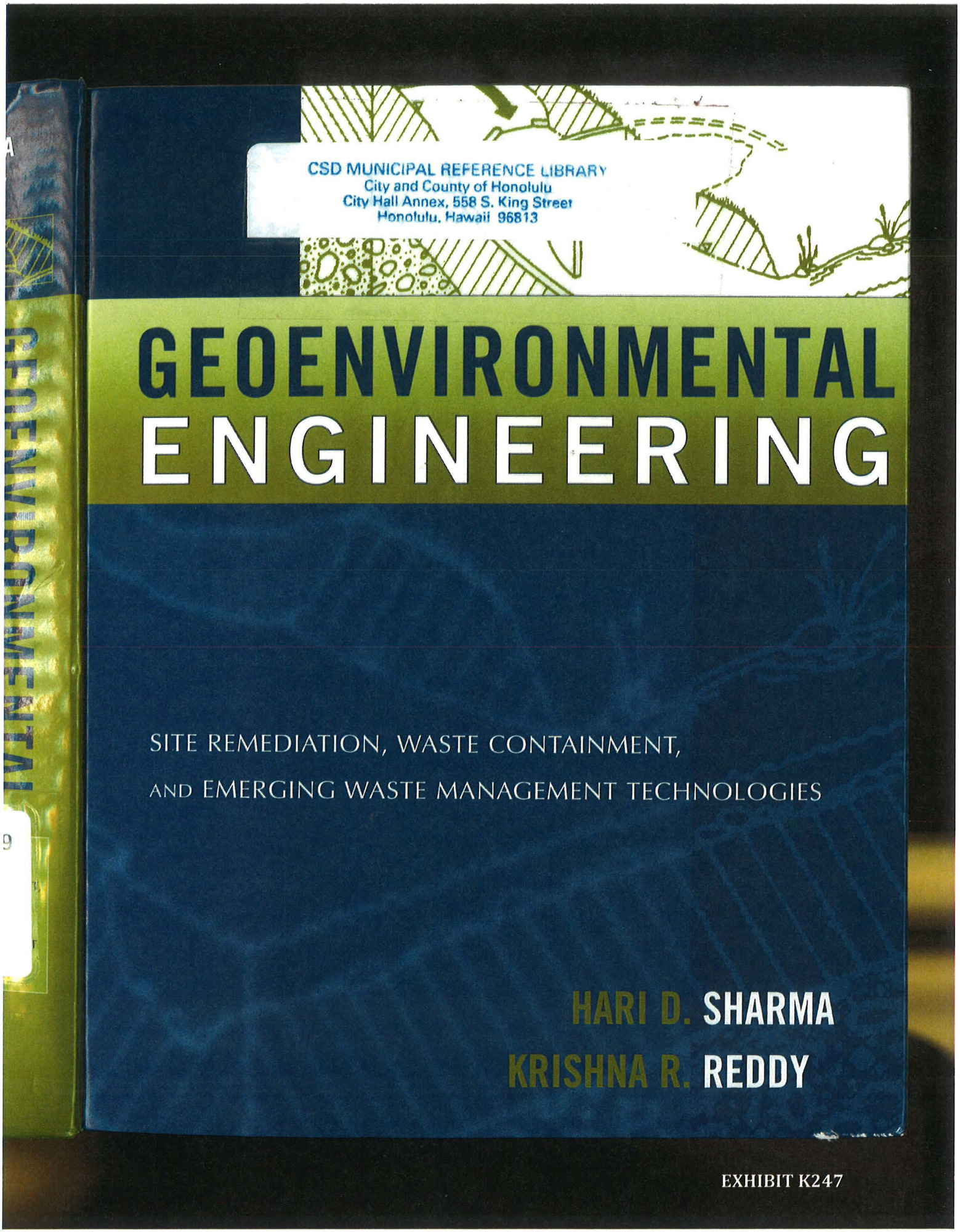
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GEOENVIRONMENTAL ENGINEERING
SITE REMEDIATION, WASTE CONTAINMENT,
AND EMERGING WASTE MANAGEMENT TECHNOLOGIES
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EXHIBIT K247

GEOENVIRONMENTAL ENGINEERING:

Site Remediation, Waste Containment, and Emerging Waste Management Technologies

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LLW. LLW wastes include the remainder of the radioactive waste materials. They constitute over 80% of the volume of all the nuclear wastes but only about 2% of the total radioactivity. Sources of LLW include all of the previously cited sources of HLW and TRU, plus hospitals, industrial plants, universities, and commercial laboratories. LLW is much less dangerous than HLW, and NRC regulations allow some very low level wastes to be released to the environment. LLW may also be stored or buried until the isotopes decay to levels low enough that it can be disposed of as normal waste. LLW disposal is managed by the states, but requirements for operation and disposal are established by the EPA and NRC. The Occupational Safety and Health Administration (OSHA) is the agency in charge of setting the standards for workers that are exposed to radioactive materials.

Mill Tailings. Mill tailings are basically residues from the mining and extraction of uranium from its ore. There are more than 200 million tons of radioactive mill tailings in the United States, and all of it is stored in sparsely populated areas of such western states as Arizona, New Mexico, Utah, and Wyoming (Dolan and Scariano, 1990). These wastes emit low-level radiation, and much of it is buried to reduce dangerous emissions.

15.3.4 Infectious (Medical) Waste

The major governmental agencies concerned with medical waste include the EPA, OSHA, the Center for Disease Control (CDC) of the U.S. Department of Health and Human Services, and the Agency for Toxic Substances and Disease Registry (ATSDR) of the Public Health Service, U.S. Department of Health and Human Services. In 1988, when medical wastes washed up on beaches along the east coast, Congress passed the Medical Waste Tracking Act (MWTA) to evaluate management issues and potential risks related to medical waste disposal. The seven types of wastes listed under MWTA include:

1. Microbiological wastes (cultures and stocks of infectious wastes and associated biologicals that can cause disease in humans)
2. Human blood and blood products (including serum, plasma, and other blood components)
3. Pathological wastes of human origin (including tissues, organs, and body parts removed during surgery or autopsy)
4. Contaminated animal wastes (i.e., animal carcasses, body parts, and bedding exposed to infectious agents during medical research, pharmaceutical testing, or production of biologicals)
5. Isolation wastes (wastes associated with animals or humans known to be infected with highly communicable diseases)
6. Contaminated sharps (includes hypodermic needles, scalpels, broken glass)
7. Uncontaminated sharps

All medical wastes represent a small fraction of the total waste stream, and it is estimated that it is a maximum of about 2%. It is important to understand whether or not infectious medical wastes are much worse than typical MSW wastes that also contain pathogens. Pathogens in MSW may be contributed from sanitary napkins, disposable diapers, tissues, and so on; however, medical wastes contain much higher concentrations of pathogens.

The current trend for disposal of medical wastes is through incineration, because, as with most wastes, it greatly reduces the volume, and it assures the destruction and sterilization of infectious pathogens. Disadvantages of incineration include the potential air pollution risks from dioxins or the disposal of hazardous ash wastes. New options for disposal of medical (infectious) wastes are still being explored as well as some other technologies, including irradiation, microwaving, autoclaving, and mechanical or chemical disinfection (OTA, 1990).

15.4 WASTE CHARACTERIZATION

The variation of waste characteristics within the United States is quite significant, due to the wide range of