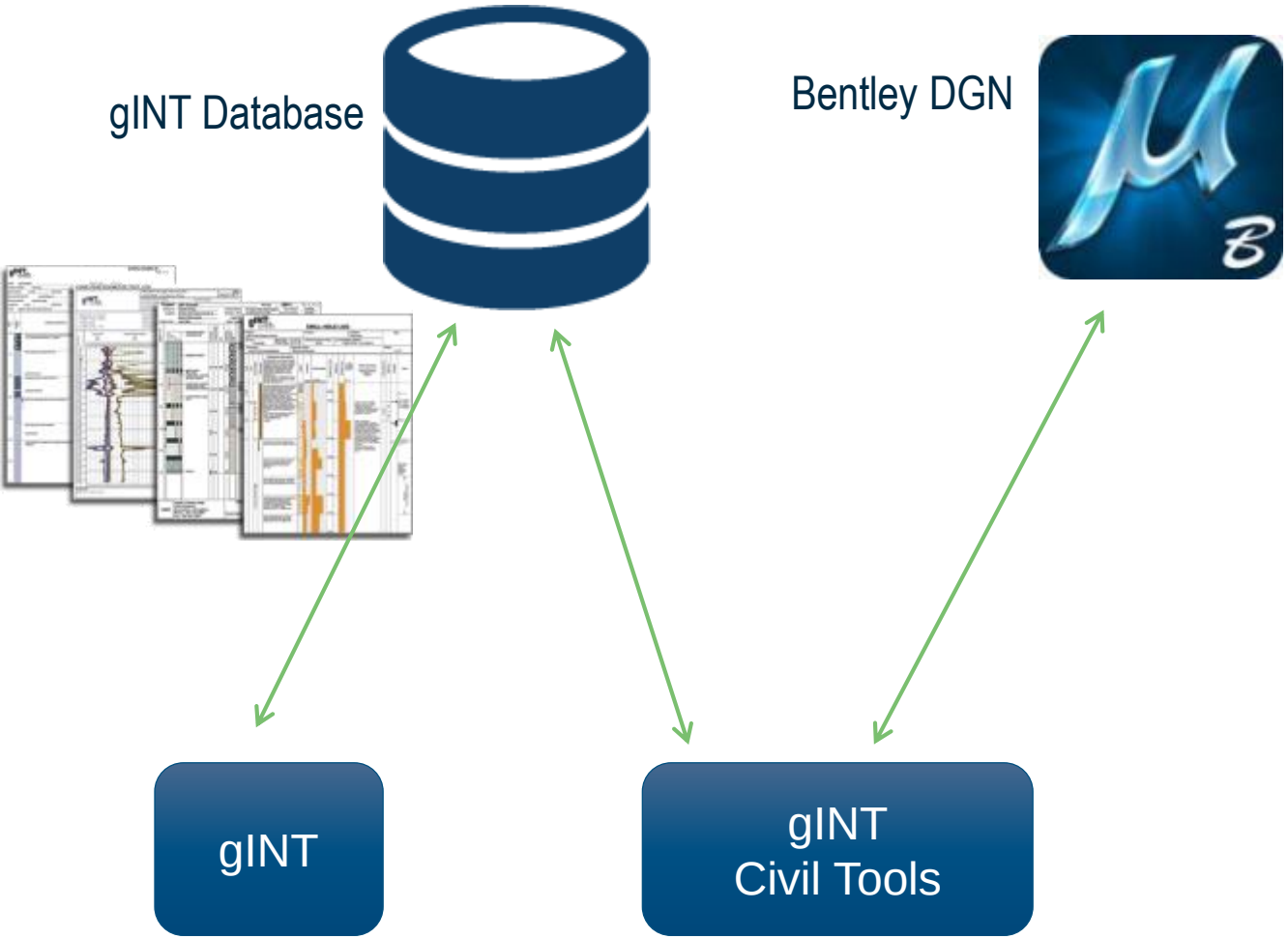
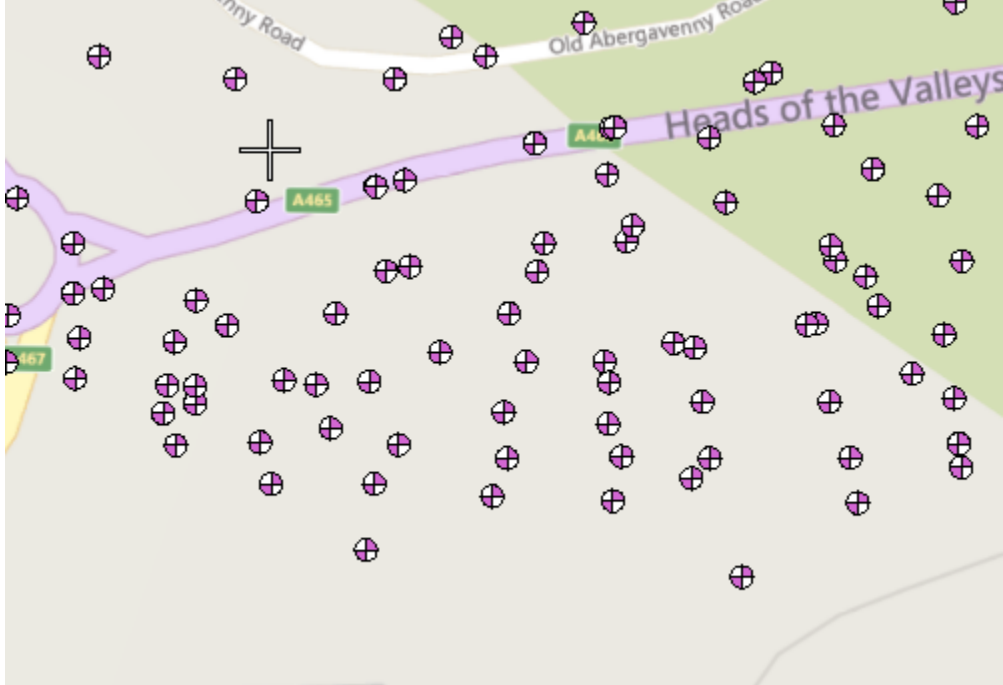
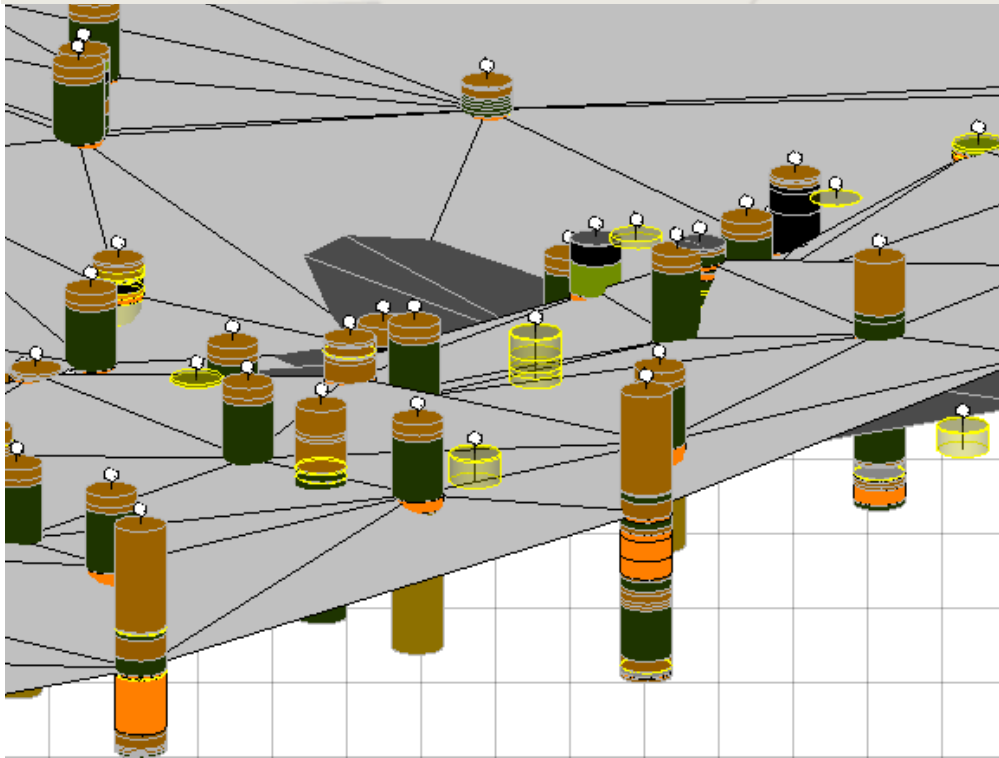
Including Geotechnical Data in an OpenRoads Designer Model

Bentley
Advancing Infrastructure

gINT Civil Tools At-A-Glance

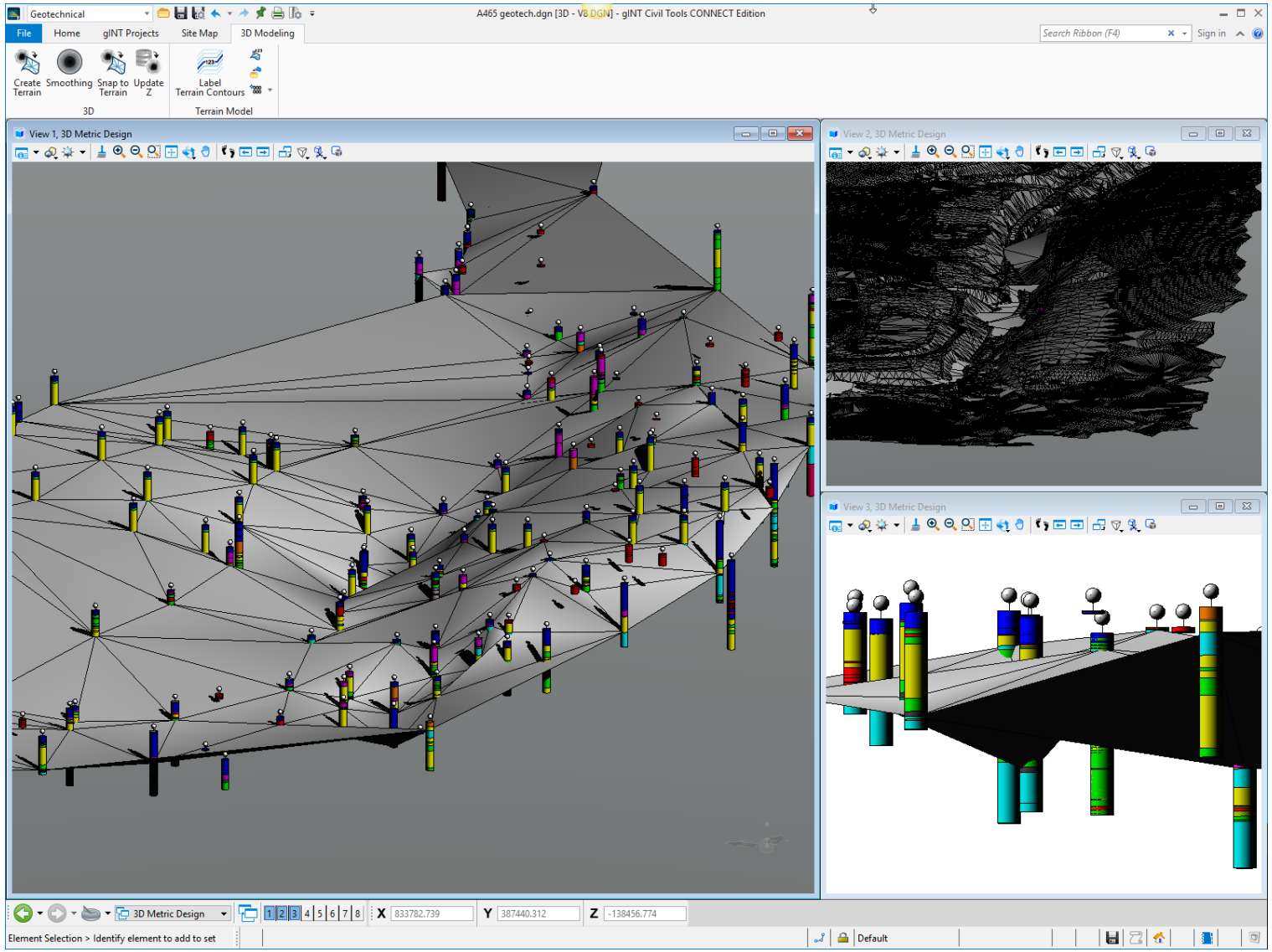






gINT Civil Tools: Standalone Application

- GIS and Mapping workflows
- Subsurface interpretation
- Simplified lithology



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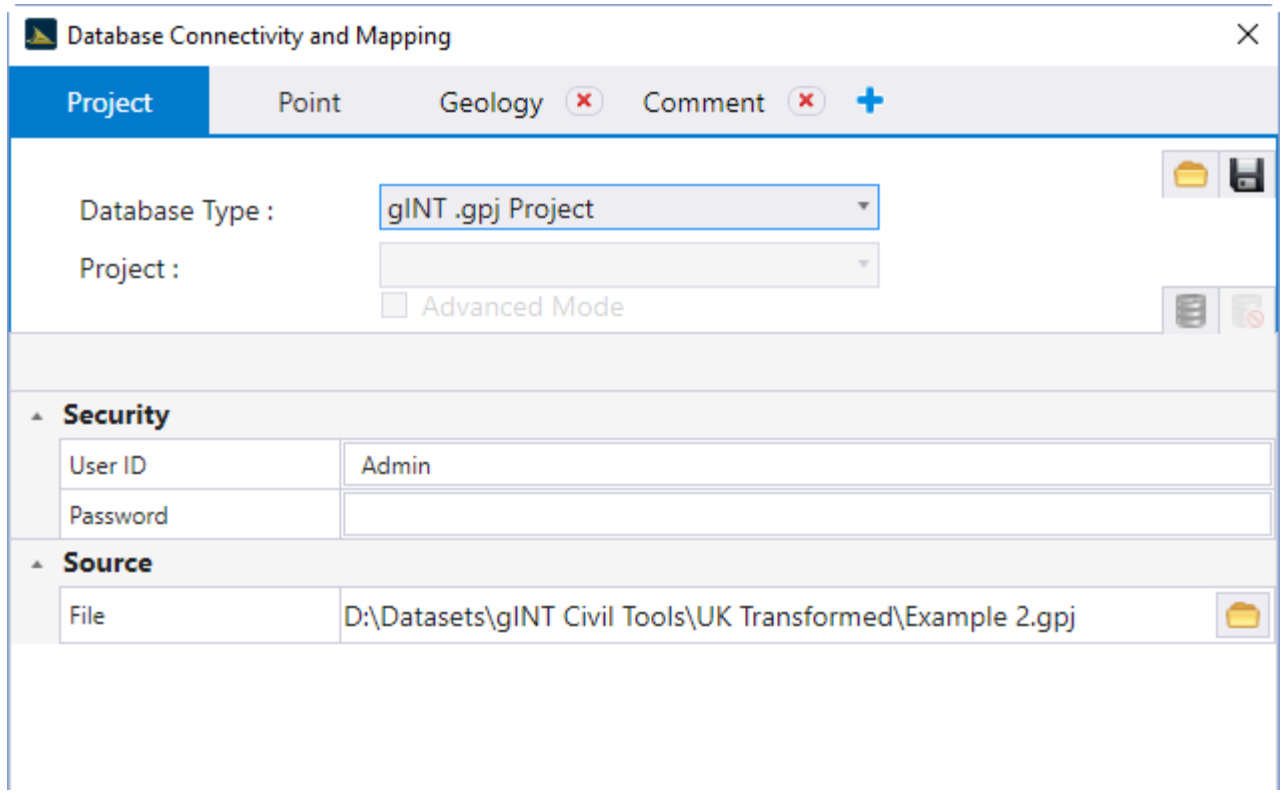
Native Read/Write of gINT Projects

- Direct access to any gINT Access and SQL Server
- Mapping between gINT schema and gINT Civil Tool
- Settings saved in DGN file and DGN Library, and can be shared



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Native Read/Write of gINT Projects

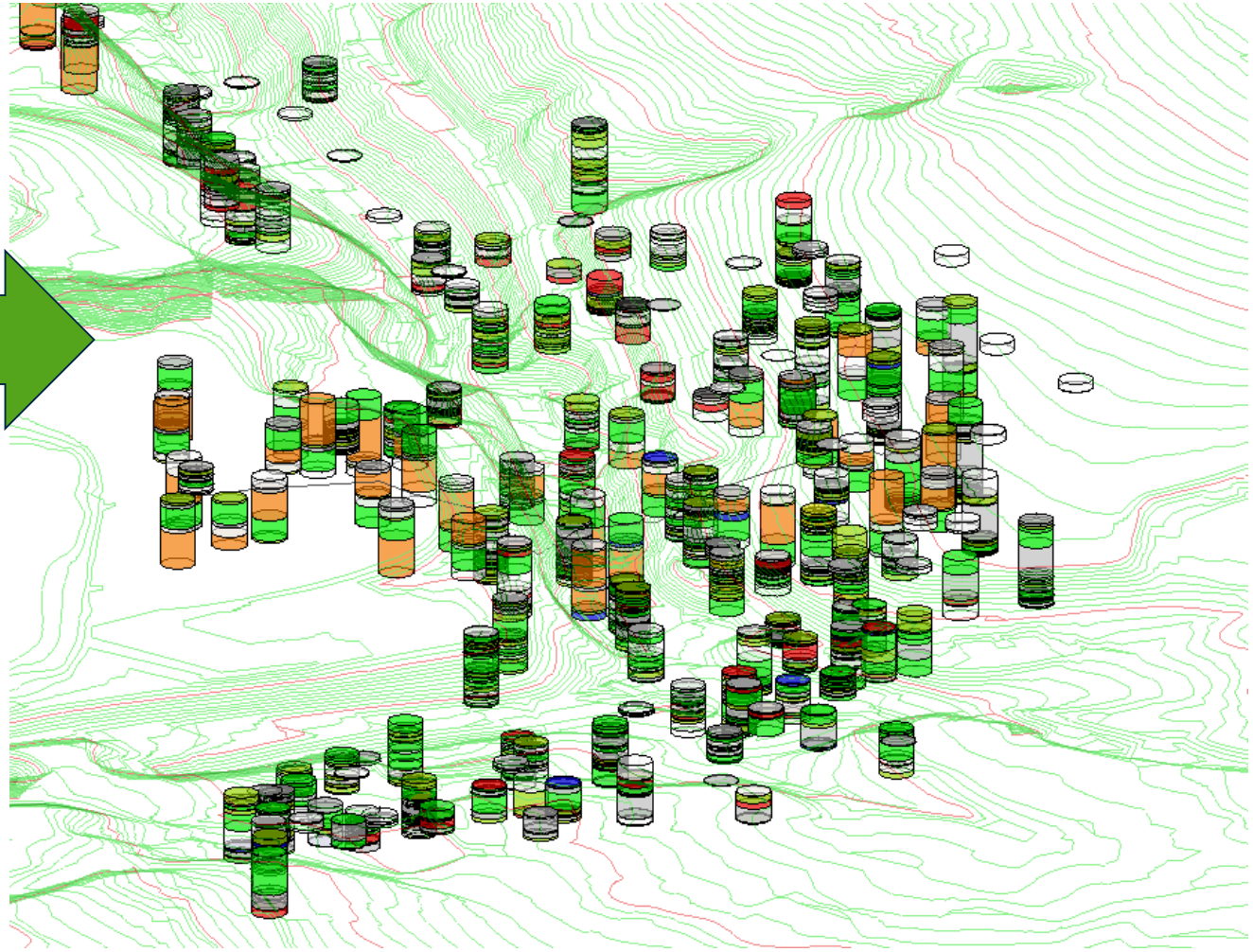
INPUT | OUTPUT | DATA DESIGN | REPORT DESIGN | SYMBOL DESIGN | DRAWINGS | UTILITIES

Main Group | Rock Coring | Depth Doc | Field Testing | Monitoring | Lab | Time Remarks | AGS | Site Map | Surfac

Project | Hole | Samples | Strata Main | Strata Soil | Strata Rock | Strata Details | Backfill

[Main Group]

Hole ID	Type	Date Started (dd/mm/yyyy)	Date Completed (dd/mm/yyyy)	Local X (m)	Local Y (m)	Local Z (m)	Final Depth (m)
BH1	RC	12/9/2011	12/9/2011	29563.92	12283.04	334.2633719	10.00
BH2	RC	11/22/1996	11/25/1996	31754.11	12625.37	203.5020308	20.10
BH3	CP	10/6/1996	10/6/1996	31757.99	12642.53	207.7561265	2.80
BH4	RC	11/27/1996	11/29/1996	31757.99	12642.53	207.7561265	30.10
BH5	CP+RC	11/17/1996	11/20/1996	31744.84	12617.09	202.8952942	25.65
BH6	CP	10/6/1996	10/6/1996	31733.05	12635.47	211.3060849	1.64
BH7	RC	11/11/1996	11/14/1996	31733.05	12635.47	211.3060849	
BH8	RC	11/14/1996	11/16/1996	31717.71	12602.48	203.9171226	
BH9	RC	10/29/1996	11/1/1996	31709.33	12623.46	214.3831528	
BH10	RC	11/8/1996	11/13/1996	31687.82	12587.65	207.7122538	
BH11	CP+RC	10/4/1996	10/23/1996	31671.69	12614.08	226.7977796	20.40
BH12	RC	11/4/1996	11/7/1996	31655.64	12575.90	223.0101711	25.20
BH13	RC	10/15/1996	10/17/1996	31645.74	12595.36	229.8863434	12.50
BH14	RC	10/23/1996	10/28/1996	31645.74	12595.36	229.8863434	20.00
BH15	RC	10/30/1996	11/3/1996	31628.77	12566.66	226.8168399	25.50
BH16	CP	10/7/1996	10/7/1996	31614.31	12586.22	234.1574465	2.10
BH17	RC	11/16/1996	11/21/1996	31614.31	12586.22	234.1574465	20.00
BH18	RC	10/22/1996	10/28/1996	31602.95	12561.89	230.2289278	29.85
BH19	CP+RC	10/3/1996	10/20/1996	31593.54	12571.26	236.0963212	25.60
BH20	RC	10/10/1996	10/16/1996	31572.02	12555.91	237.0019073	20.00
BH21	CP+RC	10/4/1996	10/18/1996	31539.99	12518.19	232.2687919	30.10
BH22	RC	10/18/1996	10/20/1996	31510.21	12508.89	241.9942571	20.20



Direct read of gINT Projects minimizes using old data and reduces opportunity for data entry errors

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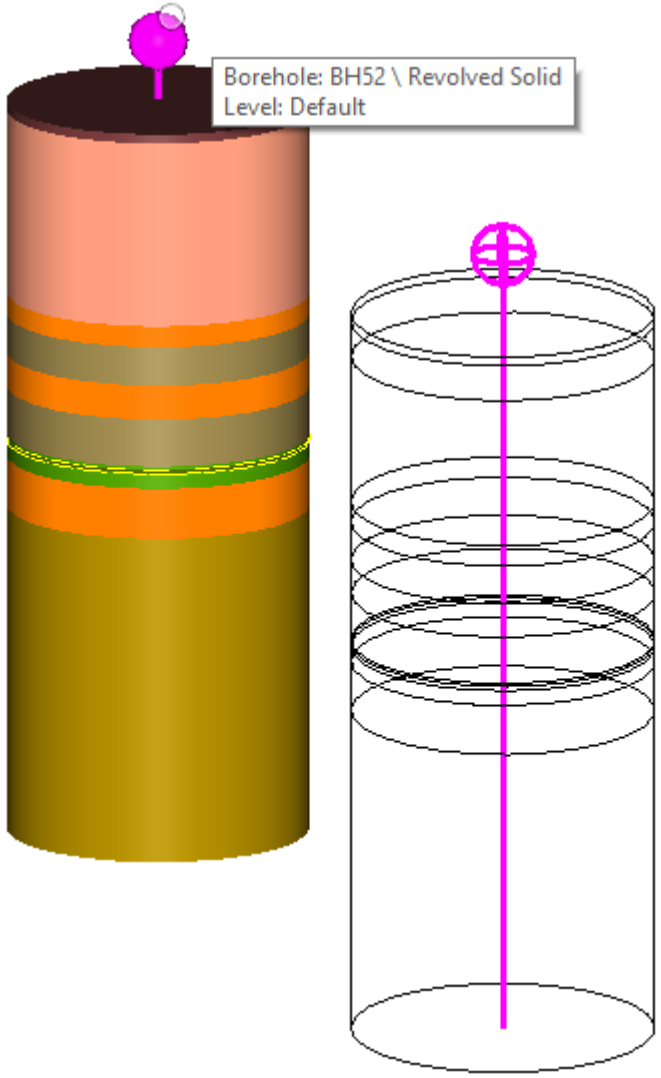
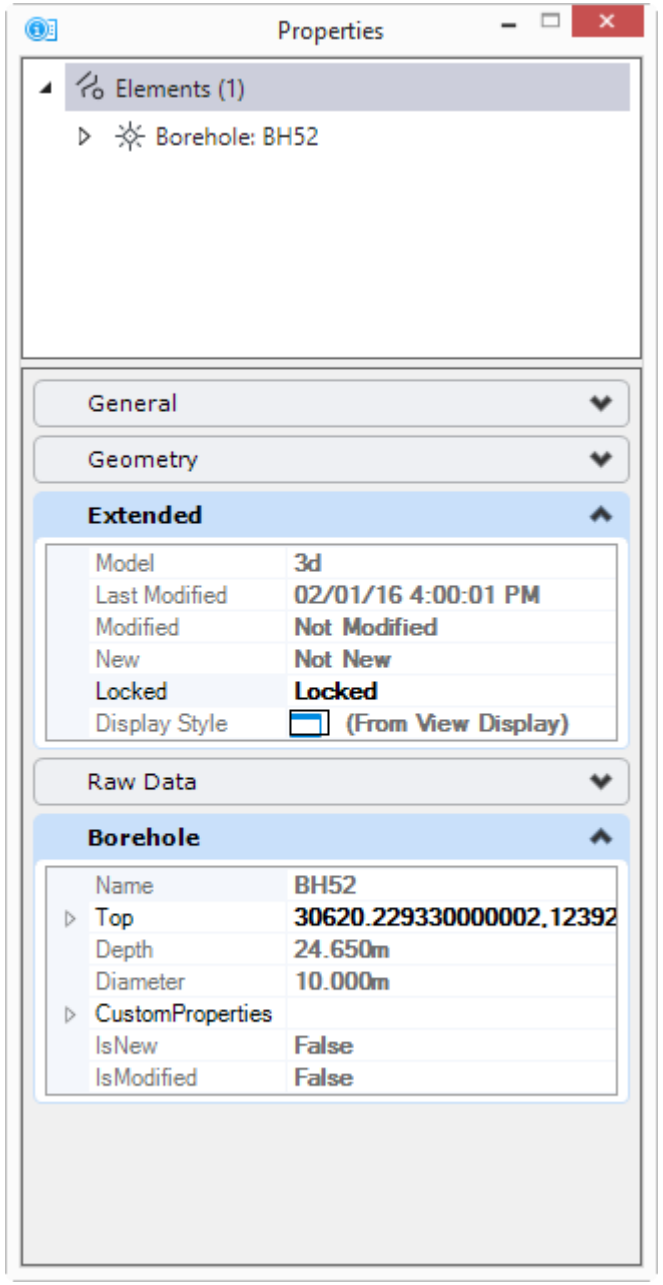
Subsurface data model : PointID

Hole ID	Type	Date Started (dd/mm/yyyy)	Date Completed (dd/mm/yyyy)	Local X (m)	Local Y (m)	Local Z (m)	Final Depth (m)
BH37	RC	10/1/1996	10/2/1996	31149.12	12398.80	237.3349670	10.25
BH38	RC	1/23/1997	1/26/1997	31099.25	12422.11	245.0492368	20.00
BH39	RC	1/27/1997	1/29/1997	31023.99	12422.26	262.1024753	25.00
BH40	CP+RC	11/29/1996	12/4/1996	31010.68	12372.64	272.7349314	15.00
BH41	RC	12/5/1996	12/5/1996	30970.56	12373.69	272.9574418	3.31
BH42	RC	12/5/1996	12/12/1996	30970.56	12373.69	272.9574418	15.00
BH43	RC	9/24/1996	9/30/1996	30891.65	12432.63	269.9964031	25.10
BH44	CP	9/24/1996	9/25/1996	30837.01	12436.47	275.1481336	1.30
BH45	CP	9/25/1996	9/25/1996	30837.01	12436.47	275.1481336	3.38
BH46	RC	10/2/1996	10/3/1996	30837.01	12436.47	275.1481336	9.46
BH47	RC	1/15/1997	1/20/1997	30837.01	12436.47	275.1481336	35.00
BH48	CP+RC	9/23/1996	9/26/1996	30869.96	12367.26	297.8937829	15.10
BH49	RC	10/1/1996	10/2/1996	30809.01	12377.77	292.3013087	10.00
BH50	CP+RC	12/9/1996	1/14/1997	30744.12	12412.70	270.4929268	30.35
BH51	CP+RC	12/10/1996	1/14/1997	30700.27	12385.44	264	30.35
BH52	CP+RC	12/4/1996	1/8/1997	30620.23	12392.58	296.3300577	24.65
BH53	CP+RC	9/20/1996	10/11/1996	30532.20	12350.90	292.7634905	11.00
BH54	RC	10/8/1996	10/16/1996	30532.20	12350.90	292.7634905	30.15
BH55	CP+RC	9/20/1996	10/21/1996	30511.81	12345.30	289.4038521	20.80
BH56	CP+RC	9/22/1996	10/14/1996	30471.00	12334.85	293.3918984	35.00
BH57	CP+RC	9/21/1996	10/20/1996	30436.65	12324.26	292.2586770	30.00
BH58	CP+RC	9/26/1996	10/23/1996	30416.30	12332.16	303.3694834	20.31
BH59	RC	10/29/1996	11/2/1996	30385.25	12311.07	301.4364342	25.14





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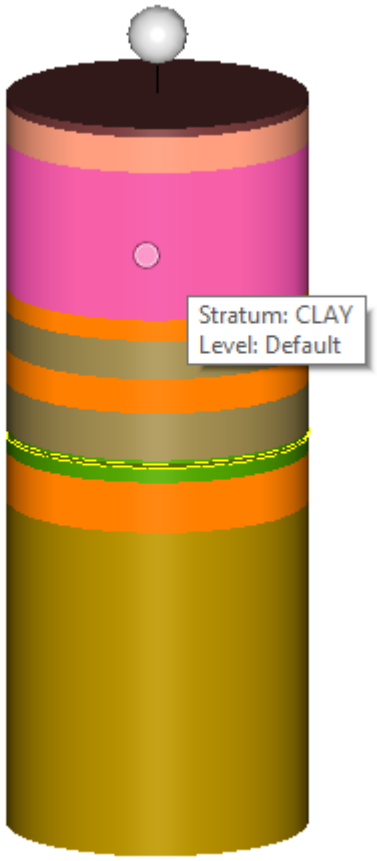
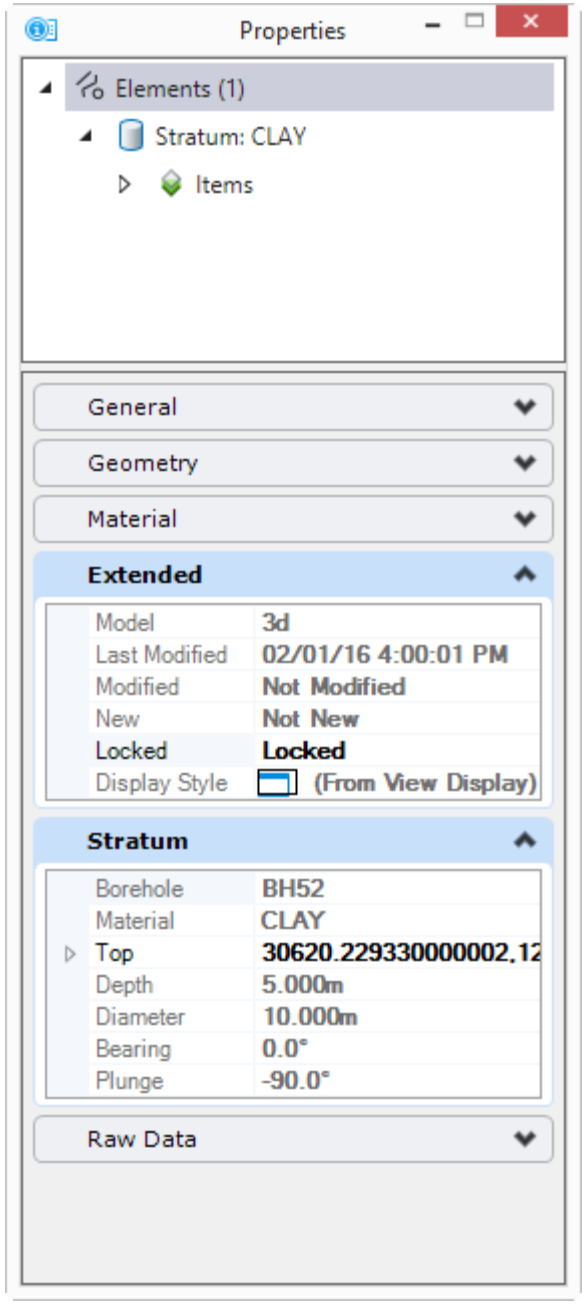
Subsurface data model : Top-Bottom

Top (m)	Base (m)	Description	Legend
0.00	0.30	TOPSOIL **	TOPSOIL
0.30	1.50	Soft to firm yellow and orange brown and grey mottled slightly sandy (fine) silty CLAY with occasional angular fine to medium gravel.	CLAY si sa gr co
1.50	6.50	Very stiff dark brown mottled grey slightly sandy (fine to coarse) silty CLAY with some to much angular to subangular fine to coarse gravel and cobbles of sandstone and quartzite.	CLAY si sa gr co
6.50	7.20	Grey fine and medium grained very thinly to thinly bedded slightly weathered SANDSTONE,strong to very strong. Prominent discontinuities: 1) Bedding fractures: subhorizontal (5? to 15?) planar,rough,clean,orange brown stained. 2) Subvertical (70? to	SANDSTONE
7.20	8.50	Grey thinly to medium bedded slightly weathered CONGLOMERATE,strong to very strong comprising subangular to subrounded up to coarse gravel sized clasts of quartz with a little to some matrix of fine to coarse grained sandstone. Prominent discontinuities: 1) Bedding	CONGLOMERATE
8.50	9.65	Grey brown fine to medium grained medium bedded slightly weathered SANDSTONE,strong and very strong. Prominent discontinuities: 1) Bedding fractures: 15? to 20?,planar,rough,clean,slightly orange brown stained. 2) Very closely to closely	SANDSTONE
9.65	11.25	Grey thinly to medium bedded slightly weathered CONGLOMERATE,strong to very strong comprising subangular to subrounded up to coarse gravel sized clasts of predominantly quartz with a little to some matrix of fine to coarse grained sandstone. Prominent	CONGLOMERATE
11.25	11.35	Grey slightly weathered SILTSTONE,weak to predominantly moderately weak with very closely to closely spaced randomly orientated and subhorizontal (0? to 20?) planar and irregular,smooth,clean discontinuities.	SILTSTONE
11.35	11.50	AZCL	Unknown
11.50	12.00		SILTSTONE
12.00	13.70	Grey fine to medium grained thinly to thickly bedded slightly weathered SANDSTONE,strong to extremely strong. Prominent discontinuities: 1) Bedding fractures: subhorizontal (5? to 20?) planar and irregular,rough,clean. 2) Subvertical (70? to 80?) irregular,rough,locally	SANDSTONE
13.70	24.65	Grey fine to medium grained thinly to thickly bedded slightly to moderately weathered crystalline LIMESTONE,strong to very strong with occasional sand to coarse gravel sized voids (occasionally infilled with quartz and calcite mineralisation). Locally discoloured brown	LIMESTONE





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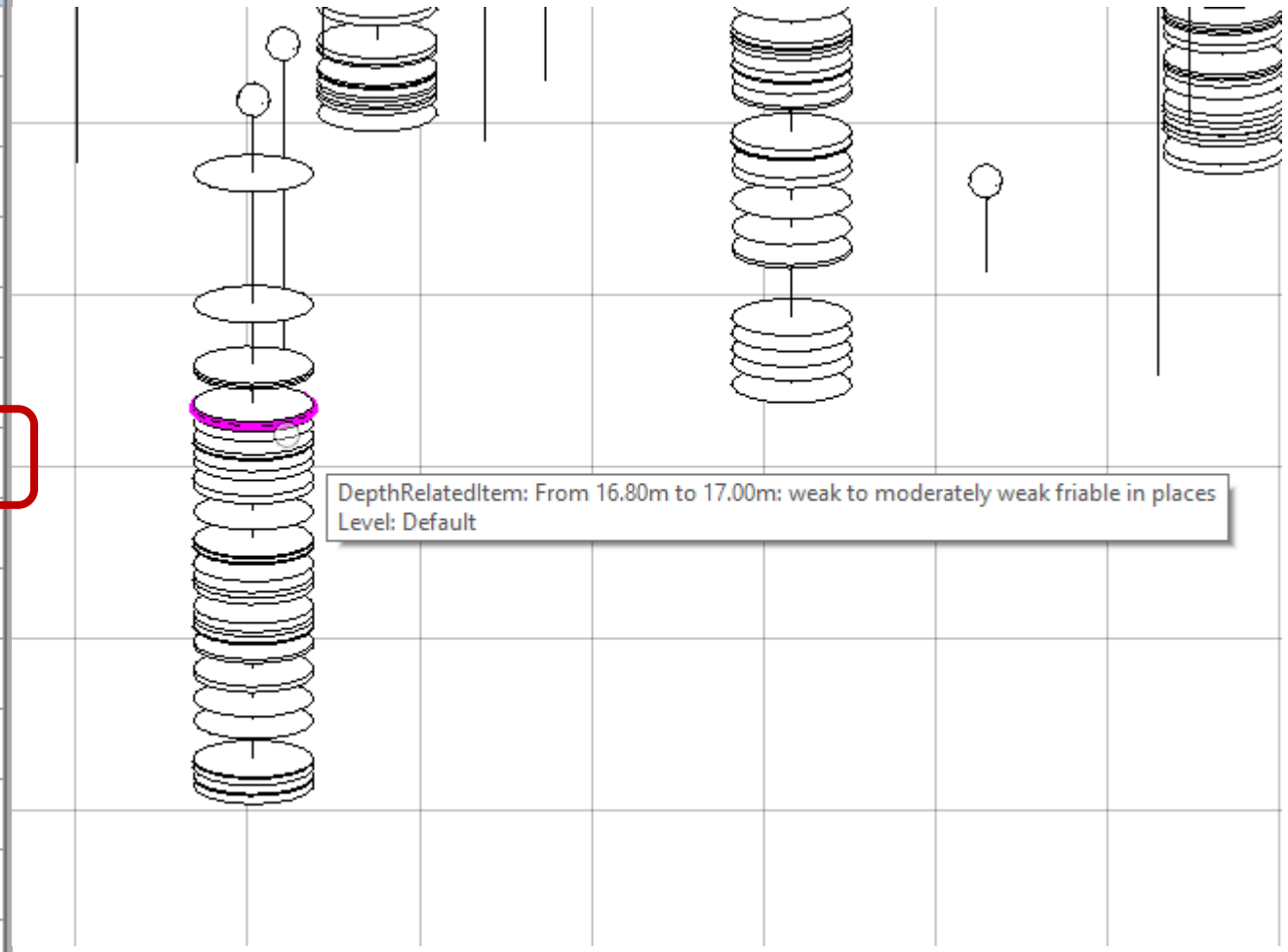
Subsurface data model : Depth Only

Depth (m)	Base (m)	Remark
2.5		From 2.5m: Samples recovered as angular fine to coarse gravel and cobbles of siltstone and fine grained sandstone with some grey brown mottled silty
10.5		At 10.50m: recovered as grey silty gravel
14.22		From 14.22m to 14.52m: 80? to 90? planar,irregular,rough,closed,iron stained joint perpendicular to main joint set
14.4		From 14.40m to 14.57m: fine to medium grained sandstone with occasional interlaminations of sandy siltstone
14.57		From 14.57m to 15.00m: with occasional thin sandy laminae
16.55		From 16.55m to 16.60m: ironstone nodule
16.8		From 16.80m to 17.00m: weak to moderately weak friable in places
17.16		From 17.16m to 17.25m: ironstone nodule
17.75		From 17.75m to 18.00m: slightly weathered,clay smearing along bedding fractures
18.55		From 18.55m to 18.65m: with some coarse gravel size ironstone nodules
18.82		From 18.82m to 18.85m: with some medium gravel size ironstone nodules
18.93		From 18.93m to 19.98m: 75? planar,smooth,closed joint
19.6		From 19.60m to 19.70m: with coarse gravel size ironstone nodules
20.15		From 20.15m to 20.28m: 45?,planar,rough,closed to slightly open (<1mm) joint with a slight clay smearing in places and slight iron staining



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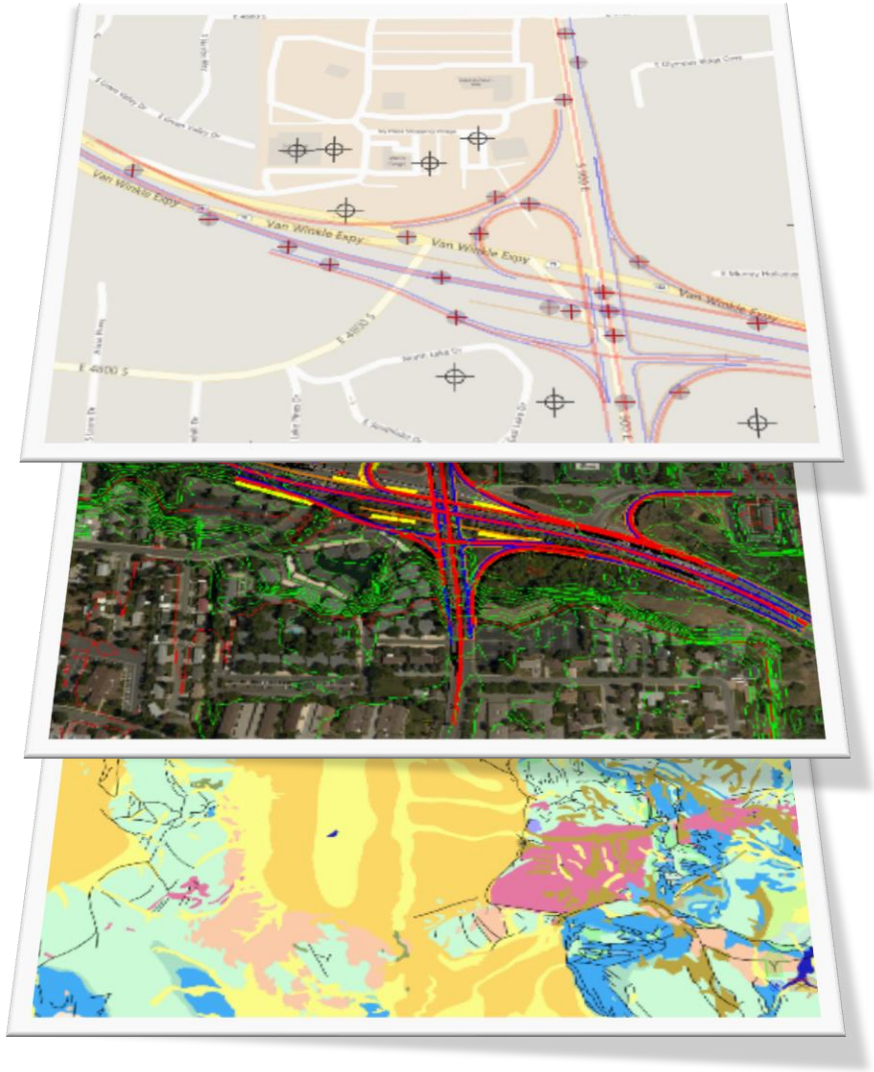
Mapping Workflow

- 2D representation of the boreholes; annotation
- Civil projects: import, reference in, ProjectWise integration
- Import / reference CAD and GIS data
- Load raster imagery: from local disk or WMS feed
- Direct Support of BING maps data with Microsoft account
- Projection on the fly: working with multiple coordinate systems and data sources live, no need to import data all in one coordinate system



Geotechnical

glNT_YII_CONNECTv2.dgn [2D - V8 DGN] - glNT Civil Tools CONNECT Edition (Technology Preview)

File | Projects | Site Map | 3D Modeling | Technology Preview

Search Ribbon (F4)

Attach Reference | Detach Reference | Clip Reference — Reference

Attach | Bring to Front — Raster

Element Selection — Selection

Coordinate System — Geographic

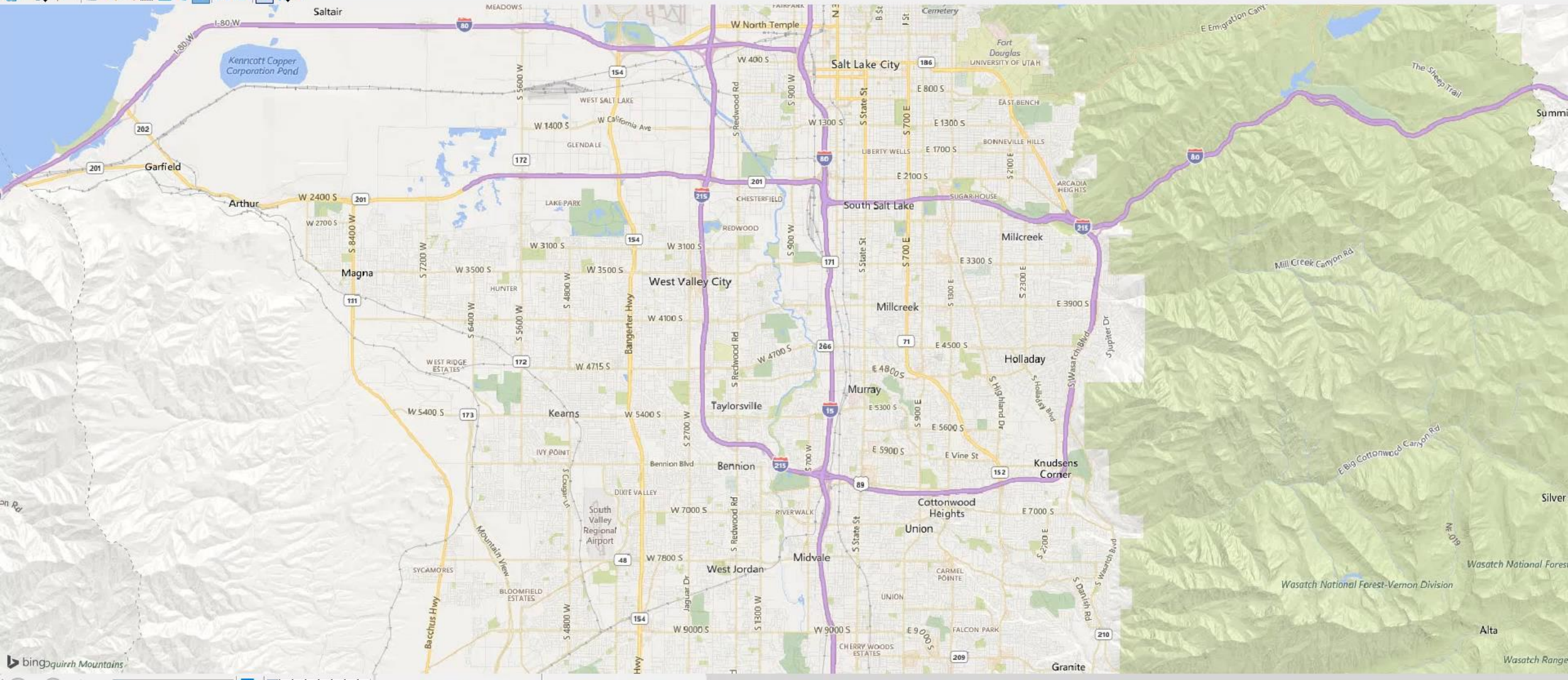
Measure Distance — Measure

Create New Boreholes — Borehole

Pan View

Move Camera

View 1, 2d



2d Views | 1 2 3 4 5 6 7 8 | X 1526649:4 5/8 | Y 7452326:6 3/8

Pan View > Select view

Default

Reporting of Geotechnical Data

- Loading Boreholes in gINT Civil Tools
  - gINT Civil Tools available in
    - OpenRoads Designer Connect Edition (CE)
      - Access from the Geotechnical Workflow
    - gINT Civil Tools Professional Plus
      - Available to all gINT Professional Plus Connect Edition users
  - Connecting to a gINT Project
  - Loading boreholes and lithology (soil and rock) in 3D context
  - Annotating boreholes and lithology
  - Links to gINT reports (boreholes logs)

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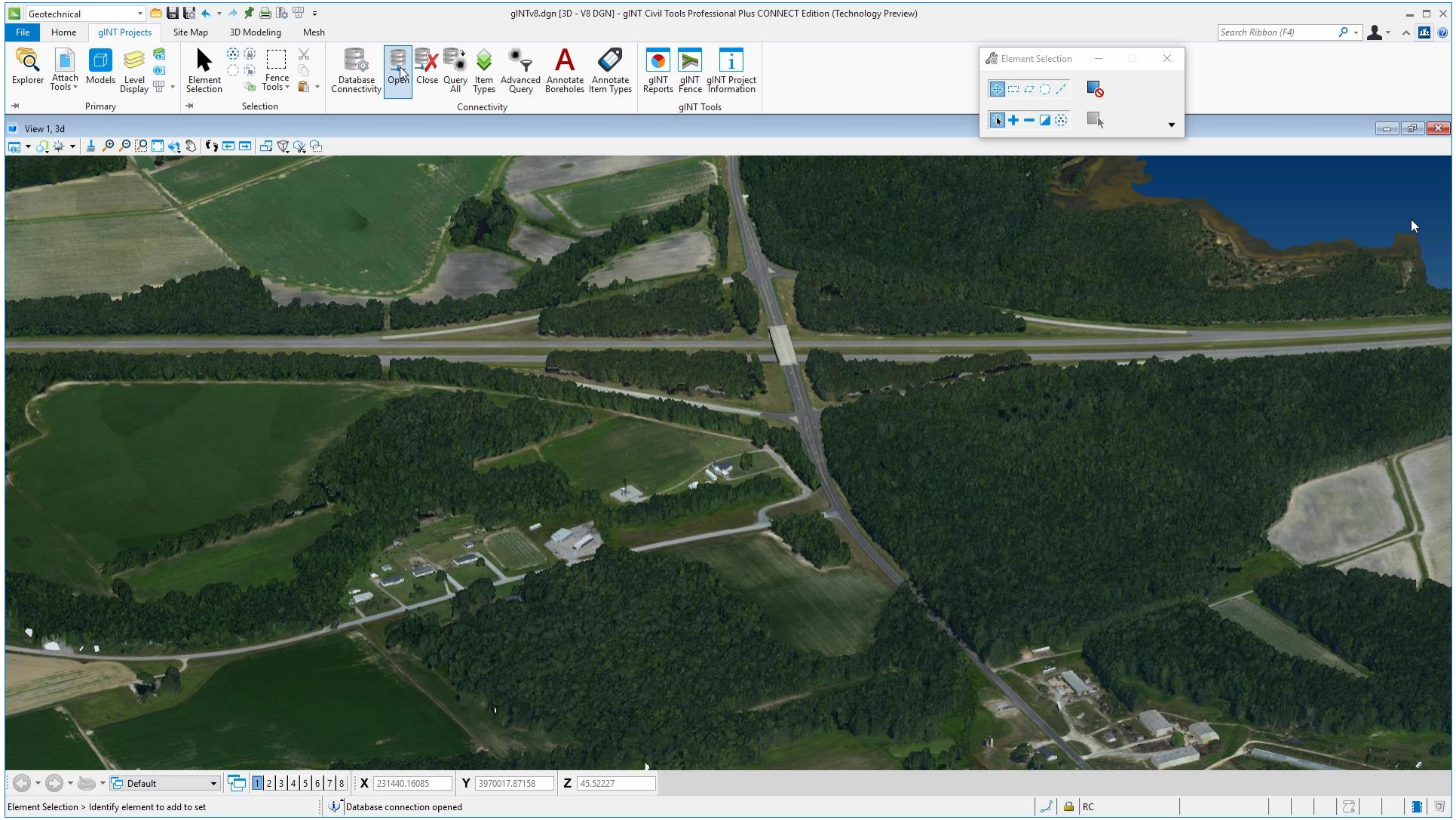
Accessing gINT Civil Tools from the Geotechnical Ribbon



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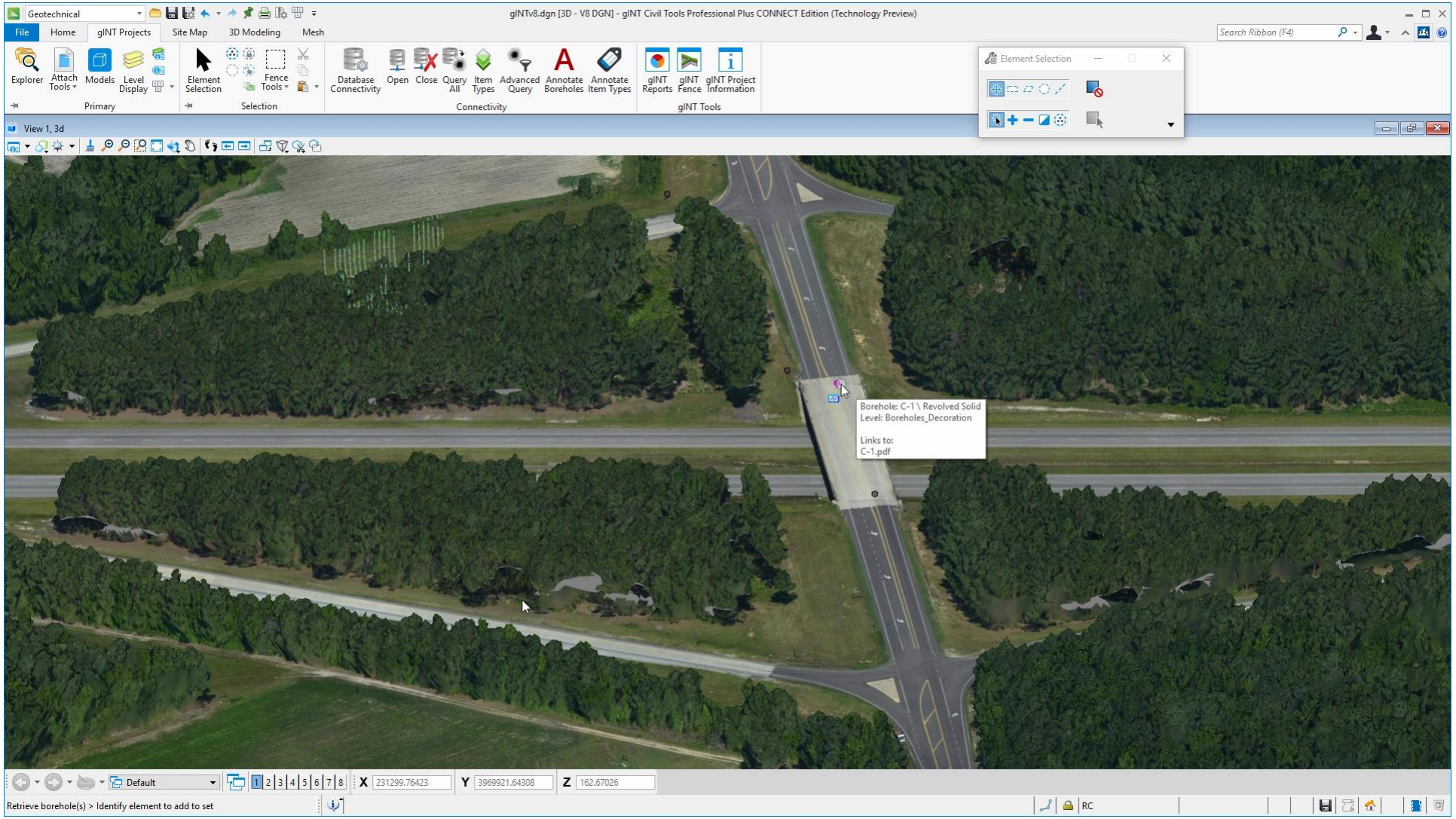
Connecting to a gINT Project



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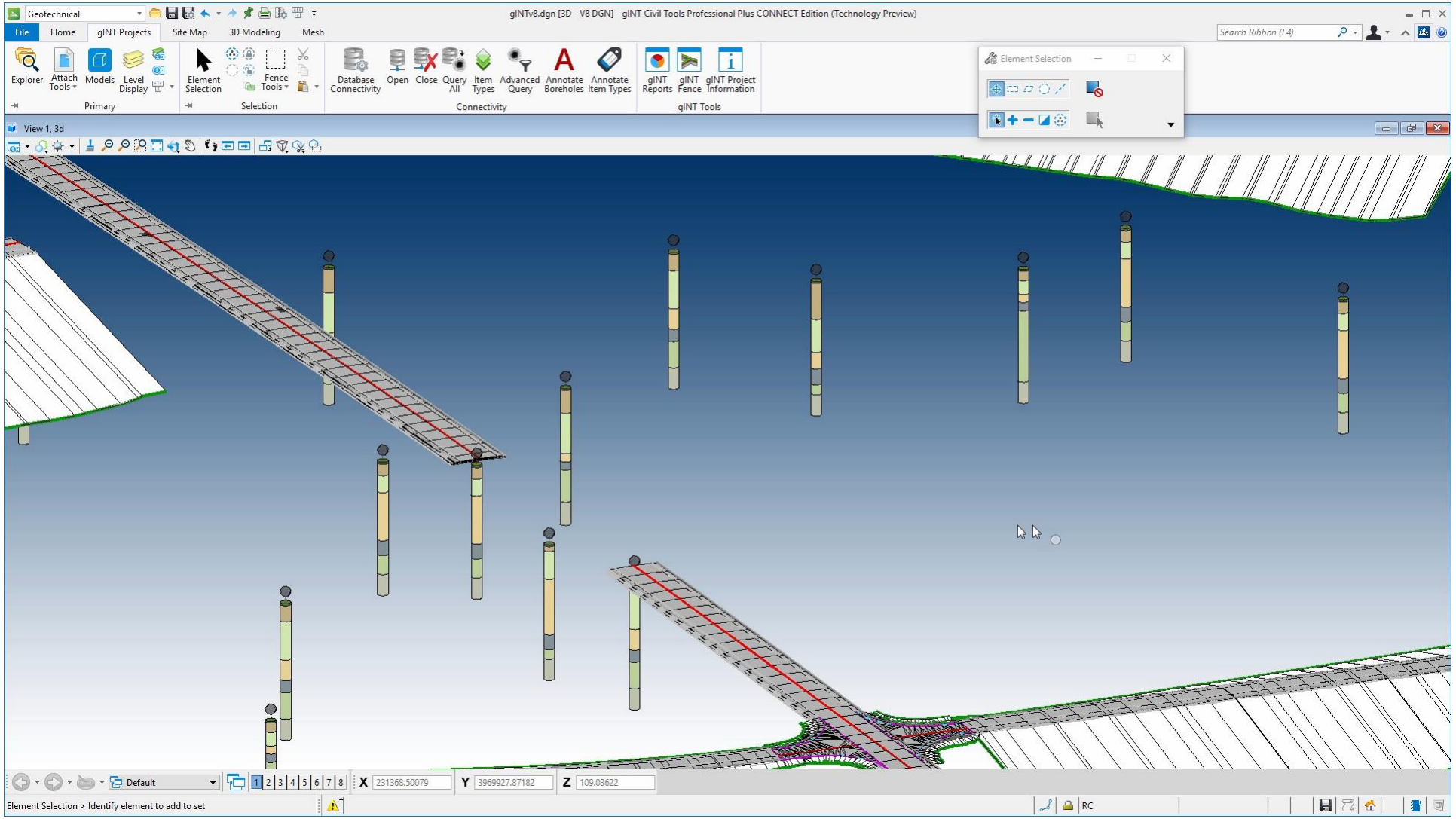
Loading boreholes and lithology (soil and rock) in 3d in context



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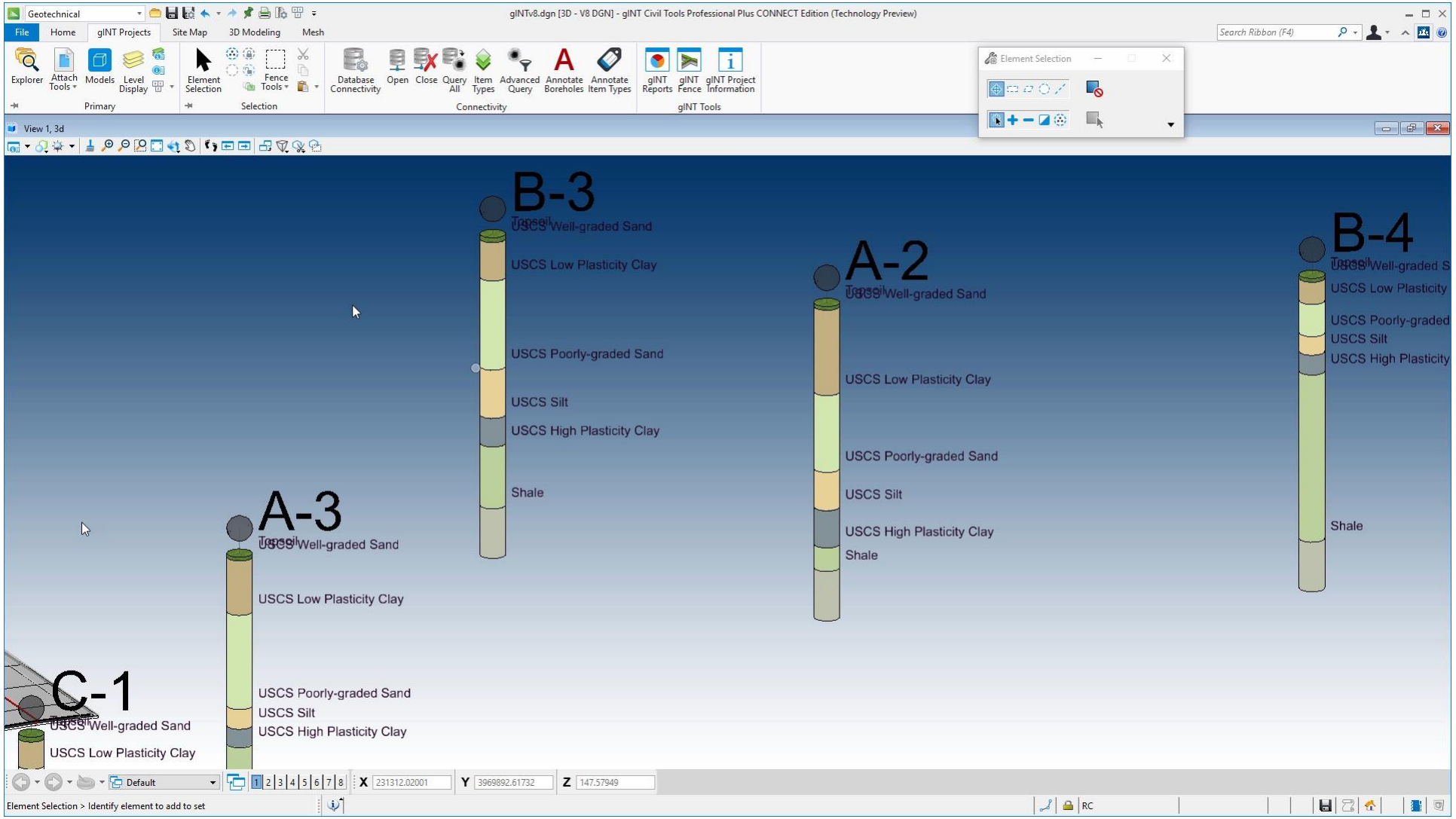
Annotating boreholes and lithology



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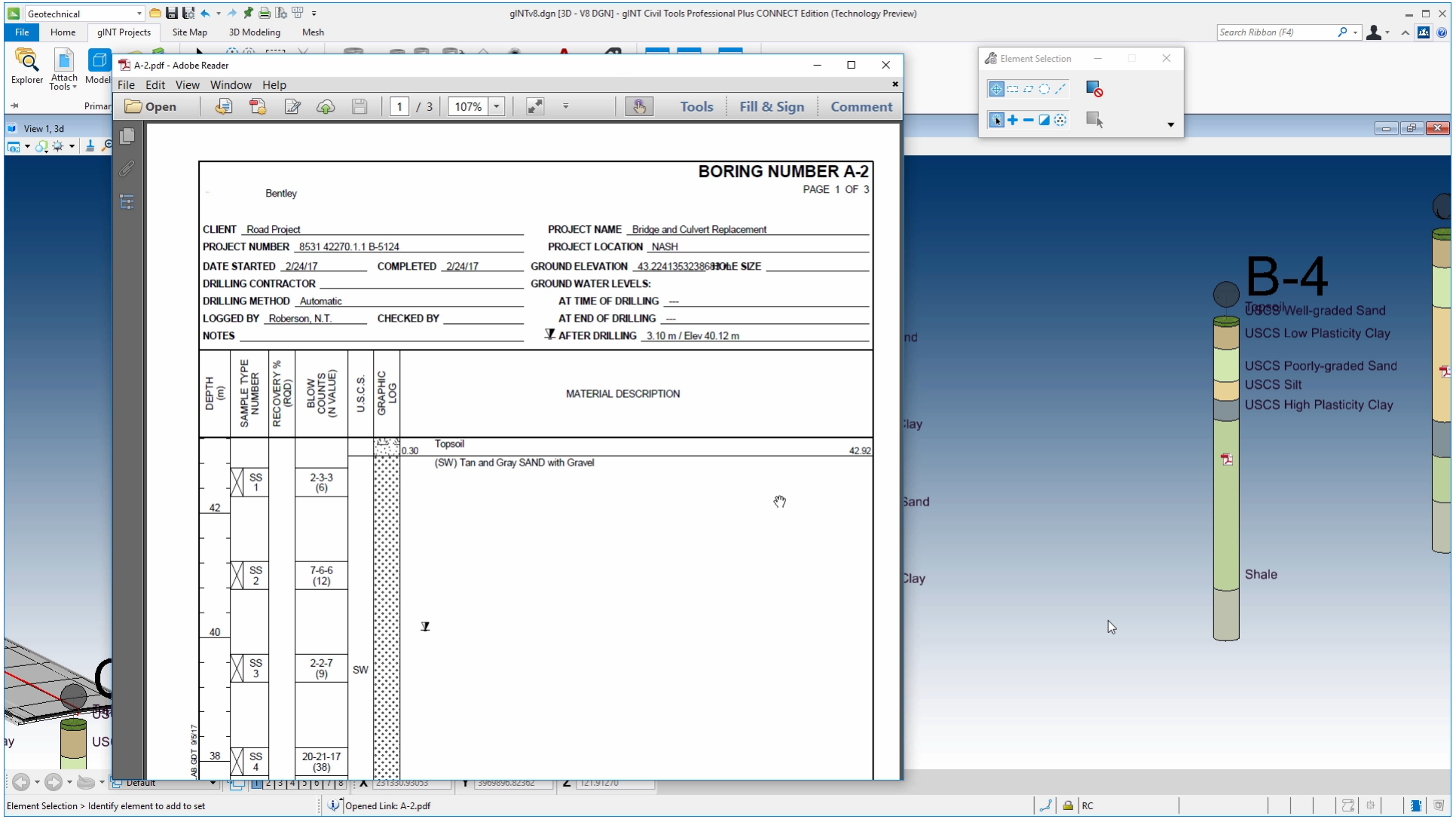
Links to gINT reports (boreholes logs)



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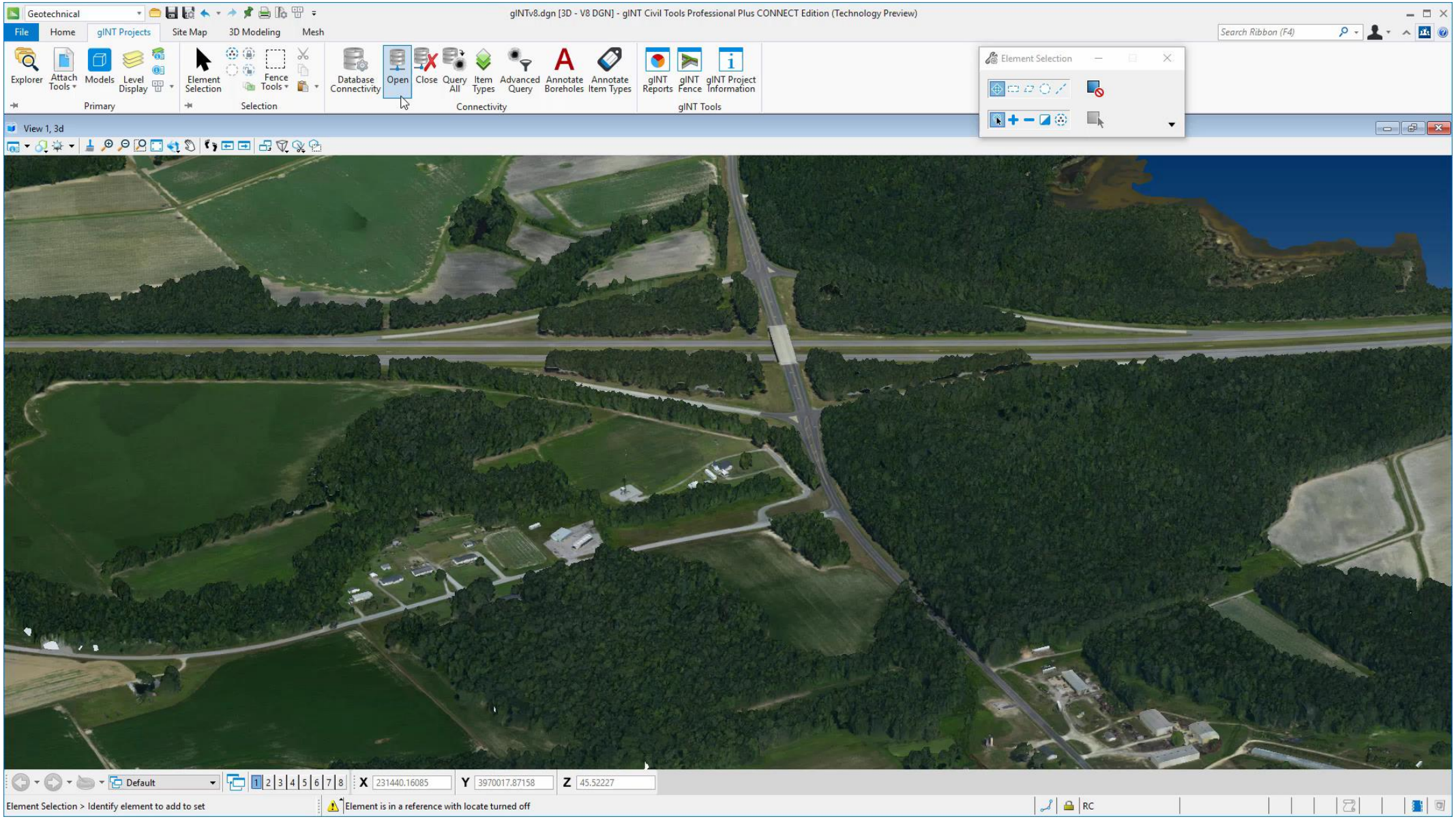
Loading Boreholes Demo



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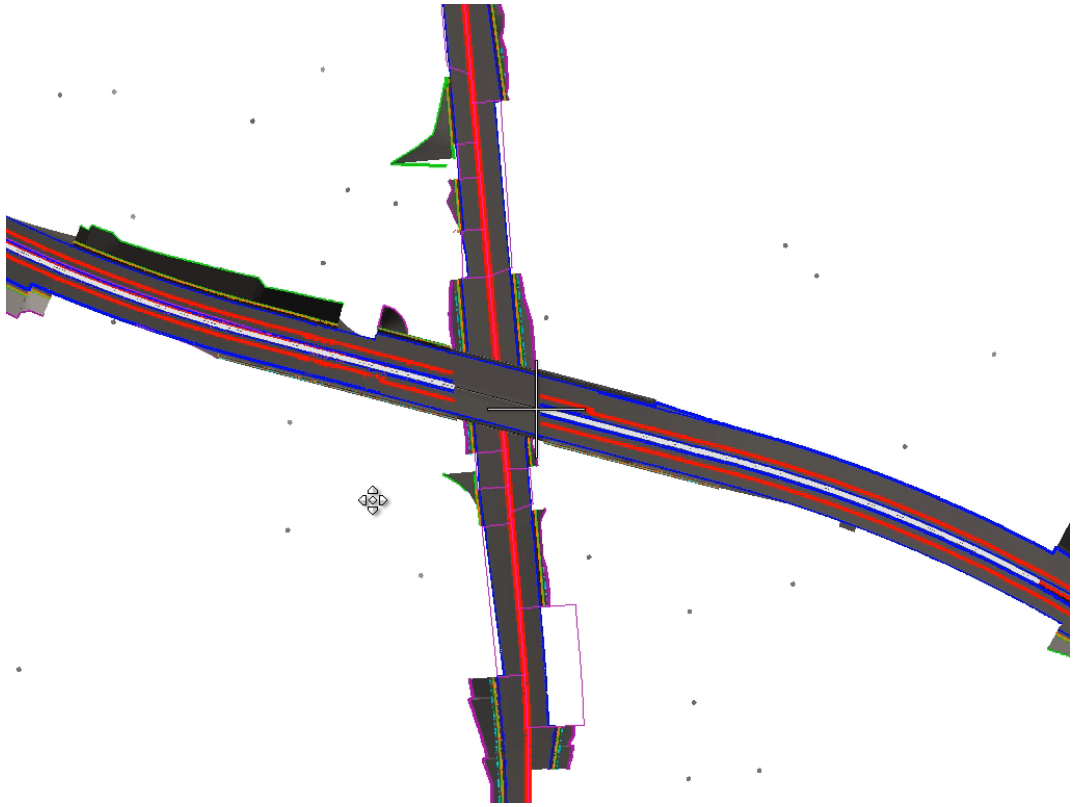
3D Workflow

- 3D visualization of gINT data
- Thematic symbolization
- Overlay site design plans to provide context view
- QA for boreholes elevation
- Data QA/analysis by combining with other data (existing ground, …)
- Subsurface creation
- Geological layers creation



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Geotechnical

gINT_YII_CONNECTv2.dgn [3D - V8 DGN] - gINT Civil Tools CONNECT Edition (Technology Preview)

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Search Ribbon (F4)

Attach Reference | Detach Reference | Clip Reference — Reference

Attach | Bring to Front — Raster

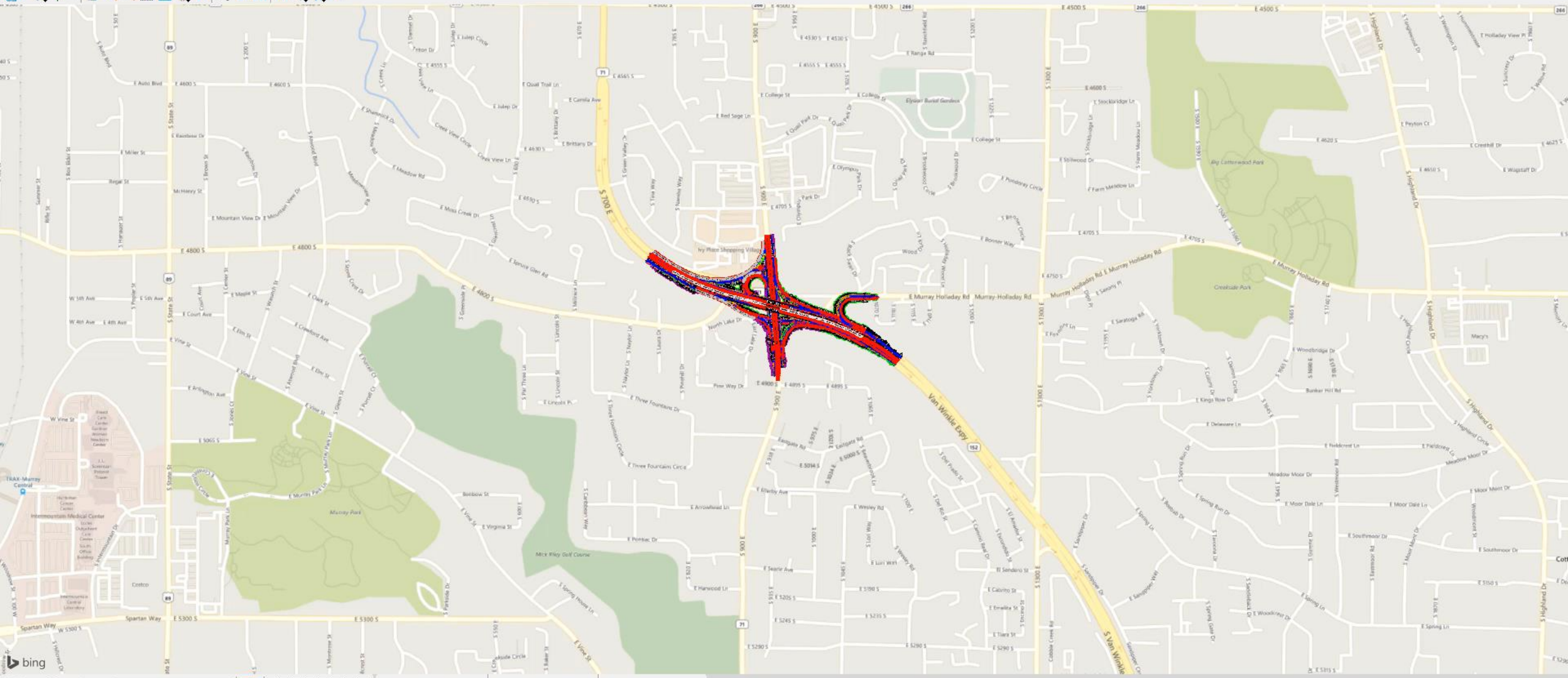
Element Selection — Selection

Coordinate System — Geographic

Measure Distance — Measure

Create New Boreholes — Borehole

View 1 - Top, 3dmetric 2



3dmetric 2 Views | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | X 467019.497 | Y 2258104.573 | Z 1222.886

Element Selection > Identify element to add to set | Raster Attachment [www.bing.com/maps/Road], Level: Bing | planned boreholes | : 1

Reporting of Geotechnical Data

- Cross Sections or Profile along line in Civil Terminology
  - Boreholes and lithology loaded
  - Loading the bridges and ramps and Cross section lines (saved view)
  - Loading water level
  - Create surface for water level
  - Create meshes (volumes) for the lithology
  - Create a Cross section

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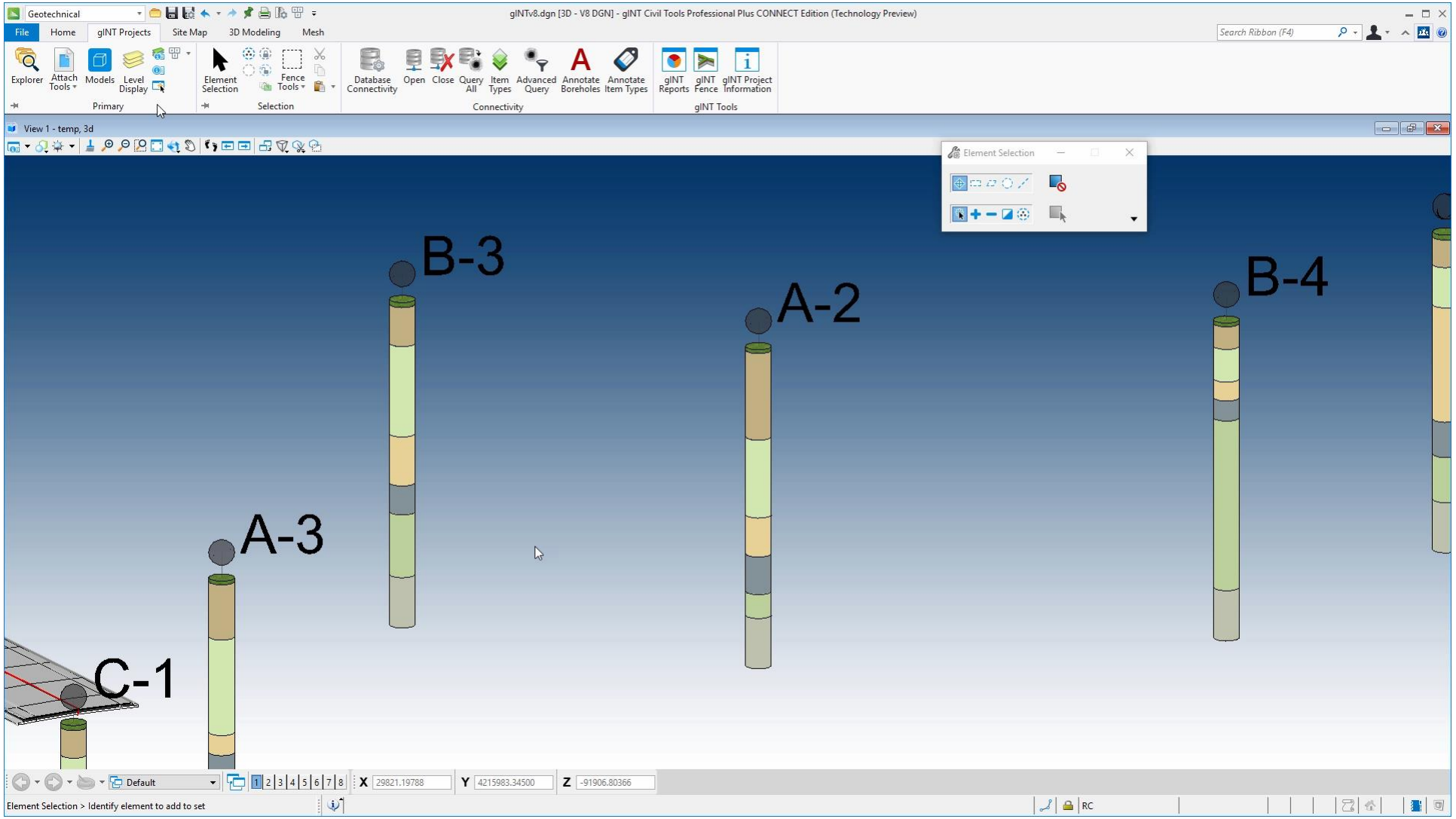
Boreholes and lithology loaded



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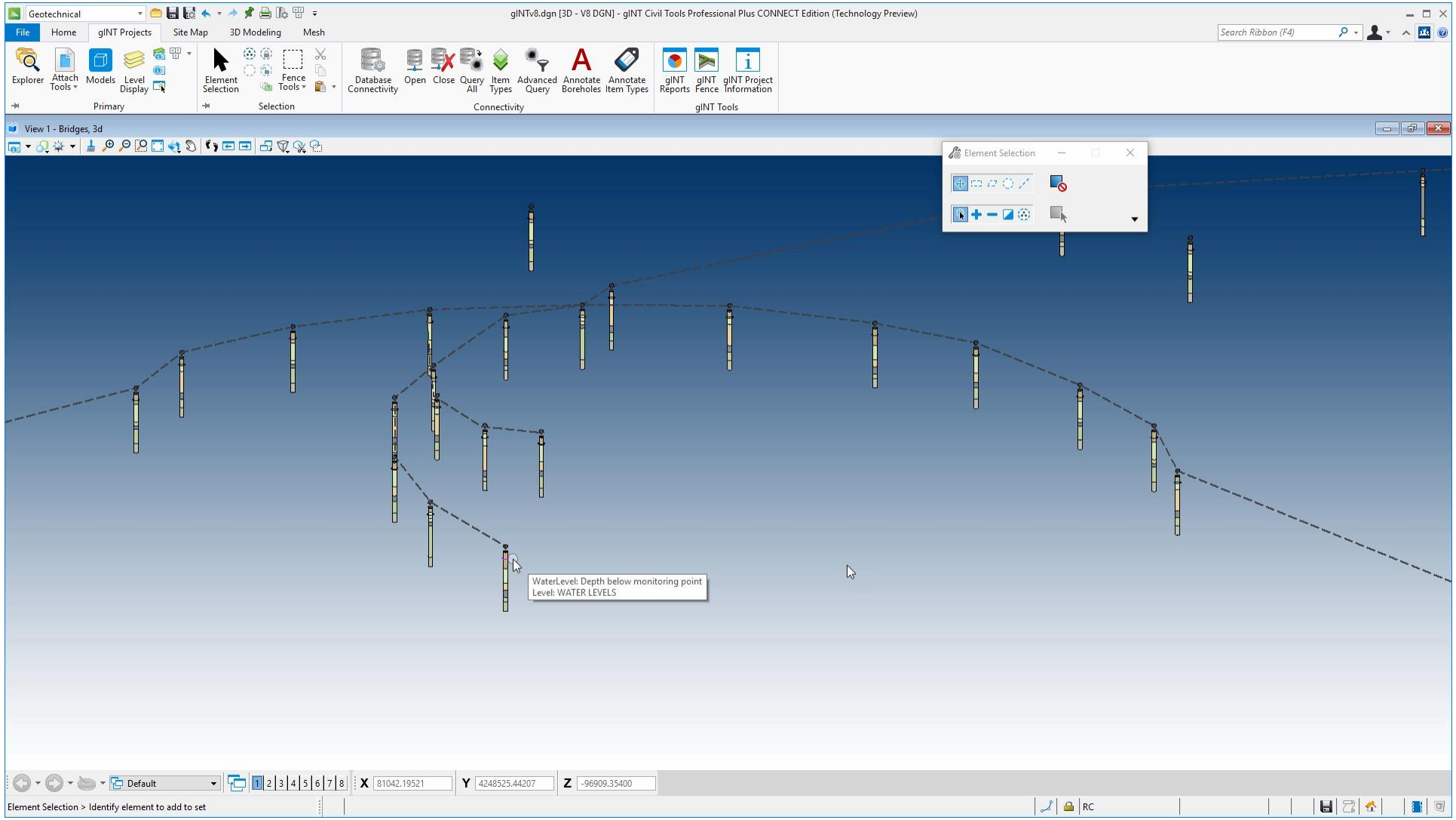
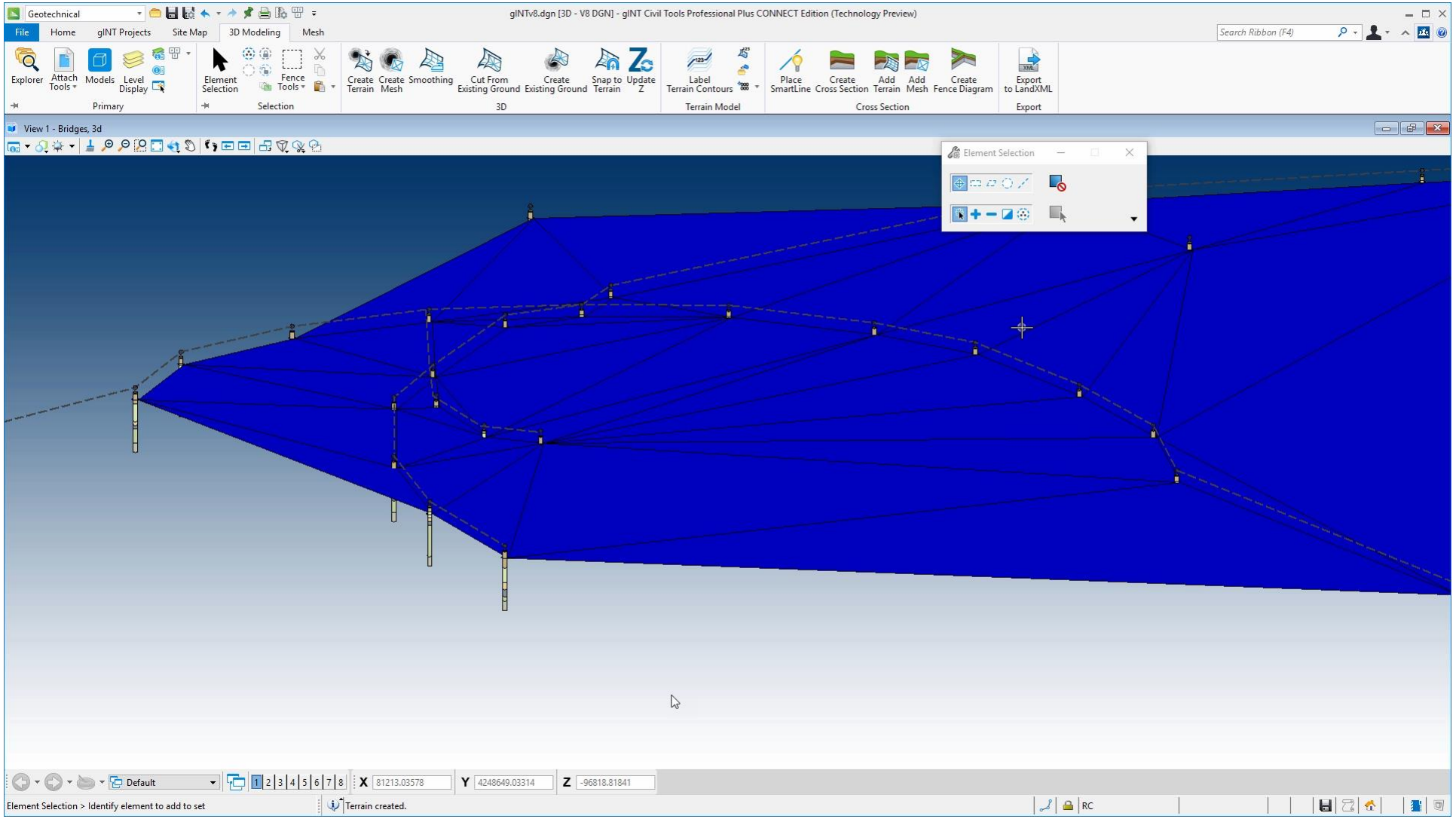
Loading water level



Create surface for water level



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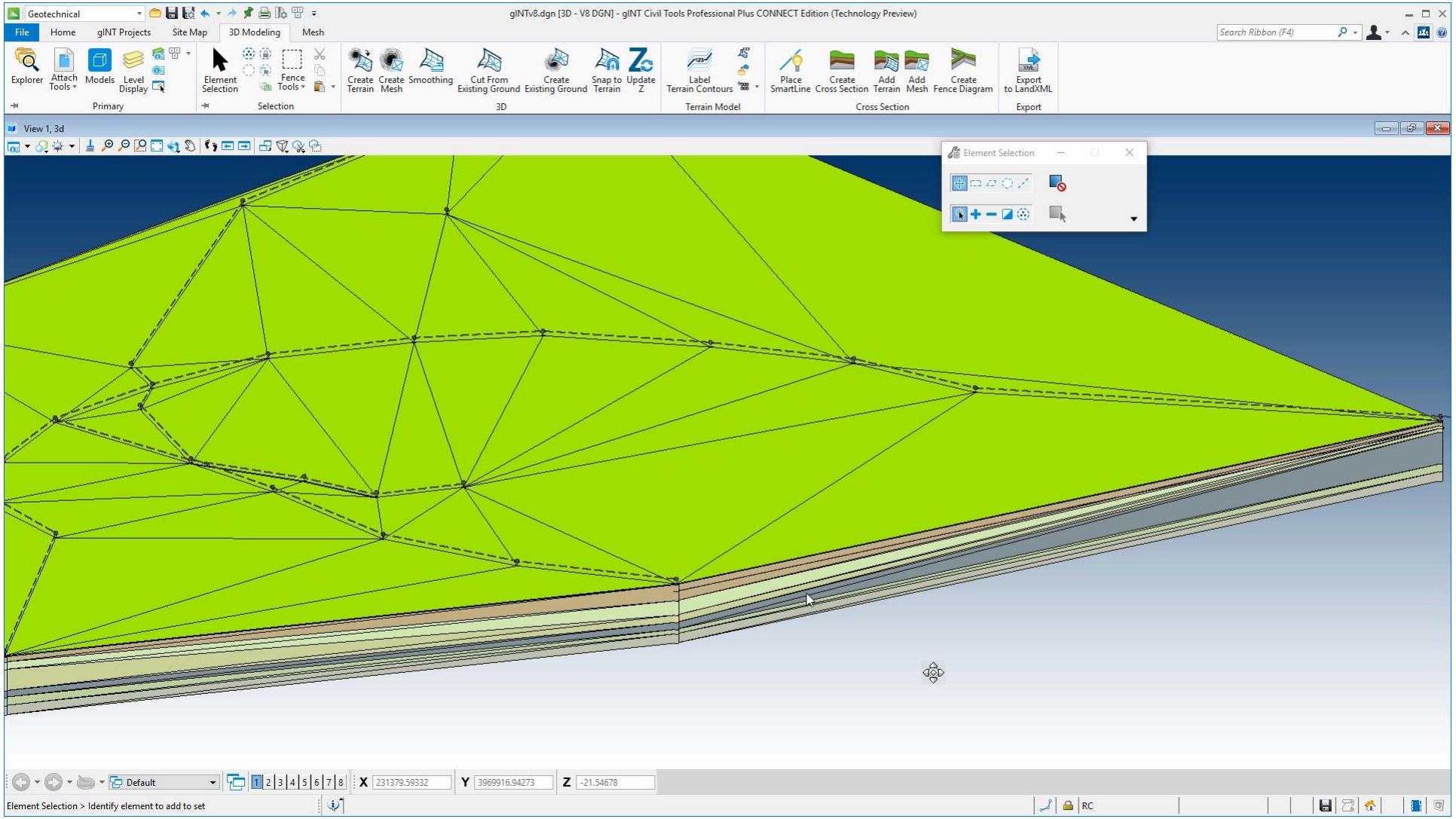
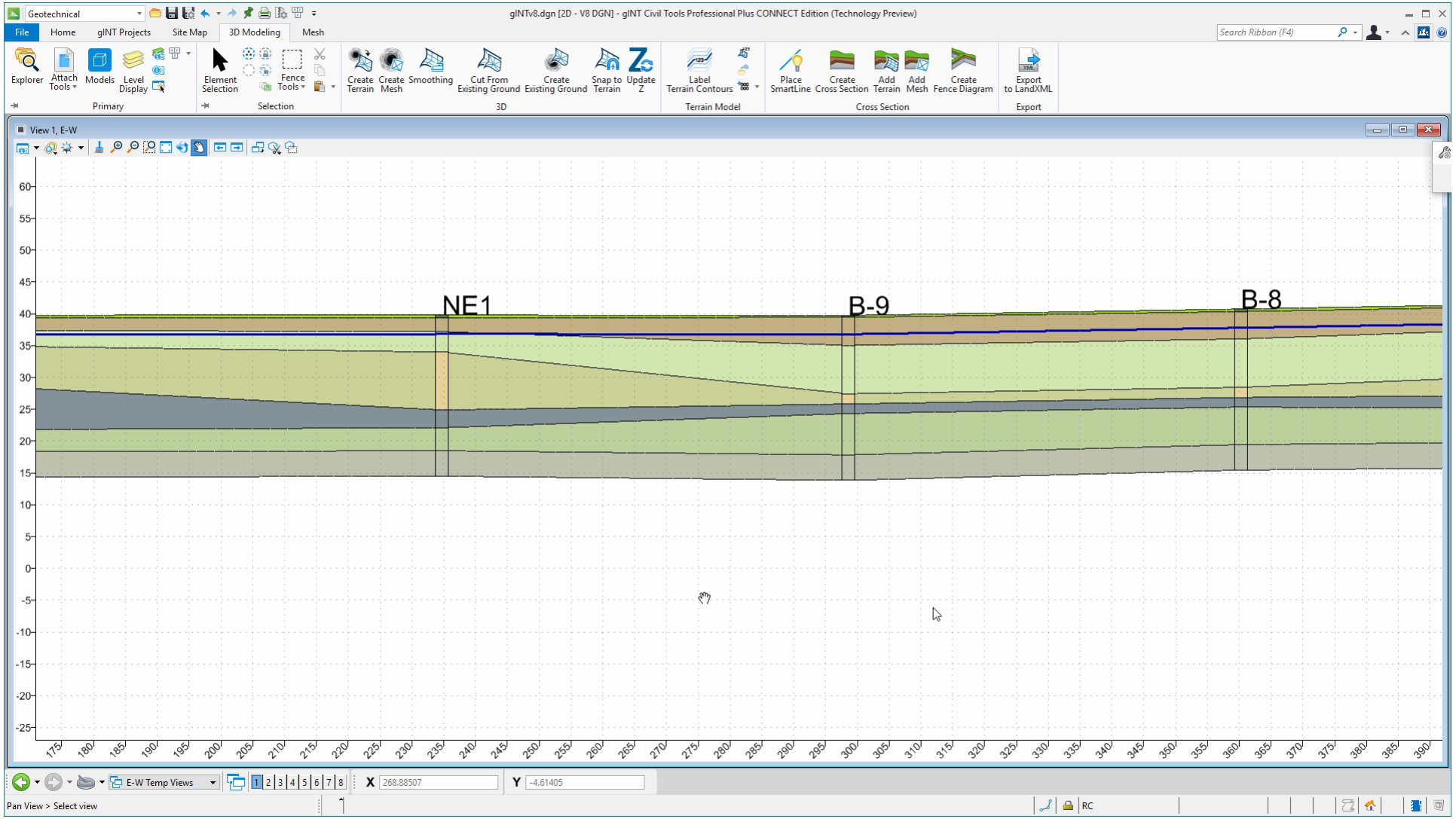
Create meshes (volumes) for the lithology



Create Section



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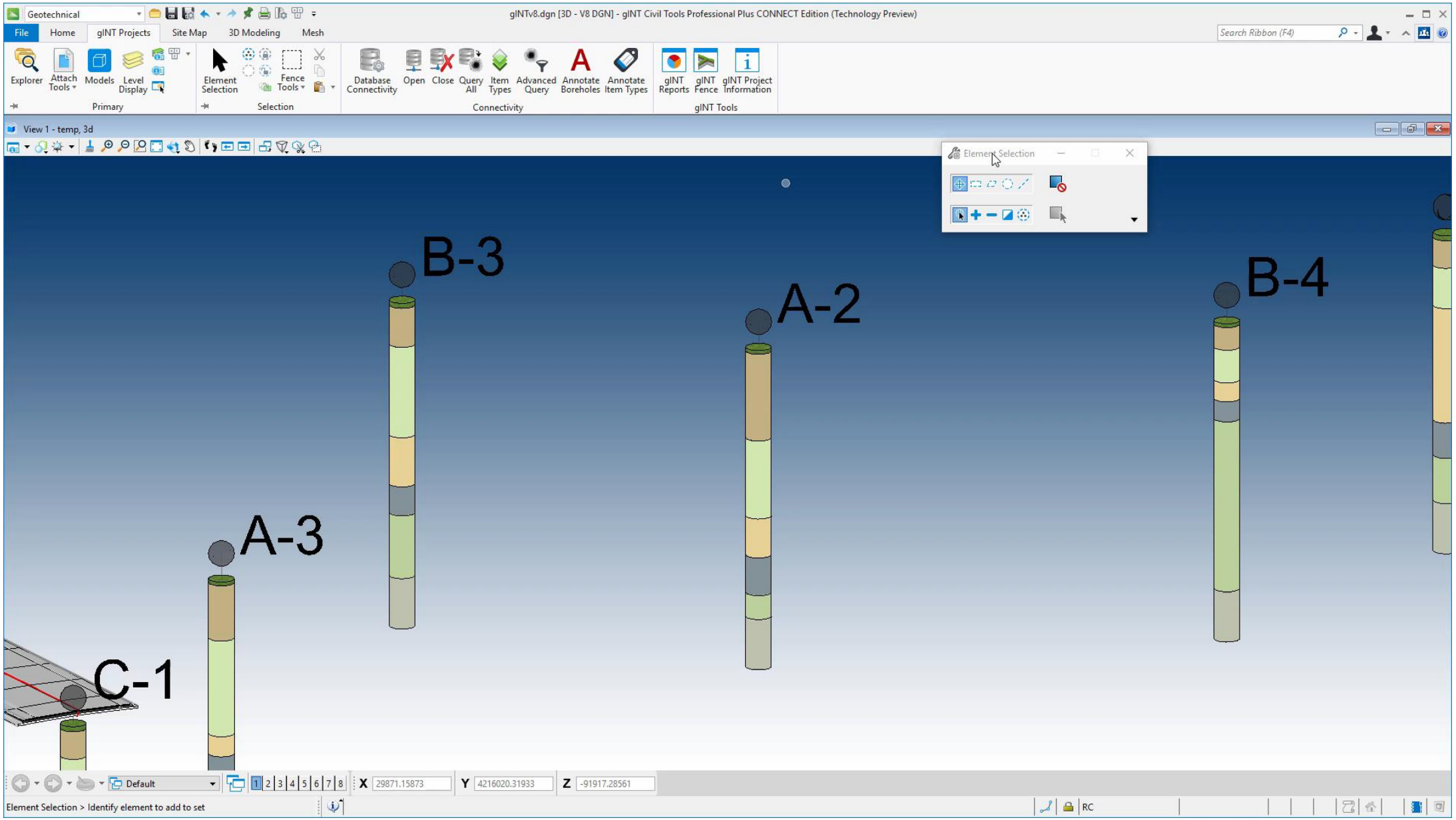
Create Section Demo



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Reporting of Geotechnical Data

- Fence Diagrams
  - 3d Model with lithology, 3 cross sections
  - Create Fence cross sections, one at a time
  - Loading Bridge and Ramps
  - Review

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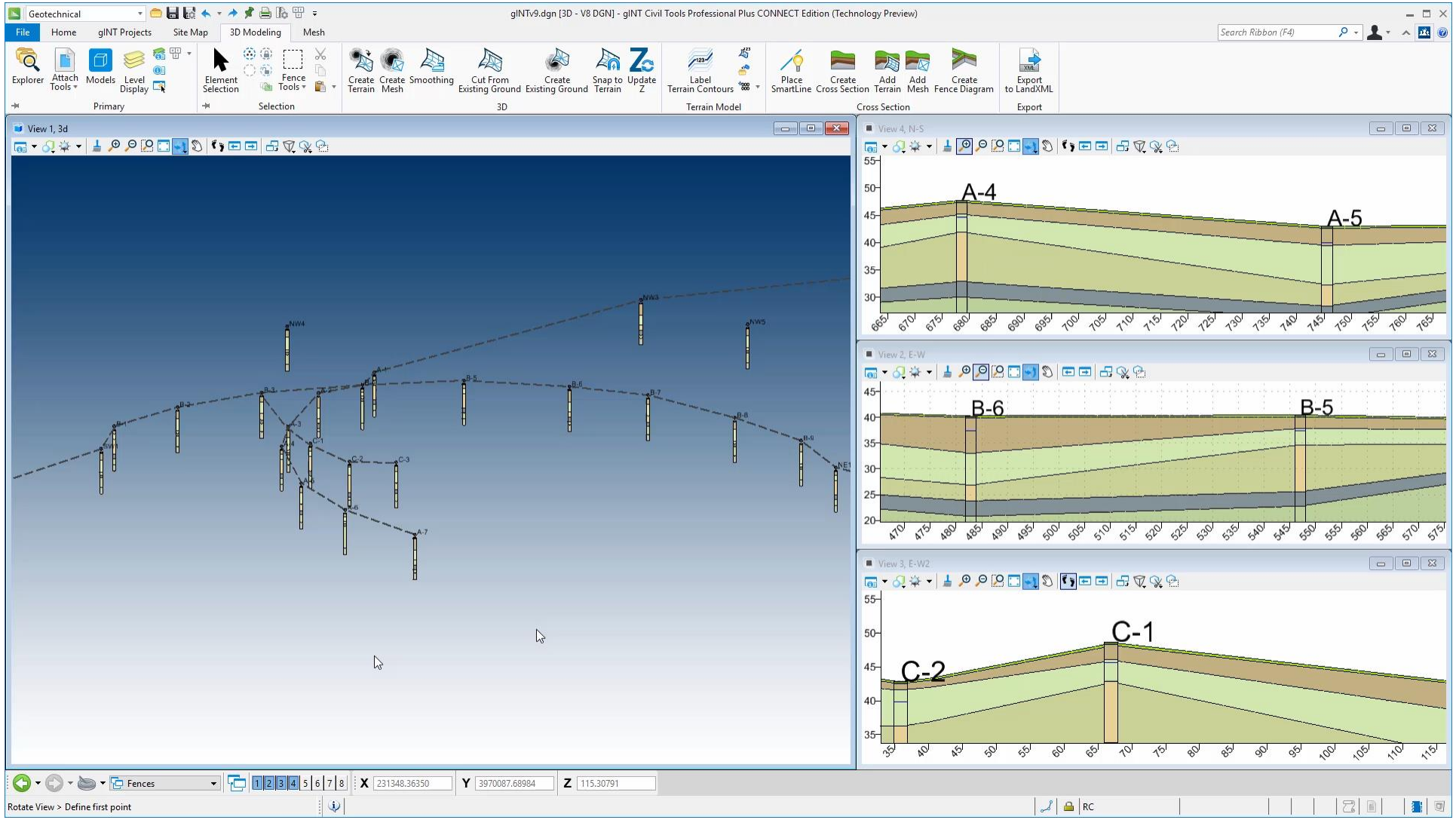
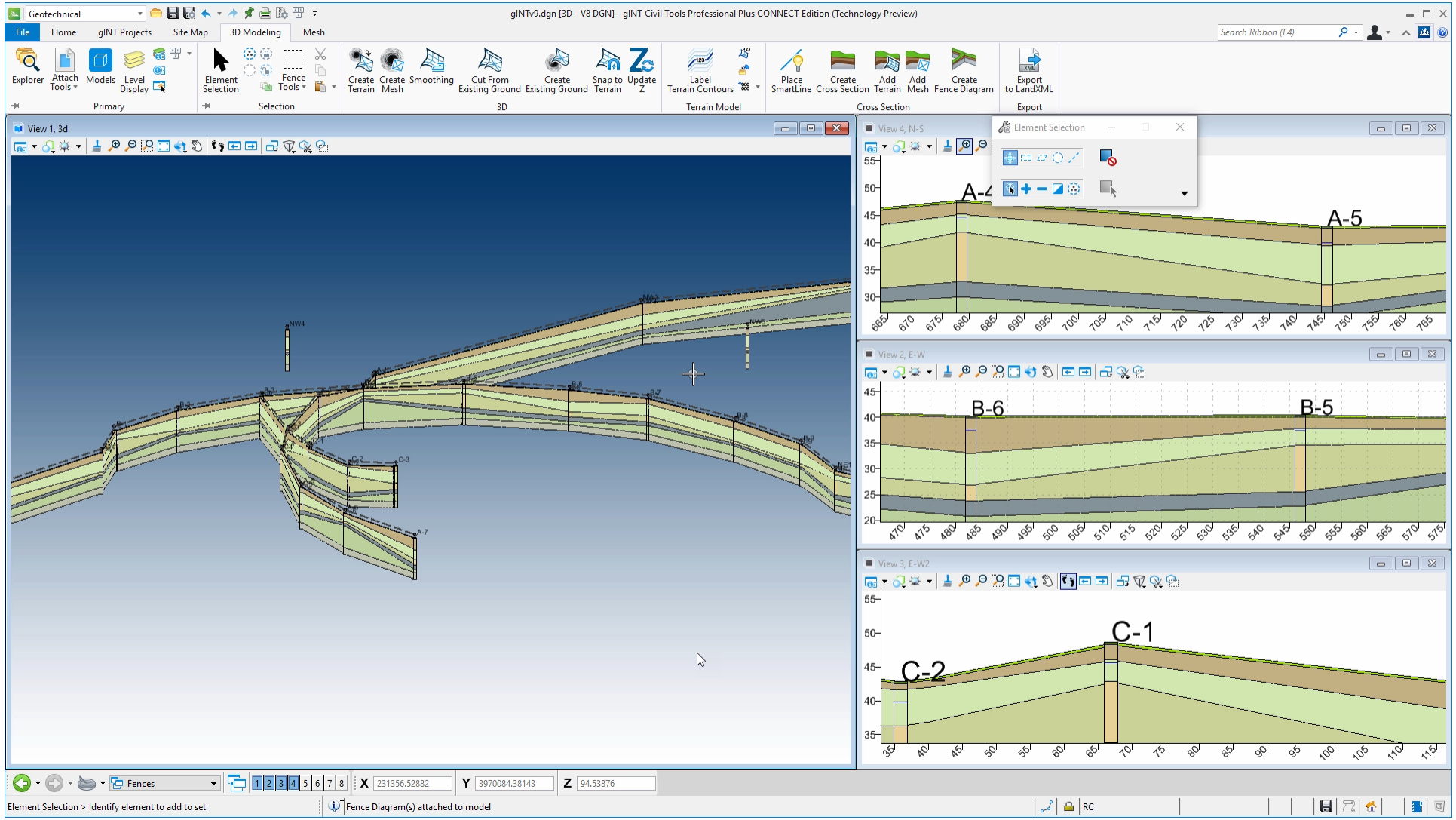
3d Model with lithology, 3 cross sections



Create Fence Diagram



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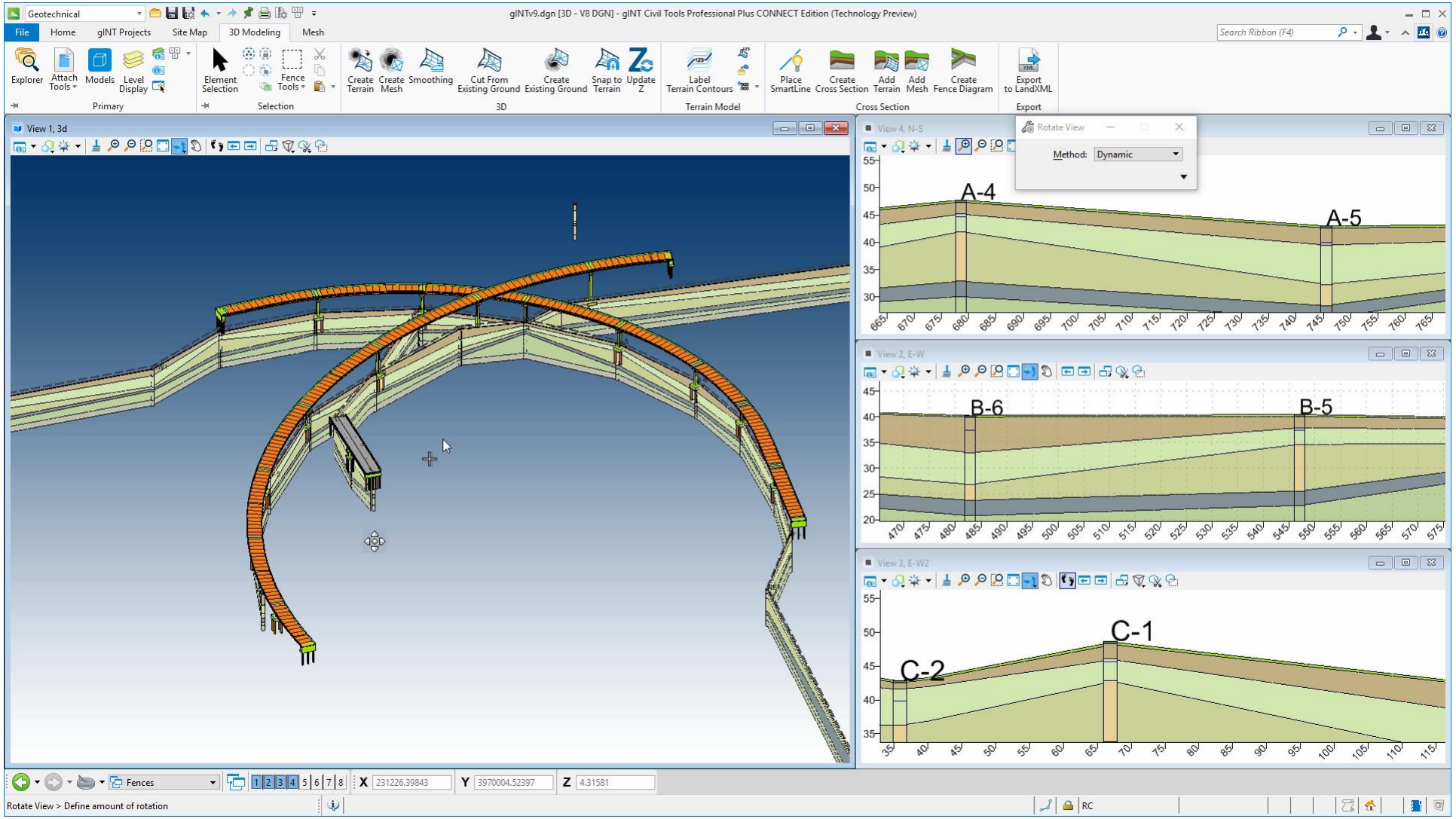
Loading Bridge and Ramps



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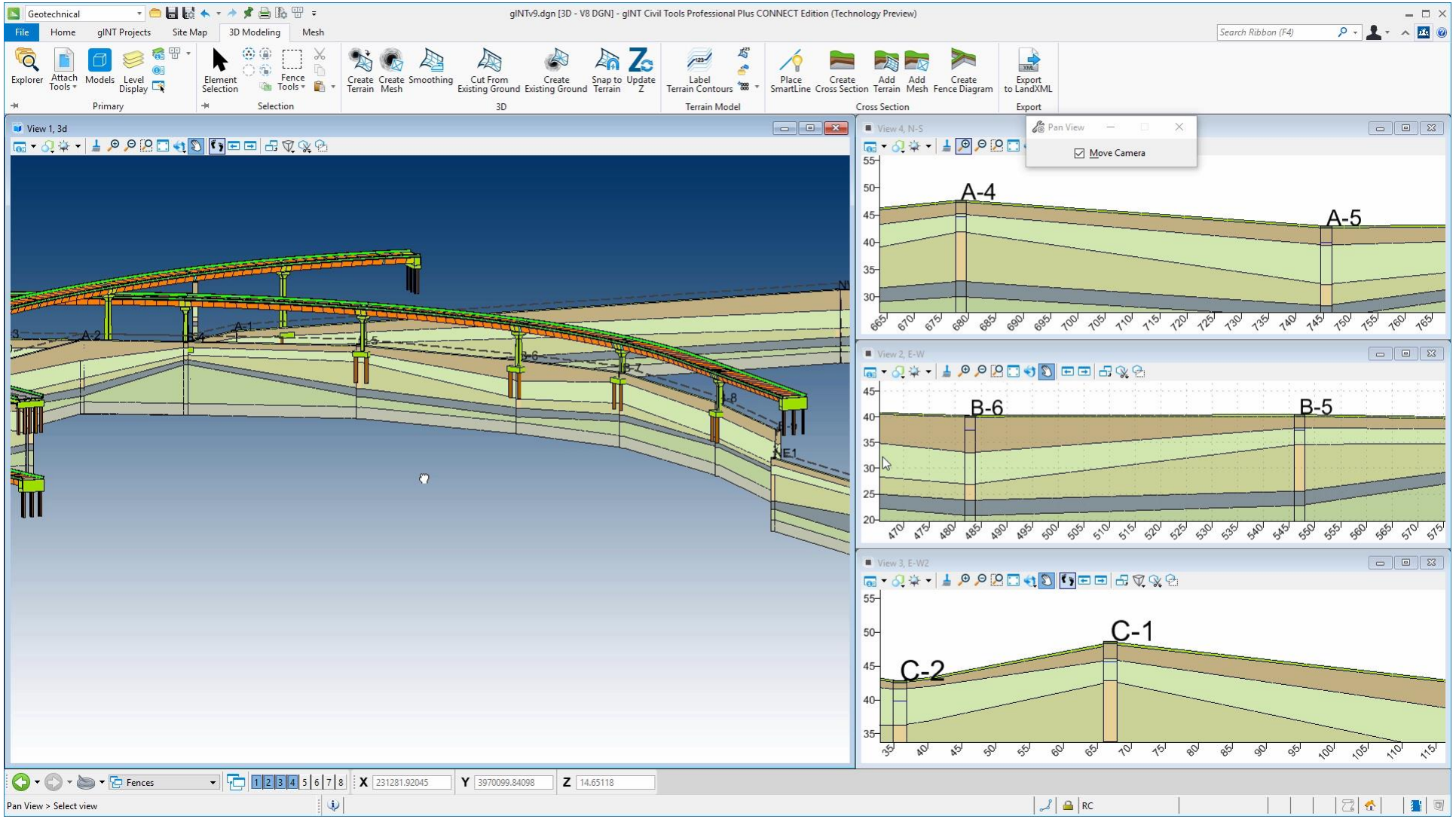
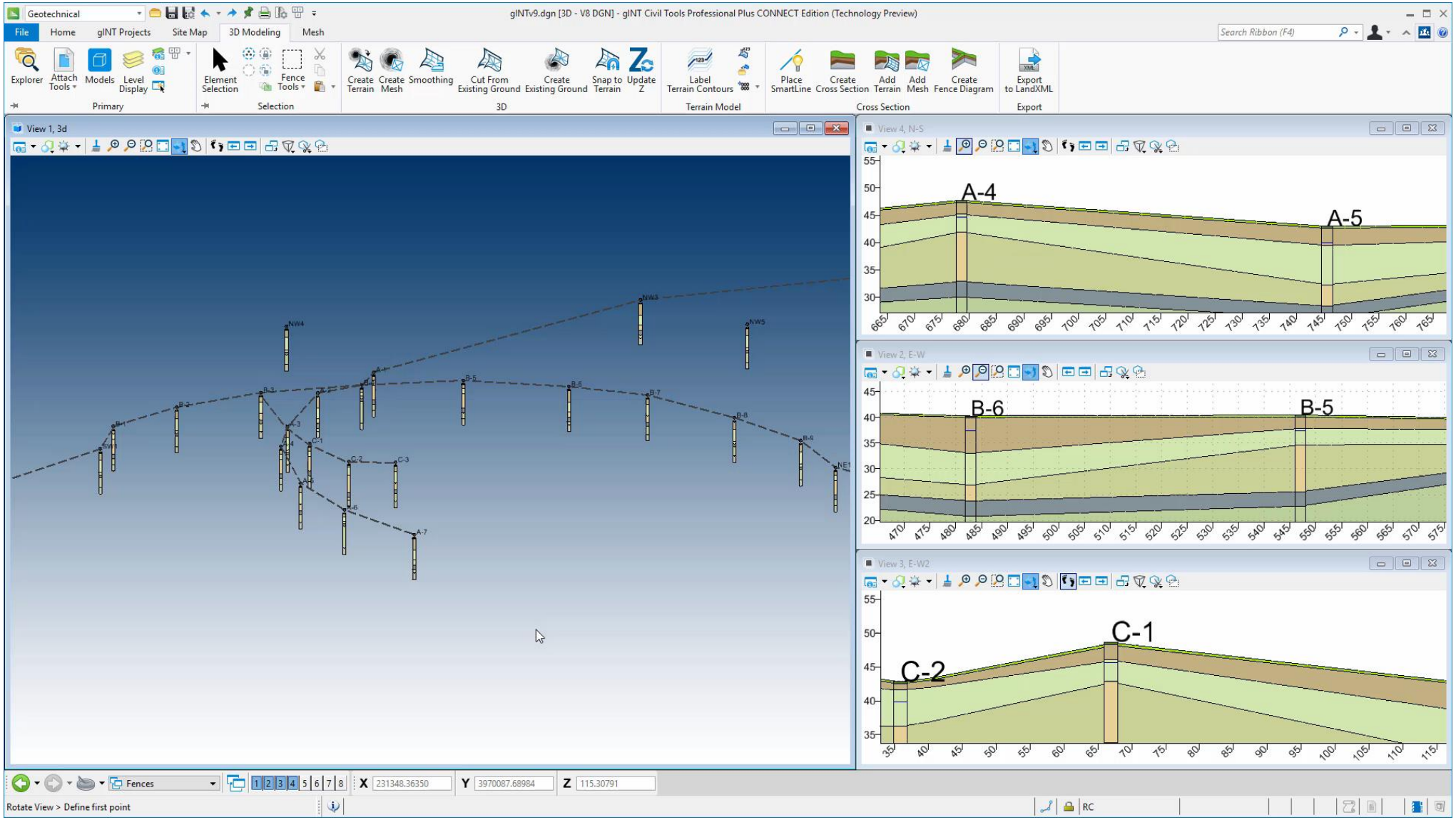
Review



Reporting of Geotechnical Data Demo



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Sharing of Geotechnical Data

- Sharing gINT Civil Tools i-model
  - 3D model, link to gINT reports in PDF
  - Publishing an i-model
    - One document
    - Embed PDF
    - Push to personal share
  - Personal Share, share with people
  - Load in navigator, Review
  - Review embedded logs

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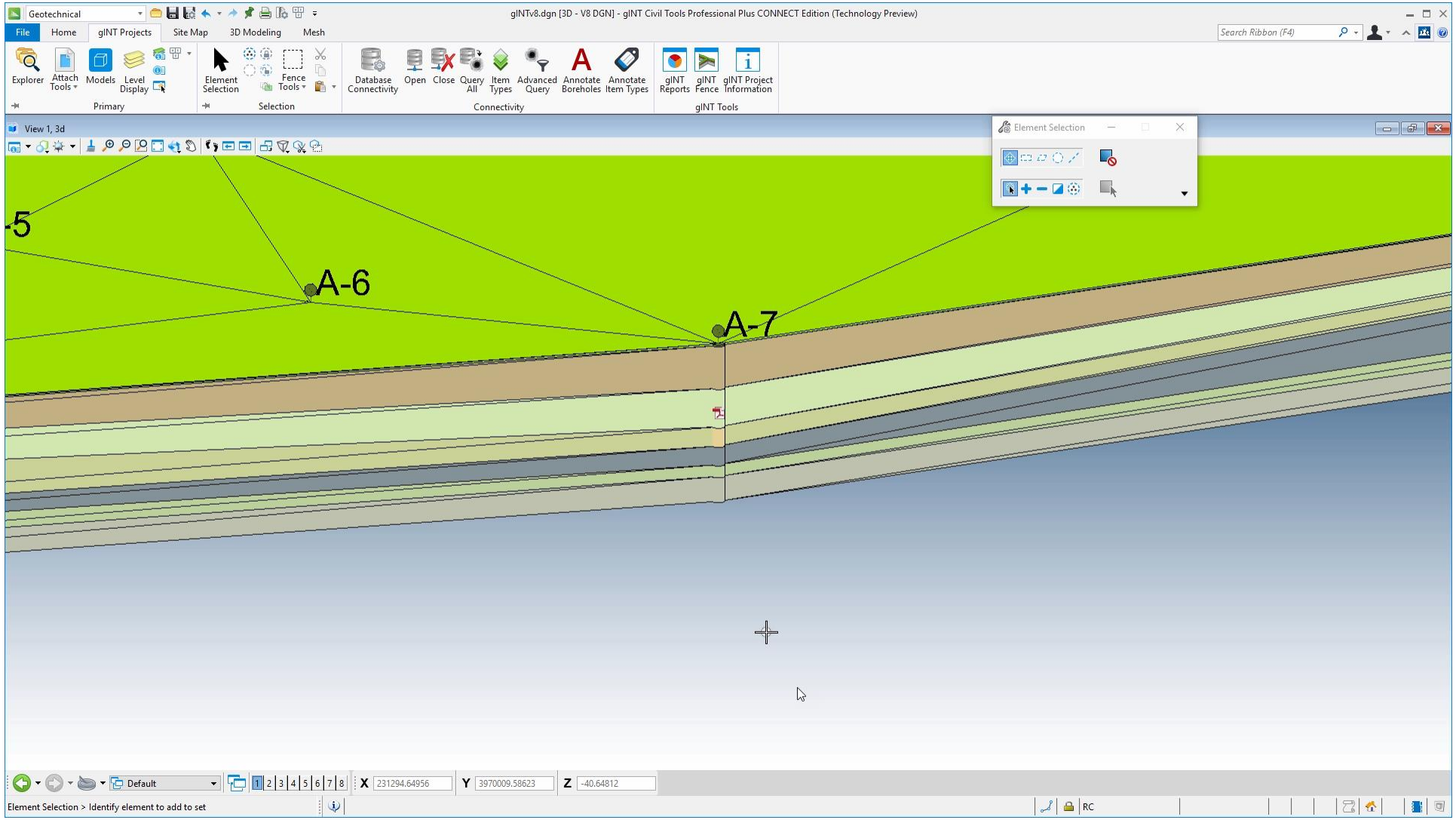
3d model, link to gINT reports in PDF



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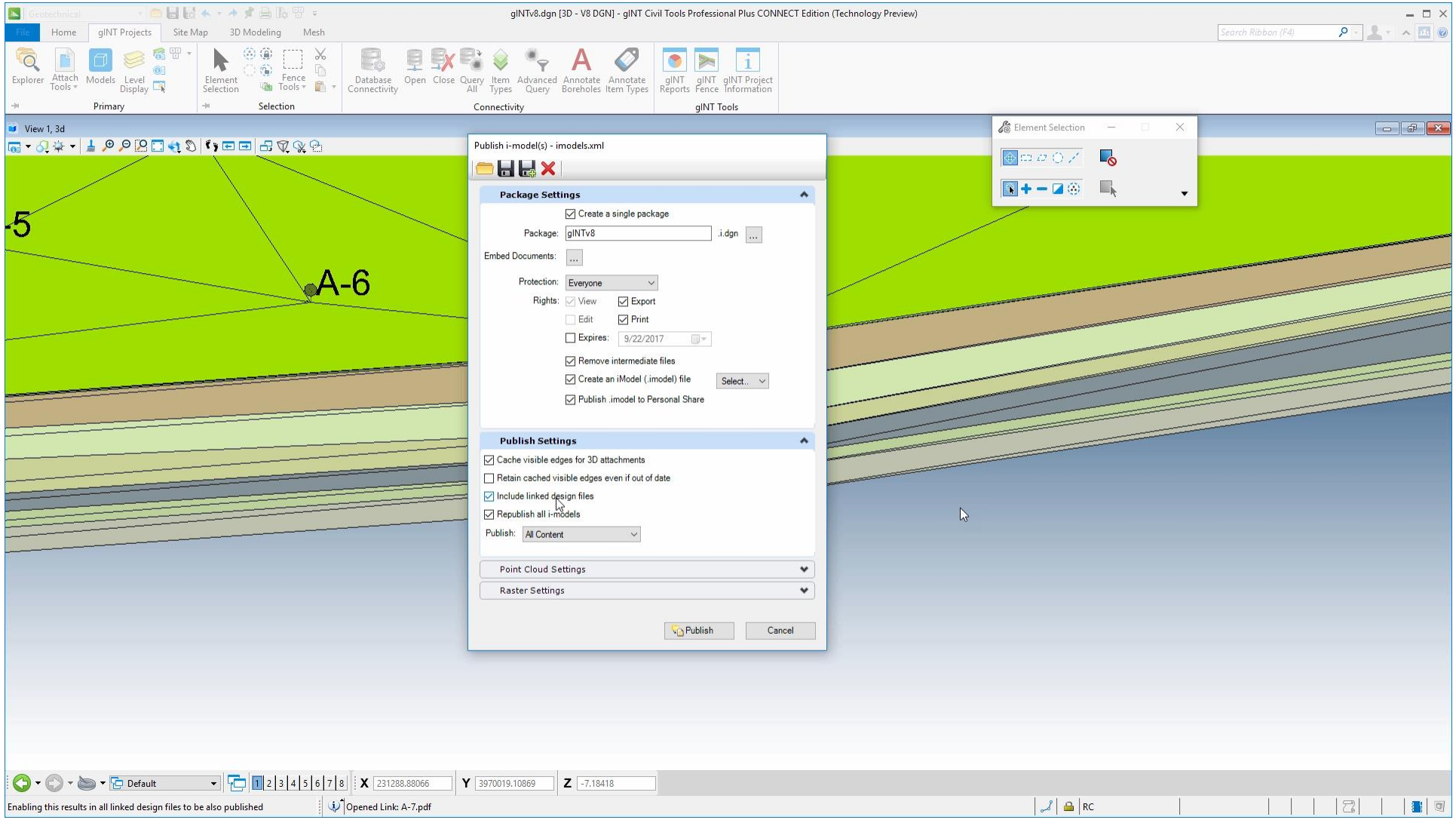
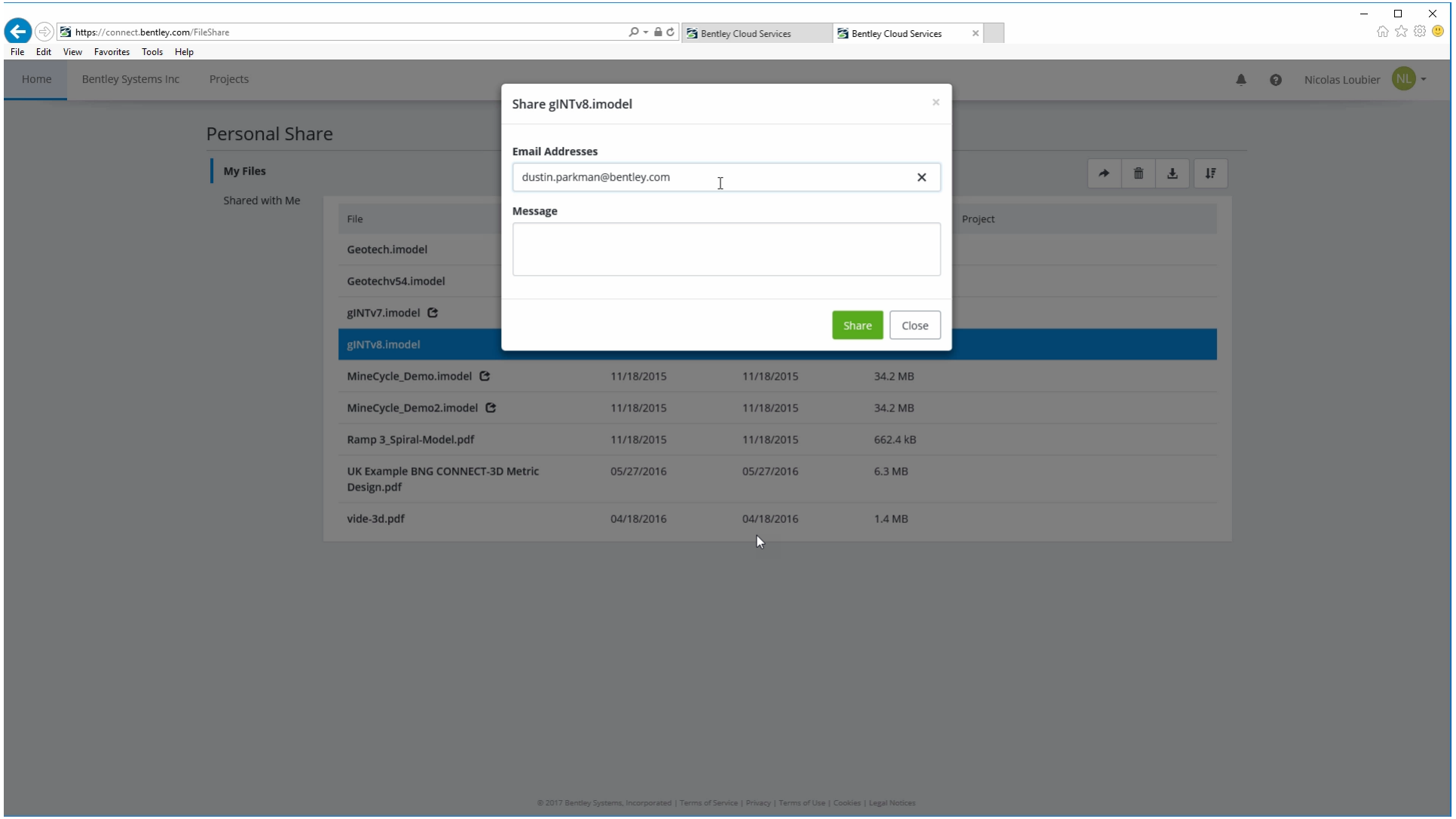
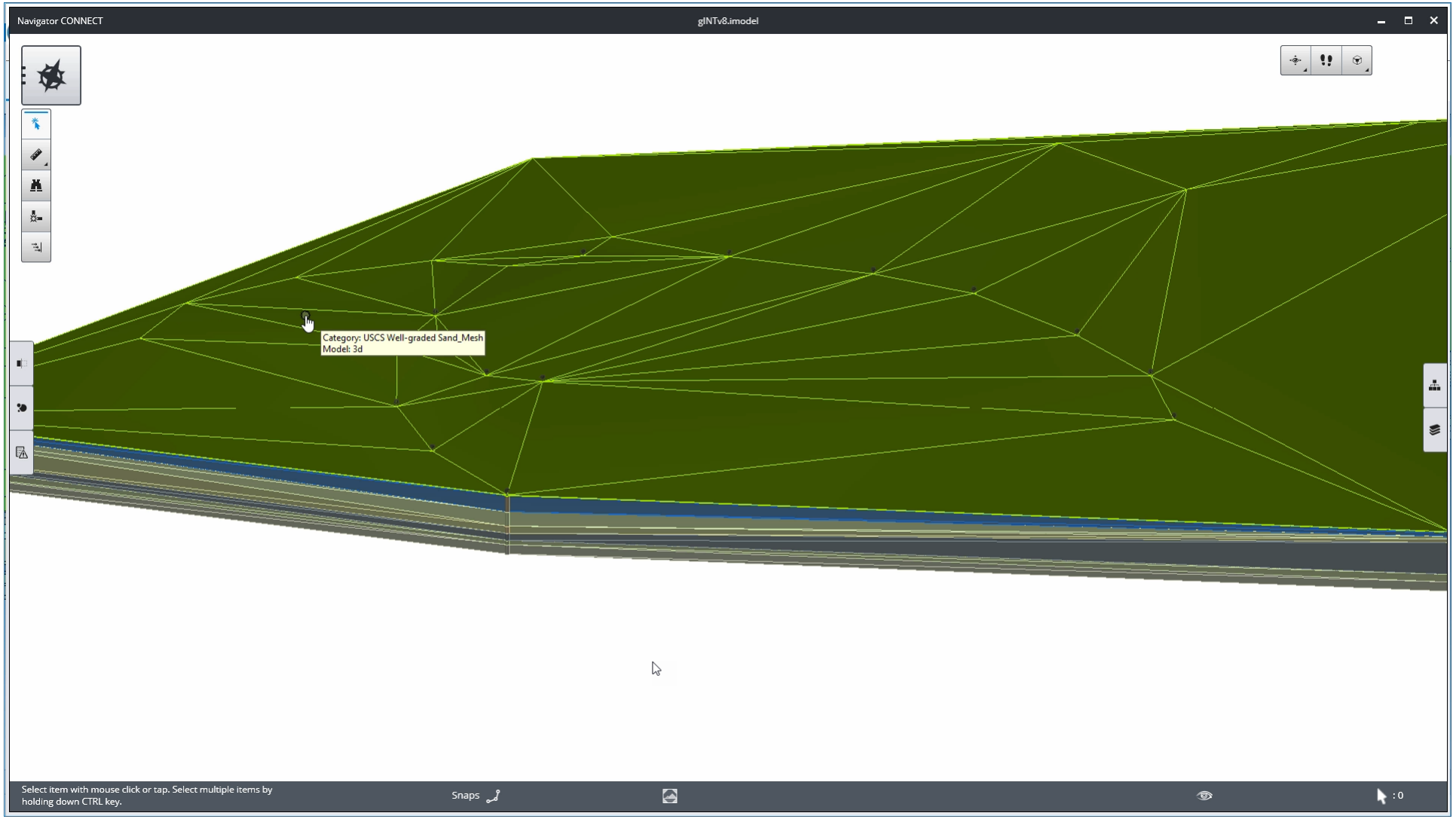
Publishing an i-model



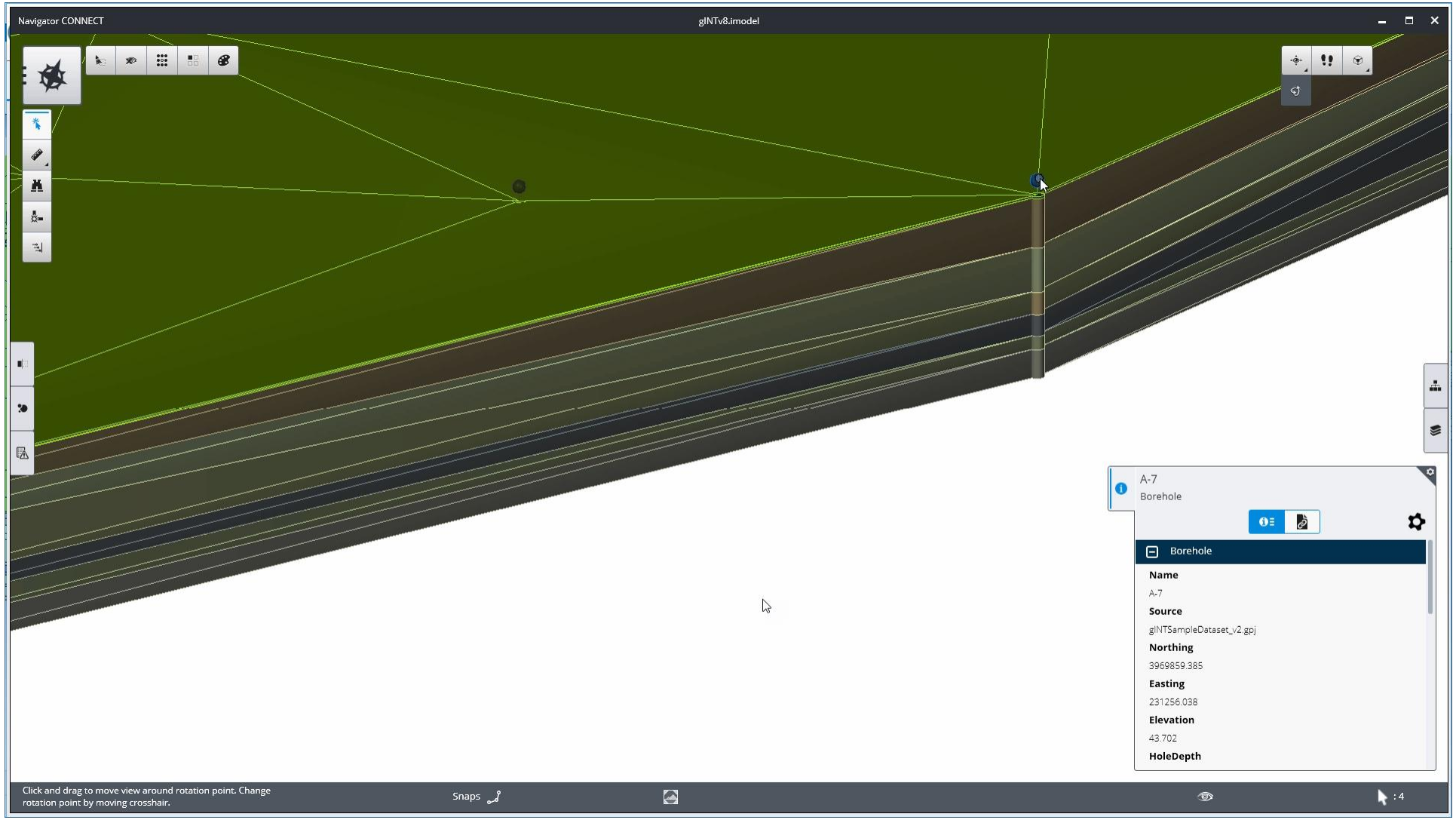
Personal Share, share with people



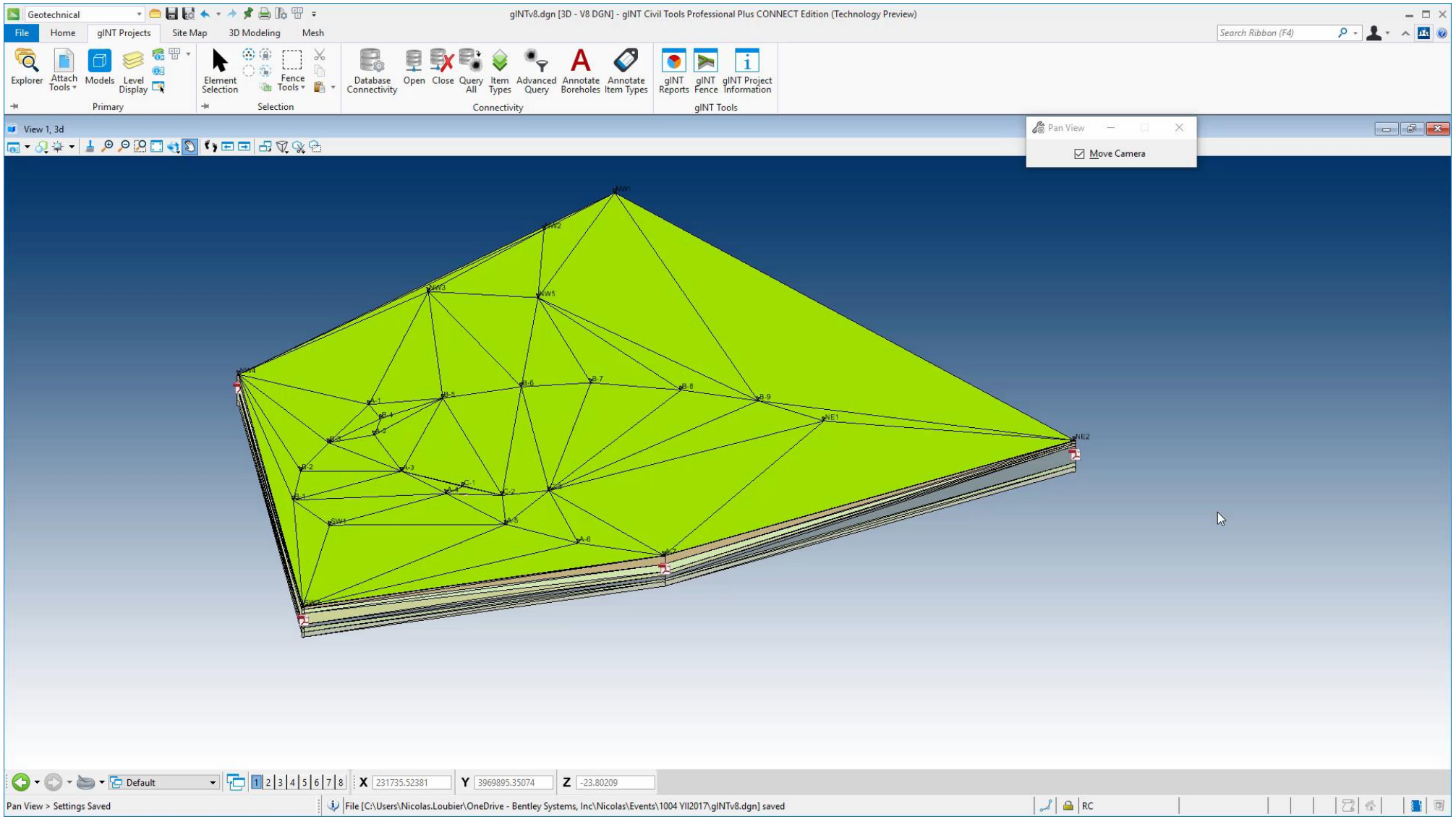
Load in Navigator



Review embedded logs



Sharing of Geotechnical Data Demo



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Geotechnical Modeling and Subsurface Analysis

- Editing Subsurface
  - Using a top view and a Cross section view
  - Double checking site with Bing maps and aerial photography
  - Editing subsurface from cross section
  - Updating Surface from cross section
  - Visualize result in 3D model

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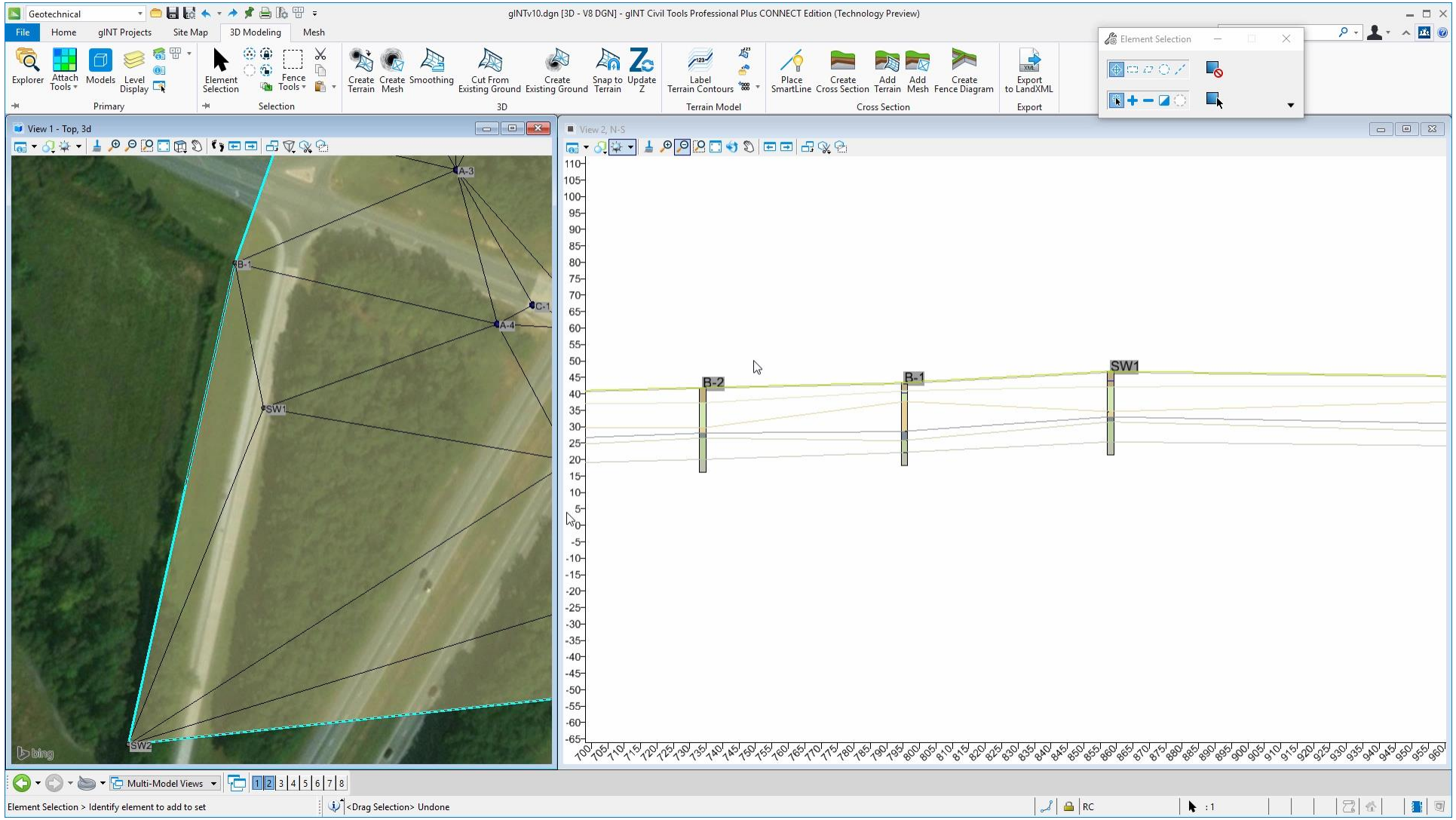
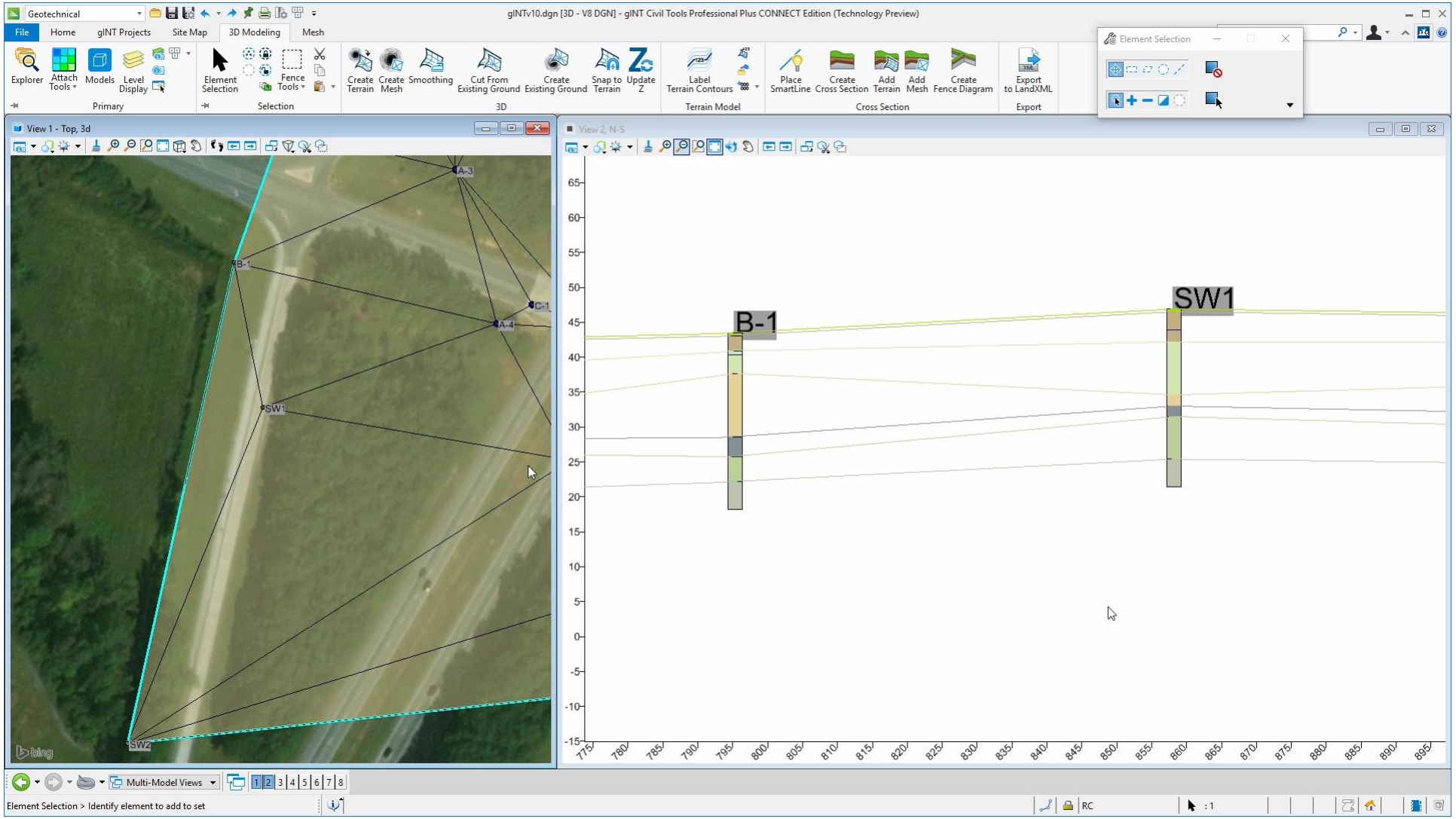
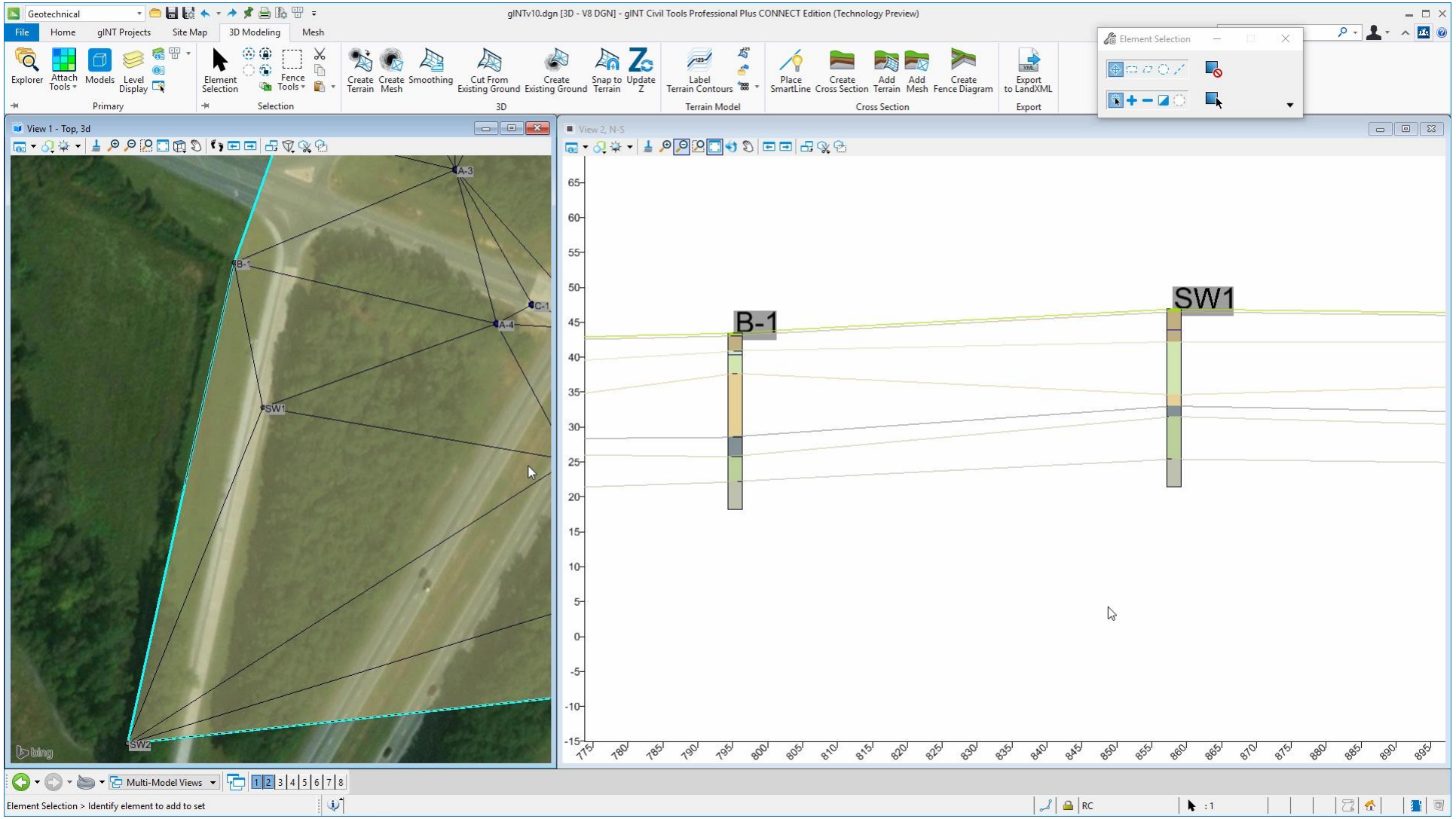
Using a top view and a Cross section view



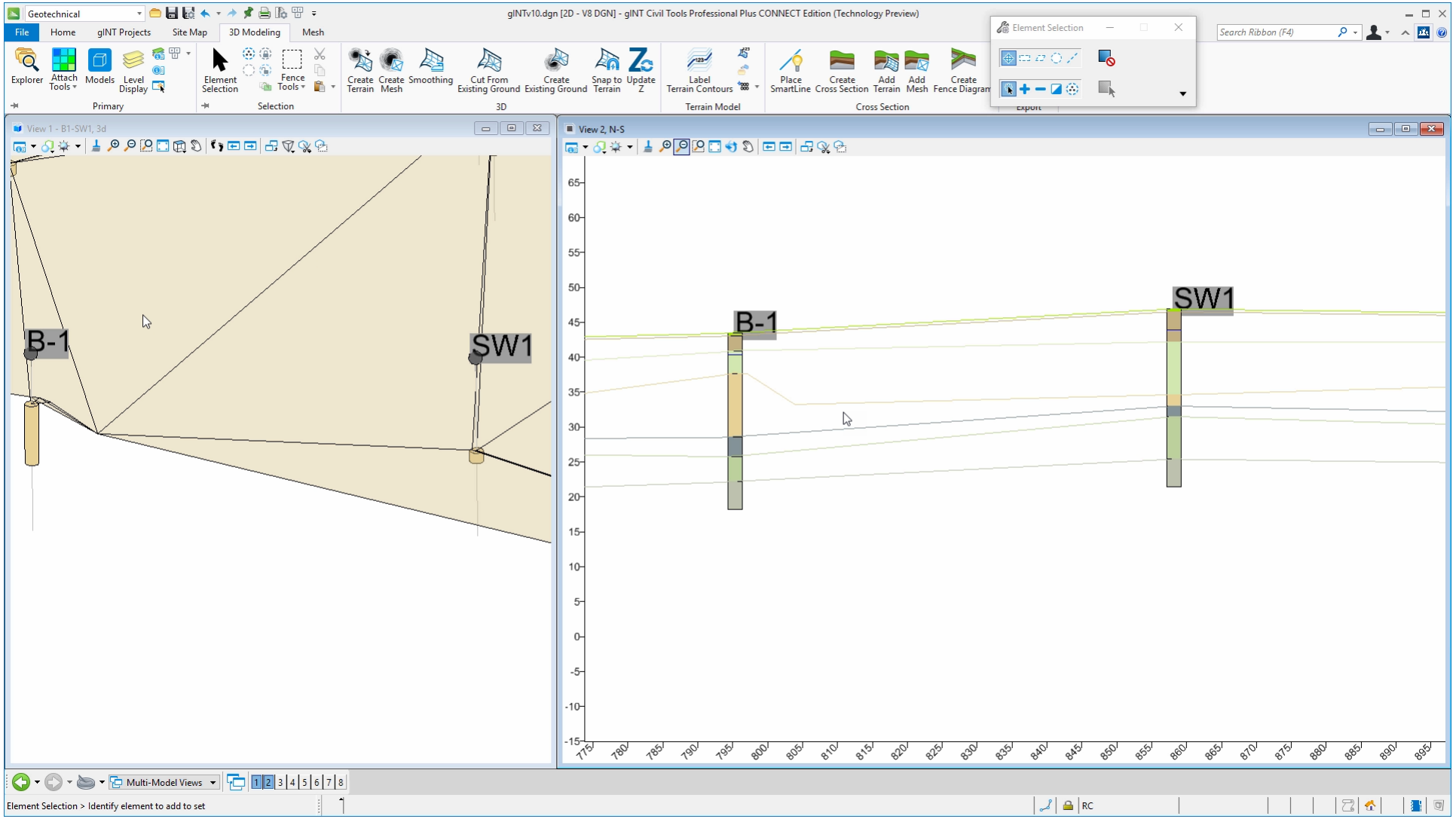
Double checking site area with Bing Maps and aerial photography



Editing subsurface from cross section to update surface



Visualize result in 3D model



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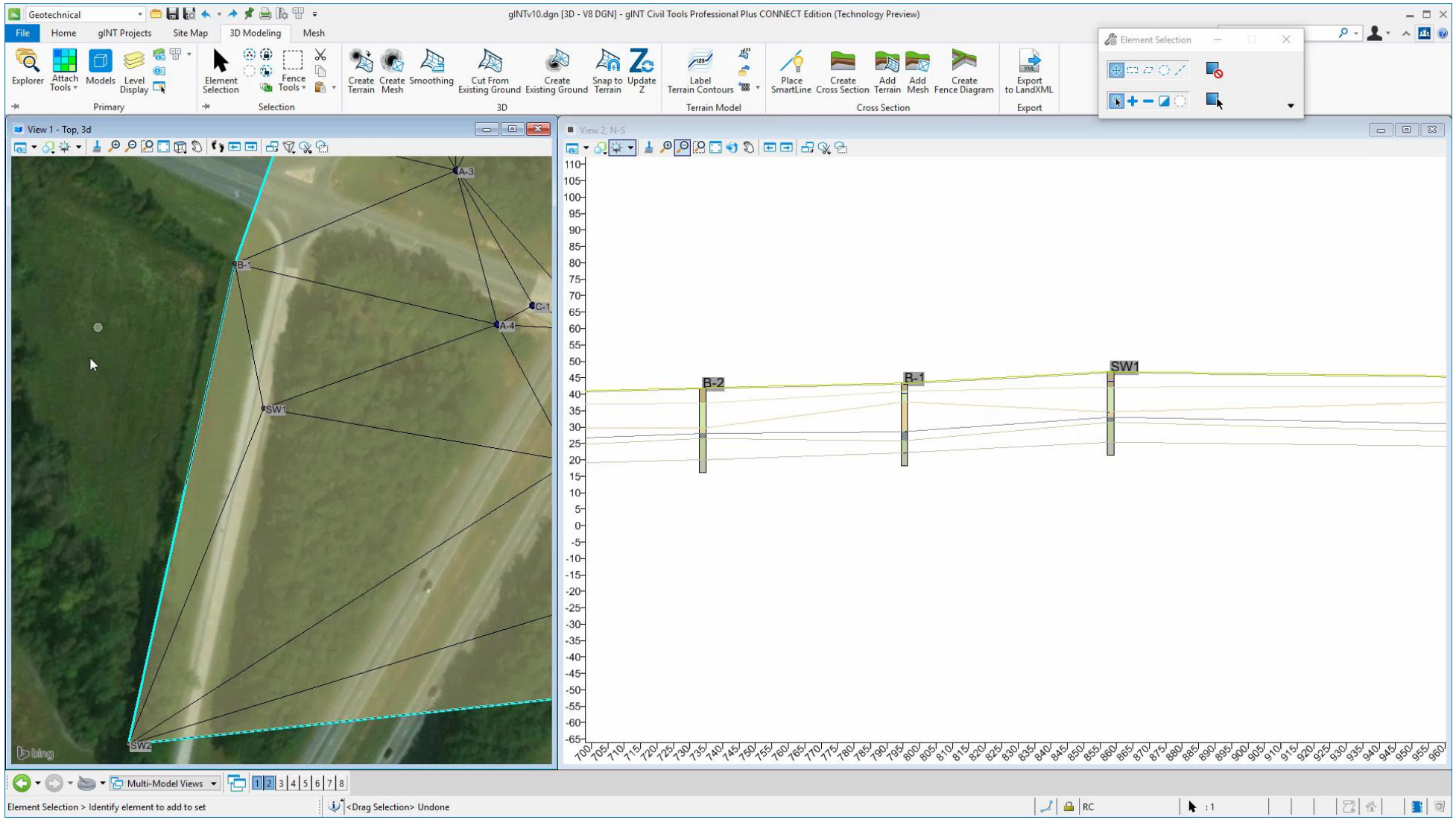
Geotechnical Modeling and Subsurface Analysis Demo



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Geotechnical Modeling and Subsurface Analysis

- Understanding Soil Conditions
  - Loading lithology
  - Loading samples with N-value calculation
  - Activating a display style with N-value gradient
  - Loading the fence along with N-values and gradient
  - Activating a display style to visualize lithology by coarse/fine soil types
  - Loading the bridges

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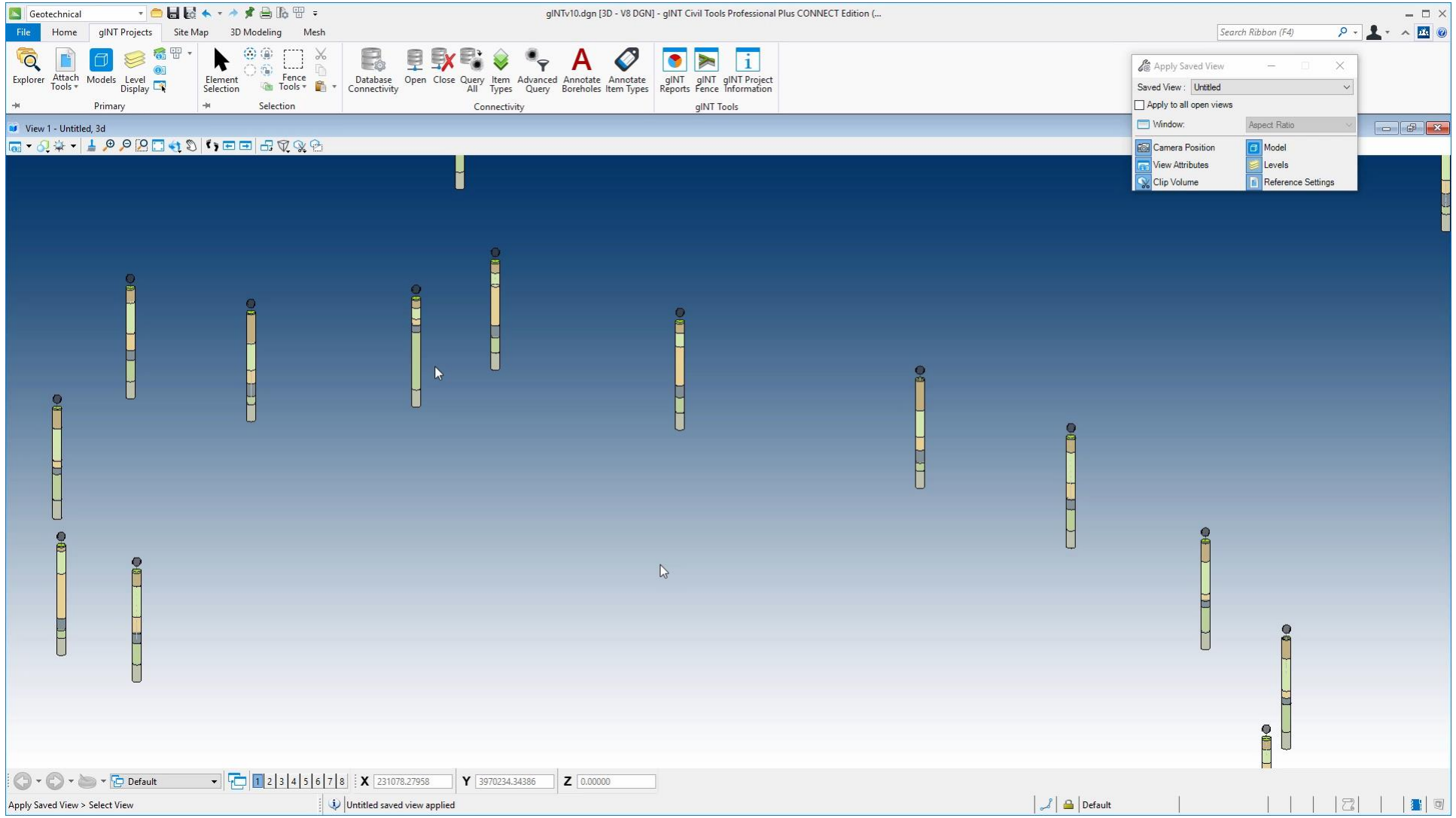
Loading Lithology



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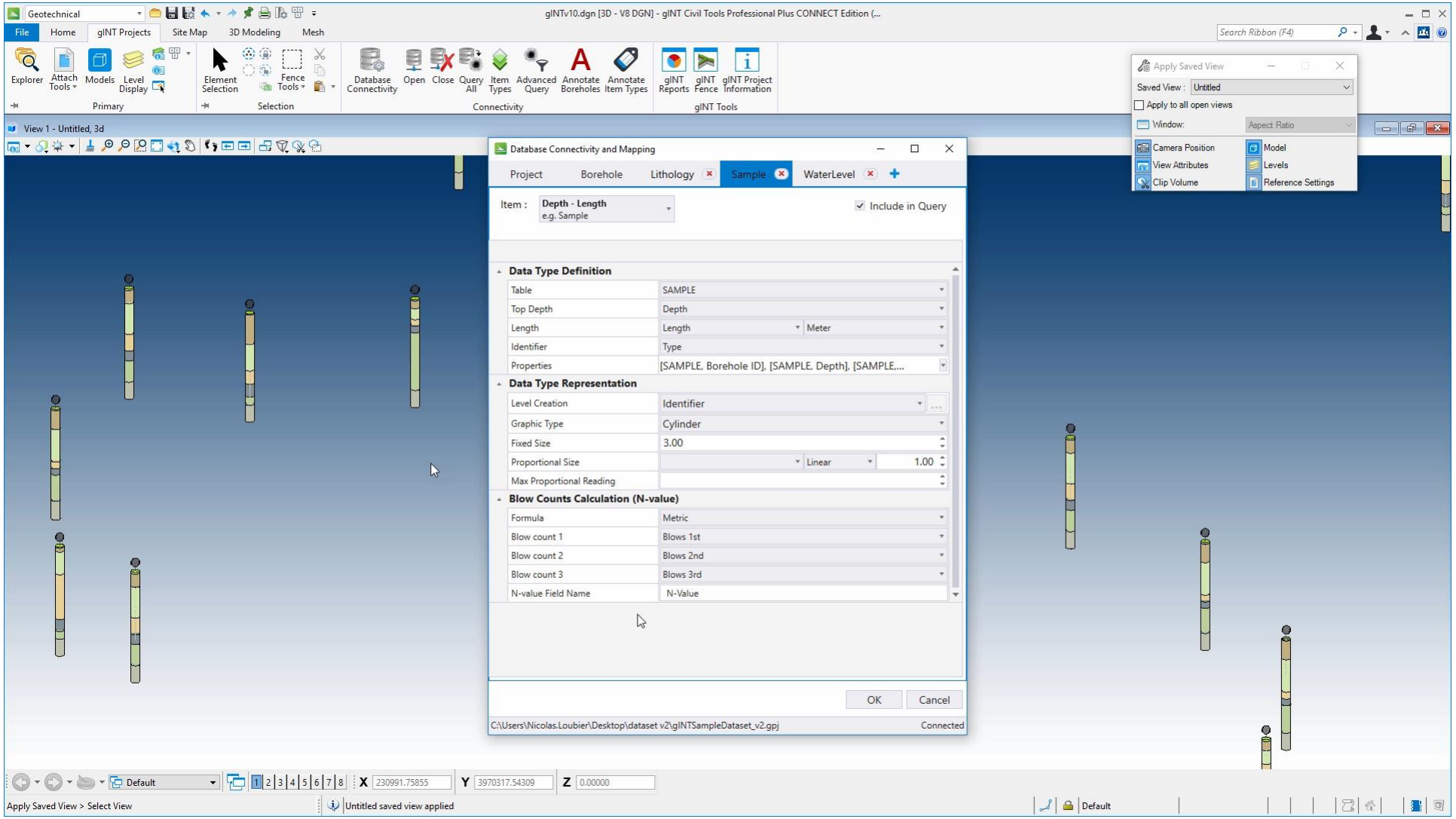
Loading Samples with N-value Calculation



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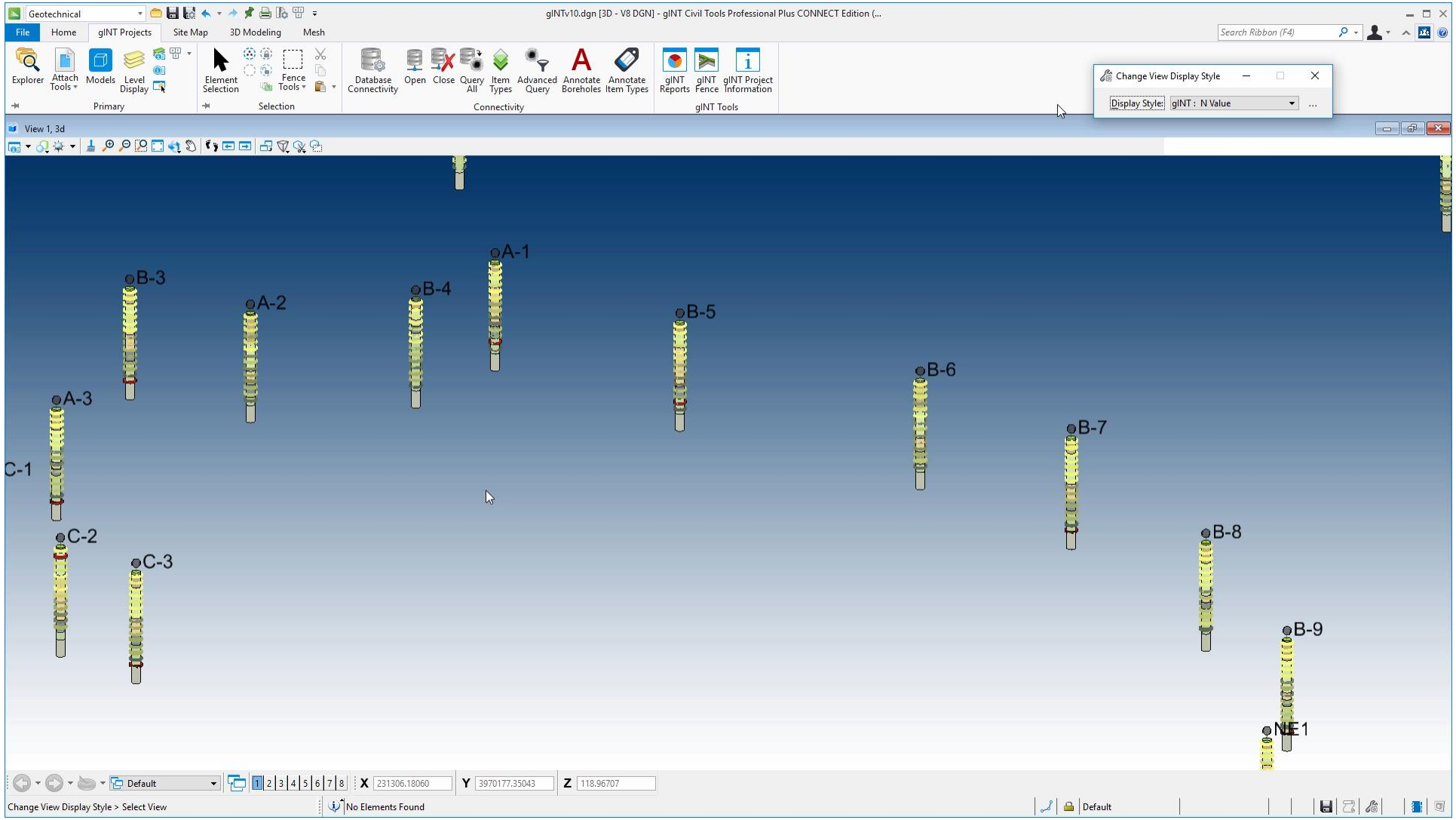
Activating a Display Style with N-value Gradient



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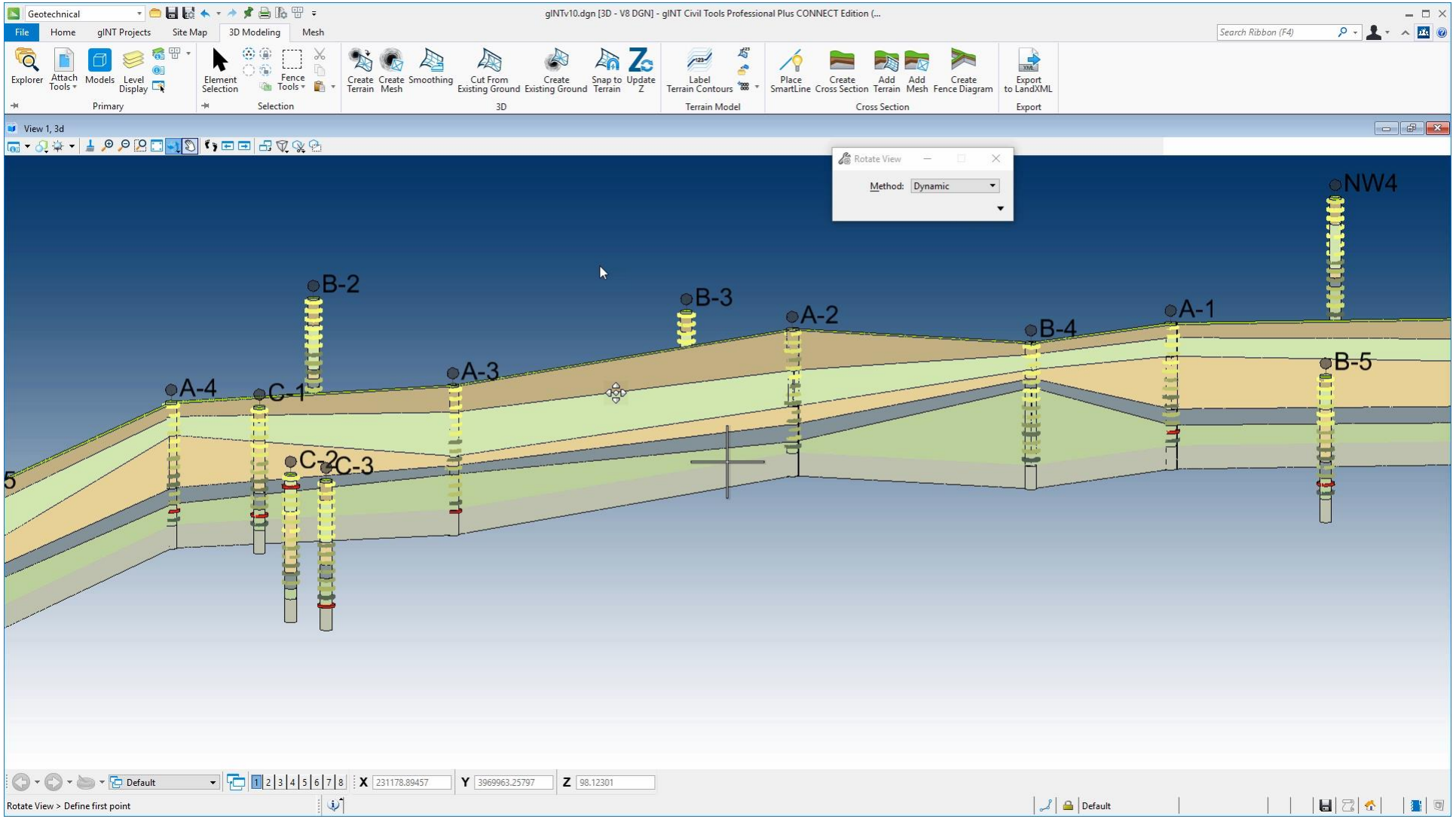
Loading the Fence along with N-values and Gradient



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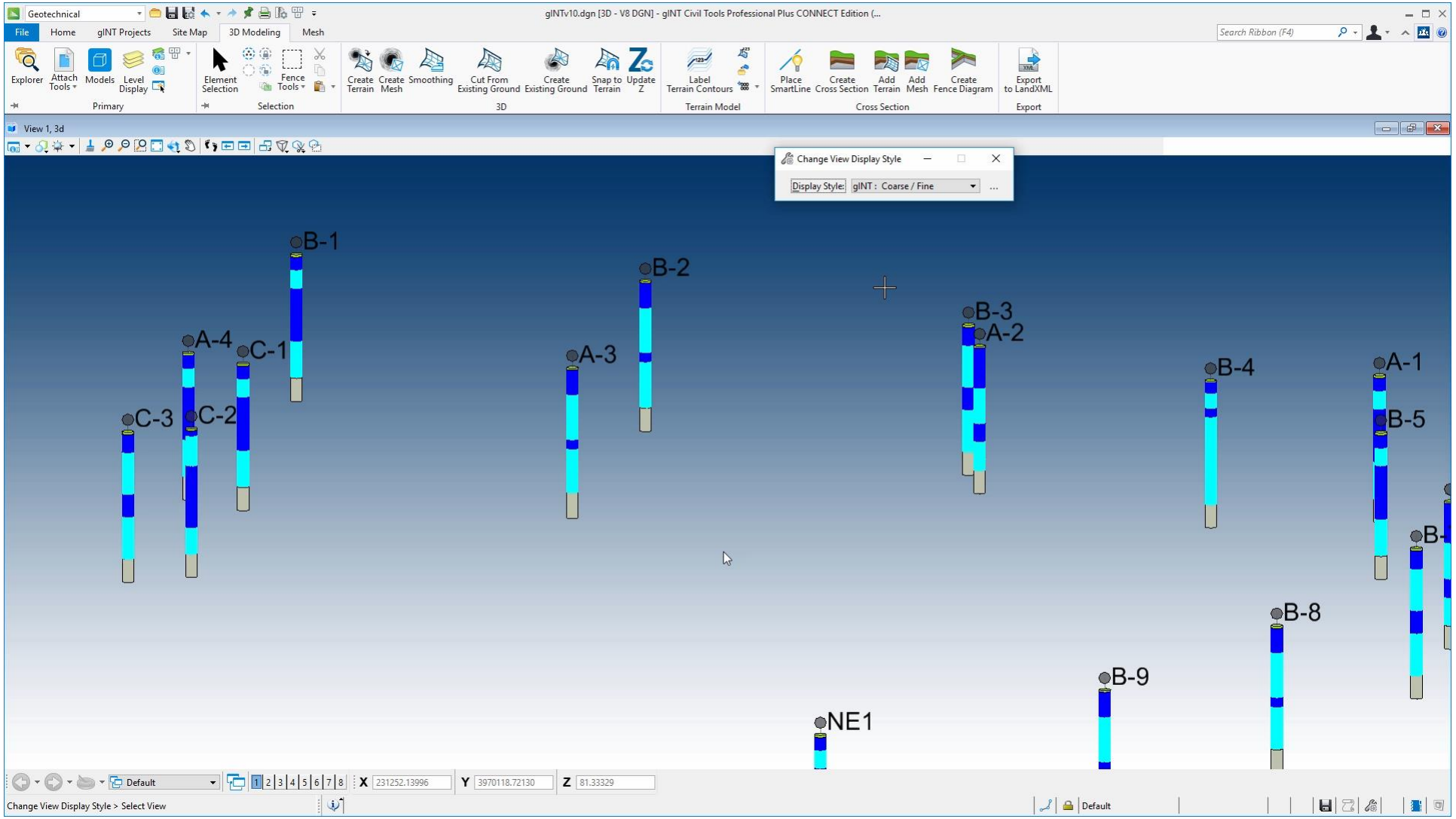
Activating a display style to visualize lithology by coarse/fine soil types



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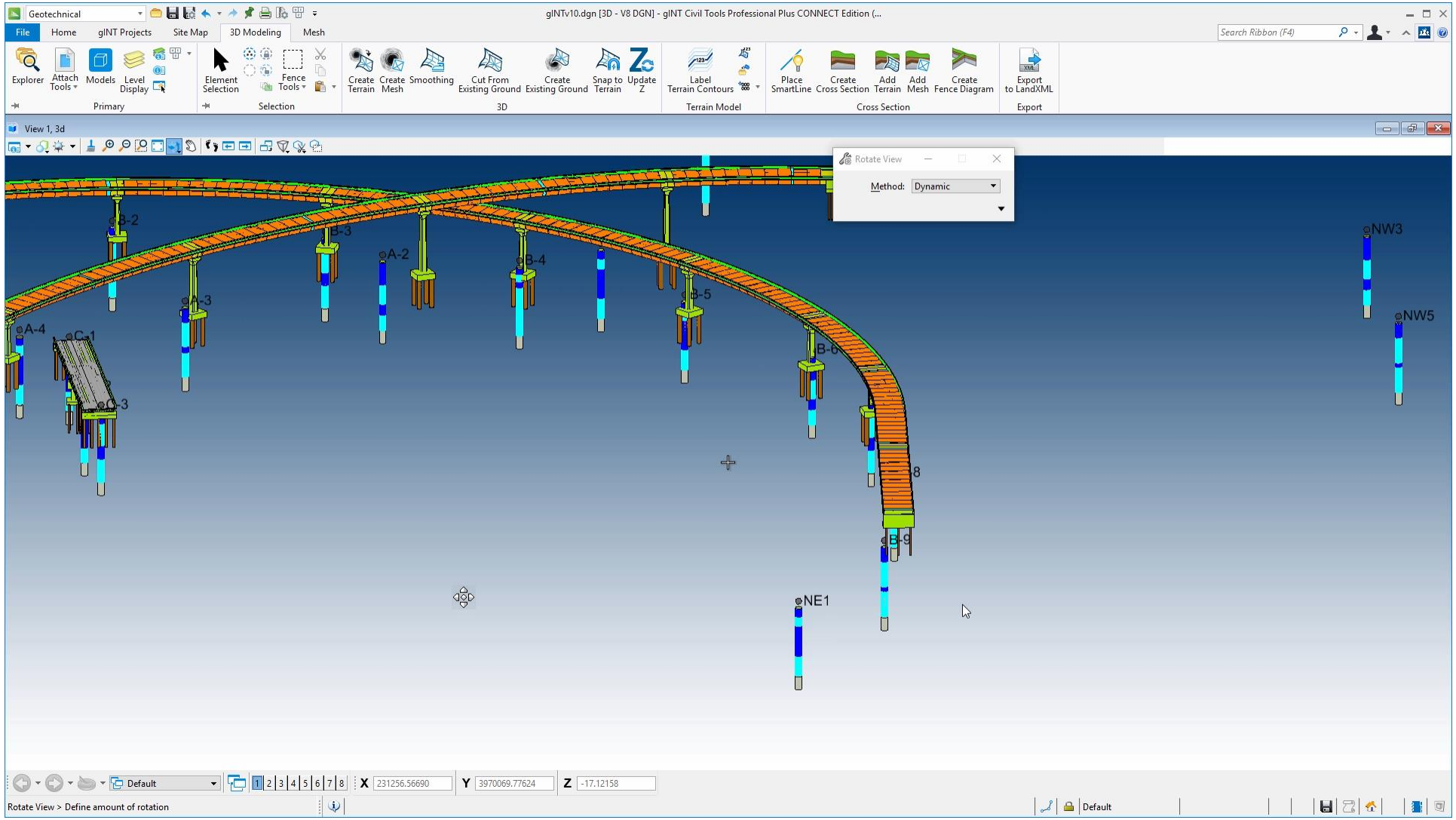
Loading the Bridges



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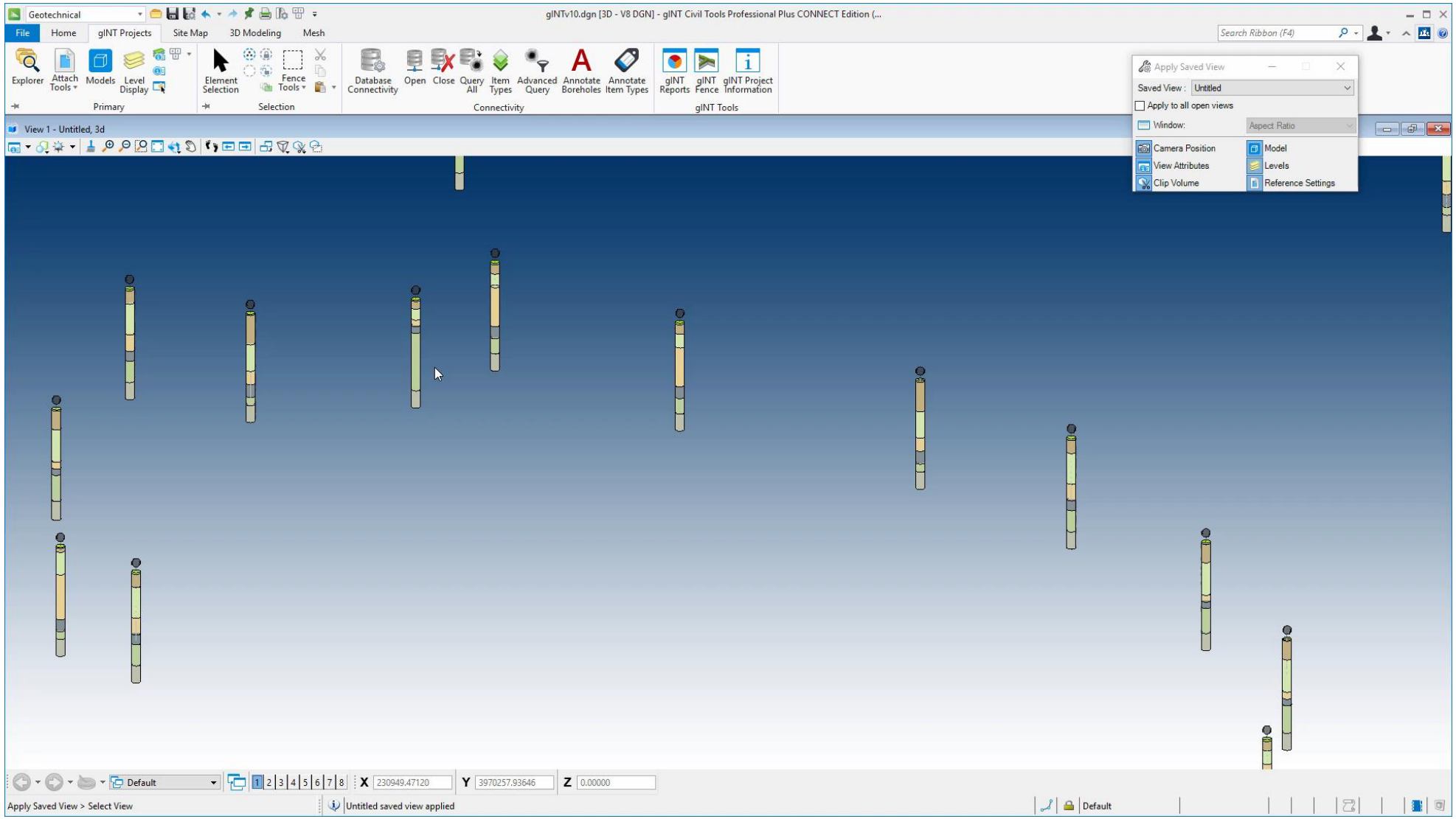
Geotechnical Modeling and Subsurface Analysis Demo



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Additional Information

- QuickStart using gINT Civil Tools
- http://learn.bentley.com/app/Public/ViewLearningPathWithMasterCourseExpanded?lpId=111600&mcId=102599
- Bentley Communities gINT Forum
- https://communities.bentley.com/products/geotechnical1/f/gint-forum#pi25960=1

Questions?

- Have a GREAT conference!

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