

## Environmental Protection Agency

## § 146.6

by owners or operators of hazardous waste management facilities, or by owners or operators of radioactive waste disposal sites to dispose of hazardous waste or radioactive waste above a formation which within one quarter ( $\frac{1}{4}$ ) mile of the well contains an underground source of drinking water.

(3) Wells used by generators of hazardous waste or owners or operators of hazardous waste management facilities to dispose of hazardous waste, which cannot be classified under § 146.05(a)(1) or § 146.05(d) (1) and (2) (e.g., wells used to dispose of hazardous wastes into or above a formation which contains an aquifer which has been exempted pursuant to § 146.04).

(e) *Class V*. Injection wells not included in Class I, II, III, or IV. Specific types of Class V injection wells are also described in 40 CFR 144.81. Class V wells include:

(1) Air conditioning return flow wells used to return to the supply aquifer the water used for heating or cooling in a heat pump;

(2) Cesspools including multiple dwelling, community or regional cesspools, or other devices that receive wastes which have an open bottom and sometimes have perforated sides. The UIC requirements do not apply to single family residential cesspools nor to non-residential cesspools which receive solely sanitary wastes and have the capacity to serve fewer than 20 persons a day.

(3) Cooling water return flow wells used to inject water previously used for cooling;

(4) Drainage wells used to drain surface fluid, primarily storm runoff, into a subsurface formation;

(5) Dry wells used for the injection of wastes into a subsurface formation;

(6) Recharge wells used to replenish the water in an aquifer;

(7) Salt water intrusion barrier wells used to inject water into a fresh water aquifer to prevent the intrusion of salt water into the fresh water;

(8) Sand backfill and other backfill wells used to inject a mixture of water and sand, mill tailings or other solids into mined out portions of subsurface mines whether what is injected is a radioactive waste or not.

(9) Septic system wells used to inject the waste or effluent from a multiple dwelling, business establishment, community or regional business establishment septic tank. The UIC requirements do not apply to single family residential septic system wells, nor to non-residential septic system wells which are used solely for the disposal of sanitary waste and have the capacity to serve fewer than 20 persons a day.

(10) Subsidence control wells (not used for the purpose of oil or natural gas production) used to inject fluids into a non-oil or gas producing zone to reduce or eliminate subsidence associated with the overdraft of fresh water;

(11) Radioactive waste disposal wells other than Class IV;

(12) Injection wells associated with the recovery of geothermal energy for heating, aquaculture and production of electric power.

(13) Wells used for solution mining of conventional mines such as stopes leaching;

(14) Wells used to inject spent brine into the same formation from which it was withdrawn after extraction of halogens or their salts;

(15) Injection wells used in experimental technologies.

(16) Injection wells used for in situ recovery of lignite, coal, tar sands, and oil shale.

[45 FR 42500, June 24, 1980, as amended at 46 FR 43161, Aug. 27, 1981; 47 FR 4999, Feb. 3, 1982; 64 FR 68573, Dec. 7, 1999]

### § 146.6 Area of review.

The area of review for each injection well or each field, project or area of the State shall be determined according to either paragraph (a) or (b) of this section. The Director may solicit input from the owners or operators of injection wells within the State as to which method is most appropriate for each geographic area or field.

(a) *Zone of endangering influence*. (1) The zone of endangering influence shall be:

(i) In the case of application(s) for well permit(s) under § 122.38 that area the radius of which is the lateral distance in which the pressures in the injection zone may cause the migration of the injection and/or formation fluid

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into an underground source of drinking water; or

(ii) In the case of an application for an area permit under §122.39, the project area plus a circumscribing area the width of which is the lateral distance from the perimeter of the project area, in which the pressures in the injection zone may cause the migration of the injection and/or formation fluid into an underground source of drinking water.

(2) Computation of the zone of endangering influence may be based upon the parameters listed below and should be calculated for an injection time period equal to the expected life of the injection well or pattern. The following modified Theis equation illustrates one form which the mathematical model may take.

$$r = \left( \frac{2.25 KHt}{S10^x} \right)^{1/2}$$

where:

$$X = \frac{4\pi KH(h_w - h_{b0} \times S_p G_b)}{2.3Q}$$

r=Radius of endangering influence from injection well (length)

k=Hydraulic conductivity of the injection zone (length/time)

H=Thickness of the injection zone (length)

t=Time of injection (time)

S=Storage coefficient (dimensionless)

Q=Injection rate (volume/time)

h<sub>b0</sub>=Observed original hydrostatic head of injection zone (length) measured from the base of the lowermost underground source of drinking water

h<sub>w</sub>=Hydrostatic head of underground source of drinking water (length) measured from the base of the lowest underground source of drinking water

S<sub>p</sub> G<sub>b</sub>=Specific gravity of fluid in the injection zone (dimensionless)

π=3.142 (dimensionless)

The above equation is based on the following assumptions:

- (i) The injection zone is homogenous and isotropic;
- (ii) The injection zone has infinite area extent;
- (iii) The injection well penetrates the entire thickness of the injection zone;

(iv) The well diameter is infinitesimal compared to "r" when injection time is longer than a few minutes; and

(v) The emplacement of fluid into the injection zone creates instantaneous increase in pressure.

(b) *Fixed radius.* (1) In the case of application(s) for well permit(s) under §122.38 a fixed radius around the well of not less than one-fourth (1/4) mile may be used.

(2) In the case of an application for an area permit under §122.39 a fixed width of not less than one-fourth (1/4) mile for the circumscribing area may be used.

In determining the fixed radius, the following factors shall be taken into consideration: Chemistry of injected and formation fluids; hydrogeology; population and ground-water use and dependence; and historical practices in the area.

(c) If the area of review is determined by a mathematical model pursuant to paragraph (a) of this section, the permissible radius is the result of such calculation even if it is less than one-fourth (1/4) mile.

[45 FR 42500, June 24, 1980, as amended at 46 FR 43161, Aug. 27, 1981; 47 FR 4999, Feb. 3, 1982]

§ 146.7 **Corrective action.**

In determining the adequacy of corrective action proposed by the applicant under 40 CFR 144.55 and in determining the additional steps needed to prevent fluid movement into underground sources of drinking water, the following criteria and factors shall be considered by the Director:

- (a) Nature and volume of injected fluid;
- (b) Nature of native fluids or by-products of injection;
- (c) Potentially affected population;
- (d) Geology;
- (e) Hydrology;
- (f) History of the injection operation;
- (g) Completion and plugging records;
- (h) Abandonment procedures in effect at the time the well was abandoned; and