

## Kiefner Recommendations Updates

### **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.

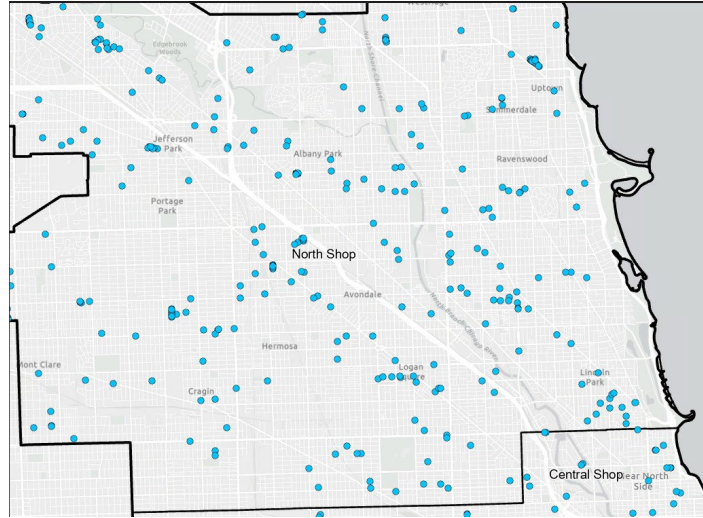
PGL acknowledges the safety risk that leaks, cracks and breaks caused by frost heave over many decades imposes on cast iron and ductile iron pipe and agrees with Kiefner's recommendation to work on better understanding these impacts. PGL has already started obtaining frost depth data and mapping it in its Geographic Information System (GIS). PGL anticipates that it will take several years of gathering frost depth data to ensure an adequate sample size is collected to effectively analyze and correlate it to its aging infrastructure.

In response to Kiefner's recommendation, PGL will collect frost depth data and incorporate the data into its 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 2024 Frost Depth Data Analysis**

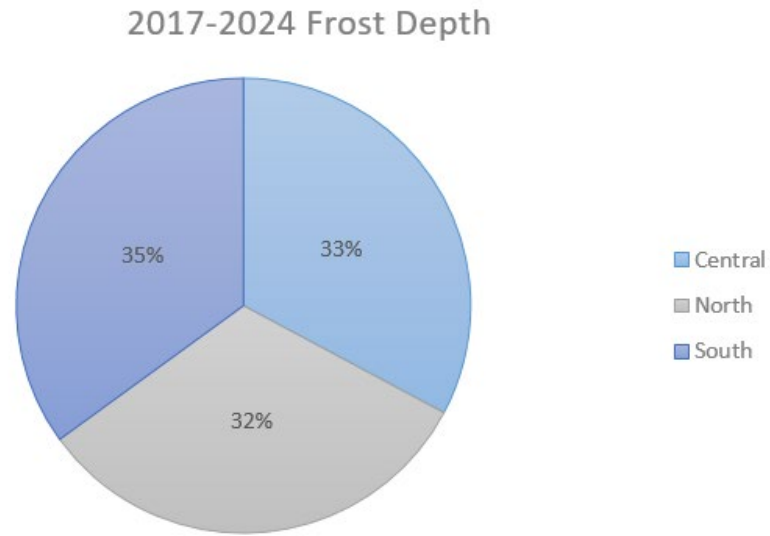
PGL began to capture frost depth data back in 2017. This data is gathered as work is performed on gas mains or services when ground frost may be present. Since 2017, a total of 27,188 frost depth measurements have been collected. This data has been grouped by winter seasons, defined as November of the previous year through April of the following year (for instance, data gathered for the winter of 2024 would include November 2023 through April 2024).

PGL has completed the integration of the frost depth data into GIS and developed a GIS application that displays the data geospatially, as shown in Figure 1 below. This gives PGL the ability to evaluate these points to determine any relationships between this data and the health of its main currently in service.



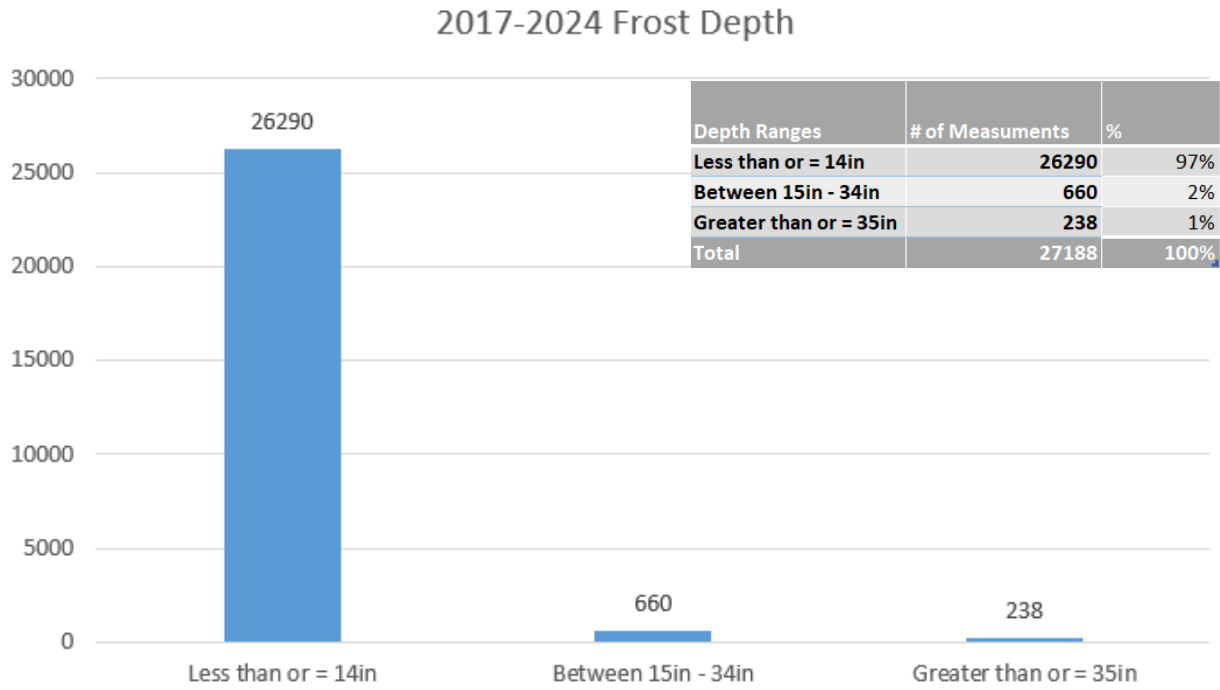
**Figure 1.** Snapshot of PGL Frost Depth Data Viewer

Figure 2 shows the breakdown of the 27,188 measurements across PGL’s three districts. The data input is evenly distributed across all three PGL district locations.



**Figure 2.** Frost Depth Data across PGL Districts

Figure 3 summarizes the measurements by frost depth and shows that a majority (97%) of the total documented frost depth measurements are less than 35”, with the majority of the measurements greater than or equal to 35” occurring during the winter of 2023 (shown in Table 1).



**Figure 3. PGL Frost Depth Data**

Year	# of Measurement >= 35”	Total %
2017	3	1%
2018	66	24%
2019	7	3%
2020	2	1%
2021	3	1%
2022	31	11%
2023	163	59%
2024	2	1%

**Table 1. Frost Depth Point Greater than or= 35in**

## **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.

PGL continues to obtain frost depth measurements during each winter season in alignment with Kiefner's recommendation. This data is currently being assessed to determine the impact of frost heave on PGL's aging infrastructure, specifically its cast iron and ductile pipes.