

Williams Gas Pipeline (WGP) -West

Addressing the Threat of Crack-like Indications on the North Seattle Lateral Line

BACKGROUND

The 8" North Seattle Lateral was originally constructed in 1956 and is 11.1 miles long. The pipeline was constructed using 8 5/8" O.D., 0.188" wall thickness, X42 ERW pipe manufactured by Kaiser. MAOP is 809 psig (44% P_{SMYS}), but this higher pressure only affects the first 0.6 miles as downstream of this point, regulators are set at 550 psig (30% P_{SMYS}). This line is also odorized downstream of Mile Post (MP) 0.6. The first 2.2 miles of the original 8" will be replaced with new 20" diameter pipe this summer from MP 0.0 to MP 2.2 as part of a capacity expansion project. In addition, the PSE (Puget Sound Energy) regulator station at MP 10.38 is set to 250 psig, therefore, the last 3/4 mile will be limited to 14 % P_{SMYS} .

The 8" North Seattle Lateral has been In Line Inspected (ILI) twice. The first run in 2003 used a Magnetic Flux Leakage (MFL) tool; two dents and six corrosion callouts were excavated with no cracking found using Magnetic Particle Inspection (MPI). In 2009, an MFL tool and a Transverse Field Inspection (TFI) circumferential MFL tool were run. Based on the ILI data, three seam weld and dent areas were addressed, again finding no cracking. One corrosion site was investigated requiring only recoat; no cracking was found.

In 2011, Williams conducted a pressure test of the 8" North Seattle Lateral to address the seam weld integrity issue and to supplement the previous circumferential MFL ILI tool run. During the first hydrostatic test, the pipe pressure declined approximately 15 psig per hour and the pressure never stabilized. The test pressure reached 1330 psig. The leak was difficult to locate so Williams used a technology that froze the water inside the pipe (freeze plugs) to allow pipe sections to be isolated and then re-pressured to isolate the leak location. After beginning excavation near North Creek (MP 8.1), a leak was found (circumferential crack-like feature) and a 71.6' section of pipe was replaced above the creek. The pipe sections at the freeze plug locations and leak site were sent to VGO Testing & Inspection Engineers lab in Portland, Oregon for analysis. A freeze plug was then installed on the east side of North Creek. After installing the plug, the pressure dropped 5 psig every 30 minutes, so WGP decided to replace the pipe on both sides of the creek. Since salmon were in the creek, a span was installed. In all, 314' of pipe was replaced. All replaced pipe was magnetic particle inspected and no additional indications were found. The original pipe crossing the creek was left abandoned in place due to the salmon. Subsequently, the 8" line was successfully hydrotested.

INTEGRITY ASSESSMENT PLAN FOR ADDRESSING THE THREAT OF CRACK-LIKE INDICATIONS

WGP plans the following steps to ensure continued safe operations on the 8 inch North Seattle Lateral:

WGP has completed the ILI data set review looking for similar indications to the two leaks near North Creek. No additional unique signals were found. This is likely due to the tightness and orientation of the cracking.

WGP has conducted preliminary engineering analysis and determined that the fatigue life of any remaining defects is well over 50 years - based on the pressure cyclic data obtained from SCADA. Circumferential crack growth rates are significantly slower than crack growth rates of the more conventional axially-oriented environmental cracking (approximately 0.011 inches per year¹) due to the fact that circumferentially-oriented cracks are not subjected to much hoop stress from pressure fluctuations or spike hydrostatic testing (approx. ½ the stress in the circumferential direction as vs. the axial direction). Even if using the more aggressive 0.011 inches per year growth rate for axially-oriented cracking, over 17 years would be required to grow an existing crack to failure.

WGP plans to inspect several bends that will be removed during the upcoming expansion project. The expansion includes replacement of the first 2.2 miles of the 8" line with new larger diameter pipe.

A more detailed independent engineering analysis will be conducted as a follow-up to the preliminary analysis. After inspection of the replacement related bends, WGP will determine if additional excavations are needed to confirm either the engineering analysis or inspection findings.

Depending on the above analysis, WGP plans to re-hydrostatic test this line in 5 – 7 years and will continue to evaluate improvements in ILI technology to detect circumferential cracking in this small diameter pipe. The external corrosion threat will likely be re-assessed with ILI at the time of the next hydrostatic test. These assessment plans have been added to the Williams Baseline Assessment Plan.

Due to the low operating pressures on this 8" pipeline, the circumferential orientation of the defects, and the desire to not subject pre-1970 ERW seams to unnecessarily high stress levels, a spike test was neither warranted nor recommended.

Footnote 1

Excerpted from Williams 26 inch CAO documents submitted to PHMSA in 2011: "Crack growth rates based on the comparison of the two ILI runs indicated a growth rate of 0.011"/yr; much less aggressive than the originally estimated 0.033"/year. This growth rate also is in line with other operator's reported data from repeated Crack Detection tool run comparisons (0.01 – 0.016"/year)."