GPRS SUBSURFACE SCANNING SOLUTIONS

Society of Texas Environmental Professionals

Nate Newsome – Business Development Manager

Nate started with the company in 2017 as the Corporate Safety Manager based out of the headquarters in Toledo, OH. Nate has helped set the tone for our current safety culture at GPRS and have "Safety" adopted as a core value. Prior to GPRS, Nate owned one of the largest commercial fishing/fish wholesale companies in Michigan for 9 years. His passion is helping meet clients needs while growing long lasting relationships.

Contact Information: nate.newsome@gprsinc.com | Mobile: (469) 332-6429

Christopher Polley, PE – Regional Director

Chris started in the construction industry with GPR-based utility locating and concrete scanning in 2017 as an operations manager. Shortly thereafter, the company was acquired by GPRS and he recently moved into leading GPRS' Central Region. Prior to GPRS, Chris was a structural engineer at Boeing and is a registered Professional Engineer, licensed in Washington State. His driving motivation is to exceed each of our clients' expectations while developing the team to be their best and provide opportunities for their growth, both personally and professionally.

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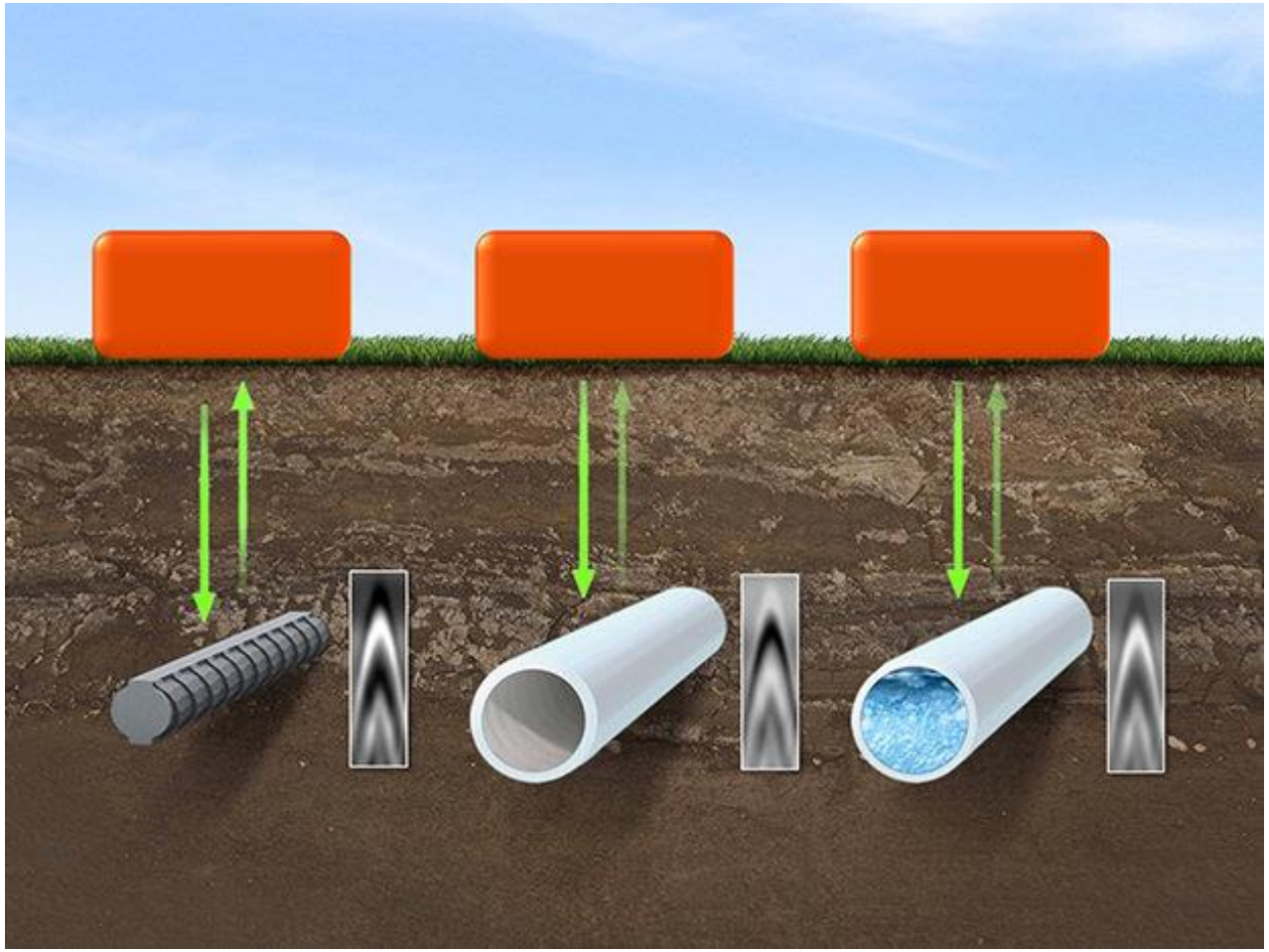
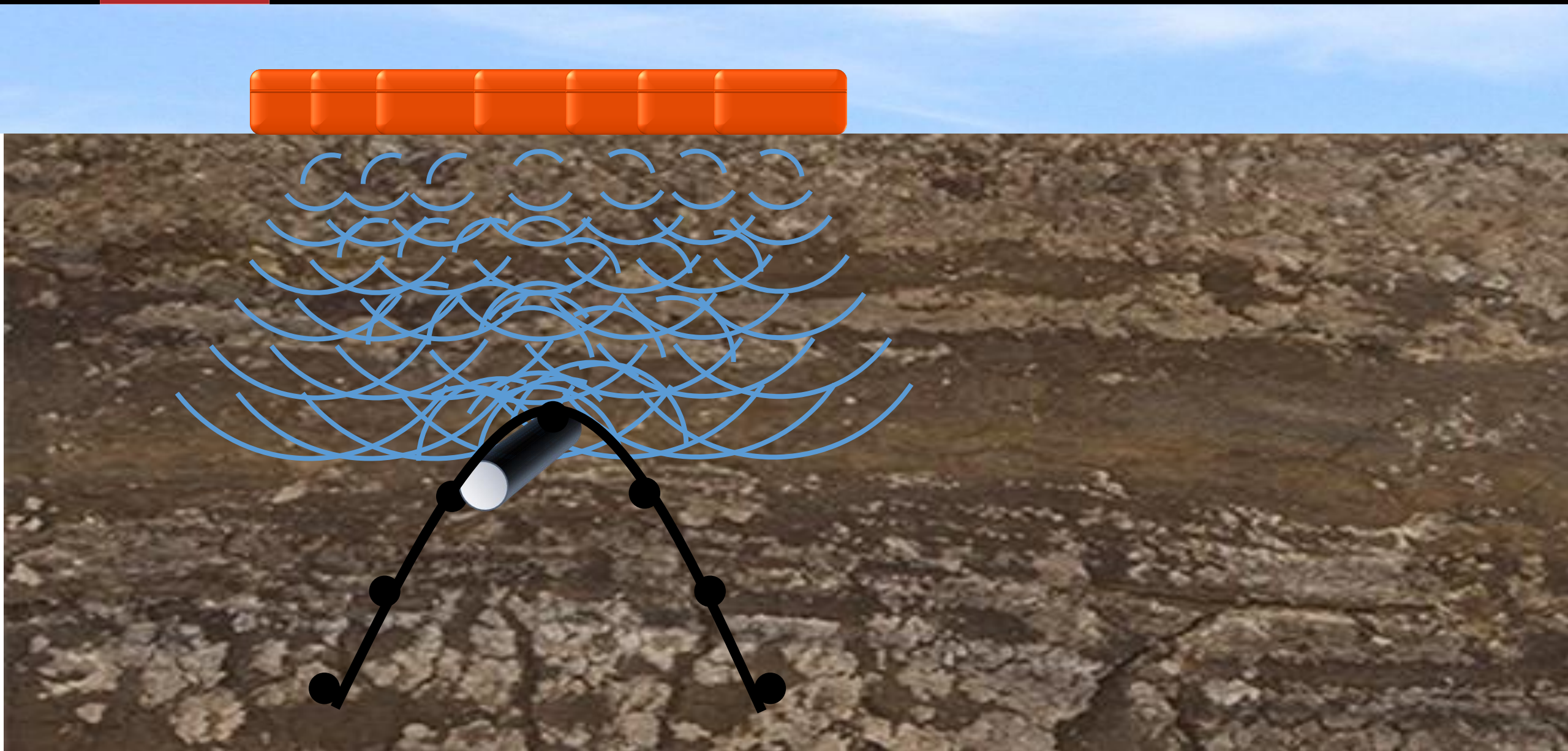
How Does GPR Work



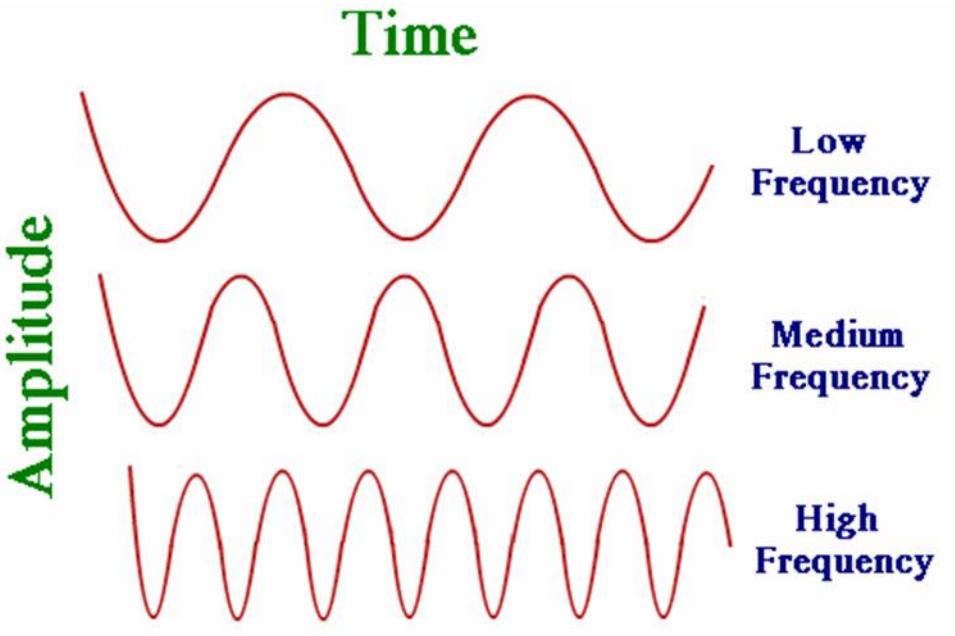
Antenna Cross-Section

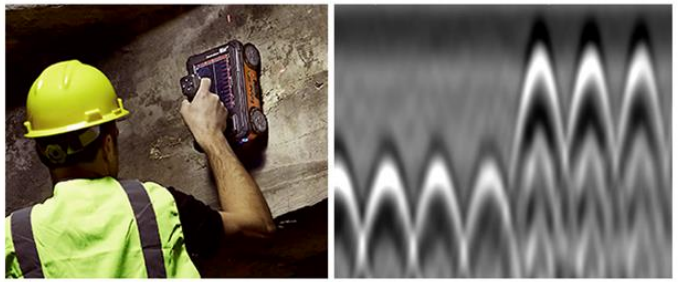
Soil



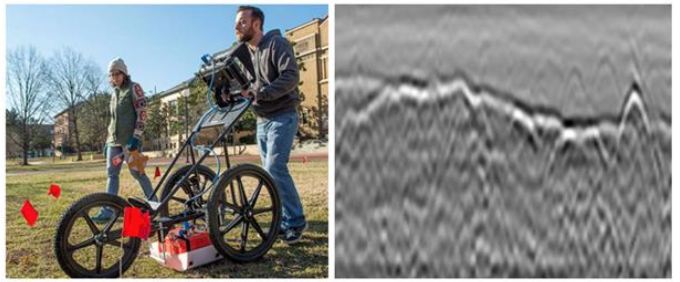
Frequency

Higher frequencies will have better resolution but will achieve less depth penetration and lower frequencies will achieve greater depths but with less resolution. This tradeoff always exists.

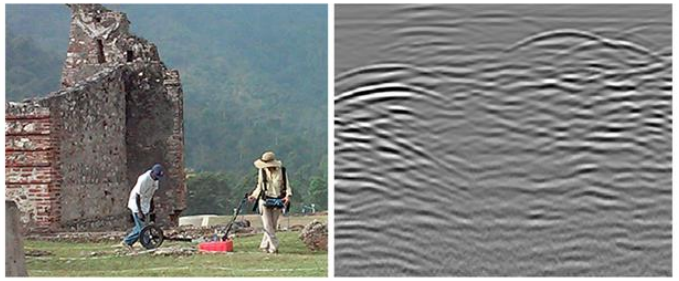




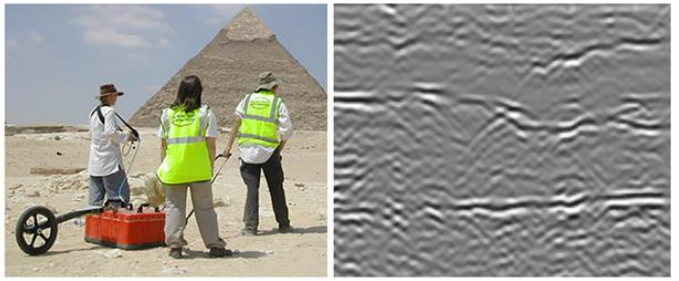
20 in concrete: 2.7 GHz



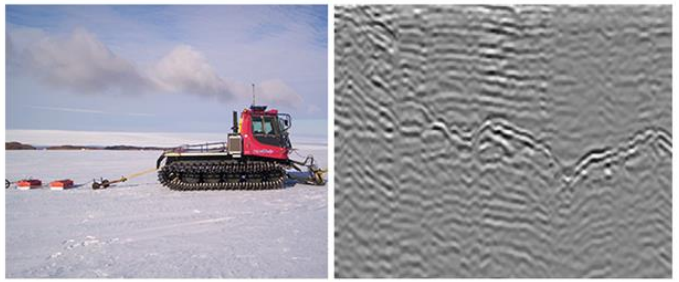
8 ft into the ground: 400 MHz



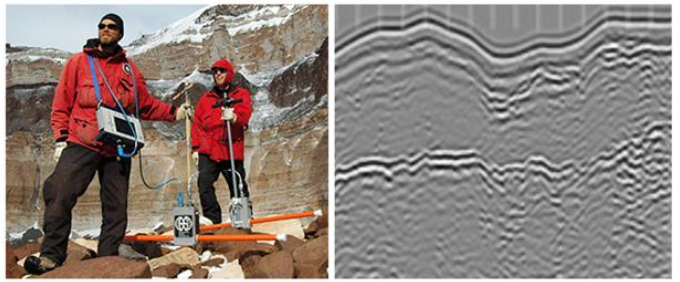
12 ft into the ground: 270 MHz



25 ft into the ground: 200 MHz



100 ft into the ground: 100 MHz



1000 ft in ice: 16 MHz – 80 MHz

Dielectric Constant & Time of Flight

Dielectric Constant (Permittivity Constant): $\varepsilon_r(\omega) = \frac{\varepsilon(\omega)}{\varepsilon_0}$

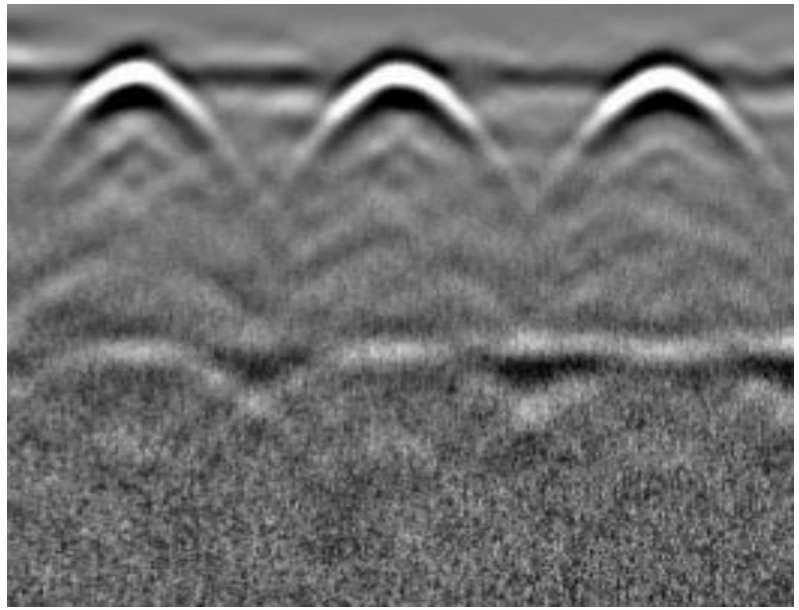
Time of Flight: $V_s \approx \frac{c}{\sqrt{\varepsilon_r(\omega)}}$

The dielectric constant provides a means of quantifying the relative radar reflectivity of commonly located items and affects the time of flight TOF calculations of the RADAR energy through a medium.

A GPR operator has the capability to adjust the baseline dielectric constant to change the TOF calculations to match measured ground truths.

A change in the dielectric constant is what ultimately provides the targets, as seen in the GPR data.

Common Dielectric Values for GPR Targets	
Air (i.e., voids and empty conduits)	1
Nominally Dry Soils and Concrete	4 – 7
Water	81
Metal (i.e., rebar, PT cables, etc.)	∞



GPR - UTILTIY LOCATING

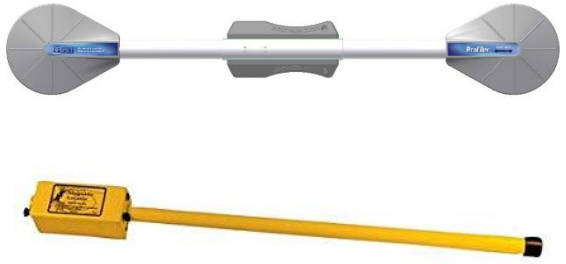
Ground Penetrating Radar:

- Utilities, underground storage tanks, voids, obstruction/debris
- Standard GPR has a typical depth penetration of 2’-5’ deep

Limitations:

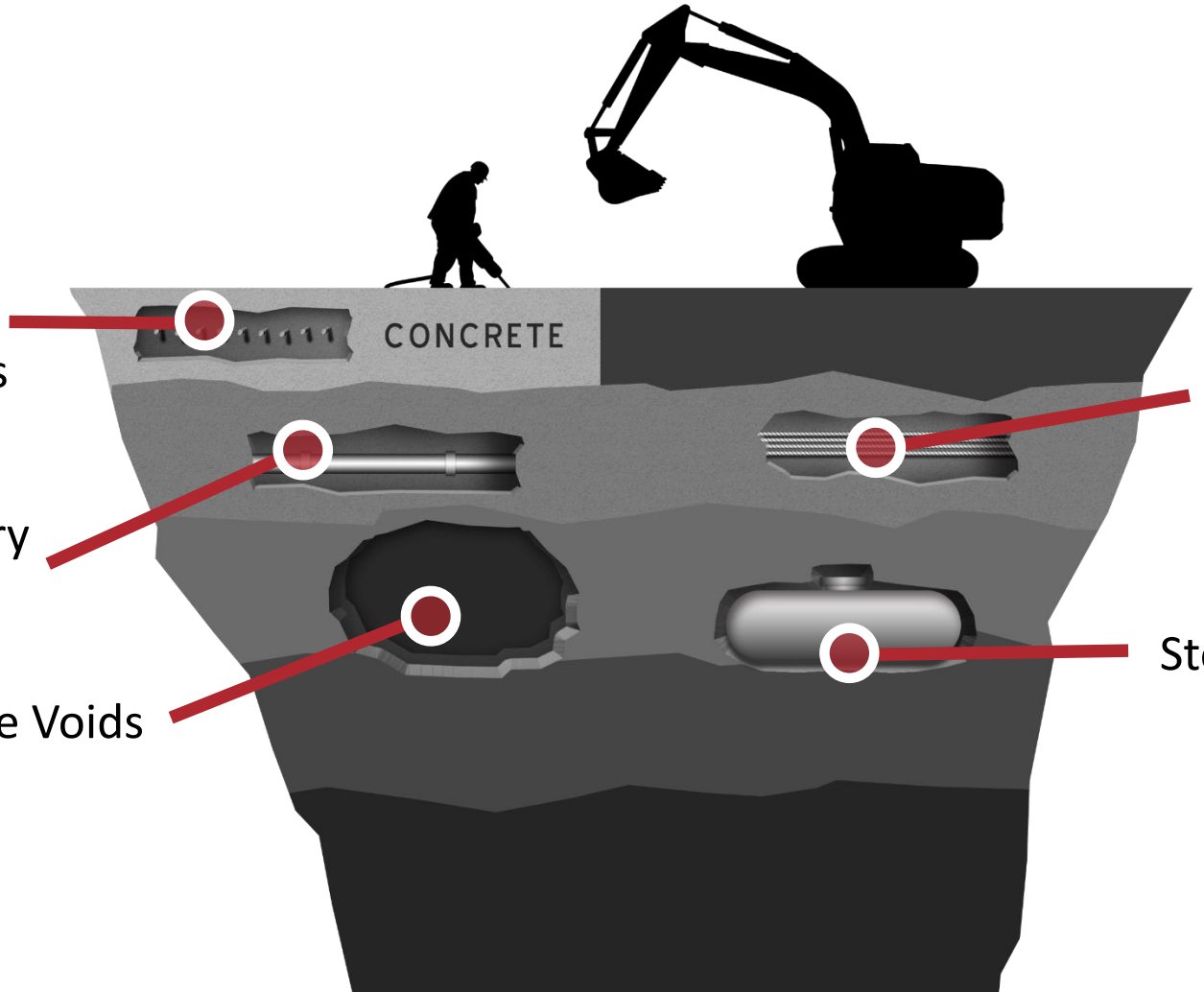
- **Size of target** – typically, a target (utility) must be at least 1” in diameter per 1’ of depth in order for it to be located with GPR.
- **Soil conditions** – clay soils, wet soil or soil which contains high amounts of debris can limit the effectiveness of GPR.
- **Surface conditions** – brush, standing water, metal plating, or anything which blocks direct access to the area to be scanned will limit the ability to perform GPR

UTILITY LOCATING



GPRS

UNKNOWNS BENEATH THE SURFACE



PT Cable,
Rebar & Conduits

Water & Sanitary
Lines

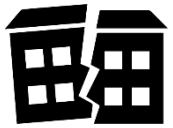
Sub Grade Voids

Gas & Electric Lines

Storage Tanks

WHAT IS AT RISK?

TIME



PROPERTY

REPUTATION

PEOPLE

UTILITY STRIKE STATISTICS

- Estimated over **20 million miles of active underground utilities throughout the United States**
- More than **65%** of underground utilities in the United States are **privately owned**.
- On average, it is estimated a utility line is damaged **every six minutes** in the United States
- The CGA came out with a 20 year study that showed utility strikes have resulted in **1906 injuries and 421 deaths**

Common Ground Alliance

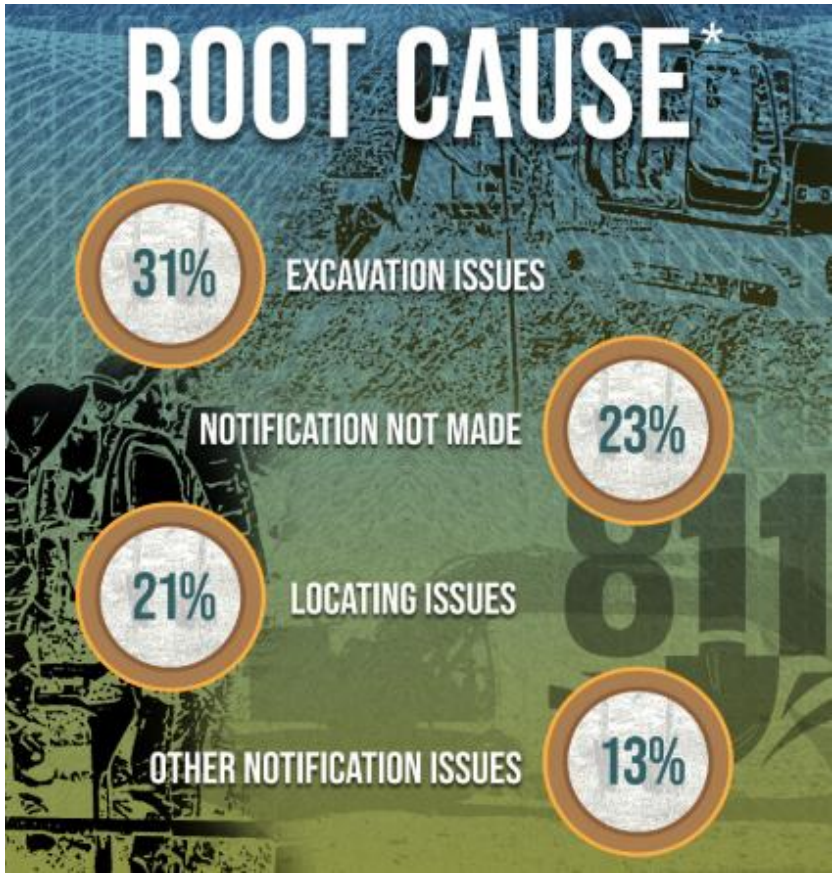
UTILITY STRIKE STATISTICS – NATIONAL (2018)

Top Four Utilities Damaged

1) Communication Lines (47%)
2) Natural Gas Lines (26%)
3) Cable TV Lines (11%)
4) Electric (9%)

Top Three Root Cause Groups

1) Excavating Issues
2) **Notification was NOT made**
3) Locating Issues



UTILITY LOCATING - MARKINGS

CONCRETE SCANNING

Targets

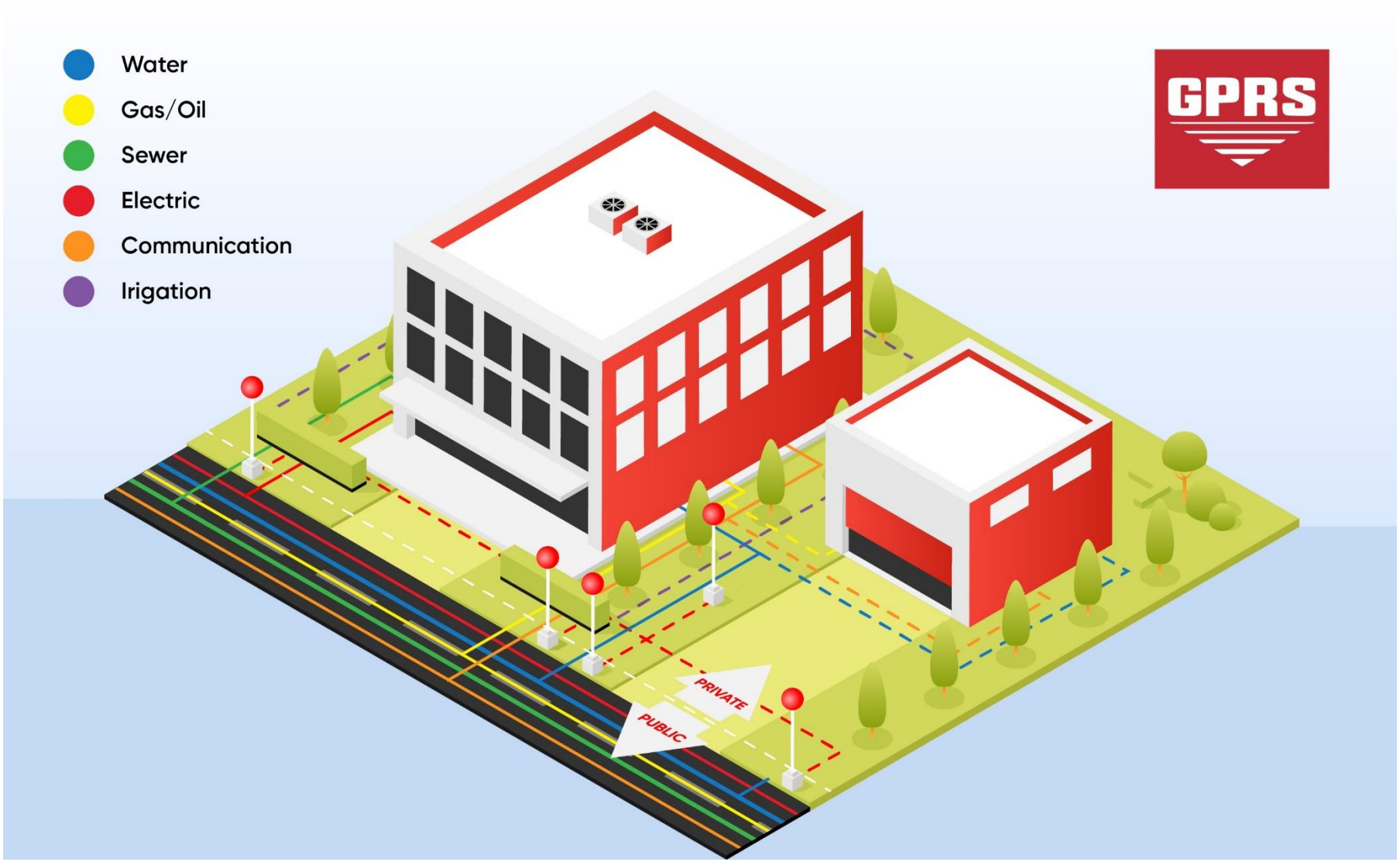
Reinforcing Steel
PT Cables
Electrical Conduits
Concrete Thickness
Voids in or under the slab
Structural Beams

Limitations

Typically 18”- 24” depth penetration
Estimated (+/-) ¼” from center, (+/-) ½” depth
GPRS recommends 1” from markings
Green or wet concrete limits effectiveness
Hard to penetrate through metal fiber slabs
Cannot determine size of reinforcing steel

CONCRETE SCANNING

Private vs Public



GPRS **REPORTING SERVICES**

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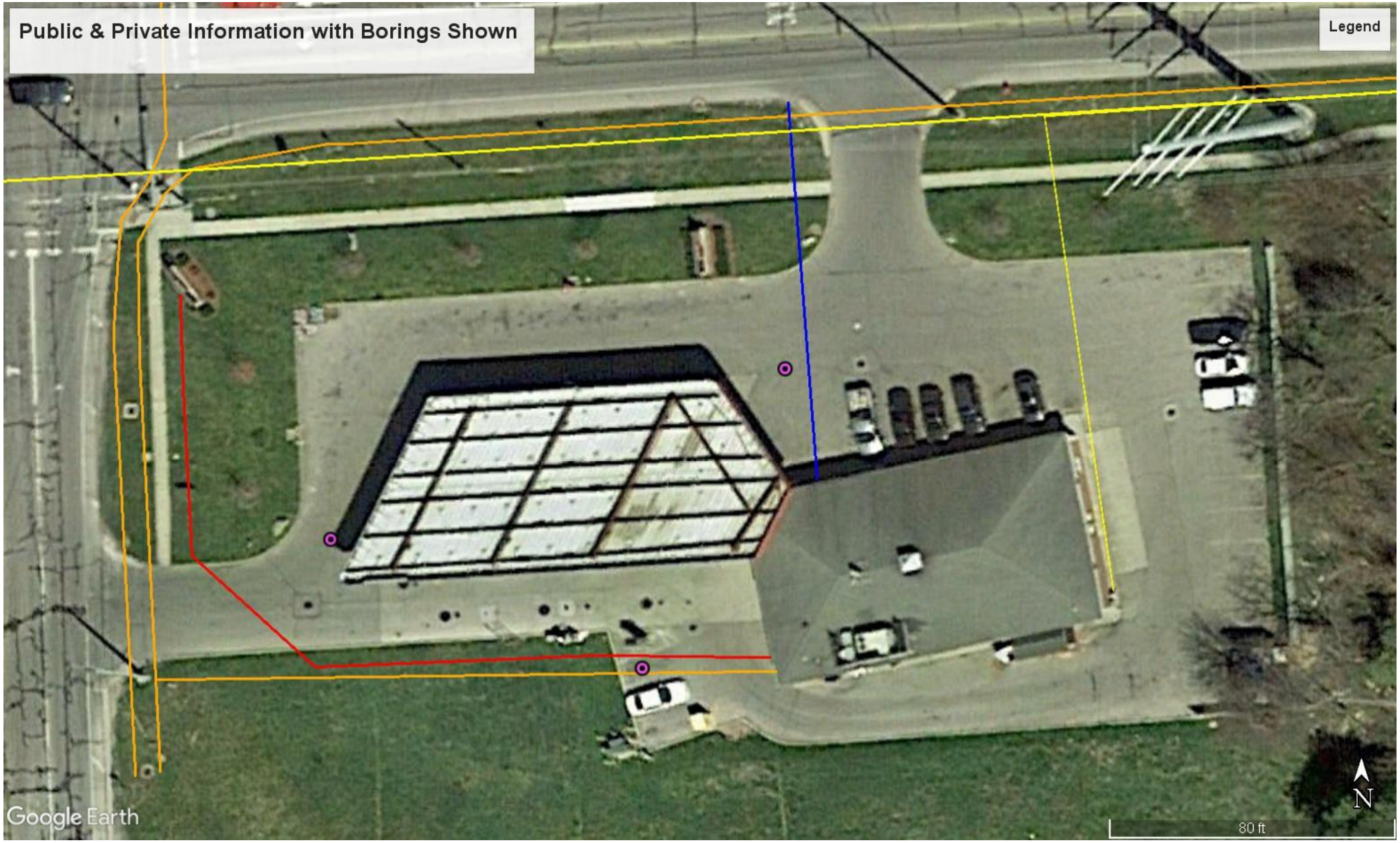

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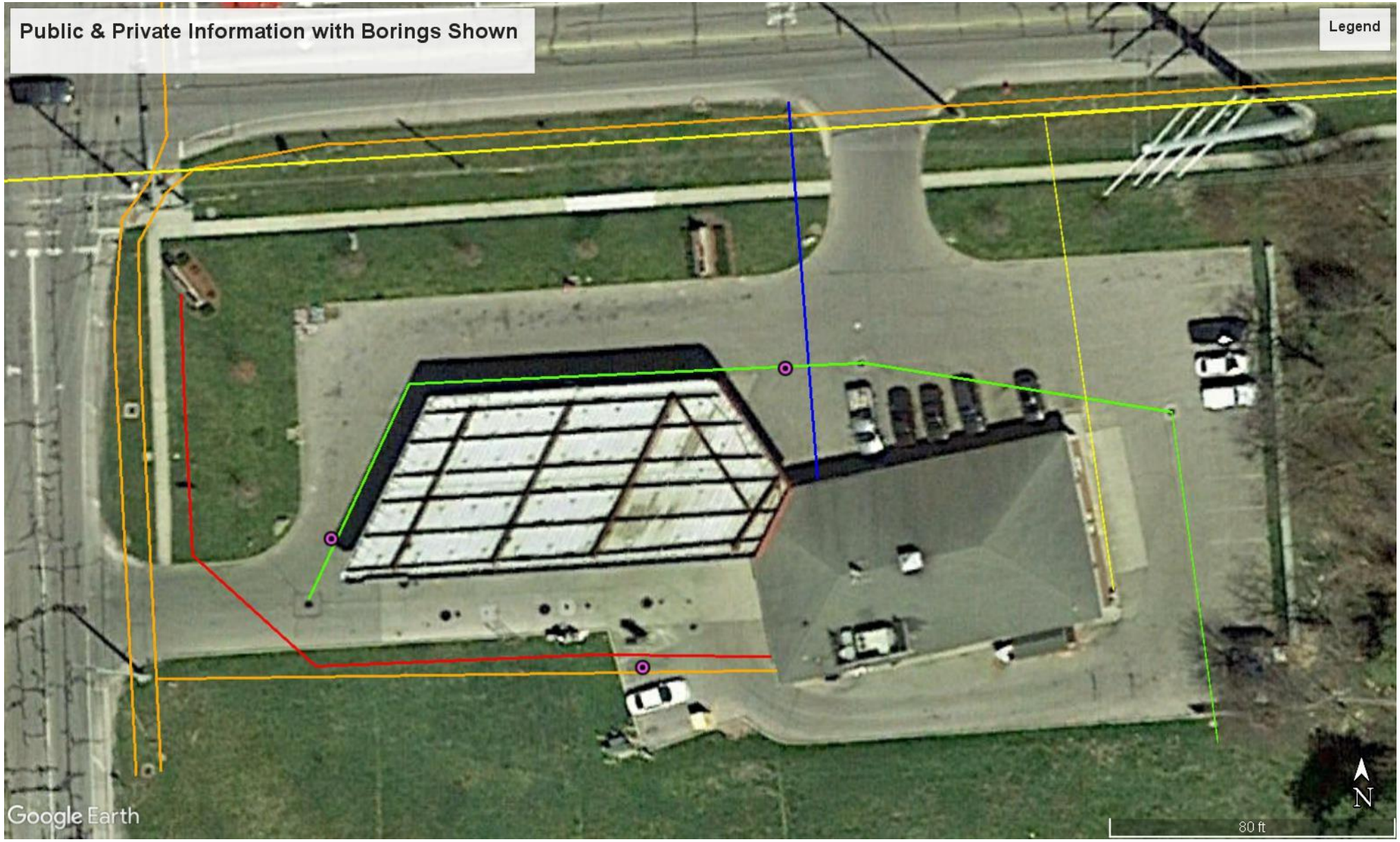

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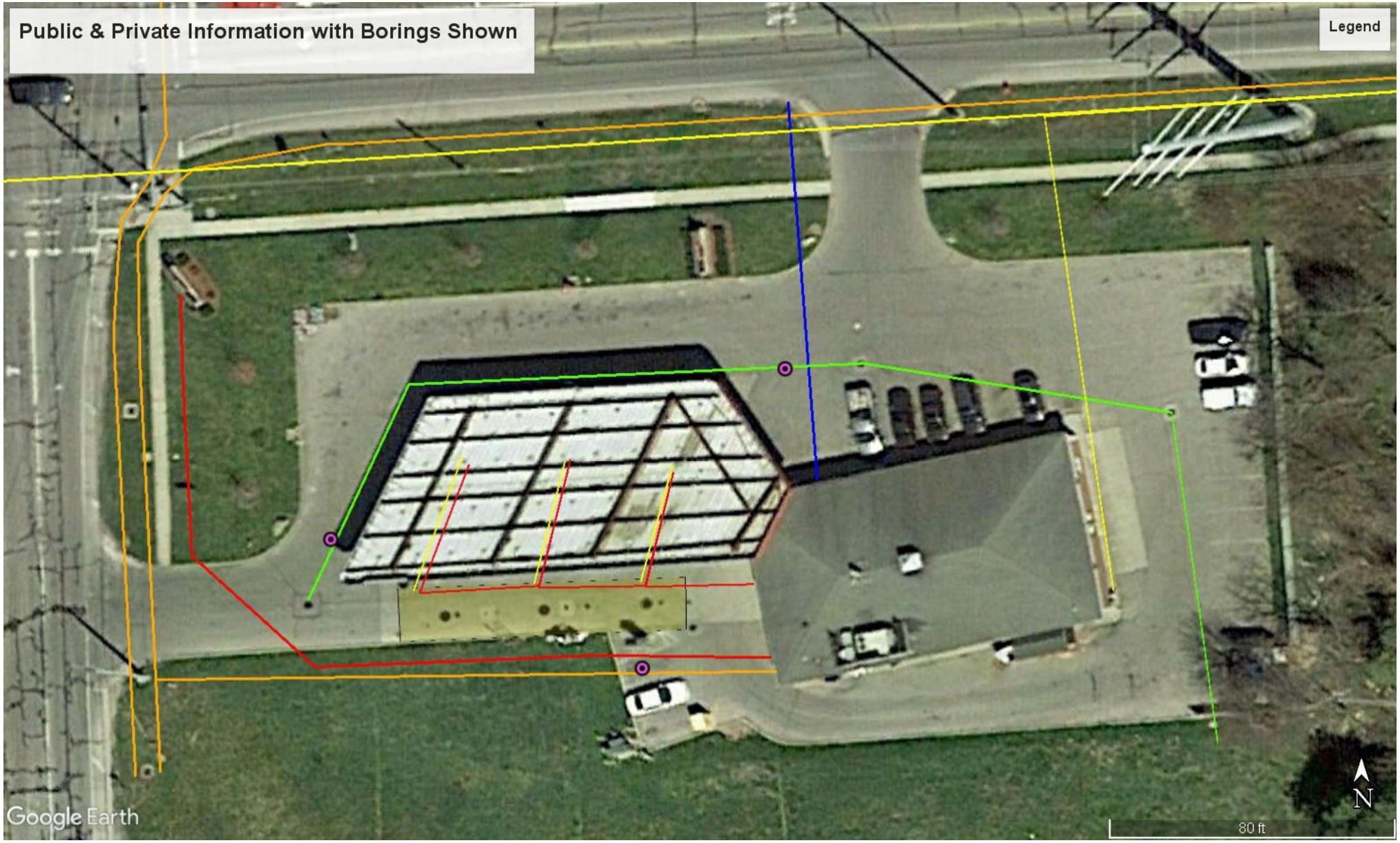

Conclusion

Questions?