**Section 817.414 Design, Construction and Operation of Groundwater Monitoring Systems**

a) All potential sources of discharges to groundwater within the facility, including, but not limited to, all waste disposal units and the leachate management system, shall be identified and studied through a network of monitoring wells operated during the active life of the unit and for the time after closure specified in accordance with Section 817.415. Monitoring wells designed and constructed as part of the monitoring network shall be maintained along with records that include, but are not limited to, exact well location, well size, type of well, the design and construction practice used in its installation and well and screen depths.

b) Standards for the location of monitoring points:

1) A network of monitoring points shall be established at sufficient locations downgradient with respect to groundwater flow and not excluding the downward direction, to detect any discharge of contaminants from any part of a potential source of discharge.

2) Monitoring wells shall be located in stratigraphic horizons that could serve as contaminant migration pathways.

3) Monitoring wells shall be established as close to the potential source of discharge as possible without interfering with the waste disposal operations, and within half the distance from the edge of the potential source of discharge to the edge of the zone of attenuation downgradient, with respect to groundwater flow, from the source.

4) The network of monitoring points of several potential sources of discharge within a single facility may be combined into a single monitoring network, provided that discharges from any part of all potential sources can be detected.

5) A minimum of at least one monitoring well shall be established at the edge of the zone of attenuation and shall be located downgradient from the unit with respect to groundwater flow, and not excluding the downward direction. Such well or wells shall be used to monitor any statistically significant increase in the concentration of any constituent, in accordance with Section 817.416(e) and shall be used for determining compliance with an applicable groundwater quality standard of Section 817.416. An observed statistically significant increase above the applicable groundwater quality standards of Section 817.416 in a well located at or beyond the compliance boundary shall constitute a violation.

c) Maximum allowable predicted concentrations. For the purposes of this Part, the maximum allowable predicted concentration (MAPC) for each monitored constituent shall be determined as follows:

1) MAPCs for those constituents with a MALC identified as a primary standard shall be background plus 10 percent of the MALC. MAPCs for those constituents with a MALC identified as a secondary standard shall be background plus 50 percent of the MALC. The MAPCs calculated in this subsection shall be applicable within the zone of attenuation.

2) For those constituents listed in Section 817.Appendix A of this Part, the MAPC shall be the practical quanitation limit (PQL) or, if the constituent's background concentration exceeds the PQL, the MAPC shall be the background constituent concentration.

d) Standards for monitoring well design and construction:

1) All monitoring wells shall be cased in a manner that maintains the integrity of the borehole. The casing material shall be inert so as not to affect the water sample. Casing requiring solvent-cement type coupling shall not be used.

2) Wells shall be screened to allow sampling only at the desired interval. Annular space between the borehole wall and well screen section shall be packed with gravel sized to avoid clogging by the material in the zone being monitored. The slot size of the screen shall be designed to minimize clogging. Screens shall be fabricated from material expected to be inert with respect to the constituents of the groundwater to be sampled.

3) Annular space above the well screen section shall be sealed with a relatively impermeable, expandable material such as a cement/bentonite grout, which does not react with or in any way affect the sample, in order to prevent contamination of samples and groundwater and avoid interconnections. The seal shall extend to the highest known seasonal groundwater level.

4) The annular space shall be back-filled with expanding cement grout from an elevation below the frost line and mounded above the surface and sloped away from the casing so as to divert surface water away.

5) The annular space between the upper and lower seals and in the unsaturated zone may be back filled with uncontaminated cuttings.

6) All wells shall be covered with vented caps and equipped with devices to protect against tampering and damage.

7) All wells shall be developed to allow free entry of water, minimize turbidity of the sample, and minimize clogging.

8) The transmissivity of the zone surrounding all well screens shall be established by field testing techniques.

9) Other sampling methods and well construction techniques may be utilized if they meet the water well construction standards of 77 Ill. Adm. Code 920 or if the Agency has issued a written approval.

e) Standards for Sample Collection and Analysis

1) The groundwater monitoring program shall include consistent sampling and analysis procedures to assure that monitoring results can be relied upon to provide data representative of groundwater quality in the zone being monitored.

2) The operator shall utilize procedures and techniques to insure that collected samples are representative of the zone being monitored and that prevent cross contamination of samples from other monitoring wells or from other samples. At least 95 percent of a collected sample shall consist of groundwater from the zone being monitored.

3) The operator shall establish a quality assurance program that provides quantitative detection limits and the degree of error for analysis of each chemical constituent.

4) The operator shall establish a sample preservation and shipment procedure that maintains the reliability of the sample collected for analysis.

5) The operator shall institute a chain of custody procedure to prevent tampering and contamination of the collected samples prior to completion of analysis.

6) At a minimum, the operator shall sample the following parameters at all wells at the time of sample collection and immediately before filtering and preserving samples for shipment:

A) The elevation of the water table;

B) The depth of the well below ground;

C) pH;

D) The temperature of the sample; and

E) Specific conductance.