



8 May 2011

Sent Via mail and Email

Trevor Dark  
Energy Resources Conservation Board  
Suite 1000, 250 – 5<sup>th</sup> Street SW  
Calgary, AB T2P 0R4

Dear Mr. Dark,

**RE: APPROVAL TO RE-START NPS 20 RAINBOW PIPELINE**

Thank you for your letter yesterday setting out the requirements that Plains Midstream Canada ULC (Plains) must satisfy to be permitted to restart the NPS 20 Rainbow Pipeline.

Enclosed please find Plains' engineering assessment and re-start plan for your consideration.

The Community Consultation Plan is being revised to reflect feedback and suggestions we received from several agencies late last night and shall be forwarded shortly under separate cover.

Should you have any questions or concerns, please do not hesitate to contact Michelle Stepp at (403) 519-5066 or myself.

Yours truly,

**PLAINS MIDSTREAM CANADA ULC**

A handwritten signature in black ink, appearing to read "Stephen Bart". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

Stephen Bart

Vice President, Crude Oil Operations

Enclosures: Appendix A – Engineering Assessment  
Appendix B – Start-up Plan  
Appendix C – Community Consultation Plan (to follow under separate cover)

# Appendix A – Engineering Assessment

Engineering Assessment of Plains Midstream Canada ULC (Plains)  
April 29, 2011 Rainbow Pipeline Rupture at MP188

## Background

The NPS 20 Rainbow Pipeline was constructed in 1967. Reference ERCB License 5592-1.

Pipeline Specifications are as follows:

- API 5L X52 (359 MPa), wall thickness is 7.14 mm; and
- manufactured using SAW (submerged arc welding).

## Failure

On or about 2:50 a.m. April 29, 2011, the pipeline experienced a rupture by way of a through-crack. The through-crack orientation was perpendicular to the longitudinal axis of the pipeline. The through-crack originated at the six o'clock position and travelled in a clockwise direction to the ten o'clock position and counter clockwise to the two o'clock position. The through-crack originated at the boundary of a full encirclement fillet weld which joined the carrier pipe to a full encirclement repair sleeve which was installed on the pipeline in 1980.

## Failure Investigation

Subsequent to the above-referenced failure the ruptured pipe was exposed by way of excavation and upon removal of the overburden the elevation of the pipe at the failure location sprung upward to the now unrestrained position.

A 10 m section (approximately) of the pipeline including the through-crack and full encirclement repair sleeve was cut out, wrapped to preserve the insitu condition, and shipped to an Acuren laboratory in Edmonton for independent third party forensic evaluation in accordance with direction from ERCB technical staff. Laboratory testing and a final report is expected the week of May 9, 2011.

## Other Investigations

Plains had completed an Internal Line Inspection (“ILI”) in January 2011. Analysis of the ILI data confirms that neither internal nor external corrosion was a contributing factor to the failure.

In addition Plains had completed a Crack Detection Tool (“CDT”) run in April 2011. Analysis of the CDT data confirms that Stress Corrosion Cracking (“SCC”) was not a contributing factor to the failure.

Subsequent to the failure Plains:

- conducted an aerial patrol of the entire pipeline and confirmed MP188 as the only leak location; and
- reviewed SCADA data to confirm that at no time was the maximum operating pressure of the pipeline exceeded.

### **Cause of Failure**

Given the information available, Plains is of the view that the most likely cause of the failure was the combination of the following three factors:

- The presence of a stress riser in the form of an increase in relative pipe stiffness from the carrier pipe to the carrier pipe with a full encirclement repair sleeve;
- Differential settlement due possibly to inadequate compaction following the re-excavation of over 20 meters of pipeline straddling the location of the stress riser; and
- Excessive stress on the bottom chord of the pipeline likely resulting from soil settlement.

### **Pipeline Repair**

The portion of the pipeline including the through-crack feature, repair sleeve and carrier pipe has been removed and replaced with new line pipe with the following specifications:

- NPS 20, Grade 359 MPa, 7.1 mm Wall thickness, Cat. II.

The new line pipe was hydrostatically tested to 9100 kPa for a minimum of 4 hours prior to installation. The tie-in girth welds were subject to magnetic particle and dye penetrant testing to confirm integrity. Hydro-test records and the weld procedures utilized are available for review upon request.

### **Corrective Action Plan**

Plains shall undertake the following corrective measures:

1. Re-coat and backfill the MP188 repair site with suitable imported fill ensuring proper compaction levels beneath the pipe.
2. Review maintenance logs to determine whether similar conditions (i.e. the combination of all 3 factors contributing to the failure referenced above) exist elsewhere on the NPS 20 Rainbow Pipeline. Note - Plains has completed this review and determined that there are no such locations.
3. Commission metallurgical tests and an independent third party failure analysis report. Review the report and develop and implement any further corrective action plans that may result based on new information (if any).
4. Reduce the MOP of the pipeline to 75% of its current level. This MOP reduction will remain in effect until such time as items 1, 2, and 3 referenced above have been completed.

5. Increase the frequency of aerial patrols from weekly to semi-weekly. This increased frequency will remain in effect until such time as items 1, 2, and 3 referenced above have been completed as a minimum.
6. Provide additional control centre supervisory oversight. Plains will increase supervisory coverage from current level of 40 hours per week to provide shift supervision on a 24 hour per day, 7 day per week basis. In the interim (i.e. while this staffing is being put in place), Plains will implement after hours on-call supervisory coverage such that supervisors can respond to the control centre to participate fully in the control of all potential line loss alerts and shutdowns.
7. Review manual block valve locations and develop and implement a program to minimize the number manual block valve sites over time. Plains will provide details of this program to the ERCB for review and will provide regular updates on the status of the program.

### **Fitness for Service**

Based on the information available to date Plains concludes the most likely cause of the April 29, 2011 Pipeline Failure at MP188 on Plains' NPS 20 Rainbow Pipeline was a singular event likely resulting from a unique combination of factors, such as the three factors set out above.

Notwithstanding the corrective actions above, Plains is confident the pipeline is safe to immediately resume normal operation.

## Appendix B – Start-up Plan

Plains proposes this start-up plan, together with engineering assessment attached herein, to address the measures requested by the ERCB as a minimum, including:

- Verification that the pipeline has no other leaks;
- A reduction in operating pressure below the pre-failure operating pressure;
- Additional on-site personnel and enhanced on-site surveillance at the failure site during startup activities;
- Enhanced surveillance over the entire length of the line – including using aerial, and other surveillance technologies and methods;
- Interim measures to enhance the SCADA-based leak detection monitoring and response to alarms;
- Timelines for the proposed activities required for implementation of the start-up plan; and
- Commitment to provide additional information to support the ERCB's investigation work.

Plains Operations, EH&S, Transportation Services, Asset Integrity and Engineering departments were engaged in the joint development of the start-up plan. All known risks have been identified and mitigated and a timeline and a step-by-step procedure developed to ensure the safe re-start of the NPS 20 Rainbow pipeline.

All Plains Standard Safe Operating Procedures and Environment, Health and Safety practices (e.g. Work-alone procedures, etc.) shall be adhered to.

All operational changes shall be completed in daylight hours with written District Superintendent approval.

All operational changes shall subject to aerial patrol prior to proceeding.

The following conditions shall be satisfied prior to initiating the re-start procedure:

- Remove and replace damaged pipe at MP-188;
- Remove stopple plugs up and downstream of rupture;
- Open manual block valves at MP-167.3 and MP-212.4;
- Ensure sufficient volume at Evi Terminal and Utikuma Terminal to pack the line (and replace up to 4,500m<sup>3</sup> of lost product);
- Temporary reduce the maximum operating pressure of NPS 20 Rainbow line to 4,000 kPa until the start-up has been completed and the system has been confirmed and has run in a stable condition for 72 continuous hours as a minimum;
- Perform HySys simulation to determine injection pressure limits at all delivery points given the 4,000 kPa temporary MOP;
- Set and confirm SCADA alarm set points to match HySys simulation pressures;
- Re-program PLC at Evi Terminal, Utikuma Terminal and Cadotte Station with new alarm points;
- Re-set shutdown switches at Evi Terminal, Utikuma Terminal and Cadotte Station;
- Deploy staff to Evi Terminal, Utikuma Terminal and Nipisi Terminal prior to any operational changes;

- Ensure control centre supervisor is at console during all operational changes; and
- SCADA snapshot of system has been taken.

**Start-up procedure / checklist**

Task	Time Initiated	Time Completed	Approved By
Perform line patrol.			
Nipisi inlet pressure set to 500kPa.			
Open Nipisi inlet valves (tag numbers BV-613 and TV-614).			
Capture readings with SCADA “snapshot”, report pressure readings to Command Centre.			
Reset PLM.			
Confirm flowpath from Evi Station to Nipisi Terminal.			
Once confirmed, bring on first pump at Evi to a rate of 80-90m <sup>3</sup> /h.			
Initiate line patrol (estimated time to complete is one hour).			
Maintain steady rate until line patrol complete.			
Bring on second pump at Evi.			
Initiate line patrol (estimated time to complete is one hour).			
Maintain steady rate until line patrol complete.			
Bring on third pump at Evi.			
Initiate line patrol (estimated time to complete is one hour).			
Maintain steady rate of ~220m <sup>3</sup> /h until line patrol complete.			
FYI: Monitor line pack in case pack is reached earlier than expected.			
Bring on first pump at Utikuma Terminal.			
Initiate line patrol (estimated time to complete is one hour).			
Maintain steady rate until line patrol complete.			

Bring on second pump at Utikuma Terminal.			
Initiate line patrol (estimated time to complete is one hour).			
Maintain steady rate until line patrol complete.			
Bring on third pump at Utikuma Terminal.			
Initiate line patrol (estimated time to complete is one hour).			
Maintain steady rate of 175m <sup>3</sup> /h – 200m <sup>3</sup> /h at Utikuma until line patrol complete.			
Reset line balance once line pack is achieved and product is received at Nipisi.			
Document line balance (loss) and take SCADA “snapshot”.			
Reset PLM.			
After pressure stabilized for one hour, start remaining pumps (if any) at Evi and Utikuma, one at a time.			
Initiate line patrol (estimated time to complete is one hour).			
Start one pump at Cadotte to push Seal batch.			
Initiate line patrol (estimated time to complete is one hour).			
Start one pump at Rainbow and one pump at Kemp simultaneously.			
Initiate line patrol (estimated time to complete is one hour).			
Operating status to remain frozen until Peace batch complete.			

## **Appendix C – Community Consultation Plan**

**To Follow Under Separate Cover**

