

**IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF INDIANA**

**THE SIERRA CLUB; THE CHEMICAL WEAPONS
WORKING GROUP; CITIZENS AGAINST
INCINERATION AT NEWPORT (CAIN);
COMMUNITY IN-POWER DEVELOPMENT
ASSOCIATION (CIDA); SARA MORGAN;
LEONARD AKERS; HILTON KELLEY;
MOYA GREEN; AND ANISHA SWALLOW,**

Plaintiffs,

v.

**DR. ROBERT M. GATES, SECRETARY OF
DEFENSE; PETE GEREN, SECRETARY OF THE
ARMY; UNITED STATES DEPARTMENT OF
DEFENSE; UNITED STATES DEPARTMENT OF
THE ARMY; VEOLIA ENVIRONMENTAL
SERVICES, INC.,**

Defendants.

**Case No.:
2:07-cv-101
LJM-WGH**

DECLARATION OF MICHAEL A. SOMMER II, PH.D.

I, Michael A. Sommer II, Ph.D., do hereby declare as follows:

1. The following is based on my personal knowledge.
2. I am an expert in forensic environmental chemistry. This includes products of chemical reactions, including chemical neutralization of organic substances and incineration. My expertise includes chemical analysis and interpretation of analytical results for organic reaction products adsorbed on carbon particles produced by incomplete combustion during incineration, many of which products are toxic.
3. I have over thirty years of experience as a chemist. I have extensive experience in identifying, characterizing, and assessing chemicals released into the air,

soil and water. Professionally, I have been called upon to calculate exposure levels and dose concentrations for individuals exposed to toxic substances. I have testified in federal and state courts, and arbitrations concerning environmental chemistry and the nature and fate of organic substances in the air, soil, water and chemical products. About 75% of my investigations and testimony are legal defense related, the other 25% for plaintiffs.

4. I currently serve on the Board Of Directors of the federal 501 (c) 3 designated organization CLEAN (Citizens League for Environmental Action Now). I also serve as the Principal Scientist for Air Analysis for CLEAN. In this capacity, I research the reaction chemistry of organic substances in direct proximity to emission sources from the burning of petrochemical wastes and atmospheric reaction chemistry.

5. As an owner of the environmental testing and consulting laboratory, Consolidated Sciences Inc., I designed and performed air analysis under the USEPA Contract laboratory program for superfund sites for the characterization and interpretation of the reaction products of toxic organic substances including organophosphorous chemicals. I also own and operate a gas chromatography/mass spectrometry laboratory that was used in 1989-1999 for the development of test methods for the trace reaction products of VX agents under contract with Mass Evolution, Inc.

6. A copy of my CV is attached as Exhibit "A."

7. I have reviewed documents provided by my colleague Dr. Neil Carmen and by Plaintiff's related to chemical agent VX, its treatment options and issues related to the Army's planned and on-going interstate transportation of approximately

2,000,000 gallons of chemical warfare agent VX caustic hydrolysate (CVXH). I have reviewed the chemistry of the reaction products of VX, data from the Texas Commission on Environmental Quality related to waste disposal and characterization, data from the USEPA regarding chemical toxicity, and EP-A846 Test Methods. Documents I have specifically reviewed include: The Proposal to Treat and Discharge VX Nerve Agent into the Delaware River (Delaware Riverkeeper); Assessment of the Treatability of Caustic VX Hydrolysate at the Dupont Secure Environmental Treatment Facility (U.S. Centers for Disease Control (CDC) document); Carbon Filtration for Reducing Emissions from Chemical Agent Incineration (The National Academies Press); Demolition of the Chemical Warfare Agent Plant at the U.S. Army Newport Chemical Depot in Newport, Indiana (NSCMP Document); Final Environmental Assessment, Accelerated Neutralization of Chemical Agent and Off-Site Shipment of Liquid Process Effluents at the Newport Chemical Agent Disposal Facility (U.S. Army Document). The conclusions and opinions I express in this declaration are based upon my review of this information and upon my education, training and professional work experience summarized above and in the attached CV.

TOXICITY AND ENVIRONMENTAL FATE OF CHEMICAL AGENT VX AND ITS BYPRODUCTS

8. VX is a nerve agent that is one of the most toxic chemical warfare agents ever synthesized. The VX nerve agent is the most well-known of the V-series of nerve agents. Its chemical name is O-ethyl-S-[2(diisopropylamino)ethyl] methylphosphonothiolate and its molecular formula is $C_{11}H_{26}NO_2PS$.

9. Agent VX is a persistent, odorless, amber-colored liquid. VX is less volatile (10.5 mg/m^3 at 25°C) than the G agents and does not evaporate readily. VX is

moderately persistent on bare ground and may remain in significant concentrations depending on temperature, organic carbon content of the soil, and moisture. With its high viscosity and low volatility, VX has the texture and feel of high-grade motor oil. This makes it especially dangerous, as it has a high persistence in the environment.

10. VX is produced via the "Transester Process". This entails a complex chemical transition whereby phosphorus trichloride is methylated to produce methyl phosphonous dichloride. The resulting material is reacted with ethanol to form a diester. This is then transesterified to produce the immediate precursor of VX. Finally, the immediate precursor is reacted with sulfur to form V-agent.

11. VX is usually formulated with 1-3% of the stabilizers diisopropyl carbodiimide or dicyclohexyl carbodiimide to protect it against decomposition by trace amounts of water.

12. A combination of methods is usually required to characterize the degradation products of VX. These methods include gas or liquid chromatography combined with mass spectrometry and nuclear magnetic resonance spectroscopy.

13. According to the National Research Council (NRC), the VX stored at Newport is only 90.5-94.8% pure, the components being poorly characterized.

14. Rohrbaugh identified the following impurities in a stored container of VX (identification was by direct gas chromatography-mass spectrometry analysis): diisopropylamine (0.7%), O,O-diethyl methylphosphonate (0.6%), O,O-diethyl methylphosphonothioate (0.4%), 2-(diisopropylamino) ethane thiol (1.4%), O,S-diethyl methylphosphonothioate (0.6%), 2-(diisopropylamino)ethyl vinyl sulfide (0.1%), 2-(diisopropylamino)ethyl ethyl sulfide (0.2%), O,O-diethyl dimethylpyrophosphonate

(1.6%), *O,O*-diethyl dimethylmonothionopyro-phosphonate (0.3%), dicyclohexyl carbodiimide (3.4%), *O*-ethyl *S*-2-(diisopropylamino)ethyl methylphosphonodithioate (0.04%), bis[2-(diisopropylamino) ethyl] sulfide (2.0%), and bis(2-diisopropylaminoethyl) disulfide (0.5%). Bis(*S,S*-(2-(diisopropylamino)ethyl) methylphosphonodithiolate (0.8%) and *O*-ethyl methylphosphonothioic acid (0.2%) were detected by nuclear magnetic resonance.

15. D'Agostino et al. previously identified many of the same compounds in a glass container of VX that had been stored for > 10 years. Additional impurities were tentatively identified by combined capillary column gas chromatography-mass spectrometry (GC/MS) under both electron impact and chemical ionization conditions. D'Agostino et al. then characterized a number of novel polar and higher molecular weight degradation products by liquid chromatography/ electrospray mass spectrometry, including phosphorus compounds containing a P-CH₃ bond, long chain bis(diisopropylamino) thiaalkanes, and urea stabilizers.

16. VX is soluble in water, 30 g/L at 25°C (8), and is relatively resistant to hydrolysis. The reported half-life in water at 25°C and pH 7 ranges from 17 to 42 days. Hydrolysis proceeds by several pathways, producing a variety of degradation products. At pH values of < 6 and > 10, cleavage of the P-S bond predominates, resulting in formation of ethyl methylphosphonic acid (EMPA) and diisopropylethyl mercaptoamine (DESH). The latter compound can be oxidized to bis(2-diisopropylaminoethyl) disulfide (EA 4196) or react with the diisopropyl ethyleneimmonium ion (CH₂)₂N + (C₃H₇)₂ to form bis(2-diisopropylaminoethyl) sulfide. In a solution of 0.01 M VX and aqueous 0.1 M NaOH, VX was hydrolyzed to EMPA and *S*-(2-diisopropylaminoethyl)

methylphosphonothioic acid (EA 2192) ions in a ratio of 87% to 13%, respectively.

17. Hydrolysis of VX produces a large number of degradation products. The toxicity of the reaction products (other than EA 2192) are virtually unknown. At neutral and alkaline pH values (7-10), hydrolysis pathways of *O*-ethyl-S-[2-(diisopropylamino)ethyl]methylphosphonothioate (VX) competes with dealkylation of the ethoxy group (cleavage of the C-O bond), the latter pathway yielding the environmentally stable and highly toxic EA 2192 and ethanol.

18. Verweij and Boter reported the isolation of MPA from VX-contaminated soil. The sulfur-containing products such as EA 2192 are relatively stable in water, no degradation of EA 2192 was observed after 1,000 hr in distilled water. The disulfide is also extremely stable in the environment. Cleavage of the S-C bond may also occur, forming ethyl methylphosphonothioic acid, 2-diisopropylaminoethanol, and diisopropyl ethyleneimmonium ion.

TOXIC COMPONENTS OF VX HYDROLYSATE

19. Like other organophosphorus nerve agents, VX may be destroyed by the reaction of VX with concentrated aqueous sodium hydroxide resulting in competing cleavage of the P-O and P-S esters, with P-S cleavage dominating. This is problematic, since the products of P-O bond cleavage include EA 2192 and numerous other toxic products.

20. Since its inception, a stated goal of the Army Chemical Demilitarization program has been to ensure the safety of both workers and the public. Army Pamphlet (PAM) 38561, entitled "Toxic Chemical Agent Safety Standards," defines the Army approach for verifying the thoroughness of the neutralization process. The Army's

stated approach is to use laboratory analyses to ensure that the residual chemical agent in the hydrolysate is less than 20 parts per billion (ppb). This limit of 20 ppb is the Army's battlefield drinking water standard for soldiers. The report prepared for the Army entitled *Generation and Clearance of Hydrolysate for Treatability Studies in Support of Newport Operations*, states: "To clear the hydrolysate, the analytical results should be non-detect for VX with a method detection limit (MDL) of less than or equal to 20 parts per billion (ppb)." If the hydrolysate does not "clear," it must be reprocessed in the neutralization reactor.

21. The Army has stated its intent to use VX and EA 2192 analytical data to clear the VX hydrolysate for off-site shipment. Laboratory analysis is to be used to assure that the residual chemical agent VX is at a level less than or equal to 20 ppb. The Army also has stated that EA 2192 must be "non-detect" in the hydrolysate with an MDL of 1 ppm or less.

22. The Army, by use of its current methods and terminology, could improperly classify analytical data as "non-detects" when, in fact, the data have been determined analytically as "detects." In the current public health-driven situation, the Army's approach is open to criticism when actual instrument detections of VX or EA 2192 are discarded as "non-detect" because the analytical result is below the MDL.

23. The Army has stated that validated testing methods for the hydrolysate resulting from VX neutralization are essential to ensure that the hydrolysate to be shipped off-site to a treatment facility meets the Army's criteria. The Army has claimed that it has developed "validated" testing methods for VX and EA 2192 in the hydrolysate. However, the basis for this "validation" is not apparent in the Army's

reports.

24. The Army claims to have a Method Detection Limit (MDL) for detection of EA 2192 in the hydrolysate calculated according to EPA procedure published in 40 CFR, Part 136, Appendix B, of less than 1 part per million (ppm). The Army claims to have a MDL for VX in hydrolysate of 20 ppb.

25. Decomposition during basic hydrolysis of VX yields up to about 10% EA 2192 (diisopropylaminoethyl methylphosphonothioic acid) and numerous other complex degradation products.

26. In practice, the neutralized hydrolysate from the caustic hydrolysis of the subject VX has an aqueous phase, an organic phase and a solid phase. The neutralized mixture is stratified with differing VX and VX degradation products distributed within each phase. The Army in its Environmental Assessment did not report details of the chemical/physical nature of these aqueous, organic and solid phases, or the concentrations of VX, EA 2192 or other toxic contaminants present in each phase.

27. The VX hydrolysate resulting from the caustic neutralization of VX has an aqueous phase and an organic phase. The organic phase exists both as an emulsion with droplets distributed throughout the continuous aqueous phase and as a visible organic layer that floats on top of the continuous aqueous phase. At 33% agent loading (weight percent) during neutralization, the organic layer was 3%–5% by volume. The VX concentration in this organic layer was approximately 20 times the concentration in the bulk hydrolysate, and was reported as greater than 20 parts per billion. The extent of the organic layer and VX concentration appear to be significantly affected by the agent

loading used in the neutralization process.

28. The major hydrolysis products of VX are well characterized, and the reaction rate and pathways depend strongly on solution pH (Figure 1). Solubility is approximately 30 grams per liter (g/L). VX is considered highly mobile in the environment, and can persist for days or even weeks in slightly acidic waters. Other VX hydrolysis products in the CVXH include EMPA, which has a half life in soils of about 8 days, with MPA being the major transformation product. Another major by-product of the hydrolysis of VX at neutral and high pH values, is EA 2192 (S-(2-diisopropylaminoethyl)methyl phosphonothioic acid), an environmentally persistent highly toxic compound also soluble in water.

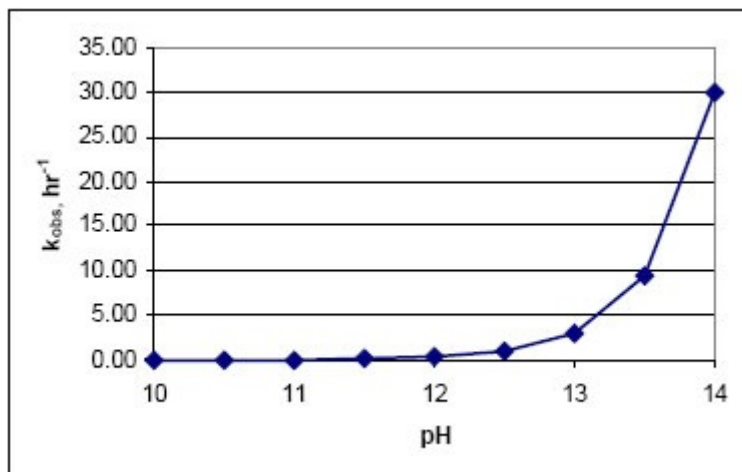


Figure 1. The pH dependence of apparent rate constant for VX hydrolysis

29. VX hydrolysis products EA 2192, EMPA and MPA, are stable at neutral pH. The NRC has noted the potential for VX to reform in VX hydrolysate (aqueous phase) if pH drops. Whether these, or other byproducts that have yet to be identified or that have been identified at low concentrations can react and form stable VX molecules in the organic layer even without a drop in pH is unknown. For the aqueous phase of the VX hydrolysate, a change from very high pH to a lower or neutral pH creates, because of the stability of these VX by-products at those pH conditions, the real possibility of recombination to reform VX at significant concentrations.

30. Thermodynamic analyses should have been performed to assess the tendency of the pH-adjusted CVXH to move toward VX reformation. Because experimental data on VX reformation in the VX hydrolysate as the pH drops are not immediately available to the public, although apparently some relevant data is in the possession of the Army or its contractors, the scientific questions and controversy regarding the potential for and extent of VX reformation remain unresolved (at least for the public). The possibility of VX reformulation at acidic (<6) pH conditions has not been adequately investigated and also remains unresolved.

31. The organic phase produced during the neutralization reaction exists both as an emulsion with droplets distributed throughout the continuous aqueous phase and as a separate organic layer. The chemistry, detailed composition, and the reformation potential of VX within the organic phase emulsion, as well as in the separated organic layer, remain unknown. However, it is known that VX is present in the emulsion droplets and the separate organic layer. All the discussions about the pH of the

hydrolysate are irrelevant to the organic phases. Organic liquids (other than certain organic acids or bases that do not apply to the VX hydrolysate organics) do not have a pH. To suggest that the total hydrolysate is safe at high pH ignores the nature of the organic layer and emulsion. It is possible that the sampling and analytical methods utilized by the Army to date do not adequately account for the VX present in the organic layer and emulsion droplets.

32. The hydrolysate that will result from the caustic hydrolysis of VX comprises an aqueous phase and organic phases. At pH lower than ~12, the aqueous phase can reform into VX. The chemical nature of the organic phases is largely unknown. The limited testing of the organic phases reveals concentrations of VX significantly higher than those in the aqueous phase. Whether VX reformation in the organic phases can occur in addition to the high levels of VX already present is unknown based on the publicly available data.

33. The proposed analytical test methods the Army developed to assure complete neutralization of the VX are wholly inadequate to ensure protection of public health and the environment because the Army's GC/MS method completely ignores numerous reaction products and naively assumes that only VX and EA 2192 are in the hydrolysate mixture. Many of these reaction products are highly toxic. The consequences of the Army's flawed analytical protocol could expose the environment to significant adverse consequences.

TOXIC EMISSIONS FROM INCINERATION OF VX HYDROLYSATE

34. The Army's proposed action, now in progress, that is the subject of this declaration, is to destroy a stockpile of the VX chemical agent located in Newport, Indiana

by an accelerated neutralization process, truck the resulting mostly liquid effluent (VX hydrolysate) from Indiana to Texas, and incinerate the hydrolysate at the Veolia Incinerator at Port Arthur, Texas. The stated purpose of the proposed action is to eliminate the hazards associated with the stored chemical agent using a procedure that the army claims to be safe, environmentally acceptable, expedient, and cost-effective. The Army relies on certain studies it cites regarding the chemical nature of the hydrolysate that results from caustic neutralization of agent VX. The Army claims to have developed and employed testing methodologies that assure that the hydrolysate is safe to transport. The Army claims that no VX or VX reaction products will enter the natural environment as a result of the proposed action.

35. Contrary to the Army's claims, the scientific evidence supports the conclusion that the incineration of the VX hydrolysate will disperse extraordinarily toxic VX and its degradation and combustion byproducts, including the family of chemicals referred to as dioxins, into the natural environment. It is my opinion, for the reasons stated herein, that the Army's proposed incineration of VX hydrolysate will contaminate the air, soil and water surrounding the Veolia facility and expose people to unacceptable health risks.

36. VX hydrolysate has solid, aqueous and an organic phases; the neutralized mixture apparently being stratified with differing VX compositions going into each separate phase. At present the chemical/physical nature of the aqueous, organic and solid phases is poorly understood. The effectiveness of incineration of this multiphase VX hydrolysate is not known. The composition of the chemicals adsorbed onto carbon particles during incineration is unknown.

37. What is known is that many of the chemical substances produced during incineration will be concentrated as they adhere to soot particles (PM2.5 and PM10) being released into the ambient air. The nature of the chemical reactions occurring on the fine particles emitted during incineration of the CVXH are unknown.

38. Veolia Environmental Services Toxic Release Inventory (TRI) reveals that large quantities of particulate matter (PM2.5 and PM10) are being released into the ambient air as a byproduct of incineration. No stack emission monitoring is proposed for the incineration of VX hydrolysate that might help determine the chemicals emitted during burning of the CVXH.

39. VX nerve agents retain chlorinated and other organic manufacturing byproducts from the synthesis of the VX nerve agents that will not be chemically degraded by the 'neutralization' process. These chlorinated compounds will lead to formation of chlorinated dioxins (and other toxins) during the incineration process which will be released into the environment. These dioxins (and other carcinogenic substances) will adhere to the PM2.5 and PM10 soot particles released from the incinerator stack.

40. The chemistry of multi-phase CVXH is only partially understood, especially the production of solids in the hydrolysate. The solids have the real potential to deposit on the metal surfaces of both the hydrolysate storage facility and the incinerator system. No trial burn or other data exists to demonstrate the effectiveness of incineration of the different phases of the hydrolysate, or to rule out the potential of high temperature secondary chemical reactions that might lead to the wide dispersal of nerve agent or agent-like chemicals emanating from the incinerator.

41. The fundamental scientific uncertainties that exist along the entire path from hydrolysis to incineration have not been addressed by the Army in its Environmental Assessment and involve serious risks to the environment. The Onyx/Veolia Environmental Services at Port Arthur, Jefferson County, Texas reported the toxic release of 13.25 tons of PM2.5 and PM10 particles for the year 2003.

42. The reason that PM2.5 and PM10 particles are toxic is that the particles are laden with adsorbed toxic substances. These particles are produced during incineration from the incomplete burning of the toxic waste. The soot particles are fine carbon that act as activated charcoal in any filtration system. The toxic chemicals adsorbed on the particles are highly concentrated. The toxic contaminants on the particles are very tightly bound. Testing for these contaminants on the particulate released may require high temperature desorption. Solvent extraction alone will not remove some of the toxic substances from the soot.

43. These soot particles when entering the lungs are deeply embedded and the toxic substances will be released into the body. The carcinogens released into the lungs from the soot will have the same or greater adverse health consequences as exposure to the pure toxin.

44. Dioxins, and numerous other toxic organic substances, were emitted to the environment during the Army's incineration of agent VX on Johnston Island (JI) (the Army's Pacific Island chemical weapons incinerator).

45. VX agent was also detected in the exhaust cyclone ash (concentrated waste including carbon particles) from a JI furnace burning VX. In 2003 the Army and Environmental Protection Agency (EPA) confirmed that VX nerve agent was released into

the environment from the Army's Pacific Island chemical weapons incinerator. Army documents stated that VX agent was detected at 45 times higher than the permitted limit. Perimeter monitors were checked for VX agent detections, but according to the Army's internal documents, the monitoring results were "inconclusive" for VX. The following day, samples were taken from the waste and "confirmed VX."

46. Army documents also show that on at least one other occasion -- in December, 2000 -- a similar event took place, also resulting in an agent release to the environment. The EPA issued a "Notice of Violation" in June 2001 for that release.

47. Earlier, in October 2000, VX agent was detected in the exhaust cyclone ash from a furnace burning VX.

48. In 2003 the EPA Settled its Case with the U.S. Army for Release of VX Nerve Agent at Johnston Island. EPA noted that a required monthly sampling of incinerator ash at JACADS found incinerator ash that contained VX nerve agent; and Johnston Atoll Chemical Agent Disposal System facility will pay a total \$273,625 in fines and projects.

49. Workers at the Army's Tooele, Utah incinerator have also identified agent detections and releases from waste that has already been processed through furnaces there. That facility was shut down for months due to a July 15, 2002 incident in which workers were exposed to nerve agents.

50. Nick Cheremisinoff, Ph.D., an expert on the design and operation of toxic waste incineration, states that incineration of VX agents would require -- in addition to the standard requirements of sufficient temperature, residence time at that temperature, maximum turbulence, and excess oxygen -- proper stack monitoring for VX components and dioxins; and the control of these factors is essential.

51. A temperature of 2400 °F is needed for chlorinated solvents and VX which are difficult to incinerate. Temperatures over 2200 °F are needed for bond breakup. At temperatures below 1500 °F incomplete combustion is likely to occur and large amounts of fine soot particle formation will result.

52. It is necessary to hold the waste at high temperatures for sufficient time to ensure destruction. The longer the material is held at high temperature the more likely it is to be destroyed. The residence time for gaseous substances is a minimum of 2 seconds. For solids the residence time could be minutes or even hours.

53. Turbulence enables waste and air to be well mixed. Turbulence should be maximized so that contact between the waste and the oxygen in air is as high as possible.

54. Excess oxygen must be present to ensure that the oxidative processes predominate and the pyrolytic processes are minimized. Generally oxygen should be present at 50-100% higher concentration than is theoretically required to decompose the waste.

55. Dr. Cheremisinoff reports that the planned Veolia incineration temperatures of 2000°F are not high enough to safely burn the subject VX and that the absence of stack monitoring for VX and VX reaction products and dioxins would produce an unacceptable risk to people exposed to the incinerator emissions plume, as well as to the ash from the incinerator during handling.

56. The danger to the public and environment created by the Army's failure to understand the nature of the hydrolysate products, to provide appropriate test methods for the CVXH hazardous waste characterization, to ensure operation of the incinerator

under the required conditions, to monitor the stack emissions for toxic substances including agent VX and dioxins, and to test the surrounding areas for environmental contamination is substantial, and in my opinion unacceptable and certainly preventable. The Army's use of this highly flawed process risks environmental contamination that could have serious and potentially catastrophic consequences on public health and the environment.

I reserve the right to amend or add additional information to this Declaration as additional relevant information becomes available during the litigation, which is anticipated.

I, Michael A. Sommer II, Ph.D., pursuant to 28 U.S.C. § 1746, do hereby declare under penalty of perjury that the foregoing is true and correct.

A handwritten signature in black ink, appearing to read 'Michael A. Sommer II', with a long horizontal flourish extending to the right.

Michael A. Sommer II, Ph.D
June 13, 2007

Exhibit "A."

AUSSOM CONSULTING INC.

*Providing Scientific and Technical Support to the Global Marine Transportation,
Legal, Environmental, Insurance and Petrochemical Industries
GeoDynamics Inc.*

Resume of Michael A. Sommer II, Ph.D.

**509 Baywood Drive
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281-798-4720**

Education:

B.S. - 1970 Geology, California State University, San Diego, California.
M. S. - 1972 Geology, University of Tulsa, Tulsa, Oklahoma - C. G. Barker
Research Director
Ph.D. - 1974 Geochemistry, University of Tulsa, Oklahoma - C. G. Barker,
Research Director

Current Positions:

Aussom Consulting Inc. – 2002 – Present, CEO, Principal Scientist
4010 Dogwood Drive, Pearland, Texas 77584

Area of Specialization:

Environmental expert for the insurance industry, petroleum and petrochemical, food and related industries involving investigation and forensic analysis of chemicals. Expert witness and scientific litigation specialist Maritime claims, chemicals, petroleum and petrochemicals, edible oils and products, oil spill response, personal injury, and general analytical consultation. Environmental analysis and technical support using GC/MS for the analysis of organics in soil, water, air, and product purity. Responsible environmental litigation support, client development and regulatory compliance expert. Expert on RCRA waste characterization, USEPA SW-846 Test Methods. Design and construct custom laboratory equipment, including Purge and Trap auto sampler for GC/MS, Batch inlet for GC/MS, modify GC/MS electronics, computer controllers, and vacuum systems. Expert in environmental metals analysis and ore geochemistry. Prepare and deliver short courses on GC/MS, and mass spectrometry and environmental exposure to various toxins. Prepare and present technical symposia and publish journal articles.

Consolidated Sciences Inc. – July 2004 to Present

Director of Environmental Services
1416 Southmore, Pasadena, TX 77502

Area of Specialization:

Responsible for all environmental analytical work, client development, work scheduling and customer and regulatory compliance agency interface. Laboratory QA/QC Officer. Method development for GC/MS and ICP-MS. Forensics drug expert; analysis, preparation, and precursors for illicit manufacturing. Design custom sampling protocols for air, water and soil monitoring for national and international clients. Expert on RCRA waste characterization, USEPA SW-846 Test Methods. Design and construct custom laboratory equipment, including: Purge and Trap auto sampler for GC/MS, Batch inlet for GC/MS, modify GC/MS electronics, computer controllers, and vacuum systems. Customer interface and customer development and sales.

Amtek Marine and Science Inc. - April 1999 – January 2003,

Principal Scientist
Uni-Plex Business Park
1414 South Friendswood Drive
Friendswood, Texas 77546

Area of Specialization:

Technical claims analyst and environmental expert for the marine insurance industry, petroleum and petrochemical, food and related industries involving investigation and forensic analysis of bulk liquids and chemicals, edible oils and related products such as fatty acids, fatty alcohols and acid oils regarding product quality complaints. Expert witness and scientific litigation specialist Maritime claims, chemicals, petroleum and petrochemicals, edible oils and products, oil spill response, and general analytical consultation. Environmental analysis and technical support using GC/MS for the analysis of organics in soil, water, air, and product purity.

GeoDynamics Inc. - April 2000 - Present, Director
509 Baywood Drive
Seabrook, Texas 77586

Area of Specilization:

In house state-of-the-art environmental analysis and technical support using Gas Chromatography/Mass Spectrometry (GC/MS) for the analysis of organics in soil, water, air, and product purity. Development of test methods for the determinations of chemical warfare agents in water air and soil. Stable isotope analysis for geochemical and natural product determinations.

CLEAN (Citizens League for Environmental Action Now) - July 2000 - Present, Board Of Directors, Principal Scientist for Air Analysis

Nature of Corporation:

Founded and directed by Miss Jane Dale Owen (Granddaughter of the founder of Humble Oil Company), CLEAN was incorporated in July 2000, and has federal 501 (c) 3 designation. CLEAN's goal is to bridge private industry and government with an informed public and to expedite positive change in the Houston regions air quality, especially for neighborhoods and schools in direct proximity to emission sources. The CLEAN GC/MS laboratory in Seabrook, Texas is operational to measure volatile organic substances in air according to EPA guidelines.

Examples of Some Recent Expert Testimony:

Court Testimony:

Various Plaintiffs vs. Burlington Northern Santa Fe Railway Company, et al, Woodfill & Pressler, Watts Law Firm, Hankins Law Firm (2005-present)

Lanier Law Firm, Plaintiffs expert regarding exposure to trichloroethylene, Houston, Texas (2006).

Hankins Law Firm, Plaintiffs expert regarding exposure to radioactive substances from an oil pipe scaling facility, New Orleans, Louisiana (2006)

Maierson Law Firm, Plaintiffs expert regarding exposure to toxic substances from the Cox Waste Site Dayton, Texas (2006).

United States District Court for the Southern District of Texas, Houston Division Cause No.: H-02-1379 Lubrizol Corp. v. Vopak/Paktank Corp., Stolt_nielson Transportation Group, Ltd., Stolt Tankers Inc. and SP Integrity Inc. Expert

Testimony (representing vessel interests; Stolt-Nielson).

South Korea Federal Court, Samsung v. Odjfell Seachem AS. Expert Testimony (representing vessel interests).

State of Texas Administrative Hearings for Application of Permit By Applerock Group for a Type IV Solid Waste Permit. Expert Testimony for Groups Opposing the Application.

Federal Court Southern District New York: BRADESCO SEGUROS S. A. and SUL AMERICA TERRESTRES, MARITIMOS E ACIDENTES COMPANHIA DE SEGUROS, v ICC Chemical Corporation, Expert Testimony (representing ICC Chemicals): *M/V Quinca*

Federal Court Southern District New York: BRADESCO SEGUROS S. A. and SUL AMERICA TERRESTRES, MARITIMOS E ACIDENTES COMPANHIA DE SEGUROS, v ICC Chemical Corporation, Expert Testimony (representing ICC Chemicals): *M/V FREJA JUTLANDIC*

Federal Court No. District of California: Marin Tug & Barge, Inc. v. Westport Petroleum, Inc., et. al. Expert Testimony (representing Westport)

Federal Court Houston, Texas: Coastal Towing v Exxon (Barge Incident) Expert Testimony in Court mandated mediation (vessel interests)

Federal Court Houston, Texas: Mitsubishi v Maersk (VCM Quality Dispute) Testimony as a certified expert: Deposition as an expert (plaintiff)

Federal Court Houston, Texas: Mitsubishi v Maersk (1,3-Butadiene Quality Dispute): Deposition as an expert (plaintiff)

Louisiana District Court: Class Action Litigation (Lindane Pesticide Exposure): Deposition as an expert (plaintiff)

Arbitrations:

New York: Matter concerning quality dispute over ethanol contamination aboard the vessel *Seabulk Pride*
Assisting: Waesche, Sheinbaum & O'Reagan

Houston: Matter concerning quality dispute over ethanol contamination aboard the vessel *M/V Azteca S*

Assisting: Eastham, Watson, Dale & Forney (for vessel interests)

New York: Matter concerning quality dispute over LPG, product trader v vessel
Norgass Victory

Assisting: Haight, Gardner, Holland & Knight (for vessel interests)

New York: Matter concerning Koch Refining v Mobil Oil (Fuel Oil Dispute).

Assisting: Kleberg Law Firm (for Mobil Oil)

New York: Matter concerning Claim against Stolt Parcel Tankers (alleged contamination of Cumene).

Assisting: Freehill, Hogan and Mahar (for vessel interests)

New York: Matter concerning alleged contamination of Soya Oil.

Assisting: Hill Rivkins (for vessel insurance underwriters)

New York: Matter concerning alleged contamination of VAM

Assisting: Haight Gardner (for vessel interests)

New York: Matter concerning alleged contamination of Styrene

Assisting: Phelps Dunbar (for vessel interests)

New York: Matter concerning Claim against Stolt Parcel Tankers (alleged contamination of Corn Oil).

Assisting: Freehill, Hogan and Mahar (for vessel interests)

Previous Employment:

Scientific and Environmental Resources - November 1994 to March 1999

A Division of Ocean Maritime Services, Inc. - Director
1560 West Bay Area Blvd., Suite 354
Friendswood, Texas 77546

Consolidated Sciences Inc. - May 1989 to July 1994

Vice President and Environmental Laboratory Manager
1416 Southmore, Pasadena, TX 77502

Area of Specilization:

Responsible for all environmental analytical work, client development, work scheduling and customer and regulatory compliance agency interface. Laboratory QA/QC Officer. Review, construct and implement laboratory P&L development. Designed, supervised and coordinated construction of a 10,000 square foot

laboratory facility. Personnel Officer (employee relations). Method development for GC/MS. Design custom sampling protocols for air, water and soil monitoring for national and international clients. Expert on RCRA waste characterization, USEPA SW-846 Test Methods. Design and construct custom laboratory equipment, including: Purge and Trap auto sampler for GC/MS, Batch inlet for GC/MS, modify GC/MS electronics, computer controllers, and vacuum systems. Customer interface and customer development and sales. Prepare and deliver short courses on GC/MS and mass spectrometry. Prepare and present technical symposia and publish journal articles.

Bicycle Design and Research Inc. - 1989 to 1994

President, Chief Designer and Geochemist, mass spectrometer Consultant
107 E. Edgewood, Friendswood, Texas 77546

Lockheed/EMSCO, NASA/Johnson Space Center - 1984 to 1986

Senior Scientist, Assistant Manager for Solar System Exploration, Director of Light Element Research Lab C-23, 2400 Nasa Rd. 1, Houston, Texas 77058

Academic Employment:

Department of Geology, Lamar University - 1986 to 1987

P.O. Box 10031, Beaumont, Texas

Program in Sciences, University of Houston - 1986 to 1987

Clear Lake, Houston, Texas

Department of Geology, Florida State University - 1979 to 1984

Tallahassee, Florida

Department of Geological Sciences, Brown University - 1974 to 1979

Providence, Rhode Island

Department of Geophysical Sciences, University of Chicago - 1973 to

1974

Chicago, Illinois

Geology Courses Taught:

Environmental Geology, Physical Geology, Physical Geology Lab, Mineralogy, Mineralogy Lab, Petrology, Petrology Lab, Optical Mineralogy, Optical Mineralogy Lab, Structural Geology, Volcanology, Isotope Geology, Geochemistry, Carbonate Geochemistry, Field Geology, Various Seminar Courses, Supervised Undergraduate and Graduate Thesis and Dissertation Research

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March 2007