STORMWATER DETENTION FEASIBILITY STUDY

SITE 1 – ALPHA RD

CITY OF FARMERS BRANCH | December 10, 2019

FARMERS BRANCH

FREESE AND NICHOLS

FEASIBILITY STUDY OBJECTIVES

1. Identify potential stormwater detention sites
2. Reduce runoff volume and peak flows
3. Delay runoff releases to reduce peaks downstream
4. Evaluate effectiveness of combined detention
5. Develop rough order of magnitude costs

Arlington Heights – Western Avenue Detention Pond

SITE 1 – ALPHA RD

SITE 1 – ALPHA RD

AVAILABLE AREA FOR DETENTION

- Surface area ~ 3 acres
- Constraints
  - Alpha Rd
  - Alpha Rd Connector Alignment
  - Topography
- **Goal: Maximize storage within available site area**

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SITE 1 – ALPHA RD

POTENTIAL POND GEOMETRY AND STRUCTURES

- Bottom elevation 561 ft (6 ft deep)
- Maximum storage capacity **~ 14 ac-ft**
- Pond intake structure: Lateral weir (~200 ft)
- Pond outlet structure: 12-in diameter pipe (~150 ft)

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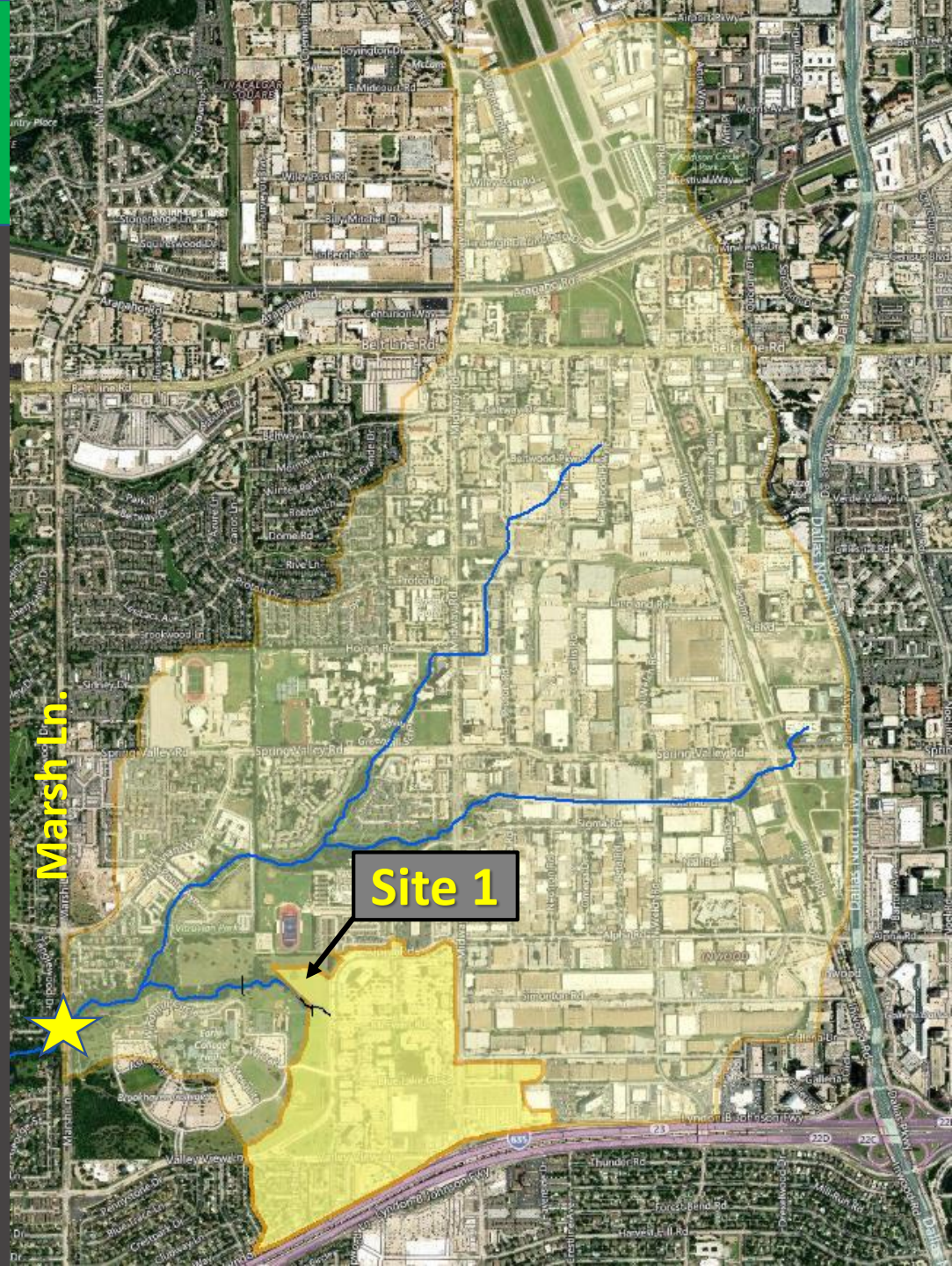
METHODOLOGY

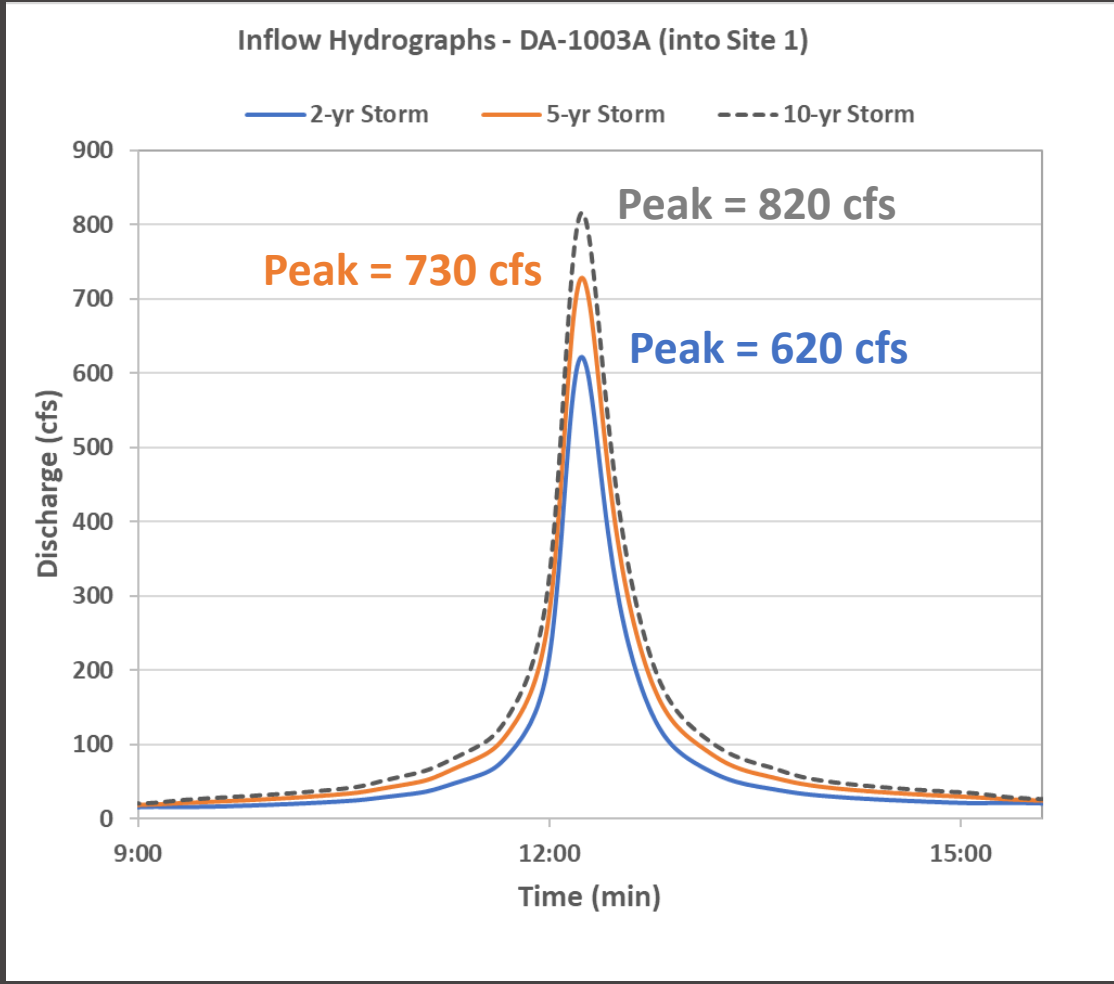
HYDROLOGIC AND HYDRAULIC ANALYSIS

- Drainage area determined based on 2009 LiDAR topography, site plans for Bella Ln/Alpha Rd connector, and storm drain network data provided by the City.
- Design point – Marsh Ln
  (to compare peak runoff results)
- Drainage area to Marsh Lane – **2181 acres**
- Drainage area to detention site – **192 acres**
  (<9% of drainage area at design point)



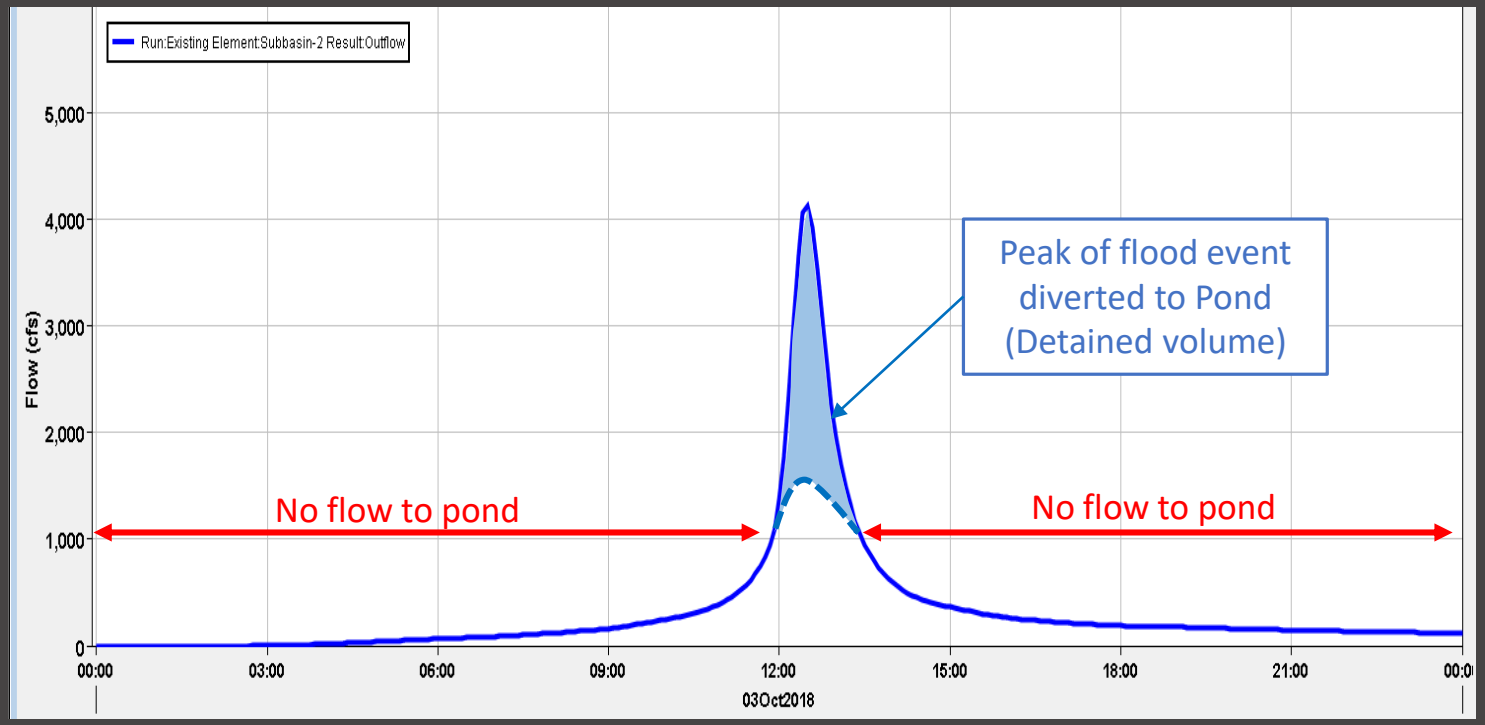
METHODOLOGY

HYDROLOGIC ANALYSIS – RUNOFF TO SITE 1



DETENTION CONCEPT

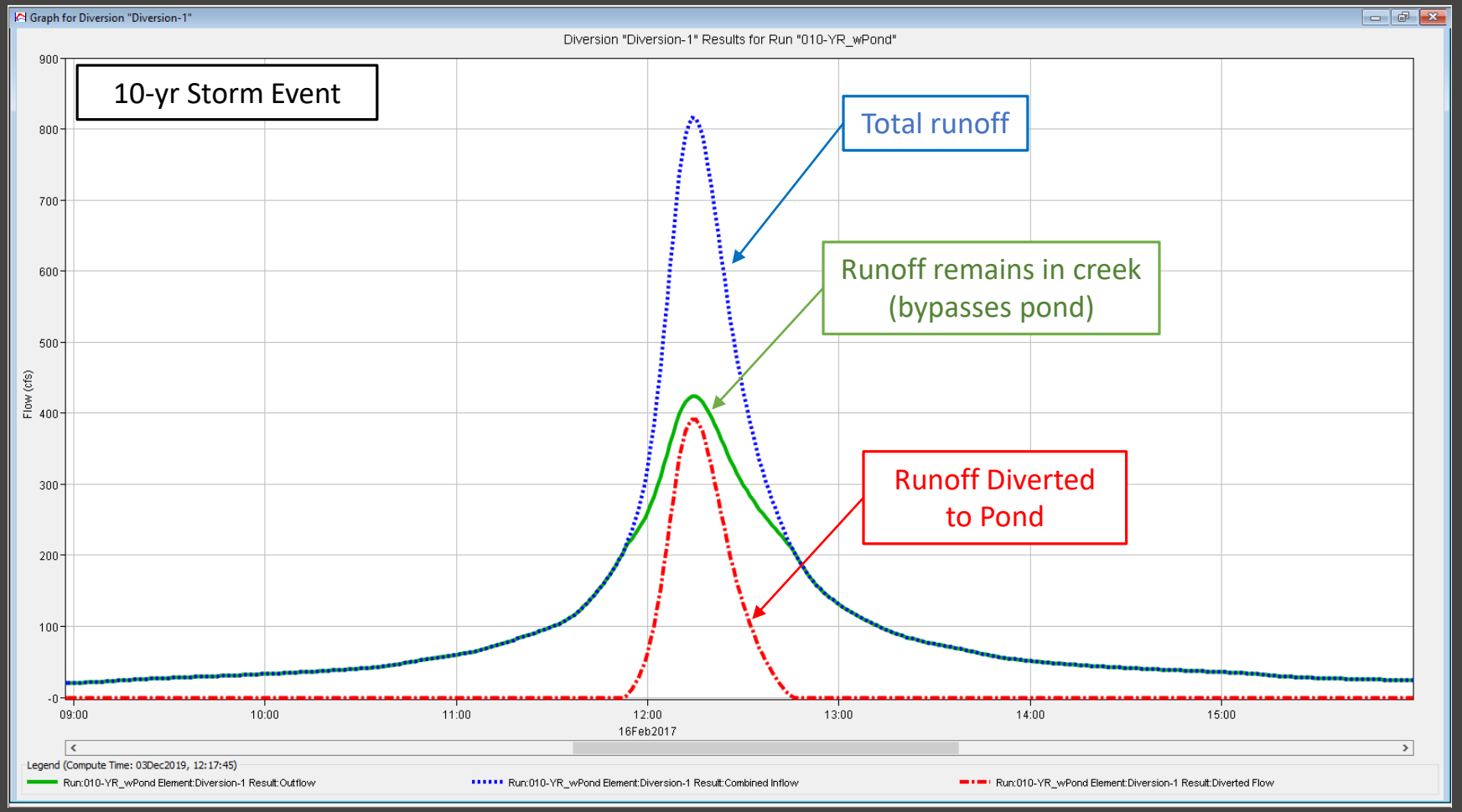
- Offline detention pond
- “Peak shaving” strategy - saves pond storage for peak of flood event
- Pond will provide flood risk reduction benefits for storms up to a given maximum magnitude
- Pond will not be effective for larger storm events



Peak Shaving Detention Concept Example

DETENTION ANALYSIS

DETENTION SIMULATION RESULTS – DIVERSION TO DETENTION POND



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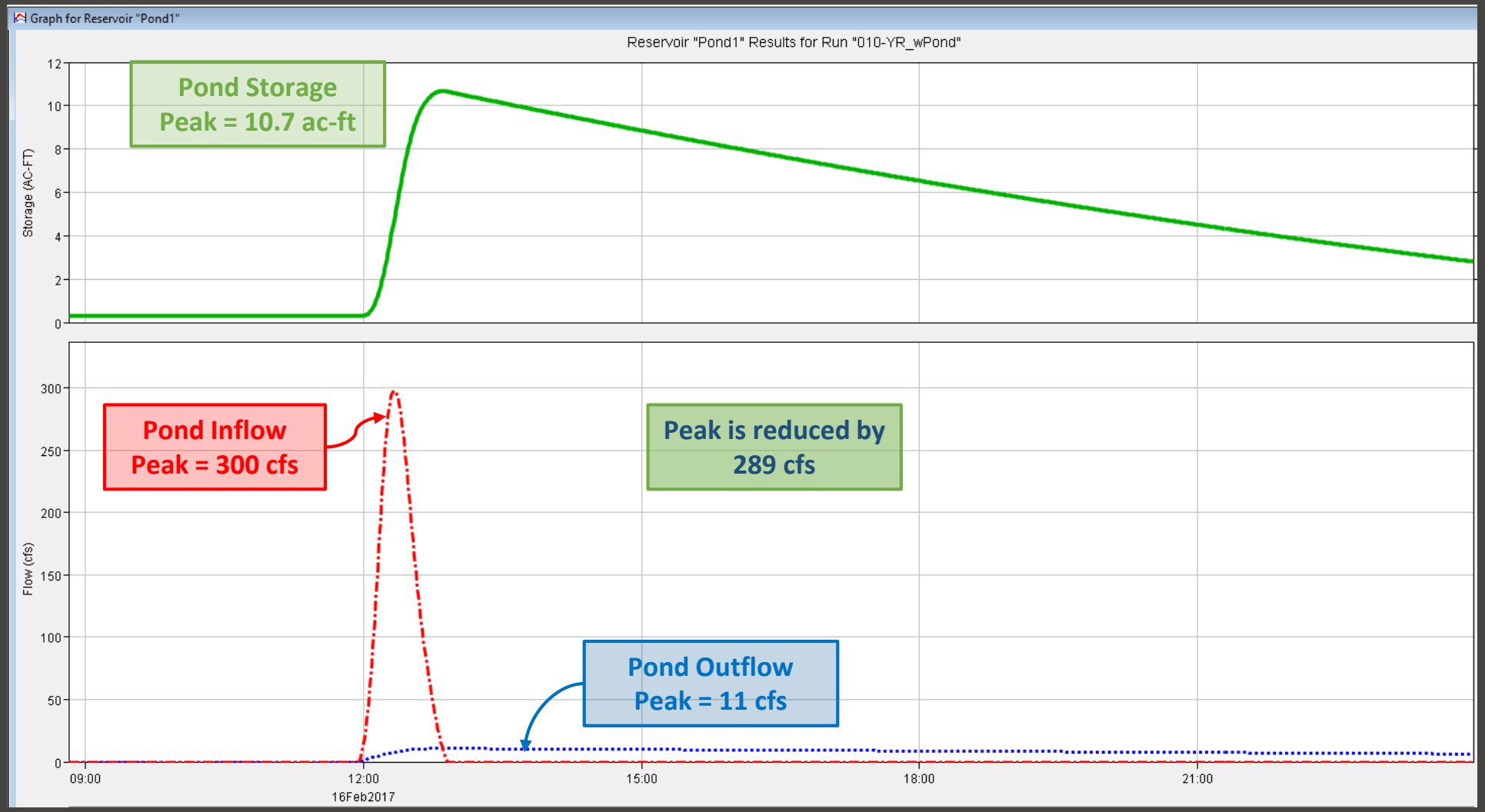
DETENTION ANALYSIS

DETENTION SIMULATION RESULTS – POND 1



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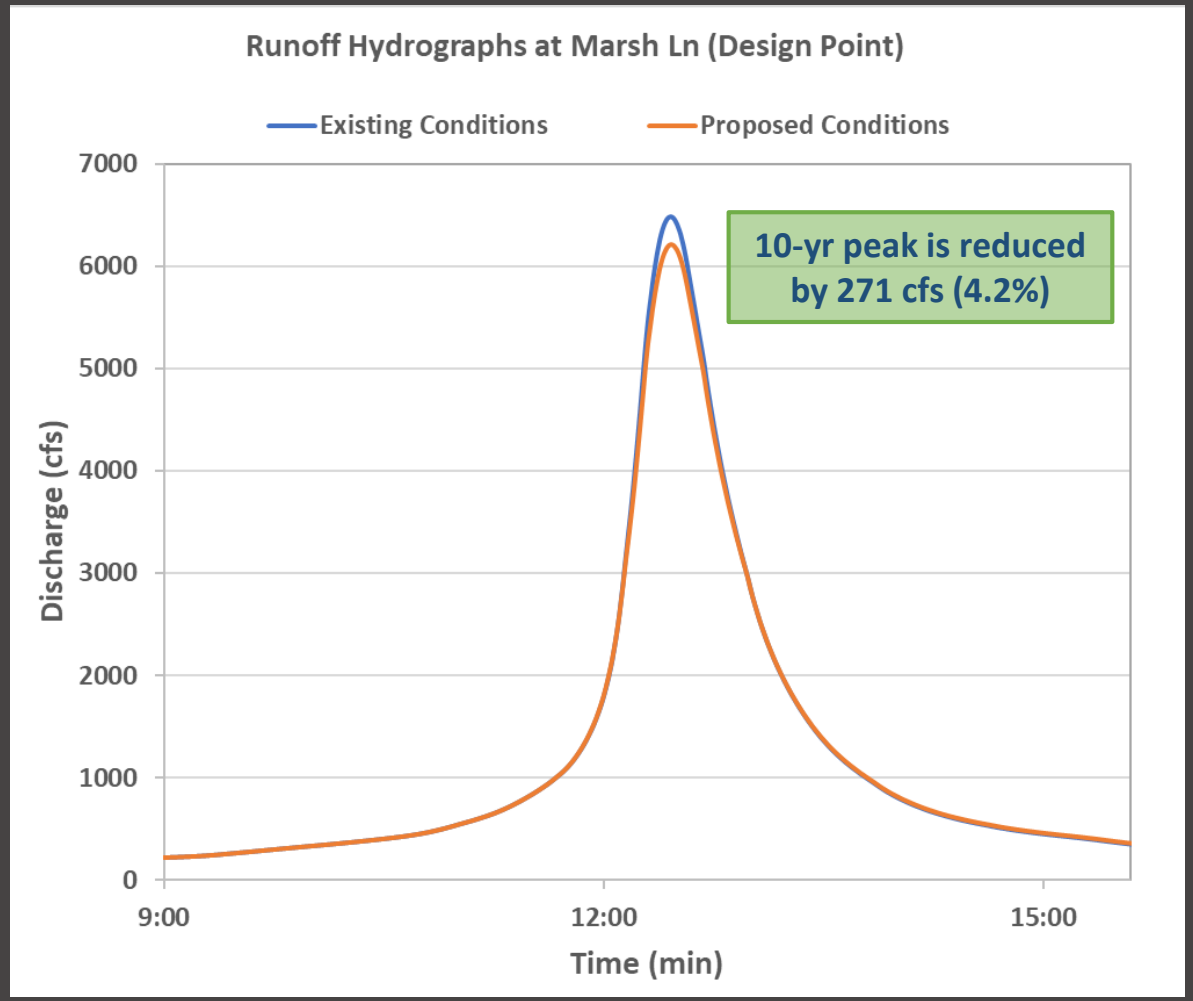
DETENTION ANALYSIS

DETENTION SIMULATION RESULTS – DESIGN POINT AT MARSH LN

Location	Recurrence Interval	Peak Discharge (cfs)			% Peak Discharge Reduction
		Existing Conditions	Proposed Conditions w/Pond	Peak Discharge Reduction	
Marsh Ln Junction	1-yr	3318	3247	71	**2.1%**
	2-yr	4874	4707	167	**3.4%**
	5-yr	5766	5542	224	**3.9%**
	10-yr	6486	6215	271	**4.2%**

Note: Pond capacity is exceeded for the 25-yr storm and greater. Design is intended to reduce flooding risks for the most frequent storm events.



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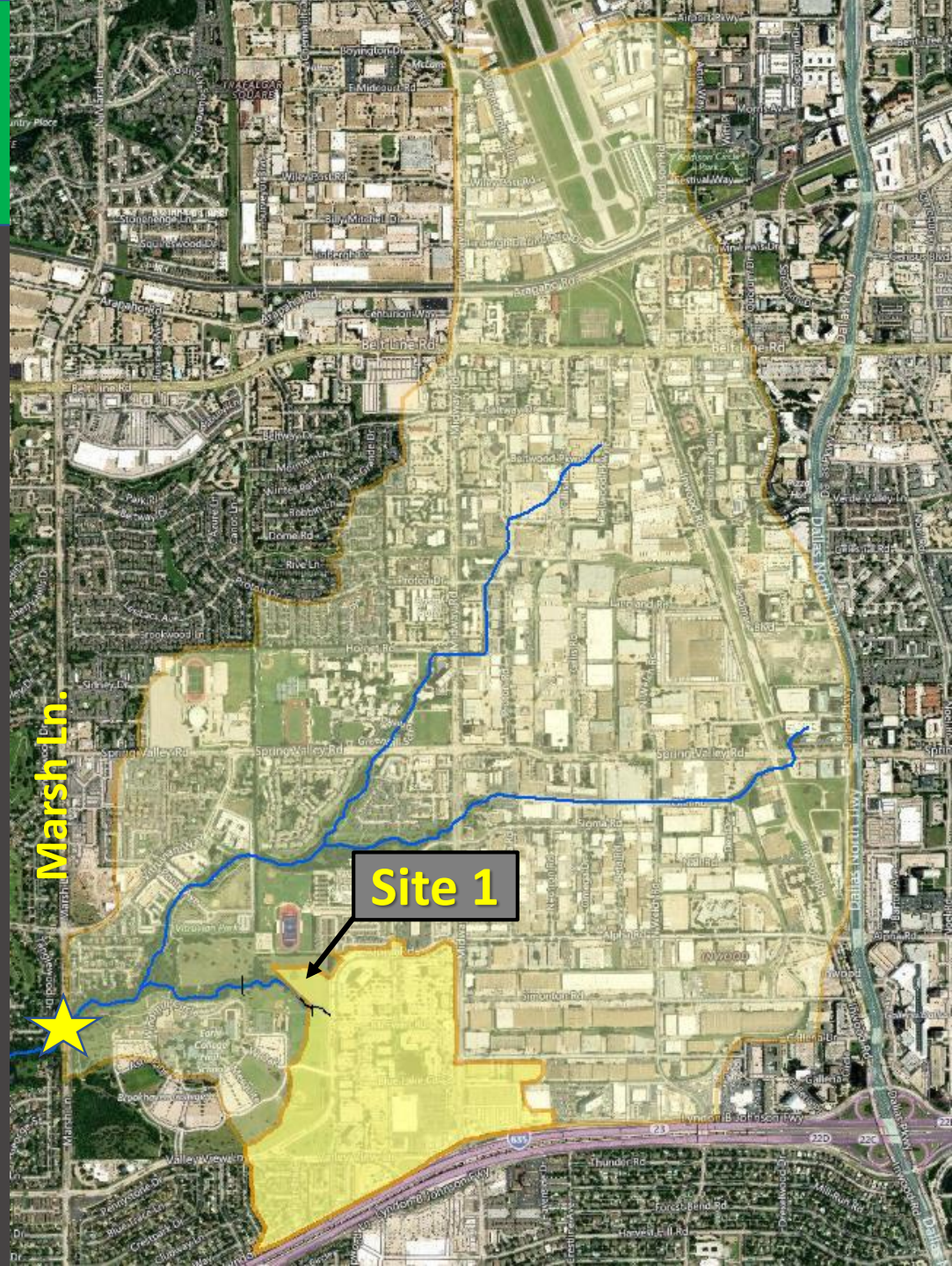
DETENTION ANALYSIS

DETENTION SIMULATION RESULTS – DESIGN POINT AT MARSH LN

- Pond 1 provides detention for **9%** of drainage area at Marsh Ln and reduces peak discharges at Marsh Ln by **4.2%** during the **10-yr storm**.
- Marsh Ln receives additional runoff from an undetained area of approximately 1,990 acres.
- Feasibility study will analyze the combined effect of multiple detention ponds in other portions of the watershed.



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PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COSTS

Item	Description	Total
	Site 1 Detention Pond	
1	Site Preparation and Restoration	$15,000
2	Excavation (Haul and On-Site Work)	$314,750
3	Concrete Outlet Structure	$50,000
4	Topsoil and Sodding	$64,960
5	Rock Rip Rap (24")	$279,600
6	Concrete Flume	$40,000
7	Water Line Abandonment and Installation	$57,500
	SUBTOTAL	**$821,810**
	Mobilization and Demobilization	$82,181
	Contingency	$246,543
	SUBTOTAL	**$328,724**
TOTAL OPINION OF PROBABLE CONSTRUCTION COST:		**$1,151,000**
Final Design		
1	Engineering / Survey / Geotech	$172,650
2	Environmental Permitting	$10,000
	SUBTOTAL	**$182,650**
OPINION OF PROBABLE DESIGN COST:		**$183,000**
OPINION OF PROBABLE PROJECT COST:		**$1,334,000**

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SUMMARY AND CONCLUSIONS

- Site 1 provides a small detention capacity (~14 ac-ft) relative to its drainage area (192 ac)
- Recommended detention strategy may help reduce flooding risks for storms up to the **10-yr event**.
- Pond preliminary cost estimate - **$1.35 million**
- Analysis of combined detention effect with other potential sites is forthcoming.
- Pond design and grading should be refined and coordinated with Alpha Rd connector design.

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