July 1, 2021

**DR: Procedures used to manage geohazard threats at the time of the accident (prior to the Geohazard Management Program procedures that were published on May 4, 2020).**

TETLP's procedure TRGD490 dated 12/12/2017 was in place to manage geohazard threats at the time of the accident. Procedure TRGD490 only applied to HCA's and references multiple Standard Operating Procedures to document and execute functions. The Following Sections/Standard Operating Procedures (SOPs) and guidelines are referenced within TRG490;

a. SOP #1-6070, "Right-of-Way Encroachments"
b. SOP #1-6040, "Aerial Pipeline Patrol"
c. SOP #1-6030, "Blasting Near Pipelines"
d. TG-111, "Blasting Adjacent to In-Service Pipelines"
e. SOP #1-6060, "Mining Subsidence and Soil Slippage"
f. TG-110, "Uncased Road Crossing Evaluation"
g. SOP #1-3030, "Pipeline Road and Rail Crossings"
h. SOP #1-6050, "Pipeline River and Waterway Crossing Surveys"
i. SOP #1-5010, "Right-of-Way Maintenance"
j. SOP #5-2010, "Area Emergency and Security"
k. SOP #1-6010, "Pipeline Patrol and Leakage Survey Frequency Criteria"
l. SOP #1-4020 "Locating Buried Pipelines Using Electronic Line Locators"

At the time of the incident, the sources of data and processes that TETLP was using to manage geohazard threats are documented in BGC's 2018 interim report(November 15, 2019), and BGC's 2020 program proposal (December 6, 2019). Landslide susceptibility maps, published state-specific landslide inventories, and SME review of publicly available LiDAR along the ROW were integrated and formed the basis of the 2018 desktop inventory of geohazard sites. The 2018 desktop study results were used to identify sites where geotechnical experts then conducted ground assessments of approximately 1,100 sites in 2019. The results from the IMU bending strain reports were incorporated into the evaluation process beginning in 2019 following the Line 10 Noble County Incident in Ohio . The geohazard management process of incorporating IMU bending strain data was outlined in the 2019 program executive summary (BGC, March 9, 2020) and the 2020 program executive summary (BGC, March 8, 2021).

Ground Inspections were scheduled for priority sites that were identified in desktop studies. . Ground Inspections were performed by a Geohazard SME to look for evidence to help explain the strain features (if present), and characterize the ground movement activity level and pipeline vulnerability to ground movement. These features include landslide morphology and their relative proximity to each pipeline, subsidence, erosion, and groundwater features.

Ground inspections completed by Geohazard SMEs were documented in Cambio™. The technical evaluation of geohazard risk to the pipeline that integrated the Ground Inspection observations and desktop information summarized above was prepared and documented in Cambio. All entries underwent an authorization process, whereby a senior geotechnical geohazard specialist performed a technical review and incorporated and required changes.

Sites with elevated activity levels or elevated strains were reviewed with TETLP as part of the multi-disciplinary review (MDR) process. TETLP considered the strain signature, site observations, and estimated strain demand and capacity to provide a recommendation for the next monitoring/mitigation action and the deadline by which it was to be accomplished.

References

• BGC Engineering Inc. (2018, November 15). Texas Eastern System, Segments in Kentucky, Ohio, West Virginia, and Pennsylvania: Baseline Geotechnical Hazards Inventory and Preliminary Screening Interim Report (Draft) [Report]. Prepared for Enbridge Gas Transmission.

• BGC Engineering Inc. (2020, March 9). 2019 Geohazard Management Program Executive Summary [Report]. Prepared for Enbridge Gas Transmission.

• BGC Engineering Inc. (2021, March 8). 2020 Geohazard Management Program Executive Summary [Report]. Prepared for Enbridge Gas Transmission.

| Procedure Name: ***Pipeline Patrol and Leakage Survey Frequency Criteria*** | **Procedure Number: 1-6010** | |
|---|---|---|
| | **Date: 11/15/2018** | **Page: 1 of 6** |

| | |
|---|---|
| **Description:** | This procedure describes the frequency of pipeline patrols and leakage surveys that will be conducted on the pipeline system for onshore and offshore pipelines that are in gas service, and for onshore pipelines that are in idle service to ensure the safety of the pipeline.<br>This SOP contains the following sections:<br>1. Frequency of Aerial Patrols<br>2. Frequency of Ground Patrols<br>3. Frequency of Leakage Surveys<br>4. Shorted Casing Leakage Surveys |
| **Frequency:** | As stipulated in this procedure. |
| **Responsibility:** | Area Management, unless otherwise noted. |
| **Safety Warnings:** | None |
| **Documentation:** | EAM Solution Database |
| **Related Procedures:** | • **SOP #1-6040, "Aerial Pipeline Patrol"**<br>• **SOP #1-6020, "Leakage Surveys Utilizing Gas Detection Equipment"** |
| **Related OQ Tasks:** | 701OP, 702OP, 725OP |
| **Task Lists:** | GP1091 LINE, LeakSur, Ground Patrol<br>OFFI2501 Office, SET REP, Accompany Patrol Pilot<br>VS1500 LINE, SURVEY, LEAK W/GAS DETECTION |

# Procedure

1. Frequency of Aerial Patrols

The Company's patrol program encompasses observation of surface conditions on and adjacent to the transmission line right-of-way for indications of leaks, construction activity, dredging operations, ice effects, scour, seismic activity, soil slides, subsidence, loss of cover, deteriorating pipeline facilities, and other factors affecting safety and operation. In addition to the use of scheduled patrols, company representatives completing their daily routines report abnormal conditions or activities observed.

1.1. Perform aerial patrols at the intervals specified in this section and in accordance with **SOP #1-6040** to satisfy the requirement outlined above.

1.2. Aerial Patrols of Onshore Pipelines

1.2.1. Patrol all onshore pipelines at the intervals stipulated in the following table.

| **Onshore Pipeline Aerial Patrols** | | |
|---|---|---|
| **Class Locations** | **PHMSA (49 CFR 192) and NEB Requirements** | |
| | **At locations that are not highway or RR Crossings** | **At highway and RR crossings** |
| 1 | 1 per calendar yr / 15 mo | 2 per calendar yr / 7½ mo |
| 2 | 1 per calendar yr / 15 mo | 2 per calendar yr / 7½ mo |
| 3 | 2 per calendar yr / 15 mo | 4 per calendar yr / 4½ mo |
| 4 | 4 per calendar yr / 7½ mo | 4 per calendar yr / 4½ mo |
| | | |
| **Pipeline System** | **Enbridge Frequency of Patrols*** | |
| | **Weekly** | **Monthly** |
| Nexus | ● | |
| Sabal Trail | ● | |
| Algonquin | ● | |
| Texas Eastern Uniontown Station to Stony Point (Hudson River) | ● | |
| All Others | | ● |

* Weather conditions may prohibit flights at the stipulated intervals. The inability to conduct an aerial survey because of weather conditions and aircraft maintenance will not be a violation of this SOP.

1.2.2. Supply area laterals and Accident Storage Field laterals shall be patrolled monthly ( only).

| **Procedure Name:** ***Aerial Pipeline Patrol*** | **Procedure Number: 1-6040** | |
|---|---|---|
| | **Date: 12/19/2017** | **Page: 1 of 7** |

| | |
|---|---|
| **Description** | This procedure describes the criteria for conducting and documenting aerial pipeline patrols.<br><br>The Company has a patrol program to observe surface conditions on and adjacent to the transmission line right-of-way for indications of leaks, construction activity and other factors affecting safety and operations.<br><br>To satisfy this requirement and to ensure the safety of the pipeline and public, aerial patrols shall be performed in accordance with this procedure.<br><br>This SOP contains the following sections:<br><br>1.0 Frequency of Aerial Patrols<br><br>2.0 Equipment<br><br>3.0 Patrol Personnel and Training<br><br>4.0 Aerial Patrol Observations<br><br>5.0 Notification of Potential Encroachments or Problems<br><br>6.0 Reporting |
| **Frequency** | In accordance with **SOP #1-6010, "Pipeline Patrol and Leakage Survey Frequency Criteria"**. |
| **Responsibility** | Area Management, unless otherwise noted. |
| **Safety Warnings** | None |
| **Documentation** | **Report of Pipeline Patrol and Leak Survey (Form #7T-65)**<br><br>EAM Solution Database |
| **Related Procedures** | • **SOP #1-5020, "Pipeline Facilities Identification"**<br>• **SOP #1-6010, "Pipeline Patrol and Leakage Survey Frequency Criteria"**<br>• **SOP #1-6020, "Leakage Surveys Utilizing Gas Detection Equipment"** |

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| **Related OQ Tasks** | None |

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|---|---|---|
| **Task Lists** | AP1091 | Air Patrol |

## Procedure

1.0 Frequency of Aerial Patrols

1.1. The Aviation Department and Area Management shall ensure that aerial patrols are conducted on all lines specified by Region Management for aerial inspection at the intervals stipulated in **SOP #1-6010** and/or at intervals stipulated by the Manager, Technical Operations – Region or designee.

1.2. The Area Supervisor or designee shall accompany the patrol pilot on the aerial patrol at least annually for all locations. The Manager, Technical Operations – Region or designee may elect to increase the inspection frequency for areas with high construction activity.

1.2.1. The patrol pilot shall document this activity for facilities patrolled by Company fixed wing aircraft as noted in Section 6.0.

1.2.2. The Area Supervisor or designee shall document this activity for facilities patrolled by contractor helicopter as noted in Section 6.0 ( only).

1.3. Area Management shall evaluate construction activity to determine if more frequent flights by Area Supervisors are warranted.

2.0 Equipment

2.1. Conduct aerial patrols utilizing fixed wing aircraft or helicopter for onshore and offshore patrols, adjacent marsh area patrols, and congested air space and as dictated by topography.

3.0 Patrol Personnel and Training

3.1. The Aviation Department shall ensure the personnel performing the aerial patrols have adequate training and experience to identify the various items in Section 4.0 relative to onshore, offshore and marsh patrols, as applicable.

3.2. The Aviation Department shall coordinate and document all training for the Company aerial patrol pilots in accordance with the Company Aerial Patrol Operations Manual.

4.0 Aerial Patrol Observations

4.1. The aerial patrol pilots shall keep a log of the patrols, observing and documenting the following items as applicable. For detailed information refer to the Company Aerial Patrol Operations Manual.

4.1.1. General conditions of the right-of-way.

4.1.2. Indications of sink holes, sunken trenches, or exposed pipelines.

4.1.3. Water erosion, soil slippage, or landslide areas, ice effects, loss of cover and excessive spans.

4.1.4. Indications of gas leakage such as discolored or wilted vegetation, bubbles in water puddles or water crossing areas, and/or ice formations over the

pipeline. Evidence of leaks shall be investigated promptly in accordance with **SOP #1-6020**.

4.1.5. Fires on or adjacent to the right-of-way.

4.1.6. The condition of pipeline markers.

4.1.7. Damage to existing Company facilities such as valves, metering and regulating stations, loop terminals, or communications facilities.

4.1.8. Construction activity on, in the vicinity of, or progressing toward the pipeline right-of-way (including evidence of possible construction such as the presence of excavation equipment) within 1/2 mile (0.8 km) of the pipeline.

4.1.9. Land leveling or grading activities.

4.1.10. Survey parties, survey stakes or other construction indicators within 660 ft. (201 m) of the pipeline.

4.1.11. Excavation near the pipelines, including routine activities occurring within industrial properties.

4.1.12. Installation of houses, mobile homes, businesses, churches, barns, sheds or other structures of human occupancy, if such structures could possibly be within 660 ft. (201 m) of the pipeline.

4.1.13. Construction of irrigation or drainage canals, ponds, or swimming pools. Installation of parks, recreation activities, or other places of assembly on or adjacent to the right-of-way, if such areas could possibly be within 660 ft. (201 m) of the pipeline.

4.1.14. Installation of irrigation piping systems, sprinkler systems, sewers, utilities, or other underground facilities or structures within 1/2 mile (0.8 km) of the pipeline.

4.1.15. Installation of telephone or power poles, fence posts, or guy wire anchors and any power auger or post hole digger within 660 ft. (201 m) of the pipeline.

4.1.16. Tree logging operations and any brush clearing that has been done immediately adjacent to the right-of-way.

4.1.17. Seismic geological survey activities, well logging operations, well drilling activities, or quarry and blasting work.

4.1.18. Offshore construction activity in the vicinity of the pipeline.

4.1.19. Large commercial fishing ships in the vicinity of pipelines in shallow water less than 15 ft. (4.6 m) deep.

4.1.20. Dredging activities and boats anchored in the area of the pipeline.

4.1.21. Any other signs of deteriorating pipeline facilities

4.1.22. Any unusual conditions which may have an effect on property, company personnel and facilities or the environment around the pipeline.

5.0 Notification of Potential Encroachments or Problems

Upon discovery of potential encroachments or problems, the aerial patrol pilot shall communicate with Area personnel as soon as safely possible during the patrol. For urgent issues, the aerial patrol pilot shall notify the Area by phone.

5.1. New Activities

5.1.1. The aerial patrol pilot shall notify Area personnel immediately regarding any new encroachment activities or other problems listed in Section 4.0 above which could affect the integrity of the pipeline(s).

5.1.2. The aerial patrol pilot shall record the details of the activity, the name of the person in the Area who was notified, and the time of the notification in the patrol log.

5.2. Previously Reported Activities

5.2.1. If previously reported activities (or occurrences) by the aerial patrol pilot have changed in a manner that might affect the pipeline(s), such as road construction, pipeline construction, or erosion on the right-of-way, the aerial patrol pilot shall notify the Area regarding the activities.

5.3. Activities on Industrial Properties

5.3.1. The following procedures shall be used to define and monitor industrial properties along the Company right-of-way.

5.3.1.1 Identification of Industrial Properties

Region Management shall develop and maintain a list of industrial properties for each Area and provide a copy of the list to the patrol pilots and maintain a current copy in the compliance file. Area Management shall ensure that these sites are marked in accordance with **SOP #1-5020**.

*****ADVISORY*****

Include specific locations along the pipeline right-of-way where the industrial activity being conducted could have an adverse impact on the pipelines. This does not include farms or other agricultural properties. Examples of industrial properties are asphalt plants, rock quarries, mining operations and other types of business that excavate, blast, cross the pipeline with large equipment, or move spoil/aggregate across the pipeline.

5.3.1.2 Monitoring Industrial Properties

The aerial patrol pilot shall notify Area personnel of specific activities within industrial properties which might affect the pipeline, such as but not limited to the following:

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| **Description** | This procedure describes mining subsidence and soil slippage. Some sections of the pipeline system are located in areas where mining operations and/or natural geological conditions can cause soil subsidence, landslides, or other problems.<br><br>The investigation of proposed mining activities or unstable soils can reduce the possibility of pipeline damage due to earth movement and associated stresses, by identifying potential problem areas and allowing sufficient time to take preventive measures. Methods of investigation include, but are not limited to, geological studies, installation of monitoring instruments, re-evaluation of existing pipe integrity, establishment of limitations, review of mining plans, and on-site field observation.<br><br>This SOP contains the following sections:<br>1.0 General<br>2.0 Communications with Mining Companies<br>3.0 Involvement of a Mining Consultant<br>4.0 Precautions for Room and Pillar Mining<br>5.0 Preparations for Subsidence Caused by Longwall Mining<br>6.0 Monitoring Integrity of Exposed Pipelines<br>7.0 Activities During Longwall Mining Subsidence<br>8.0 Restoring the Pipelines after Longwall Mine Subsidence<br>9.0 Using Linebreak or Remote Controls (RCV/ASV)<br>10.0 Protection of Pipelines from Soil Slippage |
| **Frequency** | As required. |
| **Responsibility** | Area Management, unless otherwise noted. |
| **Safety Warnings** | • Contact the Director, Pipeline Integrity - Houston immediately if mining is planned beneath Metering and Regulating stations (M&R), compressor stations, or other similar facilities.<br>• Plugs left in the ditch during subsidence can concentrate stresses and result in stress levels much higher than predicted values. Consider methods to minimize pipe-soil interaction in |

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|---|---|
| | buried pipe, such as double wrap with geotextile and/or backfilling with pea gravel.<br>• As a mining panel approaches a cased road crossing, the pipeline may begin subsiding at one end of the casing while the casing still remains at its original elevation. This could cause damage to the pipeline. |

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| **Documentation** | Daily Longwall Project Pipeline Inspection Log (**Form #7T-340**) |

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| **Related Procedures** | **SOP #1-4010, "Excavation and Backfill"** |

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| **Related OQ Tasks** | None |

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| **SAP Task Lists** | None |

8.3.1 Area Management or designee shall maintain a daily record of the strain gauge data, calculation results, and the reports from the mining company summarizing the progress of the mine.

8.3.2 The Manager, Technical Operations - Region or designee shall provide a weekly report to the Director, Pipeline Integrity - Houston on the status of mining and pipeline monitoring activities.

8.3.3 Prepare a formal report describing the surveillance of the pipeline and summarizing the ground and pipeline movement, pipe strain, and remediation efforts during the mining period.

8.3.3.1 The Manager, Technical Operations - Region or designee will do this upon completion of the mining operation and after no significant additional subsidence occurs.

8.3.4 Retain all elevation and strain gauge data obtained during the mining period in electronic form.

8.3.5 Submit a copy of the formal report to the Director, Pipeline Integrity - Houston and to Area Management for the permanent record.

9.0 Protection of Pipelines from Soil Slippage

9.1 Perform protective measures when excessive deformations or significant increases of pipe stress are suspected which may include the following:

- Relocation of the pipeline into a more stable area
- Removal of sliding soil
- Stabilization of the land slippage area by drying the area with surface or subsurface drains
- Excavation of a trench parallel to and immediately uphill of the pipeline to relieve lateral soil pressure on the pipe (This usually applies to cases where earth movement is approximately perpendicular to the pipeline.)
- Combinations of the above methods.

*****ADVISORY*****

In areas of unstable slopes where soil slippage is occurring or a high potential for soil movement exists, monitor using methods approved by the Manager, Technical Operations - Region or designee.

9.2 Determine the extent of the hazard and the appropriate remedial measures.

9.3 Discuss each case with the Director, Pipeline Integrity - Houston for approval.

| **Procedure Name:** ***Right-of-Way Maintenance*** | **Procedure Number: 1-5010** | |
|---|---|---|
| | **Date: 12/19/2017** | **Page: 1 of 6** |

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|---|---|
| **Description** | This procedure describes right-of-way maintenance which protects the pipelines, permits access to the pipelines, and aids in avoiding interference with the land's intended use. During patrols, any evidence of erosion, scour, subsidence, or slides, or the potential for any of these conditions to occur will be noted.<br><br>Particular attention will be given to those locations where the amount of cover over the pipeline no longer meets the original design requirements. In such cases, the lack of cover will be referred to Area Management for a determination of whether remedial action is necessary. If it is determined that remedial action is required, an appropriate method of restitution will be developed to provide additional protection and minimize potential for damage to the pipeline.<br><br>This SOP contains the following sections:<br><br>1.0 Clearing the Right of Way<br>2.0 Erosion Control Measures<br>3.0 Maintaining Pipeline Markers and Test Sites<br>4.0 Restoring Exposed or Shallow Pipelines<br>5.0 Maintaining Access Roads<br>6.0 Working with Landowners<br>7.0 Identifying Unsafe Conditions<br>8.0 Reporting |
| **Frequency** | As required. |
| **Responsibility** | Area Management, unless otherwise noted. |
| **Safety Warnings** | None |
| **Documentation** | Discovery of Potential Safety Related Condition (**Form #7T-8**)<br><br>Property Damage Report (**Form #7T-388**)<br><br>EAM Solution Database |
| **Related Procedures** | **SOP #1-5020, "Pipeline Facilities Identification"**<br><br>**US Environmental SOP #14-A, "Environmental Permitting for Onshore Projects"** |

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|---|---|
| **Related OQ Tasks** | None |

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|---|---|---|
| **SAP Task Lists** | LINE8749 | Line, ROW, Maintenance |
| | VS2012 | Shallow Cover/Exposed Pipe, 1YR |

## Procedure

1.0 Clearing the Right-of-Way

1.1 Scheduling

1.1.1 Environmental permitting or notifications may be required for right-of-way clearing and maintenance activities. Enter all mowing activities into the Environmental Construction Permitting Database. Please note that if the ROW crosses state lines, two permits are required.

1.1.2 Reference **US Environmental SOP #14-A** or the East Canada Environmental SOP Manual for further information.

1.2 Maintaining Right-of-Way Visibility

Review the right-of way periodically to assure sufficient visibility for proper inspection of the right-of-way by aerial and ground patrols.

1.3 Clearing Method

1.3.1 Consider the soil stability, natural vegetation, and the adjacent area when deciding the clearing method to be used.

1.3.2 Cut the vegetation on the right-of-way to a uniform level across the entire width of the right-of-way using a bush-hog or other appropriate means. Side trimming of the trees and vegetation along the edge of the ROW to prevent canopy growth should be considered.

1.3.2.1 The width of right-of-way cutting in certain areas may be defined by state/province and local laws or other agreements.

1.3.3 Consider using ground applied herbicide following mechanical cutting in those areas where woody brush exists.

1.3.3.1 Chemicals shall be handled only by licensed applicators and must be on the Company's approved herbicide chemicals list. Aerial spraying is prohibited.

1.3.3.2 The use of chemicals in some areas may be prohibited. Check with the Environmental Construction Permitting Department for further guidance.

1.4 Clearing and Maintaining Fence and Road Crossings

Trim the vegetation at fence and road crossings neatly to a uniform level. At a minimum, trim around the line markers (up to and including the entire width of the right-of-way) using a string trimmer or other appropriate means so that the pipeline markers are visible from the edge of the road.

1.5 Clearing Areas in View of the Public

Dispose of trees and other vegetation cleared from the right-of-way in areas of public view without undue delay.

1.6 Disposing of Debris

1.6.1 Follow applicable laws and regulations when burning brush or debris.

1.6.1.1 Permits may be required in some areas. Check with local agencies and the Environmental Construction Permitting Department for further guidance.

1.6.2 Take measure to control fire and prevent other hazards.

1.6.3 Do not burn brush and debris directly over the pipelines.

1.6.3.1 Scheduled burning near the pipeline shall not be approved unless a leak survey with gas detection equipment in the immediate area has been conducted.

1.6.4 Cut tree stumps which are adjacent to roads and other areas of public view to ground level or remove them for disposal.

2.0 Erosion Control Measures

Perform the following procedure to help control erosion on the pipeline right-of-way.

2.1 Maintenance of Topsoil

2.1.1 Avoid clearing the right-of-way of surface vegetation and topsoil.

2.1.1.1 If this does occur, restore and stabilize the surface.

2.2 Erosion Control

2.2.1 Construct terraces and other erosion control devices where necessary to prevent soil erosion on sloped sections of the right-of-way. Check with Environmental to determine permitting requirements.

2.2.2 Repair existing erosion sites as soon as practical after discovery.

2.2.3 If right-of-way vegetation has been damaged by natural causes and a potential for erosion exits, seed or perform other measures. Notify Region Tech staff.

2.3 Stream Crossings

2.3.1 Stabilize the banks as necessary to prevent erosion where rights-of-way cross streams and other bodies of water.

2.3.1.1 Conduct installation on the right-of-way in such a manner as to minimize damage to shorelines, recreational areas, and fish and wildlife habitats.

2.3.2 Place pipeline markers above each pipeline on both sides of any navigable body of water in accordance with **SOP #1-5020.**

3.0 Maintaining Pipeline Markers and Test Sites

3.1 Inspect all pipeline identification markers for damage while performing right-of-way maintenance.