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USDW means “underground source of drinking water.”

Well means: A bored, drilled, or driven shaft whose depth is greater than the largest surface dimension; or, a dug hole whose depth is greater than the largest surface dimension; or, an improved sinkhole; or, a subsurface fluid distribution system.

Well injection means the subsurface emplacement of fluids through a well.

Well plug means a watertight and gastight seal installed in a borehole or well to prevent movement of fluids.

Well stimulation means several processes used to clean the well bore, enlarge channels, and increase pore space in the interval to be injected thus making it possible for wastewater to move more readily into the formation, and includes (1) surging, (2) jetting, (3) blasting, (4) acidizing, (5) hydraulic fracturing.

Well monitoring means the measurement, by on-site instruments or laboratory methods, of the quality of water in a well.

(Clean Water Act, Safe Drinking Water Act, Clean Air Act, Resource Conservation and Recovery Act: 42 U.S.C. 6905, 6912, 6925, 6927, 6974)

[45 FR 42500, June 24, 1980, as amended at 46 FR 43161, Aug. 27, 1981; 47 FR 4998, Feb. 3, 1982; 48 FR 14293, Apr. 1, 1983; 53 FR 37414, Sept. 26, 1988; 64 FR 68573, Dec. 7, 1999]

§ 146.4 Criteria for exempted aquifers.

An aquifer or a portion thereof which meets the criteria for an “underground source of drinking water” in § 146.3 may be determined under § 144.7 of this chapter to be an “exempted aquifer” for Class I–V wells if it meets the criteria in paragraphs (a) through (c) of this section. Class VI wells must meet the criteria under paragraph (d) of this section:

(a) It does not currently serve as a source of drinking water; and

(b) It cannot now and will not in the future serve as a source of drinking water because:

(1) It is mineral, hydrocarbon or geothermal energy producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or III operation to contain minerals or hydrocarbons that considering their

quantity and location are expected to be commercially producible.

(2) It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical;

(3) It is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption; or

(4) It is located over a Class III well mining area subject to subsidence or catastrophic collapse; or

(c) The total dissolved solids content of the ground water is more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system.

(d) The areal extent of an aquifer exemption for a Class II enhanced oil recovery or enhanced gas recovery well may be expanded for the exclusive purpose of Class VI injection for geologic sequestration under § 144.7(d) of this chapter if it meets the following criteria:

(1) It does not currently serve as a source of drinking water; and

(2) The total dissolved solids content of the ground water is more than 3,000 mg/l and less than 10,000 mg/l; and

(3) It is not reasonably expected to supply a public water system.

(Clean Water Act, Safe Drinking Water Act, Clean Air Act, Resource Conservation and Recovery Act: 42 U.S.C. 6905, 6912, 6925, 6927, 6974)

[45 FR 42500, June 24, 1980, as amended at 47 FR 4998, Feb. 3, 1982; 48 FR 14293, Apr. 1, 1983; 75 FR 77291, Dec. 10, 2010]

§ 146.5 Classification of injection wells.

Injection wells are classified as follows:

(a) *Class I.* (1) Wells used by generators of hazardous waste or owners or operators of hazardous waste management facilities to inject hazardous waste beneath the lowermost formation containing, within one quarter (¼) mile of the well bore, an underground source of drinking water.

(2) Other industrial and municipal disposal wells which inject fluids beneath the lowermost formation containing, within one quarter mile of the well bore, an underground source of drinking water.

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(3) Radioactive waste disposal wells which inject fluids below the lowermost formation containing an underground source of drinking water within one quarter mile of the well bore.

(b) *Class II.* Wells which inject fluids:

(1) Which are brought to the surface in connection with conventional oil or natural gas production and may be commingled with waste waters from gas plants which are an integral part of production operations, unless those waters are classified as a hazardous waste at the time of injection.

(2) For enhanced recovery of oil or natural gas; and

(3) For storage of hydrocarbons which are liquid at standard temperature and pressure.

(c) *Class III.* Wells which inject for extraction of minerals including:

(1) Mining of sulfur by the Frasch process;

(2) In situ production of uranium or other metals. This category includes only in-situ production from ore bodies which have not been conventionally mined. Solution mining of conventional mines such as stopes leaching is included in Class V.

(3) Solution mining of salts or potash.

(d) *Class IV.* (1) Wells used by generators of hazardous waste or of radioactive waste, 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 into a formation which within one quarter ($\frac{1}{4}$) mile of the well contains an underground source of drinking water.

(2) Wells used by generators of hazardous waste or of radioactive waste, 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, IV or VI. 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

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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.

(f) *Class VI.* Wells that are not experimental in nature that are used for geologic sequestration of carbon dioxide beneath the lowermost formation containing a USDW; or, wells used for geologic sequestration of carbon dioxide that have been granted a waiver of the injection depth requirements pursuant to requirements at §146.95; or, wells used for geologic sequestration of carbon dioxide that have received an expansion to the areal extent of an existing Class II enhanced oil recovery or enhanced gas recovery aquifer exemption pursuant to §§146.4 and 144.7(d) of this chapter.

[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; 75 FR 77291, Dec. 10, 2010]

§ 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 dis-

tance 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; 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:

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

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_{bo} = Observed original hydrostatic head of injection zone (length) measured from the base of the lowermost underground source of drinking water

h_w = Hydrostatic head of underground source of drinking water (length) measured from the base of the lowest underground source of drinking water

S_p G_b = 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;