Hydrodynamic Modeling of New Year Creek at FM 1155

Presented on 1 May 2025 by Jon Nelson to USGS and UT Austin
as part of the Flood Assessment System for TxDOT

Augmented by David Maidment, 7 May 2025

New Year Creek at FM 1155

Static nwm flowlines: New Year Creek

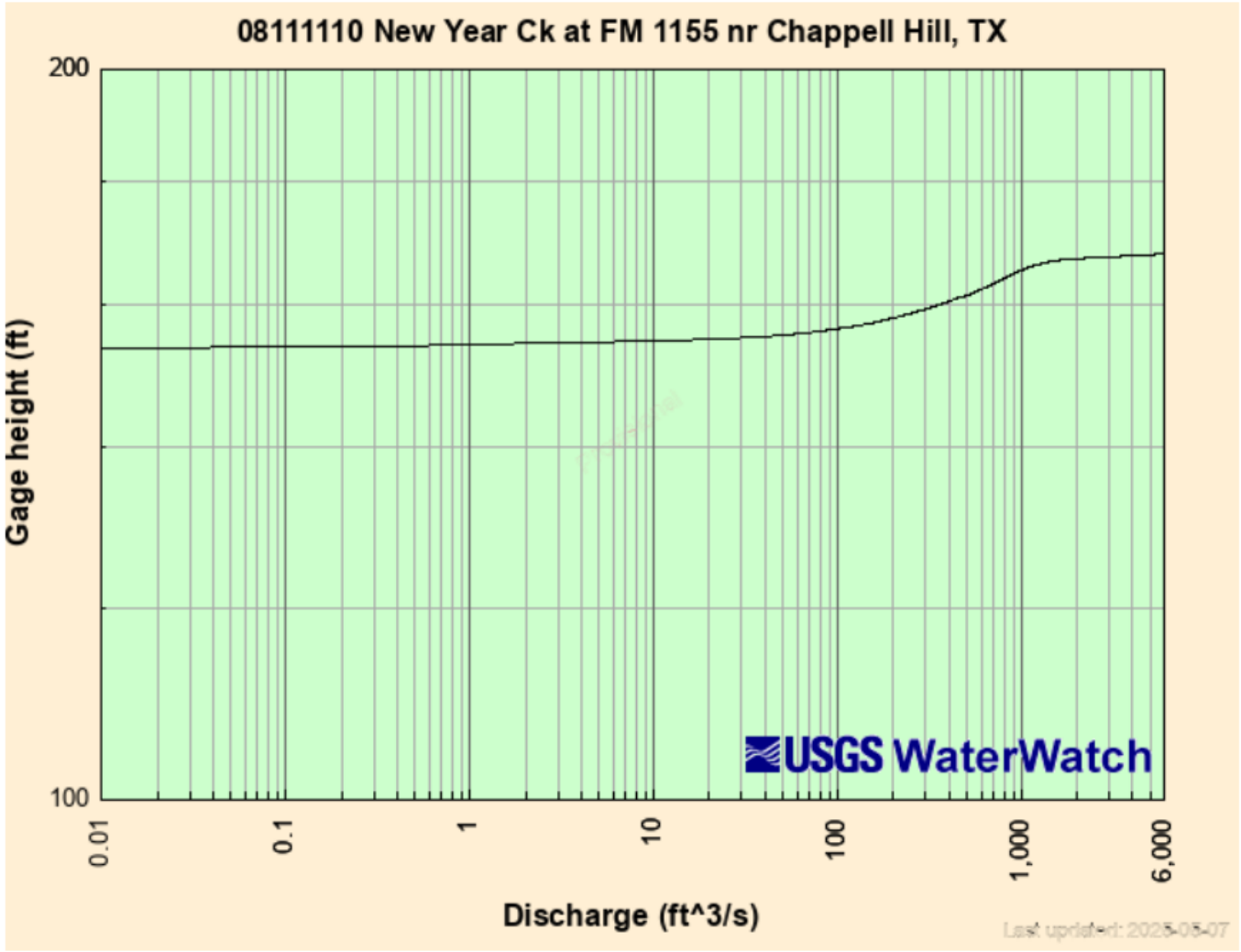
Table Zoom to

Name	New Year Creek
10% Streamflow (cfs)	15,528.06
2% Streamflow (cfs)	63,158.31
20% Streamflow (cfs)	7,302.87
4% Streamflow (cfs)	35,966.20
50% Streamflow (cfs)	1,875.40
High Water Threshold (cfs)	3,313.78

Flows from 1875 cfs to 63,158 cfs expected here, high water threshold = 3314 cfs

Current Rating Curve

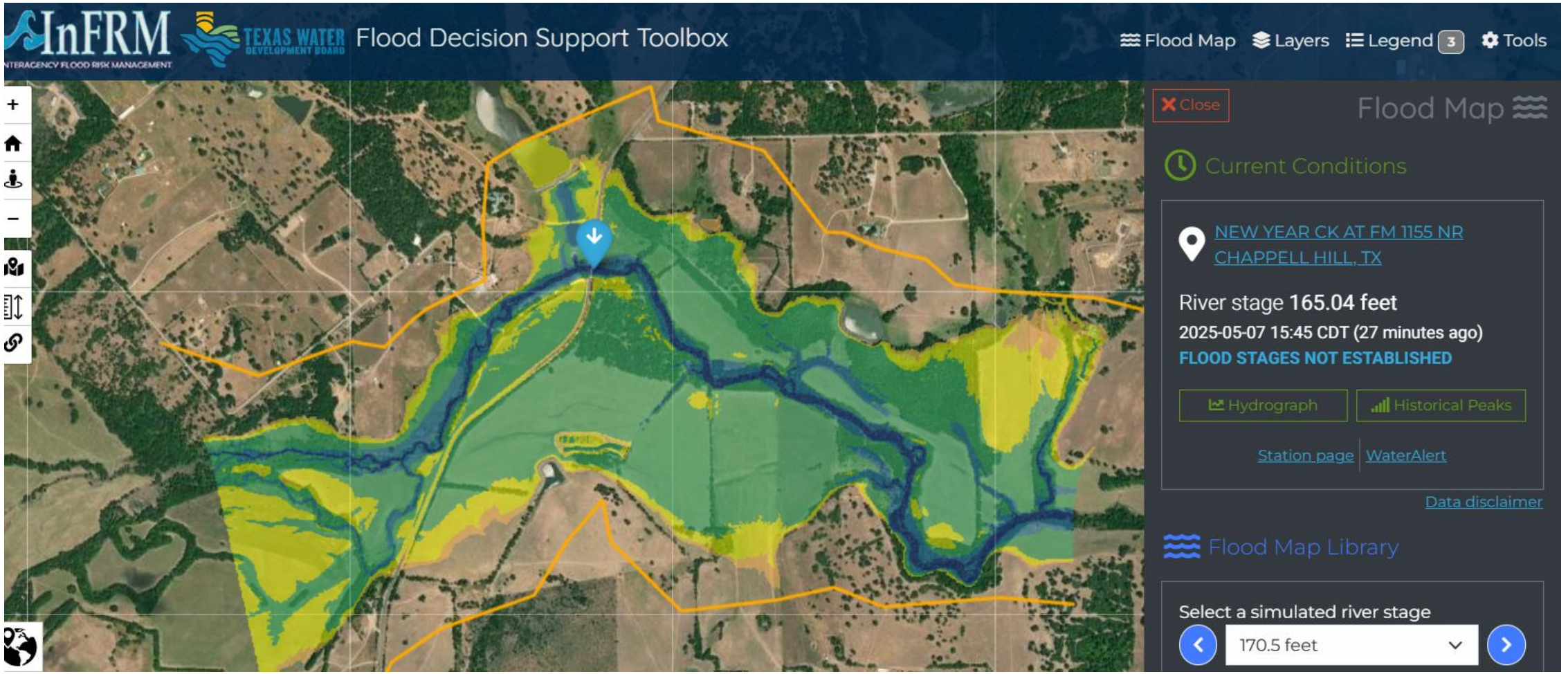
Es



Valid up to 6000 cfs

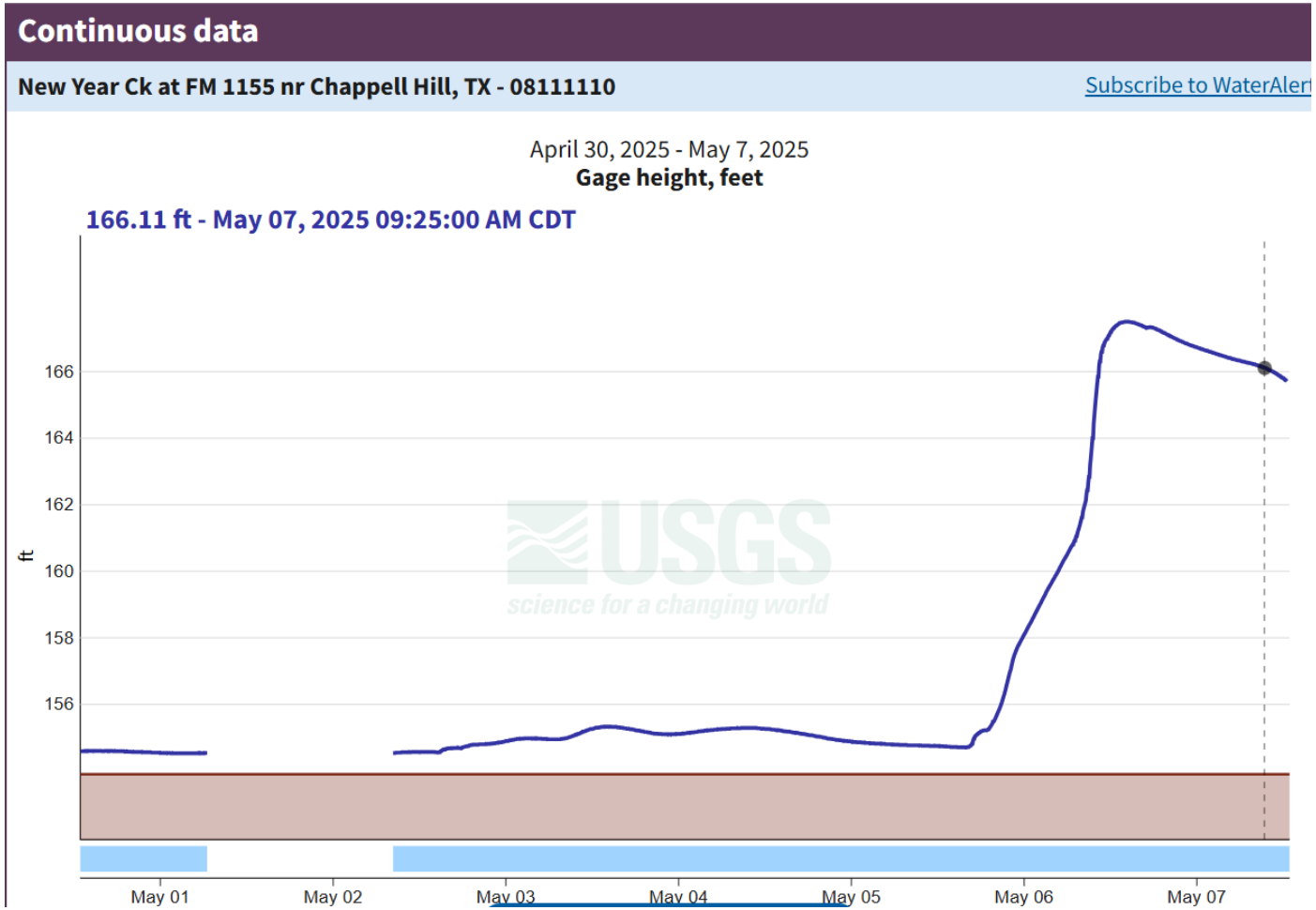
Gage Height = Water Surface Elevation because geodetic datum is gage datum

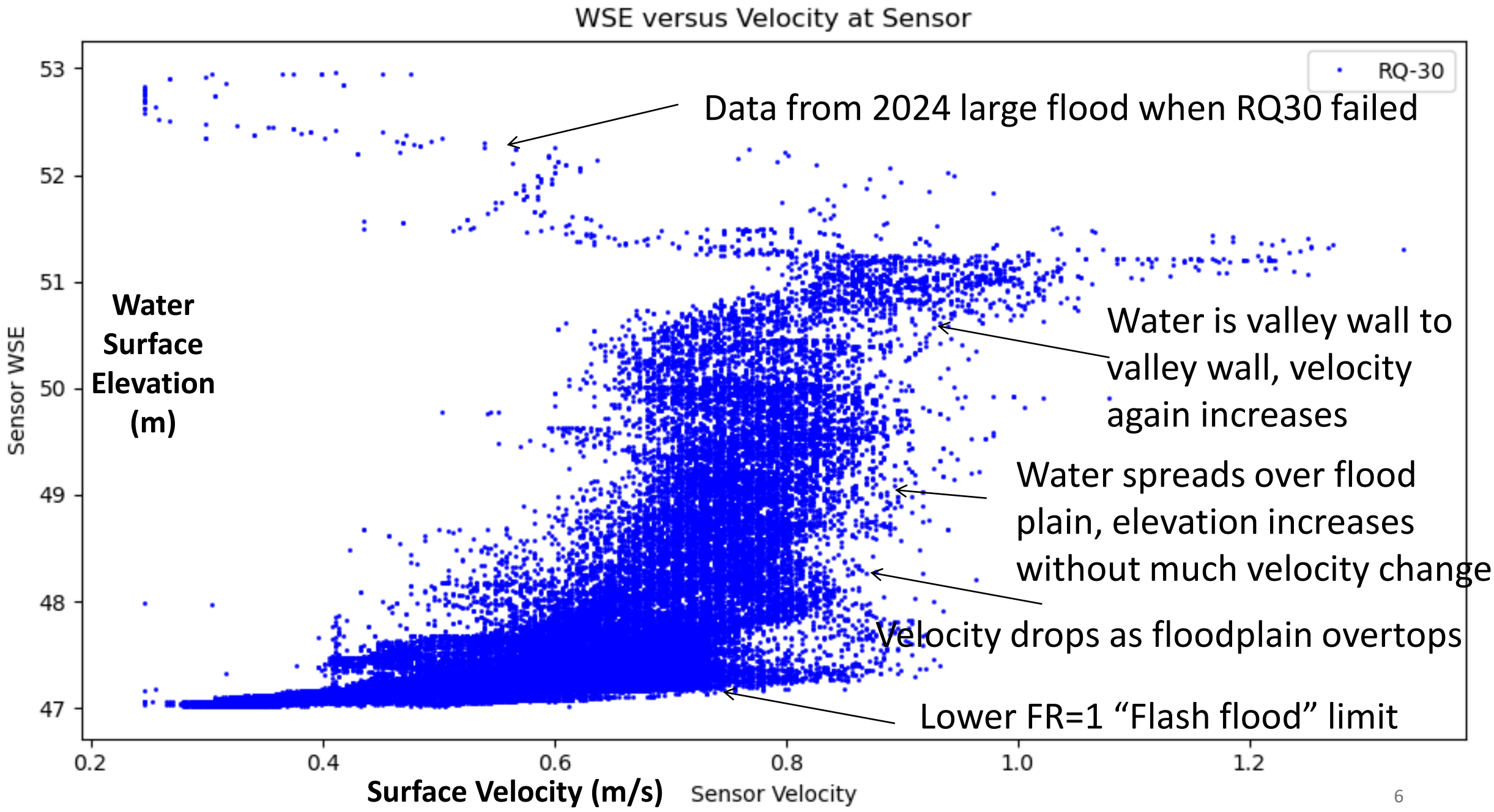
Flood Decision Support Toolbox at this site



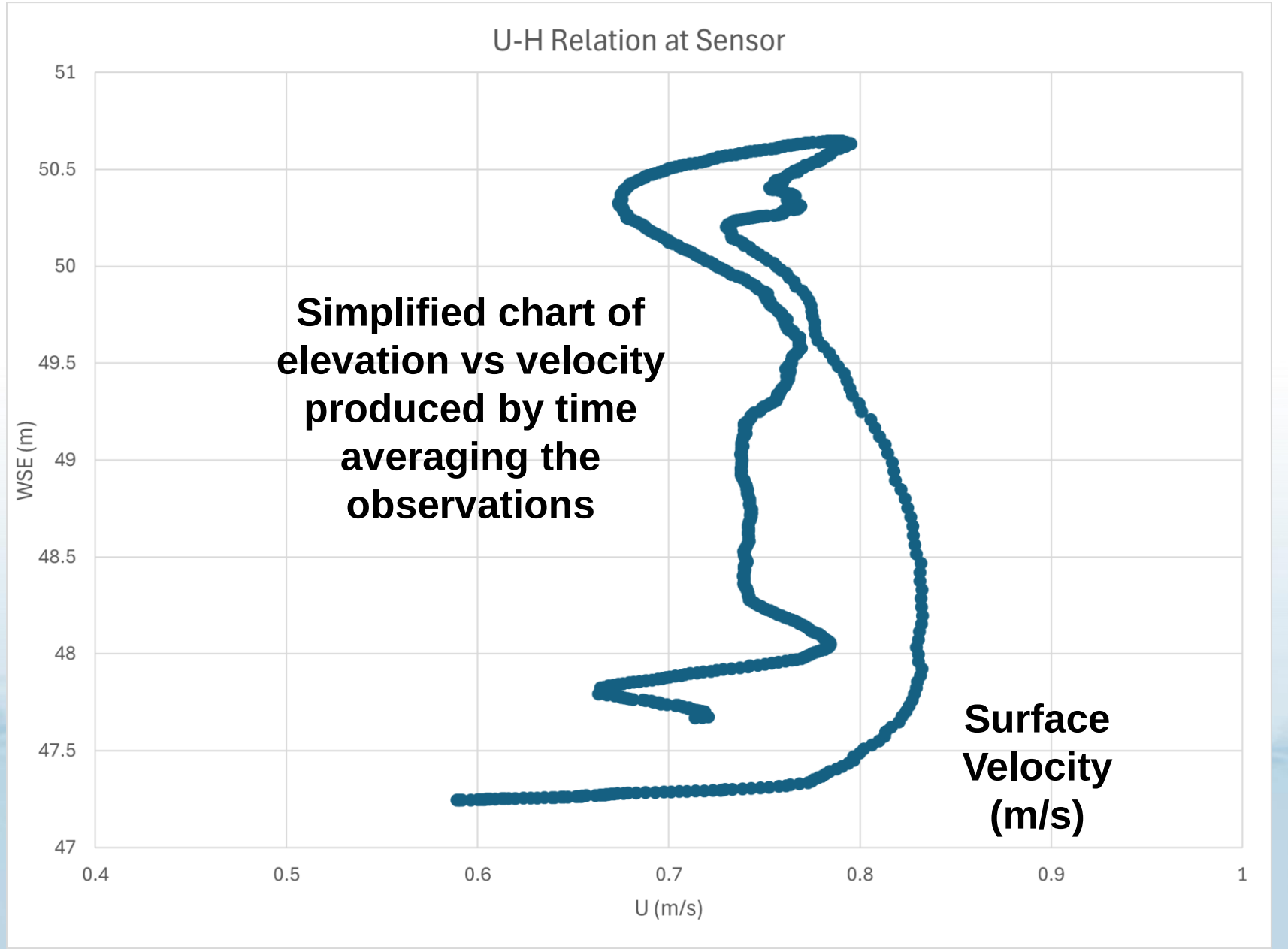
Stage Height Data for New Year Creek

[New Year Ck at FM 1155 nr Chappell Hill, TX - USGS Water Data for the Nation]

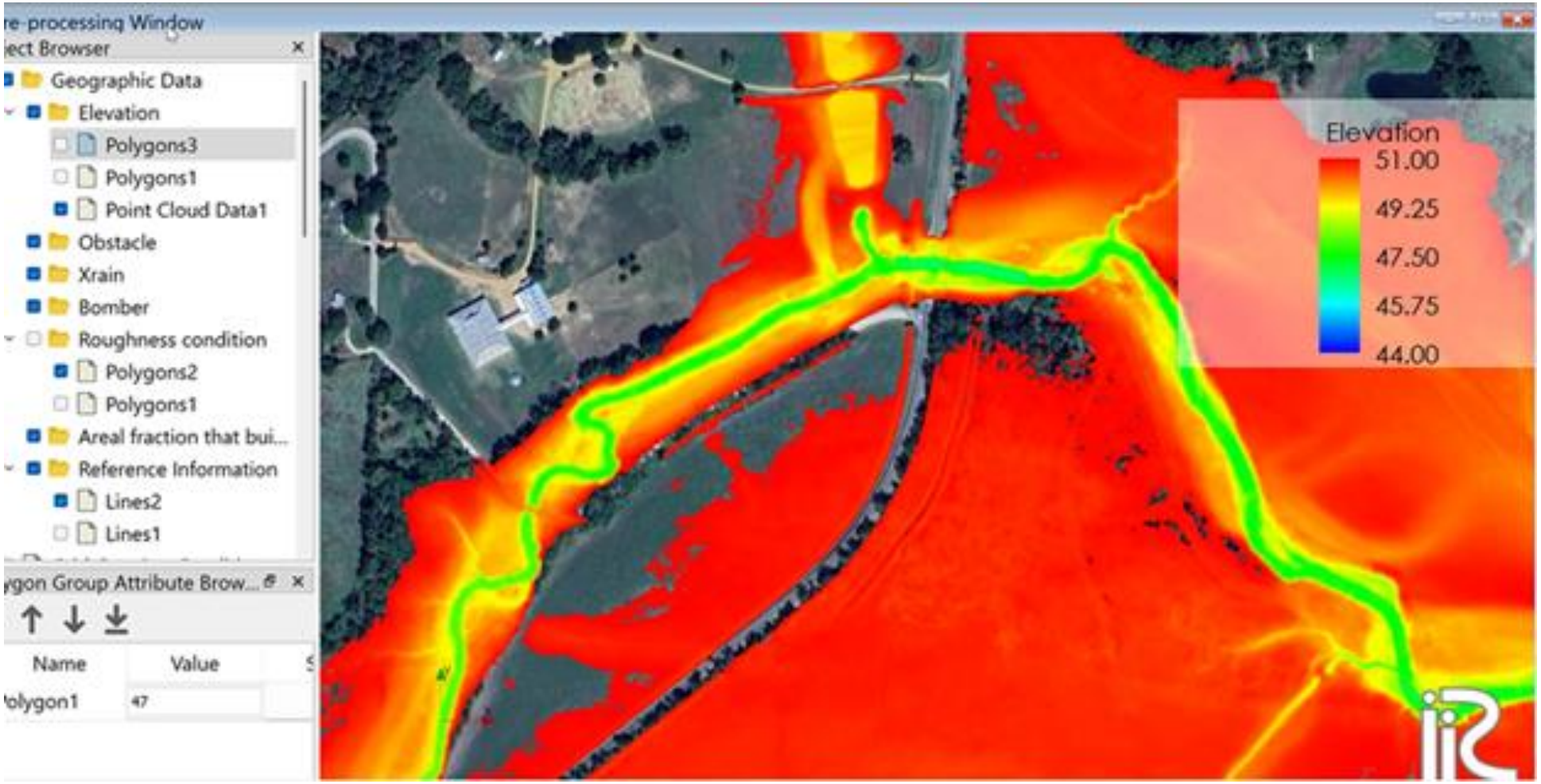


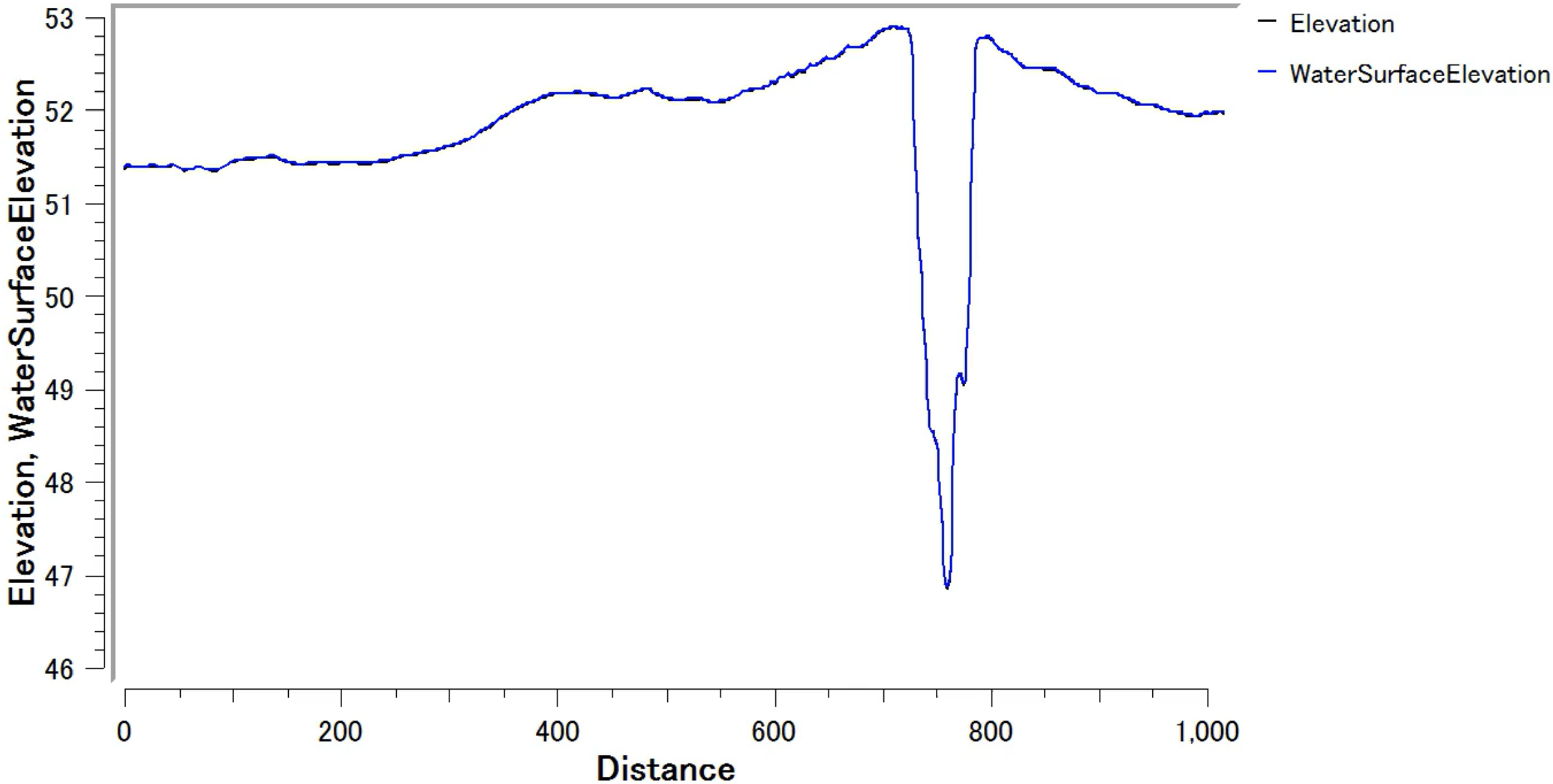

WSE versus Velocity at Sensor
RQ-30
Data from 2024 large flood when RQ30 failed
Water is valley wall to valley wall, velocity again increases
Water spreads over flood plain, elevation increases without much velocity change
Velocity drops as floodplain overtops
Lower FR=1 “Flash flood” limit
Water Surface Elevation (m)
Sensor WSE
53
52
51
50
49
48
47
0.2
0.4
0.6
0.8
1.0
1.2
Surface Velocity (m/s)
Sensor Velocity

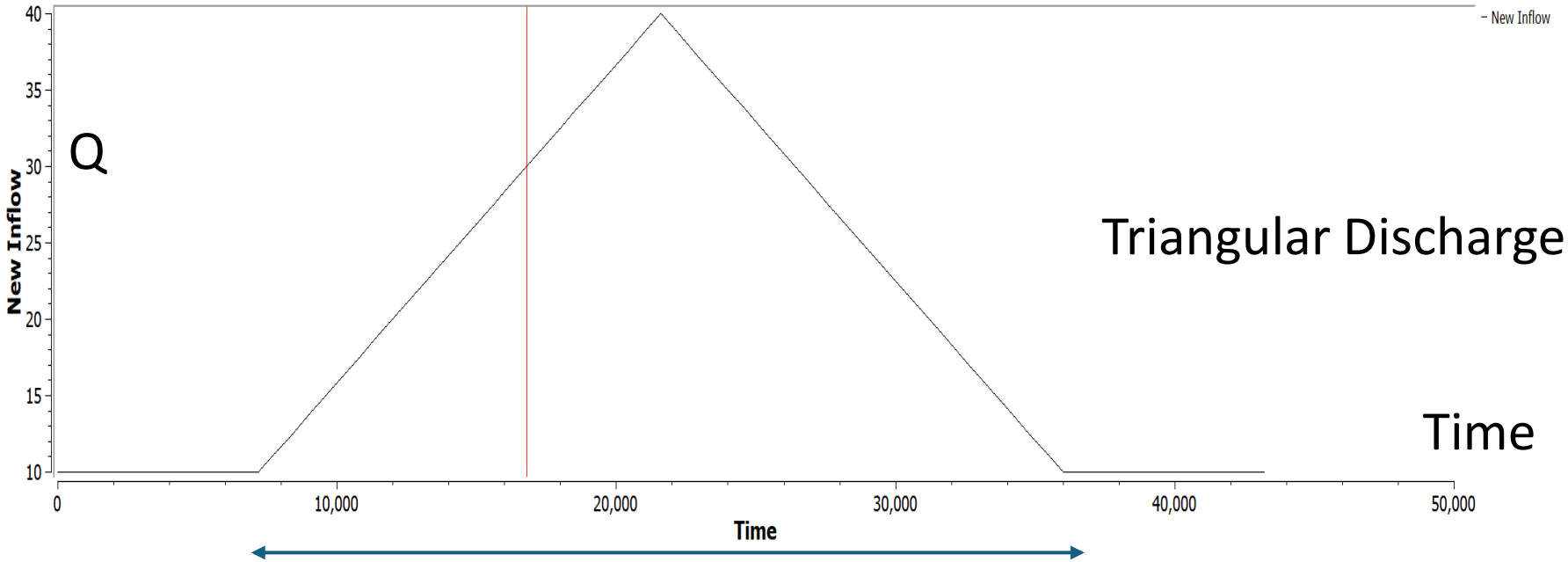
March 22-24, 2022 Flood



Nays2dFlood Model

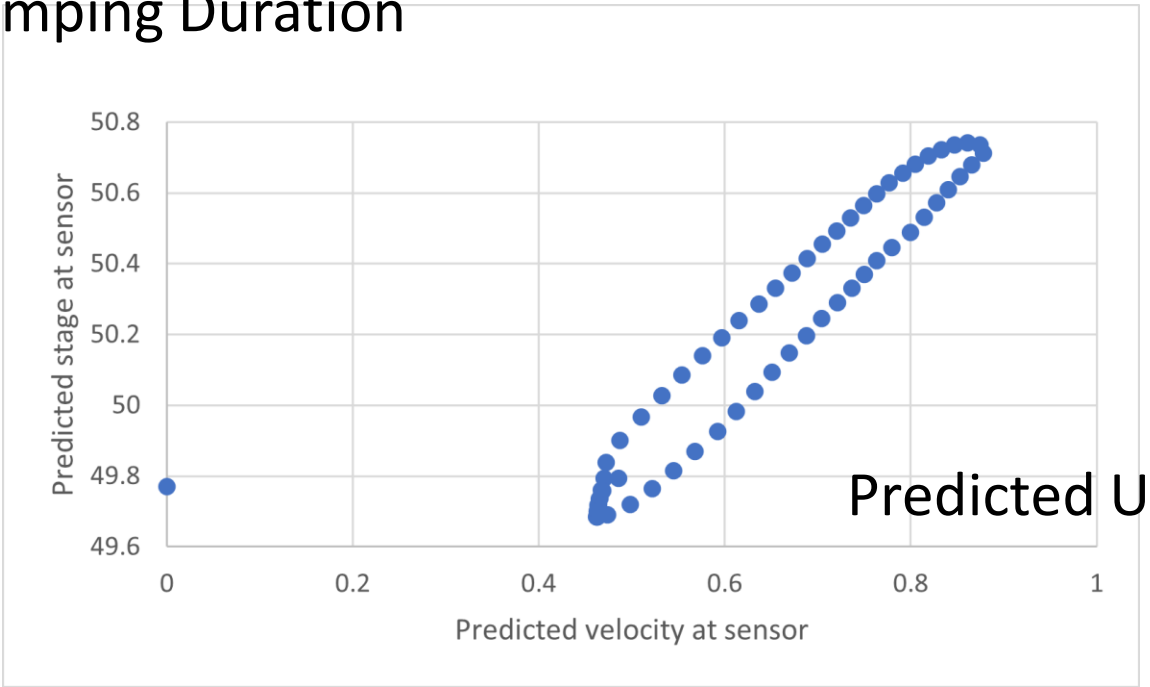



Elevation
WaterSurfaceElevation
Elevation, WaterSurfaceElevation
53
52
51
50
49
48
47
46
0
200
400
600
800
1,000
Distance

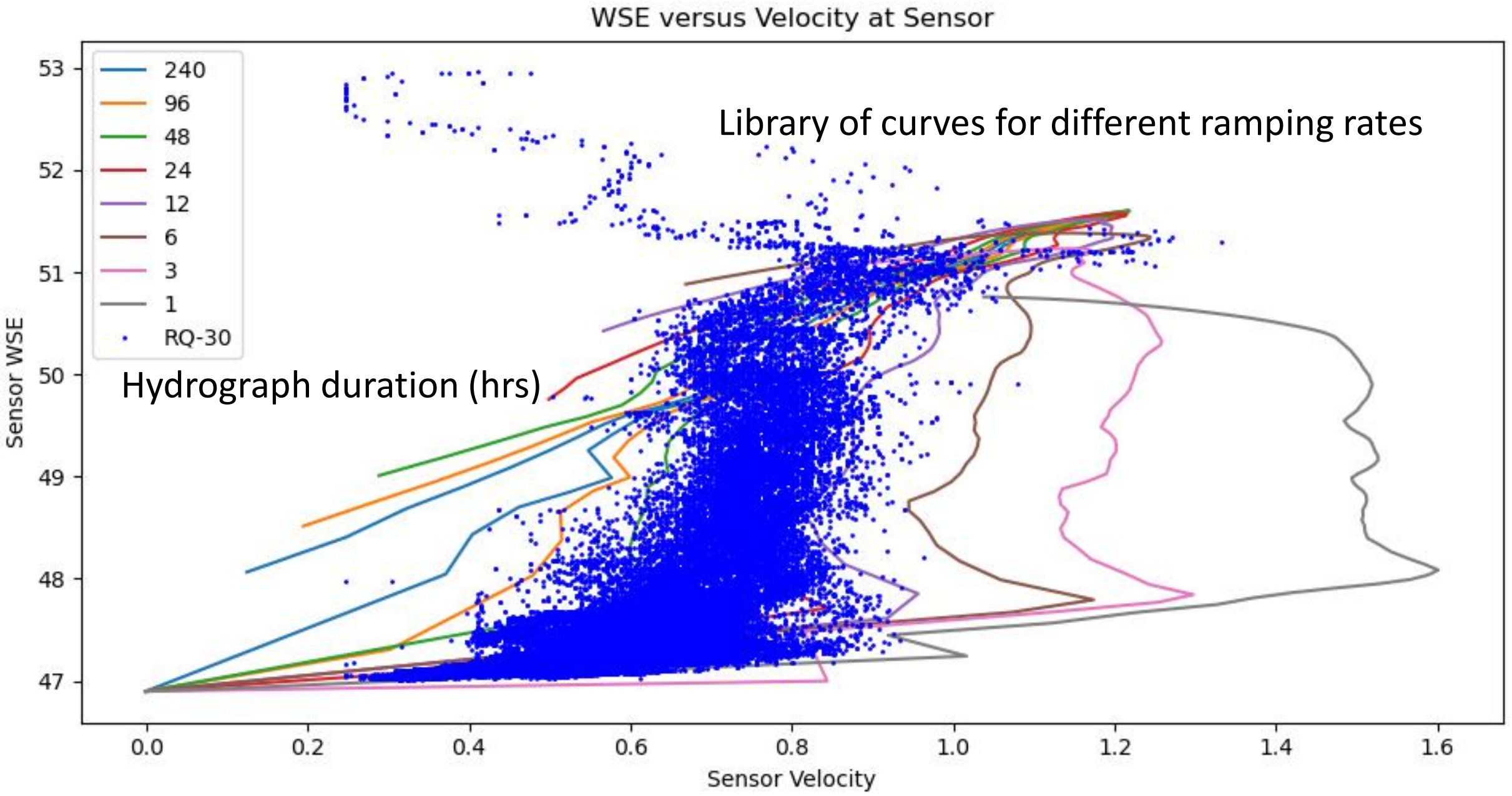


Triangular Discharge Hydrograph

Predicted Es



Predicted Us


WSE versus Velocity at Sensor
240
96
48
24
12
6
3
1
RQ-30
Library of curves for different ramping rates
Hydrograph duration (hrs)
Sensor WSE
Sensor Velocity
53
52
51
50
49
48
47
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6

Library Approach

- Conventional rating curve Q = Q(Es) only
- RQ-30 method Q = Q(E_s, U_s) = A(Es)*kc(Es)*Us (what we are doing now)
- Next step, **Q = Q(E_s, U_s),dE_s/dT, dU_s/dt) Dynamic rating curve**
- Next step, Q=Q(longer time series of E_s, U_s)
- Next step, make the library a teaching set for machine learning
- Next step, AI
- ?

DATA | DATA RELEASES

Radar-based field measurements of gage-height and surface velocity and resulting cross-sectional area and discharge from 80 U.S. Geological Survey streamgages for various locations in Texas, 2021–24

February 3, 2025

Radar-based field measurements of gage-height and surface velocity and resulting cross-sectional area and discharge from 80 U.S. Geological Survey streamgages for various locations in Texas, 2021–24 | U.S. Geological Survey

Dates

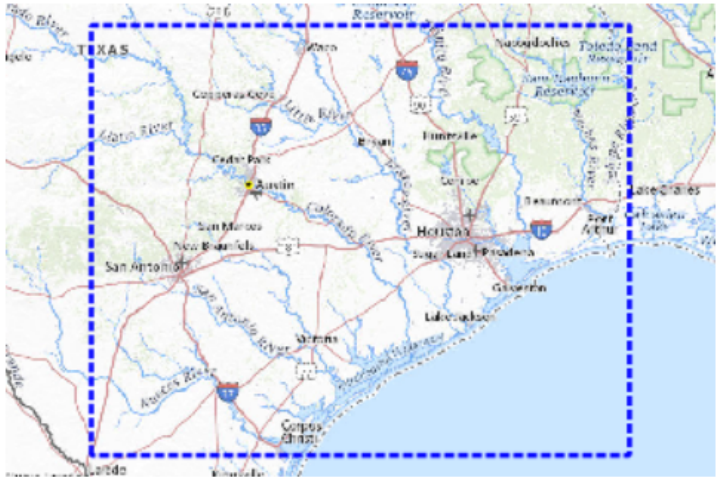
Publication Date :	2024-05-03
Start Date :	2021-01-01
End Date :	2024-02-02

Citation

Grzyb, S.D., Avant, J.L., Covarrubias, M., Null, M.L., and Matschek, S.S., 2024, Radar-based field measurements of gage-height and surface velocity, and resulting cross-sectional area and discharge, from 80 U.S. Geological Survey streamgages for various locations in Texas, 2021–24: U.S. Geological Survey data release, https://doi.org/10.5066/P14LSAMD.

Summary

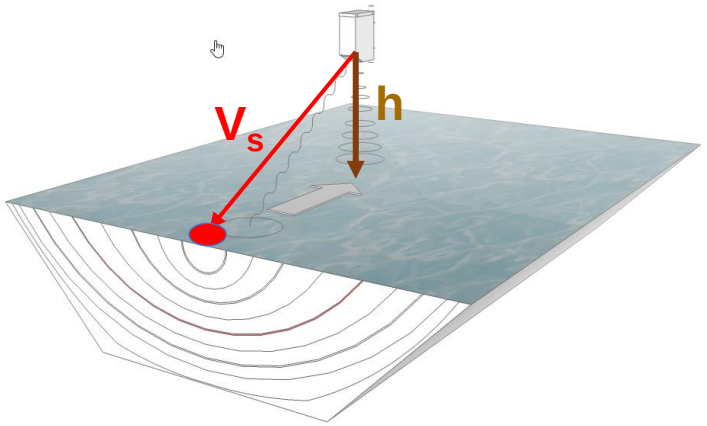
Map »



Data for New Year Creek at Chappell Hill

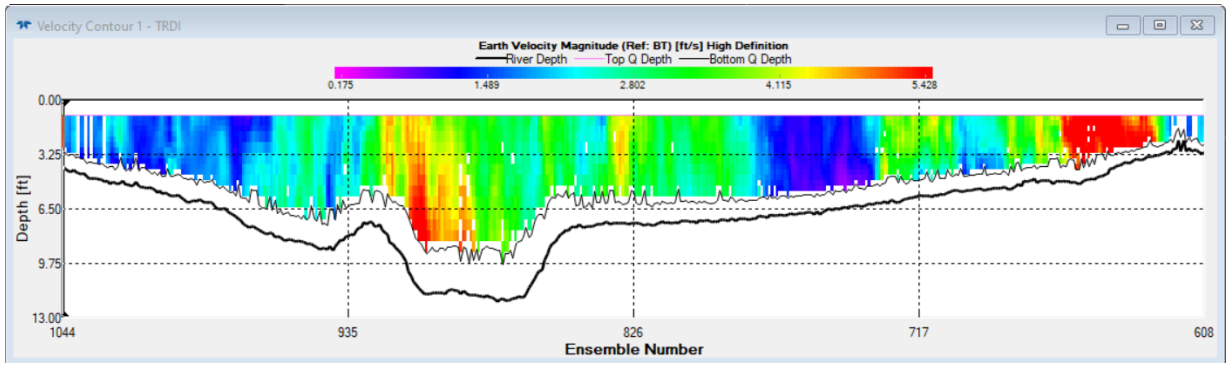
					Es		Us	A	
Agency	Site Num	Date Time	Learned Discharge	Discharge	Gage height	Learned Velocity	Velocity	Area	Time Zone
USGS	8111110	2021-08-20T17:35:0	0	7	154.74	NA	1.3	13.4	UTC
USGS	8111110	2021-08-20T17:40:0	0	7	154.74	NA	1.31	13.4	UTC
USGS	8111110	2021-08-20T17:45:0	13.3	0	NA	NA	NA	6	UTC
USGS	8111110	2021-08-20T17:55:0	0	6.5	154.71	NA	1.29	12.7	UTC
USGS	8111110	2021-08-20T18:00:0	0	6.5	154.71	NA	1.3	12.7	UTC
USGS	8111110	2021-08-20T18:05:0	0	6.6	154.71	NA	1.31	12.7	UTC
USGS	8111110	2021-08-20T18:10:0	0	6.6	154.71	NA	1.31	12.7	UTC
USGS	8111110	2021-08-20T18:15:0	0	6.6	154.71	NA	1.31	12.7	UTC
USGS	8111110	2021-08-20T18:20:0	0	6.6	154.71	NA	1.32	12.7	UTC
USGS	8111110	2021-08-20T18:25:0	0	6.6	154.71	NA	1.31	12.7	UTC
USGS	8111110	2021-08-20T18:30:0	0	6.5	154.71	NA	1.3	12.7	UTC
USGS	8111110	2021-08-20T18:35:0	0	6.5	154.71	NA	1.3	12.7	UTC
USGS	8111110	2021-08-20T18:40:0	0	6.5	154.71	NA	1.3	12.7	UTC
USGS	8111110	2021-08-20T18:45:0	0	6.6	154.71	NA	1.31	12.7	UTC
USGS	8111110	2021-08-20T18:50:0	0	6.5	154.71	NA	1.3	12.7	UTC
USGS	8111110	2021-08-20T18:55:0	0	6.5	154.71	NA	1.3	12.7	UTC

Connecting RQ-30 and ADCP



RQ-30 measures surface velocity and elevation h in time at one point

ADCP measures velocity distribution in space across stream cross-section



Discharge, Q = Cross-section area, A * average velocity, V
= A * surface velocity, V_s * k-factor

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