

For North Dakota Public Service Commission
May 16, 2011

Summary of Keystone Release Incident

Incident Identification and Emergency Response

On May 7, 2011 at approximately 03:51 MST the Keystone Leak Detection System started to show an imbalance in the Ludden, ND to Ferney, SD section of pipe. By 04:05 MST the flow imbalance had increased and the Keystone Oil Control Centre (OCC) personnel immediately started analysis of the flow imbalance trends. The 15 minute trend analysis showed a similar flow imbalance and the OCC personnel started preparations for a system shutdown. At 04:26 MST, while the OCC personnel were in the process of completing the validation procedures associated with the system shutdown, a call was received by TransCanada's call center (PDL) from a local North Dakota farmer reporting a release at the Ludden pump station located at 10075 119th Ave SE, Brampton, ND 58017.

The Ludden pump station, located in Sargent County, North Dakota, is not within a High Consequence Area nor is it within proximity of a High Consequence Area. The land use in the area is agricultural and sparsely populated.

The call lasted 9 minutes and 16 seconds. A Keystone pipeline system shutdown was initiated immediately and the entire pipeline system was shut down by 04:35 MST.

The OCC immediately notified the on-call operations area manager and dispatched a operations technician to site at approximately 04:37 MST. The operations area manager immediately notified regional emergency support staff of the incident. The Regional Incident Response Specialist proceeded directly to the regional office in Omaha, NE to activate the Regional Emergency Operations Center (EOC). The regional EOC was staffed by the Regional Director, Asset Reliability Manager, Safety Specialist, Incident Response Specialist, Integrity Specialist, and Community Relations Specialist plus administrative staff. Simultaneously a "virtual" Corporate EOC teleconference was activated and fully staffed. Both EOCs were activated prior to field verification of the release.

The dispatched pipeline technician arrived at site at approximately 07:00 MST and was met at site by the County Sheriff and Ms. Sandra Hanson, the County Emergency Manager. The technician confirmed the release, confirmed that there was no immediate threat to public safety or the environment and worked with the local officials to secure the area. The Federal National Response Center was notified by the on call Regulatory Compliance Specialist at 07:46 MST. At 07:51 MST a call from a Mr. Ben Gress from the ND Department of Health (NDDoH) – Environmental Division was received by the area manager inquiring about the spill.

The Senior Environmental Specialist immediately dispatched multiple emergency spill response contractors to site and recontacted Mr. Gress with the NDDoH at 08:40 MST to

discuss the status of the spill. The regional incident management team (IMT) was also dispatched to site and the team was in place that afternoon with an incident command structure in place. The Community Relations Specialist contacted Mr. Bob Banderet, the neighboring landowner who made the notification call and Mr. James Bosse, the adjacent landowner to the site whose land had been impacted, by phone on the afternoon of May 7, 2011.

Site clean up commenced the afternoon of May 7, 2011 with approximately 86 barrels of ponded oil being recovered from the gravel within the station yard. TransCanada's Engineering department began assessing the possible cause of the failure and developing possible corrective actions. Clean up continued through May 8, 2011 with approximately 280 barrels in total recovered by the end of that day.

On Monday, May 9, 2011 the IMT was supplemented by corporate staff and continued developing daily incident action plans, with safety, environmental protection, and rapid cleanup being the top three priorities. The plan was reviewed continuously at daily objectives, planning, and tactics meetings and revised as needed. Ms. Sandra Hanson, the County Emergency Manager revisited the site in the morning. Mr. Darren Lemmerman, an inspector with the U.S. Federal Pipeline & Hazardous Material Safety Administration was on site in the afternoon to collect information on the cause and nature of the release.

A failed fitting on the station's thermal relief valve piping was inspected by Mr. Lemmerman and shipped to a laboratory in Houston, TX for metallurgical analysis.

The Chairman of the Sargent County Commission, Mr. Jerry Waswick and Mr. Curt Tufty of the Gwinner Fire Department visited the site later in the afternoon. Ms. Tracy Lundquist with the NDDoH – Environmental Division also visited the site in the late afternoon to review the extent of the spill area and the clean up strategy with the Senior Environmental Specialist.

Failure Analysis and Corrective Action

As a result of the failure approximately 500 barrels of oil were released and contained within the property boundaries of the station. Approximately 5 barrels travelled outside the perimeter of the site and settled on adjacent farmland. More than 30 workers and their equipment were on site at the Ludden Pump station, recovering almost 400 barrels of oil in total using vacuum assisted equipment. A remaining three hundred cubic yards of contaminated soil (estimated to contain approximately 100 barrels of oil) has been stockpiled on site and will be removed and disposed of at an approved location when local road bans are lifted and trucks can safely access the site. This material will be replaced with clean native soil and gravel.

The laboratory analysis of the failed fitting determined that the release occurred due to a fracture of a 1" x 3/4" swage nipple at the inlet to a thermal relief valve located on the station discharge piping. The failure investigation revealed that the component failure was not a result of any material or manufacturing deficiency of the fitting or, as

evidenced by a review of SCADA records, an overpressure event on the pipeline. ASTM A420 WPL6 is the correct material for the swage nipples, and the results of the examinations confirmed that this material was used. The chemical compositions, mechanical properties and microstructure meet the requirements for ASTM A420 WPL6, and the threads were consistent with the manufacturer's specifications.

The swage nipple failure had initiated from shallow cracks associated with plastic deformation at the root of the thread, possibly as a result of over-torque during installation. The cyclic bending stress fatigue due to the vibration propagated the cracks to failure.

The observations consistent with this conclusion were:

- The fracture had initiated from the root of the first thread at several locations, and there were multiple secondary cracks found on the root of the second and third threads. The roots of the threads exhibited smeared surfaces, which acted as stress raisers and led to crack initiation.
- The fracture surfaces have multiple ratchet marks, the fracture surfaces exhibited parallel striations, and corresponding cross-sections across these features indicated straight transgranular cracks, all of which are indicative of fatigue crack growth.
- Fractures radiated from one side of the threads, which is consistent with failure due to bending stress due to the vibration of the piping assembly.

Based on the findings in the failure investigation the work required to prevent similar failures was focused on two areas:

- increasing mechanical strength (i.e. wall thickness) of the swage nipple by replacing it with Schedule 160 nipple (the failed swage nipple was Schedule 80);
- elimination of the low frequency vibration of the thermal relief valve piping by installing engineered pipe supports.

Between Tuesday, May 10 and Friday, May 13, 2011, the failed swage nipple on the thermal relief piping at Ludden and similarly situated nipples at all Keystone Phase 1 pump stations were replaced and accordingly braced prior to each station returning to service.

Arrangement of the thermal relief valve piping at all Keystone pump stations will be further analyzed and modified where required with the objective to improve the long term strength of the assemblies.

TransCanada submitted a corrective action and restart plan to the U.S. Pipeline and Hazardous Material Safety Administration (PHMSA) on May 12, 2011 prior to successfully restarting the Keystone pipeline on May 13, 2011. TransCanada continues to monitor the pipeline. A review of all remaining small bore piping and threaded connections, including vibration surveys, will be performed as a follow-up activity at all pump stations.

Fahn, Patrick J.

From: Ken Crowl [ken_crowl@transcanada.com]
Sent: Tuesday, May 17, 2011 10:54 AM
To: Fahn, Patrick J.; Jeffcoat-Sacco, Ilona
Cc: Jim Krause; Vern Meier
Subject: Keystone Pipeline
Attachments: Keystone ND PSC Summary.pdf

Mr. Fahn and Ms. Sacco,

Attached is a summary of the events that occurred at the Keystone Pipeline Ludden Pump Station on May 7th. Vern Meier committed to providing this information when discussing the issue on Friday, May 13th. He has also asked that I be the point of contact for you regarding this matter. If you have any questions or require additional information please contact me.

Regards,

Ken Crowl
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Hamre, John G.

From: Jeffcoat-Sacco, Ilona
Sent: Thursday, May 19, 2011 5:10 PM
To: Hamre, John G.
Subject: FW: Keystone Pipeline
Attachments: Keystone ND PSC Summary 051711.pdf

Ilona A. Jeffcoat-Sacco
ND PSC
701-328-2407 (fax 2410)
ijs@nd.gov

From: Ken Crowl [mailto:ken_crowl@transcanada.com]
Sent: Tuesday, May 17, 2011 3:32 PM
To: Jeffcoat-Sacco, Ilona; Fahn, Patrick J.
Cc: Jim Krause; Vern Meier; Todd Kranda; Gruman, Mark E.
Subject: RE: Keystone Pipeline

Please see the attached updated document with the FOIA request removed.

Regards,

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