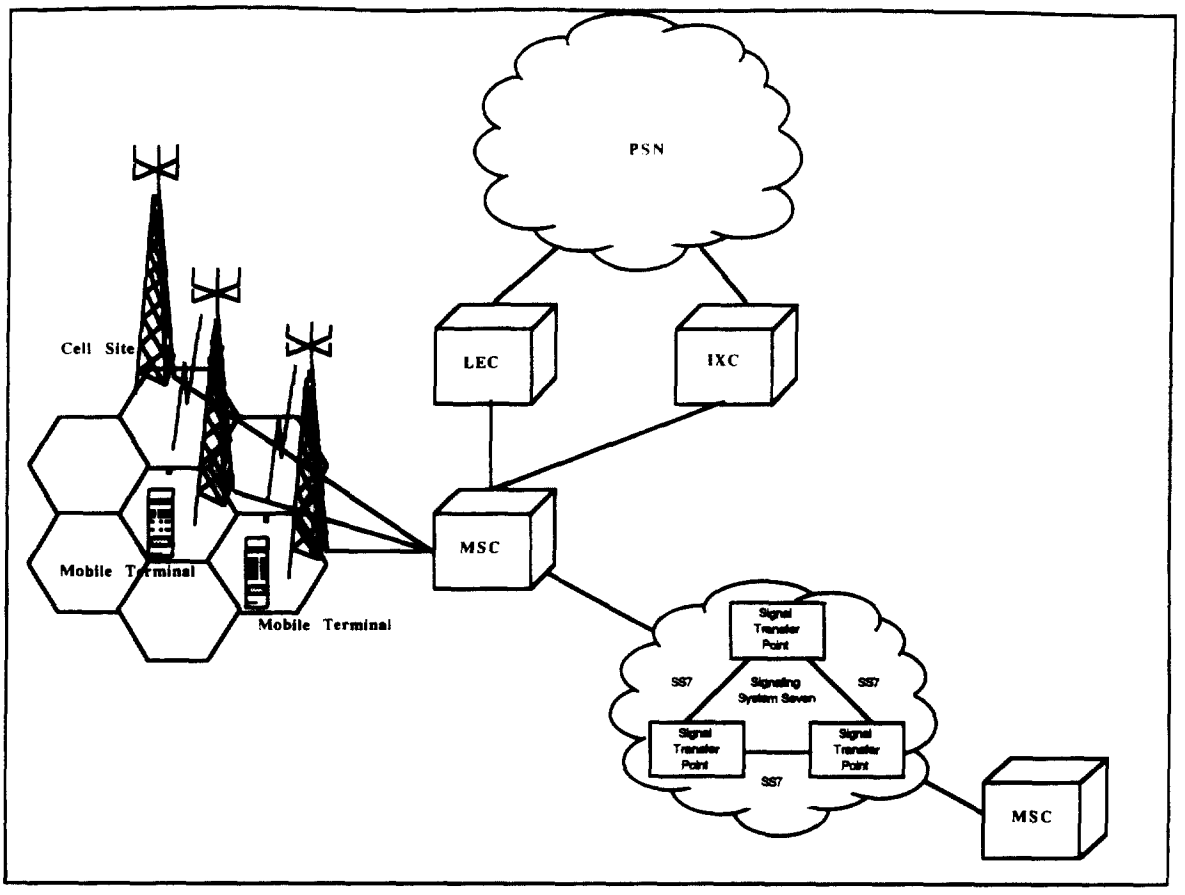

Exhibit A-3-1
Basic Cellular Network Topology

In addition to having a LEC central office connection, the MSC can connect directly to an IXC point-of-presence (POP). This arrangement is used in a few cases where traffic demand justifies the additional trunks.

This interconnection scheme allows the MSC to control and coordinate the switching of calls between the PSN and the cell sites within a system. The MSC monitors the network through data received by cell site controllers, and dynamically assigns frequency channels and power levels by sending instructions to mobile terminals through the cell sites. MSCs also process diagnostic information, compile billing data, and control call processing (e.g., incoming and outgoing call requests, paging, and hand-off).

It is important to note that while there are some mobile-to-mobile calls, about two-thirds of calls originating from mobile terminals are bound for the wireline PSN. Therefore, if there is congestion in the wireline PSN, a cellular user may succeed in obtaining a voice channel within the cellular network for outgoing call attempts, but not an end-to-end link.

Cell Site. The second part of a basic cellular system, the cell site, is the physical location of a computerized cell site controller and the radio frequency (RF) equipment providing service to the cell serving area. Cell sites connect the mobile subscriber to the MSC and, through the MSC, to other mobile or wireline users. Cell site controllers operate partially under the direction of the MSC and partially autonomously to manage the allocated radio

channels. The controller handles all cell site control functions, and controls and supervises calls to and from the MSC and mobile terminals located in that cell. Antennas are placed on a freestanding tower or existing structure at the cell site. The height of these towers relates to the cell radius (e.g., small cells have short towers and vice versa). Radio line of sight propagation is limited by the height of an antenna above ground.

A low-powered radio transmitter and receiver typically interface with the environment through three omni-directional or directional antennas: one transmits and two receive for each channel. The transmitter is only powerful enough to communicate with mobile terminals within its cell. This allows transmitters in distant cells to use the same frequencies to communicate with mobile terminals in their cells. The two receive antennas are spaced apart to achieve reception diversity for the area they serve. The receiver is tuned to the same frequency for both antennas, but only the one receiving the stronger radio signal is selected.

Frequency Allocation. The Federal Communications Commission (FCC) regulates the third part of the basic cellular system -- the radio spectrum. The FCC has allocated radio spectrum between 800 and 900 Megahertz (Mhz) for use by cellular service providers. Typically, two service providers are licensed to operate in each cellular service area. Cellular service areas include metropolitan statistical areas (MSA) and rural statistical areas (RSA). There are 306 MSAs and 428 RSAs in the United States, each with up to two cellular service carriers providing service. Service providers divide MSAs and RSAs into smaller areas called cells. Cells vary in size according to the service provider's design objectives. Chief among many service providers' network design objectives is to cover the service area without any serious discontinuities. This frequently results in cells that range in size from 2 to 24 miles, though some will be larger and some will be smaller. Conceptually, cells are hexagonal in shape and when arrayed on paper, they resemble the cells of a honeycomb. In reality, cells are not quite so geometric, nor equal in size, due to the vagaries of radio wave propagation and attenuation caused by terrain, atmosphere, and man-made structures.

Given the technical limitations imposed by modulation schemes and channel separation requirements, the typical analog cellular system can accommodate 416 two-way voice channels. Because two service providers operate in a given area, 832 two-way channels compose the total spectrum resources in any particular MSA or RSA. Digital technologies now being deployed, notably time division multiple access (TDMA) and code division multiple access (CDMA), will greatly increase the number of channels available without requiring any additional spectrum. Conserving spectrum is always a concern in cellular systems because it is a finite resource. During a disaster, cellular channels are in extremely high demand by both the public and the NS/EP user community. In today's environment, calls placed by NS/EP users are not differentiated from calls placed by public users. Therefore, when all channels are in use at a given cell site, NS/EP users coordinating disaster recovery efforts stand no better chance of getting a call through than public users. When congestion becomes severe, both public and NS/EP users must redial repeatedly until they get a voice channel through random selection.

Mobile Terminal. The fourth and final part of a cellular system is the mobile terminal. There are three types of mobile terminals: mobile (or car) phones, transportable phones (or "bag phones"), and portable (or handheld) phones. Maximum power output ranges from 3.0 to 0.6 watts. Each mobile terminal is composed of a control unit, transceiver (transmitter/receiver), and a power supply. Mobile terminals have an electronic serial number (ESN) and a mobile identification number (MIN), or directory number (DN). The ESN is a coded number assigned to the mobile terminal by the manufacturer. It uniquely identifies the unit and is used for security purposes within the cellular system. The MIN is

the phone number assigned to the subscriber by a carrier and is used in conjunction with the ESN for identification. Mobile terminals can process either analog waveforms or digital bit streams, or both. Mobile terminals that support both are called dual mode phones.

The number of voice channels per cell site varies considerably with location because the size of the population served varies. A typical cell site might have 15 to 25 voice channels, but cell sites serving rural areas can have as few as 8 to 12; and cell sites serving metropolitan areas can have as many as 90. Mobile terminals communicate with a cell site via control channels in addition to the voice channels. Control channels are used for signaling, usually in a digital format. The control channel is used to request voice channels, pass a called party's MIN to the MSC, instruct mobile terminals to tune to a certain frequency when originating a call or responding to a page, and to perform other out-of-band signaling operations necessary to establish calls. The voice channel itself provides the means to instruct the mobile terminal what new frequency to tune to during hand-off and to perform other signaling operations necessary to establish and maintain calls. Several CPAS Subgroup participants have experienced congestion on the forward control channel, which is the direction from the cell site to the mobile terminal. The reverse control channel handles communication from the mobile terminal to the cell site. Reverse control channel congestion and the resulting collisions that occur between mobile terminals attempting to establish calls is more difficult to quantify than congestion that is experienced on forward control channels. Reverse control channel blocking statistics are more difficult to collect because the blocked call attempt is never captured by the system, so the system is unable to collect any blocking statistics. Cellular priority access does not deal with blocking on control channels. It deals only with blocking on voice channels.