Gas Pipelines:
Are They A Detriment or An Enhancement For Crops?

Abstract

The summer of 1999 was hot and dry in Central New York, with precipitation coming just in time more than once to keep crops from withering. While crop growth overall was normal, a phenomenon was observed over a 32-year old natural gas pipeline. Alfalfa plant growth was noticeably higher directly over the pipeline by up to 50 percent, and the authors wondered “Why?” A corollary question raised by these observations concerns the magnitude of damages that should be recognized for gas pipeline permanent easements that cross agricultural crop fields-are the traditional damage levels excessive as well?

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Background

The parent property is a 250-cow dairy farm that includes over 700 acres of cropland used primarily for corn and alfalfa production. Crop production is used in a satellite dairy farm operation and for cash crop sales. The land that is the subject of this paper consists of a series of fields spanning a width of about 1,500 feet by a length of about 3,000 feet, alternating between corn and alfalfa. This land has been part of the farm operation for more than 35 years.

In 1967, Tennessee Gas installed a natural gas pipeline along a 50-foot wide permanent easement crossing the subject land. Pipeline installation practices at that time did not separate topsoil from the subsoils, but rather backfilled the trench indiscriminately. In the glacial till soils, this easement area yielded an extraordinary volume of rocks for over a decade.

However, after years of fertilization and conservation practices, the easement area was fully incorporated into the rest of the fields. Without observing the locations of the marker posts at the field edges, all physical characteristics of the pipeline excavation vanished–at least until 1997.

Subject Observations

The summer of 1997 was hot and dry. While mowing for second cutting alfalfa, the owner noted excessive plant growth directly over the original pipeline trench, a width of about ten feet. After observing this phenomenon individuals at two pipeline companies were contacted in an attempt to uncover its source. Similar observations had not been noted by either of these pipeline company representatives, and the unusual plant growth was forgotten, until the summer of 1999.

Figure 1

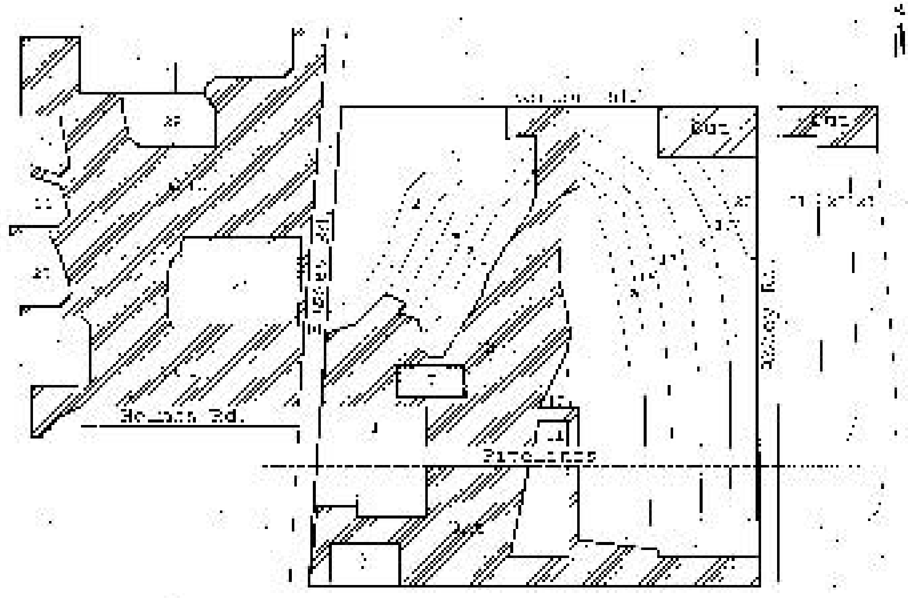

TABLE 1

Date	Crop & Field No.	Plant Height (inches)		Growth Difference
		Over Pipeline	Off Pipeline	
7/24/99	Alfalfa #21	23, 21, 23, 22, 23 Avg: 22.4	17, 19, 23, 20, 21 Avg: 20.0	+2.4" +12%
7/24/99	Corn #18	88, 87, 91, 96, 96 Avg: 91.6	85, 85, 93, 91, 87 Avg: 88.2	+3.4" +4%
8/19/99	Corn #16	111, 106, 111, 110 Avg: 109.5	95, 94, 100, 95 Avg: 96.0	+13.5" +14%
8/19/99	Alfalfa #17	28, 28.5, 28.5, 28 Avg: 28.25	20.5, 22.5, 21, 21.5 Avg. 21.38	+6.87" +32%
8/19/99	Alfalfa #15	23, 27, 26 Avg: 25.33"	17, 17, 18 Avg: 17.33"	+8.0" +46%
9/25/99	Alfalfa #21	18, 19, 21, 18, 19 Avg: 19.2	15, 10.5, 13, 13, 12 Avg: 12.7	+6.5" +51%
9/25/99	Alfalfa#19	12.5, 15, 15.5, 15, 13 Avg: 14.2	11, 12.5, 11, 11.5, 10.5 Avg: 11.3	+2.9" +26%

In July 1999, while mowing for second cutting in the vicinity of the pipeline easement, the owner found the same kind of excessive plant growth directly over the pipeline that was observed two years prior. This time the change in plant height was quite dramatic, appearing as a "hump" in the vegetation, but with the underlying ground surface being at grade with the abutting areas as was proven via cross-sections.

Data/Measurement Collection

In order to document our findings, multiple measurements in several of the fields crossing the pipeline easement were recorded. These measurements were made in both alfalfa and corn fields. Both crops reflected excessive growth directly over the pipeline, but the differences were much more pronounced in the alfalfa stands.

Measurements were completed for second, third and fourth cuttings of alfalfa at the time of harvest. Figure 1 displays the farm map showing the layout of the subject fields, location of the natural gas pipeline easement, and locations of measurements.

Table 1 identifies the date of measurement, crop type, measurements of plant height directly over and off the pipeline, and growth difference. Measurements made over the pipeline were taken directly over the center of the pipeline, located by lining up the pipeline markers positioned at the edges of each field. Measurements acquired "off the pipeline" were taken at least 20 feet to 30 feet away from the pipeline to ensure that they were also outside of the full width of the permanent easement and the original construction area. Several individual measurements were taken in each field and averaged for statistical analysis.

Theory Development

Douglas Fisher, Resource Conservation Specialist with the Skaneateles Lake Watershed Protection Project and Onondaga County Soil & Water Conservation District, and Donald Fisher, ARA, MAI, president of Pomeroy Appraisal Associates, Inc., were consulted regarding reasons for the observed heavy

The wheat directly over the pipeline kept growing through the winter and grew faster in the spring, apparently due to the warmer soil along the pipeline. The downside to this benefit was in having the wheat mature sooner than the rest of the field so that, by the time the remainder of the field was ready for harvest, the strip along the pipeline had already withered and was unproductive.

growth. These two, along with landowner David Fisher, suggested several possible causes:

1. Gas running through pipeline would keep the soil cooler and lower stress levels on plants, which would be most noticeable during hot and dry summers;
2. Moisture collects along pipeline and increases soil water content which in turn becomes available to plants;
3. Gas running through pipeline warms soil earlier in spring and encourages seeds to germinate faster and plants to grow at faster rates; and
4. Cathodic action along the pipeline stimulated plant growth.

Research

Douglas Fisher reported that it is likely moisture would collect along the pipeline and run downslope, since the disturbed soils would be easier to travel through than the original parent soils. However, since the crop growth observations were near the top of a slope, the volume of water that could collect in this manner would be minimal. He also indicated that moisture could condense along the pipeline as a result of typical "dew point" condensation, and that this source could possibly be available for plant roots.

Field observations were described to John E. Lacey, Agricultural Research Specialist for New York's Department of Agriculture and Markets and stationed at Cornell University. Mr. Lacey oversees the restoration of pipeline corridors following the construction of new pipelines.

Lacey reports that common practices today require the contractors to separate topsoil layers from less fertile subsoils. The topsoils are replaced as the top layer during the backfill phase, usually with fertilizer additives. He has noted heavy plant growth in new pipeline corridors, but not in the older easement areas such as the subject land.

Lacey proposed that the original backfilling procedures for the subject may have put all of the topsoil into the trench, increasing the level of soil nutrients and retained moisture better than the rest of the fields. However, when he was informed about the poorer surface soil quality and large volume of rocks generated along the pipeline trench for over a decade, this theory was dismissed.

Lacey did report on one observation involving winter wheat. In this example, the field was within ten miles of the compressor station, indicating that the gas would still be relatively warm. The wheat directly over the pipeline kept growing through the winter and grew faster in the spring, apparently due to the warmer soil along the pipeline. The downside to this benefit was in having the wheat mature sooner than the rest of the field so that, by the time the remainder of the field was ready for harvest, the strip along the pipeline had already withered and was unproductive. Based on Mr. Lacey's input, temperature seemed to be a factor influencing crop growth.

Wayne Kolanko and Jim Hartman of Tennessee Gas Pipeline were also contacted. Kolanko indicated that the temperature in the ground would be more consistent along the pipeline, ranging from 60 degrees to 70 degrees in the summer–cooler then the adjacent soils. He also indicated that the cathodic protection would be very slight with only about 1 volt applied to the pipeline. Finally, Kolanko confirmed that the gas flowed west to east, and that the closest compressor station was located about 50 miles to the west. He said that the gas was heated to about 125 Fahrenheit, but would cool off within 15 to 25 miles, dropping down to average soil temperatures (45° in winter, 60-70° in summer).

Hartman stated that: 1) the soil mix would not be a factor along the subject pipeline, 2) soils would have more consistent temperatures along the pipeline, 3) condensation does collect along the pipe, and 4) cathodic protection was being used. His only observations involving plant growth was in seeing the snow melt faster over the pipeline within a few miles downstream from the compressor stations.

The Tennessee personnel supported the constant cooler temperature theory but could not rule out moisture and cathodic protection as factors influencing plant growth.

Arthur Rossetti, Iroquois Gas Transmission System, indicated the Iroquois pipelines conformed to current construction practices, separating the topsoil and replacing it with high amounts of fertilizer to stimulate faster plant growth. Rossetti has observed disproportionately high plant growth along Iroquois' pipeline trench for at least a few years after construction was completed. However, in his opinion it was primarily due to the high fertilizer levels.

As for the subject's Tennessee gas pipeline, Rossetti suggested that it would not be surprising for the soils to require 20 years to 30 years to return to normal in situations when all soils were mixed during backfilling and no fertilizer was added. This timeline matches the first observations of the excessive plant growth over the subject pipeline.

Appraisal Applications

Appraised compensation from a pipeline permanent easement is typically analyzed based on the loss of property rights and the impact the easement might potentially have on the remaining property-traditionally estimated as part of a "before and after" appraisal report. Pipeline easements are usually considered to be less damaging than power line easements because fewer ownership rights are adversely affected.

In the past, permanent easements acquired for pipelines can usually be used for agricultural cropland and pasture, auxiliary residential and commercial land, and recreational land. Primary restrictions for pipeline permanent easements typically prohibit buildings, trees and deep-rooted vegetation. Land encumbered with such easements could be re-incorporated into a crop field, though the soils and related factors are often considered to be inferior along the excavation route.

Today's practices in pipeline construction usually require replacing the soil layers in the proper order, adding high levels of fertilizer to stimulate faster plant growth, and restoring the excavated area to pre-construction conditions. It is common to not be able to detect a pipeline easement route except by the aboveground markers.

Based on the observations cited in this paper, there are other factors to consider. The relatively cooler gas maintains a lower soil temperature. During hot and dry growing seasons, apparently the cooler soils reduce the stress on plants, enhancing their growth by as much as 50 percent. In addition, moisture collection along the pipeline and cathodic protection cannot be ruled out as also influencing crop growth. The appraiser should consider the potential from these affects when analyzing damages from pipeline permanent easements.

Management Applications

It would not be practical or feasible to micro-manage a ten-foot strip of crop through a larger field, especially with today's large field machinery. The landowner may receive a small benefit by having heavier growth of a particular crop over a pipeline. But since such an area would represent less than one percent of a typical field's area, there is no economic incentive to manage the pipeline corridor area different than the rest of the field.

Summary

The mindset assigning large damages to permanent easements acquired for pipeline construction may be overly aggressive given modern industry standards. New easement corridors are restored to "better than original" condition, with after effects lasting for at least a few years. The surprising effect comes from older pipelines. During hot growing seasons, the cooler gas running through the pipeline cools the surrounding soils, which appears to reduce the stress on the growing plants. This can enhance plant growth, but can also provide detrimental influences (e.g. faster maturing wheat plants). ■

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David F. Fisher, owner of Hi-Fi Farms in Onondaga County, New York, earned a Bachelor of Science degree from Cornell University's College of Agriculture and Life Sciences in 1975. He joined into a partnership with his parents, eventually acquiring the farm business that has been under his management for 20 years.

Douglas P. Fisher, District Program Team Leader and Resource Conservation Specialist for Onondaga County Soil & Water Conservation District, obtained an Associates degree from the State University of New York at Morrisville in 1974. He was employed by the Onondaga County Soil & Water Conservation Service from 1974-80, and in 1996 rejoined that organization to head the Skaneateles Lake Watershed Protection Program's Implementation Team.

The authors are brothers.

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