alternative ground-water monitoring technique at that time.

## B. Proposed Approach for Using Alternatives

1. Consideration of Site-Specific Factors in Selection of an Alternative Monitoring Technique

The Agency believes site-specific factors need to be considered in determining which, if any, alternative(s) may be appropriate to detect contamination. To ensure that appropriate decisions regarding the use of alternatives to ground-water monitoring are made, the Agency believes that the following factors should be considered, as warranted and appropriate, on a site-specific basis:

• The geology and hydrogeology of the site;

• The impact of manmade and natural features on the effectiveness of an alternative technology;

 Precipitation amounts, temperature, and other climatic factors; and

• The effectiveness of indicator parameters in detecting a potential release from the MSWLF unit.

The following discussion serves to illustrate, in general, why these sitespecific factors should be considered when choosing an appropriate monitoring alternative.

a. The geological and hydrogeological characteristics of the site.

The ground-water monitoring requirements in the final MSWLF criteria provide that the number, spacing, and depths of monitoring well systems should be determined based upon site-specific technical information that must include a site characterization of the geology and hydrogeology (40 CFR 258.51(d); see also preamble discussion in 56 FR 51066). The Agency believes that a similar understanding of the geology and hydrogeology also is desirable when deciding whether it is appropriate to use alternative monitoring technologies.

For example, the Director of an approved State or Tribe, when considering the use of gypsum blocks as an alternative, would need to determine if the presence of shallow ground water could lead to false indications of releases from the landfill through seasonal fluctuations in ground-water depth and how wet-dry periods and soil chemistry would affect the useful life of the gypsum blocks. Additionally, knowledge of site geology is important where an owner or operator is considering the use of small diameter sampling tools to sample around and beneath the landfill for detecting a release. This technology is influenced

by the ability of the tool to penetrate subsurface materials. For example, this technique is most likely to be workable where the geology consists of loosely consolidated sediment down to the depth at which samples are required.

b. The impact of manmade and natural features on the effectiveness of an alternative technology. Manmade and natural features at a

particular site may be important factors in influencing the capability of an alternative technology to detect contamination. For example, as discussed earlier, some alternatives may employ the use of electrical geophysical principles to provide an indirect method for detecting contamination by measuring the contrasting electrical properties of subsurface features to delineate contaminant plumes. However, when conducting geophysical electrical resistivity surveys, measurement errors may result from electrical currents in the ground that interfere with the current being measured. Therefore, before employing these surveys, potential subsurface interferences should be considered, such as naturally-occurring sulfide deposits, the presence of electrical power lines, or buried metal objects that are corroding. Additionally, electrical resistivity surveys are not recommended for use in paved areas.

Natural features of a site may impede access necessary to bring certain equipment on site. For example, ground penetrating radar radiates short pulses of high-frequency radio waves into the ground to delineate a leachate plume. The bulkiness of the equipment, however, may limit its use in rough and inaccessible terrain.

c. Climatic factors that may influence the selection, use, and reliability of alternative ground-water monitoring procedures.

The MSWLF owner or operator must have knowledge of precipitation amounts in order to determine whether the MSWLF qualifies for today's flexibility. In addition, an understanding of the local climatic conditions is important in understanding the effectiveness of possible alternative monitoring methods. For example, ground penetrating radar is best applied in areas with very dry soil conditions. Seismic refraction, an alternative technology that relies on an artificial seismic source (hammer, controlled explosive charge) to create underground seismic waves that are read with a seismograph to delineate soils/geology and leachate, might be limited by cold or relatively wet weather. Finally, where soil pore liquid is collected from the unsaturated

zone through the use of porous cup lysimeters, the effectiveness of the lysimeter will be hindered in areas where soils are frozen, extremely dry, or where subjected to freeze-thaw.

d. The effectiveness of indicator parameters in detecting a release.

A number of qualifying small MSWLFs may be able to use alternative technologies to detect contamination in the unsaturated zone. Where these unsaturated zone monitoring methods are allowed by an approved State or Tribe, the owner/operator would be monitoring for parameters that can be detected by application of that specific technology (e.g., gypsum blocks would monitor for the presence of moisture in the zone underlying the MSWLF). Some qualifying small MSWLFs, however, may not be able to use alternative technologies and may need to use traditional monitoring wells to sample and analyze ground water.

In these situations, the current detection monitoring program in § 258.54 requires sampling and analysis at each well for 15 metals and 47 volatile organic compounds (VOCs); however, approved States and Tribes currently are permitted to (1) replace some or all of the metals with geochemical parameters (e.g., ammonia, total dissolved solids) and (2) delete any metal or VOC if that constituent is not in or cannot be derived from the waste in the landfill.

At the June, 1994 public meetings, many of the commentors suggested that the MSWLF owner/operator should have the flexibility to use a shorter, less costly list of monitoring parameters for ground-water monitoring wells (primarily geochemical parameters) so long as these parameters would indicate a release from the MSWLF. Such flexibility would be designed to allow an owner/operator to use geochemical parameters in place of both metals and VOCs without having to demonstrate that each of the 47 VOCs is not in or cannot be derived from the waste in the MSWLF.

For the reasons discussed earlier in today's preamble (Section II.B.1), the Agency believes that approved States and Tribes should have the flexibility to establish an alternative list of indicator parameters for qualifying small MSWLFs, where appropriate given sitespecific circumstances. These reasons include low precipitation, low net infiltration, and great depth to ground water at many of these sites, the relatively small amounts of waste received at these MSWLFs, and the practicable capability (i.e., economic) considerations of qualifying small MSWLFs. The Agency's technical