

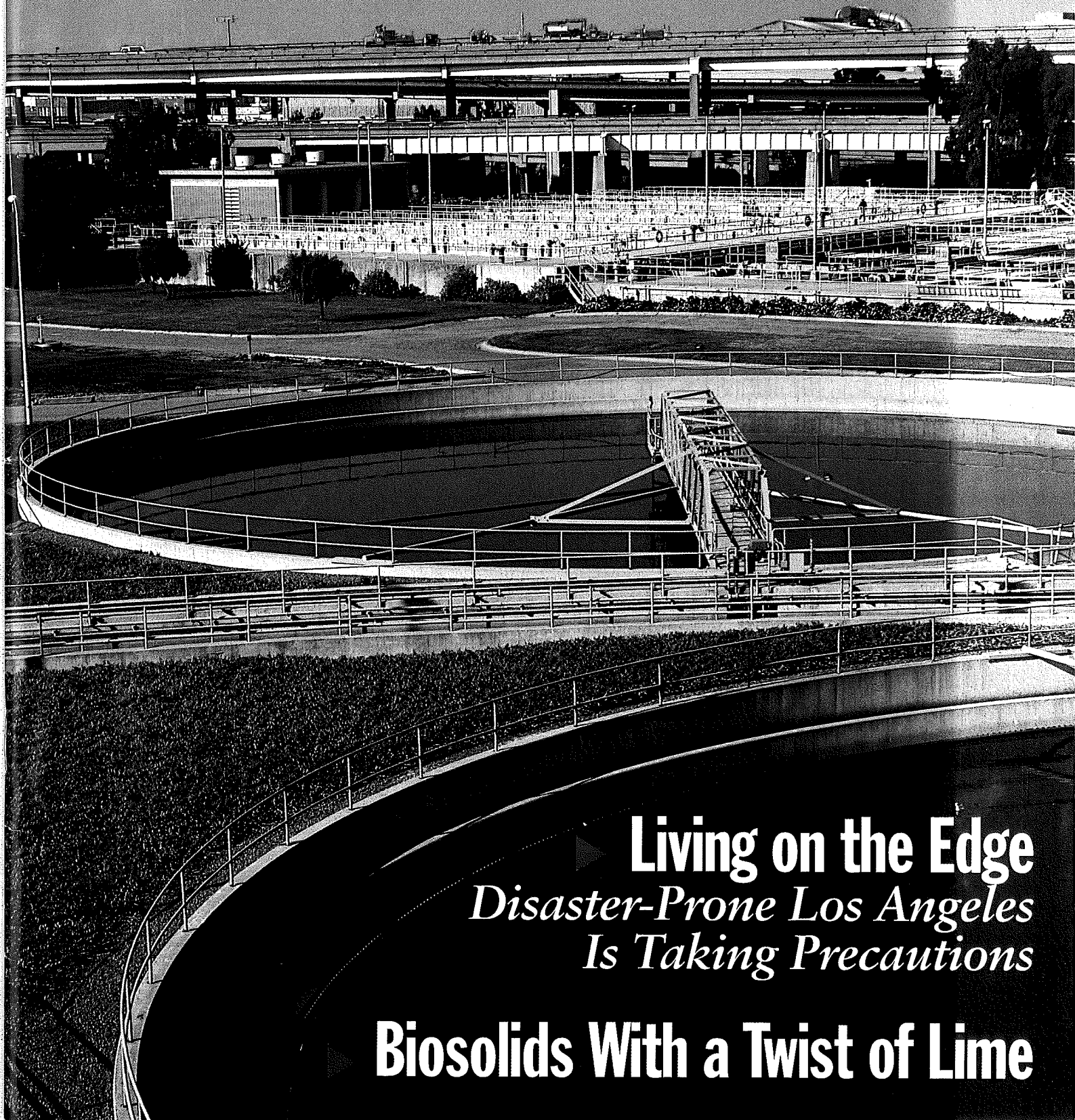
Operations Forum



Water Environment Federation

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▶ **Living on the Edge**
*Disaster-Prone Los Angeles
Is Taking Precautions*

Biosolids With a Twist of Lime

It Has a Plan...

L.A.'s Response to Emergencies

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**Ken Ludwig, Reza Iranpour, Tito Jugo,
Dennis Vander Hook, Larry Ehrmann**

Talk about being accident prone. Set against a geographic backdrop that is host to disasters, the City of Los Angeles is in a precarious position. As the city's largest treatment plant, Hyperion must brace itself for everything.

Los Angeles County is crisscrossed by many faults, the most famous being the San Andreas, that subject the city to unpredictable earthquakes. These earthquakes can, and have, caused loss of lives and extensive damage to buildings, infrastructure, and utility services—including sewerage systems.

There are other, less severe, potential emergencies that the city must prepare for. For example, earthquake-generated tidal waves (or tsunamis) can cause intense flooding, enough to damage coastal facilities in the area. Flood-inducing rainfall, drought, or even an airliner crashing into the treatment plant site itself are also possible. However, the extent and severity of the damage from a high-intensity earthquake are so large that if the city could plan for

this type of emergency, then a little more preparation might be adequate to deal with other possible disasters.

The Bureau of Sanitation's Role

The City of Los Angeles' Bureau of Sanitation is primarily responsible for the operation and maintenance of the wastewater facilities, including collection and treatment; and for solid waste management, including garbage collection and disposal. The bureau has an important role in the city's disaster preparedness for several reasons. A breakdown in the disposal and treatment of wastewater and solid wastes would have a serious impact on public health and the environment. Also, the bureau has ample equipment and many skilled and semi-skilled employees who might help respond to emergency situations not directly involving city facilities.

The bureau recognizes its responsibility and has been engaged in developing a long-term multi-hazard emergency preparedness and disaster response program.

Major Concerns

The most important element of the program is individual preparedness. The bureau management emphasizes that if individuals are prepared at home, they will be able to survive and to go to work knowing that their families are safe.

The art of survival does not limit itself to just providing emergency food, water, and basic medical supplies. Many other considerations have been given to details of preparing the bureau to respond effectively in an emergency. The most important is individual training: employees have been given training in fire suppression, first aid, and CPR. Other issues are communications, transportation, and organization, although they may somewhat overlap.

Getting workers to a bureau facility during or after an emergency is a big consideration. No one can expect bureau employees to drive individually to where they need to go in the normal time. First, some cars may have suffered disabling damage. Second, it is important to minimize traffic as most traffic signals would probably be inoperative, and some roadways closed. Congestion in bureau parking lots should be avoided to allow for maneuvering of city vehicles and heavy equipment responding to emergency calls. Carpools, emergency vans, or commandeered public transports should be provided as city vehicle operators or the vehicles themselves may not be available. Communication, therefore, is very important.

Likewise, assigning people with different skills to different tasks is an obvious part of the plan's organization. However, this also depends on communication: to know what and where specific needs have arisen and

to reach the troubled areas or the necessary equipment.

Breaking the emergency response plan into various chronological steps is helpful. These steps include initial assembly of bureau personnel; prompt attention to fires, medical needs, and hazards posed by damaged structures; assessment of lost services; and temporary restoration of critical services. Doing so provides a useful structure for dealing with the specific issues.

Specific Issues

The following are some specific considerations in planning for a major disaster. Because they cover a wide range of topics, some are already being implemented and some have yet to receive more attention.

- A list should be made of tasks that may be expected at bureau facilities. The list could be extended to include possible needs of the Department of Public Works, the city government, and the public. The distribution of damage is largely unpredictable, but many needs can be identified in advance.

- The task list should aid in determining where key personnel should report in an emergency. There should be meetings at which key personnel could see the list of tasks, make comments, and suggest modifications. The plan should include not only the preferences, but further assignments devised by the emergency response program to guarantee an optimum distribution of key personnel among the geographic locations.

- The task list, along with maps, telephone trees, home addresses, alternate locations, key personnel, personnel expertise and training records, and other important information should be assembled into a document

that can be kept in places that will be both secure and accessible during an emergency.

- There is great uncertainty about the number of bureau personnel that would be able to report for work in an emergency. If adequate communications can be maintained, and key personnel capable of adapting the bureau's response to local conditions can be suitably spread throughout the yards, offices, and treatment plants, then this will provide for substantial variations in the number of other sanitation employees that may be available at different locations.

- The key personnel may have to reallocate the other bureau employees according to the needs of the situation. It is possible that several hundred of the bureau employees might come to one location. If this happened, many of them would have to be sent to other locations to provide more uniform coverage. Emergency designations of subordinate supervisors might also have to be made to guarantee effective coordination of efforts.

- Allocation of personnel among locations should be based more on equipment availability and the functions that could be provided, and less on the physical size of the facility. For example, a large Bureau of Sanitation yard, which only has refuse collection trucks, would provide less capability than one that also has construction equipment and supplies for repairing sewer lines.

The city's radio communication network has been designed to withstand severe damage in times of disaster, and includes the provision of a backup power system. Nevertheless, it would be prudent to review the details, and to consider what might be done if, for example, some of the

radio relays feeding the network were knocked out. Great efforts would be exerted to restore telephone communication and to discourage overloading the system by unnecessary calls, but it would be unwise to rely heavily on cross-basin telephone service during the first hours, days, or even weeks after a big earthquake. Provisions should be made to maintain the operability of the city's radio communication network in case of breakdown in the intervening relay stations.

- Consideration of the many organizations that are charged with emergency preparedness planning suggests that there should be some global planning. The fire and police departments of the cities in the metropolitan area are the most important responsive organizations for preventing the spread of further damage after a disaster, so they should be well prepared to cooperate. Other departments such as the Bureau of Sanitation and the Department of Water and Power will also have major roles to play, and the plans of various non-governmental organizations such as large cooperatives and many colleges and universities need to be coordinated with those of various government agencies.

Technologies and Methods

The following describes further technological advancement for possible incorporation into the emergency response plans:

- Allocating personnel according to their skills, abilities, and the needs of an emergency can be considered a complex optimization problem. If computer software suitable for calculating the solution to such a problem is available, it should be used in setting up the plan for allocating personnel in preparation for a disastrous event. Therefore, arrangements

should be made for having the software available at bureau locations so that it can also be used in making revised allocations after a disaster. It

might be valuable also to consider how presently available software for scheduling and related tasks might be adapted to keeping track of activities

in an emergency.

- If software for optimal allocations is not available, consideration should be given to arranging for its development. Substantial research efforts have been made by business management researchers to find ways of computing solutions to such allocation problems. Businesses often have a variety of distinct, but related, goals that must be balanced, such as short-term and long-term profitability, market share, and product or service innovation. Finding an appropriate balance between them is not easy, especially when there are different ideas of what "appropriate" means.

Correspondingly, restoring wastewater service, minimizing health risks in and near damaged bureau facilities, and assisting other city agencies are all desirable goals, but balancing them will not be easy. The most commonly discussed method of solving allocation problems, called linear programming, only finds the optimum allocation for maximizing a single function (that is, satisfying only one goal or aim). Recently a method of balancing multiple goals, known as linear goal programming, has been introduced; however, there may be other novel methods known primarily to researchers in business management.

- Any plan that involves relying on management or scheduling software during an emergency would raise new questions of equipment survivability. Not only would a power supply have to be available, but also ruggedized processors and displays, as have already been developed for some industrial and military applications. Communication systems for conventional computer networks rely on wires or cables for the connections. Replacing cables with radio links is an obvious strategy for im-

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proving the ability of a network to survive disaster. Equipment suitable for standard office personnel computers is available, and operates compatibly with standard networking products. However, the capabilities of such a system as compared to bureau requirements should be evaluated. Because the city has a radio communication system for voice communication for city departments and because modems convert data signals to modulated audio frequency signals, in an emergency the voice system could also be used for data transmission. Because it was not designed for this use, excessive amounts of data transmission will undoubtedly degrade the system's ability to provide voice communication. It will be valuable to know to what extent data and voice could share the system and the data capacity that would result.

Community Involvement

Experience with several recent major disasters suggests that all of the preparations by both the bureau and the city will have only limited value unless the citizens are involved in disaster preparation and are able to respond to a disaster with their own initiative and resources. Thus, there is a growing consensus that more should be done to organize and train local communities and neighborhoods to help themselves after a disaster.

Recent experience suggests that the most immediate needs after a disaster are not food and water, which corresponds with the commonplace knowledge that most people can go for a number of hours without water, and several days without food before suffering serious hardship. The most immediate needs will be to deal with injuries and to fight or at least to prevent the spread of fires. If an earth-

quake happens at night, emergency lighting will be needed. Thus, efforts are beginning to promote a wider spread of first aid kits, fire extinguishers, emergency lighting, and knowledge of how to use all of these resources. Also, there will be a need in many areas to defend against vandalism and looting. Neighborhoods that are evidently banded together to defend themselves can be safe without being heavily armed.

There is a growing sense of need to diminish the feeling of isolation often found in big cities, and to encourage people to know their neighbors well enough to establish plans for a cooperative effort in the event of a disaster. The fire department has been working to encourage this in the training sessions offered to the public, but more could be done. It might be valuable to consider reestablishing the "block mother" system established by the Civil Defense Agency during the early years of the Cold War. Preparations that once were intended for man-made disasters should be applicable to natural disasters.

No single city department can undertake a program of community disaster preparation in the absence of support from the city government as a whole, but in the context of such a commitment, each department or bureau could make its own contribution. The police department could teach community defense as suggested above, and the Bureau of Sanitation could teach emergency sanitation measures suitable for use during a breakdown of sanitation service. All of the activities need to be coordinated or monitored by some central office to be sure that these presentations are made in a way that systematically lowers that vast area expanse of the city.

Particularly, in the aftermath of

Hurricane Andrew, but after other disasters, too, there have been reports about friction between local authorities and federal agencies that provide disaster relief. The best way to prevent this is for the local governments and their citizens to be so well prepared that the need for federal assistance is minimal. Furthermore, cooperation between local governments and their citizens and neighborhoods should ease the prolonged phase of recovery after the initial emergency is over.

More thinking needs to be done about what the bureau and the city as a whole should hope to do and can afford to prepare for during an earthquake or any other major disasters. An early effort should be made to classify these issues and concerns according to their degrees of difficulties and to coordinate present activities with additional ones that might be added in the future. Notwithstanding these issues, the emphasis of the sanitation management on disaster response planning and preparedness is clearly the right thing to do.

Ken Ludwig, Reza Iranpour, and Tito Jugo are division manager, sanitary engineering associate II, and sanitary engineer, respectively, for WSSD, and Dennis Vander Hook and Larry Ehrmann are plant manager III and bureau emergency preparedness coordinator, respectively, for HRDD, with the Department of Public Works, City of Los Angeles, Calif.

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WHAT DO YOU THINK? SEE PAGE 3