



6.1 GROUNDWATER MONITORING WELL PLACEMENT

The SAP must identify the site-specific monitoring well design and include a map showing the proposed well locations together with the area(s) of environmental concern and site boundaries. The preferred map scale is 1 inch is less than or equal to 50 feet. The well design and placement must be based on:

1. The Preliminary Conceptual Site Model and other site characteristics data (discussed in Section 3) that describe the site topography, the geologic setting, and the presumed groundwater hydrology
2. The area of environmental concern
3. The contaminants of potential concern
4. Potential receptors such as potable water supply wells, irrigation wells, and surface streams connected to groundwater
5. Influences on hydrology such as injection wells or tidal fluctuation

6.1.1 Initial Groundwater Investigation Phase

The initial investigation phase described in this section assumes a straightforward scenario consisting of the following conditions: (1) a single point source or area of suspected contamination, and (2) prior groundwater investigation has not been conducted.

The preliminary conceptual model (see Section 3) developed during this phase should include information obtained from published reports such as the Aquifer Identification and Classification Reports: Groundwater Protection Strategy for Hawai'i (Mink, J.F. and L.S. Lau, 1990; 1990b; 1992; 1992b; 1993; 1993b), published by the Water Resources Research Center at the University of Hawai'i.

The initial phase of the investigation determines whether contaminants have impacted the uppermost water bearing zone including perched groundwater. During this phase, a minimum of three wells are required for each known or suspected contaminant source area. Three wells, if placed at the proper angles relative to one another, will provide sufficient data to establish the local groundwater flow direction through static groundwater level measurements.



Place at least one of these wells in proximity to the source area (i.e., the area known or suspected to have the greatest levels of contaminants). Place at least one of these wells slightly down gradient of the source area (USEPA, 1995c). Place the third well approximately cross gradient so the three wells form a triangle.

During the initial investigation phase, the well screens must extend across the water table and groundwater sampling must include the uppermost water bearing zone, including perched groundwater. Monitoring wells with screens extending across the water table are typically installed with 7 feet of screen interval below the water table (i.e., the saturated interval) and 3 feet of screen interval above the water table. This allows for the assessment of groundwater level fluctuations as well as the accumulation of free product on the water table surface.

6.1.2 Subsequent Investigation Phases

If contamination is confirmed during the initial investigation phase, additional wells may be required to delineate the horizontal and/or vertical extent of the groundwater contamination plume. In general, contamination resulting from petroleum products (which are less dense than water, and float) requires less vertical delineation than contamination resulting from chlorinated solvents (which are denser than water, and sink).

To delineate the horizontal extent of groundwater impacts, monitoring wells are installed cross gradient, up gradient, and down gradient of the source area (identified in the initial investigation phase) to assess contaminant dispersion. The installation of one or more wells upgradient in unaffected areas for the collection of background data is recommended (USEPA, 1995c). Background data are especially important if one or more contaminants of concern occur naturally in the soil and groundwater at the site.

To delineate the vertical extent of groundwater impacts, monitoring wells are installed with successively deeper screen intervals. Screen intervals at multiple subsurface horizons can be accomplished through the use of multi-level wells or through the use of multiple wells in clusters or nests (see Subsection 6.3.9). Multiple well placements in a single borehole are not recommended (USACE, 1998).

When delineating the vertical extent of the plume, it is extremely important to maintain the integrity of any confining units between



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upper and lower aquifers to prevent the vertical spread of groundwater contamination. When possible, drill to and collect geotechnical samples from the confining unit (for permeability testing) without compromising the integrity of the confining unit. Pumping tests may be required to establish that the confining unit is impermeable and that the underlying water bearing unit is not hydraulically connected to the impacted upper water bearing unit.