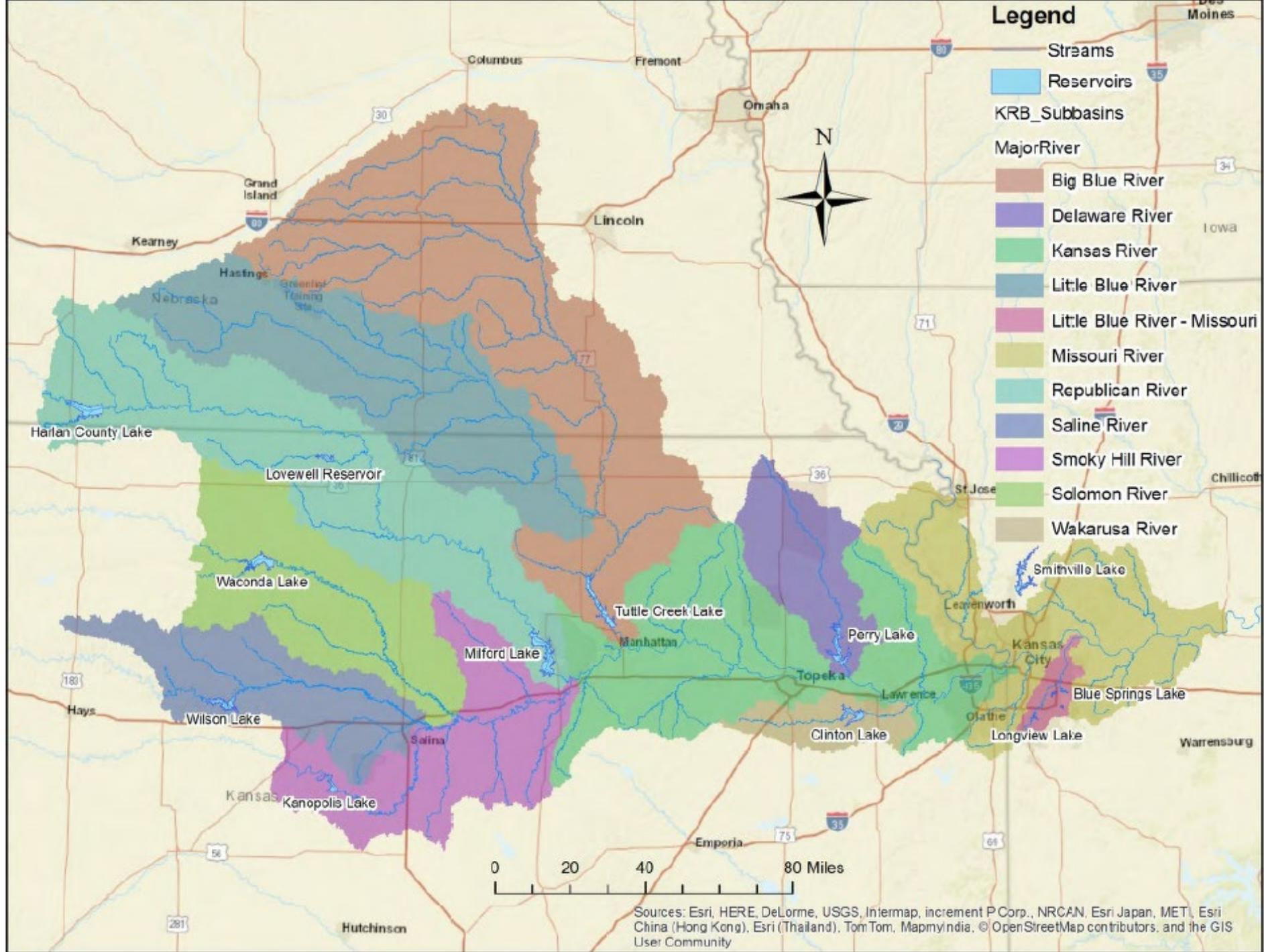


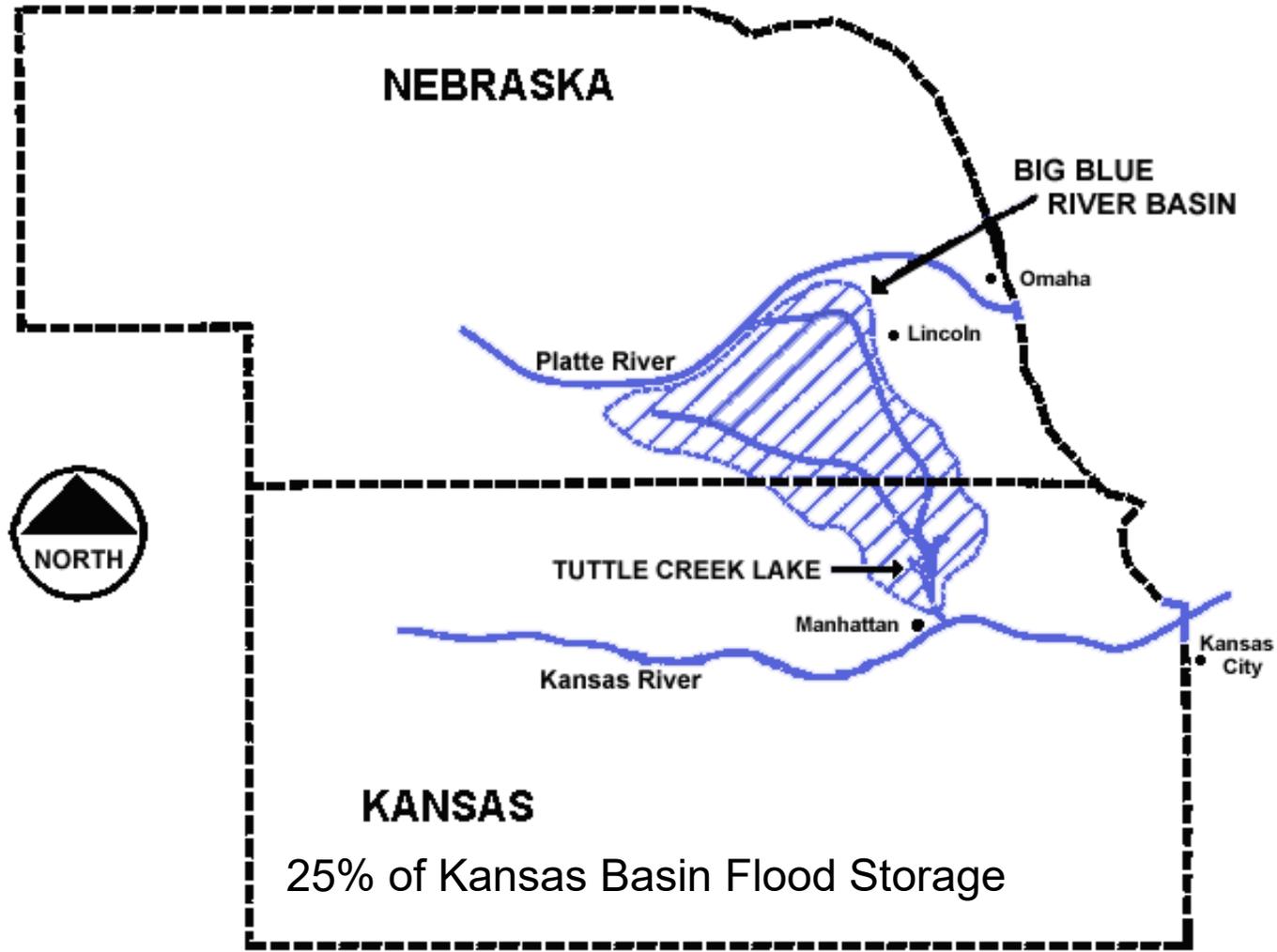


Flood Impact Planning for High Water Release Rates from Tuttle Creek Dam

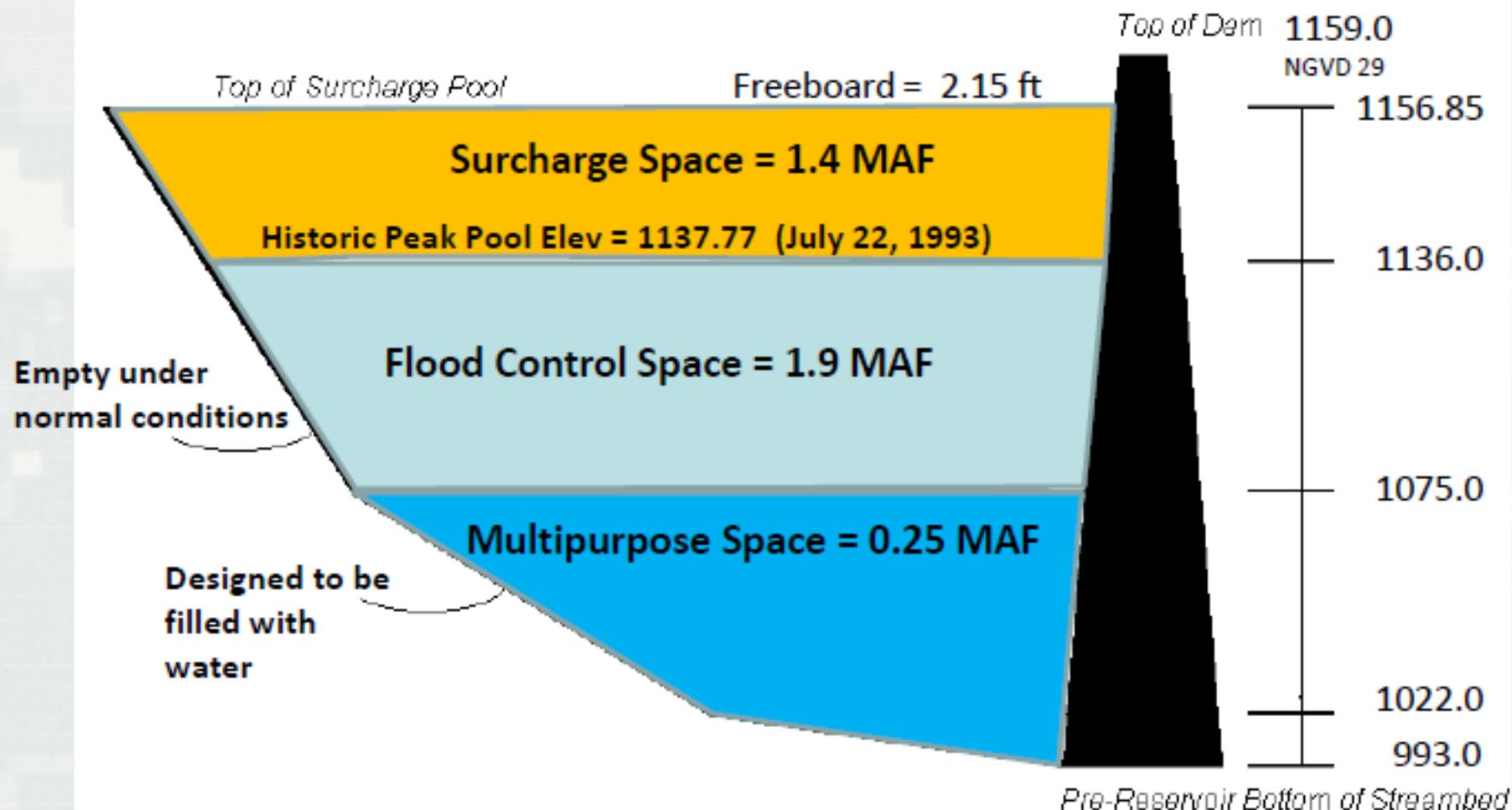
Prepared by: City of Manhattan, Public Works Department
May 20, 2019

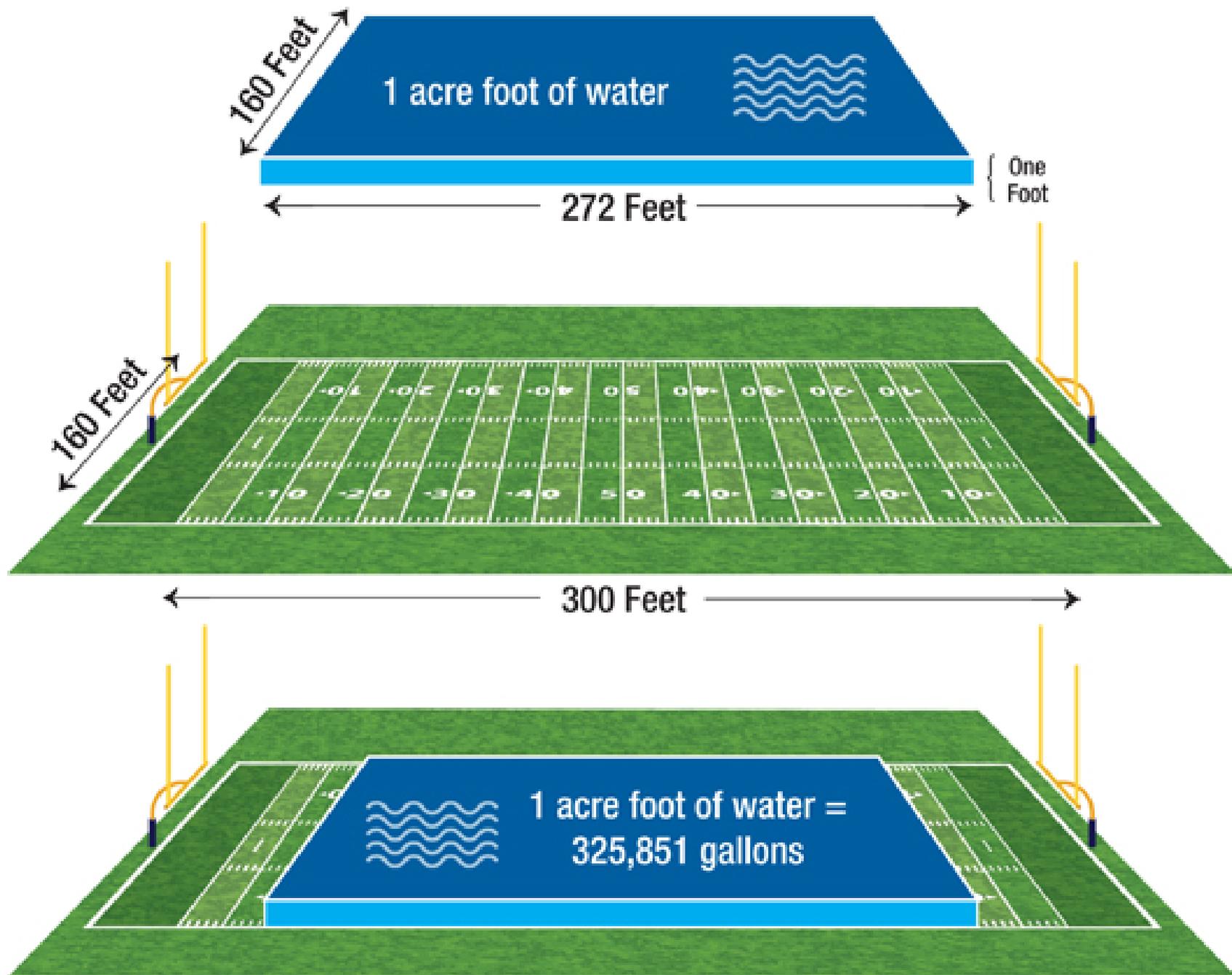


Tuttle Creek Lake Drainage Basin



Tuttle Creek Lake Pool Allocations





Tuttle Creek Max Pool Elevation by Year

Rank	Year	Pool Elevation (FT)
1	1993	1137.77
2	1973	1127.88
3	2019	1125.10
4	1984	1112.30
5	1987	1111.92
6	2015	1110.91
7	1979	1109.10
8	2010	1106.54
9	1995	1105.02
10	2018	1104.10

Action Stages in Relationship to Tuttle Creek Dam Elevations

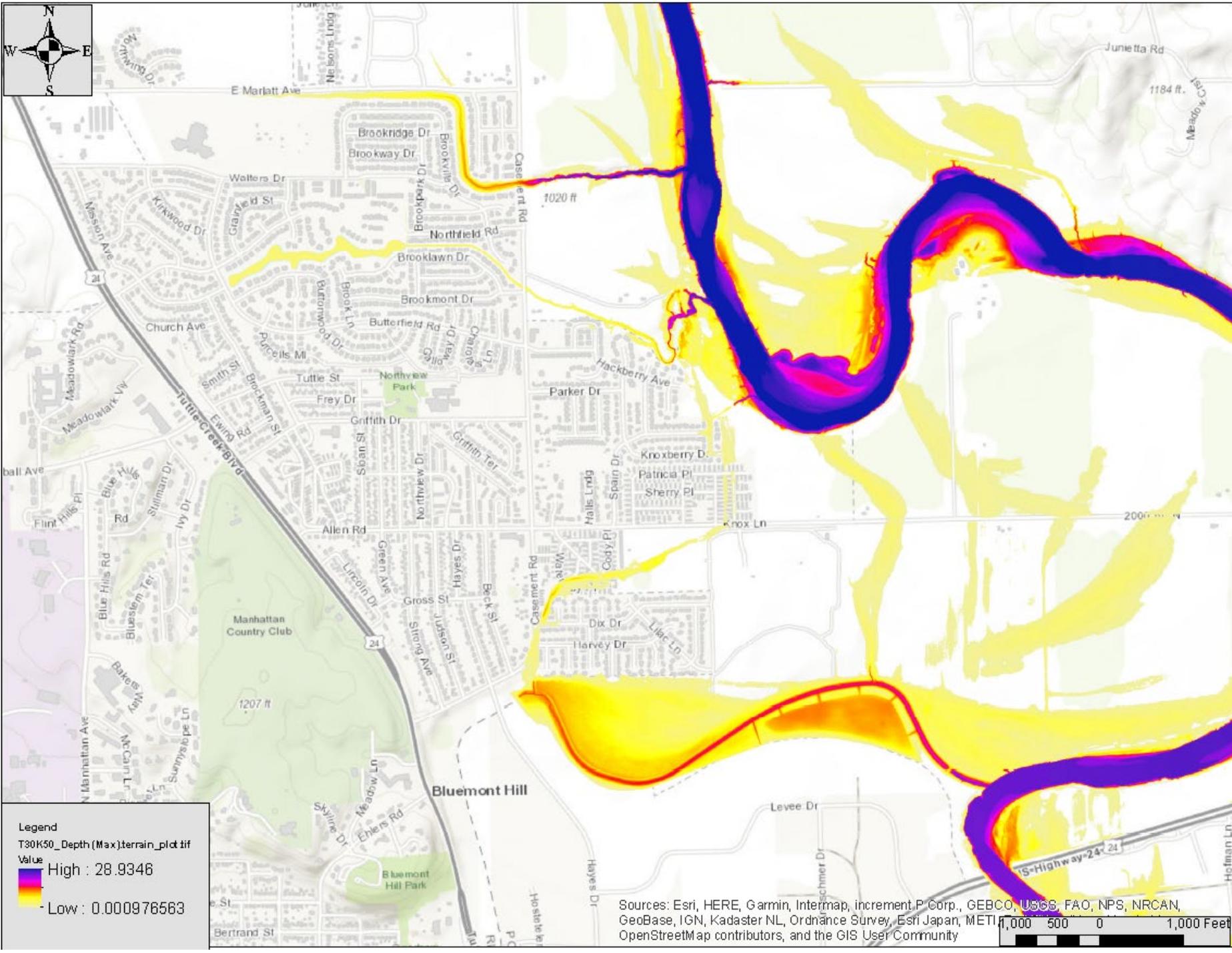
- 1102 **Gets in Spillway**
 - Call United States Army Corps of Engineers (USACE) at least once a week.
- 1114 **Action Stage**
 - Bring Emergency Services and PW together weekly to discuss USACE outlook .
- 1116 **Flood Waters Touches the Gates**
 - Schedule weekly meetings with emergency management services.
 - Update and draft public education and preparedness information.
- 1125
 - Identify and notify at risk populations of flood risks.
 - Distributes family preparedness guide to responders.
- 1126 **Daily Joint EOC meetings**
 - Identify shelter and staging areas that will not be effected.
 - PIO group drafts advisories, watch, evacuation route maps, flood warning messages.
 - Monitor and track all river gauges and lake elevations.
- 1132
 - Establish a 12 hour operational period with briefing.
 - Secure shelter locations, request shelter support from American Red Cross and Salvation Army.
 - Ramp up sandbag filling stations and stockpile sand.

Public Works Actions Taken

- Developed 42 different flood maps for various releases rates and back flow conditions along Kansas River.
- Flood fight training and education on Tuttle Creek Dam and Levee System for Water Treatment Plant Staff, Waste Water Plant Staff, Utilities Division, Engineering Division, and Street and Fleet Staff
- Sandbag Training for Street Division for flood fight along levee system
- Secured materials for flood fight for protection of public infrastructure

Release Rate Inundation Maps

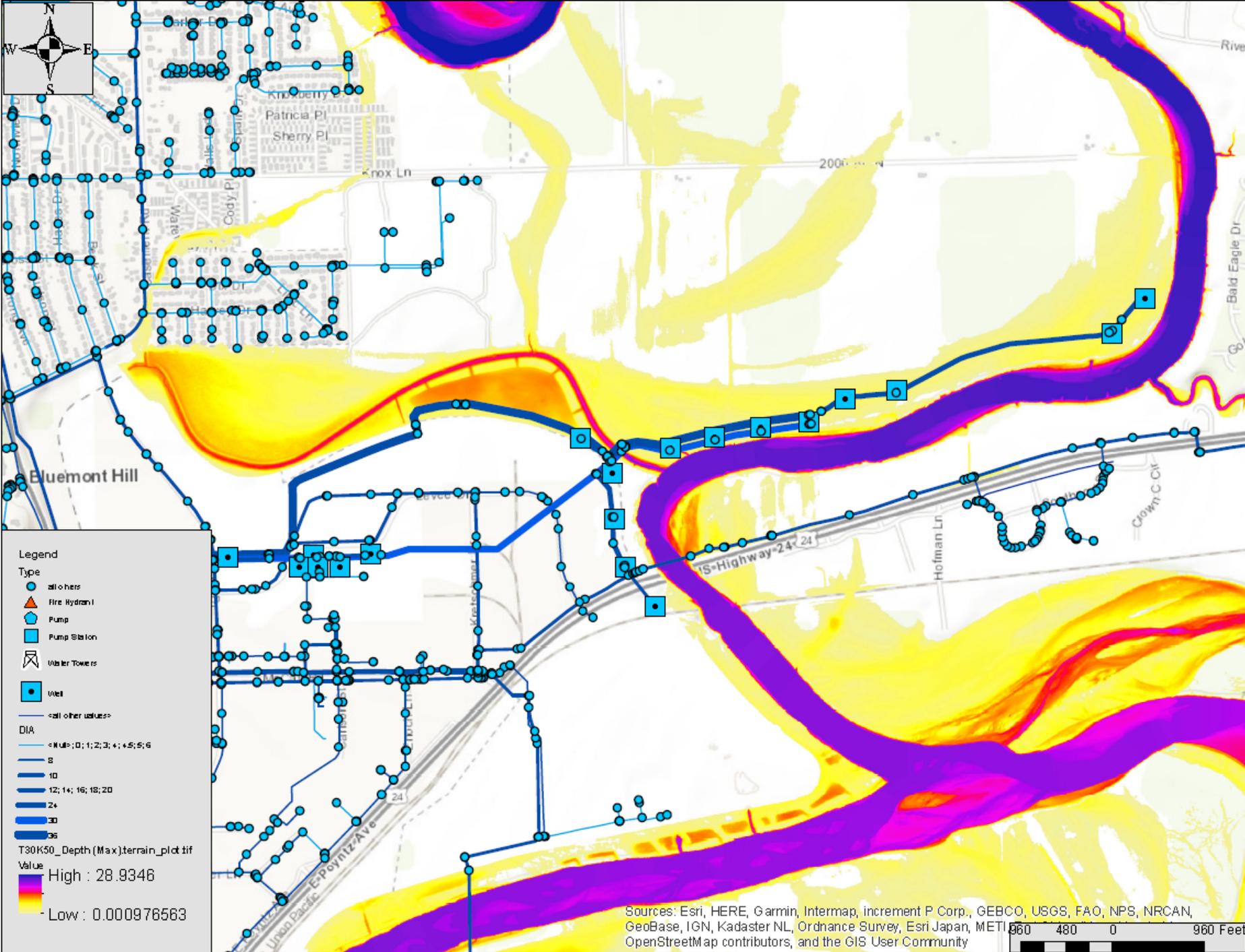
Big Blue -	20,000	25,000	30,000	40,000	50,000	65,000	80,000
30,000 -KS	1	2	3	4	5	6	7
50,000 -KS	8	9	10	11	12	13	14
80,000 -KS	15	16	17	18	19	20	21
110,000 -KS	22	23	24	25	26	27	28
140,000 -KS	29	30	31	32	33	34	35
175,000 -KS	36	37	38	39	40	41	42



Big Blue River Flow Rate Equals
 30,000 cfs
 Kansas River Flow Rate Equals
 50,000 cfs

Legend
 T30K50_Depth (Max) terrain_plot.tif
 Value
 High : 28.9346
 Low : 0.000976563

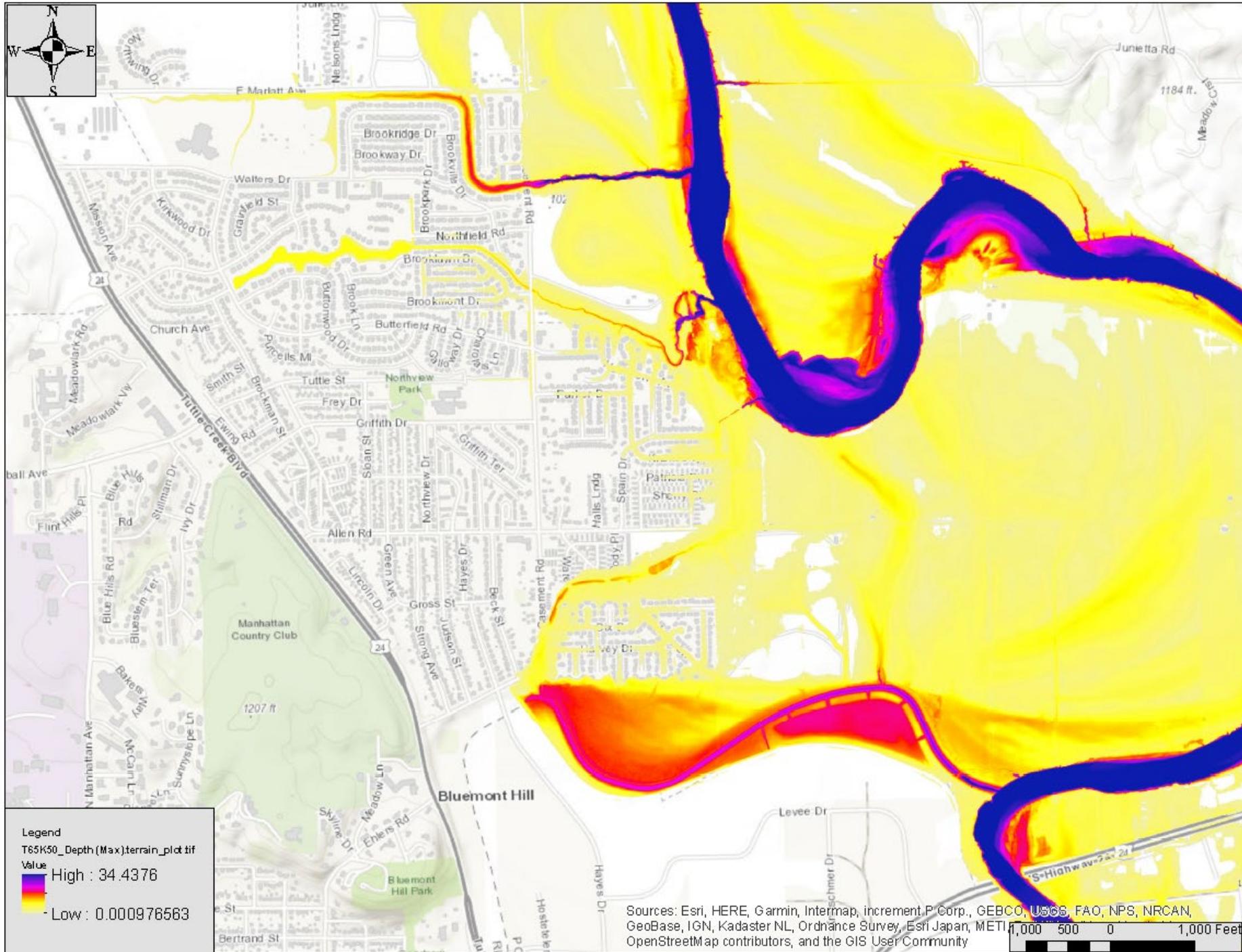
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, OpenStreetMap contributors, and the GIS User Community



Impacts to Public Infrastructure for Various Scenarios

Big Blue River Flow Rate Equals 30,000 cfs

Kansas River Flow Rate Equals 50,000 cfs



Big Blue River Flow Rate
 Equals
50,000 cfs

Kansas River Flow Rate
 Equals
50,000 cfs

Three Things Citizens Need to Know

1. Know your risk based on where live. Some portions of the community have higher risk than other areas.
2. Have a Plan “B” for your family, If you wait to prepare and receive an evacuate note that may be to late, limited resources available to rescue you.
3. Get educated on where to find updated information, Riley Co. Everbridge and Manhattan Website (www.cityofmnhk.com/floodmap).

Remaining Storage vs. Flow Rate

$$\frac{\text{Remaining Storage Volume (cuft)}}{\text{Inflow Rate (cuft/sec)}} = \text{Remaining Time}$$

- Amount of Remaining Storage = 561,109 ac-ft (May 20, 2019)
- Convert to cubic feet = 24,442,005,807 cu ft
- Roughly 2/3 of Flood Control Space is Full
- The higher the flow rate, then the less time remaining till available storage is filled.

Next Public Information Meeting

- May 22, 2019, Wednesday
- 7:00 – 8:30 pm
- Manhattan Fire Station Headquarters, 2000 Denison
- Auditorium Room
- Presenters: United State Army Corps of Engineers