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DOE-0782-01

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Dear Mr. Saric and Mr. Schneider:

SUMMARY OF LEAK TESTS OF PIPELINES BETWEEN THE ON-SITE DISPOSAL FACILITY AND THE ENHANCED PERMANENT LEACHATE TRANSMISSION SYSTEM

Purpose of this letter report is to summarize the hydrostatic leak tests recently conducted in two of the existing nine connecting pipelines between the On-Site Disposal Facility (OSDF) and the Enhanced Permanent Leachate Transmission System (EPLTS) in order to verify the necessary double-containment functionality of these lines. Acceptable testing results are required before resuming impacted material placement in the related OSDF cells.

Background

Prior to installation of the new section of the Leak Detection System (LDS), Redundant Leachate Collection System (RLCS), and Leachate Collection System (LCS) piping as part of the EPLTS at OSDF Cells 1, 2, and 3, the existing sections of piping were tested by performing a pneumatic (air) pressure test on the annular space between the 10-inch outer containment pipe and the 6-inch inner carrier pipe. Overall, nine double-containment sections of the existing piping system extending from the cells were tested during spring and early summer of 2001. This was done to ensure the validity of subsequent testing of the new piping installation, including the fused connection to the existing piping. The existing piping section end boundaries, during the pre-construction air test, were (1) the fixed-end seal at the applicable cell liner penetration box and (2) the new piping tie-in point near the applicable LDS or LCS manhole. Minor pressure drops were measured on the Cell 1 LDS and Cell 3 RLCS piping sections (4 psi drop per 30 minutes and 2 psi drop per

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30 minutes, respectively), indicating small cracks or pinholes within the existing piping – either in the 10-inch outer containment pipe or in the 6-inch inner carrier pipe. All other tested sections passed with no pressure drop.

The small drop in pressure, observed in the pneumatic pressure test, indicated a small crack or pinhole in the piping. Because a leak to the environment is the ultimate concern, four related possibilities could be evaluated by dyed water testing. The first two scenarios would indicate adequate leachate containment:

1. Due to the differing properties of air and water (primarily viscosity), water at near atmospheric pressure will not leak from the LDS and RLCS gravity-flow piping as did air during the pressure (15 psig) test, regardless of the location of the pinhole.

2. The crack or pinhole may exist above the bottom of the containment piping, at the highest elevation location (liner penetration box). At this location, the bottom (flow line) of the containment pipe will still provide containment for a leak from the carrier pipe (for a typically non-flooded containment pipe).

3. The crack or pinhole may exist in the flow line portion of the containment pipe and is significant enough to allow leakage of leachate. This is the worst case scenario.

4. The crack or pinhole may exist in the carrier pipe. Assuming adequate containment pipe integrity, environment is still protected under this scenario.

With inputs from the United States Environmental Protection Agency (USEPA) and Ohio Environmental Protection Agency (OEPA), a hydrostatic test was developed and conducted in July 2001 on the Cell 1 LDS and Cell 3 RLCS to verify the above four possibilities. A detailed test plan was informally submitted to the USEPA and OEPA in early June 2001. In general, this hydrostatic test involved the following three phases and/or tasks:

1. Filling the annular space between the containment and carrier piping (up to the bottom of the containment pipe at the Liner Penetration Box fixed-end seal if possible) with water under low pressure (~20-foot head or 10 psig, maximum) to force trapped air out through the crack or pinhole as much as achievable;

2. Releasing hydrostatic pressure provided by the standpipe, allowing the piping pressure to stabilize at atmospheric pressure, and measuring the piping water level over a period of time; and,

3. Monitoring the carrier pipe for any dyed water.

Criteria for a successful test result that support the first two possibilities and therefore, acceptable double-containment functionality include:

- No measurable loss of water during the second phase of the test; and
- Samples collected from the carrier pipe throughout the test do not show trace of dye.

Test Equipment and Set-up

See Figure 1. Inside the applicable EPLTS Valve Houses (VH), a standpipe and water fill piping/valving were installed on the containment pipe monitoring port. A level recorder probe (connected to a data logger) was installed in the standpipe to measure and record the stand pipe water level during the test. Valves were installed on the standpipe at various levels for standpipe draining near the LDS and RLCS bottom of pipe elevations (to release standpipe hydrostatic pressure). Bright Dyes Industrial Red dye tablets were used to dye the test water. A drum-type pump was used to pump water from the Dyed Water Tank into the top of the standpipe via a water hose. An additional hose, connected at the top of the standpipe, allowed excess water to drain back to the Dyed Water Tank so the maximum hydraulic pressure (about 10 psig) is not exceeded. This was necessary to prevent potential damages to the piping due to higher pressure.

Based on construction control survey points, the bottom of the Cell 1 LDS pipe at the Liner Penetration Box fixed-end seal was determined to be about 2.7 feet higher than the bottom of pipe elevation at the Valve House fixed-end seal. The Cell 3 RLCS bottom of pipe elevation difference is about 4.7 feet. Therefore, the stand pipe and drain valves were installed, accordingly, to adjust the initial water levels to start the second phase of the test. Additionally, the standpipe was installed to provide sufficient water head (~23 feet max over the bottom of the standpipe and ~20 feet over the bottom of the LDS and RLCS pipes in the two valve houses) for filling the LDS and RLCS pipes and forcing trapped air out. Likely settlements of the sections of the LDS and RLCS under the cells after initial construction due to waste placement in the cells were not considered.

The length of the RLCS and LDS piping, from VH fixed-end seal to the Liner Penetration Box fixed-end seal is approximately 193 feet and 199 feet, respectively. The total volume of water required to completely fill the annular space between the containment and carrier piping was approximately 264 gallons and 271 gallons for RLCS and LDS, respectively. This information was used for judging the viability of forcing air from the piping as the piping is filled with water and estimating the volume to attain a water level near the bottom of pipe at the liner penetration box fixed end seal.

Test Process and Resulting Data

Cell 1 LDS:

The Cell 1 LDS leak test was initiated on the morning of June 28, 2001. The test was initiated with 475 gallons of dyed water in the Dyed Water Tank. The level probe data logger was started prior to filling the Cell 1 LDS containment pipe with water.

The standpipe was filled numerous times on June 28 and 29 until the target volume of water was in the LDS containment pipe. Approximately 245 gallons remained in the piping system after the final fill and stand pipe draining (to bring the standpipe water level to near the bottom of LDS pipe at the fixed-end seal). At this point, the system was allowed to equalize, without additional water addition, until the morning of July 2, 2001. The test water level data for the test, including the filling phase and barometric pressure data, is presented in Figure 2 and Attachment A (electronically transmitted on July 31, 2001). The test water was subsequently drained into the EPLTS line.

Six samples of water from the LDS carrier pipe were taken during the test. None of the samples showed evidence of dyed water. The samples were viewed in natural light and under ultraviolet light.

Cell 3 RLCS:

The Cell 3 RLCS leak test was initiated on the morning of July 11, 2001. The test was initiated with 475 gallons of dyed water in the Dyed Water Tank. The level probe data logger was started prior to filling the Cell 3 RLCS containment pipe with water.

The standpipe did not need to be refilled significantly after the first three days between July 11 and July 19. The target volume of water was not achieved due to the very slow fill rate for this containment pipe, which indicated that the pipe might pass a pneumatic pressure test at a lower pressure (about 7 psig). A decision was made, with OEPA's concurrence, to stop the filling phase on the ninth day. Approximately 200 gallons remained in the piping system after the final fill attempt and standpipe draining. At this point, the system was allowed to equalize, without additional water addition, until the morning of July 23, 2001. The test water level data, including barometric pressure, for the test is presented in Figure 3 and Attachment B (electronically transmitted on July 31, 2001). The test water was subsequently drained into the LTS line.

Nine samples of water from the RLCS carrier pipe were taken during the test. None of the samples showed evidence of dyed water. The samples were viewed in natural light and under ultraviolet light.

Observations and Data Evaluation

Cell 1 LDS:

- Based on the volume filled and the measured standpipe water elevation, test water was filled to the intended elevation (the bottom of the containment pipe at the Liner Penetration Box fixed-end seal) within two days;
- Initial standpipe water elevation was 5.182 feet at the beginning of the second phase;
- Final standpipe water elevation was 5.202 feet at the end of the test;
- Water elevation rose immediately after the filling pressure (water head) from the standpipe was removed likely because the presence of significant residual pressure in the upper end of the pipe which was able to push the water back toward the Valve House;
- Water elevation responded noticeably during the first forty hours to changes in the barometric pressures due to differences between the residual pressure in the upper end of the pipe and the atmosphere pressure;
- Water elevation became more stable and close to the initial level during the last 16 hours of the test likely because the residual pressure in the upper end of the pipe was more equalized with the atmosphere pressure;
- Water elevation stayed above the initial elevation throughout the second phase;
- No trace of dye in the carrier pipe throughout the test;
- No loss of water from the containment pipe during the entire test was evident from evaluation of any of the test data.

Cell 3 RLCS:

- Based on the volume of water used and the measured standpipe water elevation, the pipe was not filled to the intended elevation after a continuous effort for nine days;

- It was about 0.1 feet (based on the final water elevations reached in the Cell 1 LDS of 5.182 feet, in Cell 3 RLCS of 7.095 feet, and the initial construction survey difference of 2 feet between the two pipes at the penetration boxes) short of the intended elevation;

- The maximum hydrostatic pressure that could be provided by the standpipe decreased from about 23 feet to about 16 feet of water with the rising water elevation in the RLCS containment pipe which is about 2 feet higher than the LDS at the cell end;

- Based on the difficulty of filling during the last three days of the first phase of the test, the pipe might actually be able to pass a pneumatic pressure test at 7 psig (16 feet of water) which was the pressure difference between the two ends of the containment pipe just before the filling operation was terminated;

- This indicates very low (if any at all) leakage possibility in the last section of the pipe under normal operational condition (i.e., atmosphere pressure);

- Therefore, it is not a critical flaw of this test that the intended water elevation was not fully reached;

- Initial standpipe water elevation was 7.095 feet at the beginning of the second phase;

- Final standpipe water elevation was 7.095 feet at the end of the test with very similar barometric pressure as initially measured;

- Water elevation in the standpipe responded less noticeably to changes of the barometric pressures likely because of the narrower range of barometric pressures encountered, more damping effects by a larger air volume left in the pipe, and also a more tightly closed condition in the pipe;

- However, water elevation did rise to the highest level of 7.167 feet shortly after the filling pressure from the standpipe was removed due to kickback of the residual pressure in the upper end of the pipe;

- Although, the water elevation did not stay above the initial elevation throughout the second phase of the test as in the Cell 1 LDS, water elevations only fluctuated between 7.167 feet and 7.017 feet with no overall downward or upward trend;

- The lower elevations were measured during the first day and half of the second phase of the test when the barometric pressures were slightly higher;

- However, the water elevation rose back during the last day of the test even when the barometric pressure also rose;

- For example, a higher elevation was observed near the end of the test (around 7.08 feet) when compared to previous measurements (around 7.05 feet) taken about forty hours earlier at the same upper range barometric pressure of 29.4 inches Hg;

- No trace of dye in the carrier pipe throughout the test;

- No loss of water from the containment pipe during the entire test was evident from evaluation of any of the test data.

Conclusion

The data collected from both tests satisfy the two criteria as outlined for determining adequate leachate containment. The testing conclusively support our evaluation that the Cell 1 LDS and Cell 3 RLCS have acceptable double-containment functionality. For both Cell 1 LDS and Cell 3 RLCS, there is no detectable leak in the carrier pipes and the flow line of the containment pipes has the necessary integrity for no leak of leachate to the environment. With this conclusion and completion of the EPLTS construction, impacted material placement in Cells 2 and 3 should be allowed to resume and Cell 1 final cover work can continue.

If you have any questions regarding this information, please contact Robert Janke at (513) 648-3124 or Jay Jalovec at (513) 648-3122.

Sincerely,

Johnny Reising

FEMP:R.J. Janke

Johnny W. Reising
Fernald Remedial Action
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M. Jewett, Fluor Fernald, Inc./MS52-5
U. Kumthekar, Fluor Fernald, Inc./MS64
T. Walsh, Fluor Fernald, Inc./MS46
AR Coordinator, Fluor Fernald, Inc./MS78
ECDC, Fluor Fernald, Inc./MS52-7

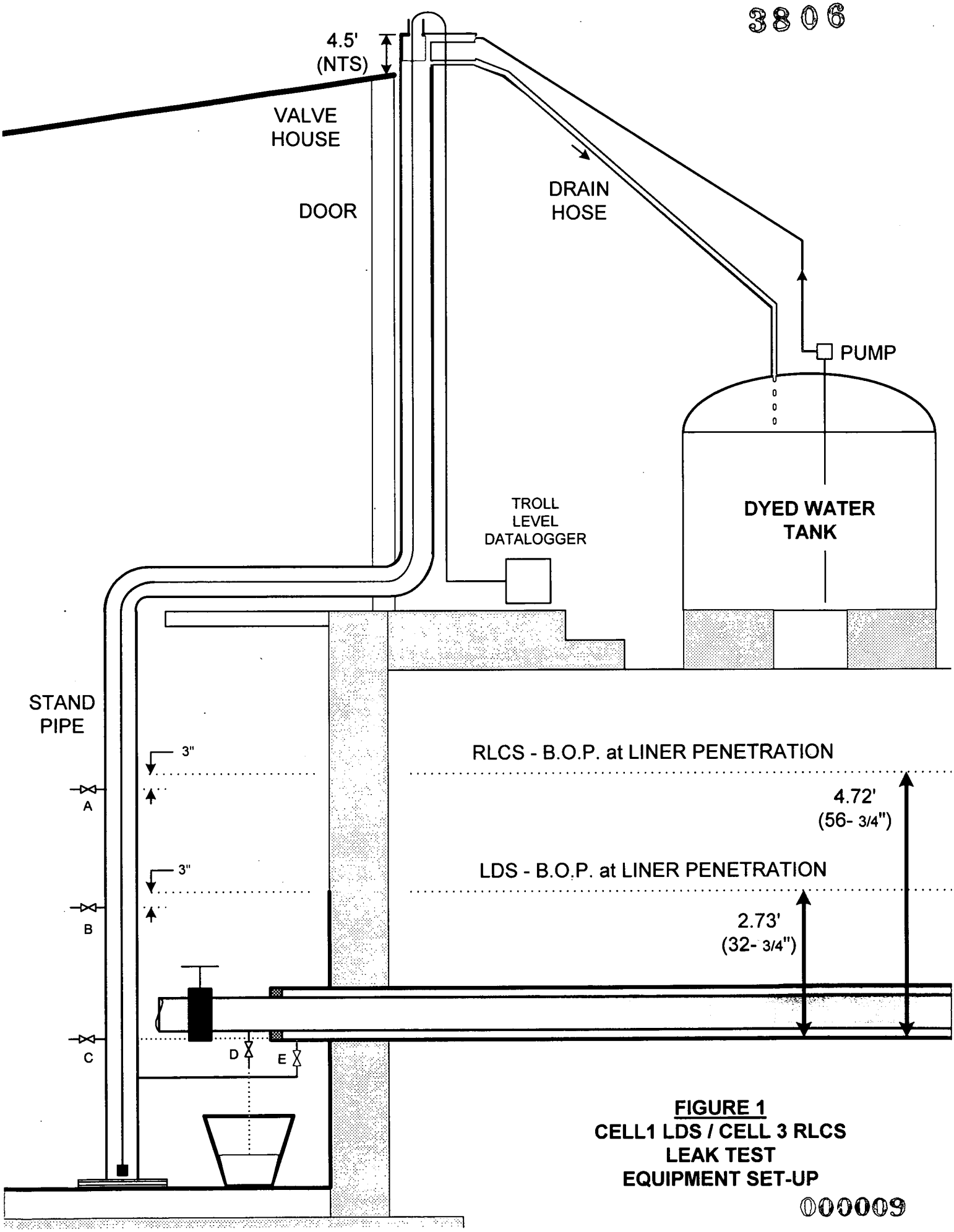

FIGURE 1
CELL1 LDS / CELL 3 RLCS
LEAK TEST
EQUIPMENT SET-UP

Figure 2
VH1 LDS Chart

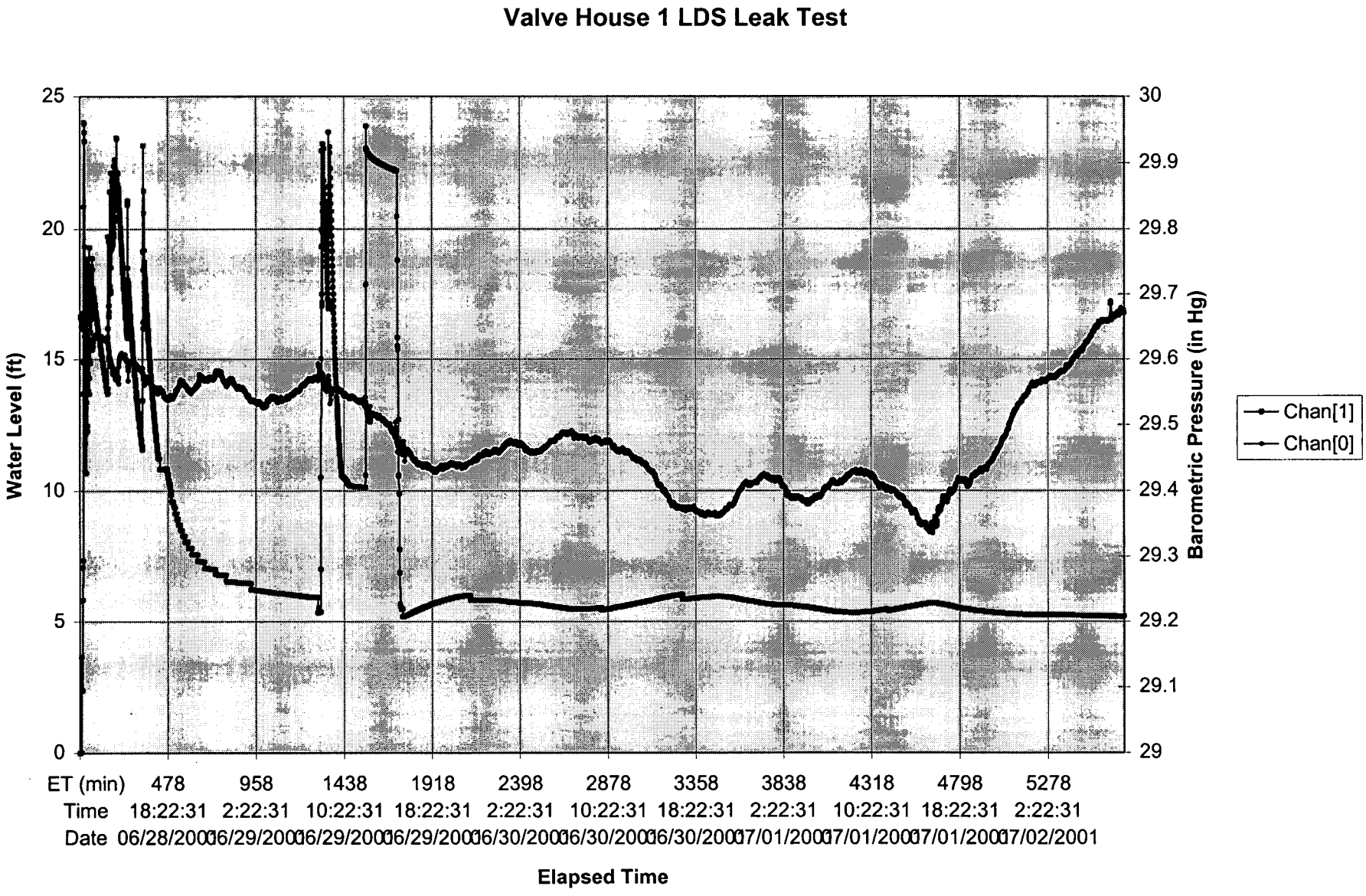

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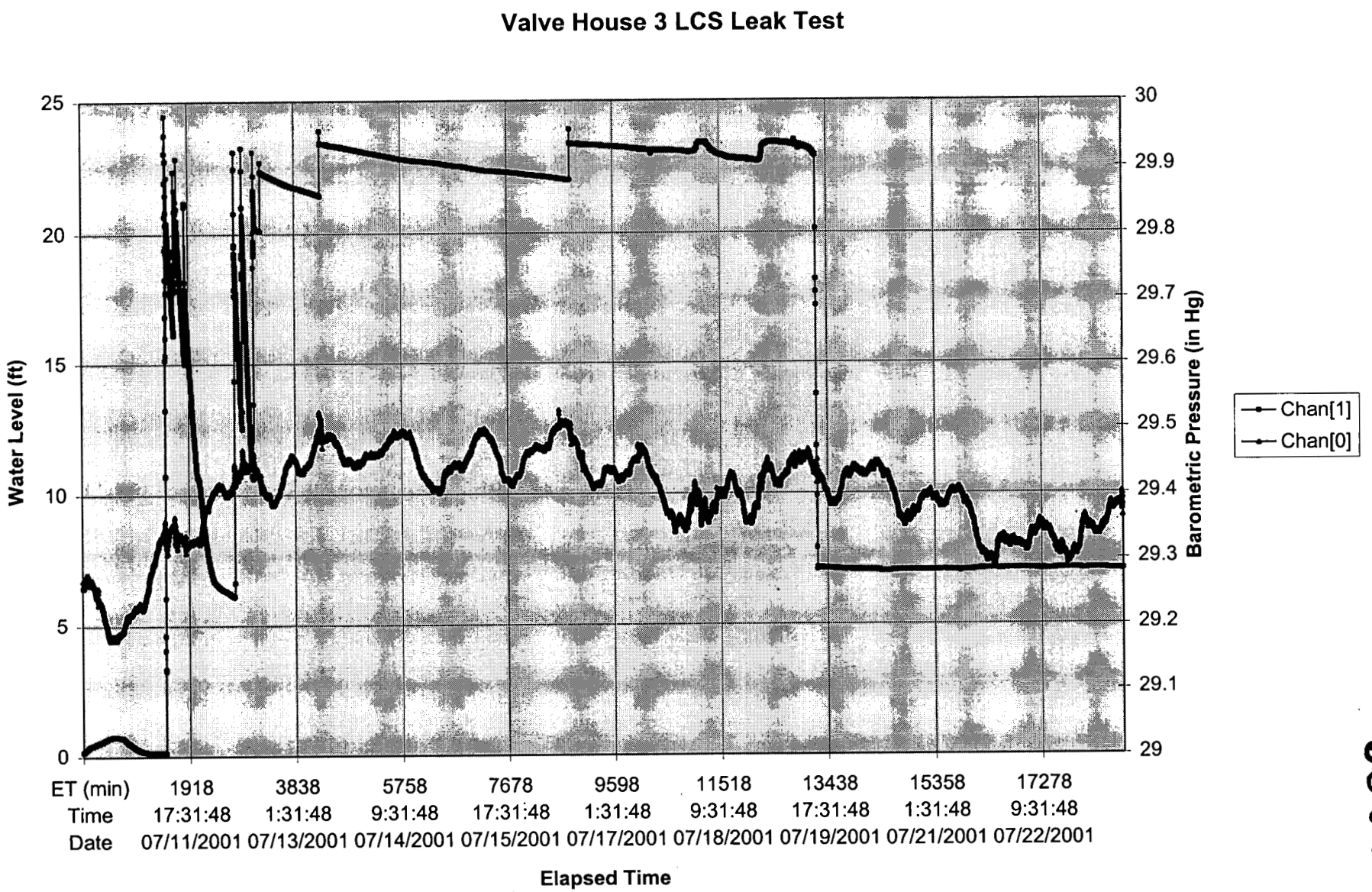
Figure 3
VH3 LCS Chart



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