

ATTACHMENT VI-2

PERMANENT ABANDONMENT OF MONITORING WELLS

1. GENERAL REQUIREMENTS

- a. Any groundwater monitoring well that is to be permanently abandoned shall be done in accordance with the provisions of R655-4-14.
- b. Permanently abandoned wells shall be completely filled in such a manner as to prevent vertical movement of water within the borehole as well as preventing the annular space surrounding the well casing from becoming a conduit for possible contamination of the groundwater.
- c. The well closure shall be completed under the direct supervision of a currently licensed water well driller who shall be responsible for verification of procedures and materials used.

2. ACCEPTABLE MATERIALS

- a. One or more of the following materials shall be used for permanent closure of groundwater monitoring wells:
 - i. Neat cement conforming to ASTM standard C150 of sufficient weight (not less than 15 lbs/gallon) to prevent the flow of any water into the hole from any aquifer penetrated.
 - ii. Cement grout consisting of equal parts of cement conforming to ASTM standard C150 and sand/aggregate with no more than six gallons of water per sack of cement.
 - iii. Bentonite-based products specifically designed for permanent well closure, which are mixed and placed according to manufacturer's recommended procedures (i.e. Plug-Gel, Shur-Gel, etc.).

3. PLACEMENT OF MATERIALS

- a. Neat Cement and Grout.
 - i. Neat Cement and Grout shall be introduced at the bottom of the well and placed progressively upward to the top of the well. Sealing materials shall be placed by the use of a grout pipe, tremie line, dump bailer, or

equivalent in order to avoid freefall, bridging, or dilution of the sealing materials or separation of aggregates from sealants.

- b. Bentonite-based Products.
 - i. Bentonite-based abandonment products shall be mixed and placed according to manufacturer's recommended procedures and result in a seal free of voids or bridges. Granular or powdered bentonite shall not be placed under water.
- c. The liquid phase of the closure fluid shall be non-saline water containing no chemicals or toxic materials or other substances that may decompose or possibly contaminate the groundwater.
- d. The uppermost 10 feet of the abandoned well casing or borehole shall consist of neat cement grout or sand cement grout.
- e. Abandonment materials placed opposite any non-water bearing intervals or zones shall be at least as impervious as the formation or strata prior to penetration during the drilling process.
- f. Prior to well or borehole abandonment, all pump equipment, piping, and other debris shall be removed to the extent possible. The well shall also be sounded immediately before it is plugged to make sure that no obstructions exist that will interfere with the filling and sealing. Verification shall be made that the volume of sealing and fill material placed in a well during abandonment operations equals or exceeds the volume of the well or borehole to be filled and sealed.

4. TERMINATION OF CASING

- a. The casings of wells to be abandoned shall be severed a minimum of two feet below either the natural ground surface adjacent to the well or at the collar of the hole, whichever is the lower elevation. A minimum of two feet of compacted native material shall be placed above the abandoned well upon completion.

5. REPORT OF ABANDONMENT

- a. Within 30 days of the completion of abandonment work on any well, the Permittee shall ensure that the driller submits an abandonment log with the state engineer. The report shall be completed on forms furnished by the state engineer and shall contain such information as he/she may require, and at least the following information:

- i. Existing well construction information;
- ii. Date of abandonment;
- iii. Reason for abandonment;
- iv. A description of the abandonment method;
- v. A description of the abandonment materials including depth intervals, material type, quantity, and mix ratio;
- vi. Replacement well information (if applicable);
- vii. The well driller's statement to include the driller name, license number, signature, and date;
- viii. Address or location of well by section, township and range;
- ix. Water right number or monitor well number covering the well;

END OF ATTACHMENT VI-2