CHAPTER III

THE FIRE IN MINUTILLI

Nature of the Event

At or just before 9:22 a.m., on a summer day, an explosion occurred in the "hot room" of a large chemical plant in the metropolitan area of the city of Minutilli. Equipment malfunction had resulted in overheating. The city fire department was called within a few minutes because a fire developed. While the fire never spread beyond the small building in which it started, a second and eventually a third alarm had to be sounded by 9:43 a.m.

Apart from continuing explosions, the greater danger stemmed from the fact that the plant manufactured and stored herbicides and pesticides, notably EPN, and methyl parathion which is a class B poison and highly toxic when inhaled, ingested or absorbed by the skin. The chemical company is on a five acre site, located in the southwestern corner of the city's metropolitan area, dozens of miles from downtown and about a mile and a half east of a major river. However, the area surrounding the company grounds is very flat, and is used for residential as well as industrial purposes. The plant area is also subject to fairly high winds which usually blow northeast towards Minutilli.

About 30 employees were in the plant when an 8,000 gallon tank of methyl parathion initially exploded. One of the employees was badly burned at this time, although others were also knocked down, three of whom had to be eventually hospitalized. The explosion and fire also generally caused the release of some of the above mentioned dangerous substances into the air. A toxic cloud formed, which drifted to the southwest towards the river. Firefighters dodged exploding 55-gallon drums of chemicals which sometimes flew 500 feet into the air or sideways, and battled heat and poisonous fumes for more than two hours before the fire was brought under control. As the firefighters worked, the first of several evacuation calls were issued, as a major disaster was feared.

Evacuation eventually involved approximately 3,000 residents in a five square-mile area. Because the fumes were drifting towards the river, the Coast Guard closed the river to all traffic from the city to a point about 60 miles away in a neighboring state. General air traffic was also restricted from five miles around the site by air traffic controllers. This was at the request of the police department, both for purposes of safety and to discourage the convergence of sightseers in flying vehicles. It was later estimated that the mushrooming cloud reached a height of 3,100 feet and spread across a 30 mile area to the southwest.

There were no reported evacuations outside the city. However, internal organizational alerts were issued by law enforcement officials in four counties outside of the metropolitan area of Minutilli. Concern about the drift of the toxic cloud extended even to a nearby state. This led to the posting of state highway patrol officers and sheriff's deputies along the state line to monitor

for toxic fumes. None was ever detected.

Some of the evacuees had to be treated for illnesses. In fact, by late Thursday night, at least 230 persons had been given treatment for symptoms believed to be related to the fumes generated by the explosions at the plant. The civilian evacuees were primarily treated in hospital emergency rooms after complaining of inhaling toxic fumes, burning sensations in their eyes, vertigo, severe sweating, chest pains, severe nausea, and other similar symptoms. No deaths occurred among the civilian evacuees and there did not appear to be any permanent damage inflicted, although eight victims stayed overnight at hospitals.

The firefighters were not so fortunate. While most who had problems suffered from heat exhaustion while fighting the fire, one fire officer died as a result of a heart attack, and another broke his leg as a consequence of being hit by a falling drum. A few firefighters also exhibited the same symptoms of exposure to toxic fumes as had the civilian evacuees. Ten of them had to be hospitalized at least overnight, although again, there did not appear to be any permanent damage.

Actually casualties could have been more severe if the winds had been blowing in their usual direction. That day the winds were blowing southeast to north at 5-10 miles per hour before changing to northeast at 9 miles per hour. A weak high-pressure system had moved into the mid-south early in the morning of the explosion and reversed the area's normal wind direction so that fumes were carried southwest towards the river instead of into the heart of the city.

Most of the evacuated residents and workers were allowed to return to the evacuated neighborhoods by late afternoon. By that time, city officials had begun to worry about water pollution. They were told that water from the fire hoses might carry dangerous chemicals into nearby streams. If that happened, there was the possibility that contaminated water which ran into the neighboring creeks and lakes, could kill much of the life in them. In addition, there was also the potential hazard created by the fact that the firefighters had dumped some sulphuric acid manufactured at the chemical plant, into the nearby river to prevent further explosions.

Dikes were hastily built to direct the runoff water into a newly constructed drainage ditch. The city's public work department also poured soda ash into the creek in an attempt to neutralize impurities in the water. These actions were seemingly not totally effective, for later testing led to the finding that traces of the toxic insecticide, methyl parathion, one of the chemicals stored at the plant, had run into a nearby creek and then into a lake. Arriving late in the day, members of an EPA Emergency Response Team quickly prepared a filter system of potash to strain out impurities in the partly contained, but contaminated water. However, apparently there were not enough impurities in relation to the water volume, so that notable ecological damage was not later observed. Furthermore, in no case, was the drinking supply of any community catastrophically threatened since none used water from the creek, lake or river even under normal circumstances.

Direct property damage to the chemical plant was estimated to be in the three and a half million dollar range. In addition, nearly a half million pounds of chemicals were destroyed. Production losses because of an indefinite plant shutdown also ran high, and 30 employees were laid off. In addition, there were indirect economic costs. A major refinery and a major shopping center had been closed down and evacuated for about half a day. A department store in the center did not reopen until the next day because an executive with the keys to the store failed to return after the evacuation period ended. That next day also, businesses in the shopping center and nearby reported receiving calls from customers wondering if it would be safe to come and shop in the stores. Apparently no one made any effort to assure the general public that the neighborhoods near the chemical plant were safe after the first few hours of the disaster.

In the days after the fire, environmental and health officers scoured the southwestern part of the metropolitan area for other signs of pesticide contamination. None was found. However, nearby residents complained of damage that had been done to gardens, a neighborhood citizen's group voted to ask the plant not to rebuild at its old site, and a class action law suit for losses from the incident was instituted against the chemical company five days after the fire. The citizens' group was apparently partially successful, for at this time, the decision has been made to rebuild the facility elsewhere.

COMMUNITY CHARACTERISTICS

The city of Minutilli is surrounded by a major metropolitan area of approximately a million and a half people, considerably less than half of which live in the city itself. The county of Rossatti, in which the metropolitan area is located, covers about 750 square miles and is mostly built up residential and industrial neighborhoods. The city is also an important river port which handles millions of tons of cargo yearly.

The area is served by seven railroads and six airlines and is the hub of four interstate highways. The river port is the headquarters of half a dozen barge companies. Much of the river and railroad transport operations are in densely populated neighborhoods, many within a few blocks of the central business district.

The population is distributed about 1,000 persons per square mile. Nonwhites constituted about a third of the residents in the metropolitan area. People over the age of 65 constitute less than 10 percent of those in Rossatti county. At the time of our study, unemployment in the labor force numbered about six percent, slightly higher than the national average.

Traditionally, the area is Democratic in its political orientation. However, Republicans have done much better in recent times. The city of Minutilli has a mayor-council form of government, with Rossatti county having a mayor-court council form. Besides Minutilli, there are six other incorporated cities or towns in the county.

The total work force numbers over 300,000, with most of the employment being in nonagricultural pursuits. However, the single largest employer in

the area manufactures farm machinery, the second, automotive products. Over 30 percent of those in the manufacturing sector, are employed in the food and kindred products area. The value added by manufacturing to shipment of goods is around a billion and a half dollars a year. Retail sales in Rossatti county have recently been close to four billion dollars a year, with per capita income in the metropolitan area being around $6,000 annually.

The economy of the area is rather diversified. Minutilli is an agribusiness center involving processors, packers, shippers, distributors and merchants. There are many military installations in the region from all three branches of the armed services, as well as defense department depots. The health sector is represented by many facilities and installations. The labor force is almost equally divided between manufacturing, service industries, and retail trade.

Chemical concerns, with more than 100 plants in the metropolitan area and around $400 million in sales annually, employ almost 10 percent of the labor force. Most of the chemical manufacturing facilities, including three major installations operated by international companies, are located in relatively populated neighborhoods. Most plants, including the one in which the fire occurred, tend to be centered in complexes or clusters of similar industrial activities. One plant, manufacturing exceptionally hazardous materials, is not in a complex, and is in an isolated location within the metropolitan area but outside of the city limits.

Disaster Preparedness

There is very extensive disaster preparedness in Minutilli. This partly reflects the fact that the area is vulnerable to a wide range of disaster agents, ranging from tornadoes and earthquakes to technological accidents and breakdowns. However, there have been few actual disasters in recent years. Thus, while truck and railroad accidents have annually averaged more than 200 in recent years, there have been almost no casualties resulting from such incidents. Nonetheless, the area would rank relatively high by most criteria of disaster preparedness. There is also notably strong leadership in a few key emergency related sectors, and this has existed for a number of years.

Community awareness of possible chemical threats had particularly increased in the last few years. The Waverly, Tennessee disaster, which several years earlier attracted nation-wide interest because of the mass media coverage, had provided impetus in Minutilli for preparations for chemical disasters. The mayor and other city officials led public efforts to improve preparedness for chemical hazards. Such efforts were strongly reinforced a year later when a local hospital had to be evacuated because of a threat of an explosion from an overturned LPG tank car. In just the six months prior to the chemical plant explosion described earlier, there had been over 30 hazardous materials incidents in the city involving fires or other threats of varying magnitude.

The civil defense office has developed a comprehensive master plan for mass emergencies including besides natural disasters, incidents associated with technological accidents, civil disturbances and nuclear warfare. The

plan consists of a matrix-type division of responsibilities specifying primary and secondary responses, plus a call-up list of organizational contacts. Under the section describing the necessities of the plan, reference is made to toxic chemical disasters both in plants and various transportation modes. Apart from the formal linkages indicated in the plan, there are important informal ties between key emergency organizations as we describe later under the "Resources" section of this case study.

An annex of the plan specifically deals with evacuation and its coordination. A standby evacuation committee has representatives from the:

1. city fire services
2. county civil defense/emergency management office
3. local chapter of the American National Red Cross
4. city police department
5. county sheriff's department
6. city and surrounding area transit authority

The committee has established which organizations are responsible for what functions, how activities are to proceed, and how the overall effort is to be integrated.

While the community disaster planning is impressive and certainly better than found in the typical American metropolitan area, it is far from perfect. For example, none of the very many transportation companies in the area are involved in the community disaster planning. The standby Emergency Operating Center is located in a city government building which is astride an earthquake fault. While the police department claims to have a subplan for dealing with hazardous chemicals, no one, including the author, could locate a copy of the plan when a DRC field team asked to see it.

Resources

As might be expected, there are many emergency relevant organizations in and around the metropolitan area of Minutilli. These include not only city agencies and county groups, but also elements of state and federal units such as the military components in the numerous bases and facilities in the area. In addition, there are the relevant resources of a variety of organizations in the private sector, in particular the chemical companies located in the region.

However, the key resources for disaster planning and response in the Minutilli area exist primarily in a few organizations. These include the local fire and police departments, the county civil defense, many of the hospitals and some of the major chemical companies in the area. They have substantial resources by way of planning, information, expertise and equipment for responding to a wide range of potential disasters in the Minutilli metropolitan area. In principle, extra community resources are also potentially available, but it would have to be a major disaster or catastrophe for such resources to be needed because the local organization could not meet emergency demands.

The city fire department has historically played a leading role in disaster planning. It numbers more than 1,500 personnel, has over 150 pieces of equipment, and receives more money per capita than does the local police department. The fire department by planning and tradition is designated as the primary responding agency to incidents involving hazardous materials. It has instituted a hazardous materials section which is currently receiving extensive training and has purchased hazardous materials equipment. All operational fire personnel have been given some instruction as to the handling of hazardous materials. In addition, the fire department was, at the time of the fire incident at the chemical plant, developing a specific hazardous materials disaster plan. This fire department also was one of the few in the country that, at the time of the fire incident, had established a special hazardous materials unit.

The police department in Minutilli actually is slightly smaller in size than the fire department, although average salaries are somewhat higher. In recent years it has been wracked by internal conflicts and disagreements, and does not seem to be as positively viewed by other public officials as is the fire department. The police department also has given its field personnel some training in the identification and handling of hazardous chemicals, although the training is nowhere as extensive as that given by the fire department to its own personnel. In the main, however, the police see their functions in acute chemical emergencies as not being too different than what they would do in any kind of major disaster.

Both by planning and understanding, there is a division of labor projected for the local police and fire departments in many disasters, and especially chemical emergencies. Thus, the agreed-upon strategy is that the fire department will deal directly with the incident and the police department will provide security and conduct evacuations. The county civil defense office is to handle all coordination with state agencies.

This recently developed cooperation between the police department and the fire department concerning the responses to hazardous materials has had the effect of breeching a 25 year old feud encompassing the local police and fire departments. Much of the newfound cooperative spirit seems traceable to the actions of the individuals responsible for the hazardous materials training in both the police and fire departments. There were reports of resistance to cooperation from higher authorities in both departments when disaster planning initially was jointly attempted. But whatever the history, and whatever formal written plans currently call for, there are close informal ties between key operational members of the fire and police departments.

Over several dozen hospitals in the region have unusually highly developed disaster plans, and frequent exercises of them. However, they are not well dispersed geographically, with many clustered in one section of the city, although there are satellite facilities in many locations. Because Minutilli is located relatively close to another state, the hospitals draw patients from across the state line, and both their everyday emergency operations and disaster plans take into account the crossing of this jurisdictional boundary. There is, in addition, a great deal of inter-hospital interaction especially with respect to disaster planning. The high degree of interaction is noteworthy, considering that until recently there was no federal support for the EMS system.

There are close links between the hospital sector and the county civil defense office. In part this is because the communication center at the civil defense office provides the back-up system for the dispatching of hospital ambulances in the region. Prior to the fire incident, the civil defense office and the hospitals had been in the process of developing plans to conduct drills with hospitals on how to handle hazardous chemical episodes, which had not been particularly attended to prior to that time.

A number of the chemical plants in the metropolitan area have intensive emergency and disaster plans for their individual facilities. However, there is no formal plan linking the chemical sector, and there is no mutual aid group or planning, as is often found in localities with many chemical plants. Nonetheless, there is considerable contact and interaction between a number of the major chemical companies and the Minutilli fire department. For example, the companies routinely send experts to help the fire department with chemically related incidents. There have been instances of the lending of specialized emergency equipment between and among the chemical companies and the fire department.

Other city and county emergency relevant organizations tend to be more low keyed in their orientation to disaster and chemical incidents planning than those just discussed. Thus, the Minutilli public works department is allocated a debris clearance function at times of disasters. This is known by key officials in the organization but is otherwise not a very salient matter. The county sheriff's office has some general plans and understanding of its role in a community emergency, but is not especially linked for this purpose to other emergency relevant agencies.

Organized Response to the Disaster

At 9:22 a.m., the city fire department received a call from an unknown observer stating that there was a large cloud of smoke around the area of the chemical plant. At 9:23 a.m., records indicate the chemical company called and informed the fire department that an explosion had occurred. The city fire department immediately sent a company to the scene of the fire. The senior fire officer who arrived on the scene then radioed back to headquarters that the other companies should stay out of the area until it could be determined exactly what dangerous chemicals might be present. However, the fire was such that at the same time, he called in a second alarm. It was not until a little after the second alarm was activated at 9:37 a.m. that the fire department, with the help of the chemical company president, identified one of the main chemicals involved--methyl parathion. By the time the third alarm was called in at 9:43 a.m., the fire department had already dispatched two hazardous materials units to the scene, and all firefighters had been instructed to don protective gear.

When the local fire chief arrived and assessed the situation, he decided to contact by radio the Rossatti county civil defense office, and requested that they send some of their personnel to the scene to set up evacuation procedures. A command post was then set up in a hazardous materials vehicle, parked upwind from the building in which the major fire raged. At the time when the fire companies responding to the third alarm were arriving on the

scene, a lieutenant in one of the hazardous materials unit of the department noted an additional potential problem. It appeared some of the runoff water being sprayed on the fire might be sweeping some hazardous chemicals into a nearby creek. Because of this, the city public works department was contacted for earthmoving equipment and dirt to build dikes to catch the runoff water in a drainage ditch. But it was some time before the work could be done, and all the runoff water was never fully channeled into the drainage ditch. The last of the fire was put out by about 11:40 a.m. In all, the city fire department eventually had 28 pieces of equipment from 17 stations on the scene.

Units from the city police department arrived at the chemical plant only after the third fire alarm had been sounded. Apparently they learned of the fire situation from hearing communications on the Minutilli fire department radio channels. When the police got to the plant they also consciously and deliberately set up their own command post apart from the one that had been established by the fire department.

The Rossatti county civil defense director arrived on the scene at approximately 10:30 a.m., summoned by his own office which had been monitoring the radio communications of the local emergency organizations. After meeting at the fire department's command post with representatives from both the fire and police departments, he decided to evacuate civilians from nearby areas. A public announcement of an evacuation was made at 11:00 a.m., more than an hour and a half after the initial explosion at the chemical plant.

The major organizations involved in the evacuation effort were the civil defense agency, the city police department, the sheriff's office, and the city mass transit authority (which was asked to participate by the local police). The local chapter of the American Red Cross was apparently only contacted by telephone. A general decision was made to evacuate nearby neighborhoods. Several different evacuation calls were consecutively issued, encompassing an even larger area. Eventually a five square mile area was evacuated, and it was later estimated that about 3,000 residents left. The evacuation was kept in effect until the late afternoon. At that time, evacuees were allowed to return to all but a two block neighborhood right around the chemical plant. At 9:00 p.m. finally, all evacuated residents were allowed to return to their homes, although most had returned much earlier.

The majority of evacuees, as is usually the case in mass emergencies and disasters, went to friends and relatives. Only about 300 persons moved into a Red Cross shelter set up at a nearby high school. These people left this shelter in the middle of the afternoon, when some public officials said it was safe to return to the affected area. The public shelter was not well organized since until about 1:45 p.m., the only organizational representative at the shelter was a Red Cross volunteer. Other agency officials arrived later, but at the time most got to the building almost all the evacuees were already starting to leave. Mass transit buses that were supposed to take people home never materialized, so most evacuees had difficulty getting quick transportation.

The organization involved in the evacuation effort originally tried to warn people by use of speakers on police helicopters and squad cars. This did not prove to be a totally effective way of reaching people. Some residents

near the chemical company had their windows closed and air conditioners running. So they never heard the warnings broadcast over the public address systems of the three helicopters being used in the effort. Most of these people learned of the possible danger from neighbors who came to their houses and told them of the fire and the explosion. Some also reported the presence of a cloud of "black smoke" coming from the plant site.

The warnings issued by the police cars were more successful in alerting people to a crisis situation. However, the warning messages were not clear on what to do. Thus, some residents left using their own cars. Others in the neighborhood collected on streetcorners, because some of the warning messages from the police indicated city buses would come into the area to evaucate people. Still other persons, including some elderly persons, attempted to walk out of the neighborhood. Little information was ever provided by anyone as to the best direction in which to flee. But as is usual in disaster evacuations, a significant number, even among those who heard the police warnings, refused to leave the area. Most of those who evacuated seemed to have left at a relatively slow pace, and except in isolated cases, there appears to have been little sense of urgency on the part of evacuees.

Part of the difficulty in the evacuation effort was that the involved emergency organizations were themselves not too clear initially about the situation. The fire, police and civil defense organizations had different and sometimes contradictory information about the incident and its development. Thus, at one point, one agency understood evacuation should be to the east whereas another organization thought the evacuees would be safer to the west of the burning chemical plant. After considerable discussion, consensus was reached on this point, but as indicated earlier, was not very well communicated to the possibly endangered population.

In retrospect, the civil defense office responsible for coordinating the evacuation thought it had gone well, and did not think much of anything would be done differently in a future similar situation. However, it was noted that afterwards some neighborhood residents complained they never received any official notice or warning of the danger, and others said that promised bus transportation, both for leaving from and returning to their homes, never materialized. In turn, civil defense officials reported observing neighborhood residents ignoring the evacuation calls and remaining in their homes.

In addition to helping and trying to coordinate the evacuation, the local civil defense office, using the Emergency Operations Center under its control, monitored all radio communications to and from the plant site so as to keep informed about the general situation. The office also answered requests for information from press representatives as well as private citizens, and attempted to keep a record of all happenings (later, the detailed time sheets that had been filled out during the emergency were accidentally thrown away when the office was cleaned up several days after the disaster). The civil defense communications officer also called CHEMTREC, duplicated a similar call for information by the hazardous materials unit of the Minutilli fire department. CHEMTREC put both organizational callers in contact with the Pesticide Safety Team network.

The police department, apart from assisting in the evacuation, primarily provided security at the plant site. Their operational command post did not seem to be as fully cognizant about the situation as was the fire department, but little effort beyond the use of couriers was made to establish better on-the-scene communication between the two. The relative absence of massive congence on the plant, and the relatively low number of evacuees, allowed the police to maintain their normal traffic control patterns. There were apparently no reports of looting in the evacuated neighborhoods, mostly consisting of a working class nature.

The area hospitals did not receive any special notification of the plant incident. Six of the hospitals started receiving patients in their emergency rooms at approximately 10:30 a.m., a good hour after the initial explosion. The influx of patients was such that none of the hospitals ever activated their disaster plans, although several went to an emergency stand-by alert. Some of the local institutions did contact the state university poison control center for information on how to handle the toxic symptoms exhibited by their patients. A rather delayed triage effort near the plant site did not handle many casualties. These patients were transported by fire department ambulances, which on an everyday basis, provide this component of the EMS system in the city of Minutilli as well as Rossatti county.

While the fire in the plant was out by noon the day of the explosion, smaller fires broke out the following two days. This necessitated further runs by the fire department. At the end of that time, several fire officials returned to the fire scene to assist in the decontamination of hoses and other appliances which might have been contaminated during the course of the fire fighting. Several fire fighters also put on special suits so they could enter the ruins of the building where the fire originated to recover the thermostat that controlled the heating unit.

During this time also, the fire department was asked to check on the temporary dam which the public works department had constructed to contain the contaminated water in a drainage ditch. It was decided that the dam was deteriorating and needed to be reinforced and its height raised. The public works department was again contacted, and performed the necessary tasks to the temporary dam.

The federal EPA was brought into the situation to deal with the possible water contamination problem. In fact, in less than two hours after the initial explosion, a local unit of the Coast Guard, following the National Contingency Plan for hazardous spills and at the urging of the local civil defense office, notified the EPA of the situation. An emergency response team was sent from a nearby state to do the chemical containment and clean up. A regional EPA coordinating officer arrived on the scene about 5 p.m. the day of the explosion. The city public works department had already made its initial effort to build dikes and to channel the runoff water into a drainage ditch. The EPA team eventually took over, and nearly a week later helped pump the contained contaminated (although somewhat treated) water into the river.

Overall, the explosions, fire and toxic releases and spills at the chemical plant were a major and serious emergency for those directly involved. However, the incident presented more of a potential threat rather than actual

disaster for the city of Minutilli. While most of the emergency organizations in Minutilli and some of those from Rossatti county participated in the emergency response, community life as a whole was not interrupted for long or in a serious way. For most people in the metropolitan area, the incident at the plant was primarily a local news story; only for several thousand people around the plant was there a direct impact or actual threat to life and well being. A more community-wide disaster had been possible, but did not materialize, which was fortunate since the organized response to the incident showed some weaknesses as well as strengths in the community disaster stance.

Evaluation of Response

In the previously discussed case study of Baer, it was observed that there was a generally poor response to the explosion. In the fire case reported in this chapter in Minutilli, both positive and negative aspects of the response can be noted. Overall, the organized effort was far better than that described for Baer, but not as good as will be detailed in the next chapter which describes the major dangerous chemical incident at Mississauga, Canada.

Extra community agencies who participated in or evaluated the organized response at Minutilli, found much to praise. Similarly, the post-disaster self critiques made by the community emergency organizations noted a number of positive aspects about what had happened. Likewise, it is possible to arrive at some favorable evaluations when the organized response is measured against the pre-impact planning for mass emergencies.

From a technological viewpoint, the community as a whole had more expertise and resources available for chemical disasters than is typically the case. There was no shortage either of appropriate knowledge or material and immaterial things necessary for the kind of incident which occurred. The fire department seemed particularly professional in its approach to the plant explosions and fires. The firefighters who initially arrived on the scene were careful, and quickly obtained information about the nature and properties of the dangerous chemicals which might be involved. Protective clothing was worn as it should have been in such a situation. Fire department members were well trained in setting up equipment, and in the use of unmanned nozzles which permitted the penetration of a volatile fire situation without unnecessarily risking personnel.

From an organizational perspective, some, although not all, appropriate communication and coordination was achieved. The civil defense office performed its mandated function of monitoring all emergency relevant communications. It did notify several key officials and organizations fairly quickly after the incident started. The Emergency Operation Center did partially operate as a general information center and a referral point. Prior liaisons between the local fire department and the chemical company enabled the two organizations to quickly exchange information when the first fire units arrived at the plant site. Officials from the company were able to keep the firefighters fairly well informed of the nature, properties and locations of dangerous chemicals in the installation. Chemical company and fire department officials kept in communication from the start of the incident through to the small fires occurring in the post-disaster period, and essentially took a

cooperative approach to the whole situation.

Some of the previously planned division of labor was carried out. The fire department, with its expertise (including its hazardous material units) was in complete charge of operations on the scene. The police department, as prior disaster planning had specified, led the effort to warn residents in the neighborhoods about the danger, and also issued the calls for an evacuation. The federal EPA regional team was the coordinative agency in charge of the neutralization and the clean-up of the resultant water contamination.

Up until the incident, the community disaster planning for a toxic chemical incident had not been seriously tested. The explosions and poisonous fumes from the chemical company presented a potentially dangerous situation for the community as a whole, and an actual disaster for those most directly involved. On the whole, emergency organization officials believed that they did well. As one official said:

> We have a plan for disaster preparedness and this is what we used to great effect. We had the potential for having a lot of people killed, but the firemen knew what to do and what had to be done. They did a superhuman effort at getting things under control.

Similar positive statements were made in post-impact mass media evaluations of the incident.

On the other hand, there were some serious technological and organizational problems in the organized response, not all of which were explicitly recognized by the responding groups. Not all parts of the disaster planning worked equally well, and in some cases, even when the plan was followed, unforeseen difficulties emerged. One very important aspect of what occurred, the evacuation effort, was seriously flawed from the initial warnings to the returning of the evacuees to their homes.

In the technological realm, at least several questions could be raised, although none are as important as some major organizational weaknesses. None proved to be serious in the particular incident involved, but the potential for problems in future similar emergencies is obvious.

There was a possibility that foam rather than water could have been used in extinguishing the initial blaze. This could have restricted the extent of the toxic plume. Even the specialists in the fire department's hazardous materials unit were unclear after the incident, as to which substance was preferable although it was acknowledged that the cost of the foam might be prohibitive.

The fire department personnel themselves felt that they may have concentrated too much of their effort on extinguishing the fire. This led them to ignore the eventual run-off problem. They indicated that they should have recognized the problem sooner and avoided much of the contamination through earlier construction of a dike.

No thought had apparently been given to the communication batteries that would certainly run dry if they were in continuous use. Minor lapses in

communication occurred because of this lack of planning. It was thought the problem might be solved in the future by maintaining additional batteries and charges at the operational command post.

There seemed to be some question, although not by the agency itself of how well the EPA Regional Team handled the whole post-disaster contamination issue. It was not certain, according to some local experts, that an adequate analysis had been made of the contaminated water contained by temporary dikes in the drainage ditch. The decision to let the water into the river appeared doubtful to some.

More important were several organizational problems. In particular, there were serious difficulties with the evacuation process and with some aspects of interorganizational communication with the public.

As already noted, while people were evacuated, there were problems at all stages of the process. There was confusion and delay in deciding when and how far to evacuate. Warning messages failed to reach all potential evacuees, and when it was heard, the information provided was sometimes incomplete or inaccurate. The public shelter was not prepared to receive evacuees. No clear system of notifying evacuees when to return was developed, and residents obtained inconsistent information on the matter from a variety of sources. Those in the public shelter had to find their own way back to their homes. Behind the scenes, key organizational officials never had a good overall grasp of the evacuation effort.

Some organizations communicated well with one another, but many did not. The separate command posts established by the fire and the police departments, according to the disaster plan, to avoid communication related convergence, created other communication problems. The use of couriers between the posts to coordinate fire fighting operations with those relating to site security and evacuation, did not work too well. The police department clearly lagged in its knowledge of disaster related happenings. Close pre-disaster informal links between some fire and police personnel helped to link the two organizations, but could not completely compensate for the consequences stemming from the establishment of two command posts. The area hospitals were never really linked to the other emergency organizations. Extra-community groups were sometimes independently and unnecessarily contacted by several different local groups.

The lack of interorganizational communication extended over from the emergency to the post-impact period. This resulted in unnecessary duplication, for example, in the testing of water quality. This task was performed by the EPA, the public health department and the local department of public works. While the EPA was sending samples for analysis to its laboratories, the state D.P.H. maintained a mobile lab at the site, and unknown to both organizations, the Minutilli public works department had comprehensive laboratory equipment and qualified analysts in its own organization who could have done the analyses.

Apart from these two major problems, there were other, more minor difficulties. Information dissemination to the press was provided by many different organizational personnel at the scene, resulting in the public receiving

confusing and inconsistent information. The civil defense agency tried to deal with this problem but could respond only to press calls to its Emergency Operations Center. No pass system was ever established. While there was no great convergence on the disaster site, law enforcement agencies enforced site security so tightly, that key officials from other emergency organizations were unnecessarily detained at roadblocks. Not all organizations which on an everyday basis have little or no emergency functions or responsibilities can quickly adapt when a disaster happens, even when they are made a part of the community disaster plan. In the Minutilli incident, the city's public works department was quickly able to provide the personnel and equipment to build temporary dikes; the mass transit company proved unable to speedily deliver the buses and drivers needed for a relatively small-scale evacuation effort.

Concluding Remarks

The technological difficulties noted should be seen in a larger context. Those aspects alluded to partly reflect the professionalism and standards of excellence pursued in a particular community. Both professionalism and standards are high in Minutilli, certainly as compared with the orientation of many other communities to chemical emergencies and disasters. The problems of contaminated water run-off, radio communications disruptions and questions relating to the use of foam in firefighting are ubiquitous in such situations although the recognition of errors in response is variable. In Minutilli, they were recognized because they were seen as falling below acceptable professional standards.

There was far less recognition of the organizational problems in the response. There was little indication that the evacuation process in disasters was going to undergo a major reexamination. Neither did it appear intensive efforts would be made to attempt to improve the planning for interorganizational communication and coordination in future disasters. In part, this may stem from the relatively weak position of the civil defense organization in Rossacti county, both in terms of legitimacy and power. While the local civil defense office seems to be more positively evaluated in the area than is the typical civil defense agency in most American communities, this is only in relative rather than absolute terms. It does not appear that advantage will be taken of the opportunity provided by the incident, to point out the weaknesses of disaster planning and response in the area, and how the event showed what serious problems could arise in a more catastrophic future situation.

There were positive aspects of the organized response, as noted earlier. Unfortunately, it appears the key and relevant emergency officials and organizations in Minutilli will only stress those in their longer run post-disaster public stance. It is valid and important to point out where disaster planning is good and when it works. In fact, the positive aspects can be used to lead into an examination and analysis of the less positive features in the situation. If this is not done in Minutilli, and it does not appear to have been done as of the writing of this report, the future may bring a catastrophe where the negative aspects might overwhelm the positive ones, unlike in the just discussed case where there were elements of both.