

UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF NEW YORK

UNITED STATES OF AMERICA,
THE STATE OF NEW YORK,

Plaintiffs,

- vs -

Civil Action No: 79-989

HOOKEE CHEMICAL & PLASTICS CORP.;
OXY CHEMICAL CORPORATION; HOOKEE
CHEMICAL CORPORATION; OCCIDENTAL
PETROLEUM INVESTMENT CO.; OCCIDENTAL
PETROLEUM CORPORATION; THE TOWN OF
LEWISTOWN; THE TOWN OF NIAGARA;
(Hyde Park Landfill),

Defendants.

A F F I D A V I T

I, DOUGLAS J. HALLETT, a resident of the Township of
West Carleton, Province of Ontario, make oath and say as
follows:

1. I have been employed by Environment Canada for 6.5 years, presently I am the Senior Adviser, Scientific Programs, Federal Department of the Environment, Ontario Region and a Research Scientist with the Canadian Wildlife Service, Federal Department of the Environment. My research responsibilities include investigating previously unknown contaminants in the Great Lakes Food chain. Presently I am Chairman of the Federal Interagency Committee on TCDD and other chlorinated dioxins and furans and have been a member of various International Joint Commission Great Lakes Water Quality Board Committees on environmental contaminants for over 5 years. I have published over 37 scientific papers on environmental contaminants analysis, toxicology, and environmental significance and made over 75 presentations at scientific conferences and symposia on environmental contaminants matters. (See curriculum vitae annexed hereto as Exhibit "A") and made a part hereof.

2. This affidavit was prepared in response to the request of Pollution Probe and the Canadian Environmental Law Association for my professional evaluation of certain scientific and technological aspects of the settlement proposed for the Hyde Park landfill site by the Parties (Civil Action No: 79-989). I am making this affidavit in my professional capacity and not as a representative or employee of the Canadian government. However, this affidavit is made with the full knowledge and permission of the Department of Environment.

3. I have reviewed the January 19, 1981 Stipulation and Judgement of this Court Approving Settlement Agreement, the April 3, 1981 Government response filed in this Court to Public Comments on the Stipulation and Judgement Approving

Settlement Agreement, the comments of the Ecumenical Task Force, the original complaint filed by the Environmental Protection Agency, all filed in this Court, and other relevant data in coming to my conclusions.

4. In December 1980 a report of my research concerning the discovery of 2,3,7,8 tetrachlorodibenzo-para-dioxin (hereafter referred to as "TCDD") in Great Lakes resident fish eating birds (Herring Gulls) was released by the Canadian Department of Environment and reported through the Department of External Affairs to the U.S. Department of State. (Appended as Exhibit B and attached hereto).

5. Only 2,3,7,8 - TCDD was found of a possible 22 tetrachlorodioxins.

6. In 1980 concentrations of TCDD ranged from 43 to 86 ppt (parts per trillion fresh weight Herring Gull tissue) in Saginaw Bay Herring Gull colonies, from 44 to 68 ppt in Lake Ontario colonies, and from 9 to 14 ppt in colonies on the other Great Lakes.

7. Levels of TCDD in archived Lake Ontario Herring Gull eggs collected in 1971-72 ranged from 800 to 1200 ppt. TCDD concentrations declined at a constant rate in Lake Ontario Herring Gull eggs collected from 1974 to 1980 falling 10 times in concentration from 502 ppt to 68 ppt.

8. It was concluded from this study that the two areas where TCDD levels were elevated (i.e. Saginaw Bay and Lake Ontario) were closely associated with the past production and disposal of 2,4,5 - trichlorophenol wastes. Although many chlorinated dioxins similar in structure to TCDD are created in chemical processes such as the low temperature (less than 700°C) incineration of industrial waste and municipal garbage

the specific compound 2,3,7,8 TCDD is a characteristic undesirable by-product in only one industrial process, the production of 2,4,5 - trichlorophenol from 1,2,4,5 - tetrachlorobenzene.

9. Hooker Chemicals and Plastics Corporation at Niagara Falls, N.Y. (hereafter referred to as Hooker) was the only known major producer of 2,4,5 - trichlorophenol in the Lake Ontario Basin area. (U.S. EPA report 600/2-80-197, 1980).

10. The decline of TCDD observed in Lake Ontario Herring Gulls starting in 1974, coincides with the cessation of 2,4,5 - trichlorophenol production by Hooker in 1974.

11. TCDD levels have been reported to be detectable (over 5 ppt) in some species of Lake Ontario fish collected in 1980. In July 1981, enough data will be available to assess whether or not Lake Ontario fish contain levels of TCDD at levels high enough to be considered a health hazard.

12. TCDD, mirex, and α and β -BHC's (lindane derivatives) are all present in the Hyde Park landfill site as well as chlorobenzenes, chlorotoluenes, and thiodan or endosulfan. Residues of all of these compounds have been found in the Lake Ontario ecosystem.

13. Mirex, and BHC's along with TCDD are of particular environmental concern because of their ability to bio-concentrate in aquatic food chains. These compounds concentrate in the fat or lipid of algae, increasing in concentration in fish eating algae, and further increasing in fish eating fish. Large carnivorous fish and Herring Gulls represent the top of the Lake Ontario food chain and have

TCDD, mirex

bioaccumulated some of the highest concentrations of these compounds found anywhere. Humans are also ultimately at the top of this food chain and bioaccumulate these residues after consumption of contaminated water or fish.

14. TCDD and mirex residues in Lake Ontario can be traced directly to the manufacturing and disposal activities of Hooker as the major source of entry into Lake Ontario.

15. Mirex is known to have been manufactured in the Great Lakes Basin area only by Hooker at Niagara Falls, N.Y. The only other source in the Lake Ontario area, considered to be relatively minor, has been traced to a deposit of mirex in the Oswego River at Armstrong Cork Company. This company purchased a quantity of mirex, but did not use the substance in its products.

16. TCDD might appear to be a very minor residue in the Hyde Park landfill sites. It is present in the 3300 reported tons of "still bottoms" from the 2,4,5 - trichlorophenol production (pg. 9, Summons and Complaint for Injunctive Relief).

17. However, TCDD in my opinion is the chemical of greatest concern in this landfill because it is much more toxic than any of the other chemicals of concern in this dump site. TCDD is 100,000 to 1,000,000 times more acutely toxic than mirex or the BHC - lindane derivatives.

18. TCDD, mirex and α -BHC's are all known mammalian carcinogens (cancer - causing agents (IARC, 1974)). However, while recognizing that the other contaminants are also present in the Hyde Park landfill are hazardous, TCDD in my opinion deserves primary attention.

19. TCDD is a known mammalian carcinogen (Kociba, R.J., Keyes, D.G., Beyer, J.E., Carreon, R.M., Wade, C.F., Dittenber, D.A., Laknins, R.P. Frauson, L.E., Park, C.N., Barnard, S.D., Hummel, R.A., and Hamiston, C.G. Toxicol Appl. Pharmacology. Vol. 46., pg 279-303, 1978), a teratogen (causes birth defects) (Courtney K.D. and Moore, A., Toxicol. Appl. Pharmacology. Vol. 20., pg 396-403, 1971), and a weak mutagen (Wassom, J.S., Hugg, J.E., and Loprieno, N. Mutation Research. Vol. 47., pg. 141-160, 1977/1978).

20. It has the highest acute toxicity of any industrial contaminant produced having an acute lethal dose which kills 50% of all animals exposed ranging from 600 ppt in guinea pigs and 70,000 ppt in rhesus monkeys.

21. On feeding first generation rats at rates as low as 10 ppt TCDD per day chronic reproductive effects including decreased litter size, increased numbers of stillbirths, and altered growth occurred in the second and third generation rats produced sequentially from the first generation which were dosed of the 10 ppt/day rate for 90 days. Chronic toxicity due to low dosage exposure to these compounds over periods as long as 30 t 40 years, or during key periods of development in children or neonates is the primary toxicological concern.

22. Prior to the decline of TCDD and mirex residues in Lake Ontario Herring Gulls (which exactly parallel each other and coincide with the cessation of production of these substances by Hooker Chemical Co.), these birds were experiencing reproduction rates 80-83% below normal.

23. Toxicological symptoms of organochlorine poisoning caused by these two potent chemicals and/or others such as chlorinated benzenes and certain PCB isomers were also observed. These include porphyria (a liver disease specifically caused by organochlorines) chick edema disease, and teratogenic effects (birth defects) such as cross bills in gull chicks.

24. Other resident fish-eating bird species had become absent entirely from the Lake Ontario area. These species exhibited greater sensitivity to organochlorine contaminants than Herring Gulls and could not reproduce at all.

25. Contrary to argument that TCDD is insoluble in water and will not move in underground aquifers or aboveground streams, TCDD is soluble in water at concentrations of 0.20 ug/L to 0.60 ug/L or 200 to 600 parts per billion. (Isensee, A.R. and G.E. Jones. Environ. Science and Technology, Vol. 9., pg. 688 to 672, 1975.) Therefore, TCDD is sufficiently soluble in water that significant amounts can be mobilized in ground water and surface water. Evidence for this phenomenon is visible where TCDD has been mobilized to the extent that concentrations reach as high as 200,000 ppt in Bloody Run Creek sediments. *Water from Bloody Run Creek which has been and continues to be contaminated with TCDD has reached the Niagara river and Lake Ontario.*

26. None of the estimates of the toxic effects of TCDD take into account that TCDD may potentiate the toxic effects of other contaminants present in the site which are leaching as well. (TCDD has been shown to promote the formation of tumors in animals previously exposed to carcinogens (Pitot, H.C., T. Goldsworthy, H.A. Campbell, and A. Poland. Cancer Research, Vol. 40, pg 3616 to 3620, 1980). None of the estimates of toxic effects of the chemicals in the landfill site, particularly TCDD and mirex, take into account that these chemicals might have synergistic effects with other environmental contaminants present in the Niagara River or Lake Ontario ecosystem.

27. TCDD is readily soluble in the basic toluenes, and lesser chlorinated benzenes known to be present in the Hyde Park landfill site. The mixture of TCDD with these chemicals will enhance its solubility in water and therefore enhance its mobilization in aquifers, and surface water.

28. Hyde Park is the largest known deposit of these "trichlorophenol still bottoms" in the world, a reported 3,300 tons (Summons and Complaint for Injunctive Relief pg.9). TCDD is present as an undesirable contaminant in the production of 2,4, 5 - trichlorophenol from 1,2,4,5, tetrachlorobenzene. TCDD is removed or "cleaned" from the product prior to the subsequent use of trichlorophenol for the manufacture of herbicides such as 2,4,5 - T or disinfectants such as hexachlorophene. This is accomplished by stirring the trichlorophenol reaction mixture with organic solvents such as toluene which are then decanted and subsequently distilled leaving a residue of "still bottoms" containing extremely high concentrations of TCDD.

29. Such "still bottoms" have been estimated to contain as low as 40 ppm (parts per million) of TCDD (Vertac Inc., Jacksonville, Arkansas USEPA 600/2-80-197, 1980) and as high as 400 ppm TCDD (T. Whiteside, The New Yorker Magazine, 1979).

30. The Hyde Park landfill therefore contains an estimated minimum deposit of 3,300 tons X 40 ppm = more than 264 lbs of pure TCDD. In my view the more realistic estimates range about 2,000 lbs (T. Whiteside, The New Yorker Magazine, 1976).

31. The total amount of mirex calculated to be present in Lake Ontario today including all sediments, the water column, fish and biota is only 2,000 to 3,000 kg. (R. Thomas. International Association of Great Lakes Research, 1981, NYS 1978, PLURAG 1978). Mirex and TCDD bioaccumulate from water into fish and Herring Gulls at roughly the same rate (approximately 10,000 times). The relative concentrations of TCDD are approximately 100,000 times lower in fish and Herring Gulls in Lake Ontario than mirex levels. Therefore, the estimated total amount of TCDD that has entered Lake Ontario to date is only between 30 to 300 grams or roughly between 1 ounce and 1 pound of TCDD.

32. This small amount of TCDD has resulted in bioaccumulation of levels as high as 1200 ppt in 1972 Lake Ontario Herring Gulls.

33. With present technology it is just barely possible to routinely measure raw water and drinking water for the presence of macro contaminants such as mirex and PCBs in Lake Ontario at concentrations of 1 ppt. Using a conservative bioconcentration factor of 10,000 to 100,000 for TCDD from water to Lake Ontario fish and gulls (presently at 20 to 50 ppt) one can estimate a present Lake Ontario water concentration of 1×10^{-4} to 1×10^{-5} ppt. It is impossible to measure TCDD (or determine the direct biological effects) of such concentrations at this time. However, that is not to say that because we cannot measure the presence of TCDD at this time in water does not mean that it does not pose a hazard at this time. Extrapolations of measurable concentrations in biota such as Herring Gulls and fish will provide our best available estimates of water concentrations for some time to come.

34. Of utmost concern is that if one shovel full (3 lbs or 1200 grams) of the 3,300 tons of "trichlorophenol still bottoms" containing TCDD were mobilized into the Niagara River over as short a period as 6 months, the levels of TCDD in the water column and biota of Lake Ontario would likely be elevated between 10 and 100 times the present levels. Levels in Herring Gulls would likely surpass the 1972 record of 1200 ppt and ^{reproduction would be as in the past} begin to fail. It is presently uncertain whether existing levels of TCDD in Lake Ontario fish are safe for human consumption.

35. Bearing in mind the extreme danger presented by the migration of these chemicals from this site, what can be done with the existing landfill?

36. First and foremost, the TCDD in this site is, in my opinion the most potent toxin present. Relative to the proposed settlement, in determining the extent of migration of TCDD deposited in the Hyde Park site by probing for traces, the presence of TCDD cannot be predicted by analysing for a surrogate chemical such as trichlorophenol or hexachlorobenzene. The ratio of TCDD to trichlorophenol or hexachlorobenzene in the still bottom wastes is unknown. Trichlorophenol is far more soluble in water and will be mobilized in water at a much higher rate, is far less toxic than TCDD, and is known to have entirely different properties than TCDD in soils, and aqueous ecosystems.

37. Therefore, the absence or presence of trichlorophenol or hexachlorobenzene in these probes will not in any way accurately reflect the presence or absence of TCDD. TCDD is of utmost concern and should be analysed as TCDD.

38. The landfill site will remain extremely hazardous far longer than the 35 years indicated in the present agreement and may survive as a threat to the environment indefinitely if left untreated. There are no distinct microbial degradation routes known for either mirex or TCDD. Nor would these chemicals be subject to ultra violet irradiation (sunlight) or sufficient heat to break them down into less toxic forms while they are buried in the landfill site.

39. The bulk of the chemicals at Hyde Park, if not removed, will persist indefinitely with the exception of a small percentage that may continue to leach into the Niagara River if the site is not properly contained.

40. The chemicals in this site, particularly TCDD, must be regarded in the long-term as extremely hazardous. In addition to being extremely toxic, TCDD is also a carcinogen a teratogen and a weak mutagen. Mirex and α - and B-BHC are also animal carcinogens. Carcinogenicity, teratogenicity and mutagenicity are also the properties of concern for human exposure to radionuclides (BEIR, The Advisory Committee on the Biological Effects of Ionizing Radiation, "The Effects of Populations of Exposure to Low Levels of Ionizing Radiation" National Academy of Sciences, National Research Council Washington, D.C., 1972) and are the reasons for the extensive precautions being taken for the disposal of radioactive wastes.

41. The principles for containment of the chemical in this site should therefore be the same as those for radioactive waste if containment of the waste is the chosen plan of action. The US Nuclear Regulatory Commission Proposed Criteria call for impervious containers and sites which are stable from erosion or earth quakes for a least 1000 years.

42. Radioactive waste sites and containers are chosen to minimize possible human tampering with the containment as well as to minimize environmental erosion. Provisions must ensure that extremely hazardous materials such as TCDD and mirex in the Hyde Park landfill site, be not mishandled by future generations who could expose themselves and Lake Ontario to a serious situation of chemical contamination.

43. At the present time the toxic contaminants are not in a contained impervious to the environment and are in a site which could be readily tampered with by present and future generations.

44. An impervious container should be developed immediately for containing the leachate presently being removed from the site.

45. The better long-term option is to destroy the chemicals in the landfill.

46. Of the chemicals known to be present in the site, TCDD and mirex are the most stable to incineration. At temperatures of 800°C TCDD is stable for 20 seconds. Mirex, being used as a fire retardant, is heat resistant but breaks down in heat more readily than TCDD.

47. Incineration of organochlorines at temperatures lower than 700°C or procedures using extremely short residence times in the incinerator will simply volatilize the chemicals into the atmosphere for deposition elsewhere, or will create additional potent toxins such as other chlorinated dioxins.

