



Utilizing Highway Network Wide Localized Roughness Analysis

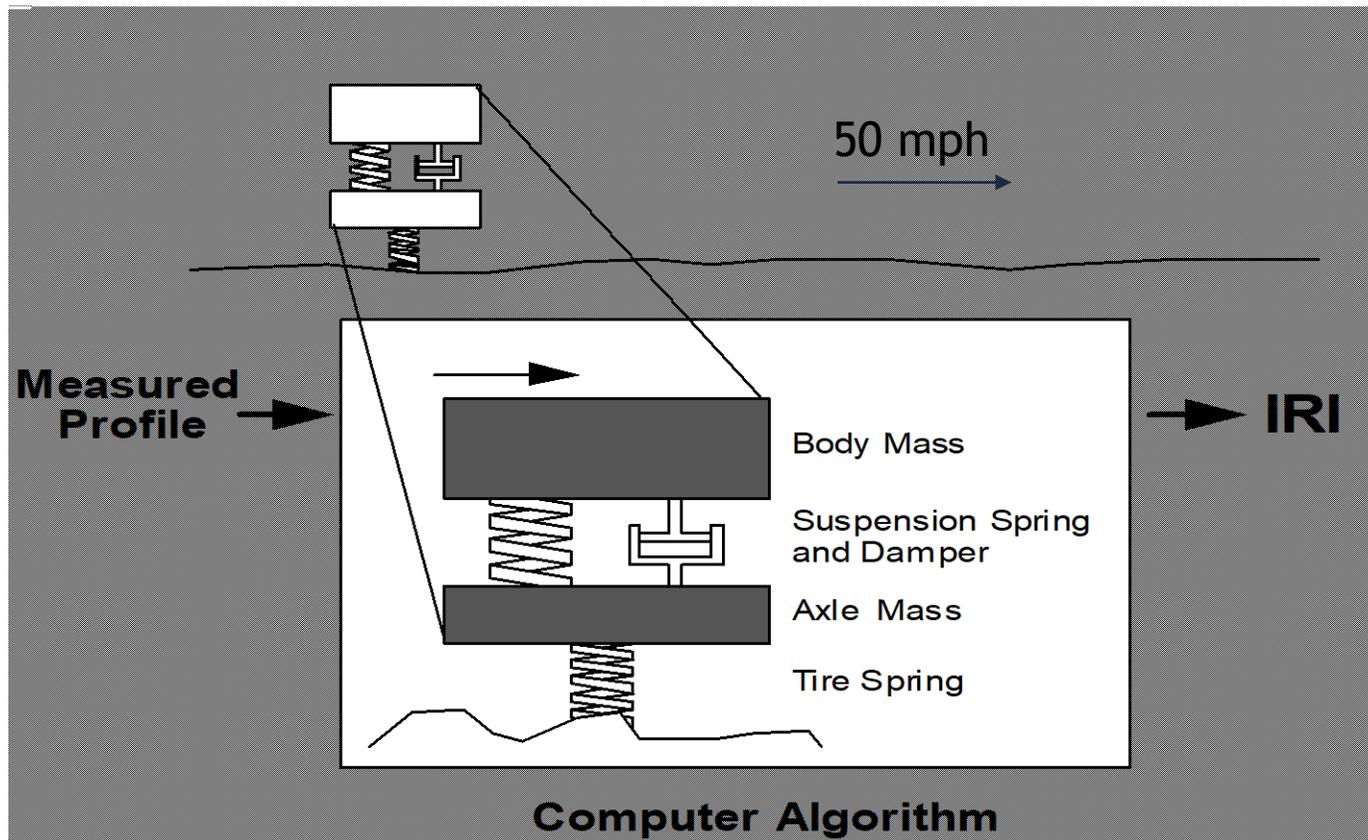
Brian L. Schleppi, OH DOT

OVERVIEW

- ④ What Road Roughness Is and the International Roughness Index (IRI)
- ④ What Localized Roughness Is/Mean
- ④ Calculating Localized Roughness on the Highway Network
- ④ Leveraging the data with Web Maps/GIS Technology

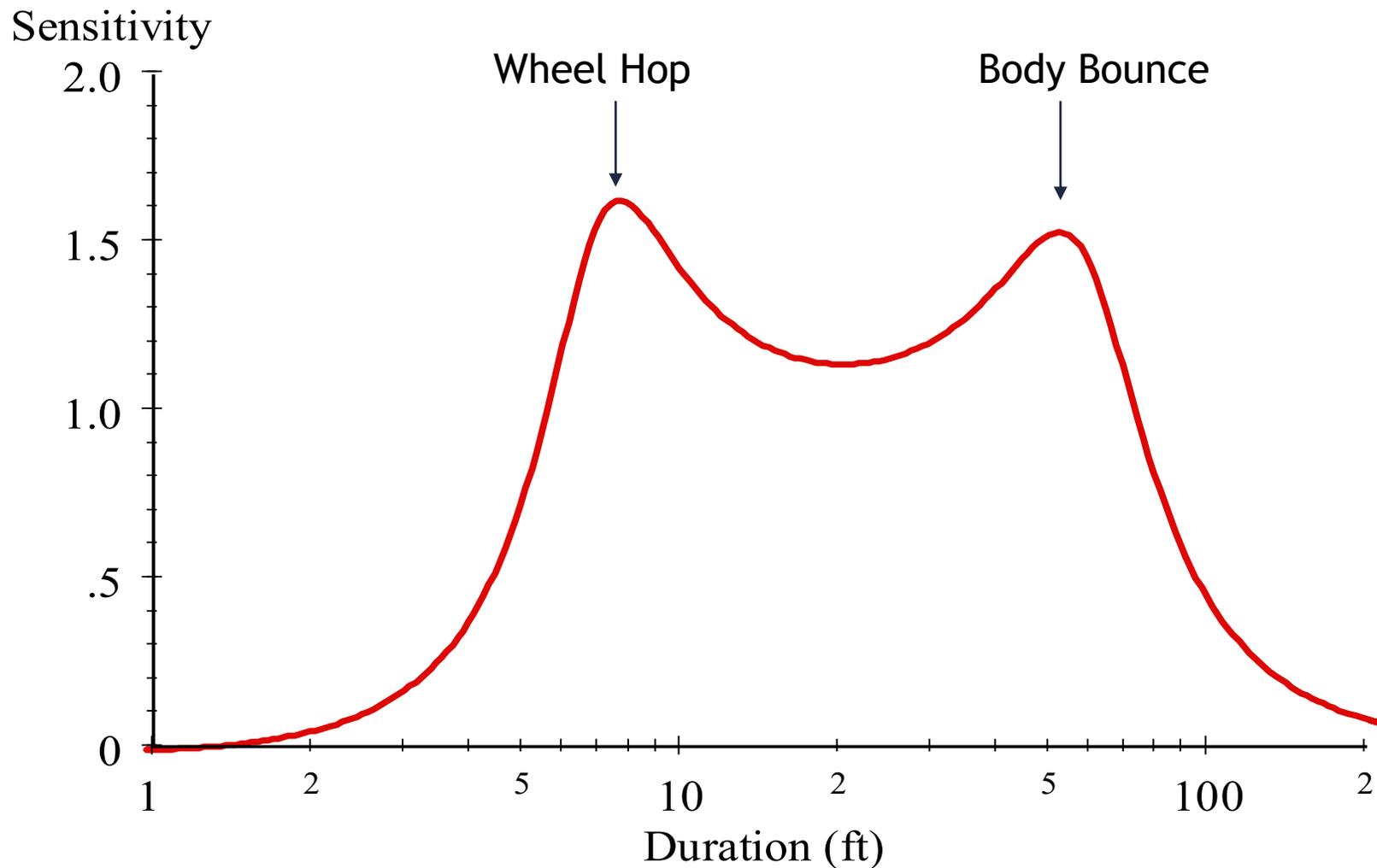
ROAD ROUGHNESS AND IRI

Road Roughness or “Rideability” means seeing the surface of the highway the way a vehicle suspension does.



Source: Steve Karamihas UMTRI

ROAD ROUGHNESS AND IRI



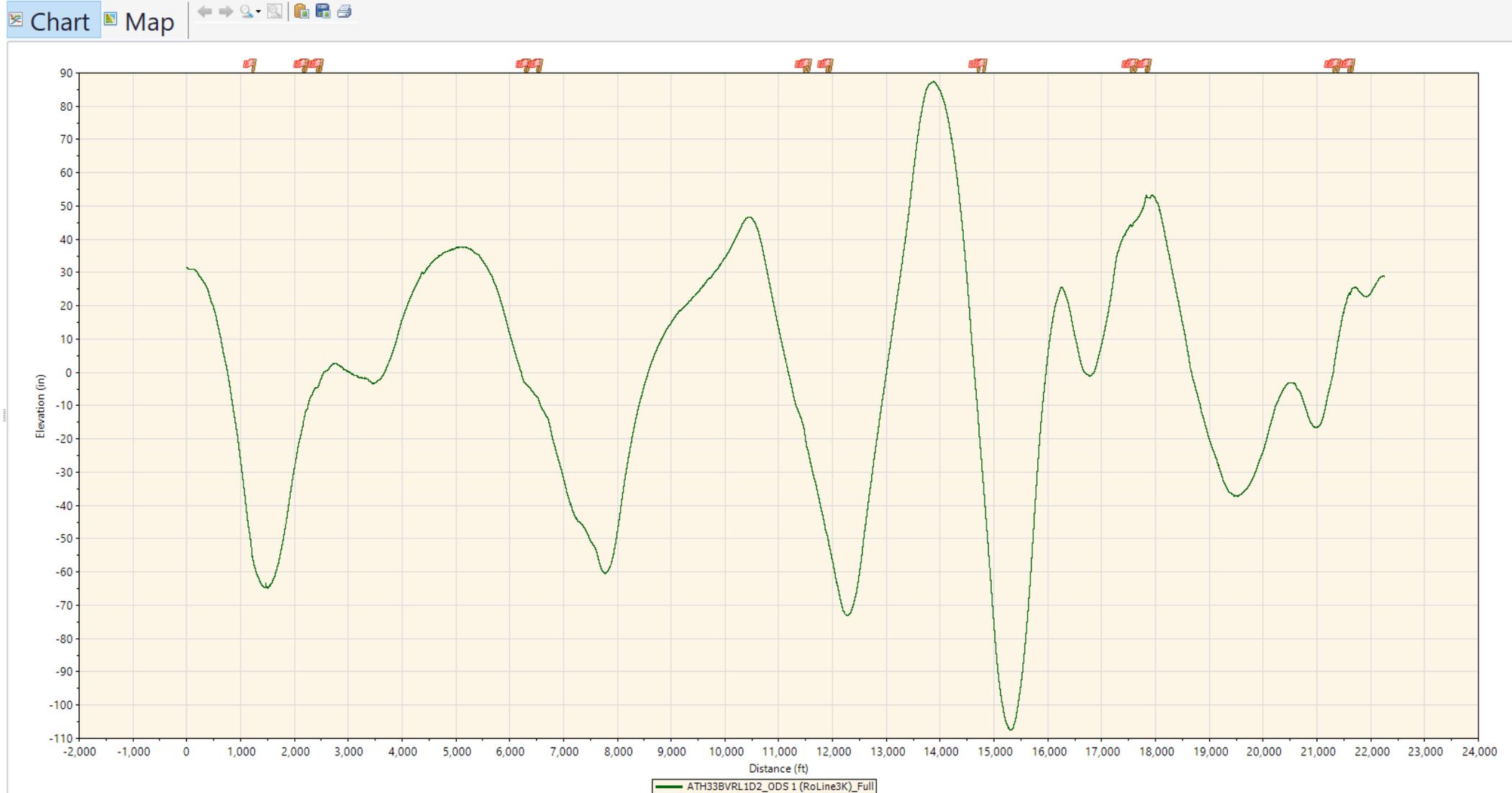
Source: Steve Karamihas UMTRI

ROAD ROUGHNESS AND IRI

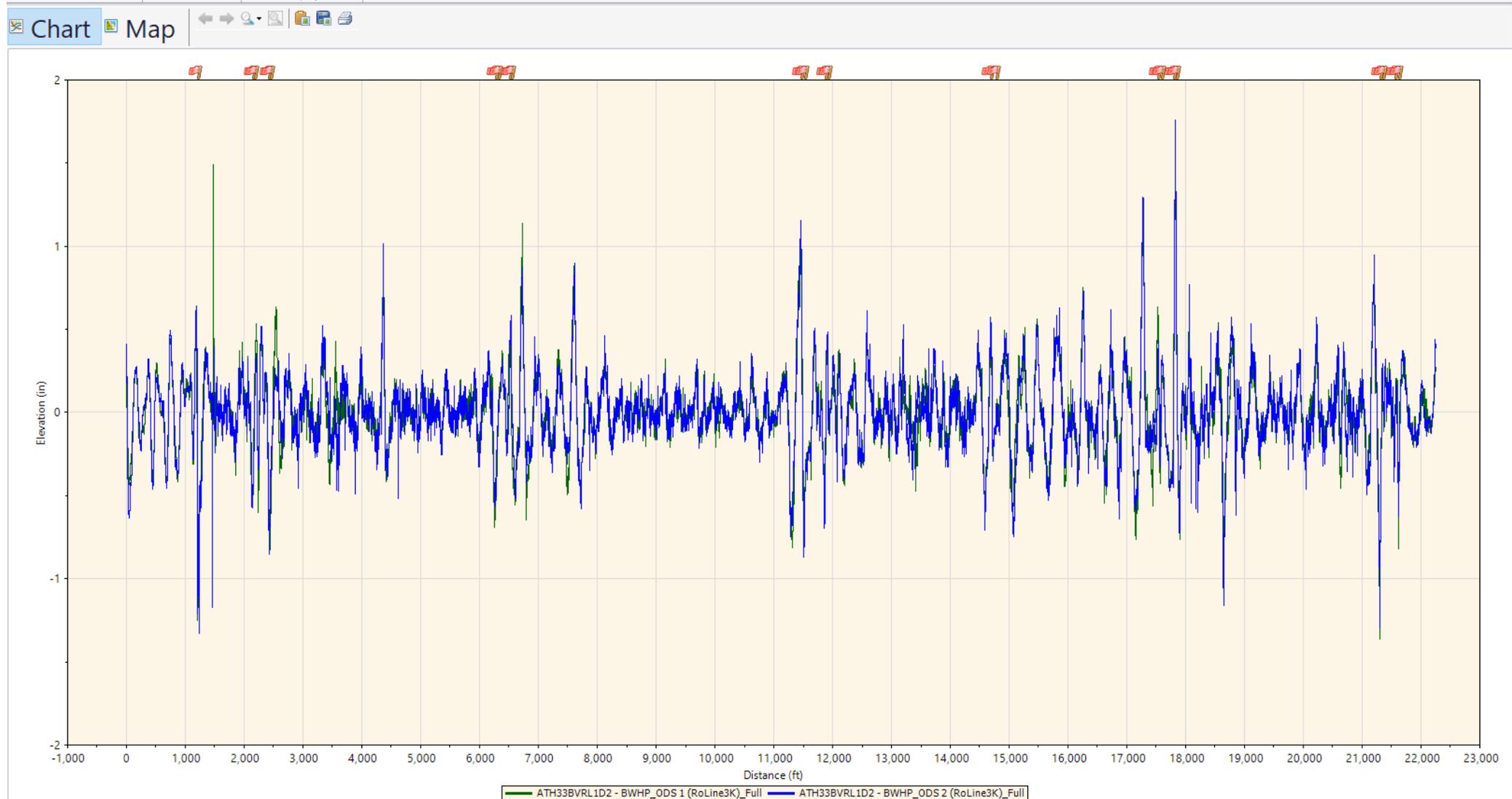
IRI is not really length data or point data, it's kind of a hybrid

- ⌚ Too much length and everything gets averaged out (10 mile long project)
- ⌚ It takes a certain amount of length traversed to cause a vehicle suspension to move
- ⌚ The summary length of IRI can make the thresholds change to make sense

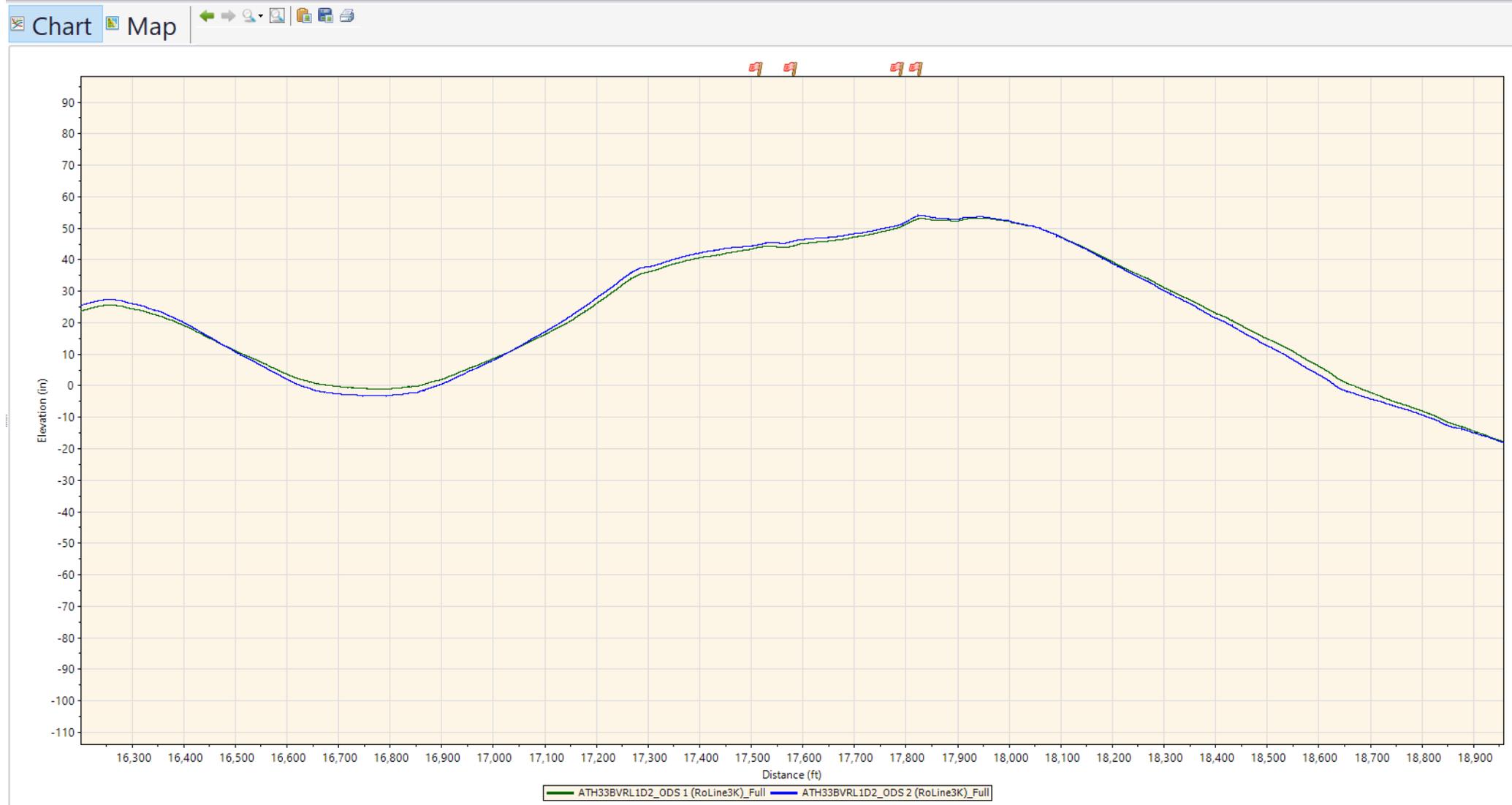
EXPLORING ROUGHNESS/IRI IN PROVAL SOFTWARE



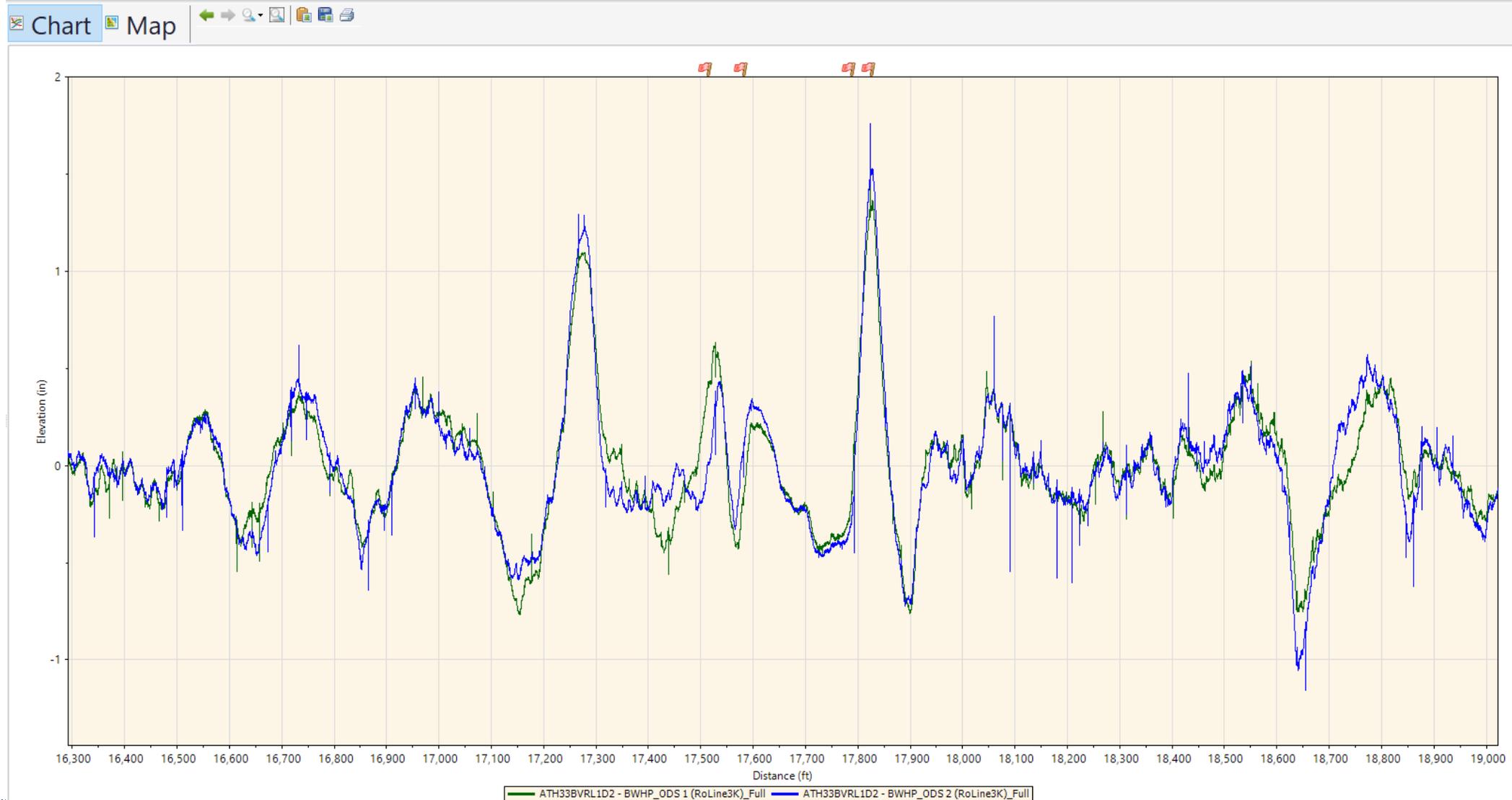
EXPLORING ROUGHNESS/IRI IN PROVAL SOFTWARE



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EXPLORING ROUGHNESS/IRI IN PROVAL SOFTWARE



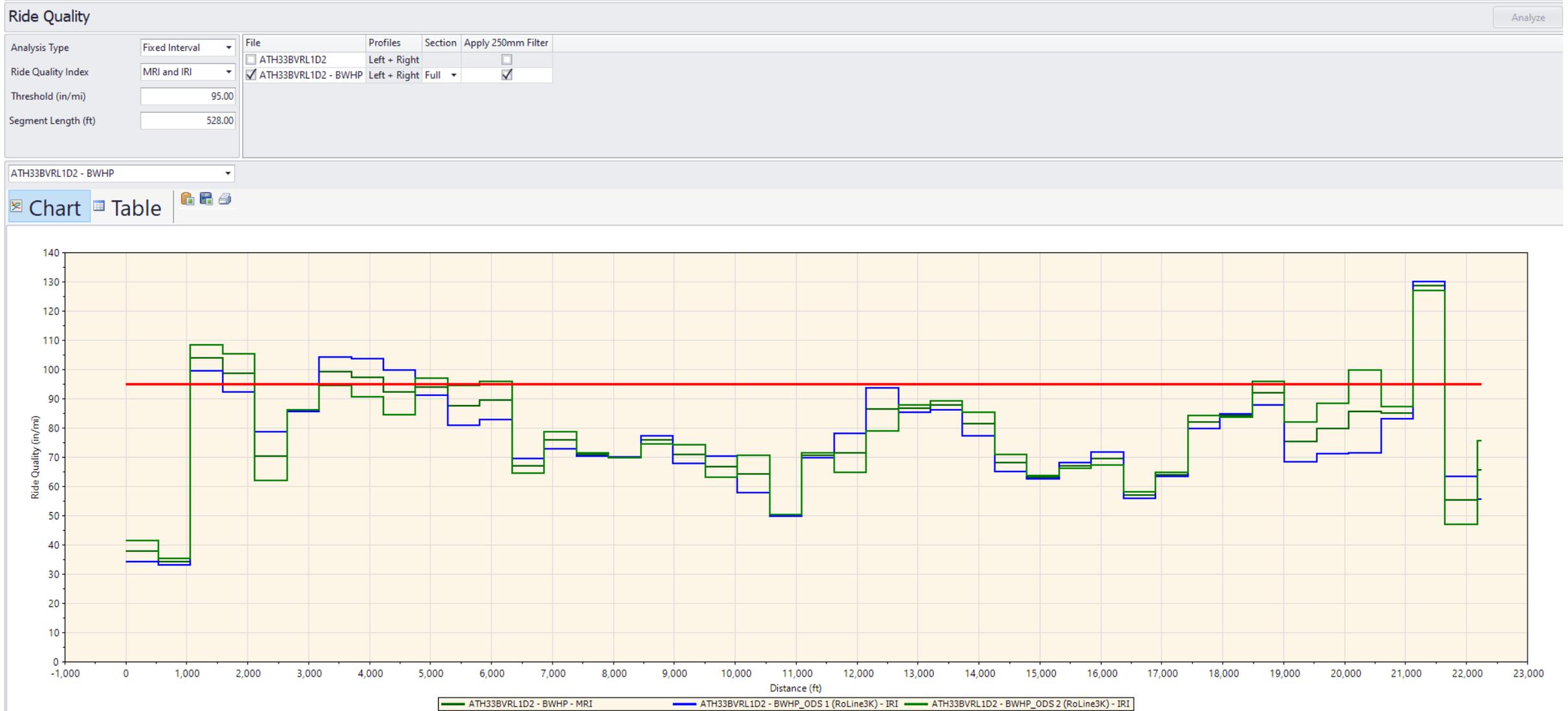
EXPLORING ROUGHNESS/IRI IN PROVAL SOFTWARE

Ride Quality

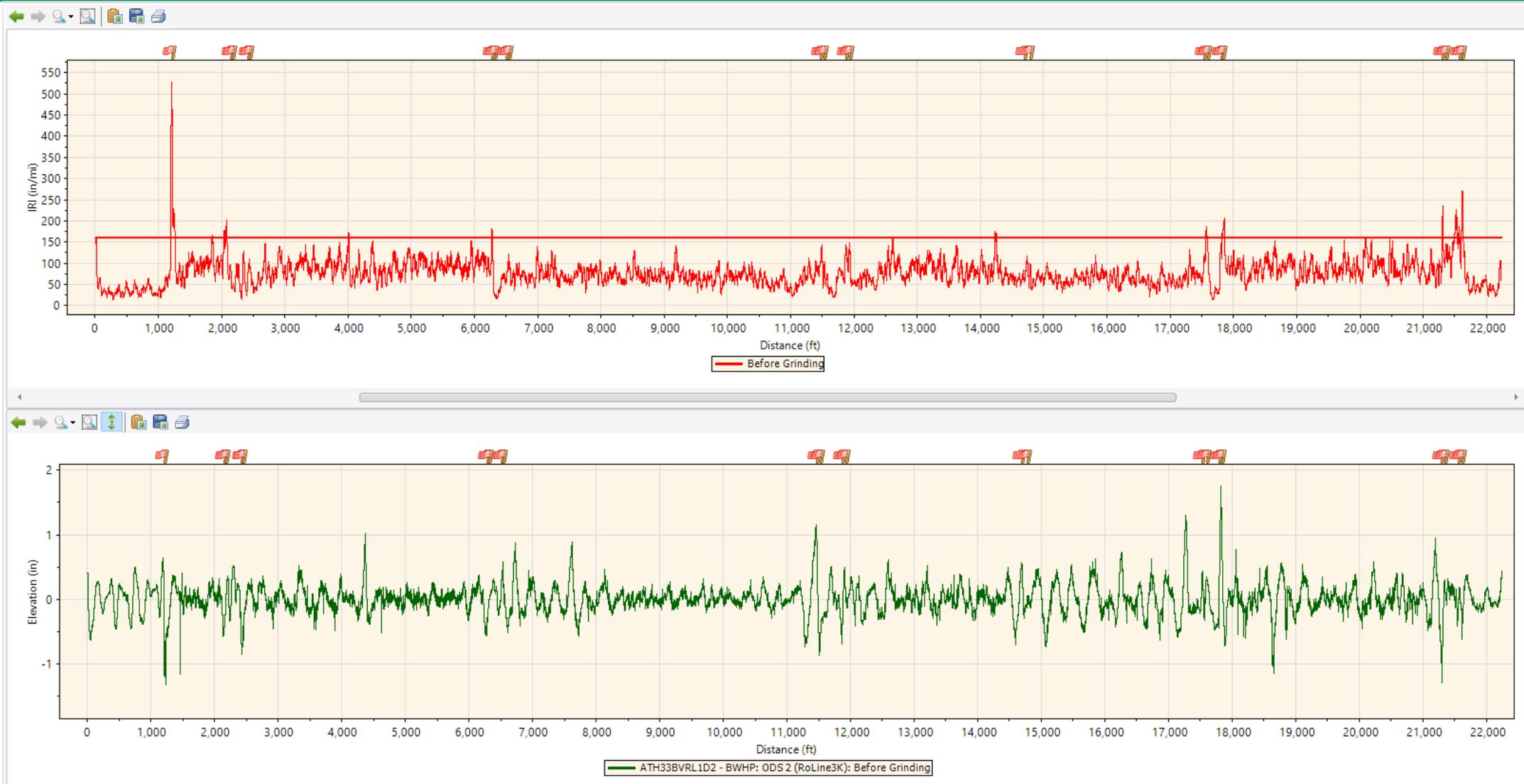
Analysis Type	Overall ▾	File	Profiles	Section	Apply 250mm Filter
Ride Quality Index	MRI and IRI ▾	<input type="checkbox"/> ATH33BVRL1D2	Left + Right		<input type="checkbox"/>
		<input checked="" type="checkbox"/> ATH33BVRL1D2 - BWHP	Left + Right	Full ▾	<input checked="" type="checkbox"/>

File	MRI (in/mi)	IRI - Left (in/mi)	IRI - Right (in/mi)
▶ ATH33BVRL1D2 - BWHP	77.12	76.28	77.96

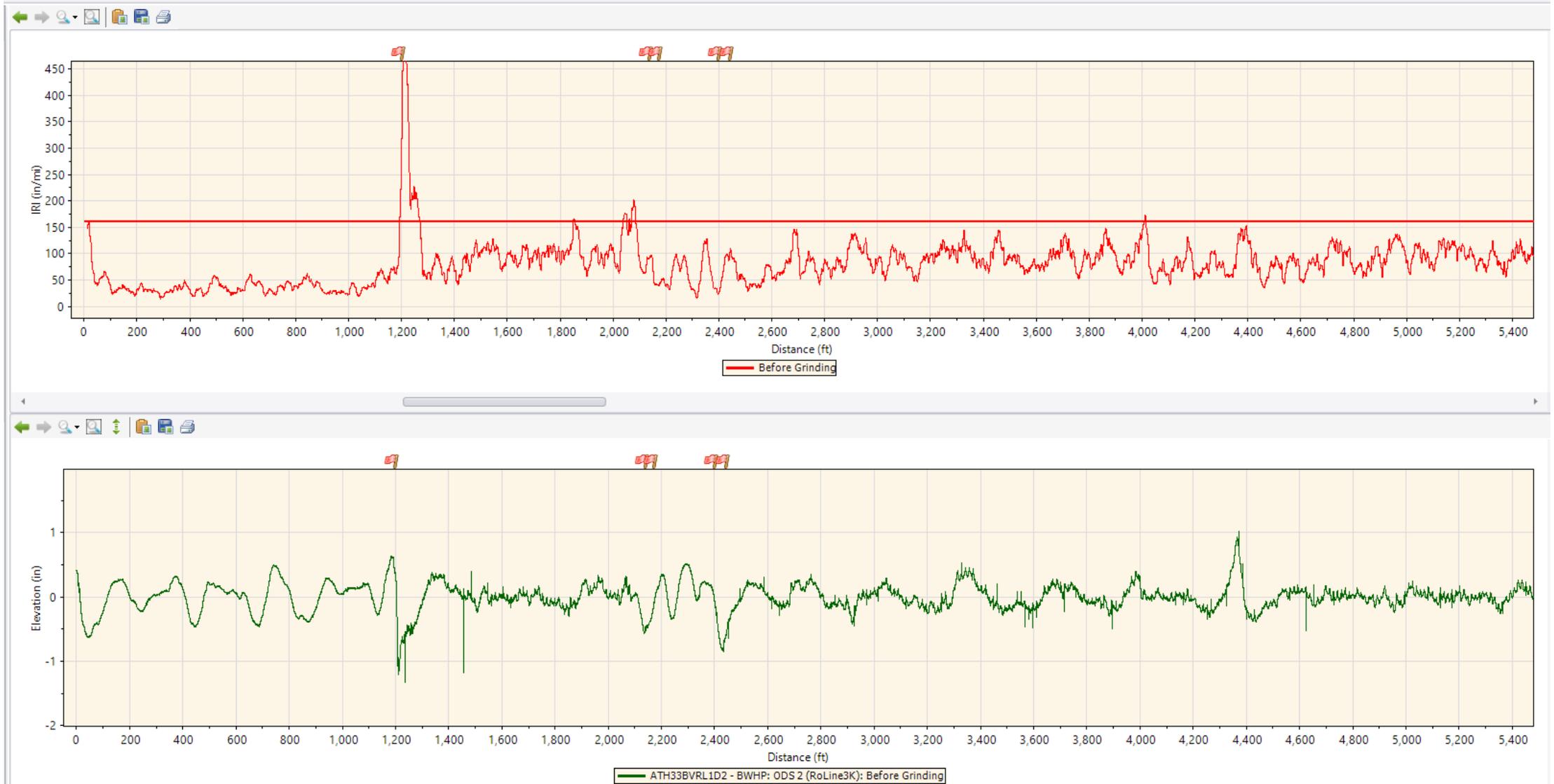
EXPLORING ROUGHNESS/IRI IN PROVAL SOFTWARE



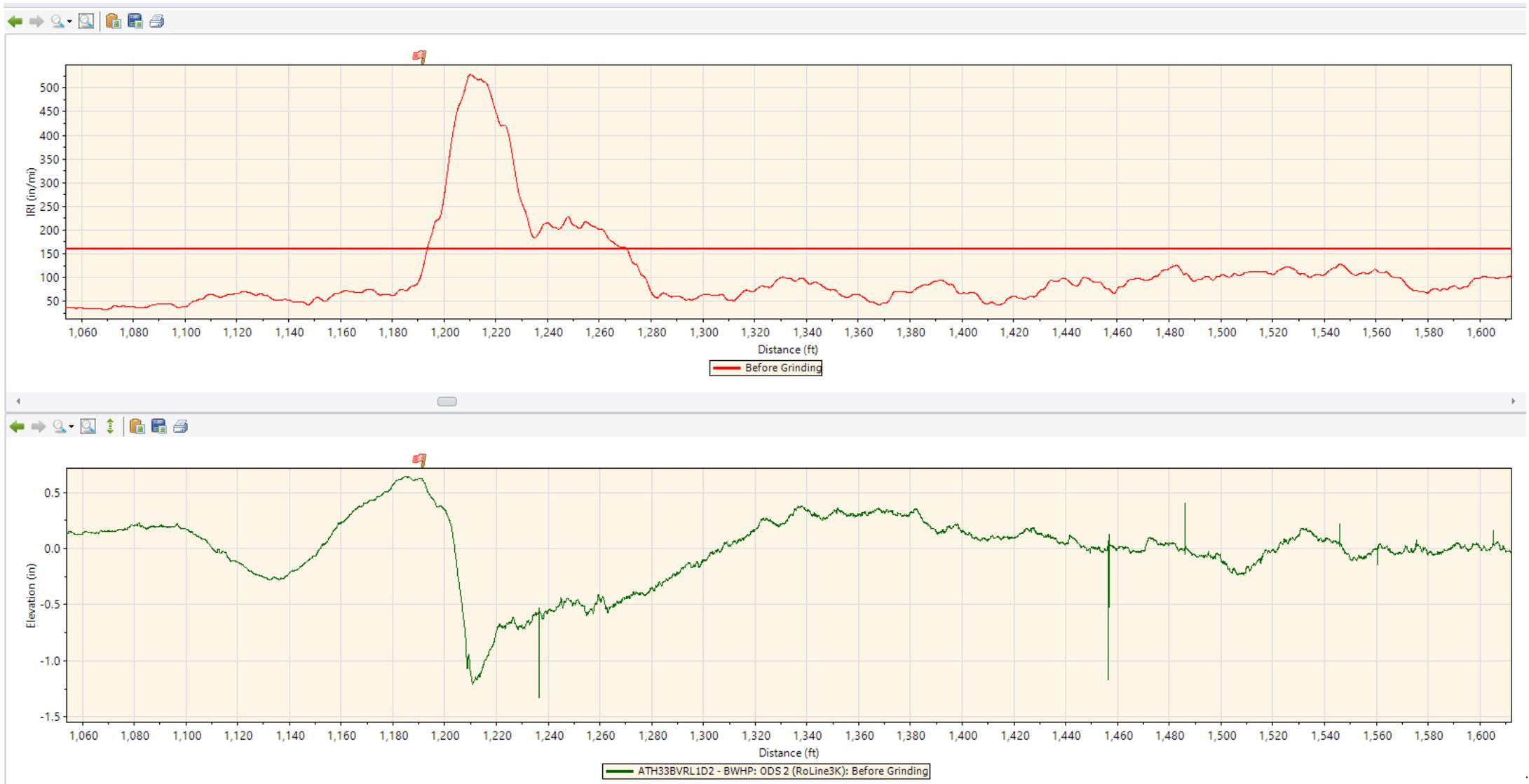
EXPLORING ROUGHNESS/IRI IN PROVAL SOFTWARE



EXPLORING ROUGHNESS/IRI IN PROVAL SOFTWARE



EXPLORING ROUGHNESS/IRI IN PROVAL SOFTWARE



EXPLORING ROUGHNESS/IRI

Summary Length of IRI Calculation	Each Roughness Event's Contribution to the total IRI
10 miles	0.1 : 1
1 mile	1 : 1
1/10 mile	10 : 1
25 feet	211.2 : 1

NETWORK LOCALIZED ROUGHNESS ANALYSIS

- ⌚ You will have gaps in data
 - ⌚ Only calculate where you have valid profile data
 - ⌚ Holes in stop and go data collection areas
 - ⌚ Most profilers can flag invalid profile data (data collection speed filter)
- ⌚ What threshold for localized roughness? **400 inches/mile in 25 feet**
 - ⌚ Limit for construction of new bridges with steel armor end dams is 350 inches per mile in 25 feet
 - ⌚ Easy to find localized roughness on the network in excess of 1000 inches per mile in 25 feet

NETWORK LOCALIZED ROUGHNESS ANALYSIS

Determine your Outputs

- ④ Unique Road/Route Identifier (NLFID)
- ④ Direction
- ④ Linear Reference (NLFID and log points of the “violation”)
- ④ Spatial Reference (beginning and end latitude and longitude of the “violation”)
- ④ Temporal Reference (Date of data collection)
- ④ Peak Roughness of the Localized Event
- ④ Duration of the Localized Roughness Event (Length in feet)
- ④ Peak X Length (computed once the data is imported into Excel)

NETWORK LOCALIZED ROUGHNESS ANALYSIS



NETWORK LOCALIZED ROUGHNESS ANALYSIS

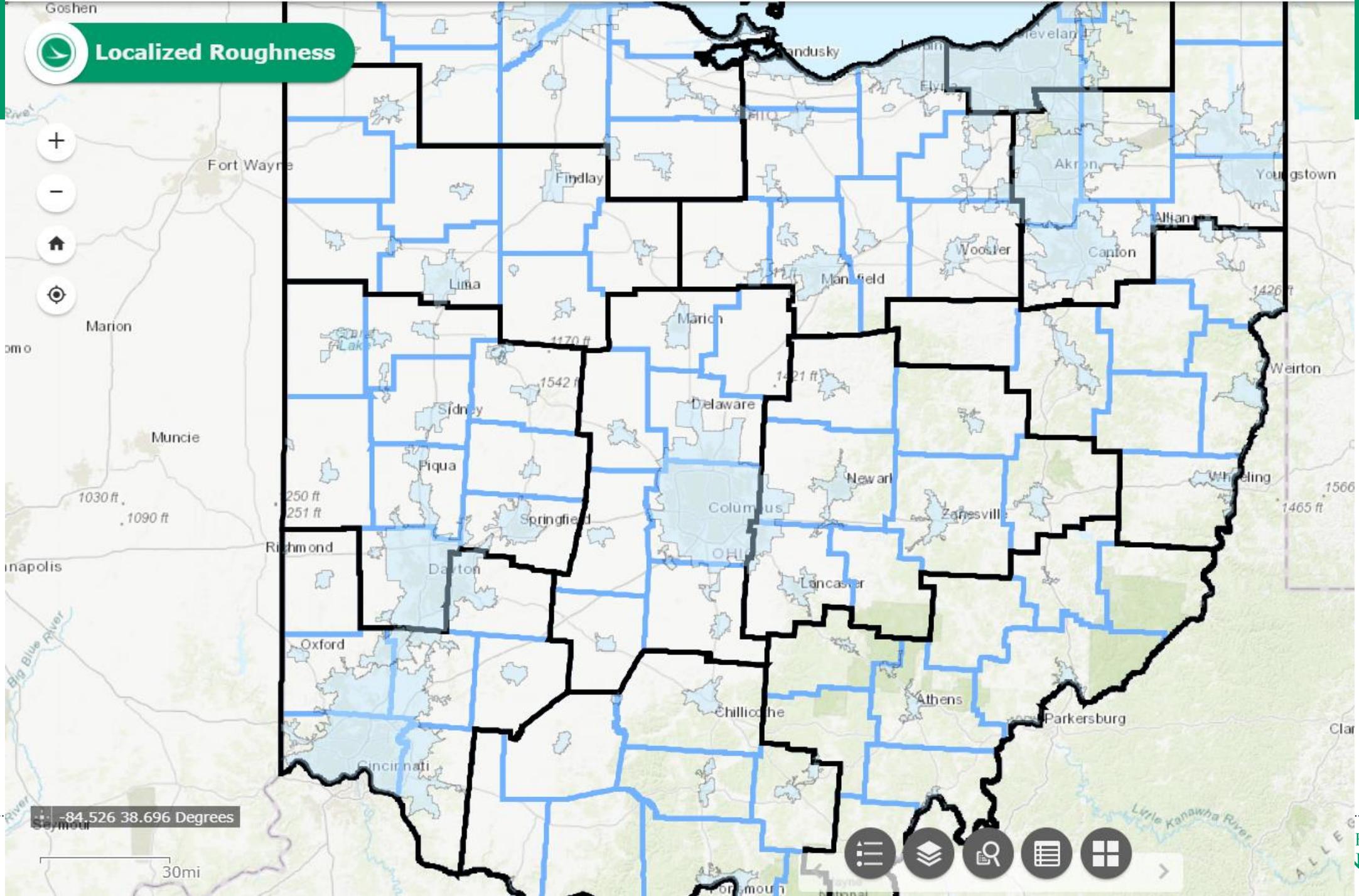
- ④ Determine what attributes you need in your network localized roughness report
- ④ Work with your profiler manufacturer to develop such report
- ④ Test and provide feedback (using ProVAL to verify and validate)
- ④ Perfect report (1:1 exact match to ProVAL with all required fields populated)
- ④ Ready for consumption in Web Map

USING GIS TO WEB MAP THE DATA

- ④ GIS Team assistance
- ④ Map and Visualize the data
- ④ Add layers for the Capital/Maintenance workplans the next 5 years out
- ④ Ability to filter the data
- ④ URL link to specific location in photolog viewer application



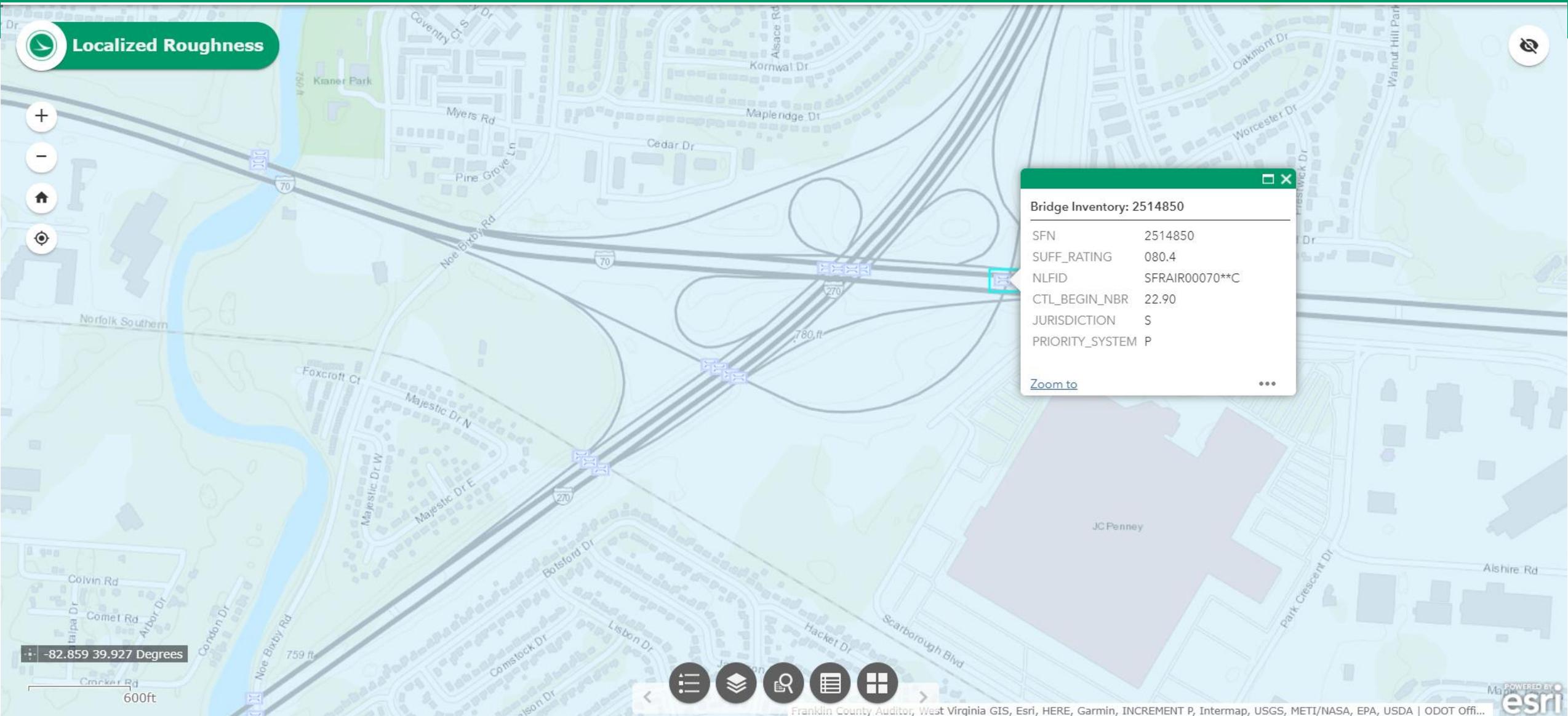
Localized Roughness



-84.526 38.696 Degrees

30mi

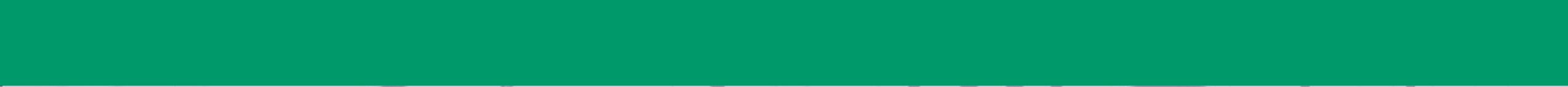




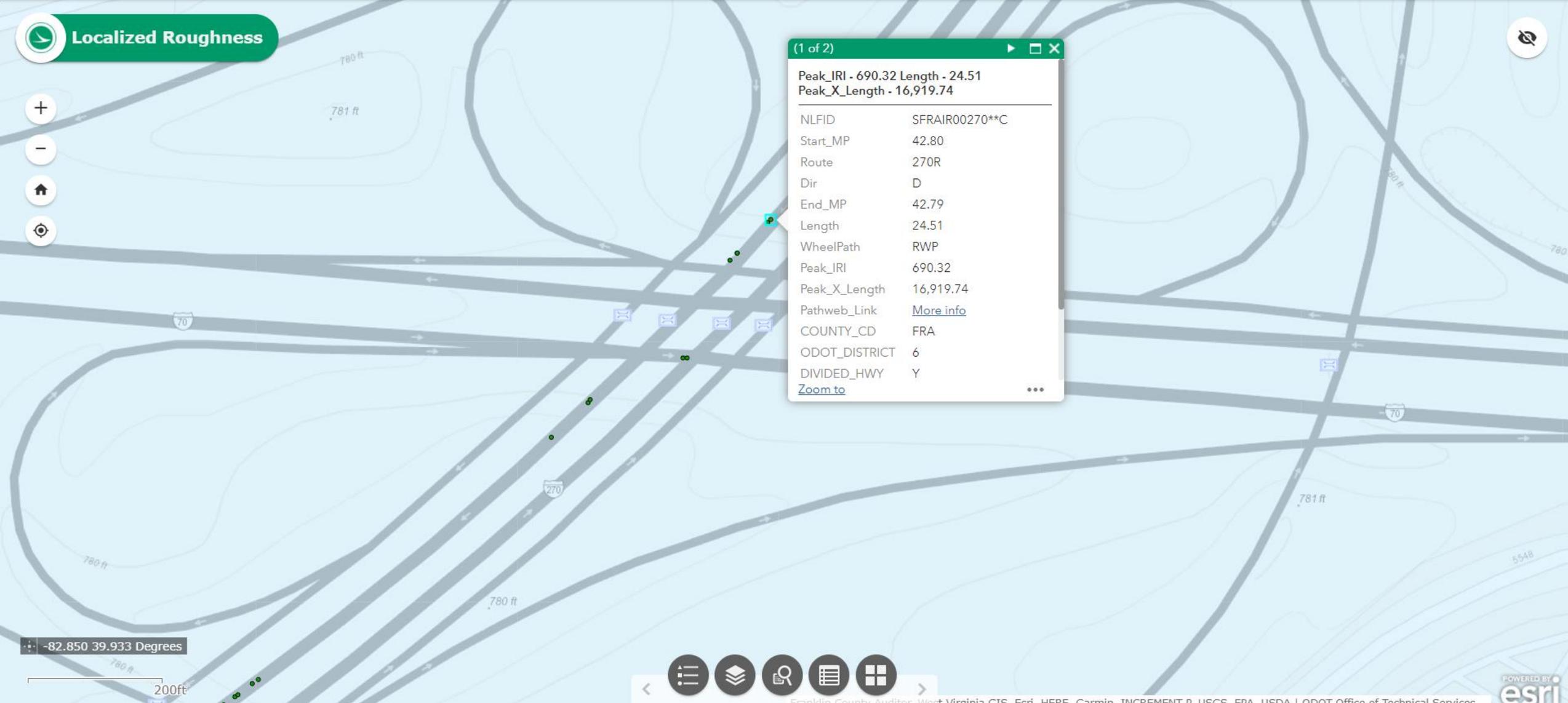
Bridge Inventory: 2514850

SFN	2514850
SUFF_RATING	080.4
NLFID	SFRAIR00070**C
CTL_BEGIN_NBR	22.90
JURISDICTION	S
PRIORITY_SYSTEM	P

[Zoom to](#) ...



Localized Roughness



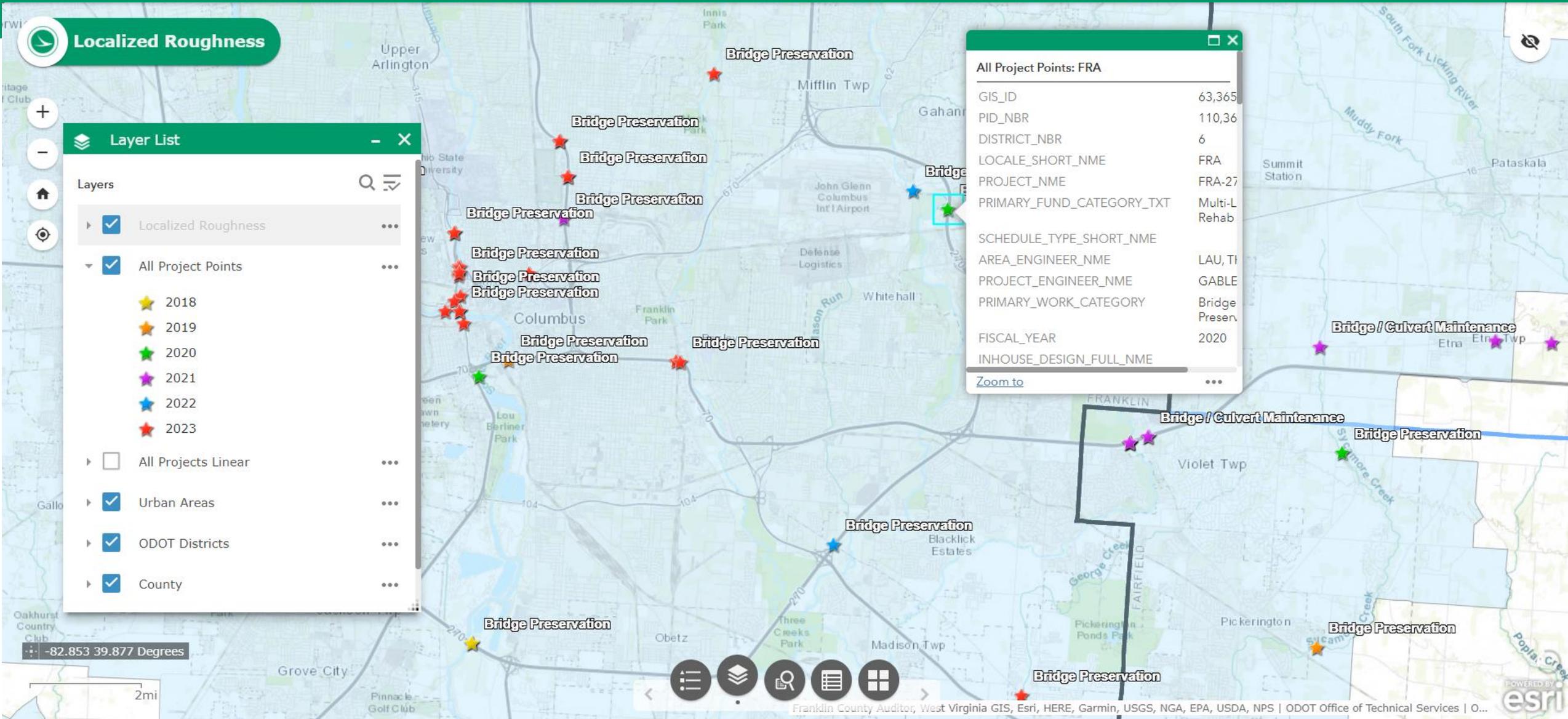
-82.850 39.933 Degrees

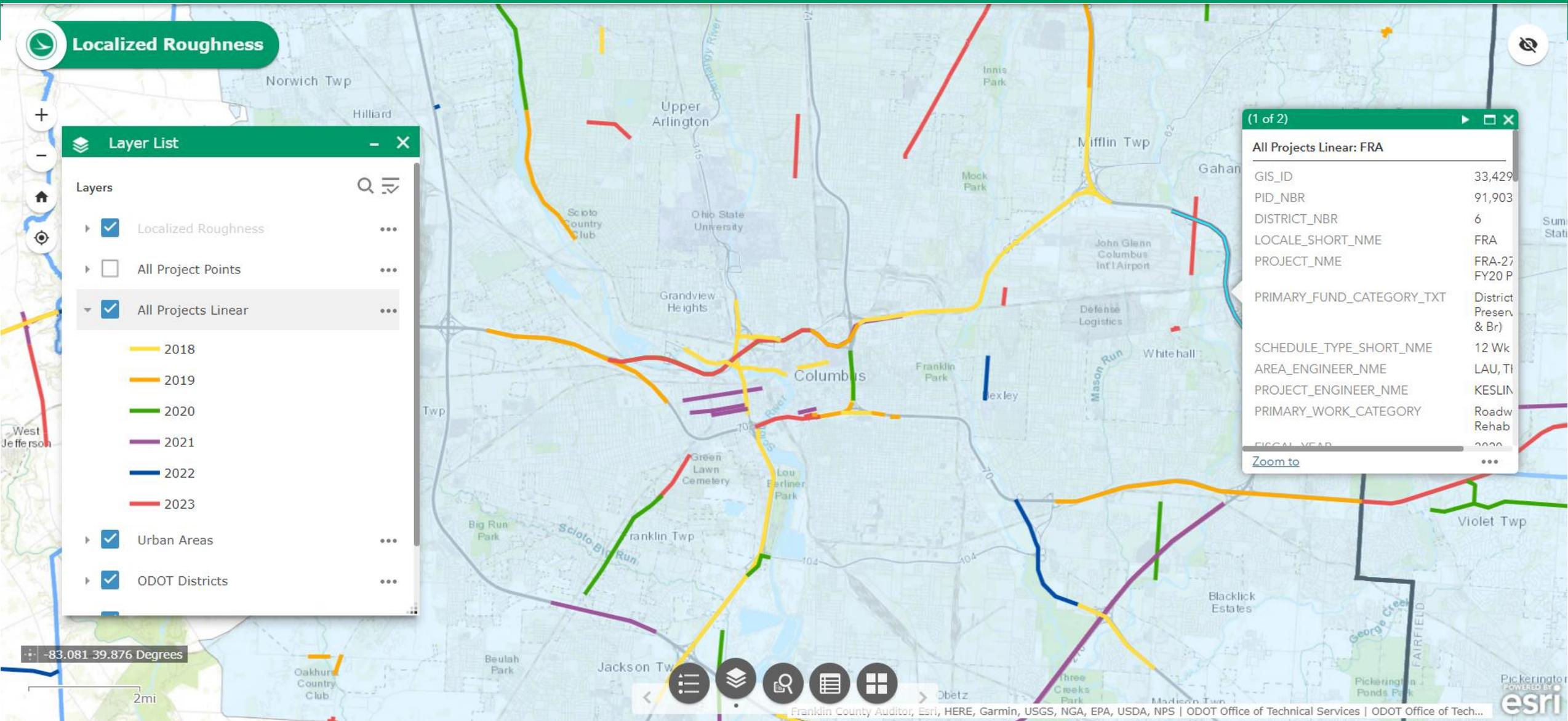
200ft



Franklin County Auditor West Virginia GIS Feri HERE Garmin INCREMENT P USCS EPA USDA | ODOT Office of Technical Services







Query

Tasks Results

District

ODOT_DISTRICT is

6

DIVIDED_HWY is

Y

Search

- empty -

N

Y

PRIORITY_SYSTEM is any of

1 selected

Search

G

P

U

Peak_IRI is greater than

900

Peak_X_Length is greater than

Length is greater than

40

Result layer name

District 6 Query result

Query

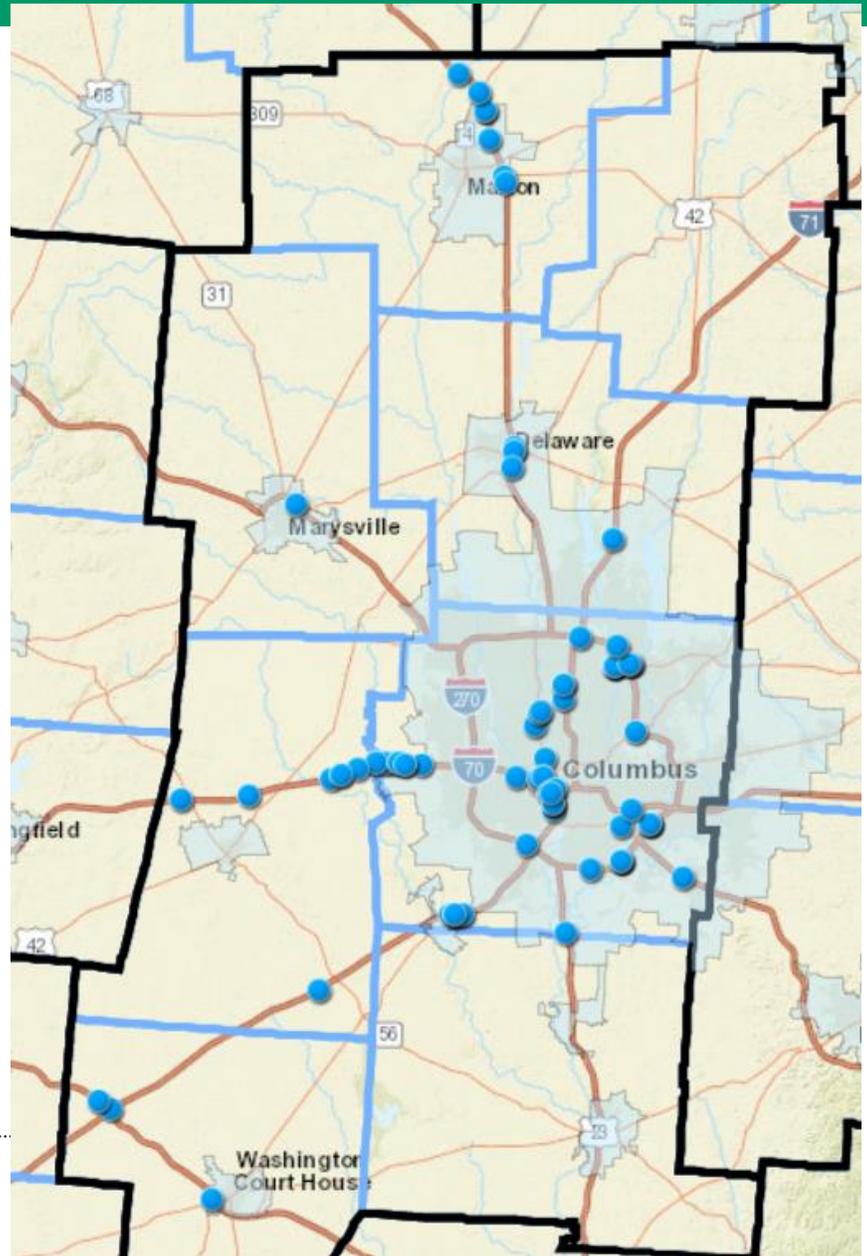
Tasks Results

District 6 Query result

Displayed features: 90/90

Peak_IRI - 901.49 Length - 65.52 Peak_X_Length - 59,065.62

NLFID	SMARUS00023**C
Start_MP	10.06
Route	023R
Dir	D
End_MP	10.04
Length	65.52
WheelPath	RWP
Peak_IRI	901.49
Peak_X_Length	59,065.62
Pathweb_Link	More info
COUNTY_CD	MAR
ODOT_DISTRICT	6





Query

District 6 Query result

Displayed features: 90/90

Tasks	Results
	Peak_IRI - 901.49 Length - 65.52 Peak_X_Length - 59,065.62
NLFID	SMARUS00023**C
Start_MP	10.06
Route	023R
Dir	D
End_MP	10.04
Length	65.52
WheelPath	RWP
Peak_IRI	901.49
Peak_X_Length	59,065.62
Pathweb_Link	More info
COUNTY_CD	MAR
ODOT_DISTRICT	6

(1 of 7)

**Peak_IRI - 1,414.46 Length - 55.25
Peak_X_Length - 78,148.91**

NLFID	SFRAIR00270**C
Start_MP	48.00
Route	270R
Dir	D
End_MP	47.99
Length	55.25
WheelPath	RWP
Peak_IRI	1,414.46
Peak_X_Length	78,148.91
Pathweb_Link	More info
COUNTY_CD	FRA
ODOT_DISTRICT	6
DIVIDED_HWY	Y
Zoom to	

-82.923 39.878 Degrees

200ft





Localized Roughness



Query

Tasks	Results
District 6 Query result	
Displayed features: 2/2	
Peak_IRI - 1,499.98 Length - 0.18	
Peak_X_Length - 270.00	
NLFID	SOTTSR00002**C
Start_MP	16.35
Route	002R
Dir	D
End_MP	16.35
Length	0.18
WheelPath	LWP
Peak_IRI	1,499.98
Peak_X_Length	270.00
Pathweb_Link	More info
COUNTY_CD	OTT

Query

Peak_IRI - 1,499.98 Length - 0.18	
Peak_X_Length - 270.00	
NLFID	SOTTSR00002**C
Start_MP	16.35
Route	002R
Dir	D
End_MP	16.35
Length	0.18
WheelPath	LWP
Peak_IRI	1,499.98
Peak_X_Length	270.00
Pathweb_Link	More info
COUNTY_CD	OTT
ODOT_DISTRICT	2
DIVIDED_HWY	Y
Zoom to	

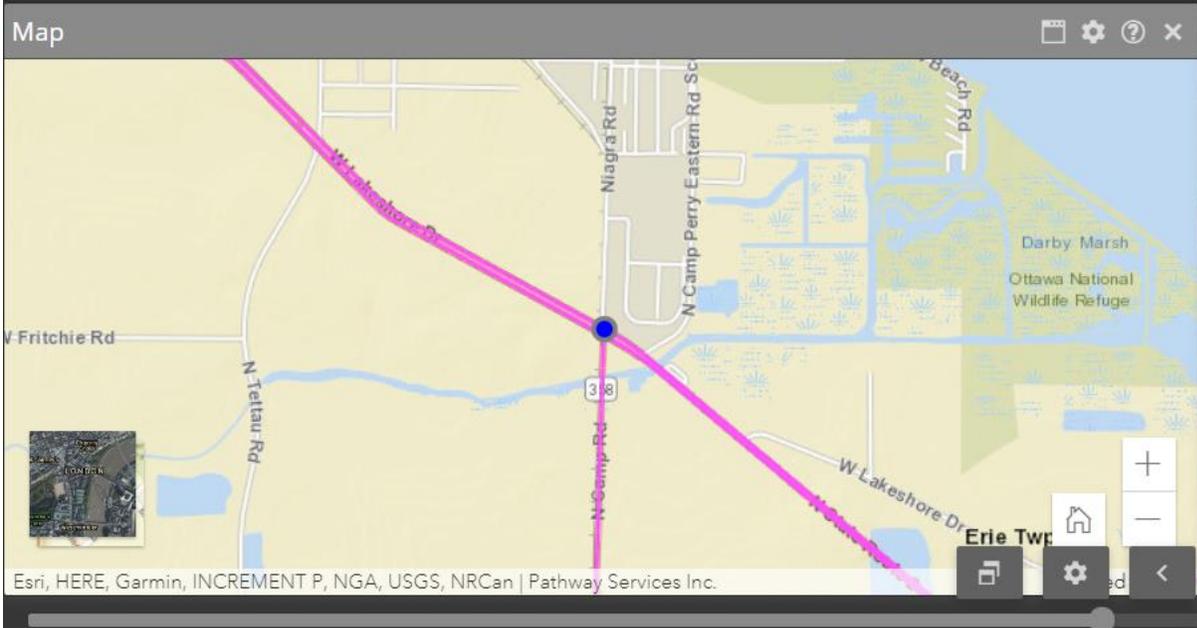
Query

Tasks	Results
District	
PRIORITY_SYSTEM is any of	1 selected
Peak_IRI is greater than	1499.97
Peak_X_Length is greater than	
Length is greater than	

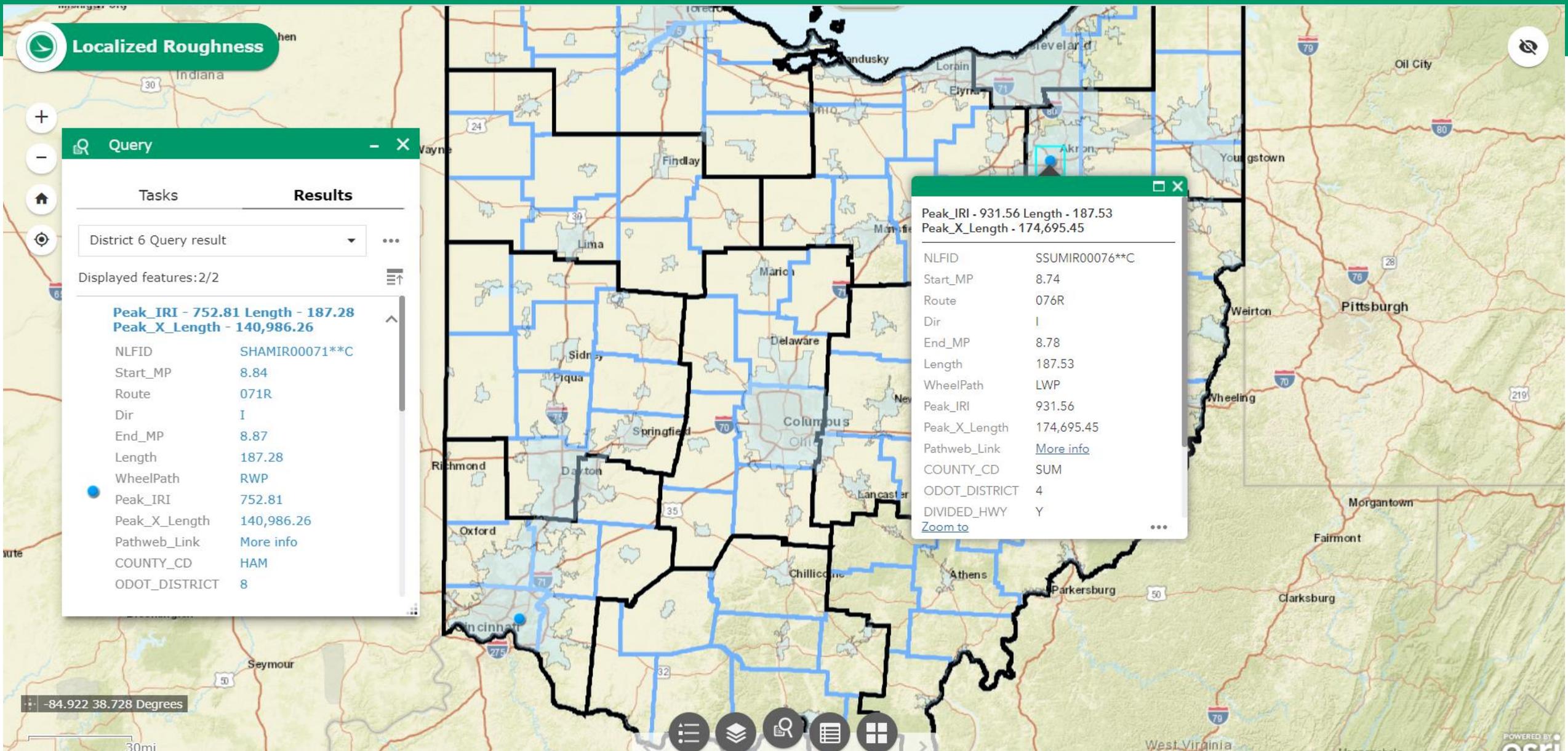
-80.710 39.865 Degrees



County: OTT | Route: 002R | Mile Post: 16.361 | Dir: Decr | Date: 08/22/2018 | Coord: 41.530690, -83.020042 | PCR: 88 | AADT: 4669 | AADT Truck: 1621

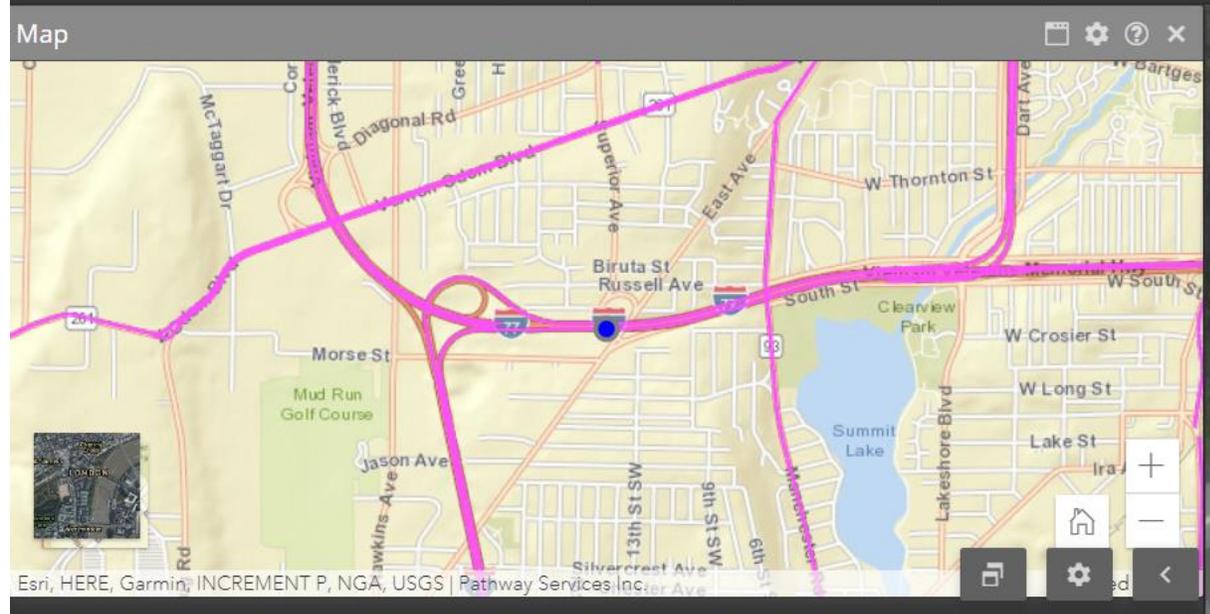


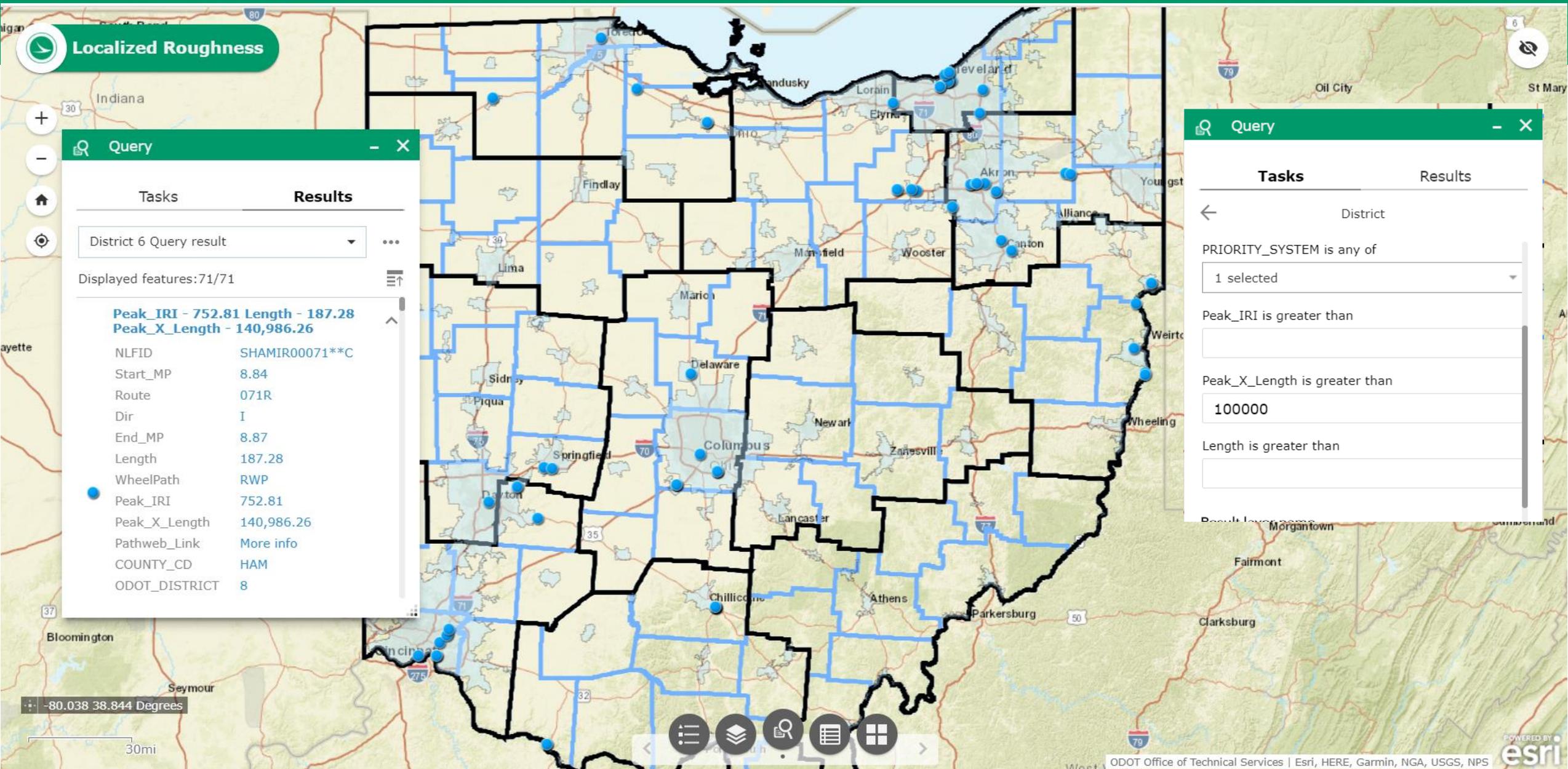


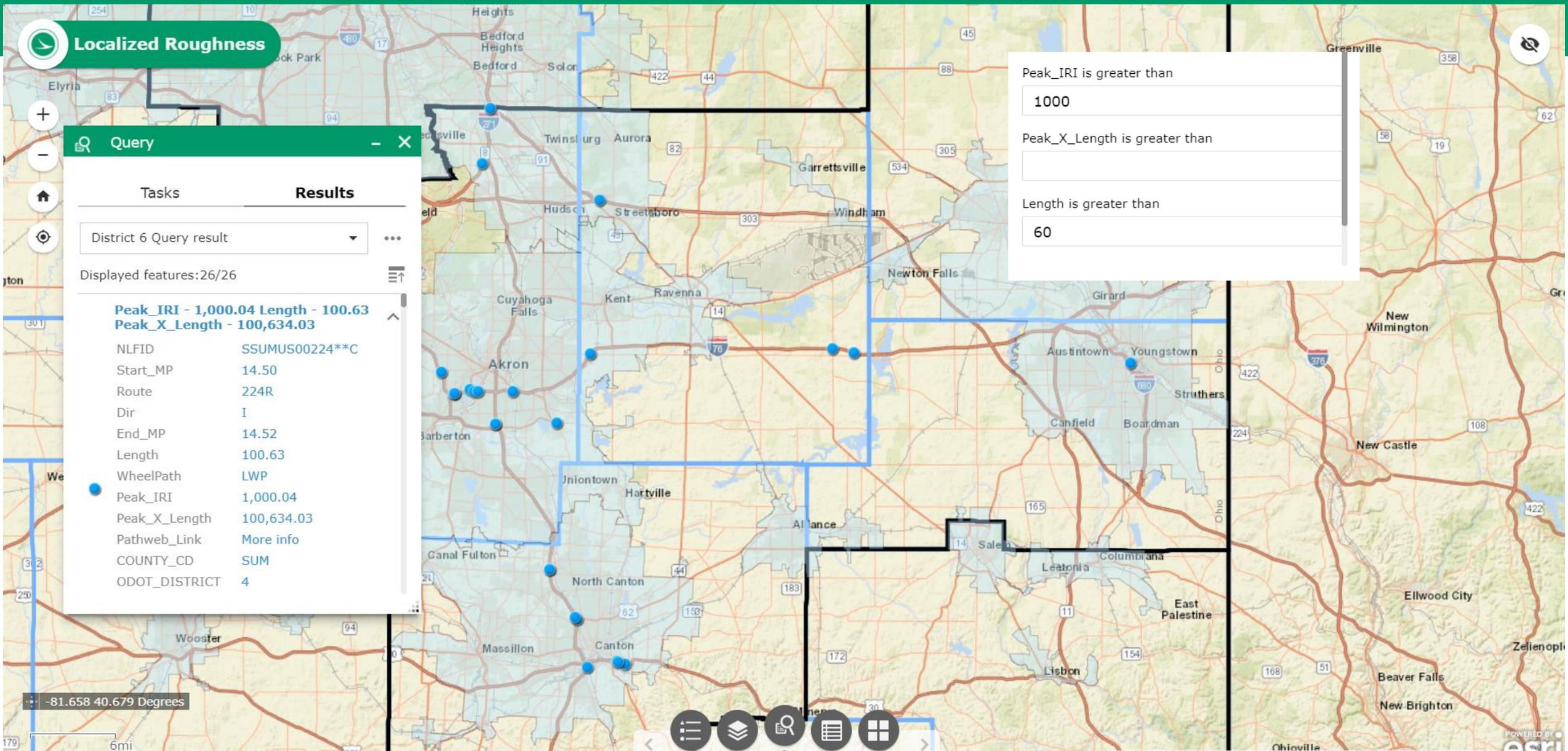




County: SUM | Route: 076R | Mile Post: 8.737 | Dir: Incr | Date: 06/06/2018 | Coord: 41.059807, -81.558845 | PCR: 71 | AADT: 107518 | AADT Truck: 13923







BENEFITS

- ④ Sort, Search & Filter how you wish to find the Roughest Locations Statewide, District or County by System, etc
- ④ Quickly verify with photolog images (date and visual of the issue)
- ④ See if you have upcoming projects to address them
- ④ Can we correct in house or let a special project to address if not currently on the workplan

BENEFITS

Already had this analysis and web map tool in place when Executive Management asked each District to put a plan together to address their 10 roughest locations on their respective part of the Priority System!

ACKNOWLEDGEMENTS AND SHOUT OUTS

- ⌚ Our Team that collects, edits, and reports the data and assists with plans for fixes
 - ⌚ R Schoff, S Miles, J Bell, R Conrad, C Slone & D Radanovich
- ⌚ Our Profiler Manufacturer and Software Vendor
 - ⌚ R Blanco & S Mathison of Pathway Services Inc.
- ⌚ GIS experts
 - ⌚ M Thompson, S Hale, B Richard, K Robertson
- ⌚ OH DOT Executive Office for recognizing the importance and supporting the use of road roughness/IRI data

Questions and Discussion

CONTACT INFORMATION

Brian L. Schleppe

Ohio DOT

brian.schleppe@dot.ohio.gov

(614) 752-5745