. The dumpsite at Dokui was not a landfill site.

296. Paragraph 4.68.7 is denied. For the reasons pleaded above, the epidemiological analysis relied on by the BBC is of no probative value in establishing either the allegations which it published, or those which it seeks to justify.

TRAFIGURA'S CONDUCT PRIOR TO 19 AUGUST 2006

297. Trafigura pleads as follows to the BBC's case on Trafigura's conduct leading up to the dumping of the Slops by Tommy on 19 and 20 August 2006. The following is pleaded without prejudice to Trafigura's primary contention that the BBC is not entitled to seek to justify meanings which are not complained of and which, even if proved, could not justify the libel which is complained of. Such an approach is impermissible as a matter of law and is wholly disproportionate.

The naphtha and the washing

298. Since it is common ground that the NFI analysis provides the best account of the constituents of the Slops, it is not necessary in order to determine their effect on the people of Abidjan to examine the process of their creation. Much of paragraphs 4.2 to 4.12 is therefore irrelevant to the libel complained of and it would be disproportionate for the issues raised to be tried in these proceedings. The following is pleaded without prejudice to that contention.

299. Paragraph 4.2 is admitted, save for the words *"very low cost"*, which are not admitted, as no comparator is given.

300. Paragraph 4.2.1 is admitted, save for the word *"toxic"* which, for the reasons given above at paragraphs 81 - 85, is denied. Naphtha is, amongst other uses, one of the constituents of gasoline. The nature and constituents of coker naphtha vary depending on the nature and constituents of the crude oil from which it has been derived.

301. As to paragraph 4.2.2:

301.1. It is admitted that coker naphtha can contain sulphur in various forms, and that those forms can include alkyl mercaptans, hydrogen sulphide and thiophenols. Whether naphtha is suitable for immediate use or not will depend on the nature of the intended use, the amounts of such constituents and the levels at which such constituents are permitted in the jurisdictions in which the coker naphtha is to be used.

301.2. It is denied that the PMI coker naphtha contained measurable levels of hydrogen sulphide, as shown by contemporaneous testing carried out by the independent inspectors Camin Cargo Control, who reported no hydrogen sulphide above the measurable level of 1ppm.

301.3. The PMI coker naphtha contained levels of mercaptans (which it is admitted are sulphur compounds and highly malodorous) which made it unsuitable for use as a blendstock for commercially saleable gasoline without pre-treatment, hence the need for the caustic washing.

301.4. The PMI coker naphtha contained levels of sulphur normally to be expected in coker naphtha derived from Mexican crude. That level of sulphur made it unsuitable for use in commercially saleable gasoline without prior blending.

301.5. The word *"toxic"* is denied for the reasons given in paragraphs 81 - 85 above.

301.6. The third sentence is admitted.

302. Paragraph 4.2.3 is not admitted.

303. The first sentence of paragraph 4.2.4, insofar as it makes an allegation of fact, is admitted.

304. The second and third sentences of paragraph 4.2.4 are denied. The scientific case advanced in the Defence is fundamentally flawed in a number of respects. The allegations as to the knowledge of Trafigura and its officers and agents is insufficiently particularised to plead to.

305. The fourth sentence of paragraph 4.2.4 is denied as it lacks particularity.

306. The first sentence of paragraph 4.3 is denied, for the reasons given above.

307. The second sentence of paragraph 4.3 is denied.

307.1. The statements quoted from the emails referred to do not on any reasonable interpretation indicate knowledge that the PMI naphtha *"contained toxic material"* as alleged. By relying on words and phrases extracted from emails shorn of their context both in the email itself, and in the chain in which the email is found, the BBC presents a misleading picture of Trafigura's knowledge of and attitude to the naphtha and the Slops.

307.2. High levels of sulphur are to be expected in naphtha obtained from Mexican crude. The levels of total sulphur in the PMI naphtha were within the contractually stipulated maximum.

307.3. The levels of hydrogen sulphide (if any) were far below the contractually stipulated maximum of 200ppm. Hydrogen sulphide was not present in the PMI naphtha at levels measurable above 1ppm.

308. The email referred to in the third sentence of paragraph 4.3 was dated 28 April 2006.

309. It is denied that extracts quoted from the emails referred to in the fourth sentence of paragraph 4.3 or the relatively low price of the PMI naphtha were indicative, or should have put Trafigura on notice of, any alleged *"toxic"* qualities, or can properly be relied on by the BBC in support of its defence of justification.

310. As to paragraph 4.4 and subparagraphs:

310.1. The implication in paragraph 4.4 that the caustic washing of the PMI naphtha aboard the Proba Koala was unsafe is denied.

310.2. It is admitted that 4.4.1. and 4.4.2 describe methods for treating coker naphtha. The use of the term *"disulphates"* is disputed. Such compounds are unknown to science. The oxidation stage of the Merox reaction (as explained in more detail below) creates disul*phides*.

311. Paragraph 4.5 is denied. The words quoted are shorn from their context in the email in question and the chain in which that email appears. The BBC does not state the nature of its case, if any, in relation to the email from which the words quoted are extracted (which in any event is not an email from Claude Dauphin). It is denied that the use of the words *"be creative"* can or does provide any probative support for the allegations made by the BBC.

312. The first sentence of paragraph 4.6 is denied.

312.1. The process followed by Trafigura cannot fairly be described as *"unsophisticated"* (or *"very unsophisticated"* as it was in the Programme complained of).

312.2. The caustic washing carried out on board the *Probo Koala* was directly analogous to and carried out the same function, with the same by-products, as the Merox process carried out routinely in refineries and storage terminals worldwide.

312.3. Caustic washing is used in refineries as a 'pre-wash' for other processes and, with the addition of a catalyst, is used in the Merox process. In 2006 it was reported that there were 1,600 licensed Merox units worldwide using the same caustic/catalyst process.

312.4. The Merox process is designed to convert malodourous mercaptans in a hydrocarbon such as naphtha into a less odourous form. It is not designed to reduce overall sulphur content.

312.5. During the Merox process the naphtha is mixed with caustic soda in the presence of a catalyst and oxygen.

312.6. The first stage of the process (extraction) involves the reaction of the aqueous caustic soda with the malodourous mercaptans in the naphtha. The reaction produces an aqueous soluble salt known as mercaptide.

312.7. The second stage of the process (oxidative regeneration) converts the mercaptides into disulphides. Disulphides are significantly less odourous than mercaptans. They also have low solubility in aqueous caustic soda but high solubility in naphtha. The disulphides therefore migrate back into the naphtha.

312.8. The Merox process carried out on the *Probo Koala* was less efficient than that which might be carried out in refinery conditions because it was not possible to mix the aqueous caustic with the naphtha as thoroughly and it was more difficult to introduce oxygen. This had the effect that:

312.9. around 37% of the mercaptans in the naphtha were converted into mercaptides (as opposed to around 50% which would have been expected in a refinery); and

312.10. around 47% of the mercaptides in the caustic created by the first stage of the process were converted into disulphides by the second stage of the process, and migrated into the naphtha.

313. The second sentence of paragraph 4.6 is denied, save that it is admitted that the caustic washing resulted in a compound, correctly described as *"spent caustic"*, which contained significant quantities of mercaptides and which required disposal.

La Skhirra

314. The BBC's case in relation to La Skhirra does not provide support for any of the meanings it has alleged that the Programme bore, or any meaning which it is capable of bearing. The only reference in the Programme complained of to La Skhirra and Tunisia is the false allegation that Trafigura had been *"kicked out of the country"*. The Defence does not purport to defend that allegation nor does it state any facts or matters which could support it. The following is pleaded without prejudice to that primary contention.

315. The third sentence of paragraph 4.6 is admitted, save that caustic washing had previously been carried out for Trafigura by the Fujairah Refinery Company Limited in the United Arab Emirates and the first consignment of the PMI naphtha had been successfully washed in January 2006.

316. The fourth sentence of paragraph 4.6 is not admitted.

317. The first sentence of paragraph 4.7 is denied.

318. The second sentence of paragraph 4.7 is not admitted.

319. Paragraph 4.8 is not admitted, save that it is admitted that odour problems occurred at La Skhirra in March 2006, as a result of material containing malodourous mercaptans being released (through no fault of Trafigura's) into an open pit rather than a closed tank.

320. The characterisation of the extracts from the email quoted in paragraph 4.9 (the second of which is a misquote) is denied.

321. The second sentence of paragraph 4.9 is not admitted.

322. The first sentence of paragraph 4.10 is admitted.

323. The second sentence of paragraph 4.10 is admitted (save for the tendentious use of the phrase of the *"problem of the resulting waste"*). The caustic washing process has been described above. The two reactions referred to took place simultaneously aboard the *Probo Koala*.

324. The third sentence of paragraph 4.10 is denied. Paragraph 312.8 above is repeated.

325. Paragraph 4.11 has been answered above.

326. The characterisation of the email quoted in the first sentence of paragraph 4.12 is denied.

327. The second sentence of paragraph 4.12 is denied. The composition of ships slops varies depending on the cargo which the ship has been carrying.

328. The third sentence of paragraph 4.12 is denied. In any event, there was no attempt or intention to discharge the Slops at La Shkirra.

Amsterdam

329. The first sentence of paragraph 4.13 is admitted save for the words in the first set of parentheses, which are not admitted, and the words *"falsely and/or misleadingly"* which are denied. The second and third sentences of paragraph 4.13 are denied. Mr Ahmed had previously spoken to Mr Vonk by telephone and informed him of the details of the operations which led to the creation of the Slops.

330. The first sentence of paragraph 4.14 is admitted.

331. The second sentence of paragraph 4.14 is denied, for the reason given above.

332. It is denied that the notice referred to in the first 5 sentences of paragraph 4.15 was false or misleading.

333. The sixth sentence of paragraph 4.15 is denied. The BBC here purports to rely in support of its factual case against Trafigura on criminal charges brought by the Dutch authorities. That is impermissible as a matter of law and logic. Those charges are being answered in the Dutch courts.

334. In the final sentence of paragraph 4.15 the BBC does not particularise the provisions and regulations on which it relies nor any case as to why it is alleged that Trafigura was in breach of those provisions or regulations. The sentence is accordingly denied.

335. The first sentence of paragraph 4.16 is admitted. No remarkable smells were noticed during that operation.

336. The second sentence of paragraph 4.16 is admitted, save that reports of foul smells did not begin until around 8 or 9 hours after the Slops had been unloaded from the *Probo Koala*.

337. The third and fourth sentences of paragraph 4.16 are admitted.

338. The first sentence of paragraph 4.17 is denied, for the reasons given above.

339. The second sentence of paragraph 4.17 is admitted, save for the final 10 words, which are denied.

340. The third sentence of paragraph 4.17 is admitted, save for the word in parenthesis, which is denied and save that it is not admitted that the increase in price resulted from any *"analysis"* on the part of APS. Wildly different figures for the Chemical Oxygen Demand of the Slops were given by APS on 3 July 2006 (from 500,000mg/l to 20,000mg/l).

341. Paragraph 4.18 is admitted, save for the implication in the word *"merely"* which is denied.

342. Paragraphs 4.19 and 4.19.1 to 4.19.3 are admitted.

343. The first sentence of paragraph 4.19.4 (which alleges that the Slops contained hydrogen sulphide) is denied, for the reasons already given above.

344. The second sentence of paragraph 4.19.4 has been answered above at paragraph 70.

345. Paragraph 4.20 is not admitted. The BBC does not seek to draw any conclusions from the pleaded anonymous fax. Trafigura reserves the right to plead further should the BBC explain the relevance of this fax to its case.

346. Paragraph 4.21 is not admitted.

347. Paragraph 4.22 is admitted. The reason for the delay in allowing the Slops to be reloaded to the *Probo Koala* was because of a protracted dialogue between

the Dutch Authorities and APS as to whether APS had "accepted" the Slops and whether APS was, therefore, legally obliged to dispose of them. It was not due to any issues with smell or alleged 'toxicity'.

348. Paragraph 4.23 is denied. For the reasons given above it is not admitted that APS had made any, or any proper, analysis of the Slops. It is denied they had conducted any analysis which demonstrated that the Slops consisted of *"toxic materials"* as alleged.

Nigeria

349. The BBC's case as to the events in and relating to Nigeria does not provide any support for the meanings which it seeks to justify in paragraph 4 of the Defence. The following is pleaded without prejudice to that primary contention.

350. Paragraph 4.24 is admitted. The *Probo Koala*'s visit to Lagos was a normal commercial voyage for the purpose of discharging 30,000 metric tons of unleaded gasoline under a Bill of Lading to Pipelines and Products Marketing Company Limited.

351. Paragraph 4.25 is admitted, save for the final sentence, which is denied.

352. The conclusions which the BBC seeks to draw from the extracts from the emails referred to in paragraph 4.26 are denied. In full and, in their proper context, the emails show that Trafigura sought at all times to dispose of the Slops lawfully.

Abidjan

353. The first sentence of paragraph 4.28 is admitted.

354. No attempt is made in the second sentence of paragraph 4.28 to explain what *"local conditions"* or which *"waste facilities"* are referred to. The sentence is

accordingly denied and Trafigura reserves the right to plead further should proper particulars be provided.

355. Paragraph 4.29 is admitted. After discharging its cargo of gasoline at Lagos, Abidjan - which was en route to the *Probo Koala*'s next scheduled stop in Estonia - was the closest suitable port for the discharge of the Slops.

356. The first sentence of paragraph 4.30 is denied.

357. The Port of Abidjan and Abidjan had at the time a sophisticated hydrocarbons industry capable of handling and disposing of slops generated by refining, blending and treating crude oil and gasoline, such that a prudent charterer acting in good faith could reasonably and properly conclude that it was appropriate to instruct a ship to berth in the Port of Abidjan to unload cargo and to unload and dispose of slops arising from the blending and treatment of gasoline and Trafigura did so conclude.

358. The Côte d'Ivoire is a signatory to MARPOL, under the provisions of which the Port of Abidjan was required to have adequate facilities for the offloading and reception of slops and the Côte d'Ivoire represented that it had adequate facilities for the offloading and reception of slops to those using the Port of Abidjan.

359. In the premises a reasonably prudent charterer would be entitled to conclude that the Port of Abidjan had facilities capable of receiving the Slops which were, by virtue of their content, MARPOL Annex II slops, and Trafigura did so conclude.

360. It is admitted that the passage quoted in the second sentence of paragraph 4.30 appeared in the report relied on. The conclusions of the report are denied for the reasons given above.

361. Paragraph 4.31 is admitted.

362. The inferences which the BBC seeks to draw from the email incompletely summarised in paragraph 4.32 are denied.

363. As to paragraph 4.33 it is denied that any material facts were withheld by Trafigura.

Tommy

364. Paragraph 4.34 is not admitted, save that it is admitted that ITE was experienced in the disposal of MARPOL slops and that Trafigura had worked in the past with ITE.

365. Paragraphs 4.35 and 4.35.1 are admitted.

366. Paragraph 4.35.2 is not admitted.

367. Paragraph 4.36 is denied, for the reasons given below at paragraph 370.

368. Paragraph 4.37 is not admitted.

369. Paragraph 4.38 is admitted.

370. As to paragraph 4.39 and subparagraphs:

370.1. Paragraph 4.39.1 is denied. The heading of the letter stated that Tommy was a specialist in *"Vidange"* which is commonly understood to mean *"deslopping"* in and around the Port of Abidjan.

370.2. As to paragraph 4.39.2, it is admitted that Tommy received its licence on 12 July 2006.

370.3. Paragraph 4.39.3 is denied. The letter made explicit that the Slops were to be discharged at a facility *"properly prepared to receive any type of chemical product"*. There was no indication that the Slops would not be handled properly.

370.4. Paragraph 4.39.4 is denied. The letter stated that there were proper facilities in Akouedo.

370.5. Paragraph 4.39.5 is denied.

370.6. Paragraph 4.39.6 is denied. The letter stated that Tommy had received specialist advice from a chemist concerning the nature of the Slops.

371. The first sentence of paragraph 4.40 is admitted.

372. The second sentence of paragraph 4.40 is denied.

373. There was nothing in any of the information that Trafigura received that suggested that Tommy would improperly dispose of the Slops and Trafigura had no grounds for suspecting that Tommy would do so. Tommy had been recommended to Captain Kablan of Puma by Desire Kouao of WAIBS, an established shipping agent in Abidjan, who had also told Captain Kablan that the head of Tommy, Solomon Ugborugbo, had previously worked with ITE.

374. The first sentence of paragraph 4.41 is not admitted.

375. Save that it is denied that the Defence contains any detail concerning the sites at which the Slops were dumped, no case being advanced by the BBC in relation to what was dumped where, the second sentence of paragraph 4.41 is admitted.

376. The third sentence of paragraph 4.41 is denied. The extracts relied on come from separate emails.

377. The conclusions which the BBC seeks to draw from the emails referred to in the fourth, fifth and sixth sentences of paragraph 4.41 are denied.

378. Paragraph 4.42 is not admitted.

379. Paragraph 4.43 and each of its sub-paragraphs is denied.

380. Paragraph 4.44 is admitted.

381. The first sentence of paragraph 4.45 is admitted and averred. The Slops would therefore have remained highly alkaline at the time of disposal.

382. The second sentence of paragraph 4.45 is not admitted. Trafigura's case based on the assertions by the claimants in the Group Litigation as to the locations and quantities of the material dumped by Tommy has been stated above.

383. The first sentence of paragraph 4.46 is not admitted.

384. The CIAPOL / SIR results are correctly recited in the second sentence of paragraph 4.46. The CIAPOL / SIR results are not a reliable record of the composition of the Slops. The reasons for that have been given above. In summary: (i) the little information which there is about the sampling indicates that it was not directly from the Slops, (ii) there is no information about the storage of the sample or the testing method used and (iii) the results are inconsistent with the NFI results, such that either a different substance was tested or the Slops had been heavily contaminated with other material by the time of testing.

Conventions and regulations

385. Save that it is admitted and averred that the Slops fell within MARPOL Annexes I and/or II paragraph 4.47 is not admitted.

386. Paragraph 4.48 is denied. Basel and MARPOL are mutally exclusive. If the Slops fell within MARPOL, which they did, they were not covered by Basel.

387. The first sentence of paragraph 4.49 is admitted.

388. The second sentence of paragraph 4.49 is denied.

389. The first sentence of paragraph 4.50 is admitted.

390. The second sentence of paragraph 4.50 is denied. As with Basel, the Bamako Convention excludes from its scope materials covered by MARPOL.

391. Paragraph 4.51 is admitted. Its relevance (which is not explained by the BBC) is denied.

392. As for paragraph 4.52 paragraph 333 above is repeated.

393. Paragraph 4.53 is denied.

394. Paragraphs 4.54 to 4.68 have been answered above.

395. The first sentence of paragraph 4.69 is admitted.

396. The second sentence of paragraph 4.69 is denied.

STATEMENTS MADE BY TRAFIGURA AFTER 19 AUGUST 2006

397. In paragraphs 4.70 – 4.73 the BBC seeks again to try and justify a defamatory meaning which was not complained of by Trafigura. As with the allegations concerning Trafigura's conduct prior to 19 August 2006 this is impermissible as a matter of law and wholly disproportionate.

Press statements

398. in several instances the extracts from press and other statements relied on by the BBC in paragraph 4.70 are misquotations, are not statements by Trafigura or have been taken out of their proper and explanatory context by the BBC. For example:

398.1. the statement complained of in the second quotation in paragraph 4.70.6 is a statement by the Prime Minister of Estonia, quoted in a press statement issued by Prime Marine Management, and concerning slops resulting from the washing of the *Probo Koala*'s tanks in Estonia, to where it had travelled after discharging the Slops in question in Abidjan. It does not relate to the Slops which were dumped by Tommy in Abidjan;

398.2. the second quoted phrase relied on in paragraph 4.70.6 also does not refer to the caustic washing, but rather to the washing of the *Probo Koala*'s tanks off Estonia, as is apparent from its context in the statement by Prime Marine Management; and

398.3. the phrases quoted in paragraphs 4.70.8 and 4.70.13 do not appear in the statements referred to in those paragraphs.

399. The statements relied on by the BBC which are accurately quoted and which were made by or on behalf of Trafigura were made in good faith and were accurate in all material respects. If necessary, Trafigura will rely on the full statements from which the passages quoted are extracted for their meaning and context, and will rely on the case pleaded above.

400. Significantly, notwithstanding the detailed examination of statements made by Trafigura, the Defence does not allege that the following claims, made by Trafigura in press statements disclosed by the BBC as documents referred to in the Defence, were untrue, or were made dishonestly:

400.1. *"Independent experts have analysed the slops and concluded that they could not have caused the illnesses alleged by Leigh Day & Co"* (16/9/08);

400.2. *"Scientific opinion suggests that the slops by themselves could not have caused the harm in Abidjan"* (4/10/06); and

400.3. *"the fact is that,. according to the independent analyses that Trafigura has seen of the chemical composition of the slops, it is simply not possible that this material could have led to the deaths and widespread injuries alleged."* (May 2009).

401. In fact, as has been demonstrated above, the public position taken by Trafigura from early on concerning the content (particularly the absence of hydrogen sulphide), toxicity and potential effects of the Slops on the people of Abidjan has been vindicated.

402. The quotation relied on by the BBC in the first sub-paragraph under paragraph 4.70 is from a press release dated 24 September 2006 (i.e. just over a month after the dumping). This is a brief extract from a press statement headed *"Trafigura Tests Contradict Media Speculation."* The media speculation referred to was described in the press statement as follows:

> *Much of the recent ill-informed debate has centred on the chemical composition of the 'slops', in particular the Hydrogen Sulphide content that is thought to have been responsible for causing the ill effects.*

403. The press statement reported 2 recently obtained tests results showing that the Slops did not contain hydrogen sulphide.

403.1. The first result was from analysis by Saybolt / Core Labs, which had been provided to Trafigura on 11 September 2006 and which reported

no hydrogen sulphide at the detectable level of 1 ppm, as pleaded at paragraph 71 above.

403.2. The second test result reported was that from the French Civil Protection Team dated 13 September 2006 which reported an *"absence of hydrogen sulphide"* in samples taken at Akouedo on 9 September 2006, as pleaded at paragraph 124.2, and elsewhere, above.

404. Moreover, by 24 September 2006 Trafigura had been informed that analysis carried out by NFI on the material in the Slops tanks of the *Probo Koala* showed that the Slops were highly alkaline, having a pH of 14. This ruled out the presence of hydrogen sulphide in its molecular form, as explained above. Earlier speculation about the presence of hydrogen sulphide in the Slops was thereby shown to be incorrect.

405. That earlier speculation had included a draft report of John Minton of Minton, Treharne and Davies Ltd dated 14 September 2006 ("the draft Minton Report"), which the BBC appears to have used in the preparation of its Defence. That report was commissioned by solicitors acting for Trafigura in the light of threatened proceedings and as such was subject to litigation privilege. The draft Minton Report was subsequently obtained by *The Guardian* newspaper and has now entered the public domain. By referring to the report in this Reply Trafigura does not waive privilege subsisting in any other document.

406. In his draft report of 14 September 2006 Mr Minton concluded that the Slops may have contained hydrogen sulphide. However, as the draft itself states, it was based on *"limited information"*. It was setting out *"outline information"* as to the potential contents of the Slops, albeit that Mr Minton's firm had *"no information"* as to the quantities of the chemicals present in the Slops or their concentrations. Mr Minton stated that he had *"very little detail of events as they occurred in Abidjan"* and that the draft would be updated as and when further information was received.

407. The information from NFI received by Trafigura on 23 September 2006 showed that hydrogen sulphide could not have existed in the Slops in its molecular form. Thus the speculation in Mr Minton's draft was quickly superseded by evidence based on testing rather than speculation within days of it being written, as Mr Minton has since publicly confirmed.

408. In the premises, the public position which Trafigura has maintained since September 2006 was based on the analysis of contemporaneous and independently obtained evidence. It has been demonstrated during the three years of the Group Litigation to be true, as explained in detail above. It was this public position which was wrongly presented by the BBC in the publications complained of as being false and unworthy of belief.

409. The allegation in paragraph 4.71 that the statements submitted to the BBC, and published by *The Guardian* and *The Times* were false and known to be false is denied. The statements referred to were made in good faith and were accurate in all material respects. They were made in response to irresponsible and untrue allegations published by those media organisations, including the demonstrably untrue allegations made by the BBC in the words and pictures complained of in these proceedings. Trafigura cannot properly be criticised for seeking to defend its reputation in this way.

Statements in the Group Litigation and these proceedings

410. Paragraph 4.72 is denied. The inference is invited in that paragraph that Trafigura changed its case in the Group Litigation so as to *"draw attention away from hydrogen sulphide".* That inference is based on a number of false premises, and a fundamental misunderstanding of the nature of the Slops and the meaning of the NFI report. The following is pleaded without any waiver of privilege.

411. In relation to the *percentage* of inorganic sulphur contained in the aqueous phase of the Slops, namely 0.5%, there was no change from the Appendix 13 attached to Trafigura's Defence in the Group Litigation dated 27 July 2007 and the amended Appendix 13 provided by Trafigura on 3 December 2008 (attached as Appendix 1 to this Reply). The percentage was based, as stated in the Group Litigation Defence at paragraph 234.2, on the NFI results.

412. Nor was there any change in the *description* of this element of the Slops from the original to the Amended Appendix 13. The NFI analysis recorded a finding of 0.5% hydrogen sulphide. For the reasons explained above, and as stated in and apparent from the NFI report, that result indicated the presence of 0.5% inorganic sulphur in the form of sulphide and bi-sulphide. The alkalinity of the Slops ruled out the presence of hydrogen sulphide in its molecular form. The description *"Inorganic Sulphur (Sulphide and Bi-Sulphide as S)"* was accurate. The fact that hydrogen sulphide could not exist in the Slops at their pH was acknowledged in the Group Litigation claimants' table of the composition of the Slops by the description *"Hydrogen Sulphide as S (bisulphide at pH 14)"* (attached as Appendix 2 to this Reply).

413. The change in the *weight* of the inorganic sulphur represented by 0.5% of the aqueous Slops (from 1.39 tons in the original Appendix 13 to 1.9 tons in the amended Appendix 13) was explained in Response 26 of Trafigura's *"Responses to requests 26 to 29 of the Claimants' amended requests for clarification of the Defence pursuant to Part 18 of the CPR"* dated 31 October 2008. It resulted from a change in Trafigura's estimation of the proportion by weight of the aqueous Slops compared with the hydrocarbon Slops (estimated respectively at 278 and 240 mt in July 2007 and 379 and 137 mt in October 2008). The estimated weights of each of the other components of the Slops were adjusted accordingly. The change had the effect of *increasing* the amount of inorganic sulphur in the aqueous phase of the Slops.

414. The change in the estimated percentage of phenols (from 1.3% in the original Appendix 13 to 4.8% in the Amended Appendix) was as a result of an error in the original Appendix 13.

415. The change in the estimated weight of the phenols (from 3.61 tons to 18.2 tons) was due to the correction of the error and the change in the estimated proportion by weight of the aqueous and hydrocarbon phases of the Slops, as explained above.

416. Phenols are in any event of little potential relevance to the question of whether the Slops caused the injuries and deaths alleged by the BBC, being of low volatility in the alkaline Slops and having a low release rate.

417. In the premises the inference that the changes explained above were made in a dishonest attempt to mask the presence of hydrogen sulphide in the Slops is unsustainable and should be withdrawn forthwith.

418. As to paragraph 4.73, it is denied that the lack of a Letter of Claim can be relied upon in support of the Defendant's plea of justification.

419. The BBC's refusal to cease making the allegations complained of, in the face of the words of Mr Justice MacDuff quoted above, and when it does not even attempt to claim in its Defence that some of the more serious allegations it is making are true, amply justifies Trafigura's decision to bring these proceedings.

420. A Letter of Claim would not have avoided the necessity for proceedings or any of the costs of this claim. The response of the BBC to Trafigura's focused complaint in the Particulars of Claim has been a disproportionate (and misconceived) attempt to justify meanings not complained of and so expand these proceedings beyond their proper ambit.

421. Trafigura's repeated attempts to explain publicly and to the press the true nature and potential effect of the Slops, particularly the fact that they did not

contain hydrogen sulphide, have been characterised by the BBC in its Defence as a dishonest attempt at exoneration. Had a letter of claim been sent before proceedings were issued it would doubtless have been pleaded as a further instance of a knowingly false statement made on behalf of Trafigura.

422. Paragraph 8 is denied.

SECTION C: INJUNCTION

423. Paragraph 11, in which the BBC denies that Trafigura is entitled to an injunction, is denied.

423.1. The BBC has continued to publish allegations which were agreed by the parties in the Group Litigation to be untrue, in a statement endorsed in open Court by the Judge as *"100% truthful"*.

423.2. Further, the BBC has continued to publish allegations which it does not even claim in its Defence to be true (namely that Trafigura was responsible for the death of Ama Grace Kouadio in December 2007 and responsible for the facial disfigurement of the woman whose photograph continues to illustrate the website Article).

423.3. By its conduct the BBC has shown an arrogant disregard for the principles of responsible journalism, its own editorial guidelines and the values of accuracy and truth in the reporting of matters of public interest.

423.4. An injunction is necessary to restrain this continuing conduct.

DESMOND BROWNE QC

JACOB DEAN

The Claimant believes that the facts stated in this Reply are true.

I am duly authorised by the Claimant to sign this Statement of Truth.

..... 20 November 2009

Adam Tudor

Partner, Carter-Ruck

Served this 20th day of November 2009 by Messrs Carter-Ruck, 6 St Andrew Street, London EC4A 3AE, Solicitors for the Claimant

Claim no: HQ09X02050

IN THE HIGH COURT OF JUSTICE
QUEEN'S BENCH DIVISION

B E T W E E N : -

TRAFIGURA LIMITED

Claimant

and

BRITISH BROADCASTING CORPORATION

Defendant

APPENDIX 1 TO THE REPLY

LIKELY CHEMICAL COMPOSITION OF THE AQUEOUS AND HYDROCARBON PHASES OF THE SLOPS

Likely Chemical Composition of the Slops

Aqueous Phase[1]

Chemical	% of Slops	Weight in Slops
Sodium Hydroxide (NaOH)	10%	37.9 tons
Total Sulphur (S)	6.80%	25.7 tons
Mercaptan Sulphur (Ethyl and Methyl Sodium Mercaptides as S)	3.34%	12.7 tons
Thiophenols	0.16%	0.6 tons
Phenols, including Cresols	4.80%	18.2 tons
Inorganic Sulphur (Sulphide and Bi-Sulphide as S)	0.50%	1.9 tons
Cobalt Phthalocyanine Sulphonate	4ppm added	1516 grams
Catalyst (as Co)	1.3ppm measured	492 grams
Mercury	0.91ppm	345 grams
Zinc	2.7ppm	1023 grams
Copper	1.8ppm	682 grams
Strontium	0.42ppm	159 grams

[1] Analysis of chemical composition is based on the Amsterdam NFI Chemical Analyses. Weight is based on 379mt (344.8m^3) aqueous slops at a density of 1.1 for 10% caustic.

Hydrocarbon Phase[2]

Chemical	%Slop	Weight in Slop
Hydrocarbons C5 to C11	Approx 98%	Approx 135 tons
Heavy Hydrocarbons C14 to C40, estimated from Tredi Analysis	0.45%	0.62 tons
Normal Alkanes	29.1%	39.9 tons
Branched Alkanes	17.2%	23.6 tons
Unsaturated Compounds	36.2%	49.6 tons
Cyclic Alkanes	10.9%	14.9 tons
Aromatics, of which	6.2%	8.5 tons
C2 Alkyl Benzenes	1.7%	2.3 tons
C3 Alkyl Benzenes	0.9%	1.2 tons
C4 Alkyl Benzenes	0.1%	0.14 tons
Total Sulphur mainly as Diethyl and Methyl Propyl Disulphides (measured as S)	1.3%	1.8 tons
Mercaptan Sulphur (S)	0.095%	0.13 tons
Organo Chlorine (ex Main VII)	2ppm	274 grams

[2] Analysis of chemical composition is based on the Amsterdam NFI Chemical Analyses. Weight is based on 137mt (183m³) at a density of 0.75 measured in Abidjan by CIAPOL on 22 August 2006 (from a sample drawn on 21 August 2006).

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APPENDIX 2 TO THE REPLY

THE GROUP LITIGATION CLAIMANTS' CASE ON THE COMPOSITION OF THE SLOPS

TABLE 1: Aqueous phase (253 m^3)

Chemical Compound	Proportion of Slops	Weight In Slops
Caustic Soda (NaOH)	10%	27.8 tonnes
Total Sulphur	6.8%	18.9 tonnes
Mercaptan Sulphur (as mercaptides at pH 14)	3.5%	9.7 tonnes
Phenols/Thiophenols	4.8%	13.3 tonnes
Hydrogen sulphide as S (bisulphide at pH14)	0.5%	1.39 tonnes (1.48 tonnes as hydrogen sulphide)
Disulphide Sulphur *	6.8%-3.5%-0.5%=2.8%	7.8 tonnes
Cobalt	1.3 mg/L	329 grams
Nickel	0.47 mg/L	119 grams
Copper	1.8 mg/L	455 grams
Zinc	2.7 mg/L	683 grams
Strontium	0.42 mg/L	106 grams
Barium	0.51 mg/L	129 grams
Mercury	0.91 mg/L	230 grams

Quoted values are based on NFI analyses and a volume of 253 m^3 of 10% caustic soda solution with a density of 1.1 g/mL, thus a total weight of 278 tonnes. - * Note: Disulphide sulphur is estimated by difference based on the balance between the total sulphur and the sour sulphur determined by NFI, not taking into account the sulphur of the thiophenols.

TABLE 2: Organic phase (174m^3)

Chemical Compound	Proportion of Slops	Weight In Slops
Hydrocarbons C5-C11	99.6%	125 tonnes
Hydrocarbons C10-C40 (as determined by TREDI)	0.46 – 1.04%	0.58 – 1.3 tonnes
Alkanes (n-paraffins)	29.1%	36.4 tonnes
Alkanes (iso-paraffins)	17.2%	21.5 tonnes
Alkene (olefins)	36.2%	45.4 tonnes
Cyclo-alkanes (naphtenes)	10.9%	13.6 tonnes
Aromatics	6.2%	7.8 tonnes
C2-benzenes	1.8%	2.3 tonnes
C3-benzenes	0.9%	1.1 tonnes
C4-benzenes	0.15%	189 kg
Total Sulphur as S	1.3%	1.6 tonnes
Disulphide Sulphur *	0.7%	0.9 tonne
Mercaptan Sulphur	*"Small quantity"* (not quantified)	—
Organic Chlorine (Sample 1.023, source unknown)	2 mg/kg	252 grams

Quoted values are based on NFI analyses and a volume of 174 m^3 of residual naphtha. NFI determined a density of 0.72 g/mL. Hence, the total weight of the naphtha was approximately 125 tonnes. - * Note: Disulphide sulphur derived from the extraction process is based on the difference between the total sulphur level and the non-extractable sulphur (approximately 6000 ppm), taking into account an average total sulphur level of 8000 ppm and an average mercaptan level of 2000 ppm for the untreated naphtha.

TABLE 3: Sediments (100 m^3)

Total Sour Sulphur	45 tonnes
Sodium mercaptides	43 tonnes ± 2 tonnes
Sodium bisulphide	2 tonnes ± 2 tonnes
Sodium carbonates	Small quantity not quantified

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APPENDIX 4 TO THE REPLY

TABLE SHOWING GROUP LITIGATION CLAIMANTS' CASE AS TO THE AMOUNTS OF SLOPS DUMPED AT EACH LOCATION

The Group Litigation claimants' case as to the amounts of slops dumped at each location:

Location and UNDAC number	**Quantity**
Abobo Foret du Banco 3.1	1 truck
Abobo 2.1	Waste at 2.1 flowed downstream from 2.2
Abobo 2.2 (Dokui)	3 trucks offloaded in the vicinity of 2.2
Abobo 2.3	-
Abobo 2.5	-
Akouedo 1.1	4 trucks
Akouedo 1.2	A truck that had been used to clean waste in Vridi was parked at 1.3. Material from this truck leaked onto the dumpsite
Akouedo 1.3	1 truck
Boulangerie 11.1	1/3rd of a truck
Djbi 4.1	1 truck
Djbi 4.2	-
Djbi 5.1	1 truck
Koumassi 10.1	1 truck plus 2/3rds of truck that went to Boulangerie
Maca 7.1	1 truck
Route d'Anyama 6.1	1 truck
Route d'Anyama 6.2	-
Vridi 8.1, Vridi 9.1	1 truck

IN THE HIGH COURT OF JUSTICE
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Claim no: HQ09X02050

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APPENDIX 5 TO THE REPLY

TABLE SHOWING AMOUNT OF EACH CONSTITUENT OF THE SLOPS DUMPED AT EACH LOCATION, ON THE GROUP LITIGATION CLAIMANTS' CASE AS TO THE TOTAL AMOUNTS DUMPED AND THE CONSTITUENTS OF THE SLOPS

Amount of each constituent of the slops dumped at each location, on the Group Litigation claimants' case as to the total amounts dumped and the constituents of the slops.

Dumpsite	%	Akouedo 1.1	Akouedo 1.3	Abobo 2.2 (Dokui)	Djbi 4.1	Djbi 5.1
Total aqueous slops (tonnnes)		**69.58**	**17.39**	**52.18**	**17.39**	**17.39**
Sodium hydroxide	10	6.96	1.74	5.22	1.74	1.74
Total sulphur	6.8	4.73	1.18	3.55	1.18	1.18
Mercaptan sulphur	3.5	2.44	0.61	1.83	0.61	0.61
Thiophenol	0.16	0.11	0.03	0.08	0.03	0.03
Disulphide sulphur	2.8	1.95	0.487	1.461	0.487	0.487
Catalyst as Co (g)	1.3	90.45	22.61	67.84	22.61	22.61
Hg (g)	0.91	63.31	15.83	47.48	15.83	15.83
Zn (g)	2.7	187.85	46.95	140.89	46.95	46.95
Cu (g)	1.8	124.24	31.31	93.93	31.31	31.31
Sr (g)	0.42	29.22	7.31	21.92	7.31	7.31
Ba (g)	0.51	35.48	8.87	26.61	8.87	8.87
Ni (g)	0.47	32.70	8.18	24.53	8.18	8.18
Total Organic Slops		**31.76**	**7.94**	**23.82**	**7.94**	**7.94**
C5-C11	99.6	31.63	7.91	23.72	7.91	7.91
C14-C40	0.5	0.14	0.04	0.11	0.04	0.04
Normal alkanes	29.1	9.24	2.31	6.93	2.31	2.31
Branched alkanes	17.2	5.46	1.37	4.10	1.37	1.37
Unsaturated compounds	36.2	11.50	2.87	8.62	2.87	2.87
Cyclic compounds	10.9	3.46	0.87	2.60	0.87	0.87
Aromatics	6.2	1.97	0.49	1.48	0.49	0.49
C2-Alkyl benzenes	1.8	0.57	0.14	0.43	0.14	0.14
C3-Alkyl benzenes	0.9	0.29	0.07	0.21	0.07	0.07
C4-Alkyl benzenes	0.2	0.05	0.01	0.04	0.01	0.01
Total sulphur	1.3	0.41	0.10	0.31	0.10	0.10
Disulphide S	0.7	0.22	0.06	0.17	0.06	0.06
Mercaptan S	0.1	0.03	0.01	0.02	0.01	0.01
Organchlorines (g)	2	63.51	15.88	47.63	15.88	15.88
Total sediments						
Total sour sulphur	45/16	11.25	2.81	8.44	2.81	2.81
Mercaptides sulphur as mercaptides	43/16	10.75	2.69	8.06	2.69	2.69
Bisulphides S	2/16	0.50	0.13	0.38	0.13	0.13

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APPENDIX 6 TO THE REPLY

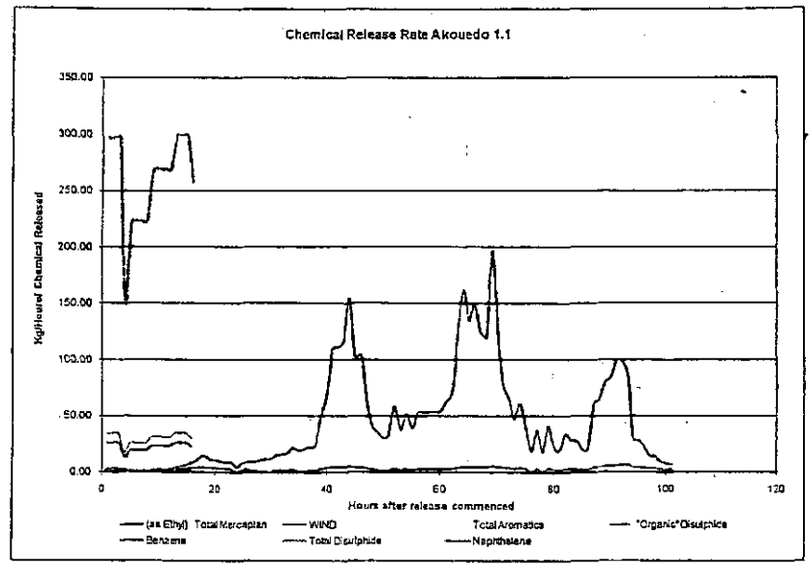
CHEMICAL RELEASE DATA FOR 5 SLOPS DISPOSAL SITES IN AND AROUND AKOUEDO, DOKUI AND DJIBI

CHEMICAL RELEASE DATA

AKOUEDO 1.1

All Release rates in kg/hr

	HOURS	WIND m/s	TIME	DATE	(as Ethyl) Total Mercaptan	CS-C11	(as Diethyl) Total Disulphide	(as Diethyl) "Organic" Disulphide	(as Xylene) Total Aromatics	Naphthalene	Benzene
day1	1	3.06	1900	19-Aug	0.25	2577	297.1	34.4	159.8	0.9	25.8
	2	3.61	2000	19-Aug	0.56	2577	297.1	34.4	159.8	0.9	25.8
	3	3.06	2100	19-Aug	0.51	2577	297.1	34.4	159.8	0.9	25.8
	4	1.94	2200	20-Aug	0.34	1302	150.1	17.4	80.7	0.5	13.0
	5	1.39	2300	20-Aug	0.76	1936	223.1	25.8	120.0	0.7	19.4
	6	1.39	2400	20-Aug	0.85	1936	223.1	25.8	120.0	0.7	19.4
	7	0.05	0100	20-Aug	0.85	1936	223.1	25.8	120.0	0.7	19.4
	8	1.11	0200	20-Aug	1.04	1936	223.1	25.8	120.0	0.7	19.4
	9	1.39	0300	20-Aug	1.72	2335	269.2	31.2	144.8	0.8	23.4
	10	1.67	0400	20-Aug	1.86	2335	269.2	31.2	144.8	0.8	23.4
	11	1.94	0500	20-Aug	2.05	2335	269.2	31.2	144.8	0.8	23.4
	12	2.22	0600	20-Aug	2.54	2335	269.2	31.2	144.8	0.8	23.4
	13	2.50	0700	20-Aug	4.18	2593	298.9	34.6	160.8	0.9	25.9
	14	2.78	0800	20-Aug	5.13	2593	298.9	34.6	160.7	0.9	25.9
	15	3.06	0900	20-Aug	6.27	2593	298.9	34.6	160.7	0.9	25.9
	16	3.61	1000	20-Aug	8.74	2238	258.0	29.9	138.8	0.8	22.4
	17	3.89	1100	20-Aug	10.58						
	18	4.44	1200	20-Aug	14.59						
	19	3.89	1300	20-Aug	11.59						
	20	3.61	1400	20-Aug	10.50						
	21	3.33	1500	20-Aug	9.49						
	22	3.06	1600	20-Aug	8.60						
	23	3.06	1700	20-Aug	8.93						
day2	24	0.05	1800	20-Aug	4.55						
	25	2.22	1900	20-Aug	7.61						
	26	2.22	2000	20-Aug	9.20						
	27	0.56	2100	21-Aug	9.01						
	28	0.56	2200	21-Aug	10.32						
	29	0.56	2300	21-Aug	11.63						
	30	0.05	2400	21-Aug	11.70						
	31	1.94	0100	21-Aug	14.72						
	32	1.94	0200	21-Aug	16.04						
	33	1.94	0300	21-Aug	17.35						
	34	2.22	0400	21-Aug	21.53						
	35	0.56	0500	21-Aug	19.21						
	36	0.56	0600	21-Aug	20.42						
	37	1.94	0700	21-Aug	22.39						
	38	1.94	0800	21-Aug	23.61						
	39	3.33	0900	21-Aug	50.61						
	40	3.89	1000	21-Aug	69.94						
	41	4.72	1100	21-Aug	109.13						
	42	4.72	1200	21-Aug	111.44						
	43	5.00	1300	21-Aug	116.20						
	44	5.28	1400	21-Aug	154.59						
	45	4.44	1500	21-Aug	103.04						
	46	4.44	1600	21-Aug	104.33						
	47	3.33	1700	21-Aug	60.35						
day3	48	2.50	1800	21-Aug	40.29						
	49	2.22	1900	21-Aug	35.54						
	50	1.39	2000	21-Aug	30.65						
	51	1.94	2100	22-Aug	32.01						
	52	3.06	2200	22-Aug	58.04						
	53	2.22	2300	22-Aug	38.08						
	54	2.78	2400	22-Aug	51.57						
	55	2.22	0100	22-Aug	39.07						
	56	2.78	0200	22-Aug	52.81						
	57	2.78	0300	22-Aug	53.25						
	58	2.78	0400	22-Aug	53.64						
	59	2.78	0500	22-Aug	53.97						
	60	2.78	0600	22-Aug	54.26						
	61	3.06	0700	22-Aug	62.92						
	62	3.33	0800	22-Aug	72.20						
	63	4.44	0900	22-Aug	125.60						
	64	5.00	1000	22-Aug	161.19						
	65	4.72	1100	22-Aug	135.15						
	66	5.00	1200	22-Aug	149.61						
	67	4.72	1300	22-Aug	125.01						
	68	4.72	1400	22-Aug	120.45						
	69	5.83	1500	22-Aug	156.55						
	70	5.00	1600	22-Aug	122.10						
	71	4.17	1700	22-Aug	77.18						
day4	72	3.89	1800	22-Aug	65.27						
	73	3.33	1900	22-Aug	47.20						
	74	3.89	2000	22-Aug	60.77						
	75	3.06	2100	23-Aug	38.33						
	76	0.05	2200	23-Aug	13.33						
	77	3.06	2300	23-Aug	36.84						
	78	0.05	2400	23-Aug	17.62						
	79	3.33	0100	23-Aug	40.61						
	80	2.22	0200	23-Aug	22.30						
	81	1.67	0300	23-Aug	18.56						
	82	3.06	0400	23-Aug	33.27						
	83	2.78	0500	23-Aug	28.06						
	84	2.78	0600	23-Aug	27.42						
	85	2.22	0700	23-Aug	20.09						
	86	2.22	0800	23-Aug	19.75						
	87	4.44	0900	23-Aug	59.85						
	88	4.72	1000	23-Aug	65.09						
	89	5.28	1100	23-Aug	80.09						
	90	5.56	1200	23-Aug	84.30						
	91	6.11	1300	23-Aug	99.04						
	92	6.39	1400	23-Aug	99.08						
	93	6.39	1500	23-Aug	85.99						
	94	4.44	1600	23-Aug	29.71						
	95	4.44	1700	23-Aug	28.15						
day5	96	4.17	1800	23-Aug	23.31						
	97	3.33	1900	23-Aug	14.57						
	98	3.33	2000	23-Aug	14.13						
	99	3.89	2100	24-Aug	8.57						
	100	2.22	2200	24-Aug	7.61						
	101	1.94	2300	24-Aug	6.47						

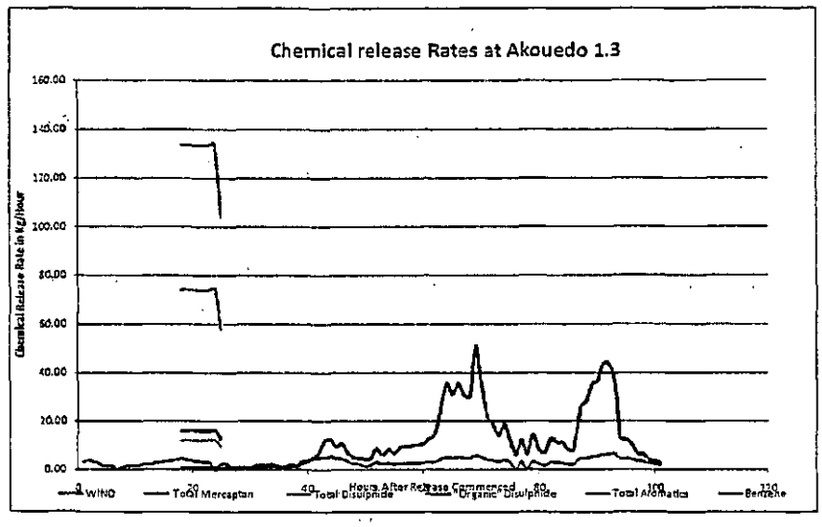


CHEMICAL RELEASE DATA

AKOUEDO 1.3

All Release rates in kg/hr

	HOURS	WIND m/s	TIME	DATE	(as Ethyl) Total Mercaptan	C5-C11	(as Diethyl) Total Disulphide	(as Diethyl) "Organic" Disulphide	(as Xylene) Total Aromatics	Naphthalene	Benzene
day1	1	3.06	1900	19-Aug							
	2	3.61	2000	19-Aug							
	3	3.06	2100	19-Aug							
	4	1.94	2200	19-Aug							
	5	1.39	2300	20-Aug							
	6	1.39	2400	20-Aug							
	7	0.05	0100	20-Aug							
	8	1.11	0200	20-Aug							
	9	1.39	0300	20-Aug							
	10	1.67	0400	20-Aug							
	11	1.94	0500	20-Aug							
	12	2.22	0600	20-Aug							
	13	2.50	0700	20-Aug							
	14	2.78	0800	20-Aug							
	15	3.06	0900	20-Aug							
	16	3.61	1000	20-Aug							
	17	3.89	1100	20-Aug							
	18	4.44	1200	20-Aug	0.49	1196	133.6	16.0	74.2	0.4	12.0
	19	3.89	1300	20-Aug	0.64	1196	133.6	16.0	74.2	0.4	12.0
	20	3.61	1400	20-Aug	0.68	1196	133.6	16.0	74.2	0.4	12.0
	21	3.33	1500	20-Aug	0.69	1196	133.6	16.0	74.2	0.4	12.0
	22	3.06	1600	20-Aug	0.69	1196	133.6	16.0	74.2	0.4	12.0
	23	3.06	1700	20-Aug	0.78	1196	133.6	16.0	74.2	0.4	12.0
day2	24	0.05	1800	20-Aug	0.42	1196	133.6	16.0	74.2	0.4	12.0
	25	2.22	1900	20-Aug	0.62	931	104.1	12.4	57.7	0.3	9.3
	26	2.22	2000	20-Aug	0.67						
	27	0.56	2100	21-Aug	0.61						
	28	0.56	2200	21-Aug	0.66						
	29	0.56	2300	21-Aug	0.71						
	30	0.05	2400	21-Aug	0.68						
	31	1.94	0100	21-Aug	0.83						
	32	1.94	0200	21-Aug	0.88						
	33	1.94	0300	21-Aug	0.93						
	34	2.22	0400	21-Aug	1.13						
	35	0.56	0500	21-Aug	0.99						
	36	0.56	0600	21-Aug	1.03						
	37	1.94	0700	21-Aug	1.12						
	38	1.94	0800	21-Aug	1.17						
	39	3.33	0900	21-Aug	1.48						
	40	3.89	1000	21-Aug	3.42						
	41	4.72	1100	21-Aug	5.85						
	42	4.72	1200	21-Aug	6.74						
	43	5.00	1300	21-Aug	11.62						
	44	5.28	1400	21-Aug	12.35						
	45	4.44	1500	21-Aug	9.33						
	46	4.44	1600	21-Aug	10.45						
	47	3.33	1700	21-Aug	6.61						
day3	48	2.50	1800	21-Aug	4.74						
	49	2.22	1900	21-Aug	4.46						
	50	1.39	2000	21-Aug	4.08						
	51	1.94	2100	22-Aug	4.43						
	52	3.06	2200	22-Aug	8.52						
	53	2.22	2300	22-Aug	5.86						
	54	2.78	2400	22-Aug	8.27						
	55	2.22	0100	22-Aug	6.52						
	56	2.78	0200	22-Aug	9.13						
	57	2.78	0300	22-Aug	9.53						
	58	2.78	0400	22-Aug	9.92						
	59	2.78	0500	22-Aug	10.30						
	60	2.78	0600	22-Aug	10.66						
	61	3.06	0700	22-Aug	12.71						
	62	3.33	0800	22-Aug	15.00						
	63	4.44	0900	22-Aug	26.82						
	64	5.00	1000	22-Aug	35.61						
	65	4.72	1100	22-Aug	31.02						
	66	5.00	1200	22-Aug	35.37						
	67	4.72	1300	22-Aug	30.52						
	68	4.72	1400	22-Aug	30.27						
	69	5.83	1500	22-Aug	50.91						
	70	5.00	1600	22-Aug	32.93						
	71	4.17	1700	22-Aug	21.46						
day4	72	3.89	1800	22-Aug	18.56						
	73	3.33	1900	22-Aug	13.94						
	74	3.89	2000	22-Aug	18.56						
	75	3.06	2100	23-Aug	12.11						
	76	0.05	2200	23-Aug	5.97						
	77	3.06	2300	23-Aug	12.32						
	78	0.05	2400	23-Aug	6.06						
	79	3.33	0100	23-Aug	14.32						
	80	2.22	0200	23-Aug	8.08						
	81	1.67	0300	23-Aug	6.39						
	82	3.06	0400	23-Aug	12.63						
	83	2.78	0500	23-Aug	10.50						
	84	2.78	0600	23-Aug	10.90						
	85	2.22	0700	23-Aug	8.16						
	86	2.22	0800	23-Aug	8.18						
	87	4.44	0900	23-Aug	25.28						
	88	4.72	1000	23-Aug	28.05						
	89	5.28	1100	23-Aug	35.19						
	90	5.56	1200	23-Aug	37.04						
	91	6.11	1300	23-Aug	43.52						
	92	6.39	1400	23-Aug	43.54						
	93	6.39	1500	23-Aug	37.79						
	94	4.44	1600	23-Aug	13.05						
	95	4.44	1700	23-Aug	12.37						
day5	96	4.17	1800	23-Aug	10.24						
	97	3.33	1900	23-Aug	6.40						
	98	3.33	2000	23-Aug	6.21						
	99	2.50	2100	24-Aug	3.84						
	100	2.22	2200	24-Aug	3.34						
	101	1.94	2300	24-Aug	2.84						



CHEMICAL RELEASE DATA

CocoService Ravine 2.2

All Release rates in kg/hr

	HOURS	WIND m/s	TIME	DATE	(as Ethyl) Total Mercaptan	C5-C11	(as Diethyl) Total Disulphide	(as Diethyl) "Organic" Disulphide	(as Xylene) Total Aromatics	Naphthalene	Benzene
day1	1	3.06	1900	19-Aug							
	2	3.61	2000	19-Aug							
	3	3.06	2100	19-Aug							
	4	1.94	2200	20-Aug							
	5	1.39	2300	20-Aug							
	6	1.39	2400	20-Aug							
	7	0.05	0100	20-Aug							
	8	1.11	0200	20-Aug							
	9	1.39	0300	20-Aug							
	10	1.67	0400	20-Aug							
	11	1.94	0500	20-Aug							
	12	2.22	0600	20-Aug							
	13	2.50	0700	20-Aug							
	14	2.78	0800	20-Aug							
	15	3.06	0900	20-Aug							
	16	3.61	1000	20-Aug							
	17	3.89	1100	20-Aug							
	18	4.44	1200	20-Aug	14.04	5421	625.2	72.3	334	2.0	54.2
	19	3.89	1300	20-Aug	13.02	5420	625.2	72.3	334	2.0	54.2
	20	3.61	1400	20-Aug	14.21	5420	625.2	72.3	334	2.0	54.2
	21	3.33	1500	20-Aug	14.96	5420	625.2	72.3	334	2.0	54.2
	22	3.06	1600	20-Aug	15.37	5420	624.3	72.3	334	2.0	54.2
	23	3.06	1700	20-Aug	17.27						
day2	24	0.05	1800	20-Aug	9.24						
	25	2.22	1900	20-Aug	14.78						
	26	2.22	2000	20-Aug	16.09						
	27	0.56	2100	21-Aug	14.58						
	28	0.56	2200	21-Aug	15.65						
	29	0.56	2300	21-Aug	16.71						
	30	0.05	2400	21-Aug	14.53						
	31	1.94	0100	21-Aug	19.79						
	32	1.94	0200	21-Aug	20.84						
	33	1.94	0300	21-Aug	21.87						
	34	2.22	0400	21-Aug	25.90						
	35	0.56	0500	21-Aug	22.65						
	36	0.56	0600	21-Aug	23.58						
	37	1.94	0700	21-Aug	25.77						
	38	1.94	0800	21-Aug	26.69						
	39	3.33	0900	21-Aug	49.41						
	40	3.89	1000	21-Aug	62.00						
	41	4.72	1100	21-Aug	81.34						
	42	4.72	1200	21-Aug	100.29						
	43	5.00	1300	21-Aug	126.14						
	44	5.28	1400	21-Aug	151.05						
	45	4.44	1500	21-Aug	131.90						
	46	4.44	1600	21-Aug	141.27						
	47	3.33	1700	21-Aug	101.55						
day3	48	2.50	1800	21-Aug	76.42						
	49	2.22	1900	21-Aug	71.31						
	50	1.39	2000	21-Aug	64.47						
	51	1.94	2100	22-Aug	68.99						
	52	3.06	2200	22-Aug	115.10						
	53	2.22	2300	22-Aug	81.11						
	54	2.78	2400	22-Aug	104.88						
	55	2.22	0100	22-Aug	81.93						
	56	2.78	0200	22-Aug	104.58						
	57	2.78	0300	22-Aug	102.60						
	58	2.78	0400	22-Aug	100.01						
	59	2.78	0500	22-Aug	96.87						
	60	2.78	0600	22-Aug	93.26						
	61	3.06	0700	22-Aug	99.79						
	62	3.33	0800	22-Aug	104.39						
	63	4.44	0900	22-Aug	140.72						
	64	5.00	1000	22-Aug	140.99						
	65	4.72	1100	22-Aug	107.87						
	66	5.00	1200	22-Aug	96.28						
	67	4.72	1300	22-Aug	72.01						
	68	4.72	1400	22-Aug	58.52						
	69	5.83	1500	22-Aug	59.24						
	70	5.00	1600	22-Aug	37.22						
	71	4.17	1700	22-Aug	22.67						
day4	72	3.89	1800	22-Aug	16.89						
	73	3.33	1900	22-Aug	11.43						
	74	3.89	2000	22-Aug	12.06						
	75	3.06	2100	23-Aug	7.23						
	76	0.05	2200	23-Aug	3.03						
	77	3.06	2300	23-Aug	5.94						
	78	0.05	2400	23-Aug	2.46						
	79	3.33	0100	23-Aug	5.34						
	80	2.22	0200	23-Aug	2.80						
	81	1.67	0300	23-Aug	2.17						
	82	3.06	0400	23-Aug	5.26						
	83	2.78	0500	23-Aug	2.44						
	84	2.78	0600	23-Aug	2.07						
	85	2.22	0700	23-Aug	1.38						
	86	2.22	0800	23-Aug	1.21						
	87	4.44	0900	23-Aug	2.40						
	88	4.72	1000	23-Aug	1.76						
	89	5.28	1100	23-Aug	1.32						
	90	5.56	1200	23-Aug	0.83						
	91	6.11	1300	23-Aug	0.52						
	92	6.39	1400	23-Aug	0.29						
	93	6.39	1500	23-Aug	0.15						
	94	4.44	1600	23-Aug	0.06						
	95	4.44	1700	23-Aug	0.04						
day5	96	4.17	1800	23-Aug	0.02						
	97	3.33	1900	23-Aug	0.01						
	98	3.33	2000	23-Aug	0.01						
	99	2.00	2100	24-Aug	0.01						
	100	2.22	2200	24-Aug	0.00						
	101	1.94	2300	24-Aug	0.00