# Telecommunications

**Someone makes a call from a cell phone in Manhattan to a house on Staten Island**. That call follows a circuitous path. The call connects to a cell site atop a private building, runs through cables under the street, navigates three separate telecommunications switching facilities, and continues through miles of underground and overhead cables. When the call finally reaches the house on Staten Island, it has been controlled by at least two phone providers, it has operated under the authority of at least three government regulators, and it has relied on the seamless operation of a vast network of equipment.

Clearly, telecommunications in New York City, as elsewhere, are complex. And, of course, they cover more than phone calls, encompassing Internet and cable television services as well. All of these telecommunications services rest on a vast infrastructure of over 50 thousand miles of cabling, thousands of cell sites, and nearly 100 critical facilities. This telecommunications infrastructure not only serves New York's population of 8.3 million residents, it also serves the city's 3.9 million workers, 250,000 businesses, and 50 million annual visitors. The city's telecommunications infrastructure plays a critical global role: it is estimated that New York City accounts for approximately 3 percent of the world's web traffic—even as the city serves as home to only 0.1 percent of the world's population.

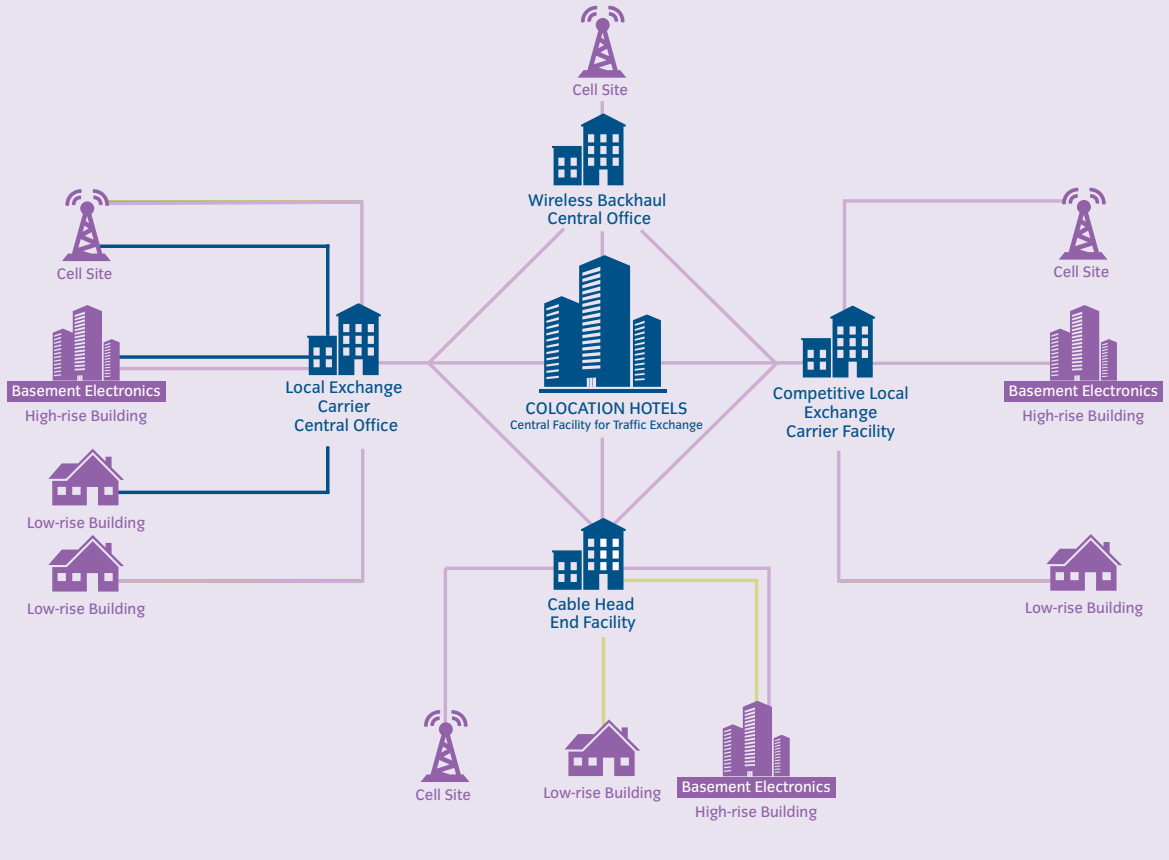
In the city's increasingly information-based economy—which depends on quickly accessing and exchanging information—telecommunications keep our city running. The finance industry depends on these services to process transactions. Small businesses rely on them to receive orders and contact customers. New Yorkers use them for everything from getting news to communicating with friends to buying food—whether ordering from favorite neighborhood takeout restaurants or paying for groceries through food assistance programs such as Electronic Benefits Transfer (EBT).

Telecommunications also are increasingly important to New Yorkers' health and public safety. Particularly for vulnerable populations during emergencies, being able to send a text to a family member or make a 911 call can be the difference between getting help and being stranded or worse. As hospitals and other healthcare providers transition to electronic medical records, connectivity is becoming even more essential to our healthcare system.

Competition across New York City's telecommunications market is robust, with multiple providers delivering overlapping services. New York City is served by four cable TV providers, the four major national wireless providers (Verizon, AT&T, T-Mobile, and Sprint), and over a dozen competitive local exchange carriers providing telephone and other services.

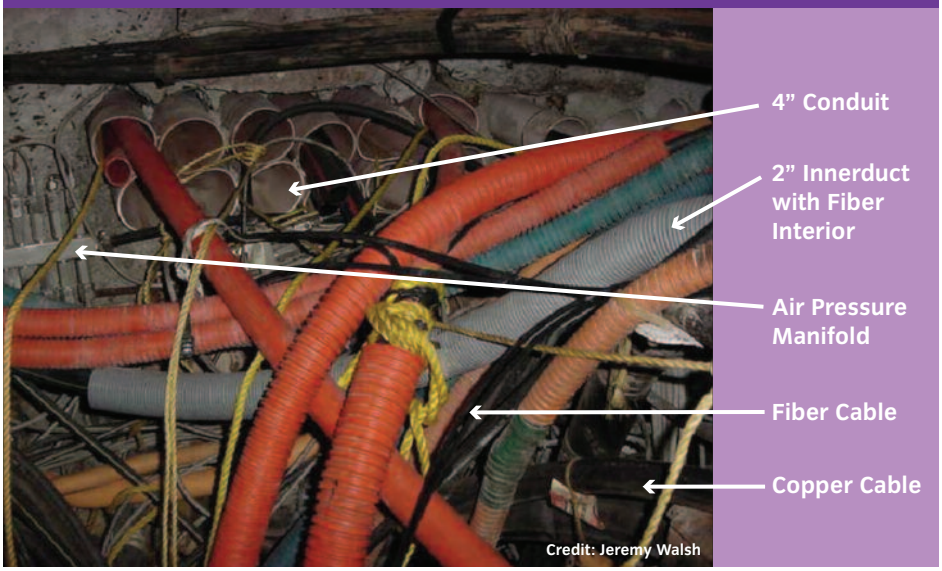
Nonetheless, improvements are needed. Sandy exposed weaknesses in the city's telecommunications infrastructure—including the location of critical facilities in areas that are susceptible to flooding. In Southern Manhattan and the Rockaways, the storm caused

## Components of the Telecommunications System




| CABLE TYPE | PERIOD IN USE | LAST INSTALLED | RESILIENCY |
|---|---|---|---|
| Copper Cables | 1910s to present | Lead sheath cable until 1970s; plastic sheath still being installed | Vulnerable to flooding |
| Coaxial Cables | 1950s to present | Still being installed | Difficult to troubleshoot; more resilient than copper |
| Fiber Cables | 1970s to present | Still being installed | Most resilient cable; slowly replacing others |

**Underground Cable and Conduit**




neighborhood-wide outages that lasted up to 11 days—and for those buildings that suffered inundation, restoration of service took well over three months in some places.

In keeping with the broad goals of this report—which are to minimize disruptions from climate hazards and to increase the New York's capacity to bounce back quickly if damage is sustained—the City's plan should enhance the resiliency of the telecommunications system. The City will advocate that a base level of telecommunications service is available and accessible throughout New York at all times for emergency communication, and will work toward quick restoration of full telecommunications services when disruptions do occur. The City will do this by increasing the accountability of telecommunications providers to invest in resiliency and by using new regulatory authority to enable rapid recovery after extreme weather events, to harden facilities so as to reduce weather-related impacts and to create redundancy to reduce the risk of outages. While competition may drive better service and resiliency in some areas, the City must take an active role in making the telecommunications infrastructure more resilient in all parts of New York.

## How the Telecommunications System Works

Telecommunications services—telephone, wireless, Internet, and cable—are delivered from interconnected central facilities that transfer data among one another and then send that data back out over a network of cables to end users in their homes and offices or on mobile devices. All components of this infrastructure need to be functioning along the entire route for a call, text message, email, or other type of data to be sent successfully from one point to another.

### Components of the Telecommunications System

The telecommunications system is comprised of four main components: critical facilities, cabling, cell sites, and equipment in individual buildings. *(See graphic: Components of the Telecommunications System)*

Critical telecommunications facilities are larger distribution and switching centers. They provide connectivity across all major services and each supports tens of thousands of customers. These critical facilities include telephone central offices; "colocation" hotels, which are secure physical sites or buildings where data are transferred from one provider to another; and cable "head ends," the facilities that distribute cable TV and Internet services to subscribers. Providing round-the-clock services, these critical facilities have back up batteries and fuel-powered generators, and they are environmentally controlled to keep electrical equipment safe from excessive humidity and overheating.

Cabling provides the connections essential to telecommunications and can be strung overhead via utility poles or can run underground. New York's oldest cabling is lead-encased copper, with sections ranging from 10 to 90 years old. The copper network is in poor condition due to its age. Many cables have leaks, compromising the pressurized air system designed to keep water away from copper wiring. Coaxial cable is a newer material that is somewhat resistant to water and is primarily used for cable TV and Internet services. Fiber cable is the newest and most resilient type of cable, being both fully water-resistant and able to carry all types of service.

Conduit, an underground pipe through which cable is threaded, is the way most cable snakes beneath New York City. While it is more expensive to construct than overhead wires, it is also more protected and less intrusive. Conduit is used in the densest areas of the city—Manhattan, the Bronx, and parts of Brooklyn, Queens, and Staten Island. Manhattan and the Bronx have a shared conduit network run by Empire City Subway, a private company that is responsible for providing conduit infrastructure for providers in all areas of those boroughs. In the other boroughs, Verizon, Time Warner Cable, and Cablevision have the most extensive conduit infrastructure, some of which is rented to other providers. *(See graphic: Underground Cable and Conduit)*

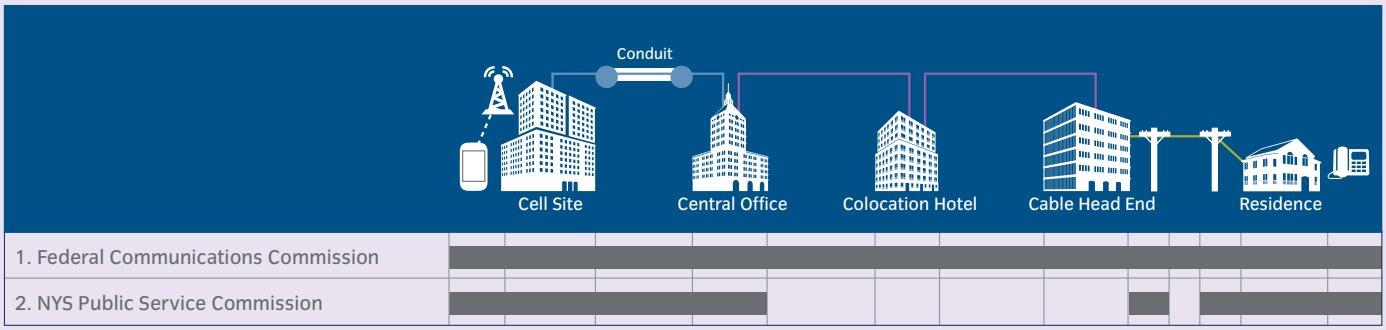
Cell sites are also key components of the telecommunications infrastructure. Unlike in rural areas, where cell sites often sit atop freestanding towers, cell sites in New York City are typically placed on the rooftops of buildings. Cell sites have three components: an antenna, electronics, and backhaul circuits—cables that connect the cell site to the larger telecommunications network. Backhaul circuits are generally copper or fiber optic cable, most frequently taking a single path back to central switching facilities. Most cell sites rely on power supplied by a utility, and have four to eight hours of battery backup.

The final piece of the telecommunications puzzle is the equipment in homes, offices, and other buildings that distributes signals transmitted via cabling from critical facilities to individual customers. This equipment ranges from electronic multiplexers in large buildings (usually found in basements) to terminals attached to the exterior of small residential buildings (positioned a few feet off the ground), to individual customers' modems.

### Regulatory Framework for the Telecommunications System

Federal, State, and City agencies are involved in the regulation of the telecommunications industry. However, none currently has comprehensive responsibility for the entire system, and none is charged with ensuring that required service is available in emergencies. While the Federal Communications Commission (FCC) has a Communications Security, Reliability, and Interoperability Council that promotes best practices for resiliency, it does not require compliance with these standards.

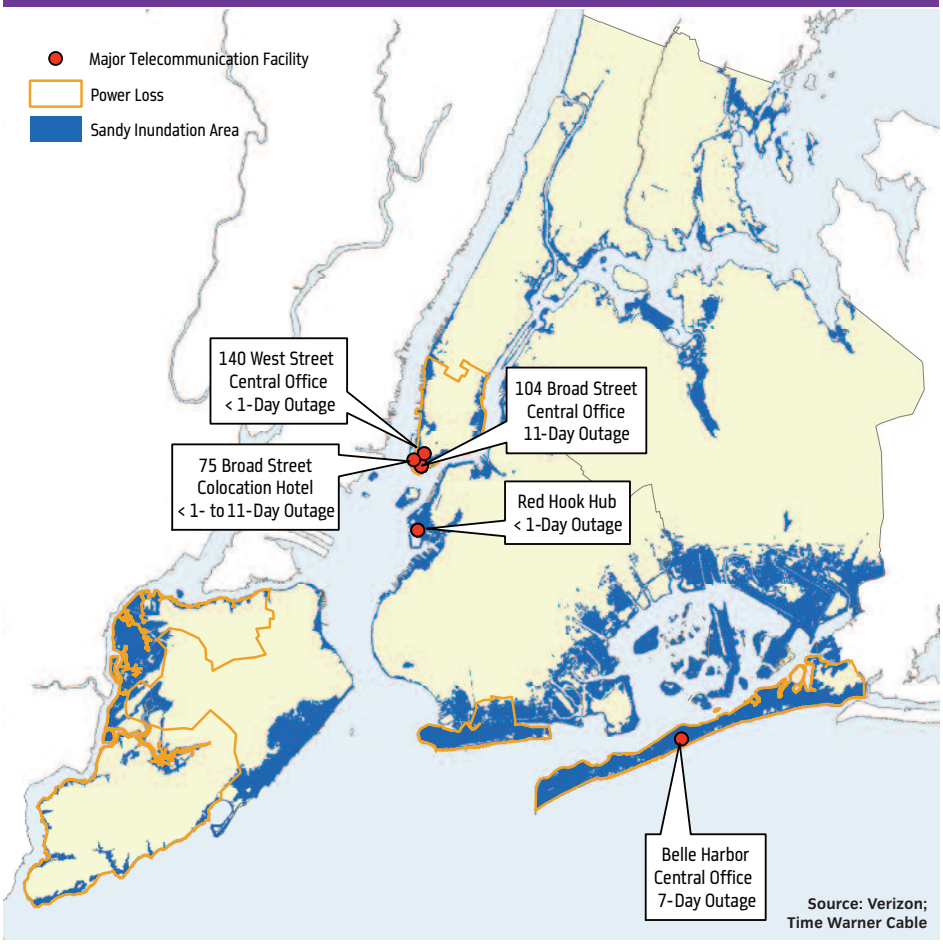
## State and Federal Regulatory Authority Over a Call in New York City




The FCC has significant authority over wireless, long-distance phone, and Internet (including at least some aspects of "Voice over Internet Protocol," or VoIP) services. The New York State Public Service Commission (PSC) has significant authority regarding local traditional landline telephone service. Finally, the FCC, the PSC, and the City all share regulatory authority over cable TV service.

Three City agencies are involved in overseeing various aspects of the telecommunications infrastructure in New York City. Founded in 1994 to consolidate the City's information technology functions with its cable and telecommunications activities, the Department of Information Technology and Telecommunications (DoITT) is responsible, among other things, for purchasing and administering internal communications services for City agencies; for administering the franchises that allow communications companies to access public rights of way for their infrastructure—above and below the city's streets—and for collecting fees and other compensation for such access. The Department of Transportation (NYCDOT) also plays a role as manager of street access through its control of permitting for street construction. Finally, the Department of Buildings (DOB) is the custodian of the Building Code, which determines, among other things, the placement of electrical equipment, backup power, and fuel storage at critical telecommunications facilities. *(See graphic: State and Federal Regulatory Authority Over a Call in New York City)*

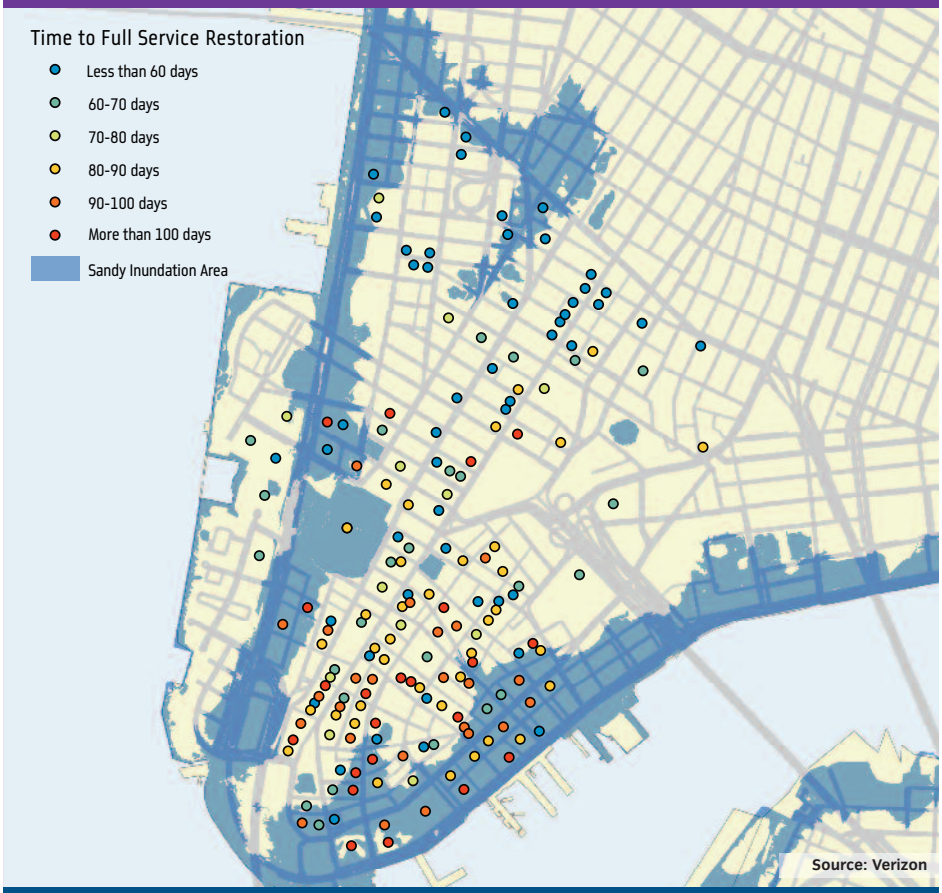
## Major Telecommunications Facility Outages During Sandy




In recent decades, evolving technology has led to shifting regulatory authority, as some services move out of one regulator's domain and into that of another. The transition from traditional wire-line phone service to phone service via fiber optic cable or Internet (VoIP) is a prime example. Consumers who make the switch from a landline phone service to VoIP move from a service that is regulated by the State to a service that is at least in part regulated at the Federal level. Not surprisingly, the popular bundled services offered by many providers have a particularly complex regulatory structure. A bundled voice, Internet, and cable package, for example, is regulated on both the local (cable) and Federal (Internet and VoIP) levels.

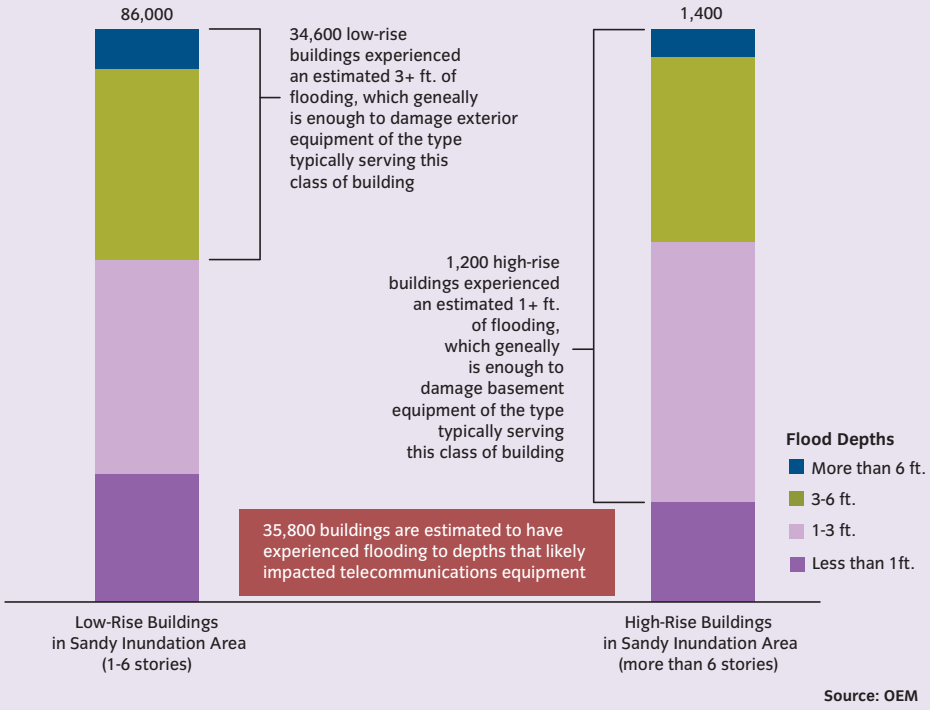
As a result of these overlapping jurisdictions, there is currently no single entity that is prioritizing or enforcing resiliency across the entire system. To ensure that changes in technology do not compromise public access and safety, a focus on creating a more resilient telecommunications system is crucial—especially as the effects of climate change are felt in New York City.

## Sample of Telecommunications Service Restoration Times of Commercial Buildings in Southern Manhattan




**High-rise commercial buildings that lost telecommunications service during Sandy took weeks or months to restore service because of damage to copper cables, and difficulties in restoring power and replacing flood-damaged equipment in individual buildings.**

## Estimated Flood Damage to Telecommunications Equipment in Buildings




## What Happened During Sandy

During Sandy, telecommunications outages followed the pattern of utility power outages and flooding. When utility power went out, it knocked out cable and Internet services in homes and businesses immediately. These power-driven telecommunications outages affected the greatest number of customers and were generally short-term. However, flood damage at critical facilities, in individual buildings, and to cable infrastructure led to longer-term outages.

The storm affected several critical facilities immediately. The loss of utility power required the use of backup power at central offices in Southern Manhattan, Staten Island, Southern Brooklyn, and the Rockaways.

At critical facilities in Southern Manhattan, Red Hook, and the Rockaways, flood damage to equipment and backup power systems caused service to go out in the areas they served. Flooding caused damage to electrical switchgear, backup generators, and fuel storage containers, particularly if they were housed in basements or sub-basements. The pumps in many of these facilities were not designed for the volume of corrosive salt water that inundated them—up to one million gallons of water at some sites. As a result, it took up to five days just to get the water out of some central offices, prompting some companies not just to repair but to redesign their facilities entirely. *(See graphic: Major Telecommunications Facility Outages During Sandy)*

Cable infrastructure experienced light outages as a result of wind damage to overhead wiring in Brooklyn, the Bronx, Queens, and Staten Island. In Southern Manhattan, the failure of the aging air pressure system caused widespread copper cable damage. The most impacted part of the city's cable infrastructure was the legacy copper network. When power failed in Verizon's central office at 104 Broad Street, the air pressure system that kept water out of its cables shut down, and the copper cables were infiltrated with salt water. Using the damage as an opportunity, Verizon swapped out its copper network for a more resilient fiber optic network. Though clearly a benefit to customers over the long term, the process required replacing equipment at all buildings served by the affected copper—even where flooding had not directly damaged a building's telecommunications equipment. This led to a loss of phone service over a wide swath of Verizon's service territory in Southern Manhattan, causing significant short-term disruption. *(See sidebar: A Tale of Two Central Offices)*

## A Tale of Two Central Offices

**140 West Street and 104 Broad Street**

Central offices that "hardened," or protected, their equipment before the storm had shorter downtimes than central offices where equipment was left vulnerable to flooding. Two Verizon central offices in Southern Manhattan that flooded during Sandy illustrate this point. One office (at 140 West Street) had raised generators and electrical equipment after September 11 and as a result was able to restore service within one day of the storm. The other (at 104 Broad Street) had basement electrical equipment and generators that were completely flooded, knocking out service there for 11 days. Restoration of service to other buildings took significantly longer, with some buildings not restored even six months after the storm. The lesson learned: investment in resiliency works.

| 140 West Street Central Office | 104 Broad Street |
|---|---|
| **Pre-Sandy Condition**<br>• Raised generators<br>• Raised electrical switchgear<br>• Newer copper infrastructure (plastic casing)<br>• Extensive fiber deployment<br>• Standby pumps to protect against flooding | **Pre-Sandy Condition**<br>• Generators at or below grade<br>• Electrical switchgear at or below grade<br>• Older copper infrastructure (lead casing) |
| **Sandy Effects**<br>• Raised generators and electrical switchgear were not impacted by flooding<br>• Newer copper infrastructure was not inundated with water for an extended period<br>• Fiber infrastructure was undamaged<br>• Fuel tanks were disabled and fuel was compromised | **Sandy Effects**<br>• Generators; electrical switchgear; and heating, ventilation, and air conditioning (HVAC) systems were inundated with salt water<br>• Water remained in the basement vault for five days<br>• Copper infrastructure was submerged for five days until vaults could be pumped out |
| **Post-Sandy Restoration**<br>• Operational within 24 hours, after temporary fuel tanks were put in place and temporary power cables were run to the switchgear | **Post-Sandy Restoration**<br>• Operational after 11 days, with delays caused by need to find locations for replacement generators, electrical switchgear, and HVAC, and to connect these to the building |

Credit: cryptome.org

**Post-9/11, Verizon hardened 140 West Street.**

Credit: Damon Dahlen, Huffington Post

**140 West Street cable vault contained relatively fewer copper wires and saw less inundation post-Sandy than 104 Broad Street.**

**104 Broad Street contained a large number of copper wires pre-Sandy.**

**Cable vault of 104 Broad Street had to be stripped of copper wire post-Sandy.**

### 140 West Street and 104 Broad Street Central Office Resiliency

Although 140 West Street fared much better during Sandy, both buildings incurred damage. Verizon currently is hardening both offices to prevent future inundation: all electrical switchgear will be raised to the second floor or higher, fuel tanks are being redesigned to withstand submersion, generators are being raised above expected flood heights, and external flood barriers are being considered by Verizon. Most of these hardening measures are expected to be in place by August 2013.

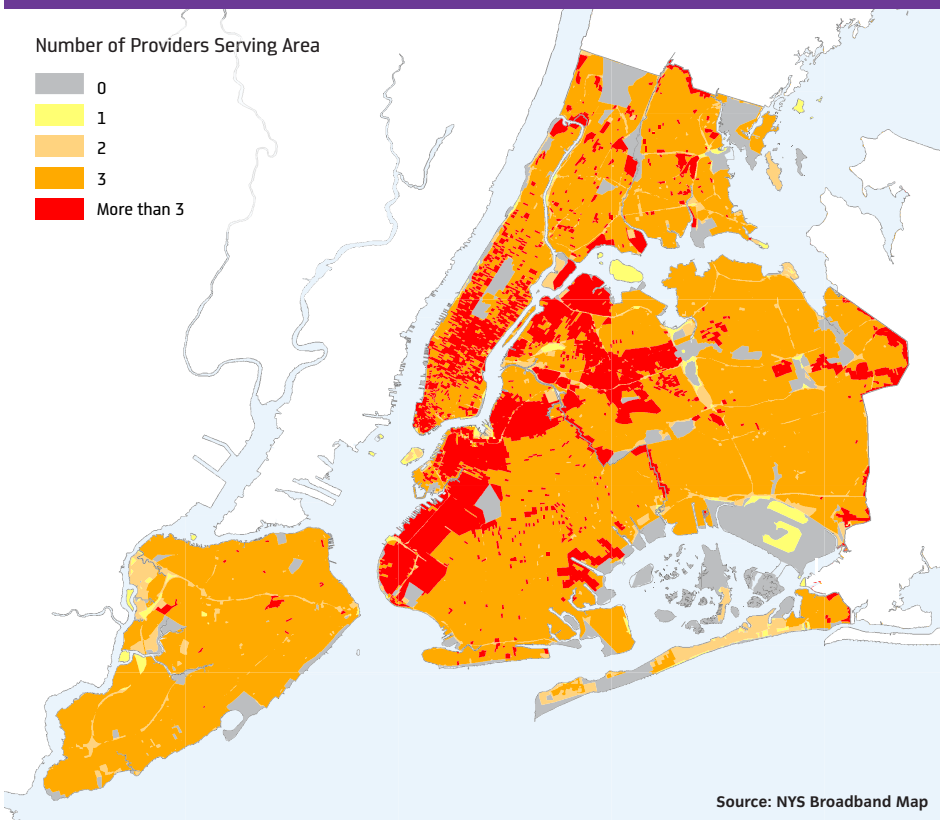
Generally, new coaxial and fiber optic cable fared better than copper cable. The coaxial and fiber cables remained in good condition throughout the storm, though wind and tree damage to overhead wires caused limited outages in areas of Staten Island, Brooklyn, and Queens. Flooding usually only interrupted service provided by coaxial and fiber cables when the electrical equipment to which they were connected lost power.

Longer-term telecommunications outages in the city were primarily caused by flood damage to commercial and residential buildings. Flooding of one to three feet or more usually resulted in damage to basement and exterior telecommunications equipment, affecting an estimated 35,800 buildings across the city. In high-rise buildings, flooding often destroyed telecommunications equipment including electronics and copper distribution frames, along with electrical switchgear that distributed power. To restore telecommunications service, buildings frequently looked for access to power and space at higher elevations for new equipment—a process that, in some cases, created delays in service restoration. *(See map: Sample of Telecommunications Service Restoration Times of Commercial Buildings in Southern Manhattan; see chart: Estimated Flood Damage to Telecommunications Equipment in Buildings)*

Cell service outages were largely caused by loss of power, loss of backhaul service, and/or physical damage to antennas, with power loss being the most significant factor. Cell providers rushed to respond to network outages by connecting generators to existing cell sites, where possible. In areas where the existing cell sites could not be quickly restored, providers used Cells On Wheels (COWs), mobile cell sites that can be deployed after a disaster. Because many cell sites in New York are affixed to private buildings, in many cases, cell sites could not be restored until power to the relevant buildings and connection to backhaul circuits were fully restored. After power was restored, providers then could work on restoring the landline connections to the cell sites. These landline reconnections caused the longest delays in restoring full cell service.

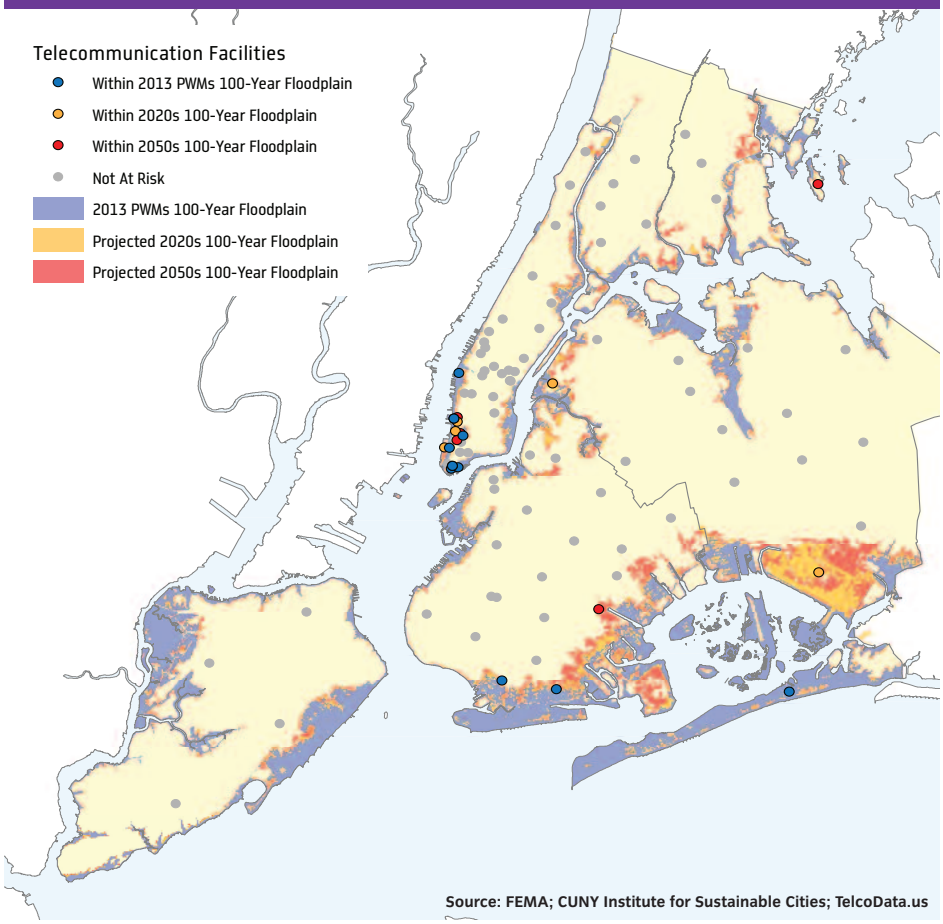
Clearly, the reasons for and duration of telecommunications outages varied, but some generalizations can be made. First, although some telecommunications equipment and facilities had been designed for power outages and flooding, many were not. Many critical facilities were not hardened to best practice standards, leaving equipment—most notably backup generators—below anticipated flood heights. In high- and low-rise buildings, telecommunications equipment in basements was flooded too easily, causing significant damage even at relatively low floodwater heights.

## Wire-Line Provider Redundancy




Source: NYS Broadband Map

## Critical Telecommunications Facilities in the Expanding Floodplain




Source: FEMA; CUNY Institute for Sustainable Cities; TelcoData.us

## Risk Assessment: Impact of Climate Change on Telecommunications

Major Risk  Moderate Risk  Minor Risk

| | Scale of Impact | | | |
|---|---|---|---|---|
| Hazard | Today | 2020s | 2050s | Comments |
| **Gradual** | | | | |
| Sea level rise | | | | Minimal impact |
| Increased precipitation | | | | Minimal impact |
| Higher average temperature | | | | Minimal impact |
| **Extreme Events** | | | | |
| Storm surge | | | | Facilities face significant and increasing risk of flooding |
| Heavy downpour | | | | Minimal impact |
| Heat wave | | | | Extreme heat for an extended period may shorten life span of electronic gear if spaces are not properly air-conditioned<br>INDIRECT: Power outages could lead to telecommunications outages |
| High winds | | | | Minimal impact |

Another problem that emerged during Sandy was that most cell sites did not have adequate backup power. Standard battery backup for cell towers of four to eight hours simply proved insufficient during the extended outages Sandy caused.

Further, single points of vulnerability in the telecommunications network posed another challenge to maintaining and restoring service post-Sandy. Though some networks were built with redundancy—for instance, cabling taking two separate routes from a cell tower back to a central switching facility—many parts of the network were not. Where these vulnerabilities exist, one cut cable or flooded facility could result in an outage for a few or a few thousand customers. The same was true for buildings, some of which had multiple telecommunications providers—in which case, residents and businesses were able to switch service to the providers that restored service fastest—but many of which, especially on the residential side, had limited or no secondary provider options. *(See map: Wire-Line Provider Redundancy)*

During and after Sandy, carriers required varying degrees of City assistance and coordination. Providers were in regular communication with City officials and elected officials at all levels about immediate recovery needs, but there were some conflicting requests. The City also had difficulty in getting accurate data from providers in consistent, usable formats on immediate outages and recovery work. In addition, some providers had trouble getting their recovery personnel access to restricted bridges because they had not been designated as critical to recovery.

Finally, the City had limited ability to gather data from or enforce standards on providers. For example, while the FCC collects information on outages, it does not do so in real-time, and does not always share it with the City. Meanwhile, the main regulators of the telecommunications network, the FCC and PSC, are exploring ways to improve communications network resiliency.

## What Could Happen in the Future

Looking to the future, climate change poses several risks to the telecommunications system.

**Major Risks**

Storm surge poses a significant and increasing risk to the power grid upon which telecommunications infrastructure depends. Though telecommunications facilities are generally farther from the floodplain than power facilities, 13 percent of critical telecommunications facilities lie in the 100-year floodplain on Preliminery FEMAs Work Maps (PWMs), meaning that they face a risk of flooding from storm surge. By the 2020s, the number of critical facilities in the 100-year floodplain will grow to approximately 18 percent. By the 2050s, that number is expected to climb to 24 percent. With up to 31 inches of sea level rise expected by the 2050s, the risk to critical central offices, including the two largest central offices serving Southern Manhattan, is likely to increase. *(See map: Critical Telecommunications Facilities in the Expanding Floodplain)*

**Other Risks**

Heat waves pose a threat to the power grid, which is crucial to the operations of the telecommunications system. Extreme heat for an extended duration also may shorten the life span of electronic telecommunications equipment in buildings if the spaces housing this equipment do not have proper cooling.

High winds present a risk of damage to overhead wires in the parts of the Bronx, Brooklyn, Queens, and Staten Island where they exist. Outages due to overhead wire damage, however, do not result in system-wide failures but, rather, only affect a few buildings or blocks at a time, and they are generally able to be repaired quickly, relative to damaged underground cables.

Credit: Karsten Moran/The New York Times

People without power after Sandy had to use their electronic devices at a Chase Bank

This chapter contains a series of initiatives that are designed to mitigate the impact of climate change on New York's telecommunications system. In many cases, these initiatives are both ready to proceed and have identified funding sources assigned to cover their costs. With respect to these initiatives, the City intends to proceed with them as quickly as practicable, upon the receipt of identified funding.

Meanwhile, in the case of certain other initiatives described in this chapter, though these initiatives may be ready to proceed, they still do not have specific sources of funding assigned to them. In Chapter 19 (*Funding*), the City describes additional funding sources, which, if secured, would be sufficient to fund the full first phase of projects and programs described in this document over a 10-year period. The City will work aggressively on securing this funding and any necessary third-party approvals required in connection therewith (i.e., from the Federal or State governments). However, until such time as these sources are secured, the City will only proceed with those initiatives for which it has adequate funding.

The City will pursue a set of initiatives to ensure that all New Yorkers have access to robust telecommunications services backed by resilient networks and infrastructure. These initiatives address the telecommunications system's vulnerabilities that Sandy exposed and that climate change will exacerbate—in particular, the risk of likely service outages due to loss of power from damage caused to facilities by storm surges and heat waves. They do so by addressing a central challenge for New York—the distributed regulatory environment for telecommunications that historically has given the City little authority.

The City's initiatives can be grouped as follows: those seeking to increase accountability to promote resiliency; those seeking to enable rapid recovery after extreme weather events; those seeking to harden facilities to reduce weather-related impacts; and those seeking to create redundancy to reduce the risk of outages.

## Strategy: Increase accountability to promote resiliency

The 21st century has witnessed the convergence of telecommunications service across wired voice, cable TV, and broadband, and the increasing centrality of communications networks in the daily lives, jobs, and safety of the city's people. The rapid shift in communications technology has revealed significant gaps in the regulatory framework—gaps that leave the network exposed.

To address these gaps, the City will work to strengthen its regulatory powers while also developing a stronger relationship with telecommunications providers to facilitate more consistent coordination of resiliency measures and disaster preparedness efforts.

### Initiative 1

**Establish an office within DoITT to focus on telecommunications regulation and resiliency planning**

While the City has regulatory authority over some aspects of telecommunications service, it has no entity focused on ensuring the resiliency of public communications networks. Subject to available funding, the City, therefore, will form within DoITT a new Planning and Resiliency Office (PRO) that will have the resources needed to maintain more strategic communication with providers and provide additional monitoring of franchisee compliance with requirements.

DoITT PRO will work to better understand the way providers operate in order to promote and enforce resiliency for telecommunications providers through the franchise renewal process and through other agreements into which such providers enter with the City. Additionally, DoITT PRO will assist providers in navigating City processes, and will explore options to increase conduit infrastructure and resiliency. Furthermore, the office will standardize the formats and frequency of performance data reporting about significant outages across providers, publish service data where appropriate, and tighten service and restoration standards.

Finally, the new office will advocate for State and Federal regulatory changes, encouraging better alignment in Federal, State, and local approaches to regulation, and will push for reporting and resiliency requirements that would lead to better preparation, awareness, and response in the event of extreme weather events. DoITT will launch the new office in 2013.

### Initiative 2

**Establish new resiliency requirements for providers using scheduled renewals of the City's franchise agreements**

Flooding caused outages during Sandy in facilities that were not following the FCC's recommended best practices for resiliency, including flood protection measures. DoITT will promulgate and enforce resiliency standards through the franchise renewal process. Franchise agreements with cable TV service providers are renewed periodically, with most up for renewal in 2020.

Within such new franchise agreements, the City may establish, for example, standards for issues such as repair timelines (called "Mean Time to Repair") in the event of individual outages, including as a result of extreme weather events. The City also will seek to standardize data reporting and publishing requirements to support quicker data analysis in the event of limited or widespread service disruption. Planning for the 2020 renewals will start in 2014 because of the long negotiation period that has been standard in previous renewals.

## Strategy: Enable rapid recovery after extreme weather events

While hardening facilities and preventing damage is critical, it is not always possible to avoid every emergency. Anticipating and responding efficiently to disasters is a key feature of resilient infrastructure. The Office of Emergency Management (OEM) leads the City's efforts to prepare for emergencies and coordinates response and recovery, relying on other City agencies within each of their particular areas of expertise. For telecommunications, DoITT PRO will expand resiliency planning efforts and will liaise with franchisees to ensure restoration and resiliency.

### Initiative 3

**Request business continuity plans from current City franchisees as permitted under existing franchise agreements**

All telecommunications providers conduct business continuity planning, but that planning has not traditionally been coordinated with the City. DoITT PRO, through the City's cable TV service franchise agreements, will encourage providers to increase disaster preparedness. Using applicable provisions in existing franchise agreements, DoITT PRO will require that providers share business continuity plans with the City and update and publish them on a regular basis. The office also will assist with preparing for providers' operational needs during emergencies such as access to the city via bridges and tunnels and deployment of equipment to critical facilities. The office also will encourage providers to take additional preparedness measures such as putting in place agreements for sharing cell networks in emergencies. Beginning in 2013, DoITT PRO will meet with providers to coordinate business continuity plans and meet regularly thereafter to update plans and address barriers to effective plan implementation with other City agencies.

## Strategy: Harden facilities to reduce weather-related impacts

Short of removing equipment from the floodplain entirely—an impractical option for many buildings—the best way to protect telecommunications equipment in buildings from storm surge is to harden buildings and building systems. The City will develop new flood protection standards and encourage retrofitting of existing buildings through a combination of mandates and incentive programs. DoITT PRO also will work with cell providers to encourage hardening of cell sites. The office will request equipment hardening and upgrades in connection with the City's cable TV service franchise agreements.

### Initiative 4

**Develop flood protection standards for placement of telecommunications equipment in buildings**

The City will develop flood protection standards for new buildings, together with programs to encourage retrofitting of existing buildings to ensure protection of utility equipment, including telecommunications equipment (see Chapter 4, *Buildings*).

### Initiative 5

**Use the DoITT franchise agreements to ensure hardening of all critical facilities**

Damage to critical facilities caused neighborhood-wide outages during Sandy, in turn resulting in significant disruption to business and personal communications. The City will work with providers to strengthen the resiliency of these critical facilities. Specifically, through its franchise agreements with cable TV providers, DoITT has a number of tools already at its disposal that it will put to use, including requesting reports on the state of technology at provider facilities and potentially establishing requirements for facilities and equipment. DoITT already has requested from its cable TV franchisees plans to minimize the occurrence of significant outages due to future climate events. DoITT PRO will seek to expand this authority through future cable TV service franchise agreements.

### Initiative 6

**Work with cell providers to encourage hardening of cell sites**

Wireless service went down in large sections of the city during Sandy as a result of the loss of power or connections to the larger telecommunications network at cell sites. The City will work with providers locally to encourage measures that will keep the cell networks functioning in emergencies. Although the wireless industry is regulated primarily at the Federal level, DoITT PRO will work with providers to encourage the creation of plans to pilot the hardening of some existing cell sites, including 48-hour backup power from batteries, generators, or a combination of both; raising key equipment out of the floodplain; and providing multiple wire-line paths from the sites to central facilities to provide backup network connections in the event of cable damage. DoITT PRO also will seek to meet with cell providers regularly beginning in 2013 to develop these hardening measures and clear barriers to implementation within the city.

## Strategy: Create redundancy to reduce risk of outages

Beyond strengthening existing systems, ensuring system redundancy may be the best way to protect critical infrastructure from outages. Accordingly, the City will explore options for creating a redundant and resilient conduit infrastructure. The City also will implement programs to encourage redundancy among telecommunications providers in individual buildings and to disseminate information about provider redundancy and resiliency in buildings to the general public.

### Initiative 7

**Study options to increase conduit infrastructure redundancy and resiliency**

After the significant telecommunications outages during Sandy, some areas with damaged cable did not have service for days or weeks. To avoid this in the future, the City will seek to encourage provider redundancy throughout New York through expanded spare conduit capacity and new approaches to laying cable. DoITT PRO, in consultation with NYCDOT, will explore tracking and managing providers' conduit requests to Empire City Subway in Manhattan and the Bronx, ensuring that Empire City makes spare conduit available. DoITT PRO also will work with providers to develop and test inexpensive alternatives to delivering telecommunications service, such as "micro-trenching," which provides a cheaper and faster method of conduit installation in certain areas of the city. DoITT PRO will explore further options for improving the availability and redundancy of conduit in Queens, Brooklyn, and Staten Island, including options such as a "shadow conduit policy" modeled after the current micro-trenching pilot. The office also will investigate a system to produce accurate conduit maps to manage more effectively shared infrastructure and monitor more effectively spare capacity. DoITT PRO will work to identify areas both within the Empire City Subway system and in Brooklyn, Queens, and Staten Island for potential conduit expansion initiatives. Planned ongoing engagement will include regular meetings with providers and with Empire City Subway.

### Initiative 8

**Continue implementation of ConnectNYC Fiber Access to create broadband redundancy**

During Sandy, some providers restored service more quickly than others. Customers in buildings with multiple providers were able to switch to the service that was operational, while those without choice were left without options. Increasing broadband connections to buildings is another way to create redundancy. Through ConnectNYC, the City is partnering with providers to connect commercial and industrial businesses across the city with fiber. As required by their franchise agreements negotiated with DoITT, Time Warner Cable and Cablevision have allocated $12 million from their capital budgets to connect new businesses to their fiber networks. The New York City Economic Development Corporation (NYCEDC) is soliciting interest from businesses and will allocate these connections free of charge on a competitive basis. The first round of applications was received in December 2012, and the second round of applications is launching in June 2013.

### Initiative 9

**Add telecommunications provider quality and resiliency to the WiredNYC and NYC Broadband Map ratings**

A significant challenge to broadband deployment throughout the city—and telecommunications service more broadly—is the lack of accessible data about the availability of providers, the service quality, and the resiliency of providers' systems. Without this information, companies looking for new space are unable to make informed decisions, reducing the incentive for providers to ensure that their networks are sufficiently resilient. Through the WiredNYC and NYC Broadband Connect Map programs, the City will publish information about broadband service at buildings around the city, rating the quality and resiliency, among other factors. NYCEDC will manage these programs. The WiredNYC certification system website will launch in June 2013, and the NYC Broadband Map website will launch in fall 2013.