UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
DENVER, CO 80202-1129
Phone 800-227-8917
http://www.epa.gov/region08

Radioactive Tracer Survey to Demonstrate Part II Mechanical Integrity

(Velocity Shot Method)

PURPOSE:

The purpose of this document is to provide a guideline for conducting a radioactive tracer survey (RTS), for determining the ability of wellbore cement to prevent injected fluid migration along the wellbore. This guidance may be used to develop a well-specific survey plan that accounts for specific well construction and operation considerations. Prior approval of planned testing procedures by EPA is strongly recommended.

Radioactive Tracer Survey results must be documented with service company and other appropriate log records and/or charts, and the test should be witnessed by an EPA inspector. Arrangements may be made by contacting EPA Region 8 Underground Injection Control (UIC) offices using the EPA toll-free number 1-800-227-8917 (ask for extension 6155 or 6137).

RECORDING GUIDELINES

- The logging must be conducted while the well is **injecting at the maximum allowed injection pressure and rate**. The injection pressure should be set at the current MAIP. The approved MAIP will be set at the injection pressure used during the RTS .The pressure and rate should be brought to equilibrium conditions prior to conducting the survey.

- "Tracer log accuracy depends on the tracer rapidly mixing with the wellbore fluid and traveling with the same velocity as the wellbore fluid. Log results depend on the ability to measure the tracer transit time from the gamma ray detector responses accurately; the tracer must maintain a sharp peak, or sharp leading edge, for reliable transit-time measurement." The tool must be centralized in the pipe.

- The log scale should be set so that calculation of time period and gamma deflections should be easy to identify.

- If a well is reworked (s.a. frac job, acid job, move perfs up hole), then the operator is required to repeat Part II MI.

- Every 5 years thereafter, both a RTS and Temp survey should be run in conjunction.

RECOMMENDED PROCEDURE:

1. Background Gamma Log readings should be made in both a sand and shale to show the magnitude of "noise" measured at the proposed logging sensitivity. The readings

are taken while holding the tool stationary and recording gamma radiation in time drive for a period of 3 to 5 minutes. Set the tool sensitivity so that lithological effects are identifiable to allow correlation to open hole logs. This is about 40 API units or equivalent per inch. (From R5 Guidance) ie statistical check shale vs sand and set gain appropriately—tool calibration

2. Reduce the GR sensitivity enough to keep the entire slug of the tracer radiation within the width of the chart paper (horizontal scale). To do this, a non-recorded pass through the slug may be run.

3. Commence injection at normal operating injection pressure and rate, and continue to do so until the pressure and rate become stabilized.

4. Run a profile survey to determine the uppermost perforation that is up taking fluid and calculate the percent fluid that is being up taken. Calculate the amount of time needed for the R/A tracer to travel from the ejection port through the perforation and back up to the detector. Multiply this time by 1.5; it is the length of time required for the test to be run at.

5. Set the tool so that the detector is within 20 feet above the top perforation.

6. Run the test for the calculated time.

7. If R/A tracer is detected moving up hole, reposition the tool up hole and repeat the test. Repeat this process to see how far up the R/A travels. Repeat until the R/A tracer is jno longer detected up hole.

SUBMITTING THE RESULTS:

- **An interpretation of the logging results must be supplied when submitting the data for EPA approval**. The interpretation must include a fluid loss profile across the perforations, in increments of at least 25%.

- **Include a schematic diagram of the well construction on or with the log**. The diagram should show the casing diameters and depths, tubing diameter and depth, perforated interval, location of packer, any open hole intervals, total depth or plugged back total depth, and the location of the tool when the slug was injected. Also, indicate with arrows the pathway(s) the tracer slug appears to have gone.

Additional Ideas:
Keep all ejections of tracer material as close to the perforations as possible. This reduces any tracer residual from adhering inside of pipe up hole. Any occurrence of a hot spot can be assumed as movement behind pipe.