

US EPA ARCHIVE DOCUMENT

- Q. PLUGGING AND ABANDONMENT PLAN** -Submit a plan for plugging and abandonment of the well including: (1) describe the type, number, and placement (including the elevation of the top and bottom) of plugs to be used; (2) describe the type, grade, and quantity of cement to be used; and (3) describe the method to be used to place plugs, including the method used to place the well in a state of static equilibrium prior to placement of the plugs. Also for a Class III well that underlies or is in an exempted aquifer, demonstrate adequate protection of USDWs. Submit this information on EPA Form 7520-14, Plugging and Abandonment Plan.

### **WELL PLUGGING AND ABANDONMENT PLANS**

General well closure procedures and any post-closure care plans are detailed in the following subsections. These procedures follow Arizona Oil and Gas Conservation Commission requirements for proper well abandonment (*R12-7-127*). An exact plugging and abandonment program will be developed prior to actual well abandonment. This detailed plugging and abandonment plan will be based on final as-built well construction and the specific zones perforated and used for the experiments/monitoring in the well. This well-specific plan will include: 1) information on type, number and placement of the proposed plugs; 2) type, grade, and quality of the cement(s) to be used; and, the method that will be used to place the plugs. The plan will be submitted a minimum 30 days in advance of well plugging for review and approval.

#### **General Well Closure Procedures**

The closure procedures for the CO<sub>2</sub> Injection Well are designed to be implemented following completion of monitoring activities for the pilot test. The general procedures for well closure are described below and may be modified prior to performing field operations according to the direction of the Arizona Oil and Gas Conservation Commission and/or

EPA:

- A. Notice of intent to plug will be made at least 30 days prior to planned closure. Notification of the start of closure will be made to the Arizona Oil and Gas Conservation Commission at least 48 hours ahead of start of field operations.
- B. The following detailed information will be provided with the formal notice of intent to plug:
  1. Type and number of plugs to be set.
  2. Placement of each plug including the approximate elevation of both the top and bottom of the plug.
  3. Type, grade, and quantity of the plugging material and additives to be used.
  4. Method used to place plugs in hole.
  5. Procedure used to plug and abandon the well.
  6. Any information on newly constructed or discovered wells, or additional well data, within the Area of Review.

- C. Plugging operations for the CO<sub>2</sub> Injection Well will generally be conducted as follows:
1. Prepare location for workover rig.
  2. Move workover rig onto location.
  3. Record any shut-in tubing and/or casing pressures. Kill well with brine fluid. Remove wellhead and nipple up blow out preventers.
  4. Pull injection tubing, injection packer(s), and downhole instrumentation from the well. Perform any end of experiment monitoring activities
  5. Run in the well open-ended and displace the well with mud. Plugging mud, at a minimum, will have 15 pounds per barrel of sodium bentonite and a nonfermenting polymer, have a minimum consistency of 9 pounds per gallon, a minimum viscosity of 50 seconds per quart, and mixed with fresh water.
  6. Trip in the well with a 5-1/2" cement retainer and set the retainer approximately 50 feet above the upper perforation in the CO<sub>2</sub> Injection Well. Squeeze approximately 100 feet cement below the retainer. Shear out of the cement retainer and spot approximately 100 feet of cement above the retainer in the 5-1/2" casing.
  7. Pressure up on the 5-1/2" casing and plug to 1,000 psi for at least 30 minutes in order to verify integrity of the protection casing and the cement plug. Record the pressure test on a strip chart, circular chart, or digital recording device. Note Arizona Oil and Gas Conservation Commission and/or EPA may witness the casing/cement pressure test.
  8. Place a cement plug opposite the base of the surface casing, located at +/-965 feet. Plug will extend a minimum of 50 feet above and below the surface casing shoe depth (at a minimum top of plug at approximately 915 feet and bottom of plug at 1,015 feet). Displace cement out of tubing and pull up work string. Reverse circulate the hole clean. Allow cement to set and tag top of plug to verify depth. [Note, if the annular cement behind the 5-1/2-inch protection casing by 9-5/8-inch surface casing does not come up to the surface casing shoe, the 5-1/2-inch casing will be perforated at the depth of the surface casing shoe and cement squeezed outside the casing.]
  9. A cement surface plug of at least 50 feet will be set from the anticipated casing cut-off point in the protection casing (at a minimum top of plug at surface or cut-off depth and bottom of plug at 50 feet or 50 feet plus cut-off depth). All open annular spaces that extend to surface in any of the other casing strings will also be cemented (minimum 100 feet of cement).
  10. Cut off casing three to five feet below ground surface (or depth as designated by the Arizona Public Service Company (surface owner)) and fill any remaining open annular spaces with cement. The well will be marked by a piece of metal pipe, not less than 4 inches in diameter, that is securely set in cement and extends at least 4 feet above general ground level. The well location and identity will be permanently inscribed on the marker.

- D. A plugging report will be filed with the Arizona Oil and Gas Conservation Commission and EPA within 15 days after completion of closure operations. The report will include: 1) the method used in plugging the well; 2) casing record details; 3) the size, kind, and depth of plugs used; and 4) the name and depth interval of each formation containing fresh water, oil or gas, or geothermal resources.

#### **POST CLOSURE PLANS**

Post-closure monitoring is not anticipated for the CO<sub>2</sub> Injection Well.