Tookany Creek Feasibility Study

Hydrologic Model With Project Conditions

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US Army Corps of Engineers

BUILDING STRONG®

With Project Conditions

- Structural and Non-Structural Solutions
  - Warning Systems
  - Buyouts
  - Channelization
  - Storage Areas
  - Floodwalls / Levees
  - Low Impact Development
  - etc.

- Implementation Concerns
  - Structural / Geotech
  - Environmental
  - Societal

Low Impact Development

Rain Barrels

- Modeling Assumptions
  - 2500 ft^2 building roof space
  - 50 gal drums
    - 0.032 inches of runoff from 2500 ft^2 will fill 1 drum
    - 5 drums per building = 0.16 inches of runoff per building
  - One Building per grid cell (each grid cell is ~2420 ft^2)
  - Buildings assigned using NLCD 2006 for all spaces designated as:
    - (22) Developed, Low Intensity
    - (23) Developed, Medium Intensity
    - (24) Developed, High Intensity
  - Results in 24,325 rain barrels
  - Assumptions favor greater reductions in runoff -> More impact than likely

Image from Philadelphia Water Department

Low Impact Development

Porous Pavement

- Modeling Assumptions
  - ½ inch of runoff intercepted by areas with greater than 75% impervious cover
  - Results in approx. 600 acres of porous pavement
  - Assumptions favor greater reductions in runoff -> More impact than likely

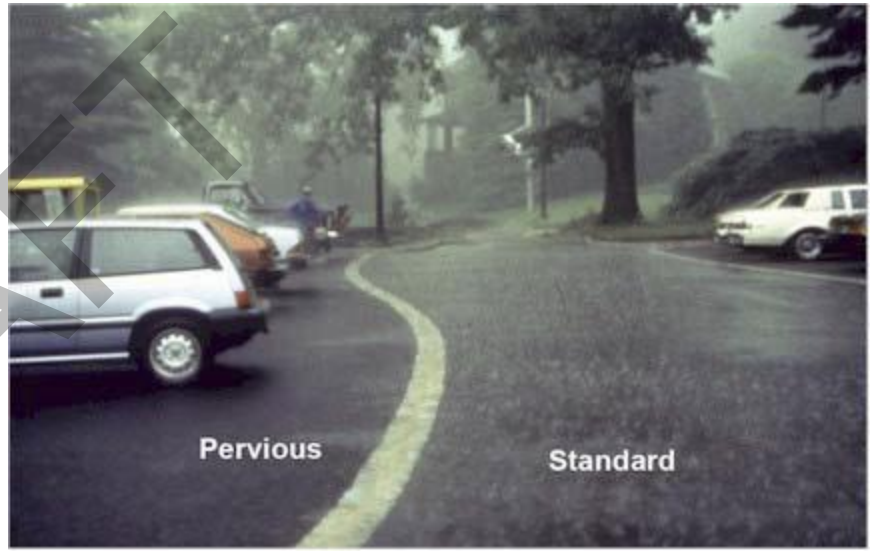
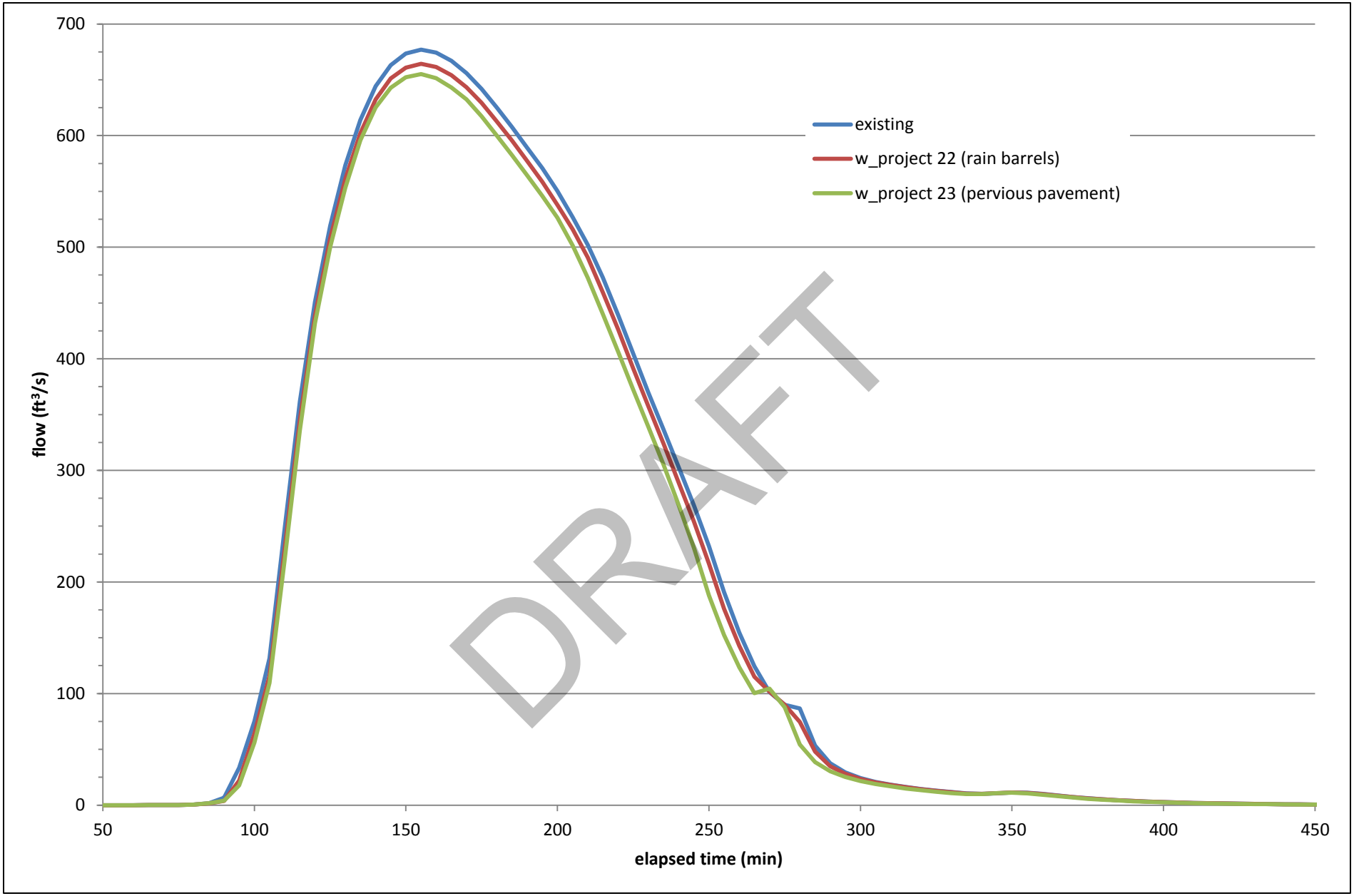


Image from PA BMP Manual



Low Impact Development Options
10% Annual Chance Exceedance Event, 3hr Duration
U/S end of Brookdale Levee

Figure 5

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Storage Areas

- "Dry Dams" with no permanent pool
  - Minimize environmental damage
  - Maximize available flood storage
- NOT this big…

Images courtesy of Dr. Robert Traver, Villanova University

Small-Scale Dry Dam Examples

Figure 7

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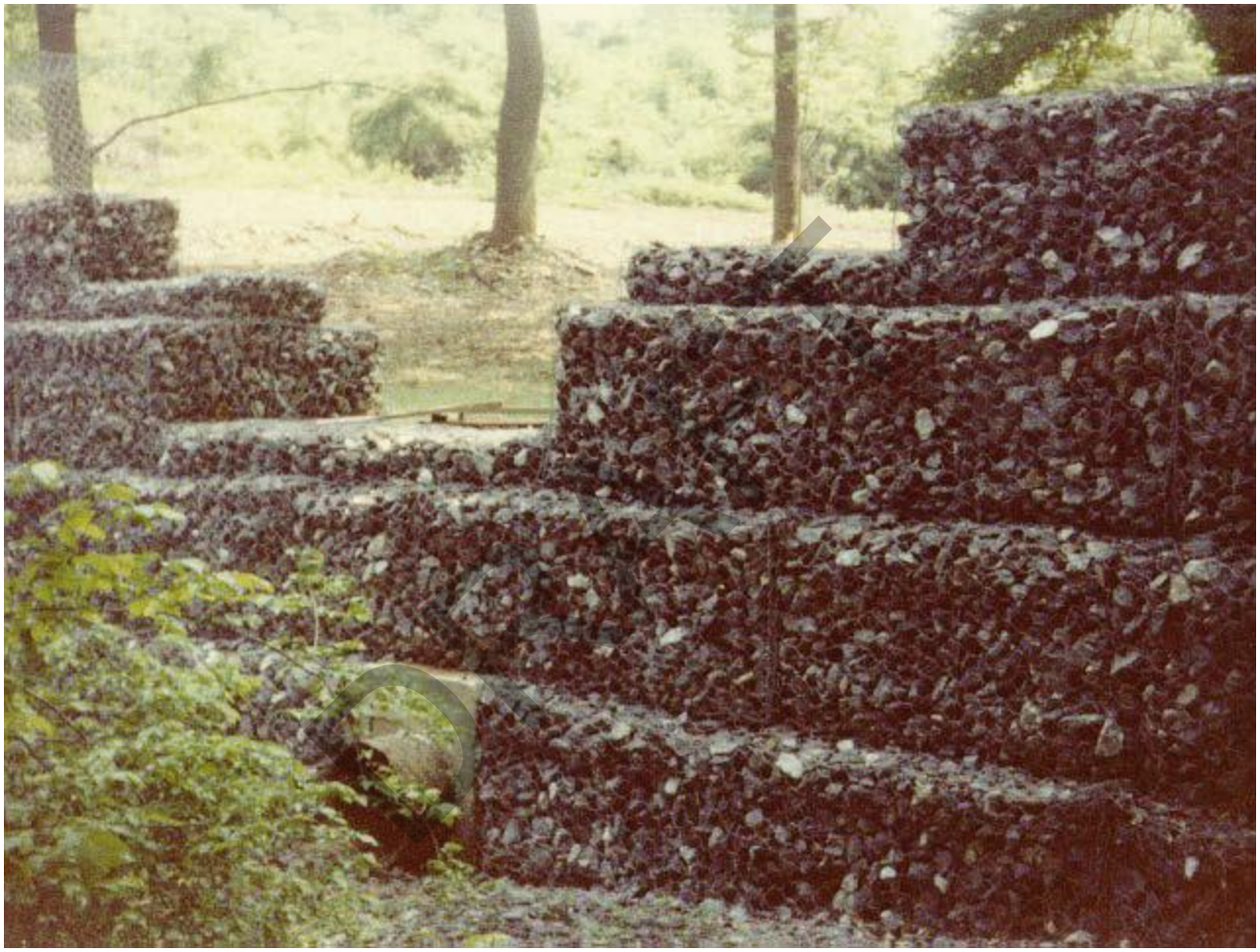

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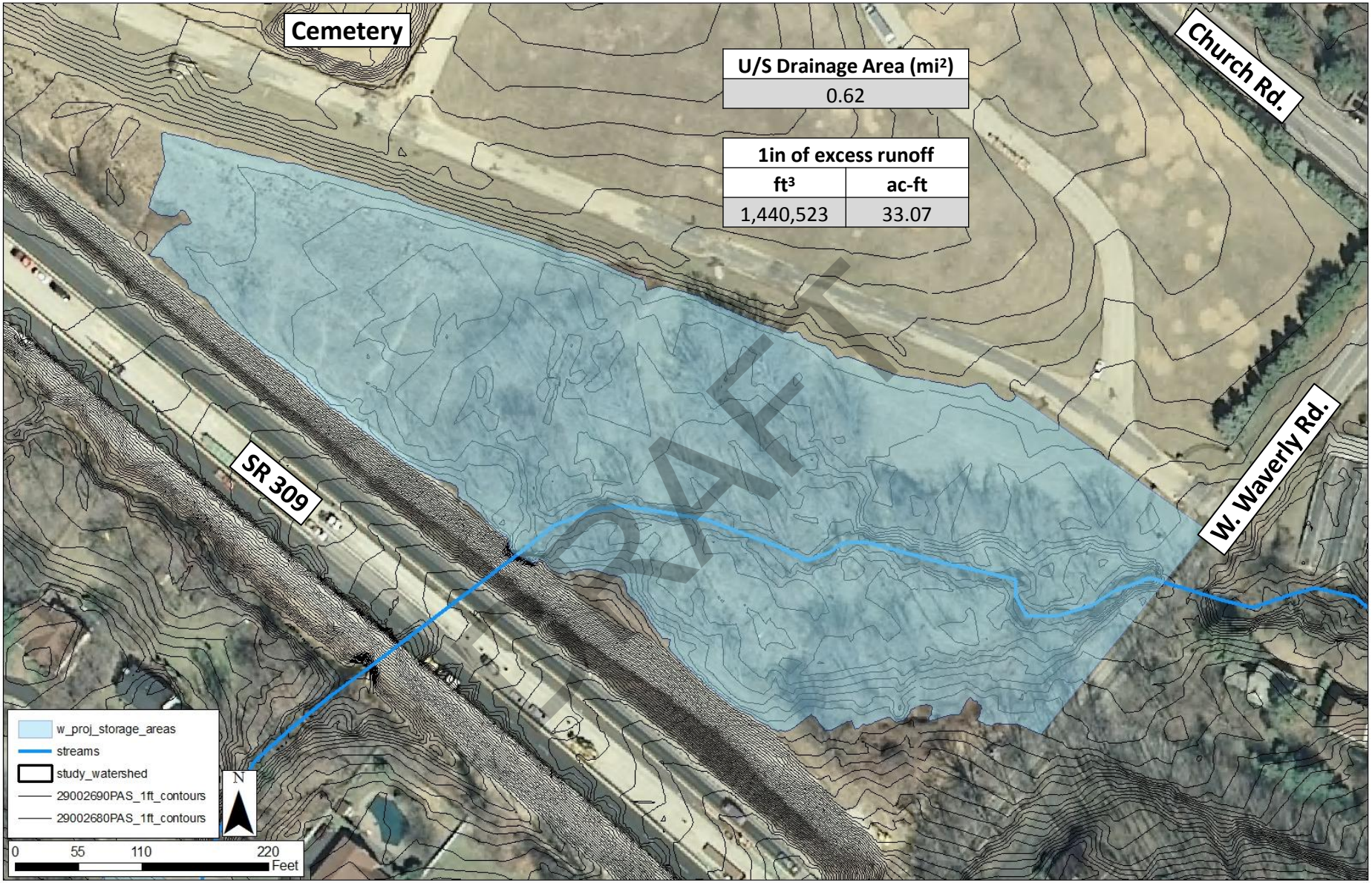
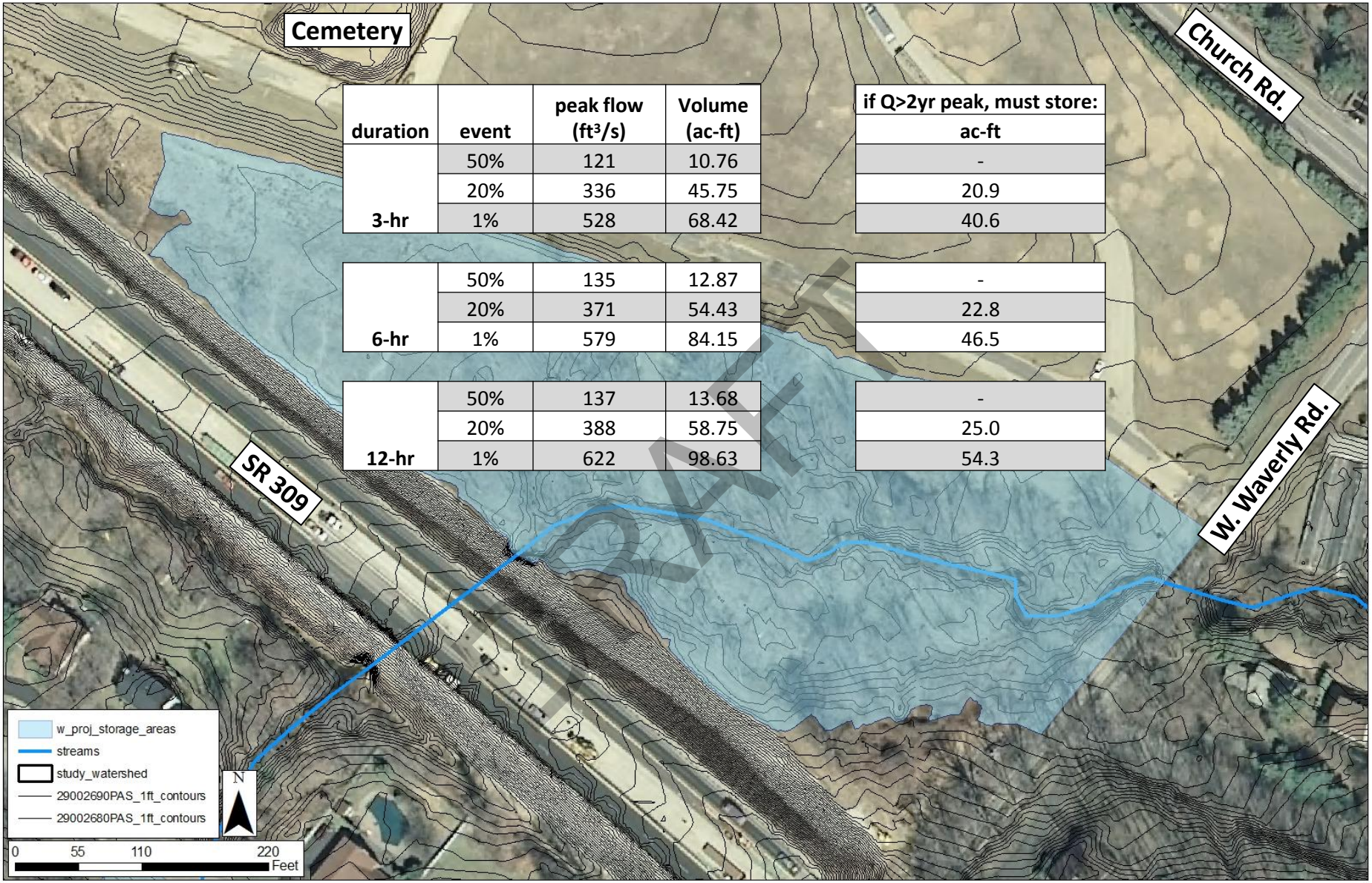


Possible Storage Area
W. Waverly Rd.
DCNR / PAMAP Orthophotograph

Figure 9

JULY 2013



duration	event	peak flow (ft^3/s)	Volume (ac-ft)	if Q>2yr peak, must store: ac-ft
3-hr	50%	121	10.76	-
	20%	336	45.75	20.9
	1%	528	68.42	40.6
6-hr	50%	135	12.87	-
	20%	371	54.43	22.8
	1%	579	84.15	46.5
12-hr	50%	137	13.68	-
	20%	388	58.75	25.0
	1%	622	98.63	54.3

Possible Storage Area
W. Waverly Rd.
DCNR / PAMAP Orthophotograph

Figure 10

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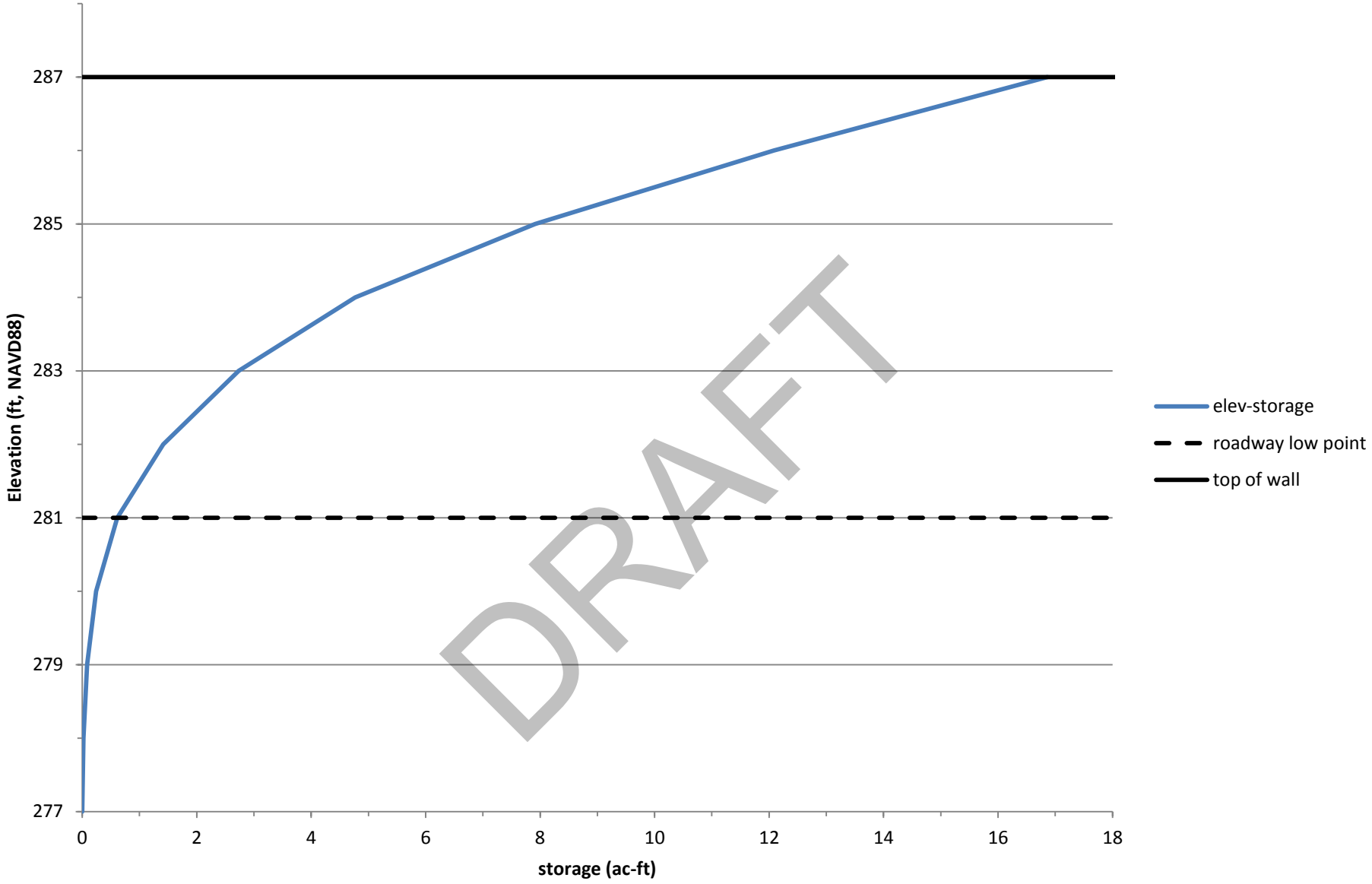
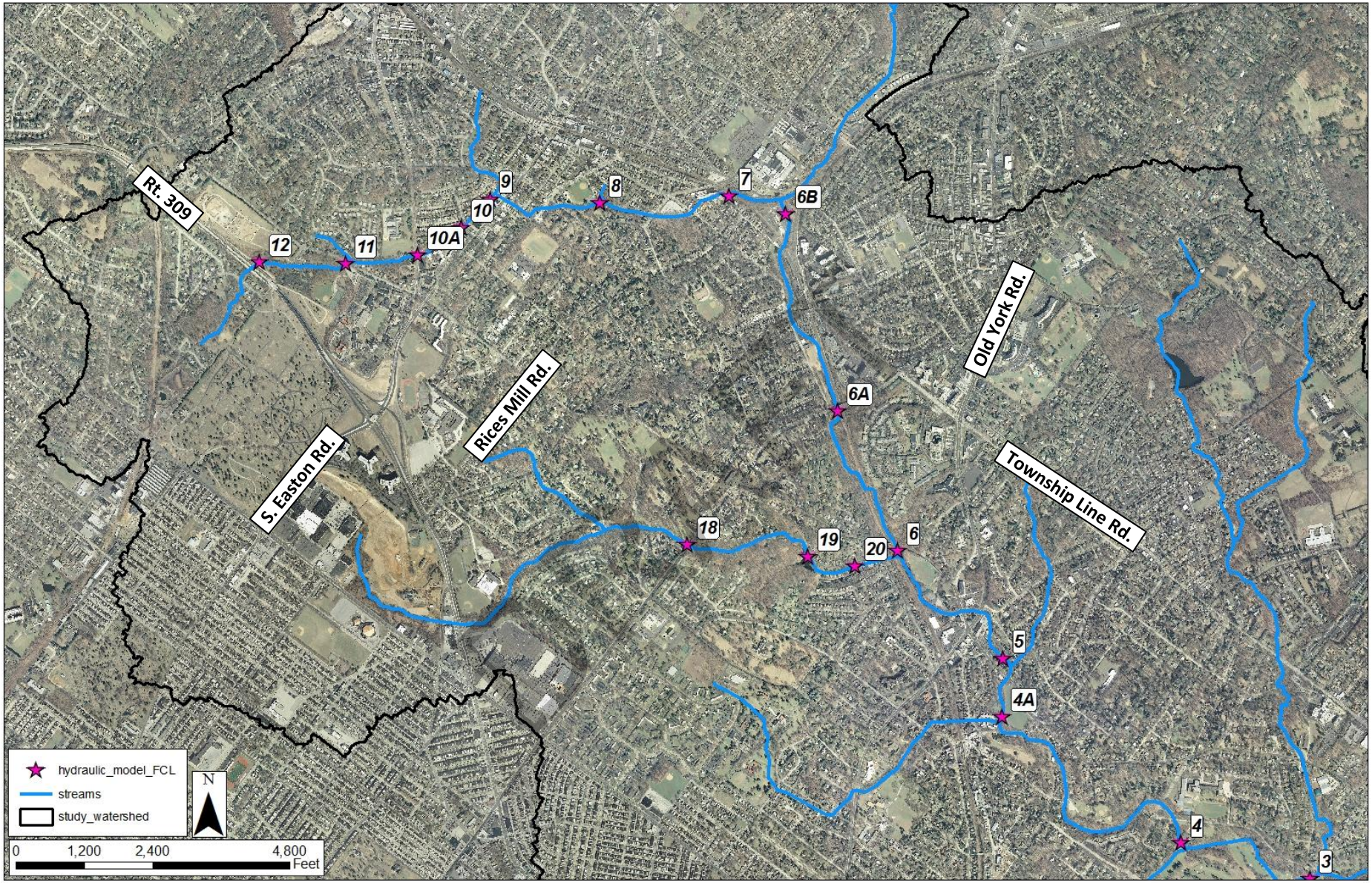


	Possible Storage Area W. Waverly Rd. Elevation-Storage Relationship	Figure 11 JULY 2013



Upper Tookany Creek Flow Change Locations

DCNR / PAMAP Orthophotograph

Figure 12

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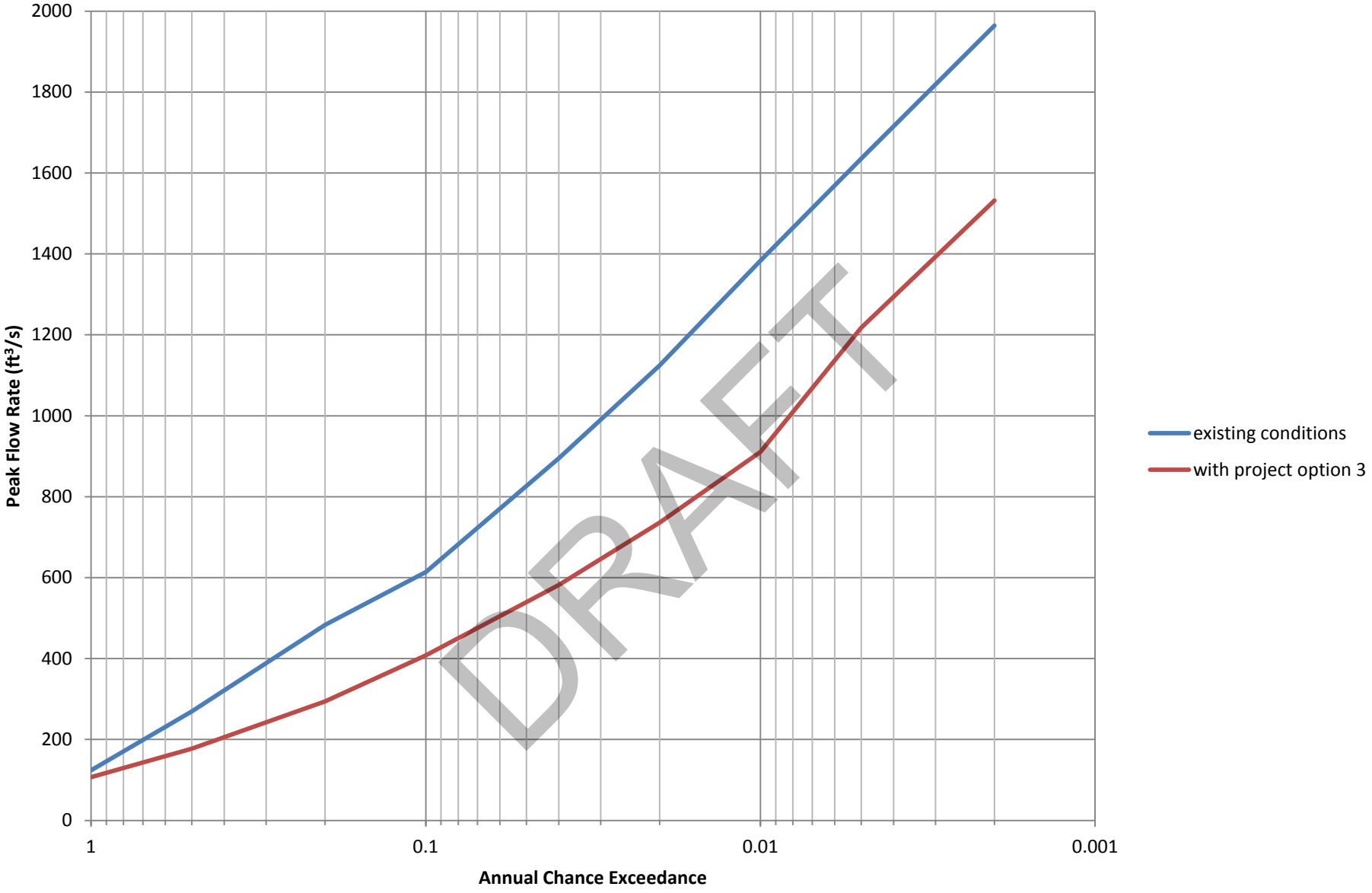

Annual Chance Exceedance – Peak Flow Rate
Existing Conditions vs. Possible West Waverly SA
Flow Change Location 10A – D/S of Rt. 152

Figure 13

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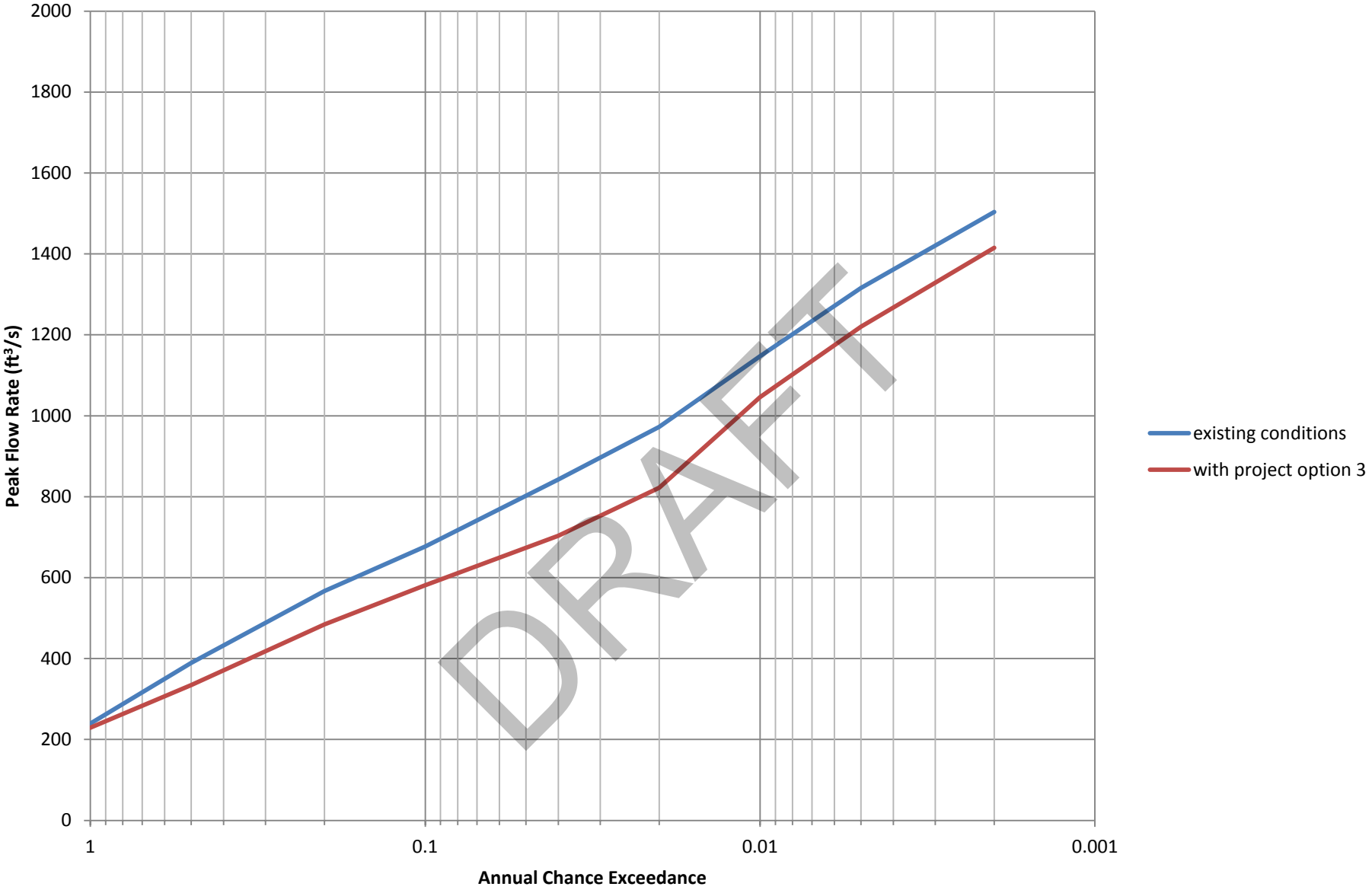

Annual Chance Exceedance – Peak Flow Rate
Existing Conditions vs. Possible West Waverly SA
Flow Change Location 8 – U/S of Keswick Ave. Culvert Confluence

Figure 14

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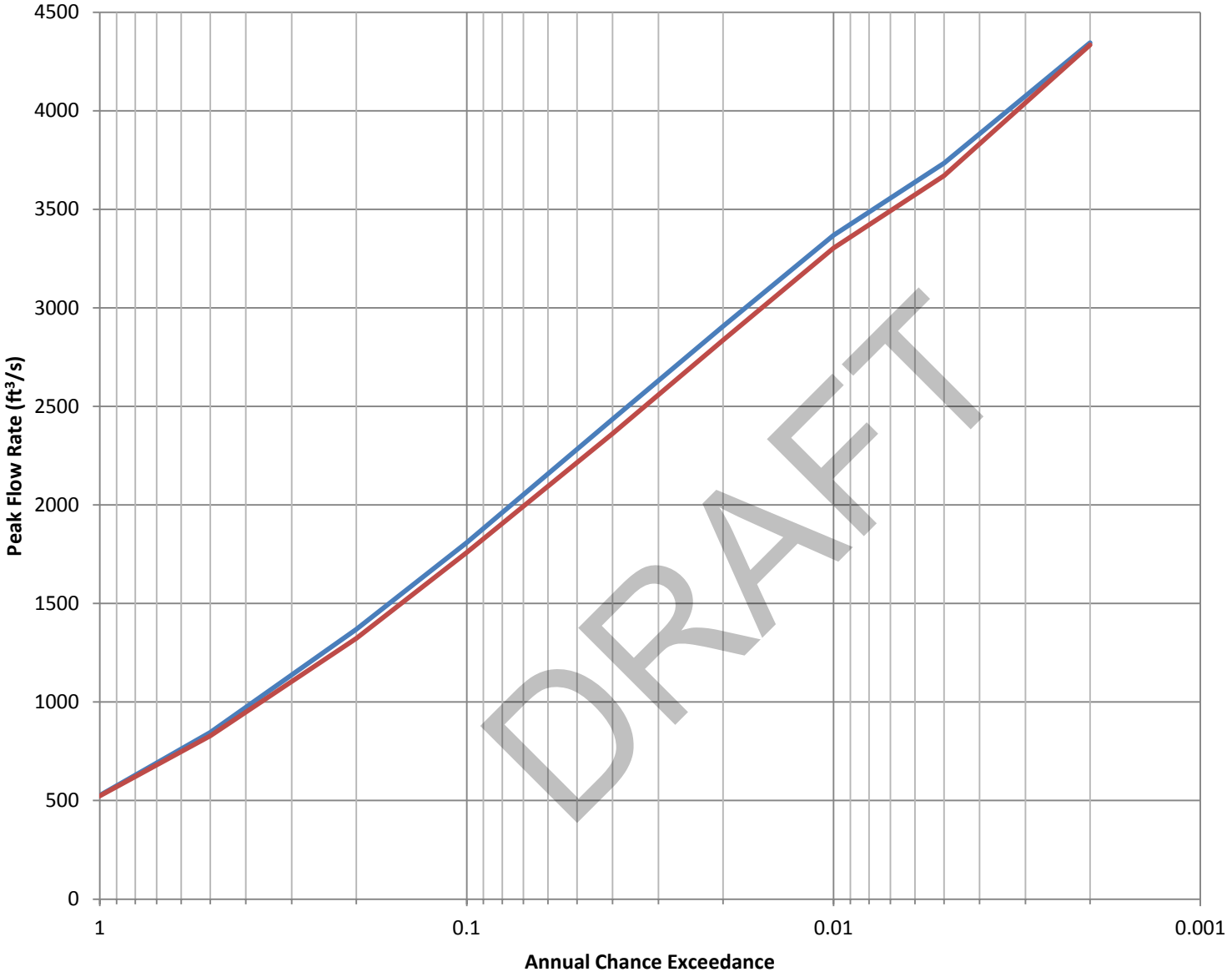

Annual Chance Exceedance – Peak Flow Rate
Existing Conditions vs. Possible West Waverly SA
Flow Change Location 6 – U/S of Rock Creek Confluence

Figure 15

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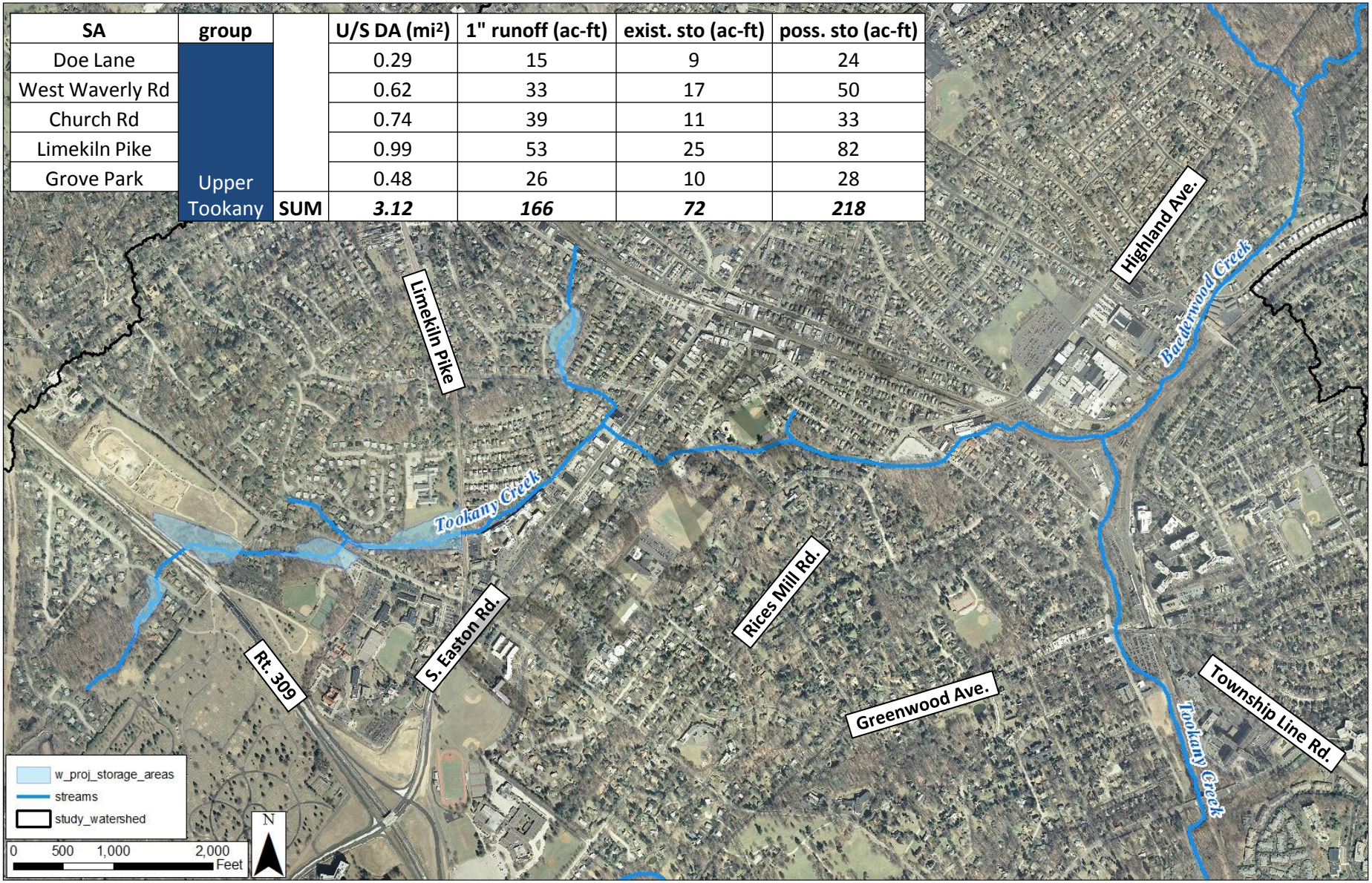
SA	group		U/S DA (mi²)	1" runoff (ac-ft)	exist. sto (ac-ft)	poss. sto (ac-ft)
Doe Lane	Upper Tookany		0.29	15	9	24
West Waverly Rd			0.62	33	17	50
Church Rd			0.74	39	11	33
Limekiln Pike			0.99	53	25	82
Grove Park			0.48	26	10	28
		SUM	***3.12***	***166***	***72***	***218***



Possible Storage Areas – Upper Tookany Creek

DCNR / PAMAP Orthophotograph

Figure 16

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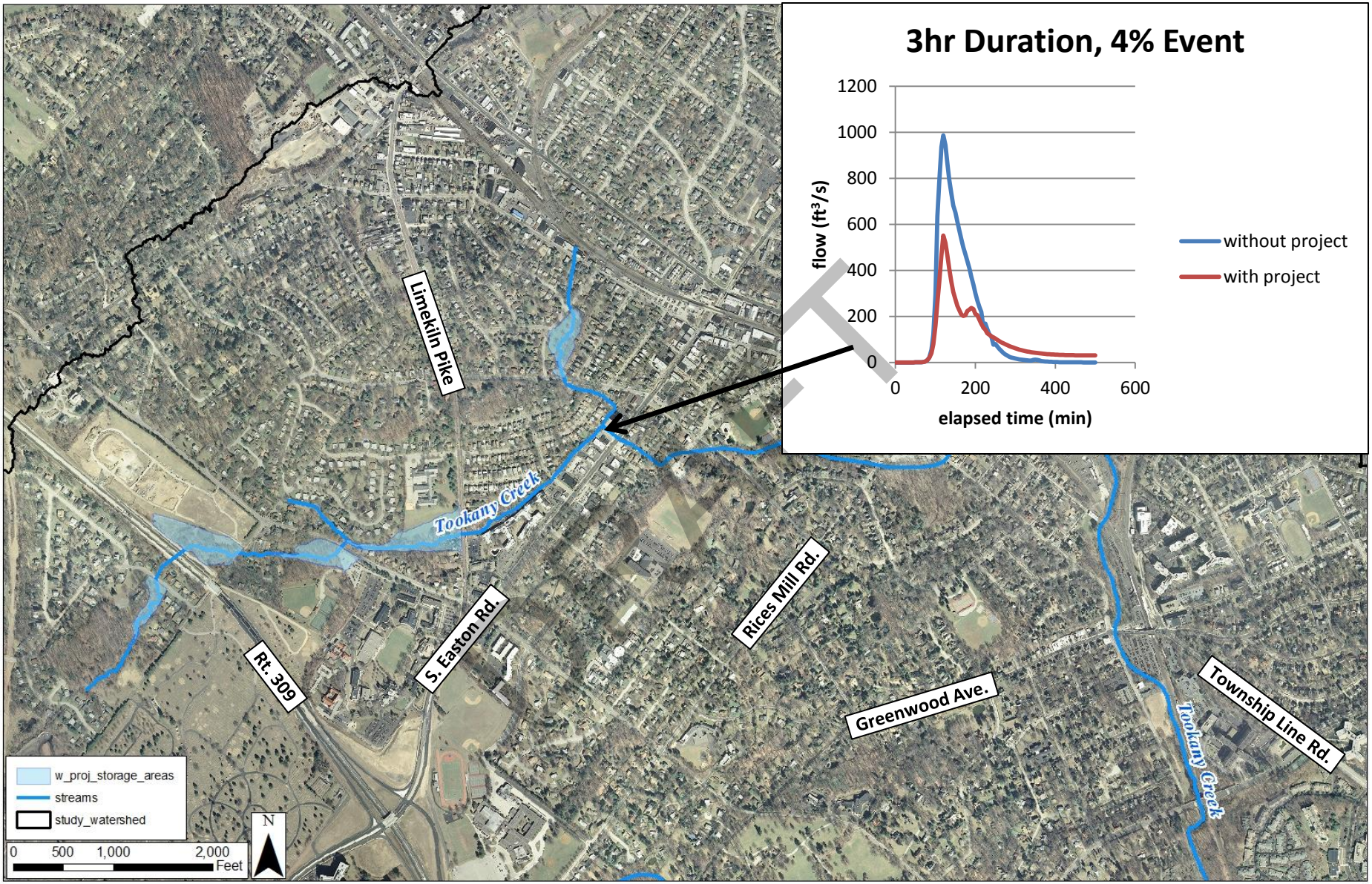

Possible Storage Areas – Upper Tookany Creek
Results at Easton Rd.
DCNR / PAMAP Orthophotograph

Figure 17

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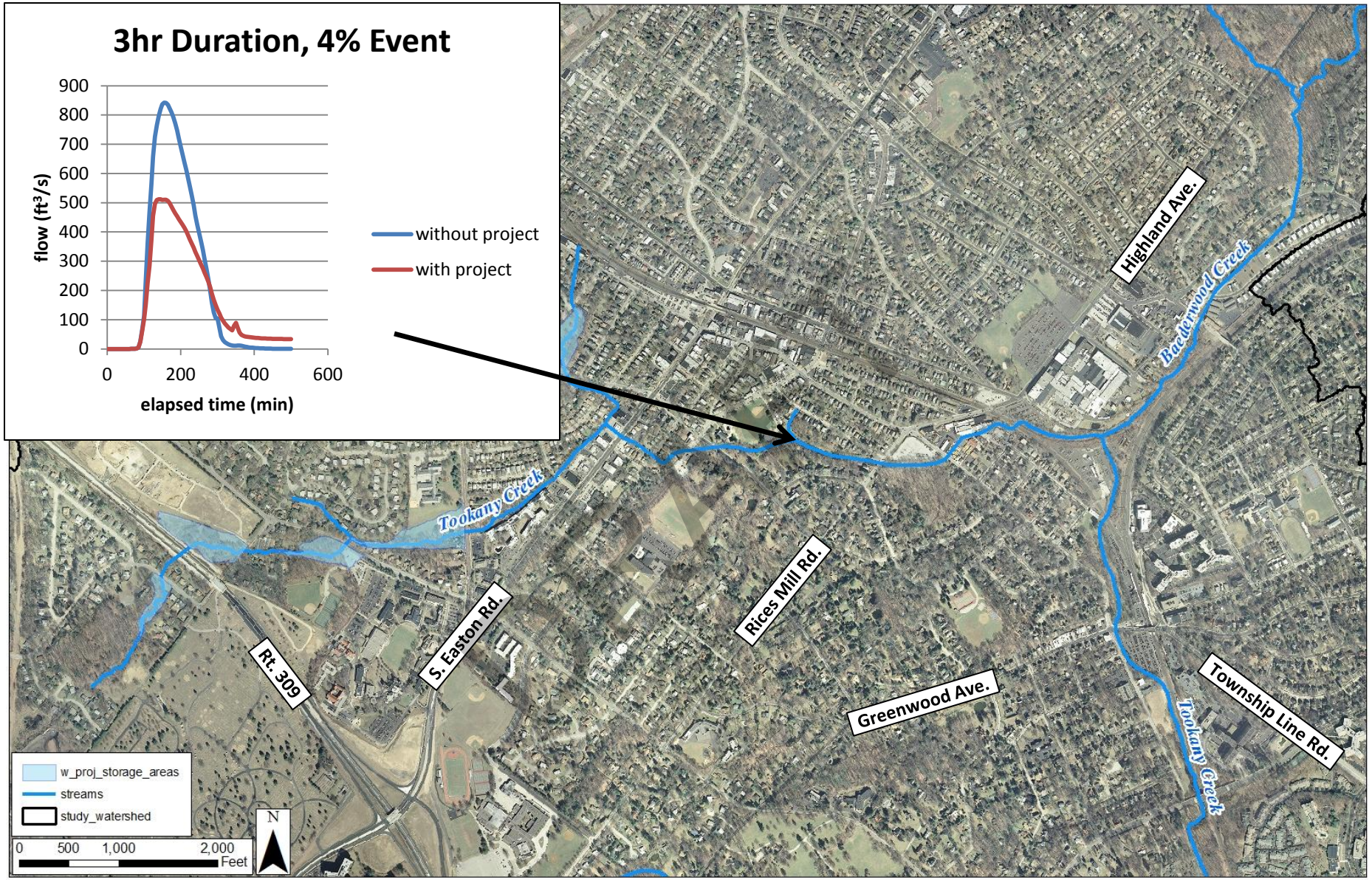

Possible Storage Areas – Upper Tookany Creek
Results at Keswick Ave. Culvert
DCNR / PAMAP Orthophotograph

Figure 18

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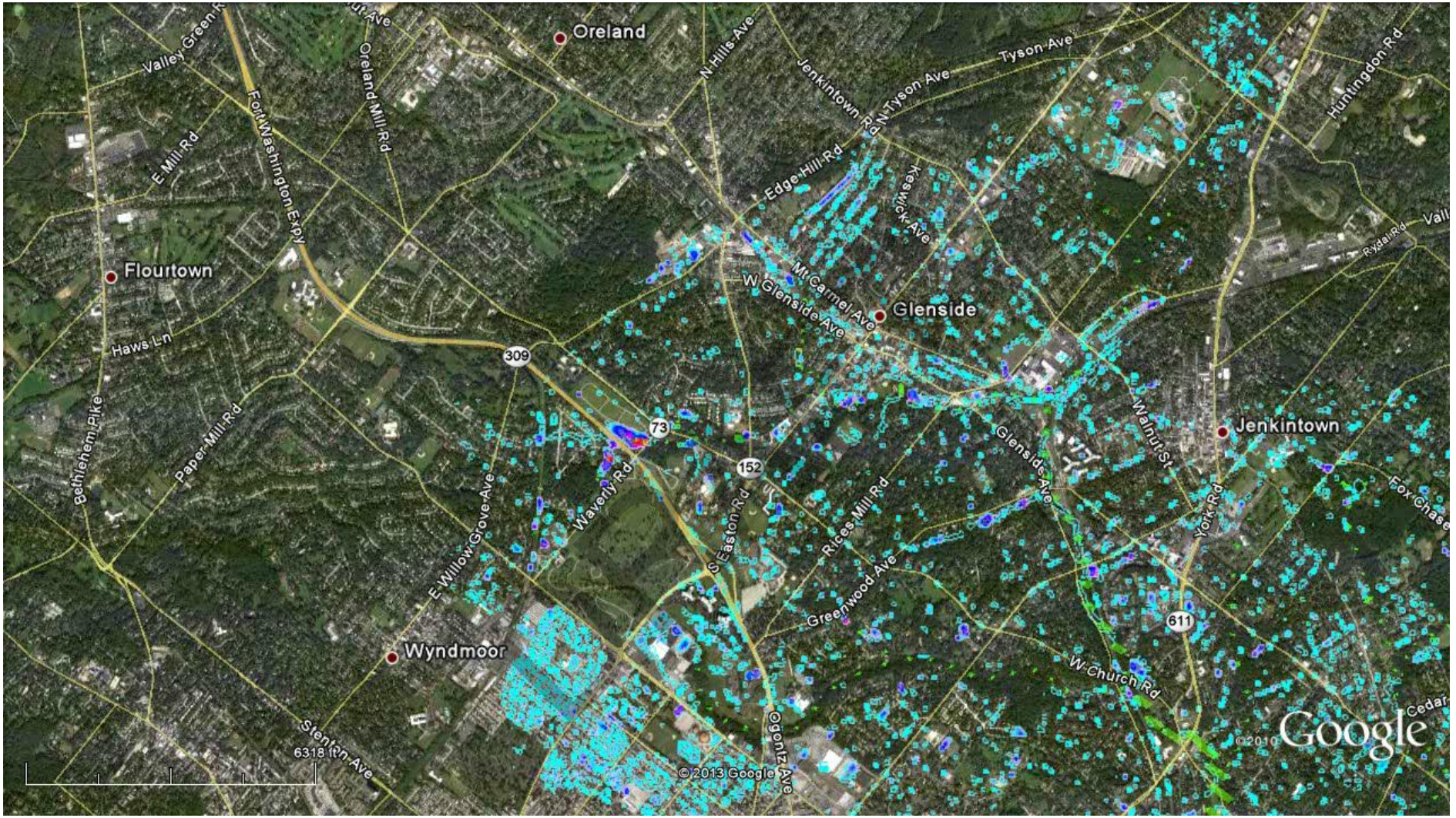
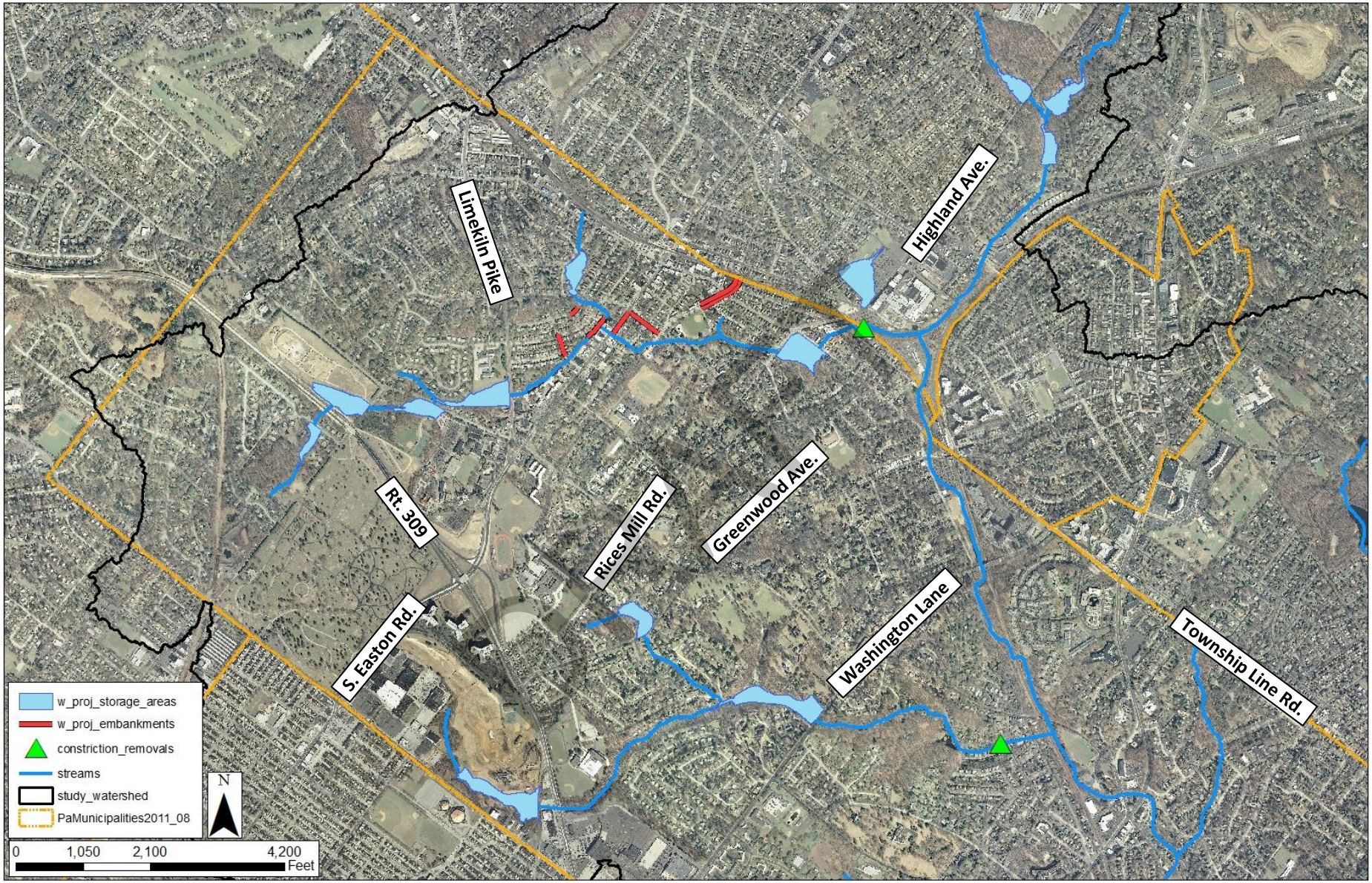


	Possible Storage Areas – Upper Tookany Creek *GSSHA – Google Earth Movie*	Figure 19 JULY 2013



Possible Hydrologic With Project Conditions

DCNR / PAMAP Orthophotograph

Figure 20

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With Project #	Name	Type
1	Upper Tookany SAs	SA
2	Doe Lane	SA
3	West Waverly Rd	SA
4	Church Rd	SA
5	Limekiln Pike	SA
6	Grove Park	SA
7	George Perley Bird Sanctuary	SA
8	Highland - Mt Carmel	SA
9	Baederwood Creek SAs	SA
10	Baeder Rd	SA
11	Highland East	SA
12	Highland West	SA
13	Limekiln - Ogontz	SA
14	Trib - Greenwood	SA
15	Washington Lane	SA
16	Rock Creek SAs	SA
17	SEPTA 11.22 Culvert	Constriction Removal
18	Rock Creek Culvert	Constriction Removal
19	Harrison Ave. Wall	Floodwall
20	Bickley Rd. Wall	Floodwall
21	Brookdale Ave. Wall	Floodwall
22	5 Rain Barrels / Building	LID
23	Porous Pavement	LID

Conclusions

- Some With Project Conditions work, others don't
- Can combine options
  - i.e. Storage Areas plus wetland creation
- Still need plan optimization
  - Environmental Issues
  - Economics
  - Other issues