



CARDINAL SURVEYS COMPANY

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WRITTEN AGREEMENT

Tracer Study Operations

Date: _____
Company: _____
Well Name & Number: _____
County, State: _____

Check one as applicable: Well Owner Well Operator Drilling Contractor
 Pumping Service Company

Authorized Representative: _____
(Please print name)

Type Of Tracer Study: Tagmaster® Study Using Ejector Tool or Other

Isotope(s) Used: _____

Background

The Texas Regulation for Control of Radiation (TRCR 21.108 [21.1302], 21.109 [21.1303], 36.4), as issued by the Texas Department of Health, Bureau of Radiation Control, requires tracer companies performing tracer studies with radioactive material (licensees) to have a written agreement with the pumping service company, well operator, drilling contractor or well owner. Cardinal Surveys Company, as licensee, is required to have established procedures and equipment or facilities to deal with situations where radioactive material is reversed from the well or well screen-outs, or where the well-head might be contaminated. Cardinal has approved procedures for decontamination and disposal.

Prior to commencement of the operation, the regulations stipulate that Cardinal and the pumping service company, well operator, drilling contractor or well owner have agreed that in the event radioactive material is to be reversed from the well or in the event that the well screens out, the pumping service company, well owner, operator or drilling contractor shall provide equipment or facilities to do the following:

- i. reverse material into a preconstructed pit which is specifically established in the event of a screen out;
or
- ii reverse material into suitable transport container(s) in the event of a screen out.

Further, in the event of radioactive material reversal, Cardinal must be notified and present to provide monitoring and supervision of the operation.

A copy of this agreement shall be maintained for inspection by the Agency (Texas Department of Health) for a period of five years following completion of the well logging service operation or study.

The applicable regulations are: TRCR 36.4, 21.109 [21.1303], 21.108 [21.1302] and applicable appendices. Cardinal is a licensee which has requisite authority to perform tracer studies with radioactive materials.

Tracer Study Operations with Pumping Service Company

Control of Operations. Cardinal's personnel will, at all times, have exclusive control of their equipment and employees and the radioactive operations. Due to the nature of the service being performed, Cardinal's personnel, during a pumping operation, will be operating under instruction from pumping service company. Communications will be established prior to pumping radioactive tracer material with pumping service company as field supervisor. Pumping service company shall immediately notify Cardinal of any condition which might create a flowback of materials or a screen-out and Cardinal will immediately cease injection of additional radioactive material.

Location of Equipment. The equipment used in the tagging operation will be placed at the maximum possible distance, within the limits of equipment and the field location, away from other personnel and equipment. Usual procedure calls for the installation of an in-line injection assembly ("tee") in the high-pressure treatment line, downstream from conventional pumping equipment. The radioactive material will be injected into the assembly and pass through only the minimal amount of treatment line necessary to complete the connection to the wellhead.

Procedures Relating to the Tracer. If the job procedures call for a tracer or tag throughout the treatment, adequate untagged flush will be pumped to clear the treatment lines and displace tagged material into the formation. Procedures calling for flush to top of zone, or in any event that call for less than complete displacement of the well bore, should have tagging stopped early enough to compensate for flush volume. If an approaching screen-out is detected, the tag shall be stopped immediately, and an effort shall be made to flush material below the surface. A bleed line shall be

available in the event of a complete screen-out so that it is possible to flush all surface equipment before the Pumping Service Company is released from location.

Other Tracer Study Operations

Control of Operations. Cardinal's personnel will, at all times, have exclusive control of their equipment and employees and the radioactive operations. Due to the nature of the service being performed, Cardinal's personnel, during a tracer study operation, will be operating under instruction from the designated field representative of the well owner, well operator, or the drilling contractor. The field representative shall immediately notify Cardinal of any condition which might create a flowback of materials and Cardinal will immediately cease injection of additional radioactive material.

Preparation of Tracer Equipment. The equipment used in the tracer study operation may be prepared at the field site prior use in the well. During the equipment preparation period, all non-essential personnel shall remain at a safe distance from the preparation area, and strictly follow instructions from Cardinal.

Procedures Relating to the Tracer. Normally, tracer studies are conducted within a closed system for production or injection of oil field related materials. In the event a tracer study is conducted in an open system, such as production to a pit or open tank, the system shall meet the requirements as described in items i and ii, above.

Contamination, Survey and Control

Equipment Survey. Using appropriate instrumentation, a location survey will be taken both prior to and after the job. This will establish base radiation levels in the event of equipment or well-site contamination.

Equipment Contamination. If measurable radiation levels on pumping service company equipment are detected following the tracer study, steps will be taken as outlined in the written agreement between the pumping service company and Cardinal, or according to Cardinal's procedures if this agreement is governing. Decontamination of any other equipment will be affected according to Cardinal's written procedures.

Responsibilities for Cleanup

Conduct of Cleanup Operations. Under state regulations, in the event of contamination, Cardinal has the responsibility to perform the required decontamination procedures of personnel and equipment. The pumping service company, operator, well owner or drilling contractor shall make all personnel and equipment available for Cardinal's contamination survey and shall cooperate fully with Cardinal in allowing Cardinal to perform any decontamination procedures relating to the pumping service company, well owner, operator or drilling contractor's equipment and/or personnel.

Activities of Cardinal. Cardinal will not knowingly place radioactive material into or through storage tanks, stimulation blending equipment, or conventional stimulation pumps. If the pumping service company allows no backflow through pumps or blenders, contamination will be contained within the treatment line generally below the tee connection of Cardinal and can be removed simply by additional flushing of untagged material through the flowline. Pumping service company equipment failure upstream of the injection tee will result in no contamination to the pumping equipment so long as backflow through the treatment lines is prevented by pumping service company personnel.

During tracer studies utilizing ejector tools, or other tracer operations, Cardinal will operate in such a manner as to prevent contamination of surface equipment, including well-heads, and soil. Loose radioactive materials shall not be used for any purpose that is inconsistent with permissible regulatory levels of equipment or soil contamination.

Signature: _____
(Authorized Representative)

Signature: _____
(Cardinal)