



High School UNDERGROUND UTILITY DAMAGE PREVENTION *Locating Utilities*

Presentation by: On

Month Day 2022



KEEN

KENTUCKY

ENGINEERING

EXPOSURE NETWORK



**An education initiative by the
Kentucky Transportation Cabinet**

in partnership with:



ATMOS
energy®



What are utilities?

Occupying road right of way

Locating utilities before excavating

Utilities layout

Utilities test equipment

What are utilities?



- Electricity
- Gas
- Crude oil
- Water
- Sewage
- Other fluid
- Phone and Cable

**Conveyed to or for the public, for compensation*
Kentucky Revised Statute KRS 278.010



Why are utilities in a row?

- Utilities may construct and maintain lines in the road right-of-way
- They can't interfere with the road
- The Department of Highways regulates access via a permitting process
- If the lines interfere with the road, the utility has to relocate or remove it



NAME THAT UTILITY

Name that Utility



Name that Utility



Name that Utility



WATER

SEWER

Name that Utility



Name that Utility



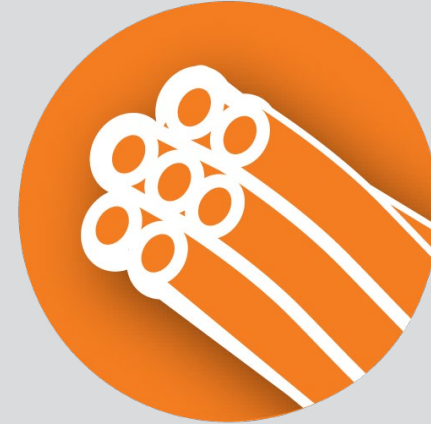
**SEWER PUMP
STATION**

Name that Utility





Name that Utility



**TELECOMMUNICATION
(UNDERGROUND PHONE)**

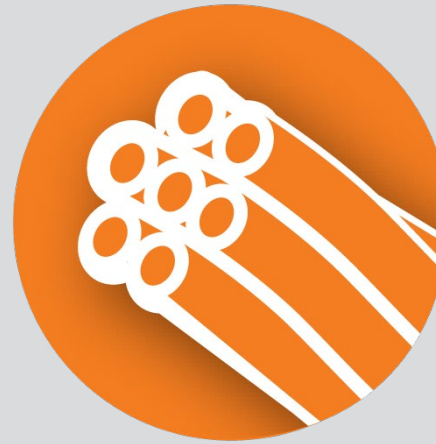
PEDESTALS

Name that Utility





Name that Utility



**TELECOMMUNICATION
(UNDERGROUND PHONE)**

WATER FIRE HYDRANT

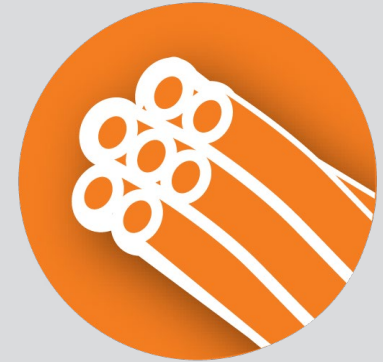
UG FIBER OPTIC

Name that Utility





Name that Utility



**AERIAL POLE ROUTE
ELECTRIC
CATV W/ SLACK
TELECOMMUNICATION
(PHONE)**



Locating utilities before excavating

- Locating underground utilities is becoming more of a challenge as the amount and variety of underground lines increase.
- As the ground under our feet becomes more congested, it's vital to identify the location of utilities to ensure safety and reduce cost.

Locating utilities before excavating

CAMBY IND, NEAR
INDIANAPOLIS



Locating utilities before excavating

DALLAS FORT
WORTH TX AREA



Locating utilities before excavating

SAN ANTONIO, TX

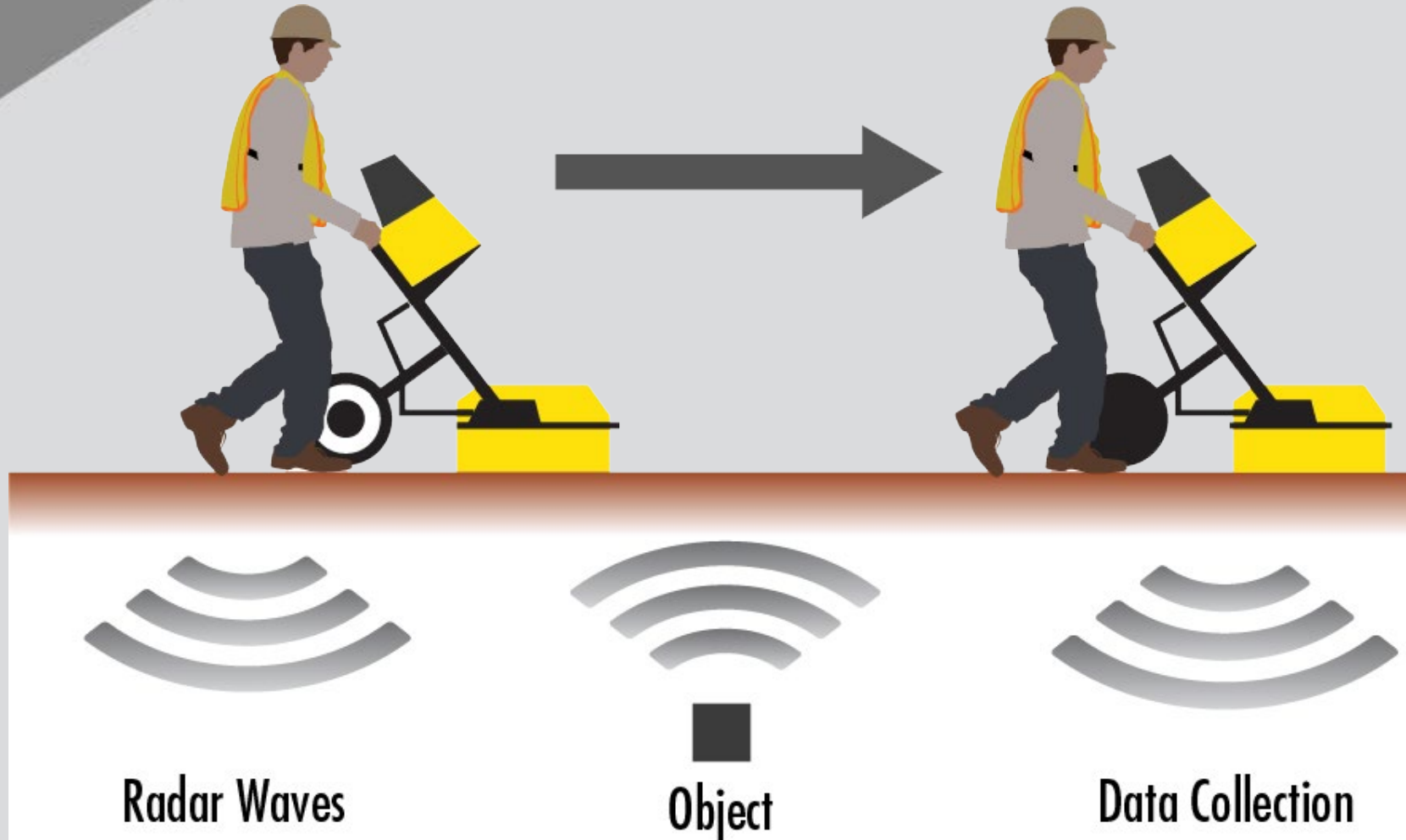


An illustration in the top-left corner shows a white house with a red roof and a red door, a green lawn with a small tree, and a grey sidewalk. A yellow rounded rectangle containing the title is positioned over the middle of the image.

What are the common underground utility location methods?

- 1. Ground penetrating radar**
- 2. Hydro excavation**
- 3. Electromagnetic utility locating**

Ground Penetrating Radar





Ground Penetrating Radar

- Uses high frequency pulses
- Radio waves are emitted into the ground
- Underground utilities deflect the radio wave back up
- Requires experience and training



A photograph of a utility worker wearing a white hard hat and a high-visibility yellow-green safety vest with reflective stripes. The worker is standing on a gravel surface in a utility field, operating a Ground Penetrating Radar (GPR) device. The device has two large black wheels and a handle. In the background, there are several tall metal poles and power lines. The ground is covered in gravel, and there are some red markings on the ground in the foreground.

Ground Penetrating Radar

- Best imaging solution for both metallic and non-metallic targets
- Both position and depth can be found
- Detects changes in underground conditions by reflecting off any disturbance:
 - Wet soil
 - Rocks
 - Metal
 - Plastic

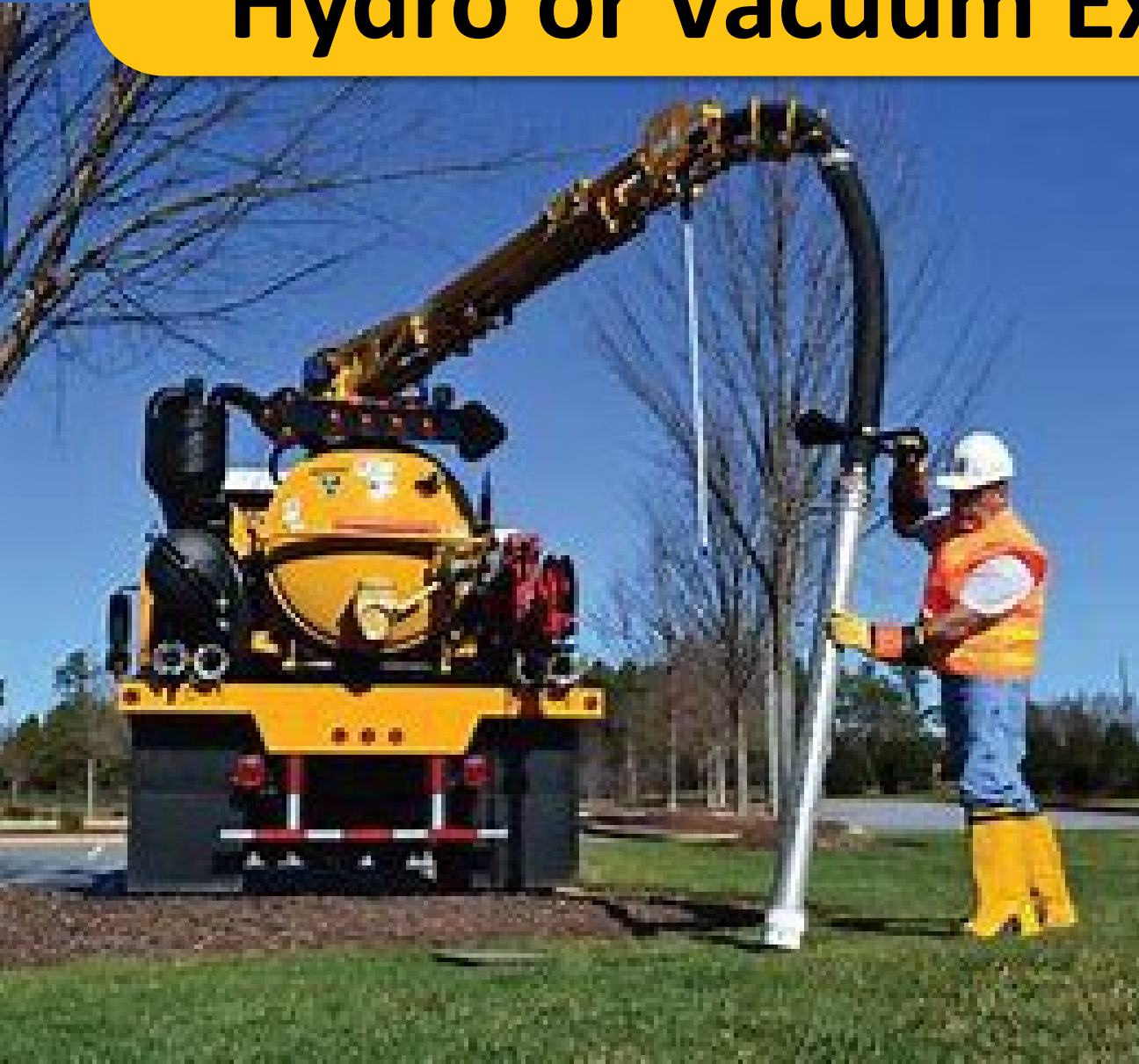
Ground Penetrating Radar



Limitations:

- Some soils like shale or clay
- Only for shallow utilities
- Dense soil
- Crowded utilities

Hydro or Vacuum Excavation (potholing)



- Fast and non-destructive
- High pressure air or water is used to break up the soil,
- Soil is then vacuumed into a tank
- Precisely locates the utility but only at this specific location

**Also known as potholing, hydro-digging, hydro-trenching or soft digging*

Electromagnetic Utility Locating



- Most common method
- Generates an electromagnetic signal
- Commonly used to detect gas, electric, telephone, cable, propane, water, sewer, storm and irrigation lines

Electromagnetic Utility Locating



Limitations:

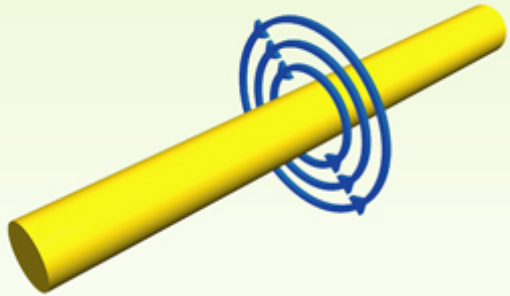
- Cannot locate plastic, concrete, clay or other non-ductile pipes
- Doesn't perform well beyond the depth of 10-15 feet

How Electromagnetic Locating Works

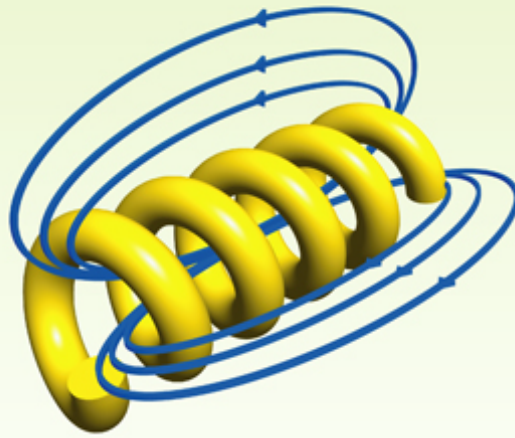


- Two parts: a transmitter and a receiver
- The transmitter places a “signal” onto the line then
- The signal is located with the receiver
- The signal placed on the line is an electromagnetic frequency

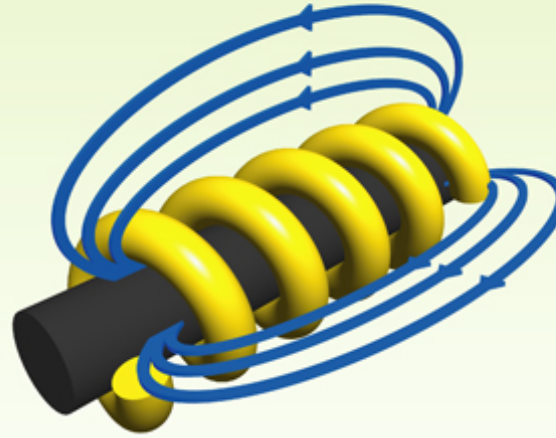
How Electromagnets Work



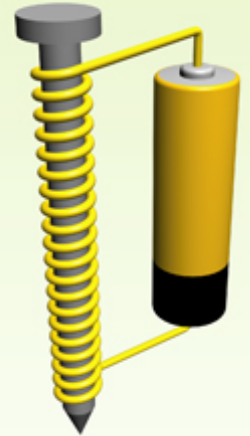
When electric current runs through a wire it generates a magnetic field around it. The magnetic field around a single wire very weak.



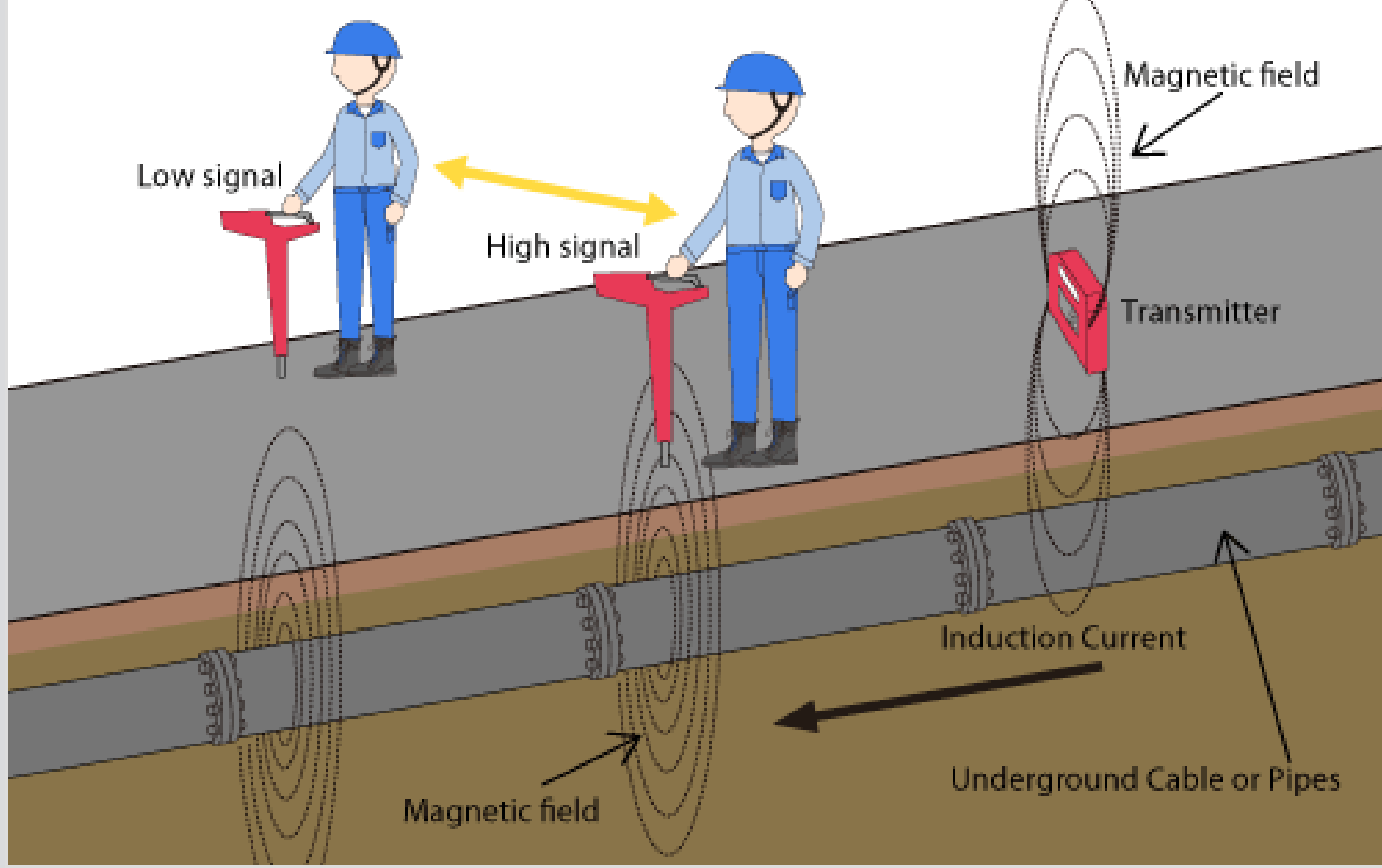
By wounding the wire into a coil and concentrating the magnetic field it produces a stronger field. More electrical current produces a stronger magnetic field.



The magnetic field can be made even stronger by placing an iron bar in the centre of the coil. This has a big effect on the electromagnet's power.



Try it your self by coiling a copper wire around a nail. Then connect the wire to a 1.5V battery. See how many staples you can pick up by changing the numbers of loops. You can also see what happens if you connect it to two batteries.





Pipe Types

Plastic Pipe:

PVC (polyvinyl-chloride) is a type of plastic pipe. It is a commonly used pipe for drain and water lines. It's strong, untouchable by chemicals, and seems to last forever!



Pipe Types

HDPE high density polyethylene pipe:

HDPE pipe is commonly used for sewer and storm water. It is more durable than standard PVC pipe and has become a popular material for underground piping systems.

A close-up photograph of several large-diameter steel pipes stacked together. The pipes are arranged diagonally, with some showing their circular ends. The metal surface is highly reflective, showing bright highlights and deep shadows that emphasize the industrial texture.

Pipe Types

Steel:

Steel pipe is strong, and can be used to transport liquids and gases including water. It can have a useful lifetime of about 50 years.

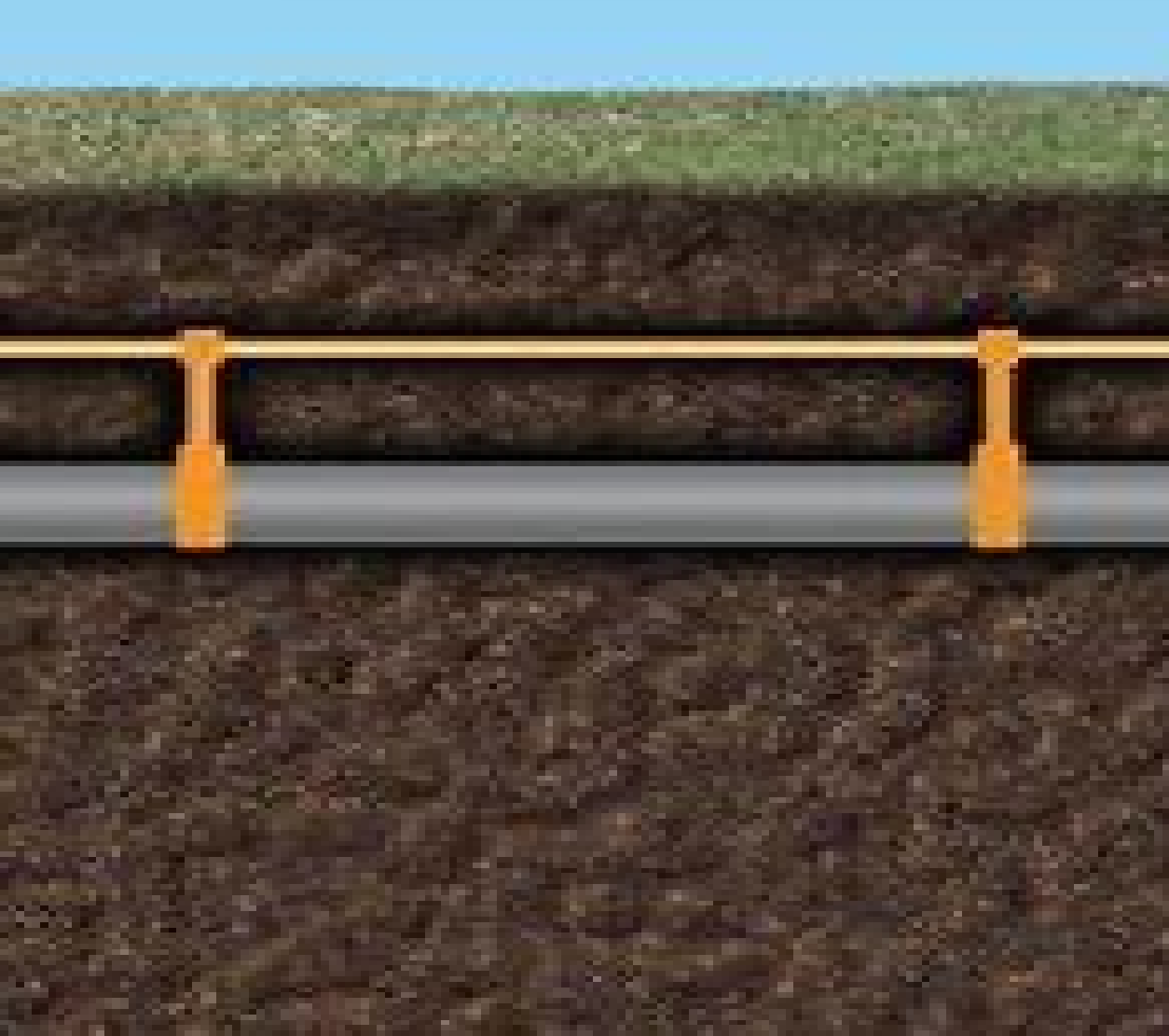


Electromagnetic Utility Locating

Utility lines like gas lines are generally constructed plastic pipe.

So, tracer wire is run alongside or on top of the pipeline to make the line “locatable.”

Electromagnetic Utility Locating



In these situations by having access to the system (e.g. a tracer wire box), a current can be induced on the tracer wire and the tracer wire can be located.

Electromagnetic Utility Locating



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**2 business days before
you dig, call**

811

**Or (800) 752-6007
www.Kentucky811.org**



Locating utilities

COLOR CODE



FOR MARKING UNDERGROUND UTILITY LINES

Electric



Gas,
Oil,
Steam



Communication
CATV



Potable
Water



Irrigation,
Reclaimed Water,
Slurry Lines



Sewer



Temporary
Survey
Markings



Proposed
Excavation



Locating utilities

Gas line



Electrical/comm line



Water line



Sewer/Storm line



An illustration in the top-left corner shows a white house with a red roof and a red door, a sidewalk, a road, and some green trees.



Ways to induce field

1. Connect to the metal tracer wire
2. Connect to the metal facility
3. Lay the transmitter over the line and induce signal onto it

An illustration in the top-left corner shows a white house with a red roof and a red door, a green lawn with two trees, and a grey sidewalk leading to a grey road.

Ways to induce field


First two methods are best, but require us to actually be able to touch the facility.

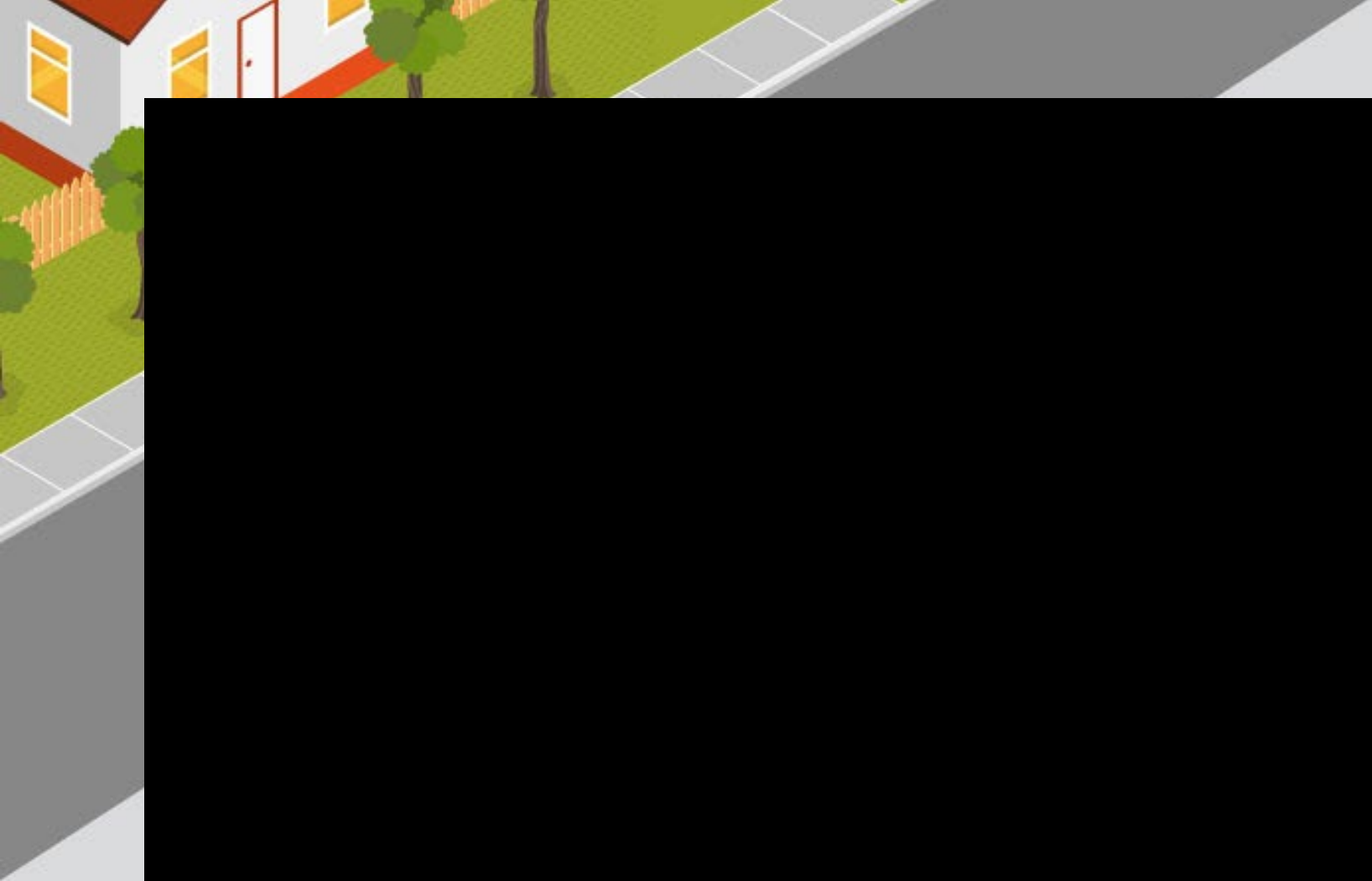
- 
- 
1. Connect to the metal tracer wire
 2. Connect to the metal facility
 3. Lay the transmitter over the line and induce signal onto it

An illustration in the top-left corner shows a portion of a white house with a red roof and a red door. A grey sidewalk runs along the front of the property, which is bordered by a green lawn and a few small green trees.

Ways to induce field

**Last method
puts signal onto
everything in
the ground and
is imprecise,
but sometimes
the only option.**

- 
- A large yellow arrow pointing from the text box on the left towards the third item in the list.
1. Connect to the metal tracer wire
 2. Connect to the metal facility
 3. Lay the transmitter over the line and induce signal onto it





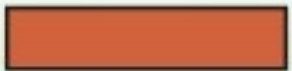


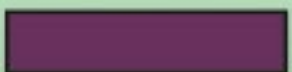

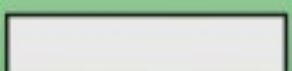
Time to be locators!





Know what's **below**.
811 before you dig.

COLOR CODE FOR UTILITY MARKINGS

	ELECTRIC
	GAS-OIL-STEAM
	TELEPHONE & CABLE TV
	WATER
	SEWER
	RECLAIMED WATER
	TEMPORARY SURVEY MARKINGS
	PROPOSED CONSTRUCTION

In Kentucky, visit 811Now.com or call 811
(or 800-752-6007) two full working days before you dig.

www.kentucky811.org

Time to be locators!

There are three lines in the project area:

1. Schedule 40 PVC Water Line
2. Polyethylene (PE) Sewer Line
3. Steel Gas Line



Time to be locators!

We've been called to locate them, where are they?

1. Hook onto their exposed tracer wire or metal pipe
2. Locate them
3. Mark them



An isometric illustration of a suburban street scene. On the left, a white house with a red roof and a red door is visible. A sidewalk runs along the street, with green lawns and small trees on either side. The street itself is grey and runs diagonally across the frame.

THANK YOU!



in partnership with:



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transportation.ky.gov/Education
/Pages/KEEN.aspx