maintain a general compliance date for qualifying small landfills of October 9, 1995, but would extend the effective date of ground-water monitoring and financial assurance until October 9, 1997. Under this alternative approach, such an owner/operator that accepts waste after October 9, 1995 would have to comply with the location restrictions and operating requirements. Should that owner/operator cease receipt of waste by October 9, 1997 and place final cover on the landfill by October 9, 1998, that facility would be exempt from groundwater monitoring. Under this approach, the owner/operator also would be exempt from the financial assurance requirements for closure since closure would be completed within one year of last receipt of waste. In addition, because most of the costs of post-closure care are attributed to ground-water monitoring, the Agency also would exempt the owner/operator from demonstrating financial assurance for the post-closure care period. Table I provides a summary of the proposed delay of the general compliance date and the alternative approach.

TABLE I.—PROPOSED APPROACHES FOR EXTENDING THE EFFECTIVE DATES FOR SMALL LANDFILL LOCATED IN DRY OR REMOTE LOCATIONS

Approach	Requirements effective on October 9, 1995	Requirements effective on October 9, 1997
Proposed Approach: Delay of Gen- eral Compliance Date. Alternative Approach: Delay of Groundwater monitoring and fi- nancial assurance.		<ul> <li>All requirements take effect.</li> <li>If cease receipt of waste by October 9, 1997: placement of final cover required by October 9, 1998. [Note: owner/operator exempt from groundwater monitoring and financial assurance requirements.]</li> <li>If continue receipt of waste after October 9, 1997: all other requirements take effect, including groundwater monitoring and financial assurance.</li> </ul>

## III. Alternatives to Ground-Water Monitoring

In addition to reviewing the comments described in section II.C.1 of this preamble, the Agency conducted a literature review to assess the types of equipment and techniques that can function as alternatives to the full ground-water monitoring requirements of Part 258. This literature may be found in the docket for today's rule (F-95-AGAP–FFFFF). The following discussion presents a summary of this review. While this discussion does not contain an exhaustive description of all possible alternatives, it does discuss several of the technologies available and in use today for a variety of geological and hydrogeological purposes. Based on this literature review, the Agency believes that ground-water monitoring well alternatives, such as those described in this section, can, on a sitespecific basis, detect contamination and determine the nature and extent of contamination.

Alternatives to conventional groundwater monitoring include various types of equipment and measurement techniques that are capable of recovering physical samples of ground water or soil and are capable of detecting changes in subsurface conditions that are indicative of a release from a landfill. In general, alternatives to ground-water monitoring wells can be placed into two categories depending on the type of measurements made and the data collected. One category, geochemical alternatives, includes samples of soil, water, rock, or other materials for laboratory analysis. A second category, geophysical alternatives, involves methods that rely on the measurement of electrical properties, such as conductivity or resistivity. Both unsaturated zone monitoring and saturated zone monitoring are possible with geochemical and geophysical alternatives, depending on the particular characteristics of a landfill and the capabilities of the alternative chosen.

Common sampling devices are readily available and may be used for collecting geochemical sample material. Handheld soil samplers can be used for sampling at depths of several feet, and power-driven augers may be needed to penetrate and sample consolidated subsurface material. The use of a rotary drill may be necessary if geochemical samples must be collected from relatively great depths. Small diameter sampling tools may be pushed into the subsurface with hydraulic equipment for the collection of soil or ground-water samples beneath the landfill. Small diameter sampling tools are capable of reaching depths of about 50 feet in loosely consolidated soil or sediment, but are not designed to penetrate thick rock formations. During sample collection, geochemical samples must be handled and stored to avoid accidental sample contamination.

Under appropriate conditions, soil pore liquid from the unsaturated zone may be collected for laboratory analysis. This procedure involves a porous cup that is placed into the subsurface and is connected to a vacuum-pressure source. The vacuum draws liquid into the cup, and the liquid is transported through a tube to the surface where it is collected.

Alternatives that employ geophysical principles generally provide an indirect method for detecting contamination. Electrical geophysical methods can measure the contrasting electrical properties of subsurface features. By injecting an electrical current into the ground with electrodes and measuring the resulting potential field, a geophysical electrical resistivity survey can delineate conductive contaminant plumes, vertical and lateral extent of geological features, and fresh/salt water interfaces. Electrical resistivity measurements are normally correlated with geology from subsurface borings to validate survey results.

Another method relying on geophysical measurements involves moisture detection blocks or electrical resistance sensors. Electrical resistance sensors measure the electrical potential between two wires spaced a few centimeters apart. The two wires are embedded in a porous matrix (typically gypsum-based), forming a block a few inches in diameter with wire leads. The blocks are embedded in the subsurface and the wires extend to the surface where they are attached to a portable resistivity meter. Because the block matrix is porous, soil pore liquids can freely enter and leave. When the soils and the electrical resistance blocks are dry, the resistance to electrical current flow is high, and conversely, when the soil and blocks become wet, a low resistance is measured on the meter. These blocks represent a point