Evaluation of National Weather Service Flood Inundation Mapping for Operational Use

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Why Evaluate Ahead of Time?

- *From **early evaluation** of the available NWS FIM, we have **identified errors and fixes** which have been **implemented ahead of high water events.***

- *Early evaluation also allows for **confidence to be assessed** ahead of high water events*
  - *If **Static NWS FIM** (ex: Categorical FIM [CatFIM]) struggles, **Dynamic NWS FIM** (ex: RFC/NWM 5-Day FIM) will also **have the same shortcomings***
  - *If Static FIM **verifies** ahead of time, **increased confidence** can be placed in the Dynamic NWS FIM **during high flow events***

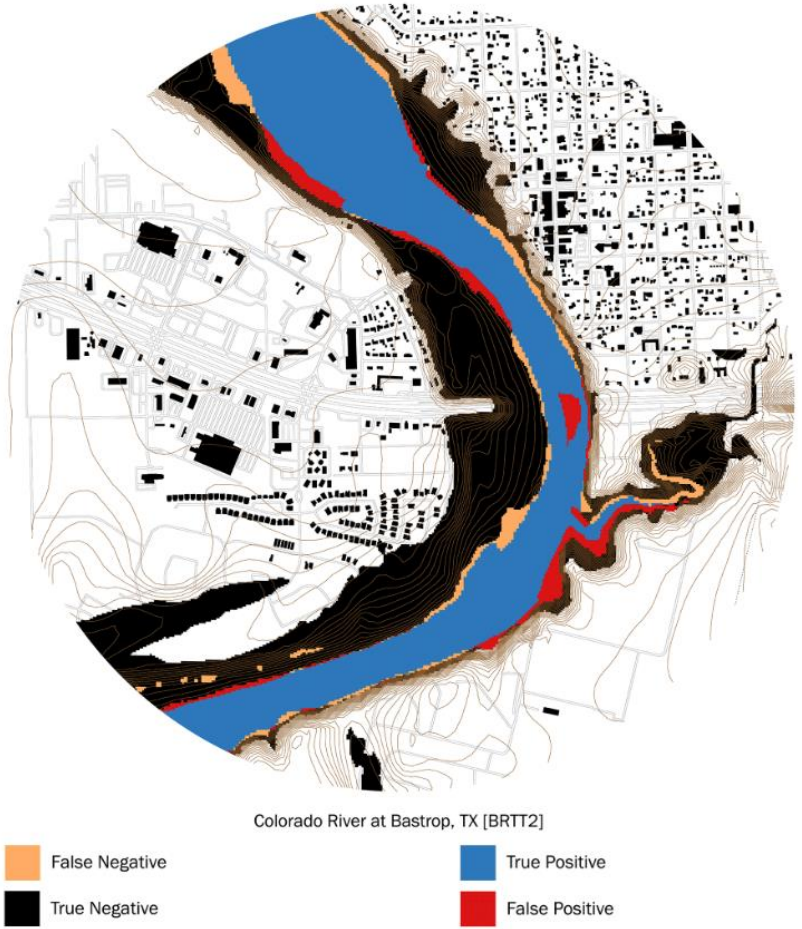
- *Evaluating ahead of public roll out allows for **more constructive partner communication.** The ability to **identify strengths and weaknesses** reduces the guess work for partners upon introduction.*

Evaluation Methods

FIM Performance

- Automated process of comparing HAND FIM to established benchmarks
- Benchmarks include:
  - **AHPS FIM Libraries**
    - **Best-available FIM from NWS**
  - FEMA Base Level Engineering (BLE)
  - RAS2FIM
- Calculate Contingency Statistics
  - POD, FAR, CSI, etc.

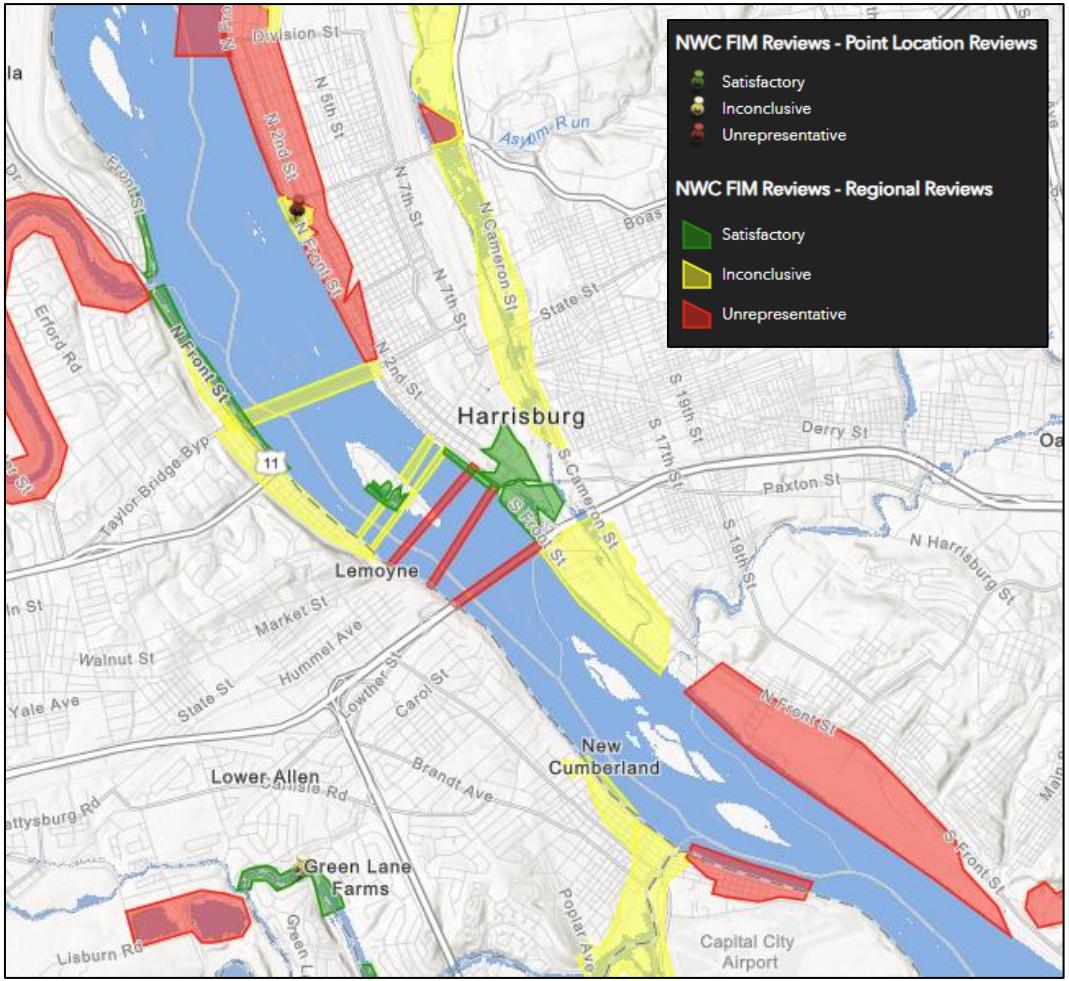
Contingency Table		Benchmark	
		Wet	Dry
Predicted	Wet	True Positive	False Positive
	Dry	False Negative	True Negative



Evaluation Methods

Manual Review

- Refer to prior flood history to assess HAND FIM accuracy
- NWS Impact Statements
- FEMA NFHL Maps
- Flood photos, videos, imagery
- Among others…



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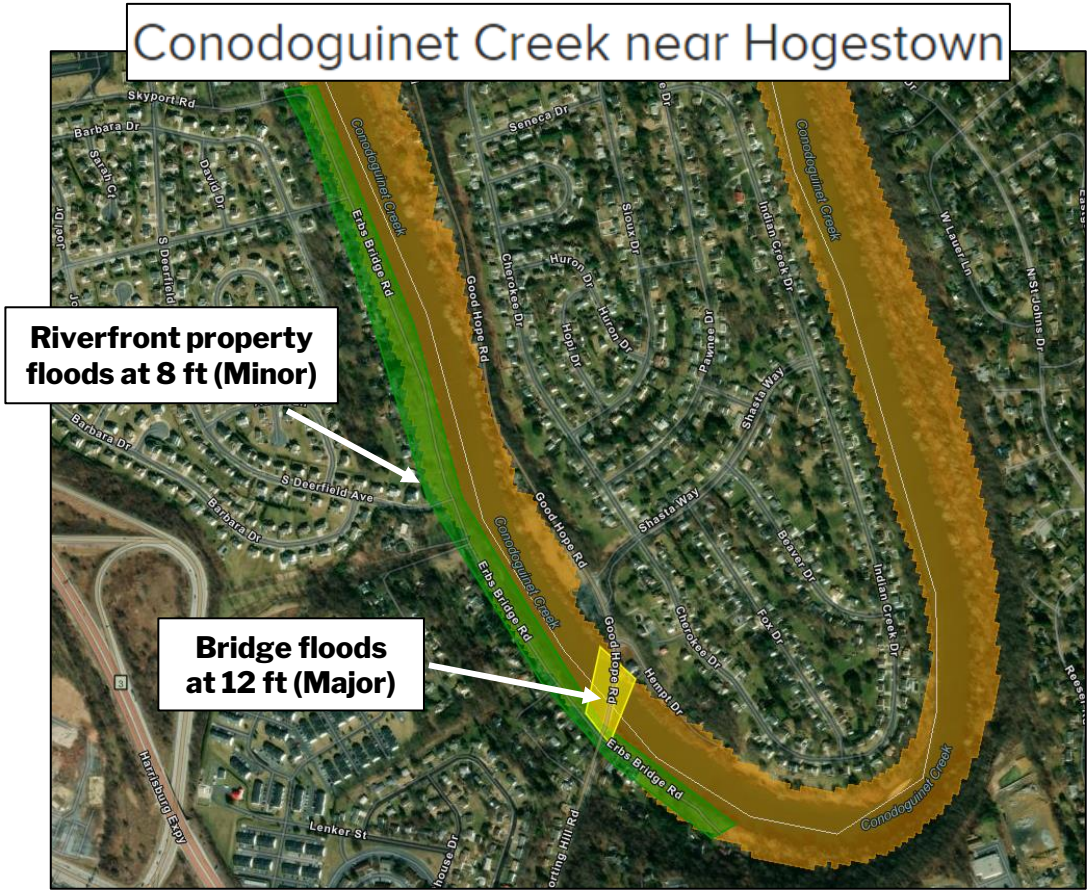

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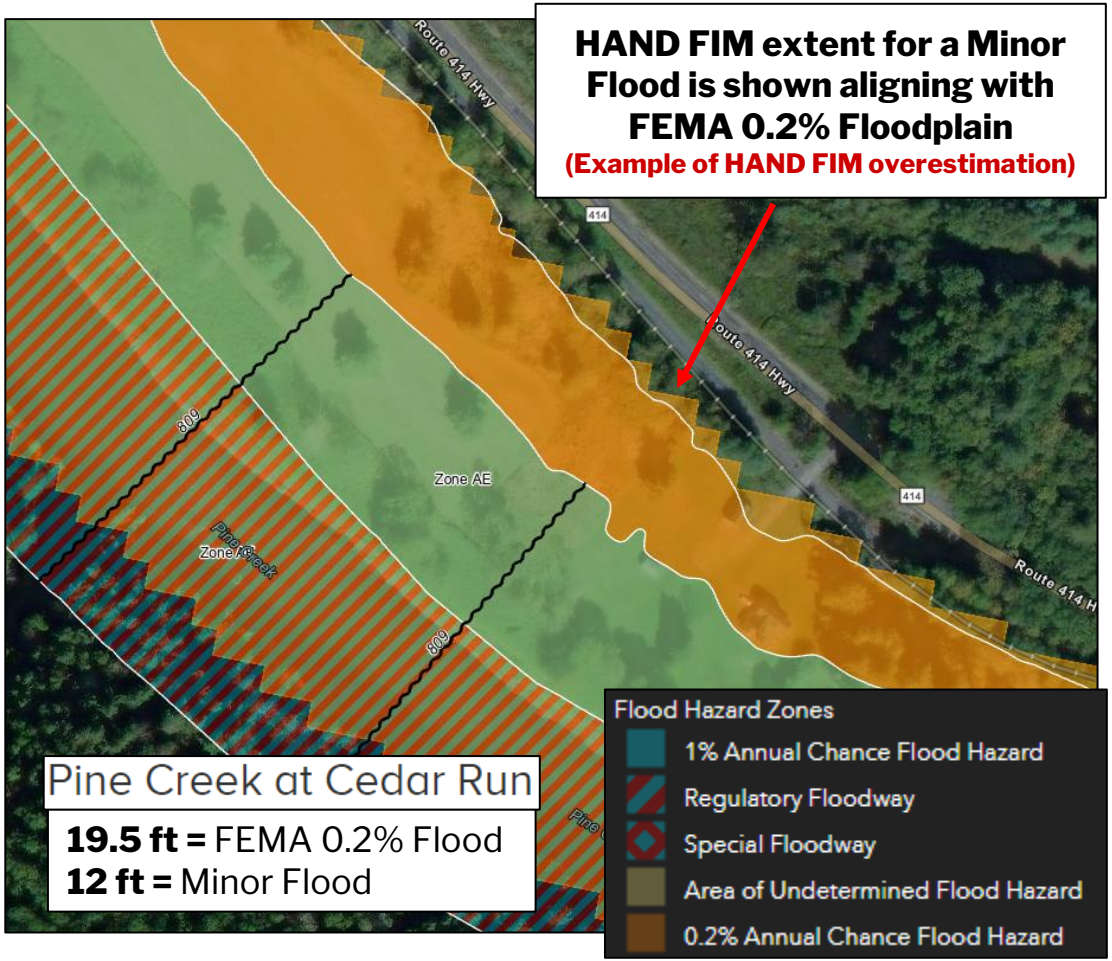

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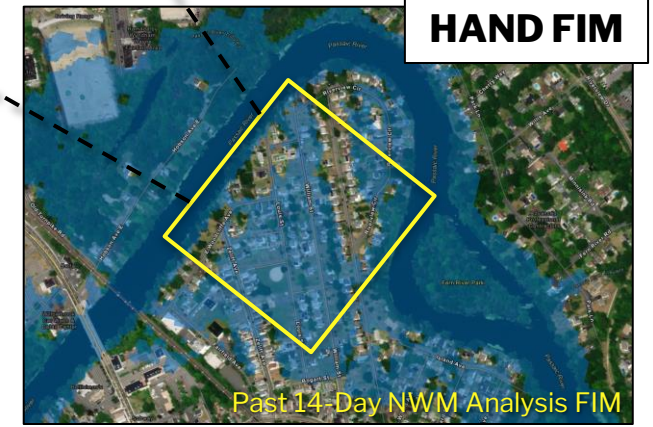
WABC-TV
Dec 20, 2023



HAND FIM

Evaluation Results

- Leverage **local knowledge** of flood history to appraise the **confidence** in **HAND FIM output**
- **Complete reviews** for priority river locations and **share the findings:**
  - Communicate to **FIM developers** to pursue fixes
  - Communicate to **field forecasters** for providing partner decision support services

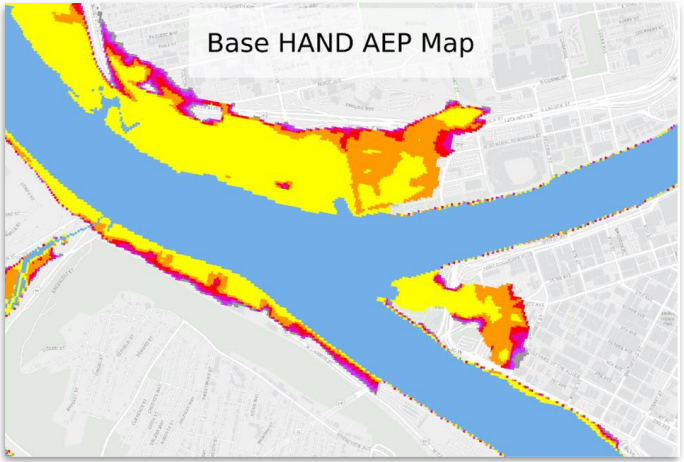
FIM Reviewer Dashboard

MARFC HAND FIM Quality Table

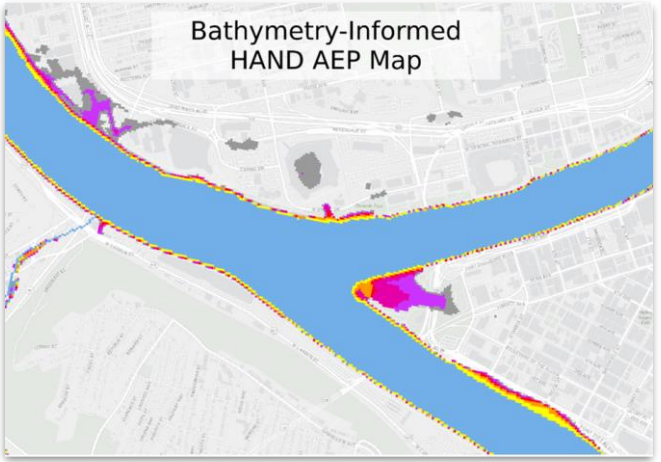
WFO	Location	State	NWSLI	HAND FIM Quality	
CTP	Hershey	PA	HERP1	Good Overall	very slightly underpredicting flooding of properties in se including near Sand Beach and in the Derry Township possibly due to omission of contributions from smaller matches nicely at Moderate, including in some areas w underpredicting.
CTP	Hogestown	PA	HGSP1	Good Overall	Good inundation depiction overall at Moderate and Abo Action/Minor). Matches AHPS impacts and aligns with backwater is seen along tributaries, which should be ig between flood stages due to confined floodplain (even nearly overlap). Use AHPS FIM for backwater effects f use CatFIM for lower portions of Conodoguinet Creek, HAND artifact from Harrisburg.
BGM	Hale Eddy	NY	HLEN6	Do Not Use, Serious Issues	Compared to stage based, it inundates more at major- areas. However, it significantly overinundates at action issues on the right bank in Deposit.
CTP	Harper Tavern	PA	HTVP1	Good Overall	Use AHPS FIM here. Missing Record CatFIM, otherwis nicely with AHPS FIM in most cases. Some minor devi underprediction of flooded homes at Major near Valley Road (marked on FIM Reviewer). There are a few catc overall depiction looks good. Flow-Based is overpredic as usual (Stage-Based looks better at Action/Minor).

“Pittsburgh” Effect - A Success Story

- **Initial HAND FIM overpredicted** inundation in downtown Pittsburgh
  - DEM did not represent in-channel area due to artificially-elevated navigational pool
- **Early evaluation caught the issue**
  - More accurate bathymetry was inserted, allowing for a more reliable FIM representation



Before



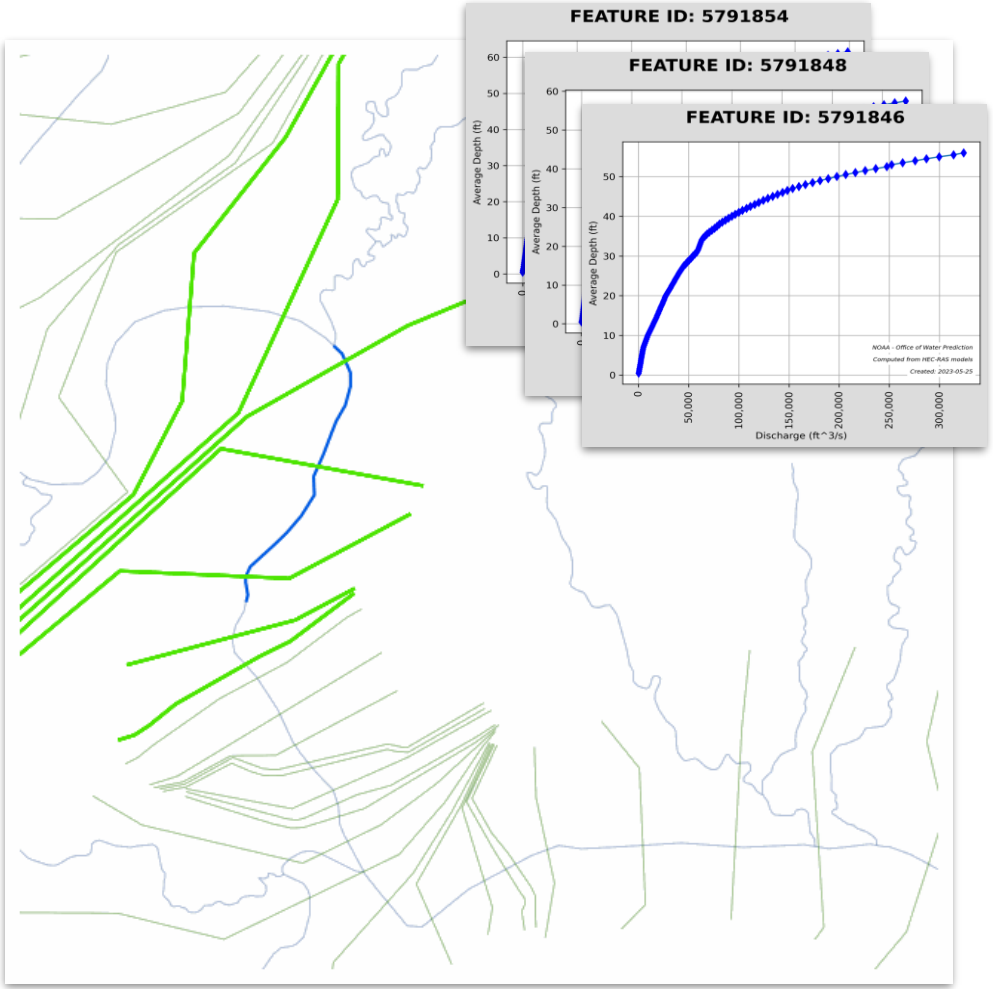
After

RAS2FIM brings more Help to Same Issues

Hydraulic Modeling could prove invaluable for complex hydrologic situations

While the **HAND method has proven valuable** due to low computational power needed, HAND is **not applicable** to some areas with **complex hydraulics.**

Using **HEC-RAS Hydraulic modeling** is a better method for these complex situations including backwater, reservoir operations, and navigation influences (Locks & Dams)



A Coordinated Roll Out

FIM Evaluation creates collaborative opportunities with other Local, State and Federal partners.

Pennsylvania Silver Jackets project proposal seeks interagency funding in support of….

- Educational/Outreach Support
- Map Product Verification/Validation
- Field Data Collection
- Community Prioritization for Analysis
- Support for Additional Modeling

Just the Beginning!

NWS FIM is rapidly advancing

- Thanks to NWS FIM Development Team and collaborators
- FIM as a forecast and flood impacts communication tool has a promising future

Thank You!

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