



# UAS Pipeline Monitoring Burnt Lake Gas COOP Findings Report - TAP 10

May 6, 2019

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# Mission Summary

Silver Spring Energy Consulting Ltd. was contracted by Burnt Lake Gas COOP to fly a UAV surveillance mission over the Tap 10 high pressure gas line south of Sylvan Lake Alberta. The purpose of this flight was to inspect for signs of undetected leaks or possible ground activities that could threaten the integrity of the pipeline.

## Flight Map (Pipeline Location)

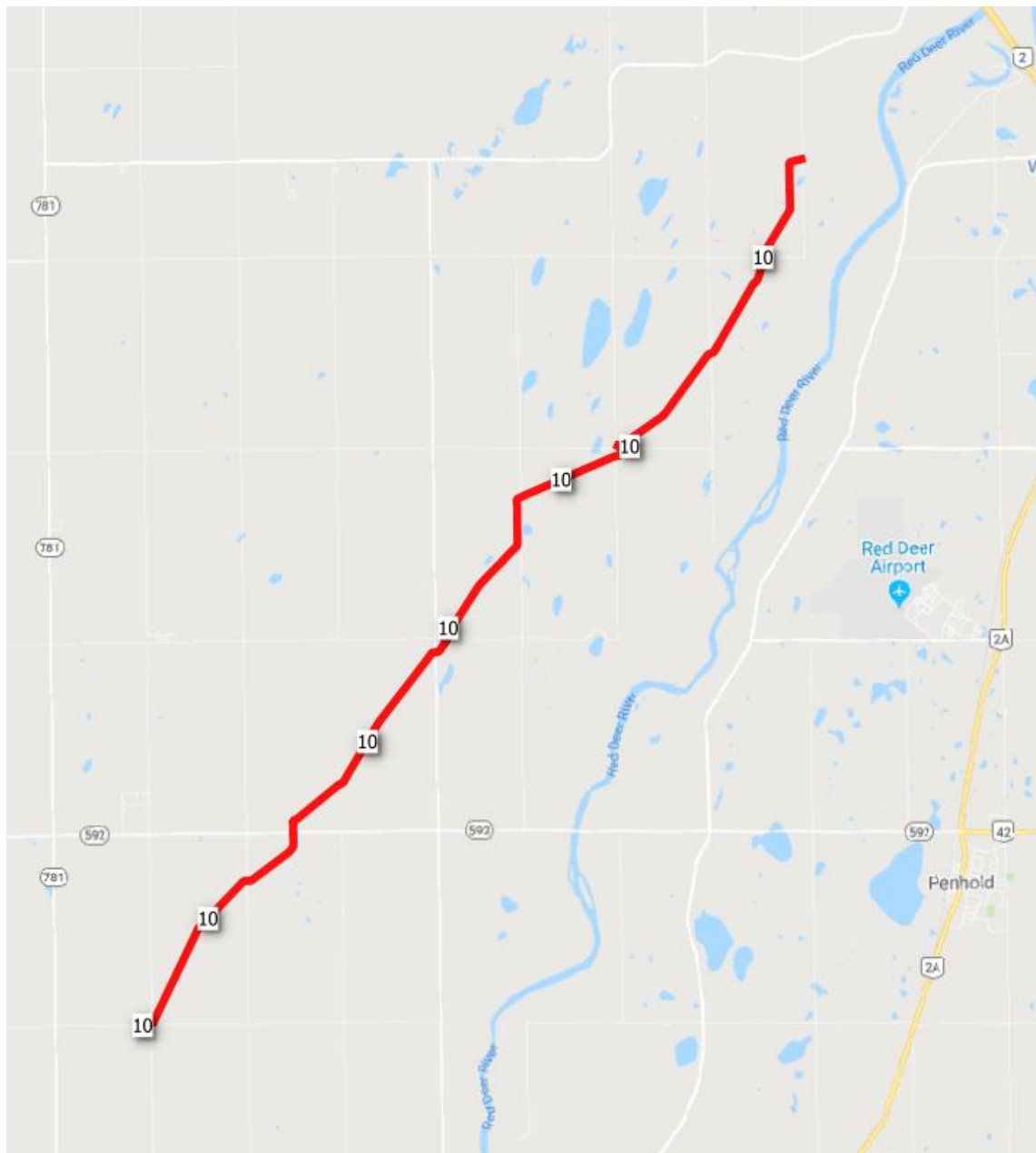


Figure 1: Tap 10 Pipeline Location

## Flight Parameters

<b>Flight Date / Time</b>	May 6, 2019 10:00hrs - 17:00hrs
<b>Weather Conditions</b>	Partly Cloudy Wind 10km/h gusting to 15km/h + at end of mission ENE 5 to 15 degrees C
<b>Sensors Used</b>	Laser Methane Detector
<b>Time In-Air</b>	108 minutes.
<b>Flight Segments</b>	12
<b>Planned Flight Altitude</b>	25m AGL
<b>Executed Flight Altitude</b>	25m AGL (Average)
<b>Comments</b>	Wind blowing toward west and south. Flights offset down wind of pipeline.

## Survey Data

<b>Number Of Images</b>	N/A
<b>Flying Altitude</b>	25m
<b>Ground Resolution</b>	N/A
<b>Coverage Area</b>	18.30 linear km
<b>Camera Stations</b>	N/A
<b>Tie Points</b>	N/A
<b>Projections</b>	N/A
<b>Methane detection lower threshold</b>	200ppm/m
<b>Geographic Location Accuracy</b>	3.50m
<b>Geographic Coordinate System</b>	WGS84 (EPSG::4326)

## Results

Flight operations were completed successfully. Methane readings collected for entire length of pipeline.

Results were interpreted from direct atmospheric methane readings of entire air column from UAV to ground level. Note that readings beyond 30m from pipeline location were excluded from these results.



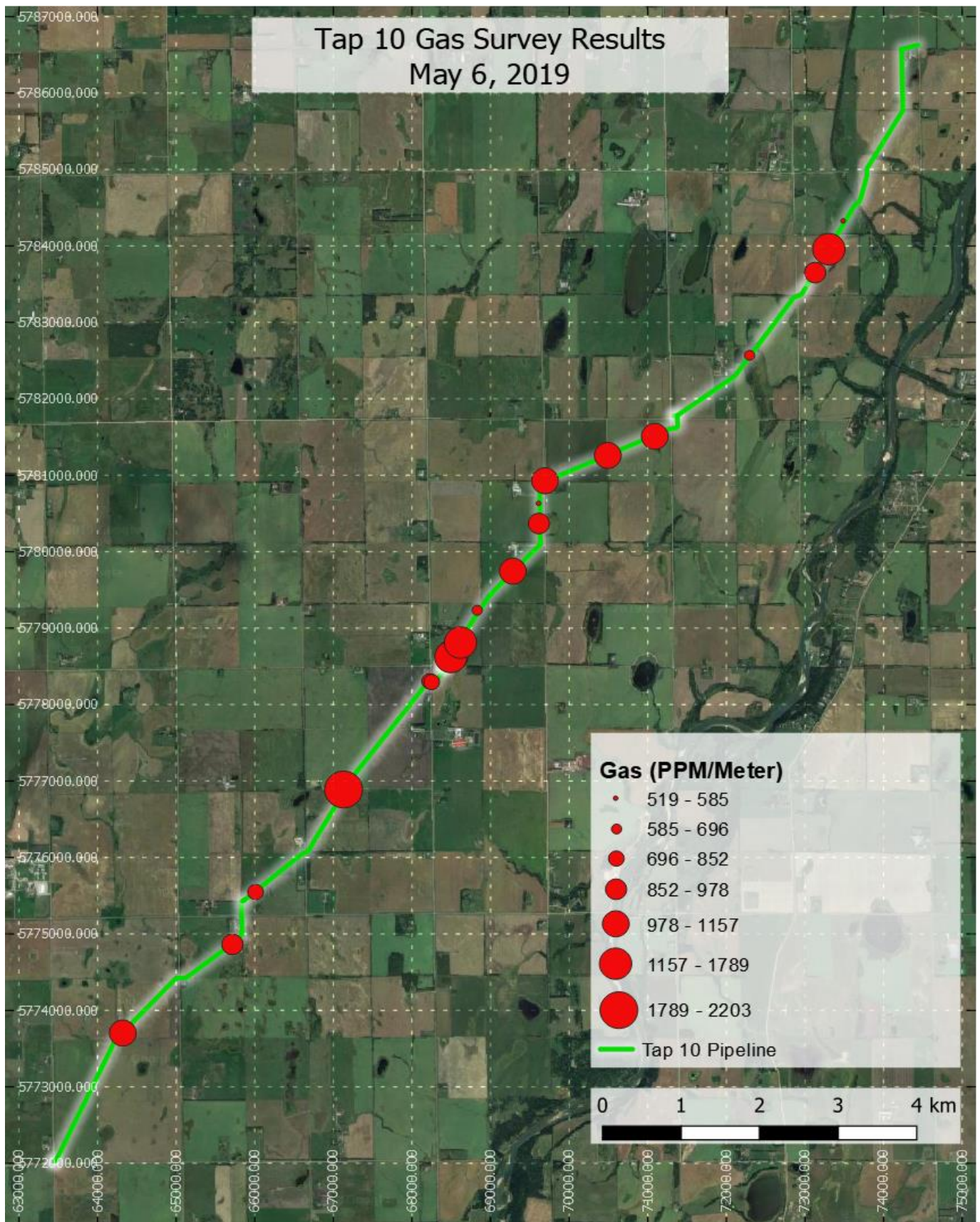


Figure 2: Complete Pipeline Survey Map (see link for online interactive version)

## Interactive Web Map

Follow the below link for the interactive web-map version of the above survey results:

[https://api.mapbox.com/styles/v1/kpubben/cjve9d2ajpgq11fnu1p2pxiyj.html?fresh=true&title=true&access\\_token=pk.eyJ1ljoia3B1YmJlbilslmEiOiJjanV1NnZudnZnR6M3lwaGxzemd6MjE3In0.9bfM9SkEGnTZJN11T3FoOw#11.9/52.181283/-113.992807/0](https://api.mapbox.com/styles/v1/kpubben/cjve9d2ajpgq11fnu1p2pxiyj.html?fresh=true&title=true&access_token=pk.eyJ1ljoia3B1YmJlbilslmEiOiJjanV1NnZudnZnR6M3lwaGxzemd6MjE3In0.9bfM9SkEGnTZJN11T3FoOw#11.9/52.181283/-113.992807/0)

### BREAKDOWN OF AREAS OF CONCERN

Concern Level	Number of Locations
Immediate Action	1
Moderate Concern	1
Minor Concern	1

### LOCATIONS OF CONCERN

#	Concern Level	Coordinates (WGS84 Lat/Long)	Description
1	Immediate (611 - 761ppmm)	52.172402, -114.0349482	Moderate to high gas readings with visibly poor vegetation health in surrounding area. No other environmental factors present to otherwise explain readings.
2	Moderate	52.130842, -114.059996	Moderate to high gas readings with no visible environmental factors to otherwise explain readings.
3	Minor	52.190162, -113.981248	Moderate gas readings with no visible environmental factors to otherwise explain readings.

## Summary of Findings

This report finds moderate evidence of possible leakage at the location(s) indicated above. Location #1 (below) merits immediate attention due to factors surrounding the region; primarily the low vegetation health surrounding the high readings. This area should be closely inspected if gas balance readings indicate a leak on Tap 10.



*Figure 3: Location #1 (52.172402, -114.0349482) - Note poor vegetation health (brown patch) surrounding the readings (red).*

Location #2 shows a cluster of moderate gas readings in an area with no visible cause, and merits moderate concern. There are no physical/environmental signs of leakage (dying vegetation, etc.), however the cluster of points in the area may indicate a leak. This area should be considered if gas balance readings indicate a significant leak in the line.





*Figure 4: Location #2 (52.130842, -114.059996) - Note the cluster of readings in this area. No visible crop damage or other signs of leakage.*

Location #3 is similar to Location #2; however the gas readings are lower. Still, there are no visible features in the area to account for these readings, and therefore this area has been classified as one of minor concern.



*Figure 4: Location #3 (52.190162, -113.981248) - Note the lack of methane causing features in this region*



# Appendix

## Area of Concern Parameters

The following key indicates how each area of concern is categorized:

### Immediate Action Required

- Visible gas plume or oily sheen on surface water
- Defined and definite irregular snow melt along gas pipeline path
- Pronounced and defined vegetation stress along pipeline
- New unauthorized building construction directly over pipeline
- Extreme gas readings (multiple readings above 800 ppm/m down wind of pipeline)

### Moderate Concern

- Slightly anomalous snow melt along pipeline
- Possible anomalous vegetation stress along pipeline
- Slight oil sheen on surface water in vicinity of pipeline
- High gas readings (multiple readings above 500 ppm/m down wind of pipeline or single reading above 1000).

### Minor Concern

- Patchy vegetation stress
- Farm operations or minor construction (fencing, sheds, drilling rig set-up) near pipeline
- New tree growth directly on pipeline
- Elevated gas readings above between 200 and 300ppm/m clustered along pipeline.