Executive Summary

This report provides the findings of a ten-month study requested by the Maryland Department of Health and Mental Hygiene of a possible cancer cluster among fire fighters in Anne Arundel County, Maryland. Fire fighters are exposed to smoke from a variety of materials, and the smoke is known to contain carcinogens. An exposure of particular concern in this case was to smoke from fires set at the Anne Arundel County Training Facility. For a reported period of 9 years, from 1971-1979, the training fires used waste oils provided by BGE that were contaminated with polychlorinated biphenyls (PCBs). Consequently, a substantial number of fire fighters and instructors were exposed to PCBs, along with compounds generated by their combustion. This multi-part investigation addressed key issues related to this exposure including characterizing the cluster and evaluating potential exposures to PCBs and their combustion by-products of fire fighters who participated in training fires at the Academy, assessment of applicable scientific literature, and consideration of research that might provide greater insight into the risks sustained by fire fighters.

We conducted interviews with fire fighters that covered demographic, occupational, and medical information. In the case of the Anne Arundel County fire fighters, the accounts of the training fires and the use of PCB-contaminated oil establish that participants in the training exercise were exposed to PCBs through both inhalation and the skin. The PCBs are classified as a probable human carcinogen by the International Agency for Research on Cancer of the World Health Organization and the National Toxicology Program of the U.S Department of Health and Human Services. Some of the toxic compounds that would have been generated by the combustion of
PCBs, include another group of compounds, polychlorinated dibenzo-p-dioxins that are classified as carcinogens. The doses of the carcinogens received by the fire fighters, which would predict risk, cannot now be reconstructed, and it is therefore difficult to judge what doses were received, as the basis for estimating cancer risk for either the group or individuals. Measurements of levels of PCBs in tissues would probably not be informative, given the number of years elapsed since exposure ended.

Seventeen fire fighters (all male) contacted us to report a diagnosis of at least one form of cancer. Respondents ranged in age from approximately 30 to 70 years. Cancers reported include bladder, brain, colon, leukemia or non-Hodgkin’s lymphoma, lung, prostate, and skin. Skin cancer was the most commonly reported cancer, representing 47% of the cancers. Excluding skin cancer, brain cancer (n=2) and leukemia/lymphoma (n=3) were the most common forms of cancer at 22% and 33%, respectively.

We reviewed the literature on cancer mortality among fire fighters and on occupations including fire fighting, as a cause of brain cancer. The scientific literature on cancer risks among fire fighters provides limited evidence, with only small numbers of mortality studies (N= 18) and case-control studies of brain cancer and occupation (N= 17). After pooling data across studies, we found modestly elevated and statistically significant risks of cancer in fire fighters for the following cancer categories: all cancer combined and, bladder, brain, colon, hematopoietic/lymphatic, kidney, pancreas, prostate, skin, rectal, and testicular cancers. Non-significant elevations were found for cancers of the larynx, liver, respiratory system, and buccal cavity/ pharynx. The limited data available indicate that fire fighters with greater exposure to fires (increase number of runs, greater number of years served as a fire fighter) have higher risks of cancer.
The information on the cluster, particularly with regard to brain cancer, raises concern; on the other hand, the literature does not definitely link brain cancer to either the occupation of being a fire fighter or to exposure to PCBs. This lack of evidence does not establish that there is no risk, however, and further research on risks for cancer and other diseases among fire fighters is needed.

Our review led to some recommendations applicable to fire fighters generally. Because of the limited evidence, we recommend that future consideration be given to developing a larger study of disease risks among fire fighters, drawing on contemporary epidemiological approaches. Fire fighters continue to face unavoidably hazardous exposures on a routine basis and the exposures change as the materials change. Ongoing surveillance strategies, involving biomonitoring and tracking of illness and mortality, should also be developed and carried out.

Specific recommendations in relation to the Anne Arundel County fire fighters include:

- A strategy is needed for communicating the findings of this report to the fire fighters in Anne Arundel County, as well as those from other jurisdictions who participated in fires at the Academy during the years that the PCB-contaminated oil was in use for training fires. We will work with DHMH, the unions, and the Fire Department to assure that the findings are communicated with opportunity for questions, clarification, and amplification.

- One approach to better understand the doses of PCBs that may have been associated with the fires is to measure levels of PCBs in either blood or adipose tissue. These measurements are not readily made and are costly. Our review of
the literature indicates that measurements of biomarker levels would not be useful. Confirmation of this opinion might be sought from someone with specific expertise in this area.

- The US Preventive Services Task Force and the American Cancer Society periodically make recommendations for routine cancer screenings. Such recommendations should be followed to enhance the possibility of early detection of cancers for which routine screening is recommended. At present, screening is not recommended for either lung cancer or brain cancer, two sites of potential concern for the fire fighters.

- With the scope of funding available and the limited time of this project, a formal epidemiological study of Anne Arundel County fire fighters could not be undertaken. One approach that could be used for that purpose would use the retrospective cohort design. With this design, an attempt would be made to identify all Anne Arundel County fire fighters who worked during a time when exposure to the training fires with PCB-containing oil took place. Record linkage and other follow-up methods would then be used to determine who developed cancer so that the rate of cancer development in the cohort could be compared to that in the general population or another worker group. This study might be limited by the number of potential participants; on the other hand, it would provide surveillance for risks in this population and position the Fire Department and the State of Maryland to respond to concerns about occurrence of cancer or other diseases with actual data. Records could be used to establish a cohort of fire fighters who were employed in the era when the training facility was in use. We
learned that the exposed population extends beyond the Anne Arundel County fire fighters. Occurrence of cancer could then be documented by linkage to the Maryland Cancer Registry and other registries, as well as to the National Health Index. The population available for study numbers under 1,000, so that the small numbers of cancers anticipated might leave uncertainty as to increased risk, unless there was an unusually strong risk detected. Such a study, however, would be the most direct approach to gain evidence relevant to the cancer risks from using the PCB contaminated fuel. The results might be inconclusive because of the numbers of fire fighters who could be studied; however, no other approach can add further, useful evidence to the study that we have carried out.