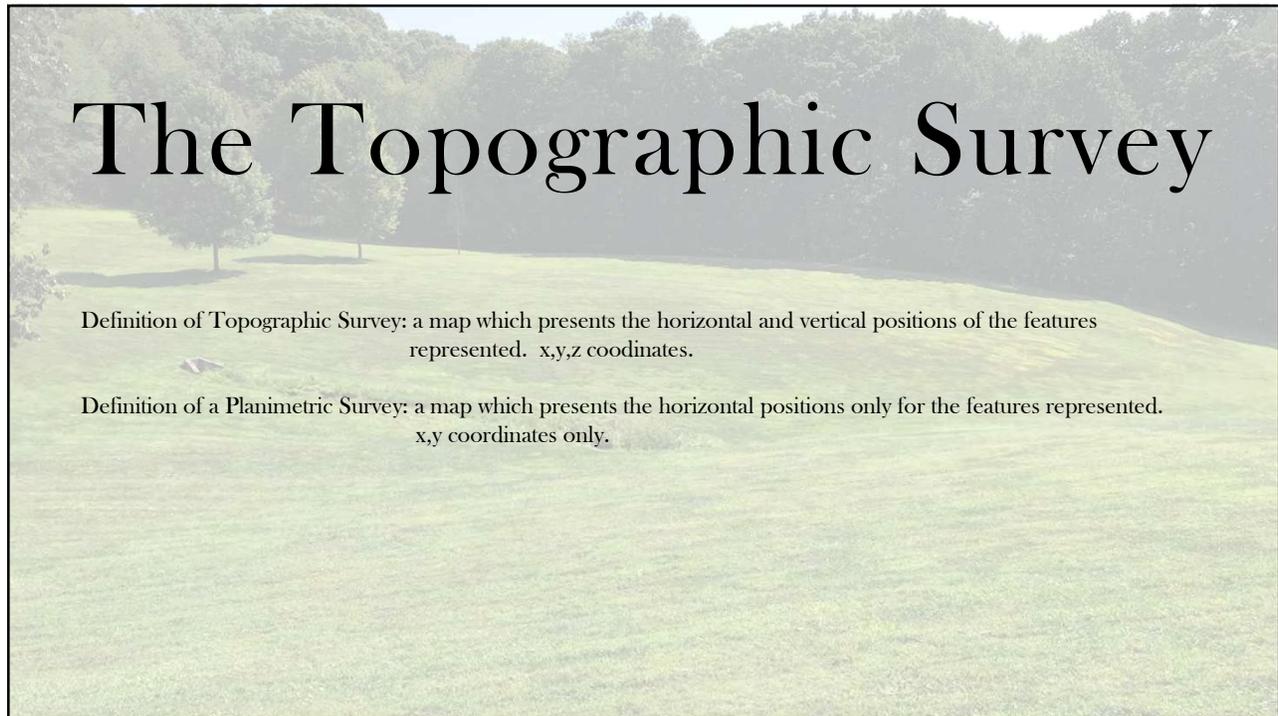


# The Topographic Survey

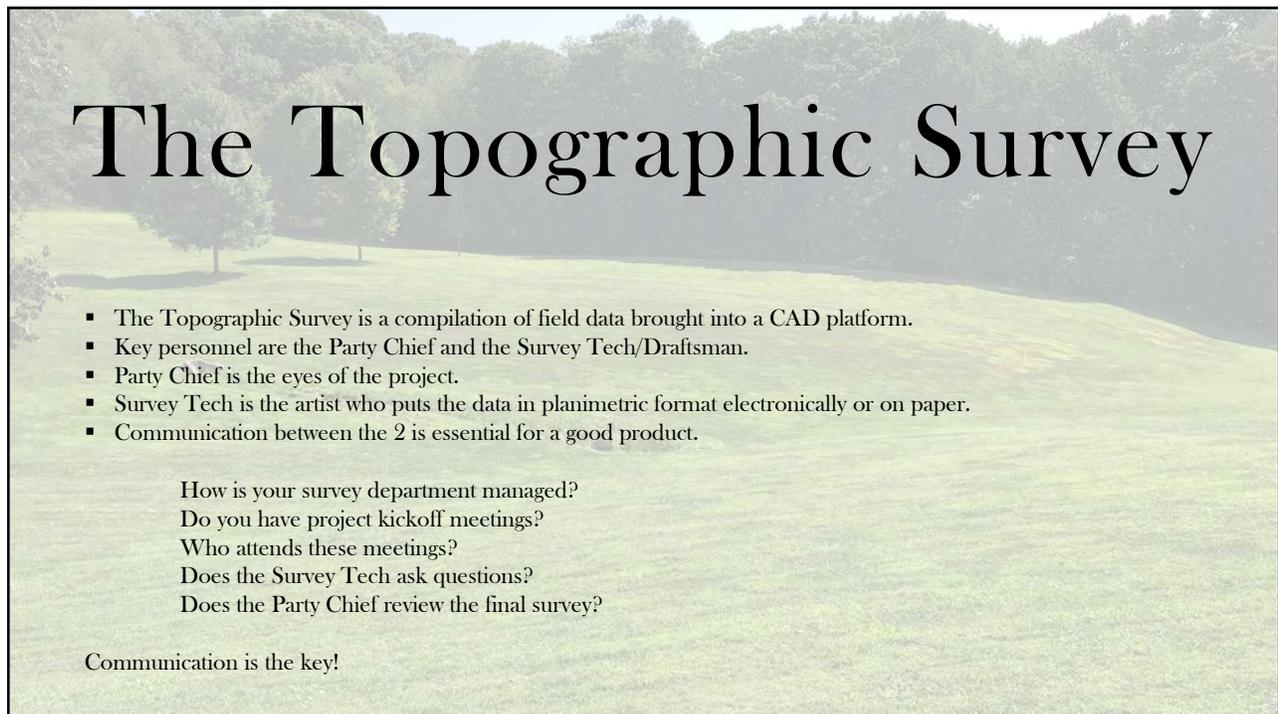
Pennsylvania Society of Land Surveyors  
2026 Conference

Presented by: Amy Hopkins, PLS (PA,NY)  
PSLS Past President  
January 11-14, 2026 | Hershey, PA





2



3

**Communication:**

How well do you convey what you expect from your field crew?

How well do you interpret those instruction?

**Scenario:**

You're wife asks you to make a fire pit in the back yard  
so you all can sit around the fire and toast marshmallows.

What kind of fire pit would you make?

6

**Communication:**

This is a functional option.

Ring of stones to contain the fire

It's in the back yard

You even collected limbs from around the yard



7

**Communication:**

**This is what she was envisioning!**



8

**Communication:**

**Did she give bad instructions or did you not Interpret the instructions correctly.**



9

# The Topographic Survey

Working parts or “elements” of a topographic survey:

**Ground shots:** elevation on ground surfaces.  
elevation of hard surface

**Breaklines:** 3 dimensional lines that help define the topography such as top & bottom of bank; centerline of ditch;  
top & bottom of retaining walls; top, bottom & back of curb; gutter lines; centerline or crown of road;

**Feature locations:** edge or outline of a physical feature that may or may not be a breakline, such as edge of pavement,  
sidewalk, buildings, utility poles, fences.

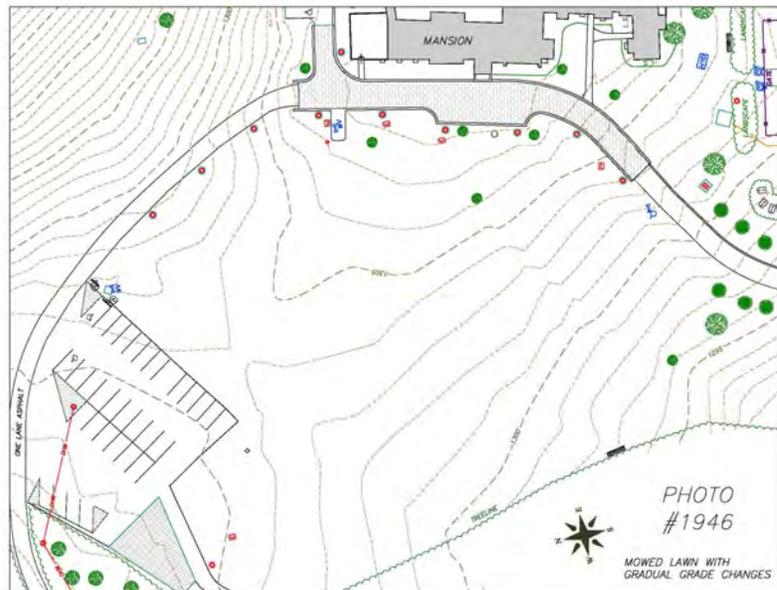
12

## Topographic Survey

Definitions:

**Contour:** an imaginary line on the ground, all points of which are at the same elevation.

**Contour interval:** the difference in elevations between adjacent contours on a map.



13

## Topography Examples:

## Gradual Grade Changes

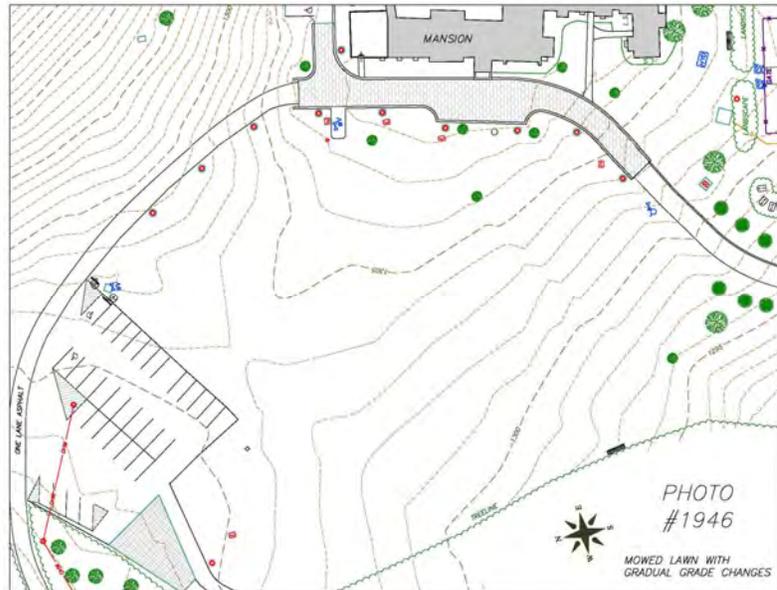
- No breaklines
- 50' grid of ground shots would suffice.



14

## Topography Examples: Gradual Grade Changes

- Determine Contour interval:  
Interval depends on how steep the terrain is and the scale of your map.
- 1' contour interval, index contours every 5'
- 2' contour interval, index contours every 10'
- 20' contour interval, index contours every 100'
- No breaklines needed in this example



15

## Topography Examples: Gradual Grade Changes

- No breaklines
- 50' grid of ground shots would suffice.
- Locate abnormalities in the terrain:
  - Depressions
  - Mounds
  - Naturally occurring drainage
- Practice sheet

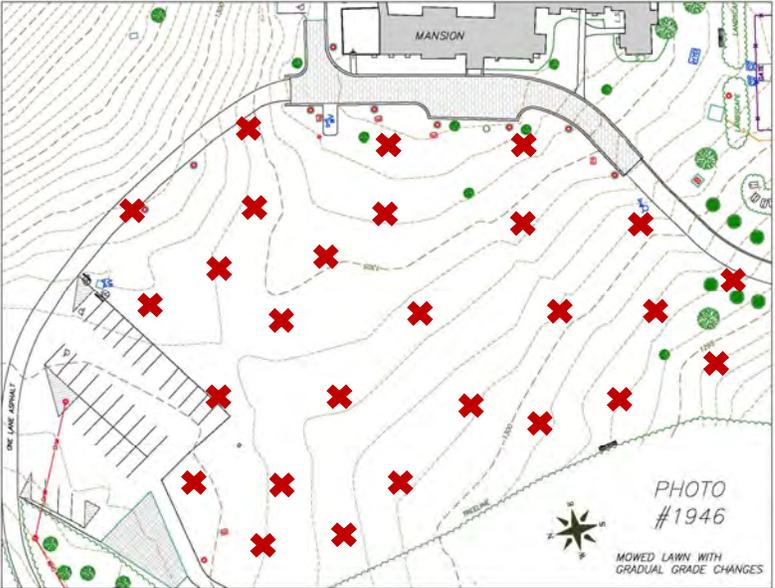


PHOTO  
#1946  
MOWED LAWN WITH  
GRADUAL GRADE CHANGES

16

## Topography Examples: Distinct Grade Changes

- Breaklines along Top & bottom of banks
- Supplement with ground shots



19

### Topography Examples: Distinct Grade Changes

- Breaklines along Top & bottom of banks
- Supplement with ground shots



20

### Topography Examples: Distinct Grade Changes

- Breaklines along Top & bottom of banks
- Supplement with ground shots

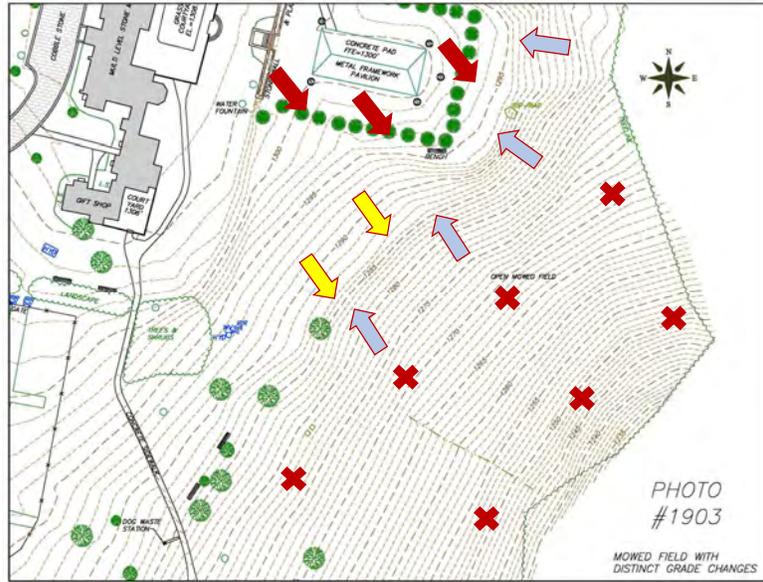


21

### Topography Examples:

- Breaklines along Top & bottom of banks
- Supplement with ground shots

### Distinct Grade Changes



22

### Project #1: Topographic Survey at Hartwood Acres



25

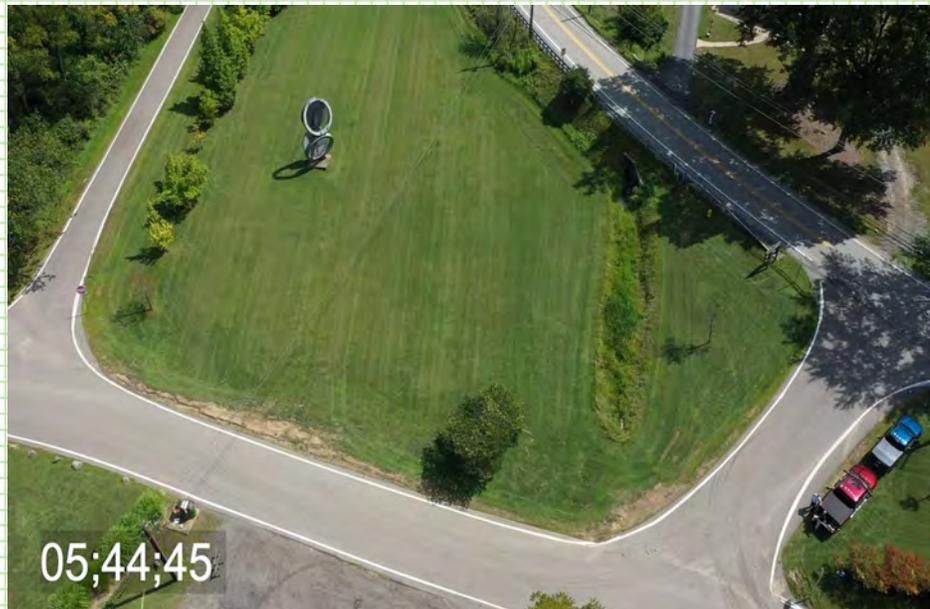
**Project #1:** Obtain permission for drone flight



26

**Project #1: Parts of the Topography**

- Paved State Road
- Paved access Roads
- Ditch or Swale
- Headwall
- Gradual grade open field



29

## Project #1: Parts of the Topography

- Paved State Road
  - Edge of pavement
  - Centerline of crown
  - Edge of shoulder
  - Top of bank
  - Bottom of bank
- Paved access Roads
  - Edge of pavement
  - Top of bank
  - Bottom of bank
- Ditch or Swale
  - Top of bank
  - Bottom of bank
  - Flowline
- Headwall
  - Top of wall
  - Bottom of wall
  - Invert of pipe



30

## Project #1: A State Road

- Paved State Road
  - Edge of pavement
  - Centerline of crown
  - Edge of traveled cartway
  - Edge of shoulder
  - Top of bank
  - Bottom of bank
- Non-topographic features
  - Guide rail
  - Sign
  - Utility poles

Carry elevations of all features, you may or may not use the elevation in your surface.

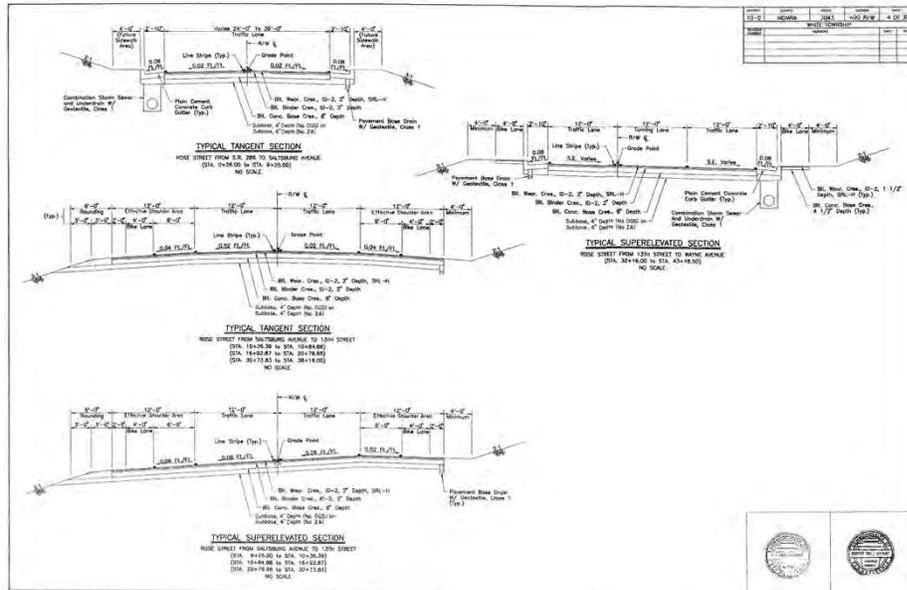
Be consistent with shots or note that elevation is not to be used to create the surface. (0.00 or -9999)



31

# Project #1: Road Section

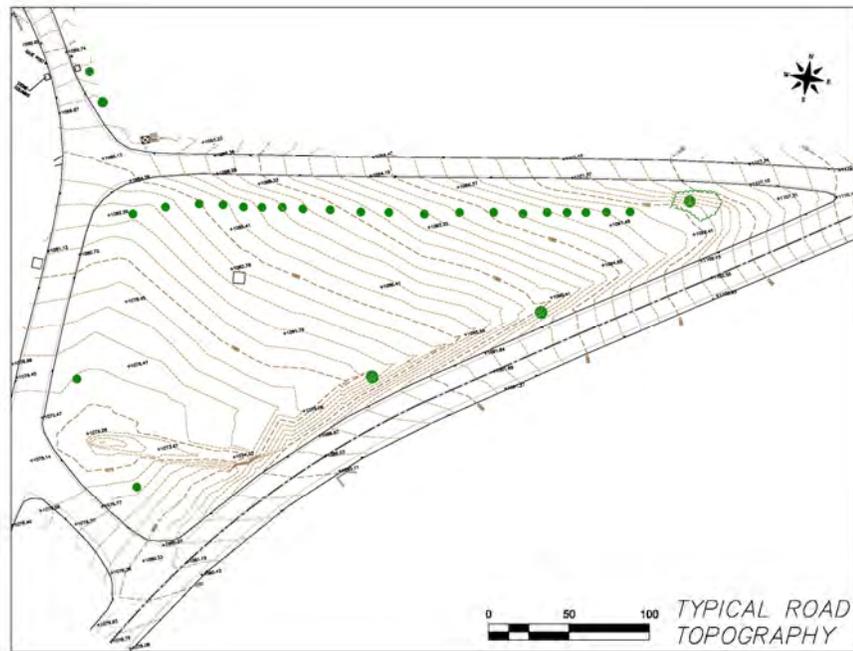
- Typical Road Sections



32

# Project #1: Road Contours

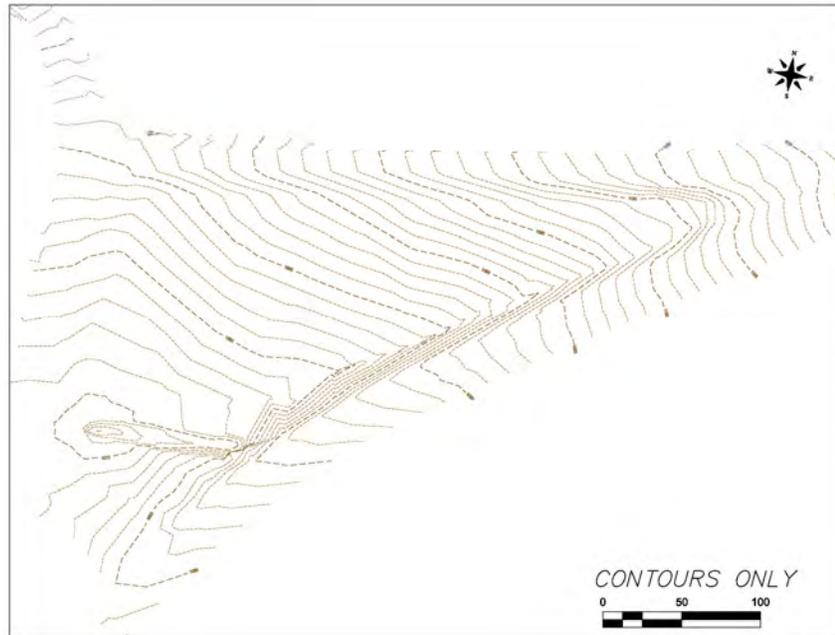
- Paved State Road
  - Crown defined by contours.
  - Contours point down hill
  - Superelevated thru curve
- Access roads
  - Crown was not shot.
  - Edge of pavement used as breaklines



33

## Project #1: Road Contours

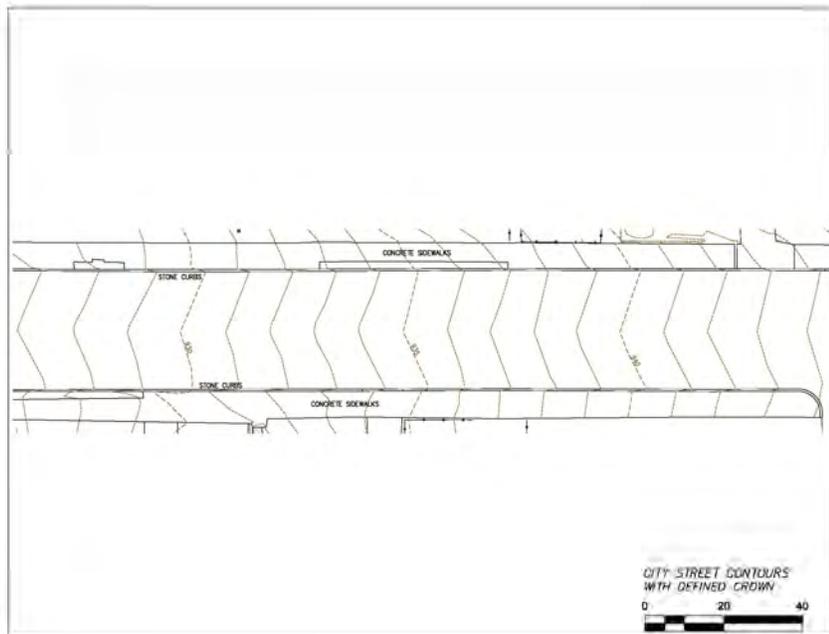
- Paved State Road
- Paved Access Roads
- Embankment
- Ditch



34

## Example: City Street

- Crown
- Curb
- Sidewalk
- Shots:
  - Sidewalk edges
  - Back of Curb
  - Top of Curb
  - Bottom of Curb
  - Gutter line
  - Crown
  - Ground shots



35

# Project #1: A Trapezoidal Ditch

- Parts of a ditch
  - Top of Bank
  - Bottom of Bank
  - Flow line
- Man-made features
  - Headwall
  - Pipes & invert

Look for small pipes draining into the ditch.

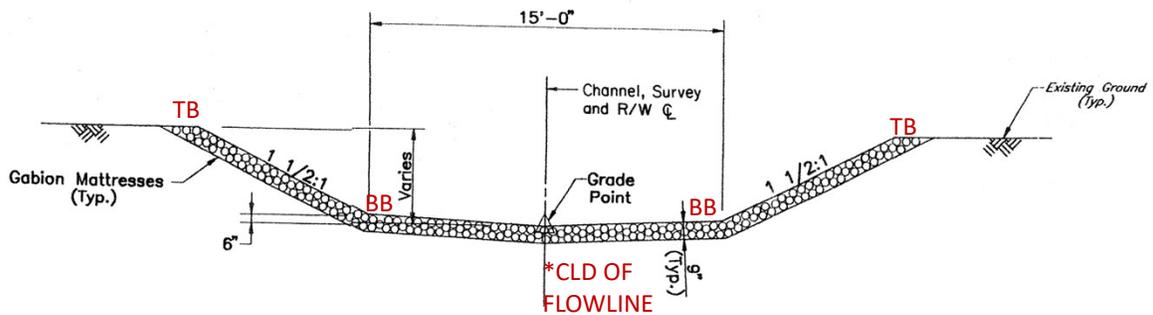
Take shots cross section style when feasible.



38

# Project #1: A Trapezoidal Ditch

- Sections



\*LOCATE THE FLOWLINE WHICH IS NOT ALWAYS IN THE CENTER OF THE DITCH.

## TYPICAL CHANNEL SECTION

(STA. 11+50.00 to STA. 20+00.00)  
NO SCALE

39



## Project #1: Headwall

- Parts of a headwall
  - Top of wall
  - Bottom of Wall
  - Pipes & inverts

Note pipe size and material.



42

## Project #1: Complex Headwall

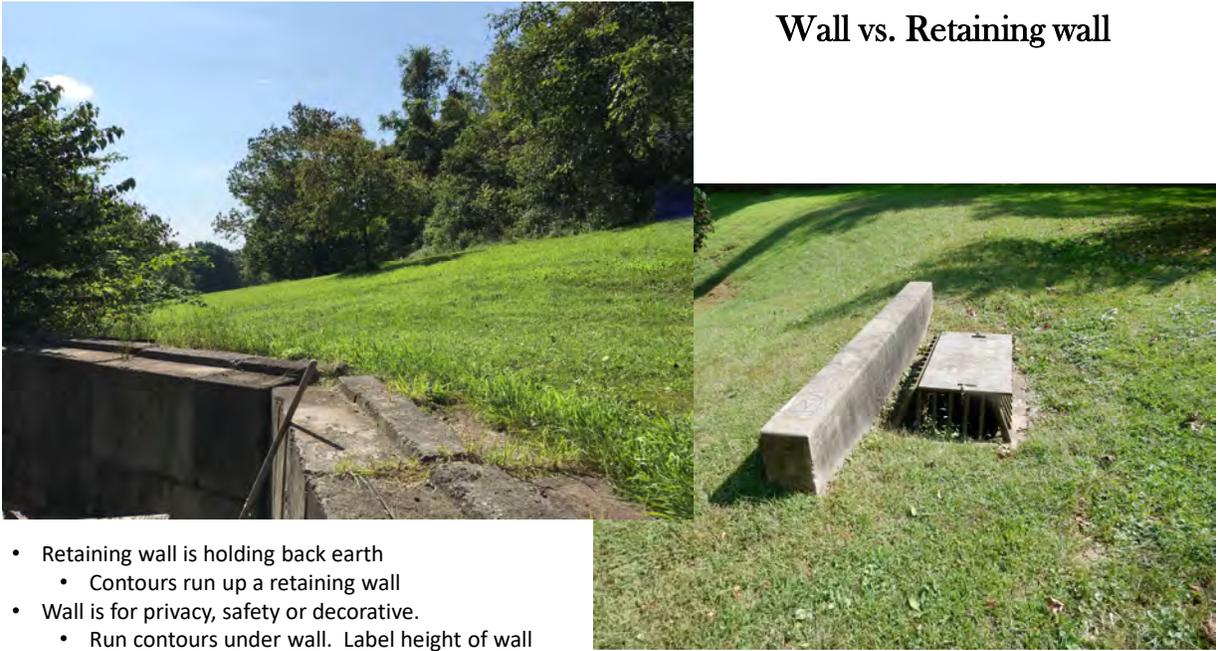
- Parts of a headwall
  - Top of wall
  - Bottom of Wall
  - Pipes & inverts

Isolate the breaklines  
Use specific codes



43

## Wall vs. Retaining wall



- Retaining wall is holding back earth
  - Contours run up a retaining wall
- Wall is for privacy, safety or decorative.
  - Run contours under wall. Label height of wall

44

## Unique Features

---

- Steps & sidewalk elevated
- Shot as a wall
- Breakline along bottom of wall/steps
- Edge of sidewalk as breakline



45

## Project #2: Sink Hole

Topographic Survey of old cobblestone street to repair a sinkhole and design stormwater improvements.



48

## Project #2: Sink Hole

- The real star of the show is the street itself.
- Water under the road is pushing up the brick



50

## Project #2: Cobble Stone Street

### Parts of the Topo

- Ground Shot
- Edge of Sidewalk
- Ground Shot (if needed)
- Top back of curb
- Top of curb
- Bottom of curb/Gutter line
- Edge of Concrete/Brick
- Centerline (not well defined)

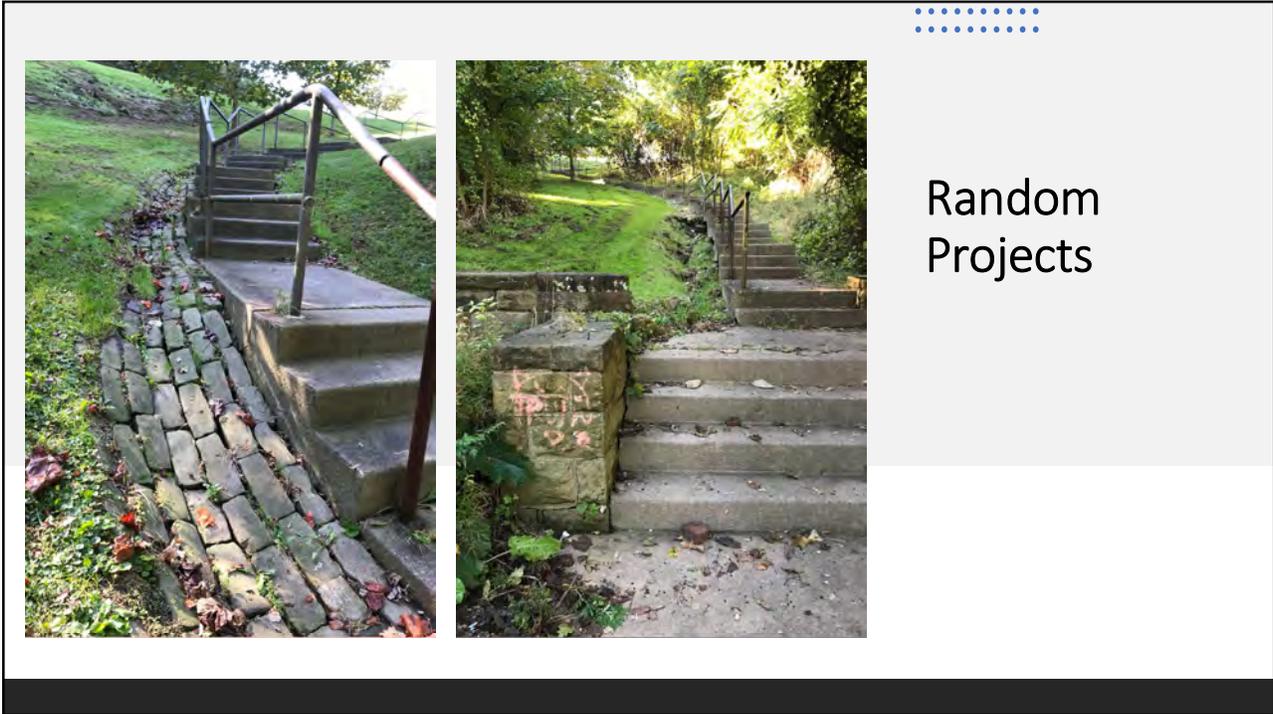


51

## Project #2: Cobble Stone Street

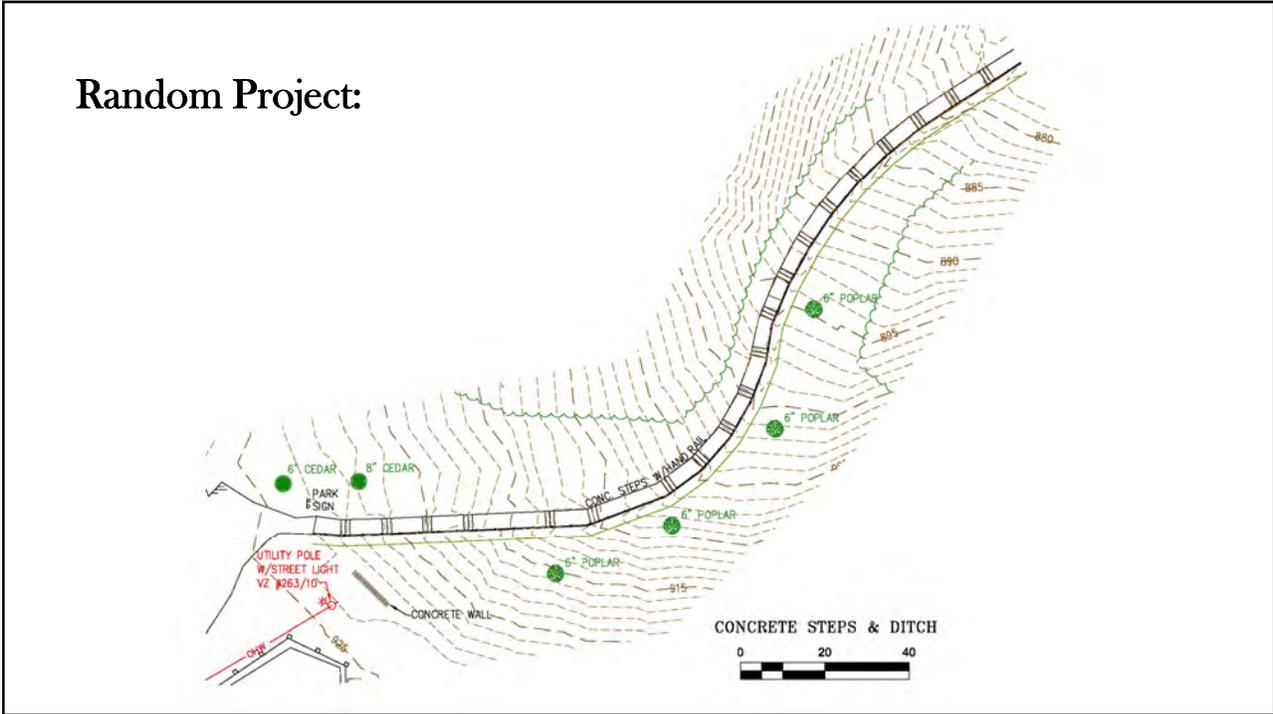


52



# Random Projects

55



56



## Reading Contours: Hill

GS=Ground shot  
TB=Top of Bank  
BB=Bottom of Bank

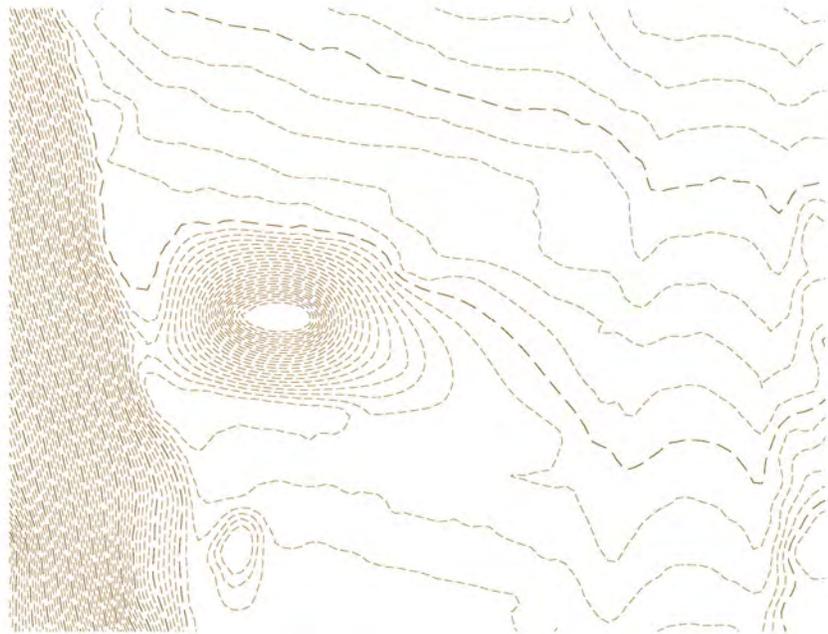
\*practice sheet



59

## Know what you're looking at:

When ordering topography from a third party, be sure you're getting a quality product. Ask if they have a licensed land surveyor or photogrammetrist on staff.

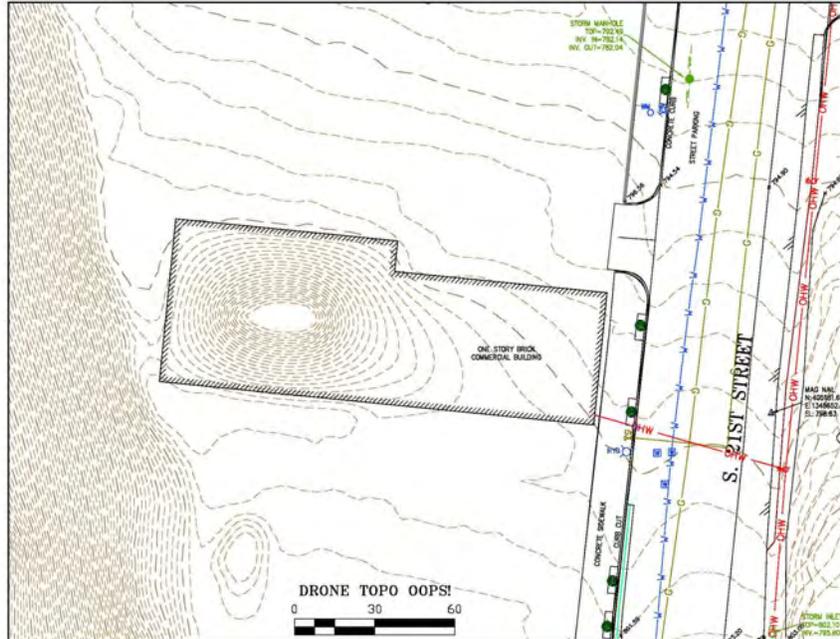


60

## Know what you're looking at:

When ordering topography from a third party, be sure you're getting a quality product. Ask if they have a licensed land surveyor or photogrammetrist on staff.

Contoured to roof of building.



61

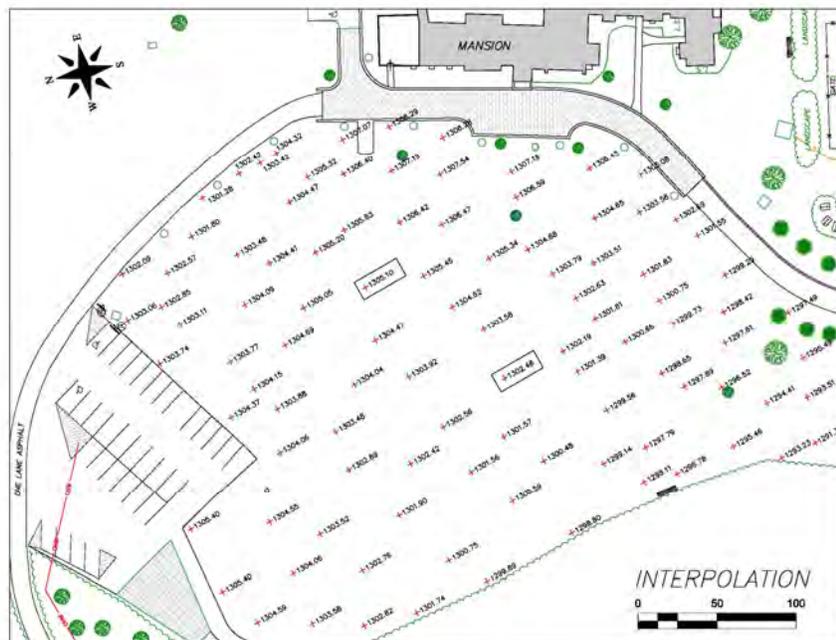
## Interpolation

Fill in the gaps between grades.

Difference in elevations divided by distance between points = elevation difference per foot.

Measure distance for next spot elevation, multiply by edpf.

Add or subtract elevation depending on grade.



62

# SESSION EVALUATION



[HTTPS://WWW.SURVEYMONKEY.COM/R/PSLS2026EVAL](https://www.surveymonkey.com/r/PSLS2026EVAL)