A HEALTH SURVEY OF WORKERS AND RESIDENTS IN THE VICINITY OF RESEARCH ORGANIC/INORGANIC CHEMICAL COMPANY

Belleville, New Jersey

August 27, 1984

NEW JERSEY DEPARTMENT OF HEALTH
A BETTER STATE OF HEALTH

Division of Epidemiology and Disease Control

REPORT

A Health Survey of Workers and Residents in the Vicinity of Research Organic/Inorganic Chemical Company Belleville, New Jersey

Conducted by

Environmental Health Program
New Jersey State Department of Health
in Cooperation with the
Belleville Health Department

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AUTHORSHIP AND ACKNOWLEDGEMENTS

Report Prepared by:

Curtis E. Cummings, M.D.
Senior Public Health Physician
Office of the State Epidemiologist
New Jersey State Department of Health

Steven M. Miller, M.S.
Epidemiologist
Environmental Health Program
New Jersey State Department of Health

Data Analysis:

Steven M. Miller, M.S.
Joseph E. Rizzo, B.A.
Environmental Health Program
New Jersey State Department of Health

Evaluation Conducted by:

Environmental Health Program
New Jersey State Department of Health
Dhun B. Patel, Ph.D., Chief

Belleville Health Department
Thomas Longo, Health Officer

Environmental Monitoring:

Emergency Response Team
New Jersey State Department of Health
Frank Marshall, M.S., Chief

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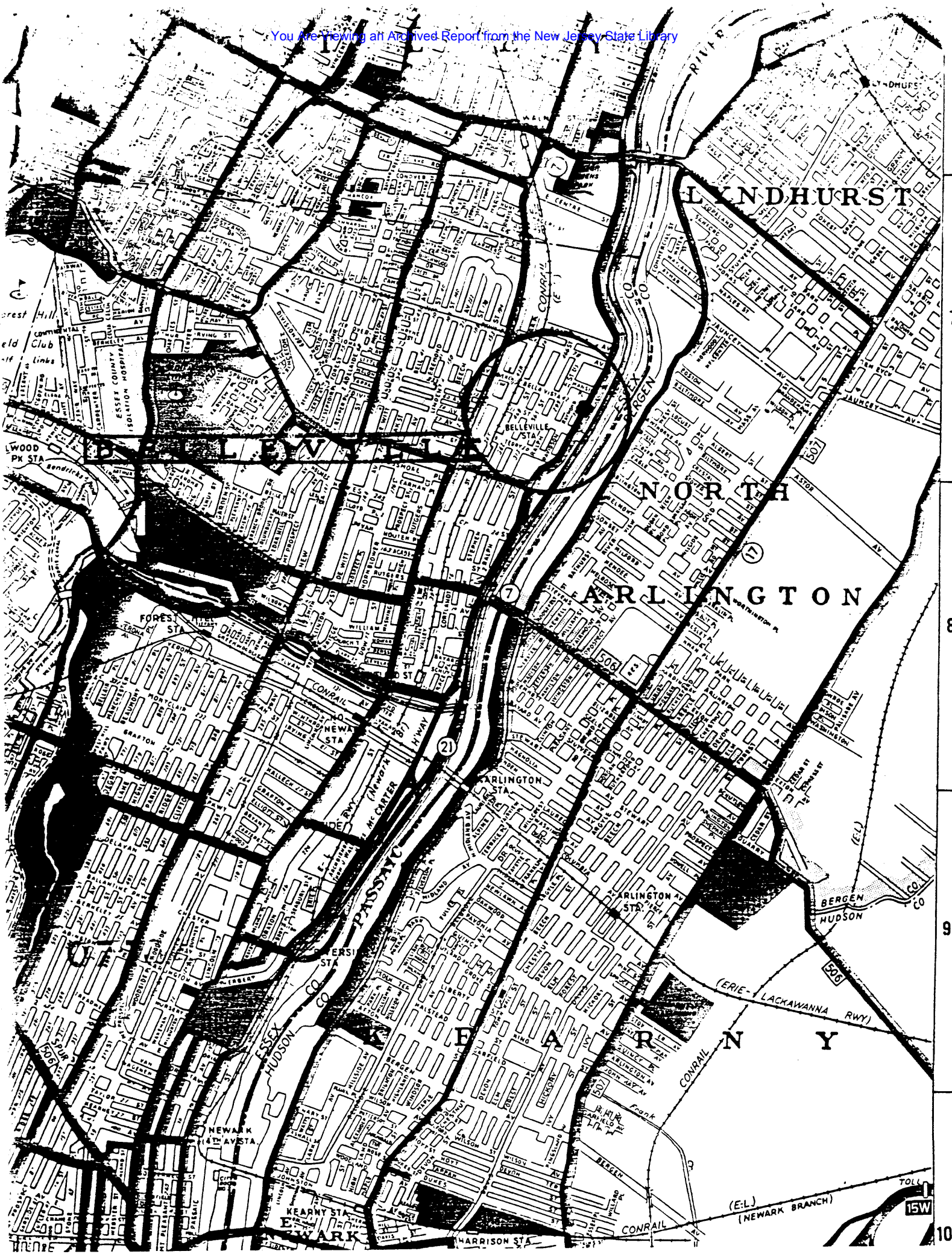
I. INTRODUCTION

A. History of ROC/RIC

The Research Organic/Inorganic Chemical Company (ROC/RIC) occupied 507-19 Main Street, Belleville, New Jersey, in December, 1968, at which time it began to manufacture food flavorings and additives for food and cosmetics (Map 1). The local health department received complaints from residents and industry about odors from ROC/RIC over many years; these increased in frequency and severity from approximately 1980 through early 1983. Municipal workers also suspected organic chemical discharges into sewer systems.

B. Preliminary Evaluations

As a result of such complaints, the facility was inspected by the local Health Officer several times in 1982 and by OSHA in December, 1982; during these inspections poor housekeeping was observed. In March, 1983, there was a further increase in reported odors, and more allegations of chemical discharges into sewers. The local Health Officer noted a marked deterioration of storage and housekeeping practices at ROC/RIC and requested that the Division of Waste Management of the New Jersey State Department of Environmental Protection (DEP) inspect the facility. DEP observed waste handling violations and unsafe storage, and ordered ROC/RIC to correct these problems immediately. Also during March, 1983, the Consumer Health Services of the State Department of Health (DOH) inspected ROC/RIC as a food facility, but found no violations of their codes.



Following allegations by ROC/RIC employees of mislabelling and mishandling of chemicals and at the request of the local Health Officer, the Essex County Prosecutor's office raided the plant on May 13, 1983. Many potentially hazardous radioactive materials and toxic chemicals were found in improper conditions of storage and labelling. A court order closed ROC/RIC, by request of the local Health Officer, and the municipality assumed control of the site.

C. DOH Response

On Thursday, May 19, the Health Officer requested assistance of the DOH Division of Epidemiology and Disease Control to assess health hazards associated with ROC/RIC. The Emergency Response Unit (ERU) inspected the plant the next day, during which time deteriorating and leaking chemical drums were noted; some of these were unlabelled or appeared to be mislabelled. Local officials evacuated the adjacent community, including a nearby school, and stabilized leaking drums. ERU performed air sampling on May 21, 23, and 26, inside and outside ROC/RIC.

On Wednesday, May 25, DOH, with the cooperation of the local Health Department, conducted a survey of health symptoms of all who lived within one and one-half blocks of the plant. Public health nurses attempted to interview the estimated 250 residents, including school children, in one day's time to evaluate symptoms over the previous six months. Of 232 residents interviewed using a standardized questionnaire (see Appendix A), 85% had two or more symptoms of upper respiratory (eye, nose, throat) irritation, 44% claimed skin irritation or

rash, 99% had at least one lower respiratory (lung/chest) complaint, and 99% claimed to be annoyed by odors, within the previous six months. The most frequent specific complaints were headaches (40%), nasal irritation (38%), and skin rash (35%). By the afternoon of this survey, results of the May 21 and 23 air sampling indicated no detectable levels of volatile organic chemicals outside the plant.

The environmental and health survey results were presented and explained at a community meeting in the evening of May 25. Considerable public concern and anxiety were expressed regarding the site.

On May 31, 1983, the State Commissioner of Health, Dr. J. Richard Goldstein, toured ROC/RIC and announced that DOH would administer a comprehensive health screening to area residents. The DOH Division of Epidemiology and Disease Control and the local Health Department identified a four-square block area adjacent to the plant, within which all persons who lived, worked, or attended school were invited to a health survey free of charge.

Six hundred eighty people were interviewed or examined in some or all phases of the survey on June 7, 8, and 9, 1983. The survey included questionnaires administered by DOH and local health workers, physical examinations by DOH physicians, spirometry, and laboratory testing of blood and urine samples.

II. MATERIALS AND METHODS

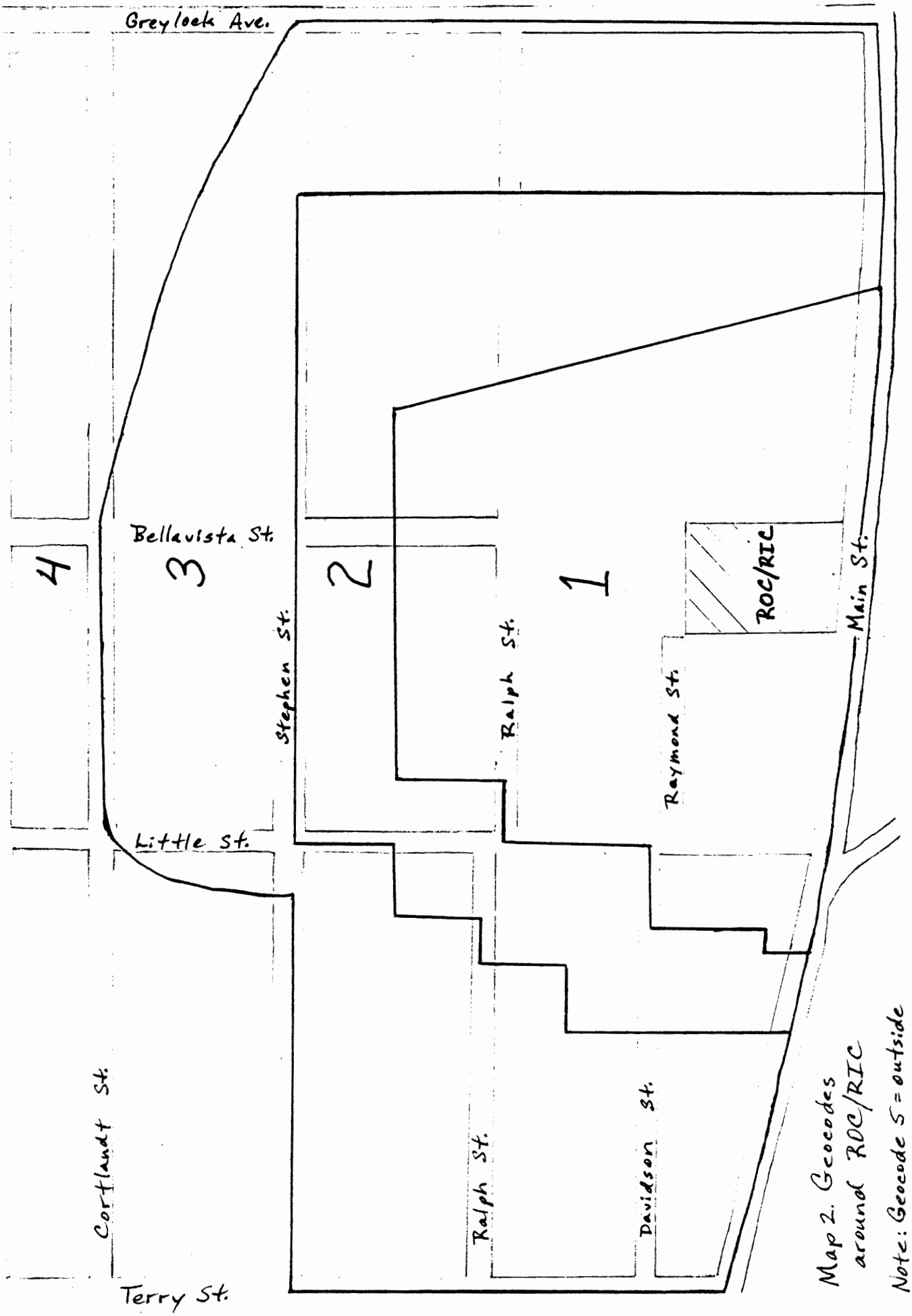
A. Study Population

By design, the study group was limited to residents and workers in an area bounded by the following borders (Map 2):

> Little Street, from Main to Stephen Street; Stephen Street, from Little to Greylock Avenue; Greylock Avenue, from Main to Stephen Street; Main Street, from Little to Greylock Avenue; Ralph Street, from Little to Greylock Avenue; Bella Vista Avenue, from Ralph to Stephen Street; and the length of Raymond Street.

Later, this area was opened up to include three-square blocks from Main to Stephen and from Terry to Little, and one-square block between Stephen and Cortlandt and Little and Bella Vista. There were 144 dwellings in the entire study area. The immediate study area (1000 feet from ROC/RIC) was divided into geographic areas, called Geocodes 1-3, to serve as an index of possible exposure. Geocode 4 included persons who attended school or worked in or near ROC/RIC but lived in Belleville beyond Geocode 3. Geocode 5 included those who attended school or worked in or near ROC/RIC and who lived outside of Belleville.

The invited group also included all workers from Research Ogranic/Inorganic Inc., an adjoining U.S. Postal Service Depot, seven small businesses and industrial sites, and students from a public school (School #9). In addition, many of Belleville's police, fire-fighters and



Map 2. Geocodes around ROC/RIC

Note: Geocode 5 = outside of Belleville

sewer workers had been involved with the plant site as part of their duties, so these groups were also invited to participate in the study.

An estimate of the size of the invited population is shown in Table 1 and was made based on: inquiries of the workplaces in the area; a count of private dwellings from tax maps using an estimate of 2.79 people per household (U.S. Census of Housing Essex Co., 1980); and an enrollment list for School #9. The total resident population in Geocodes 1-3 was estimated to be 402 (144 counted households x 2.79 people per household). From the enrollment list, 66 of the 138 students were found to be residents of the demarcated area, and the students were divided into Geocodes by residence. The remaining 336 estimated residents (402 minus 66) of Geocodes 1-3 were called "adults and other children." There were 84 police, about 70 fire-fighters and 40 sewer workers (total Department of Public Works staff) employed in Belleville; all were invited. There were about 150 workers at the U.S. Postal Service Depot, and an estimated 87 other non-resident workers invited to participate (footnote, Table 1). The study area is small, and casual inquiries made to employees indicated that very few of the workers mentioned above also lived in the demarcated area, so all were considered "non-residents." Using these estimates, the estimate of the total delineable invited population is 908. In addition, 147 people who claimed to often pass through the area were allowed to participate.

Of the delineable population 533 people participated in the study. Thus the overall response rate is estimated as 533/980 = 58.7%. A more precise estimate can be made for some of the subgroups. The response

TABLE I

INVITED POPULATION

AND ESTIMATED RESPONSE RATES

	Invited Population	Response n	Response %
Residents (geocodes 1-3)			
Children, School #9	66	44	66.7
Adults and other Children	336	199	59.2
Subtotal	402*	243	60.4
Non-residents (geocodes 4-5) who work or attend school in the immediate vicinity of ROC/RIC.			
Children, School #9	72	37	51.4
Workers			
U.S. Postal Service	150	79	52.7
Municipal**	194	124	63.9
Non-municipal and miscellaneous workers	87***	50	57.5
Subtotal	506	290	57.3
Total Delineable Population	908	533	58.7
Non-resident/Non-Workers (geocodes 4-5) eligible based on frequently passing through the immediate vicinity of ROC/RIC.	-	147	-
Total Participants		680	

* Estimate based on U.S. Census of Housing data for Essex County, number of persons per household.

** Belleville police, firefighters and sewer workers (Department of Public Works Employees).

*** Based on estimates provided by canvassing managers of businesses and governmental organizations in Belleville. The estimate includes private businesses and the staff of School #9. It is minimal because it does not include the estimate of total vendors or contractors who often work in the area, or former ROC/RIC employees. Since some such subjects did participate, but the actual number eligible is unknown, the corresponding response rate in this category is probably artificially high.

rate for all students from School #9 is 81/138 = 58.7%. The estimated response rate for all residents is 243/402 = 60.4%. The response rate among U.S. Postal Workers was 52.7% and among municipal workers was 63.9%. The response rate for the non-municipal and miscellaneous worker category is 57.5%, but it is based on an underestimated denominator, and thus is probably smaller than this. The response rate for all residents and non-residents was 58.7%.

B. Environmental Assessment

ERU began its hazard assessment of ROC/RIC upon arrival on Saturday, May 21. ERU collected a total of 19 continuous air samples of 2 to 6 hours' duration on three different days, inside and immediately outside ROC/RIC. DuPont, MSA, and SKC air pumps were used, combined with activated charcoal and silica gel collection tubes or distilled water midget-impingers.

Although chemical containers were unlabelled or obviously mislabelled, the following chemical classes were represented on labelled containers found in the plant: volatile organics (including aromatics, aldehydes, ketones, acids, and alcohols), aromatic amines, inorganic acids and anhydrides, chlorinated hydrocarbons, nitriles, caustics, inorganic salts, mustard gas, and radioactive materials.

Three outdoor air samples were collected, adjacent to the plant building, on three different sides of ROC/RIC on Saturday, May 21. Five samples were collected inside ROC/RIC on Monday, May 23; one in the sample storage area, one in the main warehouse, and three in the

plant's laboratory. On Thursday, May 26, eleven samples were collected; two outside ROC/RIC, five inside the warehouse, two inside the laboratory, one in the shipping room, and one in the production area. All samples from May 21 and 23 were for volatile organic chemicals (VO); the May 26 samples included six for VOs, three for acids, and two for aromatic amines.

Radiation monitoring was performed by the Nuclear Regulatory Commission and by the Bureau of Radiation Protection, NJDEP. Radionuclides were found in the ROC/RIC laboratory. These were thereafter assembled in one laboratory location and stored in a metal safe or under lead shielding in order to mitigate extraneous radiation exposure.

U.S. Army personnel surveyed for explosive substances. Some heat or shock sensitive or spontaneously explosive chemicals were removed; others were identified for later control actions by a private contractor for the Town.

C. Health Effects Assessments

Appendix B shows the consent form and standardized questionnaire used to determine the respondents' demographic characteristics; residential, occupational, smoking, alcohol, medical and medication histories; symptomatology; and physical findings. All questionnaires were individually administered to the respondents by interviewers from the DOH Division of Epidemiology and Disease Control and the Belleville Health Department. Physical examinations were performed by DOH and local health personnel. Spirometry and laboratory tests

were performed by DOH personnel and contractors using standardized procedures (Appendix C). The questionnaires and examinations were completed in Belleville in a three-day period (June 7-9, 1983).

III. RESULTS

A. Study Sample Characteristics

Nearly 36% of the entire study group were residents within 1000 feet of ROC/RIC (Geocodes 1-3), and 75% were residents of Belleville (Geocodes 1-4). The remaining 25% of the study group (Geocode 5) were non-resident workers and students.

Table 2 shows the demographic characteristics of the study population by Geocode and in comparison to 1980 Census data for the Town of Belleville. Nearby residents (Geocode 1-3) were generally similar to all Belleville residents (first column), although the age and race distributions were slightly different. Geocodes 1-3 had proportionally fewer persons under age 5, ages 20-34 and over age 59 than in the Town of Belleville. There was a greater percentage of Hispanics in Geocodes 1-3 than in Belleville, but the small sample size and differences in race group definitions between the Census and the survey prevent a meaningful interpretation of the data.

Table 3 describes the occupational distribution of all participants over age 15. Very few ROC/RIC employees participated in the survey. The "workers near ROC/RIC" are municipal employees who conducted frequent, short-term work activities near the plant. The "other workers" were nearby residents who worked elsewhere -- employees of small private business near the plant, staff of School #9, workers at the adjacent U.S. Postal facility, and people whose work activities often took them through the area. Any adults who were "not employed" at the time of the study were grouped together and include persons who spent a large part of their time near ROC/RIC.

Table 2

DEMOGRAPHIC FACTORS

Characteristic	1980 Census: Residence in Town of Belleville		Residence in geocode 1-3 (Residence in immediate 1000 foot radius from plants)		Residence in geocode 4 (town of Belleville but not immediate vicinity of plant)		Residence in geocode 5 (not residing in town of Belleville)		Total study subjects (geocodes 1 thorugh 5)	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
AGE										
<5	1835	(5.32)	9	(3.70)	9	(3.38)	4	(2.34)	22	(3.24)
5 to 9	1834	(5.32)	20	(8.23)	47	(17.67)	1	(0.58)	68	(10.00)
10 to 15	3097	(8.99)	28	(11.52)	40	(15.04)	1	(0.58)	69	(10.15)
16 to 19	2115	(6.14)	21	(8.64)	13	(4.89)	1	(0.58)	35	(5.15)
20 to 34	8658	(25.11)	46	(18.93)	48	(18.05)	68	(39.77)	162	(23.83)
35 to 59	10105	(29.32)	77	(31.69)	86	(32.33)	80	(46.78)	243	(35.74)
≥60	6824	(19.80)	40	(16.46)	23	(8.65)	16	(9.36)	79	(11.62)
No answer	0		2		0		0		2	(0.29)
Total	34466	(100.0)	243	(100.0)	266	(100.0)	171	(100.0)	680	(100.0)
SEX										
Male	15553	(45.13)	116	(47.74)	134	(50.38)	109	(63.74)	359	(52.79)
Female	18913	(54.87)	127	(52.26)	132	(49.62)	62	(36.26)	321	(47.21)
Total	34466	(100.0)	243	(100.0)	266	(100.0)	171	(100.0)	680	(100.0)

Table 2 (Continued)

Characteristic	1980 Census: Residence in Town of Belleville		Residence in geocode 1-3 (Residence in immediate 1000 foot radius from plants)		Residence in geocode 4 (town of Belleville but not immediate vicinity of plant)		Residence in geocode 5 (not residing in town of Belleville)		Total study subjects (geocodes 1 thorugh 5)	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
RACE										
White	33352	(94.30)	228	(93.83)	250	(93.98)	130	(76.02)	608	(89.41)
Black	933	(2.78)	3	(1.23)	6	(2.26)	36	(21.05)	45	(6.62)
Other										
Hispanic	228*	(0.64)	6	(2.47)	6	(2.26)	3	(1.75)	15	(2.21)
Non-Hispanic	845*	*(2.41)	6	(2.47)	4	(1.50	2	(1.17)	12	(1.76)
N/A	0		0		0		0		0	
Total	33567	(100.0)	243	(100.0)	266	(100.0)	171	(100.0)	680	(100.0)

* Listed as Spanish in the 1980 Census.
** Categories other than Spanish in the 1980 Census.

TABLE 3

DISTRIBUTION OF ADULT PARTICIPANTS
BY
OCCUPATIONAL GROUPS

Occupational Groups	N	%
Chemical workers		
Research Organic/Inorganic	3	0.6
Other	8	1.5
Municipal workers		
Sewer workers	24	4.6
Police	12	2.3
Firefighters	16	3.1
Workers near ROC/RIC		
Postal workers	79	15.2
Industrial/blue collar	205	39.3
Service/white collar	131	25.1
Not employed*	42	8.1
No reply	1	0.2
Total	521	100.0

*Includes unemployed, disabled, housewives and retired persons.

Table 4 shows the distribution of adult study subjects by smoking and drinking characteristics at the time of the survey. Smoking status was defined by the responses to the first two questions of page E-1 of the questionnaire (see Appendix B). Over 38% of the adults were classified as "never smoker" because their responses to both questions were "no". "Former smokers" made up 24% of the adults and were persons who reported that they had stopped smoking at least one month before the survey. Over 37% of adult participants reported that they were smokers. Over 46% of the adult participants stated that they were not drinkers of alcoholic beverages. A drink was defined as one 12-oz. glass of beer, one 4-oz. glass of wine or one shot (1.5-oz.) of liquor other than beer or wine (see page E-2 of the questionnaire in Appendix B). Among the adult subjects, 36.5% reported that they drank from one to ten drinks per week, 10.0% said they drank 11-21 drinks per week, and 6.7% stated that they consumed over 22 drinks per week. One adult did not respond.

B. Environmental Assessment Data

Volatile organic air sampling (VO) outdoors on May 21 indicated "none detected" (ND) (limit of detection = approximately 0.05 parts per million, or ppm). All but one indoor air sample from May 23 (all VO) indicated ND; the last indicated 0.175 ppm methyl ethyl ketone and 0.297 ppm benzene in the laboratory of ROC/RIC. On May 26, all six indoor and outdoor VO samples indicated ND; both indoor samples for aromatic amines indicated ND. The three indoor inorganic samples indicated: #1-pH of 6.9, chloride 350 nanograms per liter (ng/l); #2-pH of 2.9, chloride 450 ng/l; and #3-pH of 2.2, chloride 350 ng/l, respectively.

TABLE 4

DISTRIBUTION OF ADULT PARTICIPANTS

BY SMOKING AND DRINKING

CHARACTERISTICS

Smoking Status	N	%
Never smoker	200	38.4
Former smoker	125	24.0
Current smoker	196	37.6
Total	521	100.0
Drinking Status		
Never drinker	243	46.6
Current drinker		
1-10 drinks/week	190	36.5
11-21 drinks/week	52	10.0
22 + drinks/week	35	6.7
No response	1	0.2
Total	521	100.0

No radioactivity above background was detected outside ROC/RIC, or within ROC/RIC except for the laboratory where radionuclides were found, according to the radiation monitors.

C. Health Effects Data

The interviewer-administered questionnaire data on physician-diagnosed conditions are presented in Table 5. Participants were asked whether they had ever been told by a doctor that they had any of the conditions specified in the medical history section of the questionnaire. (See pages F1-F4 on the questionnaire in Appendix B.) The most commonly reported diagnoses were:

Other ear/nose/throat problems	42.9%
Hay fever, or nasal or laryngeal polyps	25.3%
Other musculoskeletal conditions	21.8%
All eye disorders	20.5%
Eczema or other skin problems	19.0%

Also, 12.4% reported that they had had pneumonia, pleurisy or bronchiectasis diagnosed, while 9.7% said that they had never had any of the specified conditions.

Table 6 shows the distribution of respondents who stated that they had ever had specific symptoms (listed on pages I-1 to I-2 of Appendix B) at least once a week during the twelve months prior to the survey. Each symptom category on the table includes several conditions, so a positive response to any one symptom in a category was treated as

SUBJECTS' REPORTING OF
PHYSICIAN - DIAGNOSED CONDITIONS

Condition # on Questionnaire	Diagnoses	# of Respondents Reporting *	% (of 680 total) of Respondents Reporting
	Respiratory		
21	Asthma	31	4.6
22	Chronic Bronchitis	77	11.3
23	Emphysema	6	0.9
24	Pneumonia, pleurisy or bronchiectasis	84	12.4
25	Work-related lung condition	4	0.6
26	Other	60	8.8
	Skin		
44	Psoriasis or Hives	66	9.7
43	Eczema or other skin problems	129	19.0
	Cancer		
01	Skin Cancer	4	0.6
02	All cancer except leukemia and skin cancer	10	1.5
	Head and Neck		
55	Eyes (all disorders)	141	20.5
61	Hay fever, allergies, nasal or laryngeal polyps	172	25.3
62	Ear infections	88	12.9
63	Other Ear/Nose/ and Throat Problems	292	42.9

TABLE 5 (CONTINUED)

Condition # on Questionnaire	Diagnoses	# of Respondents Reporting	% (of 680 total) of Respondents Reporting
	Blood		
51	Low white count	9	1.3
52	Anemia	68	10.0
53	Other Blood Conditions	28	4.1
	Cardiovascular		
11	Hypertension	104	15.3
12	Heart Attack, Angina or Claudication	40	5.9
13	Other Heart Conditions	95	14.0
	Gastrointestional		
31	Ulcer	51	7.5
33	Liver or Gallbladder Disease	62	9.1
32	Other Gastro-intestional conditions	118	17.4
	Neurologic		
71	"Nervous Disorder"	9	1.3
72	Epilepsy, Stroke, Parkinson's Disease, and other Neurologic Conditions	23	3.4
	Musculoskeletal		
81	Arthritis	75	11.0
82	Other Musculoskeletal Conditions	148	21.8

TABLE 5 (CONTINUED)

Condition # on Questionnaire	Diagnoses	#of Respondents Reporting	% (of 680 Total) of Respondents Reporting
	Genitourinary		
41	Urinary or Kidney Infection	110	16.2
42	Other Genito-urinary Conditions	66	9.7
	Metabolic		
91	Diabetes	16	2.4
92	Other Metabolic Conditions	33	4.9
	No conditions	66	9.7

See Appendix, pages F1 through F4. Diagnosed conditions which appear on the appended questionaire but not on Table 5 were not reported by any responder.

*Number represents respondents who answered "yes" when asked if a physician had ever advised them that they were affected with the specified condition.

TABLE 6

FREQUENCY OF SELF-ASSESSED CONDITIONS WHICH OCCURRED OFTEN[1] DURING THE PREVIOUS YEAR

Condition # on Questionnaire +	Type of Condition	Total	Number Reporting No Conditions of Given Type	Number Reporting Any Conditions of Given Type	Number Reporting From 1 to 3 Conditions of Given Type	Number Reporting More Than 3 Conditions of Given Type
1 (a) - 1 (f)	Eye	n 679[*] % (99.9)	385 (56.6)	294 (43.3)	243 (35.7)	51 (7.5)
2 (a) - 2 (e)	Skin	n 680 % (100.0)	413 (60.7)	267 (39.3)	265 (39.0)	2 (0.3)
4 (a) - 4 (i)	Respiratory	n 680 % (100.0)	297 (43.7)	383 (56.3)	286 (42.1)	97 (14.3)
6 (a) - 6 (g)	CNS	n 680 % (100.0)	306 (45.0)	373 (55.0)	257 (37.8)	117 (17.2)
5 (a) - 5 (g)	Urinary	n 680 % (100.0)	596 (87.6)	84 (12.4)	82 (12.1)	2 (0.3)
3 (a) - 3 (h)	Gastro-intestinal	n 680 % (100.0)	484 (71.2)	196 (28.8)	170 (25.0)	26 (3.8)

(1) From "once or twice a week" to "nearly every day"

+ See Appendix, Questionnaire pages I-1 through I-4

(*) Denominator = 680 in all tabled percentages except Eye Conditions, for which there was 1 Non-responder

"any" on the table. The "any" data are further separated into "1-3 conditions" and "more than 3 conditions". Respiratory, CNS, eye and skin symptoms were reported two to four times more often than gastrointestinal or urinary tract conditions. Subjects reported more than 3 symptoms primarly for CNS and respiratory conditions. The most common CNS complaints were general constitutional complaints such as headache, fatigue, and insomnia.

All but six of the 680 subjects (or 674 people) were seen by DOH physicians for physical examination. The prevalence of several selected items in each category of examination is listed in Table 7. Only one item, skin rash, stands out with a high frequency, 20.3%. A dermatologist characterized only three of these as probable irritant dermatitis, and the etiology was not thought to be organic chemicals. The rest had multiple other diagnoses, including psoriasis and hives, not clearly relatable to chemical exposure. Table 8 shows the rash data by Geocode. There is an overall trend in reporting rash; the rash decreases with distance from the plant. However, even if only the strongest part of the trend (Geocode 1-3) is tested for linear trend, the test falls outside the level of statistical significance, at $p = 0.11$.

The distribution of blood pressure measurements are presented in Table 9 by race, sex and age groups. The non-white sample (Black, Hispanics and Others) is small, and could not be subdivided by age groups. Hispanics and Others were very similar to whites (80.8% vs. 83.0% normals, respectively). Black male data (only 55% normal) indicate that they had higher measurements than other males,* who had

TABLE 7

PHYSICIAN'S FINDINGS ON PHYSICAL EXAMINATION

Specific Condition (Questionnaire Item #)*	Abnormal	
	N	%**
Extremities: Clubbing (5.1)	4	0.6
Skin: Rash or other abnormalities (6.4 to 6.5)	137	20.3
Nose: Mucosal abnormalities (9.1 to 9.4)	14	2.1
Chest: Percussion-abnormal (4.1 to 4.5)	9	1.3
Auscultation: Wheezing (15.3 to 15.4)	12	1.8
Auscultation: Other abnormal breath sounds (15.1 to 15.2 and 15.5 to 15.7)	17	2.5
Abdominal Palpation: Tenderness right upper quadrant or enlarged liver (17.1 to 17.4)	0	0.0
CNS: Reflexes-abnormal (18 through 20 and 21.1)	2	0.3
Other abnormalities: (22.1)	36	5.3

*see appended questionnaire pages J-1 to J-2.
*All but 6 of the 680 participants were examined by a physician. Therefore the % is based on a denominator of 674.

TABLE 8

DISTRIBUTION OF SKIN RASH

BY GEOCODE

	Skin Rash					
	Yes		No		Total	
Geocode	N	%	N	%	N	%
1	13	26.5	36	73.3	49	100.0
2	13	18.1	59	81.9	72	100.0
3	19	16.1	99	83.9	118	100.0
4	53	20.1	211	79.9	264	100.0
5	39	22.8	132	77.2	171	100.0
Total	137	20.1	543	79.9	674	100.0

Test for trend on Geocodes 1-3 not significant, p=0.114*

*Test for linear trend in proportions, Snedecor and Cochran, Statistical Methods, Sixth Edition, 1976, University of Iowa Press.

TABLE 9

BLOOD PRESSURE STATUS BY RACE, SEX AND AGE

	<140/90	140/90 to 160/100	160/100 to 180/115	>180/115	TOTAL MEASURED	NOT MEASURED	GRAND TOTAL
WHITES:							
MALES:							
AGES 0 - 9	38	1	0	0	39	6	45
10 - 19	45	0	0	0	45	1	46
20 - 59	152	35	7	2	196	1	197
GE 60	21	16	2	0	39	0	39
NR	0	0	0	0	0	0	0
TOTAL	256	52	9	2	319	8	327
(% OF THOSE MEASURED)	(80.3%)	(16.3%)	(2.8%)	(0.6%)	(100.0%)	—	—
FEMALES:							
AGES 0 - 9	23	0	0	0	23	10	33
10 - 19	47	0	0	0	47	1	48
20 - 59	135	16	5	0	156	4	160
GE 60	22	10	4	1	37	0	37
NR	2	0	0	0	2	0	2
TOTAL	229	26	9	1	265	15	280
(% OF THOSE MEASURED)	(86.4%)	(9.8%)	(3.4%)	(0.4%)	(100.0%)	—	—

TABLE 9

(continued)

BLOOD PRESSURE STATUS BY RACE, SEX AND AGE

	<140/90	140/90 to 160/100	160/100 to 180/115	>180/115	TOTAL MEASURED	NOT MEASURED	GRAND TOTAL
BLACKS:							
MALES:	11	6	1	1	19	1	20
(% OF THOSE MEASURED)	(57.9%)	(31.6%)	(5.3%)	(5.3%)	—	—	—
FEMALES:	25	0	0	0	25	0	25
(% OF THOSE MEASURED)	(100.0%)	—	—	—	—	—	—
HISPANICS AND OTHERS:							
MALES:	10	2	0	0	12	0	12
(% OF THOSE MEASURED)	(83.3%)	(16.7%)	—	—	—	—	—
FEMALES:	11	3	0	0	14	0	14
(% OF THOSE MEASURED)	(78.6%)	(21.4%)	—	—	—	—	—

higher readings than females. "Normal" readings among white subjects were found for 98.4% of persons under age 10, 100.0% aged 10-19, 81.5% aged 20-59 and 56.6% over age 59. These last figures are consistent with data from other studies.

Blood and urine samples were taken from 508 of the 537 adult study participants; 143 children under age 16 were excluded from this sampling. Samples were sent to Metpath Laboratories in Teterboro, New Jersey, for analysis, at the end of each day. Results are summarized in Table 10 as a series of Lab Tables (1 through 8). Lab Tables 1 through 5 show the serum enzyme data. Elevated serum alkaline phosphatase is expected among young people, because of bone growth. Hematocrit among women, is typically lower because of childbirth and menstruation. None of the subjects had abnormally low white blood cell counts (Lab Table 6). Prevalence of low hematocrit counts are given in Lab Table 7. Urinary phenols, were measured in the first 243 adults tested. Thirty-two (13.2%) were found to be above the reference range (up to 20 parts per billion, or ppb).

*This could be to small sample size or different age distribution of the white and black male study participants.

TABLE 10

Lab 1. Serum Creatinine

	Number	% Among Those Measured
Usual range (≤ 1.70 mg/dl)	505	99.4
Above range (>1.70 mg/dl)	3	0.6
Attribute Not Measured	172	
Total	680	

Lab 2. Serum Alkaline Phophatase

Age: 1-19:

Usual adult range (≤ 50.0 I.U./L)	30	58.8
Above adult range (>50.0 I.U./L)	21	41.2
Attribute Not Measured	143	
Total	194	

Over 19:

Usual range (≤ 50 I.U./L	446	97.0
Above range (>50 I.U./L)	14	3.0
Attribute Not Measured	26	3.0
Total	486	

Lab 3. Serum Gamma - Glutamyl - Transpeptidase

	Number	% Among Those Measured
Normal (≤ 70 units/L)	489	96.6
Elevated (> 70 units/L)	17	0.4
Attribute Not Measured	174	
Total	680	

Lab 4. Serum SGOT

Normal (≤ 70 units/L)	496	99.4
Elevated (> 70 units/L)	3	0.6
Attribute Not Measured	181	
Total	680	

Lab 5. Serum SGPT

Normal (≤ 70 I.U./L)	486	97.4
Elevated (>70 I.U./L)	13	2.6
Attribute Not Measured	181	
Total	680	

Lab 6. White Blood Cell Count

Normal (≥ 3.5 cells thousand/cu.mm)	507	100.0
Diminished (<3.5 cells thousand/cu.mm)	0	
Attribute Not Measured	173	
Total	680	

TABLE 10 (CONTINUED)

Lab 7. Hematocrit

Sex	Age	Very Low*	Low**	Normal***
Male	0 - 9	0	0	1
	10 - 19	0	8	16
	20 - 59	0	5	201
	GE 60	0	2	36
	TOTAL	0	15	254
	(% of Measured Males)	(0)	(5.6)	(94.4)
Female	0 - 9	0	0	0
	10 - 19	0	16	10
	20 - 59	1	70	104
	GE 60	0	7	30
	NR	0	0	0
	TOTAL	1	93	144
	(% of Measured Females)	(0.4)	(39.1)	(60.5)

* Very Low = Less than 33%

** Low = From 33% to 41%

*** Normal = Greater than 41%

TABLE 10 (CONTINUED)

Lab 8. Urinary Phenol Levels

	Number	% Among Those Measured
Usual range ($\leq$ 20 ppb)	211	86.8
Above range (> 20 ppb)	32	13.2
Attribute Not Measured	437	

The spirometry data obtained for each subject were reported as percentage of predicted value (for height and age) for each of three lung function parameters: FVC (forced vital capacity); FEV_1 (forced expiratory volume over one second); and FEF25-75 (mean forced expiratory flow during the middle half of the FVC). FEV_1/FVC (or FEV_1%) was calculated as the ratio of FEV_1 to FVC and expressed as a percentage. FVC measures dynamic lung capacity; FEV_1 and FEV_1% assess large airways function; and FEF 25-75 assesses the small airways. The expected normal values to which these are compared were derived from a standard population (Morris, 1971). If a subject's value was over 78% of the expected population value for a particular parameter, the value was classified as "normal". If the value was less than 69% of the normal population, it was classified as "abnormal." Values falling in-between (70-78%) were classified as "borderline".

The lung function test results in Table 11 are presented by the reported smoking status of the subjects. Spirometry data were taken for 634 of the 680 subjects (93.2%); children younger than 6 years old were excluded from testing because there are no standardized data for them. There are trends towards slight reductions in FVC and FEV, among former and current smokers, as in other populations, which have shown little deterioration of these values until individuals have smoked heavily for many years. FEV_1/FVC ratio is reduced in Belleville according to smoking status, as in other populations. FEF 25-75, a measure of small-airways function, also reveals more abnormals among smokers, but ex-smokers were approximately the same as non-smokers, and apparently had recovered their small-airways function.

TABLE 11

LUNG FUNCTION BY SMOKING STATUS*

FVC

Smoking Status	Normal	Borderline	Abnormal	Not measured or uninterpretable*	Total
Never Smoked ** (%) ***	273 (86.7%)	22 (7.0%)	20 (6.3%)	44	359 (100.0%)
Former Smoker (%)***	108 (86.4%)	10 (8.0%)	7 (5.6%)	0	125 (100.0%)
Current Smoker (%)***	163 (84.0%)	23 (11.9%)	8 (4.1%)	2	196 (100.0%)

FEV 1

Never Smoked** (%) ***	285 (90.8%)	17 (5.4%)	12 (3.8%)	45	359 (100.0%)
Former Smoker (%) ***	117 (93.6%)	2 (1.6%)	6 (6.4%)	0	125 (100.0%)
Current Smoker (%) ***	173 (89.2%)	10 (5.2%)	11 (5.7%)	2	196 (100.0%)

TABLE II (Continued)

FEV/FVC

Smoking Status	Normal	Borderline	Abnormal	Not measured or uninterpretable*	Total
Never Smoked ** (%) ***	264 (83.8%)	43 (13.7%)	8 (2.5%)	44	359 (100.0%)
Former Smoker (%)***	85 (68.0%)	34 (27.2%)	6 (4.8%)	0	125 (100.0%)
Current Smoker (%)***	130 (67.0%)	48 (24.7%)	16 (8.3%)	2	196 (100.0%)

FEF 25 - 75%

Never Smoked** (%) ***	223 (71.6%)	33 (10.5%)	56 (17.9%)	46	359 (100.0%)
Former Smoker (%)***	92 (74.2%)	12 (9.7%)	20 (16.1%)	1	125 (100.0%)
Current Smoker (%)***	127 (65.8%)	26 (13.5%)	40 (20.7%)	3	196 (100.0%)

* Note: Many of these people are children under 5 years old, who were excluded by protocol. Also, spirograms may be excluded by criteria given in the appendix (Protocol for Lung Function Tests).

** Note: This category includes children.

*** This percentage is among those who were measured in each row.

To determine if ROC/RIC had affected individuals' lung function, the most sensitive parameter, FEF 25-75, was analyzed by Geocode in non-smokers. Table 12 shows these results; the trends by Geocode were not statistically significant.

Lung function test results for children, ages 6 through 12, have been listed separately in Table 13. The high percentage of abnormal FEF 25-75's is notable.

TABLE 12

DISTRIBUTION OF $FEF_{25-75\%}$

BY GEOCODE

GEOCODE	SUBNORMAL N	SUBNORMAL %	NORMAL N	NORMAL %	TOTAL N	TOTAL %
1	20	41.7	28	58.3	48	100.0
2	22	32.4	46	67.7	68	100.0
3	27	26.2	76	73.1	103	100.0
4	76	32.2	169	68.4	245	100.0
5	42	25.3	124	74.3	166	100.0
TOTAL	187	30.1	443	69.9	634	100.0

Test for trend on Geo codes 1-3

$X^2 = 3.59$, df= 2, $p > 0.10$

TABLE 13

LUNG FUNCTION FOR 6-12 YEAR-OLDS*

	Normal	Borderline	Abnormal	Not measured or not Acceptable**	Total
FVCPCT (% of those measured)	87 (96.7%)	0 (-)	3 (3.3%)	8	98 (100.0%)
FEV_1	86 (95.6%)	3 (3.3%)	1 (1.1%)	8	98 (100.0%)
FEV/FVC	87 (96.7%)	3 (3.3%)	0	8	98 (100.0%)
FEF 25-75%	65 (72.2%)	8 (8.9%)	17 (18.9%)	8	98 (100.0%)

* None of these children report ever smoking

** Inadequate spirometry as judged by criteria given in appendix

IV. DISCUSSION

A. Study Population and Response Rates

The invited study population was designed to include residents within 1000 feet of ROC/RIC, non-resident workers and students within 1000 feet of ROC/RIC, and municipal employees who had worked on or near the site. However, non-residents who claimed to frequently pass close to the site were included. These persons expressed concern over their health and were not refused a physical examination and evaluation of their complaints. They were not removed from the analysis here, because they were participants in the field survey. It is clear from Table 1 that there was a large group (147) of such people, which makes it difficult to determine the response rate among invited non-residents. The estimated response rate for non-residents, 57.3%, is similar to the response rate of 60.4% for residents. This level of response is similar to other field surveys conducted by DOH under similar circumstances.

Since no database could be identified that could serve as an appropriate comparison group for the entire study group, or for Belleville residents alone, the health data presented here could only be evaluated descriptively. Only a few analytic statistics were appropriate. Subjects in Geocodes 1-3, who lived in the area of interest, were demographically similar to all Belleville residents, and subjects in Geocodes 4 and 5, who lived outside the area of interest, were demographically dissimilar.

B. Environmental Factors

The reports of improper storage and labelling of chemicals at ROC/RIC raised concerns that exposure of area residents and workers to numerous hazardous substances was occurring routinely. These suspicions were not borne out, however, by the environmental sampling data. Although toxic and radioactive substances were found at ROC/RIC by DOH staff, neither indoor nor outdoor air samples revealed levels of volatile chemicals high enough to cause health symptoms or disease. The indoor benzene, MEK, and chloride air readings are very low, and the pHs measured would not affect people.

The noticable odors associated with the site were, according to chemists, due to benzaldehyde and other fragrant food additives at levels below the limits of detection of DOH monitoring devices. These odors, even at low levels, and the presence of many unmarked chemical containers, caused stress in the community and led to widespread concern that serious health hazards were being caused by emissions from the plant.

There are no data for the years prior to the DOH investigation, so there is no way to determine whether exposure to hazardous chemicals related to ROC/RIC operations had occurred before May, 1983. Levels higher than those found by DOH may have been present at one time. During the inspections conducted by DOH staff, no conditions were found that would have resulted in large chemical releases to the air.

C. Health Effects

The most commonly reported physician-diagnosed conditions (Table 5, and preceeding text) include conditions the rates of which are similar to those seen in other communities surveyed by DOH. Since subjects were asked if they had ever had a diagnosed condition, and since most normal people have ears-nose-throat, musculoskeletal, eye, and skin problems in their lifetimes, these data were not further analyzed. There was no clearly increased reporting of unexpected or uncommon diagnoses.

The high rates of self-reported upper and lower respiratory, CNS, eye, and skin symptoms in Belleville are what would be expected in setting of short or long-term exposure to irritant chemicals. As mentioned before, there were no corresponding abnormal physical findings, and the physicians did not diagnose chemical-related disease. Irritative complaints have been observed by DOH staff in other communities, office buildings, and chemical plants, with both moderate and low-level exposures. As in Belleville, such complaints were not accompanied by abnormal physical findings or systemic disease, when exposures were at very low levels. When there are irritative complaints without abnormal physical findings or test, the medical diagnosis is the Syndrome of Non-specific Respiratory Irritation.

The 20.4% of the study population who had rashes had a variety of common skin conditions not known to be associated with chemical exposure. Although practically any solvent can cause contact dermatitis, significant air levels of volatile organics were not measured

and it is unlikely that levels at any time were high enough to cause direct chemical skin effects. The reason for high rates of various unrelated skin disorders in this and other DOH surveys, and the reason for a trend towards more rashes in Geocodes near ROC/RIC, is not known.

Blood pressure values were very similar to U.S. population data. The blood and urine sample results are typical of other communities surveyed by DOH, and show no unusual patterns. Serum alkaline phosphatase levels are known to be elevated among the prepubescent population and pregnant women, and when specimens must be transported to laboratories, as in Belleville. Low hematocrits are very common in menstruating women. The proportion of elevated urinary phenols (over 20 ppb) levels in the group studied was similar to that found in other groups evaluated by DOH. Urinary phenols may be elevated by certain foods and drugs, and the data do not indicate any unusual benzene exposure among the persons sampled. The lack of other abnormal blood and urine tests is compatible with the absence of detectable levels of chemicals found on air testing.

Evaluation of population statistics for lung function is difficult, particularly in the absence of a New Jersey comparison group. Data for the general population of Portland, Oregon, (Morris, 1971) which has different socio-economic characteristics than does the Belleville population, are not ideal but provide a basis for comparison. The expected normal values, derived from equations from the Morris population, take into account age, weight, height, race and sex. Other

investigators (e.g. Schoenberg et al, 1978) have noted that lung function characteristics are not linear, or even roughly decrease over all age ranges in subsequently investigated populations. The Morris equations then are imperfect means to determine expected values, but are the best available, and are widely used.

We compared Belleville's spirometry data to general population data from Burbank, California (Detels et al, 1979), which has considerable outdoor air pollution, and found them similar. Both in Belleville and in Burbank, as well as in other studies, there is little FVC difference between the population that never smoked and the current or former smokers. FEV_1 is abnormal in both Burbank and Belleville to a very similar degree among current smokers and non-smokers. For FEF 25-75%, the degree of abnormality in Belleville is slightly less than in Burbank. Data were not available from Burbank for FEV_1/FVC ratio. These comparisons, and the lack of significant trends by Geocode, suggest that pulmonary function in Belleville has been affected by community-wide exposure, such as ambient air pollution, or smoking or other sources of indoor air pollution, rather than by a point source such as ROC/RIC.

Spirometry for children ages 6 to 12 has been listed separately in Table 13. Some of the numbers were recalculated for Table 14 with 75%, instead of 79%, as the cut-off for "normal", to make them comparable to the study of Detels et al. The overall conclusions are that the lung function of youngsters in Belleville was not much different from those in Burbank, California, and for some parameters (FVC and FEV_1) lung function is a little better in Belleville than in

Burbank. FEF 25-75% was slightly worse in Belleville, especially in pre-adolescents but the difference is not statisticaly significant. As with the adult data, there were no trends by Geocode. Although these comparisons are very crude, the outcome is consistent with the findings for adults and suggest a community-wide exposure rather than a point-source such as ROC/RIC.

Comparing the data from the preliminary survey and the full-scale study, it is notable that the percentage of symptoms reported in the former was not confirmed in the latter. The two study groups are not comparable, because the data in the two surveys were collected in different ways. The differences in study group composition may also explain the differences in symptom rates. The preliminary study involved door-to-door canvassing of a limited area (mostly Geocodes 1 and 2) while the full-scale study accepted voluntary participants from a wider area. Therefore, the estimated response rate in the preliminary study (232 of approximately 250, or 92.8%) was unusually high because of canvassing, while the full-scale study's response rate was typical of other DOH studies using similar methodology. Finally, the full-scale study occurred at a different time, a week after the preliminary study.

Table 14

Comparisons of Belleville Adolescent and Pre-Adolescent Non-smoking Youngsters to Similar Groups from Burbank, California for Three Lung Function Parameters.

	Percentage of Population below Normal*		
	Burbank California Non-smoking 7-17 years old	Belleville New Jersey Non-smoking 6-12 years old	Belleville New Jersey Non-smoking 13-19 years old
FVC	6.4%	3.3%	5.3%
FEV_1	6.5%	3.3%	5.3%
FEF 25-75%**	20.0%	24.4%	21.1%

* Normal = 75% of expected population values for purposes of this comparison

** The two Belleville age groups were combined for statistical comparison to the Burbank group. The binomial comparison was 128/641 Burbank subjects abnormal vs. 22/120 Belleville subjects. $X^2_{1\ d.f.} = 0.181$, $p > 0.30$. The difference is not significant.

V. CONCLUSIONS

The long-term odor nuisance produced by Research Organic/Inorganic Chemical Company raised residents' concerns that a serious environmental health hazard was present. Their unresolved concerns, along with reports of hazardous conditions at ROC/RIC, led to the June, 1983, survey reported here. The data do not indicate that there were health hazards to the participants of this study related to ROC/RIC operations. The very low levels of environmental contamination found at ROC/RIC in May 1983, would not pose a health hazard to the workers or residents near the site. The health complaints in this study population were irritant effects similar to those reported by other populations subjected to odors, or to low-level chemical exposure. There was a decrement in certain lung-function parameters, not geographically related to ROC/RIC, but of a pattern typical of communities with urban air pollution.

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Appendix A

State of New Jersey
DEPARTMENT OF HEALTH
JOHN FITCH PLAZA
CN 360, TRENTON, N.J. 08625

J. RICHARD GOLDSTEIN, M.D.
COMMISSIONER

CONSENT FORM

I have been informed that the New Jersey State Department of Health is conducting a study of environmental factors and their effect on the health of individuals. This study involves obtaining information from me about my residence, and health, as well as some information about other substances I may have been exposed to. The interview will require approximately 15 minutes of my time. I understand it may be necessary to contact me again.

I have agreed to take part in this study and to give information to the interviewer understanding that:

1. My responses will be kept completely confidential.

2. My participation is voluntary and I am free to discontinue participation at any time.

3. The information in this study will be summarized by New Jersey State Department of Health to determine whether environmental factors in this area may be contributing to health problems.

Name (Print)_____

Participant Signature_____

Date_____

Household _____
Subject _____

Are you bothered by any of the following:

If yes, to any of the below symptoms, ask: How frequently does these symptoms occur?

Code: 1 = Seldom
2 = Monthly
3 = Weekly
4 = Daily

Have you been bothered by these symptoms?

	Yes	No	Date of Onset	Frequency of Symptom	Seen By Physician Yes
Eye irritation (itchy, red or watery eyes)	___	___	_____	_____	___
Nasal irritation (sneezing, runny nose or stuffiness)	___	___	_____	_____	___
Skin rash	___	___	_____	_____	___
Skin irritation (redness)	___	___	_____	_____	___
Tiredness	___	___	_____	_____	___
Cough	___	___	_____	_____	___
Wheezing	___	___	_____	_____	___
Chest tightness	___	___	_____	_____	___
Shortness of breath with exertion	___	___	_____	_____	___
Bring up phlegm (sputum)	___	___	_____	_____	___
Sore throat	___	___	_____	_____	___
Headache	___	___	_____	_____	___
Other problems (specify)	___	___	_____	_____	___
Describe lung or respiratory	___	___	_____	_____	___

_____

_____

Have you been told by a physician that you have a medical problem?
Yes ____ No ____ If yes, name of physician and phone number.

If yes, describe condition and date of diagnosis.

_____

_____

_____

Have you ever been bothered by odors in this community? Yes ____ No ____
When did you move into present residence? _____ (month), _____ (year), _____ (calculate total years)

Appendix B

State of New Jersey
DEPARTMENT OF HEALTH
JOHN FITCH PLAZA
CN 360, TRENTON, N.J. 08625

J. RICHARD GOLDSTEIN, M.D.
COMMISSIONER

CONSENT

I have been informed that the New Jersey State Department of Health is conducting a study of environmental factors and their effect on the health of individuals. This study involves obtaining information from me about my residence, occupation, and health, as well as some information about other substances I may have been exposed to. This study also involves a physical examination, and medical testing, including blood and pulmonary function tests; some individuals may be offered urine tests. I understand it may be necessary to contact me again.

I have agreed to take part in this study and to give information understanding that:

1. My responses and results will be kept completely confidential unless ordered to release the information by a court.

2. My participation is voluntary and I am free to discountinue participation at any time.

3. The information in this study will be summarized by the New Jersey State Department of Health to determine whether environmental factors in this area may contribute to health problems.

4. Blood specimens may be stored for future analysis.

Name of Participant (Print)	Signature	Date

OCCUPATIONAL AND ENVIRONMENTAL HEALTH SURVEY

SECTION - A

QUESTIONNAIRE/ HOUSEHOLD ID NO. ____ ____ ____ ____	RESPONDENT ID NO. ____ ____

GENERAL

NEW JERSEY STATE
DEPARTMENT OF HEALTH

P5165

OCCUPATIONAL AND ENVIRONMENTAL HEALTH SURVEY

SECTION A - GENERAL

1. Questionnaire/Household Ident. No. ___ ___ ___ ___	2. Respondent Ident. No. ___ ___
3. Study Number DO NOT USE ___ ___ ___ ___	4. Census Tract DO NOT USE ___ ___ ___
5. Block DO NOT USE ___ ___ ___ ___ ___ / ___ ___ ___ ___ ___	6. Lot Number DO NOT USE ___ ___ ___ ___ ___ / ___ ___ ___ ___ ___
7. Interviewer Code ___ ___ ___	8. Type Interview: 1. ☐ Personal 2. ☐ Telephone 3 ☐ Other-Specify_____
9. Respondent's Name (Also enter on Page C1.)	Home Phone Number ( ) / Work Phone Number ( )
10. Current Address (include Apt. No.)	

11. City	12. County	13. State	14. Zip Code

15. Is this your mailing address?

_____Yes _____No (If "No" fill in below.)

16. Address (include Apt. No.)

17. City	18. County	19. State	20. Zip Code

CONSENT

I have been informed that the New Jersey State Department of Health is conducting a study of environmental factors and their effect on the health of individuals. This study involves obtaining information from me about my residence, occupation, and health, as well as some information about substances I may have been exposed to. The interview will require approximately one hour of my time. I understand it may be necessary to contact me again.

I have agreed to take part in this study and to give information to the interviewer understanding that:

1. My responses will be kept completely confidential unless ordered to release the information by a court.
2. My participation is voluntary and I am free to discontinue participation at any time.
3. The information in this study will be summarized by the New Jersey State Department of Health to determine whether environmental factors in this area may contribute to health problems.

Name of Participant (Print)	Signature	Date
Name of Participant (Print)	Signature	Date

OCCUPATIONAL AND ENVIRONMENTAL HEALTH SURVEY

SECTION - B

QUESTIONNAIRE/ HOUSEHOLD ID NO. ___ ___ ___ ___	RESPONDENT ID NO. ___ ___

DEMOGRAPHICS

NEW JERSEY STATE

DEPARTMENT OF HEALTH

MARK BOX ABOVE PERSON RESPONDING	1 ☐			2 ☐		
1a. What is the name of the head of this household? —Enter name in first column b. What are the names of all other persons who have lived here? Please give me the names of current residents, as well as the names of former residents belonging to this household who have either moved away or died. —List all persons who have lived here. (Circle Race and Sex)	LAST Name FIRST Name		SEX 1 M 2 F RACE 1 White 2 Black 3 Other	LAST Name FIRST Name		SEX 1 M 2 F RACE 1 White 2 Black 3 Other
2. How is —— related to —— (Head of Household).	Relationship HEAD		AGE	Relationship HEAD		AGE
3. What is ——'s Date of Birth? (Enter date and age.)	Month	Date	Year	Month	Date	Year

3 ☐	4 ☐	5 ☐	6 ☐
LAST Name	LAST Name	LAST Name	LAST Name
SEX 1 M 2 F	SEX 1 M 2 F	SEX 1 M 2 F	SEX 1 M 2 F
FIRST Name	FIRST Name	FIRST Name	FIRST Name
RACE 1 White 2 Black 3 Other	RACE 1 White 2 Black 3 Other	RACE 1 White 2 Black 3 Other	RACE 1 White 2 Black 3 Other
Relationship HEAD	Relationship HEAD	Relationship HEAD	Relationship HEAD
AGE	AGE	AGE	AGE
Month / Date / Year	Month / Date / Year	Month / Date / Year	Month / Date / Year

OCCUPATIONAL AND ENVIRONMENTAL HEALTH SURVEY

SECTION - C

QUESTIONNAIRE/ HOUSEHOLD ID NO. ___ ___ ___ ___	RESPONDENT ID NO. ___ ___

RESIDENTIAL HISTORY

NEW JERSEY STATE

DEPARTMENT OF HEALTH

RESIDENTIAL HISTORY

1. Are you currently a resident of Belleville? ☐ Yes ☐ No

2. If "Yes" how many years? _____

3. If "No" give dates lived in Belleville.

19 _____ to 19 _____

5. Characteristics of Dwelling Unit - Check category best describing type of dwelling unit, asking if necessary.

   1. ☐ Mobile Home or Trailer
   2. ☐ One-Family House Detached from Any Other House
   3. ☐ One-Family House Attached to One or More Houses

   Apartment House or Building with the Following Number of Living Quarters (Check Number of Dwelling Units.)

   4. ☐ 2-4
   5. ☐ 5-9
   6. ☐ 10-26
   7. ☐ 27-49
   8. ☐ 50 or more

6. What Kind of Fuel do you use Most for Heating your House?

   1. ☐ Gas from Underground Pipes Serving the Neighborhood
   2. ☐ Gas: Bottled, Tank or LP
   3. ☐ Electricity
   4. ☐ Fuel Oil, Kerosene, Etc.
   5. ☐ Coal or Coke
   6. ☐ Wood
   7. ☐ Other Fuel
   8. ☐ No Fuel Used

7. What Kind of Heating System is Used to Heat Your Quarters?

1. ☐ Steam or Hot Water System
2. ☐ Central Warm Air Furnace With Ducts to the Individual Rooms, or Central Heating Pump
3. ☐ Built-In Electric Units
4. ☐ Floor, Wall, or Pipeless Furnace
5. ☐ Room Heaters <u>With</u> Flue or Vent, Burning Gas, Oil, or Kerosene
6. ☐ Room Heater as 5. above <u>Without</u> Vent
7. ☐ Fireplaces, Stoves, or Portable Room Heaters
8. ☐ Some Other Way
9. ☐ No Heating Equipment

8. Do You Have Any Air Conditioner(s), Humidifier(s), or Airfilter(s) in Your House?

1. ☐ None
2. ☐ Air Conditioners
3. ☐ Humidifiers
4. ☐ Air Filters
5. ☐ Air Conditioners and Humidifiers
6. ☐ Air Conditioners and Air Filters
7. ☐ Humidifiers and Air Filters
8. ☐ Air Conditioners and Humidifiers and Air Filters

9. What Kind of Fuel do You Use Most for Cooking?

1. ☐ Gas from Underground Pipes Serving the Neighborhood
2. ☐ Gas: Bottled, Tank, or LP
3. ☐ Electricity
4. ☐ Fuel Oil, Kerosene, Etc.
5. ☐ Coal or Coke
6. ☐ Wood

10. In General, How Do You Feel About Living In This Area?

1. ☐ Good
2. ☐ Fair
3. ☐ Poor
4. ☐ Don't Know

OCCUPATIONAL AND ENVIRONMENTAL HEALTH SURVEY

SECTION - D

QUESTIONNAIRE/ HOUSEHOLD ID NO. ___ ___ ___ ___	RESPONDENT ID NO. ___ ___

OCCUPATIONAL HISTORY

NEW JERSEY STATE
DEPARTMENT OF HEALTH

P5165

OCCUPATIONAL HISTORY

Name _____ Respondent I.D. No. _____

I would like some information about each of the jobs, part time or full time, that you have (Your_____had) held for three months or more after completing your education. Please include work in the armed services. We will start with your first full time job after leaving school and come up to your (his/her) most recent job.

If Respondent says she/he/deceased has never worked, check here ( ) and go to page D-3. Otherwise, Ask Q. 1 through Q. 8 For each job.

On the most recent job, when, (you _____) worked as a _____ did you (He/She) wear protective clothing or equipment ☐Yes ☐No

Put C in current job	Q-1 What was the name and address of the Company/Employer you worked for? Q-2 What did they do or manufacture? Q-3 What was your job title?	Q-4 Mo/Yr Start Q-5 Mo/Yr Stop Q-6 Was job full time or part time
FIRST JOB	1.	4.
		5.
	2.	6. ☐ Part-Time
	3.	☐ Full-Time
	1.	4.
		5.
	2.	6. ☐ Part-Time
	3.	☐ Full-Time
	1.	4.
		5.
	2.	6. ☐ Part-Time
	3.	☐ Full-Time
	1.	4.
		5.
	2.	6. ☐ Part-Time
	3.	☐ Full-Time
	1.	4.
		5.
	2.	6. ☐ Part-Time
	3.	☐ Full-Time
	1.	4.
		5.
	2.	6. ☐ Part-Time
	3.	☐ Full-Time
	1.	4.
		5.
	2.	6. ☐ Part-Time
	3.	☐ Full-Time

OCCUPATIONAL AND ENVIRONMENTAL HEALTH SURVEY

SECTION - E

QUESTIONNAIRE/ HOUSEHOLD ID NO. ___ ___ ___ ___	RESPONDENT ID NO. ___ ___

SMOKING AND ALCOHOL HISTORY

NEW JERSEY STATE

DEPARTMENT OF HEALTH

SMOKING HISTORY

Enter 1=Yes-2=No or Number

1. Have you ever smoked cigarettes? (Yes means 20 or more packs of cigarettes or 12 or more ounces of tobacco in a lifetime of one or more cigarettes a day for one year.)

   1. Yes 2. No (If No, go to Question 8.) _____

2. Do you now smoke cigarettes (as of one month ago)?

   1. Yes 2. No _____

3. How old were you when you first started regular cigarette smoking? _____

   If Question 2 was No, ask:

4. If you have stopped smoking cigarettes completely, how old were you when you stopped? _____

5. How many cigarettes did you smoke per day during the time in question? _____

6. On the average of the entire time you smoked, how many cigarettes did you smoke per day? _____

7. Do or did you inhale the cigarette smoke:

   1. Not at all 3. Moderately

   2. Slightly 4. Deeply _____

8. Have you ever smoked cigars? (Yes means more than one cigar per week for a year.)

   1. Yes 2. No _____

9. Have you ever smoked a pipe? (Yes means more than 12 ounces of tobacco in a lifetime.)

   1. Yes 2. No _____

ALCOHOL BEVERAGES

1. During the time in question, how many days a week do (did) you usually drink beer? _____ day(s)

2. During the time in question, when you drink beer, how many do (did) you drink a day? _____

3. During the time in question, about how many days a week do (did) you usually drink wine? _____ day(s)

(If No, for 1.- 3. Go to Question 7.)

4. During the time in question, when you drink wine how many glasses do (did) you drink a day? _____

5. During the time in question, how many days a week do (did) you usually have drinks such as whiskey, vodka or gin? _____ day(s)

6. During the time in question, when you have these drinks, how many do (did) you usually have in a day? _____

TOTAL _____

7. a. Do or did you ever have a drinking problem? 1. ☐ Yes 2. ☐ No

b. If Yes, When: _____ to _____

c. How many days per week did you drink? _____ day(s)

d. How many drinks did you have in a day? _____

OCCUPATIONAL AND ENVIRONMENTAL HEALTH SURVEY

SECTION - F

QUESTIONNAIRE/ HOUSEHOLD ID NO. ___ ___ ___ ___	RESPONDENT ID NO. ___ ___

MEDICAL HISTORY

NEW JERSEY STATE

DEPARTMENT OF HEALTH

MEDICAL HISTORY

I would like to ask you some questions about your health. These will include specific questions about diagnoses that a doctor may have given you, symptoms you may have had, and general questions about your health practices.

In general, how would you say your health is these days? Would you say your health is good, or not too good?

1. ☐ Good 2. ☐ Not Good

2. Have you ever been told by a doctor that you had any of the following conditions? If yes, continue with questions in column headings Q-C through Q-D.

A Condition	Q B Advised By Doctor		Q C When Was It First Diagnosed		Q D Are You Being Treated Now	
	Yes	No	Mo.	Yr.	Yes	No
CARDIOVASCULAR						
13. Heart Murmur						
12. Angina						
12. Heart Attack						
13. Other Heart Condition – Specify						
11. High Blood Pressure						
12. Claudication (Circulation other than Heart)						
13. Phlebitis						
PULMONARY						
24. Pneumonia						
24. Pleurisy						
21. Asthma						
22. Chronic Bronchitis						
23. Emphysema						
24. Bronchiectasis						
26. Pulmonary Tuberculosis						
25. Work Related Lung Condition, i.e., Dust on Lungs, Silicosis or Pneumoconioses						
26. Rib Fracture 1. ☐ Right 2. ☐ Left						
26. Other - Specify						
GASTROINTESTINAL						
31. Gastric Ulcer Diagnosed By: UGIS						
31. : Hemorrhage						
31. Duodenal Ulcer Diagnosed By: UGIS						
31. : Hemorrhage						
31. Bleeding Ulcer						
32. Other GI Bleeding						

MEDICAL HISTORY

Condition	Q B Advised By Doctor		Q C When Was It First Diagnosed		Q D Are You Being Treated Now	
	Yes	No	Mo.	Yr.	Yes	No
GASTROINTESTINAL, (Cont'd.)						
32. Hiatus Hernia						
32. Inguinal Hernia						
33. Jaundice						
33. Gallbladder Disease						
33. Liver Disease						
33. Enlarged Liver						
33. Cirrhosis						
32. Appendix Removal						
32. Ulcerative Colitis						
32. Diverticulitis						
32. Other GI – Specify						
GENITOURINARY						
41. Urinary Infection						
41. Kidney Infection						
42. Kidney Stones						
42. Prostate Enlargement						
42. Blood in Urine Not Caused by Any of Above						
42. Protein in Urine Not Caused by Any of Above						
42. Other Genitourinary – Specify						
SKIN						
44. Psoriasis						
43. Eczema						
44. Hives						
43. Other Skin – Specify						
BLOOD						
52. Anemia						
51. Low White Blood Count						
53. Blood Clotting or Bleeding Problems						
53. Sickle Cell						
53. Thalessemia						
53. Other Blood – Specify						
EYE						
55. Blindness in One or Both Eyes						

MEDICAL HISTORY

Condition	Q B Advised By Doctor		Q C When Was It First Diagnosed		Q D Are You Being Treated Now	
	Yes	No	Mo.	Yr.	Yes	No
EYE, (Cont'd.)						
55. Glaucoma						
55. Cataracts						
55. Weak or Lazy Eye						
55. Optic Neuritis						
55. Other Eye, – Specify						
EAR, NOSE AND THROAT						
61. Sinus Problems						
63. Impaired Hearing						
61. Nasal Allergies						
62. Ear Infection						
61. Hay Fever						
61. Nasal Polyps						
61. Laryngeal Polyps						
63. Tonsils Removed						
63. Other ENT – Specify						
NERVOUS SYSTEM						
72. Epilepsy Seizure or Convulsions						
72. Stroke						
72. Parkinson's Disease						
71. Nervous Disorder						
72. Other Nervous – Specify						
MUSCULOSKELETAL						
81. Rheumatoid Arthritis						
81. Other Arthritis – Specify						
82. Back Injury						
82. Degenerative Disc Disease						
82. Bone Lesions						
82. Other Musculoskeletal – Specify						
GENERAL AND METABOLIC						
92. Thyroid or Goiter						
91. Diabetes						
92. Gout						
92. Other – Specify						

MEDICAL HISTORY

Condition	Q B Advised By Doctor		Q C When Was It First Diagnosed		Q D Are You Being Treated Now	
	Yes	No	Mo.	Yr.	Yes	No
CANCER						
01. Skin Cancer						
02. Throat Cancer						
02. Lung Cancer						
02. Stomach Cancer						
02. Bowel or Colon Cancer						
02. Rectum Cancer						
02. Prostate Cancer						
02. Breast Cancer						
02. Cervical Cancer						
02. Cancer of the Uterus						
03. Leukemia						
02. Hodgkins Disease						
02. Other Lymphoma						
02. Liver Cancer						
02. Bladder Cancer						
02. Other Cancer – Specify						

MEDICAL CARE

99. One year prior to time in question, has any illness, pain or health condition caused you to: (exclude pregnancies)

	Yes	No	If Yes, No. of Days	Type Illness
a. Stay in a hospital overnight or longer	☐	☐	_____	_____
b. Visit a physician or medical facility	☐	☐	_____	No. of Visits
c. Stay in bed all day	☐	☐	_____	
d. Miss any work or other usual activity	☐	☐	_____	

100. Have you ever been hospitalized (excluding pregnancies)? ☐ Yes ☐ No If Yes, complete below.

	YEAR	REASON
a.	_____	_____
b.	_____	_____
c.	_____	_____
d.	_____	_____
e.	_____	_____
f.	_____	_____

OCCUPATIONAL AND ENVIRONMENTAL HEALTH SURVEY

SECTION - G

QUESTIONNAIRE/ HOUSEHOLD ID NO. ___ ___ ___ ___	RESPONDENT ID NO. ___ ___

MEDICATION HISTORY

NEW JERSEY STATE

DEPARTMENT OF HEALTH

MEDICATION HISTORY

1. During the time in question, did you take any of the following medication?

Check Type Being Taken:

1. ☐ Antibiotics for More than two weeks
2. ☐ Antibiotics for Less than two weeks
3. ☐ Anti-Convulsants (Epilipsey Medicine)
4. ☐ Antihistamines (Allergy Medicine)
5. ☐ Anti-Inflammatories
6. ☐ Aspirins or Tylenol More than once a week
7. ☐ Blood Thinners (Anti-Coagulants)
8. ☐ Broncho-Dilators (Breathing Medicine)
9. ☐ Decongestants (Cold Medicine)
10. ☐ Digitalis
11. ☐ High Blood Pressure Pills
12. ☐ Insulin
13. ☐ Laxatives
14. ☐ Medication for Arthritis
15. ☐ Medication to Lower Fat in Blood
16. ☐ Medication for the Nerves
17. ☐ Nitroglycerine
18. ☐ Other Cardiac Medication
19. ☐ Oral Diabetic Medication
20. ☐ Pain Medicine
21. ☐ Radiotherapy
22. ☐ Sleeping Pills for More than three times a week
23. ☐ Steroids-Oral
24. ☐ Steroids-Topical
25. ☐ Thyroid Medication
26. ☐ Tranquilizers
27. ☐ Tuberculosis Medication
28. ☐ Water Pills (Diuretic)
29. ☐ Other-Specify _____
30. ☐ _____
31. ☐ _____
32. ☐ _____

INTERVIEWER ONLY:

Are prescribed medications being taken? ☐ Yes ☐ No

SUPPLEMENT SUBSTANCES THAT INTERFERE WITH URINARY PHENOL

To be administered on the day of urine collection.

In the past forty-eight (48) hours, have you:	Yes	No
1. Used Listerine	☐	☐
2. Used Cepacol	☐	☐
3. Used Sucrets	☐	☐
4. Used Chloraseptic Lozenges	☐	☐
5. Used Pepto-Bismol	☐	☐
6. Taken Aspirin or Aspirin-Containing Medications	☐	☐
7. Eaten Apricots	☐	☐
8. Eaten Prunes	☐	☐
9. Eaten Peaches	☐	☐
10. Eaten Grapes	☐	☐
11. Eaten Cucumbers	☐	☐
12. Eaten Tomatoes	☐	☐
13. Eaten Black Pepper	☐	☐
14. Eaten Red Pepper	☐	☐
15. Eaten Food like ice cream, baked goods, gelatin, chewing gum, or foods flavored artificially with wintergreen	☐	☐
16. With lime/lemon	☐	☐
17. With strawberry	☐	☐
18. With mint	☐	☐
19. With raspberry	☐	☐
20. With grape	☐	☐
21. Are you exposed to benzene either at work or at home with a hobby?	☐	☐
22. Within the past forty-eight (48) hours, how many miles did you travel in a car or bus or motor vehicle?	_____	

OCCUPATIONAL AND ENVIRONMENTAL HEALTH SURVEY

SECTION - I

QUESTIONNAIRE/ HOUSEHOLD ID NO. ____ ____ ____ ____	RESPONDENT ID NO. ____ ____

SYMPTOMATOLOGY

NEW JERSEY STATE

DEPARTMENT OF HEALTH

SYMPTOMATOLOGY

FREQUENCY NUMBER:

1 = Nearly Every Day (3 or more days a week)
2 = Once Or Twice A Week
3 = Once or Twice a Month
4 = Less Than Once A Month
5 = Seasonally
9 = Never

1. Starting with your EYES, during the past twelve months, how often have you had any:

	Frequency No.		Frequency No.
a. Irritation of the Eyes	_____	e. Sudden loss of sight	_____
b. Burning Eyes	_____	f. Any other Eye problems, specify: _____	_____
c. Redness of the Eyes	_____		
d. Blurred or double vision	_____		

2. Now about your SKIN, during the past twelve months have you had any:

	Frequency No.		Frequency No.
a. Rash	_____	d. Trouble with acne	_____
b. Trouble with dry or itching Skin	_____	e. Any other problem with your Skin, specify: _____	_____
c. Skin growth or tumor	_____		

3. Now about your STOMACH AND DIGESTIVE SYSTEM, during the past twelve months, have you had:

	Frequency No.		Frequency No.
a. Indigestion or heartburn	_____	f. Rectal bleeding	_____
b. Stomach cramps or pain	_____	g. Change in bowel habits	_____
c. Diarrhea	_____	h. Any other problems with your stomach or intestinal system, specify: _____	_____
d. Constipation	_____		
e. Rectal burning or pain	_____		

4. Now about your LUNGS AND RESPIRATORY SYSTEM, during the past twelve months, have you had:

	Frequency No.		Frequency No.
a. A cough that lasted more than 3 months	_____	e. Cough with blood	_____
b. A daily cough when you first get up in the morning	_____	f. Nasal stuffiness or runny nose	_____
c. To bring up phlegm when you first get up in the morning	_____	g. Sore throat	_____
d. Shortness of breath that makes you stop work or usual activity	_____	h. Wheezing or whistling sounds in your chest	_____
		i. repeated pain, pressure or tight feeling in your chest	_____

FREQUENCY NUMBER:

1 = Nearly Every Day (3 or more days a week)
2 = Once Or Twice A Week
3 = Once or Twice A Month
4 = Less Than Once A Month
5 = Seasonally
9 = Never

4. LUNGS AND RESPIRATORY SYSTEM (Continued)

	Frequency No.		Frequency No.
j. More than 3 colds or upper respiratory infections	_____	k. Any other problem with your Lungs or Respiratory System, specify: _____	_____

5. Now about your KIDNEYS AND BLADDER, during the past twelve months, have you had:

	Frequency No.		Frequency No.
a. Pain when urinating	_____	f. Loss of bladder control	_____
b. Increase in number of times urinated per day	_____	g. Any other problem with your Kidneys or Bladder, specify: _____	_____
c. Trouble starting or stopping urinating	_____	_____	
d. Blood in your urine	_____		

6. Finally, during the past twelve months have you had any of the following:

	Frequency No.		Frequency No.
a. Persistent tiredness or weakness	_____	j. Nausea	_____
b. Loss of muscle strength	_____	k. Sore throat	_____
c. Paralysis	_____	l. Unusual sensations like pins and needles	_____
d. Numbness or loss of sensation	_____	m. Loss of consciousness, fainting or coma	_____
e. Tremors or uncontrolled movement	_____	n. Spells of feeling very upset, depressed or crying	_____
f. Difficulty in walking	_____	o. Headaches	_____
g. Difficulty in writing	_____	p. Any other problems with your muscles or nerves, specify: _____	_____
h. Difficulty in sleeping	_____	_____	
i. Dizziness	_____		

SYMPTOMS

Use the actual wording of each question. Put "X" in the appropriate box after each question. When in doubt, record "NO."

INTERVIEWER: I am going to ask you some questions mainly about your chest. I should like you to answer "YES" or "NO" whenever possible.

	Yes	No	N/A
COUGH			
1. Do you usually cough first thing in the morning or on getting up? (Count a cough with first smoke or on first going out of doors. Exclude throat clearing or a single cough.)	☐	☐	☐
2. Do you cough like this on most days for as much as three months each year?	☐	☐	☐
3. Do you cough at work?	☐	☐	☐
PHLEGM			
4. Do you usually bring up some phlegm from your chest first thing in the morning or on getting up? (Count phlegm with the first smoke or on first going out of doors. Exclude phlegm from the nose. Count swallowed phlegm.)	☐	☐	☐
5. Do you bring up phlegm like this on most days for as much as three months each year?	☐	☐	☐
6. In the past three years, have you had a period of (increased) cough and phlegm lasting three (3) weeks or more?	☐	☐	☐
7. Have you had more than one such period?	☐	☐	☐
TIGHTNESS			
8. Does your chest ever feel tight or your breathing become difficult?	☐	☐	☐
9. Do you get this apart from colds?	☐	☐	☐
(If YES:...(Interviewer to code)			
a. With Exercise	☐	☐	☐
b. At Work	☐	☐	☐
c. Any Other Time	☐	☐	☐
If disabled from walking by skeletal or other physical disability put "X" here.	☐		
BREATHLESSNESS			
10. Are you troubled by shortness of breath, when hurrying on the level or walking up a slight hill? (If NO omit questions 11 and 12)	☐	☐	☐

BREATHLESSNESS (Continued)	Yes	No	N/A
11. Do you get short of breath walking with other people of your own age on level ground?			
(If No omit question 12)	☐	☐	☐
12. Do you have to stop for breath when walking at your own pace on level ground?	☐	☐	☐

NASAL DRAINAGE			
13. Do you usually have a stuffy nose or catarrh at the back of your nose in the winter?	☐	☐	☐
14. Do you have this in the summer? (If No to both questions 13 and 14, go to question 16.)	☐	☐	☐
15. Do you have this on most days for as much as three months each year?	☐	☐	☐

RELATED SYMPTOMS			
16. Do you have difficulty sleeping while lying flat in bed?	☐	☐	☐
17. Has a blue or grayish color to your skin ever been noticed?	☐	☐	☐
18. Have you had a recent unintentional weight loss?	☐	☐	☐

If Yes, how many pounds? _____

OCCUPATIONAL AND ENVIRONMENTAL HEALTH SURVEY

SECTION - J

QUESTIONNAIRE/ HOUSEHOLD ID NO. ___ ___ ___ ___	RESPONDENT ID NO. ___ ___

ADULT PHYSICAL EXAMINATION

NEW JERSEY STATE

DEPARTMENT OF HEALTH

ADULT PHYSICAL EXAMINATION

1. Blood Pressure 2. Pulse Rate

1. Pressure Reading

_____/_____ _____/_____

☐ Results of examination are normal. Abnormalities are checked off below.

3. Heart: ☐ Regular ☐ Irregular

4. General Appearance
   1. ☐ Overweight
   2. ☐ Underweight
   3. ☐ Appears Ill
   4. ☐ Other-specify

   _____

5. Extremities
   1. ☐ Clubbing
   2. ☐ Cyanosis
   3. ☐ Deformed Joints/Hands
   4. ☐ Swollen, Tender Joints/Hands
   5. ☐ Crepitations
   6. ☐ Amputation
   7. ☐ Ankle edema
   8. ☐ Other-specify

   _____
   _____

6. Skin
   1. ☐ Seborrhea
   2. ☐ Acne
   3. ☐ Psoriasis
   4. ☐ Rash
   5. ☐ Other-specify

   _____

7. Eyes
   1. ☐ Pale Conjunctive
   2. ☐ Icteric Sclerae
   3. ☐ Abn. Pupils
   4. ☐ Prosthesis
   5. ☐ Other-specify

   _____

8. Mouth
   1. ☐ Carles/Untreated
   2. ☐ Gingivitis
   3. ☐ Edentulous
   4. ☐ Tongue abnormality
   4. ☐ Other-specify

   _____
   _____

9. Nose
   1. ☐ Inflamed
   2. ☐ Swollen
   3. ☐ Polyps
   4. ☐ Other-specify

   _____

Abnormal

10. Thyroid
    1. ☐ Enlarged
    2. ☐ Nodular
    3. ☐ Other-specify

    _____

11. Lymph Nodes
    1. ☐ Cervical
    2. ☐ Supraclavicular
    3. ☐ Axillary
    4. ☐ Other-specify

    _____

12. Breasts
    1. ☐ Multi-cystic
    2. ☐ Discrete Nodule
    3. ☐ Mastectomy
    4. ☐ Other-specify

    _____

13. Chest Inspection
    1. ☐ Increased A-P Diameter
    2. ☐ Kyphosis
    3. ☐ Scoliosis
    4. ☐ Other-specify

    _____

14. Chest Percussion
    1. ☐ Dullness Right
    2. ☐ Dullness Left
    3. ☐ Hyper-Resonant Right
    4. ☐ Hyper-Resonant Left
    5. ☐ Other-specify

    _____

15. Auscultation
    1. ☐ Decreased Right
    2. ☐ Decreased Left
    3. ☐ Wheezing/Rhonchi Localized
    4. ☐ Wheezing/Rhonchi Diffuse
    5. ☐ Lengthened Oxpiratory Pha
    6. ☐ Moist Rales
    7. ☐ Dry Rales
    8. ☐ Other-specify

    _____

16. Heart Sounds
    1. ☐ Murmur
    2. ☐ Distant Heart Sounds
    3. ☐ Other-specify _____

Abnormal

17. Abdominal Palpation

1. ☐ Tenderness RUQ
2. ☐ Tenderness, Diffuse
3. ☐ Tenderness, Other

_____

4. ☐ Enlarged Liver

Size: _____

Description:

_____

5. ☐ Palpable Spleen

_____

6. ☐ Palpable Kidney

_____

18. Reflexes

1. ☐ Ankle Hyperactive
2. ☐ Ankle Decreased
3. ☐ Ankle Absent
4. ☐ Knee Hyperactive
5. ☐ Knee Decreased
6. ☐ Knee Absent
7. ☐ Babinski
8. ☐ Other-specify

_____

_____

19. Motor and Coordination

1. ☐ Romberg
2. ☐ Nystagmus
3. ☐ Abn. Finger to Nose
4. ☐ Adiadochoinesia
5. ☐ Other-specify

_____

Abnormal

20. Tremor

1. ☐ Outstreached Hands
2. ☐ Intentional
3. Other-specify

_____

21. Psychomotor Activity

1. ☐ Decreased
2. ☐ Other-specify _____

22. Other Significant Abnormalities from any of the above

1. ☐ Other _____

_____

_____

APPENDIX 2

Protocol for Lung Function

1. All individuals willing to participate over 5 years of age were tested for the following:
   a) FVC (forced vital capacity)
   b) FEV (forced expiratory volume)
   c) FEF (forced mid expiratory flow)
   d) FEV, FVC and compared to the predicted normal values of Morris (1971, American Review of Respiratory Disease).
   e. For black race was adjusted for in calculations.

2. All participating individuals:
   a) had the purpose of the test explained.
   b) did not participate if having any kind of acute illness, having smoked a cigarette, eaten or used a bronchodilator in the last hours, and/or having had a respiratory illness in the last 3 weeks.
   c) were seated and made comfortable by removing dentures, loosening tight clothing and elevating the chin.
   d) wore a nose clip.

3. A spirogram was considered valid if 3 acceptable forced maneuvers were accomplished free of:
   a) cough
   b) early termination of expiration
   c) variable effort
   d) excessive variability between trials

4. Individual reports were filed separately and confidentially.

5. The examiner signed and dated each record.

6. Temperature and barometric pressure were determined each day and recorded on each spirogram.

7. Ten percent of records picked randomly were reviewed daily for completeness and acceptability.

8. Results were interpreted by a physician. Criteria for for assessing ventilatury impairment followed Kanner and Morris (1975, Intermountain Thoracic Society).

9. Individuals with results outside the normal range will be notified.

10. A summary report free of individual identifying date will be prepared.

7.F. STANDARD SOFTWARE AND PREDICTION EQUATIONS

F.1. The APEX 420 uses the following set of spirometry prediction equations for adults 18 and over. Where two equations are listed, the first applies to males, the second to females. Refer to section 7.F.7. for references on the prediction equations. Throughout these equations, H = height in inches and A = age in years.

Morris (Oregon)[5]

$$\text{FVC and SVC (L)} = 0.148H - 0.025A - 4.24$$
$$0.115H - 0.024A - 2.85$$

$$FEV_1 \text{ (L)} = 0.092H - 0.032A - 1.26$$
$$0.089H - 0.025A - 1.93$$

$$FEV_3 \text{ (L)} = 97\% \text{ of FVC}$$

$$FEF_{25-75\%} \text{ (L/sec)} = 0.047H - 0.045A + 2.51$$
$$0.060H - 0.032A + 0.551$$

Kory[6]

$$FEV_{0.5} \text{ (L)} = 0.050H - 0.024A + 0.24$$
$$0.046H - 0.011A - 0.3$$

Cherniack[7]

$$\text{PEFR (L/sec)} = 0.144H - 0.024A + 0.225$$
$$0.090H - 0.018A + 1.13$$

$$FEF_{25\%}\ (L) = 0.090H - 0.020A + 2.726$$
$$0.069H - 0.019A + 2.147$$

$$FEF_{50\%}\ (L) = 0.065H - 0.030A + 2.403$$
$$0.062H - 0.023A + 1.426$$

$$FEF_{75\%}\ (L) = 0.036H - 0.041A + 1.984$$
$$0.023H - 0.035A + 2.216$$

$$MVV\ (L/min) = 3.03H - 0.816A - 37.9$$
$$2.14H - 0.685A - 4.87$$

F.2. The APEX 420 uses the following set of spirometry prediction equations for children. As before, where two equations are listed for a given parameter, the first applies to males, the second to females.

Dickman, Schmidt, Gardner[8]

42 through 59 inches tall, 5 through 17 years

$$FVC \text{ and } SVC\ (L) = 0.094H - 3.04$$
$$0.077H - 2.37$$

$$FEV_1\ (L) = 0.085H - 2.86$$
$$0.074H - 2.48$$

$$FEF_{25-75\%}\ (L/sec) = 0.094H - 2.61$$
$$0.087H - 2.39$$

$$PEFR\ (L/sec) = 0.161H - 5.88$$
$$0.130H - 4.51$$

$$MVV\ (L/min) = 3.81H - 134$$

60 through 78 inches tall, 5 through 17 years

$$FVC \text{ and } SVC\ (L) = 0.174A + 0.164H - 9.43$$
$$0.102A + 0.117H - 5.87$$

$$FEV_1\ (L) = 0.121A + 0.143H - 7.86$$
$$0.085A + 0.100H - 4.94$$

$$FEF_{25-75\%}\ (L/sec) = 0.126A + 0.135H - 6.50$$
$$0.083A + 0.093H - 3.50$$

$$PEFR\ (L/sec) = 0.205A + 0.181H - 9.54$$
$$0.139A + 0.100H - 4.12$$

$$MVV\ (L/min) = 3.81H - 134$$

F.3. The APEX 420 uses the following prediction equation for FVC volume ratios:

$$FEV_T/FVC\ (L) = \frac{FEV_{T(PRED)}}{FVC_{(PRED)}} \times 100$$