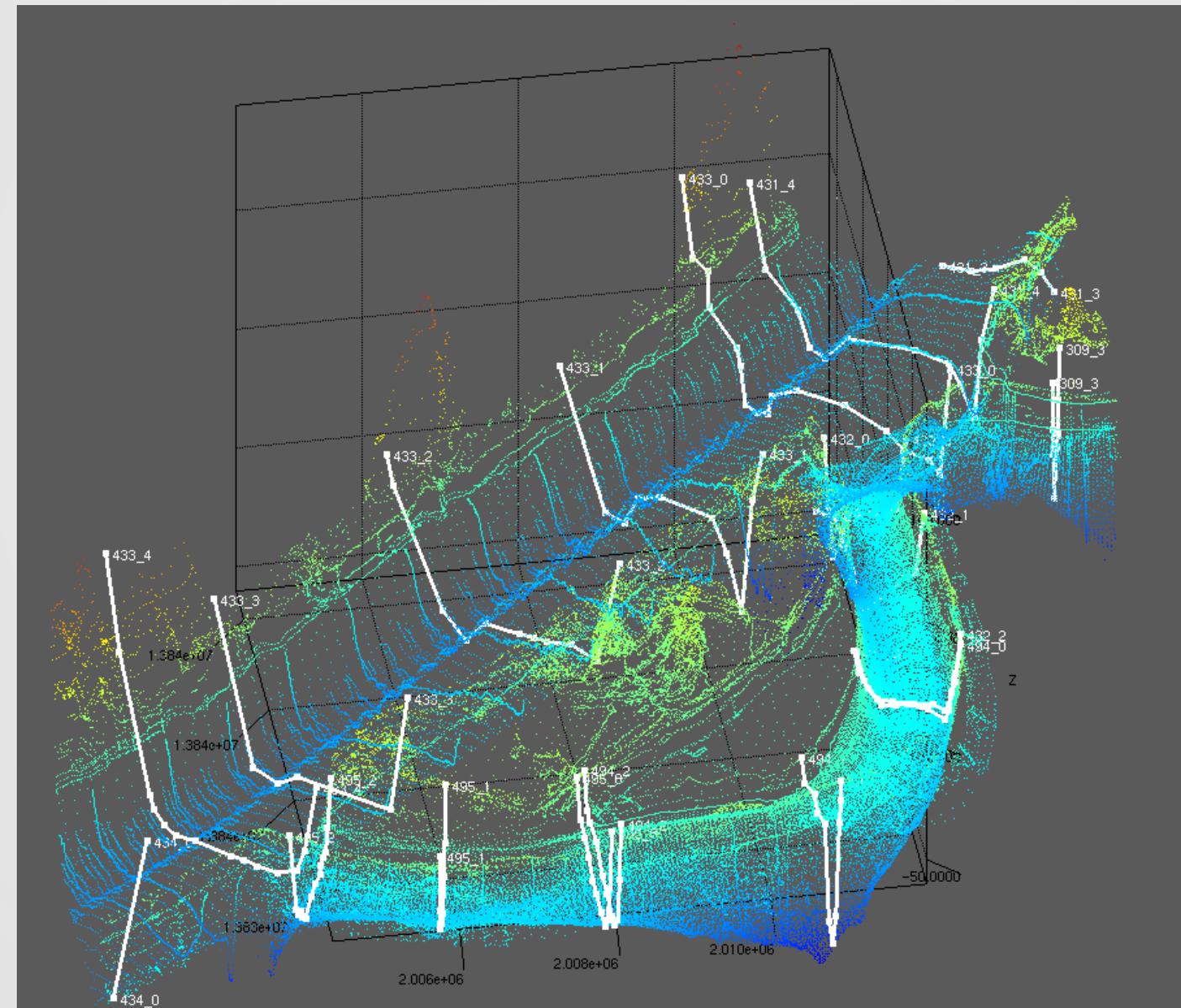


CALIFORNIA DEPARTMENT OF WATER RESOURCES

DSM2 CSDP Quick Start

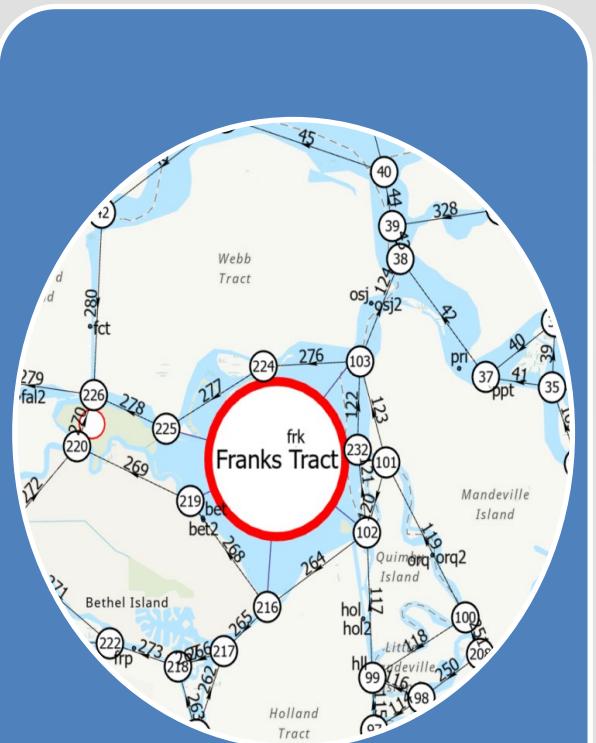
December 3, 2025



Brad Tom

Modeling Support Office, Delta Modeling Section

Overview



9:15-9:20 Welcome & Introduction



9:20-10:00

CSDP

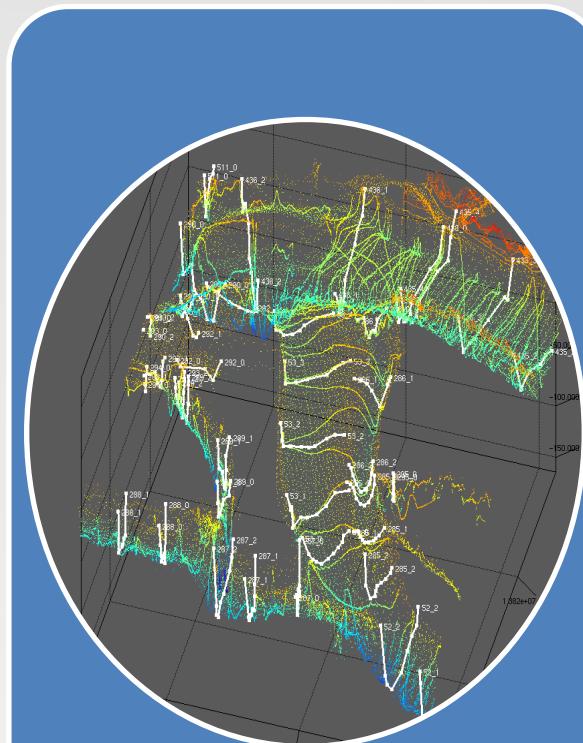
Introduction

- History/references
 - CSDP interface
 - Import DEM Data
 - Create channels,
nodes, and
cross-sections



10:00-10:10

Break



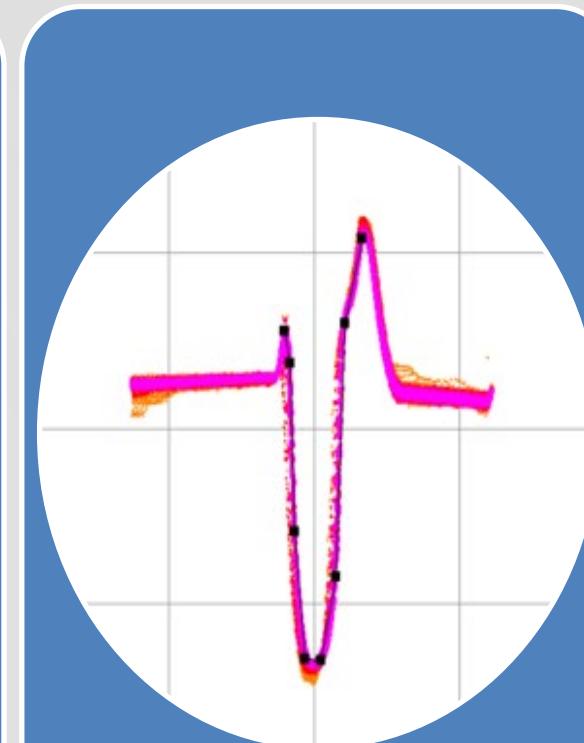
10:10-10:40

Hands-on exercise:

- Load data
 - view cross-section
 - 3d bathymetry and cross-section plot



10:40–10:50
Break



10:50 – 12:00
Hands-on
exercise:

- Clear network
 - Create centerline
 - Create cross-section
 - Create DSM2 input
 - Run Hydro

CSDP Introduction

History
and
references

CSDP
process
flow
diagram

CSDP
data types

Creating
cross-
sections

DSM2
virtual
cross-
sections

Cross-
section
best
practices

History and references

- **History**

- Developed in the 1990's to replace the Bathymetry Data Display (**BDD**) application*
- **CSDP** = “Cross-Section Development Program”
- Developed in Java
- Two attempts were made to replace it:
 - DSM2 grid Map Tool—Google Maps API**
 - ArcMap based tool***

- **References**

- Training Video youtube playlist:
<https://www.youtube.com/playlist?list=PL33EJkVWqElVrUCFtst0o4cnEnVjzkV39>
- An Open-Source Cross-Section Tool for Hydrodynamic Model Geometric Input Development
<https://doi.org/10.3390/hydrology10110212>
- Annual reports 1998, 2000, 2001, 2005, 2011, 2016, 2020:
<https://data.cnra.ca.gov/dataset/methodology-for-flow-and-salinity-estimates-in-the-sacramento-san-joaquin-delta-and-suisun-marsh>
- csdp-data repo:
<https://github.com/CADWRDeltaModeling/csdp-data>
- csdp source repository:
<https://github.com/CADWRDeltaModeling/csdp>

*John Crapuchettes, 1996

** Nicky Sandhu, 2011

*** Tom Heinzer, 2016

CSDP Introduction

History
and
references

CSDP
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flow
diagram

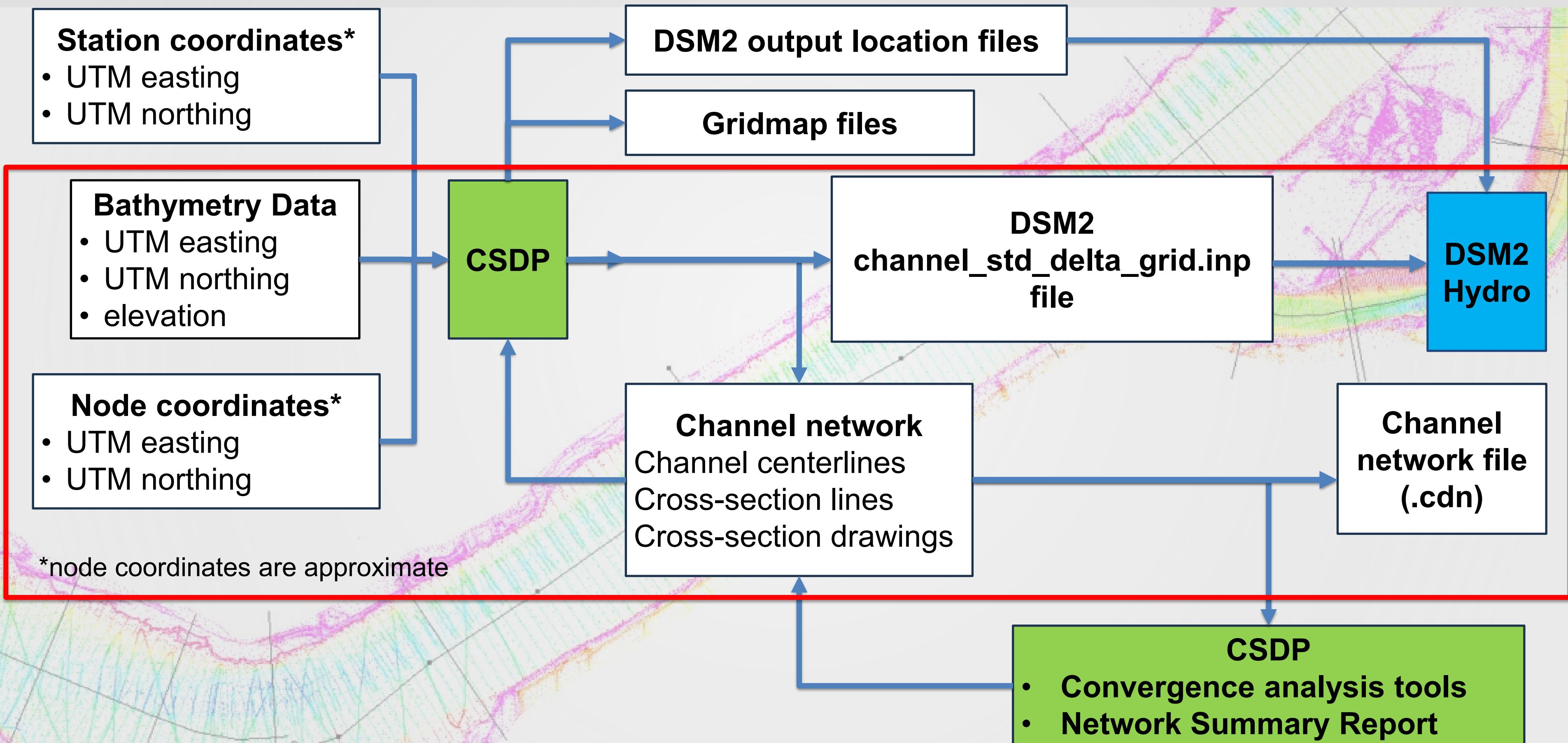
CSDP
data types

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cross-
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DSM2
virtual
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sections

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section
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practices

CSDP Introduction: Creating DSM2 input



CSDP Introduction

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and
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flow
diagram

CSDP
data types

Creating
cross-
sections

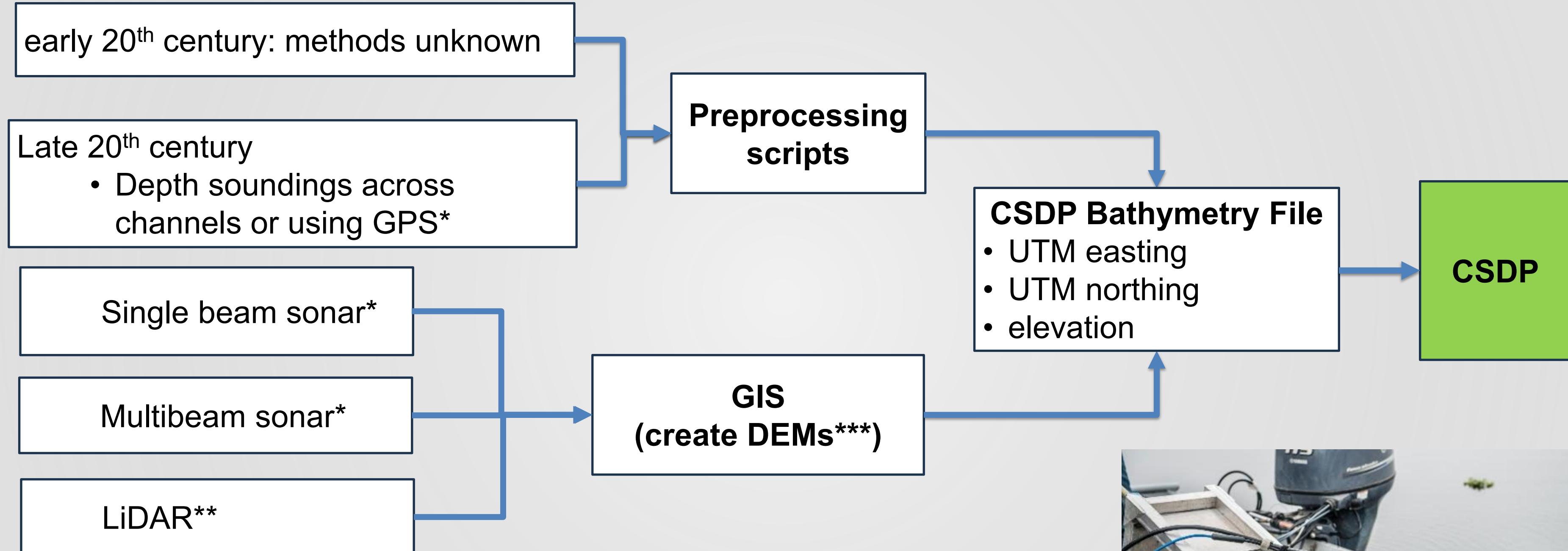
DSM2
virtual
cross-
sections

Cross-
section
best
practices

CSDP data types

| Data type | Text format | Binary format | Definition |
|------------------|-------------|---------------|---|
| Bathymetry | .prn | .cdp | Channel bottom elevations for specific locations |
| Network | .cdn | | DSM2 channel centerlines and cross-section lines |
| Landmark | .cdl | | Points representing features such as nodes, gates, monitoring stations |
| DSM2 input files | .inp | | Files read by the DSM2 input system. The CSDP reads and/or creates some of these. |
| Other files | .txt, .csv | | Files containing other types of data used by CSDP functions |

CSDP Bathymetry Data



* DWR North Central Region Office, Shawn Mayr

** Light Detection and Ranging, used for levees and land surface

*** DWR Modeling Support Office, Eli Ateljevich, Sophie Munger, Rueen-Fang Wang



Boat with Multibeam scanner

Creating DEMs from Bathymetry Data

Bathymetric soundings

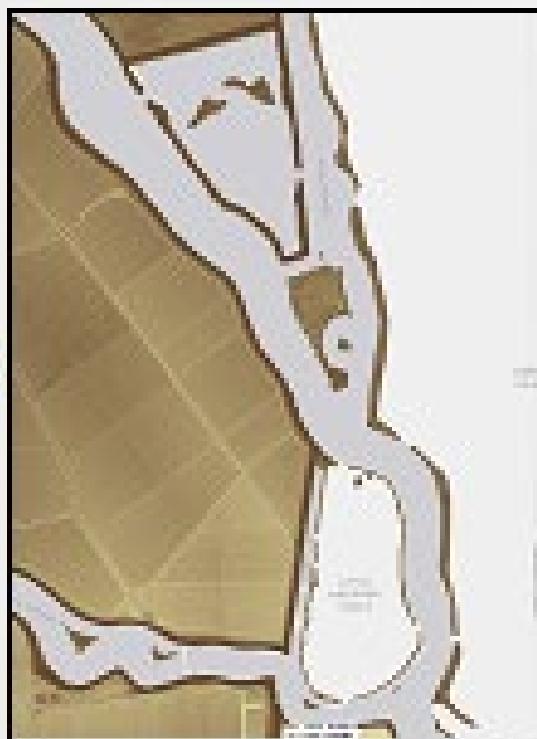
multibeam



single-beam



Terrestrial Data



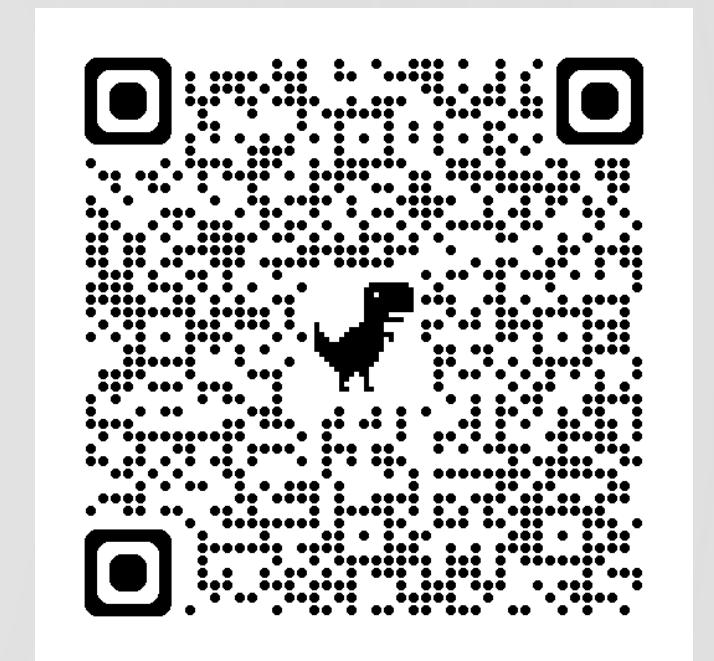
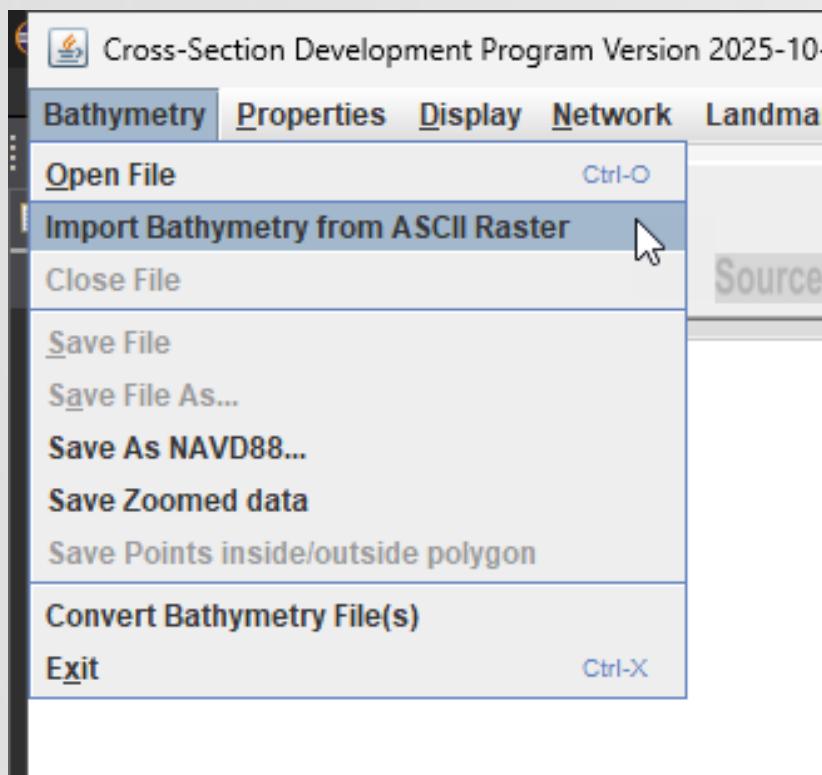
1. Gap filling
2. Contour smoothing

Digital Elevation Model



Importing DEM Bathymetry (with LiDAR)

- Download from <https://data.cnra.ca.gov/dataset/san-francisco-bay-and-sacramento-san-joaquin-delta-dem-for-modeling-version-4-3#markdown>
- Load into GIS application of your choice (I use ArcGIS Pro)
- Export to ASCII raster
- Import into CSDP



CSDP Bathymetry Data

Consists
of

Easting

Northing

Elevation

Year

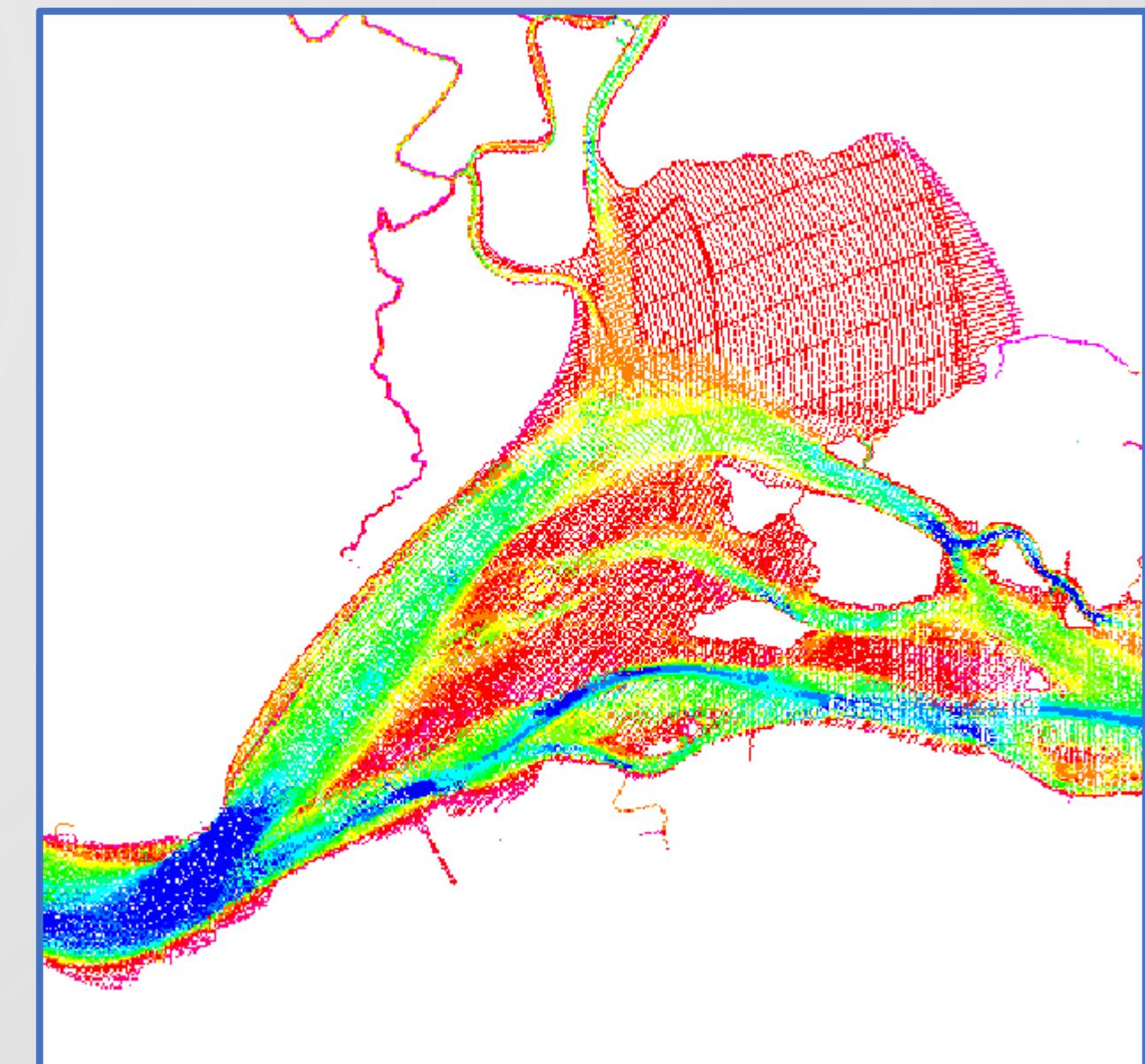
Source

Format

Text (.prn)

Binary
(.cdp)

```
;HorizontalDatum: UTMNAD83
;HorizontalZone: 10
;HorizontalUnits: Meters
;VerticalDatum: NAVD88
;VerticalUnits: USSurveyFeet
;Filetype: bathymetry
;NumElements: 6314090
584757.00000,4233401.00000,10.43,2018,DWR-DMS_2mDEM,
584759.00000,4233401.00000,10.40,2018,DWR-DMS_2mDEM,
584761.00000,4233401.00000,10.43,2018,DWR-DMS_2mDEM,
584763.00000,4233401.00000,10.39,2018,DWR-DMS_2mDEM,
584765.00000,4233401.00000,10.39,2018,DWR-DMS_2mDEM,
584767.00000,4233401.00000,10.62,2018,DWR-DMS_2mDEM,
584769.00000,4233401.00000,10.21,2018,DWR-DMS_2mDEM,
584771.00000,4233401.00000,10.38,2018,DWR-DMS_2mDEM,
584772.00000,4233401.00000,10.26,2018,DWR-DMS_2mDEM,
```



CSDP Network Data

Consists
of

Channel
centerlines

Cross-
section lines

Cross-section
drawings

Created
by

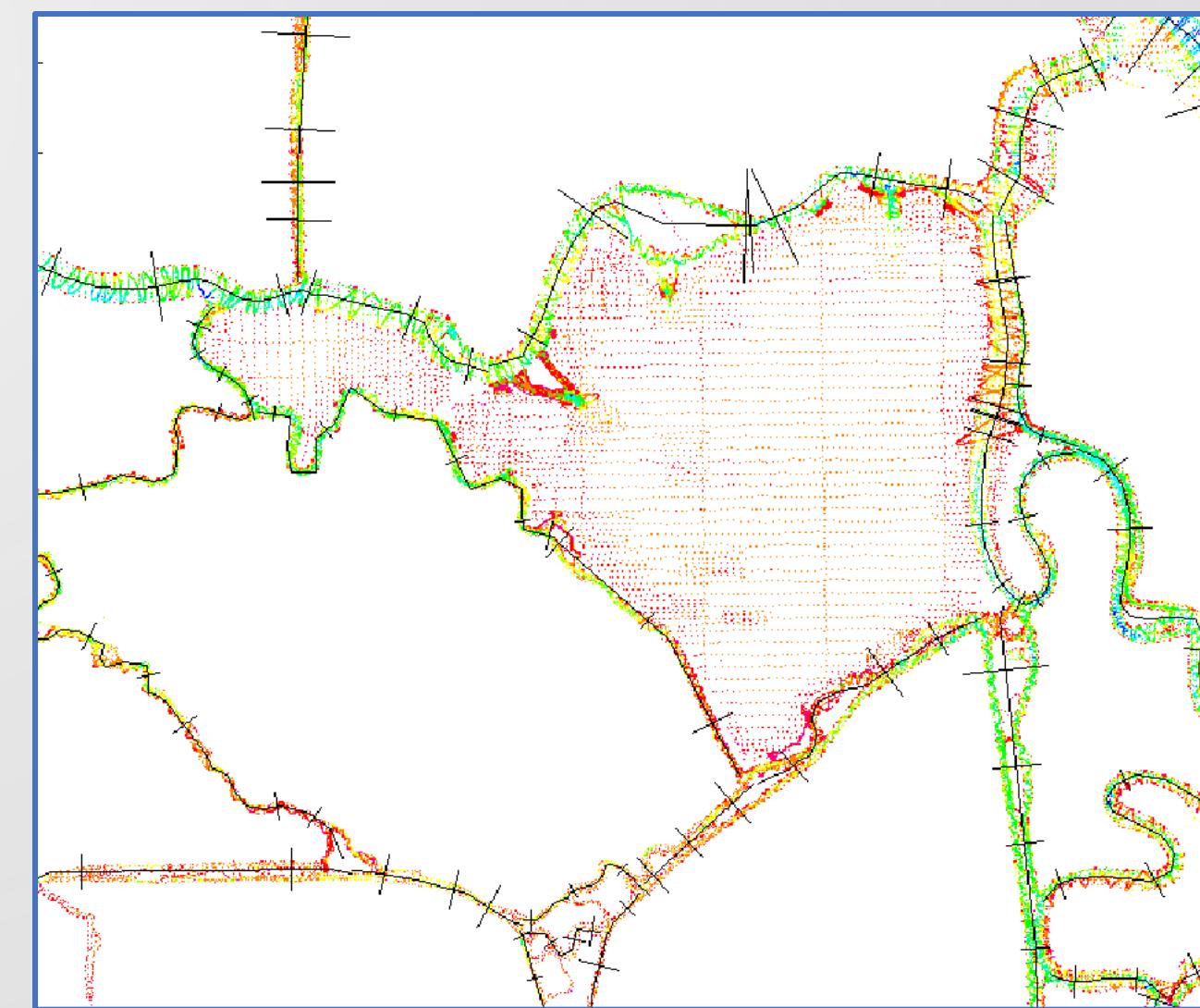
CSDP

Usage

Creating
DSM2
geometry
input

Format

Text (.cdn)



CSDP Landmarks

Consists of

Coordinates

Name/numb

Typical usage

Nodes

Monitoring stations

Gate

▶ Reservoirs

Created by

CSDF

Text editor

Can be used for

Other features

Format

Text (.cdl)



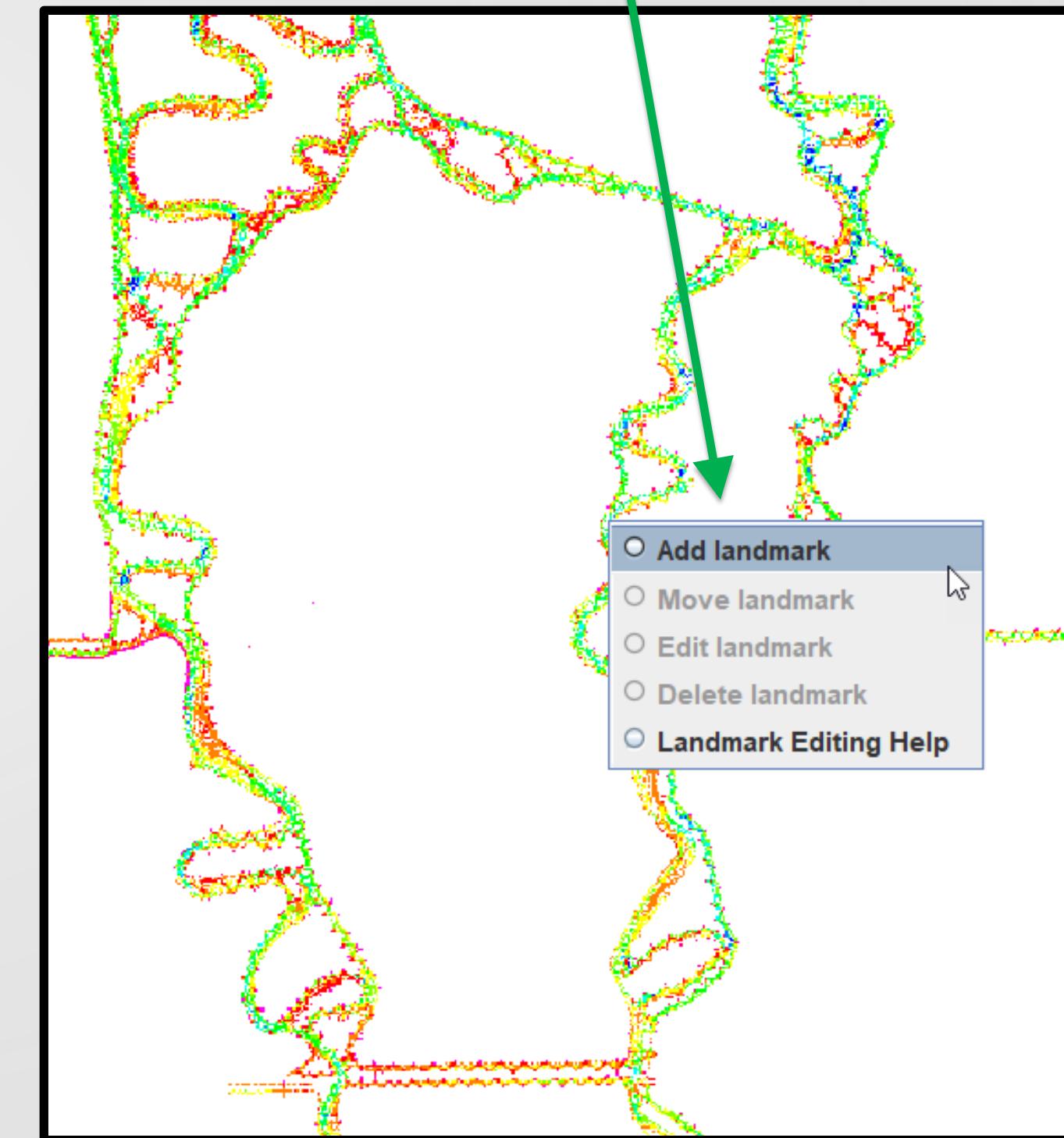
Creating CSDP Landmarks

text editor

```
;HorizontalDatum: UTMNAD83  
;HorizontalZone: 10  
;HorizontalUnits: Meters  
;VerticalDatum: NAVD88  
;VerticalUnits: USSurveyFeet  
;Filetype: landmark  
;NumElements: 460  
652291.3125,4172465.0,1  
652401.187500001,4174797.25,2  
651800.6875,4176016.25,3  
650044.0,4176792.75,4  
649423.0,4179715.75,5  
649669.187499999,4182589.25,6  
648443.8125,4184173.5,7  
647237.0625,4185855.5,8  
648354.25,4187713.0,9  
647489.8125,4190138.5,10  
647526.5,4192087.499999995,11  
646971.1875,4195317.5,12  
647722.9375,4198306.0,13  
646960.6875,4199204.5,14  
646258.6875,4200263.0,15  
645341.875,4200690.0,16  
653984.124999999,4170361.25,17
```

Make sure this number matches the number of landmarks in the file

CSDP context menu (right click)



DSM2 channels input file

channel_std_delta_grid.inp

Contains

Channel
number &
length

Manning's n &
dispersion

Channel
connectivity
(nodes)

Cross-section
input

Usage

used by DSM2

Previous
version used by
CSDP to create
new centerlines

Previous
version used by
CSDP to create
a new file

Created
by

CSDP

Format

Text (.inp)

| CHANNEL | CHAN_NO | LENGTH | MANNING | DISPERSION | UPNODE | DOWNNODE |
|---------|---------|--------|---------|------------|--------|----------|
| | 1 | 9823 | 0.035 | 360 | 1 | 2 |
| | 2 | 10941 | 0.028 | 360 | 2 | 3 |
| | 3 | 12756 | 0.028 | 360 | 3 | 4 |
| | 4 | 17164 | 0.028 | 360 | 4 | 5 |
| | 5 | 8150 | 0.028 | 360 | 5 | 6 |

| XSECT_LAYER | CHAN_NO | DIST | ELEV | AREA | WIDTH | WET_PERIM |
|-------------|---------|---------|--------|---------|---------|-----------|
| | 1 | 0.01194 | -3.205 | 0 | 0 | 0 |
| | 1 | 0.01194 | 1.602 | 415.221 | 172.759 | 173.032 |
| | 1 | 0.01194 | 4.247 | 1089.79 | 337.311 | 337.699 |
| | 1 | 0.01194 | 6.409 | 1864.43 | 379.303 | 380.019 |
| | 1 | 0.01194 | 11.737 | 4181.2 | 490.325 | 491.835 |
| | 1 | 0.01194 | 12.606 | 4619.35 | 515.952 | 517.422 |

CSDP Introduction

History
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CSDP
process
flow
diagram

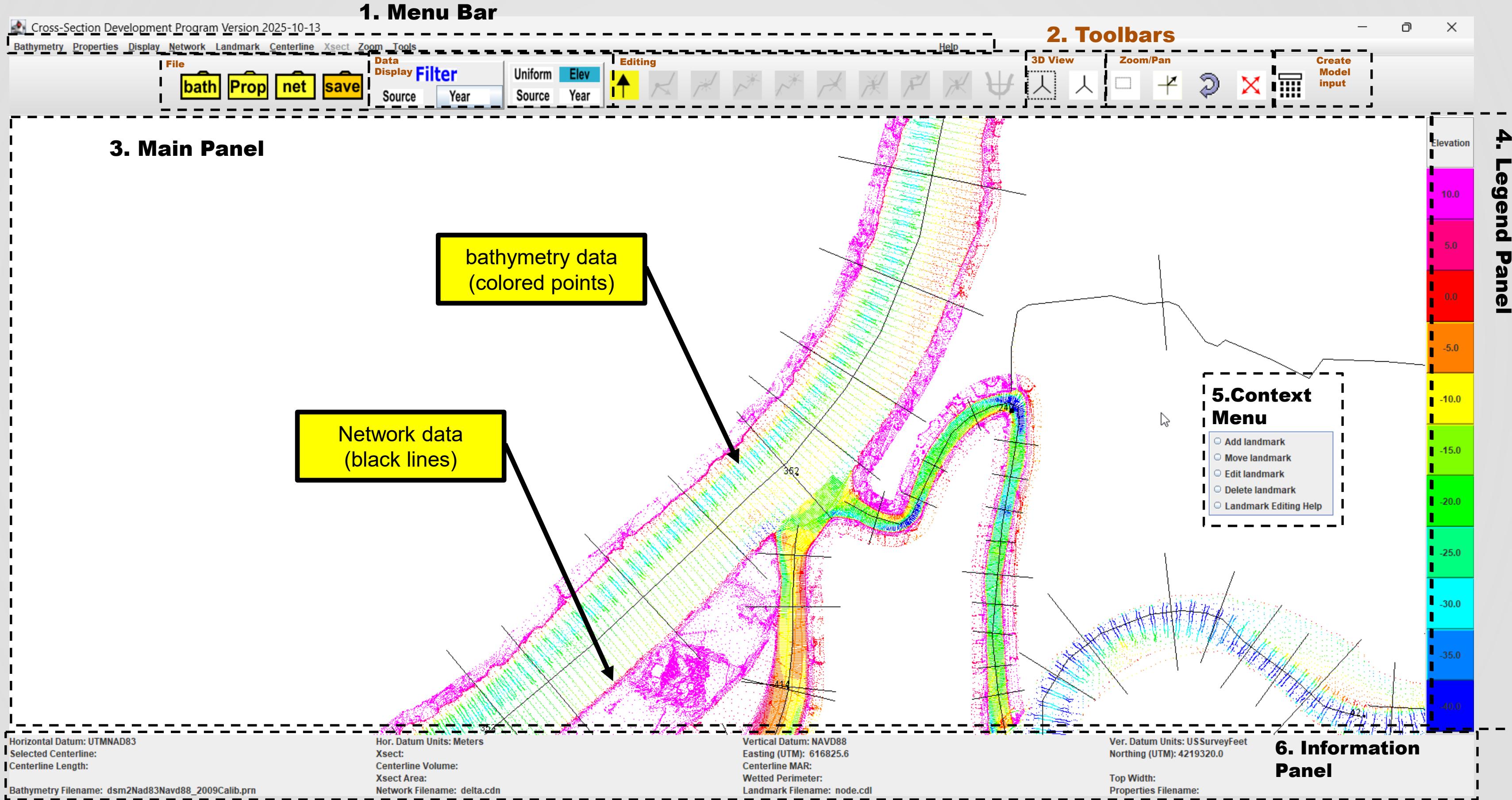
CSDP
data types

Creating
cross-
sections

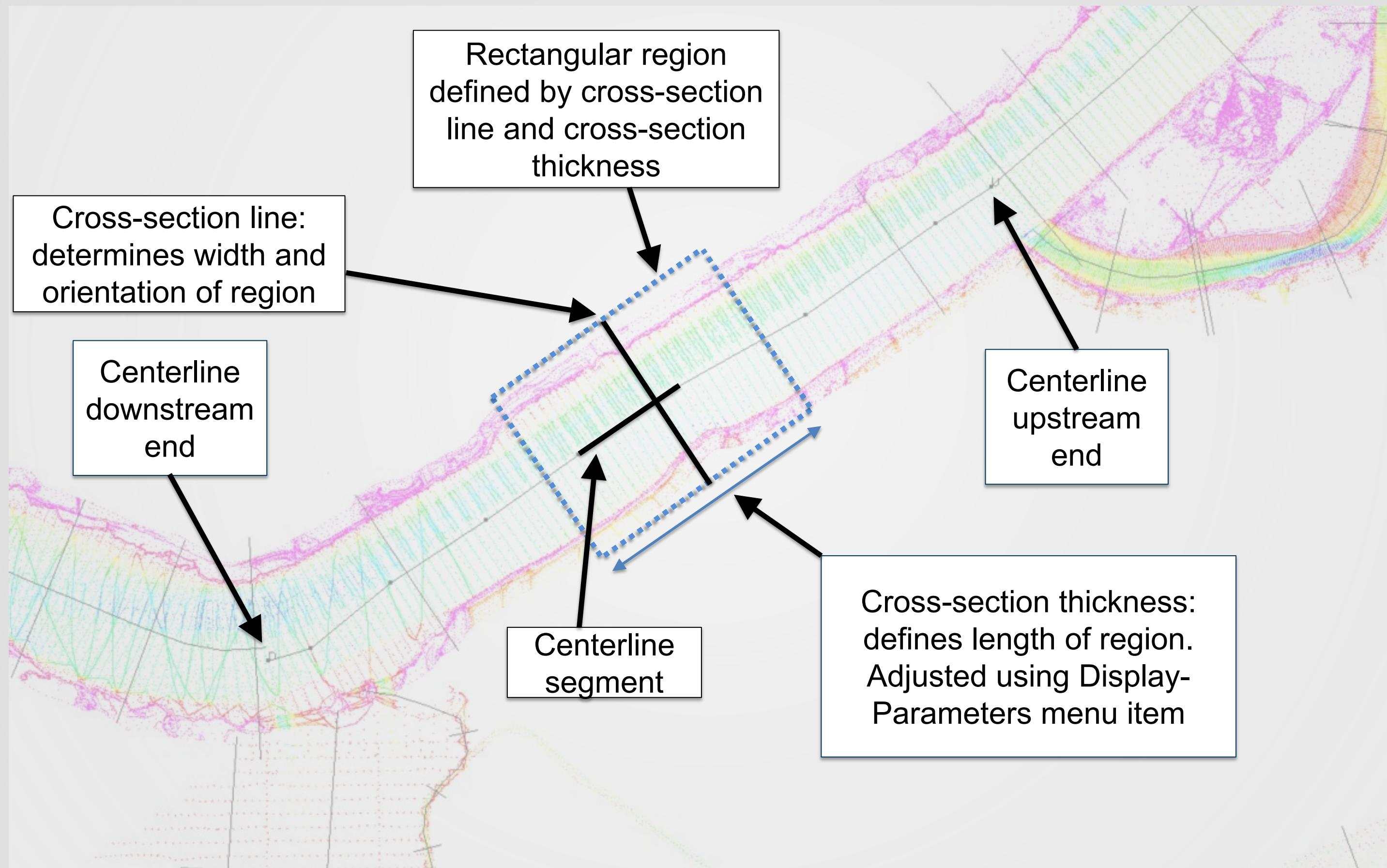
DSM2
virtual
cross-
sections

Cross-
section
best
practices

CSDP Main Application Window

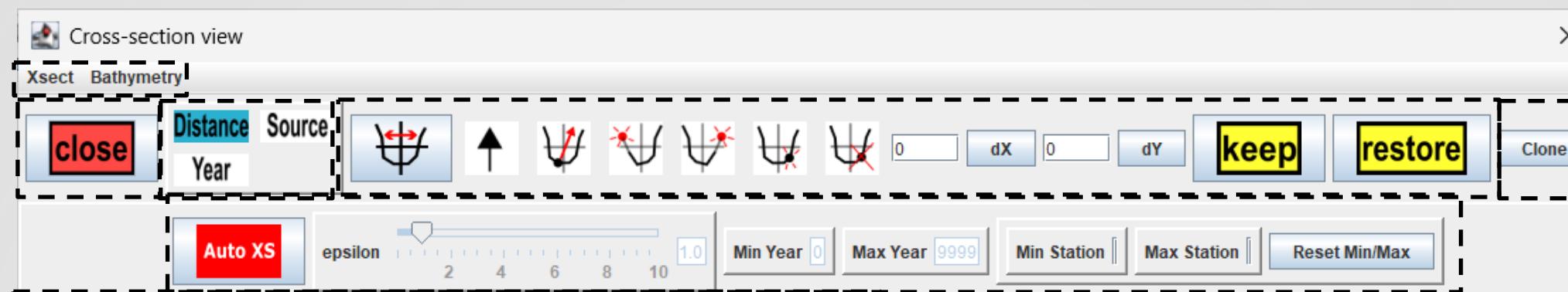


CSDP Cross-Section Data Selection

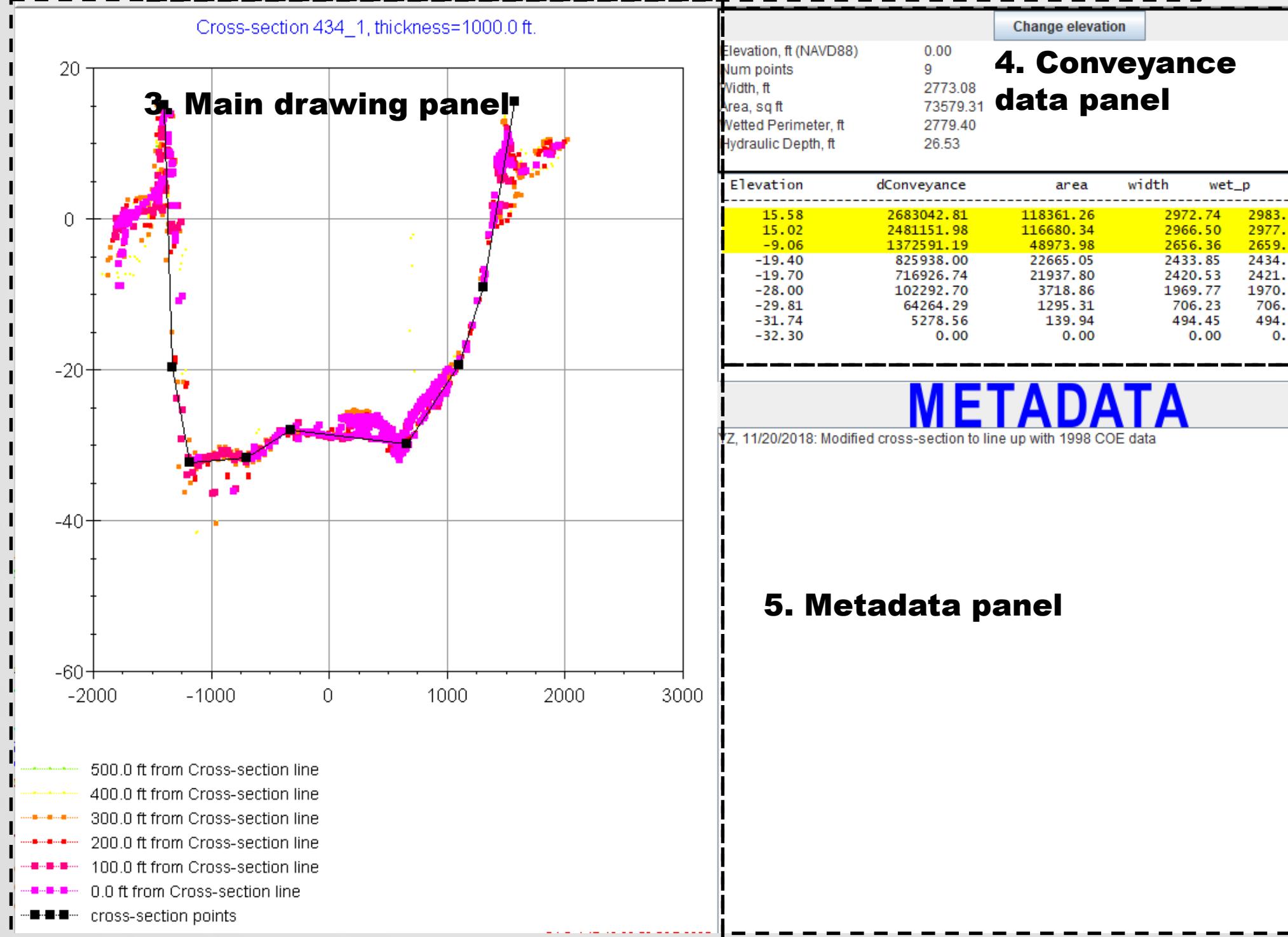


CSDP Cross-Section Window

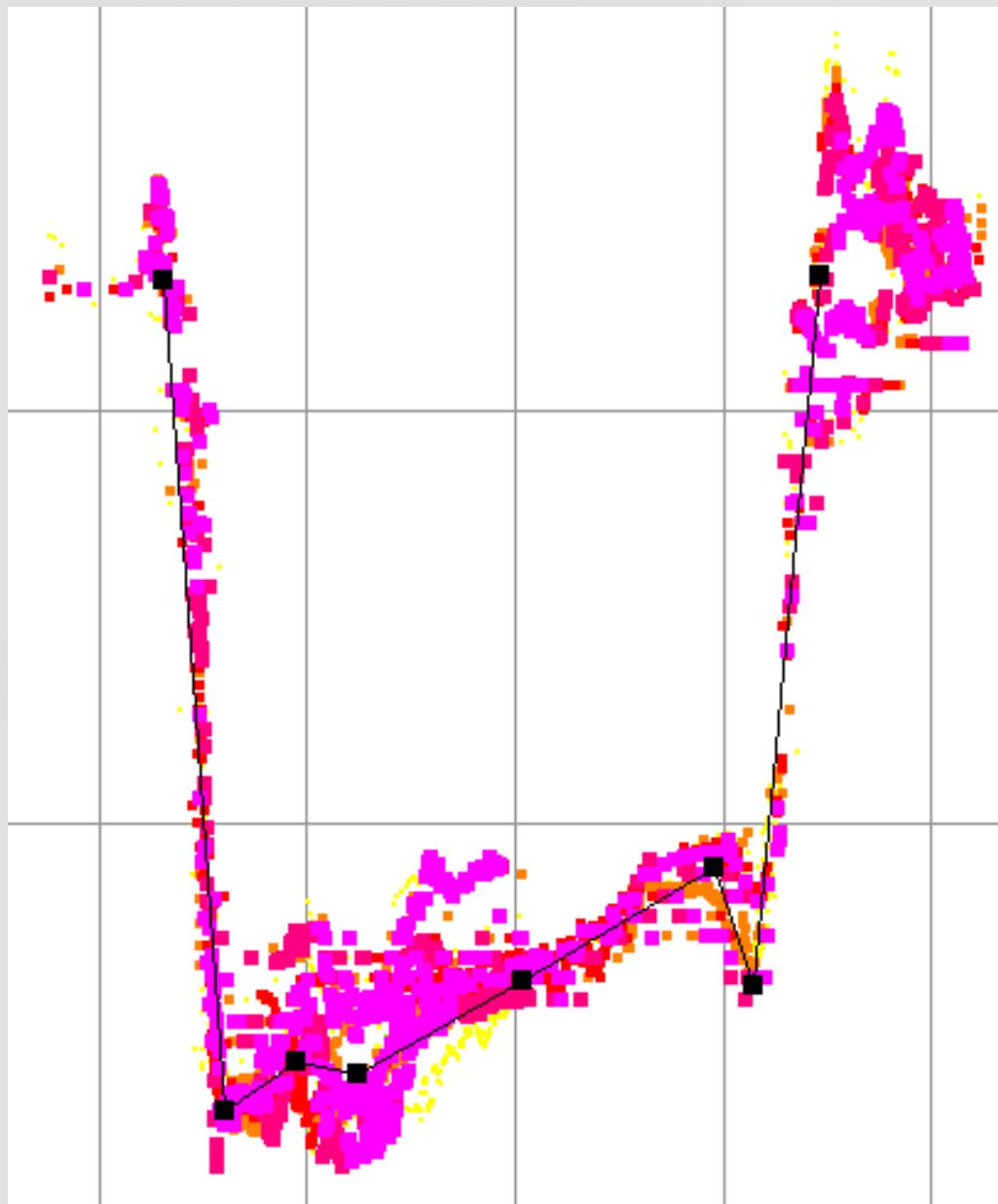
1. Menu Bar



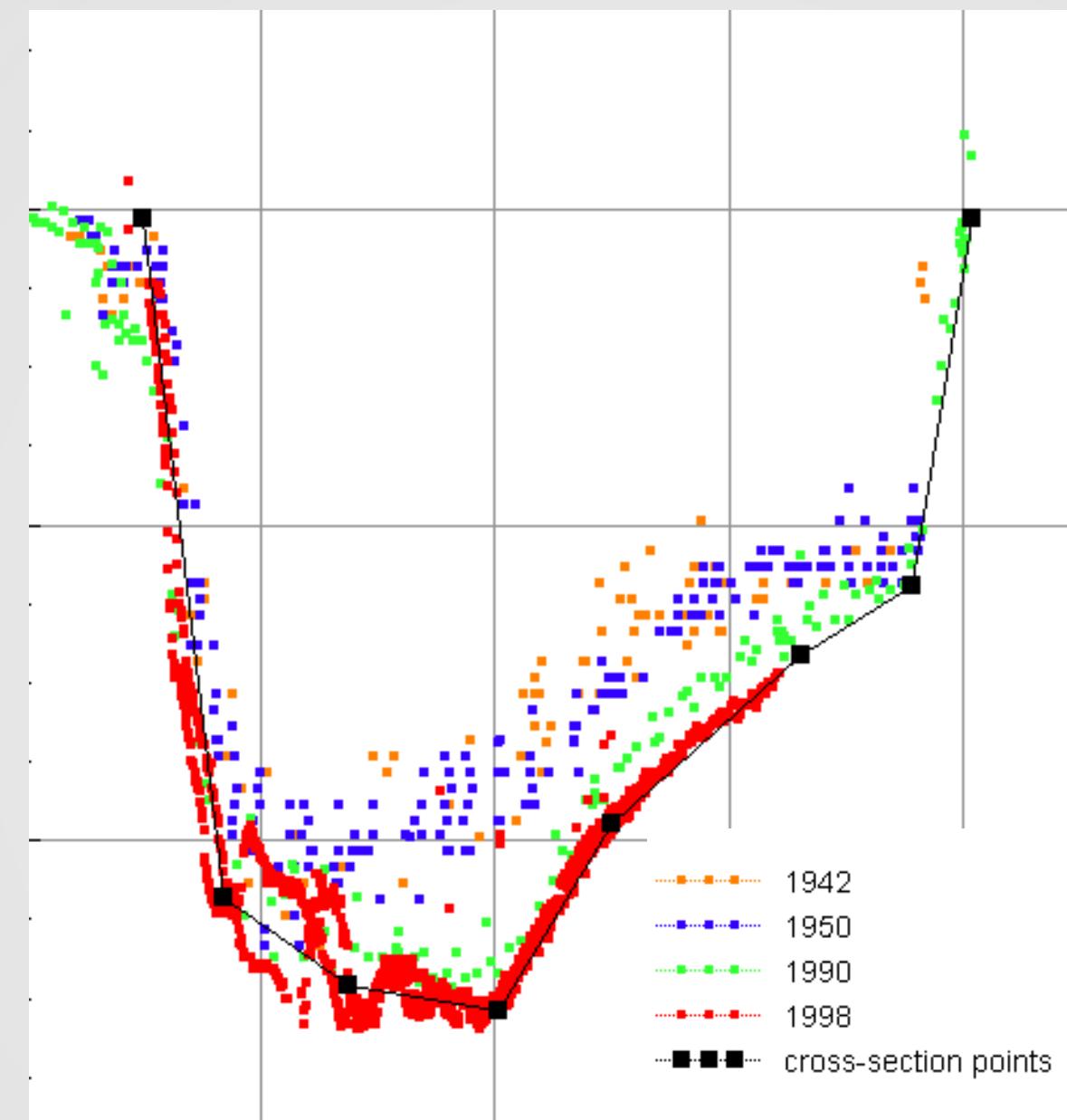
2. Toolbars



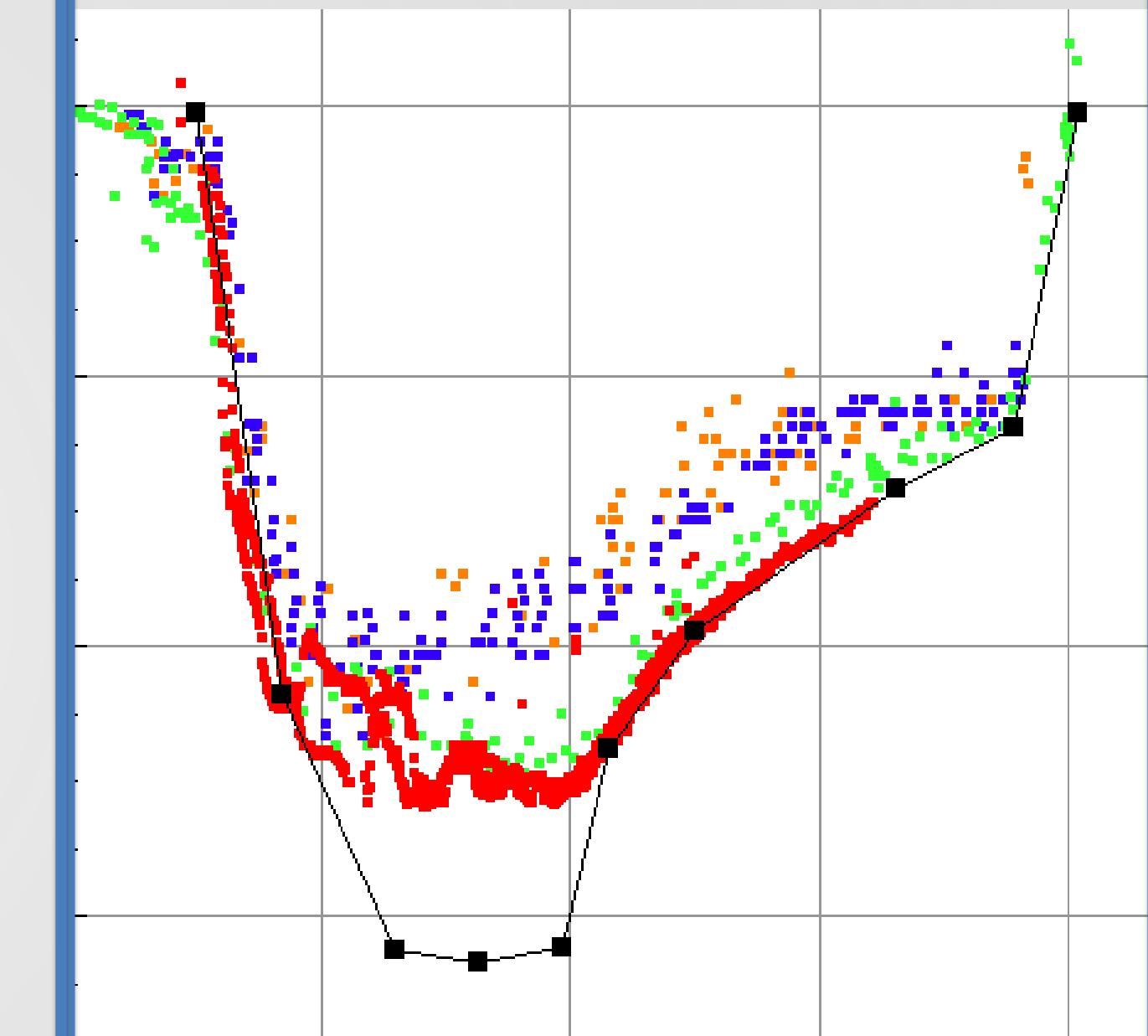
Cross-section doesn't always match bathymetry



- Bathymetry used as a guide
- Cross-sections represent channel conveyance characteristics
- Used efficiently by DSM2

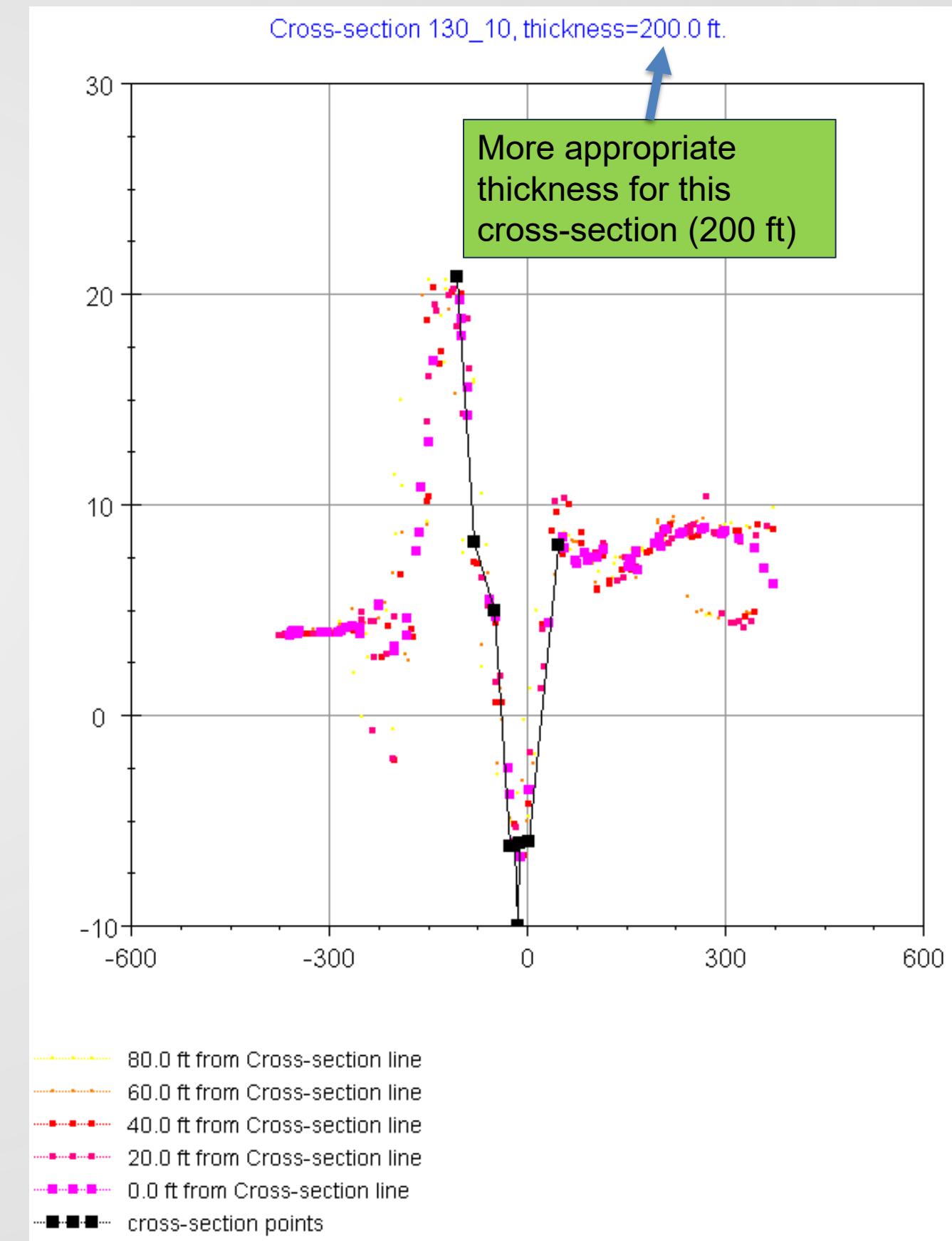
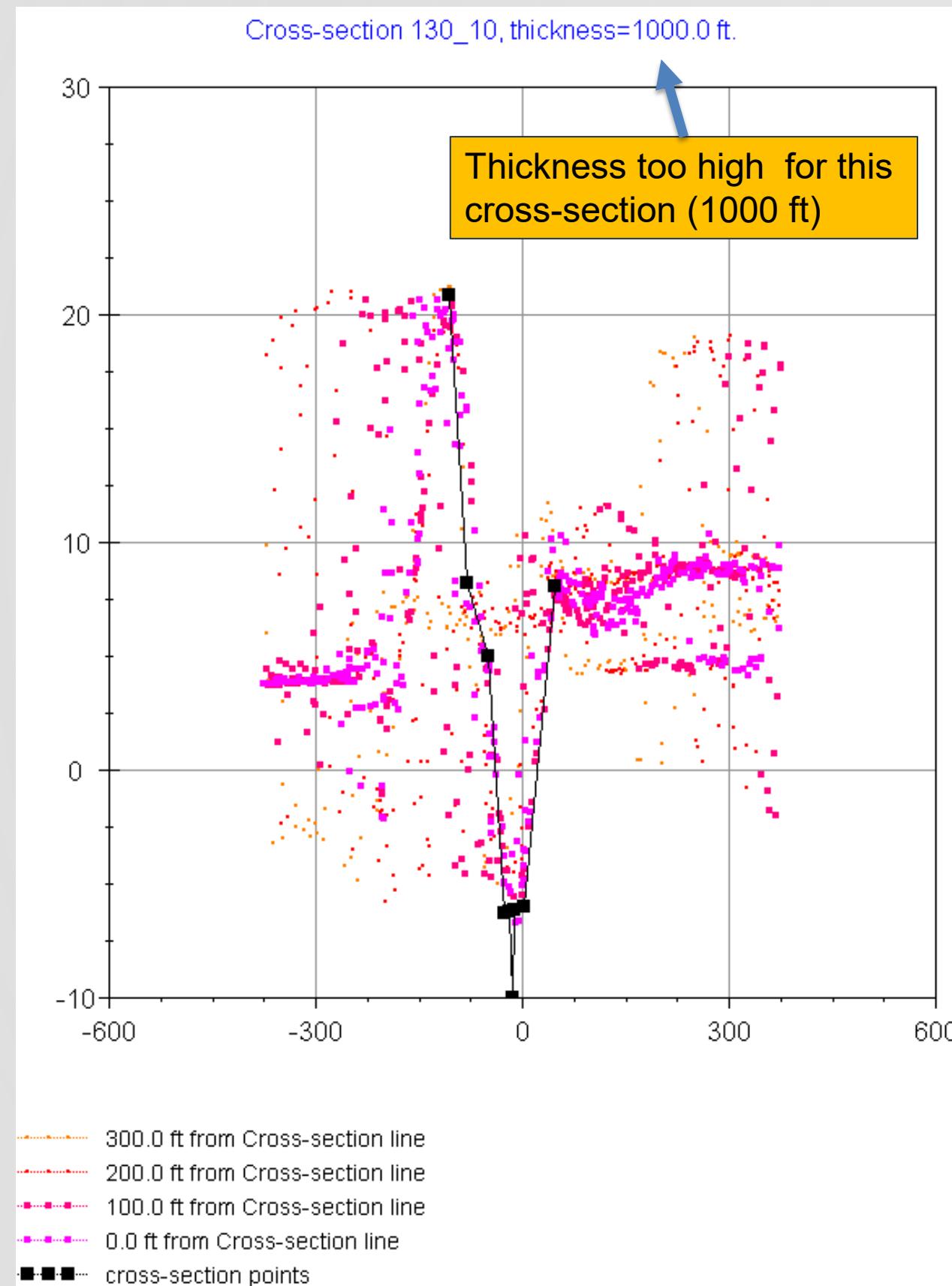


- Emphasize best data

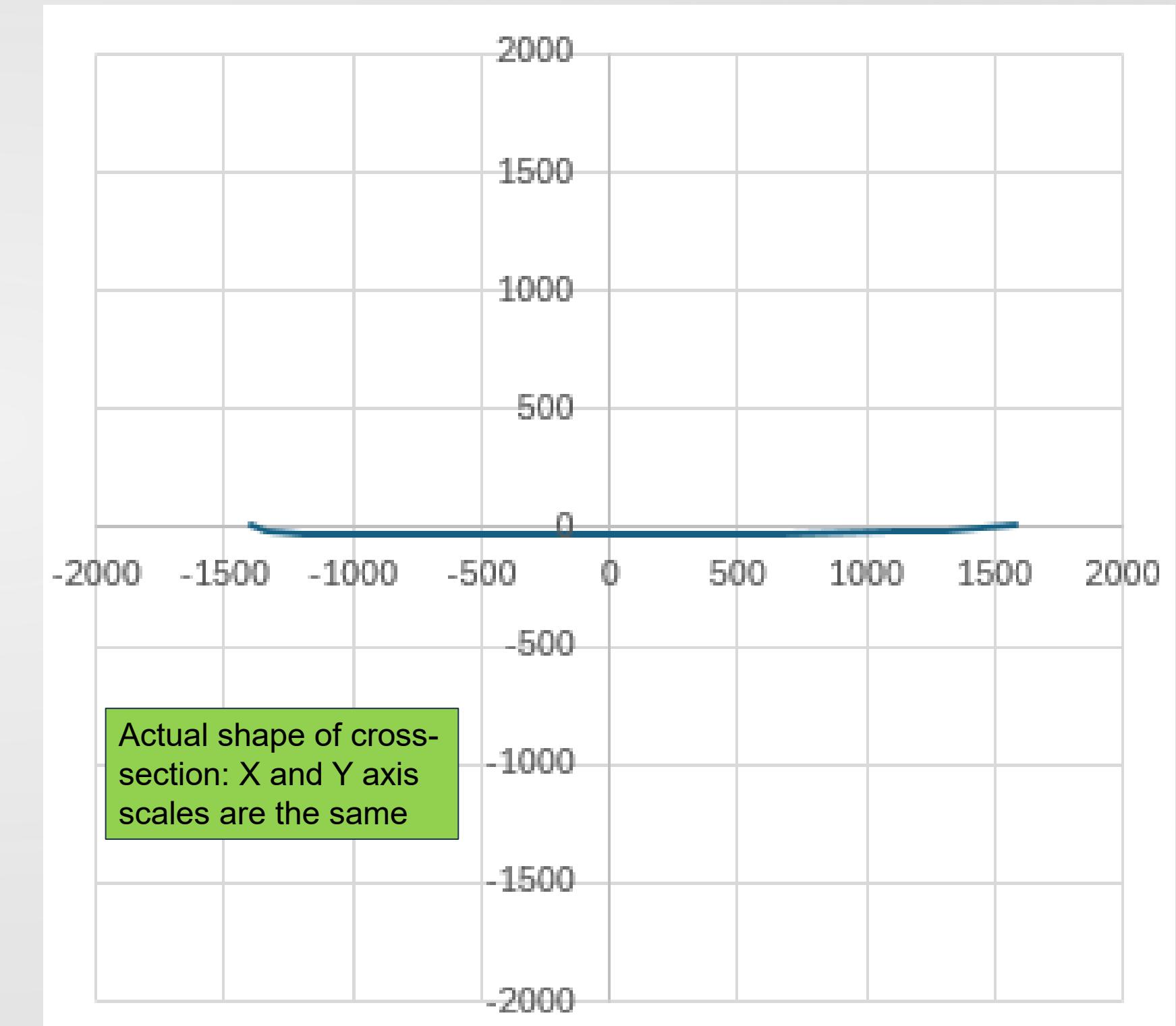
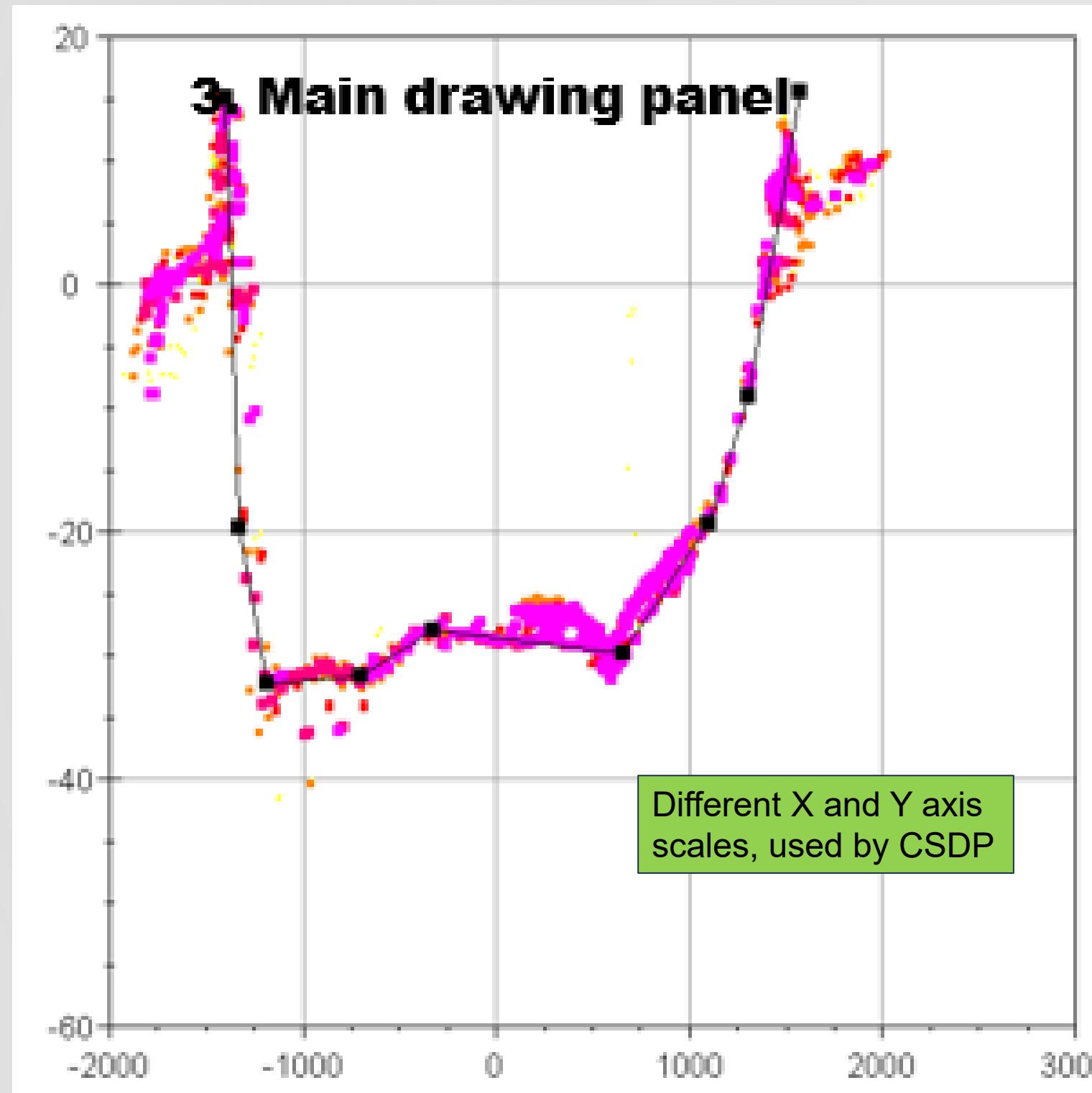


- Proposed changes

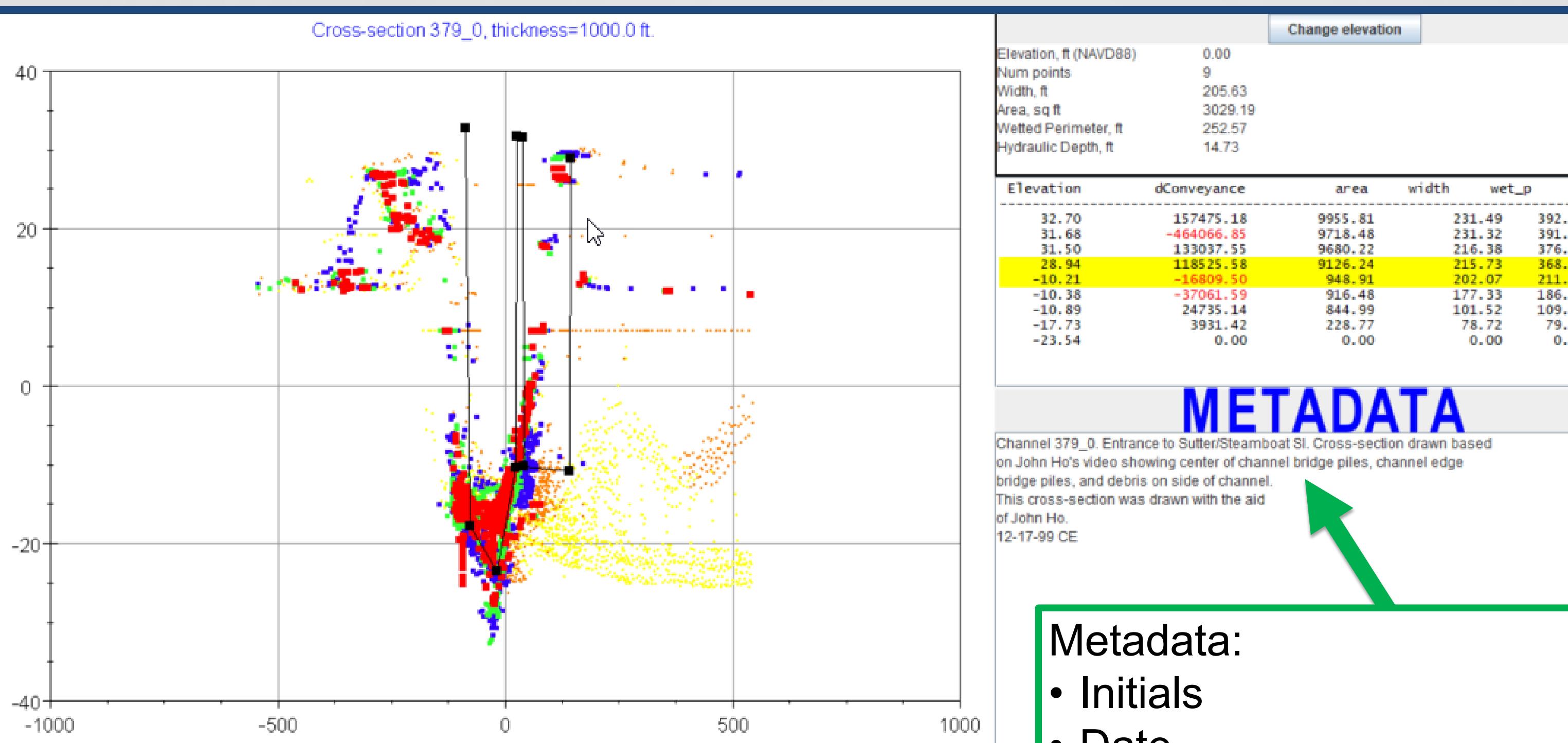
Reduce cross-section thickness in curved channels



Cross-section axis scales



CSDP Cross-Section Window: Metadata



Metadata:

- Initials
- Date
- Explain your goals--What should someone think about before undoing your changes?

Metadata examples

RW-11/30/2018: modify cross-section to line up with 1991 NOAA-NOS data

KH,11/9/2018: XS lines up well with 2012 data; no changes made.

BT, 3/12/2024: Updated to line up with 2023 2m DEM data.

LL, 1/3/2019: Created the centerline and XSs to line up with 2018 data.

Cross-Section Variations

“W” Shaped



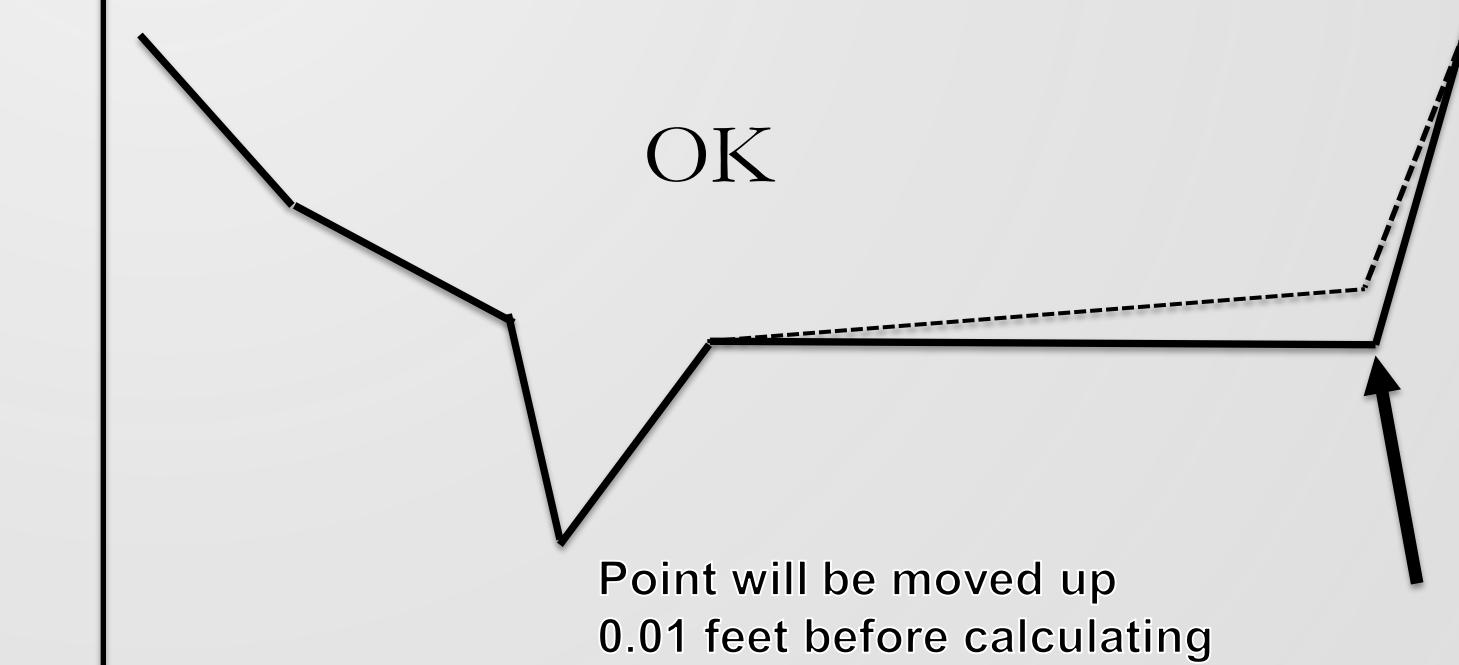
“J” Shaped



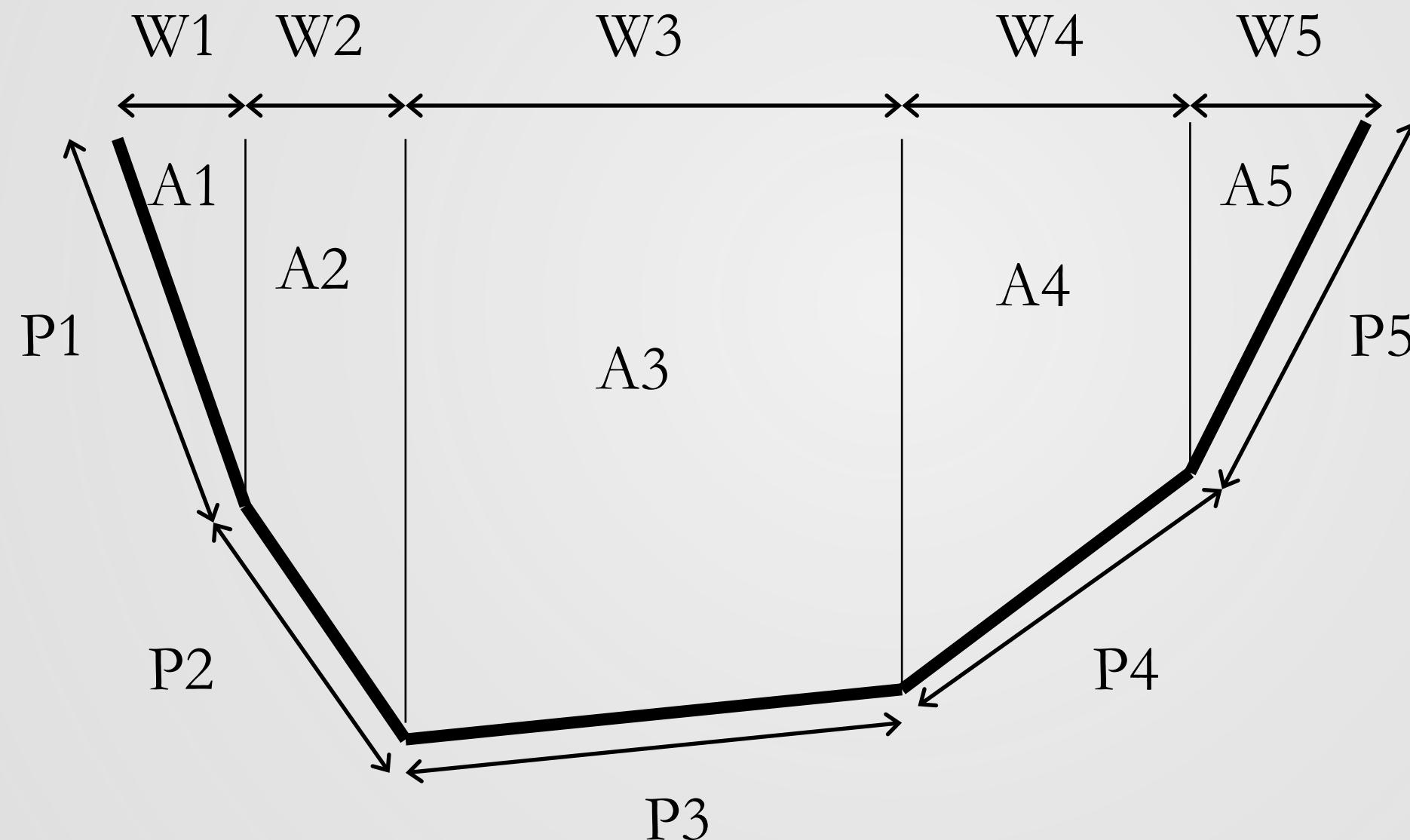
“deep v”: for low flow channels



Horizontal Line Segment



CSDP Conveyance Characteristics Calculation

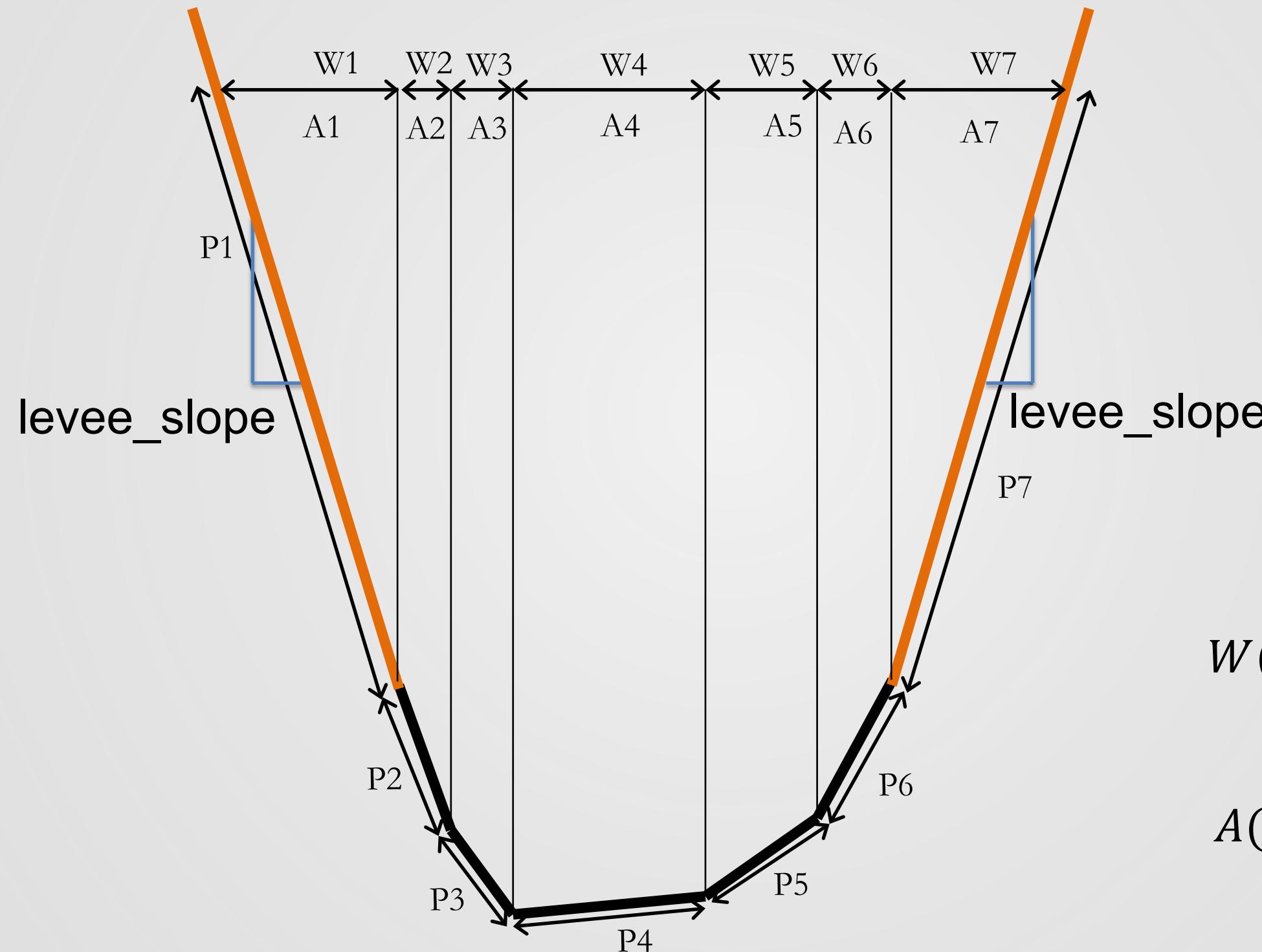


$$W(z) = \sum_{i=1}^n W(z)_i$$

$$A(z) = \sum_{i=1}^n A(z)_i$$

$$P(z) = \sum_{i=1}^n P(z)_i$$

CSDP Conveyance Characteristics Calculation: DSM2 Cross-Section Extrapolation



$$W(z) = \sum_{i=1}^n W(z)_i$$

$$A(z) = \sum_{i=1}^n A(z)_i$$

$$P(z) = \sum_{i=1}^n P(z)_i$$

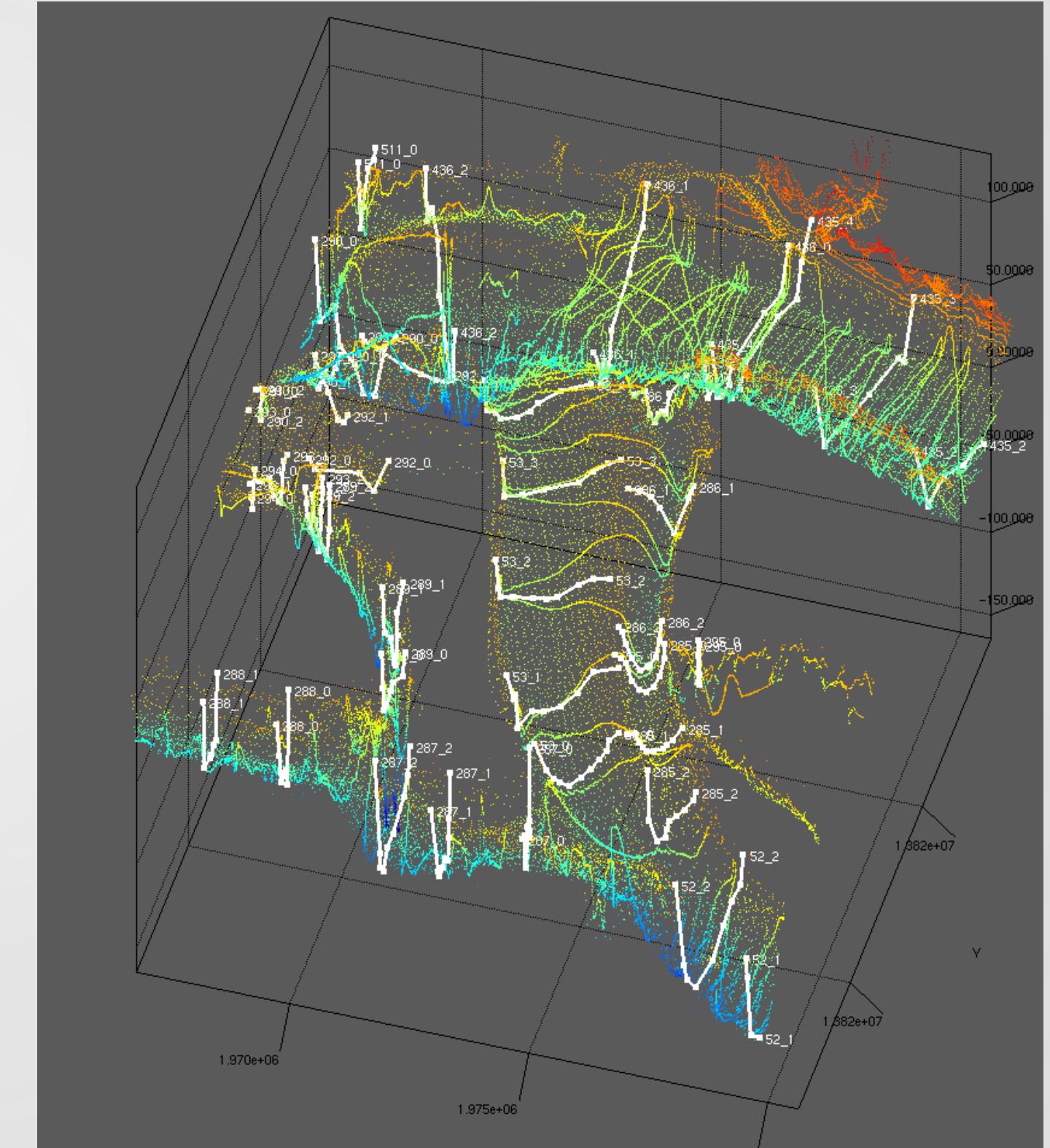
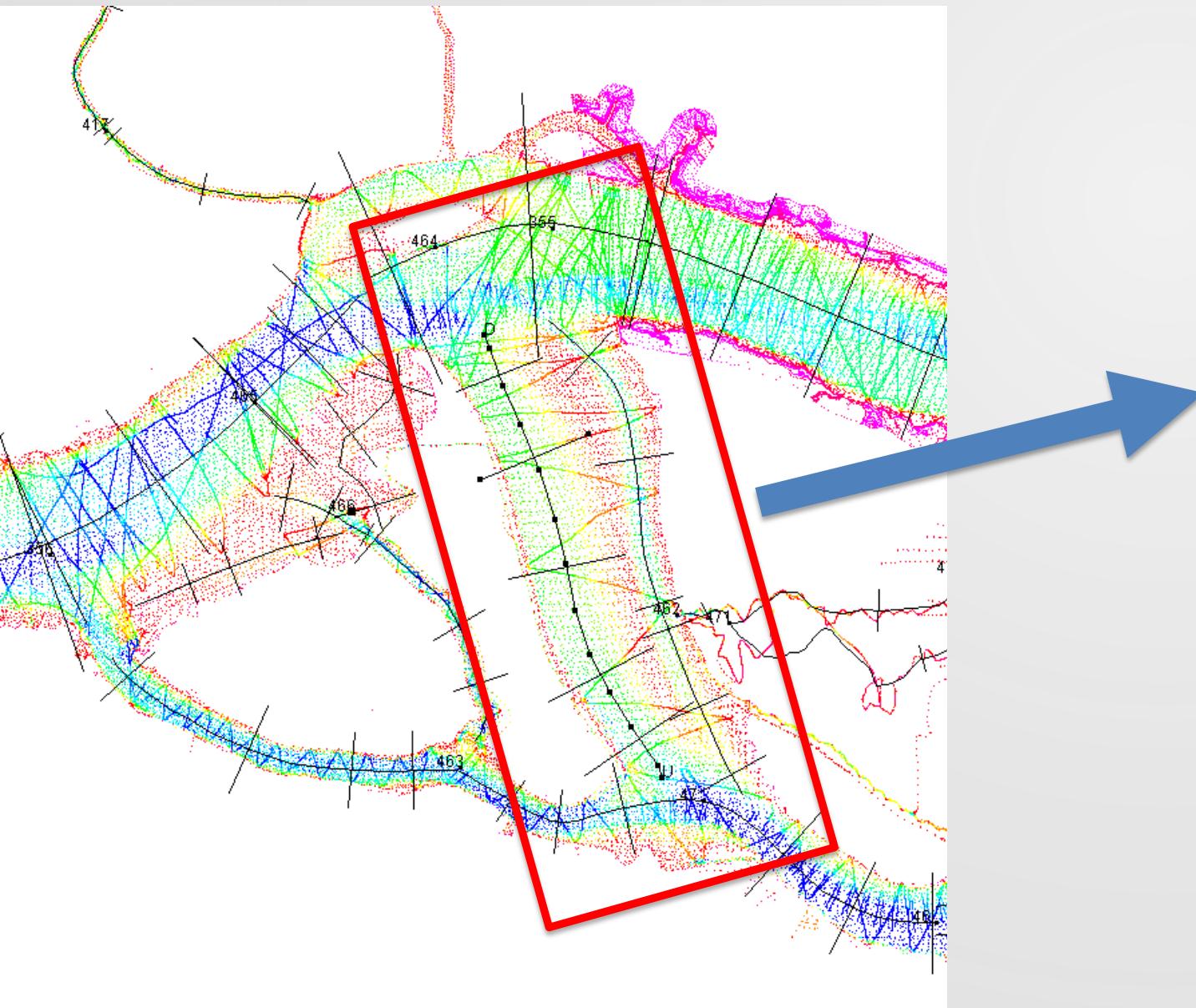
How J shapes affect conveyance characteristics



Results:
 $A_1 = A_2$
 $W_1 = W_2$
 $P_1 < P_2$

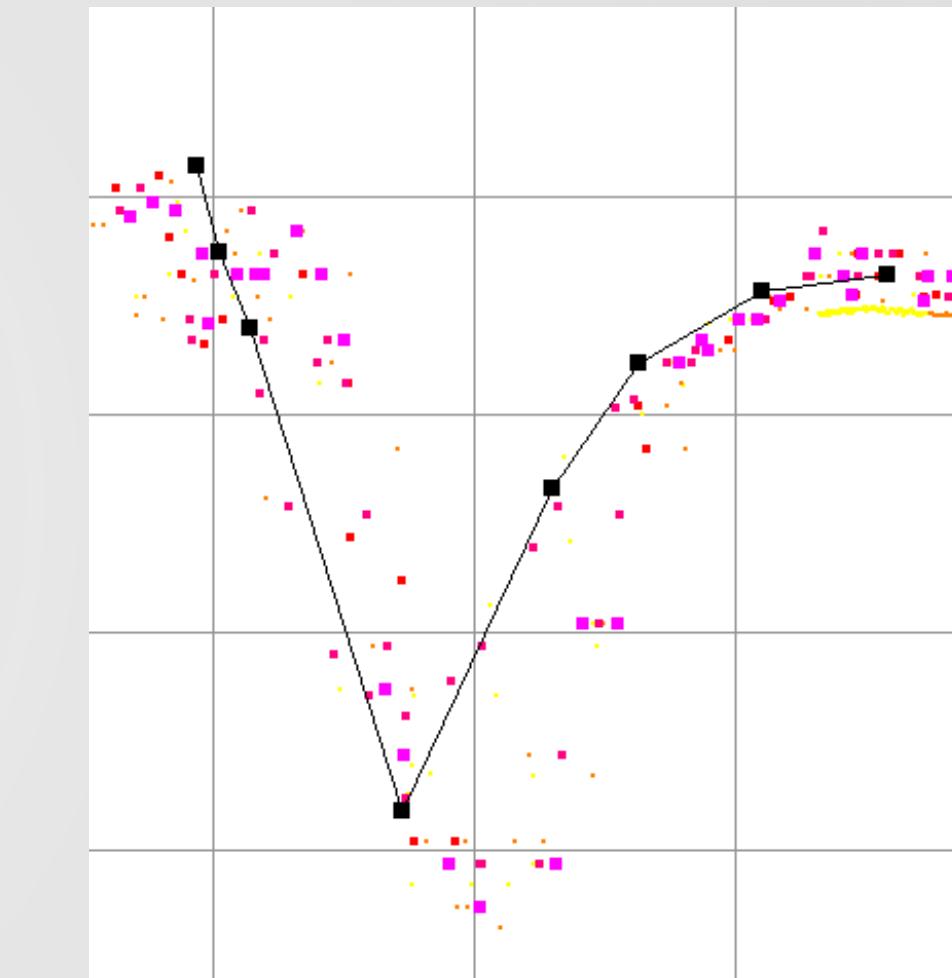
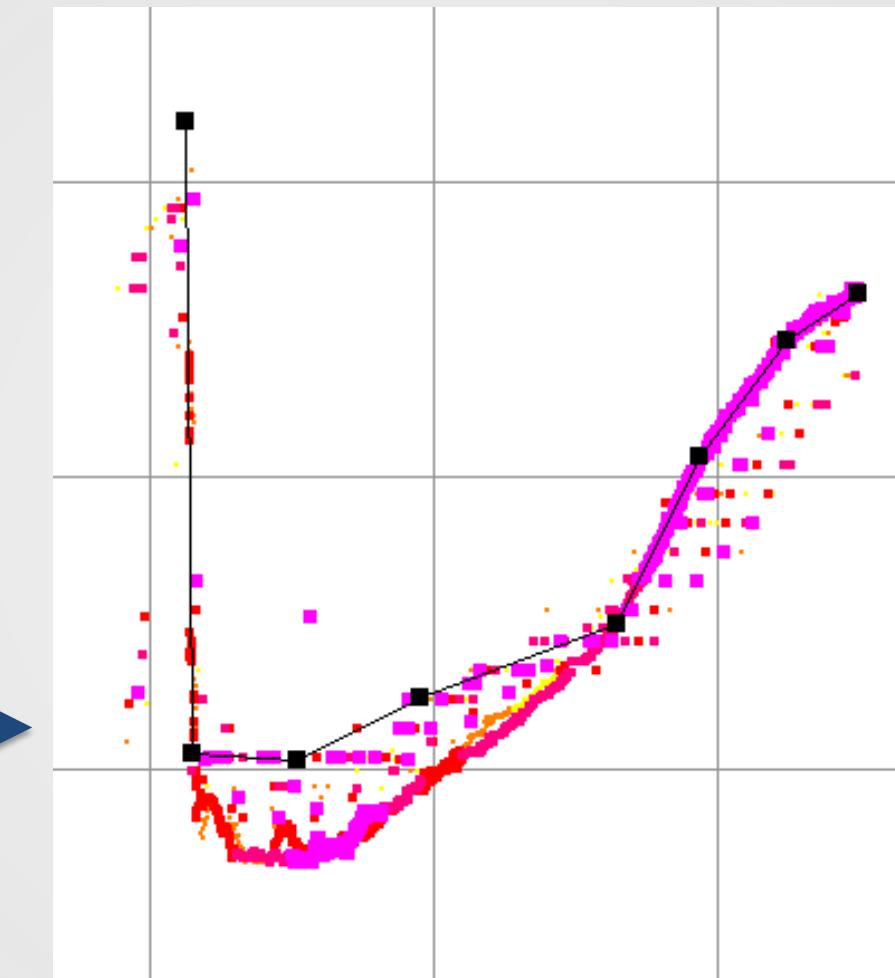
Some cross-Sections should be J-shaped Broad Slough

Broad Slough:
parallel channels in DSM2 with
opposite positive flow directions

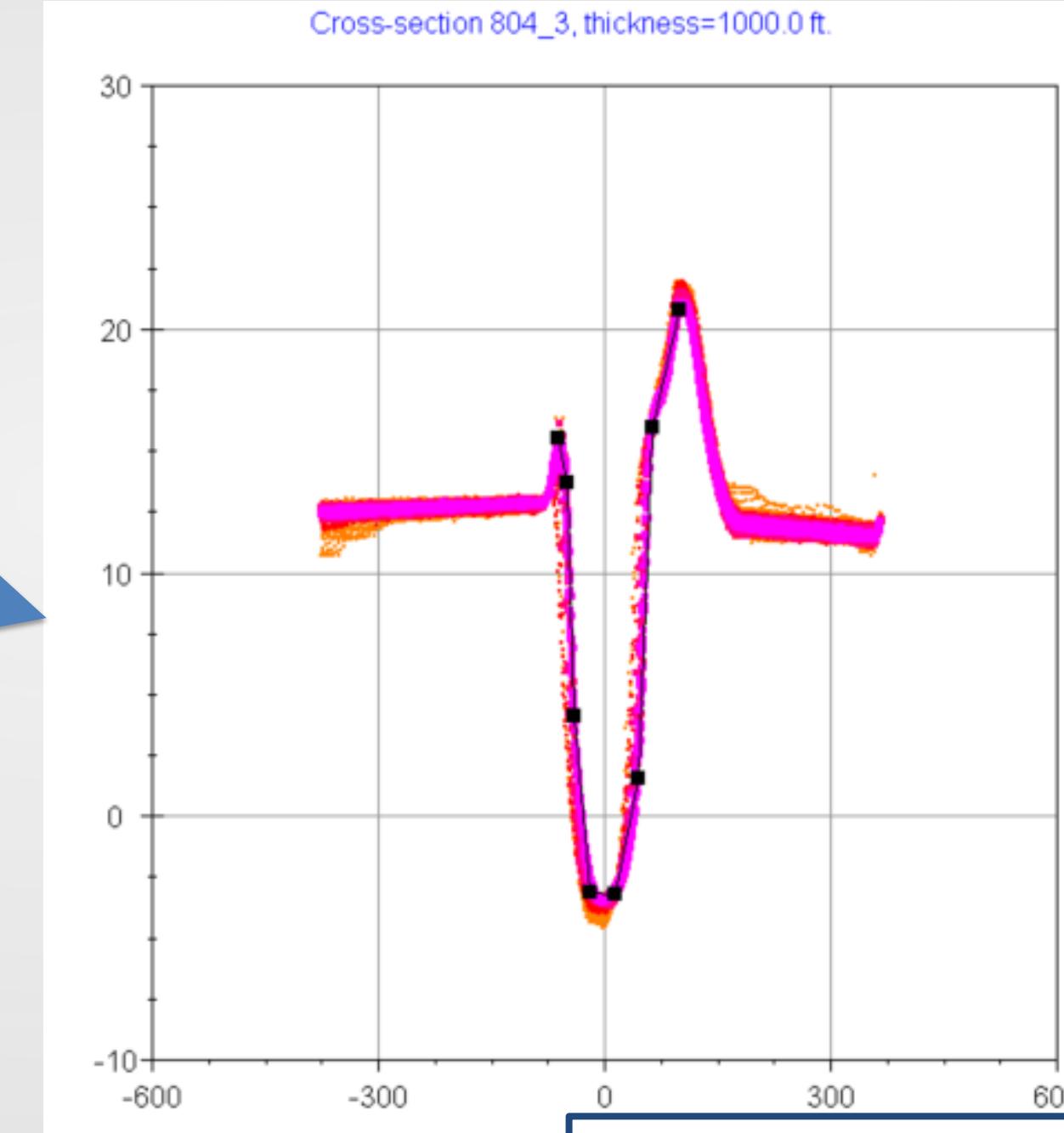
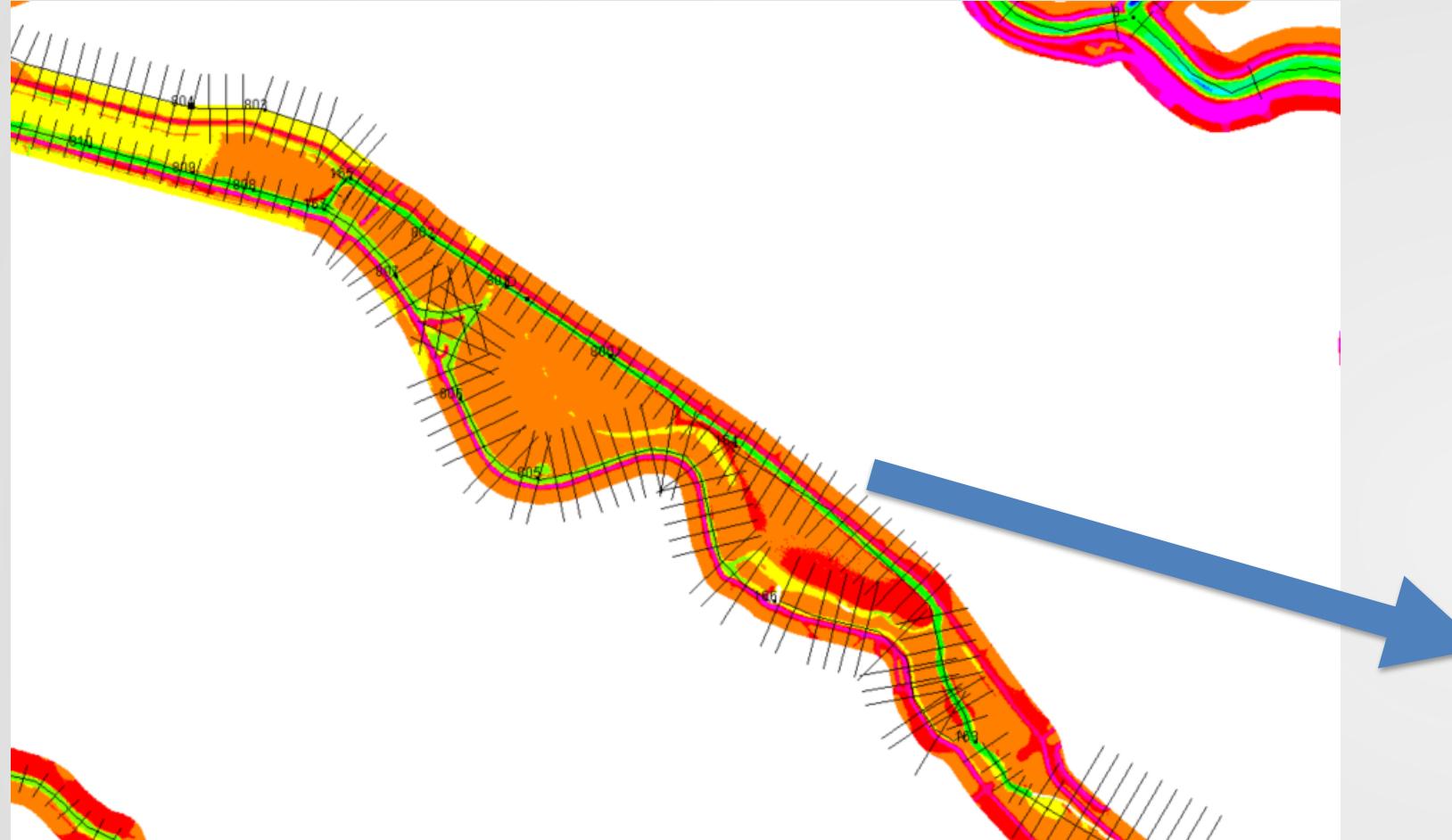


Some cross-Sections should be J-shaped Broad Slough

Broad Slough is represented by parallel channels in DSM2



Some cross-Sections should be J-shaped Paradise Cut



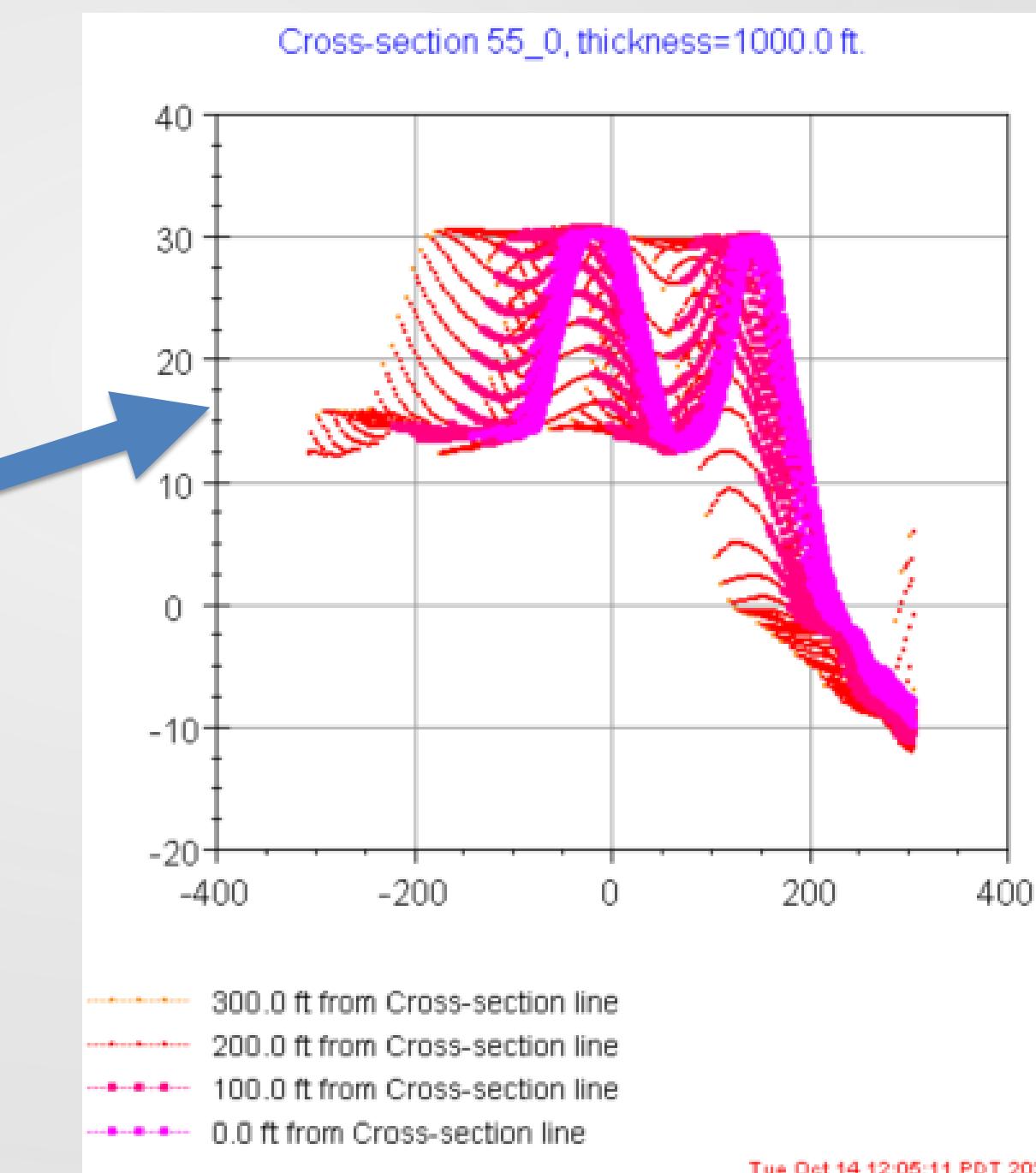
Legend:
— 300.0 ft from Cross-section line
— 200.0 ft from Cross-section line
— 100.0 ft from Cross-section line
— 0.0 ft from Cross-section line
■ cross-section points

The levee crown on the southwest bank
is lower than
the levee crown on the northeast bank

Most cross-sections should not be J-shaped

Missing data or cross-section line too short

- cross-section line should include both levee crowns, if available
- Exclude land surface from cross-section drawing



CSDP output/DSM2 geometry input: channel_std_delta_grid file

CHANNEL input section

From CSDP
network

From previous version of
channel input file

| CHANNEL | | | | | |
|---------|--------|---------|------------|--------|----------|
| CHAN_NO | LENGTH | MANNING | DISPERSION | UPNODE | DOWNNODE |
| 1 | 9823 | 0.035 | 360 | 1 | 2 |
| 2 | 10941 | 0.028 | 360 | 2 | 3 |
| 3 | 12756 | 0.028 | 360 | 3 | 4 |
| 4 | 17164 | 0.028 | 360 | 4 | 5 |
| 5 | 8150 | 0.028 | 360 | 5 | 6 |
| 6 | 9437 | 0.028 | 360 | 6 | 7 |
| 7 | 8967 | 0.028 | 360 | 7 | 8 |
| 8 | 11620 | 0.028 | 360 | 8 | 9 |
| 9 | 10395 | 0.028 | 360 | 9 | 10 |

XSECT_LAYER input section

From CSDP
network

| | | | | | |
|-----|------|------|-----|-----|-----|
| 817 | 1853 | 0.03 | 360 | 168 | 811 |
| 818 | 2460 | 0.03 | 360 | 811 | 812 |
| 819 | 2328 | 0.03 | 360 | 812 | 169 |
| 820 | 2494 | 0.03 | 360 | 813 | 149 |
| 821 | 1935 | 0.08 | 360 | 58 | 814 |
| 822 | 3883 | 0.08 | 360 | 814 | 59 |
| 823 | 3677 | 0.03 | 360 | 815 | 66 |

The following channels are missing from the CSDP network file
data are copied from the previous version of the DSM2 input
END

| XSECT_LAYER | | | | | |
|-------------|---------|--------|----------|---------|-----------|
| CHAN_NO | DIST | ELEV | AREA | WIDTH | WET_PERIM |
| 1 | 0.01194 | -3.205 | 0.000 | 0.000 | 0.000 |
| 1 | 0.01194 | 1.602 | 415.221 | 172.759 | 173.032 |
| 1 | 0.01194 | 4.247 | 1089.787 | 337.311 | 337.699 |
| 1 | 0.01194 | 6.409 | 1864.430 | 379.303 | 380.019 |
| 1 | 0.01194 | 11.737 | 4181.200 | 490.325 | 491.835 |
| 1 | 0.01194 | 12.606 | 4618.246 | 515.853 | 517.422 |
| 1 | 0.01194 | 20.428 | 9267.803 | 673.089 | 675.492 |

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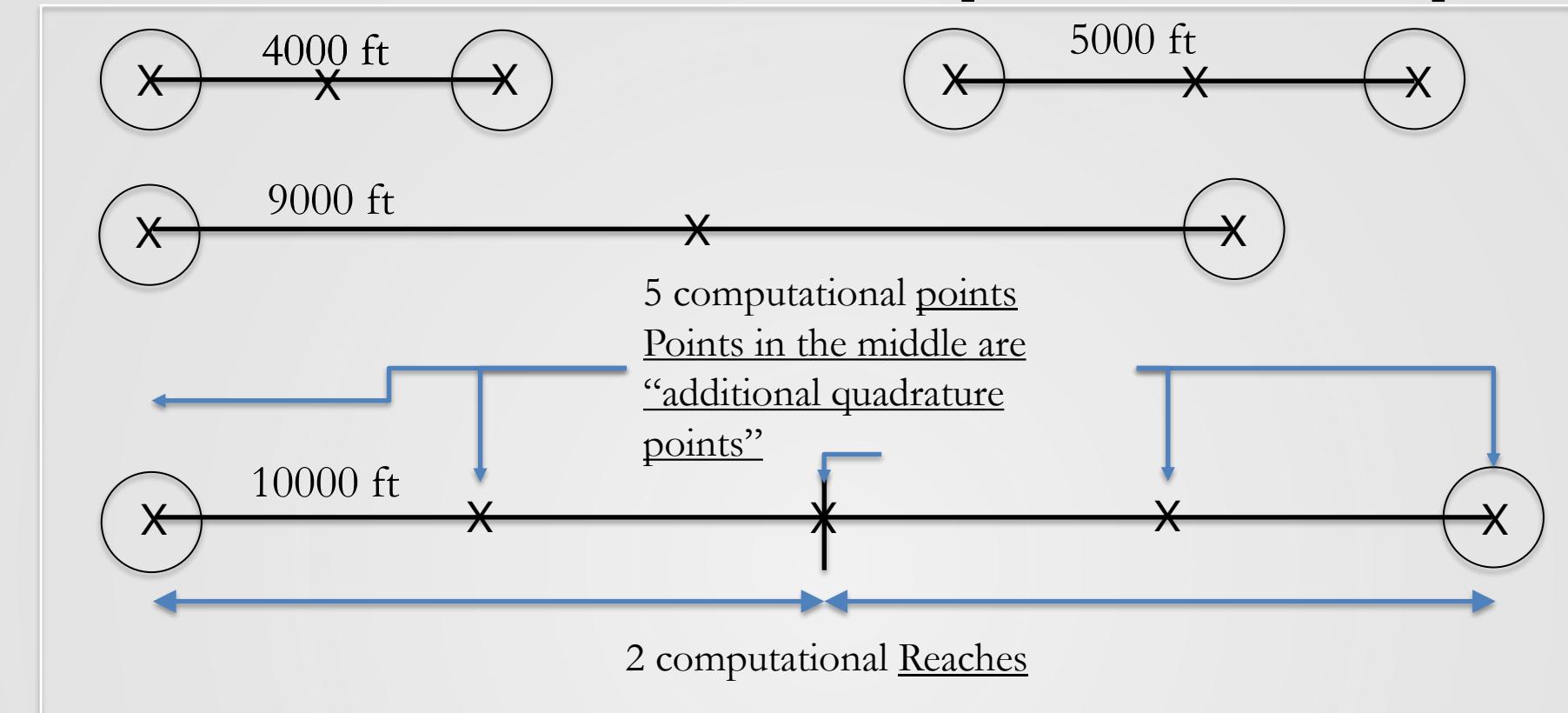
Creating
cross-
sections

DSM2
virtual
cross-
sections

Cross-
section
best
practices

Virtual (interpolated) cross-sections at computational points

DSM2 Computational Reaches and computational points for $\Delta x=5000\text{ft}$



$$\#\text{Computational Reaches} = 1 + \text{int} \left[\frac{\max(0, \text{length} - \Delta x)}{\Delta x} \right]$$

$$\#\text{Computational Points} = 3 + 2 * \text{int} \left[\frac{\max(0, \text{length} - \Delta x)}{\Delta x} \right]$$

Note: The int function truncates

| Length | # Computational Reaches | # Computational Points |
|----------|-------------------------|------------------------|
| 4000 ft | 1 | 3 |
| 5000 ft | 1 | 3 |
| 9000 ft | 1 | 3 |
| 10000 ft | 2 | 5 |
| 15000 ft | 3 | 7 |

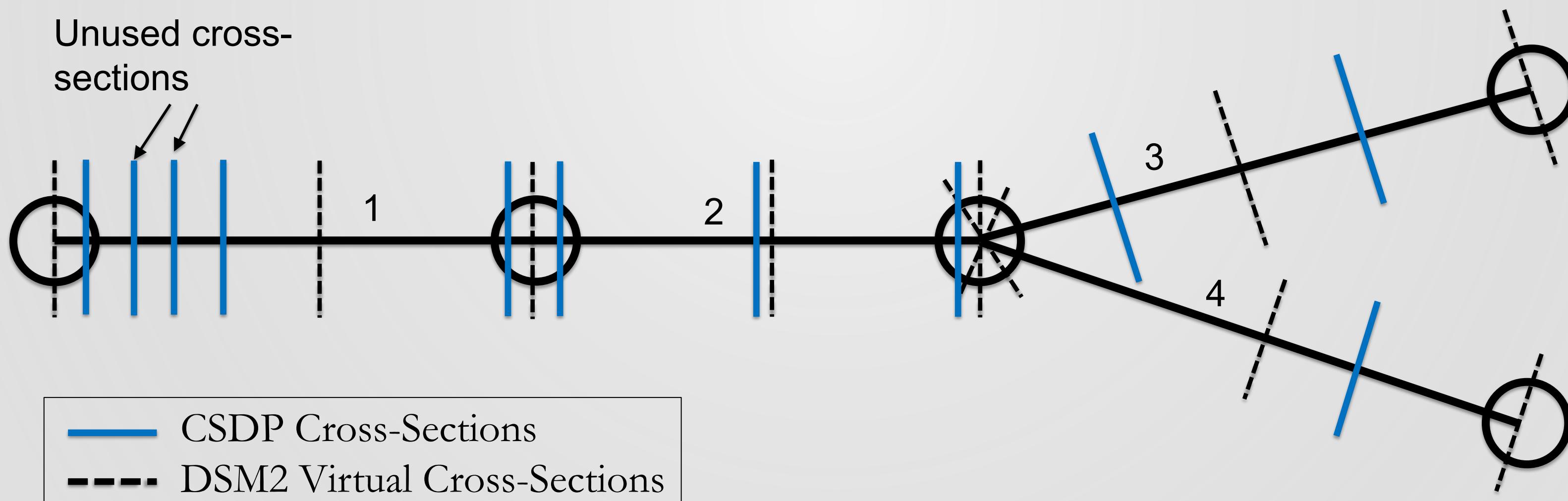
Cross-section Interpolation rules

Interpolate between nearest CSDP cross-sections

Interpolate across node allowed if 2 channel connections

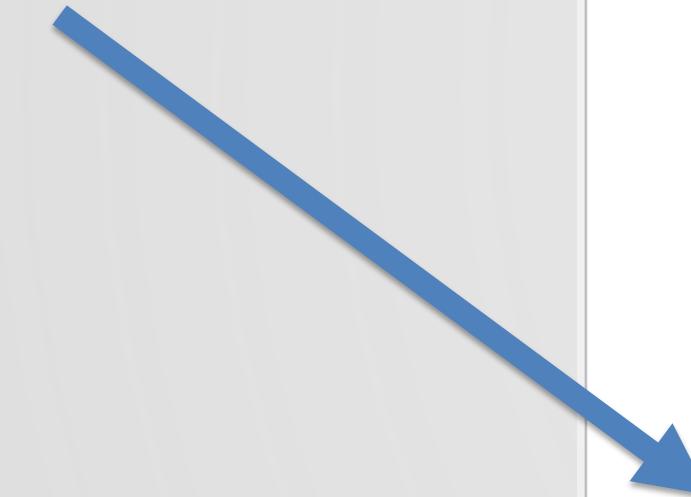
There must be at least 1 CSDP cross-section to create irregular virtual cross-sections

If interpolation not possible, CSDP cross-sections will be copied to all computational points



DSM2 Virtual Cross-Sections

1. Load tidefile into HDFView or similar application
2. Select “hydro-geometry-virtual_xsect” to view virtual cross-sections



HDFView 3.3.2

File Window Tools Help

Recent Files lsm2_input_2025-07-03_historical_update\dsm2_studies\studies\D-WL-Base\output\D-WL-Base.h5 Clear Text

D-WL-Base.h5

- hydro
- data
- geometry
 - channel_bottom
 - channel_dx
 - channel_location
 - channel_number
 - external_flow_name
 - hydro_comp_point
 - node_flow_connecti
 - qext
 - reservoir_flow_conn
 - reservoir_names
 - reservoir_node_con
 - stage_boundaries
 - transfer_names
 - virtual_xsect
- input

virtual_xsect at /hydro/geometry/ [D-WL-Base.h5 in X:\DSM2\full_calibration_8_3\delta\l\dsm2_input_2025-07-03_historical_update\dsm2...

Table Import/Export Data

0-based

| | chan_no | num_virt_sec | vsecno | num_elev | min_elev | elevation | area | wet_p | width |
|---|---------|--------------|--------|----------|----------|-----------|--------|-------------|-------------|
| F | 0 | 1 | 3 | 1 | 24 | -3.205 | -3.205 | 0.0 | 0.0 |
| F | 1 | 1 | 3 | 1 | 24 | -3.205 | -2.036 | 24.55645... | 42.07913... |
| F | 2 | 1 | 3 | 1 | 24 | -3.205 | -1.445 | 55.66239... | 63.35267... |
| F | 3 | 1 | 3 | 1 | 24 | -3.205 | -1.069 | 81.98587... | 76.88711... |
| F | 4 | 1 | 3 | 1 | 24 | -3.205 | -0.323 | 149.2534... | 103.7400... |
| F | 5 | 1 | 3 | 1 | 24 | -3.205 | -0.169 | 165.6304... | 109.2833... |
| F | 6 | 1 | 3 | 1 | 24 | -3.205 | 1.602 | 415.2262... | 173.032 |
| F | 7 | 1 | 3 | 1 | 24 | -3.205 | 1.694 | 431.3833... | 178.7595... |
| F | 8 | 1 | 3 | 1 | 24 | -3.205 | 3.583 | 879.5339... | 296.3610... |
| F | 9 | 1 | 3 | 1 | 24 | -3.205 | 4.247 | 1089.793... | 337.699 |
| F | 10 | 1 | 3 | 1 | 24 | -3.205 | 6.409 | 1864.453... | 380.019 |
| F | 11 | 1 | 3 | 1 | 24 | -3.205 | 6.431 | 1872.803... | 380.4807... |
| F | 12 | 1 | 3 | 1 | 24 | -3.205 | 7.336 | 2225.020... | 399.4734... |
| F | 13 | 1 | 3 | 1 | 24 | -3.205 | 11.737 | 4181.142... | 491.835 |
| F | 14 | 1 | 3 | 1 | 24 | -3.205 | 12.606 | 4618.326... | 517.422 |
| T | 15 | 1 | 3 | 1 | 24 | -3.205 | 14.899 | 5854.023... | 563.7598... |

CSDP Introduction

History
and
references

CSDP
process
flow
diagram

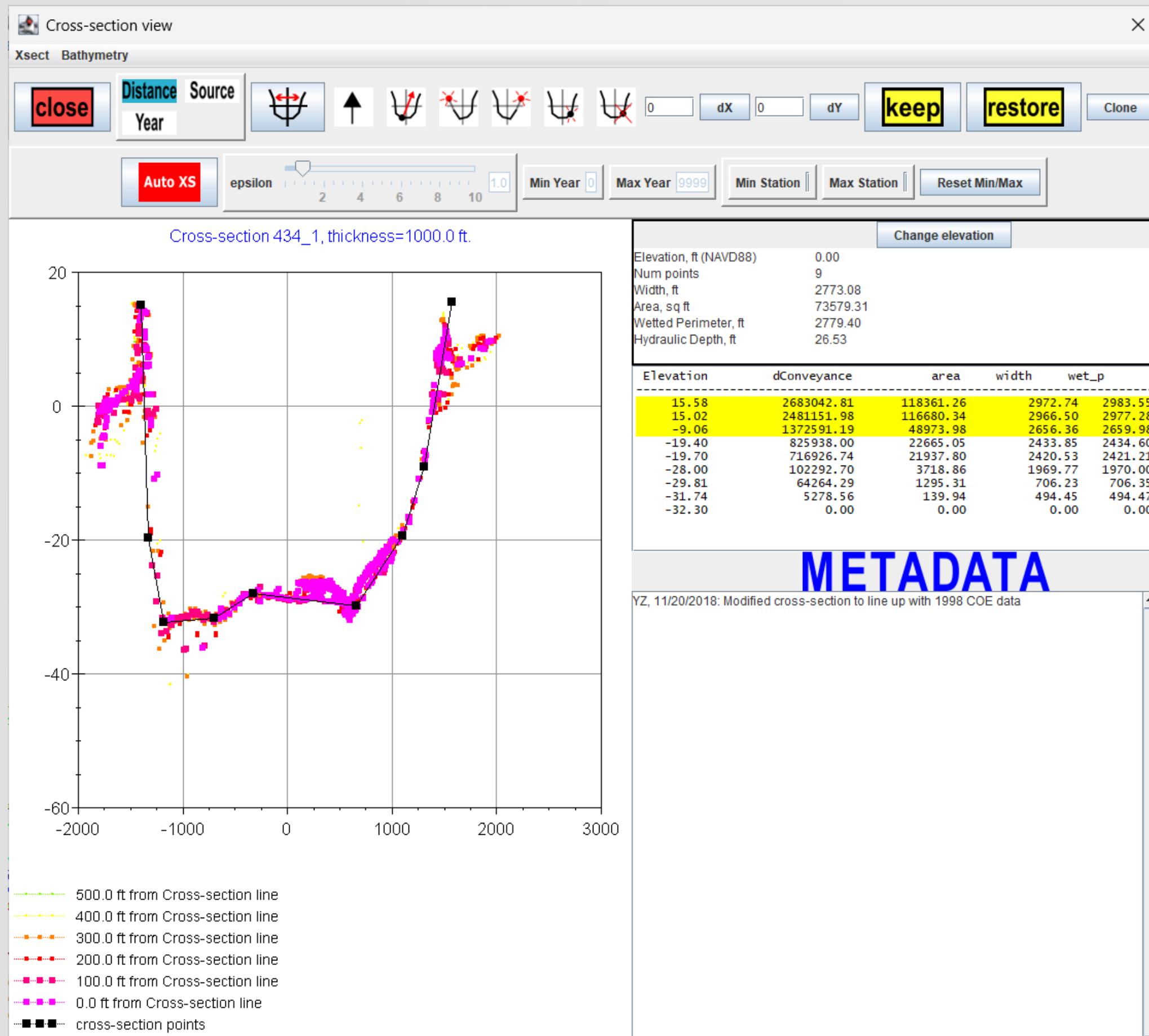
CSDP
data types

Creating
cross-
sections

DSM2
virtual
cross-
sections

Cross-
section
best
practices

CSDP Cross-Section Best Practices



- Set thickness based on delta x (dX), density of data, and curvature of channel
- Cross-sections should represent the portions of the channel between computational points
- Don't use excessive points
- Avoid large changes in WAP wrt elevation in the intertidal zone
- Avoid large changes in area between adjacent cross-sections
- Make sure every cross-section line has a drawing
- Try to go from levee crown to levee crown, excluding land surface
- Avoid line segments that overlap horizontally
- To adjust area, large adjustments can be made by moving points horizontally, small adjustments by moving vertically.
- Always add metadata when modifying a cross-section.
- When reviewing cross-sections with new bathymetry, adding metadata is recommended.

Break

10:00-10:10

Hands-on exercise: load CSDP files, view cross-sections

Goals: Learn how to

1. Load CSDP data files
2. Select and view a cross-section
3. Use the 3D bathymetry and cross-section plot

Load CSDP
files

Select
centerline

Select
cross-
section line

View cross-
section

View 3D
plot of
bathymetry
with cross-
sections

Hands-on exercise: load CSDP data

The screenshot shows the Cross-Section Development Program interface with a toolbar at the top and a main workspace below. The toolbar includes buttons for Bathymetry, Properties, Display, Network, Landmark, Centerline, Xsect, Zoom, Tools, and several yellow buttons labeled 'bath', 'Prop', 'net', and 'save'. A context menu is open over the 'bath' button, showing options like 'open bathymetry file'. Three callout boxes provide instructions:

1. Load bathymetry file
tms_area.cdp
2. Load landmark file
node.cdl
3. Load network file
delta_tms_horseshoe_adj.cdn

A large green arrow points from the 'Choose each file using the file selector dialog' text to a separate 'Select bathymetry(.prn, .cdp, .cdp.gz) file' dialog window.

Select bathymetry(.prn, .cdp, .cdp.gz) file

Look In: csdp_quick_start

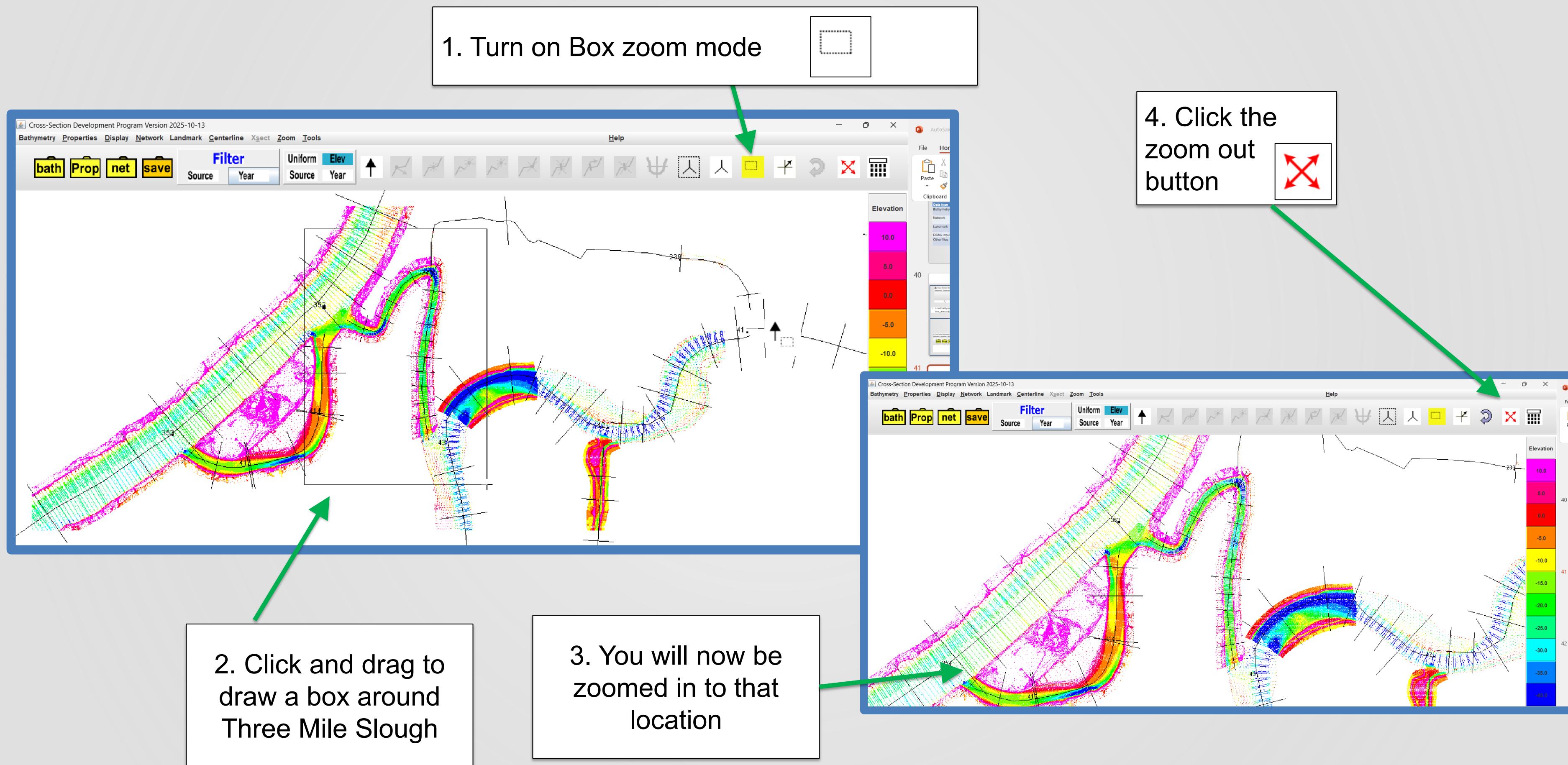
File Name: tms_area.cdp

Files of Type: Filetypes: *.prn, *.cdp, *.cdp.gz

Open Cancel

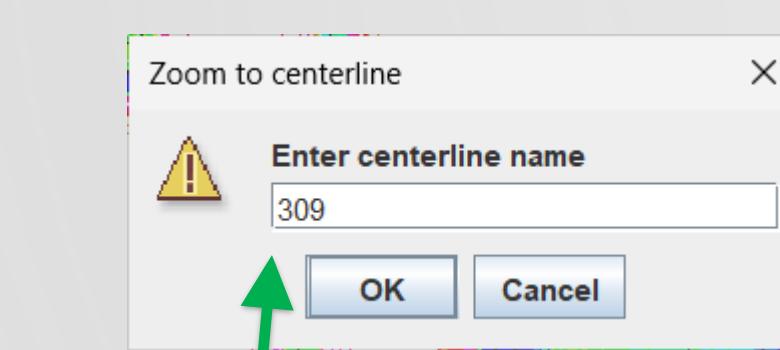
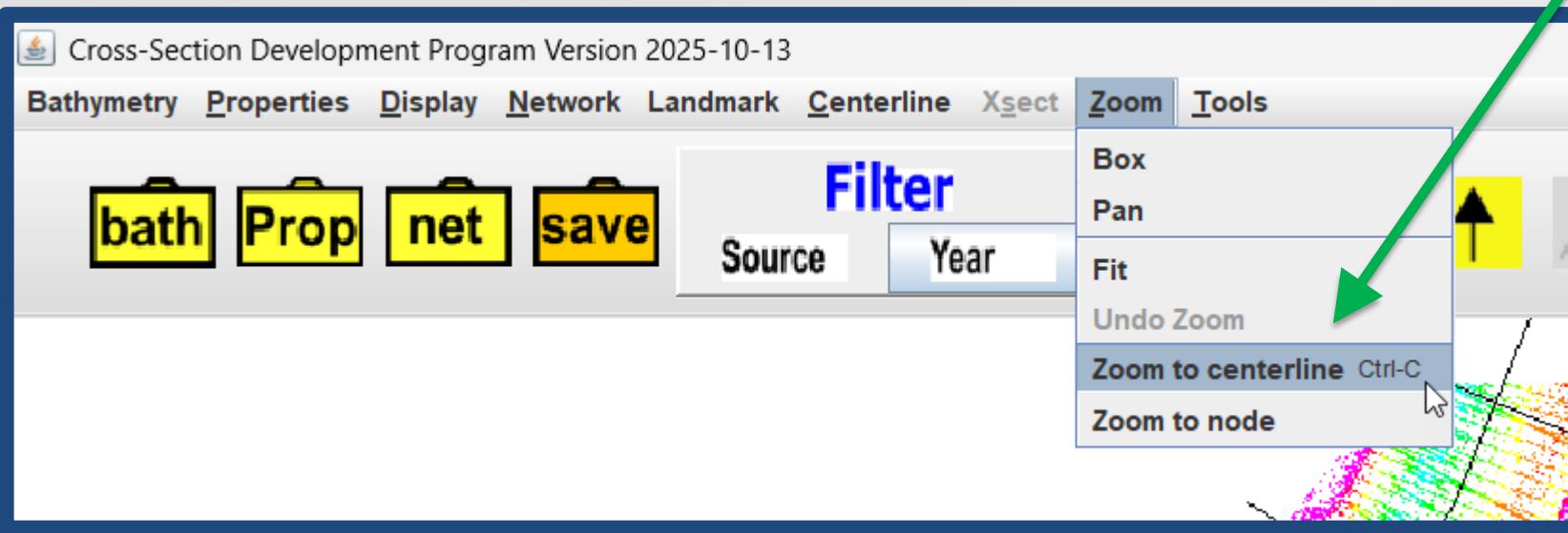
The bottom portion of the screenshot shows the same interface after loading files, with the 'Landmark' tab selected in the menu bar. The 'Landmark' button in the toolbar is highlighted, and a context menu is open over it, showing options like 'Open Landmark File', 'Clear Landmarks', 'Save', 'Save As', 'Export to WKT Format for GIS', and 'Landmark Editing Help'.

Hands-on exercise: Box Zoom



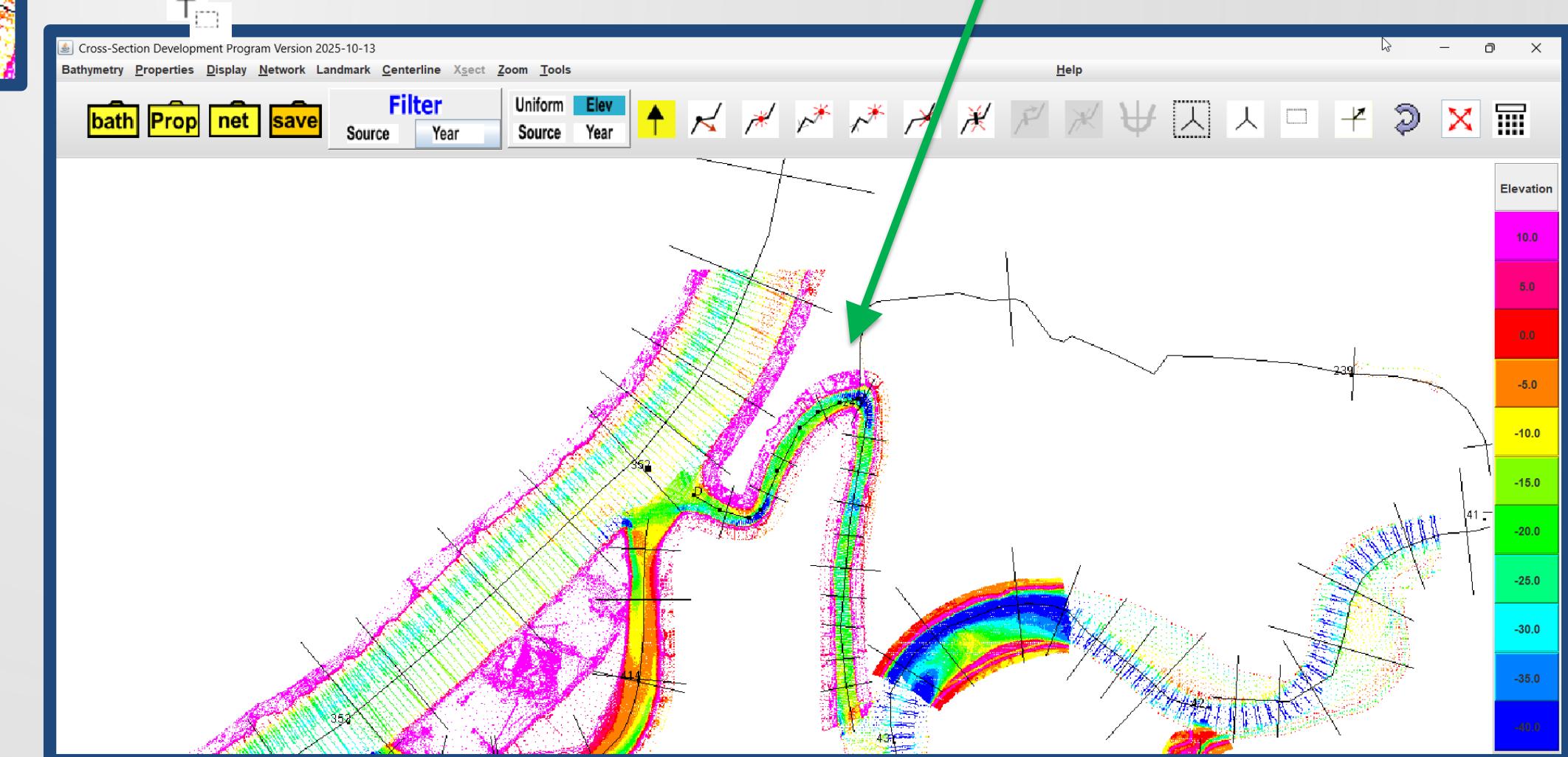
Hands-on exercise: Zoom To Centerline

1. Select “Zoom-Zoom to centerline” OR
Press **Ctrl-c**

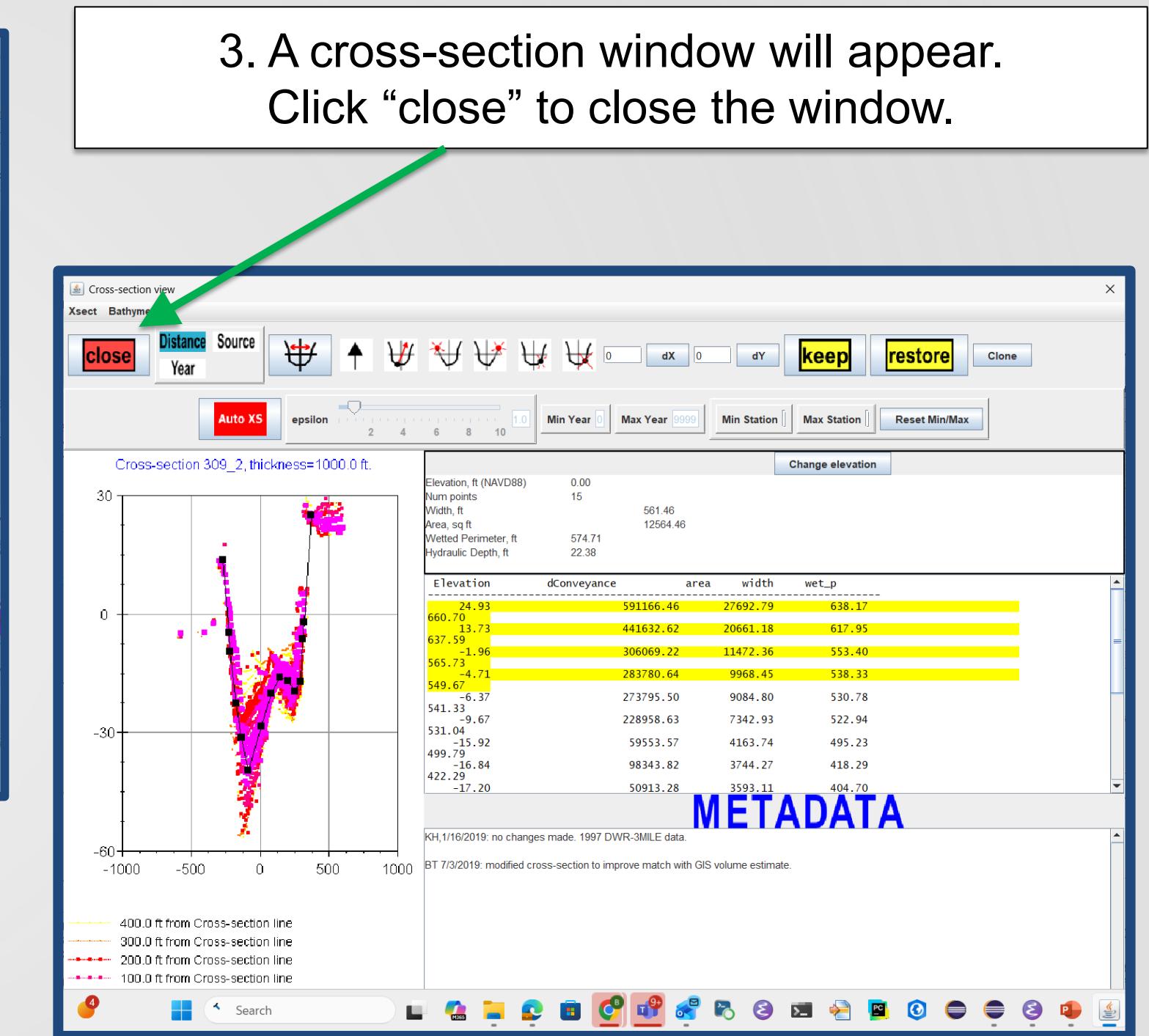
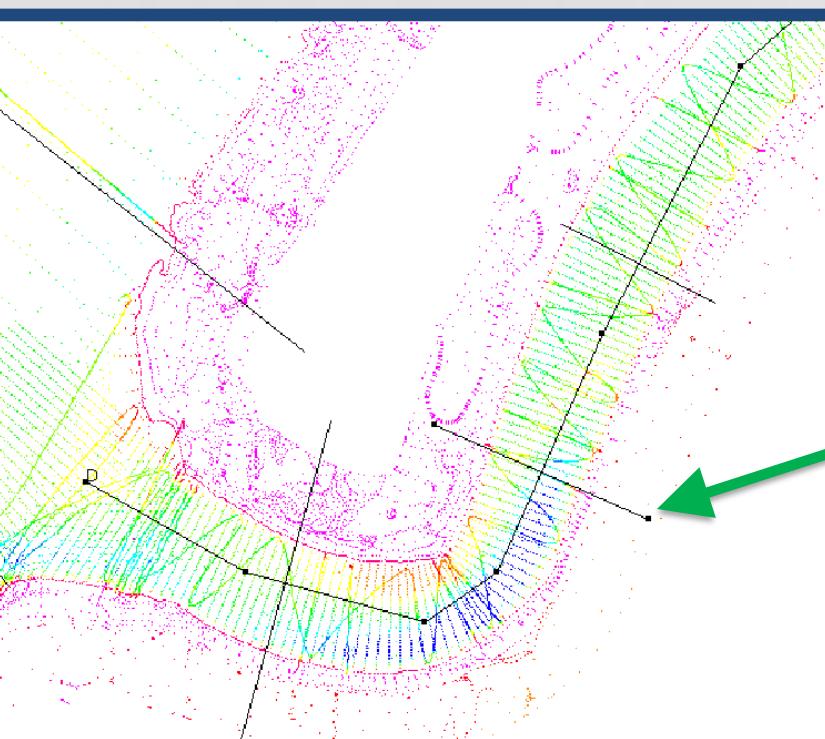
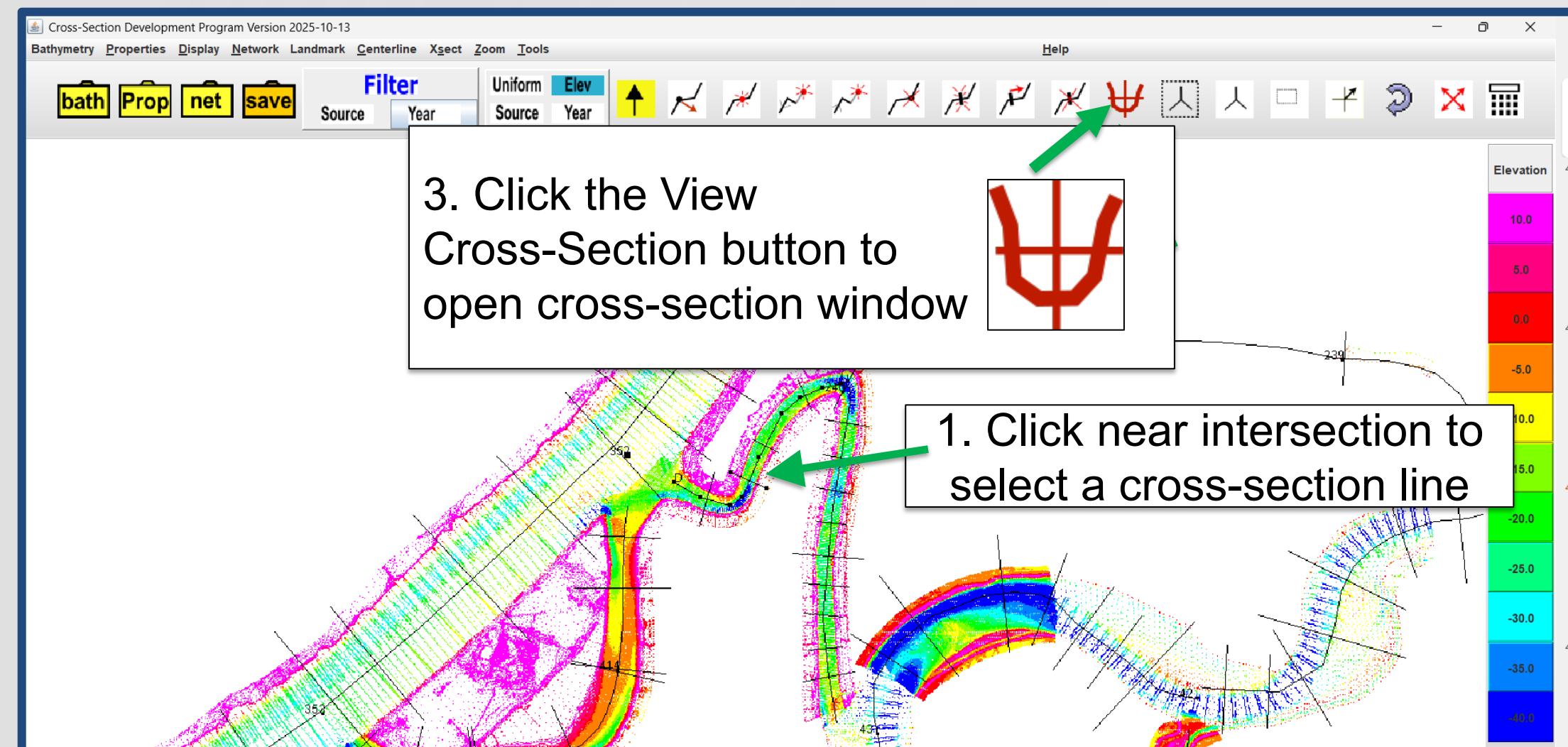


2. Enter “309” to zoom to
and select channel 309

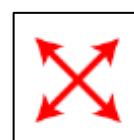
3. You will now be zoomed in to channel 309,
and it will be selected



Hands-on exercise: Select & View Cross-Section

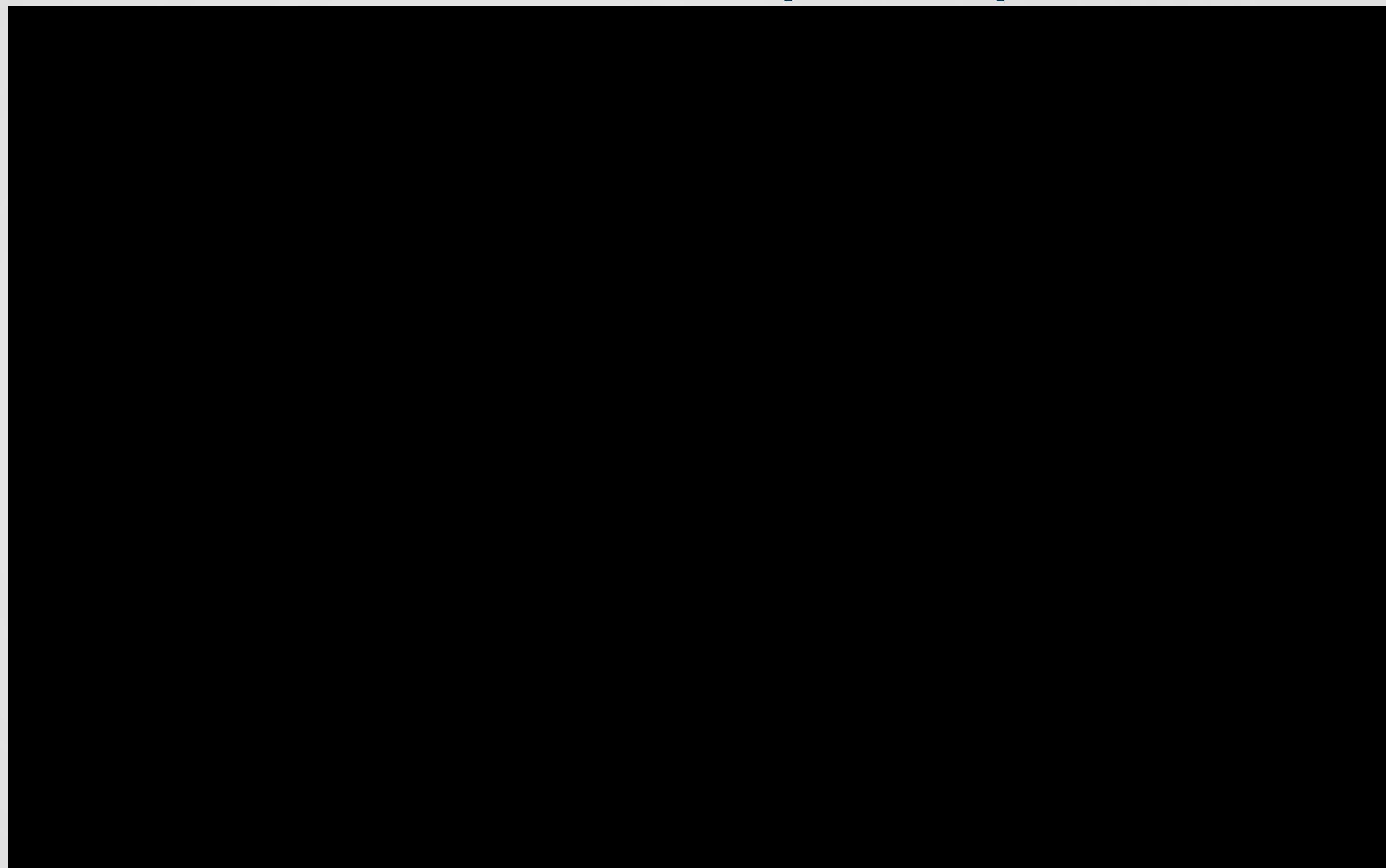


4. In the main window, click the zoom out button



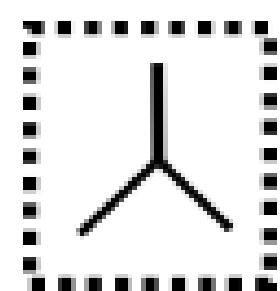
Channel 3D plot demo (video)

| | |
|---------------------|-------------------------|
| Correct distortion | Ctrl or alt mouse wheel |
| Rotate | Left drag |
| Adjust z axis scale | Mouse wheel |
| X and y zoom | Ctrl-alt mouse wheel |
| Right drag | Z axis pan |
| Ctrl-alt right drag | X and y pan |



Hands-on exercise: View Channel 3D plot

1. 3d plot button



1a. You can also try this button to specify channel numbers



2. Click and drag to draw a window around Decker Island and Three Mile Slough



4. Close the instructions window, and a 3D plot will appear. Right click and drag on window to fix display. Ctrl- and alt- mouse wheel to adjust x and y axis scales. Right mouse wheel to adjust vertical axis scale. Left click and drag to rotate about all axes. If a command does not work, try left-clicking on the window first.

Message



For some reason, you must right click with the mouse on the graph to get it to display properly.

Usage:

Left drag: rotate plot

Right click: rotate plot continuously

Rotate Mouse Wheel: zoom z axis

Ctrl-Mouse Wheel: zoom x axis

Alt-Mouse Wheel: zoom y axis

Ctrl-Alt-Mouse Wheel: zoom x and y axes

Right drag: pan z axis

Ctrl-Right drag: pan x axis

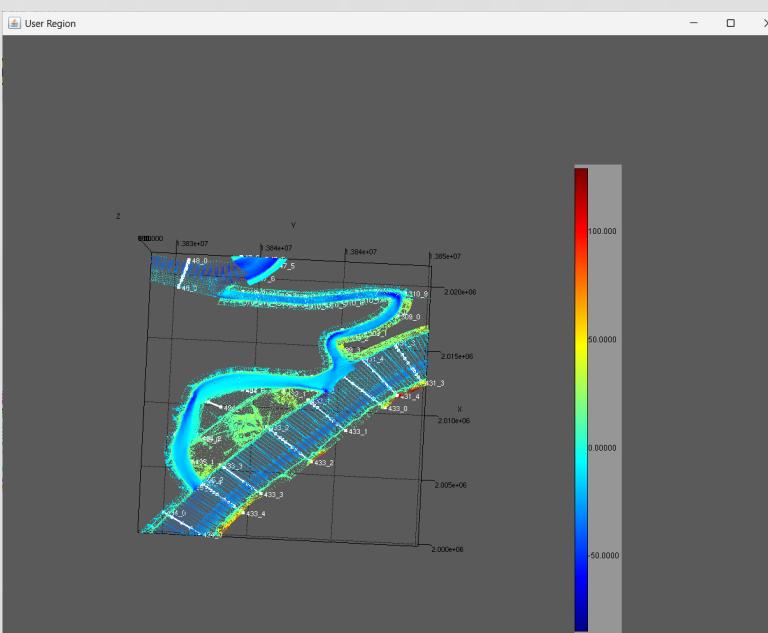
Alt-Right drag: pan y axis

Ctrl-Alt-Right drag: pan x and y axes

Display this message next time?

Yes

No



Break

11:00-11:10

Hands-on exercise: create cross-sections, run DSM2

Goals: Learn how to

1. Set up DSM2 for geometry modifications
2. Create channel centerline
3. Create and adjust cross-section lines
4. Create a cross-section
5. Run DSM2 with modified geometry

Create a folder for CSDP output/DSM2 geometry input

Load CSDP files

Create Centerline

Create Cross-section lines

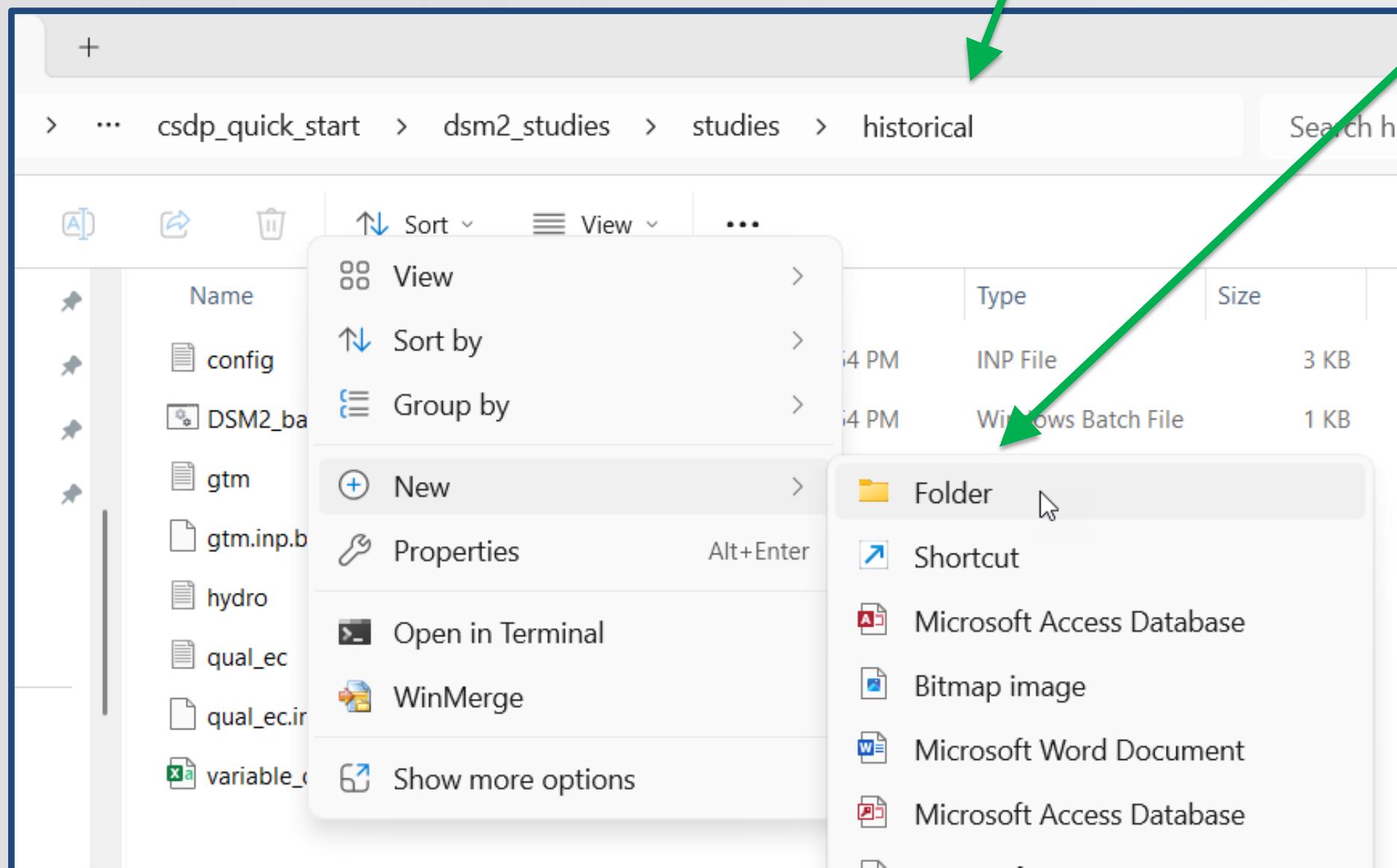
Create Cross-sections

Create DSM2 geometry input

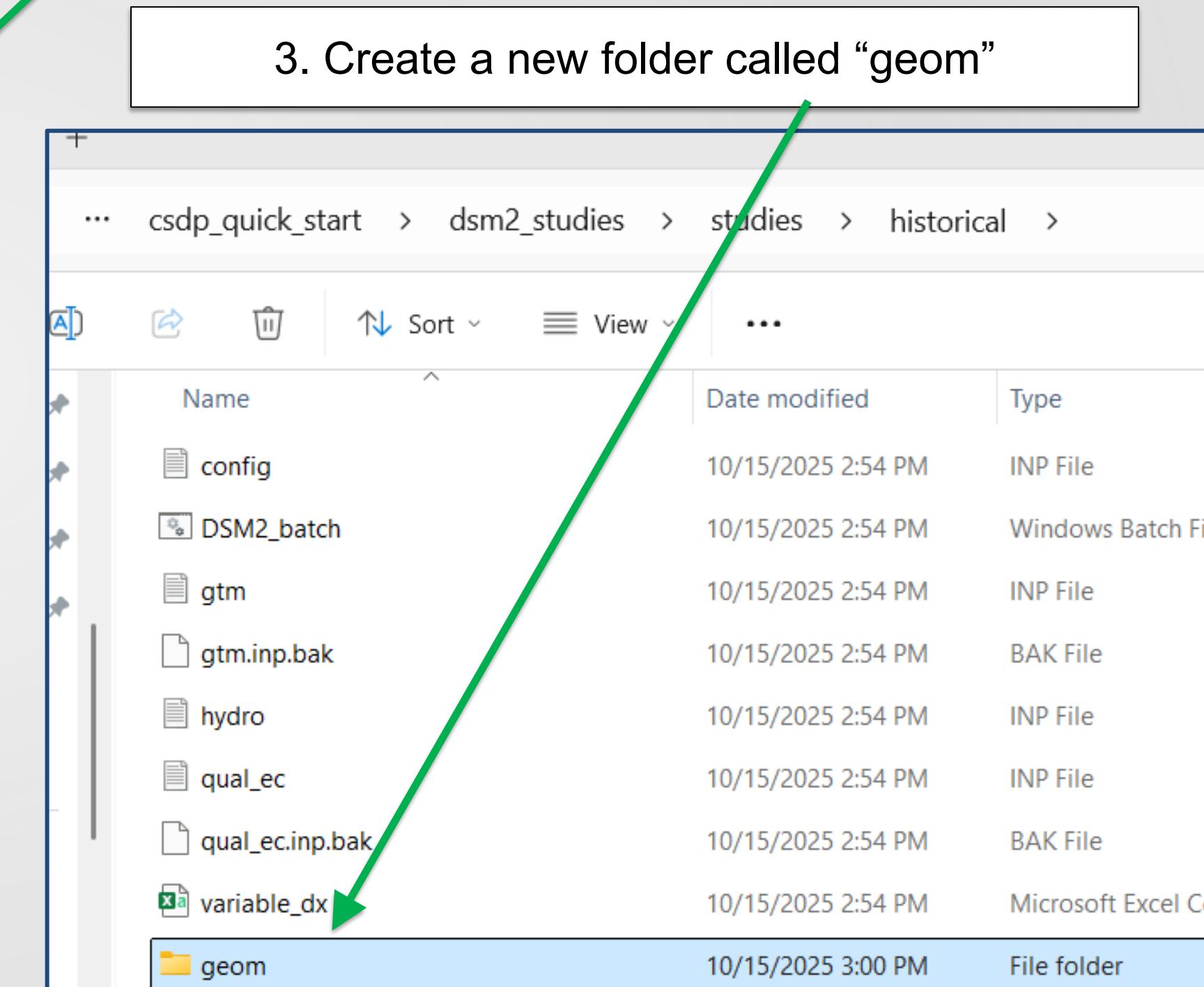
Run DSM2-Hydro

Hands-on exercise: create a geom folder

1. Open Windows explorer, and navigate to the historical folder in your DSM2 installation

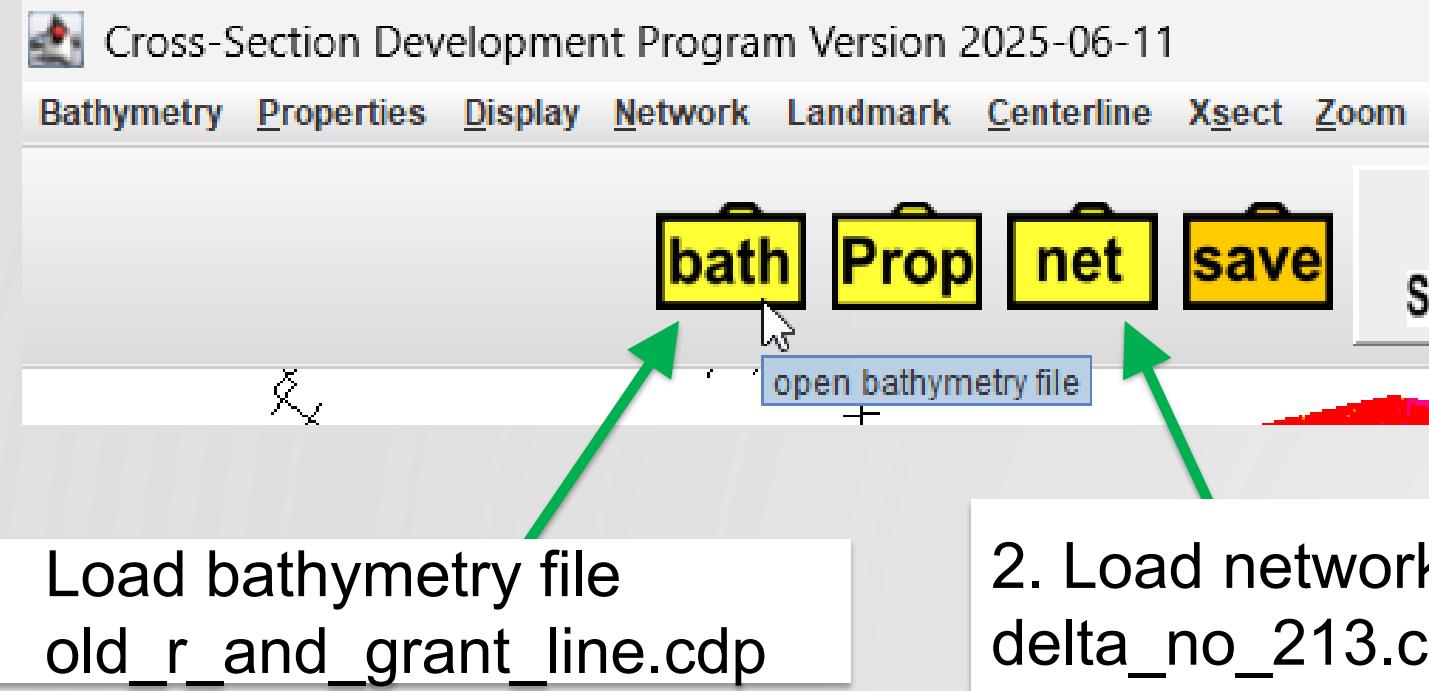


2. Right click and select New-Folder



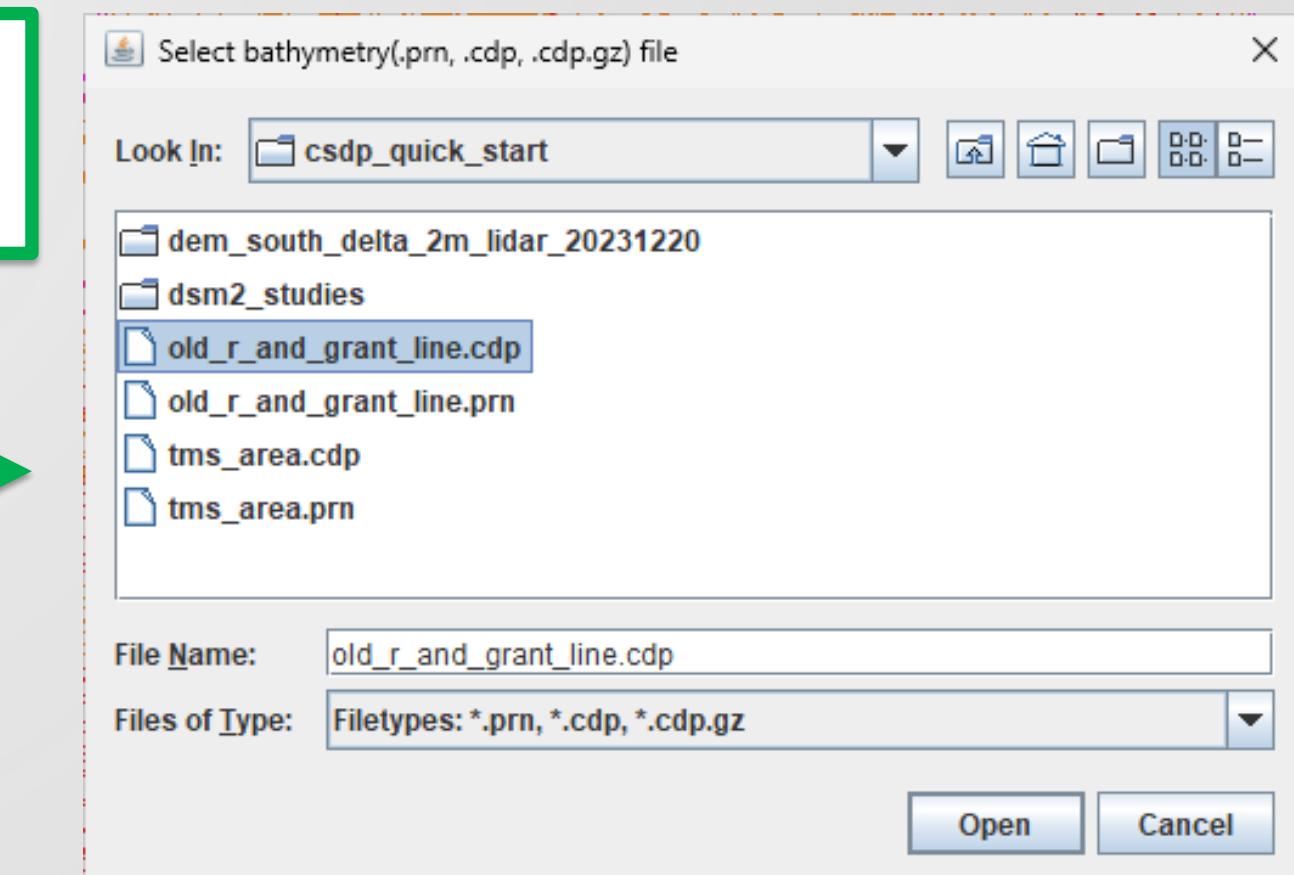
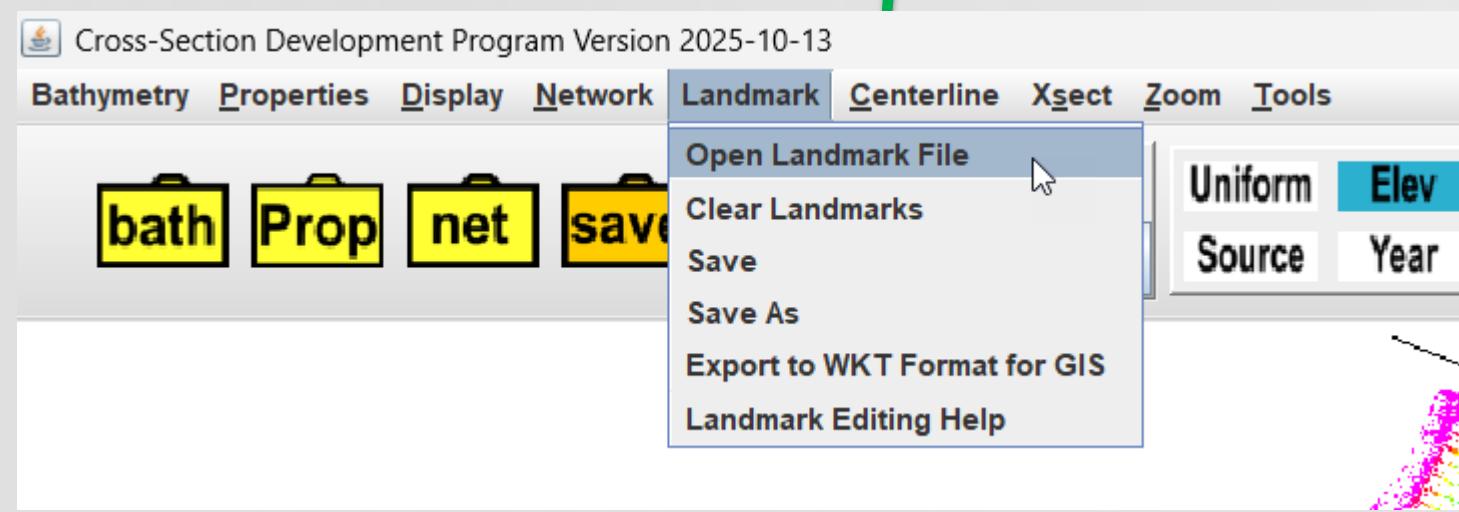
3. Create a new folder called “geom”

Hands-on exercise: load CSDP data

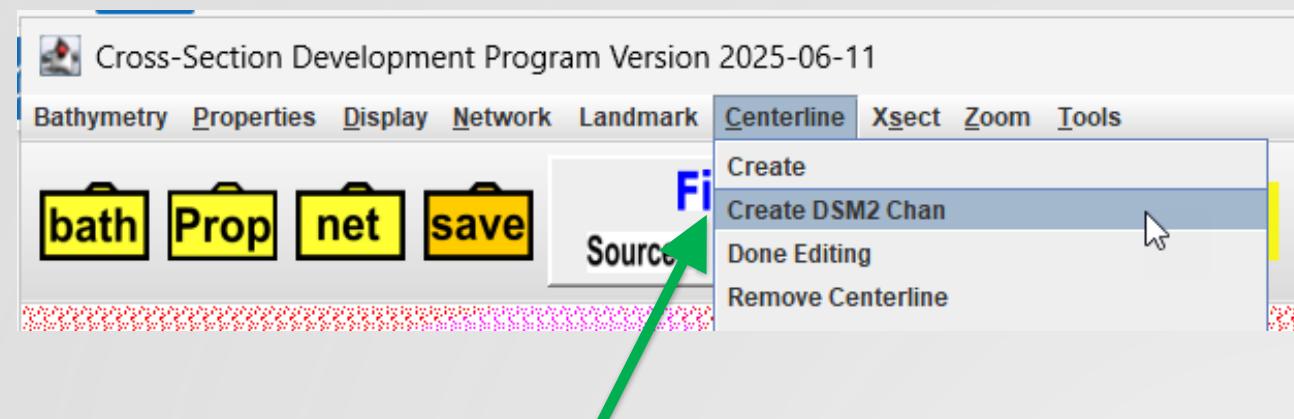


3. Load landmark file
node.cdl

Choose each file using
the file selector dialog

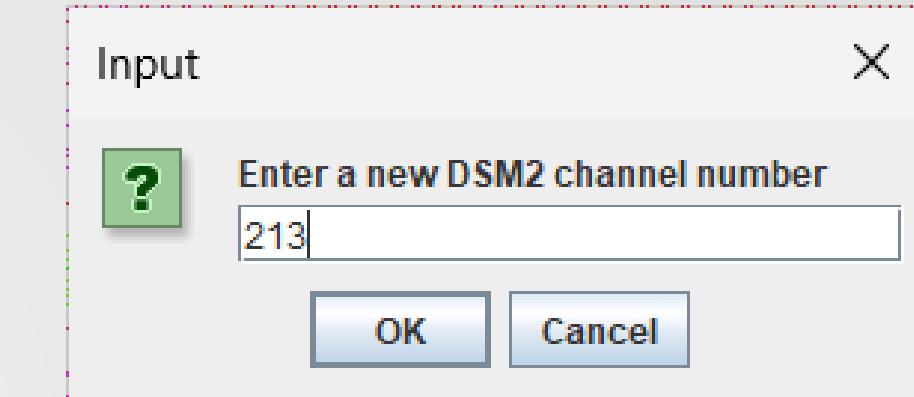


Hands-on exercise: Create Centerline

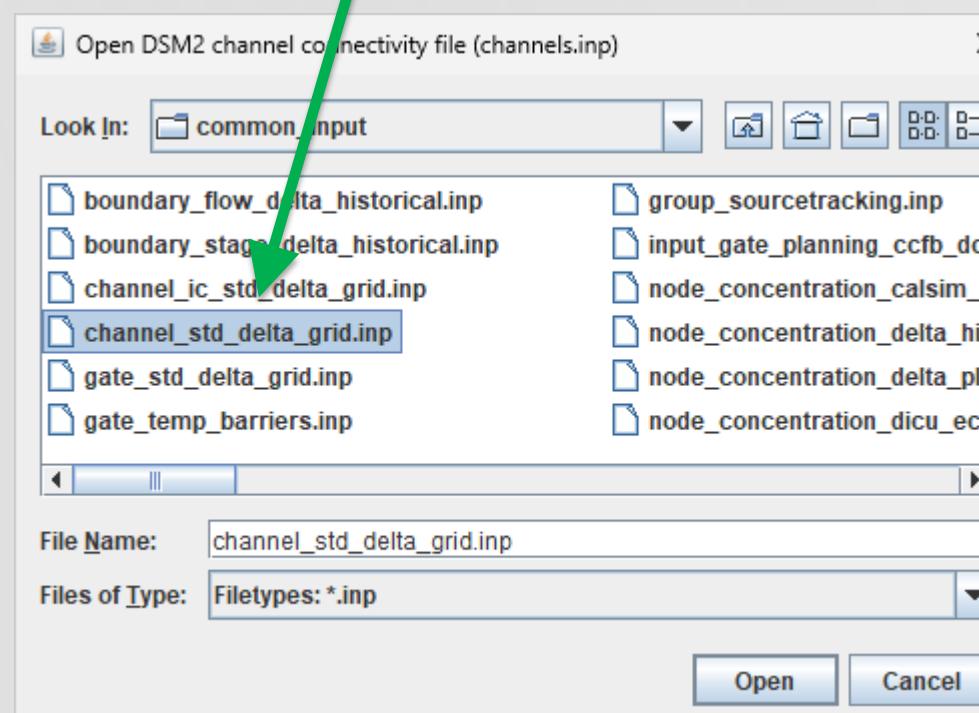


1. Select Centerline-
Create DSM2 Chan

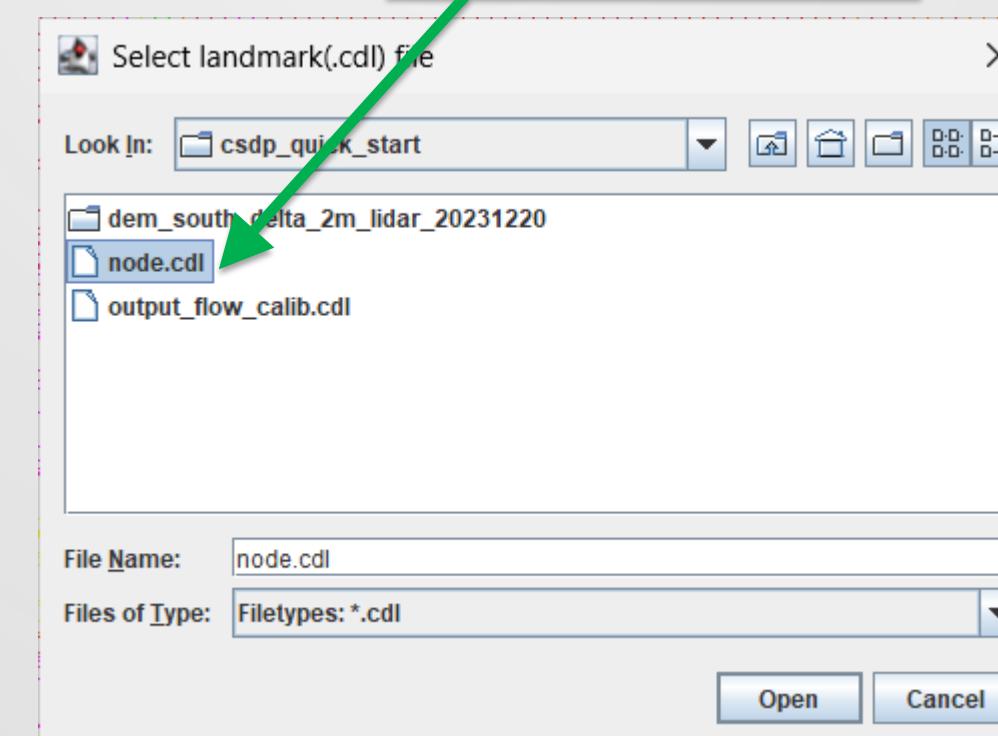
2. Enter the number 213



3. Select the
channel_std_delta_grid.inp file

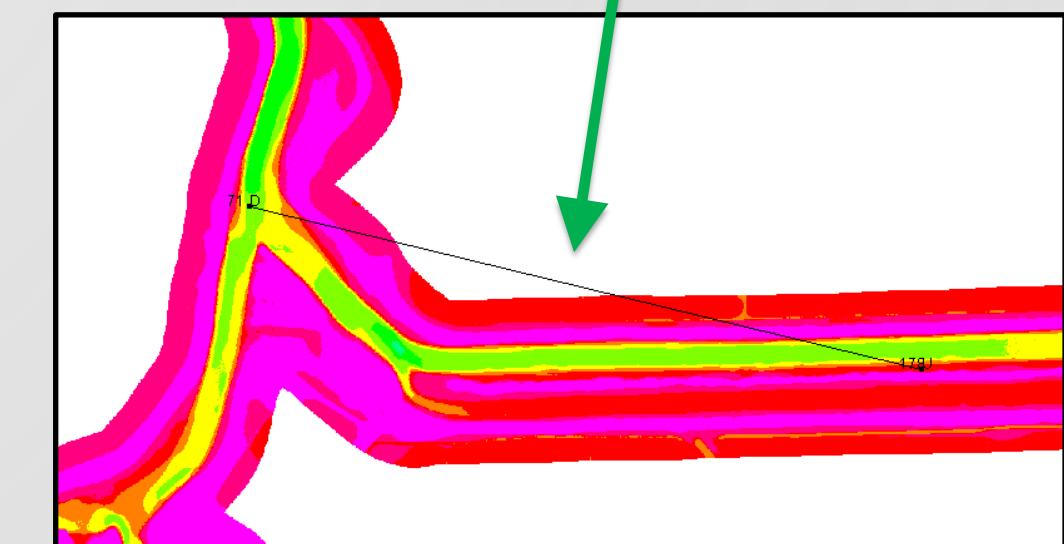


4. Select the
node.cdl file*

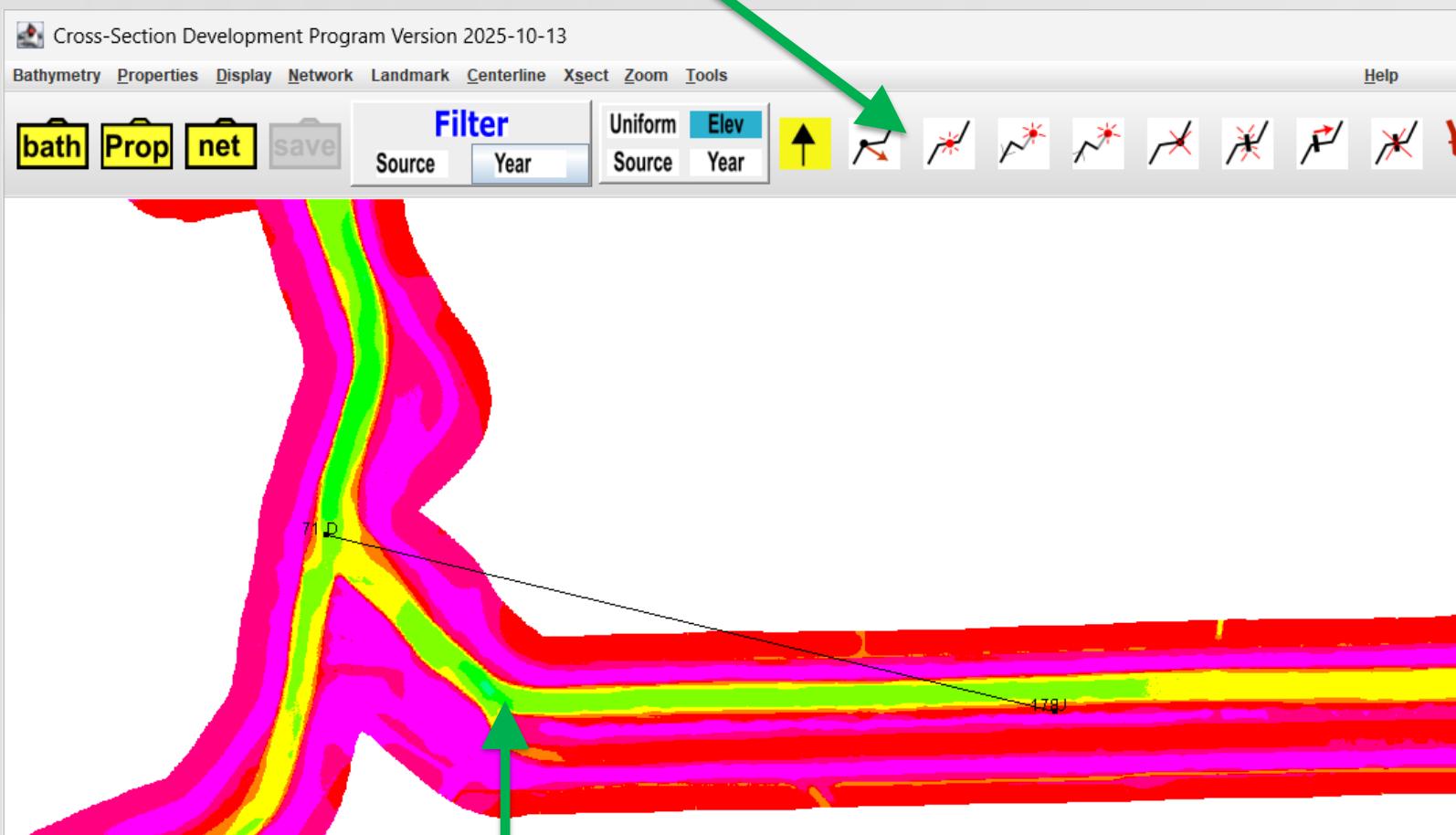
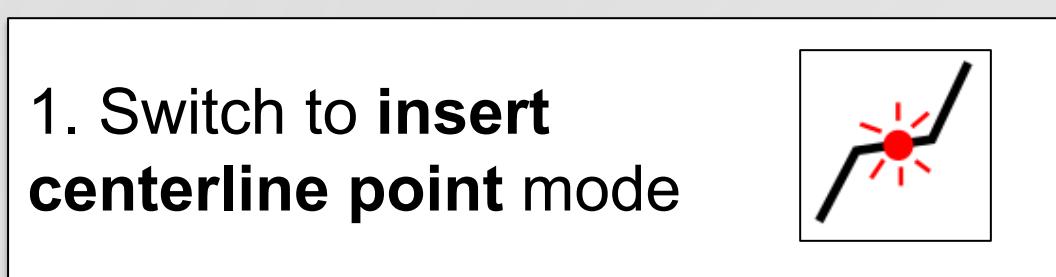


* If already loaded, you can skip this step

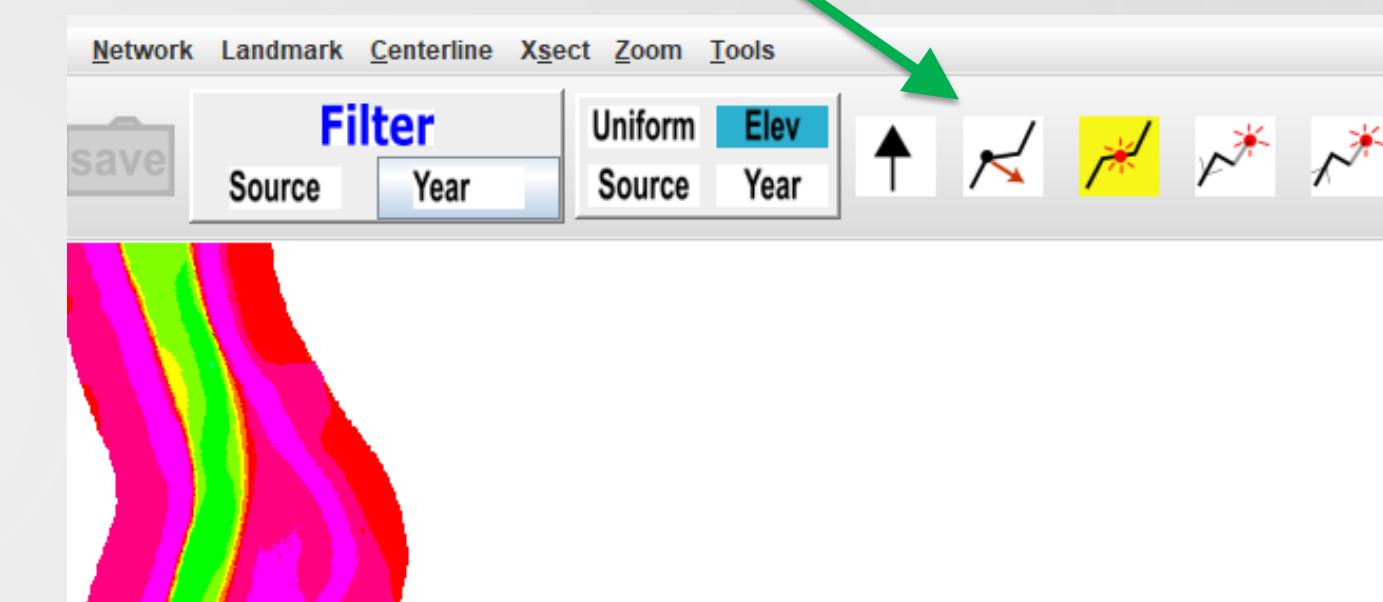
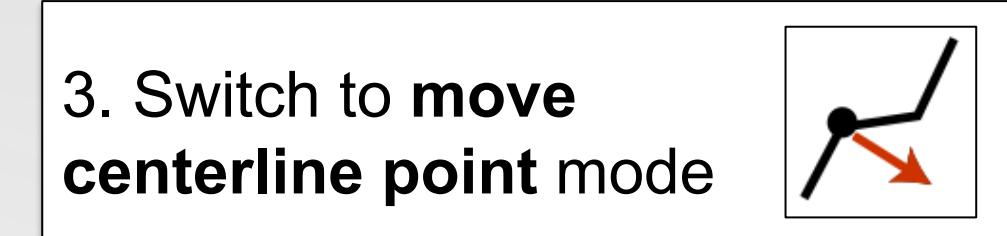
5. A new centerline
appears



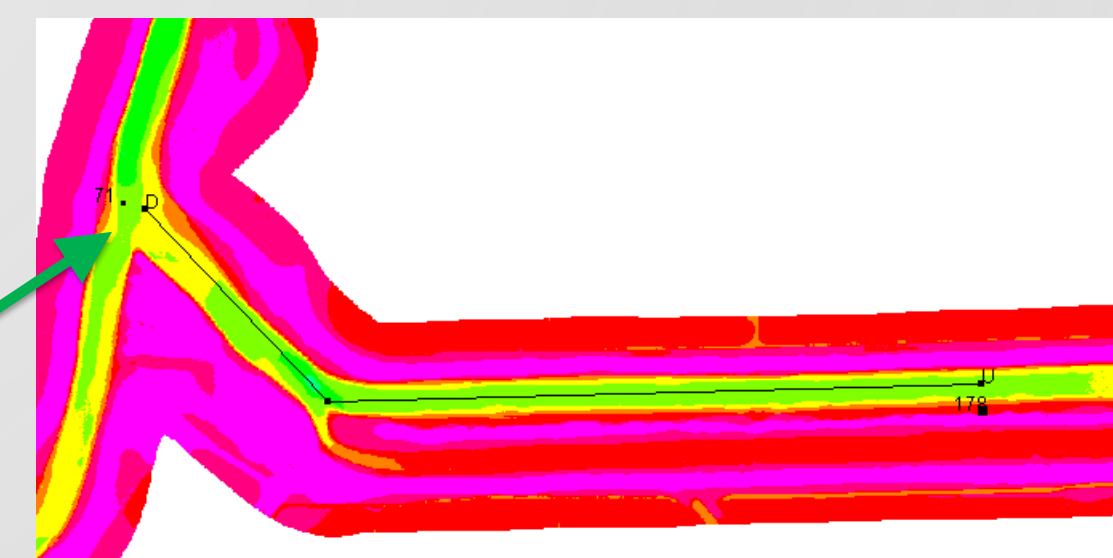
Hands-on exercise: Insert/Move Points



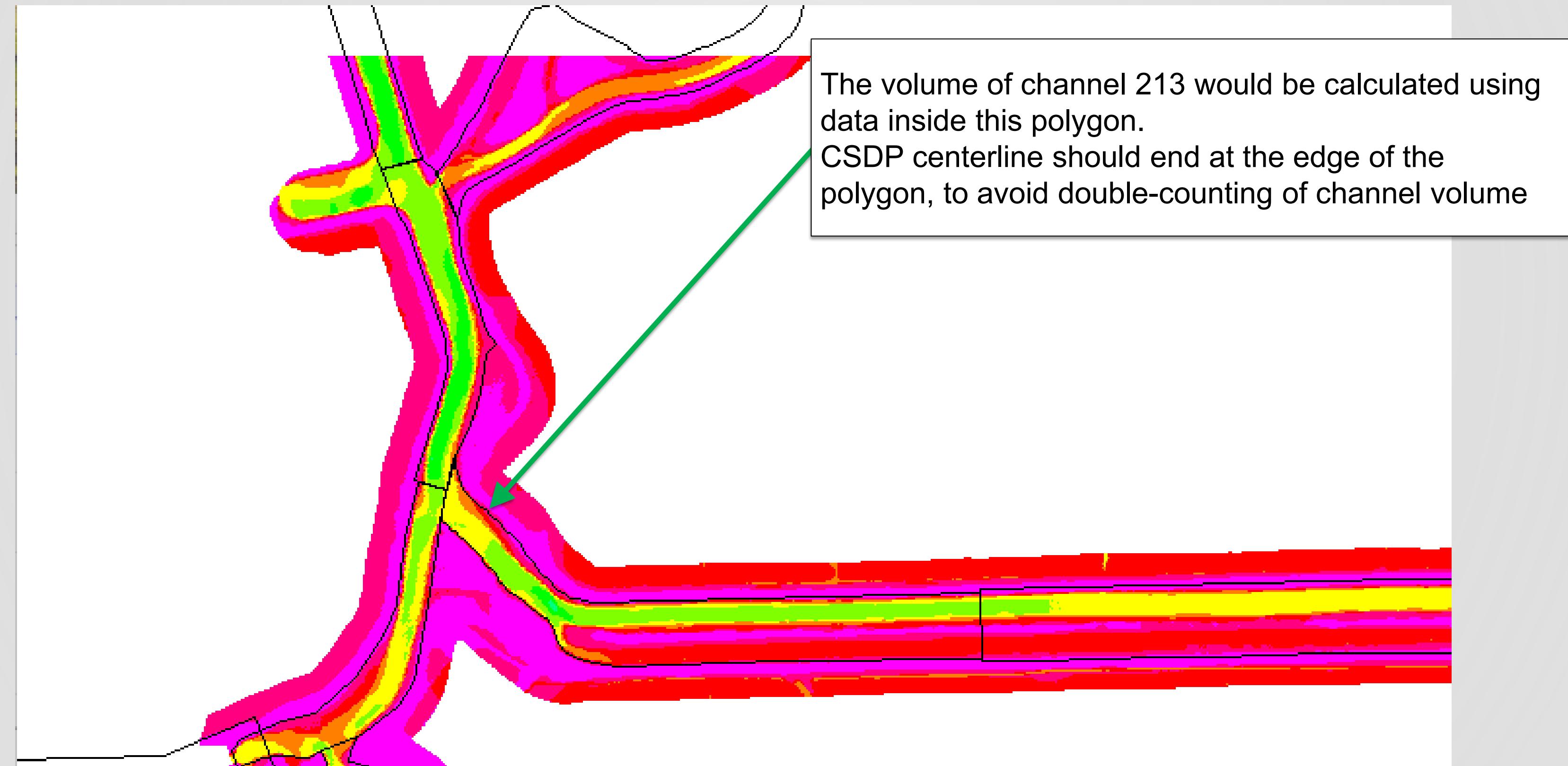
2. Click here to insert a point



4. Click near a point to change its location

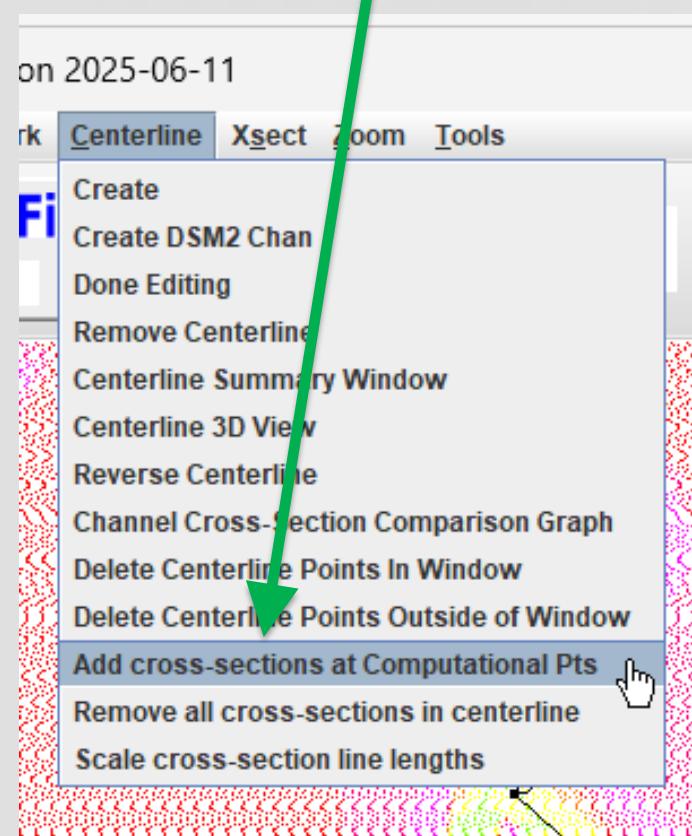


Hands-on exercise: channel boundaries



Hands-on exercise: Add cross-section lines

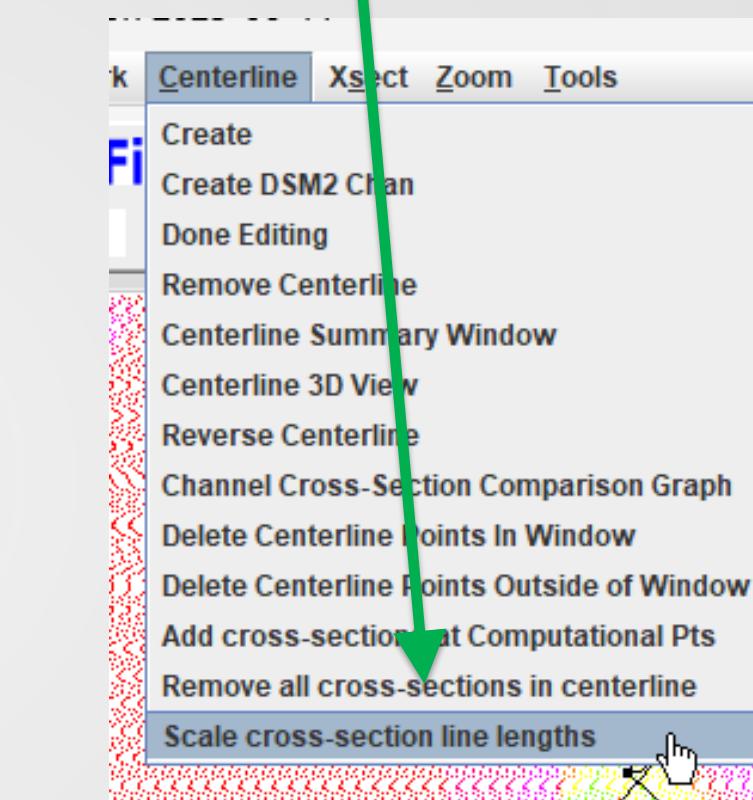
1. Select “Add cross-sections at computational points”



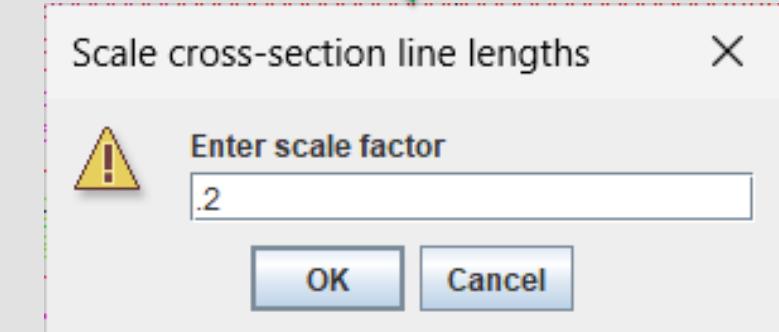
2. Cross-section lines appear



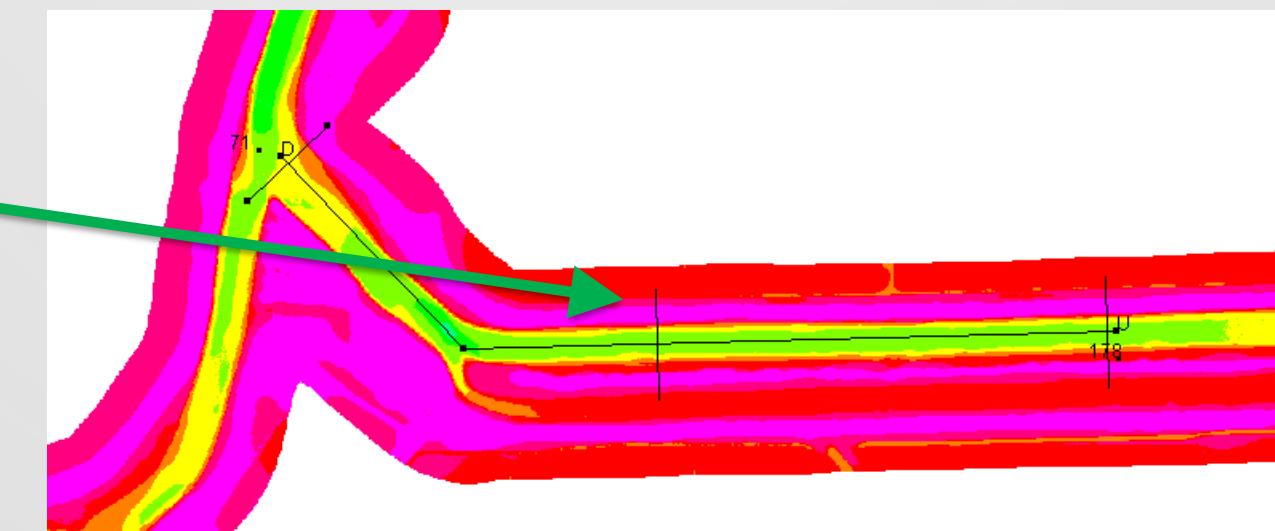
3. Scale cross-section line lengths



4. Enter a scale factor of 0.2



5. Cross-section lines are scaled to a more appropriate length

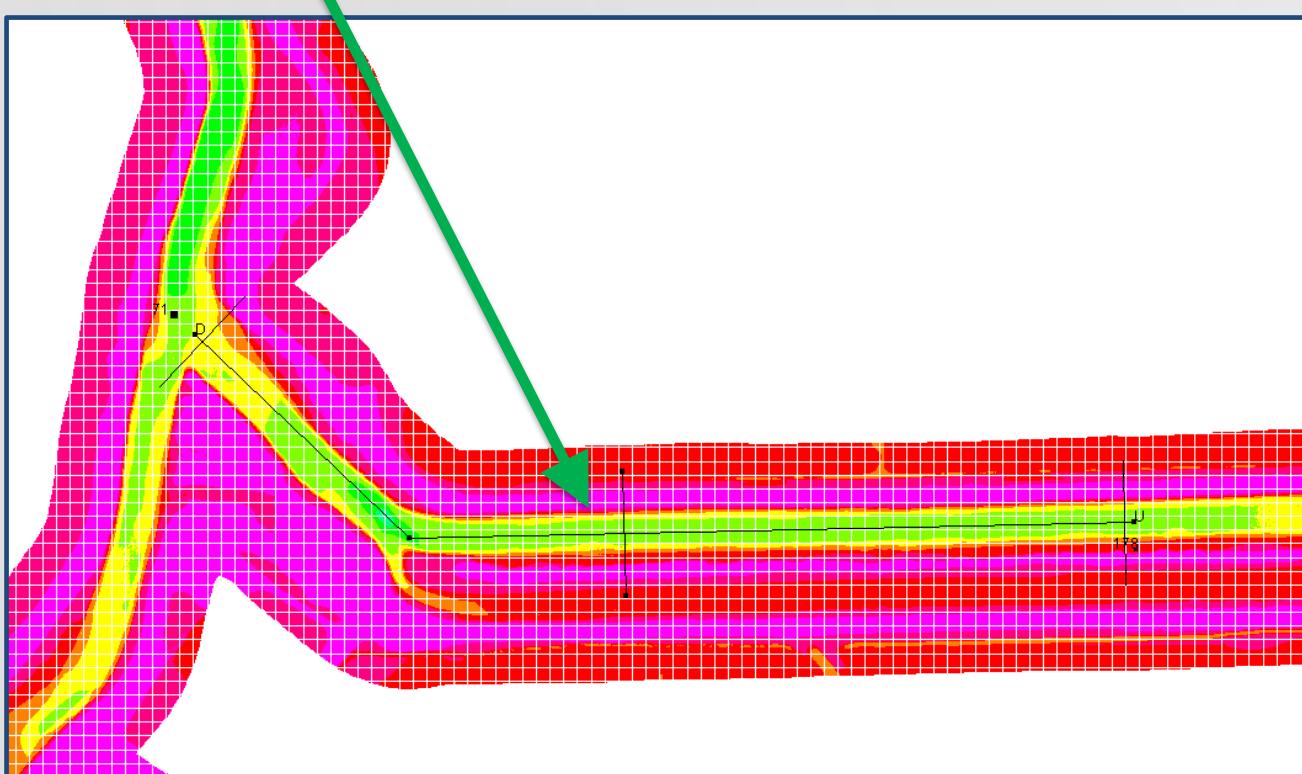


Hands-on exercise: View cross-section

1. Switch to select mode

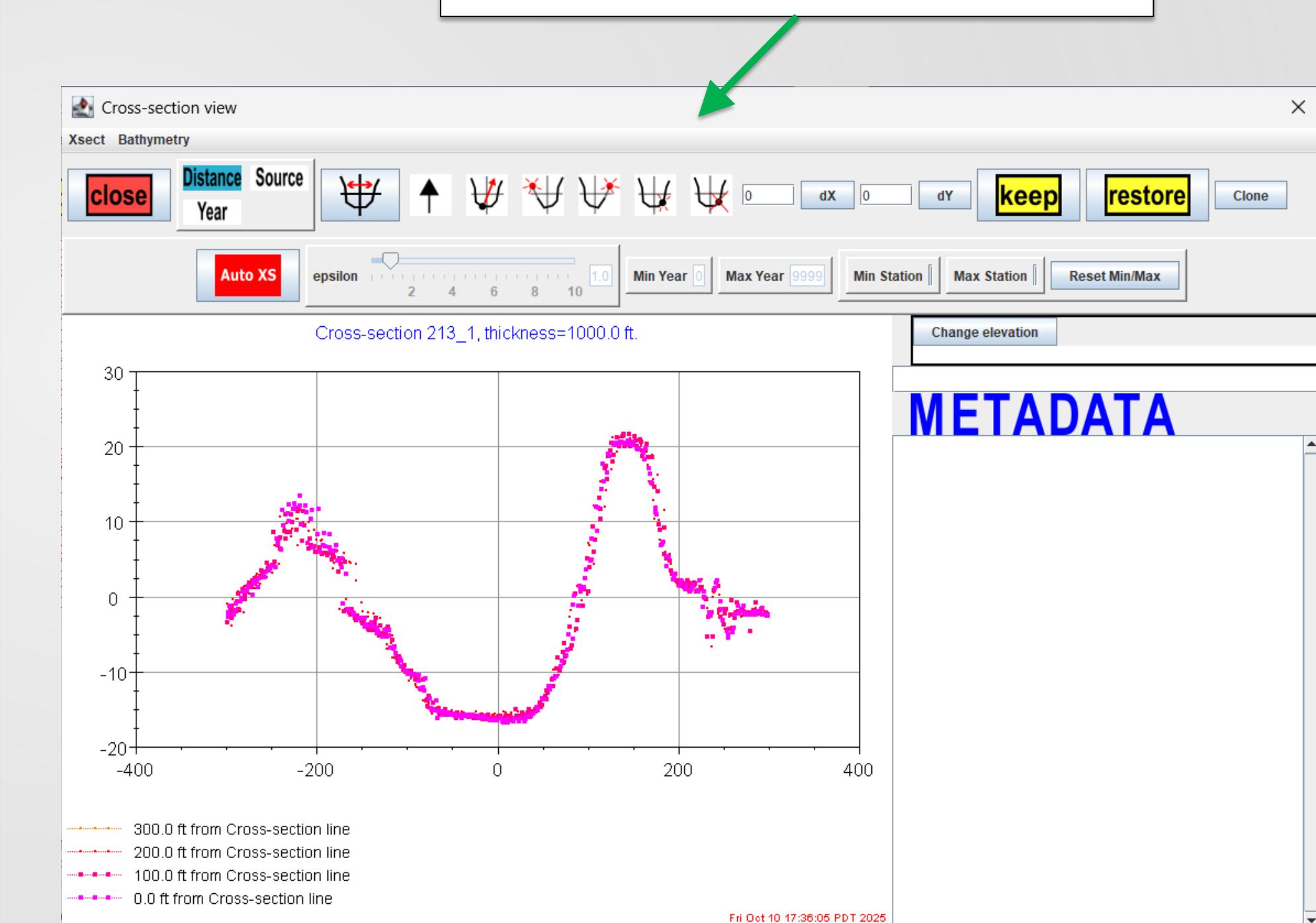


2. Click near intersection to select the cross-section line

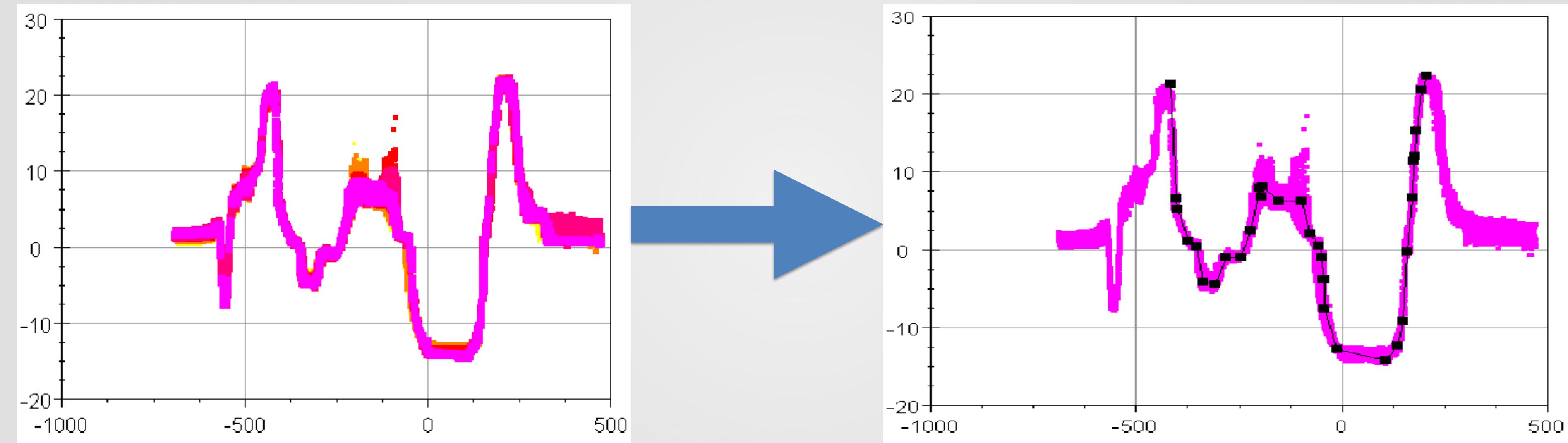


3. Click the view cross-section button

4. A cross-section window appears



Automatic Cross-Section generation



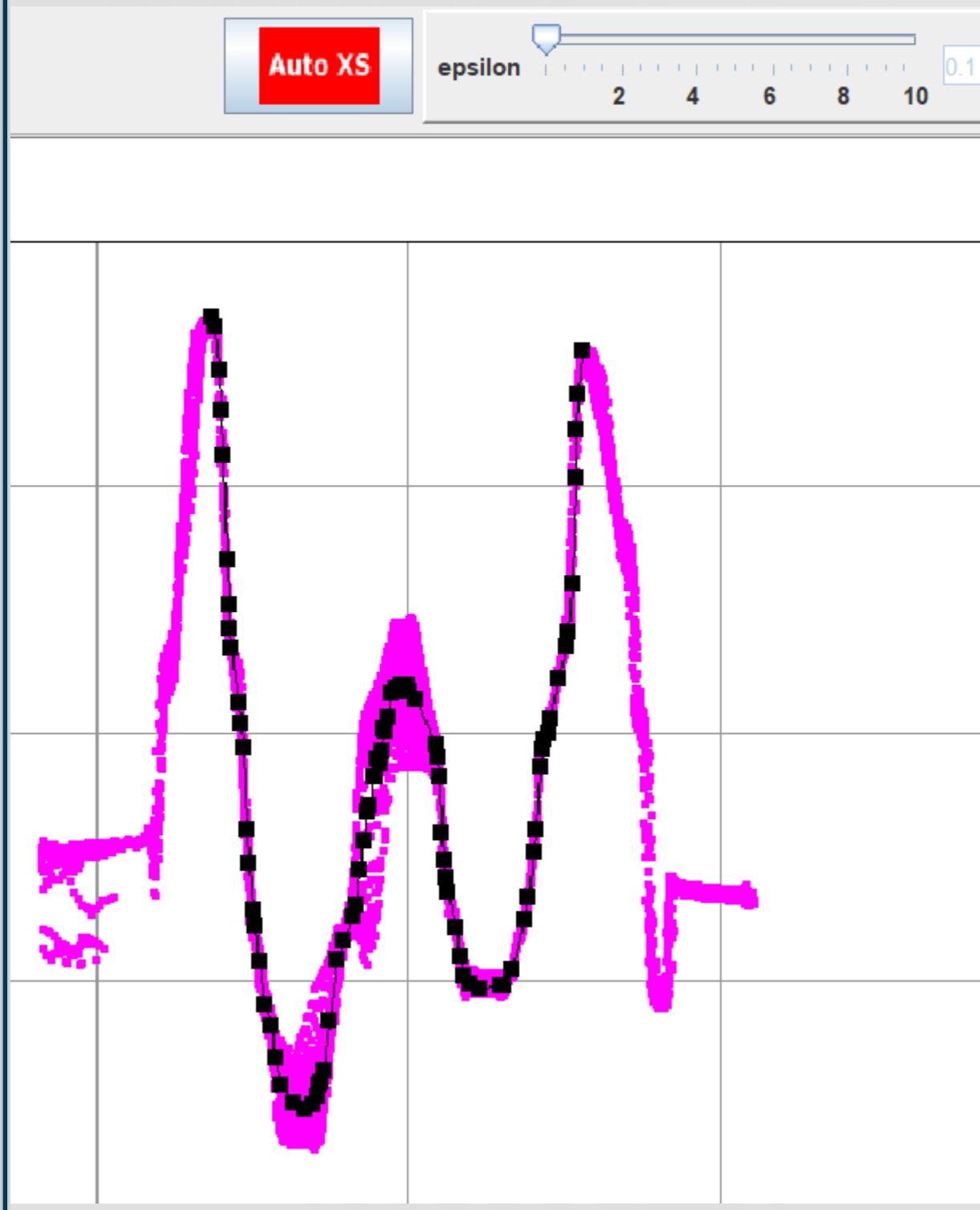
Automatic Cross-Section generation

- Can be used with, or instead of manual process
- Works better if less scatter in data
- Ramer-Douglas-Peucker (RDP) algorithm
 - Used for line simplification
 - Uses epsilon ϵ (Tolerance):
 - determines the maximum distance a point can deviate from the line segment connecting the end points of a curve segment before being considered for removal.

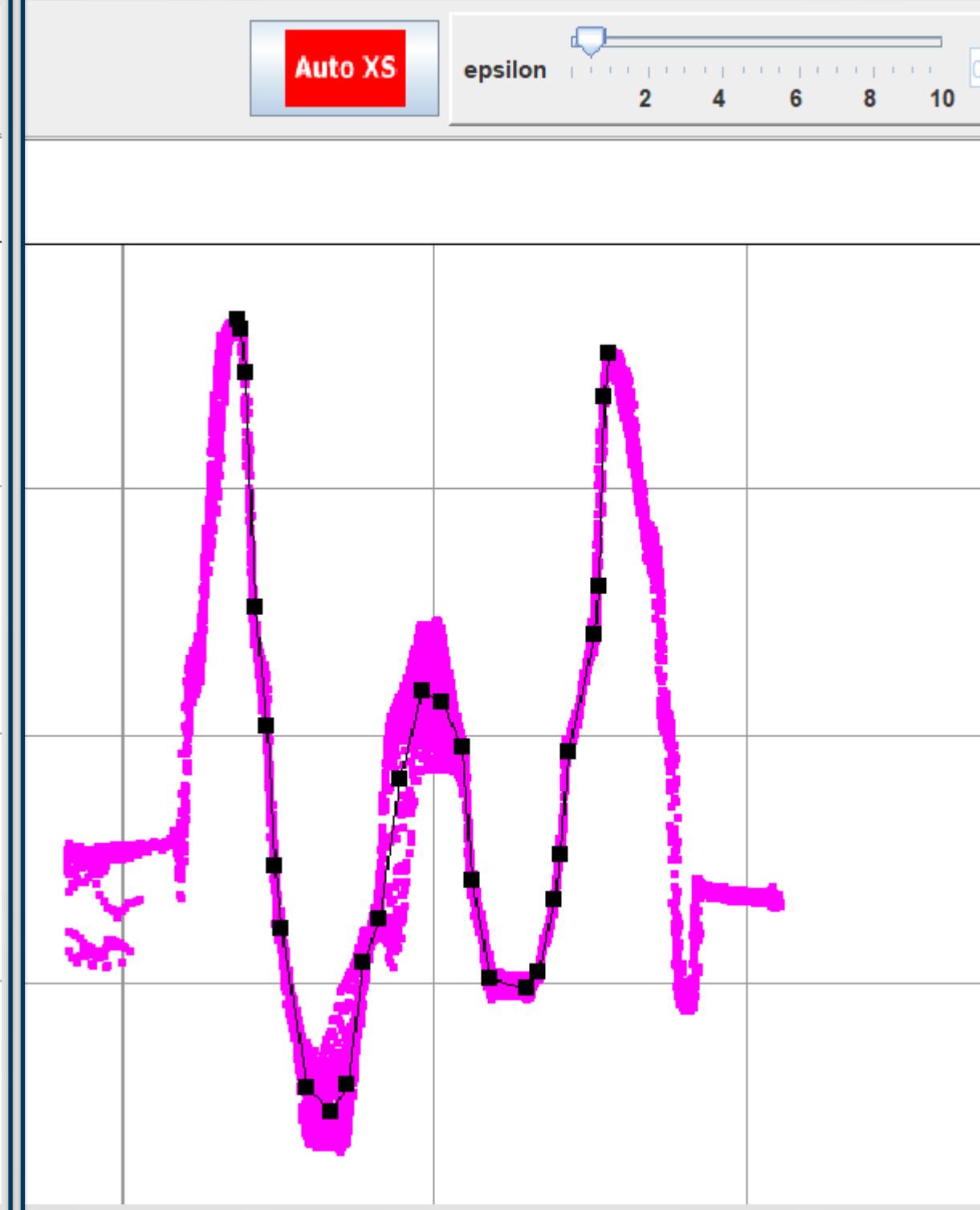
Automatic Cross-Section generation

Adjusting epsilon (ϵ) for best fit

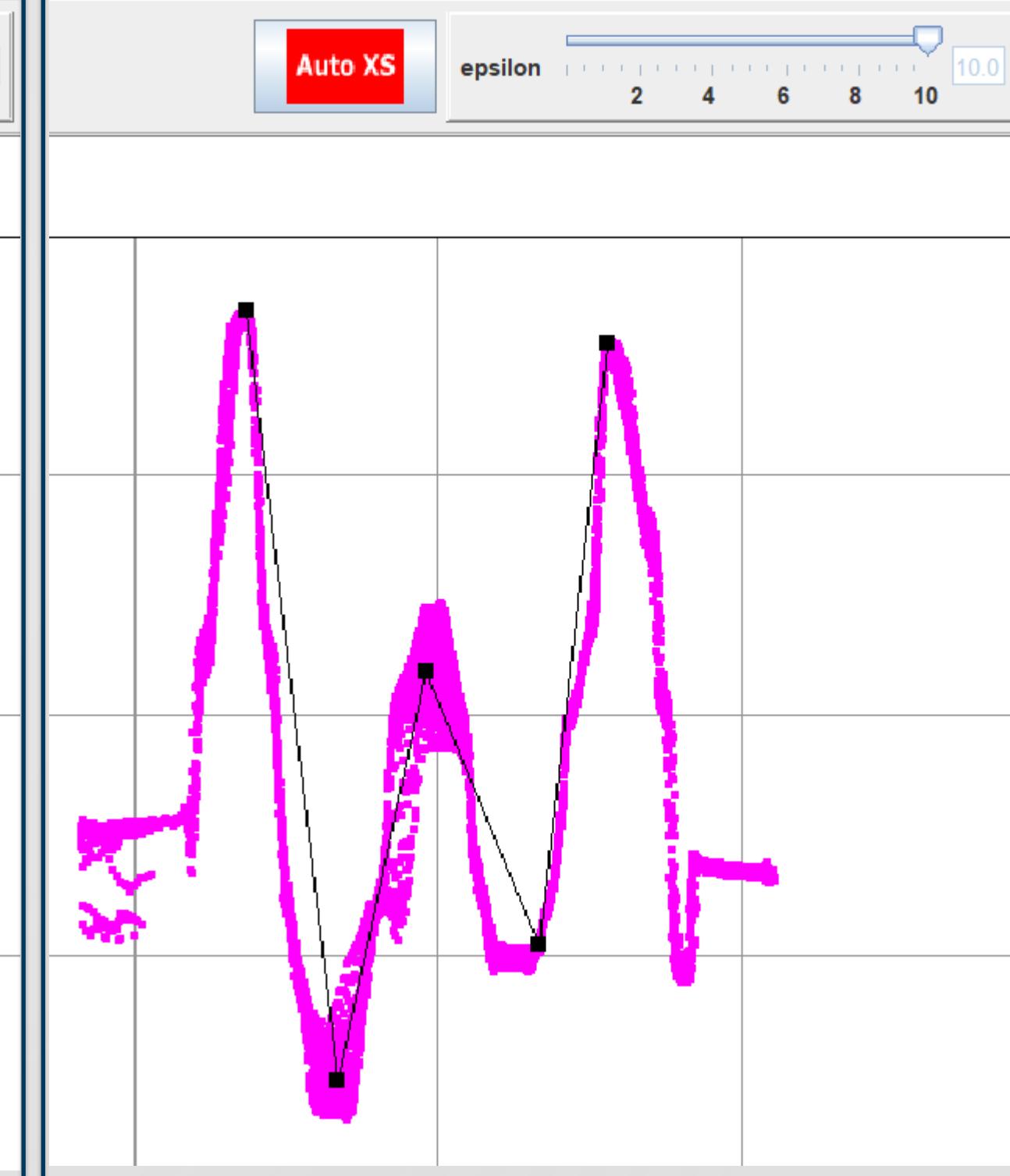
ϵ low: overfitting



ϵ optimal

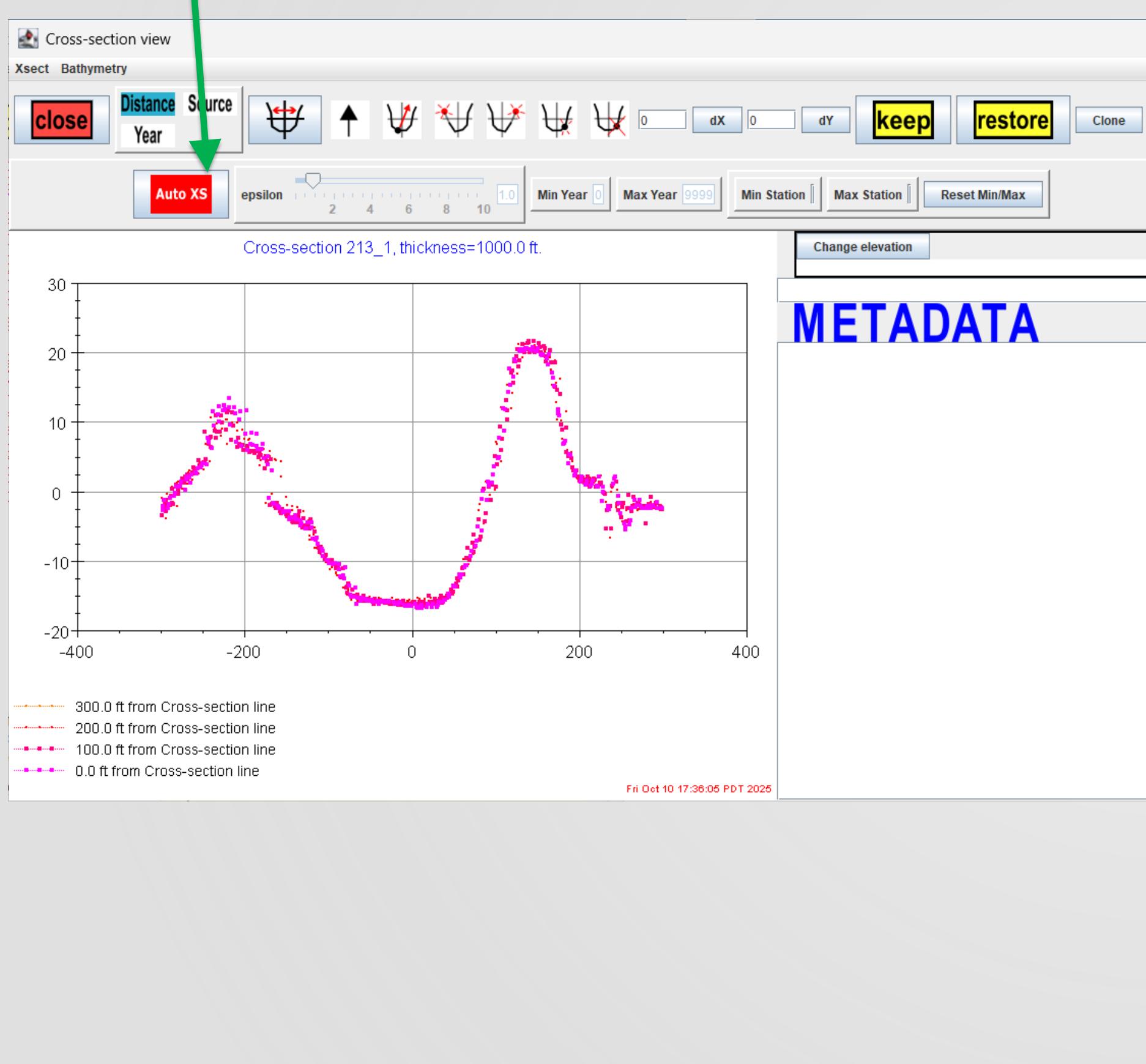


ϵ high: underfitting

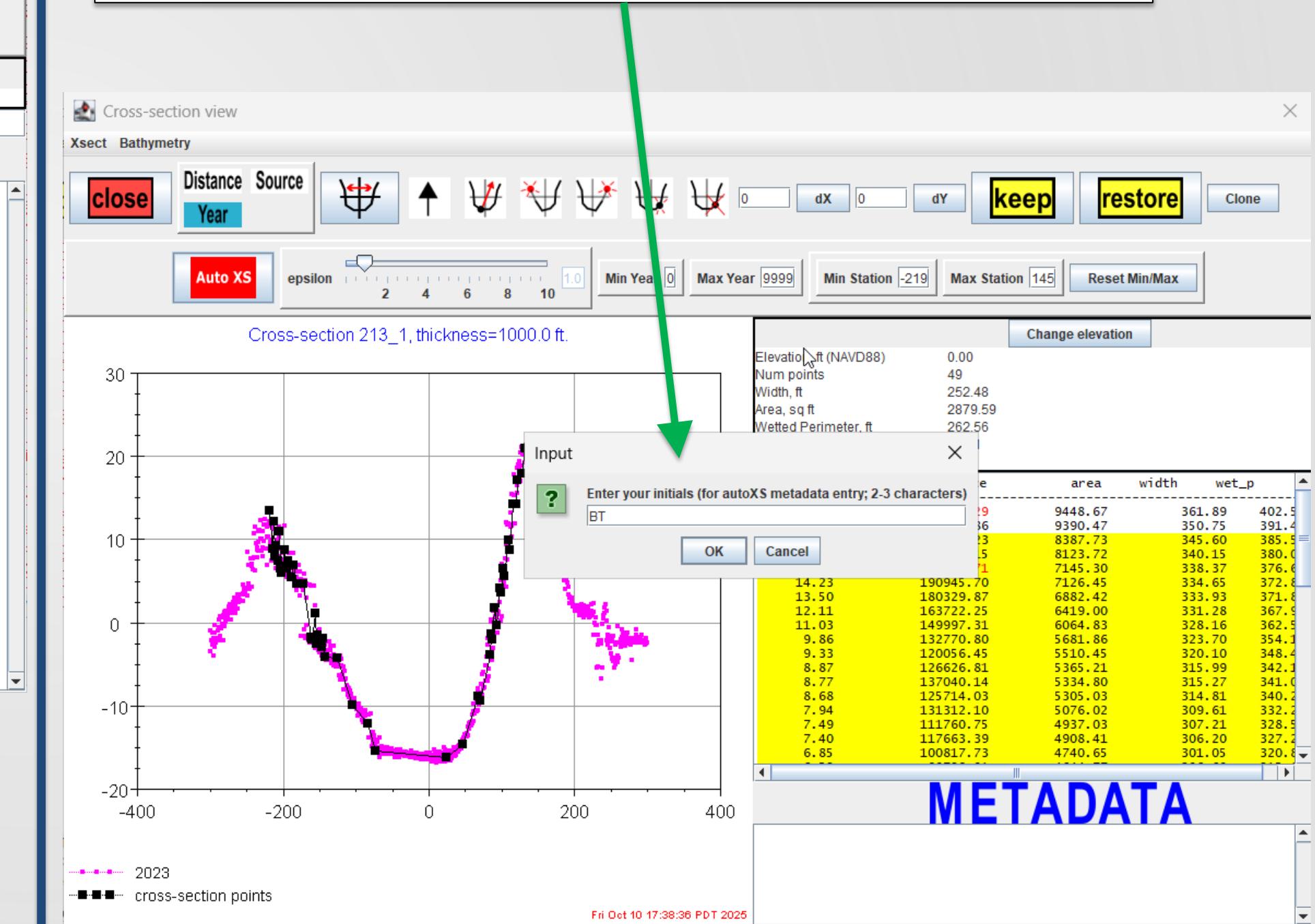


Hands-on exercise: Create cross-section drawing

1. Click the Auto XS button

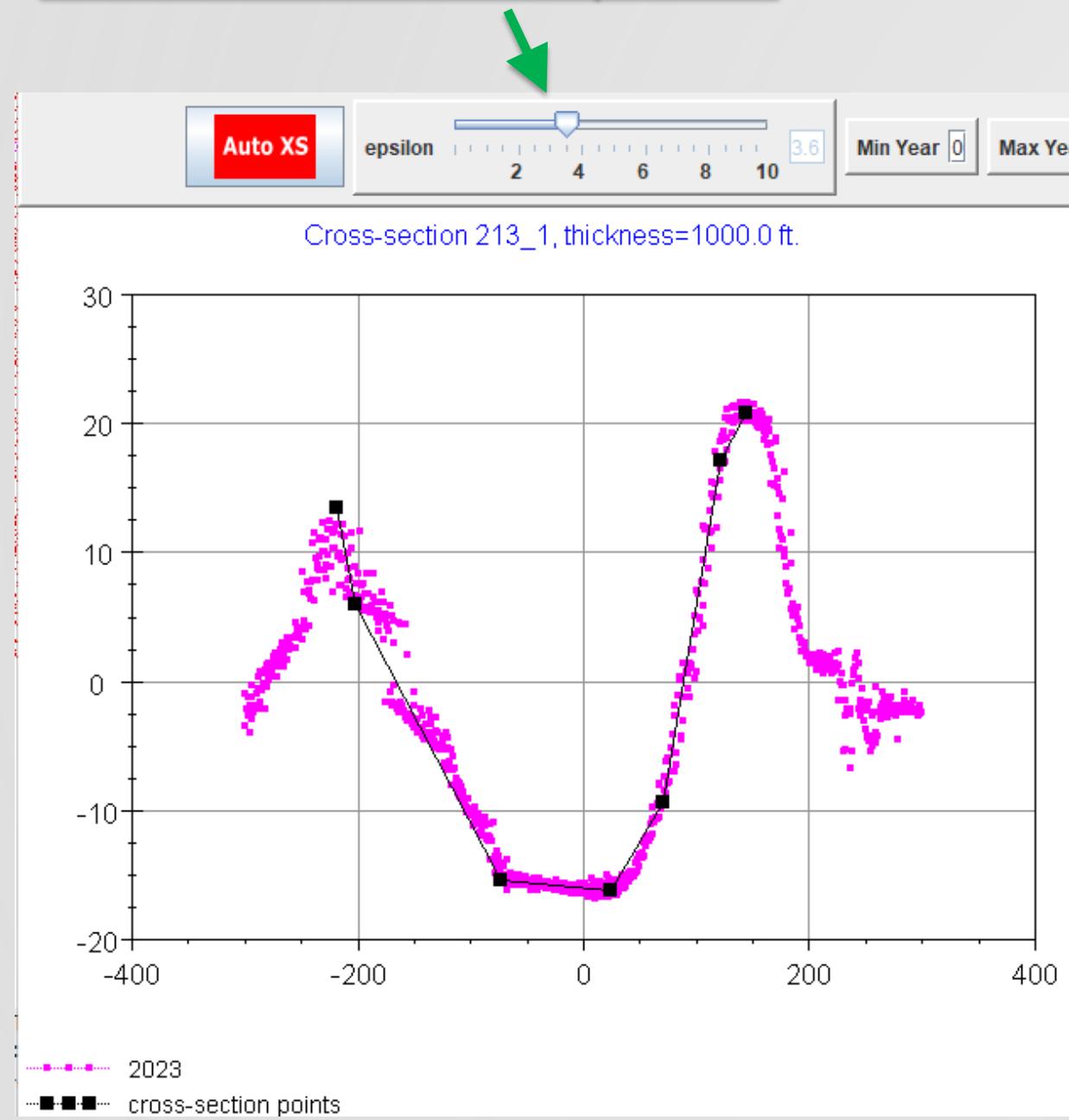


2. A cross-section drawing is automatically created. Enter your initials in the Input dialog

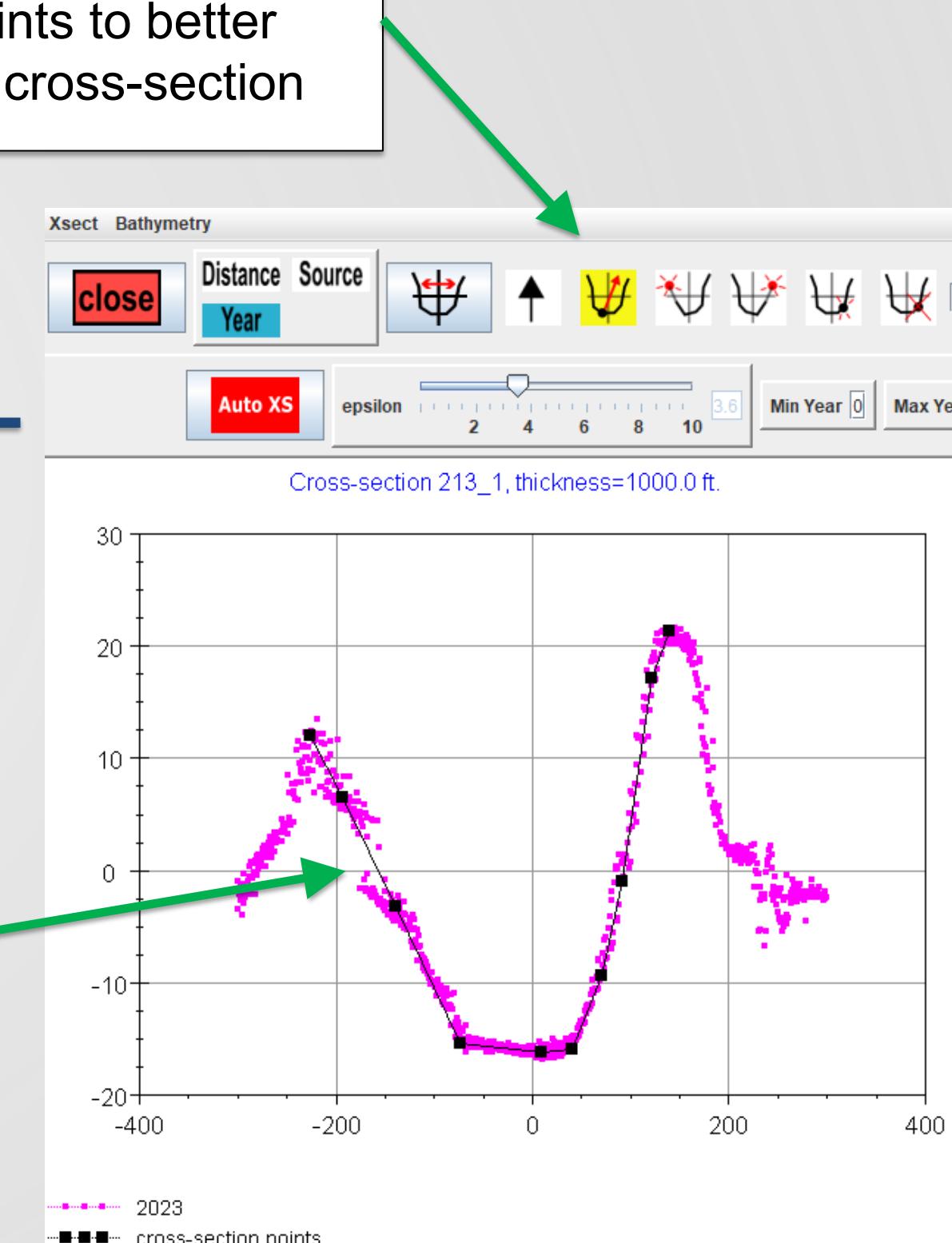


Hands-on exercise: Adjust cross-section drawing

1. Adjust the epsilon slider to reduce number of points



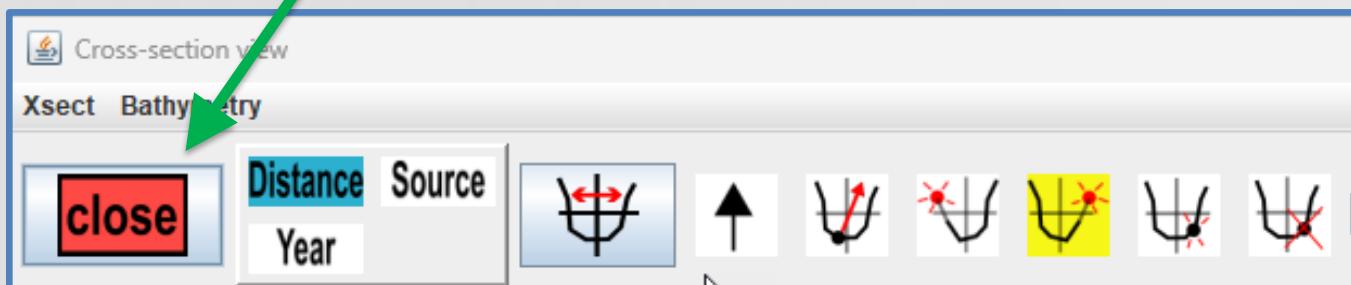
2. Hand editing: use the cross-section editing tools to add and move points to better represent the shape of the cross-section



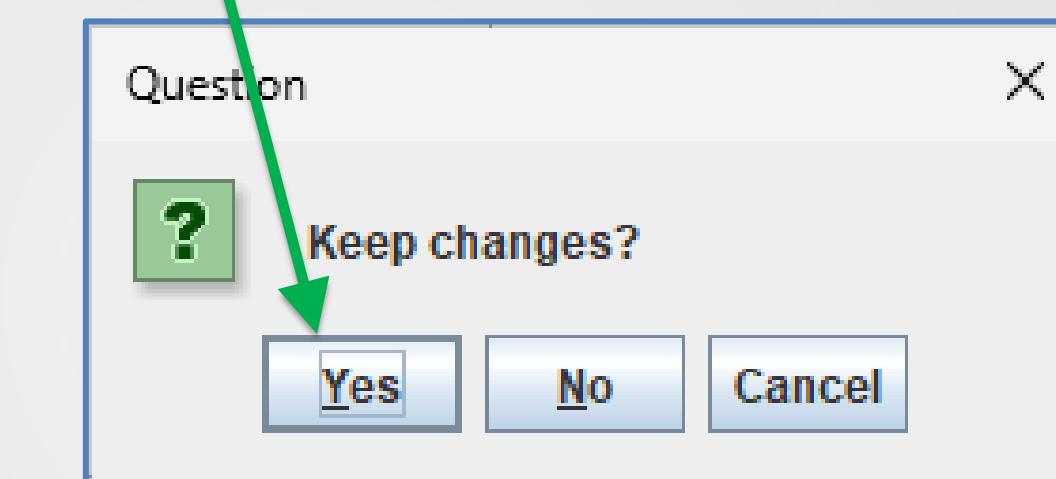
3. Result should look something like this

Hands-on exercise: Closing cross-section

1. Click the “close” button

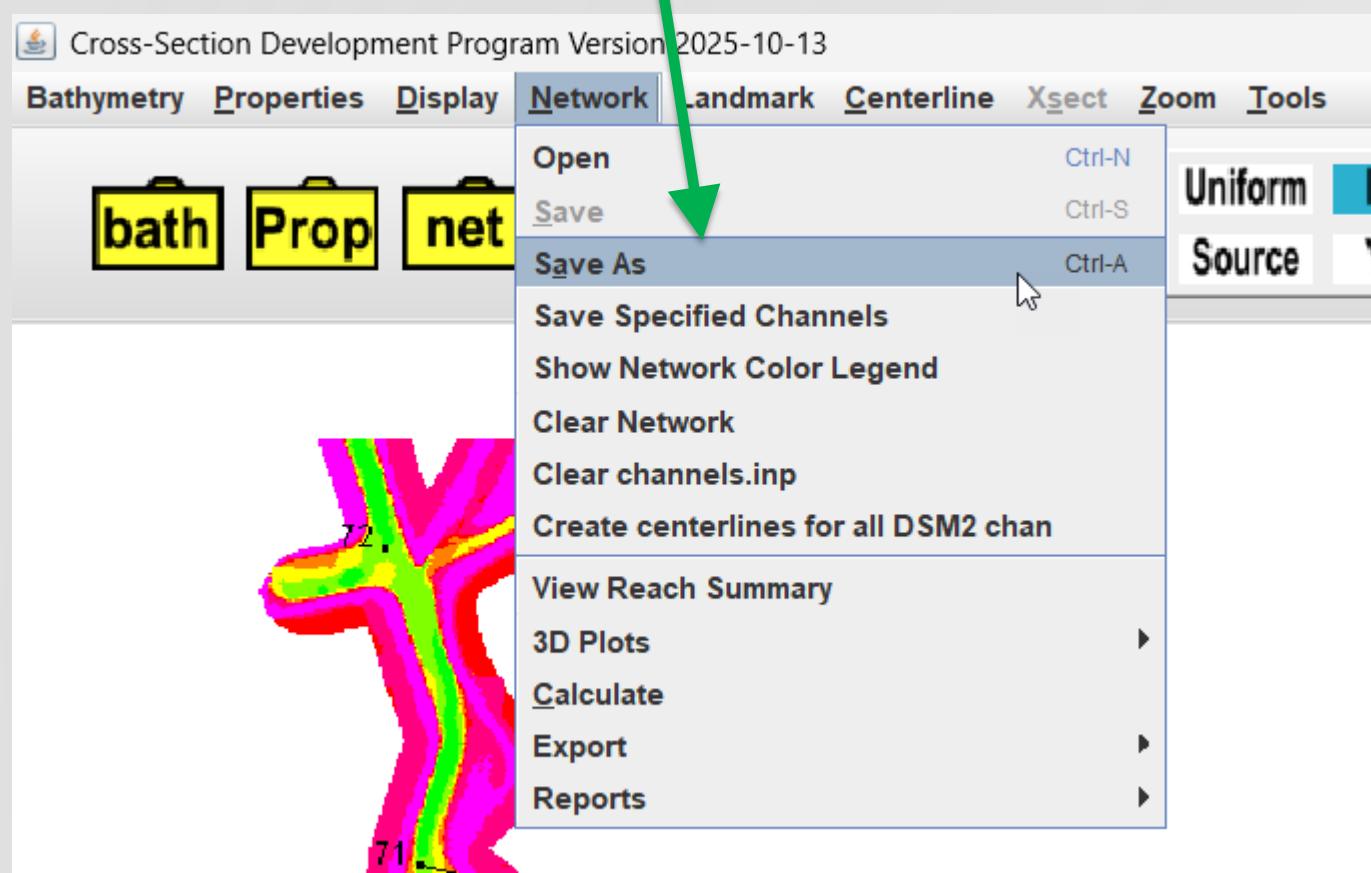


2. Select “Yes” to keep changes, which will
not save to file

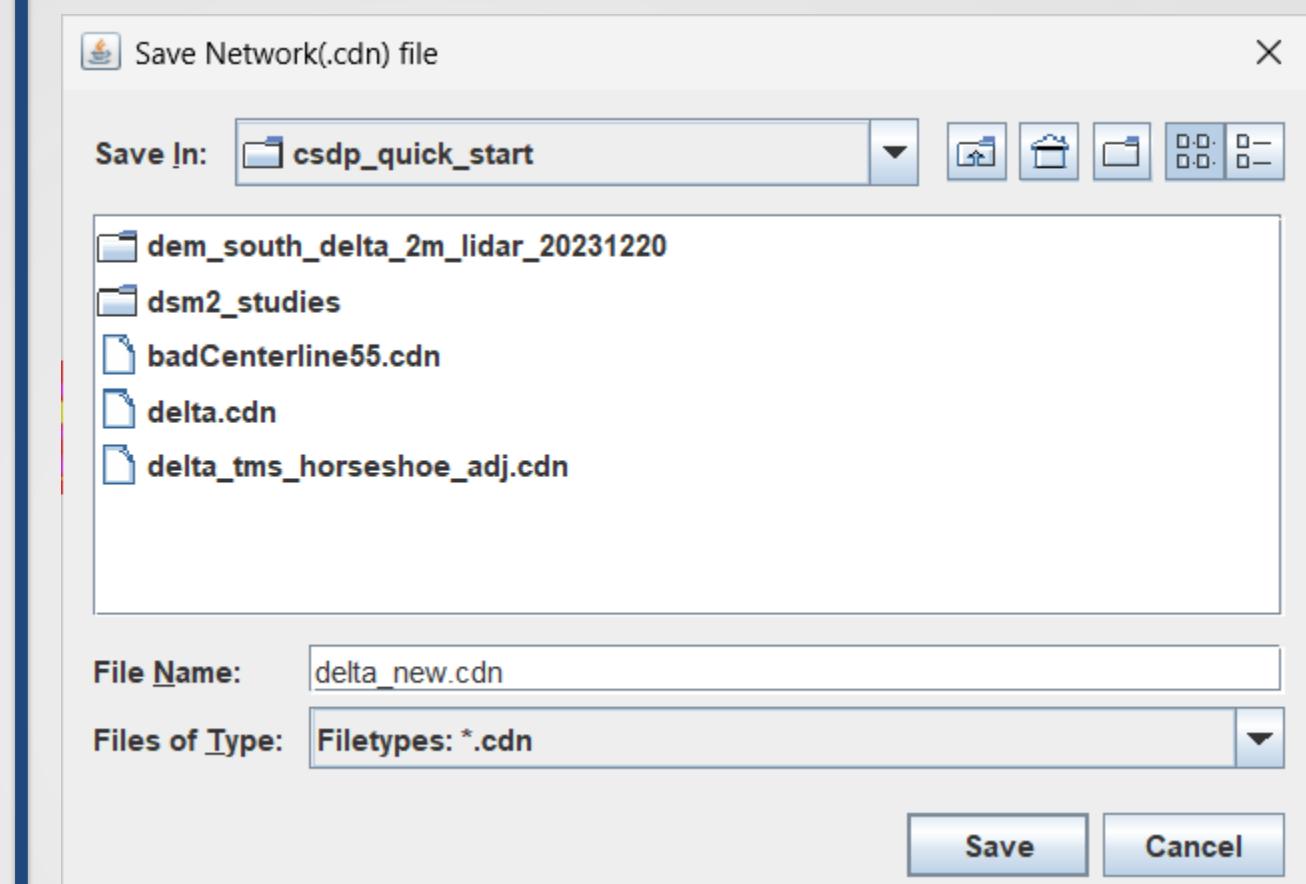


Hands-on exercise: Save-As network file

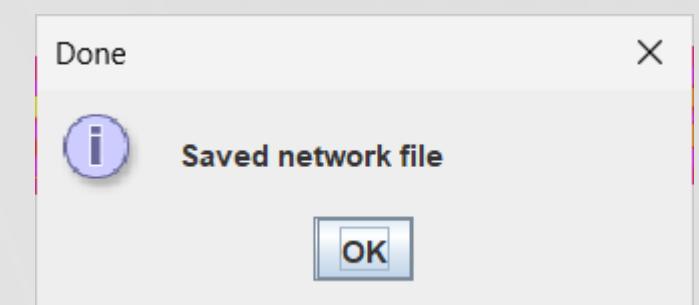
1. “Network-Save As” or **Ctrl-a**



2. Enter filename, click “Save”

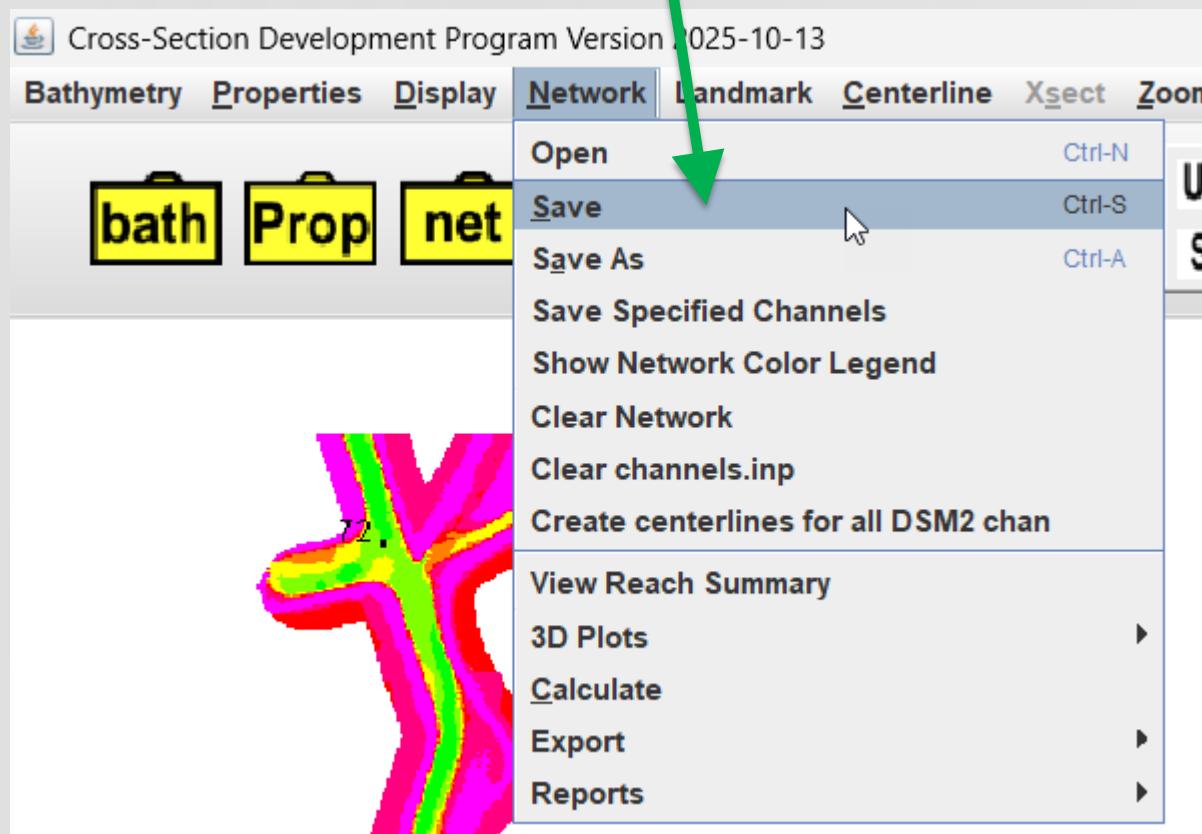


3. Wait for confirmation

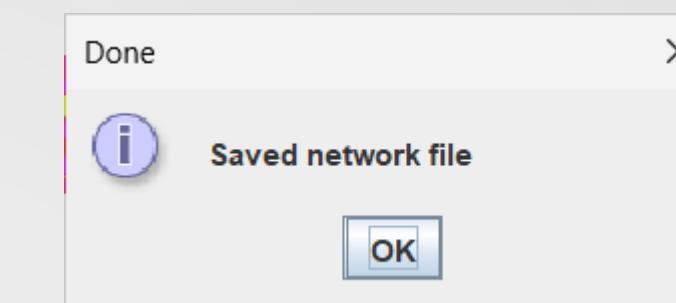


Hands-on exercise: Save network file

1. “Network-Save” or Ctrl-s



2. Wait for confirmation

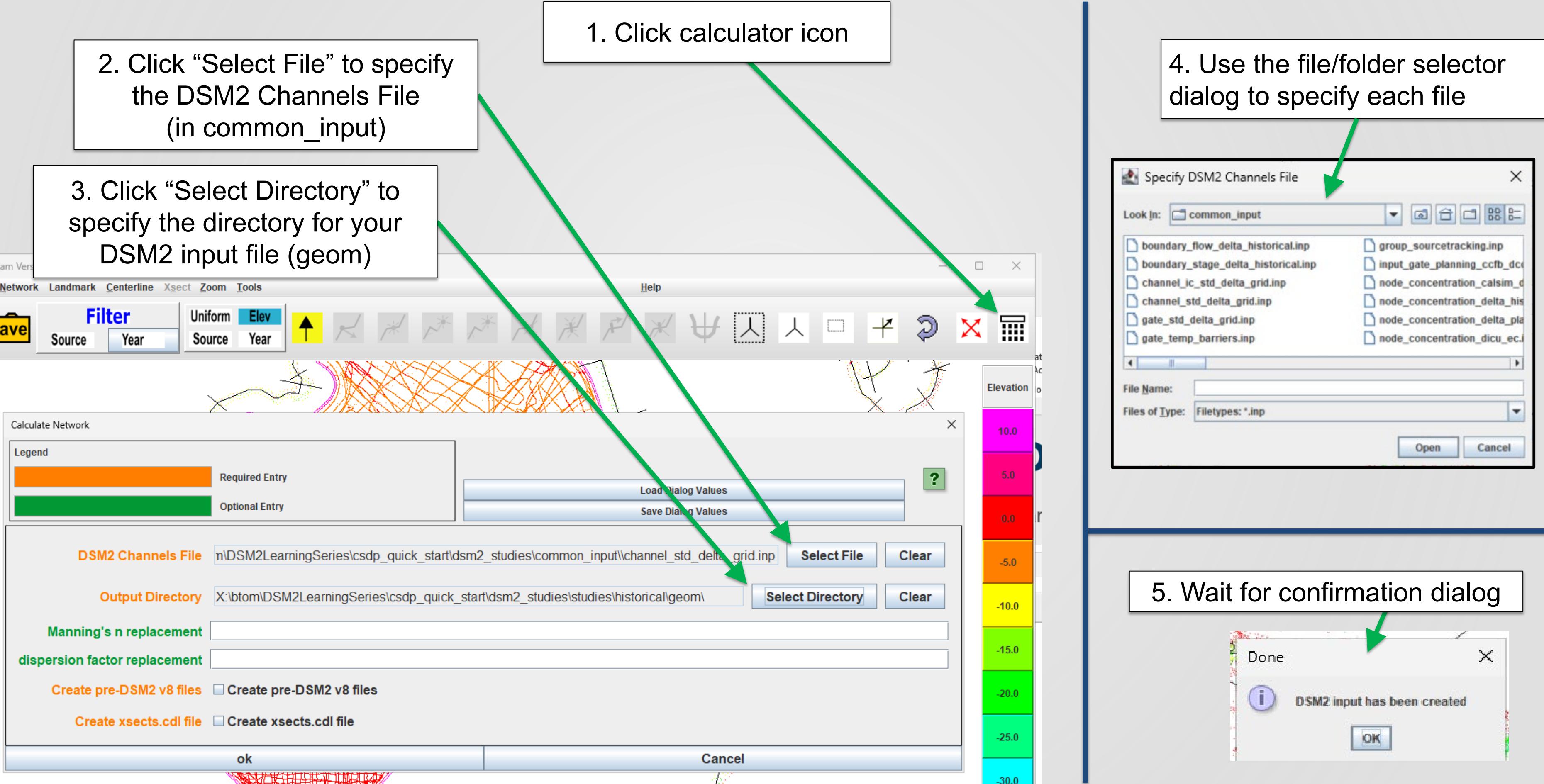


3. A .bak file is created each time you save

09-17 13:57 channel_std_delta_grid.inp
09-26 07:21 delta.cdn
10-23 11:52 delta_tms_horseshoe_adj.cdn
10-23 11:52 delta_tms_horseshoe_adj.cdn.bak
10-22 15:34 dem_south_delta_2m_lidar_20231220
10-15 16:08 dsm2_studies
no_26 07-21 node.edl

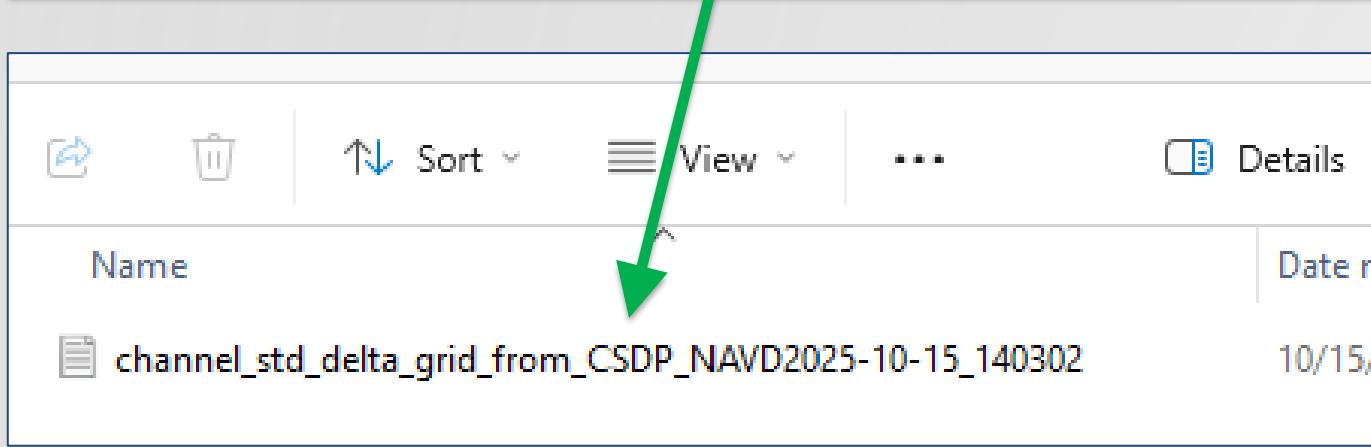
A green arrow points from the text "3. A .bak file is created each time you save" to the ".bak" file entry in the list.

Hands-on exercise: create DSM2 geometry input

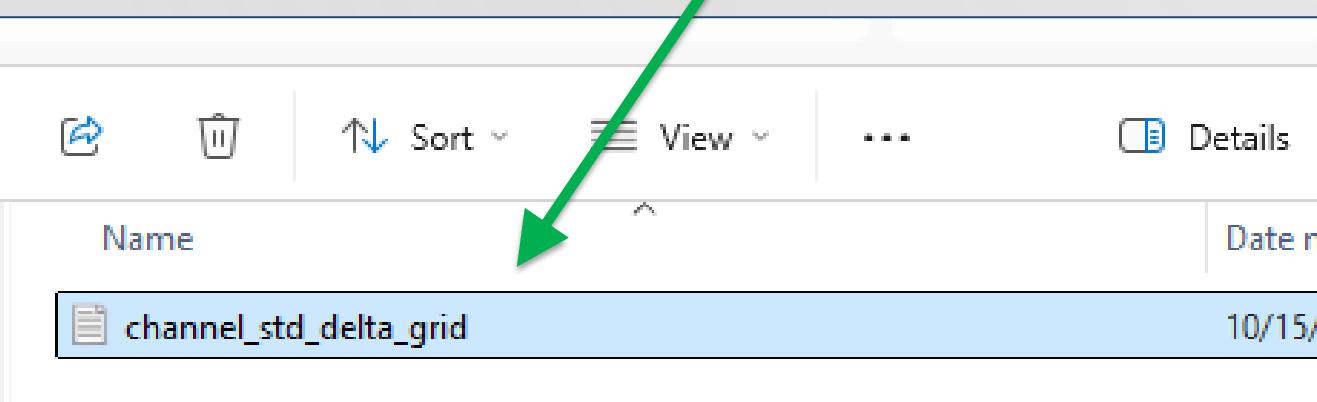


Hands-on exercise: set up Hydro with new geom

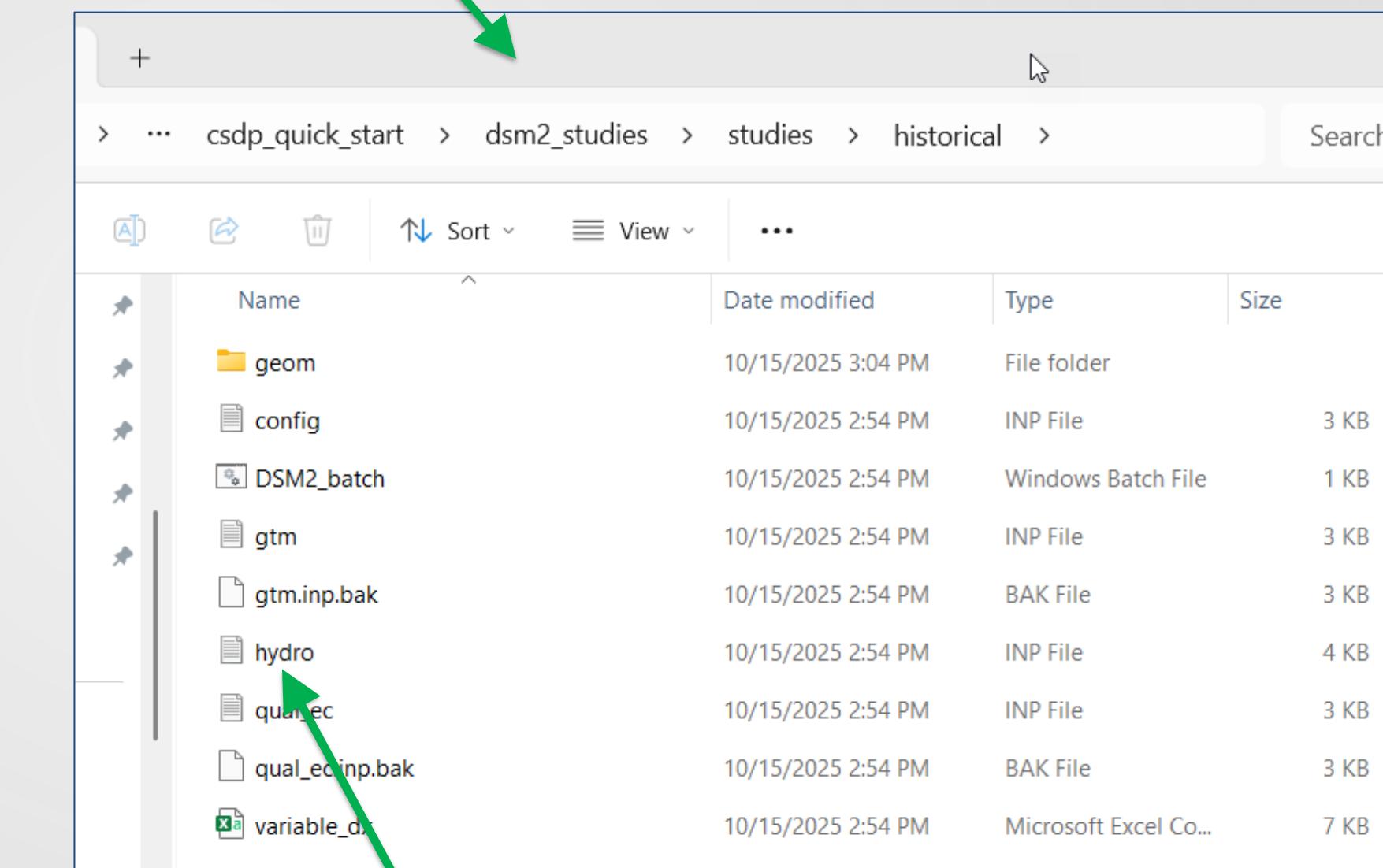
1. Open windows explorer, and navigate to your specified output folder. You should see a file with a name like this, including the date and time in milliseconds.



2. Rename the file to channel_std_delta_grid.inp



3. In windows explorer, navigate to the “historical” folder



4. Open the hydro.inp file in a text editor

Hands-on exercise: set up Hydro with new geom

1. Edit this portion of the **hydro.inp** file.

| before | |
|--|---|
| GRID \${DSM2INPUTDIR}/channel_std_delta_grid.inp area, Yolo Toe Drain \${DSM2INPUTDIR}/reservoir_std_delta_grid.inp restoration areas \${DSM2INPUTDIR}/gate_std_delta_grid.inp END | #20221213 new channels and cross-sections for FC.2023.01. A #20220114 includes reservoir profile data. Adds Yolo Flyway #20220114 add 2015 drought barrier, adds gates for restorat |

2. Comment out

| after | |
|---|---|
| GRID ##\${DSM2INPUTDIR}/channel_std_delta_grid.inp area, Yolo Toe Drain geom/channel_std_delta_grid.inp \${DSM2INPUTDIR}/reservoir_std_delta_grid.inp restoration areas \${DSM2INPUTDIR}/gate_std_delta_grid.inp END | #20221213 new channels and cross-sections for FC.2023.01. Add #20220114 includes reservoir profile data. Adds Yolo Flyway, D #20220114 add 2015 drought barrier, adds gates for restoration |

3. new line pointing
to the new file

4. Save your changes and close the file

Hands-on exercise: change end_date

1. Open the **config.inp** file.

Comment out the END_DATE line and add a new END_DATE line, which will end the run on 30SEP2014

```
#runtime
START_DATE          01SEP2014
QUAL_START_DATE    02SEP2014
PTM_START_DATE     ${QUAL_START_DATE}
GTM_END_DATE        31DEC2024
GTM_START_DATE     02SEP2014
END_DATE           31DEC2024
START_TIME          0000
END_TIME            0000
```

before

```
#runtime
START_DATE          01SEP2014
QUAL_START_DATE    02SEP2014
PTM_START_DATE     ${QUAL_START_DATE}
GTM_END_DATE        31DEC2024
GTM_START_DATE     02SEP2014
#END_DATE           31DEC2024
END_DATE           30SEP2014
START_TIME          0000
END_TIME            0000
```

after

2. Save your changes and close the file

3. Go back to windows explorer and open the **DSM2_batch.bat** file. Add a character to the beginning of the 2nd and 3rd lines in the file, to prevent running qual and GTM.

```
...\\bin\\hydro hydro.inp
...\\bin\\qual qual_ec.inp
...\\bin\\gtm gtm.inp
```

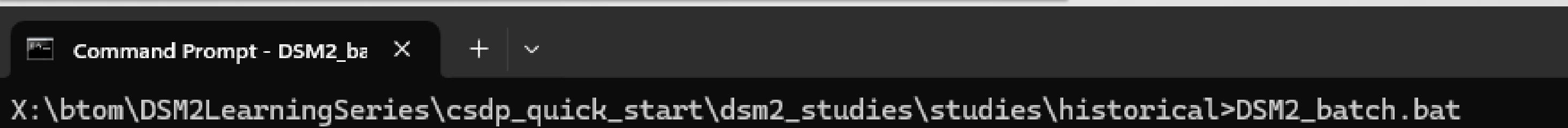
before

```
...\\bin\\hydro hydro.inp
#...\\bin\\qual qual_ec.inp
#...\\bin\\gtm gtm.inp
```

after

4. Save your changes and close the file

5. Open a command prompt window, and execute the batch file



Summary

You now know how to

- Load data into CSDP (bathymetry, network, landmark)
- Create and edit centerlines, cross-sections, landmarks
- Create DSM2 geometry input

You may also be interested in

- Adjusting geometry to improve convergence
- Creating DSM2 output locations with CSDP
- Creating GIS grid maps from CSDP data

Questions?



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