FLUORINE-FREE FIREFIGHTING FOAMS (3F)

VIABLE ALTERNATIVES TO FLUORINATED AQUEOUS FILM-FORMING FOAMS (AFFF)

Independent Expert Panel Convened by IPEN
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FLUORINE-FREE FIREFIGHTING FOAMS (3F) – VIABLE ALTERNATIVES TO FLUORINATED AQUEOUS FILM-FORMING FOAMS (AFFF)

Allcorn, M. [a], **Bluteau**, T. [b], **Corfield**, J. [c], **Day**, G. [d], **Cornelsen**, M. [e], **Holmes**, N.J.C. [f], **Klein**, R.A. [g], **McDowall**, J.G. [h], **Olsen**, K.T. [i], **Ramsden**, N. [j], **Ross**, I. [k], **Schaefer**, T.H. [l], **Weber**, R. [m], **Whitehead**, K. [n].

[a] Alert Disaster Control, Loyang Crescent, Singapore
[b] Leia Laboratories, France
[c] Brisbane Airport Authority, QLD Australia
[d] London Heathrow Airport, United Kingdom
[e] Cornelsen Umwelttechnologie GmbH, Essen, Germany
[f] Department of Environment and Science, Queensland Government, Australia
[g] Cambridge, United Kingdom; Christian Regenhard Center for Emergency Response Studies, John Jay College of Criminal Justice, City University New York (CUNY), NY USA
[h] 3FFF Ltd, Corby, Northants., United Kingdom
[i] Copenhagen Airports, Denmark
[j] LASTFIRE and ENRG Consultants, Monks Risborough, United Kingdom
[k] Arcadis, Manchester, United Kingdom
[l] Penrith, NSW Australia
[m] POPs Environmental Consulting, Schwäbisch Gmünd, Stuttgart, Germany
[n] Unity Fire & Safety, Oman

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Corresponding author: R. A. Klein <rogeraklein@yahoo.co.uk>

CONTENTS

INTRODUCTION

IPEN respectfully presents this paper, *Fluorine-Free Firefighting Foams—Viable Alternatives to Fluorinated Aqueous Film-Forming Foams (AFFF)*, prepared by eminent, independent experts for consideration by the Stockholm Convention Persistent Organic Pollutants Review Committee (POPRC), observers, and the public. We believe that it offers a fresh perspective from experts in the field who have direct experience and knowledge concerning the efficacy of fluorine-free firefighting foams as safer substitutes for AFFF. The paper concludes: "*The continued use of PFAS (per- and polyfluorinated substances) foams is not only unnecessary but would continue to add to the legacy and ongoing contamination that is responsible for the substantial, widespread and growing socio-economic and environmental costs being experienced globally.*" We hope that the evidence presented in the paper will contribute toward decisions that will prevent further harm to the global environment and human health caused by the dispersive contamination associated with continued production and use of fluorinated aqueous film-forming foams (AFFF) used in firefighting.

The POPRC has made crucial determinations about PFOA, including the conclusion in the Risk Profile (UNEP/POPS/POPRC.12/11/Add.2) that, "*based on the persistence, bioaccumulation, toxicity in mammals including humans and widespread occurrence in environmental compartments, it is concluded that PFOA, its isomers, salts and related compounds that degrade to PFOA, as a result of their long-range environmental transport, are likely to lead to significant adverse human health and environmental effects such that global action is warranted.*" In assessing the adverse human health effects of PFOA in the Risk Profile (UNEP/POPS/POPRC.12/11/Add.2), the Committee notes that the International Agency for Research on Cancer classifies PFOA as a Class 2B carcinogen with particular regard to testicular and kidney cancers. The Risk Profile also summarizes epidemiological evidence linking PFOA exposure with high cholesterol, inflammatory diseases, ulcerative colitis, thyroid disease, immune effects, pregnancy-induced hypertension, endocrine disruption and impaired neuro- as well as reproductive development. New insights about the adverse health effects of PFAS chemicals at exquisitely low exposure levels, including PFOA and PFHxS, are coming to light in the peer-reviewed scientific literature.

Patrick Breysse, director of the U.S. Centers for Disease Control's National Centre for Environmental Health, described the contamination of drinking water supplies by AFFF as "one of the most seminal public health challenges for the next decades." Millions of people around the world are now drinking water contaminated with PFOA and other per- and polyfluorinated substances that exceed thresholds known to cause harm to human health. In June 2018, the U.S. Agency for Toxic Substances and Disease Registry's Toxicological Profile concluded that health advisory levels for PFOA and other evaluated PFAS far exceed health protective standards based on sensitive health endpoints such as immune effects.

Based on the evidence presented in this paper concerning the availability, effectiveness, and certifications of fluorine-free firefighting foams, we affirm that no exemptions for continued production and use of PFOA and its precursors or PFOS in AFFF should be recommended and no exemption should permit continued use of existing AFFF stockpiles containing PFAS substances. We further caution that replacement of other per-and polyfluorinated substances in

AFFF including short-chain PFAS, would be regrettable substitutions that perpetuate harm to the environment and human health. Precaution is embedded in the Stockholm Convention and protective action is a moral imperative for implementing treaty objectives.

Pamela Miller
IPEN Co-Chair

September 9, 2018

FLUORINE-FREE FIREFIGHTING FOAMS (3F) VIABLE ALTERNATIVES TO FLUORINATED AQUEOUS FILM-FORMING FOAMS (AFFF)

An Agreed Position Paper by an Expert Panel (the F3 Panel) assembled on behalf of IPEN www.ipen.org for presentation to the Stockholm Convention POPRC-14 meeting in Rome at the UN FAO Headquarters 17-21 September 2018. The Position Paper is structured to include verbatim statements as Appendices from individual Panel Members.

THE F3 PANEL

The panel consists of experts across the fire engineering industry covering firefighting foam end-users from airports, the aviation rescue and firefighting sector (ARFF), the oil, gas and petrochemical industries, including emergency disaster control, F3 foam formulators, trade associations involved in independent product testing and holistic assessment of risk, specialists in environmental chemistry, and national environmental regulatory bodies.

The panel was convened as the result of an initiative by the International POPs Elimination Network (IPEN) (Pamela Miller, co-chair of IPEN), a global network of approximately 500 NGOs worldwide). The panel were tasked to provide expert opinion and an agreed position for presentation to POPRC14 on the viability of non-persistent fluorine-free firefighting foams (F3) as alternatives to persistent fluorinated AFFF and related foams that are having widespread and considerable socio-economic and environmental impacts due to the extremely persistent, toxic, bio-accumulative, fluorochemical (PFAS) content. The expert panel consists of the following members together with their areas of expertise:

Michael ALLCORN	Alert Disaster Control Singapore. Decades of experience dealing with large oil industry fire, storage tanks, oil well-head fires, marine firefighting; using F3 foams operationally for some 15 years.
Dr. Thierry BLUTEAU	Leia Laboratories Ltd. France. PhD organic chemist and foam formulation chemist; formerly Croda Kerr and BioEx France, developer of ECOPOL (F3); currently developing solvent-free F3 foams.
John CORFIELD	Brisbane Airport Corporation Pty Ltd (BNE) Australia; environmental advisor. Extensive experience in the management of PFAS site contamination and remediation.
Martin CORNELSEN	Cornelsen Umwelttechnologie GmbH, Essen, Germany. Water treatment engineer; remediation and clean-up of PFAS contaminated soil and groundwater; developed absorption technology.
Graeme DAY	London Heathrow Airport (LHR): fire service compliance manager; formerly senior fire officer Kent and West Sussex Fire & Rescue Service. Extensive experience in use and effectiveness of firefighting foams.
Supt. Nigel HOLMES	Department of Environment and Science, Queensland Government, Australia; Principal Advisor Incident Management. Extensive experience across environmental and pollution management and regulation. Primary author of the Queensland Environmental Management of Firefighting Foam Operational Policy;
Dr. Roger A. KLEIN	Cambridge UK; panel coordinator; PhD chemist and medical doctor; extensive experience of advising the fire service; formerly Principal Scientific Adviser Cambridgeshire Fire & Rescue Service; affiliated research faculty Christian Regenhard Center for Emergency Response Studies (RACERS), John Jay College of Criminal Justice, City University New York (CUNY), NY USA;

Gary McDOWALL	3FFF Corby Northants UK. Extensive experience in the foam industry; formerly Croda Kerr; F3 foams for hand-held and portable extinguishers; formerly founding director of IAFPA; currently chairman of the British Fire Consortium;
Kim T. OLSEN	Copenhagen Airports (CPH). Head of fire training academy; formerly fire officer; member of the Danish defence forces;
Dr. Niall RAMSDEN	Coordinator LASTFIRE. PhD physicist, fire engineering consultant; extensive experience of the effectiveness of firefighting foams for large-scale fires;
Dr. Ian ROSS	Arcadis; senior partner global remediation. Extensive experience in the analyses, behaviour, effects and remediation of fluorinated organic chemical contamination.
Ted SCHAEFER	Sydney Australia. Developed re-healing (RF) fluorine-free foam; formerly 3M and Solberg;
Roland WEBER	Germany; POPs Environmental Consulting;
Kevan WHITEHEAD	Fire Chief, Unity Fire & Safety Oman oil and gas fields. Previously serving senior fire officer Greater Manchester Fire & Rescue Service.

EXECUTIVE SUMMARY

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- The operational capabilities of fluorine-free Class B firefighting foams (F3s) suitable for liquid hydrocarbon and polar-solvent fuel fires have continued to advance and expand in use dramatically since their initial development in the early 2000s by Ted Schaefer working for the 3M Company and are now well-established as high-performance firefighting agents.
- Current top-quality Class B fluorine-free firefighting foams are capable of meeting all the standard firefighting performance certifications applicable to AFFF and related foams. An unfortunate exception is US MIL-Spec which, due to a legacy-wording technicality dating from the early 1960s requires the inclusion of fluorochemicals and has not been updated significantly since. In contrast, other national defence forces have not been subject to such inertia and have adopted fluorine-free foams, as have many large and high-risk industries, based on demonstrated operational effectiveness including use on very large incidents such as spills and fires of refineries, bulk fuel storage tanks, oil and gas production, and shipping since 2003 [ECHA submission April 2016].
- Fluorine-free firefighting foams have considerable financial, socio-economic, public health and environmental advantages over persistent fluorochemical-based firefighting foams. They are non-persistent, biodegradable with only short-term, localized and self-remediating effects versus highly persistent PFAS in AFFF which are all toxic and bio-accumulative to varying degrees for the environment and human health, as well as exhibiting extreme long-range transport that has resulted in worldwide contamination.
- PFAS contamination often extends to agricultural land, waterways used for industry, recreation, fishing and aquaculture, as well as surface or groundwater used for drinking water. Treatment to remove PFAS (especially short-chain PFAS) is very difficult and expensive with crops, fisheries, industries, livestock and human health values potentially exposed. Fluorine-free foams do not have this disadvantage.
- PFAS pollution of sites resulting from foam incidents or training results in large, spreading down-gradient contamination plumes which may affect many kilometers off-site. Short chain PFAS (RC6) are more mobile and more difficult to remove from ground- or waste-water than longer chain (>C6) compounds such as PFOS or PFOA.
- Operational releases of fluorine-free foam runoff will degrade naturally in soils, waterways or groundwater. Discharges to sensitive hydrological or aquatic environments like enclosed waterways can cause limited, localise, short-term effects but will largely self-remediate. On the other hand, fluorinated foam releases have caused widespread, long-term pollution; runoff must be contained, collected and treated at significant cost as regulated industrial waste under many jurisdictions.
- PFAS contamination remediation and clean-up, if it is at all possible, is enormously expensive, time consuming with substantial socio-economic impacts such as loss of drinking water supplies, lost agricultural production, damage to river and offshore fisheries, depressed property values, economic and mental hardship for residents affected, as well as serious long-term public health consequences. Coupled with this is loss of public confidence in government, adverse public perception of the dangers to health, reputational damage and loss of brand image for industry, possible prosecution by the regulator, and lengthy, expensive legal class actions seeking compensation from the polluter. All the associated costs and losses will ultimately be felt by the community as a whole.
- Since the early to mid-2000s many foam users such as chemical industries, fire brigades, airports, bulk fuel storages, ports, oil and gas platforms and refineries have transitioned to fluorine-free foams and demonstrated their effectiveness in operational use. The fluorine-free foam market is now well-established and highly competitive and cannot be described as an untried or new technology. Regular advances in formulations are now being made for various specialised applications.
- A late-comer to change is the US Federal Aviation Authority (FAA) that currently requires that MIL-Spec fluorinated firefighting foams be used at civilian airports. In recognition of PFAS being a contributor to significant legacy and on-going pollution problems the recently passed US Federal Aviation Authorization Act 2018 removes the requirement for fluorinated foam use at US FAA airports.[1] Similarly, the US Department of the Navy, the custodian of MIL-Spec, has for some years been considering changing the MIL-Spec standard to be based around performance rather than referencing specific chemical content and properties.
- A key advantage of fluorine-free foams is that they have almost none of the large and growing socio-economic or potential health impacts of fluorinated foam with only limited, short-term, localise environmental impacts which mostly self-remediate through natural

biodegradation or can be dealt with by simple remediation technologies.

- Fluorine-free foams do not need complex, expensive and time-consuming remediation; if limited environmental damage occurs it is rapidly ameliorated, and very importantly, vital assets and amenities such as societal infrastructure, livelihoods, food supply, drinking water, public health, agriculture and livestock production, industrial continuity, recreational activities, etc., will rarely be under threat and if they are at all impacted will become normalized far faster with a minimal risk of long-lasting infrastructural, political and reputational damage.

Fluorine-free foams are available, certified and effective for all firefighting applications, for the few specialised uses remaining to be fine-tuned developments to address these are well advanced. As such there is absolutely no need for any exemptions, whether conditional, i.e., derogations, or otherwise, allowing the continued use of existing or new stocks of fluorinated foams (including those containing free PFOA, its salts, or PFOA precursors) as the local regulatory legislation of almost all jurisdictions has more than adequate provisions to permit transition to best practice with controls, milestones and timelines appropriate to the particular circumstances.

The continued use of PFAS foams is not only unnecessary but would continue to add to the legacy and on-going contamination that is responsible for the substantial, widespread and growing socio-economic and environmental costs being experienced globally.