

**PRELIMINARY
Health
Assessment
for**

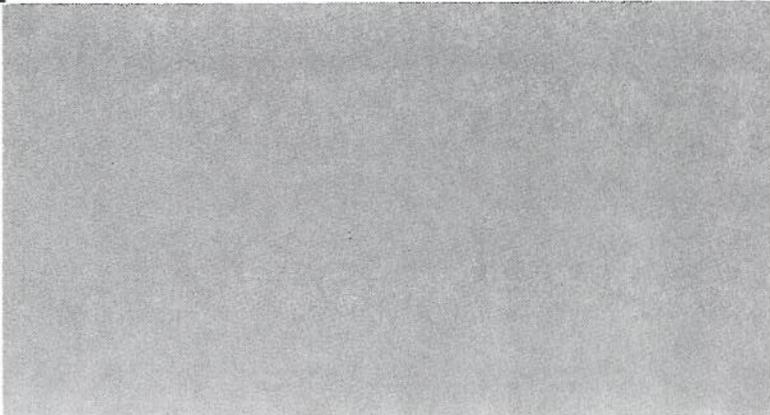
DURHAM MEADOWS SITE

DURHAM, CONNECTICUT

CERCLIS NO. CTD001452093

JUNE 1, 1990

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry**



THE ATSDR HEALTH ASSESSMENT: A NOTE OF EXPLANATION

Section 104(i) (7) (A) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, states "...the term 'health assessment' shall include preliminary assessments of potential risks to human health posed by individual sites and facilities, based on such factors as the nature and extent of contamination, the existence of potential pathways of human exposure (including ground or surface water contamination, air emission, and food chain contamination), the size and potential susceptibility of the community within the likely pathways of exposure, the comparison of expected human exposure levels to the short-term and long-term health effects associated with identified hazardous substances and any available recommended exposure or tolerance limits for such hazardous substances, and the comparison of existing morbidity and mortality data on diseases that may be associated with the observed levels of exposure. The Administrator of ATSDR shall use appropriate data, risk, assessments, risk evaluation and studies available from the Administrator of EPA."

In accordance with the CERCLA section cited, the Agency for Toxic Substances and Disease Registry (ATSDR) has conducted this Preliminary Health Assessment using the data available to ATSDR. Additional Health Assessments may be conducted for this site as more information becomes available to ATSDR.

Use of trade names is for identification only and does not constitute endorsement by the Public Health Service or the U.S. Department of Health and Human Services.

SUMMARY

The Durham Meadows site, Durham, Connecticut, has been proposed by the Environmental Protection Agency (EPA) for inclusion on the National Priorities List. Site investigations so far have centered on Merriam Manufacturing Company, an active facility that manufactures metal containers, boxes, and cabinets. Inappropriate disposal of paint and degreasing wastes has resulted in contamination of on-site soil and on-site and off-site groundwater with volatile organic chemicals (VOCs), including trichloroethylene, perchloroethylene, chloroform, and methylene chloride. There may be additional sources of VOCs in the area. The environmental medium and human pathway of primary public health importance is contaminated groundwater. Several private wells have been affected, resulting in remedial actions that initially included bottled water and finally carbon filtration. The entire town of Durham uses the bedrock aquifer for its water needs. The bedrock is highly fractured, making the determination of groundwater flow patterns difficult. Additionally, contaminated soil, surface water, and sediment may be of public health importance.

Based on the available information, this site is considered to be of public health concern because of the risk to human health caused by the likelihood of exposure to hazardous substances at concentrations that may result in adverse health effects. As noted in the Human Exposure Pathways Section below, human exposure to VOCs may be occurring via ingestion of contaminated groundwater. Exposure to contaminated soil, surface water, and sediment may be occurring but is expected to be of lesser importance. ATSDR recommends additional soil sampling, identification of other potential sources of VOCs, and a surveillance program for the early detection of newly affected private wells.

BACKGROUND

A. SITE DESCRIPTION AND HISTORY

The official U.S. Environmental Protection Agency (EPA) name for this site is Durham Meadows, which refers to a hunting area adjacent to the town of Durham, Connecticut. However, the actual focus of the investigation, conducted so far by the Connecticut Department of Environmental Protection (CTDEP), is Merriam Manufacturing Company in Durham.

The Merriam Manufacturing Company is located on a residential and small business street in a historical district of Durham. Main Street forms the west boundary of the property. Along Main Street are private residences and small businesses housed in converted single-family residences. The eastern portion of the property extends to a sparsely populated street. See the Appendix for a site map. The manufacturing portion of the site consists of a one-story building and a formerly used paint-waste lagoon and drum-storage area.

Merriam Manufacturing Company manufactures metal displays and boxes (e.g., filing cabinets, tackle boxes). Industrial operations include welding, metal pressing, degreasing, and painting. Before 1972, the company discharged degreasing and paint liquid waste sludge directly to a septic system. In 1972, CTDEP issued a pollution-abatement order to Merriam requiring a treatment system for all wastes. In response, Merriam constructed two waste-disposal lagoons on site. These were used until 1982, when a dry-powder paint system was installed. Since then, degreasing wastes have been transported off site by a waste hauler. In 1981, CTDEP conducted a site inspection and found waste-handling deficiencies, and subsequently issued another pollution-abatement order requiring Merriam to conduct a hydrogeologic investigation of the site. An additional order was issued in 1983 to provide a potable water supply to 19 residents in the vicinity of the site. By 1985, approximately 60 residents were using bottled water.

B. SITE VISIT

Site visits were conducted by Agency for Toxic Substances and Disease Registry (ATSDR) personnel on November 9, 1988, and April 19, 1989.

The site is not fenced or restricted to public access in any way. A private residence located on site. Children were observed playing in the yard of this residence on the first visit, although there were no visible indications of children at the time of the second visit. The two lagoons have been emptied and are now grass-covered. The man-made wall that separated the two lagoons has been demolished; now only one depression remains as evidence of the lagoon's existence. The drum-storage area has been removed.

C. COMMUNITY HEALTH CONCERNS

The CTDEP files contain several letters from concerned citizens indicating a desire for the site to be placed on the National Priorities List. Any health effects related to exposure to site contaminants were not made known to ATSDR.

DEMOGRAPHICS, LAND USE, AND NATURAL RESOURCE USE

The population of Durham is estimated to be 5,600. Several additional communities are within a 3-mile radius--Middlefield, population 3,700, Baileyville, and Rockfall. (The populations of the latter two towns are unknown.) Durham Center (population unknown) is within a 1-mile radius of the site. Merriam employs approximately 70 people.

The entire community of Durham uses private sources of groundwater. Groundwater flow in the area is believed to be from east to west, although this direction is complicated by the drawdown from the large number of

wells in the area. This assumption possibly is in conflict with data derived from water-level and contaminant-concentration measurements. Regional groundwater flow is northerly. The aquifer in use is the extensively fractured bedrock aquifer, which begins from 4 down to 30 feet below ground surface. Private wells are from 75 to 300 feet deep. Surface water in the area includes two small streams and Ball Brook which flow east to west into the Coginchaug River (a half mile from the site). The Coginchaug River flows north into the Connecticut River (7 miles from the site to the east). Laural Brook Reservoir and Mount Higby Reservoir are within 2 miles to the north of the site.

Information on land use in the area generally is lacking. A hunting preserve called Durham Meadows is located within a 1-mile radius of the site.

Durham Manufacturing Company is another, similar manufacturing company located south of Merriam Manufacturing Company. Contaminant concentrations appear to increase closer to Durham Manufacturing Company. Durham Manufacturing Company apparently is under investigation by CTDEP for groundwater contamination.

ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

A. ON-SITE CONTAMINATION

The environmental contamination on-site (maximum concentrations reported) identified in the documents provided for review consists of 1,1,1-trichloroethane (12 ppb), trichloroethylene (1,100 ppb), perchloroethylene (32 ppb), 1,1-dichloroethylene (26 ppb), and cis-1,2-dichloroethylene (70 ppb) in groundwater. Toluene (43,000 ppb), xylenes (150,000 ppb), methylene chloride (4,000 ppb), trichloroethylene (530 ppb), and perchloroethylene (256,000 ppb) were found in soil. Sediments from an on-site drainage ditch to Ball Brook were sampled, but no organic contamination was found.

Anecdotal information, provided by a Merriam Manufacturing representative during the site visit, indicated that lead sampling (based on the waste-inventory records Merriam maintained) was conducted in the waste lagoon area. Results were reported to be unremarkable; however, no written documentation of this sampling could be found.

B. OFF-SITE CONTAMINATION

Groundwater off-site (maximum concentrations reported) is contaminated by 1,1,1-trichloroethane (110 ppb), trichloroethylene (530 ppb), 1,1-dichloroethylene (3 ppb), 1,2-dichloroethane (5 ppb), chlorodibromomethane (9 ppb), bromochloromethane (51 ppb), chlorobenzene (4 ppb), dibromomethane (4 ppb), 1,1,2,2-tetrachloroethane (2 ppb), trans-1,2-dichloroethylene (14 ppb), cis-1,2-dichloroethylene (28 ppb),

perchloroethylene (55 ppb), methylene chloride (130 ppb), and chloroform (5 ppb). No other off-site environmental media have been sampled.

Several volatile organic compounds (VOCs) (1,1,1-trichloroethane, bromochloromethane, cis- and trans-1,2-dichloroethylene, 1,2-dichloroethane, dichlorobromoethane, carbon tetrachloride, dibromomethane, 1,1,2,2-tetrachloroethane) were not considered further in this Preliminary Health Assessment for one or more of the following reasons: they were detected in very few samples; they were detected in limited areas of the investigation area; they were in low concentrations relative to levels considered to be of public health importance; they were in low concentrations relative to typical concentrations found in environmental media (i.e., lower than typical background concentrations, applies mainly to soil values); or they were in low concentrations and similar to other compounds that were retained for discussion.

C. QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

Little information was provided concerning QA/QC procedures for the environmental data. It is not evident that standard sampling and analytical procedures, such as blank and spike samples, were followed. However, ATSDR assumes, for the purpose of this Preliminary Health Assessment, that the data are sufficiently representative of actual contamination.

D. PHYSICAL AND OTHER HAZARDS

This is an active site with unrestricted access. Unauthorized persons could come in contact with physical hazards associated with the manufacturing process. Children might find the depression where the lagoons were previously located inviting for play although no signs of this activity were noted.

PATHWAYS ANALYSES

A. ENVIRONMENTAL PATHWAYS (Fate and Transport)

VOCs have been measured in groundwater both on and off site. VOCs also have been found in on-site soil. The VOCs identified as contaminants of concern at this site may be grouped roughly into three categories, according to their structure and approximations of their behavior in the environment: 1) the chlorinated alkenes trichloroethylene, tetrachloroethylene or perchloroethylene, and 1,1-dichloroethylene; 2) the chlorinated aliphatic hydrocarbons methylene chloride and chloroform; and 3) the methyl-substituted aromatic hydrocarbons toluene and xylenes.

Because of their relatively high volatility, all compounds of concern can be expected to partition into the atmosphere eventually, unless they undergo either photochemical or microbial degradation or are in media in

which volatilization is retarded (as in groundwater or subsurface soil). Groups 1 and 2 would be expected to exhibit more rapid atmospheric partitioning than group 3, and thus factor more highly in atmospheric transmission. Vapor pressures for groups 1 and 2 range from 74 to 591 millimeters of mercury (mm Hg) at 25 degrees Centigrade versus 10-22 mm Hg for group 3.

On the other hand, group 3 substances show a greater affinity for adsorption onto soil particles than group 1 or 2 compounds, as evidenced by an organic carbon partition coefficient of 240-330 versus 49-152. An exception is perchloroethylene, with an organic carbon coefficient of 364. Therefore, group 3 substances discharged into the soil are less likely to be transported via groundwater or surface water dissolution. The water solubilities of group 3 versus groups 1 and 2 are 200-500 mg/L and 1,400-8,000 mg/L, respectively. Soil composition changes can affect the movement of contaminants. For example, soils with a higher organic content would be expected to retain contaminants more strongly than soils with a lesser organic content.

In summary, the contaminants discharged onto the surface soil would be expected to volatilize into the atmosphere. Atmospheric volatilization would be limited in contaminants discharged into the subsurface soil. Transport (leaching) from soil to water (surface or ground) would be expected to occur readily, with the soil's higher organic content being a retarding factor for group 3.

The environmental pathways of probable concern at this site are continued migration of contaminants in groundwater, volatilization of VOCs from groundwater and soil into the atmosphere, migration of contaminated soil (sediment) off site via surface water runoff, and leaching of VOCs from soil into surface water.

B. HUMAN EXPOSURE PATHWAYS

Human exposure to the environmental pathways identified above can occur from ingestion, dermal contact and subsequent absorption, and inhalation. Exposure from domestic use of contaminated groundwater can occur as a result of drinking, cooking, and other household uses, such as showering and bathing. Heating and agitating the water, as would occur during most cooking, showering, and bathing, would cause increased volatilization of VOCs from the water to the atmosphere. The resulting inhalation exposure could be of greater public health significance than exposure by ingestion, depending on various factors such as the amount of water used, water temperature, size of the shower stall, the length of the shower, building tightness, and air current patterns. Dermal contact will occur during bathing and showering (more so during bathing than showering). However, the degree of absorption through the skin will be minor because of the low

concentrations in water (relative to the concentration gradient necessary to penetrate intact skin).

Other human exposure pathways potentially of concern are inhalation of VOCs released from soil to the air, and dermal contact with contaminated soil and surface water, if these contaminated media ultimately concentrate in areas of human activity. Some contaminated surface soil may have been removed. Depending on the completeness of this removal, these routes of exposure may no longer be of importance. Additional data and information are needed to more fully evaluate these potential pathways.

In summary, ingestion, inhalation, and dermal contact and absorption of VOCs in contaminated groundwater are the pathways of public health concern. Inhalation of VOCs from soil, sediment, and surface water, and dermal contact with and ingestion of contaminated surface water, soil, and sediment are anticipated to be of minor importance.

PUBLIC HEALTH IMPLICATIONS

Unless results of further site investigations reveal substantially more surface soil contamination than is presently believed to exist, ATSDR does not expect releases of VOCs from soil, sediment, or surface water to result in appreciable public exposures. Worker exposures to VOCs via inhalation or dermal contact from the work process will be more important than inhalation of or dermal contact with contaminated environmental media. From a public health perspective, VOCs in groundwater used for domestic purposes, in particular, drinking, are of most concern.

In general, the VOCs identified at this site may cause headache, dizziness, and nausea (central nervous system effects); skin irritation, eye, nose, and throat irritation (upper respiratory effects); and liver and kidney effects, if exposure occurs at sufficiently high levels. However, these acute effects are much more likely to occur as a result of occupational rather than environmental exposure, and they are not expected to occur in persons at this site who are not occupationally exposed concomitantly.

Many of these VOCs (chloroform, 1,1-dichloroethylene, perchloroethylene, trichloroethylene, and methylene chloride) are suspected of causing cancer in humans, based on results and conclusions from laboratory animal studies. Cancer of the liver, kidney, and lung have been reported, depending on the particular chemical in question and the route of exposure. The level of risk posed by potential exposure to site contaminants at Durham Meadows warrants action to reduce the risk. The higher concentrations found in on-site groundwater and soil suggest a reservoir of material available for continued contamination of off-site groundwater, increasing the risk to those who use this groundwater.

CONCLUSIONS

Based upon information reviewed, ATSDR has concluded that this site is of public health concern because of the risk to human health resulting from probable exposure to hazardous substances at concentrations that may result in adverse human health effects. As noted in the Human Exposure Pathways Section above, human exposure to VOCs has probably occurred via groundwater.

The leading edge and direction of the groundwater plume have not been determined. ATSDR understands that some type of private well monitoring program meant to discover any wells that are subsequently impacted by the plume has been initiated, but the Agency has no information other than anecdotal reports that further defines this surveillance measure.

The information concerning groundwater flow patterns in the vicinity of Merriam Manufacturing is insufficient to predict the ultimate destination of groundwater contaminants. The information available suggests that there may be additional sources of VOCs in groundwater. This conclusion is supported by the fact that certain VOCs found in private wells were not found in the well on the Merriam Manufacturing Company property.

The number of soil samples collected is insufficient to draw any conclusions about the extent of surface soil contamination, either on or off site. Delineating surface soil contamination is important in view of the unrestricted access the public has to the site.

RECOMMENDATIONS

In accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended, the Durham Meadows site has been evaluated for appropriate follow-up with respect to health effects studies. Since human exposure to on-site and off-site contaminants currently may be occurring and may have occurred in the past, this site is being considered for follow-up health effects studies. After consultation with Regional EPA staff and State and local health and environmental officials, the Division of Health Studies, ATSDR, will determine if follow-up public health actions or studies are appropriate for this site.

The following recommendations are presented:

1. Further investigations at this site should include an evaluation of the surveillance and corrective action program for private wells that could be affected in the future.
2. Additional surface soil sampling should be performed for metals in addition to lead. Paint wastes generally have chromium, lead, zinc, and possibly other heavy metals associated with them.

3. Surface water drainage pathways should be identified and soil and water samples from these areas should be collected.
4. The the source of the different VOCs found in wells other than the suspected source well should be identified. Possible causes could be contamination as a result of sampling or analytical procedures or additional, undiscovered sources.
5. When indicated by public health needs, and as resources permit, the evaluation of additional relevant health outcome data and community health concerns, if available, is recommended.

Information concerning further environmental characterization and sampling of the site and impacted off-site areas during the Remedial Investigation and Feasibility Study (RI/FS) should be designed to address the environmental and human exposure pathways discussed above. When additional information and data become available, e.g., the completed RI/FS, such material will form the basis for further assessment by ATSDR at a later date.

PREPARER OF THE REPORT

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ATSDR REGIONAL REPRESENTATIVE

Regional Representative:	Louise House Public Health Advisor Region I
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REFERENCES

The following documents were provided to ATSDR for review. These documents form the basis of this Preliminary Health Assessment. Further information made available after the development of this Preliminary Health Assessment will be addressed in any subsequent Health Assessment.

1. Environmental Protection Agency. Hazard Ranking System Package. Environmental Protection Agency, Washington, DC. 1983.
2. Roux Associates, Inc. Site investigation of Merriam manufacturing Company, Durham Connecticut. East Granby, CT. September 23, 1988.

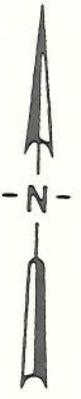
3. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Trichloroethylene. In draft.
4. Agency for Toxic Substances and Disease Registry. Toxicological Profile for 1,1-Dichloroethylene. In draft.
5. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Toluene. In draft.
6. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Chloroform. Agency for Toxic Substances and Disease Registry, Atlanta, Georgia. ATSDR Publication No. ATSDR/TP-88/09. January 1989.
7. Environmental Protection Agency. Superfund Public Health Evaluation Manual. Washington, DC. October 1986.

APPENDIX

Site maps, Durham Meadows, Durham, CT.

MERRIAM MANUFACTURING COMPANY
Durham, Connecticut

SCALE	Shown	FIGURE
DATE	Dec 1982	1



Merriam
Manufacturing
22

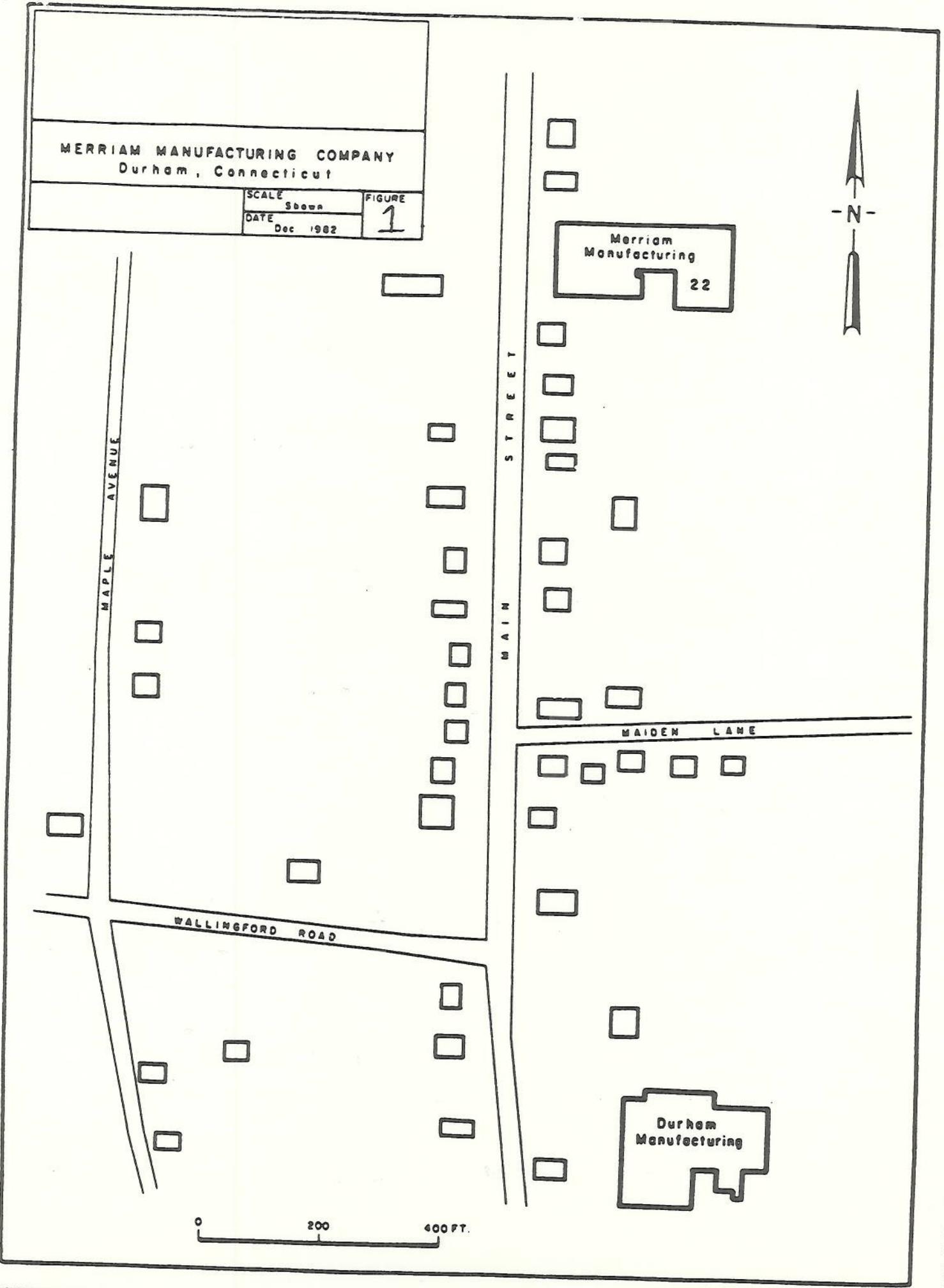
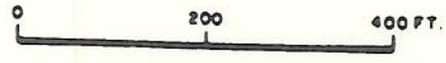
MAIDEN LANE

Durham
Manufacturing

MAPLE AVENUE

MAIN STREET

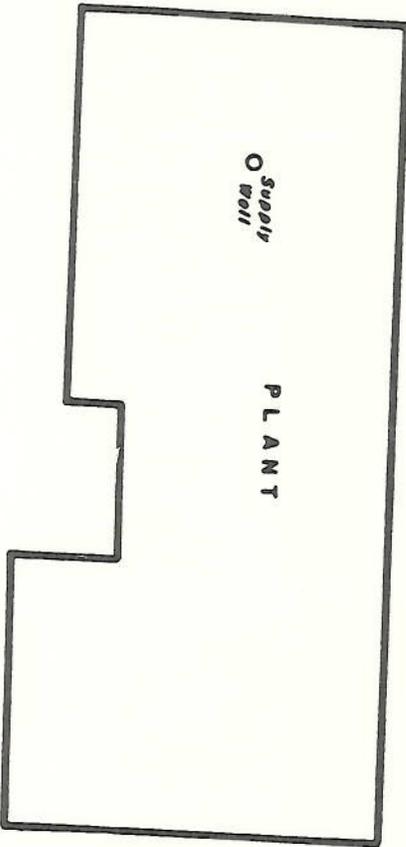
WALLINGFORD ROAD



MAIN STREET



HOUSE

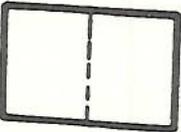


Supply
Well

PLANT



DRUM
STORAGE
AREA



LAGOONS

Property Boundary

MERRIAM MANUFACTURING COMPANY		
Durham, Connecticut		
SCALE	DATE	FIGURE
3/8" = 1'-0"	Dec. 1962	2

