

Recommendation 3

Background

Kiefner & Associates made twelve recommendations in its 2020 Engineering Study. The Peoples Gas Light and Coke Company (PGL) responded to these recommendations in May of 2020.

Recommendation 3 suggested that PGL work on a greater understanding of the impact of natural forces on its distribution network.

Frost heave is a natural force that causes the ground to shift around a pipe due to the freeze-thaw cycle typical of Chicago winters. As the pipe shifts, cracks, breaks or leaks can occur; specifically around cast and ductile iron pipe joints. The 2020 Engineering Study analyzed the effect of other natural forces as well as potential effects of a combination of multiple natural forces on pipe integrity. Notably, the 2020 Engineering Study found that frost heave, on its own, is a significant enough force to cause structural failure of cast and ductile iron pipe.

PGL acknowledges the safety risk that leaks, cracks and breaks caused by frost heave over many decades imposes on cast iron and ductile iron pipe and agrees with Kiefner's recommendation to work on better understanding these impacts. Obtaining frost depth data based on actual field conditions will take several years. As a result, it will be several years before sufficient frost heave data would be available to determine the impact of frost heave on the aging portions of our system's cast and ductile iron pipe and its influence on the System Modernization Program's (SMP). PGL will continue to collect frost depth data and evaluate it to determine if a correlation exists that would assist in predicting failures, which could be incorporated into future SMP design and planning.

In response to Kiefner's recommendation, PGL will collect frost depth data and incorporate the data into its Geographic Information System (GIS). This data will be plotted and analyzed with an attempt to better understand where susceptible main may have experienced breaks due to frost heave.

Winter 2020 Frost Depth Data Analysis

PGL has captured frost depth data since 2017. This data is gathered as work is performed on gas mains or services when ground frost may be present. Since 2017, a total of 547 frost depth measurements have been collected. This data has been grouped by winter seasons, defined as November through April of the following year (for instance, data gathered for the winter of 2020 would include November 2019 through April 2020).

PGL has completed the integration of the frost depth data into GIS and developed a GIS application that displays the data geospatially. This gives PGL the ability to begin evaluating these points in relations to neighborhoods and planned SMP design.

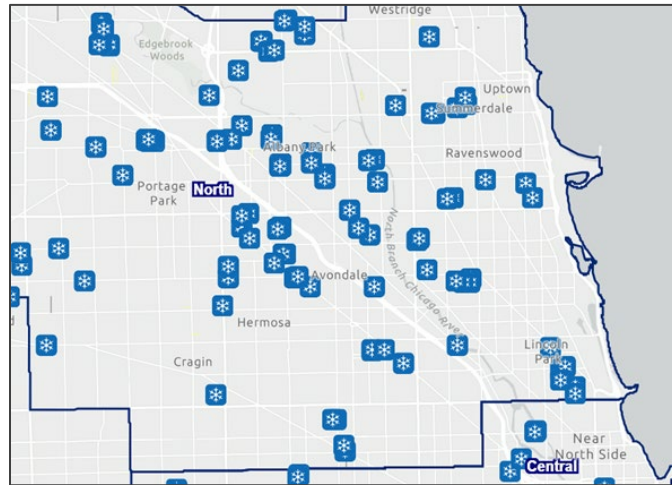


Figure 1. Snapshot of PGL Frost Depth Data Viewer

Figure 2 shows the breakdown of the 547 measurements across PGL’s districts and Figure 3 summarizes the measurements by frost depth. Analyzing the data shows that 87% of the total measurements documented a frost depth less than 36”, with the majority of the measurements greater than or equal to 36” occurring during the winter of 2017. Evaluating the neighborhoods where frost depth measurements were taken shows that 13% of the measurements were taken in neighborhoods currently being upgraded through the SMP, or scheduled to start construction by 2022.

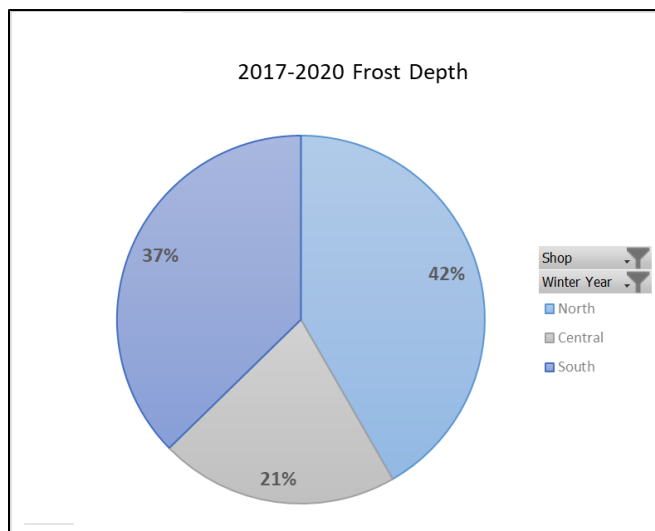


Figure 2. Frost Depth Data across PGL Districts

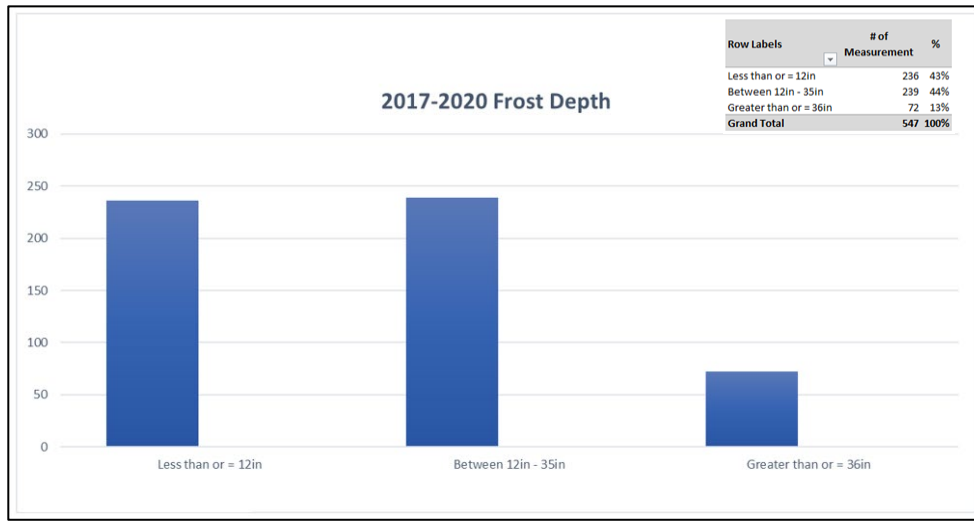


Figure 3. PGL Frost Depth Data

Conclusions

In conclusion, PGL has a process in place for the collection of frost depth data. This process begins with field crews taking a measurement as part of routine work activities when ground frost may be present. PGL has also completed the integration of the frost depth data into GIS and developed a GIS application that displays the data geospatially.

Currently the volume of data points available are not enough to make broad conclusions as to frost depth but PGL will continue to obtain frost depth measurements during each winter season in alignment with Kiefner’s recommendation and assess the impact of frost heave on PGL’s cast iron and ductile pipes. As data points increases, PGL will evaluate methods to incorporate the data into project planning activities.