

INLAND FLOODING ANALYSIS UPDATE

Updates to Transportation Risk & Vulnerability Assessment using new data

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CEEPC Meeting
July 23, 2025

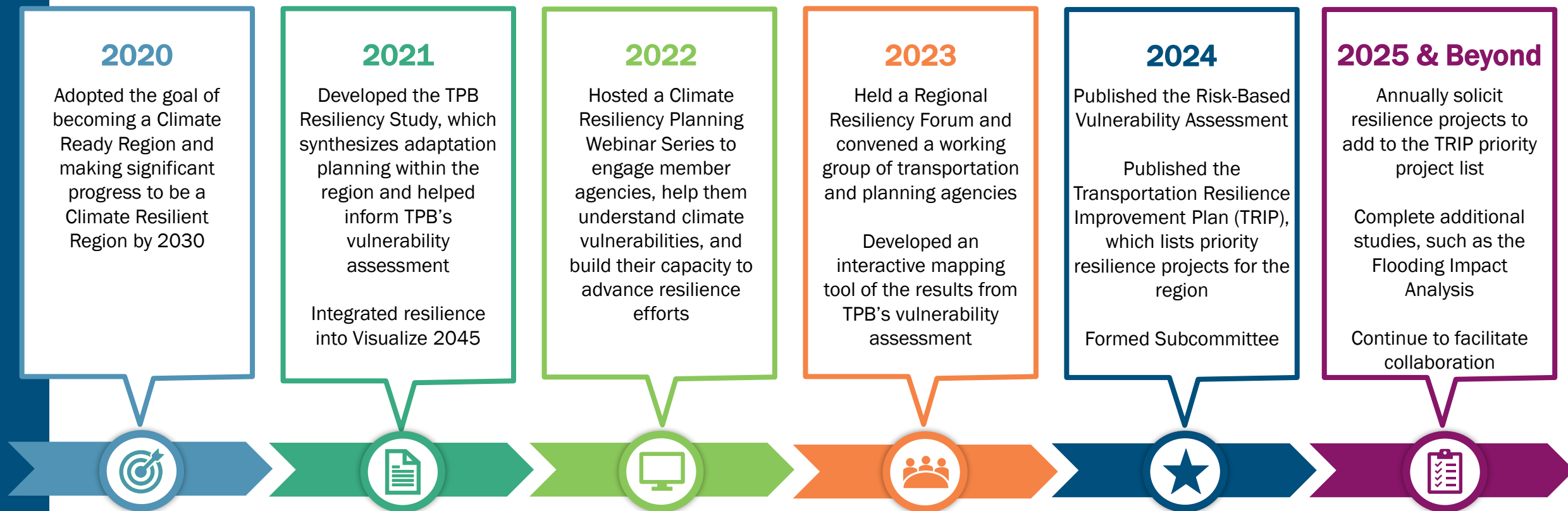


Agenda

- Overview of resilience work at TPB to date
- Prior transportation asset flood risk analysis
- Updated flood risk analysis methodology and results
- Key takeaways & what you can do



TPB's Road to Resilience



2024 Risk-Based Vulnerability Assessment

Found that many of the region's transportation assets are at risk to coastal and riverine flooding using FEMA Floodplain data:

- 13.8% of roads/highway miles
- 4% of bus stops
- 6.9% of rail stops
- 39.1% of rail line miles

But that wasn't the whole story...

NATIONAL CAPITAL REGION TRANSPORTATION SYSTEM CLIMATE VULNERABILITY ASSESSMENT

May 2024



Different types of flooding

Coastal and Riverine Flooding – 2020
Route 50 flooding event in Prince George's county – within a FEMA floodplain



Route 50 flooding in Prince George's County, 2020 (WTOP News)

Different types of flooding

Sea Level Rise – King Street in Old Town Alexandria floods regularly with severe tides



Flooding in Alexandria, 2021 (Chesapeake Bay Program/[Flickr](#))



Different types of flooding

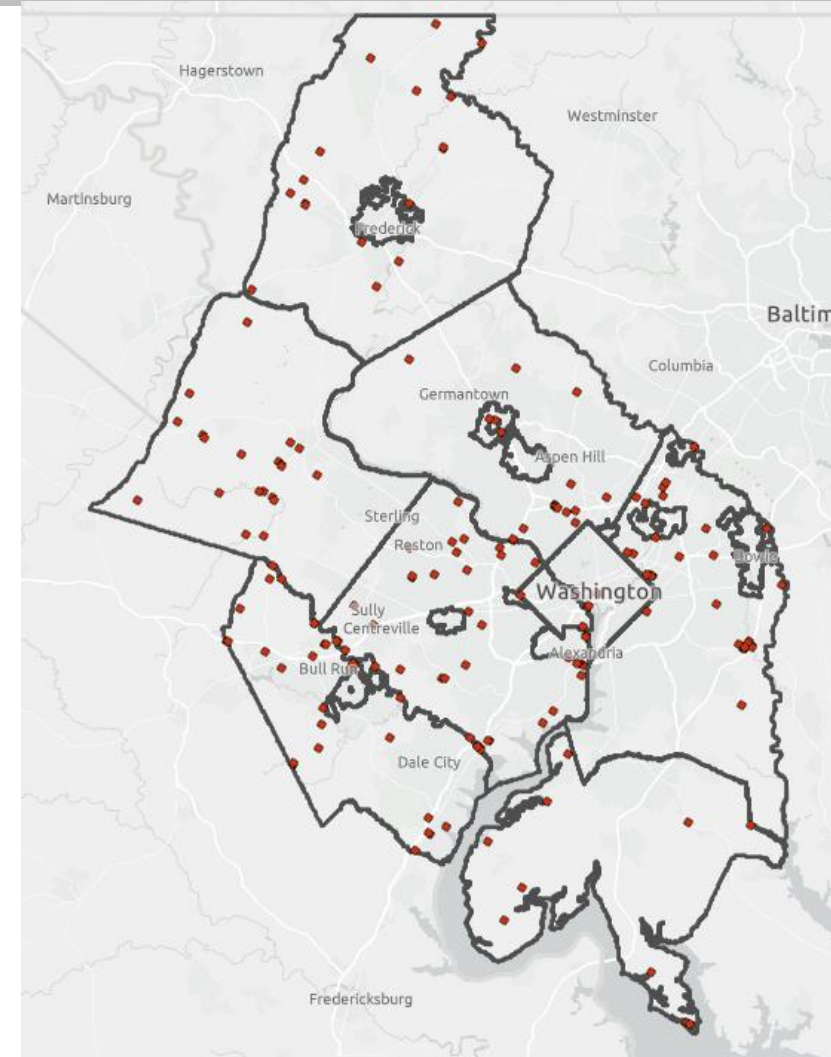
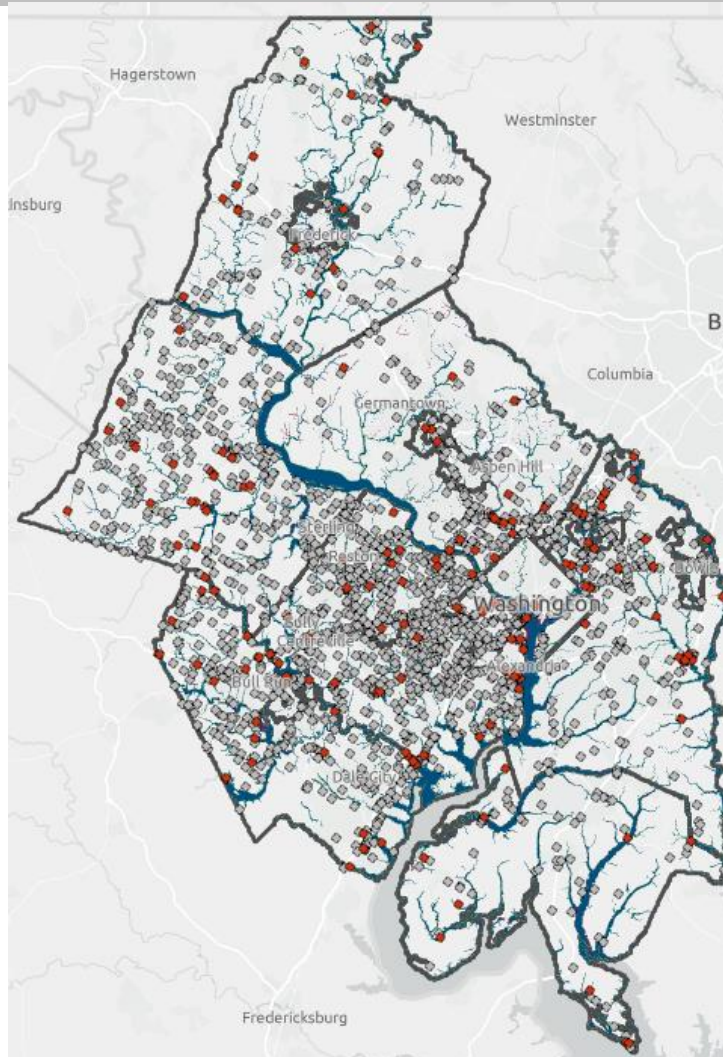
Urban Flooding – Historic flooding events at Rhode Island Ave and Bloomingdale neighborhood were *not* within FEMA floodplain



Rhode Island Ave Flooding, 2022 (WJLA)



Reported events inside/outside FEMA floodplain



Goal of the new analysis:

Improve TPB's understanding of future inland flood risk and increase the region's resilience and long-term planning.



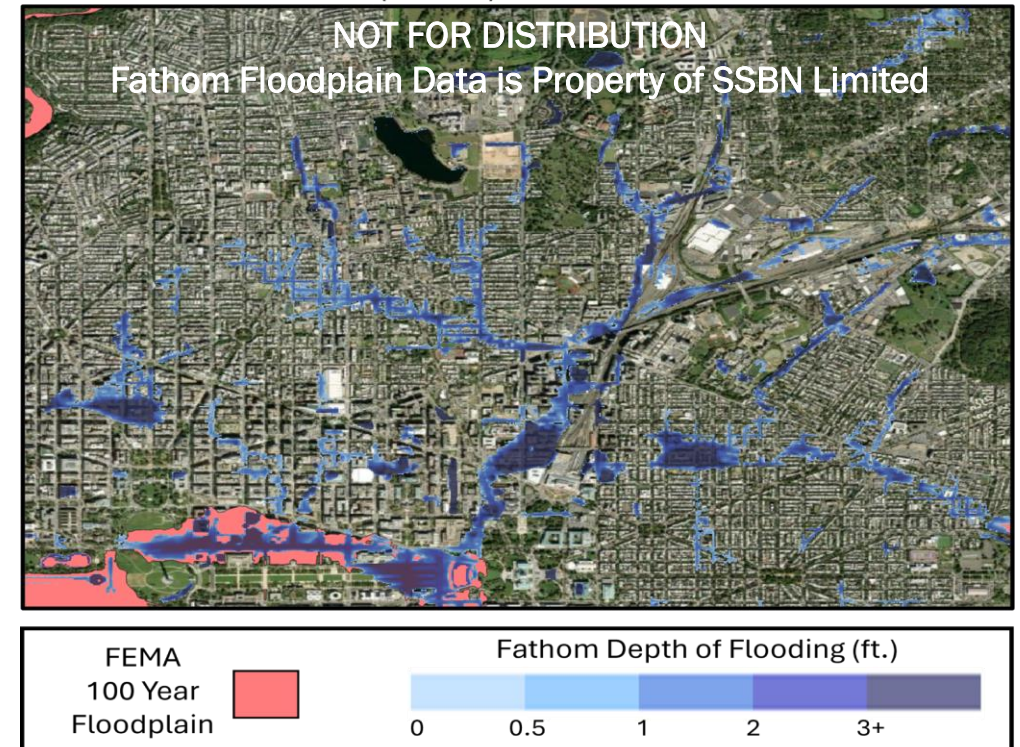
Fathom Data Selection

TPB selected the **Fathom US Flood Maps**, which:

- Better captures flood extents relative to FEMA by incorporating pluvial flooding and potential future changes in floodplain extent and depth due to heavy precipitation
- Multiple emission scenarios, return period floods, time horizons, and different flood types (e.g., pluvial and riverine)
- Nationally recognized and ready-to-use floodplain data

Fathom-informed analysis provides an additional, forward-looking understand of pluvial and fluvial flood that complements the original present-day FEMA-informed analysis.

Historical Fathom (Pluvial) vs. FEMA 1-in-100 Year Event



Spatial comparison between Historical 1-in-100-year event extents between Fathom and FEMA.



Fathom-Informed Temporary Flooding: Methodology

The Fathom-informed analysis scores exposure based on **floodplain extent** and **inundation depth**, rather than relying solely on floodplain extent.

Exposure scoring rubric for Fathom-informed temporary flooding.

Weighting	50%		50%	
Indicator	Exposure Score	Flood extent	Exposure Score	500-year flood depth
Fathom U.S. Flood Maps	3	100-year floodplain	3	>24 inches
	2	500-year floodplain	2	>12 inches
	1	500-year floodplain + differential buffer	1	>0 inches
	0	None	0	None

The 12- and 24-inches inundation depth thresholds **align with the Maryland DOT SHA vulnerability assessment and FEMA Flood Risk and Analysis guidance**

Time Horizons: 2020 (historical), 2030, 2050, 2080

Emission Scenarios: SSP2-4.5 (moderate emissions), SSP5-8.5 (high emissions)

Fathom-Informed Temporary Flooding: Risk Methodology

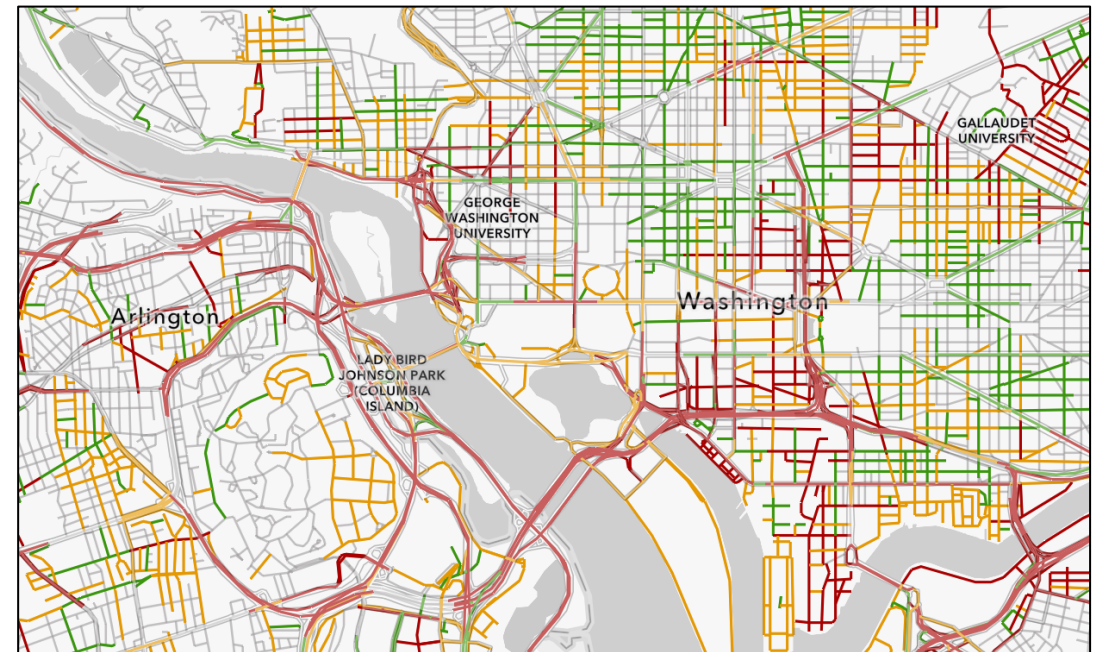
The Fathom-informed analysis used the same risk calculation used in the vulnerability assessment:

- **Exposure indicator:** Hazard Exposure (70% weighting)
- **Criticality indicator:** MWCOG Equity Emphasis Areas, Functional Classification, Detour Length (30% weighting)

Assets are classified as having **high**, **medium**, **low**, or **no risk**.

Assets: Roads and highways, bus stops, rail stops, and rail lines

Screenshot from Mapping Tool demonstrating risk score categories



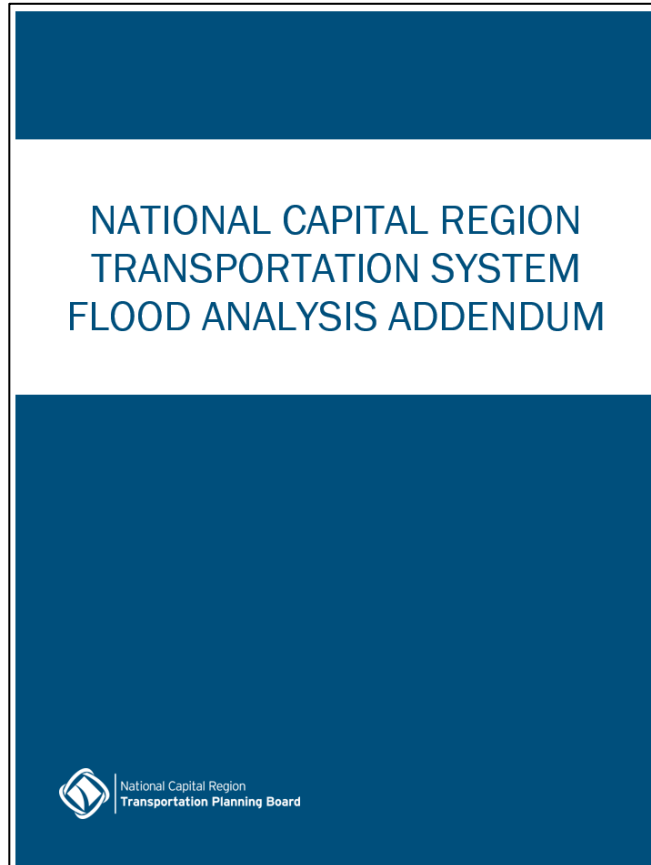
ANALYSIS RESULTS



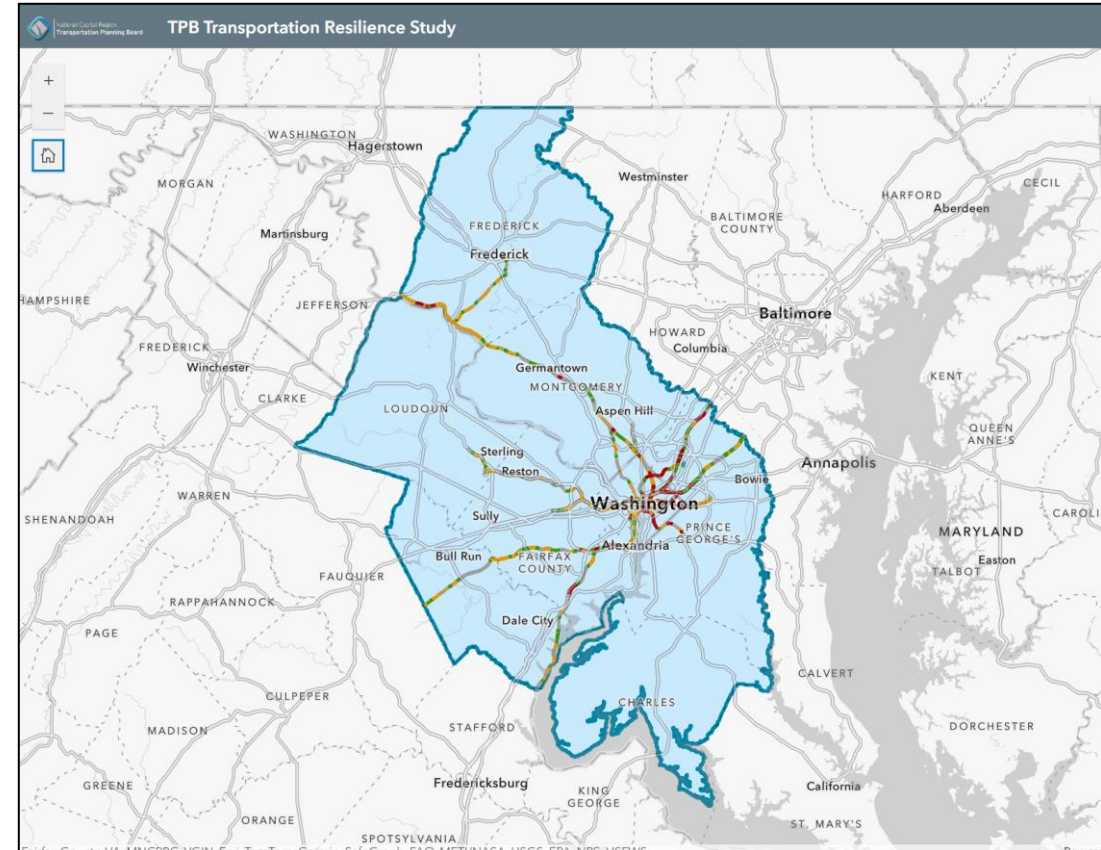
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Analysis Products

Flood Analysis Addendum



Regional Interactive Resilience Mapping Tool Update



Key Takeaway

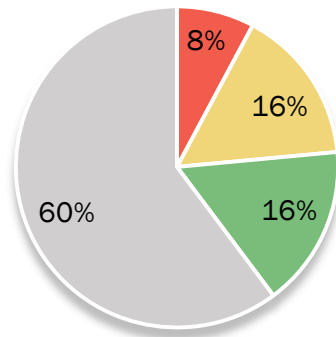
More transportation assets are at risk to temporary flooding based on the Fathom-informed analyses relative to the FEMA-informed analysis across historical and future time horizons.

Percent change in exposed assets identified in the 2020 Fathom-informed analysis compared to the FEMA-informed analysis

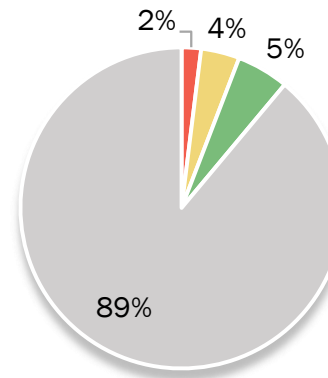


Risk score distribution for 2050 Fathom-informed analysis

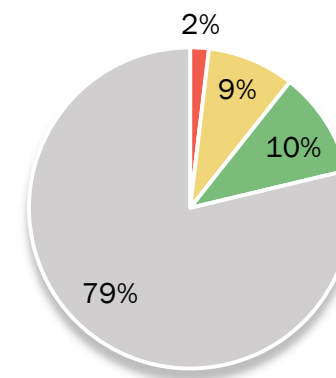
Roads and Highways (miles)



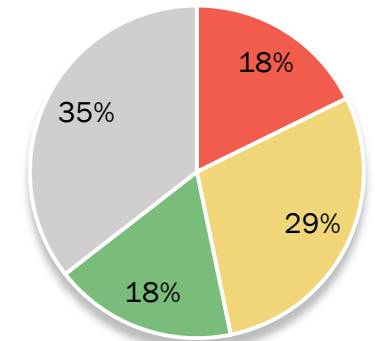
Bus Stops



Rail Stops



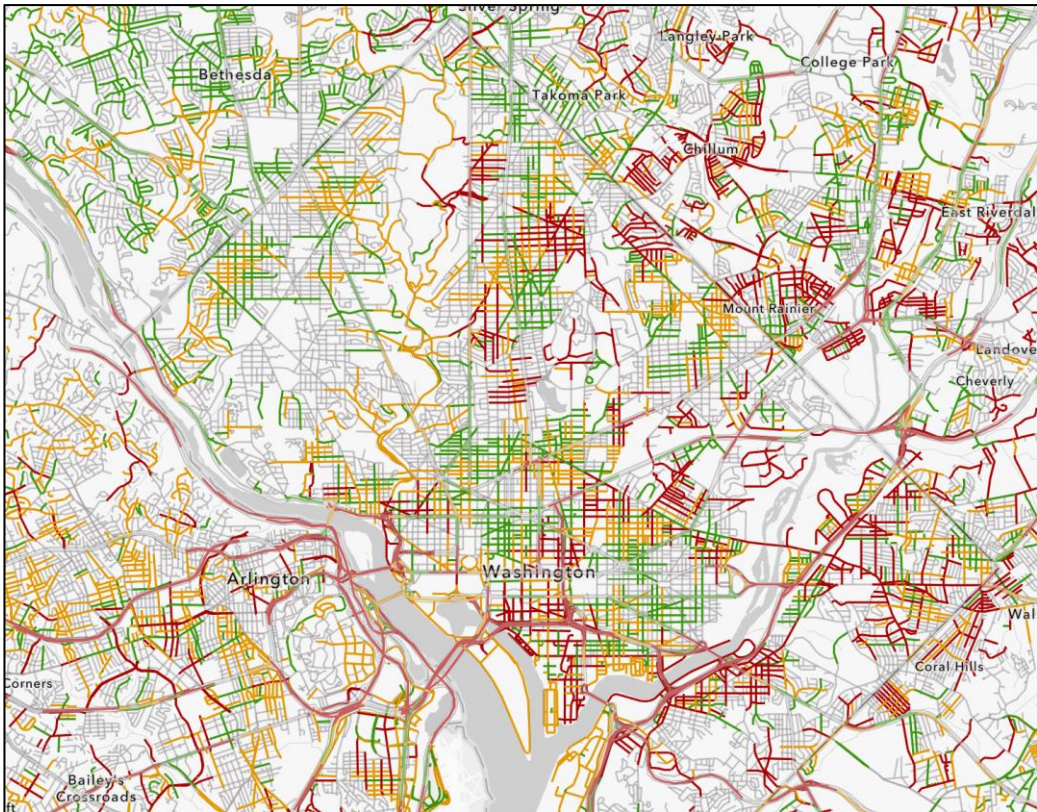
Rail Line (miles)



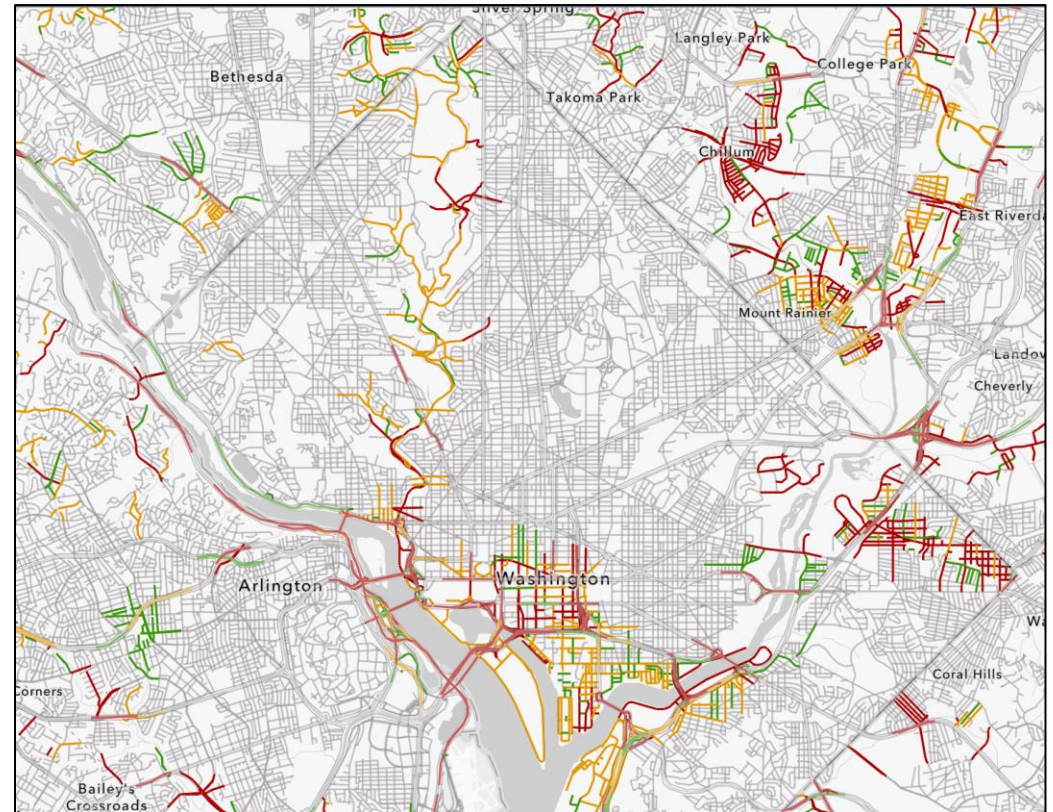
Road and Highway

Fathom-informed analysis identified **38%** of road and highway miles at risk in 2020, compared to 14% in FEMA-informed analysis.

Fathom-informed SSP2-4.5 2020



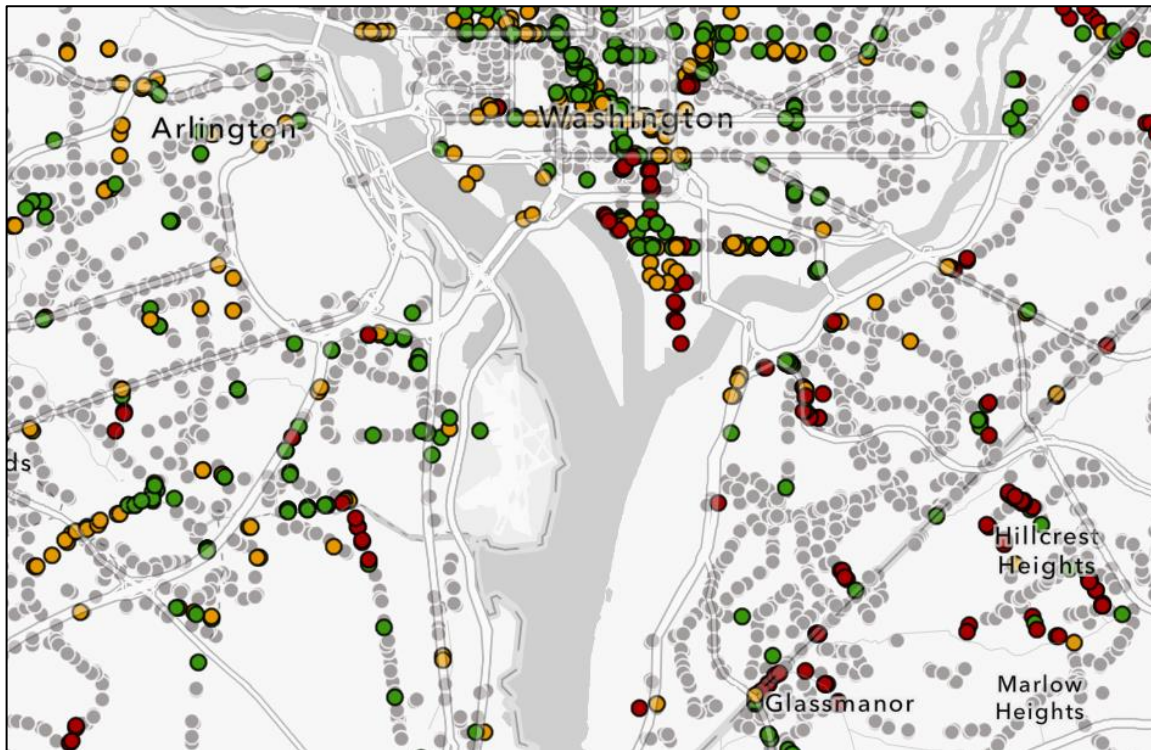
FEMA-informed



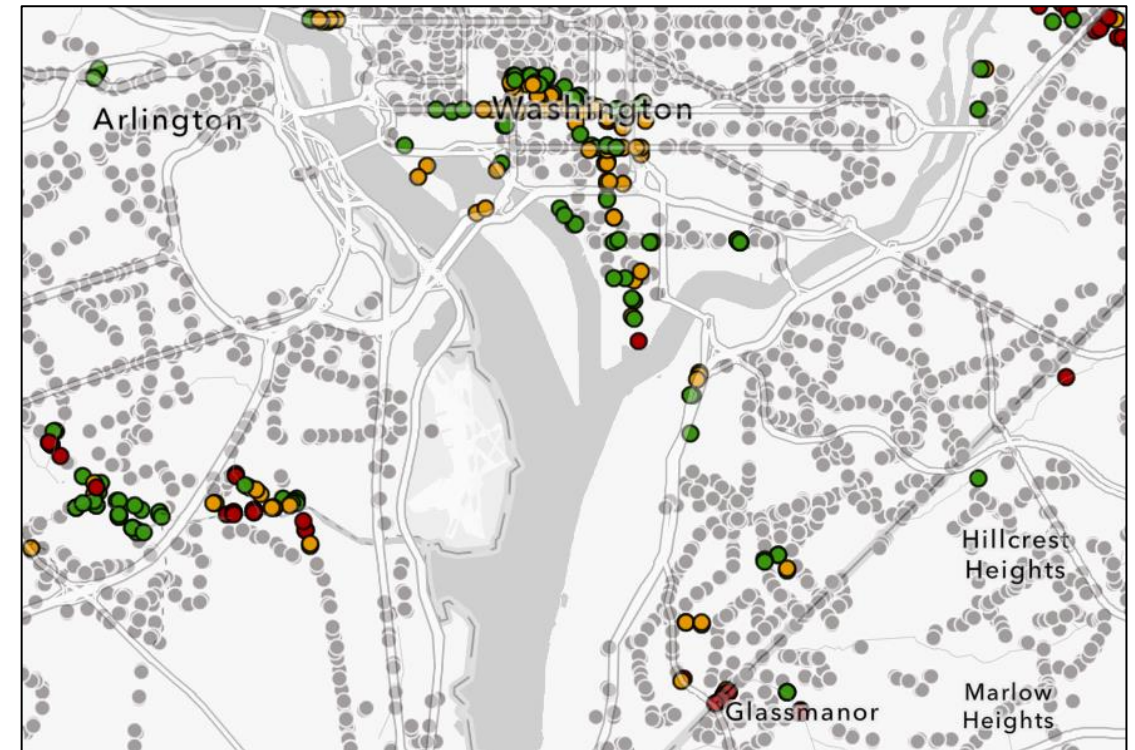
Bus Stops

Fathom-informed analysis identified **11% of bus stops at risk in 2020**, compared to 4% in the FEMA-informed analysis.

Fathom-informed SSP2-4.5 2020



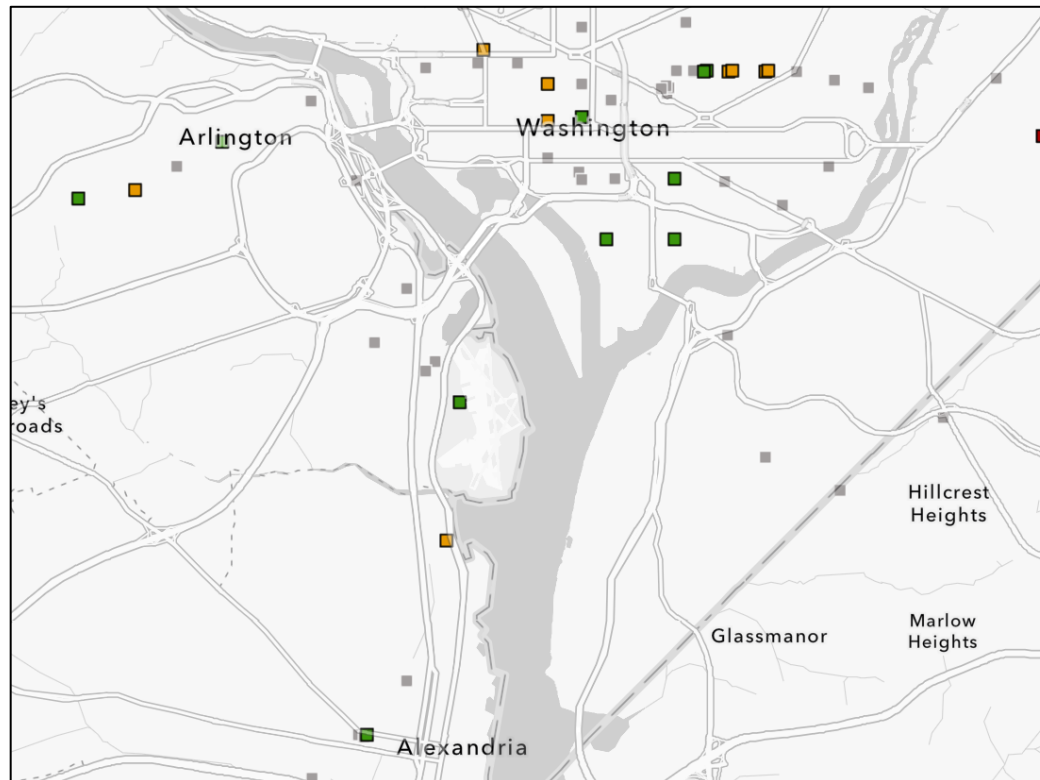
FEMA-informed



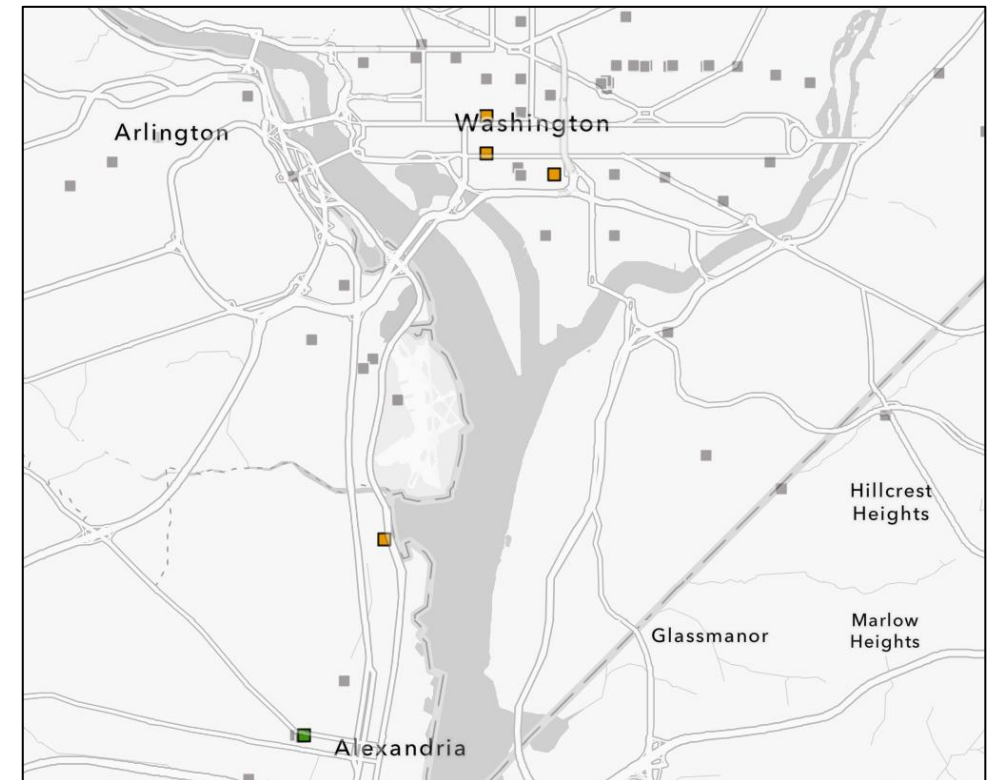
Rail Stops

Fathom-informed analysis identified **21% of rail stops at risk in 2020**, compared to 7% in the FEMA-informed analysis.

Fathom-informed SSP2-4.5 2020



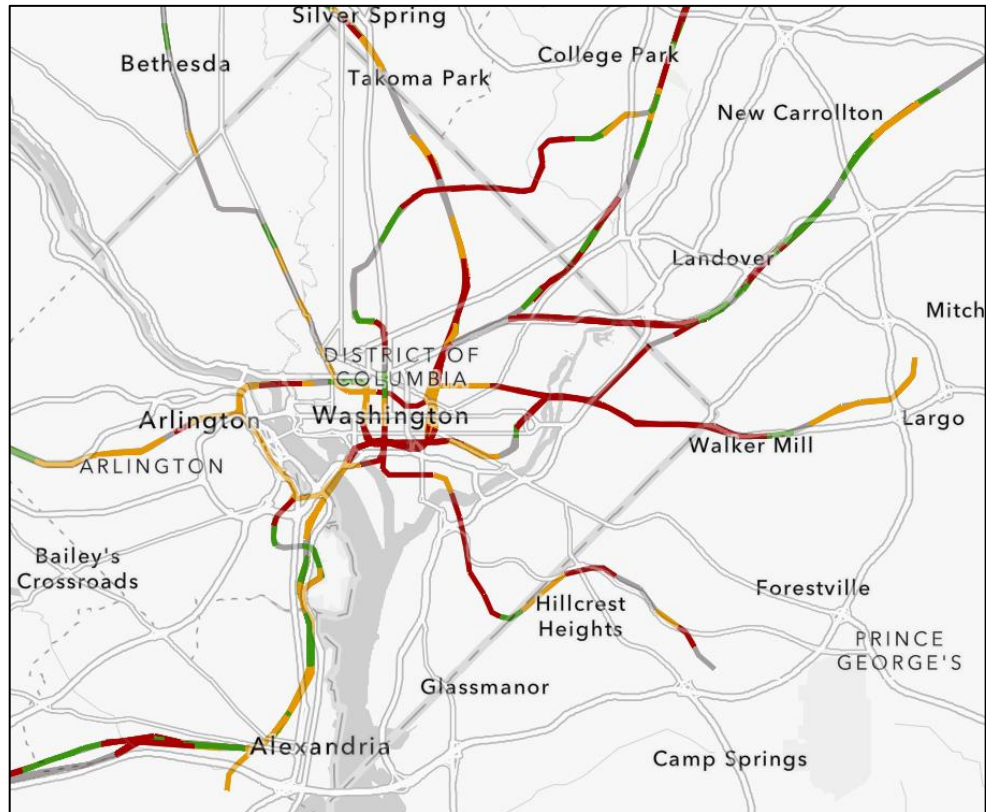
FEMA-informed



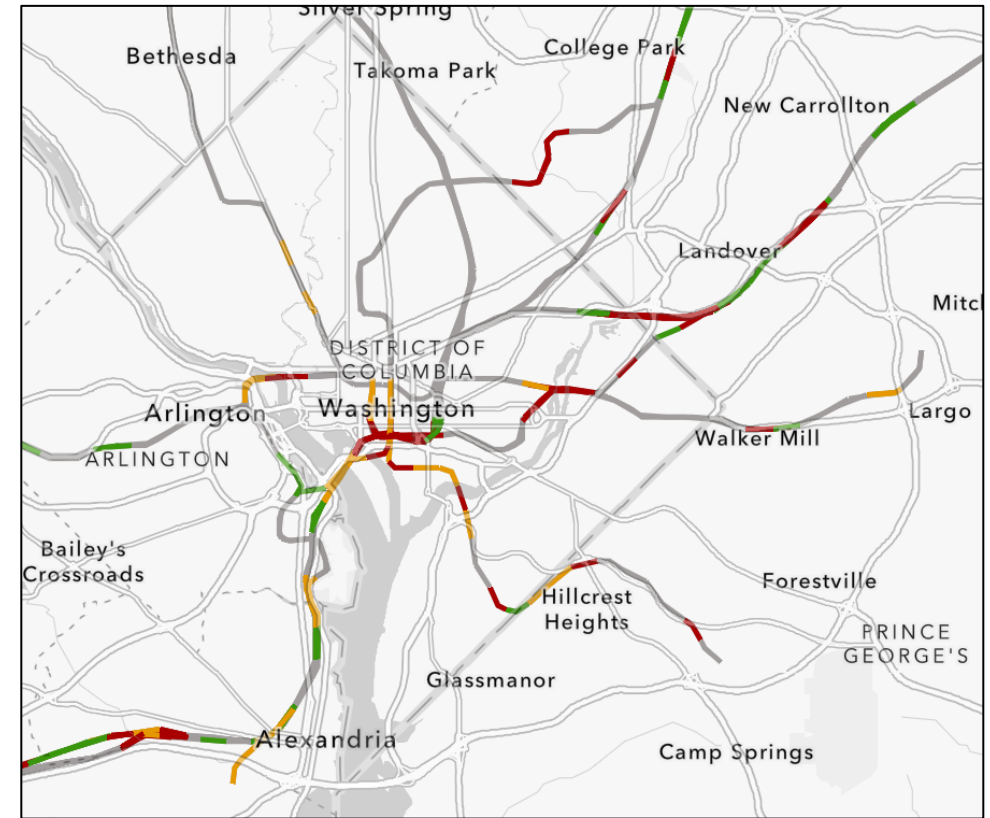
Rail Lines

Fathom-informed analysis identified **64% of rail line miles at risk in 2020**, compared to 39% in the FEMA-informed analysis.

Fathom-informed SSP2-4.5 2020



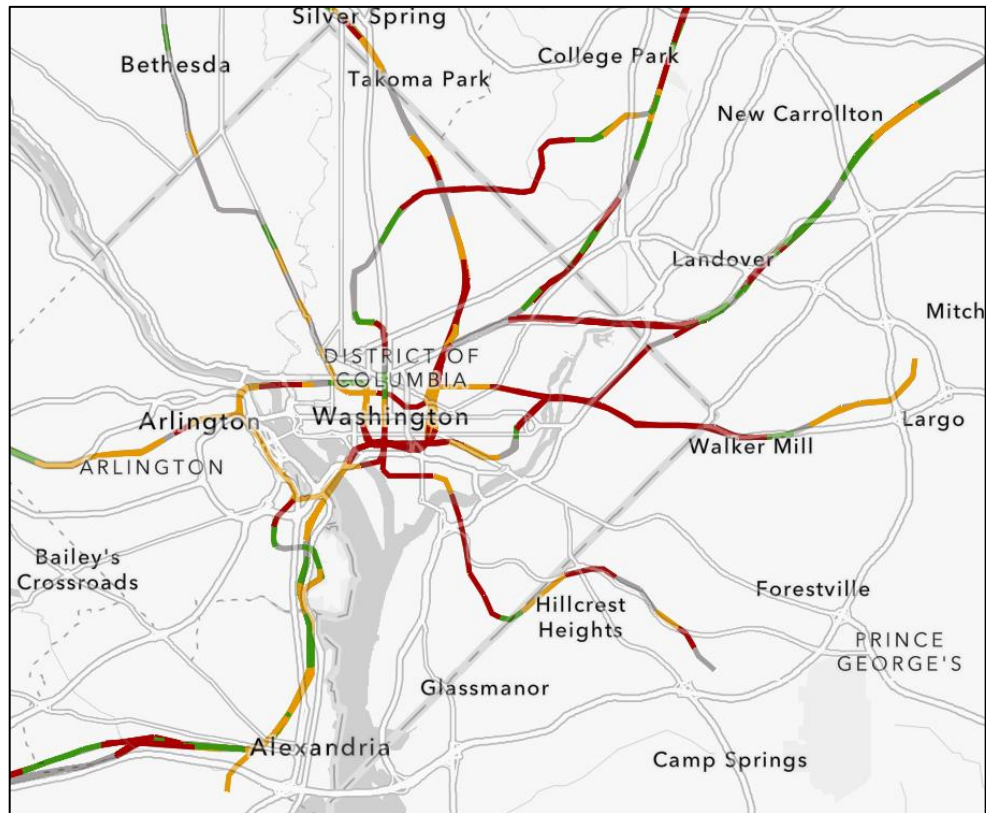
FEMA-informed



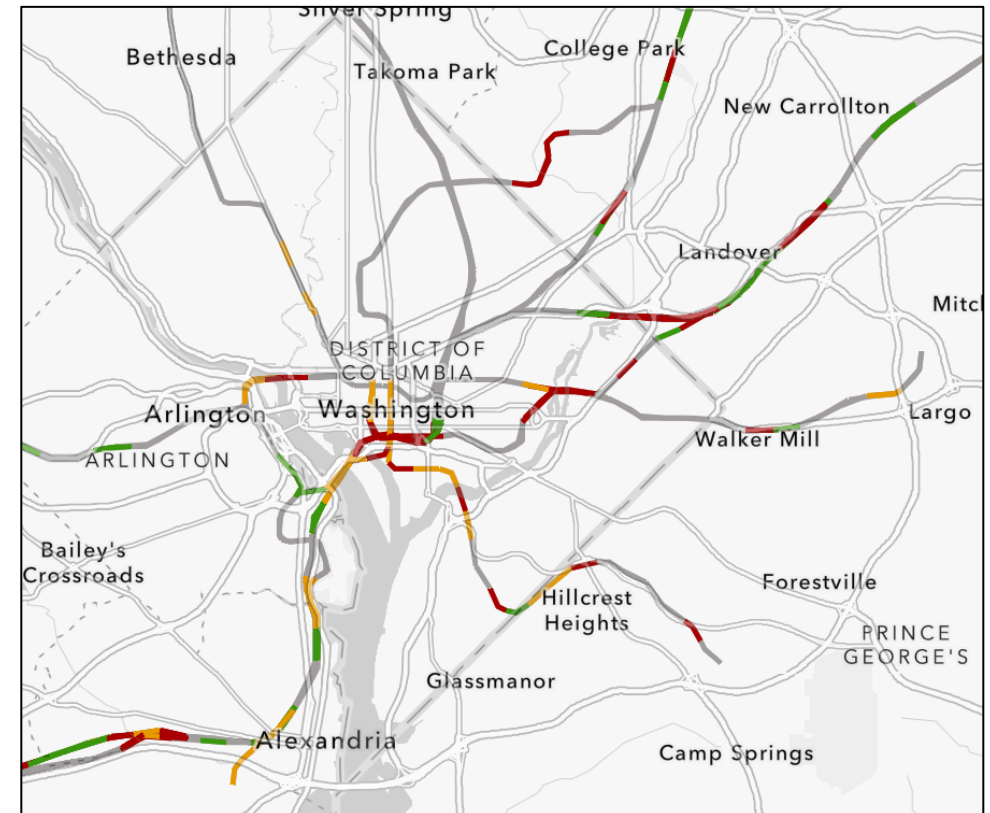
Rail Lines

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Fathom-informed SSP2-4.5 2020



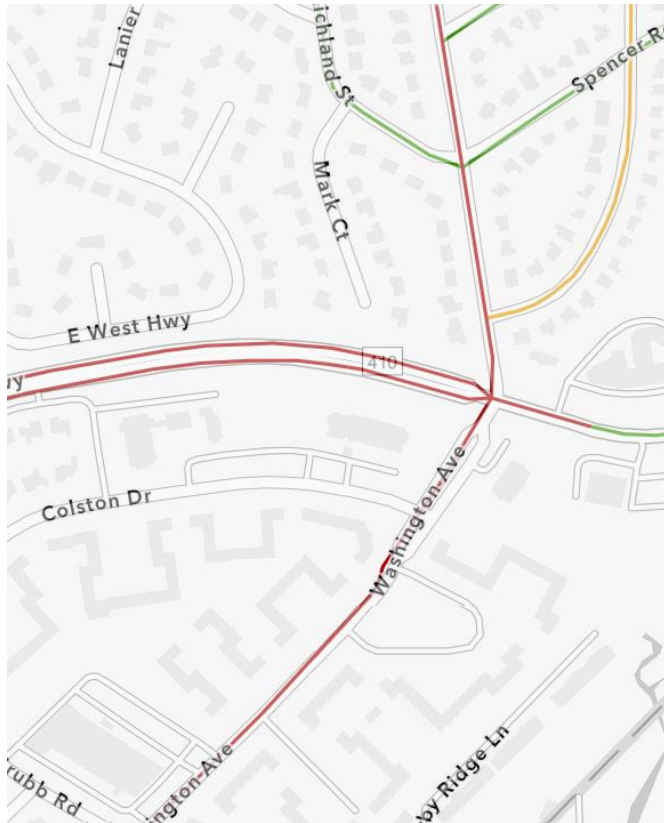
FEMA-informed



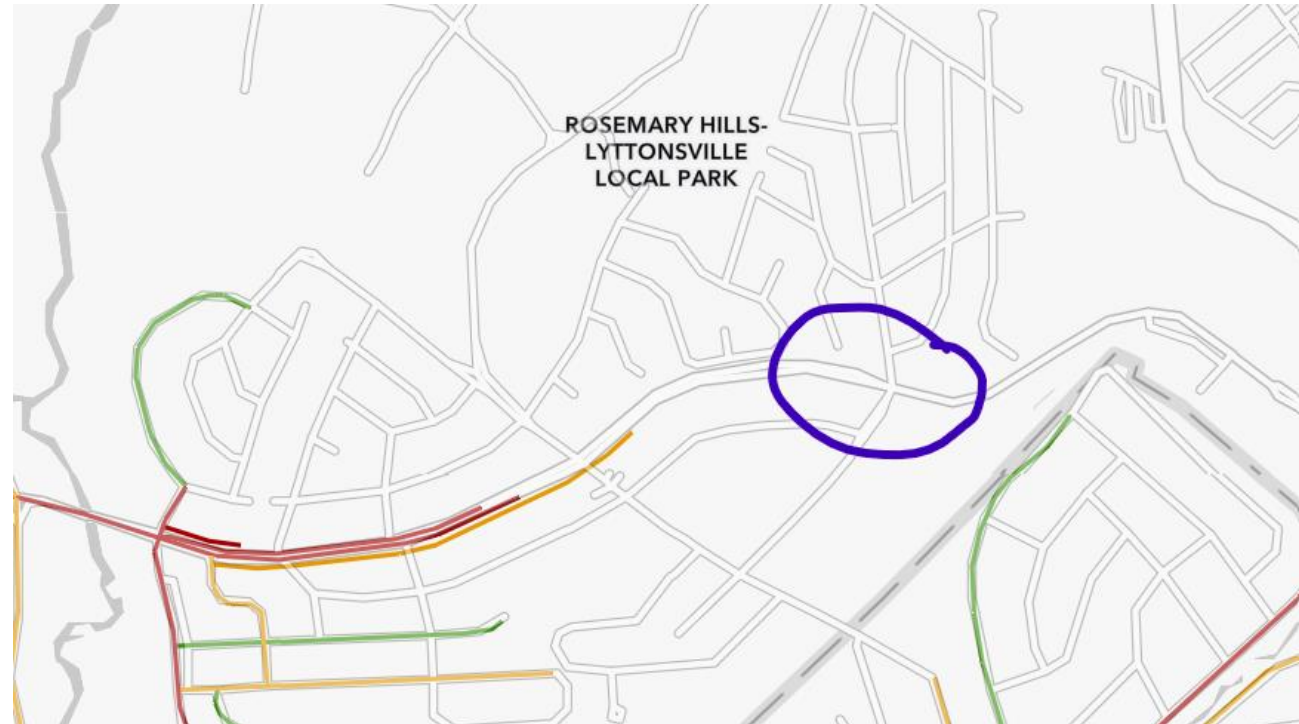
Example from July 19, 2025

Intersection of East-West Highway and Sundale Drive in Silver Spring MD (Montgomery County)

Fathom-informed SSP2-4.5 2020



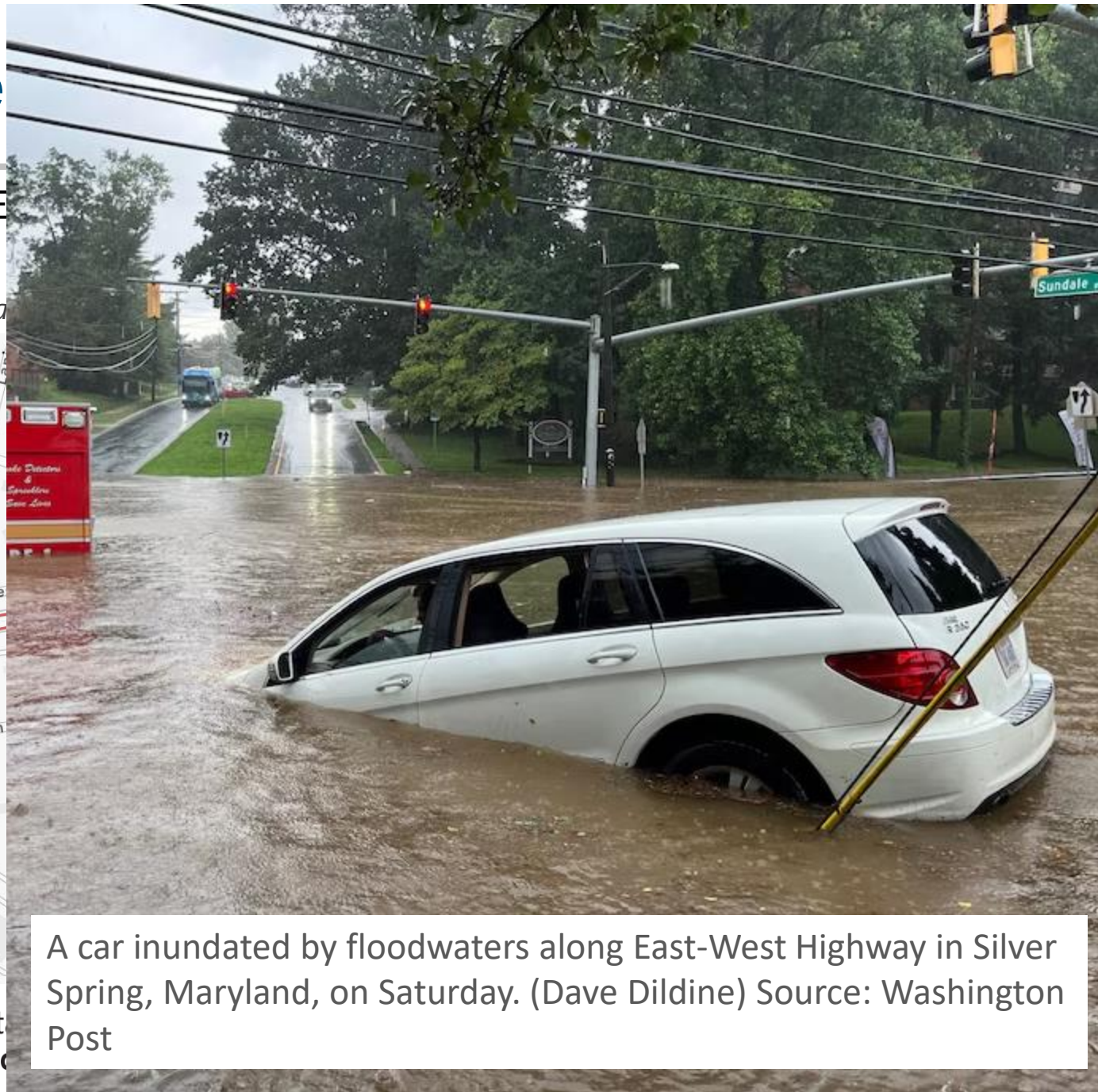
FEMA-informed



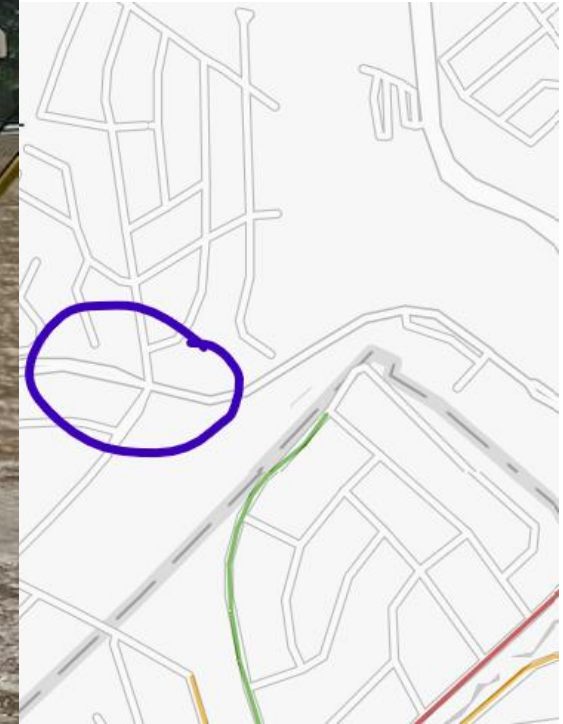
Example

Intersection of E

Montgomery County)



formed



A car inundated by floodwaters along East-West Highway in Silver Spring, Maryland, on Saturday. (Dave Dildine) Source: Washington Post

Updated Mapping Tool

The Mapping Tool is updated with the Fathom-informed temporary flooding analysis, with the following scenarios:

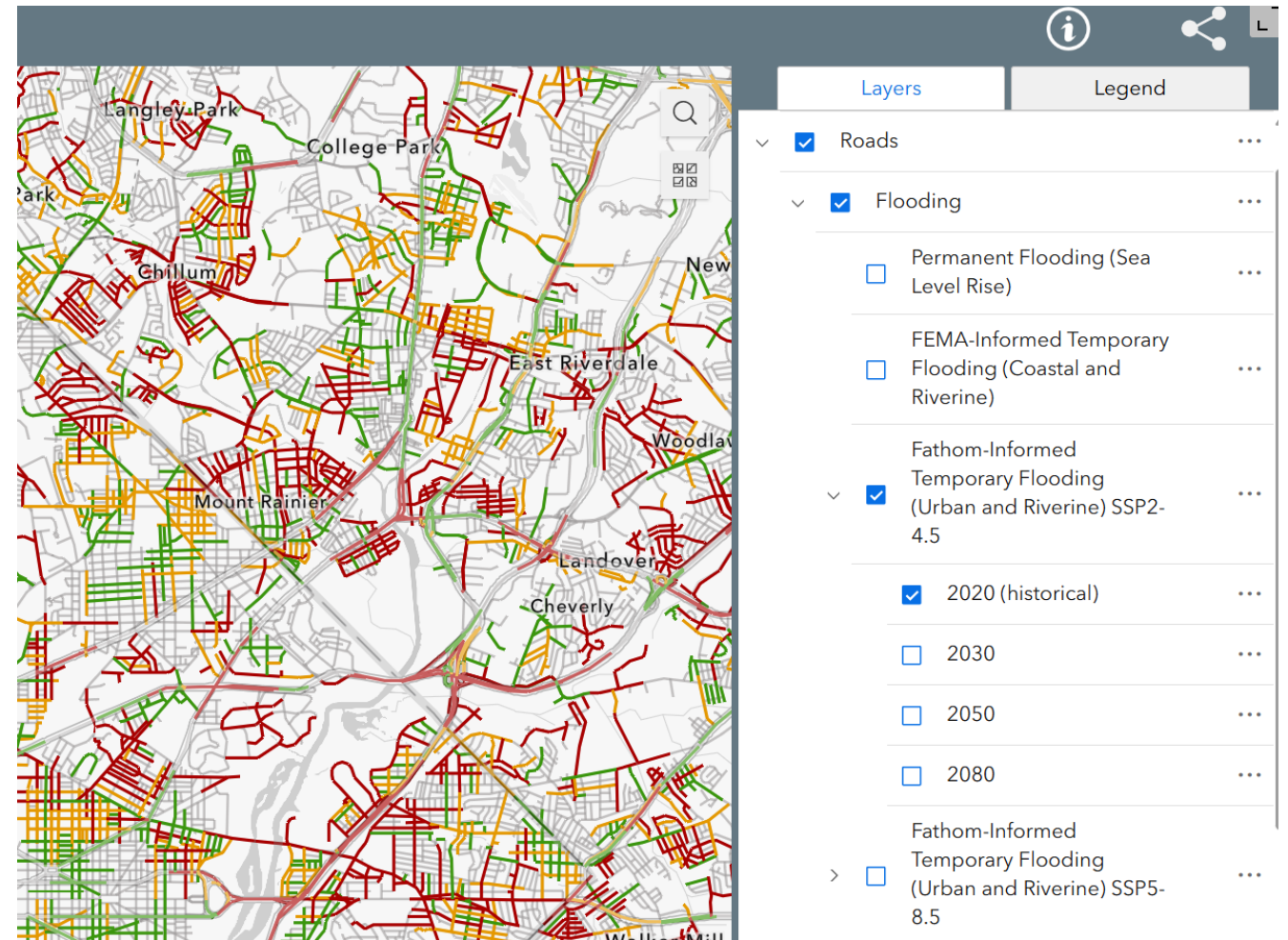
- SSP2-4.5
 - 2020 (historical)
 - 2030
 - 2050
 - 2080
- SSP5-8.5
 - 2020 (historical)
 - 2030
 - 2050
 - 2080

[TPB Mapping Tool](#)



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Example of the updated selection panel



Final Takeaways

This updated temporary flooding analysis provides:

Enhanced Flood Risk Insights: Fathom-informed inland flood modeling provides a more comprehensive understanding of total flood risk for transportation infrastructure in TPB's service area, complementing existing FEMA-informed flood data.

Long-Term Planning Support: Empowers planners to evaluate resilience investments and transportation projects across multiple future scenarios and planning horizons.

Bolstered Regional Resilience: Strengthens the region's overall preparedness and ability to adapt to future inland flooding challenges.



How can you use this analysis?

- Be aware that more assets than just those in FEMA Floodplains may be at risk to flooding, and spread awareness (educational campaign, press, etc.)
- Use tool as a resource when prioritizing funding for infrastructure maintenance
- Use tool as a resource when opportunities arise to go after additional funding for new projects, better specificity about vulnerability for grant applications
- Reach out to TPB with any questions or a more in-depth presentation or discussion of findings or how to use the tool
- CEEPC – do you have any ideas for me on how we can use this?

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ADDITIONAL SLIDES



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