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December 18, 2015

DEC 21 2015

Mr. Allan Beshore
Director, Central Region
Pipeline and Hazardous Material Safety Administration
901 Locust Street, Suite 462
Kansas City, MO 64106-2641

Re: CPF 3-2015-5010; Notice of Proposed Violation, Proposed Civil Penalty, and Proposed Compliance Order issued to TC Oil Pipeline Operations Inc.

VIA ELECTRONIC AND U.S. MAIL

Dear Mr. Beshore,

Please find attached our response to the above referenced Notice of Proposed Violation (NOPV), Proposed Civil Penalty, and Proposed Compliance Order issued to TC Oil Pipeline Operations Inc. on November 20, 2015.

TransCanada submits for your review the enclosed documents:

- Response to the Notice of Probable Violation
- Statement of Issues
- Request for Hearing, and;
- 2015 Closed Interval Survey (CIS) Data for KS9 MP 1078.

In lieu of a formal hearing, we would welcome the opportunity to meet with you informally to review our response and supporting documentation.

TransCanada respectfully asks that you consider this request and confirm your acceptance at your earliest convenience.

Please contact me directly at 832-320-5505 if you wish to discuss.

Sincerely,

Vern Meier

President, TC Oil Pipeline Operations Inc.

December 18, 2015

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Allan C. Beshore
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Office of Pipeline Safety
Pipeline and Hazardous Materials Safety Administration
U.S. Department of Transportation
901 Locust Street, Suite 462
Kansas City, Missouri 64106-2641

VIA ELECTRONIC AND U.S. MAIL

Re: CPF 3-2015-5010; Notice of Proposed Violation, Proposed Civil Penalty, and Proposed Compliance Order issued to TC Oil Pipeline Operations Inc.

Dear Mr. Beshore:

TC Oil Pipeline Operations Inc. (TC Oil) received the above-referenced Notice of Proposed Violation (NOPV), Proposed Civil Penalty, and Proposed Compliance Order on November 20, 2015. The NOPV was issued following inspections conducted by the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) between April 2, 2012 and November 15, 2012 on portions of the Keystone Pipeline system. Part of the general inspection focused on and followed from an issue that TC Oil self-reported to PHMSA in March 2012 regarding cathodic protection of the Keystone Pipeline on which TC Oil provided regular monthly and quarterly updates and in-person presentations to PHMSA. The NOPV alleges that TC Oil violated four related regulations in connection with that issue. By this response to the NOPV, TC Oil contests one proposed violation and requests elimination of the associated proposed civil penalty. In addition, TC Oil is providing herein additional supplemental information and explanation concerning the factual allegations underlying the other three proposed violations. Based on such information and explanation, TC Oil respectfully requests that PHMSA eliminate or reduce portions of the proposed civil penalty associated with those proposed violations.

Factual Summary and Background

As an initial matter, while PHMSA's chronology of remedial efforts that TC Oil took to remediate and improve the cathodic protection system is generally correct, several important facts are reflected in the record but are not noted in the NOPV or bear additional emphasis in assessing TC Oil's compliance. TC Oil's response to the proposed violations reflects the more comprehensive chronology of the cathodic protection issue and the remedial and mitigation measures implemented by TC Oil, as set forth below.

Keystone Phase 1

Construction of Phase 1 of the Keystone Pipeline from Cavalier County, North Dakota near the Canada/U.S. border to Patoka, Illinois began in 2008. This segment of the pipeline went into service in June 2010. Construction of Phase 1's cathodic protection (CP) system commenced in the spring of 2010 and was completed in December 2010.[1] In particular, the CP system within the Salisbury, Missouri to Patoka, Illinois section of Keystone Pipeline Phase 1 (which ultimately experienced the identified corrosion) was activated and energized in March 2010, shortly after construction and well in advance of the line being placed into service.[2]

Generally, a CP system functions to reduce and mitigate naturally occurring corrosion of buried steel pipe. Corrosion is an electro-chemical reaction caused, for instance, when metal pipe is in contact with the ground. The resulting flow of electrical current from the pipe to the ground causes metal loss from the pipe. A CP system mitigates corrosion by applying a direct current onto the buried pipeline and thereby provides a substitute, sacrificial source of electrical flow to minimize corrosion. A CP system typically consists of a combination of rectifiers, which are AC to DC voltage transformers, and sacrificial anode ground beds. A CP system that uses a rectifier and groundbed combination is commonly referred to as an impressed current system. The Keystone Phase 1 and Cushing Extension utilized such an impressed current CP system.

The required initial annual CP survey was timely conducted on Keystone Phase 1 in December 2010, after all the CP systems were energized along the line. These surveys identified isolated sections experiencing low potentials and/or potential stray current interference. In June 2011, TC Oil increased the level of protection by raising the current output on the rectifiers at all 12 of the Phase 1 pump stations.[3] This adjustment timely corrected any low potentials from the Canadian border to Salisbury, Missouri in compliance with the regulations. Additionally, in August/September 2011, TC Oil installed six CP bonds with three other pipeline facilities on Phase 1 within the Salisbury to Patoka section, including a bond to the third-party pipeline

[1] Exhibit A, Corrosion Anomaly Report at MP 995 KS9 Salisbury to Patoka on Keystone Pipeline (Nov. 21, 2012) at p. 1 and Attachment 1. (Note: Exhibit references are to Exhibits A through C to the Pipeline Safety Violation Report.)
[2] *See* Exhibit C, Specialized Inspection of TransCanada Keystone East Leg (Nov. 13-16, 2012) at Table A.
[3] *Id.*; Exhibit A, Corrosion Anomaly Report at MP 995 KS9 Salisbury to Patoka on Keystone Pipeline (Nov. 21, 2012) at p. 1; Exhibit A, Keystone Cathodic Protection Report Phase 1 Canada to Milepost 752 (MO River) & Cushing Extension (Aug. 20, 2012 at Table 1, Table 2.

facility causing the most significant CP system interference.[4] TC Oil installed the bonds both to reduce those facilities' interference with Keystone's CP system and improve the level of cathodic protection on this segment of Keystone Phase 1.

Concurrently with the August/September 2011 installations, TC Oil moved up the 2011 annual CP survey from December 2011 to August 2011 to be able to assess the effectiveness of the previously conducted remediation activities. The 2011 annual survey confirmed that the CP potentials from the Canada/U.S. border to Salisbury had been successfully remediated and met criteria, but showed that some CP and interference issues continued to exist from Salisbury to Patoka.[5] In December 2011, TC Oil conducted a close interval survey (CIS), which confirmed below-criteria CP levels and the existence of CP interference from other operators' facilities at some limited locations on the Salisbury to Patoka section of Phase 1.

Based on the annual and CIS surveys, TC Oil developed a comprehensive mitigation plan to supplement the 2011 remediation activities on Keystone Phase 1 and initiated supplemental CP facility installations on both Phase 1 and the Cushing Extension (described below) to remediate low potential areas along the pipelines. This project necessitated extensive design work as well as acquiring the necessary land access rights and environmental permitting. In March 2012, TC Oil informed PHMSA regarding the survey results on both Keystone Phase 1 and the Cushing Extension and described the proposed mitigation plan, which included installation of additional rectifiers, groundbed facilities, and bonds. The program was not only designed to achieve compliance on the Salisbury to Patoka section, but also to generally improve the overall operational effectiveness of the CP systems. Immediately after informing PHMSA, TC Oil began construction of the additional, supplemental CP facilities on both the pipeline and at the pump stations.

In September 2012, prior to the three-year requirement and while the remediation work was ongoing on both Phase 1 and the Cushing Extension, an initial high-resolution magnetic flux leakage in-line inspection (ILI) tool run was completed on the Salisbury to Patoka section of the Keystone system. On October 17, 2012, the ILI vendor informed TC Oil that four potential metal loss anomalies existed on the Keystone Pipeline in Missouri that met the criteria requiring immediate repair. TC Oil immediately depressurized the pipeline, isolated the affected section, concurrently notified PHMSA, and completed appropriate repairs. TC Oil continued implementing the interference mitigation plan and additional CP facility installations.

In total, in 2012 and continuing into 2013, following the previously described 2011 CP system enhancements, and as part of the comprehensive mitigation plan, TC Oil installed 13 additional impressed current systems on the pipeline, 6 additional supplemental groundbeds at pump stations, and completed 6 additional mitigation bonds and one magnesium anode interference shield on Keystone Phase 1. The supplemental CP facilities on the pipe were placed into service as they were completed so that the pipeline system could incrementally benefit from the

[4] Exhibit C, Specialized Inspection of TransCanada Keystone East Leg (Nov. 13-16, 2012) at Table A.
[5] Exhibit C, TC Condition 37 Response at p.1.

enhanced corrosion protection.[6] The effectiveness of the comprehensive mitigation plan has since been confirmed through the 2012, 2013, and 2014 annual surveys and close interval CP surveys. Though the Phase 1 low potentials and interference issues had been resolved, TC Oil continued and will continue to adjust and balance the CP levels to ensure that the system remains in compliance with regulatory requirements, as part of routine operations and sound pipe integrity practice.

Cushing Extension

The Cushing Extension portion of Keystone Pipeline was placed into service in February 2011. By August 2011, the Cushing Extension CP system had been commissioned.[7] TC Oil completed the initial annual CP survey on the Cushing Extension in October 2011, which identified two areas with below-criteria potentials, one of which was also subject to stray current interference. In December 2011, TC Oil installed temporary bonds to a foreign pipeline identified as the likely source of the stray current interference which effectively mitigated the interference. The bond was subsequently converted to a permanent bond.

In addition to the immediate remediation activities conducted in 2011 on Keystone Phase 1, and as discussed above, TC Oil commenced implementation of a comprehensive mitigation plan immediately after notifying PHMSA of the plan in March 2012. On the Cushing Extension, rectifiers and associated groundbeds were added at four locations in June 2012 to August 2012. In October 2012 to December 2012, anodes were added to the existing rectifiers at three of the Cushing Extension pump stations to mitigate low potentials on drain piping.

TC Oil addresses the individual items noted in the NOPV below. However, the foregoing demonstrates TC Oil's comprehensive and sustained approach to ensuring that the Keystone system has adequate cathodic protection in place, which is successfully operating. TC Oil proactively identified and self-reported the issue and has already undertaken and completed each of the actions required by the Proposed Compliance Order. The valuable information learned as a result of the extensive investigation, analysis, and mitigation efforts was promptly incorporated into TransCanada's future pipeline corrosion control design. The effectiveness of the revised practices has been demonstrated on subsequent projects since that time, including on the Gulf Coast and the Houston Lateral projects. Examples of improved measures include on-site field testing for and mitigation of stray current interference during construction. Additionally, TC Oil now electrically isolates pump stations from the pipeline itself to eliminate the loss of the protective current from the pipeline to the pump station grounding equipment.

In response to the individual proposed NOPV findings, TC offers the following:

1. § 195.401 General requirements.

[6] Exhibit A, Keystone Cathodic Protection Report Phase 1 Canada to Milepost 752 (MO River) & Cushing Extension (Aug. 20, 2012 at Table 1, Table 2.

[7] Exhibit B, December 20, 2012 CP Annual Pipeline Report from Cushing Extension Steele City B Section to Ponca City Section; Exhibit C, TC Condition 37 Response at p.1 and Table 1.

(a) No operator may operate or maintain its pipeline systems at a level of safety lower than that required by this subpart and the procedures it is required to establish under § 195.402(a) of this subpart.

The NOPV alleges that TC Oil operated the Keystone Pipeline below the level of safety required by the regulations because it did not have adequate cathodic protection on portions of the pipeline within one year after Keystone Phase 1 and Cushing Extension had been constructed.

TC Oil Response

TC Oil acknowledges that the original CP system's inadequate compensation for the unanticipated amount of current primarily lost to the substation grounding grids at the pump stations had an adverse effect on localized portions of the pipeline. However, TC Oil clarifies that the original CP facilities on the portion of Keystone from Steele City, Nebraska to Salisbury, Missouri were adequately designed and commissioned within six months of the pipeline entering service. Although the rectifier output was adjusted after the first annual survey, the initial design of the CP system on this segment was adequate. TC Oil subsequently installed supplemental CP facilities from the Canadian border to Salisbury to improve the distribution of current along the pipeline and to compensate for the additional, mitigative bonds that were added between Keystone Pipeline and the co-located third-party pipelines.

As detailed above, TC Oil identified the issues with the CP system within six months of Phase 1 being placed in service and immediately took a series of iterative and progressive steps to mitigate and remediate any CP system inadequacies. Moreover, the time required to implement those measures was affected by unavoidable factors such as acquiring land access permission, environmental permitting, and the need for the supplemental facilities to polarize the pipeline before they could be adequately assessed. PHMSA's inspection report recognizes that TC Oil took significant steps to comply with the regulations. Indeed, TC Oil had already commenced remediation and mitigation efforts prior to any response or direction from PHMSA. As a result, TC Oil requests that PHMSA consider TC Oil's proactive, sustained, good faith effort to operate and maintain the pipeline in full compliance with the pipeline safety regulations prior to PHMSA's involvement as a factor warranting a reduction in any civil penalty assessed.

2. § 195.573 What must I do to monitor external corrosion control?

(a) Protected pipelines. You must do the following to determine whether cathodic protection required by this subpart complies with Sec. 195.571:

(1) Conduct tests on the protected pipeline at least once each calendar year, but with intervals not exceeding 15 months. However, if tests at those intervals are impractical for separately protected short sections of bare or ineffectively coated pipelines, testing may be done at least once every 3 calendar years, but with intervals not exceeding 39 months.

The NOPV alleges that TC Oil failed to conduct annual CP tests and states that 51 required CP test station readings were not taken from 2010 to 2012 on the Steele City, Nebraska to Patoka, Illinois section of Keystone Pipeline.

TC Oil Response

TC Oil contests this allegation. Each of the alleged missed CP readings was, in fact, timely taken in compliance with the regulations. However, the data had been entered into a historical data application and the data set provided to PHMSA during the audit was partially incomplete and may have been somewhat confusing in its tabulation, formatting, and naming convention. TC Oil requests a hearing to re-present the data in a complete, reformatted data set which shows the date and results of the each CP reading originally interpreted as having been missed. TC Oil submits its Request for Hearing and Statement of Issues concurrently with this response.

Because TC Oil complied with 49 C.F.R. § 195.573 by having completed all required test readings within the required time interval, it requests that this proposed violation be withdrawn and that the associated proposed civil penalty be eliminated.

3. §195.573 What must I do to monitor external corrosion control?

(e) Corrective action. You must correct any identified deficiency in corrosion control as required by Sec. 195.401(b).

The NOPV alleges that TC Oil failed to correct cathodic protection deficiencies at 62 locations on Keystone Phase 1 and 6 deficiencies on Cushing Extension within a reasonable time.

TC Oil Response

Keystone Phase 1

The supplemental CP installations described above were sequentially commissioned as they were completed, thereby incrementally improving CP performance. All previously reported low potential test station measurements had been remediated by August 20, 2013, as documented in the September 16, 2013 status update submitted to PHMSA.

Cushing Extension

Between identification of the low potentials in October 2011 and the subsequent annual survey in November 2012, the addition of three bonds and four rectifiers/anode beds fully remediated the low CP potentials on the Cushing Extension.[8] The Cushing Extension crosses a third-party's pipeline at three locations at approximately MP 137. TC Oil identified the low CP levels in October 2011 at the crossings. On December 15, 2011, TC Oil completed installation of a

[8] Exhibit C, TC Oil's May 29, 2013 Keystone CP Mitigation Status Update to PHMSA.

temporary bond to the other operator's readily accessible above-ground CP equipment, which effected an immediate reduction in stray current interference from the foreign pipeline as evidenced by a 400 millivolt improvement in the polarization level in the vicinity of MP 137. TC Oil determined that a permanent bond directly to the foreign pipe itself would be required. Because such a permanent bond to another pipeline can only be made with that pipeline operator's consent, TC Oil was not able to install the permanent bond until November 2012, after the operator had consented and had coordinated with TC Oil regarding the bond installation. TC Oil validated the effectiveness of the permanent mitigation bond through extensive testing conducted in November 2012.

After self-reporting the issue to PHMSA, TC Oil promptly acted to implement interim remedial measures to mitigate stray current interference and then engaged in a sustained effort to install a permanent bond to the interfering pipeline. On this basis, TC Oil requests that these good faith efforts be considered as warranting a reduction in the proposed civil penalty.

4. §195.577 What must I do to alleviate interference currents?

(a) For pipelines exposed to stray currents, you must have a program to identify, test for, and minimize the detrimental effects of such currents.

The NOPV alleges that TC Oil failed to timely minimize the detrimental effects of interference currents at MPs 991-998 on Keystone Pipeline Phase 1 and at MP 137 on the Cushing Extension.

TC Oil Response

TC Oil had developed and implemented a stray current interference program to identify, test for, and minimize stray current interference. The program identified the potential existence of stray current interference when an interference survey was conducted in December 2010 on Keystone Pipeline Phase 1 and in August 2011 on the Cushing Extension. Both surveys were completed within six months of the respective facilities being placed into service.

TC Oil promptly took remedial action to correct conditions on Keystone Phase 1 and the Cushing Extension after analyzing the CP survey data. On Keystone Phase 1, in June 2011, TC Oil initially increased the current output at the rectifiers at all 12 pump stations. TC Oil additionally installed a bond in August 2011 in the area which immediately effected a significant mitigation of the adverse effect of the interference. In total, as part of the 2012-2013 comprehensive mitigation plan, TC Oil installed 13 additional rectifiers and groundbeds, six additional groundbeds at the pump stations, completed six mitigation bonds, and one magnesium anode interference shield on Keystone Phase 1.

On the Cushing Extension, as detailed above, TC Oil took prompt and effective action to minimize effects from stray current interference by first installing a temporary bond to the interfering pipeline within three months of discovering the issue and completed a permanent

solution as expeditiously as allowed given the need to obtain the third-party operator's cooperation and seasonal constructability constraints.9

As required by section 195.577(e) operators must minimize the inevitable, detrimental effects of stray current interference. As described above, TC Oil timely identified the existence of stray current interference and undertook efforts to remediate its adverse effect. TC Oil requests that PHMSA consider TC Oil's sustained, incremental efforts to mitigate the effects of stray current interference through interim and permanent measures as warranting a reduction in the proposed penalty.

Proposed Compliance Order

The Proposed Compliance order requires TC Oil to (1) provide documentation of installed cathodic protection facilities and close interval surveys conducted on the Keystone Pipeline confirming that the pipeline is adequately protected on the pipeline segment from Steele City, Nebraska to Patoka, Illinois and that interference currents have been alleviated; and (2) correct any remaining cathodic protection deficiencies and record the cathodic protection pipe-to-soil potentials.

TC Oil Response

From March 2012 and continuing to 2015, TC Oil has previously submitted extensive documentation regarding the originally-designed and supplemental CP system facilities and the effectiveness of the CP protection as shown by remediation program field surveys, CIS, and annual surveys. Some, but not all, of the documentation requested through the Proposed Compliance Order is appended to the Pipeline Safety Violation Report itself. Other information submitted by TC Oil is not included in the violation report appendices

Currently, and as reported to PHMSA in September 2013, all previously identified cathodic protection deficiencies have been remediated. In TC Oil's 2015 presentation to PHMSA regarding Keystone's CP system, TC Oil identified a four mile section of the pipe which traversed a wilderness preserve in which in which post-remedial CIS data was not yet available. Although a comparative analysis of the adjacent test leads demonstrated that the four mile section was adequately protected, the CIS survey results attached to this response definitively validate that the potentials are above criteria.

While adjustments to the CP system will be required in the future, as is typical for pipeline facilities, Keystone Pipeline and the Cushing Extension have a fully functioning and effective cathodic protection system. Because TC Oil has submitted all of the requested documentation and made the required corrections, TC Oil respectfully requests that PHMSA rescind the Proposed Compliance Order.

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[9] TC Oil notes that the metal loss indications specifically referenced by PHMSA were unrelated to interference currents.

Conclusion

TC Oil proactively identified the necessity for enhancements to its CP systems on portions of the Keystone Phase 1 and Cushing Extension pipelines within six months of the CP systems being energized. After the initial analysis of the CP system performance, TC Oil promptly took initial remedial steps to correct the conditions within a reasonable time. TC Oil then timely reported the initial CP system analysis findings to PHMSA together with the proposed comprehensive plan to adjust the CP system and add supplemental facilities to enhance portions of the system. TC Oil implemented the comprehensive mitigation plan – incrementally energizing and validating the effectiveness of the additions as they were constructed. In accordance with the evidence offered by PHMSA in this matter and based on additional documentation previously submitted, TC Oil respectfully requests that PHMSA consider TC Oil's proactive, sustained, good faith effort to operate and maintain the pipeline in full compliance with the pipeline safety regulations as a factor warranting a reduction in any civil penalty assessed on Item No.1 in the NOPV. Similarly, regarding Item No. 3, TC Oil urges that its measured, incremental improvements to the CP system achieved compliance on Keystone Phase 1 and that it remediated any deficiencies on the Cushing Extension within a reasonable period of time. For Item No. 4 of the NOPV, the evidence shows that TC Oil implemented progressive, remedial actions to minimize stray current interference on isolated sections of Keystone Phase 1 and the Cushing Extension. In light of the documented, extensive enhancements and remedial activities performed by TC Oil, the company requests a reduction or elimination of proposed violations 1, 3, and 4, or the associated proposed civil penalties.

With respect to Item No. 2, TC Oil asserts that it timely took the allegedly missed CP readings in compliance with the regulations and requests a hearing to demonstrate that the proposed violation and associated civil penalty should be withdrawn.

Regards,

Vern Meier
President, TC Oil Pipeline Operations Inc.

U.S. DEPARTMENT OF TRANSPORTATION
PIPELINE HAZARDOUS MATERIALS SAFETY ADMINISTRATION
OFFICE OF PIPELINE SAFETY

In the Matter of	)	
	)	
TC Oil Pipeline Operations Inc.,	)	CPF 3-2015-5010
	)	NOTICE OF PROBABLE VIOLATION
Respondent	)	
	)	**REQUEST FOR HEARING**

TC Oil Pipeline Operations Inc. (TC Oil) respectfully requests a hearing on the above-referenced Notice of Probable Violation (NOPV) and included Proposed Compliance Order. The Pipeline Hazardous Materials Safety Administration (PHMSA) issued the NOPV to TC Oil on November 20, 2015, and it was received by TC Oil that same day. This request is timely pursuant to 49 C.F.R. § 190.208.

As required by 49 C.F.R. § 190.211(b), TC Oil attaches its Statement of Issues which incorporates by reference its Response to the NOPV.

Pursuant to 49 C.F.R. § 190.211(d), TC Oil requests a copy of all materials, records, documents, and exhibits at least ten (10) days prior to the date of hearing.

Respectfully submitted,

TC OIL PIPELINE OPERATIONS INC.

Vern J. Meier
President, TC Oil Pipeline Operations Inc.

Date: December 18, 2015

U.S. DEPARTMENT OF TRANSPORTATION
PIPELINE HAZARDOUS MATERIALS SAFETY ADMINISTRATION
OFFICE OF PIPELINE SAFETY

In the Matter of	)	
	)	
TC Oil Pipeline Operations Inc.,	)	CPF 3-2015-5010
	)	NOTICE OF PROBABLE VIOLATION
Respondent	)	
	)	**STATEMENT OF ISSUES**

In connection with its Request for Hearing and in accordance with 49 C.F.R. § 190.211(b), TC Oil Pipeline Operations Inc. (TC Oil) submits its Statement of Issues that it intends to raise at the Hearing. The Statement of Issues incorporates by reference TC Oil's Response to the Notice of Probable Violation (NOPV).

Without admitting the facts and conclusions contained in the NOPV, TC Oil intends to raise the following issues at the Hearing:

1. Whether Item No. 2 of the NOPV should be withdrawn because TC Oil conducted and documented the required tests to monitor Phase 1 of the Keystone Pipeline in accordance with 49 C.F.R. § 195.573.

2. Whether the Proposed Compliance Order should be rescinded or modified based on the fact that TC Oil had already complied with the Order prior to its issuance by providing PHMSA the requested documentation from 2012 through 2015.

TC Oil's Response to the NOPV fully addresses these issues and is incorporated by reference.

For the foregoing reasons and as supported by the evidence to be presented by TC Oil at the Hearing and as justice may require, TC Oil respectfully requests that PHMSA withdraw Item No. 2 of the NOPV and the Proposed Compliance Order.

Respectfully submitted,

TC OIL PIPELINE OPERATIONS INC.

Vern J. Meier
President, TC Oil Pipeline Operations Inc.

Date: December 18, 2015

2015 CIS Gap – KS9 MP 1078

During the Closed Interval Survey (CIS) that was completed on Keystone in Q2 2015, an approximately 4 mile gap was present in the dataset along KS9 (Salisbury to Patoka) at approximately milepost 1078. This gap was located at the Carlyle State Fish and Wildlife Area, which was inaccessible at that time due to flooding. In late August when the water had receded to a manageable level to allow safe passage a crew returned to the site to obtain the remaining CIS potentials. As can be seen in the screenshot below, no below criteria CP measurements exist in CIS performed across the former gap.

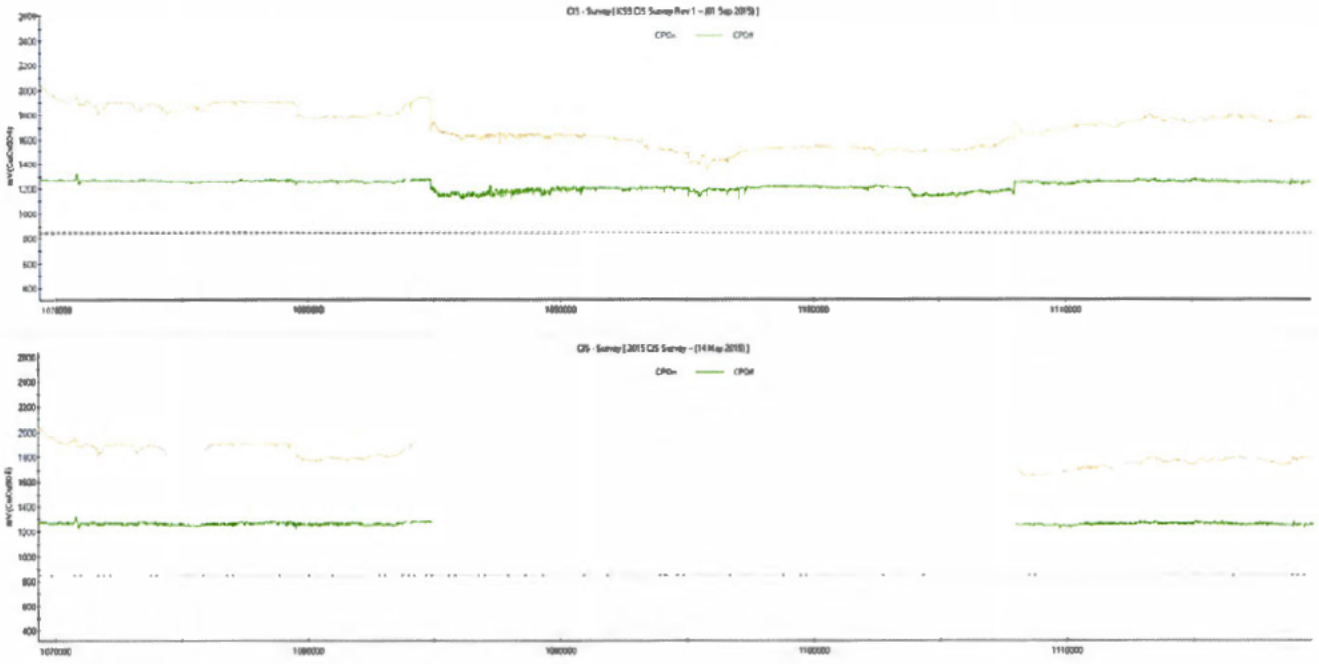

Figure 1: 2015 CIS Datasets showing resolved gap