Concerns of Residents Adjacent to a Superfund Site in Middletown, IA

I. Background

The Iowa Army Ammunition Plant (IAAP) is an operational 19,015-acre load, assemble and pack munitions facility located in Middletown, Iowa. Construction and plant operations began in 1941 and construction was essentially completed by 1943. The IAAP site consists of 1,000 buildings, 1 million square feet each of product and storage space and 100 miles of railroad. The facility continues to operate as a U.S. Government owned, contractor operated installation under U.S. Army contracts.

From 1947 to present, the IAAP contractor manufactured conventional weapons on Line 2 under the authority of the U.S. Department of Defense (DoD). In addition, between 1947 and 1975, there were adjacent but separate areas of the IAAP used by the Atomic Energy Commission (AEC). This included a manufacturing area, temporary holding area, test firing area, and conventional explosives disposal area. Although the manufacturing area was reportedly relatively clean for the time, ventilation and dust accumulation, test firing, and waste stream management may well have resulted in off-site contamination. Large temporary holding areas containing earth-covered igloos were used for temporary storage. The test firing sites consisted of several separate control rooms, camera rooms and firing pads for testing high explosives. There were separate waste disposal areas used for burning explosive wastes, and decontamination or incineration of high explosive contaminated equipment.

The IAAP site has been placed on the U.S. Environmental Protection Agency (EPA) National Priorities List as of 1990 on the basis of contamination of ground water, surface water, private wells and on-site soils. The environmental contaminants of primary interest based on selected assays revealing elevated residues and or historically assumed risk include RDX (1,3,5 trinitro-1,3,5 triazine), HMX, (cyclotetramethylene tetranitramine), TNT, (trinitrotolorene), volatile organic solvents, MOCA, (methylene orthochloroaniline), lead azide, mercury fulminate, manganese, barium and beryllium. A considerable amount of environmental quality information has been collected by the ATSDR. A Restoration Advisory Board (RAB) has been convened, and a system for communicating environmental quality information and airing of community concerns exist .

Despite this mechanism, there is a sense to those of us working in the community that a significant number of current or former residents continue to be concerned about potential health risks or adverse health effects resultant from exposures experienced as a result of living adjacent to the facility. To date, there appears to have been little focus on either on- or off-site assessment of persistent toxins such as asbestos, beryllium and depleted uranium. These data could be collected systematically and reported to the community. On behalf of these concerned community members, we respectfully request that the EPA undertake an epidemiologic investigation of health risks specific to bystander exposures from the IAAP. A sample letter from a community member is included as Appendix A.

From reviews of environmental sampling data and interviews with the U.S. Army industrial hygiene and medical staff at the Rock Island Arsenal, we have generated the following preliminary list of toxic materials reportedly used in significant quantities at the IAAP , Table 1. Table 2 includes selected potential occupational exposures, relevant chronic disease outcomes and possible screening measures which may be pertinent to the cohort based upon subsequent exposure and risk assessment. Unfortunately, given the state of historical records, we expect that neither the exposure assessment nor the cohort identification can be performed without considerable effort, especially for the oldest members of the workforce.

Table 1 *Toxic Substances Historically Used at the IAAAP*

"1,1-dichlororoethane"
"1,1-dichlororoethylene"
"2,4-Dinitrotoluene"
Acetone
Alcohol
Aluminum
Americium
Antimony
Arsenic
Azides (Sodium Azide)
Baratol
Barium
Benite aka (1,2,4 Triazole)
Benzene
Beryllium
Black Powder
Butanone aka (Methyl ethyl ketone)
Cadmium
Californium
Chromium
Copper
Cyano-acrylates
Cyclotetramethylene Tetranitramine [HMX]

Cyclotrimethylenetrinitramine, aka (Hexahydro-1,3,5- trinitro-s- triazine) [RDX]
Depleted Uranium
DI(2-Ethylhexyl) Phthalate aka (Dioctylphthalate)
1,1-Dichloroethane
1,1 Dichloroethylene
Dinitrobenzene
Dinitrotoluene [DNT]
Freon aka (1,1,2- Trichloro-1,2,2- trifluoroethane)
"High Explosive Compositions TNT, RDX, HMX, Octol, PETN"
Lead
Manganese
Mercury
Methyl ethyl ketone
4,4'-Methylenebis(2-chloroaniline) or (Methylene orthochloroaniline) [MOCA]
Methylene Chloride
Methylnapthalene
Nickel
Nitrobenzene aka (Nitrobenzol or Oil of mirbane)
Nitrocellulose
Nitroguanidine
Plutonium
Polychlorinated Biphenyl's aka (Aroclor)
Radium-226/228
Selenium
Silver
Stoddard Solvent
Styphnates aka (Trinitroresorcinol or Dihydroxy-trinitrobenzene)
Tetracene aka (2,3-Benzanthracene or Naphthacene)
Tetryl or (N-Methyl-N,2,4,6-tetranitroaniline)
Tetrytol (75% Tetryl, 25% TNT)
Titanium
Toluene di-isocyanate
1,1,1-Trichloroethane
Trichloroethene
Trichloroethylene
1,3,5-Trinitrobenzene
Trinitrotoluene [TNT]
Tritonal
Uranium both Depleted and Enriched
Xylene
Zinc

Table 2 Selected Exposures and Health Outcomes of Potential Interest

Exposure	Health Outcomes
Asbestos (Miles of Tremolite Board Construction)	lung cancer, colorectal cancer mesothelioma, asbestosis
Beryllium	berylliosis, lung cancer
Cadmium	chronic obstructive lung disease, lung cancer
Hydrofluoric acid and other Respiratory Irritants	pulmonary irritation chronic obstructive lung disease
Laed& Mercury	renal, neurologic, reproductive diseases
Nickel	lung cancer, asthma
Chromium	lung cancer,asthma
Carbon tetrachloride	liver, renal, neurologic and reproductive toxicity
4,4-methylene dianiline (MDA)	bladder cancer
MOCA (epoxyhardener)	bladder cancer
Noise	noise induced hearing loss
RDX, HMX, TNT	aplastic anemia, liver disease, hepatoma
Radiation	leukemia, myeloma, lung and other cancers, reproductive toxicity
Uranium (as metal)	renal toxicity

Proportional Cancer Ratio Data for the Communities of Middletown and West Burlington

The enclosed preliminary data detail analyses conducted to evaluate the cancer incidence among residents of the community adjacent to the IAAP. This data file was linked to the Iowa Cancer Registry database for the years 1969-1999. This analysis was done to evaluate the cancer incidence in the communities of West Burlington and Middletown, Iowa. All AEC and DOD workers identified through personnel records were excluded for the purpose of this analysis. Addresses at the time of diagnosis in our database were used to identify cancer patients living in West Burlington and Middletown for the years 1969-1999. Two age groups were used, 0-64 years of age and 65+ to identify any differences in the cancer experience based on age. Age 65 was chosen because it reflects retirement age. The total number of cancers identified in West Burlington and Middletown in the 0-64 year group was 76 among males and 96 among females. In the 65+ age group there were 118 cancers among males and 144 among females. These became our cancers of interest (target group). The comparison group was the remainder of the state minus the AEC and DOD workers and West Burlington and Middletown. For these residents aged 0-64, the number of cancers was 63,470 among males and 73,168 among females. In the 65+ age group, the numbers were 130,171 among males and 112,887 among females.

For this type of data, a method of examining the impact of a disease upon the target group is to calculate the proportional incidence ratio (PIR). In the PIR, the proportion of cancer from a specified cancer site relative to all sites of cancer in the target group is compared with the corresponding proportion in the comparison group. If the PIR is 1.00, the proportions among the target group and comparison group are the same. If it is greater than 1.00, the proportion among the target group is greater than the corresponding proportion among the comparison group. A 95% confidence interval can be computed for the PIR. The 95% confidence interval consists of the range within which the true magnitude of effect lies with 95% assurance.

Summary results for this analysis are provided in Table 3. This summary provides the statistically significant elevations by age, sex, and cancer type. More details of the analysis including results for every cancer type evaluated can be found in Appendix B.

There are several general limitations to these analyses. A major problem in the interpretation of the PIR is that the relative frequency of other cancer sites can affect the proportional incidence for the site of interest. Thus PIR analysis can only suggest that a risk exists. There are also some specific limitations to these analyses. We could only track the cancer experience of the groups from 1969 to 1999. We were told that some members of these groups were initially employed in the 1940s, thus we are likely missing some cancers.

Overall, the results of these data analyses suggest that the cancer experience in West Burlington and Middletown was similar to the cancer experience in the remainder of the state. Liver and eye & orbit cancers were elevated among males aged 0-64 but similar results were not seen in females. Tongue and rectal cancers as well as leukemia were elevated among females, but similar results were not seen in males. In the 65+ age group, we did not see any of the same elevations of the younger aged group. Lip cancer and multiple myeloma were elevated among males but similar results were not seen in

females. Other female genital cancers were elevated, but this was based on only 2 cases in this 30-year time period.

Table 3. West Burlington and Middletown (minus AEC and DOD workers)
Statistically significant elevations (p<0.05) by age and cancer type

Ages 0-64 (PIR;n)		65+ (PIR;n)	
Males	Liver (13.8;2)	Males	Lip (3.5;5)
	Eye & orbit (7.6;2)		Multiple myeloma (3.2;5)
Females	Tongue (6.2;2)	Females	Other female genital (10.1;2)
	Rectum (2.3;6)		
	Leukemia (3.3;6)		

Summary

There is a segment of the population that lived on (?) or lived adjacent to the IAAP property who are concerned about health risks or adverse health effects they, their families, and neighbors may have experienced. On behalf of these individuals and this community, we ask you to consider increasing activity in this community to include increased risk communications, a more thorough risk assessment process, and an epidemiologic investigation of relevant exposures and health outcomes such as cancers and reproductive outcomes.
Thank you very much.

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Appendix A

Dr. Fuortes,

I will be happy to remind you of my circumstances regarding growing up at the IAAP.

I lived there from 1959 - 1978. My father was the Chief Engineer at the plant for years - in fact, the big lake is named for him, George Mathes. We lived caddy-corner from the administration building. There were 13 children in our family. I am the youngest.

Both my parents died of cancer. My mother also had emphysema. She died in 1980 at age 62. My father died in 1984 at age 66. I have a sister who had melanoma. The reason I wrote to you originally was because I was diagnosed in 1994 with chronic myleogenic leukemia, otherwise known as CML. In 1995 I had a stem cell transplant using my brother's stem cells, and am "cured." I'm a very lucky person. My oncologists have told me that leukemia is "environmentally" caused. Benzene being just one of the chemicals that has been indicated. All of this has concerned me as to why I ended up with leukemia.

When we were growing up as children at the plant, we were in constant touch with all the testing, etc. that was going on out there. We drank the water, we went swimming in the water, we played in the grass and we heard and watched the huge clouds that floated over our home on a daily basis, from the testing at the plant. It is my belief that there is NO way that this did not affect those of us living in the plant area. We were there 24 hours a day, 5 days a year (for the most part). There are numerous others that have survived or died from cancer that grew up at the plant. I think a study into this would prove that there are many people that have been affected by the dangerous chemicals used at the plant.

In 1979, when I was working for United Airlines in Chicago, I developed some odd bumps, all over my head. They put me through many tests and one of the possible causes was leukemia. To this day I believe it really was leukemia and that it has been in remission all these years - which is classic for CML. I have always suspected that it had something to do with living at the plant. I don't know why I ended up with it rather than any of my siblings - but I can only assume it had something to do with the time frame of when I lived out there - or, perhaps I was just more susceptible.

Whether or not my leukemia was caused by something at the plant or not - I truly believe that for the people that lived there, a study into this would perhaps provide answers for those of us who have suffered traumatically from their experience with cancer. I wouldn't wish this on anyone. I was years old with two children, 4 & 9, when I was diagnosed. It scares me to think that what caused this awful disease could have been right in my own backyard when I was growing up!

I sincerely hope that the director of the EPA considers my concerns and those of others that grew up at the plant important enough to pursue this. You may use my name or have anyone who would like to contact me do so.

I greatly appreciate your help.

Sincerely,

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Appendix B.

Proportional Incidence Ratios (PIRs) and 95% Confidence Intervals for Addresses involving West Burlington and Middletown (minus AEC & DOD) versus the state (minus AEC, DOD, West Burlington and Middletown), Males, Ages 0-64, 1969-1999

Cancer Site	Observed Number of Cancer Cases		PIR	95% Confidence Interval
	West Burlington & Middletown	Selected state comparison		
Colon	6	5294	0.95	0.44-2.04
Rectum	4	2936	1.14	0.44-2.95
Liver	2	121	13.80	3.52-54.19*
Pancreas	2	1570	1.06	0.27-4.18
Lung	19	13,110	1.21	0.82-1.79
Skin melanoma	5	2630	1.59	0.68-3.70
Prostate	6	8139	0.62	0.29-1.33
Bladder (invasive & noninvasive)	5	3783	1.10	0.47-2.58
Eye & orbit	2	219	7.62	1.94-29.94*
Brain	3	1693	1.48	0.49-4.49
Hodgkin's disease	3	1075	2.33	0.77-7.07
Non-Hodgkin's lymphoma	5	3003	1.39	0.60-3.24
Total leukemia	2	2329	0.72	0.18-2.82
Other sites	12	17,568	0.57	0.34-0.96*
All sites	76	63,470	reference	

* $P < 0.05$; interval does not include 1.00.

Appendix C

Proportional Incidence Ratios (PIRs) and 95% Confidence Intervals for Addresses involving West Burlington and Middletown (minus AEC & DOD) versus the state (minus AEC, DOD, West Burlington & Middletown), Females, Ages 0-64, 1969-1999

Cancer Site	Observed Number of Cancer Cases		PIR	95% Confidence Interval
	West Burlington & Middletown	Selected state comparison		
Tongue	2	245	6.22	1.58-24.52*
Stomach	2	533	2.86	0.73-11.27
Colon	6	5406	0.85	0.39-1.84
Rectum	6	1997	2.29	1.06-4.97*
Pancreas	2	927	1.64	0.42-6.48
Lung	6	5779	0.79	0.36-1.72
Skin melanoma	4	2664	1.14	0.44-2.99
Breast	31	24,948	0.95	0.71-1.27
Cervix	6	3725	1.23	0.57-2.66
Uterus	5	6183	0.62	0.26-1.45
Ovary	2	4178	0.36	0.09-1.44
Bladder (invasive & noninvasive)	2	1050	1.45	0.37-5.72
Thyroid	6	2249	2.03	0.94-4.41
Hodgkin's disease	3	867	2.64	0.87-8.03
Total leukemia	6	1406	3.25	1.50-7.06*
Other sites	7	11,011	0.48	0.24-0.99*
All sites	96	73,168	reference	

* $P < 0.05$; interval does not include 1.00.

Appendix D

Proportional Incidence Ratios (PIRs) and 95% Confidence Intervals for Addresses involving West Burlington and Middletown (minus AEC & DOD) versus the state (minus AEC, DOD, West Burlington & Middletown), Males, Ages 65+, 1969-1999

Cancer Site	Observed Number of Cancer Cases		PIR	95% Confidence Interval
	West Burlington & Middletown	Selected state comparison		
Lip	5	1576	3.50	1.48-8.25*
Esophagus	2	1369	1.61	0.41-6.37
Stomach	3	2951	1.12	0.37-3.43
Colon	16	13,968	1.26	0.80-1.99
Rectum	8	5821	1.52	0.78-2.96
Larynx	2	1825	1.21	0.31-4.78
Lung	28	23,957	1.29	0.93-1.78
Prostate	25	38,152	0.72	0.51-1.02
Bladder (invasive & noninvasive)	7	9930	0.78	0.38-1.60
Kidney & renal pelvis	2	2952	0.75	0.19-2.95
Multiple myeloma	5	1721	3.21	1.36-7.56*
Total leukemia	3	4642	0.71	0.23-2.18
Other sites	12	21,307	0.62	0.36-1.06
All sites	118	130,171	reference	

* $P < 0.05$; interval does not include 1.00.

Appendix E

Proportional Incidence Ratios (PIRs) and 95% Confidence Intervals for Addresses involving West Burlington & Middletown (minus AEC & DOD) versus the state (minus AEC, DOD, West Burlington & Middletown), Females, Ages 65+, 1969-1999

Cancer Site	Observed Number of Cancer Cases		PIR	95% Confidence Interval
	West Burlington & Middletown	Selected state comparison		
Gum & other mouth	2	450	3.48	0.88-13.80
Stomach	3	2066	1.14	0.37-3.49
Colon	27	18,973	1.12	0.79-1.57
Rectum	11	5072	1.70	0.96-3.00
Pancreas	5	3823	1.03	0.43-2.43
Lung	10	9684	0.81	0.45-1.47
Breast	36	28,973	0.97	0.73-1.29
Uterus	8	6734	0.93	0.47-1.83
Ovary	3	4064	0.58	0.19-1.77
Vulva	2	866	1.81	0.46-7.17
Other female genital	2	156	10.05	2.54-39.80*
Non-Hodgkin's lymphoma	5	4545	0.86	0.36-2.04
Multiple myeloma	2	1769	0.89	0.22-3.51
Total leukemia	4	3861	0.81	0.31-2.13
Other sites	24	21,851	0.86	0.60-1.24
All sites	144	112,887	reference	

* $P < 0.05$; interval does not include 1.00.