APPENDIX A

Tracer Research Corporation Final Report of the Tracer Test Results of the Kinder Morgan JP-8 Pipeline Near Fallon Naval Air Station.

TRACER TIGHT® TEST

of the

Kinder Morgan JP-8 Delivery Line

to

Fallon Naval Air Station

Fallon, Nevada

9 July 2001 – 29 July 2001

Tracer Tight® Test

Kinder Morgan JP-8 Delivery Line
Fallon Naval Air Station
Fallon, Nevada

9 July 2001 – 29 July 2001

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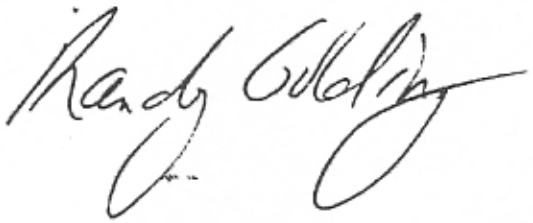

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Executive Summary

Tracer Research Corporation performed line tightness testing of the last 15 miles of the 6-inch Kinder Morgan JP-8 delivery line to Fallon Naval Air Station in Fallon, Nevada. There is no indication in the data from the test that any leakage occurred from the test section of the pipeline.

A tracer test is performed by adding a leak-indicating chemical called a tracer to the product in the pipeline. If the pipeline leaks, the product carries the tracer into the soil. The tracer evaporates from the product and diffuses away from the leak in all directions as a vapor. Some of the tracer diffuses upward toward the ground surface and escapes from the ground into the atmosphere. Some of the tracer that escapes to the atmosphere can be collected in the air near the ground surface above the leak. An ultra-sensitive analysis of the sample is used to determine the amount of tracer present in the sample. A leak is indicated when more than the usual amount of tracer is present in the sample.

The test was initiated on 9 July 2001 by adding a tracer known as Tracer R to the jet fuel in the pipeline at an access point upstream of the section to be tested. Tracer R was added to the pipeline at a constant rate while jet fuel was pumped past the access point. This process was continued until the entire test section was filled with tracer labeled fuel. When this was accomplished, flow through the pipeline was stopped and the presence of Tracer R in the pipeline at the end of the test section was confirmed by the analysis of a fuel sample. The pipeline was pressurized to approximately 600 psig and the tracer labeled fuel was left under pressure in the test section until 17 July 2001 (8 days).

In order to validate the test and provide an estimate of the test sensitivity, leaks were simulated at 4 representative locations along the 15-mile test section. The simulation of a leak involved injecting a non-toxic fluid into the ground at the same depth as the pipeline. The leak simulation fluid included a tracer known as Tracer E that is very similar to the tracer that was put into the pipeline, Tracer R. The amount of Tracer E included in each leak simulation was equal to the amount of Tracer R in 10 gallons of jet fuel inside the pipeline. The four leak simulations were initiated on 9 July 2001.

On 10 July 2001, samples were collected above the leak simulations. Tracer E was detected at sufficient levels to validate the test. Based on the performance of the measured levels of the leak simulation tracer, Tracer E, and the baseline level of the tracer added to the

pipeline, Tracer R, the sensitivity of the test was estimated. The test was able to detect any release of tracer labeled fuel greater than 0.5 gallons during the test period.

Sampling of the air at ground level along the test section commenced on 11 July 2001. The pipeline was sampled in a total of 110 intervals. Twenty (20) additional samples were collected at river, canal, road and railroad crossings. Sampling was completed on 29 July 2001.

None of the samples contained any indication that any tracer-labeled jet fuel was released from the pipeline during the test period.

1.0 Objective

The objective of this effort was to perform a sensitive line tightness test on the last 15 miles of the Kinder Morgan JP-8 jet fuel pipeline leading to Fallon Naval Air Station. Tracer Research Corporation applied the **Tracer Tight®** method. The test was shown to be capable of detecting any release of tracer labeled fuel greater than 0.5 gallons during the test period.

2.0 Concept

Tracer Tight® line tightness testing is a patented and patent pending process performed by mixing a chemical concentrate, a tracer, with the product inside a tank or pipeline followed by the detection of the tracer in the vapor phase outside the tank or pipeline. The tracer is added to the product at very low concentrations. The tracer has no impact on the chemical or physical properties of the product. The tracer chemical distributes itself throughout the product and is distributed with the product throughout the pipeline.

If the pipeline inoculated with the tracer is leaking, the tracer is released into the soil and disperses in all directions through the air porosity of the soil by molecular diffusion. A portion of the tracer vapor will escape through the soil into the air above. The tracer escaping into the air above ground can be used to detect the existence and the approximate location of the underground leak.

A continuous sampling device is passed over the pipeline right of way which pumps air through sampling tubes. The sampling tubes collect the tracer from the air. Each tube contains the sample collected from above a segment of the pipeline, called a test interval, that is typically several hundred feet in length. An ultra-sensitive analysis of the sampling tube is accomplished using a combination of standard analytical instruments and techniques.

3.0 Applications of the Technology

Tracer Research Corporation began **Tracer Tight®** tightness testing in 1985. Since that time, the technology has been applied to the testing of tens of thousands of underground storage tanks, thousands of miles of pipeline and hundreds of above ground storage tanks. In 1986, the flexibility of the **Tracer Tight®** test captured the imagination of the United States Air Force. They required a sensitive test that could be conducted without taking mission critical systems out of operation. Because the **Tracer Tight®** test could be applied to

systems of virtually any size without loss of sensitivity and did not require that systems being tested be taken out of service, Tracer Research Corporation was awarded a contract to test all the tanks and hydrant piping systems for the Tactical Air Command. Tracer Research Corporation has tested or is currently testing nearly all of the United States Air Force's underground storage tanks and hydrant piping systems worldwide. **Tracer Tight®** testing has become the industry standard where flexible, sensitive testing is required.

Because of the increasing frequency of underground storage tank (UST) sites that were contaminated with the new gasoline additive MTBE, some officials in the State of California began to express concerns about whether the current UST standards were good enough. In 2000, the State of California was looking for an ultra-sensitive tightness test to help evaluate the current UST regulations. **Tracer Tight®** was the only tightness test that could provide the sensitivity and reliability required by the State. Tracer Research Corporation is currently conducting field studies through the University of California at Davis for the California State Water Resources Control Board. In accordance with the requirements of recent legislation, new regulations have also been written requiring "enhanced leak detection" at specific kinds of higher risk UST facilities. Currently, enhanced **Tracer Tight®** is the only tightness testing method that meets California's requirements for enhanced leak detection.

Beginning in February 2000, Tracer Research Corporation began development of the **Seeper Trace™** technology. The **Seeper Trace™** technology applies the tried and true **Tracer Tight®** technology to cross-country piping systems. By adopting a more sensitive analytical approach, Tracer Research Corporation has been able to demonstrate that leaks can be detected with samples collected above ground. This eliminates the need for the installation of sampling probes to allow retrieval of samples from below the ground surface.

4.0 Inoculation

The tracer test for the last 15 miles of the Kinder Morgan JP-8 delivery line was initiated on 9 July 2001 when Tracer R was added to the pipeline. The inoculation of tracer occurred at a pipeline access point approximately 1.5 miles up-stream of the beginning of the test section. As JP-8 was being delivered to Fallon Naval Air Station, tracer was metered into the pipeline. The addition of Tracer R continued until the entire test section was full of

tracer labeled fuel. The flow of jet fuel in the line as well as the injection of Tracer R at the access point was then stopped. When the presence of tracer in the fuel was verified at the (downstream) end of the test section, the line was blocked-in and pressurized to approximately 600 psig. The jet fuel in the test section was left under this pressure for the following 8 days.

The presence of tracer was verified by on-site analysis. A sample of fuel was collected from the end of the pipeline at the point of entry into the storage tanks at Fallon NAS. A portion of this sample was injected into a closed air-filled container. The Tracer R was allowed to evaporate from the fuel in the container and a portion of the air from the container was analyzed for the presence of Tracer R using a laboratory grade instrument that was brought to the site.

5.0 Leak Simulations

The leak simulation refers to an intentional release of a tracer into the soil along the pipeline. The simulation tracer will mimic the movement of tracer escaping from a real underground leak. The simulation tracer is virtually identical in its chemical and physical properties to the leak detection tracer, but they are analytically distinguishable from each other. Leak simulations serve two primary purposes. The first is to evaluate the time necessary for tracer to migrate to the ground surface. The second is to establish the relative sensitivity of the test. The results of the leak simulations are used to set site-specific limits for the test. If the test is performed within the limits established by the leak simulations, such as this test was, then it is a valid test.

To conduct the simulations for this investigation, 4 solutions of Tracer E were prepared. Tracer E was mixed into one half gallon of drinkable ethanol. The amount of Tracer E mixed with the leak simulation solution was equal to the amount of Tracer R contained in ten gallons of the tracer labeled fuel, contained in the test section of the pipeline. Each simulated leak contained an equivalent amount of tracer to 10 gallons of tracer labeled jet fuel.

Once the solutions were prepared, they were taken to 4 representative locations along the pipeline. The leak simulations, numbered 1 through 4, were located at mileposts 48.8, 49.4, 58 and 67.1, respectively. At each location, the simulation solution was released into the soil at a depth of 5 feet, the typical reported depth of the pipeline. The solution was

released into the soil through a steel pipe hand-driven into the ground. When all the solution was introduced into the ground, the pipe was left in place and the top of the pipe was sealed with pipefittings.

On the following day, 10 July 2001, samples were collected at the leak simulation locations and transported to Tracer Research Corporation's laboratory in Tucson, Arizona for analysis (please refer to the following sections on Sampling and Analysis). The leak simulation samples were collected using the same procedures and parameters that were used for collecting all of the test samples along the test section of the pipeline. The results indicated that the leak simulation tracer was detected in each of the samples collected from the 4 leak simulation locations. The detection of the simulation tracer indicated that enough time had elapsed for the tracer to migrate from the depth of the pipeline to where it could be detected above ground. Based on this information, leak detection sampling was initiated on 11 July 2001.

The leak simulation results are summarized in Appendix A. The area above each of the leak simulations was sampled multiple times during the test. On 10 July 2001, 11 July 2001 and July 2001, samples were collected above the leak simulations for that sole purpose. The leak simulation locations are also located within one of the sampling intervals. Consequently the area above the leak simulations was also sampled whenever the corresponding test interval was sampled. All of these results are included in Appendix A.

The second function of the leak simulation is to provide a gauge of the sensitivity of the leak test. There is some variability in the results. This is normal. Because of the variability, test sensitivity is deduced on an order of magnitude basis. All but 2 of the results are greater than 100 times the baseline level of the leak detection tracer (see Sampling for discussion of baseline levels). Tracer Research Corporation conservatively estimates that a leak can be declared when the tracer detected is 5 times the baseline level. Given that a 10 gallon release gives off enough tracer to produce a test sample that contains approximately 100 times more than the baseline level, a 0.5 gallon release of jet fuel would give off enough tracer to be 5 times more than the baseline level. It is estimated that the test was sufficiently sensitive to detect a 0.5-gallon release of tracer labeled jet fuel.