U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION
REPORT HE 78-30-519

RADIO STATION WSNY
ROUNSAVILLE OF JACKSONVILLE, INC.
JACKSONVILLE, FLORIDA

AUGUST 1978

I. TOXICITY DETERMINATION

We determined that there were noxious odors in the vicinity of the radio station and that at times various irritative and non-specific symptoms were associated with these odors, which came from the adjacent chemical manufacturing plant. However, a mailed questionnaire survey of present and former employees of the station and a review of their medical records revealed no evidence that serious adverse health effects could be associated with exposure to emissions from the chemical plant.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Services, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia. Information regarding its availability through NTIS can be obtained from NIOSH, Publications Office at the Cincinnati address.

Copies of this report have been sent to:

a) Radio Station WSNY, Rounsaville of Jacksonville, Inc., 138 Wamsley Road, Post Office Box 6877, Jacksonville, Florida 32205
b) Authorized representative of Radio Station WSNY employees
c) Regional Administrator, Region IV, OSHA, U.S. Department of Labor
d) Area Director, OSHA, Jacksonville, Florida
e) Regional Program Consultant, Region IV, NIOSH
f) Chief, Bio-Environmental Services Division, and Chief, Public Health Division, Department of Health, Welfare and Bio-Environmental Services, City of Jacksonville

For the purpose of informing the approximately 24 "affected employees" the employer shall promptly "post" for a period of 30 calendar days the Determination Report in a prominent place(s) near where exposed employees work.

III. INTRODUCTION AND BACKGROUND

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by an employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found. In December 1977 an authorized representative of several current employees submitted such a request for a Health Hazard Evaluation because they believed that exposure to a neighboring chemical plant's emissions caused serious adverse health effects.

Radio station WSNY (formerly WMBR) is an AM broadcasting station, operating on a frequency of 600 khz with an output of 5000 watts, located in the western part of Jacksonville, Florida. It is located adjacent to a chemical manufacturing plant that produces alkyd, unsaturated polyester, and silicone resins. The radio station is located less than 50 meters from the chemical plant's wastewater treatment facility, an activated sludge process that receives chemical wastes as well as the plant's sanitary wastes.

The Wamsley Road facility of Station WSNY is used for studio programming and office space; there are no transmission facilities. When fully staffed the station employs 24 persons (19 full-time and 5 part-time), 13 in programming and the rest in sales, engineering, and administration. Also, there may be persons working part-time at the station who are actually employed by an associated FM station located elsewhere in the city. Sales personnel spend much of their working time away from the station, and engineering personnel work only part-time at the AM station. Programming personnel may routinely work at night and on weekends, as well as during the day. There is a high turnover rate; approximately 60 persons were employed in 1977.

The 2300-square-foot single-story building is serviced by two independent central air-conditioning units located in the north and south storage rooms. The main entrance is at the north end of the building. At the south end, nearest the wastewater treatment plant, on the west wall of the storage room is an approximately six-square-foot area covered on the inside by a loose board hung by a hinge. Directly adjacent to this is the south end air-conditioning unit with an eight-inch-diameter air intake at about the same height as the open area on the wall; there is also a rectangular air intake at the base of the unit.

The chemical plant primarily produces unsaturated polyester and alkyd resins, with secondary production of a silicone resin. The unsaturated polyesters are manufactured by a continuous process and by a standard two-stage batch process. The alkyd and silicone resins are also manufactured by a batch process. The primary materials used in the production of these resins may include oils or fatty acids (tall oil, soybean oil); polyols (ethylene, diethylene, or propylene glycol, glycerine, pentaerythritol); anhydrides (maleic, phthalic); solvents (mineral spirits, xylene); monomers (styrene, methyl methacrylate); silicone; and carbon dioxide. A four percent solution of sodium hydroxide is used to clean reactors and other related vessels.

Wastes from the manufacturing processes, cleaning operations, spillage, etc., are received by a central sump pump which in turn feeds four open-surface activated-sludge aeration tanks connected in series. The four tanks have a combined capacity of approximately 450,000 gallons. The tanks serve for biological degradation of glycols and other potential oxygen-demanding water pollutants. Phosphoric acid and urea are added to the aeration tanks to serve as a phosphate and nitrogen source, respectively, for the aerobic bacteria. After a prescribed retention aeration time (usually ten days), the waters flow to the clarifier to separate the sludge components from the treated process waters. Some of the sludge is returned to the aeration tanks to maintain the biological growth, and the wastewater, now relatively free of organic contaminants, passes to the chlorine-contact basin for disinfection. The treated wastewaters are then discharged from the plant for ultimate disposal in an adjacent creek. The treatment plant has a daily flow of approximately 30,000 gallons.

Forced-air blowers (tank 1, which initially receives the influent) and mechanical agitators (tanks 2, 3, and 4) are used to aerate the activated sludge tanks, which are within 50 meters of the radio station's south end. It is the opinion of the NIOSH investigators that some of the more volatile hydrocarbons entering the treatment plant could be released through the aeration process, thus contaminating the ambient air.

IV. EVALUATION DESIGN AND METHODS

1. Environmental

On January 4 and 5, 1978 exploratory air sampling was conducted at the wastewater treatment plant, and outside and inside the radio station. (Sampling periods and volumes are shown in Table 1.) Due to the unknown chemical nature of the prospective contaminants, multiple collection media were used. Included were solid sorbents such as activated charcoal, silica gel, and florisil, and 0.8 um mixed-cellolose-ester filters for anhydrides. Samples of the wastewaters and respective resins were also obtained. The samples were submitted for a complete qualitative/quantitative analysis using gas chromatographic and mass spectrophotometric analytic techniques. Direct measurements of several chemical compounds were made using colorimetric detector tubes.

2. Medical

A. Preliminary Survey

On January 4 and 5, in order to determine the characteristics, extent, and effects of odorous emissions from the plant, we interviewed (1) the requester, (2) the radio station manager and several current employees, (3) the chemical plant manager, plant engineer, and several employees, (4) spokesmen for the two nearby business establishments, and (5) residents of all 5 houses directly across the street from the chemical plant (Figure 1).

B. Odor Identification Tests

In an attempt to identify the substances causing the offensive odors, samples of ten substances were collected at the chemical plant. They included 3 resins, 2 gylcols, styrene, methanol, well water (which, because of a high sulfur content, had a distinct odor), influent wastewater, and water from an activated sludge tank. Four radio station employees - two who attributed illness to the plant's emissions and two who did not - were asked to smell the ten samples without knowing what they were.

C. Questionnaire Survey

Because most of the employees mentioned in the health hazard evaluation request - including the requester - were no longer employed at the station we surveyed present and past employees by mail using self-administered questionnaires. The radio station provided the employment records of 61 employees who had worked at the station since January 1977. On January 13, 1978 we mailed questionnaires to 59 of them - we had no address for two, one of whom worked at the station less than 10 days and the other of whom was hired at the end of 1977. On February 13 we sent another questionnaire to all those who hadn't responded to the first, in the case of some former employees using more recent addresses provided by the requester after the January 13 mailing. A net total of 5 questionnaires were returned undeliverable. We therefore assume that 56 reached the addressee.

The questionnaire was accompanied by a cover letter that explained the purpose of the survey, it's voluntary nature, and the confidentiality of information. The questionnaire covered demographic and employment information, occupational activities at the radio station, awareness of and effects of emissions from the chemical plant, and a medical history with emphasis on symptoms in the preceding year. Persons who sought medical care for problems attributed to the chemical plant's emmissions or for other medical problems in the preceding year were requested to authorize the health care providers to release information to NIOSH; forms for this purpose were enclosed with the questionnaire.

D. Review of Medical Records

We requested medical records from all hospitals, clinics, physicians, and psychologists for which we received authorization, except that we did not ask for information from persons such as emergency room physicians and radiologists whose reports we expected would be included or mentioned in the requested hospital records.

V. RESULTS AND DISCUSSION

1. Environmental

On January 4 and 5 environmental sampling was conducted at the wastewater treatment plant and radio station. The purpose of the sampling was to characterize the chemical contaminants that were present at this arbitrarily selected time. A total of four samples of the treatment plant's wastewater were obtained: three of the influent wastewater and one of the wastewater contained in activated-sludge tank number 3. The four samples were analyzed for organic compounds using a gas chromatograph equipped with a flame ionization detector. The sample obtained from activated-sludge tank 3 did not show the presence of any organics on the chromatograms, while the other three samples showed the presence of similar components on their respective chromatograms. The identity of the extraneous components was confirmed by the retention time of the reference standards. The identity of others was determined by gas chromatograph and mass spectrophotometric analysis. The following compounds were found in the three samples obtained from the influent wastewater:

1. Styrene monomer
2. N,N-dimethyl aniline
3. Phthalic anhydride
4. Propylene glycol
   (no ethylene glycol was found)
5. Ethyl thioisocyanate
6. 4-methyl-2-ethyl-1, 3-dioxalane and its isomers

Subsequent analysis of the air samples was based on the reported analyses of the water samples. The charcoal tubes and florisil tubes were desorbed with carbon disulfide and ethyl acetate, respectively. The silica gel tubes were first desorbed with ethyl acetate, and then methyl alcohol was added to check the desorption. Both front and back-up sections were desorbed separately in all cases; no contaminant break-through was observed. The analysis of the aliquots was performed using gas chromatograph/flame ionization or gas chromatograph/mass spectrophotometric techniques. The membrane filters were analyzed for phthalic anhydride using liquid chromatography.

The air sampling results are presented in Table 1. The florisil and silica gel samples did not show any extraneous components. The charcoal samples obtained at the waste-treatment influent pipe area contained some of the organic components as found in the water samples including styrene monomer, N,N-dimethyl aniline, ethyl thioisocyanate, and 4-methyl-2-ethyl-1,3-dioxalane and its isomers. The airborne levels of styrene monomer and N,N-dimethyl aniline were less than 4 and 1% of their respective Federal OSHA occupational health standards. However, a distinct odor characteristic of styrene was apparent to the NIOSH industrial hygienist working at treatment tank number 1 (this tank receives the influent flow) during approximately 10:00 a.m. to 1:00 p.m. on January 5. The odor threshold for styrene monomer is approximately 0.5 mg/M^3. This odor was not detected at the radio station (southwest corner) with the winds from the southwest to southeast, i.e., towards the radio station. Measurements with direct reading colorimetric indicator tubes showed the airborne levels of styrene around tank number 1 to be less than 7% of the Federal OSHA standard. Due to the unavailability of standards the quantitation of the dioxalane homologs and ethyl thio-isocyanate was not conducted. Neither phthalic anhydride nor ethylene or propylene glycols were detected.

It is apparent from the above data that some of the more volatile hydro-carbons contained in the wastewater become airborne through vaporization. Although the data is limited, it indicates that there is a significant variation in levels from day to day. This variation may be due to environmental (temperature, sunny or cloudy days) and non-environmental (chemical composition of influent wastewater at a particular time) factors. Based on a thorough review of the environmental and medical data (see below) collected, available toxicologic information on the compounds evaluated, and the conditions of exposure, we concluded that additional environmental monitoring was not necessary for purposes of this health hazard evaluation. We fully realize that a network of ambient air samplers strategically positioned around the radio station and chemical plant would be necessary to understand the apparent variation in air quality as it may relate to different meteorological conditions and process phases. However, the responsibility for profiling industrial emissions and the resultant air quality belongs to city and state air pollution control agencies or the U.S. Environmental Protection Agency, not NIOSH.

A qualitative air flow study was conducted of the radio station's south air-conditioning unit's air intake pattern using a visual smoke tracer released through a small-diameter hand-held probe. It was readily apparent that the unit pulled air from within the storage room and particularly from the outside via an open area on the west wall. It is logical to assume that with winds from the south the unit would pull in the air coming from the chemical plant and circulate it throughout the areas it serviced.

2. Medical

A. Preliminary Survey

None of the chemical plant employees we talked to, including those who spend time at the wastewater treatment facility, attributed any symptoms or other ill effects to the chemical emissions. The neighboring businesses reported complaints by employees and customers of offensive odors, but no attributable illness. Residents of all five houses reported offensive odors, and in four of the houses persons associated such symptoms as headache, dizziness, nausea, and respiratory discomfort with the emissions. The reported symptoms occurred when odors were strong, and in most cases the symptoms resolved shortly after the odors subsided. There was no consistent association of odors with weather conditions other than wind direction. The symptoms reported by neighborhood residents are similar to those reported by many of the radio station employees. The businesses are usually upwind (particularly during the summer) from the chemical plant and thus may be exposed to a lower level of emissions than are the houses and radio station. This may account for the lack of odor-associated symptoms. An alternate, or additional, explanation might be their greater distance from the wastewater treatment plant, if this is the major source of the symptom-producing emissions.

B. Odor Identification Tests

Three of the four persons selected the influent wastewater as the characteristic odor from the plant; the other person selected water from the activated sludge tank. In addition, three persons picked polyester resin, three picked styrene, and two picked methanol as odors they have smelled. (Two other resins were chosen by two persons as possibly being involved.)

The polyester resin and styrene are not supposed to be present in the wastewater but could get there in the event of a spill or leak. (It is possible that these odors ordinarily come from the production area, but we found styrene in the wastewater and in the air over the treatment plant even though there had been no spill or leak reported.) Methanol is used only in the laboratory and should thus not be present in production emissions or, except for the small amounts from laboratory drains, in the wastewater. It is probable that methanol was mistaken for some other similar-smelling substance.

C. Questionnaire Survey

1. Response and Characteristics of Respondents

Of the 56 persons presumed to have received a questionnaire, 32* answered it, a response rate of 57%. Seven (70%) of the 10 females and 18 (39%)

---

* Including one person whose questionnaire was received several days after a letter describing the preliminary medical findings was mailed to interested parties.

of the 46 males responded. Respondents and non-respondents differed little with respect to age or duration of employment at the radio station (Table 2). (The nonrespondents have a much greater mean duration of employment at the station, but - as is evident from the similar medians - this is due to the effect of one employee with an unusually long duration of employment.)

Of the 16 persons identified to us in our preliminary investigation as attributing illness to emissions from the chemical plant, 13 (81%) responded; all attributed illness to the plant's emissions. Overall, 19 persons (59% of the respondents) attributed symptoms to the plant's emissions. Fifteen of these consulted a physician; 7 were admitted to a hospital. Eleven persons did not attribute any symptoms to the plant's emissions, although 5 had some symptoms during 1977. Two persons provided contradictory information. (One initially attributed symptoms to the plant's emissions but later indicated that he had no symptoms. The other, whose returned questionnaire was incomplete, at first associated symptoms with the plant's emissions but later denied the association.) We excluded these two from further analyses involving symptoms or comparisons between "cases" and "non-cases".

2. Symptoms

The distribution of various symptoms among the respondents is shown in Tables 3 and 4. It appears that the 19 persons who attributed symptoms to the emissions tended to have a greater number and variety of symptoms than the 11 who did not attribute their symptoms to the emissions. Commonly reported symptoms included headache, dizziness, psychological dysfunction, visual disturbances, respiratory tract irritation, gastro-intestinal upset, skin problems, and unusual sensations. A majority of both symptomatic groups were ill enough to consult a physician, but only among those who attributed symptoms to the emissions were there persons admitted to a hospital. These differences can be explained by either of two alternatives: (1) Severity of illness was an important factor in the individual's perception of its cause, or (2) the individual's perception of the cause of his illness influenced his perception of its severity and/or seriousness.

Among the ill persons there was such a variety of symptom patterns that we could not discern a characteristic "epidemic" illness. We therefore considered using the number of symptoms and/or the symptomatic recovery time as case definition criteria. Attempting to use the number of symptoms presented two problems. First, in an open-ended symptom questionnaire the number of symptoms reported is influenced by both the descriptive tendencies of the respondent and by the biases of the reviewer in categorizing symptoms for purposes of counting. Second, there was no number of symptoms that seemed to be appropriate for differentiating cases from non-cases.

Of the 19 persons who attributed symptoms to emissions, all reported symptomatic improvement while away from the radio station, but only 6 said that this occurred soon after leaving. In this respect, these 6, none of whom were admitted to a hospital, are more like the neighborhood residents than like the other 13 radio station employees who attributed symptoms to emissions. This suggests the possibility of two qualitatively different problems: (1) temporary, acute symptoms due to the irritant effects of the emissions, and (2) illness due to factors other than irritant effects of the emissions. Since the 6 "quick-recoverers" are intermediate, with respect to number of symptoms, between the 13 "slow-recoverers" and the 11 persons who did not attribute illness to the emissions (Table 4), recovery time might have been used as part of a case definition. Unfortunately, the questionnaire was structured in such a way that the question about symptomatic improvement was asked only of those who attributed symptoms to the emissions. Thus, recovery time cannot validly be used here as an independent criterion for defining a case. The following discussion, then, will refer to the 19 self-defined "cases" of emission-related illness and the 11 self-defined "non-cases" (the other respondents, whether symptomatic or not). Any noteworthy differences between the slow-recoverers and the "cases" will be mentioned.

Without an "objective" case definition, and especially because many of the symptoms were non-specific, recurring, and/or chronic, we could not determine a specific time of onset in many cases and so did not attempt to construct an epidemic curve.

3. Odors

Only 5 of the 11 non-cases said that the emission odors were noticeable inside the station, and only 3 characterized them as annoying or offensive. In contrast, only 2 cases said that the odors were not noticeable; the other 17 characterized them as annoying or offensive. Eight non-cases said that the odors did not interfere with their work; 3 said that they occasionally did. In contrast, 14 cases said that the odors interfered with their work frequently or most of the time, and the other 5 (including 3 of the 6 quick-recoverers) said that such interference occurred occasionally. While it is evident that the cases were substantially more aware of and bothered by the odors than the controls, it cannot be determined from the available data whether this is a cause of or a result of their symptoms.

Only 1 of 6 non-cases who had an opinion on the subject said that the odors were worse on weekends, whereas 13 of 18 cases said so. This could reflect either differences in sensitivity to the odors or differences in working hours (see below). This latter possibility is somewhat supported by the fact that 5 (45%) of the non-cases had no opinion because they didn't work on weekends, whereas only 1 (5%) of the cases had no opinion for this reason. The difference between cases and non-cases could, of course, also be due to cases who didn't work weekends having an opinion based on other employees' observations.

Only 3 employees, all slow-recoverers, thought that there was any seasonal difference in the frequency or severity of the odors. Two thought that summer was the worst season, but neither worked at the station during winter, and one worked only during the summer. The remaining case said that spring and summer were the worst seasons. All other cases and all non-cases either had no opinion because of a short duration of employment or did not think that there was any seasonal difference. Ten of the 11 cases employed at least 6 months did not think that there was a seasonal difference.

Determination of whether the odors varied with the time of day was impeded by 2 problems: (1) several respondents gave ambiguous answers, and (2) several employees had an opinion even though they never worked evenings or nights. Excluding employees who did not work at least 10% of the time evenings or nights, 3 of 4 non-cases and 1 of 12 cases said that there was no worst time of day. Of the 6 cases that selected a single worst time of day, 3 picked dawn or early morning, 2 night, and 1 dusk. Of the 5 that selected 2 worst times, 2 picked night and dawn, 1 daytime and dawn, 1 dusk and dawn, and 1 dusk and night. Finally, of 4 cases who worked only during the daytime but still expressed an opinion, 2 selected dawn as the worst time, 1 selected no particular time, and the other inexplicably selected night and dawn.

In summary, cases are more likely than non-cases to have found the odors to be annoying and to interfere with work. There is apparently no appreciable seasonal difference. Cases, but not controls, tend to believe that the odors are worse on weekends. Early morning is apparently the worst time of day, but the data is not adequate to discern any other diurnal feature.

4. Demographic, Environmental, and Occupational Factors

Eleven of the 19 cases (including 3 of the 6 quick-recoverers) but only 3 of the 10 non-cases who answered the question about temperature and humidity inside the radio station said that it was uncomfortable during hot weather. Since such a large proportion of cases found the emission odors to be offensive and to interfere with work, the good correlation among cases between temperature/humidity discomfort and olfactory discomfort is not surprising and provides no additional insight.

Table 5 shows the distribution of cases, slow recoverers, and non-cases according to proportion of working time spent at the station and proportion of time working other than regular daytime hours. Table 6 shows the distribution of respondents, cases, and slow-recoverers according to job category. It is apparent that cases are more likely than non-cases to work at least some of the time during evening and night hours and are much less likely to be away from the station for an appreciable amount of time. (The latter trend is even more pronounced among the slow-recoverers, but the former is less pronounced.) Since the majority of cases were among programming personnel (the largest group), and few among sales personnel (the next largest), these findings are consistent with the nature of the work done by these groups. While it may seem that the higher prevalence of illness among programming personnel is due

to greater exposure to the chemical plant's emissions by virtue of being at the station more hours and at a greater variety of times, it is also possible that the stress associated with such a job may also account for the frequency of illness.

These findings assume, of course, that the questionnaire respondents are representative of all the station's employees, a tenuous assumption when dealing with a self-selected sample.

5. Medical and Behavioral Factors (Table 7)

Cases were more likely than non-cases to have had pre-existing environmental allergies. Since many of the cases had symptoms of mucous membrane irritation, a history of "allergy" - particularly "hayfever" and "allergy" to "dust" - might indeed suggest that a greater sensitivity to mucous membrane irritants is a determinant of emission-related symptoms.

Cases were somewhat more likely than non-cases to have regularly or frequent used medications prior to the illnesses in questions, but these tended to be common symptomatic medications and hormonal preparations (primarily oral contraceptives). The frequency of use of such medications in these groups does not seem unusual and does not suggest any relationship to the illnesses in question.

Cases were no more likely than non-cases to smoke cigarettes or to drink immoderate amounts of alcohol.

Slow-recoverers did not differ substantially from all cases with respect to any of these medical and behavioral factors.

D. Review of Medical Records

Fifteen (79%) of the 19 cases consulted a physician; 7 of these (37% of the cases), all slow-recoverers, were admitted to a hospital. Fourteen of the 15, including all those admitted to a hospital, authorized NIOSH to obtain medical records from their physicians and/or hospitals. We obtained medical records in all 14 cases, and in each case the records we received contained essentially all of the available medical information relevant to this study. (The few bits of information we know to be missing (reported to us directly by the cases) do not appear to qualitatively affect our conclusions.)

We also obtained the medical records concerning all 3 non-cases who consulted a physician in the past year.

The medical records (cases and non-cases) reiterated the wide variety of symptoms reported in the questionnaires. Again, there appeared to be no consistent pattern of illness. There were no findings specifically suggestive of exposure to a toxic substance. Diagnoses included various

common illnesses, psychological problems, developmental disorders, and biochemical "abnormalities" of uncertain cause. Essentially all of the latter were minor elevations of liver enzymes, generally without corroborative evidence of liver disease. Such "abnormalities" appeared to reflect normal variation and/or transient elevations not necessarily indicative of liver disease.

In two cases, an organic (that is, "physical" as opposed to "psychological") brain disorder was diagnosed on the basis of psychological tests. In only one of these cases was any abnormality found by a thorough neurological evaluation, and the abnormality in this case, while possibly accounting for some of the symptoms, was a developmental disorder not related to any recent chemical exposure. NIOSH psychologists do not think that psychological testing is sufficiently specific to "diagnose" organic brain disorders except in severe cases; rather, in most cases, such testing can only "suggest" its presence. They think it unlikely that an organic brain disorder severe enough to be unequivocally diagnosed by psychological testing would be otherwise undetected by a comprehensive neurological evaluation. Finally, they do not think that in these two cases the reported test data necessarily warrant an interpretation of "organic" or "toxic" brain dysfunction.

In general, among the WSNY/WMBR employees, there seems to be more illness and minor biochemical abnormalities than one would expect in a group composed primarily of young adults. But this may be more apparent than real, since their belief in the potential health hazards of working near the chemical plant may have lead them to have had more than the usual concern about various symptoms and to have had more diagnostic tests than would ordinarily have been done. In any event, there appears to be no pattern of illness suggestive of exposure to a toxic substance. In those cases where a diagnosis of chemical poisoning was considered by a physician it was based on the patient's (and physician's) speculation, the lack of any other apparent explanation for the illness, and/or reports of similar illnesses among other radio station employees, rather than on findings actually suggestive of chemical toxicity.

VI. SUMMARY AND CONCLUSIONS

A. There is general agreement that there are offensive odors in the neighborhood where the radio station is located and that they come from the chemical plant adjacent to the radio station.

B. A majority of neighborhood residents and radio station employees complain of certain symptoms that they associate with emissions from the plant. Common symptoms include eye and upper respiratory tract irritation, headache, nausea, and dizziness.

C. Only radio station employees attribute more serious health effects to the plant's emissions.

D. At the time of our investigation there were no airborne contaminants found at the radio station, and none were found at the wastewater treatment plant in excess of any current occupational health standards or criteria. The limited environmental findings suggest that there is a considerable dilution of airborne contaminants between the wastewater treatment plant and the radio station, even with the wind blowing from the treatment plant toward the station.

E. Considering all the available data, we conclude that the major medical problems among WSNY/WMBR personnel were probably not due to toxic effects of emissions from the chemical plant. This conclusion should not be interpreted as diminishing the validity or seriousness of anyone's medical problems. Nor should it necessarily imply that the plant's emissions have no long-term adverse health effects in the community, since we did not address the issue of future effects of chronic exposure. [We did not do so because (1) the health hazard evaluation request concerned acute and sub-acute problems among employees, most of whom were young and had worked a relatively short time at the radio station, and (2) such an undertaking would involve extensive, complex epidemiologic studies of the chemical plant employees and community residents - whose cumulative exposures would presumably be greater than those of radio station employees - and would be beyond the scope of a NIOSH health hazard evaluation.]

VII. RECOMMENDATIONS

According to the City of Jacksonville, Department of Health, Welfare and Bio-Environmental Services (BES), as of January 4, 1978 the chemical plant was in compliance with all ambient air standards for criteria pollutants and is under a voluntary compliance plan to abate odorous emissions. At the time of our investigation the chemical plant management had already agreed to abate the odor problem during 1978 by installing an afterburner (thermal oxidizer) to incinerate the emissions from all reactor/thinning vessels, which are currently uncontrolled or vented to a water scrubber system. We presume BES will continue to monitor the plant to insure that emissions are adequately controlled. After the equipment is operational for a period of time we suggest that BES survey neighborhood residents and businesses (including the radio station) to determine if there has been a reduction in emission-related symptoms.

VII'. AUTHORSHIP AND ACKNOWLEDGMENTS

Report Prepared By:

Mitchell Singal, M.D., M.P.H.
Medical Officer
Medical Section
Hazard Evaluations and
Technical Assistance Branch
Cincinnati, Ohio

John R. Kominsky, M.S.
Project Officer
Industrial Hygiene Section
Hazard Evaluations and
Technical Assistance Branch
Cincinnati, Ohio

Originating Office:

Jerome P. Flesch
Acting Chief
Hazard Evaluations and
Technical Assistance Branch
Cincinnati, Ohio

Acknowledgments

Chemical Analysis:

Gangadhar Choudhary, Ph.D.
John L. Holtz
Robert Kurimo
Measurements Services Section
Measurements Support Branch
Cincinnati, Ohio

Report Typed By:

Marie A. Holthaus
Clerk-Typist
Industrial Hygiene Section
Hazard Evaluations and
Technical Assistance Branch
Cincinnati, Ohio

Figure 1

Neighborhood of radio station WSNY, Jacksonville, Florida
(All buildings are arbitrarily shown as rectangular,
not necessarily to scale.
Property boundaries and building relationships are only approximate.)

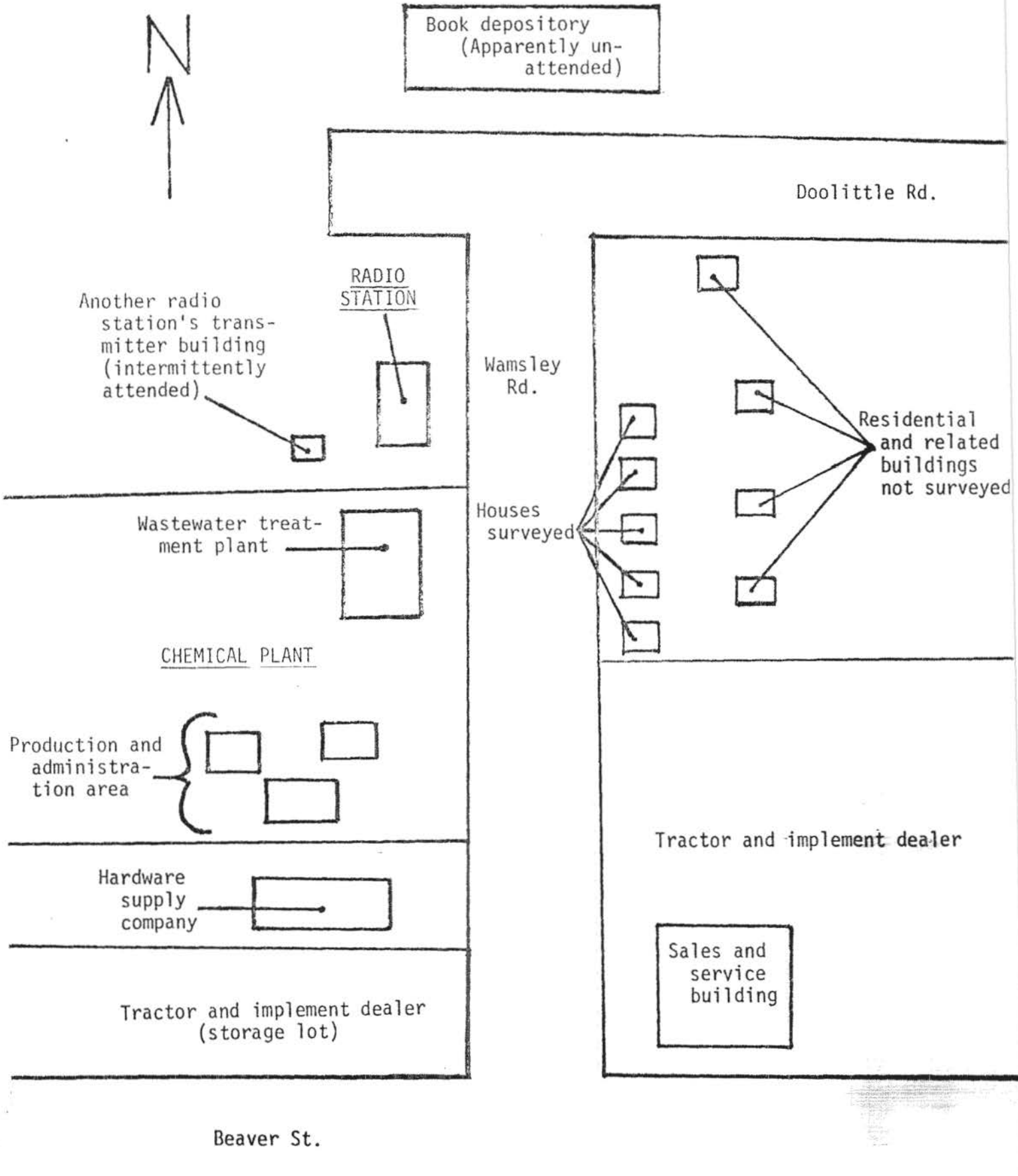

Table 1

Stationary air sample concentrations measured at the wastewater treatment plant and radio station, Jacksonville, Florida, January 4 and 5, 1978

Sample Date	Sample No.[a]	Sample Description	Sampling Period	Sample Volume Liters	Airborne Concentration - mg/M^3 Styrene Monomer	N,N-dimethyl Aniline	Phthalic Andydride	Propylene Glycol	Ethylene Glycol
1-4	C-01	Waste Treatment Unit: No. 1 Sludge Tank at Influent Pipe	1905 - 2125	140	<0.04	0.14	<0.04	<0.03	<0.05
"	S-01	" " " " " " " "	" "	"	"	<0.01	"	"	"
"	F-01	" " " " " " " "	" "	"	"	"	"	"	"
"	AA-01	" " " " " " " "	" "	"	"	"	"	"	"
1-5	C-02	Waste Treatment Unit: No. 1 Sludge Tank at Influent Pipe	0927 - 1230	183	14.10	0.05	<0.04	<0.03	<0.05
"	S-02	" " " " " " " "	" "	"	<0.04	0.16	"	"	"
"	F-02	" " " " " " " "	" "	"	"	0.05	"	"	"
"	AA-02	" " " " " " " "	" "	"	"	<0.01	"	"	"
1-5	C-03	Waste Treatment Unit: No. 4 Sludge Tank on Aerator Gear Box	1000 - 1245	165	<0.04	<0.01	<0.04	<0.03	<0.05
"	S-03	" " " " " " " " " "	" "	"	"	"	"	"	"
"	F-03	" " " " " " " " " "	" "	"	"	"	"	"	"
"	AA-03	" " " " " " " " " "	" "	"	"	"	"	"	"
1-5	C-04	WSNY: Inside Bldg.(SW Corner) at Intake of Air Handler	0911 - 1300	229	<0.04	<0.01	<0.04	<0.04	<0.05
"	S-04	" " " " " " " "	" "	"	"	"	"	"	"
"	F-04	" " " " " " " "	" "	"	"	"	"	"	"
"	AA-04	" " " " " " " "	" "	"	"	"	"	"	"
1-5	C-05	WSNY: Outside Bldg. (SW Corner)	0907 - 1302	235	<0.04	<0.01	<0.04	<0.04	<0.05
"	S-05	" " " " "	" "	"	"	"	"	"	"
	Environmental Criteria[b]				425	25	--	--	--

[a]Sample collection medium: C = activated charcoal; S = silica gel; F = florisil; AA = mixed cellulose ester membrane filter

[b]Standards promulgated by the U.S. Dept. of Labor - OSHA (Federal Register, July 1, 1975, Volume 39, Title 29, Part 1910, Subpart Z, Section .1000)

Table 2

Comparison of questionnaire respondents and non-respondents with respect to age and duration of employment at the radio station, Jacksonville, Florida 1978

	Respondents (32)	Non-respondents (24)
Age		
Range	19-50	19-54
Mean ± S.E.M.[1]	29 ± 1.4	32 ± 2.1
Median	28	29
Months employed at radio station		
Range	1-52	<1-294[A]
Mean ± S.E.M.	12 ± 2.6	24 ± 12.2
Median	7	6
Months employed at radio station in 1977[B]		
Range	<1-13	<1-13
Mean ± S.E.M.	5 ± 0.8	5 ± 0.9
Median	4	3

1 - Standard error of the mean
A - Second highest: 70
B - Through January 1978

Table 3

Occurrence of various symptoms among radio station employees responding to the questionnaire, Jacksonville, Florida 1978

Symptoms	Respondents attributing symptoms to emissions from chemical plant (19)		Respondents not attributing symptoms to emissions from chemical plant (11)	
	Number	%	Number	%
Respiratory	10	53	2	18
Headache	17	89	1	9
Neurologic (includes visual or auditory symptoms and problems maintaining balance or consciousness)	15	79	2	18
Psychological or emotional (includes impairment of mental function)	16	84	2	18
Gastrointestinal	15	79	0	0
Genitourinary	5	26	0	0
Dermatologic	7	37	1	9
Generalized (fatigue, weakness, unintentional weight loss)	16	84	3	27
Other	2	11	1	9
None	0	0	6	32

Table 4

Number of symptoms among radio station employees responding to the questionnaire, Jacksonville, Florida 1978

Number of symptom categories (described in Table 2)	Respondents attributing symptoms to emissions from chemical plant (19)			Respondents not attributing symptoms to emissions from chemical plant (11)
	Slow-recoverers[1] (13)	Quick-recoverers[1] (6)	All	
Range	3-8	2-5	1-8	0-4
Mean ± S.E.M.[2]	6 ± 0.6	4 ± 0.6	5 ± 0.6	1 ± 0.3
Median	7	4	6	0

1 - See text for definitions
2 - Standard error of the mean

Table 5

Distribution of cases and non-cases
according to time spent at the radio station
Jacksonville, Florida
1978

	Cases[1] (19)		Slow-recoverers[1] (13)		Non-cases[1] (11)	
	Number	%	Number	%	Number	%
Proportion of work time spent at radio station building						
≥90%	16	84	12	92	6	55
≤90%	3	16	1	8	5	45
<50%	0	0	0	0	5	45
<25%	0	0	0	0	3	27
Proportion of employees working at times other than daytime						
Any amount of time	14	74	8	62	5[A]	45
≥10% of the time	13	68	7	54	4[A]	40
≥20% of the time	9	47	4	31	3[A]	30
≥50% of the time	7	37	2	15	3[A]	30
≥75% of the time	3	16	0	0	2[A]	20
≥90% of the time	3	16	0	0	1[A]	10

1 - See text for definitions
A - Based on only 10 non-cases because one said that the amount of time "varies"

Table 6

Distribution of job category among radio station employees, Jacksonville, Florida 1978

	All employees		Questionnaire recipients		Questionnaire respondents		Cases[1]			Slow-recoverers[1]		
	Number	%	Number	%	Number	% of recipients	Number	% of recipients	% of respondents	Number	% of recipients	% of respondents
Sales	14	23	12	21	6	50	2	17	33	2	17	33
Programming	33	54	30	54	18	60	12	40	67	7	23	39
Engineering	6	10	6	11	2	33	1	17	50	0	0	0
General and Administrative	8	13	8	14	6	75	4	50	67	4	50	67
Total	61	100	56	100	32	57	19	34	59	13	23	41

1 - See text for definitions

Table 7

Medical and behavioral factors
among cases and non-cases,
Jacksonville, Florida
1978

	Cases[1] (19)		Slow-recoverers[1] (13)		Non-cases[1] (11)	
	Number	%	Number	%	Number	%
History of pre-existing allergy						
All allergies	9	47	6	46	4	36
Excluding drug allergies	8	42	6	46	1	9
Regular or frequent use of medication prior to illness in question	5	26	4	31	1	9
Cigaret smoking						
Non-smokers	12	63	7	54	6[A]	600
Smokers	7	37	6	46	4[A]	40
<1 pack per day	5	26	4	31	1[A]	10
>1 pack per day	2	11	2	15	3[A]	30
Alcohol use[2]						
<7 drinks[2] per week	18	95	13	100	8[B]	89
8-14 drinks per week	1	5	0	0	1[B]	11
>14 drinks per week	0	0	0	0	0[B]	0

1 - See text for definitions
2 - One drink = 1 bottle or can of beer = 1 glass of wine = 1 ounce of hard liquor
A - Excludes 1 smoker who quit at an unknown time in 1977
B - Excludes 1 person with unknown alcohol use and one with ambiguous answer (either <7 or 8-14)