City of Chicago

R2018-676

Office of the City Clerk

Document Tracking Sheet

Meeting Date:	6/27/2018
Sponsor(s):	Emanuel (Mayor)
Type:	Resolution
Title:	Adoption of Cook County Multi-Jurisdictional Hazard Mitigation Plan and The City of Chicago Annex to the Plan
Committee(s) Assignment:	Committee on Public Safety

OFFICE OF THE MAYOR

CITY OF CHICAGO

RAHM EMANUEL
MAYOR

June 27, 2018

TO THE HONORABLE, THE CITY COUNCIL
OF THE CITY OF CHICAGO

Ladies and Gentlemen:

At the request of the Executive Director of Emergency Management and Communications, I transmit herewith a resolution adopting the Cook County Multi-Jurisdictional Hazard Mitigation Plan.

Your favorable consideration of this resolution will be appreciated.

Very truly yours,

Rahm Emanuel

Mayor

A RESOLUTION ADOPTING VOLUME 1 OF THE COOK COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN AND ADOPTING THE CITY OF CHICAGO ANNEX TO THE PLAN

WHEREAS, The federal Disaster Mitigation Act of 2000 (Public Law 106-390, enacted October 30, 2000) requires jurisdictions to adopt a Hazard Mitigation Plan on a form approved by the Federal Emergency Management Agency ("FEMA") to enable local eligibility for future hazard mitigation grant funds; and

WHEREAS, The Hazard Mitigation Grant Program ("HMGP") is a program managed by the State of Illinois to administer funds from FEMA; and

WHEREAS, The intent of the HMGP is to reduce the risk of future damage, hardship, loss, or suffering caused by natural hazards by providing financial support to carry out cost-effective hazard mitigation projects and plans as required of state and local governments as a condition of receiving federal disaster and emergency management assistance; and

WHEREAS, proactive mitigation of known natural hazards before a disaster event occurs can reduce or eliminate long-term risk to life and property; and

WHEREAS, the current Hazard Mitigation Plan ("City HMP") of the City of Chicago ("City") expires in August, 2018; and

WHEREAS, in lieu of creating a new City HMP to replace the expiring City HMP, the City of Chicago seeks to adopt Volume 1 of the Cook County Multi-Jurisdictional Hazard Mitigation Plan ("County HMP") to enhance regional collaboration, as well as a City jurisdictional annex document ("City Annex") to the County HMP; now, therefore,

BE IT RESOLVED:

The City:

1.) Adopts Volume 1 – Planning-Area-Wide Elements of the County HMP, attached hereto as Exhibit A, effective immediately.

2.) Adopts the City Annex, attached hereto as Exhibit B, as the City's annex to Volume 2 of the County HMP, effective immediately upon the expiration of the City HMP.

3.) Will use the adopted and approved portions of the County HMP, and the City Annex, to guide pre- and post-disaster mitigation of the natural hazards identified therein.

4.) Will coordinate the strategies identified in the County HMP and the City Annex with other planning programs and mechanisms under the City's jurisdictional authority.

5.) Will continue its support of the County HMP Steering Committee and continue to participate in the Planning Partnership as described by the County HMP.

6.) Will help to promote and support the mitigation successes of all Planning Partners participating in the County HMP.

Exhibit A

Volume 1 of the County HMP

[see attached Executive Summary]

The entirety of Volume 1 (381 pages) can be located on the internet at:

https://www.cookcountyhomelandsecurity.org/sites/default/files/images/CookCountyHMP_Vol1-Final-11-06-14small.pdf

COOK COUNTY
MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

VOLUME 1—PLANNING-AREA-WIDE ELEMENTS

FINAL

SEPTEMBER 10, 2014

Prepared for:

Cook County
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Toni Preckwinkle
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Revised November 6, 2014

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EXECUTIVE SUMMARY

Hazard mitigation is the use of long-term and short-term policies, programs, projects, and other activities to alleviate the death, injury, and property damage that can result from a disaster. Cook County and a coalition of 114 planning partners (115 partners total) prepared the Cook County Multi-Jurisdictional Hazard Mitigation Plan in order to identify the risks posed by hazards and find ways to reduce their impacts. The plan reduces risk for those who live in, work in, and visit the County.

COOK COUNTY OVERVIEW

Cook County is located in northeast Illinois on the western shore of Lake Michigan (see Figure 2-1). It is the most populous of Illinois' 102 counties, with a 2013 estimated population of 5.24 million. It is the sixth largest county in the state by area, covering 946 square miles. Cook County makes up approximately 40 percent of the population of Illinois. The surrounding counties are Lake and McHenry to the north, Kane and DuPage to the west, and Will to the southwest. Lake Michigan is the county's eastern border.

Cook County is the second most populous county in the United States, after Los Angeles County. The county contains 134 municipalities, covering about 85 percent of the area of the county. The remaining unincorporated areas are under the jurisdiction of the Cook County Board of Commissioners, a 17-member board elected by district.

The planning area's economy is strongly based in the educational services, health care, and social assistance industry, followed by the professional, scientific, management, administrative, and waste management industries. Major businesses include the U.S. Government, Jewel-Osco, United Airlines, Motorola, Abbot Laboratories, Target Corporation, Walgreens, Bank One, and Sears, Roebuck and Company. Major educational and research institutions in the county include Northwestern University, Loyola University, DePaul University, the University of Chicago, and the University of Illinois at Chicago.

Cook County has experienced 19 hazard events since 1967 for which federal disaster declarations were issued. The Spatial Hazard Events and Losses Database for the United States (SHELDUS), maintained by the University of South Carolina, includes many more hazard events. For Cook County, SHELDUS lists 748 instances of monetary or human loss due to a hazard event.

PARTICIPATING PARTNERS AND THE PLANNING AREA

The responsibility for hazard mitigation lies with many, including private property owners; business and industry; and local, state, and federal government. Through multi-jurisdictional partnerships, local jurisdictions within an area that has uniform risk exposure can pool resources and eliminate redundant planning activities. Cook County opened this planning effort to all municipalities within the County. Table ES-1 lists the planning partners that participated in the planning process and are covered under this plan. The planning area was defined as all incorporated and unincorporated areas of Cook County as well as the incorporated areas of cities that cross county boundaries. The planning area boundary is shown on Figure 2-1.

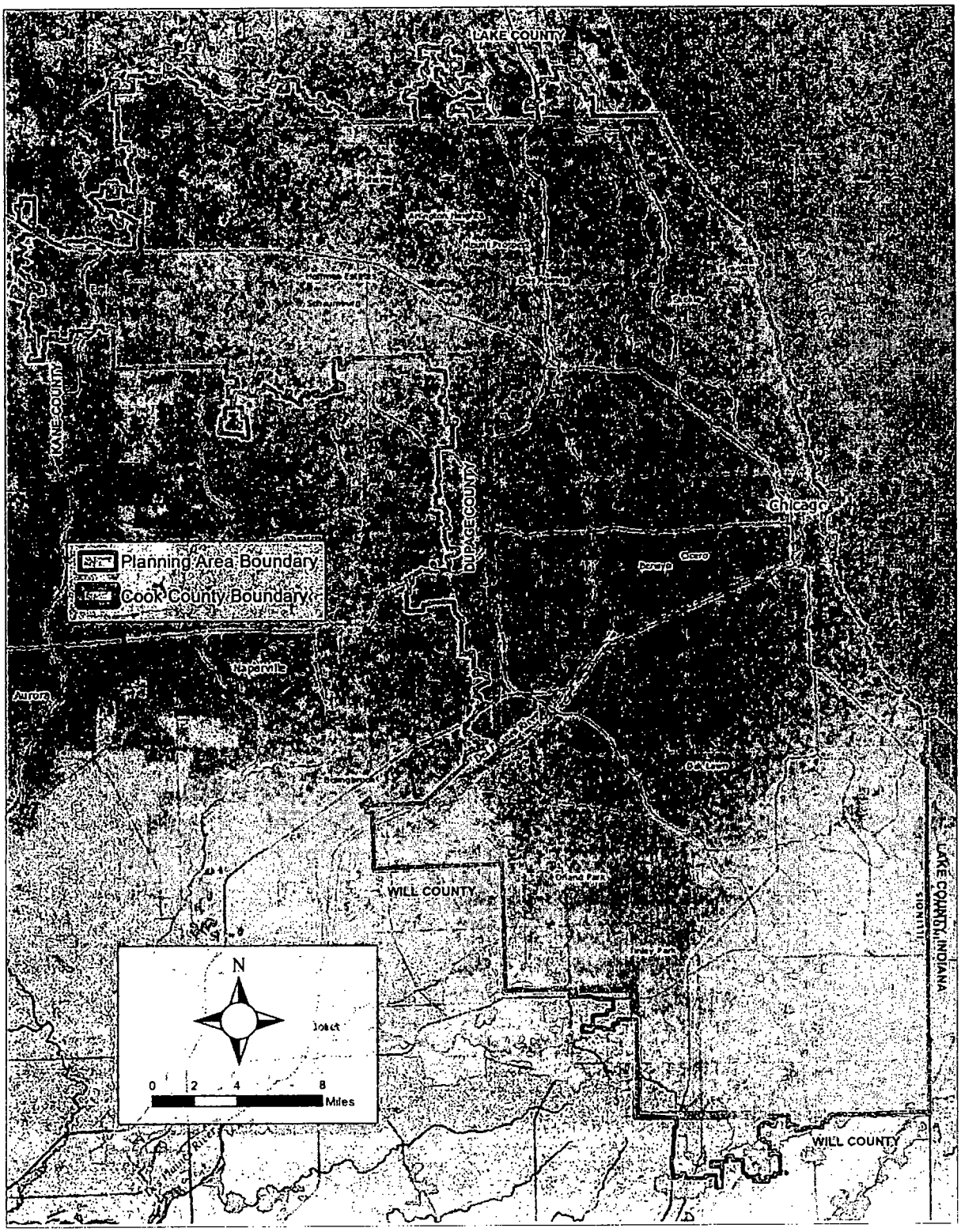


Figure ES-1-1 Main Features of the Planning Area

TABLE ES-1.
PLANNING PARTNERS COVERED BY THIS HAZARD MITIGATION PLAN

Village of Alsip	Village of Arlington Heights	Village of Bedford Park	Village of Bellwood
Village of Berkeley	City of Berwyn	City of Blue Island	Village of Bridgeview
Village of Broadview	Village of Brookfield	City of Burbank	Village of Burnham
City of Calumet City	Village of Calumet Park	City of Chicago Heights	Village of Chicago Ridge
Town of Cicero	Cook County	City of Country Club Hills	City of Countryside
Village of Crestwood	Village of Dixmoor	Village of Dolton	Village of East Hazel Crest
Village of Elk Grove Village	Village of Elmwood Park	City of Evanston	Village of Evergreen Park
Village of Flossmoor	Village of Ford Heights	Village of Forest Park	Village of Forest View
Village of Franklin Park	Village of Glencoe	Village of Glenview	Village of Glenwood
Village of Golf	Village of Hanover Park	City of Harvey	Village of Harwood Heights
Village of Hazel Crest	City of Hickory Hills	Village of Hillside	Village of Hodgkins
Village of Hoffman Estates	Village of Homewood	Village of Indian Head Park	Village of Inverness
Village of Justice	Village of Kenilworth	Village of La Grange	Village of La Grange Park
Village of Lansing	Village of Lemont	Village of Lincolnwood	Village of Lynwood
Village of Lyons	City of Markham	Village of Matteson	Village of Maywood
Village of McCook	Village of Melrose Park	Village of Merrionette Park	Village of Midlothian
Village of Morton Grove	Village of Mount Prospect	Village of Niles	Village of Norridge
Village of North Riverside	Village of Northbrook	Village of Northfield	Village of Northlake
City of Oak Forest	City of Oak Lawn	Village of Oak Park	Village of Olympia Fields
Village of Orland Hills	Village of Orland Park	Village of Palatine	City of Palos Heights
City of Palos Hills	Village of Palos Park	City of Park Ridge	Village of Phoenix
Village of Posen	Village of Prospect Heights	Village of River Forest	Village of River Grove
Village of Riverdale	Village of Riverside	Village of Robbins	City of Rolling Meadows
Village of Rosemont	Village of Sauk Village	Village of Schaumburg	Village of Schiller Park
Village of Skokie	Village of South Barrington	Village of South Chicago Heights	Village of South Holland
Village of Steger	Village of Stickney	Village of Stone Park	Village of Streamwood
Village of Summit	Village of Thornton	Village of Tinley Park	Village of Westchester
Village of Western Springs	Village of Wheeling	Village of Willow Springs	Village of Wilmette
Village of Winnetka	Village of Worth	Metropolitan Water Reclamation District of Greater Chicago	

PLAN DEVELOPMENT AND ORGANIZATION

The Cook County Multi-Jurisdictional Hazard Mitigation Plan was developed under a grant from the Illinois Emergency Management Agency by a planning team of Cook County Department of Homeland Security and Emergency Management staff and expert consultants, with guidance from a Steering Committee representing the planning partners and other local stakeholders. The key steps in developing the plan were as follows:

- **Coordination with Other Agencies**—Opportunities for involvement were provided to neighboring communities, local and regional agencies involved in hazard mitigation, agencies that regulate development, businesses, academia, and other private and nonprofit interests
- **Review of Existing Programs**—Existing local and state plans, studies, reports and technical information were reviewed and incorporated as appropriate.
- **Public Involvement**—Broad public participation in the planning process was provided through Steering Committee participation, use of a widely distributed questionnaire, media outreach, and public meetings.

The final plan consists of two volumes. Volume 1 includes all federally required elements of a disaster mitigation plan that apply to the entire planning area. Volume 2 includes all federally required jurisdiction-specific elements, in individual annexes for each participating jurisdiction.

MISSION, GOALS AND OBJECTIVES

The defined mission for the Cook County Multi-Jurisdictional Hazard Mitigation Plan is to "Identify risks and sustainable cost-effective actions to mitigate the impact of natural hazards in order to protect the life, health, safety, welfare, and economy of the communities of Cook County." Mitigation goals were established as follows:

1. Develop and implement sustainable, cost-effective, and environmentally sound risk-reduction (mitigation) projects.
2. Protect the lives, health, safety, and property of the citizens of Cook County from the impacts of natural hazards.
3. Protect public services and critical facilities, including infrastructure, from loss of use during natural hazard events and potential damage from such events.
4. Involve stakeholders to enhance the local capacity to mitigate, prepare for, and respond to the impacts of natural hazards.
5. Develop, promote, and integrate mitigation action plans.
6. Promote public understanding of and support for hazard mitigation.

Thirteen objectives were established for the plan that meet multiple goals, serving as stand-alone measurements of the effectiveness of the mitigation action. Proposed mitigation actions were evaluated in part based on how many objectives they would help to fulfill.

HAZARDS ADDRESSED

The Steering Committee considered the full range of natural hazards that could impact the planning area and identified the following hazards as presenting the greatest concern:

- Dam or levee failure

- Drought
- Earthquake
- Flood
- Severe weather
- Severe winter weather
- Tornado.

Detailed risk assessments were performed for each of these hazards of concern. In addition, a brief qualitative review was conducted of technological and human-caused hazards of interest, which were not considered as critical as the hazards of concern: epidemic or pandemic; nuclear power plant incident; mass influx of evacuees; widespread power outage; hazardous material incident. A separate qualitative review also was performed for climate change.

RISK ASSESSMENT METHODOLOGY

The risk assessments of the identified hazards of concern describe the risks associated with each hazard. The following steps were used to define the risk of each hazard:

- Profile each hazard, describing the geographic area it affects, its frequency and severity, and the warning time provided before a hazard event occurs.
- Use maps of hazard impact areas to determine how many structures, facilities, and systems are exposed to each hazard.
- Assess the vulnerability of exposed structures and infrastructure based on exposure and the probability of occurrence of a hazard event. Tools such as the Federal Emergency Management Agency's (FEMA's) hazard-modeling program called Hazus-MH were used to perform this assessment for flood, dam failure, earthquake hazards, and tornado. Outputs similar to those from Hazus-MH were generated for other hazards, using maps generated by the Hazus-MH program.

A detailed inventory of critical facilities and infrastructure was developed for this plan using GIS applications. Over 6,000 facilities were inventoried and uploaded into the Hazus-MH model to support the risk assessment. Table 5-3 and Table 5-4 summarize the general types of critical facilities and infrastructure, respectively.

TABLE ES-2.
CRITICAL FACILITIES BY JURISDICTION AND CATEGORY

Medical and Health	Government Functions	Protective Functions	Schools	Hazardous Materials	Other Critical Functions	Total
696	79	495	2551	2476	221	6518

TABLE ES-3.
CRITICAL INFRASTRUCTURE BY JURISDICTION AND CATEGORY

Bridges	Water Supply	Wastewater	Power	Communication	Transportation	Dams	Total
1,499	102	143	244	209	639	31	2,867

PROFILES OF COOK COUNTY HAZARDS OF CONCERN

Dam and Levee Failure

There are 23 state regulated dams in the planning area. Ten of these dams are classified as "high hazard" which means they have significant downstream populations at risk if the dam should fail. Flooding as a result of a dam and levee failure would significantly impact properties and populations in the inundation zones. No records of dam failures in the planning area are available.

There are three levee systems in Cook County. There is no history of levee failures in the planning area. The State of Illinois experienced levee failures in 1993 and 2008. In 1993, 17 levee systems breached along the Mississippi River and the Illinois River just north of where it meets the Mississippi River. Over 237,000 acres along the rivers were flooded.

Warning time for dam or levee failure varies depending on the cause of the failure. In events of extreme precipitation or massive snowmelt, evacuations can be planned with sufficient time. In the event of a structural failure due to earthquake, there may be no warning time. Cook County and its planning partners have established protocols for flood warning and response to imminent dam failure in the flood warning portion of its adopted emergency operations plan. These protocols are tied to the emergency action plans created by the dam owners.

Important issues associated with dam and levee failure include the following:

- Federally regulated dams have an adequate level of oversight and sophistication in their emergency action plans. However, the protocol for notifying downstream citizens of imminent failure needs to be tied to local emergency response planning.
- Mapping that estimates inundation depths is needed for non-federal-regulated dams to better assess the risk associated with dam failure from these facilities.
- Most dam failure mapping required at federal levels requires determination of the probable maximum flood, which is a worst-case scenario and generally the event with the lowest probability of occurrence. For non-federal-regulated dams, mapping of dam failure scenarios that are less extreme than the probable maximum flood but have a higher probability of occurrence could better illustrate areas potentially impacted by more frequent events to support emergency response and preparedness.
- The concept of residual risk associated with structural flood control projects should be considered in the design of capital projects and the application of land use regulations.
- Addressing security concerns and the need to inform the public of the risk associated with dam failure is a challenge for public officials.
- Not all levees are reflected in the current flood mapping, which makes delineation of the hazard area difficult.

Drought

Droughts originate from a deficiency of precipitation resulting from an unusual weather pattern. If the weather pattern lasts a short time (a few weeks or a couple months), the drought is considered short-term. If the weather pattern becomes entrenched and the precipitation deficits last for several months or years, the drought is considered to be long-term. Drought generally affects large geographic areas, so drought descriptions in the hazard mitigation plan are generally for the entire State of Illinois rather than the immediate planning area of Cook County.

The most severe droughts in Illinois occurred in the summer of 1934, the summer of 1931 and 1954. All three of these events were categorized as extreme droughts. More recently, in September 1983, all 102 counties were declared state disaster areas because of high temperatures and insufficient precipitation. In 1988, 54 percent of the state was impacted by drought-like conditions, resulting in disaster relief payments to landowners and farmers exceeding $382 million. Historical drought data for the planning area indicate there have been seven significant droughts in the last 115 years. This equates to a drought every 16 years on average, or a 6.25-percent chance of a drought in any given year.

Drought can have a widespread impact on the environment and the economy, although it typically does not result in loss of life or damage to property, as do other natural disasters. The National Drought Mitigation Center describes likely drought impacts as those affecting agriculture, water supplies, and the risk of fire.

Scientists at this time do not know how to predict drought more than a month in advance for most locations. How long a drought lasts depends on interactions between the atmosphere and the oceans, soil moisture and land surface processes, topography, internal dynamics, and the accumulated influence of weather systems on the global scale.

Important issues associated with drought include the following:

- Identification and development of alternative water supplies
- Use of groundwater recharge techniques to stabilize the groundwater supply
- The probability of increased drought frequencies and durations due to climate change
- The promotion of active water conservation even during non-drought periods.

Earthquake

An earthquake is the vibration of the earth's surface following a release of energy in the earth's crust. Earthquakes tend to occur along faults, which are zones of weakness in the crust. Earthquakes occur throughout Illinois, with most in the southern third of the state. Over 360 earthquakes have occurred in Illinois during the past 20 year, with 32 resulting in damage. Fifteen events have been recorded in Cook, DuPage, Kane, Kendall, and Will Counties since 1804. Cook County has experienced three earthquakes ranging from a magnitude of 3 (categorized as "minor") to 4.9 (categorized as "light").

The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Casualties generally result from falling objects and debris, because the shocks shake, damage or demolish buildings and other structures. Disruption of communications, electrical power supplies and gas, sewer and water lines should be expected. Earthquakes may trigger fires, dam failures, or releases of hazardous material, compounding their effects. Any seismic activity of 6.0 or greater on faults within the planning area would have significant impacts throughout the county. Earthquakes of this magnitude or higher would lead to massive failure of structures built on loose soils. Levees and revetments built on such soils would likely fail, representing a loss of critical infrastructure. These events could cause secondary hazards, including mudslides that would further damage structures.

There is currently no reliable way to predict an earthquake at any given location with any significant advance warning time. Research is being done with warning systems that use the low energy waves that precede major earthquakes to give approximately 40 seconds notice that a major earthquake is about to occur. The warning time is very short but it could allow for someone to get under a desk, step away from a hazardous material they are working with, or shut down a computer system.

Important issues associated with earthquakes include the following:

- The public perception of the earthquake risk within the planning area is low. It can be difficult to get the public to think about earthquake mitigation with little or no perceived risk.
- Most of the planning area's building stock was built prior to 1975, when seismic provisions became uniformly applied through building code applications. A building stock analysis that looks at the potential fragility of the older building stock constructed without building code influence would be beneficial in the identification of seismic mitigation projects.
- More earthquake mapping is needed for the planning area.
- Critical facility owners/operators should be encouraged to create or enhance continuity of operations plans using the information on risk and vulnerability contained in the Cook County hazard mitigation plan.
- Geotechnical standards should be established that take into account the probable impacts from earthquakes in the design and construction of new or enhanced facilities.
- The County has over 6 miles of earthen levees and revetments on soft, unstable soil. These soils are prone to liquefaction, which would severely undermine the integrity of these facilities.
- There are a large number of earthen dams within the planning area. Dam failure warning and evacuation plans and procedures should be reviewed and updated to reflect the dams' risk potential associated with earthquake activity in the region.

Flood

Flood Types and History

Two types of flooding are typical in Cook County: riverine flooding when water overflows the banks of a stream; and stormwater/urban drainage flooding, when storm runoff exceeds the capacity of local drainage systems in place to convey stormwater to a receiving body. Flood events of historical significance occurred in the Cook County region in 1849, 1855, 1885, 1938, 1952, 1954, 1957, 1961, 1973, 1979, 1986, 1987, 1996, 2001,2004, 2010 and 2013. Since 1972, 13 presidential-declared flood events in the County have caused in excess of $628.5 million in property damage.

In the past 20 years, stormwater/urban drainage flooding has become the principal cause of flood losses in the Cook County planning area. Urban portions of the county annually experience nuisance flooding related to drainage issues. After flooding in August 2010, FEMA provided more than $435 million in disaster recovery, response, and mitigation in Cook and DuPage Counties, and more than 75 percent of this went to individual homeowners, most of whom suffered sewer back-ups and basement flooding caused by stormwater/urban drainage flooding. The frequency and the magnitude of stormwater/urban drainage flooding in Cook County dictated the assignment of stormwater management within the County to a single entity—the Metropolitan Water Reclamation District of Greater Chicago.

Cook County experiences episodes of river flooding almost every winter. Large floods that can cause property damage typically occur every three to seven years.

Flood Mapping

Flood studies use historical records to determine the probability of occurrence for different river discharge (flow) levels. The flood frequency equals 100 divided by the discharge probability. For example, the 100-year discharge has a 1-percent chance of being equaled or exceeded in any given year. The extent of flooding associated with a 1-percent annual probability of occurrence (the base flood or 100-year flood) is

used as a regulatory boundary by many agencies. This boundary is a convenient tool for assessing risk in flood-prone communities. For most communities participating in the National Flood Insurance Program (NFIP), FEMA has prepared a detailed Flood Insurance Study that presents water surface elevations for the 1-percent annual chance flood and the 0.2-percent annual chance flood (the 500-year flood). The boundaries of the 100- and 500-year floodplains are shown on Flood Insurance Rate Maps.

FEMA has mapped over 78 square miles of 100-year floodplain and 99 square miles of 500-year floodplain along 172 water courses in the Cook County planning area. Approximately 8 percent of the County is located within mapped 100-year floodplains.

Flood Severity

The principal factors affecting flood damage are flood depth and velocity. The deeper and faster flood flows become, the more damage they can cause. Shallow flooding with high velocities can cause as much damage as deep flooding with slow velocity. This is especially true when a channel migrates over a broad floodplain, redirecting high-velocity flows and transporting debris and sediment.

The worst-case scenario for flooding in the Cook County planning area has happened numerous times in the past. It involves intense rain storms that stall over the planning area, dropping rainfall totals in excess 6 inches over a 48-hour period (this scenario is significantly exacerbated by the presence of snow pack on the ground). This leads to both riverine and stormwater/urban drainage flooding that can overwhelm flood response capabilities in the planning area. Major roads can be blocked, preventing critical access for many residents and critical functions. High in-channel flows can cause water courses to scour, possibly washing out roads and creating more isolation problems.

Flood Warning

The Cook County flood threat system consists of a network of precipitation gages throughout the watershed and stream gages at strategic locations that constantly monitor and report stream levels. All of this information is analyzed by agencies such as Cook County Department of Homeland Security and Emergency Management (DHSEM) and Metropolitan Water Reclamation District to evaluate the flood threat and possible evacuation needs.

Floods are generally classed as either slow-rise or flash floods. Due to the sequential pattern of meteorological conditions needed to cause serious slow-rise flooding, it is unusual for a slow-rise flood to occur without warning. Slow-rise floods may be preceded by a warning time from several hours, to days, to possibly weeks. Evacuation and sandbagging for a slow-rise flood may lessen flood damage. Flash floods are more difficult to prepare for, due to the extremely short warning time given, if any. Flash flood warnings usually require evacuation within an hour. However, potential hazard areas can be warned in advance of potential flash flooding danger.

Participation in Federal Flood Programs

The NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities. Cook County entered the NFIP on April 15, 1981. The effective date for the current countywide Flood Insurance Rate Map is August 19, 2008. In addition to the County, most Cook County municipalities participate in the NFIP. The planning area has 17,807 flood insurance policies providing $3.464 billion in insurance coverage. According to FEMA statistics, 14,335 flood insurance claims were paid between January 1, 1978 and February 28, 2014, for a total of $157.7 million, an average of $10,970 per claim.

Twenty communities in the planning area also participate in the Community Rating System (CRS) a voluntary program that encourages floodplain management activities that exceed the NFIP requirements. The CRS requires participating communities to identify repetitive loss areas, where flood insurance claims have been paid multiple times for individual properties. FEMA identifies 1,571 such properties in the planning area as of January 31, 2014.

Issues

Important issues associated with flooding include the following:

- The 2-D, unsteady-state modeling performed by the Metropolitan Water Reclamation District is considered to be the best available flood risk data for the planning are, but it is not the basis of FEMA's current effective Flood Insurance Rate Map. The District's flood hazard data should be formatted so that can be used to support risk assessment and thus validate best available data.
- The planning area has a large percentage of policies and losses outside a mapped hazard area.
- Basement flooding is a common problem.
- The stormwater/urban drainage flooding risk is not mapped, which makes it difficult to assess this hazard, other than looking at historical loss data.
- The risk associated with the flood hazard overlaps the risk associated with other hazards such as earthquake. This provides an opportunity to seek mitigation alternatives with multiple objectives that can reduce risk for multiple hazards.
- There is no consistency of land-use practices and regulatory floodplain management within the planning area.
- It is unclear how potential climate change may impact flood conditions in the planning area.
- The concept of residual risk should be considered in the design of future capital flood control projects and should be communicated with residents living in the floodplain.
- More information is needed on flood risk to support the concept of risk-based analysis of capital projects.
- There needs to be a sustained effort to gather historical damage data, such as high water marks on structures and damage reports, to measure the cost-effectiveness of future mitigation projects.
- Ongoing flood hazard mitigation will require funding from multiple sources.
- There needs to be a coordinated hazard mitigation effort between jurisdictions affected by flood hazards in the county.
- Floodplain residents need to continue to be educated about flood preparedness and the resources available during and after floods.
- The promotion of flood insurance as a means of protecting private property owners from the economic impacts of frequent flood events should continue.
- The economy affects a jurisdiction's ability to manage its floodplains. Budget cuts and personnel losses can strain resources needed to support floodplain management.

Severe Weather

Severe weather refers to any dangerous meteorological phenomena with the potential to cause damage, serious social disruption, or loss of human life. It includes extreme heat, lightning, hail, fog, and high winds. Severe-weather events can happen anywhere in the planning area. Severe local storms are probably the most common widespread hazard. They affect large numbers of people throughout Cook County and the surrounding region when they occur. The heat wave of July 1995 was one of the worst disasters in Illinois history, with over 700 deaths statewide over five-days.

Records from the National Climatic Data Center and SHELDUS indicate approximately 500 severe weather events in the planning area between 1950 and 2013. The 169 severe weather events for the planning area from 1993 to 2013 represent an average of 8 events per year. According to the 2013 Illinois Natural Hazard Mitigation Plan, the planning area is designated as severely vulnerable to severe storms, with a high vulnerability to extreme heat.

The most common problems associated with severe storms are immobility and loss of utilities. Roads may become impassable due to flooding, downed trees, or a landslide. Power lines may be downed due to high winds, and services such as water or phone may not be able to operate without power. Lightning can cause severe damage and injury. A worst-case severe-weather event would involve prolonged high winds during a thunderstorm. Such an event would have both short-term and longer-term effects. Initially, schools and roads would be closed due to power outages caused by high winds and downed tree obstructions. In more rural areas, some subdivisions could experience limited ingress and egress. Prolonged rain could produce flooding and overtopped culverts with ponded water on roads. Flooding could further obstruct roads and bridges, further isolating residents.

Meteorologists can often predict the likelihood of a severe storm or other severe weather event. This can give several days of warning time. The Chicago Office of the National Weather Service issues severe storm watches and warnings when appropriate to alert government agencies and the public of possible or impending weather events. The watches and warnings are broadcast over NOAA weather radio and are forwarded to the local media for retransmission using the Emergency Alert System.

Important issues associated with severe weather include the following:

- Redundancy of power supply throughout the planning area must be evaluated.
- The capacity for backup power generation is limited.
- Public education on dealing with the impacts of severe weather needs to be provided
- Debris management (downed trees, etc.) must be addressed.
- The effects of climate change may result in an increase in frequency of extreme heat events.

Severe Winter Weather

The severe winter weather hazard encompasses snow, blizzards, ice storms and extreme cold temperatures and wind chill. Severe winter weather events can happen anywhere in the planning area. NOAA identifies nearly 100 severe winter weather events in the planning area since 1950, excluding snowstorms classified as less than major snowstorms. The planning area typically receives 36 inches of snow each year and can expect to experience exposure to some type of severe winter weather event at least annually.

Severe winter weather impacts can be significant. Roads may become impassable due to ice or snow. Power lines may be downed due to high winds or ice accumulation, and services such as water or phone

may not be able to operate without power. Physical damage to homes and facilities can occur from wind damage or accumulation of snow or ice. Freezing rain can cause the most dangerous conditions. Ice buildup can bring down trees, communication towers, and wires, creating hazards for property owners, motorists, and pedestrians alike. Many severe winter weather events in the planning area have resulted in the loss of life.

Meteorologists can often predict likely severe winter weather, giving several days of warning time. The National Weather Service provides public warnings on storm, snow and ice events as appropriate to alert government agencies and the public of possible or impending weather events. Watches and warnings are broadcast over NOAA weather radio and are forwarded to local media for retransmission using the Emergency Alert System.

Important issues associated with severe winter weather in the planning area include the following:

- Older building stock in the planning area is built to low code standards or none at all. These structures could be highly vulnerable to severe winter weather events such as windstorms.
- Redundancy of power supply must be evaluated.
- The capacity for backup power generation is limited.
- Isolated population centers are at significant risk.

Tornado

Tornadoes are the most violent of all atmospheric storms, and all of Illinois is susceptible to them, including Cook County. The tornado season runs March through August, although a tornado can occur in the state at any time. Many tornadoes have struck Cook County, including several within the Chicago city limits. Between 1955 and 2008, there were 92 significant tornadoes (tornadoes rated F2 or greater on a scale of F1 to F5, or that caused fatalities or injured at least 10 people). The F4-rated Oak Lawn tornado in April 1967 was the deadliest tornado in the planning area, with 33 fatalities. The only F5 tornado to ever strike the Chicago area was on August 28, 1990.

Tornadoes can cause fatalities and devastate a neighborhood in seconds. Winds can reach 300 mph and damage paths can be more than a mile wide and 50 miles long. If a major tornado were to strike within the populated areas of Cook County, damage could be widespread. Businesses could be forced to close for an extended period or permanently, fatalities could be high, many people could be homeless for an extended period, and routine services such as telephone or power could be disrupted. Buildings can be damaged or destroyed.

The local NWS office issues a tornado watch when tornadoes are possible in an area and a tornado warning when a tornado has been sighted or indicated by weather radar. The current average lead time for tornado warnings is 13 minutes. The National Weather Service has established a goal of 15 minutes in its strategic plan. Occasionally, tornadoes develop so rapidly that little, if any, advance warning is possible.

Important issues associated with tornadoes in the planning area include the following:

- Older building stock in the planning area is built to low code standards or none at all. These structures could be highly vulnerable to tornadoes.
- Redundancy of power supply must be evaluated.
- The capacity for backup power generation is limited.

- The amount of the tornado zone that contains vacant, developable land is not known. This would be valuable information for gauging the future development potential of the tornado zone.
- Declining growth rate makes it difficult for code standards to have impacts on new development.
- The planning area has insufficient suitable tornado shelters.
- Public awareness of tornado response protocols is a concern, given the area's many visitors.

QUALITATIVE REVIEW OF HAZARDS OF INTEREST

Though risk assessments were not conducted for hazards identified as hazards of interest rather than hazards of concern, each was reviewed for the hazard mitigation plan. Key findings are as follows:

- Climate Change— Climate change impacts on hazard events could include an increased risk for extreme events such as drought, storms and flooding, as well as more heat-related stress. In many cases, communities are already facing these problems to some degree. Information about how climate patterns are changing provides insight on the reliability of future hazard projections used in mitigation analysis.
- Epidemic or Pandemic—Health hazards that affect the residents of Cook County may arise in a variety of situations, such as during a communicable disease outbreak, after a natural disaster, or as the result of a bioterrorism incident. All populations in Cook County are susceptible to such events. According to national projections by the Centers for Disease Control and Prevention, a pandemic flu with a 15- to 35-percent attack rate could cause 2 to 4.5 million cases in Illinois with up to 9,000 deaths.
- Nuclear Power Plant Incidents—There are no nuclear power plants in Cook County. The only site within 50 miles of Cook County is the Dresden Nuclear Power Plant in Grundy County. Locations that are 10 to 50 miles from a nuclear plant are not considered to be at risk for direct radiological contamination, but could be impacted by indirect contamination entering the region via waterways, vegetation, or animals originating from within 10 miles of the plant. The Nuclear Regulatory Commission's estimate of the risk each year of an earthquake intense enough to cause core damage to the reactor at Dresden is 1 in 52,632.
- Secondary Impacts from Incoming Evacuees—People evacuated to the planning area from a hazard event outside the planning area can have great impacts if local receiving jurisdictions lack the capacity to handle them. The IL-IN-WI Regional Catastrophic Grant Program's 2012 Regional Hub Reception Center Plan, which includes Cook County, outlines ways to process, track, and care for evacuees and spread them out to a larger area for long-term shelter.
- Widespread Power Outage—Utilities that use aboveground wiring are vulnerable to damage from high wind, heavy snow, ice, rain, and vehicular accidents. All facilities considered critical infrastructure are vulnerable to utility interruptions, especially loss of power. Establishment of reliable backup power at these facilities is extremely important to continue to provide for the health, safety, and well-being of the population.
- Hazardous Material Incident—A hazardous material is any substance that can adversely affect safety and health. In 2013, the City of Chicago undertook a risk assessment of hazardous material transportation routes to assess risks to the city and its inhabitants in the shipment of hazardous materials through its borders. Local jurisdictions should consider conducting a risk assessment to profile the potential hazardous concerns within their jurisdiction and to further assess health and safety impacts on their population, potential economic impacts, consequences, and the overall probably or frequency of incident.

PLANNING AREA RISK RANKING

Risk rankings were performed by each planning partner to compare the probable impacts of the hazards of concern. For each community, the rankings assessed the probability of each hazard's occurrence as well as its likely impact on people, property, and the economy. A separate ranking to assess probable impacts countywide was conducted via facilitated brainstorming sessions with the Steering Committee. The results of the countywide ranking, which were are used in establishing mitigation action and priorities, are summarized in Table 15-6.

TABLE ES-4.
HAZARD RISK RANKING

Hazard Ranking	Hazard Event	Category
1	Severe Weather	High
1	Severe Winter Weather	High
2	Flood (including urban flooding)	High
3	Tornado	High
4	Earthquake	Medium
5	Dam Failure	Low
6	Drought	Low

AREA-WIDE MITIGATION ACTIONS

Recommended hazard mitigation actions were selected from among alternatives presented in catalogs of hazard mitigation alternatives. The catalogs provided a baseline of alternatives that are backed by a planning process, are consistent with the planning partners' goals and objectives, and are within the capabilities of the partners to implement. One catalog was developed for each hazard of concern evaluated in this plan. Each planning partner selected its own set of recommended mitigation actions.

Cook County and the Steering Committee determined that some actions from the mitigation catalogs could provide hazard mitigation benefits countywide. Table 17-2 lists these recommended countywide mitigation actions and the priority of each action. The priorities are defined as follows:

- **High Priority**—A project that meets multiple objectives, has benefits that exceed its cost, meets eligibility requirements for a federal hazard grant program, and has funding secured or is an ongoing project. High priority projects can be completed in the short term (1 to 5 years).
- **Medium Priority**—A project that meets at least one objective, that has benefits that exceed its cost, that is grant eligible under federal hazard or other grant programs, but for which funding has not been secured. Medium priority projects become high priority projects and can be completed in the short term once funding is secured.
- **Low Priority**—A project that will mitigate the risk of a hazard, that has benefits that do not exceed the costs or are difficult to quantify, for which funding has not been secured, that is not eligible for federal hazard grant funding, and for which the timeline for completion is long term (1 to 10 years). Low priority projects may be eligible for grant funding from other programs.

TABLE ES-5.
PRIORITIZATION OF COUNTYWIDE MITIGATION ACTIONS

Action Number and Description	Priority
CW-1—Cook County DHSEM will develop its disaster intelligence capabilities in order to provide comprehensive support to the planning area for preparedness, mitigation, response, and recovery.	High
CW-2—Continue to support the success of the Public Safety Consortium in the following areas: mission, guidance, scope, structure, and training.	High
CW-3—Complete the countywide mass notification system project.	High
CW-4—Integrate the WebEOC into countywide operations and partner agencies.	High
CW-5—Enhance the current Cook County evacuation plan.	High
CW-6—Review the Cook County sheltering inventory (type, location, and future development based on population models).	High
CW-7—Expand the Cook County Mobile Response Team capabilities for emergency and disaster response.	High
CW-8—Create a template to promote uniformity in Emergency Operations Plans within the planning area.	High
CW-9—Develop and implement a countywide critical infrastructure security program.	High
CW-10—Develop a Cook County Community Emergency Response Team Program that is interoperable with local Community Emergency Response Team programs.	Medium
CW-11—Review outreach strategies for populations with access or functional needs to expand countywide support capabilities in all phases of the disaster cycle.	High
CW-12—Continue to promote the core competencies of the StormReady Program for increased countywide severe weather preparedness.	High
CW-13—Revisit and review all existing mutual aid agreements and memorandums of understanding and determine how new action items should be incorporated.	High
CW-14—Develop a countywide hazards task force to create a collective approach to natural hazard mitigation through the unification of plans, actions, and data.	High
CW-15—Identify and promote local, state, and federal funding sources for local flood mitigation projects.	Medium
CW-16—Consider the development of a countywide green infrastructure plan.	Medium
CW-17—Consider the development of a countywide climate adaptation strategy committee.	High
CW-18—Maintain a hazard mitigation plan website where this final plan will be housed and planning partners as well as members of the public will be able to monitor plan implementation.	High
CW-19—Support planning partner education by requesting mobile training courses covering National Flood Insurance Program and Community Rating System information during the period of this plan.	High
CW-20—Work with the Illinois Department of Natural Resources (IDNR), U.S. Army Corps of Engineers (USACE), and the Metropolitan Water Reclamation District of Greater Chicago (MWRD) to study and assess in greater detail the risk associated with stormwater/urban drainage flooding.	Medium

IMPLEMENTATION

Plan Adoption

The hazard mitigation plan will be submitted for a pre-adoption review to the Illinois Emergency Management Agency and FEMA prior to adoption by Cook County. Once pre-adoption approval has been provided, all planning partners will formally adopt the plan.

Plan Maintenance Strategy

The hazard mitigation plan includes a formal process to ensure that the Cook County Multi-Jurisdictional All Hazards Mitigation Plan remains an active and relevant document and that the planning partners maintain their eligibility for applicable funding sources. The plan's format allows sections to be reviewed and updated when new data become available, resulting in a plan that will remain current and relevant. The strategy for ongoing maintenance of the plan includes the following components:

- Plan Implementation—Plan implementation and evaluation will be a shared responsibility among all planning partners and agencies identified as lead agencies in the mitigation action plans. Cook County DHSEM will assume lead responsibility for implementing the plan maintenance strategy.
- Steering Committee—It is recommended that a steering committee remain a viable body involved in key elements of the plan maintenance strategy. The new steering committee should strive to include representation from the planning partners, as well as other stakeholders in the planning area.
- Annual Progress Report—The steering committee will convene to perform annual reviews. DHSEM will then prepare a formal annual report on the progress of the plan.
- Plan Update—The planning partnership intends to update the hazard mitigation plan on a five-year cycle from the date of initial plan adoption.
- Continuing Public Involvement—The public will continue to be apprised of the plan's progress through the Cook County hazard mitigation website and by copies of annual progress reports provided to the media. DHSEM has agreed to maintain the hazard mitigation plan website, and each planning partner has agreed to provide links to the website on their individual jurisdictional websites.
- Incorporation into Other Planning Mechanisms—All municipal planning partners are committed to creating a linkage between the hazard mitigation plan and their individual comprehensive plans by identifying a mitigation action as such and giving that action a high priority. As information becomes available from other planning mechanisms that can enhance this plan, that information will be incorporated via the update process.

Exhibit B

City Annex

[see attached]

CHAPTER 117
CITY OF CHICAGO ANNEX

117.1 HAZARD MITIGATION PLAN POINT OF CONTACT

Primary Point of Contact

David R. Ramos, Deputy Director, EM
Chicago OEMC
1411 W Madison St.
Chicago, IL 60607
Telephone: 312-746-9233
e-mail Address: David.Ramos2@cityofchicago.org

Alternate Point of Contact

Matthew Doughtie, Sr. EM Coordinator
Chicago OEMC
1411 W Madison St.
Chicago, IL 60607
Telephone: 312-746-9462
e-mail Address: mdoughtie@cityofchicago.org

117.2 JURISDICTION PROFILE

The following is a summary of key information about the jurisdiction and its history:

- **Date of Incorporation:** 1837
- **Current Population:** 2,704,958 as of 2016
- **Population Growth:** While Chicago experienced a population decline of over 200,000 persons between 2000 and 2010, the City's population has increased .003% from 2010 to 2016.
- **Location and Description:** The City of Chicago is located in northeastern Illinois at 41°59 N and 86°54 W, and at an altitude of 578.5 feet above sea level. It is the third-most populous city in the United States and is the county seat of Cook County. Chicago has often been called a global architecture capital and is considered one of the most important business centers in the world. Positioned along Lake Michigan, the City is an international hub for finance, commerce, industry, technology, telecommunications, and transportation. O'Hare International Airport is the second-busiest airport in the world when measured by aircraft traffic; the region also has the largest number of U.S. highways and railroad freight. In 2012, Chicago was listed as an alpha global city by the Globalization and World Cities Research Network, and it ranked seventh in the world in the 2016 Global Cities Index. Chicago has the third-largest gross metropolitan product in the United States—about $640 billion according to 2015 estimates. The City has one of the world's largest and most diversified economies, with no single industry employing more than 14% of the workforce.
- **Brief History:** Chicago's recorded history begins with the arrival of French explorers, missionaries and fur traders in the late 17th century and their interaction with the local Potawatomi Native Americans. The modern city was incorporated in 1837 by Northern businessmen and grew rapidly from real estate speculation and the realization that it had a commanding position in the emerging inland transportation network, based on lake traffic and railroads, controlling access from the Great Lakes into the Mississippi River basin. Despite the Great Chicago Fire in 1871, the city grew exponentially, becoming the nation's rail center and the dominant Midwestern center for manufacturing, commerce, finance, higher education, religion, broadcasting, sports, jazz, and high culture. Chicago is now a highly urbanized area and much of its natural environmental has been altered since its early development.

  Climate: The climate of Chicago is classified as humid continental, with all four seasons distinctly represented: wet springs; variably hot, humid summers; pleasantly mild autumns; and cold winters. Temperatures are at the lowest in the months of January and February, and the

highest during the months of July and August. Chicago's weather has the presence of Lake Michigan which influences the weather throughout the year. The highest official temperature ever recorded in Chicago was 105°F on July 24th, 1934. The coldest official temperature ever recorded was -27°F on January 20th, 1985. The yearly precipitation averages are at 36.89 inches. Chicago is prone to thunderstorms from spring to early fall. Heavy rainfall events can occur with thunderstorms and occasional prolonged systems. The average Chicago winter season produces 36.7 inches of snow, but these tend to vary.

- **Governing Body Format:** Chicago City government is divided into executive and legislative branches. The mayor is the chief executive while the City Council, elected from 50 wards, is the legislative body. Government priorities and activities are established in a budget ordinance usually adopted in November of each year. The city takes official action through the passage of ordinances and resolutions. In addition to the Mayor, Chicago's two other city-wide elected officials are the City Clerk and the City Treasurer. The Chicago Police Department provides law enforcement and the Chicago Fire Department provides fire suppression and emergency medical services for the city and its residents. Civil and criminal law cases are heard in the Cook County Circuit Court of the State of Illinois court system, or in the Northern District of Illinois, in the federal system. In the state court, the public prosecutor is the Illinois State's Attorney; in the Federal court it is the United States Attorney.
- **Development Trends:** Chicago is a heavily urbanized city, with only 7.1% of its total land area classified as open space. The City has seen a large increase in its Central Business District (CBD) population over the last 20 years. The CBD and adjacent neighborhoods are currently undergoing a building boom, with over $20 billion in "megaprojects" currently underway or in the planning stages. The Chicago Sustainable Development Policy has been continually implemented since 2004. The goal of the policy is to enhance the sustainable performance of projects receiving City assistance. It requires development projects that are receiving financial assistance or special approvals from the City to include sustainable elements. The Policy has been a driving force in making Chicago a global leader in the green roof movement as well as the number of LEED certified projects. As of 2013, the City of Chicago had more than 500 green roofs totaling nearly 5.6 million square feet. More than 500 development projects have been LEED certified, which equates to roughly 180 million square feet.

117.3 CAPABILITY ASSESSMENT

The assessment of the jurisdiction's legal and regulatory capabilities is presented in Table 117-1. The assessment of the jurisdiction's fiscal capabilities is presented in Table 117-2. The assessment of the jurisdiction's administrative and technical capabilities is presented in Table 117-3. Information on the community's National Flood Insurance Program (NFIP) compliance is presented in Table 117-4. Classifications under various community mitigation programs are presented in Table 117-5.

TABLE 117-1.
LEGAL AND REGULATORY CAPABILITY

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated	Comments
Codes, Ordinances & Requirements					
Building Code	Yes	No	No	Yes	Municipal Code of Chicago – adopted 1939 In accordance with Public Act 096-0704, Illinois has adopted the IBC as its state Building Code
Zonings	Yes	No	No	Yes	Municipal Code of Chicago – adopted 1939 65 ILCS 5/ Illinois Municipal Code.
Subdivisions	Yes	No	No	Yes	765 ILCS 205/PLAT ACT as passed by Illinois State General Assembly
Stormwater Management	Yes	No	Yes	Yes	Municipal Code of Chicago, Chapter 11-18 (Stormwater Ordinance) – adopted 1939 State regulates industrial activity from Construction sites 1 acre or larger under section 402 CWA.
Post Disaster Recovery	No	No	No	No	
Real Estate Disclosure	No	No	Yes	Yes	(765 ILCS 77/) Residential Real Property Disclosure Act.
Growth Management	Yes	No	No	No	Municipal Code of Chicago – adopted 1939 (Chicago Zoning Ordinance, MCC § 17-1-0100 et seq., controls development in Chicago)
Site Plan Review	Yes	No	No	No	Municipal Code of Chicago – adopted 1939

Public Health and Safety	Yes	No	Yes	Yes	Municipal Code of Chicago – adopted 1939
Environmental Protection	Yes	No	No	No	Municipal Code of Chicago – adopted 1939
Planning Documents					
General or Comprehensive Plan	Yes	No	No	No	Chicago Central Area Action Plan Chicago Sustainable Development Policy CMAP GOTO 2040 Comprehensive Regional Plan
Is the plan equipped to provide linkage to this mitigation plan? Yes					
Floodplain or Basin Plan	No	No		No	
Stormwater Plan	Yes	No	MWRD	No	Regional stormwater planning is managed by MWRD.
Capital Improvement Plan	Yes	No	No	No	Chicago Capital Improvement Program
What types of capital facilities does the plan address? transportation, parkland, lakefront/shoreline, municipal facilities, neighborhood infrastructure, sewer infrastructure, water infrastructure *How often is the plan revised/updated?* annually					
Habitat Conservation Plan	Yes	No	Chicago Mayor's Office	No	2011 Chicago Nature and Wildlife Plan; Chicago Wilderness Biodiversity Recovery Plan
Economic Development Plan	Yes	No	Yes	Yes	The Chicago City Council reviews economic development related programs and incentives including tax incentives offered through the Cook County 6b Program
Shoreline Management Plan	Yes	No	No	No	Lake Michigan and Chicago Lakefront Protection Ordinance, Municipal Code of Chicago § 16-4-010, et seq. and the Municipal Code of Chicago—adopted 1939 (Chicago Zoning Ordinance, MCC § 17-1-0100 et seq.)
Response/Recovery Planning					

Comprehensive Emergency Management Plan	Yes	No	Yes	Yes	2016 City of Chicago Emergency Operations Plan
Threat and Hazard Identification and Risk Assessment	Yes	No	Yes	No	2016 Chicago Urban Area THIRA
Terrorism Plan	Yes	No	Yes	Yes	2016 City of Chicago EOP – Human-Caused Hazards Annex
Post-Disaster Recovery Plan	No	No	No	No	
Continuity of Operations Plan	No	No	Yes	No	
Public Health Plans	Yes	No	Yes	No	Chicago Public Health Emergency Operations Plan

TABLE 117-2.
FISCAL CAPABILITY

Financial Resources	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes
User Fees for Water, Sewer, Gas or Electric Service	Yes
Incur Debt through General Obligation Bonds	Yes
Incur Debt through Special Tax Bonds	Yes
Incur Debt through Private Activity Bonds	Yes
Withhold Public Expenditures in Hazard-Prone Areas	Yes
State Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes
Other	

TABLE 117-3.
ADMINISTRATIVE AND TECHNICAL CAPABILITY

Staff/Personnel Resources	Available?	Department/Agency/Position
Planners or engineers with knowledge of land development and land management practices	Yes	Planning and Development
Engineers or professionals trained in building or infrastructure construction practices	Yes	Buildings
Planners or engineers with an understanding of natural hazards	Yes	Transportation, Buildings, Water Management
Staff with training in benefit/cost analysis	Yes	Budget and Management
Surveyors	Yes	Transportation
Personnel skilled or trained in GIS applications[a]	Yes	Innovation and Technology, Police Department, Planning and Development
Scientist familiar with natural hazards in local area	Yes	
Emergency manager[b]	Yes	Office of Emergency Management and Communications
Grant writers	Yes	Office of Emergency Management and Communications

[a] All partners have access to Cook County GIS Consortium as a technical resource.

[b] If your jurisdiction does not have an emergency manager, Cook County DHSEM acts as your emergency manager.

TABLE 117-4.
NATIONAL FLOOD INSURANCE PROGRAM COMPLIANCE

What department is responsible for floodplain management in your jurisdiction?	Dept of Buildings
Who is your jurisdiction's floodplain administrator? (department/position)	Andrew Billing, PE, CFM, consultant to Dept of Buildings
Are any certified floodplain managers on staff in your jurisdiction?	Yes
What is the date of adoption of your flood damage prevention ordinance?	6/28/1991
When was the most recent Community Assistance Visit or Community Assistance Contact?	8/5/2014
Does your jurisdiction have any outstanding NFIP compliance violations that need to be addressed? If so, please state what they are.	No
Do your flood hazard maps adequately address the flood risk within your jurisdiction? (If no, please state why)	Yes
Does your floodplain management staff need any assistance or training to support its floodplain management program? If so, what type of assistance/training is needed?	No
Does your jurisdiction participate in the Community Rating System (CRS)? If so, is your jurisdiction seeking to improve its CRS Classification? If not, is your jurisdiction interested in joining the CRS program?	No. Chicago is interested in joining the CRS program.

TABLE 117-5.
COMMUNITY CLASSIFICATIONS

	Participating?	Classification	Date Classified
Community Rating System	No		
Building Code Effectiveness Grading Schedule	No		
Public Protection/ISO	Yes	1	2017
Storm Ready	Yes	Gold (Countywide)	2014
Tree City USA	Yes		1982

117.4 JURISDICTION-SPECIFIC NATURAL HAZARD EVENT HISTORY

Table 117-6 lists all past occurrences of natural hazards within the jurisdiction. Repetitive flood loss records are as follows:

- Number of FEMA-Identified Repetitive Loss Properties: 60 (Non-Mitigated): 37 (Single-Family), 15 (Other Residential), 8 (2-4 Family)
- Number of FEMA-Identified Severe Repetitive Loss Properties: 0
- Number of Repetitive Flood Loss/Severe Repetitive Loss Properties That Have Been Mitigated: 2 (1 Other Residential, 1 Single-Family)

TABLE 117-6.
NATURAL HAZARD EVENTS

Type of Event	FEMA Disaster # (if applicable)	Date	Preliminary Damage Assessment
Severe Storms, Straight-Line Winds & Flooding	DR-4116	4/16/13	Not available
Extreme Heat		7/4/12	Not available
Severe Winter Storm and Snowstorm	DR-1960	2/1/11	Not available
Severe Storms and Flooding	DR-1935	7/19/10	Not available
Severe Storms and Flooding	DR-1800	9/13/08	Not available
Severe Storms and Flooding	DR-1729	8/20/07	Not available
Severe Winter Storm	EM-3161	12/11/00	Not available
Winter Snow Storm	EM-3134	1/1/99	Not available
Flooding	DR-1188	8/16/97	Not available
Flooding	DR-1129	7/17/96	Not available
Extreme Heat		7/12/95	Not available
Flooding and Severe Storms	DR-997	4/13/93	Not available
Severe Storms and Flooding	DR-798	8/13/87	Not available
Severe Storms and Flooding	DR-776	9/21/86	Not available
Severe Storms, flooding, and tornadoes	DR-643	6/30/81	Not available
Blizzards and snowstorms	EM-3068	1/16/79	Not available
Severe Storms, flooding, and tornadoes	DR-509	6/18/76	Not available

117.5 HAZARD RISK RANKING

Table 117-7 presents the ranking of the hazards of concern.

Hazard area extent and location maps are included at the end of this chapter. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes.

TABLE 117-7.
HAZARD RISK RANKING

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Severe Weather	54
2	Severe Winter Weather	54
3	Flood	36
4	Tornado	18
5	Earthquake	18
6	Drought	18
7	Dam Failure	6

117.6 HAZARD MITIGATION ACTION PLAN AND EVALUATION OF RECOMMENDED ACTIONS

Table 117-8 lists the actions that make up the jurisdiction's hazard mitigation plan. Table 117-9 identifies the priority for each action. Table 117-10 summarizes the mitigation actions by hazard of concern and the six mitigation types.

Table 117-8.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards mitigated	Objectives met	Lead agencies	Estimated cost	Sources of funding	Timeline
Action C.1—Where appropriate, support retrofitting, purchase, or relocation of structures in hazard-prone areas to prevent future structure damage. Give priority to properties with exposure to repetitive losses.						
Existing	All	7, 13	Dept. of Buildings	Low	FEMA Haz Mitigation Grants	Long-term
Action C.2—Continue to support the countywide actions identified in this plan.						
New and existing	All	All	City of Chicago	Low	General Fund	Short- and long-term
Action C.3—Actively participate in the plan maintenance strategy identified in this plan.						
New and existing	All	3, 4, 6	Chicago OEMC	Low	General Fund	Short-term
Action C.4—Consider participation in incentive-based programs such as the Community Rating System, Tree City, and StormReady.						
New and existing	All	3, 4, 5, 6, 7, 9, 10, 11, 13	City of Chicago	Low	General Fund	Long-term
Action C.5—Continue to maintain the minimum National Flood Insurance Program participation requirement for communities with no mapped Special Flood Hazard Area.						
New and existing	Flooding	4, 6, 9	Dept. of Buildings	Low	General Fund	Short-term and ongoing
Action C.6—Integrate the hazard mitigation plan into other plans, programs, or resources that dictate land use or redevelopment.						
New and existing	All	3, 4, 6, 10, 13	City of Chicago	Low	General Fund	Short-term
Action C.7—Complete construction and implementation of the Albany Park Stormwater Diverson Tunnel.						

Table 117-8.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards mitigated	Objectives met	Lead agencies	Estimated cost	Sources of funding	Timeline
Existing	Flooding	3, 4, 9	CDOT	Medium		Short-term/ Ongoing
Action C.9—Continue implementation of the Chicago Sustainable Development Policy, which enhances the sustainable performance of projects receiving City assistance.						
Existing	Flooding, Severe Weather	3, 4, 7, 10, 13	Buildings, Planning & Development	Low	Grants/ General Fund	Long-term/ Ongoing
Action C.10—Continue implementation of the Green Stormwater Infrastructure Policy, which guides City's efforts in renewing water infrastructure, conserving water, greening water operations, and sustainably managing stormwater.						
Existing	Flooding	2, 4, 10, 13	Buildings, Water Management	Low	N/A	Long-term/ Ongoing
Action C.11—Continue implementation of the Inlet Control System (Rainblocker) program, which installs restrictors to slow the flow of stormwater into the sewer system.						
Existing	Flooding	4, 9, 13	Dept. of Water Management	Low		Long-term/ Ongoing
Action C.12—Continue implementation of the Chicago Shoreline Protection Project, which provides storm damage protection to the Lake Michigan shoreline and Lake Shore Drive.						
Existing	Flooding	2, 3, 4, 8, 9, 13	USACE, Park District	Medium	USACE, IL Dept of Natural Resources	Long-term/ Ongoing
Action C.13—Continue implementation of the RainReady Program, which provides individualized services to help homes and communities reduce their flood risks.						
Existing	Flooding	2, 3, 6, 8, 9, 10	Center for Neighborhood Technology	Low	CNT	Long-term/ Ongoing
Action C.14—Continue construction and implementation of the Metropolitan Water Reclamation District of Greater Chicago's Tunnel and Reservoir Plan (TARP).						

Table 117-8.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards mitigated	Objectives met	Lead agencies	Estimated cost	Sources of funding	Timeline
Existing	Flooding	1, 2, 3, 6, 9, 12, 13	MWRDGC	Medium	MWRDGC, ACOE	Long-term/ Ongoing
Action C.15—Continue to expand the usage and capabilities of the City's Notify Chicago public notification system.						
Existing	All	4, 5, 6, 12	OEMC	Low	Corporate	Long-term/ Ongoing
Action C.16—Continue to expand the usage and capabilities of the City's Reverse 9-1-1 public notification system.						
Existing	All	4, 5, 6, 12	OEMC	Low	Corporate	Long-term/ Ongoing
Action C.17—Continue to expand the usage and capabilities of the City's Digital Sign Network public notification system.						
Existing	All	4, 5, 6, 12	OEMC	Low	Corporate	Long-term/ Ongoing
Action C.18—Develop local capabilities for implementation of FEMA's Integrated Public Alert & Warning System (IPAWS).						
Existing	All	4, 5, 6, 12	OEMC	Low	Corporate	Long-term/ Ongoing
Action C.19—Continue the installation and maintenance of Green Alleys, which results in rainwater being allowed to infiltrate into the soils through permeable pavement or infiltration basins.						
Existing	Flooding	2, 3, 4, 9, 12, 13	CDOT	Low	General Obligation Bond	Long-term/ Ongoing
Action C.20—Continue the installation and maintenance of bioinfiltration systems and rain gardens throughout the city, which promote the absorption and infiltration of stormwater runoff.						
Existing	Flooding	2, 3, 4, 9, 12, 13	DWM/ CDOT	Low	Corporate	Long-term/ Ongoing
Action C.21—Continue development and maintenance of the City of Chicago Flood Operations Guidance Document.						

Table 117-8.
HAZARD MITIGATION ACTION PLAN MATRIX

Applies to new or existing assets	Hazards mitigated	Objectives met	Lead agencies	Estimated cost	Sources of funding	Timeline
Existing	All	2, 4, 8, 12	OEMC	Low	Corporate	Long-term/ Ongoing
Action C.23— Continue implementation of Chicago's Basement Flooding Partnership, where the Dept of Water Management works with neighborhoods to reduce flooding impacts.						
Existing	Flooding	2, 3, 6, 8, 9, 10	DWM	Low	Corporate	Long-term/ Ongoing
Action C.24— Encourage the development of continuity planning for Chicago departments and the Chicago area's largest employers and companies headquartered in Chicago.						
Existing	All	1	OEMC	Low	Corporate	Long-term/ Ongoing
Action C.25—Ensure continued compliance with the National Flood Insurance Program (NFIP).						
Existing	Flooding	2, 3, 4, 9, 10, 11, 12	Buildings	Low	Corporate	Long-term/ Ongoing

TABLE 117-9.
MITIGATION STRATEGY PRIORITY SCHEDULE

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Costs?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Priority[a]
1	2	High	High	Yes	Yes	No	Medium
2	13	Medium	Low	Yes	No	Yes	High
3	3	Medium	Low	Yes	Yes	Yes	High
4	9	Medium	Low	Yes	No	Yes	Medium
5	3	Medium	Low	Yes	No	Yes	High
6	3	Medium	Medium	Yes	Yes	No	Medium
7	5	Medium	Low	Yes	No	Yes	High
8	5	High	Medium	Yes	No	Yes	High
9	4	High	Low	Yes	No	Yes	High
10	3	Medium	Low	Yes	No	Yes	Medium
11	6	High	High	Yes	Yes	Yes	Medium
12	6	Medium	Low	Yes	No	No	Low
13	7	High	High	Yes	Yes	Yes	High
14	4	Medium	Low	Yes	Yes	Yes	Medium
15	4	Medium	Low	Yes	Yes	Yes	Medium
16	4	Medium	Low	Yes	Yes	Yes	Medium
17	4	Medium	Low	Yes	Yes	Yes	Medium
18	6	Medium	Low	Yes	Yes	Yes	Medium
19	6	Medium	Low	Yes	No	Yes	Medium
20	24	Medium	Low	Yes	No	Yes	Medium
21	6	Medium	Low	Yes	No	Yes	Medium
22	1	High	Low	Yes	No	Yes	Medium
23	7	Medium	Low	Yes	No	Yes	Medium

a. See Chapter 1 for explanation of priorities.

TABLE 117-10.
ANALYSIS OF MITIGATION ACTIONS

	Action Addressing Hazard, by Mitigation Type[a]					
Hazard Type	1. Prevention	2. Property Protection	3. Public Education and Awareness	4. Natural Resource Protection	5. Emergency Services	6. Structural Projects
Dam Failure	N/A	N/A	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A	N/A	N/A
Earthquake	2,6	1, 2	2	2	2	2
Flood	2,6	1, 2	2	2	2	2
Severe Weather	2,6	2	2	2	2	2
Severe Winter Weather	2,6	2	2	2	2	2
Tornado	2,6	2	2	N/A	2	2

a. See Chapter 1 for explanation of mitigation types.

TABLE 117-11.
PREVIOUS ACTION PLAN IMPLEMENTATION STATUS

Action Status			
Completed	Carry Over to Plan Update	Removed; No Longer Feasible	Action[a]
		✓	Integrate mitigation & recovery operations into the daily functions within the City of Chicago. (Removed – action is not specific enough.)
✓			Ensure thoroughness of NIMS, NRF compliance and integration of emergency management planning documents, operations, and functions. Implement planning documents for recovery, debris management, continuity of operations, etc.
	✓		Ensure that areas and populations that could be isolated during a disaster are accounted for in planning efforts. Integrate the needed preparedness, mitigation, response and recovery actions into existing emergency management plans and operations. Now action C6.
✓			Re-alignment of Chicago's Homeland Security Strategies with the National Preparedness Goal.
✓			Strengthen the infrastructure of critical facilities in Chicago, including hospitals, by installing backup systems and redundancies.
	✓		Develop OEMC Continuity of Operations Plan and identify auxiliary facility to provide Emergency Operation Center capabilities. Now Action C22.
		✓	Target regulatory, development, and preparedness efforts of Tier II hazardous material facilities. Efforts include planning and site buffering. (Removed – does not apply directly to natural hazards.)
		✓	Identify and develop projects and programs, as well as expand existing programs, to alleviate the impact of a terrorist attack on high profile facilities and structures. (Removed – does not apply directly to natural hazards.)
✓			Identify available and appropriate shelters.
✓			Support BioWatch program to monitor the interior of high-profile facilities and systems.
✓			Improve high-rise building codes and design to mitigate from structural fires.
		✓	Develop a Comprehensive Recovery Plan to prepare a community for an orderly recovery operation. (Removed – does not apply directly to the mitigation mission area.)
✓			First responder prophylaxis and training.
		✓	First responder preparedness and training, planning, and preparedness for all hazards. (Removed -- action is not specific enough.)
✓			Develop public awareness and education of falling ice from tall buildings. Educate private owners of mitigation measures to prevent falling ice from tall buildings.

		✓		Reduce flooding and improve Chicago's water quality by completing the Tunnel and Reservoir Plan system.
		✓		Increase open space and natural features in high flood risk areas throughout MWRDGC jurisdictional boundaries.
				Expand regional collaboration by enhancing the Illinois-Indiana-Wisconsin CSA Regional Catastrophic Preparedness Grant Program.
				Encourage the development of continuity planning for Chicago departments and the Chicago area's largest employers and companies headquartered in Chicago.
				Identify, incorporate, and integrate hazard mitigation into existing and future plans, programs and projects. (Removed – action not specific enough).
		✓		Demonstrate and capitalize upon the connection between hazard mitigation and sustainable development. Now Action C8.
				Provide public outreach on alertness, awareness, and how to notify authorities of suspicious activities. (Removed – does not apply directly to natural hazards.)
		✓		Strengthen infrastructure, build redundancies, and implement contingency plans for vulnerable populations and essential services and networks. Now Action C6.
				Support the advancement of emergency management profession. (Removed – action is not specific enough.)
		✓		Support the advancement of technological tools to aid emergency management personnel. Now Actions 15, 16 & 17.
				Continue redevelopment of the Chicago Harbor Locks System
				Reduce the risk of flooded basements through the City's Basement Flooding Partnership.
		✓		Stormwater mitigation actions. Now Action C9.
				Strengthen public/private partnerships and information sharing capabilities. (Removed – action is not specific enough).
		✓		Ensure continued compliance with the National Flood Insurance Program (NFIP). Now Action C23.
		✓		Ensure that "green" building strategies are integrated into the design phase of every public building project and incorporate environmentally friendly design concepts into renovation projects. Now Action C8.

a. Listed actions are found in the 2012 City of Chicago Hazard Mitigation Plan. Some actions have been marked as "removed" since they do not apply directly to natural hazards.

117.7 FUTURE NEEDS TO BETTER UNDERSTAND RISK/ VULNERABILITY

No needs have been identified at this time.

117.8 ADDITIONAL COMMENTS

In addition to the mitigation actions listed above, the City of Chicago has also developed the *Sustainable Chicago 2015 Action Agenda*, which highlights the City's efforts in creating a more sustainable environment for our citizens. This document contains over 100 identified sustainable actions the City has taken and will continue to take within the following categories: Economic Development and Job Creation; Energy Efficiency and Clean Energy; Transportation Options; Water and Wastewater; Parks, Open Space, and Healthy Food; Waste and Recycling; and Climate Change. This document can be found at https://www.cityofchicago.org/content/dam/city/progs/env/Sustainable_Chicago_2012-2015_Highlights.pdf

HAZUS-MH RISK ASSESSMENT RESULTS FOR CHICAGO

CHICAGO EXISTING CONDITIONS	
2016 Population	2,704,958
Total Assessed Value of Structures and Contents	$579,392,639,428
Area in 100-Year Floodplain	5223.88 acres
Area in 500-Year Floodplain	5664.46 acres
Number of Critical Facilities	3,642

HAZARD EXPOSURE IN CHICAGO

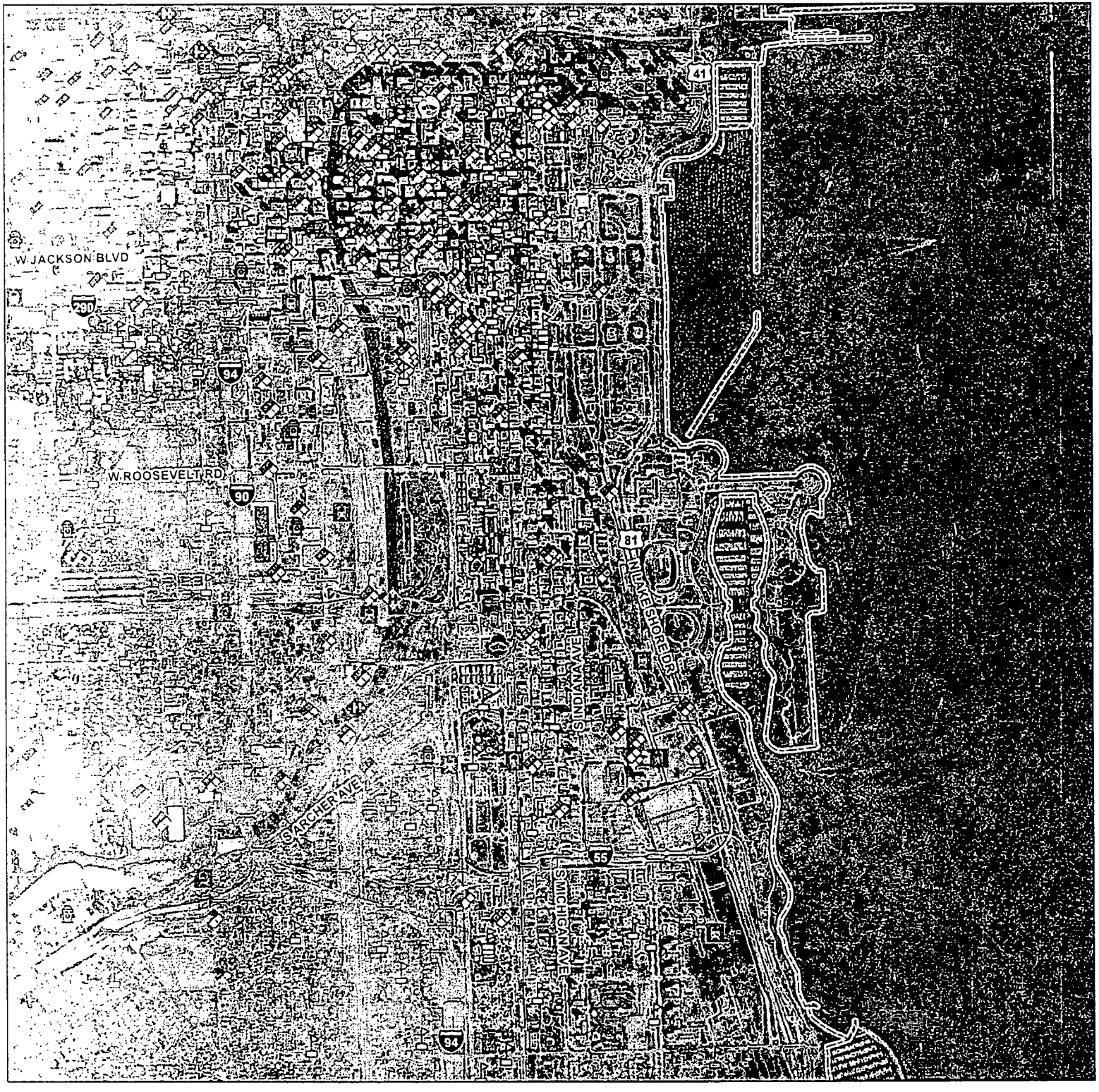
	Number Exposed		Value Exposed to Hazard			% of Total Assessed Value
	Population	Buildings	Structure	Contents	**Total**	Exposed
Dam Failure						
Buffalo Creek	0	0	$0	$0	**$0**	0.00%
Plum Grove	0	0	$0	$0	**$0**	0.00%
Touhy	3	1	$13,035,000	$13,035,000	**$26,070,000**	0.00%
St. Michael	0	0	$0	$0	**$0**	0.00%
Twin Lakes	0	0	$0	$0	**$0**	0.00%
Flood						
100-Year	653	201	$452,655,425	$455,142,279	**$907,797,704**	0.16%
500-Year	991	305	$485,870,440	$471,749,787	**$957,620,226**	0.17%
Tornado						
100-Year	—	—	$676,044,430	$515,681,760	**$1,191,726,200**	.21%
500-Year	—	—	$1,802,179,350	$1,570,940,430	**$3,373,119,780**	.58%

ESTIMATED PROPERTY DAMAGE VALUES IN CHICAGO

	Estimated Damage Associated with Hazard			% of Total Assessed Value
	Building	Contents	**Total**	Damaged
Dam Failure				
Buffalo Creek	$0	$0	**$0**	0.00%
Plum Grove	$0	$0	**$0**	0.00%
Touhy	$0	$0	**$0**	0.00%
St. Michael	$0	$0	**$0**	0.00%
Twin Lakes	$0	$0	**$0**	0.00%
Earthquake				

1909 Historical Event	$2,854,751,334	$759,966,776	**$3,614,718,109**	0.62%
Flood				
10-Year	$20,941,832	$52,361,673	**$73,303,505**	0.01%
100-Year	$31,363,512	$71,466,941	**$102,830,453**	0.02%
500-Year	$485,870,440	$471,749,787	**$957,620,226**	0.17%
Tornado				
100-Year	$6,760,444,340	$5,156,817,620	**$11,917,261,960**	2.06%
500-Year	$12,343,694,180	$10,759,865,970	**$23,103,560,150**	3.99%

HAZARD MAPPING FOR CHICAGO



CITY OF CHICAGO

Critical Facilities

- Emergency Operations Center
- Police Station Facility
- Fire Station Facility
- School Facility
- Medical Care Facility
- Dams
- Military
- Hazardous Materials
- Airport Facility
- Bus Facility
- Highway Bridge
- Light Rail Bridge
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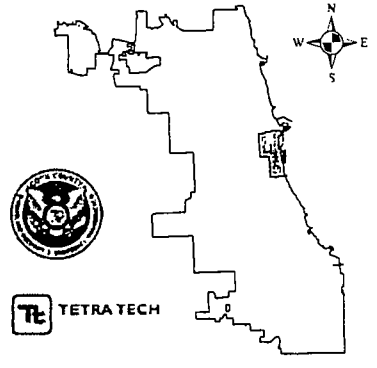
- Oil Facility
- Potable Water Facility
- Other Facility

Note: Critical facility locations based on 2014 information.

Base Map Data Sources:
Cook County, U.S. Geological Survey



TETRA TECH

0 0.325 0.65
Miles

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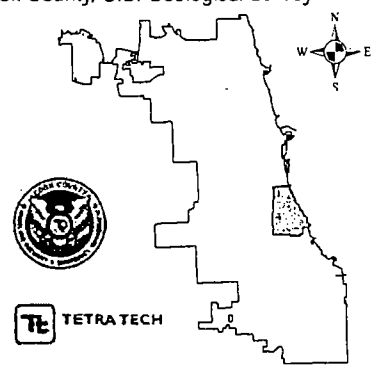

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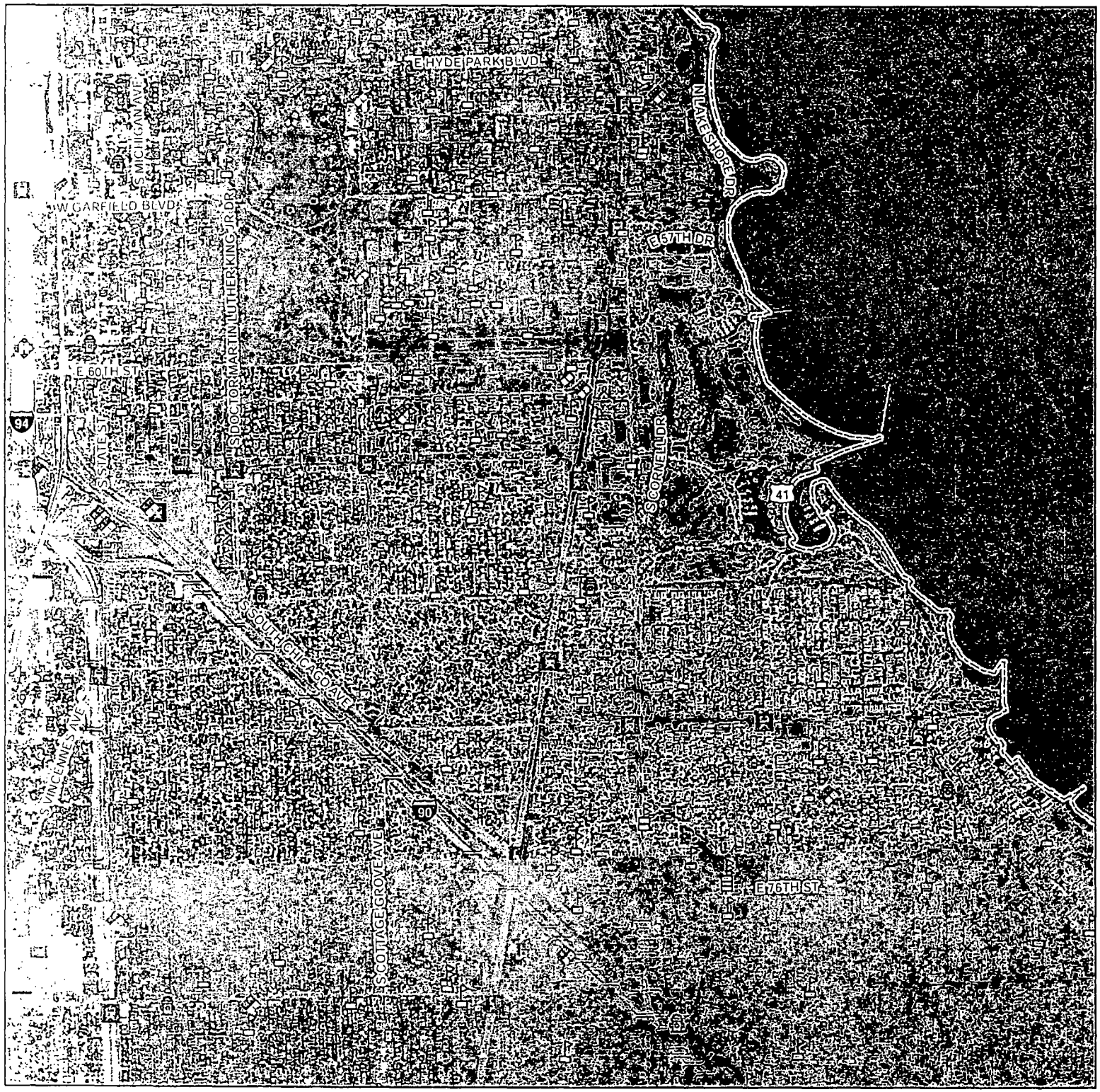
0 0.35 0.7 Miles



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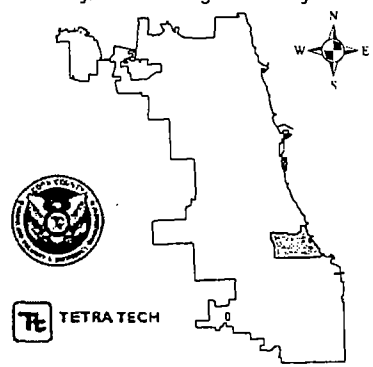
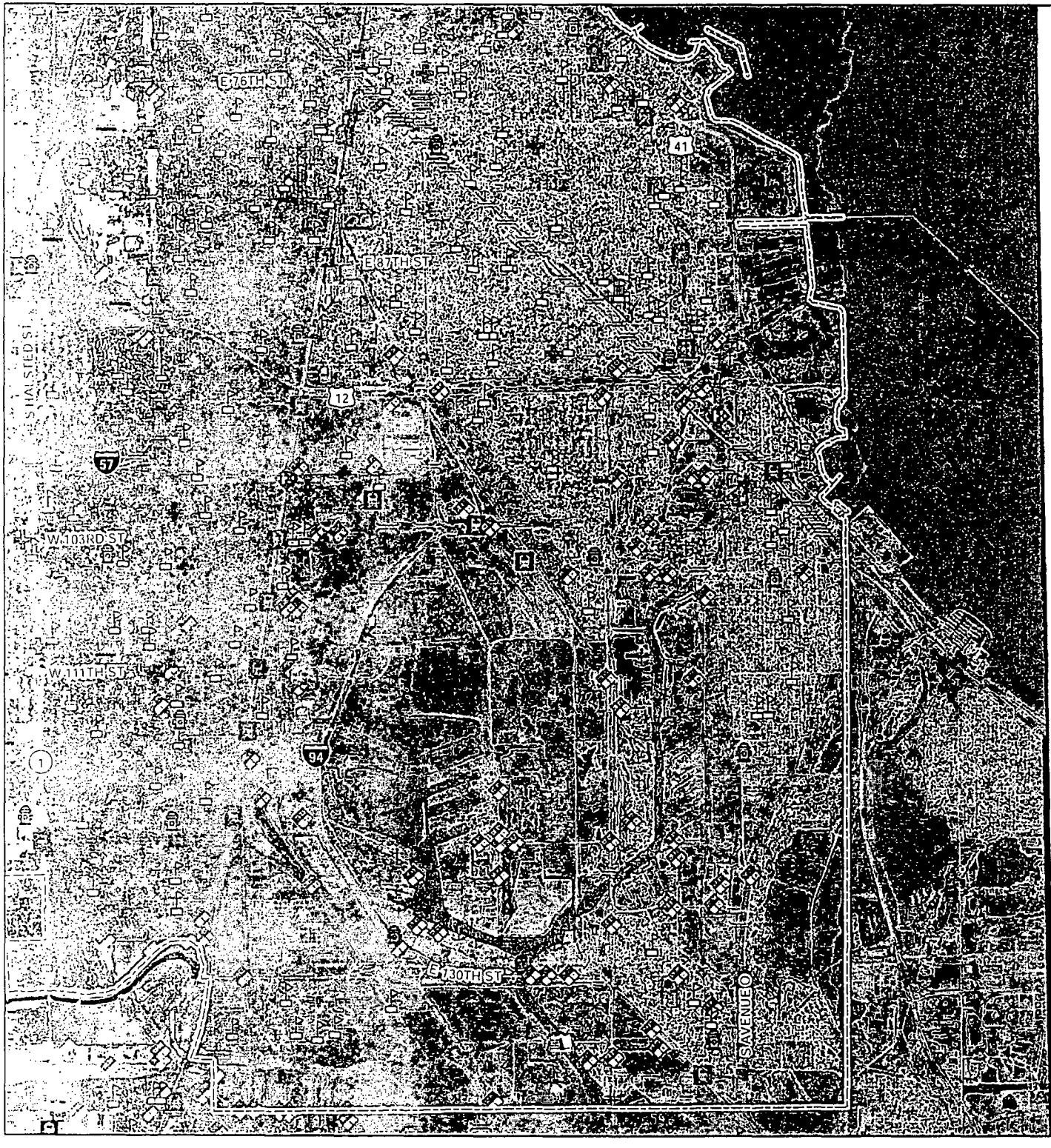


TETRA TECH

0 0.375 0.75
Miles



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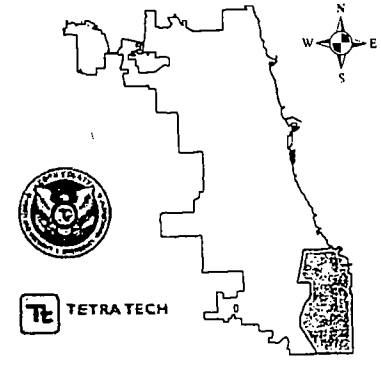
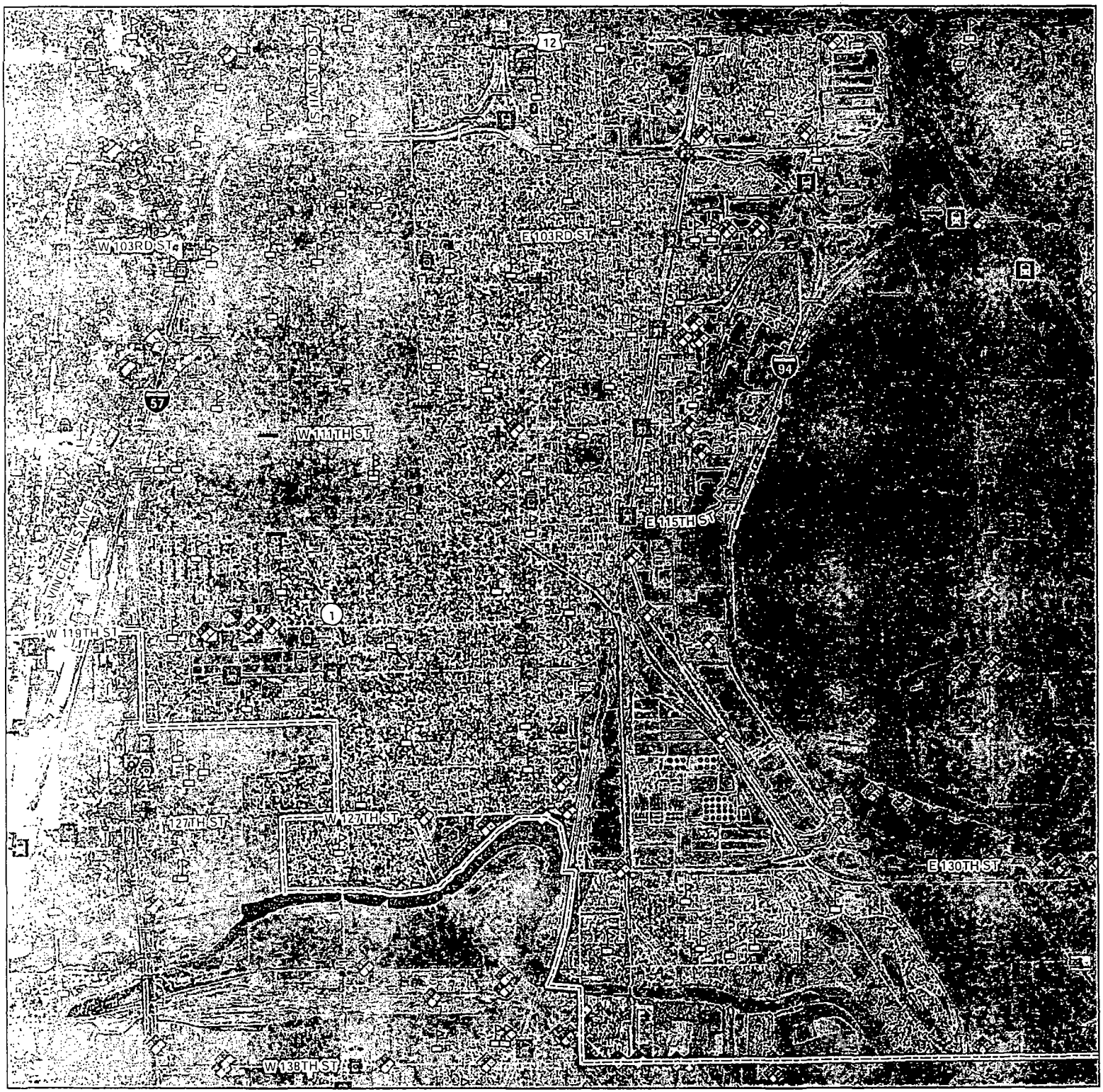


TETRA TECH

0 0.75 1.5 Miles



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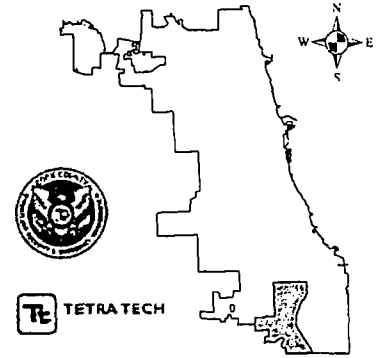
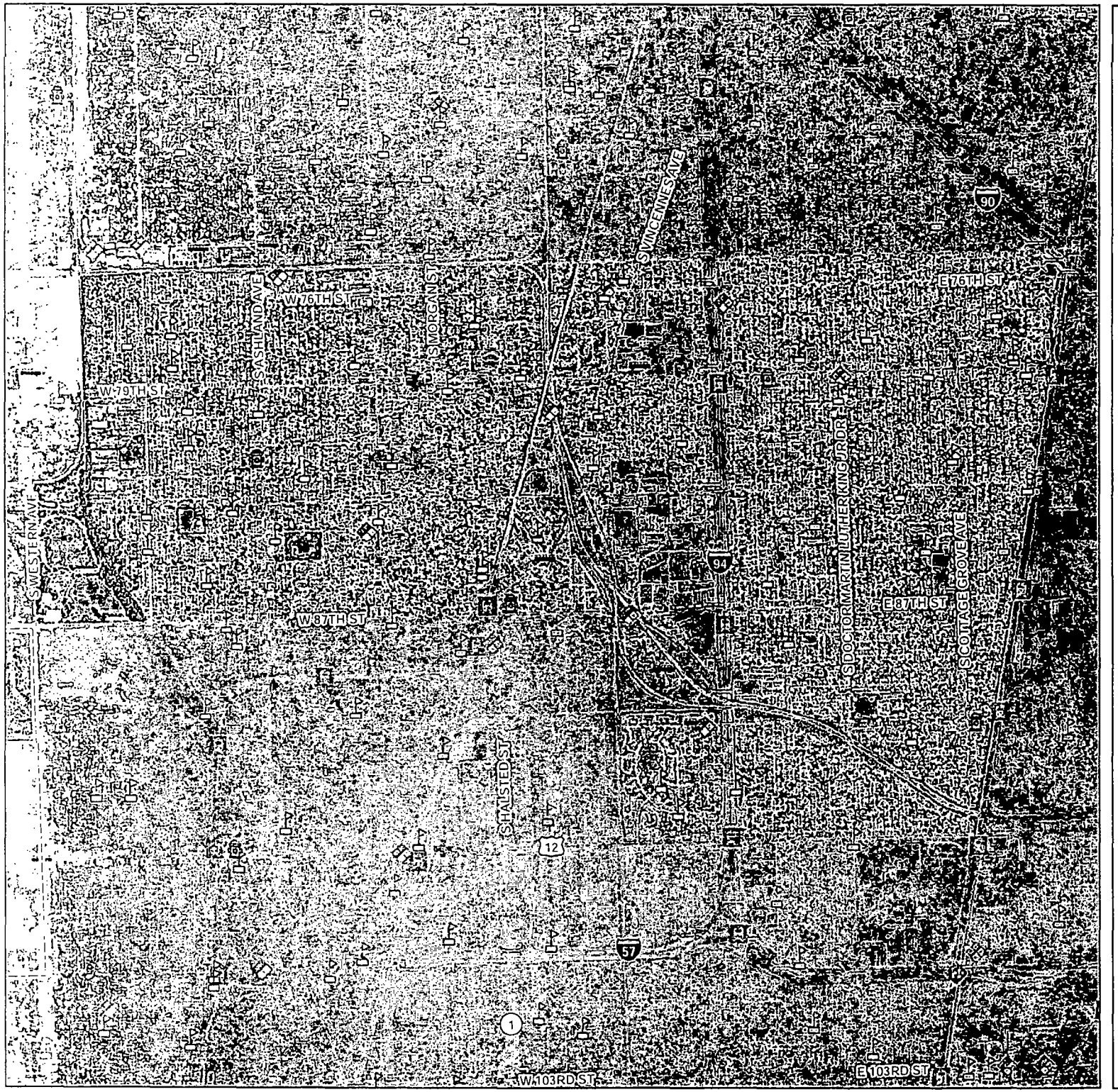


TETRA TECH

0 0.5 1 Miles



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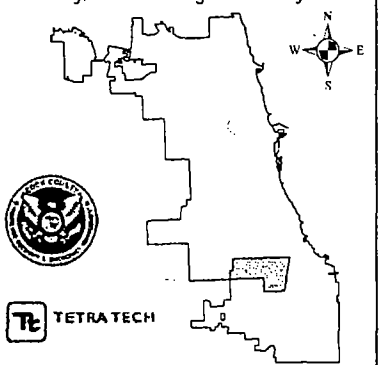

TETRA TECH

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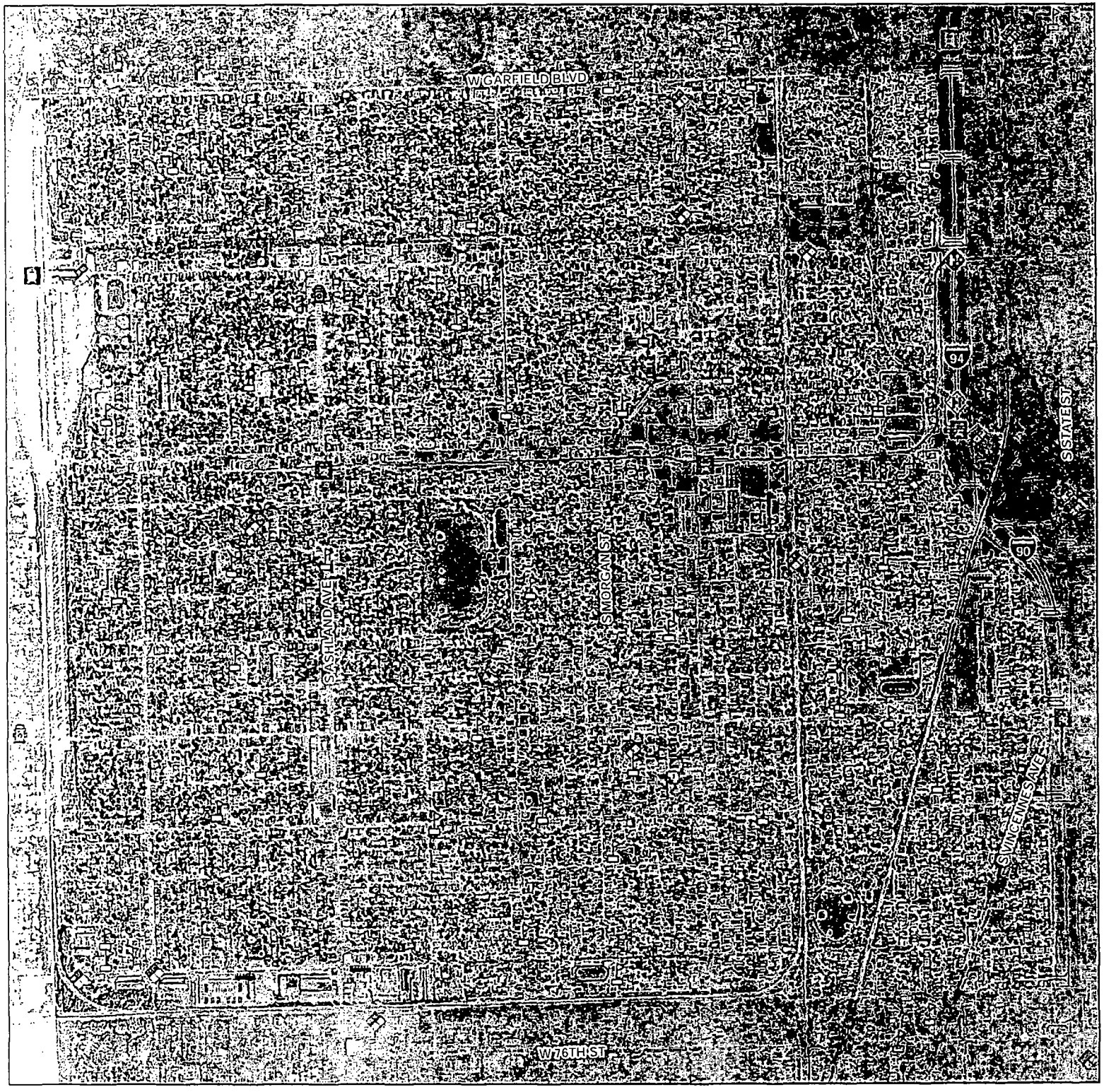

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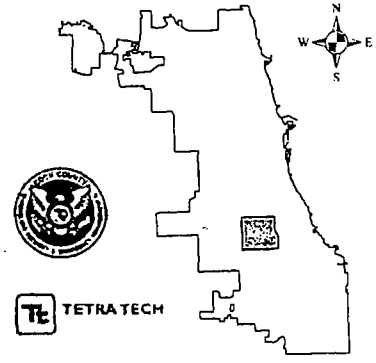

TETRA TECH

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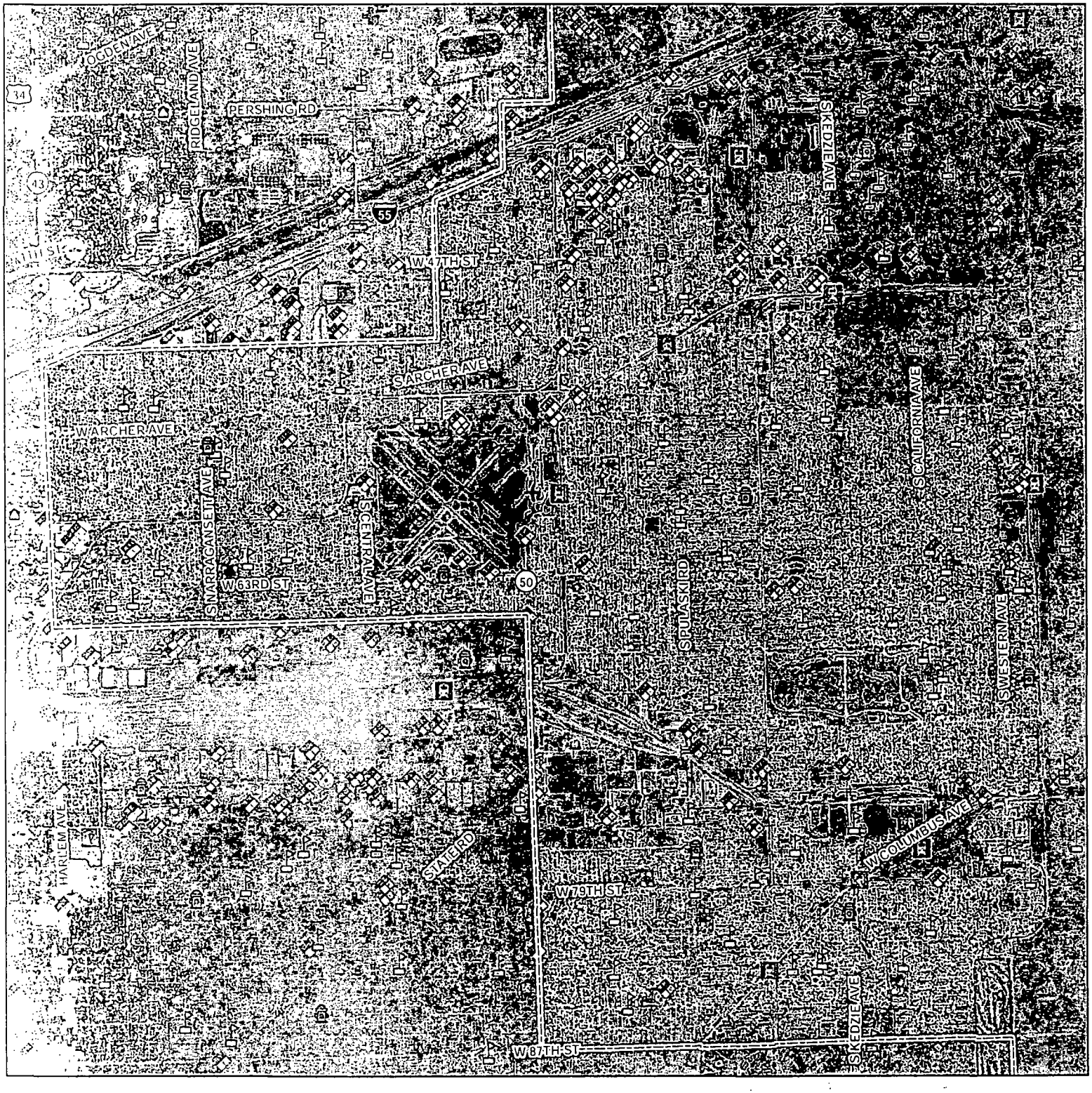

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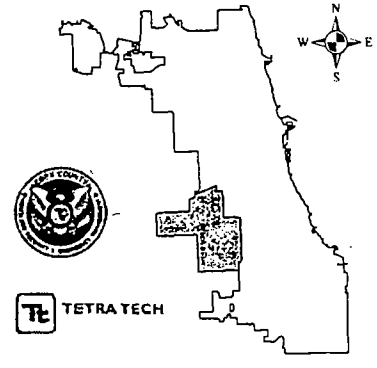
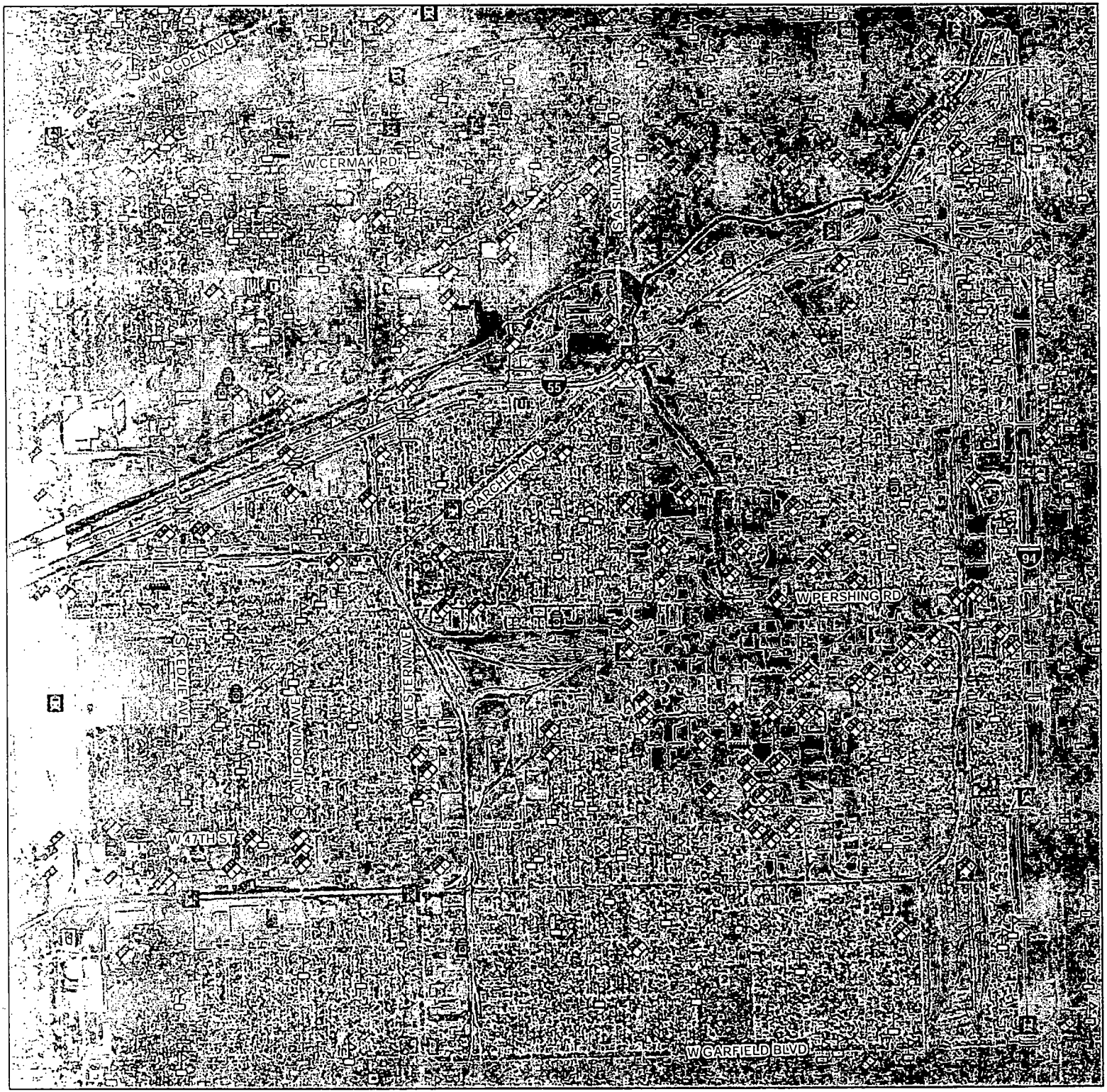


TETRA TECH

0 0.5 1 Miles



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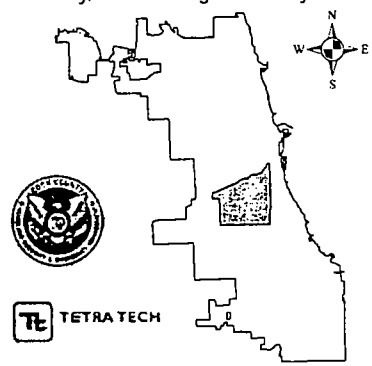

TETRA TECH

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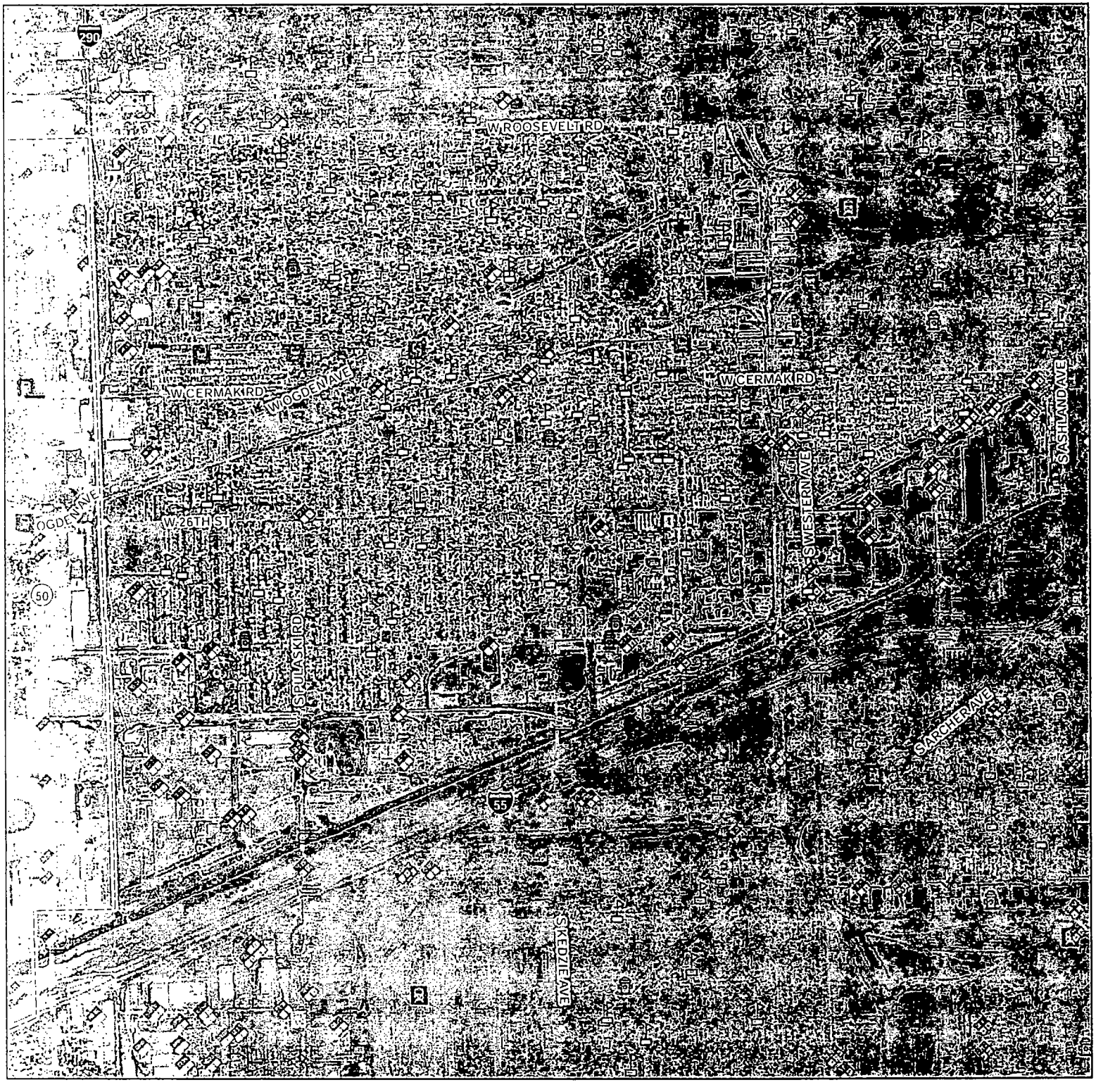

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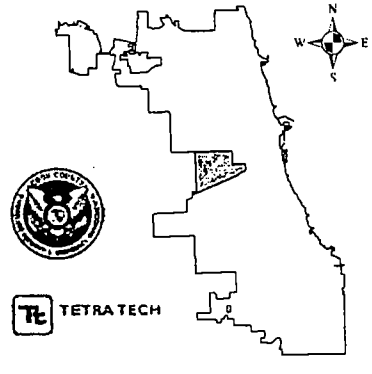
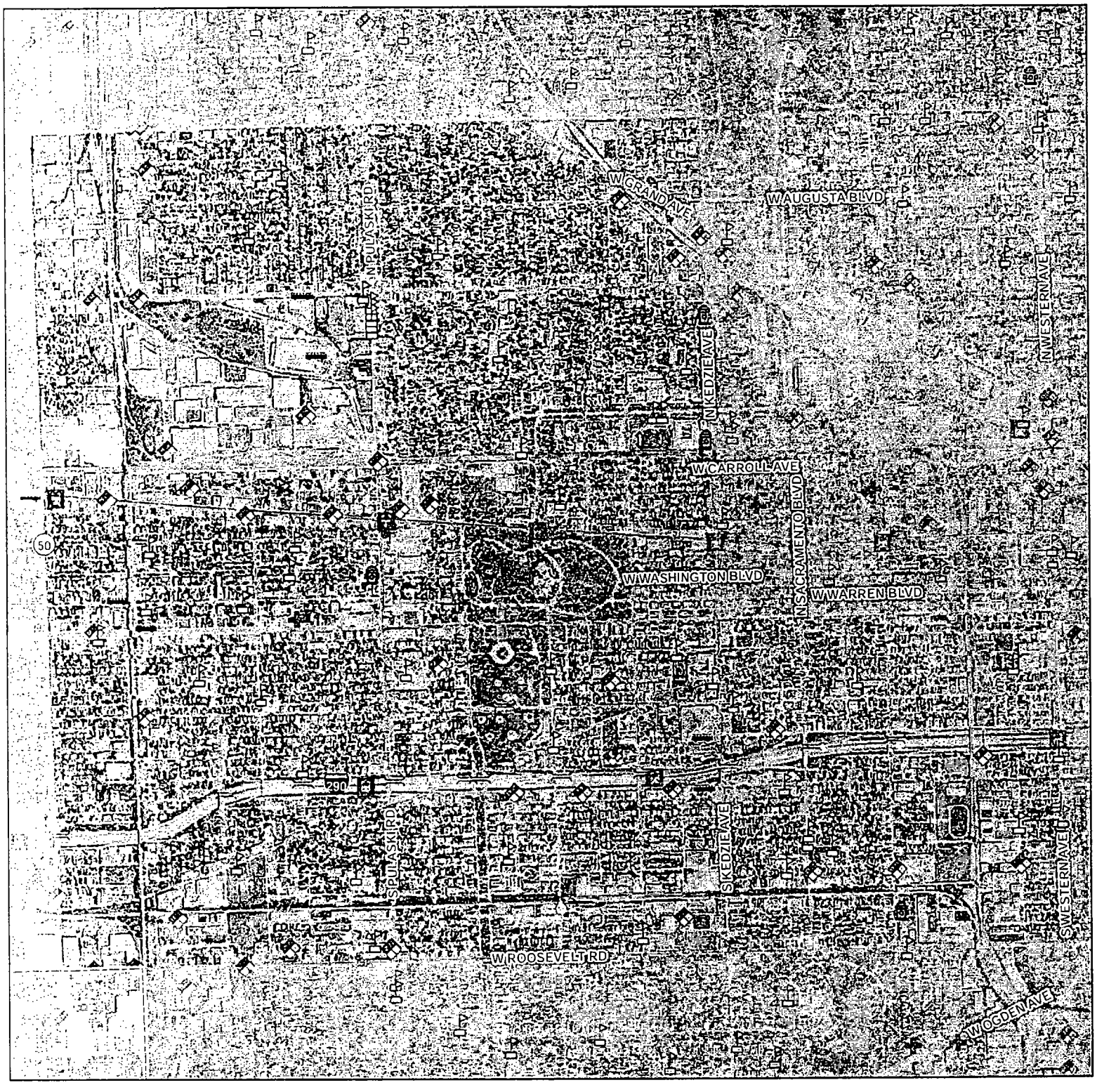


TETRA TECH

0 0.375 0.75 Miles



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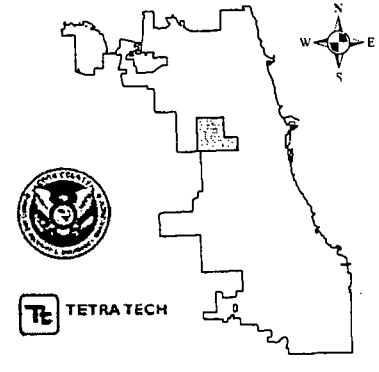
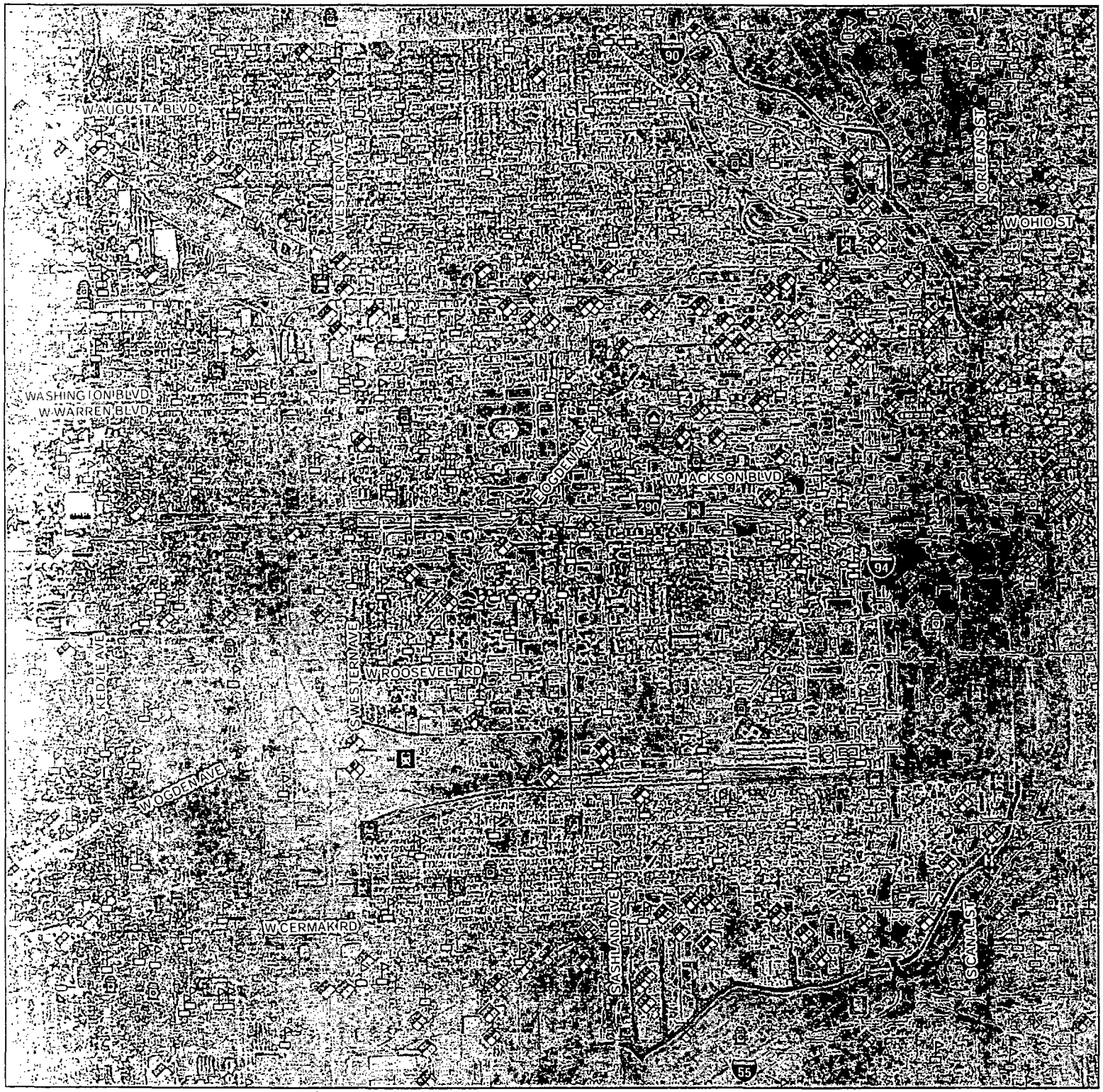


TETRA TECH

0 0.3 0.6 Miles



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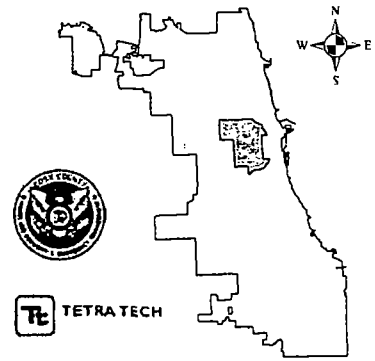
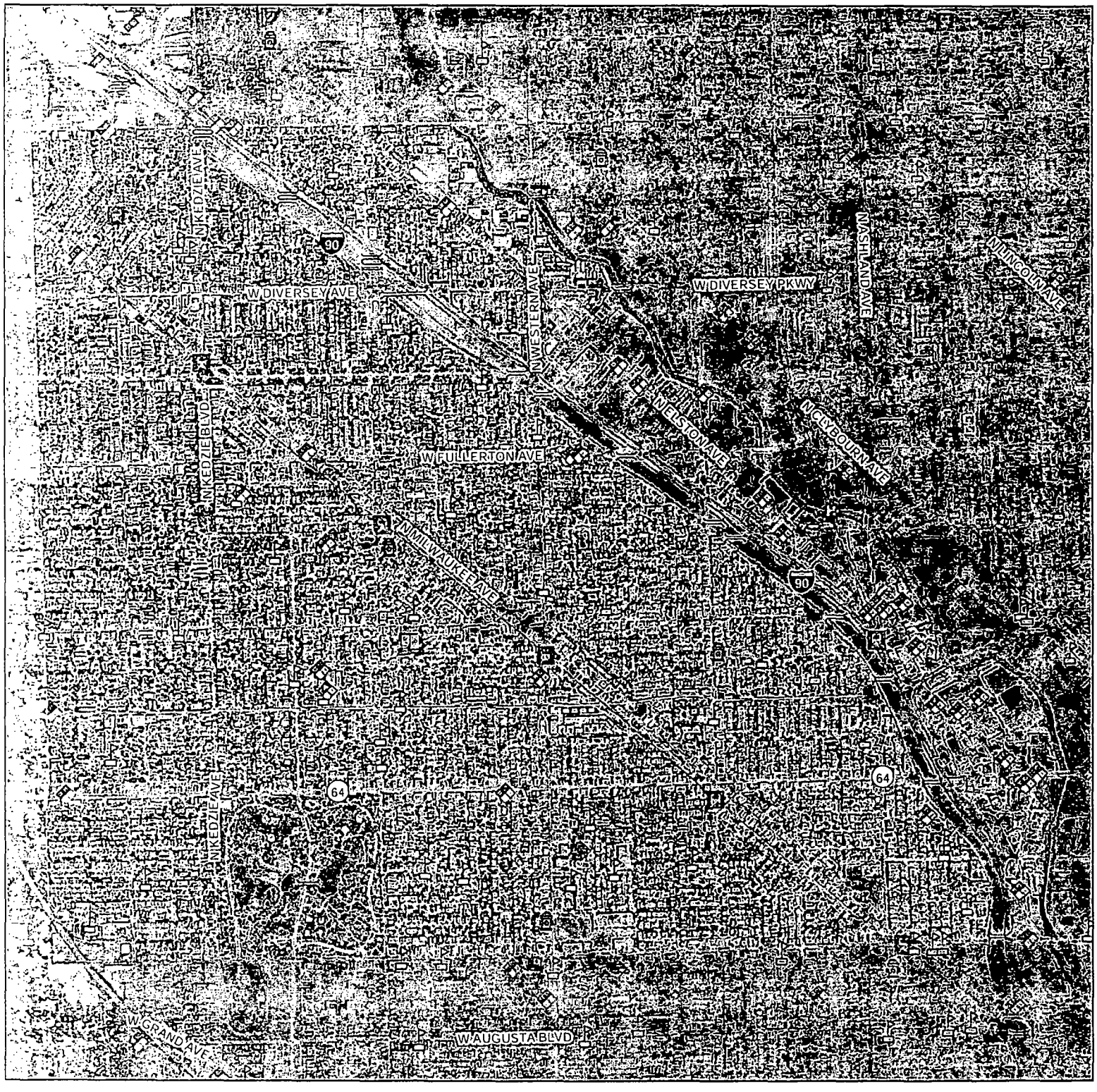


TETRA TECH

0 0.4 0.8 Miles



CITY OF CHICAGO

Critical Facilities

- Emergency Operations Center
- Police Station Facility
- Fire Station Facility
- School Facility
- Medical Care Facility
- Dams
- Military
- Hazardous Materials
- Airport Facility
- Bus Facility
- Highway Bridge
- Light Rail Bridge
- Light Rail Facility
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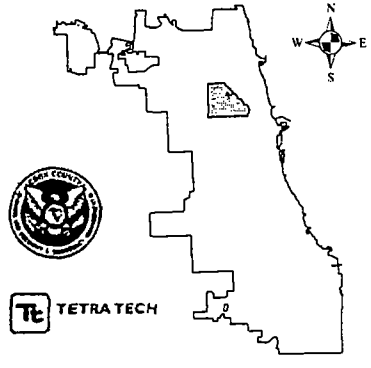
- Rail Facility
- Railway Bridge
- Oil Facility
- Potable Water Facility
- Other Facility

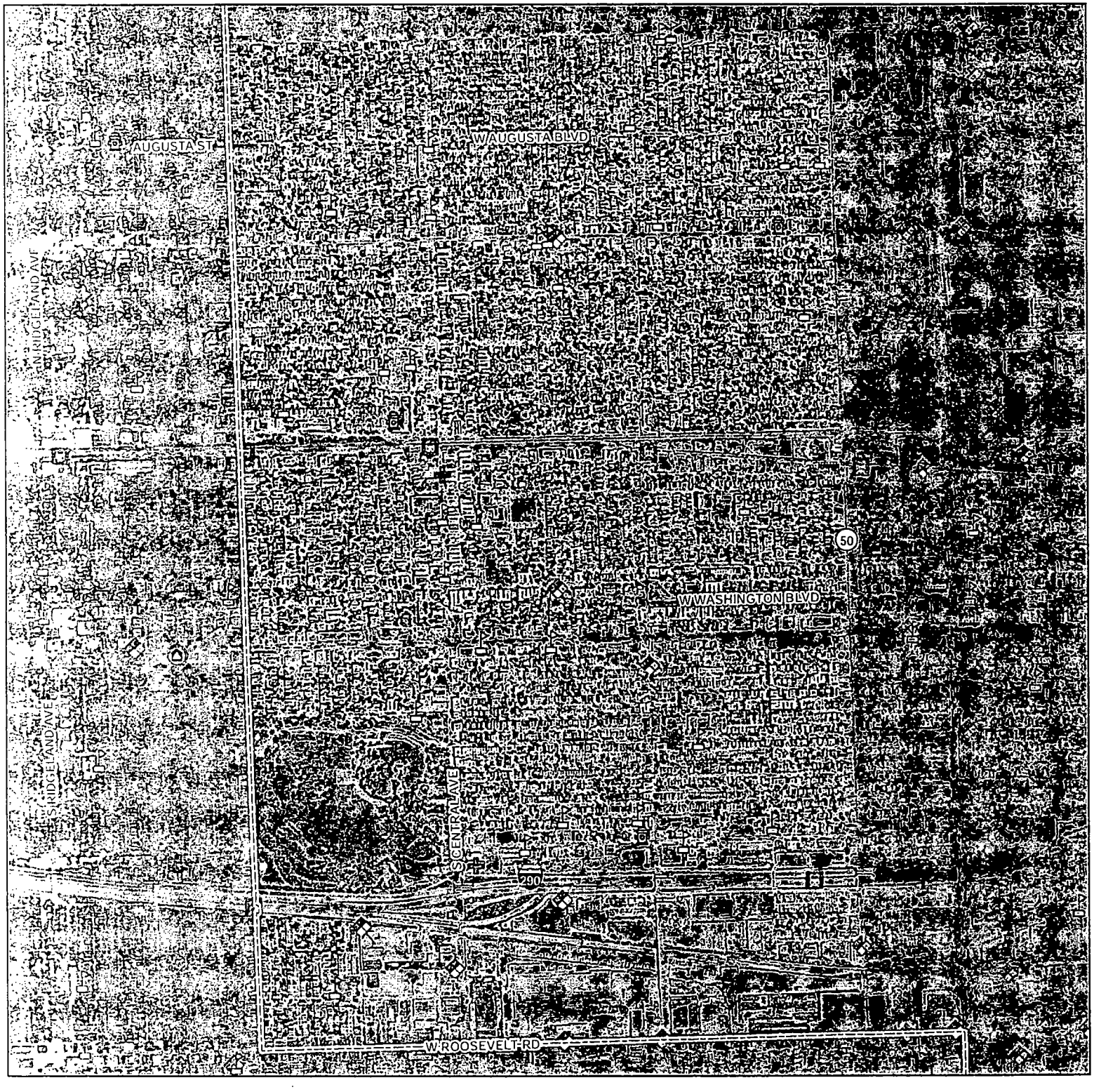
Note: Critical facility locations based on 2014 information.

Base Map Data Sources:
Cook County, U.S. Geological Survey



TETRA TECH

0 0.3 0.6 Miles



CITY OF CHICAGO

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Note: Critical facility locations based on 2014 information.
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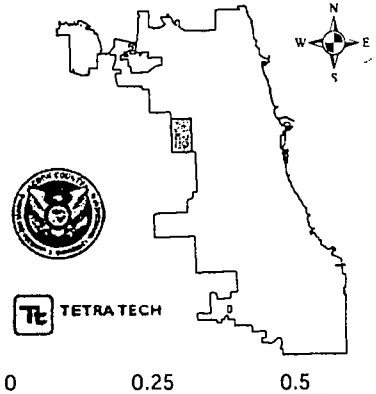
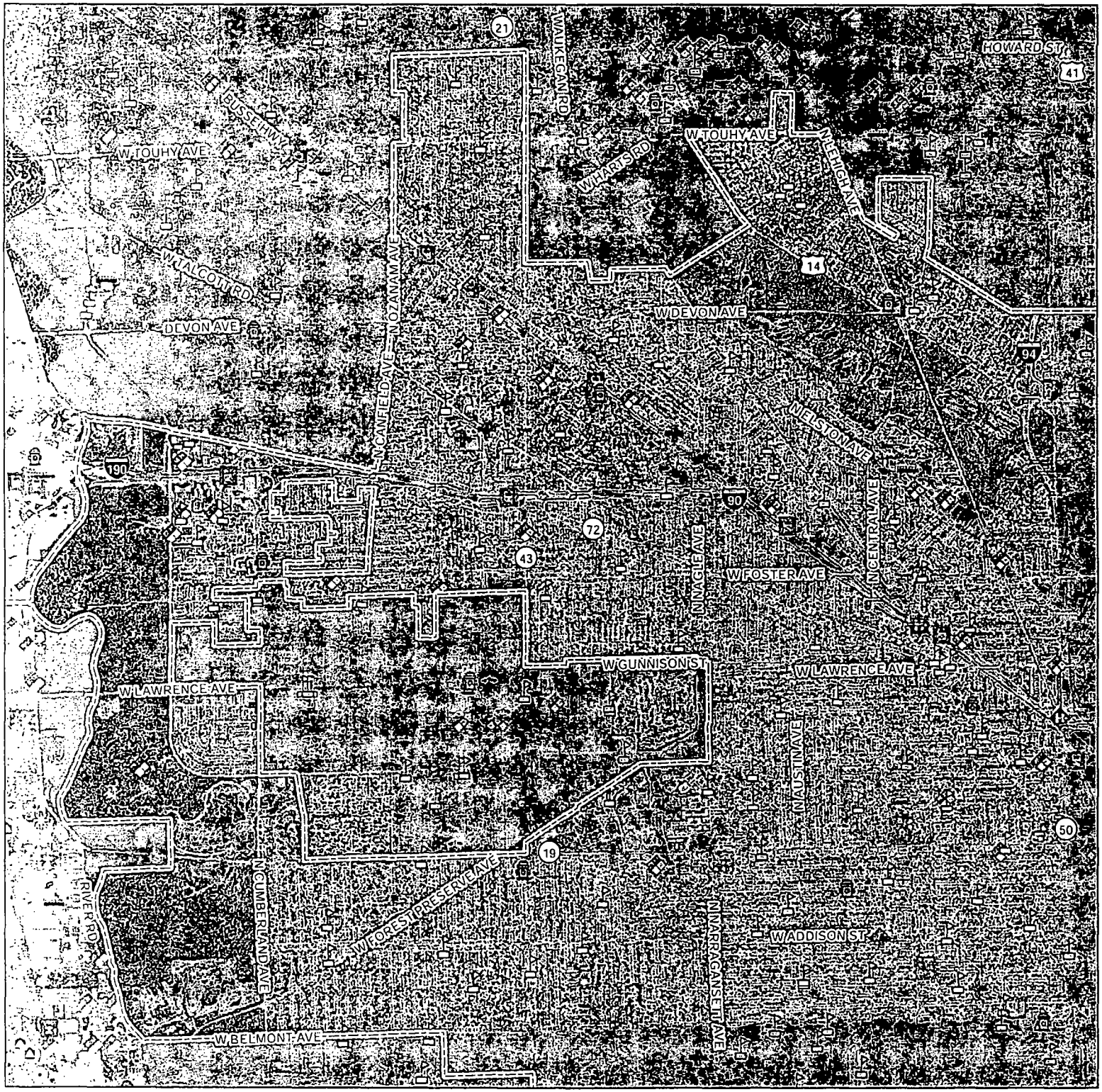
Cook County, U.S. Geological Survey



TETRA TECH

0 0.25 0.5 Miles



CITY OF CHICAGO

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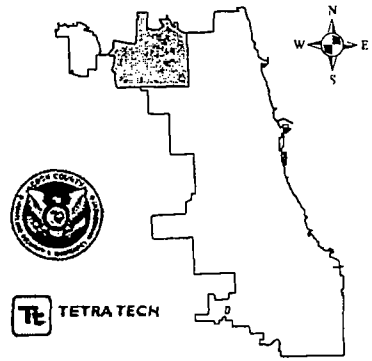
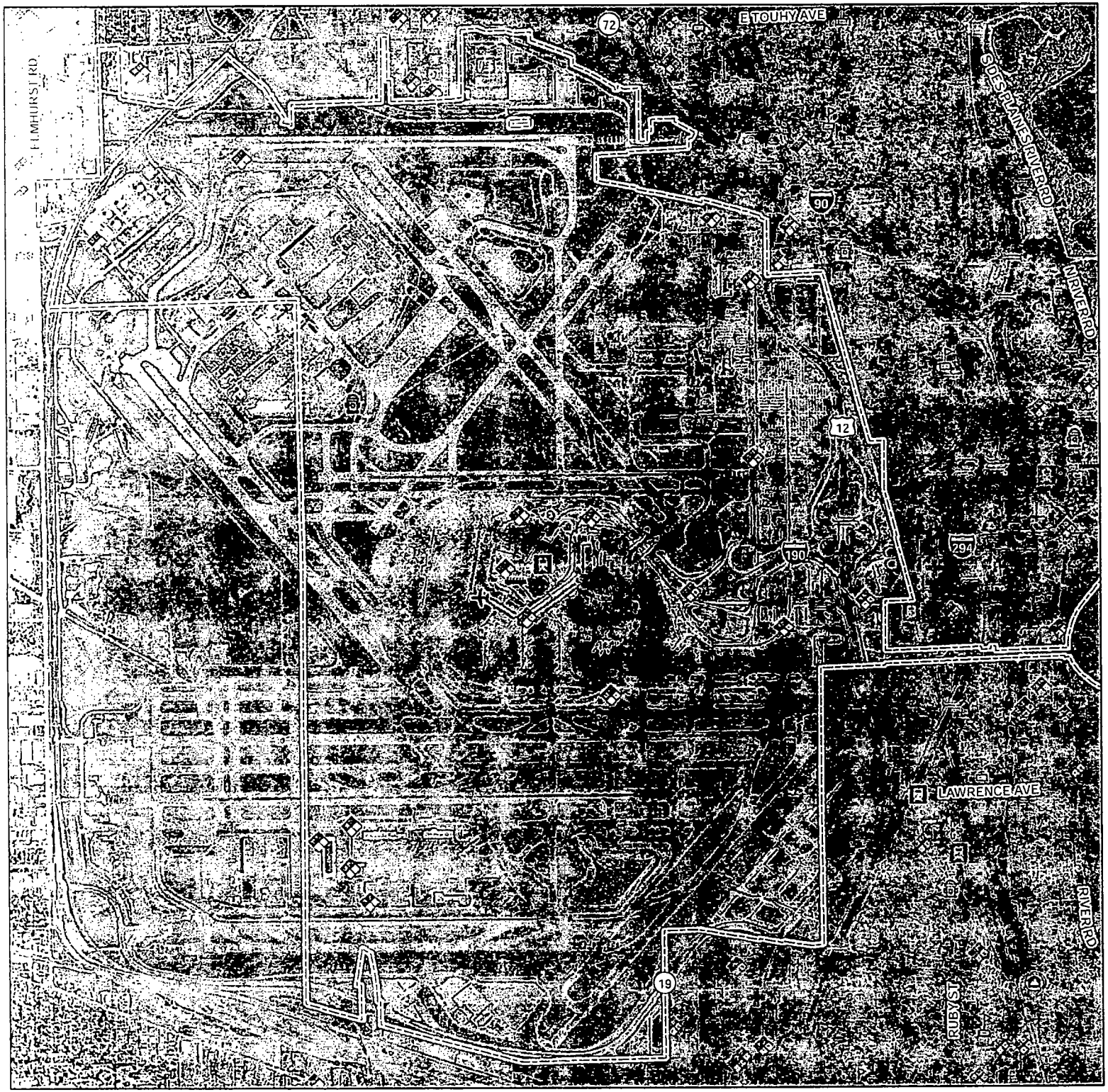


TETRA TECH

0 0.5 1 Miles



CITY OF CHICAGO

Critical Facilities

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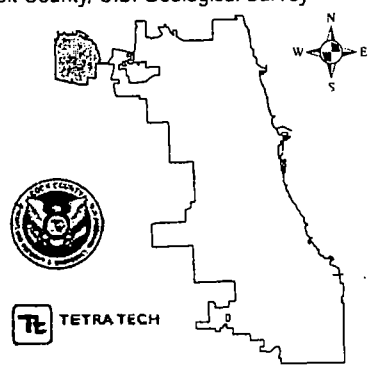
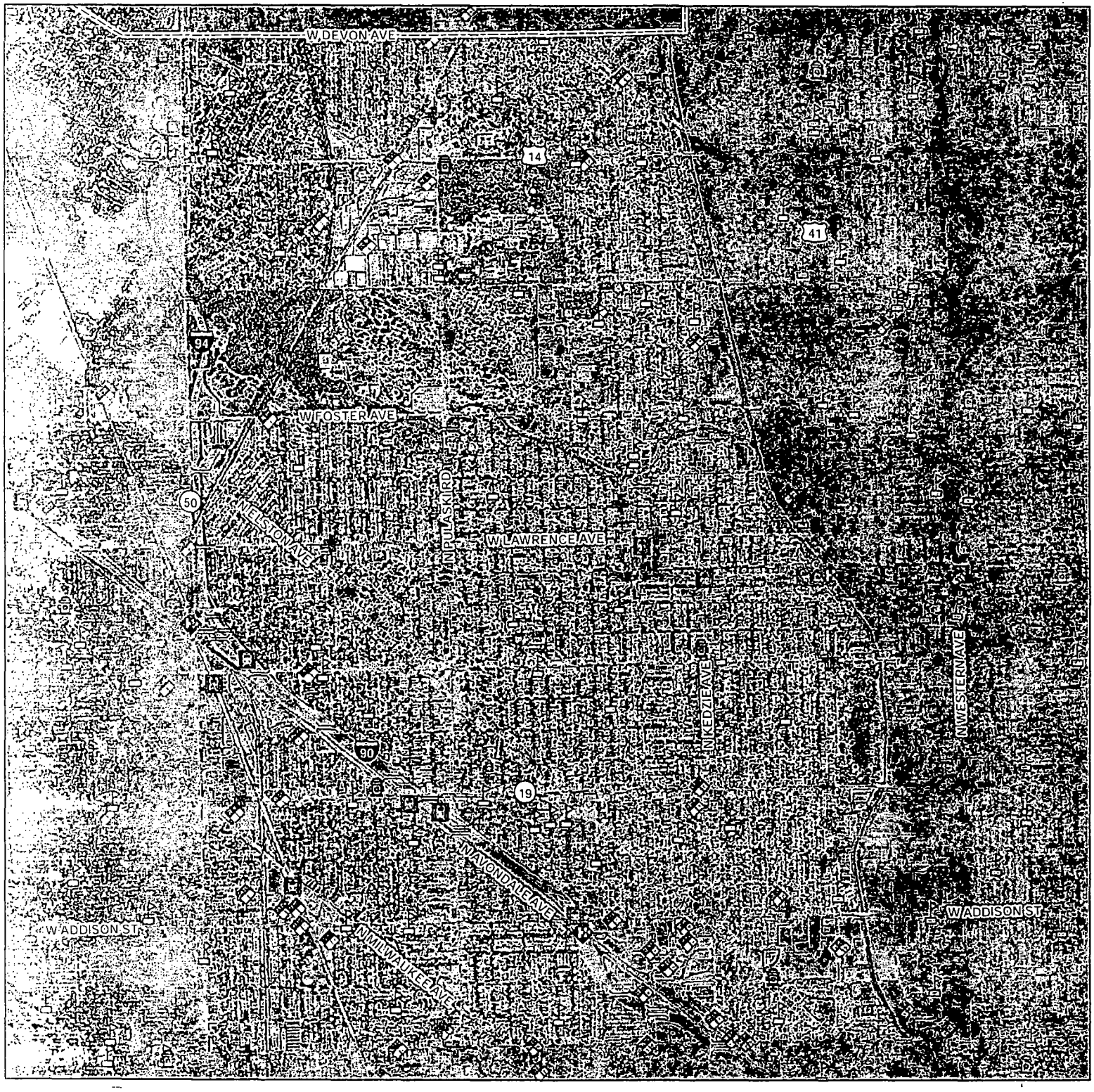
Cook County, U.S. Geological Survey



TETRA TECH

0 0.375 0.75
Miles



CITY OF CHICAGO

Critical Facilities

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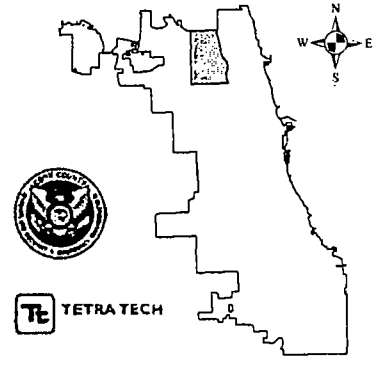
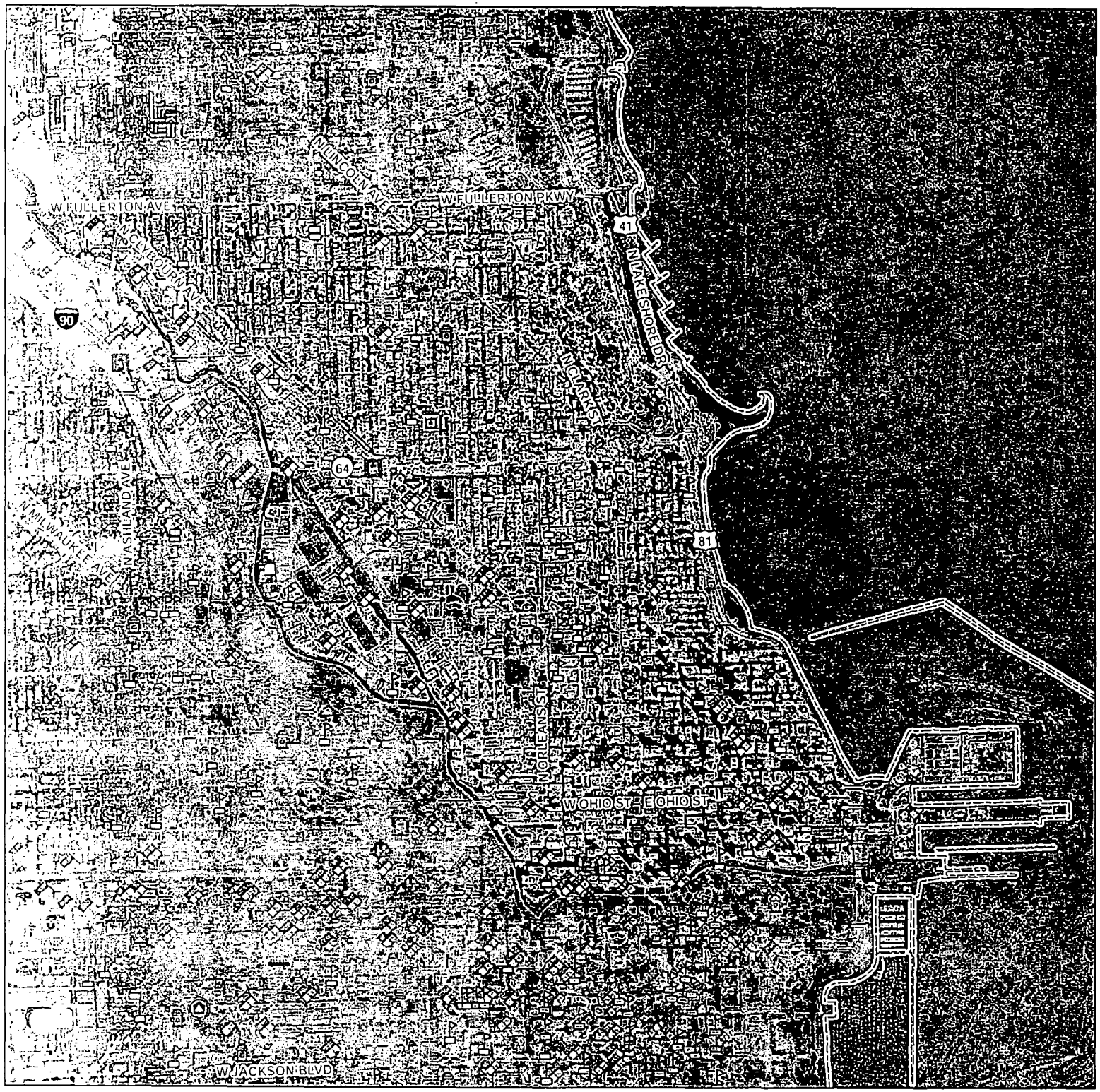
Note: Critical facility locations based on 2014 information.

Base Map Data Sources:
Cook County, U.S. Geological Survey



TETRA TECH

0 0.4 0.8 Miles



CITY OF CHICAGO

Critical Facilities

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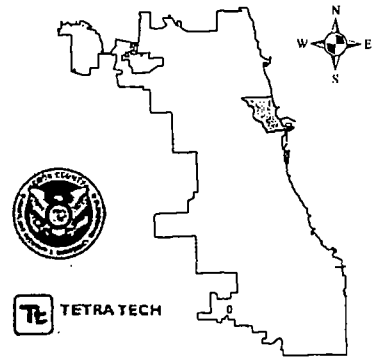

TETRA TECH

0 0.375 0.75 Miles

CITY OF CHICAGO

Critical Facilities

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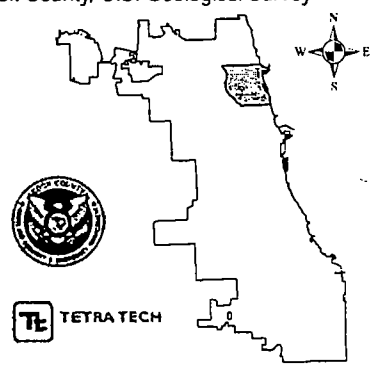
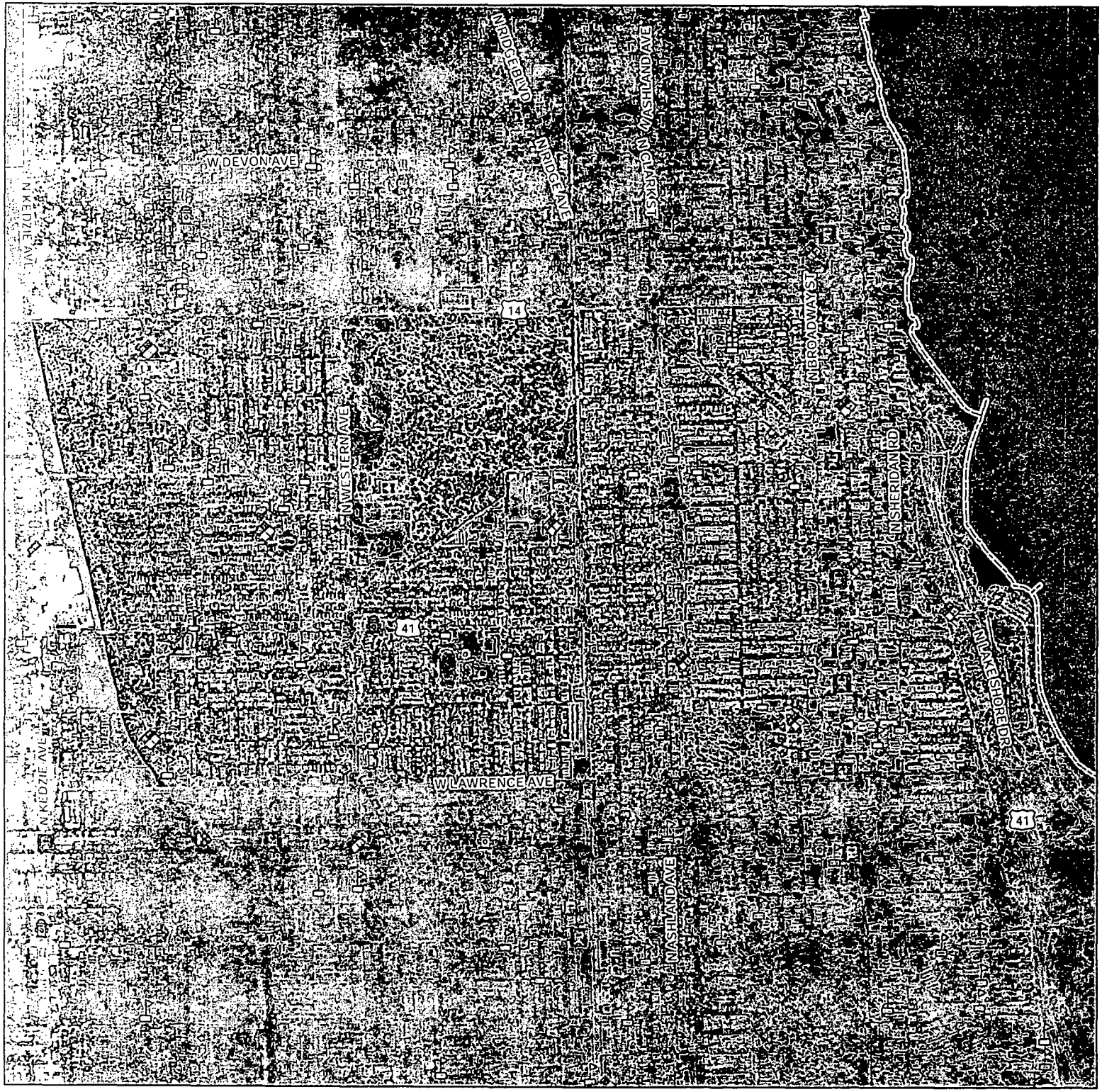
Cook County, U.S. Geological Survey



TETRA TECH

0 0.35 0.7
Miles



CITY OF CHICAGO

Critical Facilities

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- Fire Station Facility
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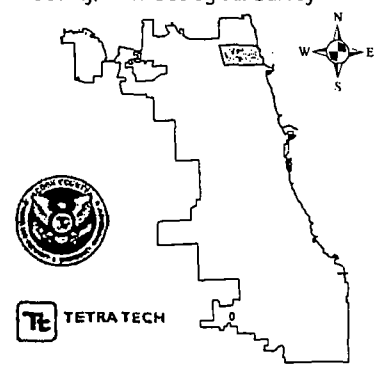
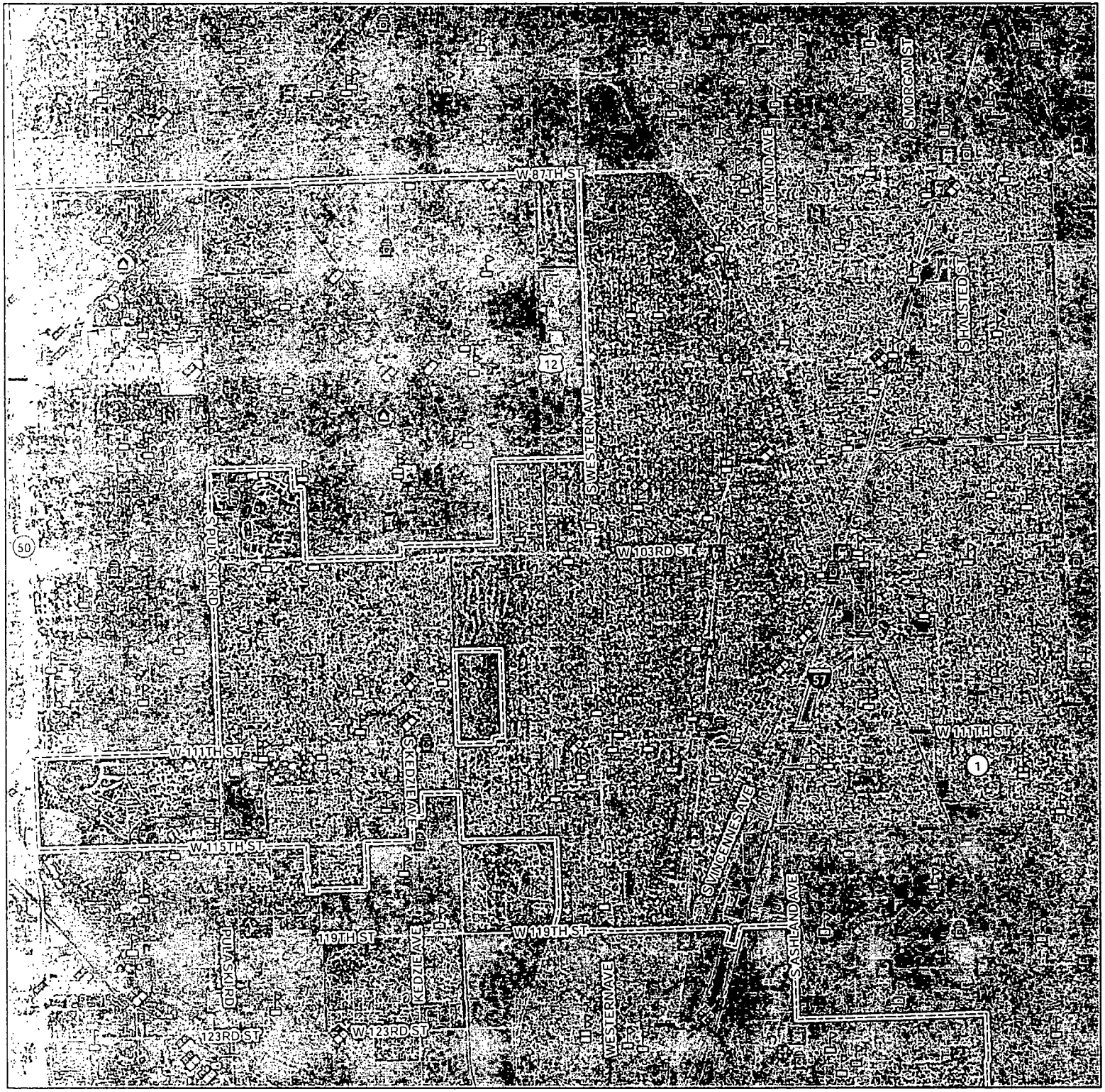
Base Map Data Sources:
Cook County, U.S. Geological Survey



TETRA TECH

0 0.325 0.65
Miles



CITY OF CHICAGO

Critical Facilities

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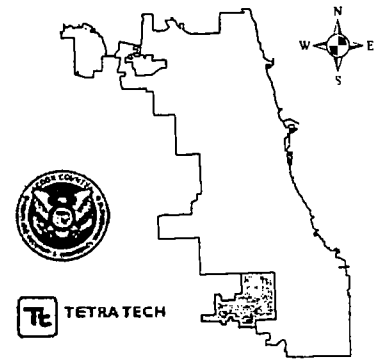
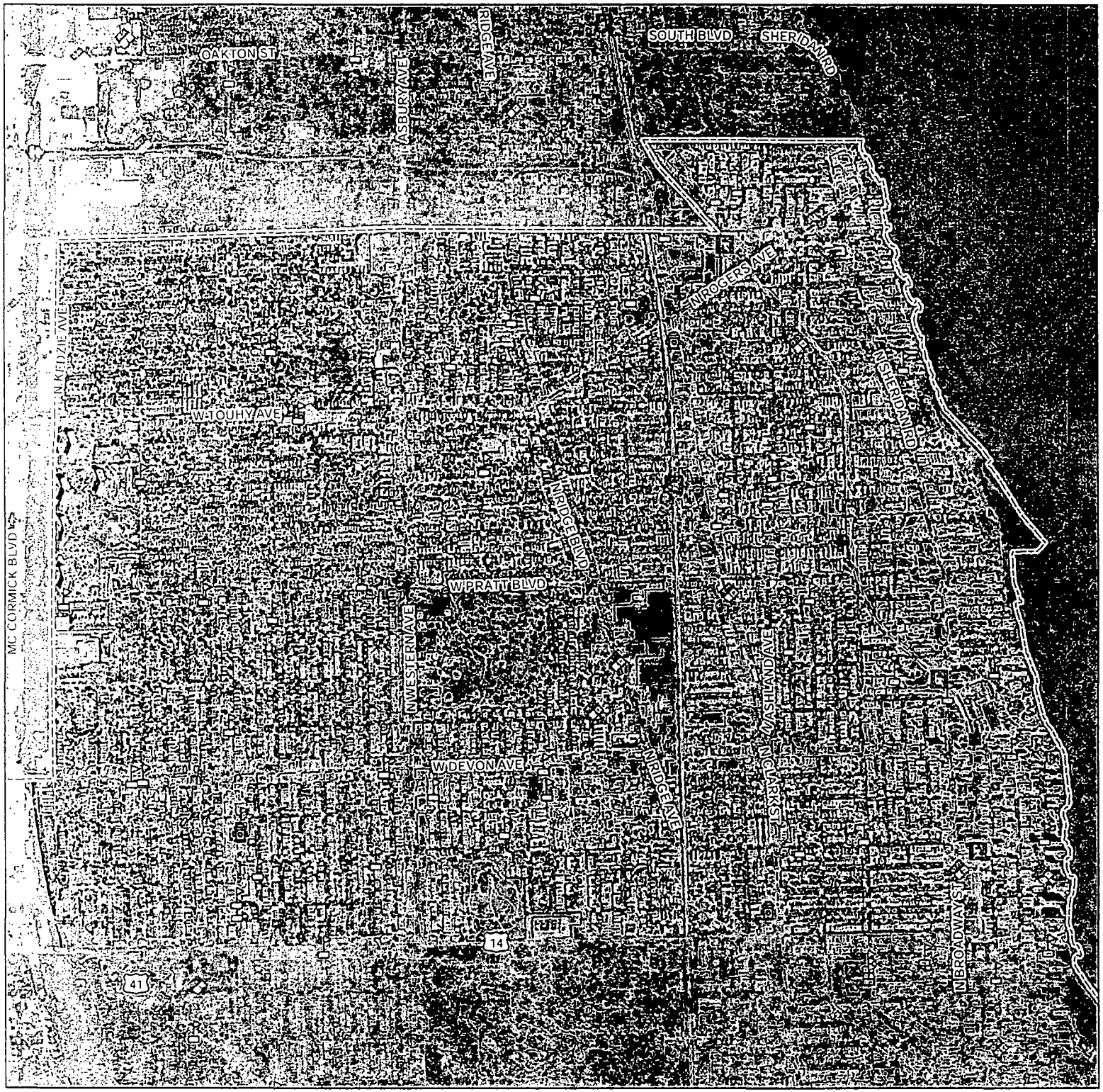


TETRA TECH

0 0.5 1 Miles



CITY OF CHICAGO

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- *School Facility*
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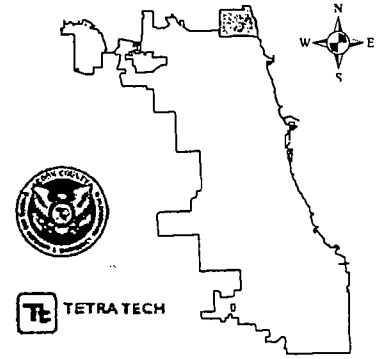
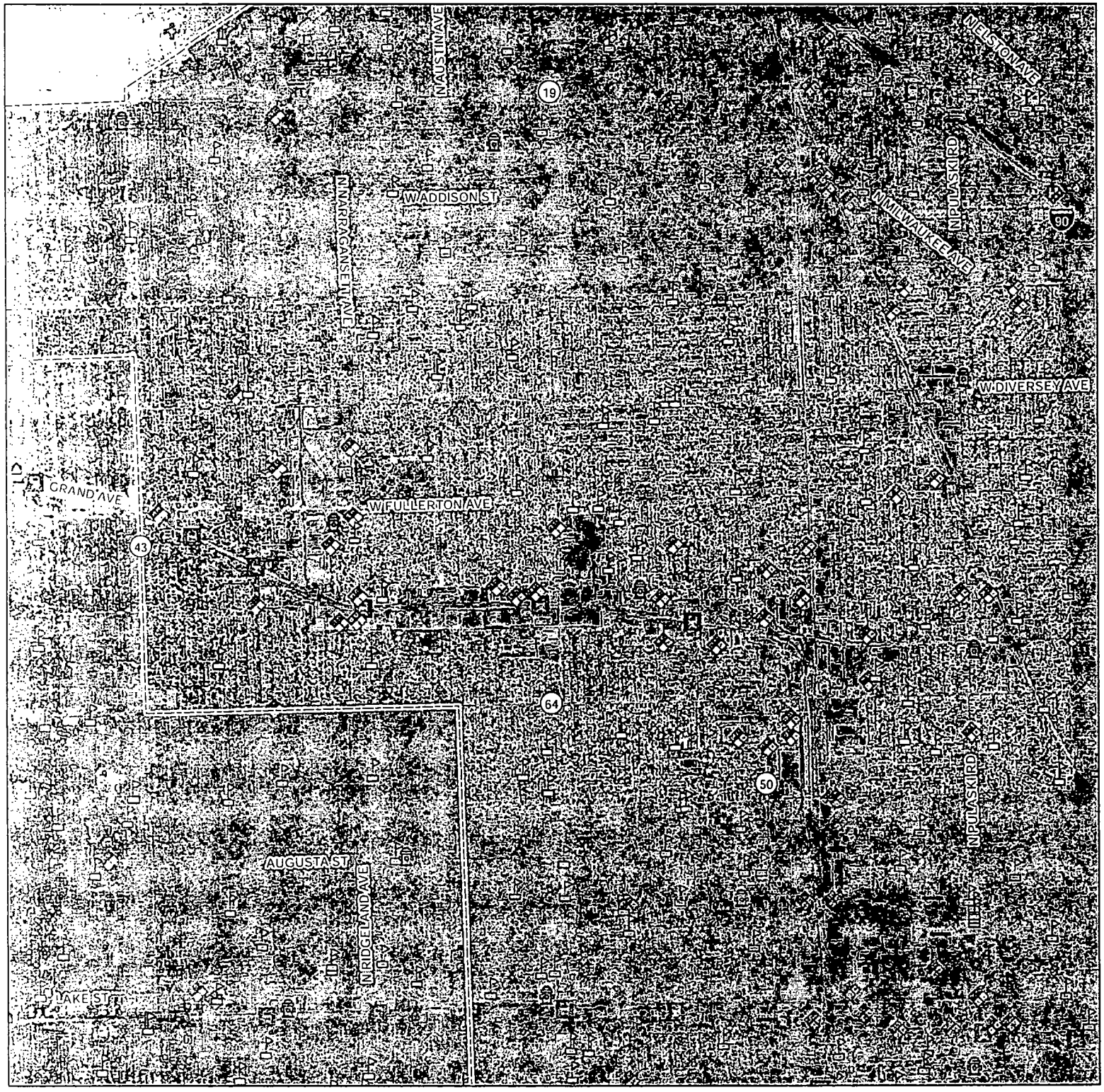


TETRA TECH

0 0.275 0.55 Miles



CITY OF CHICAGO

Critical Facilities

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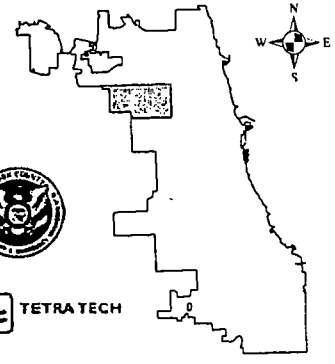
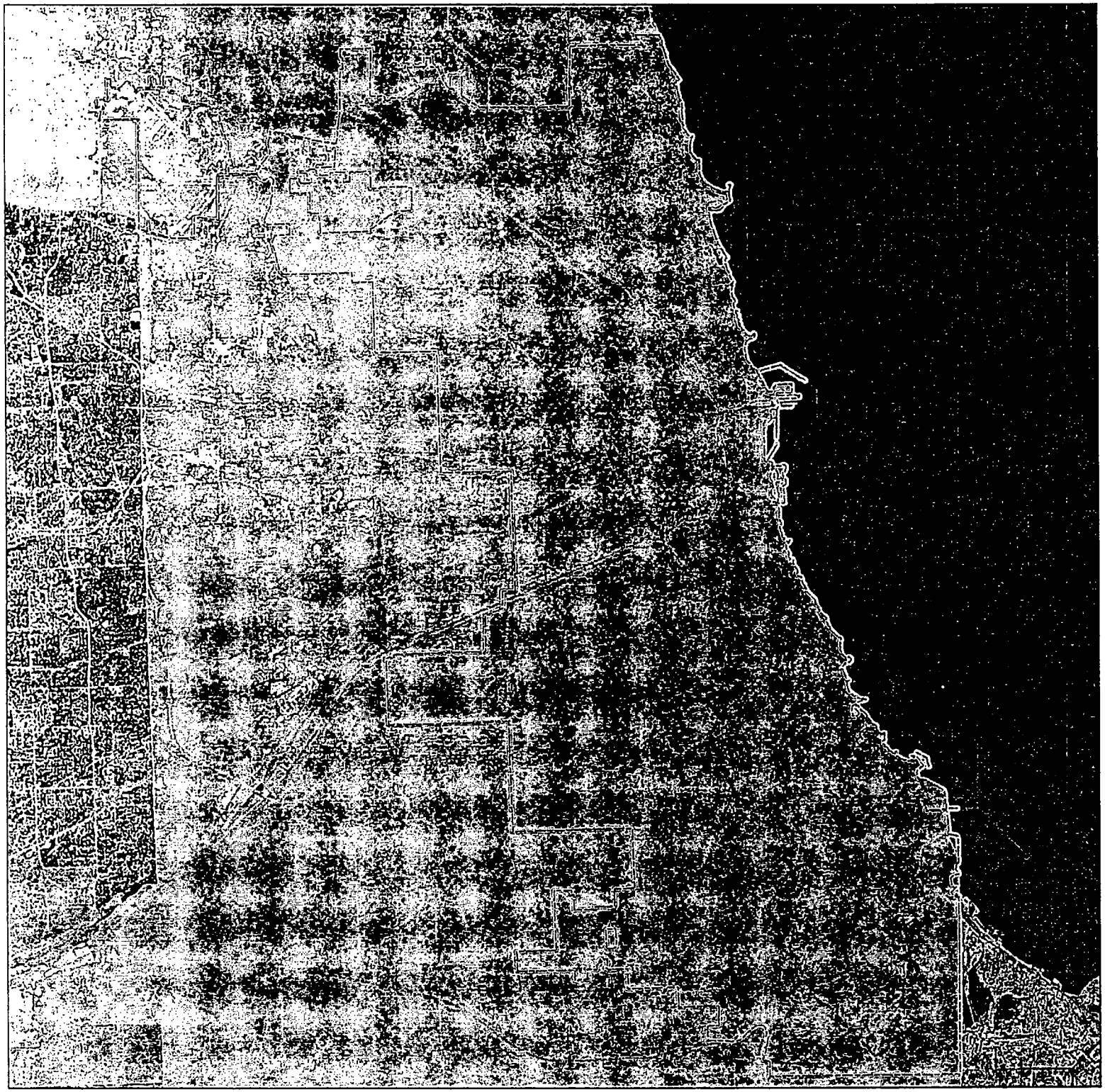


TETRA TECH

0 0.5 1 Miles



CITY OF CHICAGO

Illinois Historical 1909 Earthquake

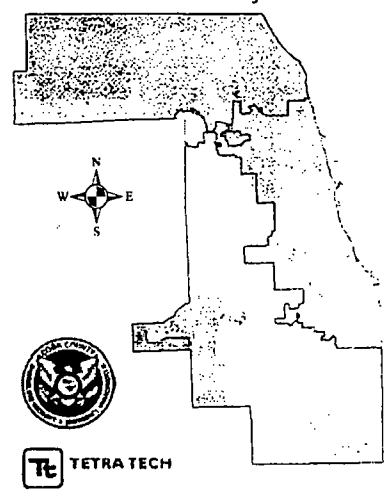
Modified Mercalli Intensity

- V (Moderate)
- VI (Strong)
- VII (Very Strong)
- VIII (Severe)
- IX (Violent)

Event Date of May 26, 1909. Original magnitude of 5.0; increased magnitude for analysis of 6.0. Depth: 10 km. Epicenter Lat/Long: 41.6N 88.1W

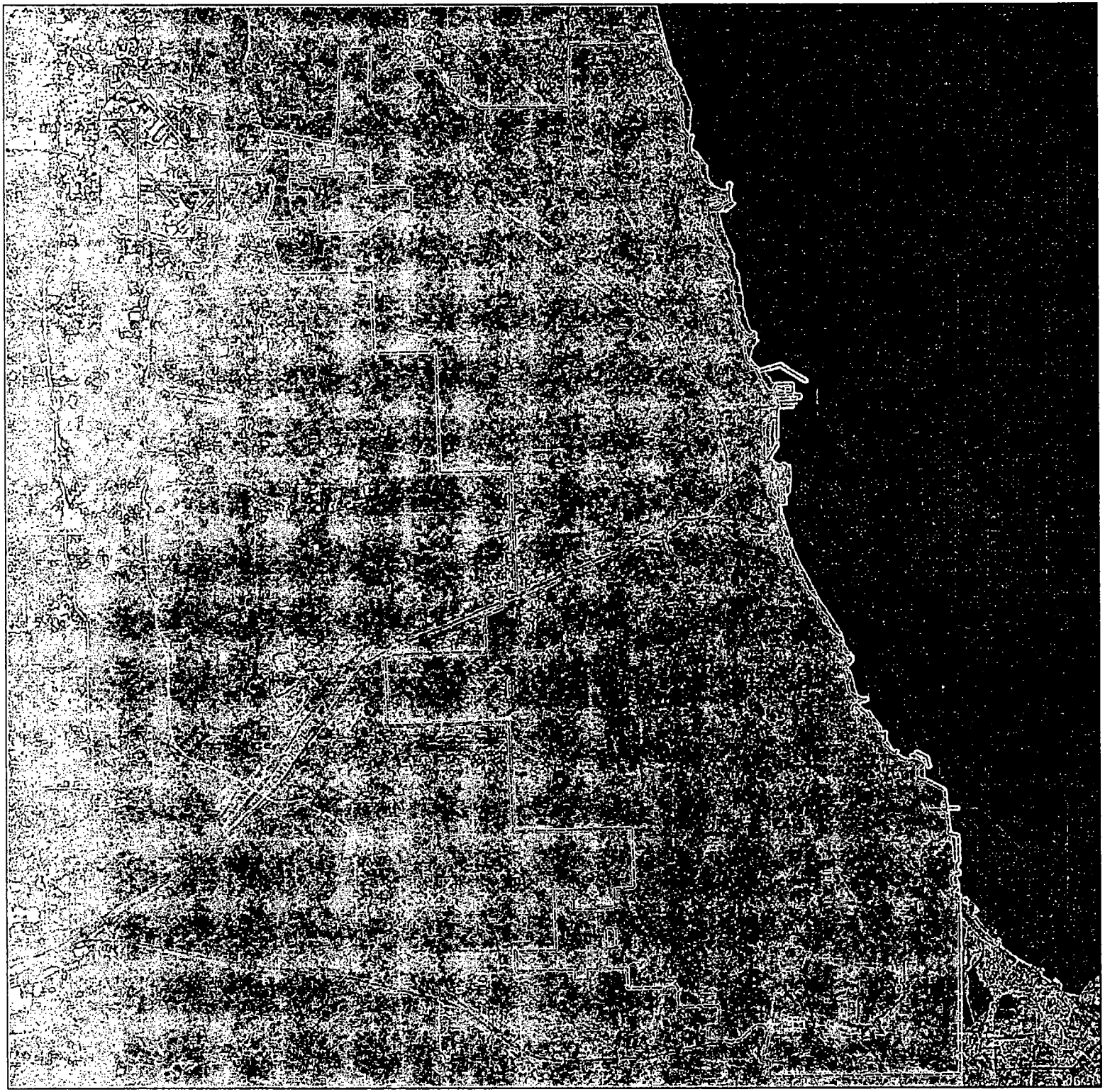
An Epicenter Map is derived from a database of historical earthquakes developed from three sources (Composite Earthquake Catalog, 2002, Earthquake Data Base, 2002, and Earthquake Seismicity Catalog, 1996). The database has been sorted to remove historical earthquakes with magnitudes less than 5.0. The Epicenter Map is based on a historical earthquake epicenter, selected from the database.

Base Map Data Sources:
Cook County, U.S. Geological Survey
Image Data Sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/ Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



TETRA TECH

0 2.5 5 Miles



CITY OF CHICAGO

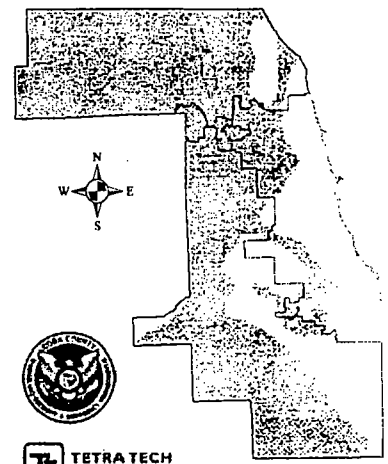
National Earthquake Hazard Reduction Program (NEHRP) Soil Classification

Site Class

- A - Hard Rock
- C - Very Dense Soil, Soft Rock
- D - Stiff Soil
- F - Site-Specific Evaluation

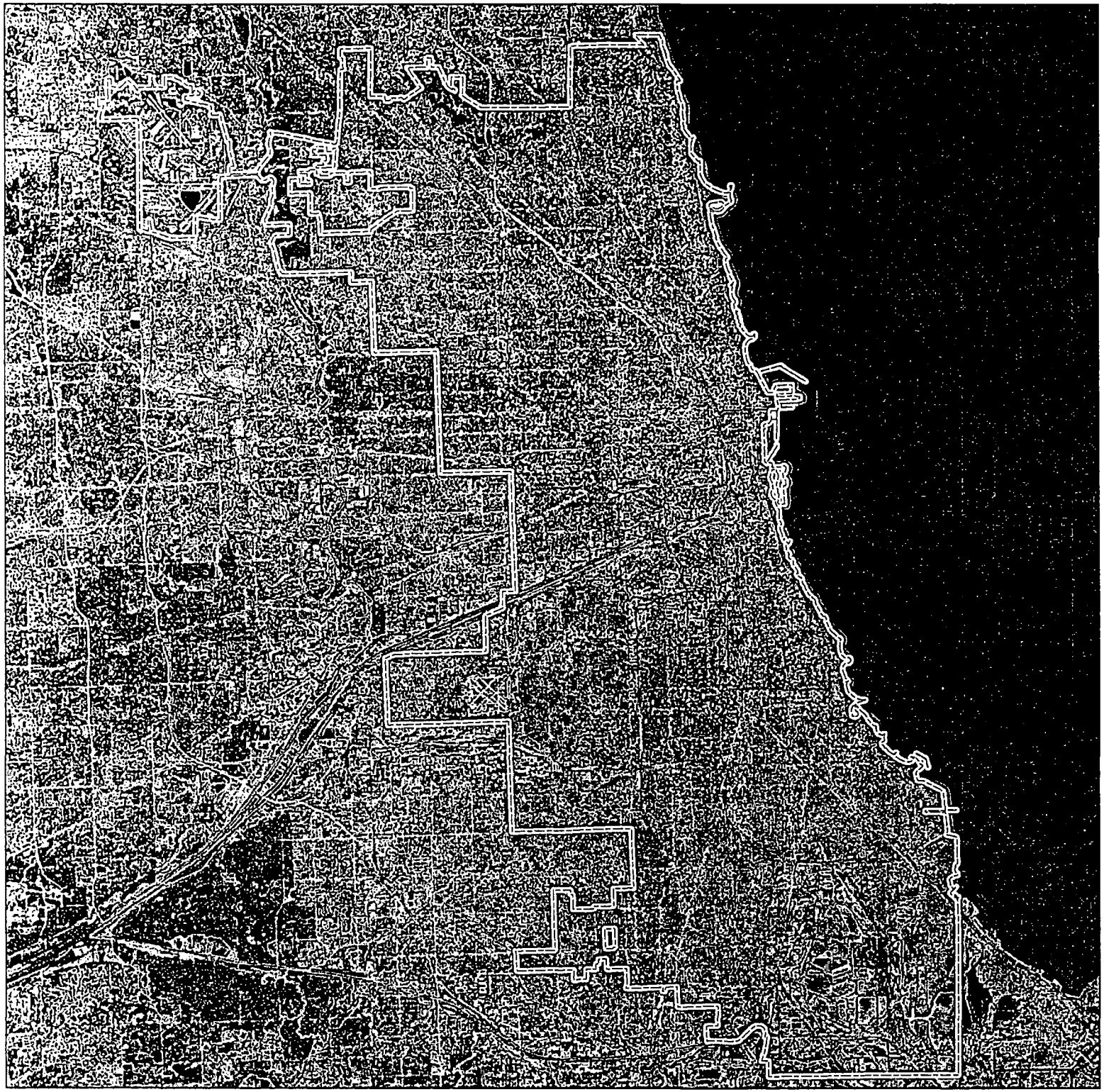
Soil classification data provided by the Illinois State Geological Society.
The procedures outlined in the NEHRP provisions (Building Seismic Safety Council, 2004) and the 2003 International Building Codes (International Code Council, 2002) were followed to produce the soil site class maps. Central U.S. Earthquake Consortium (CUSEC) State Geologists used the entire column of soil material down to bedrock and did not include any bedrock in the calculation of the average shear wave velocity for the column, since it is the soil column and the difference in shear wave velocity of the soils in comparison to the bedrock which influences much of the amplification.

Base Map Data Sources:
Cook County, U.S. Geological Survey
Image Data Sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/ Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



TETRA TECH

0 2.5 5 Miles



CITY OF CHICAGO

FEMA DFIRM
Flood Hazard Areas

Floodway

1 Percent Annual Flood Hazard

Flood Depth

High : 20 ft

Low : -1 ft

Flood hazard areas as depicted on FEMA Digital Flood Insurance Rate Maps (DFIRM).

The 1 percent annual flood hazard is commonly referred to as the 100 year floodplain.

Base Map Data Sources:
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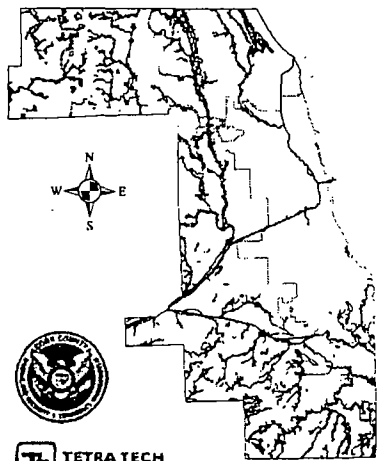
Image Data Sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/ Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



TETRA TECH

0 2.5 5 Miles

CITY OF CHICAGO

Liquefaction Susceptibility

- Very High
- High
- Low
- Very Low
- None

Liquefaction data provided by the Illinois State Geological Society. Liquefaction data based on the Youd and Perkins (1978) method. A liquefaction susceptibility map provides an estimate of the likelihood that soil will liquefy as a result of earthquake shaking. This type of map depicts the relative susceptibility in a range that varies from very low to high. Areas underlain by bedrock or peat are mapped separately as these earth materials are not liquefiable, although peat deposits may be subject to permanent ground deformation caused by earthquake shaking.

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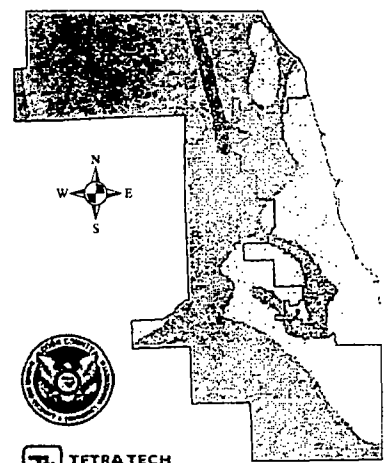
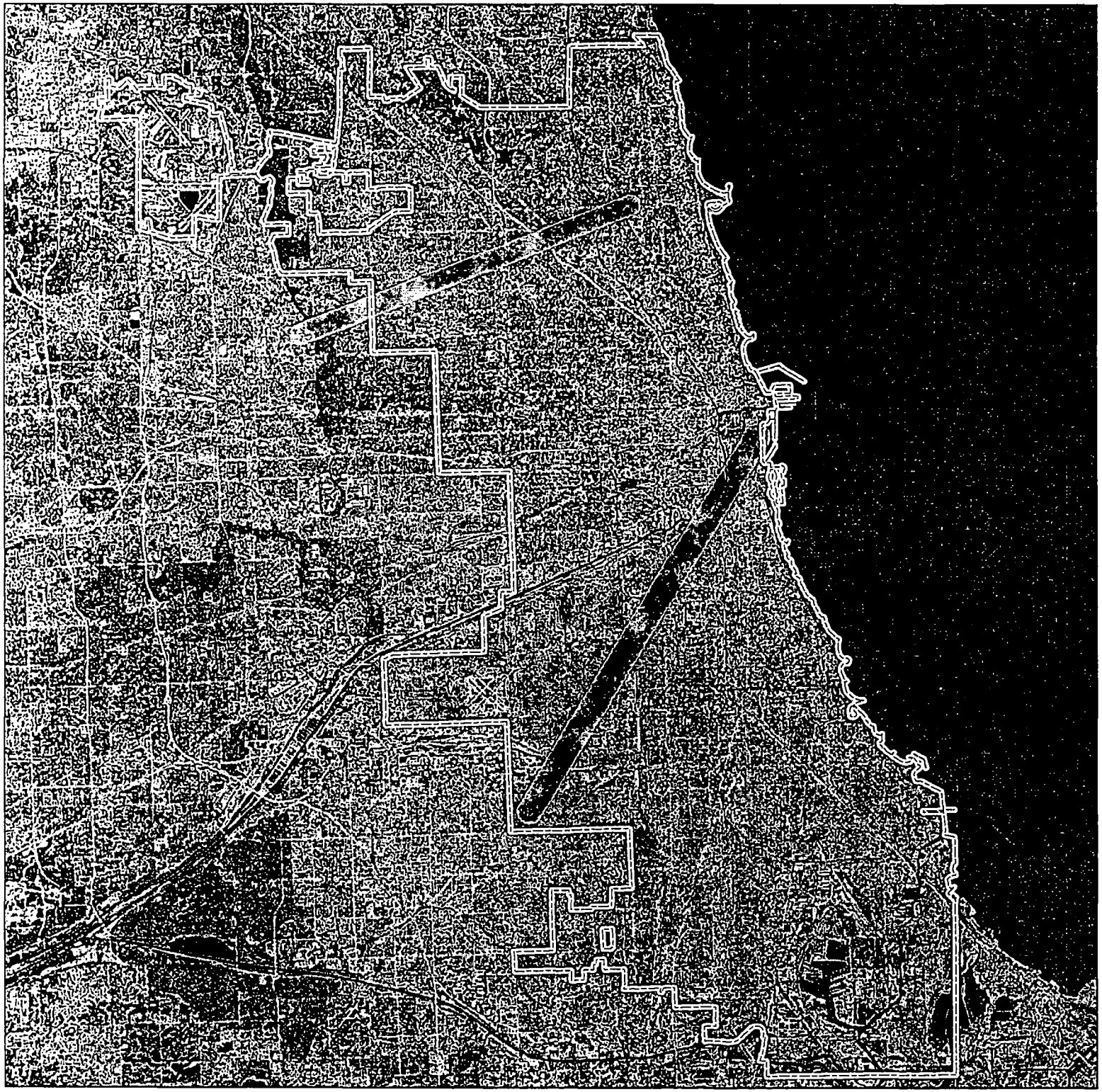
Image Data Sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/ Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



TETRA TECH

0 2.5 5 Miles

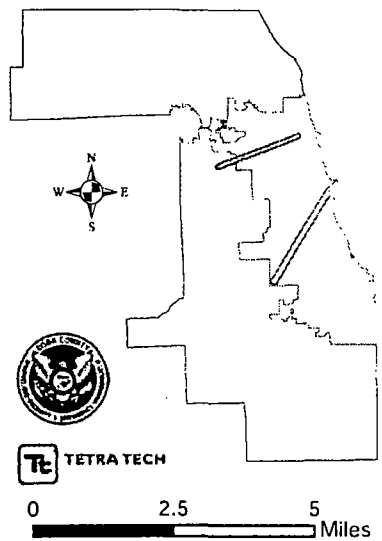


CITY OF CHICAGO

100- and 500-Year Tornado Events

100-Year Modeled Tornado Event (F4)

500-Year Modeled Tornado Event (F5)

The 100- and 500-year events have been modeled based on fifty-nine years of tornado data for Cook County. The wind speeds, widths, lengths, and direction for each event were developed using existing historical tornado data. The simulated storms and their corresponding losses within this jurisdiction were used to determine the 100- and 500-year economic loss event.

Base Map Data Sources:
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