DIGITAL MAPPING TECHNIQUES 2025

The following was presented at DMT '25
May 18 - 21, 2025

The contents of this document are provisional

See Presentations and Proceedings
from the DMT Meetings (1997-2025)
http://ngmdb.usgs.gov/info/dmt/

A Pilot Study: Updating and Connecting Geologic Cross Sections Across Quadrangle Boundaries

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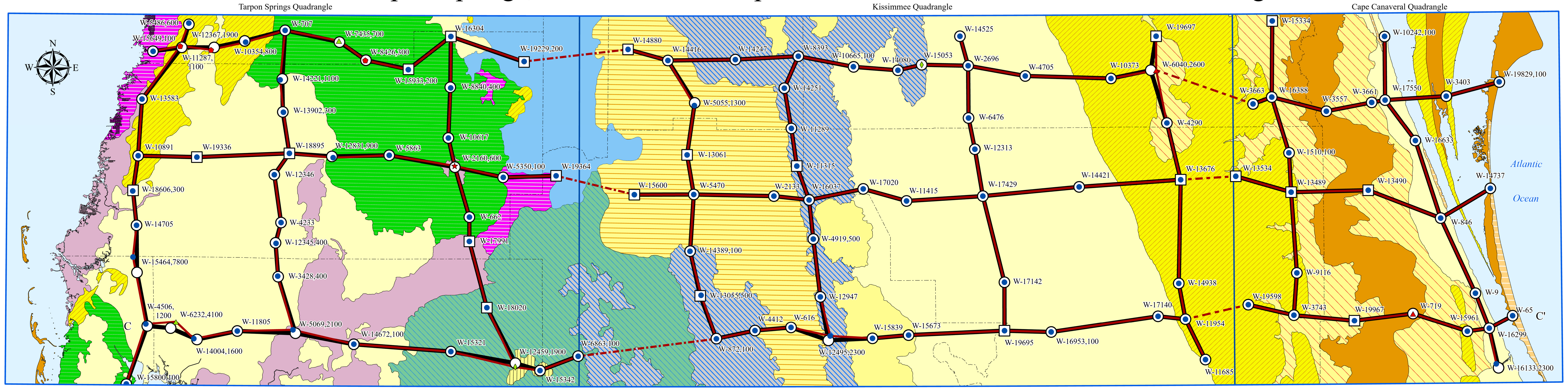
2025

Tarpon Springs, Kissimmee and Cape Canaveral: Cross Section Borehole Changes

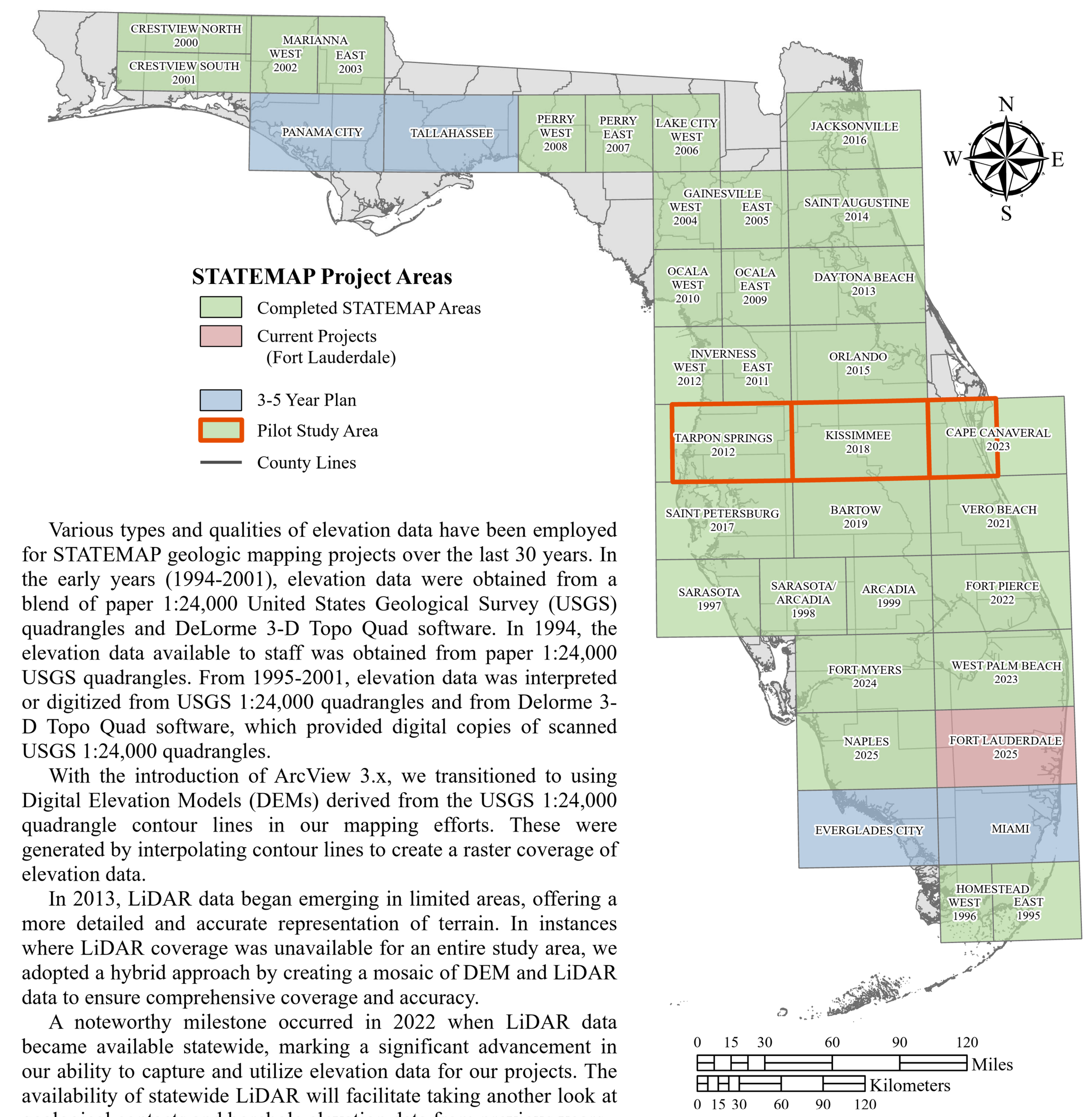


Legend

0 2.5 5 10 15 20 Miles
0 2.5 5 10 15 20 Kilometers

- Original location of continuous core
- Original location of cuttings
- Verified cross section lines
- Additional cross section: Connecting quads
- Original cross section lines
- County Lines
- -25 to -20 ft elevation change
- -15 to -10 ft elevation change
- -10 to -5 ft elevation change
- 0 ft elevation change
- 5 to 10 ft elevation change
- 10 to 15 ft elevation change
- W-19695, Insignificant change in location
- W-12495, 2300ft

STATEMAP Cross Section Pilot Study



Various types and qualities of elevation data have been employed for STATEMAP geologic mapping projects over the last 30 years. In the early years (1994-2001), elevation data were obtained from a blend of paper 1:24,000 United States Geological Survey (USGS) quadrangles and DeLorme 3-D Topo Quad software. In 1994, the elevation data available to staff was obtained from paper 1:24,000 USGS quadrangles. From 1995-2001, elevation data was interpreted or digitized from USGS 1:24,000 quadrangles and from Delorme 3-D Topo Quad software, which provided digital copies of scanned USGS 1:24,000 quadrangles.

With the introduction of ArcView 3.x, we transitioned to using Digital Elevation Models (DEMs) derived from the USGS 1:24,000 quadrangle contour lines in our mapping efforts. These were generated by interpolating contour lines to create a raster coverage of elevation data.

In 2013, LiDAR data began emerging in limited areas, offering a more detailed and accurate representation of terrain. In instances where LiDAR coverage was unavailable for an entire study area, we adopted a hybrid approach by creating a mosaic of DEM and LiDAR data to ensure comprehensive coverage and accuracy.

A noteworthy milestone occurred in 2022 when LiDAR data became available statewide, marking a significant advancement in our ability to capture and utilize elevation data for our projects. The availability of statewide LiDAR will facilitate taking another look at geological contacts and borehole elevation data from previous years.

When cross sections were originally published, boreholes were located using multiple sources ranging from field notes, hand-written records, hand-plotted locations on Department of Transportation base maps, and a variety of other sources. At the time of publication, we made every effort to assure that the boreholes were properly located given the data sets we had available. In recent years, we have gained access to additional databases for borehole locations that, in some instances, allow for improving borehole location accuracy.

As part of a pilot project, we have begun to re-check published borehole locations to determine if changes in locations (and elevations) for boreholes significantly affect the accuracy of the geologic cross-sections. The first panel of this poster shows original borehole locations and cross-section lines (thicker black lines on map), along with the changes in borehole locations for three pilot quadrangles (thinner red lines). Changes in surface elevations of the boreholes are denoted by the borehole symbols and colors of symbols (red = decrease in elevation; green = increase in elevation).

Geologic Cross Section Legend

Quaternary

Holocene
- Qh — Holocene sediments

Pleistocene/Holocene
- Qbd — Beach Ridge and dune
- Qu — Undifferentiated sediments

Pleistocene
- Qa — Anastasia Formation

Tertiary/Quaternary

Pliocene/Pleistocene
- TQsu — Shelly sediments of Plio-Pleistocene
- TQu — Undifferentiated sediments
- TQd — Dunes
- TQuc — Reworked Cypresshead sediments
- TQc — Cypresshead Formation

Tertiary

Miocene/Pliocene
- Thp — Peace River Formation

Oligocene/Miocene
- Tha — Hawthorn Group; Arcadia Formation
- That — Hawthorn Group; Arcadia Formation, Tampa Member

Oligocene
- Ts — Suwannee Limestone

Eocene
- To — Ocala Limestone
- Tap — Avon Park Formation

- Contact
- Inferred contact
- TD — Total depth
- BLS — Below land surface
- (5) — Sample interval in feet
- (V) — Variable sample interval
- Core
- Cuttings
- (1) / (91) — Roads

Geologic Map Legend

Quaternary

Holocene
- Qh — Holocene sediments

Pleistocene/Holocene
- Qal — Alluvium
- Qbd — Beach Ridge and dune
- Qu — Undifferentiated sediments

Pleistocene
- Qa — Anastasia Formation
- Qk — Key Largo Limestone
- Qm — Miami Limestone
- Qtr — Trail Ridge sands

Tertiary/Quaternary

Pliocene/Pleistocene
- TQsu — Shelly sediments of Plio-Pleistocene
- TQu — Undifferentiated sediments
- TQd — Dunes
- TQuc — Reworked Cypresshead sediments
- TQc — Cypresshead Formation

Tertiary

Pliocene
- Tci — Citronelle Formation
- Tmc — Miccosukee Formation
- Tic — Intracoastal Formation
- Tt — Tamiami Formation
- Tjb — Jackson Bluff Formation

Miocene/Pliocene
- Thcc — Hawthorn Group; Coosawhatchie Formation; Charlton Member
- Thp — Peace River Formation
- Thpb — Hawthorn Group; Peace River Formation; Bone Valley Member

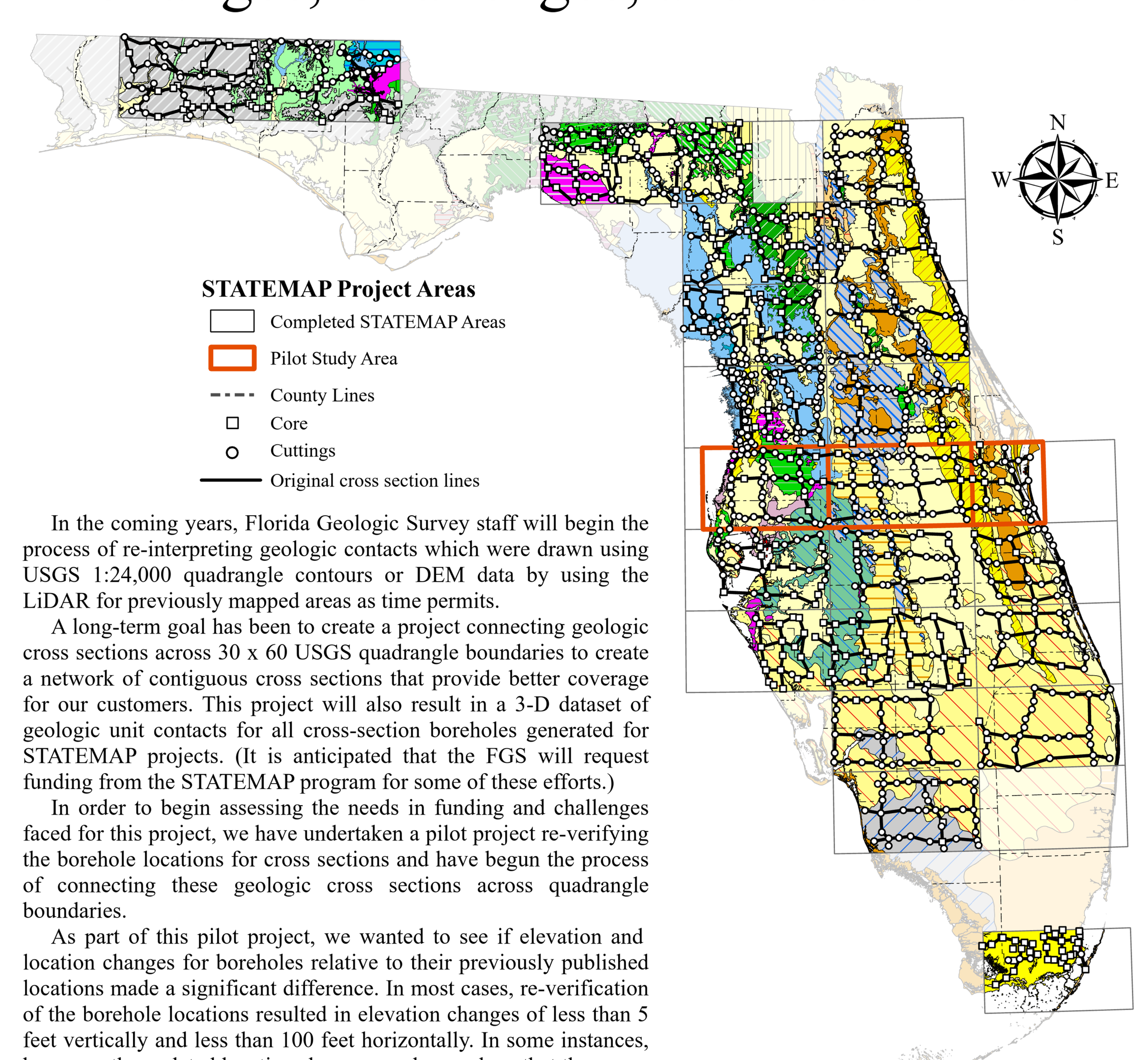
Miocene
- Trm — Residuum on Miocene sediments
- Tab — Alum Bluff Group
- Th — Hawthorn Group
- Thc — Coosawhatchie Formation
- Ths — Statenville Formation
- Tht — Torreya Formation
- Tch — Chattahoochee Formation
- Tsmk — St. Marks Formation

Oligocene/Miocene
- Tha — Hawthorn Group; Arcadia Formation
- That — Hawthorn Group; Arcadia Formation, Tampa Member

Oligocene
- Ts — Suwannee Limestone
- Tsm — Suwannee Limestone — Marianna Limestone Undifferentiated
- Tm — Marianna Limestone
- Tmb — Marianna/Bridgeboro Limestone
- Tbr — Bridgeboro Limestone

Eocene
- To — Ocala Limestone
- Tap — Avon Park Formation

Changes, Challenges, and Future Plans



In the coming years, Florida Geologic Survey staff will begin the process of re-interpreting geologic contacts which were drawn using USGS 1:24,000 quadrangle contours or DEM data by using the LiDAR for previously mapped areas as time permits.

A long-term goal has been to create a project connecting geologic cross sections across 30 x 60 USGS quadrangle boundaries to create a network of contiguous cross sections that provide better coverage for our customers. This project will also result in a 3-D dataset of geologic unit contacts for all cross-section boreholes generated for STATEMAP projects. (It is anticipated that the FGS will request funding from the STATEMAP program for some of these efforts.)

In order to begin assessing the needs in funding and challenges faced for this project, we have undertaken a pilot project re-verifying the borehole locations for cross sections and have begun the process of connecting these geologic cross sections across quadrangle boundaries.

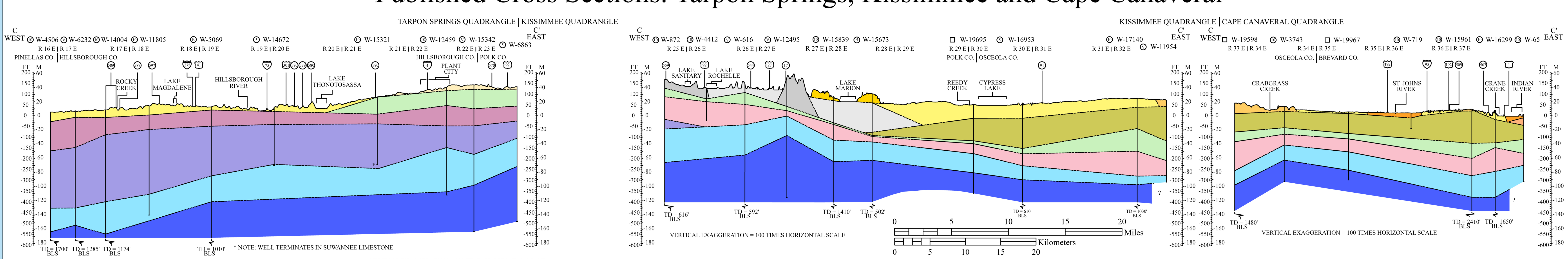
As part of this pilot project, we wanted to see if elevation and location changes for boreholes relative to their previously published locations made a significant difference. In most cases, re-verification of the borehole locations resulted in elevation changes of less than 5 feet vertically and less than 100 feet horizontally. In some instances, however, the updated locations have moved enough so that the cross-section lines needed to be rebuilt from scratch.

The second panel to the left shows geologic cross sections (C-C') for each 30 x 60 USGS quadrangle in the pilot study (Tarpon Springs, Kissimmee and Cape Canaveral) as they were published. They are spaced the correct distances apart in the panel in order to more easily compare them with the rebuilt and connected cross sections (bottom panel).

The panel on the bottom left depicts the results of re-building each of these geologic cross sections (based on new borehole locations and elevations) and connecting them across quad boundaries. The borehole that moved the most in this exercise was W-6232. It moved approximately 4,100 feet to the northeast and up in elevation approximately 5 feet.

The ultimate goal for this project is to take geologic cross-section lines constructed for individual 30 x 60 minute quadrangles and connect them across quad boundaries, resulting in creating a set of "coast to coast" geologic cross-sections throughout the state of Florida. To date, approximately 190 geologic cross-sections have been created for STATEMAP projects (see map above). It is our plan to create a web page and digital publication that will allow readers to access these composite cross-sections in one place by 2028. At the moment, a user would have to go to each individual project page in our publications in order to compare geologic cross sections.

Published Cross Sections: Tarpon Springs, Kissimmee and Cape Canaveral



Connected Cross Sections: Tarpon Springs, Kissimmee and Cape Canaveral