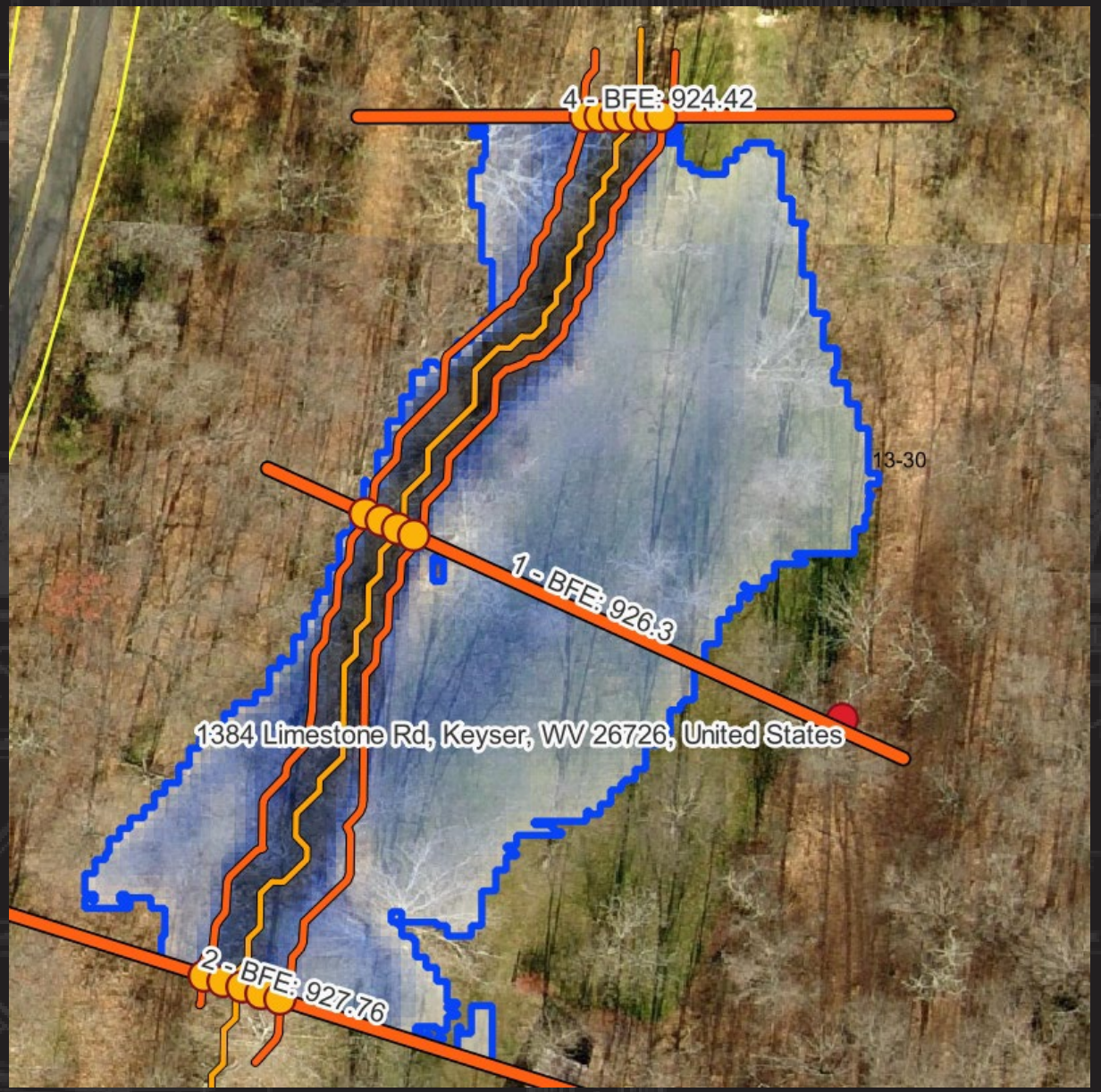
GIS IN SUPPORT OF DIGITAL FLOOD RISK MAPPING

15 MAY 2023

Joe Trimboli, MSc, GIS-SME
Huntington District
Planning Branch
Plan Formulation



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US Army Corps of Engineers®

HUNTINGTON DISTRICT BFE PROGRAM

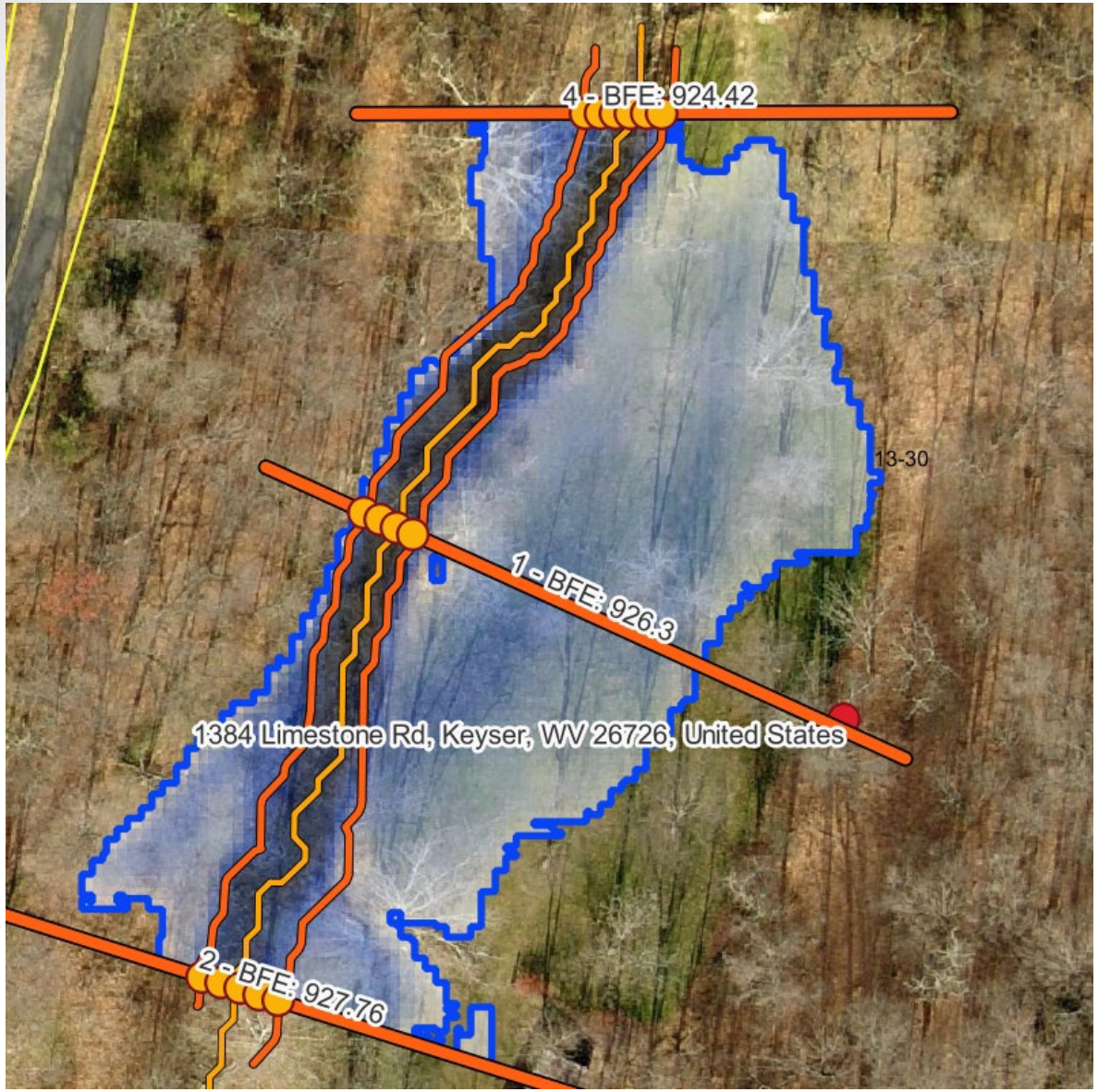
- The Huntington District Base Flood Elevation (BFE) program has developed over time in Planning Branch and resulted from outreach in support of the State of West Virginia. The earliest BFE request database is dated **May 2006** and represents 17 years of development in a multi-agency environment. The **West Virginia NFIP Coordinator** requested a Zone A BFE solution meeting NFIP requirements. A previous study comparing **FEMA Quick2 and HEC-RAS** conducted by the state and used in initial discussions.

- **FEMA 265** – "Managing Floodplain Development in approximate Zone A Areas (April 1995)" documents a FEMA approved process as well as a user manual for the associated DOS based version of **Quick2**

- A review of FEMA 265 shows **manual methods of mapping**, explains, different methods of determining risk, and describes a minimum acceptable method of determining BFE's in Zone A's using Quick2.

1. Floodplain **Geometry** (topography/DEM/LiDAR)
2. Flood **Discharge** and/or volume (hydrology)
3. Flood **Height** (hydraulics)

CURRENT STATUS



Current Status

- BFE requests are part of a Huntington District outreach program authorized under **Floodplain Management Services (FPMS)**
- There is a **charge to private entities** based on a program table of charges for compiling information that takes less than a day ($125, unless additional work is required)
- Floodplain Managers (FPM) and other public entities are **coordinating partners** and are not charged for services
- The **example graphic** shows an FPM request for new construction that includes a floodway, depth grid, inundation limit, and cross sections with BFE results. Not shown is an interpolated raster layer of the BFE surface.

PROGRAM IMPROVEMENT

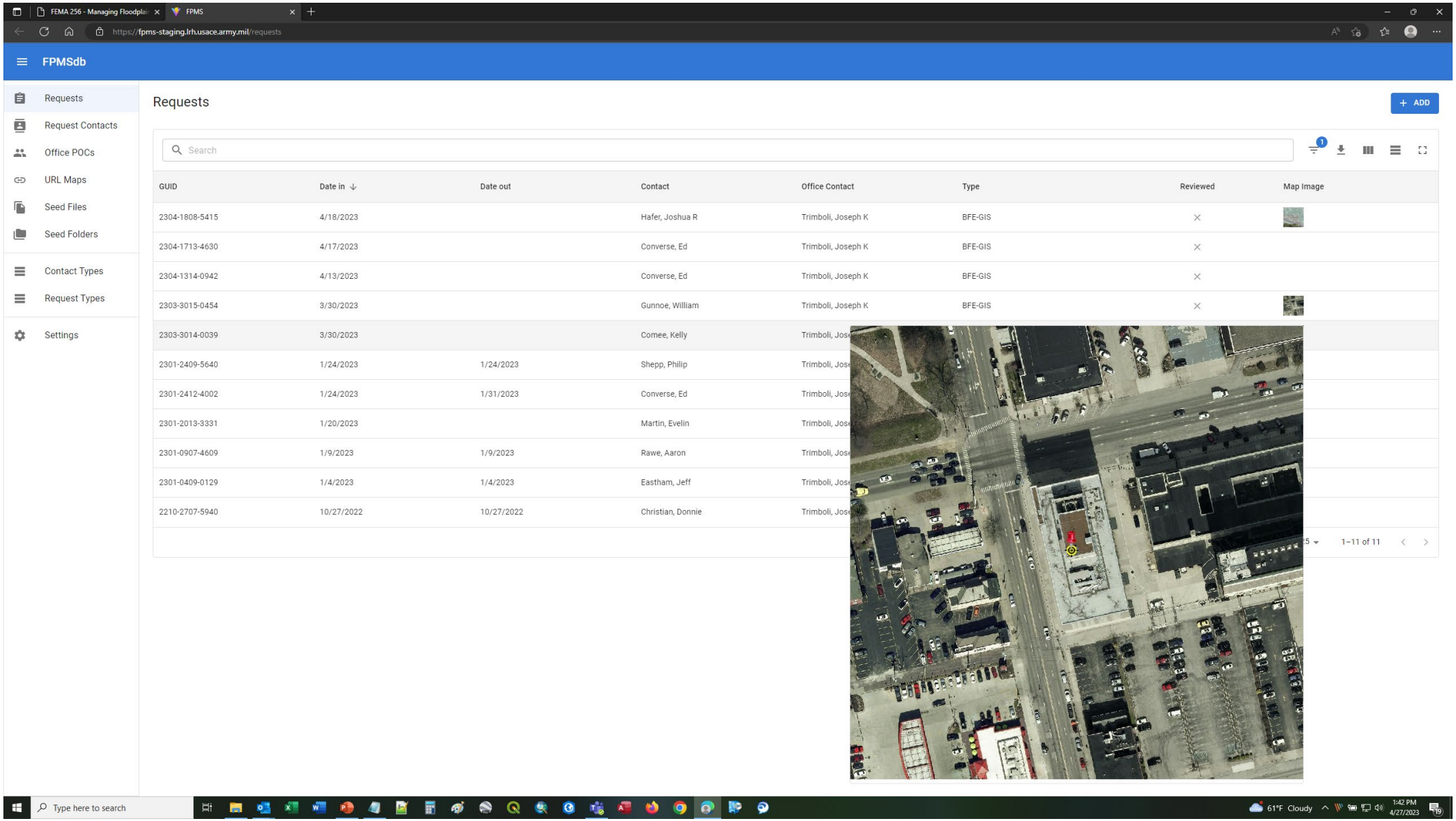
Process Validation and Review

- Establishing an **annual review** with District H&H Section
  - Overall process **approval**
  - Annual check of **random locations**
- Planning Branch review done when the invoice is emailed to requesting individual
  - **Integrated** into database process
  - Includes initial training for **GIS mentoring** (data review)

Database Transition

- Microsoft Access **database conversion** to SQL/React (java based)
- Current status: Pre-Production
- **No BFE process** without Quick Response Database

FPMSDB


FEMA 256 - Managing Floodplai
FPMS
https://fpms-staging.lrh.usace.army.mil/requests
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Requests
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+ ADD
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Date in
Date out
Contact
Office Contact
Type
Reviewed
Map Image
2304-1808-5415 4/18/2023 Hafer, Joshua R Trimboli, Joseph K BFE-GIS
2304-1713-4630 4/17/2023 Converse, Ed Trimboli, Joseph K BFE-GIS
2304-1314-0942 4/13/2023 Converse, Ed Trimboli, Joseph K BFE-GIS
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2303-3014-0039 3/30/2023 Comee, Kelly
2301-2409-5640 1/24/2023 1/24/2023 Shepp, Philip
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2301-2013-3331 1/20/2023 Martin, Evelin
2301-0907-4609 1/9/2023 1/9/2023 Rawe, Aaron
2301-0409-0129 1/4/2023 1/4/2023 Eastham, Jeff
2210-2707-5940 10/27/2022 10/27/2022 Christian, Donnie
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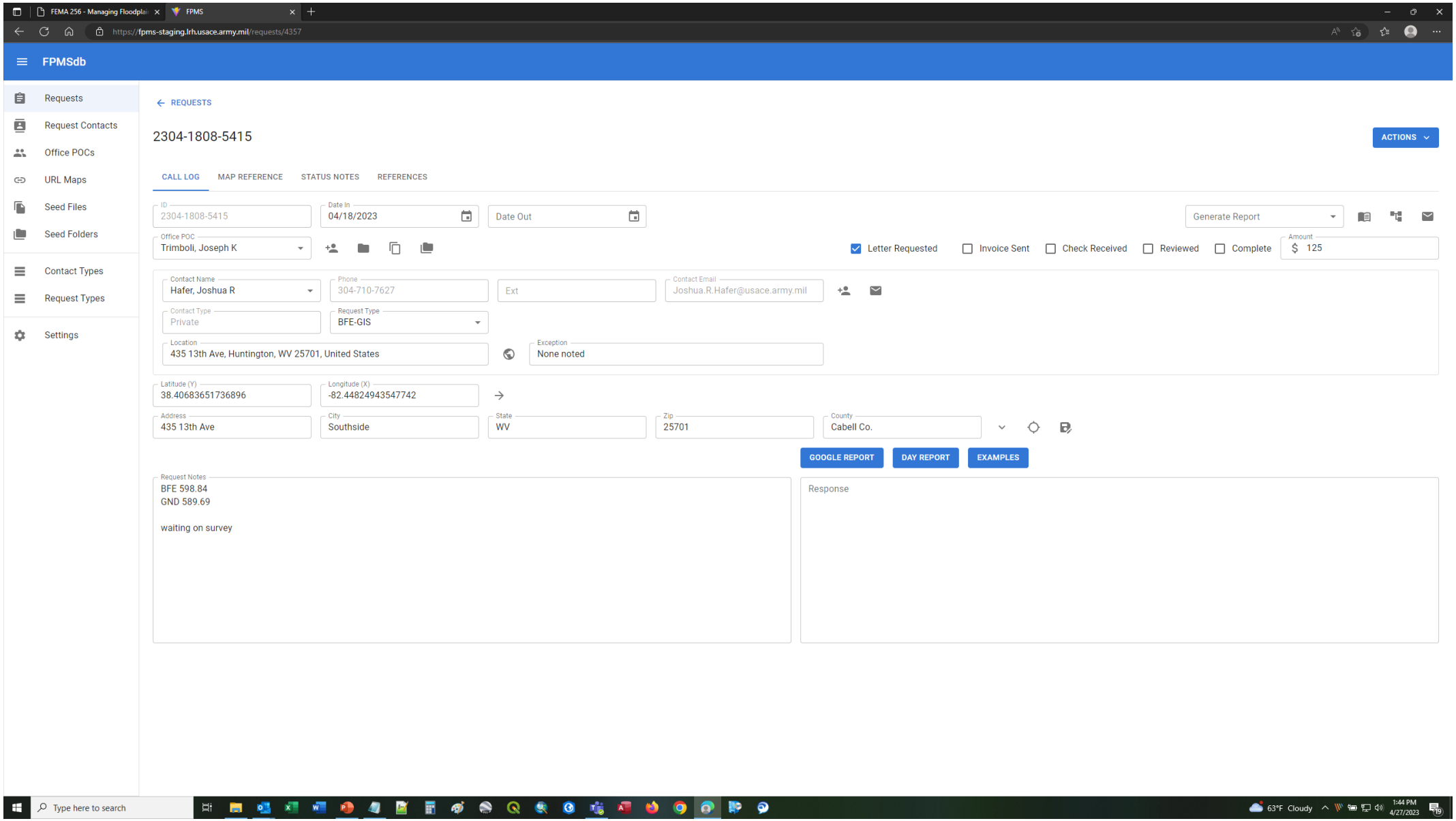
4/27/2023

FPMSDB


FEMA 256 - Managing Floodplai
FPMS
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FPMSdb
Requests
Request Contacts
Office POCs
URL Maps
Seed Files
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Contact Types
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Settings
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ACTIONS
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STATUS NOTES
REFERENCES
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Date In
04/18/2023
Date Out
Generate Report
Office POC
Trimboli, Joseph K
Letter Requested
Invoice Sent
Check Received
Reviewed
Complete
Amount
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Contact Name
Hafer, Joshua R
Phone
304-710-7627
Ext
Contact Email
Joshua.R.Hafer@usace.army.mil
Contact Type
Private
Request Type
BFE-GIS
Location
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Longitude (X)
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Address
435 13th Ave
City
Southside
State
WV
Zip
25701
County
Cabell Co.
GOOGLE REPORT
DAY REPORT
EXAMPLES
Request Notes
BFE 598.84
GND 589.69
waiting on survey
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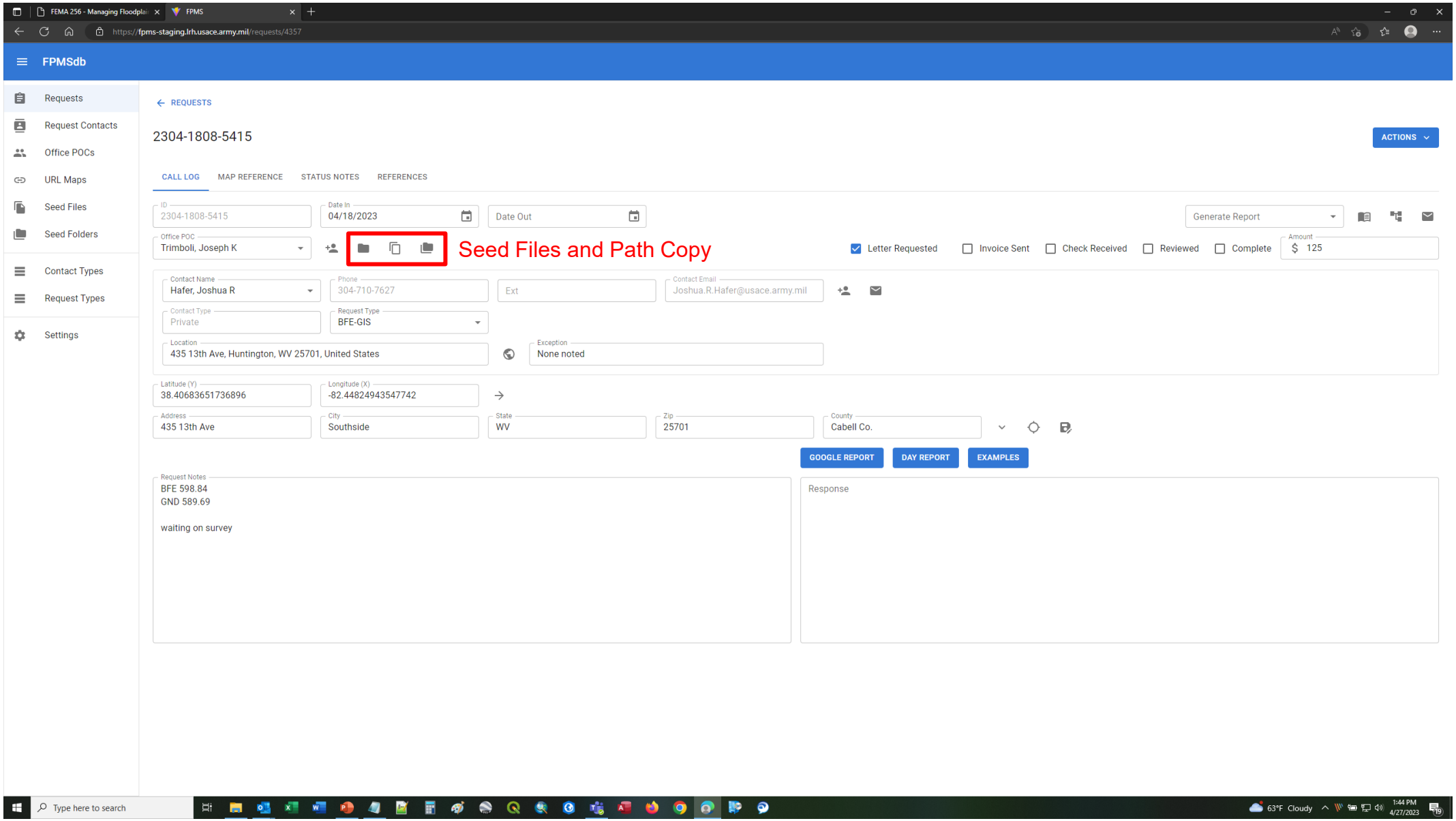
FPMSDB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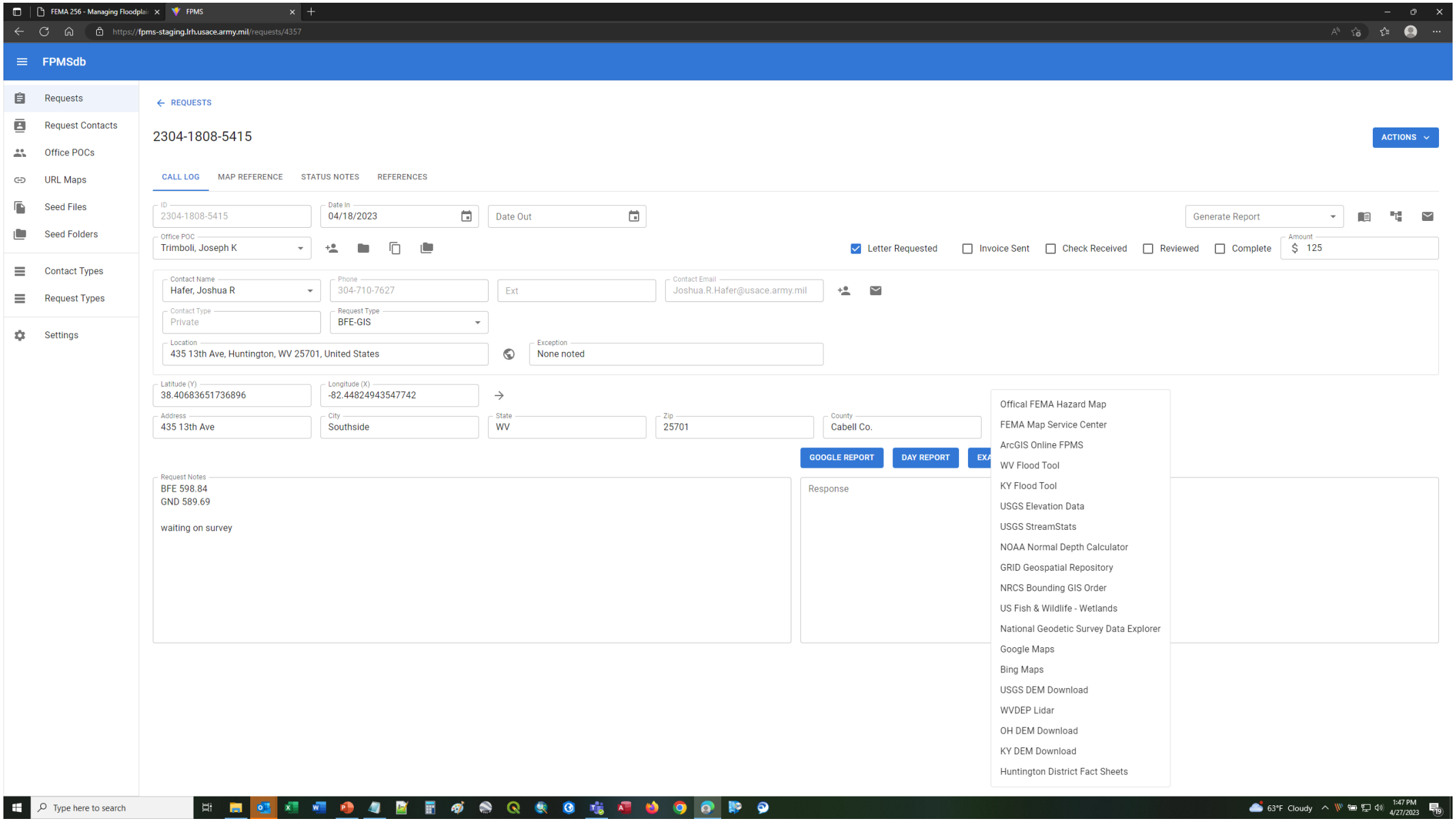
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FEMA Map Service Center
ArcGIS Online FPMS
WV Flood Tool
KY Flood Tool
USGS Elevation Data
USGS StreamStats
NOAA Normal Depth Calculator
GRID Geospatial Repository
NRCS Bounding GIS Order
US Fish & Wildlife - Wetlands
National Geodetic Survey Data Explorer
Google Maps
Bing Maps
USGS DEM Download
WVDEP Lidar
OH DEM Download
KY DEM Download
Huntington District Fact Sheets
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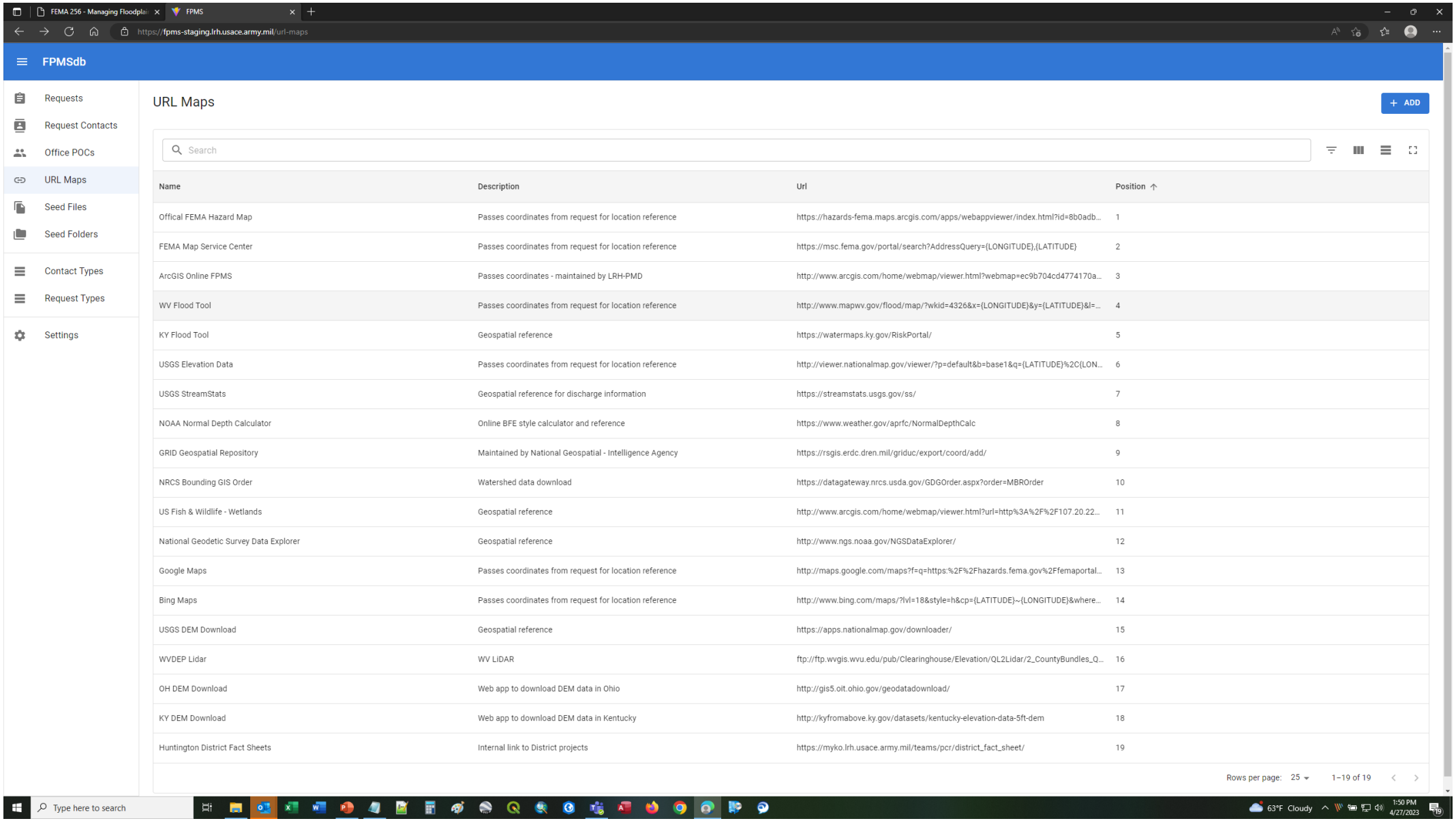
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URL Maps
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Seed Folders
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Description
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Position
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Passes coordinates from request for location reference
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WV Flood Tool
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KY Flood Tool
Geospatial reference
https://watermaps.ky.gov/RiskPortal/
5
USGS Elevation Data
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6
USGS StreamStats
Geospatial reference for discharge information
https://streamstats.usgs.gov/ss/
7
NOAA Normal Depth Calculator
Online BFE style calculator and reference
https://www.weather.gov/aprfc/NormalDepthCalc
8
GRID Geospatial Repository
Maintained by National Geospatial - Intelligence Agency
https://rsgis.erdc.dren.mil/griduc/export/coord/add/
9
NRCS Bounding GIS Order
Watershed data download
https://datagateway.nrcs.usda.gov/GDGOrder.aspx?order=MBROrder
10
US Fish & Wildlife - Wetlands
Geospatial reference
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USGS DEM Download
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OH DEM Download
Web app to download DEM data in Ohio
http://gis5.oit.ohio.gov/geodatadownload/
17
KY DEM Download
Web app to download DEM data in Kentucky
http://kyfromabove.ky.gov/datasets/kentucky-elevation-data-5ft-dem
18
Huntington District Fact Sheets
Internal link to District projects
https://myko.lrh.usace.army.mil/teams/pcr/district_fact_sheet/
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4/27/2023

REPORT EXAMPLE

US Army Corps of Engineers

HUNTINGTON DISTRICT, US ARMY CORPS OF ENGINEERS

FLOODPLAIN MANAGEMENT SERVICES

502 EIGHTH STREET
HUNTINGTON, WEST VIRGINIA 25701
1-866-401-3980 Email: fpms-lrh@usace.army.mil
01 November 2022 12:59:14 PM

ID:	2211-0108-1243	DATE IN: 11/1/2022	DATE OUT: 11/1/2022
CONTACT:	Michael Ash	STATE:	WV
INTEREST:	Professional Surveyor	COUNTY:	Upshur
PHONE:	(304) 476-8668	LAT:	39.06515
REQUEST:	Base Flood Elevation - GIS	LON:	-80.19508
LOCATION:	83 Hackers Creek Rd, Buckhannon, WV 26201		
EXCEPTION:	Large Area Zone A BFE		

RESPONSE

ISSUED BFE:
1416.8 EL FT (NAVD88)

CALCULATIONS:

Digital Elevation Models: When a digital elevation model (DEM) is used to calculated a BFE, its is typically downloaded from a state or federal web site. The most current DEM data is used to insure it matches the accuracy of the current regulatory DFIRM. If the file is in meters it is converted to feet my multiplying the DEM values by 3.2808399.

DEM Source - WVGISTC: WV - DEM_Mosaic_WV_Statewide_1m_UTM17_p2021

Two cross sections were used to create a BFE surface across the property. USGS NSS peak flow statistics were used and were referenced from the Central Mountain Region with the following values:

ID | Basin Area | Slope | MN-L | MN-C | MN-R | Discharge | WS_EL
1 | 3.88 | 0.0073 | 0.080 | 0.040 | 0.080 | 879 | 1416.91
2 | 0.38 | 0.0116 | 0.080 | 0.040 | 0.120 | 137 | 1421.23

This request fell between cross sections 1 and 2 at the coordinates referenced above with a BFE of 1416.84

This information meets FEMA minimum requirements for Zone A's but can be more accurate if a ground survey is performed and/or an engineer consulted.

This letter reflects FEMA National Flood insurance Program standards. It is

US Army Corps of Engineers

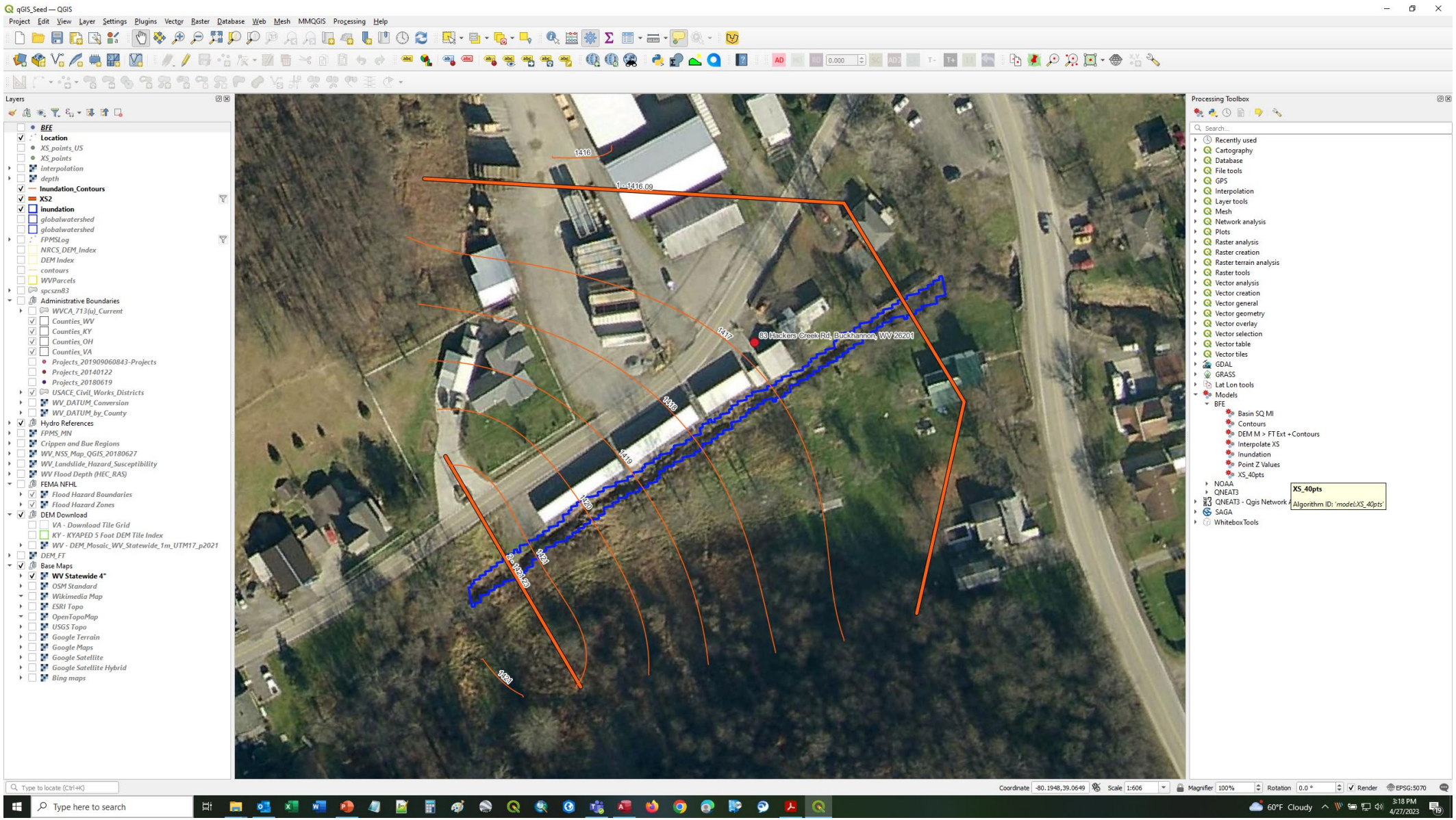
HUNTINGTON DISTRICT, US ARMY CORPS OF ENGINEERS

FLOODPLAIN MANAGEMENT SERVICES

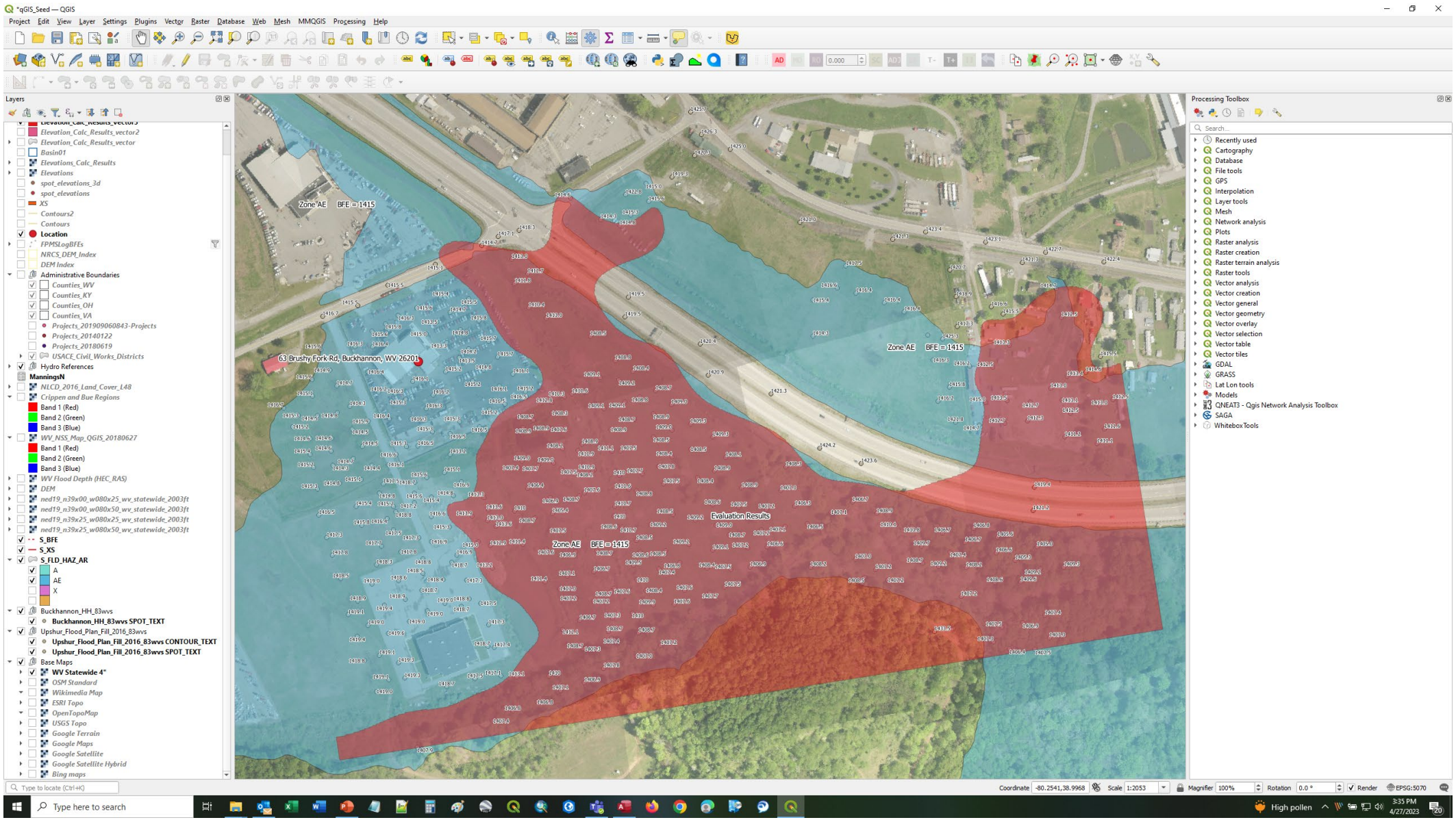
502 EIGHTH STREET
HUNTINGTON, WEST VIRGINIA 25701
1-866-401-3980 Email: fpms-lrh@usace.army.mil
01 November 2022 12:59:14 PM

Measured results based on cross section calculations at the requested site. The heavy orange lines show the calculated BFE elevation references while the lighter orange lines are interpolated at one foot increments'. The red dot is the coordinate location for the issued BFE.

GIS PROJECT TEMPLATE



QGIS DWG EXAMPLE

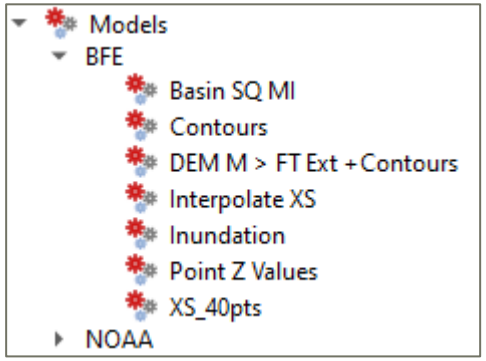


GIS TOOLS

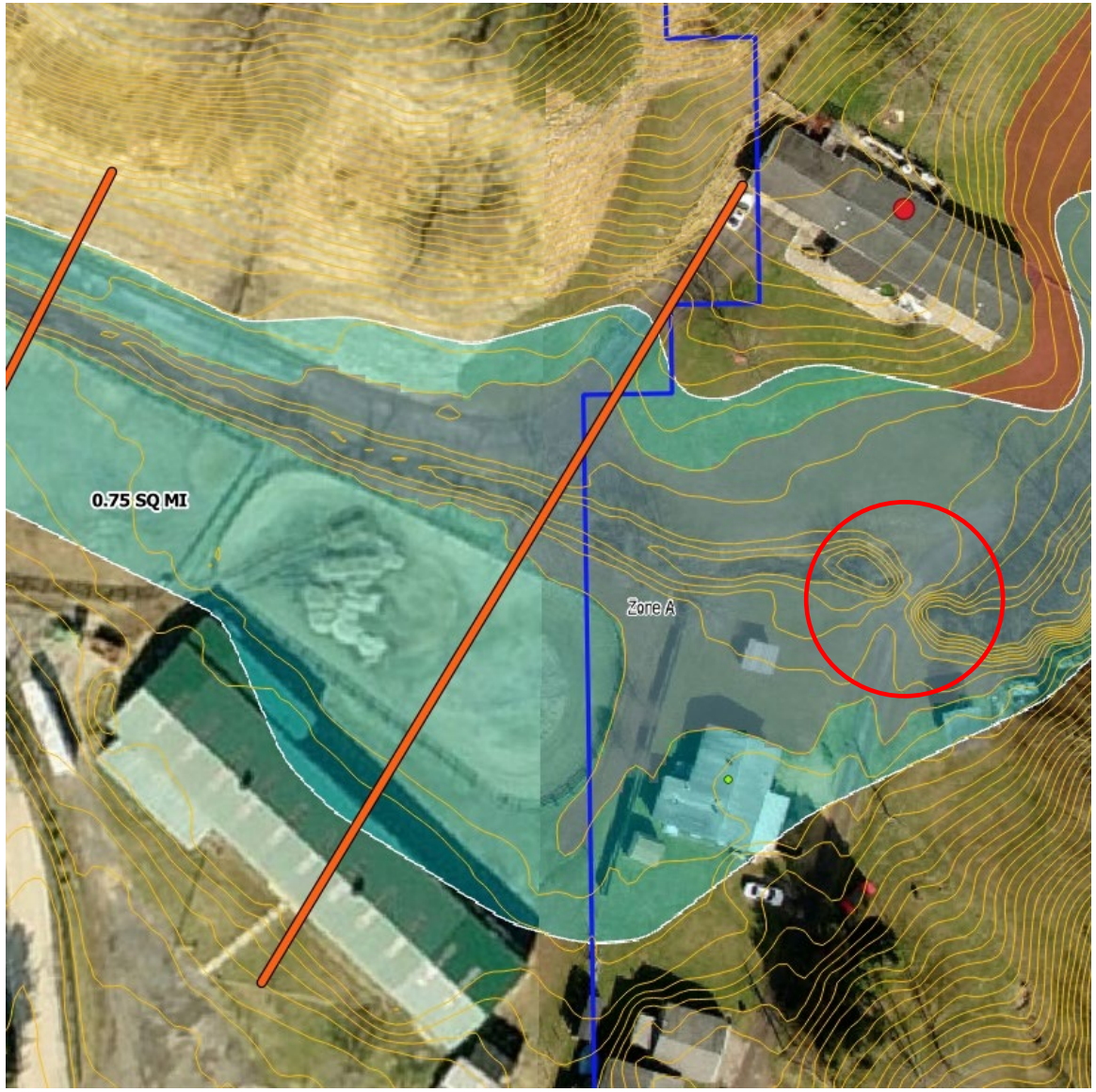
GIS Functionality not software specific

- Process has been used in training with
  - ESRI ArcMap – 3 day, 4 hours a day workshop
  - AutoCAD – QA with surveyor interested in duplicating the process

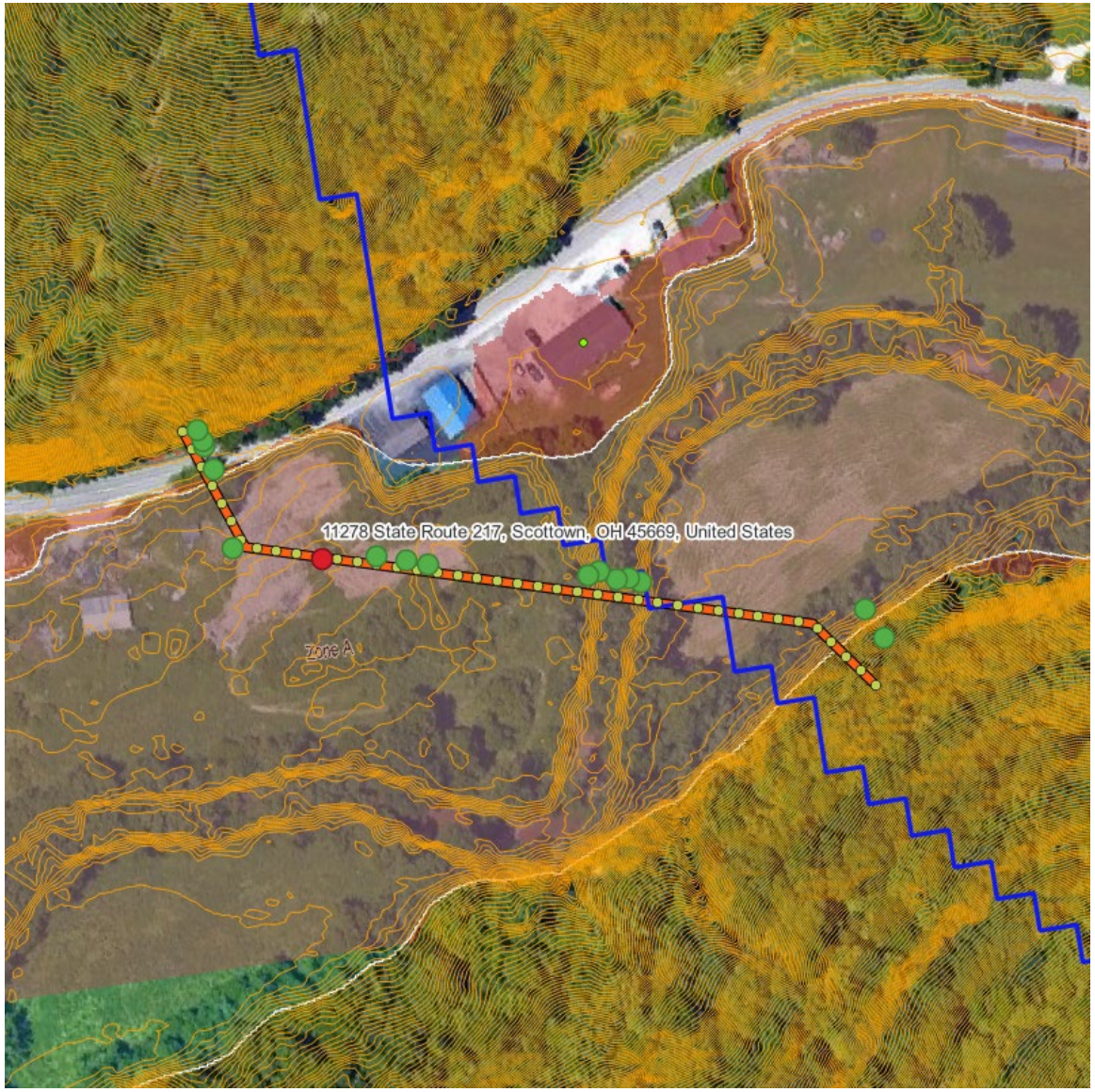
- **Tools developed** specifically for QGIS
  - Contours, Interpolate XS, Inundation, Point Z Values, and XS_40pts
  - Tools automate repetitive GIS functionality – easily created
  - Fayette County, OH, used an ESRI Toolbox designed for Biologist



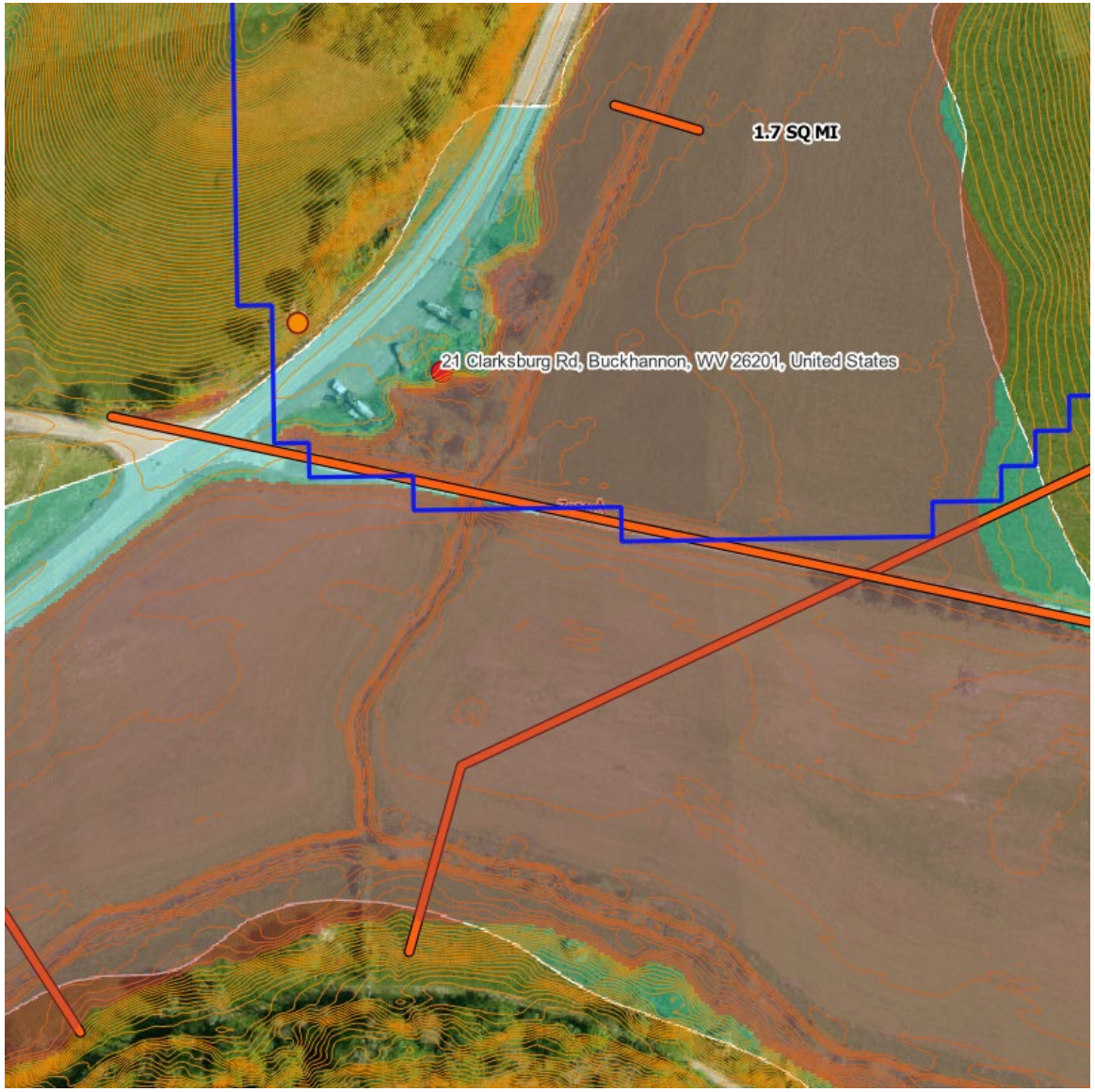
CONTOURS (DEM ASSESSMENT)



CONTOURS (CROSS SECTION PLACEMENT)



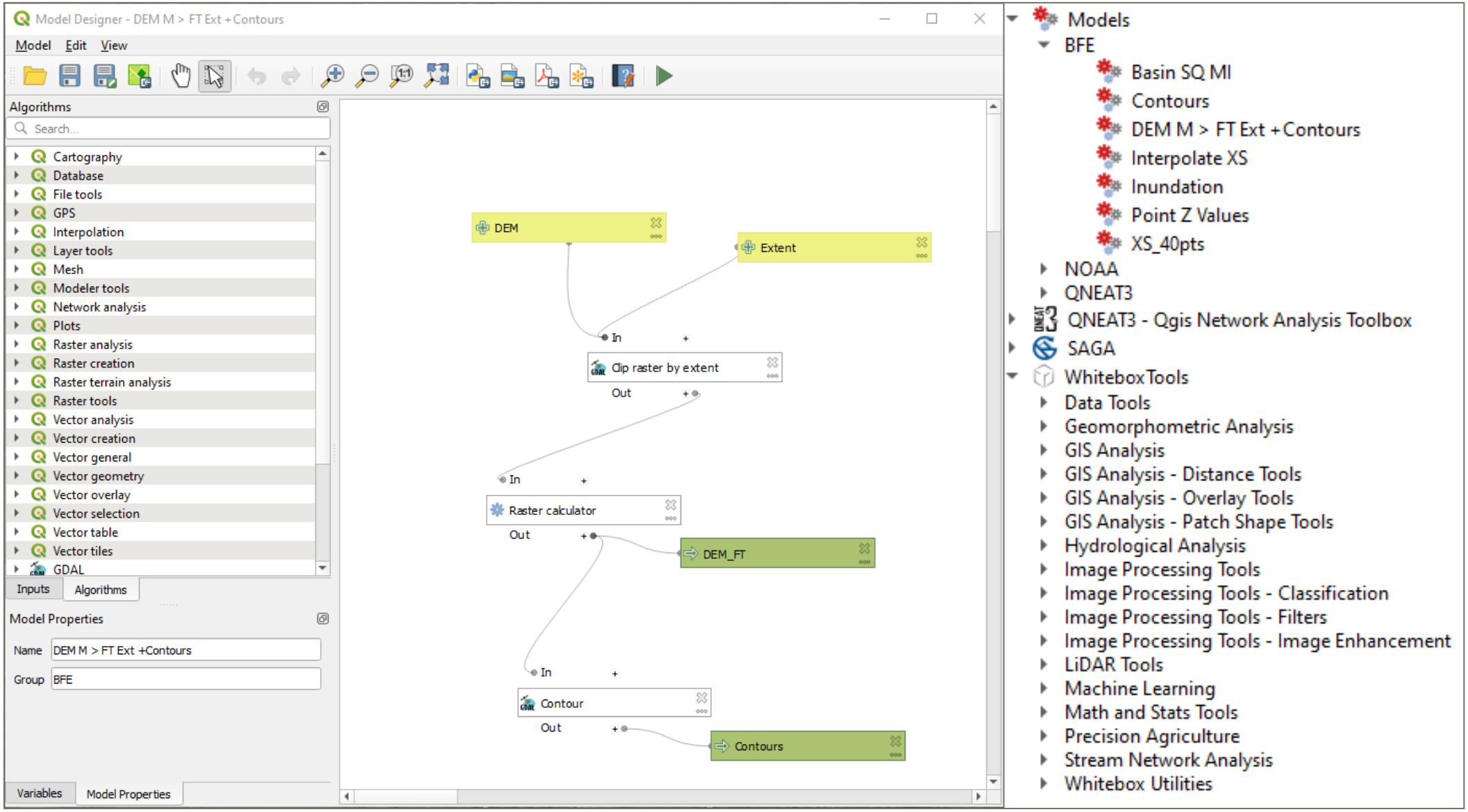
CONTOURS (BACKWATER ID)



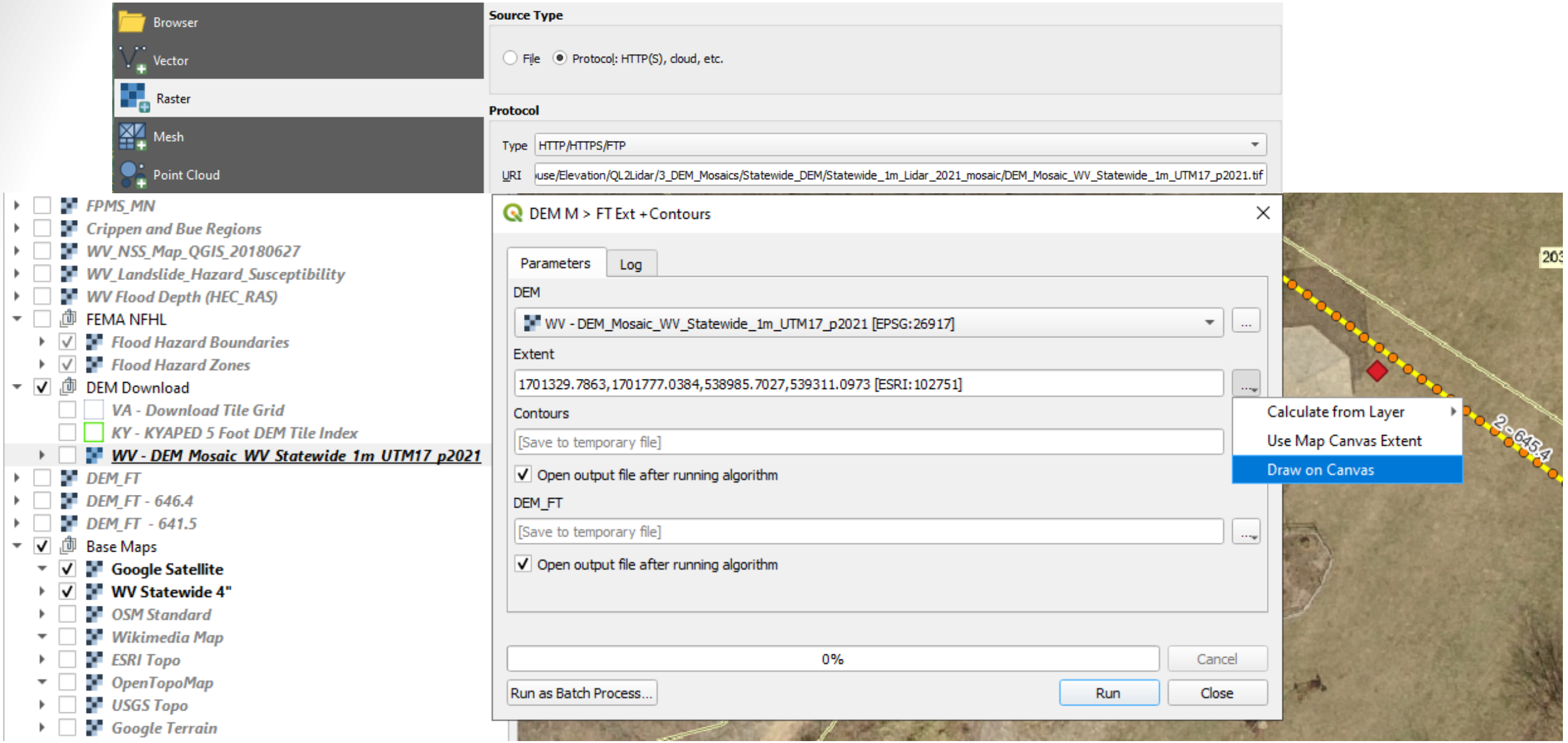
INTERPOLATE XS & INUNDATION

POINT Z VALUES & XS_40PTS

WV STATEWIDE 1M DEM



WV STATEWIDE 1M DEM



SUMMARY

Micro GIS projects in support of flood risk management using open-source GIS and nonproprietary request database.

QUESTIONS

Joe Trimboli, MSc GIS-SME
Community Planner (Geographer)
Floodplain Management Services (FPMS)
Technical Lead

fpms-lrh@usace.army.mil
866.401.3980 (toll-free)

https://www.lrh.usace.army.mil/Missions/Flood-Plain-Management-Services/