

Alleviating Flood Damage to Critical Hospital Infrastructure through Stream Restoration At Jewish Hospital and St. Mary's Foundation in Louisville, Kentucky

Session B

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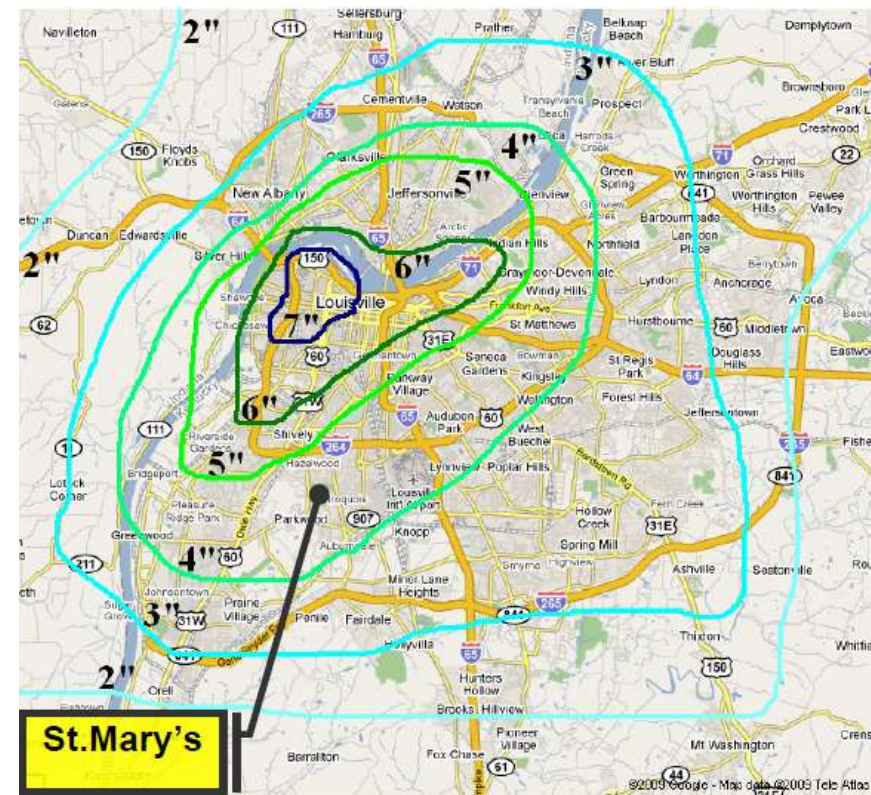


Project Team



The Flood

- August 2009 – JHSMF experienced near 100-year flood event
- Flooded hospital basement housing mechanical/electrical
- Shut down hospital and required patients to be transferred
- Flooded southwest parking lot damaging numerous vehicles



Scope of Project

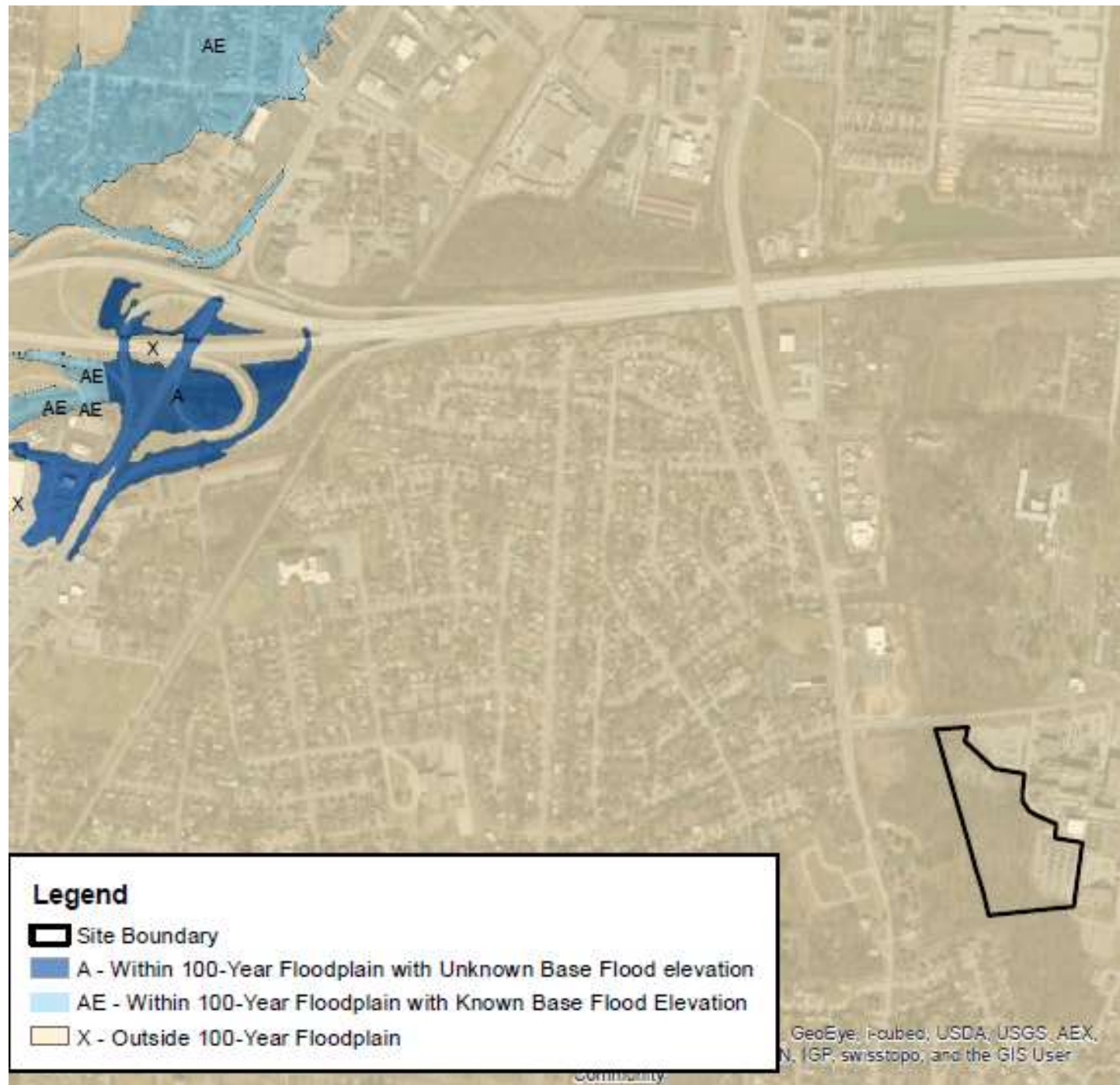
- Conduct a hydraulic and hydrologic study
- Determine flood flow conveyance improvements to protect hospital and infrastructure
- Utilize natural channel design techniques for restoring stream channel
- Provide for a native riparian buffer zone along restored stream channel
- Ensure project is aesthetically pleasing



Project Area



Project Area



Existing Conditions - Hydraulic Constraints

- Wooden pedestrian bridge
- Small 7'6"x9' box culvert for parking lot access crossing
- Mostly blocked 12'x7' box culvert at Bluegrass Avenue
- Elevated streambed downstream of 12'x7' box culvert

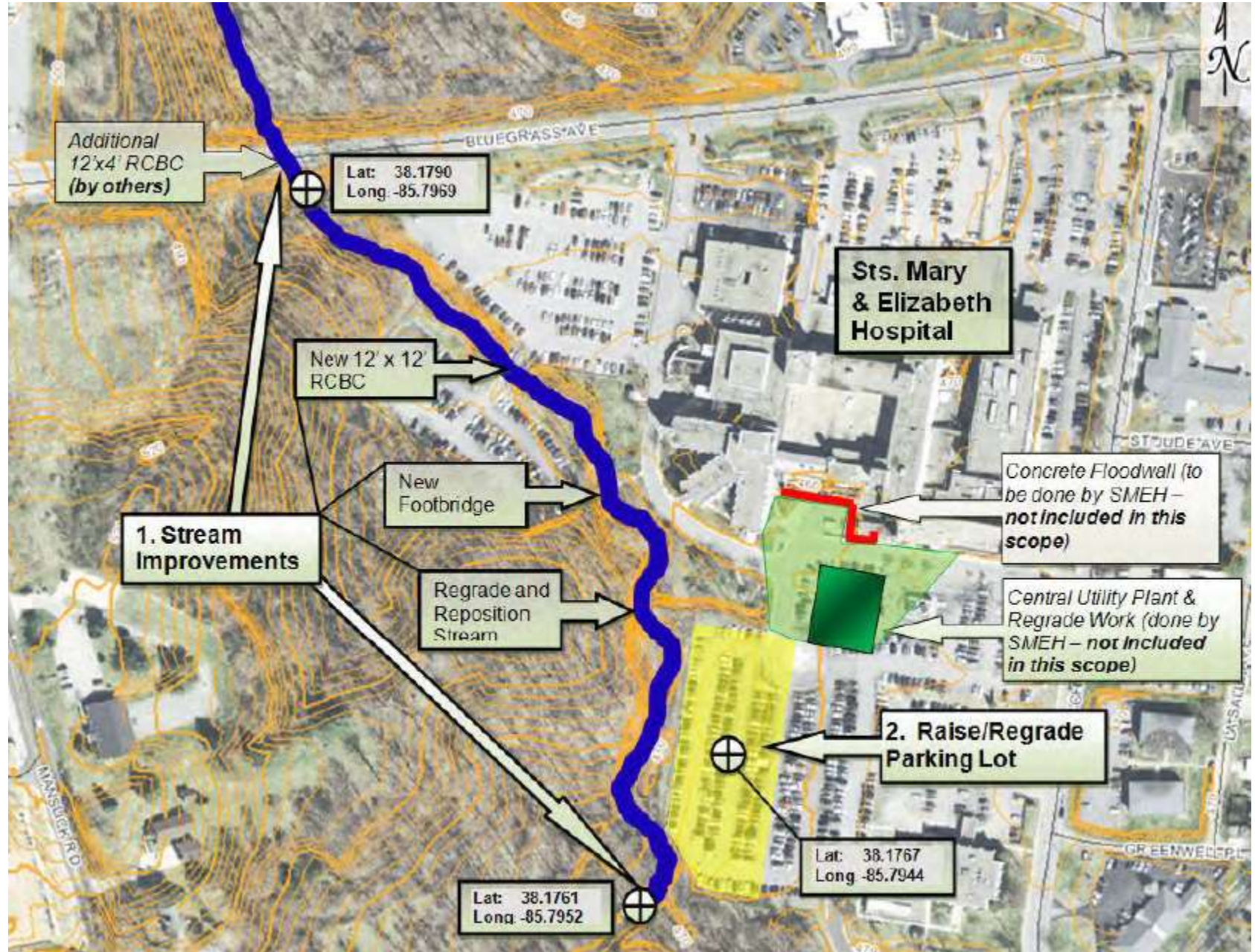


Existing Conditions - Stream

- Intermittent streams with 260 to 510-acre drainage areas
- Low stream slopes from 0.3% to 0.5%
- Streams overwidened, incised and entrenched with vertical eroding banks
- Stream corridor overgrown with invasive shrub species



Proposed Solution



Proposed Solution

- Restore 1,530 lf of stream utilizing NCD principles with floodprone benches
- Replace 7'6"x9' RCBC with 16'10"x8'3" arched open bottom culvert
- Replace existing pedestrian bridge with elevated wider spanning bridge
- Install additional 12'x4' floodflow conveyance box culvert
- Elevate south parking lot
- Construct concrete floodwall adjacent to utility building



Proposed Solution



Stream Restoration

- Establish bankfull channel with riffle/pool morphology and stable planform/geometry
- Increase channel slope
- Create floodprone benches for flood flow conveyance
- Utilize in-channel structures such as boulder j-hooks and log vanes
- Utilize bioengineering techniques
- Stream restoration construction activities completed in Fall 2015



Stream Restoration

Bankfull Channel with Floodprone/Floodplain Benches

- Provides low flow channel to prolong and maintain deeper base flow
- Allows frequent overbanking to reduce in-channel shear stress
- Vegetated floodprone/floodplain benches allow for filtering of overbank flows



Stream Restoration

Riffle/Pool Morphology

- Riffles provide both grade control and in-channel aquatic habitat
- Turbulent flow through riffles increase dissolved oxygen in water
- Pools provide slower velocities and allow organics to settle and provide food for aquatic organisms
- Pools provide deeper water aquatic habitat



Stream Restoration

Boulder J-Hooks and Log Vanes

- Provide both vertical and horizontal grade control
- Provide in-channel aquatic habitat
- Reduce near-bank shear stress and protects outer streambanks from erosion



Stream Restoration

Branch Layering and Live Staking

- Uses quick growing, natural woody cuttings to provide streambank stability and outer streambank protection
- Provides natural armorment of streambanks and protects against streambank erosion
- Provides shading of stream channel and aquatic habitat



BEFORE



DURING



AFTER



BEFORE



DURING



AFTER



BEFORE



DURING



AFTER



Summary

- Successful project
- Has protected hospital and infrastructure from flooding
- Improved stream function
- Increased in-stream habitat
- Enhanced riparian zone
- Aesthetically pleasing



Contact Us

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