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From Blueprint to Permit: Stormwater Compliance in Primrose Farm Expansion

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Agenda

- Background
  - Proposed site improvements
  - Existing stormwater facilities
  - Stormwater management design criteria
- Stormwater Modeling Approach
  - Model setup, inputs and assumptions
- Stormwater Modeling Results
  - Hydraulic model results summary
  - Stormwater mitigation management best practices (BPMs)
- Summary

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Background

Proposed Site Improvements

- St. Charles Park District is proposing the following:
  - Additional building
  - Parking lot
  - Access roads on site
  - Storm sewer and water service utilities
  - Detention BMPs
  - Sidewalks
- Need a stormwater management permit

Site Location (Google Earth)

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Why a Stormwater Management Permit?

Control sedimentation

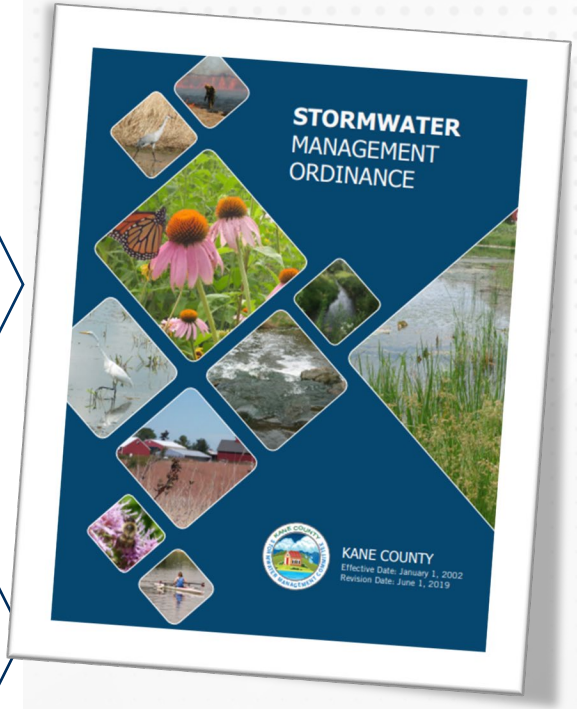
Protect environmentally sensitive areas

Comply with national NFIP

Protect from floods

Mitigating urbanization

Protect surface water quality



Kane County Stormwater Management Ordinance

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Stormwater Management Design Criteria

» Proposed redevelopments will add ~12,400 square feet of impervious area

- Subject to Stormwater Mitigation/BMP requirements
- Category I

Development Category	New Impervious Area for Development or Net New Impervious Area for Redevelopment	Detention Storage Facility (Section)	Stormwater Mitigation / BMP (Section)	Watershed Benefit Measure[1] (Section)	Fee-in-Lieu[3] (Section)
Development or **Redevelopment**	< 5,000 sq.ft.		X[2] (9-107.C)		A (9-85)
	5,000 sq.ft. – 24,999 sq.ft.		X (9-107.C)		A (9-85)
	≥ 25,000 sq.ft. AND < 1% Site area	X (9-84)	X (9-107.D)	O (9-108)	A (9-85)
	≥ 25,000 sq.ft. AND ≥ 1% Site area	X (9-84)	X (9-107.D)	O (9-108)	A (9-85)
Linear Project (Trails/Roads)	> 1-acre in aggregate for roads and trails that are ≤ AASHTO max. width		X (9-107.C)		A (9-85)
	> 1-acre in aggregate for roads and trails that are > AASHTO max. width		X (9-107.D)		A (9-85)
Total **Impervious Area** > 50% **Site** area (for **Sites** < 1-acre)			X (9-107.C)		A (9-85)
Hydrologically Disturbed Area > 3-acres			X (9-107.D)		A (9-85)
X = Required; A = Allowed					

Development Category	New Impervious Area for Development or Net New Impervious Area for Redevelopment	Stormwater Mitigation / BMP		Fee-in-Lieu[2] (Section)
		Category I (Section)	Category II (Section)	
Development or **Redevelopment**	< 5,000 sq.ft.	X[1] (9-107.C)		A (9-85)
	5,000 sq.ft. – 24,999 sq.ft.	X (9-107.C)		A (9-85)
	≥ 25,000 sq.ft. AND < 1% Site area		X (9-107.D)	A (9-85)
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Hydrologically Disturbed Area > 3-acres			X (9-107.D)	A (9-85)
X = Required; A = Allowed				

Stormwater Management Requirements (Kane County Stormwater Management Ordinance)

Stormwater Management Design Criteria

- According to section 9-84 (*Detention Storage Facility Requirements*), the detention basin must:
  - Contain the 100-year storm volume
  - Allowable Release Rate less than or equal to 0.1 cfs/acre of development
  - Minimum diameter restrictor orifice of 4”
  - 1 ft freeboard above high-water elevation based on emergency overflow weir
- According to section 9-107.C, Category I, BMPs must:
  - Provide volume reduction and water quality treatment
    - Volume = proposed impervious area and 1” rainfall event with no abstractions detained by the BMP

Impervious Area Mitigation

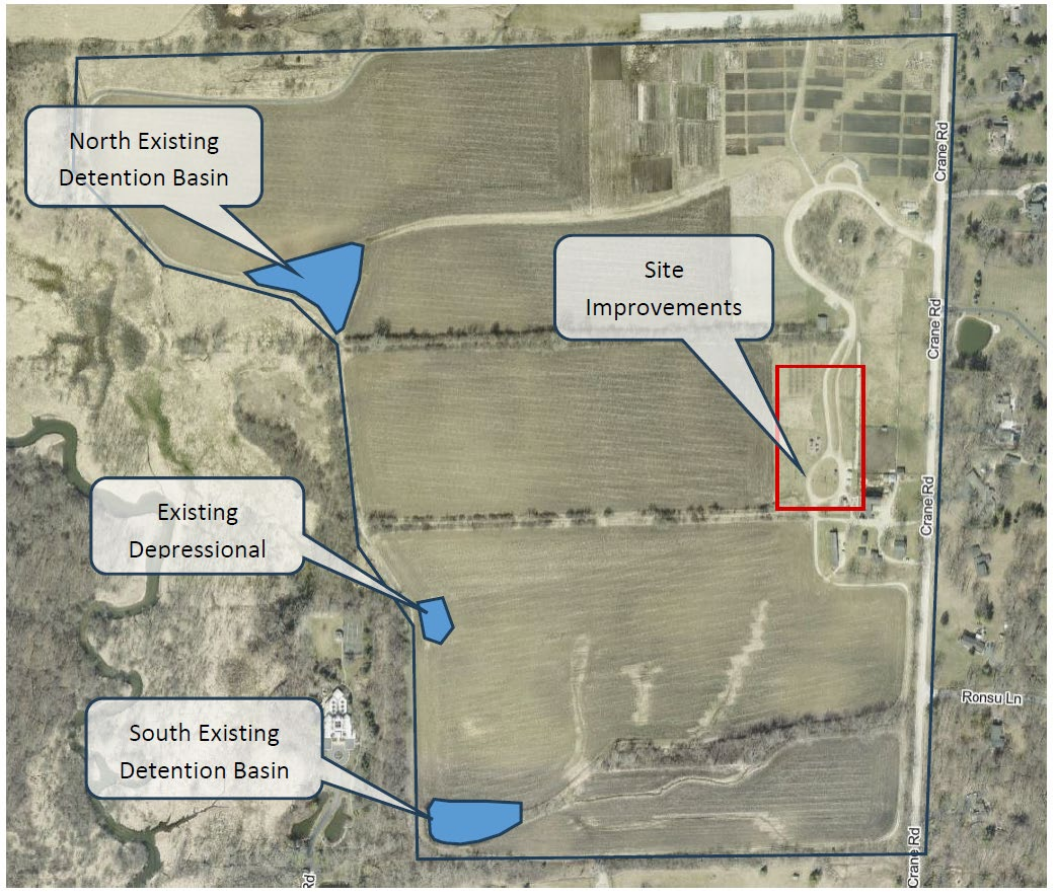
Two Proposed Rain Gardens BMPs

Existing Stormwater Facilities

Existing Stormwater Facilities

» Three stormwater facilities

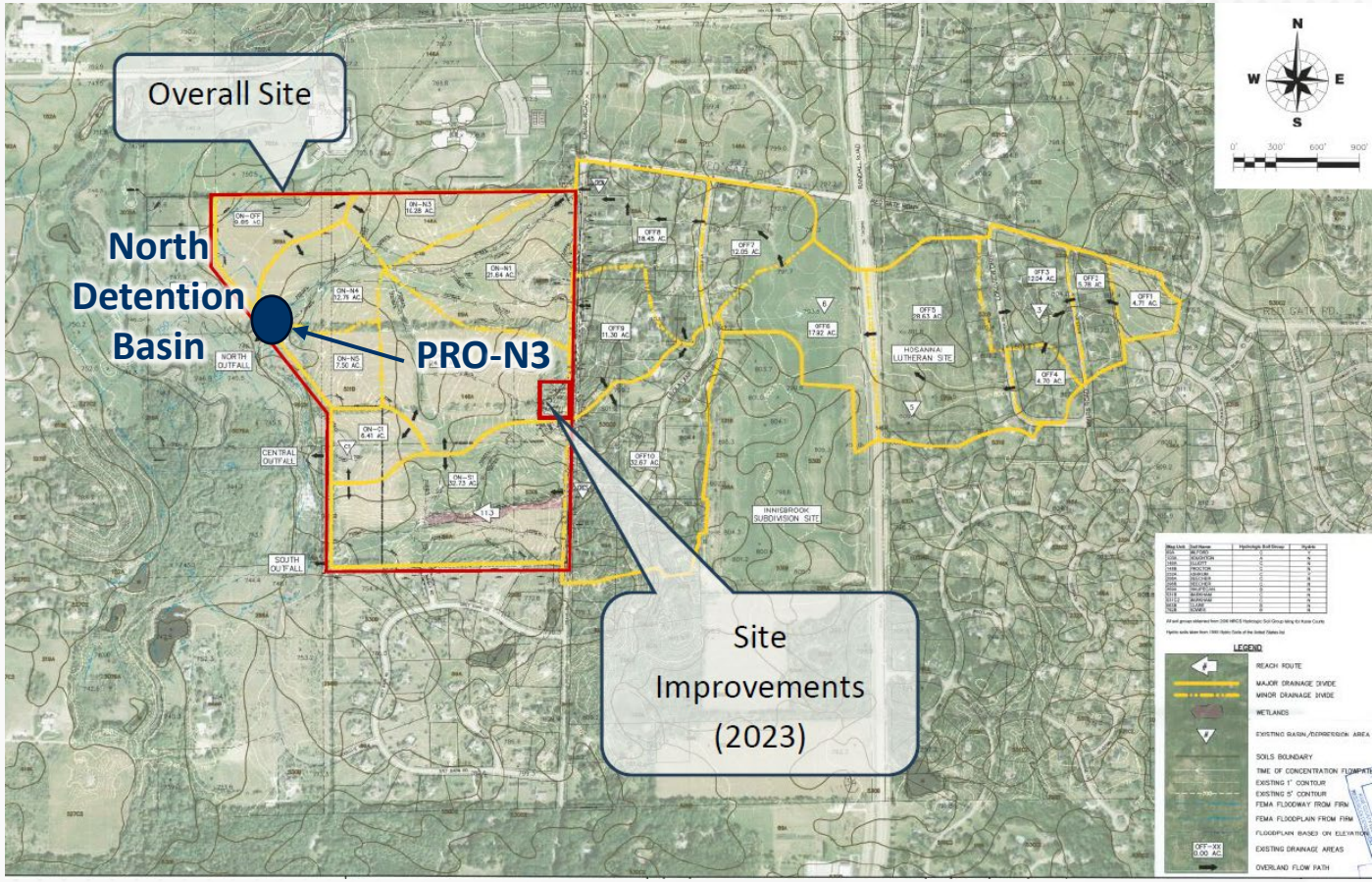
- North detention basin
- Existing depressional basin
- South detention basin



Stormwater Facilities Locations (Kane County GIS Technologies)

Site Drainage

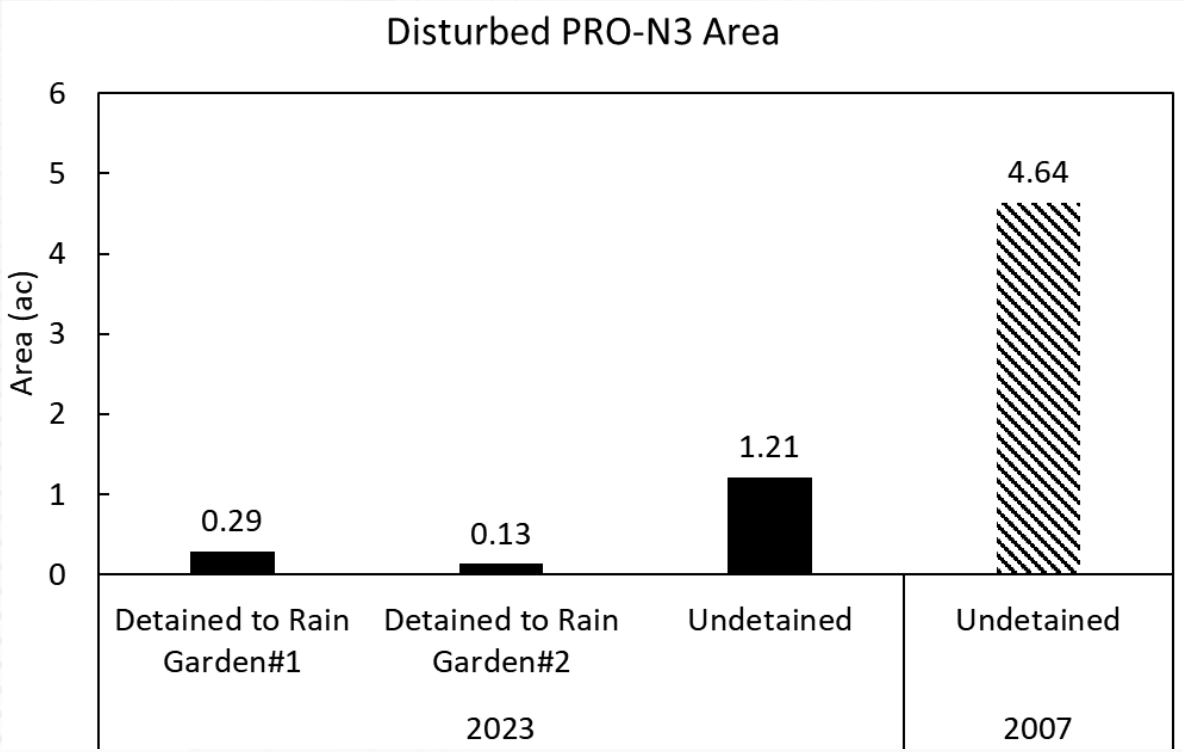
- Site improvements are within sub-catchment PRO-N3
  - Discharges to the north detention basin
    - Volume: 0.66 acre-ft
    - Overtop weir: 751.1 ft



Onsite Topographic Map (Christopher B. Burke, 2007)

Sub-catchment PRO-N3

» Disturbed area → 6.27 acres



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Stormwater Modeling Approach

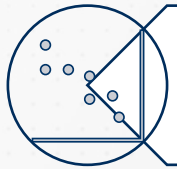
Modeling Approach

- Section 9-84C of Kane County Stormwater Management Ordinance:
  - Event hydrograph methods
  - Huff rainfall distribution
  - 24-hour duration
  - 100-year storm (1% probability of occurrence)

- The Hydrologic Modeling System (HEC-HMS)

Model Inputs and Outputs

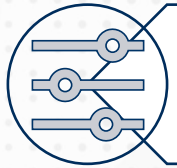
Tributary Area and Land Use



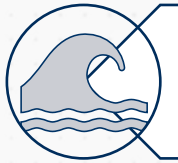
SCS* Curve Numbers & Unit Hydrographs

Rainfall Depths & Huff Distributions

Outlet Structure

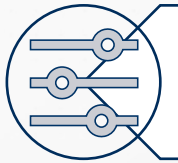


Existing Storage Elevations



Runoff Volumes

Peak Storage



Peak Elevation

*Soil Conservation Service

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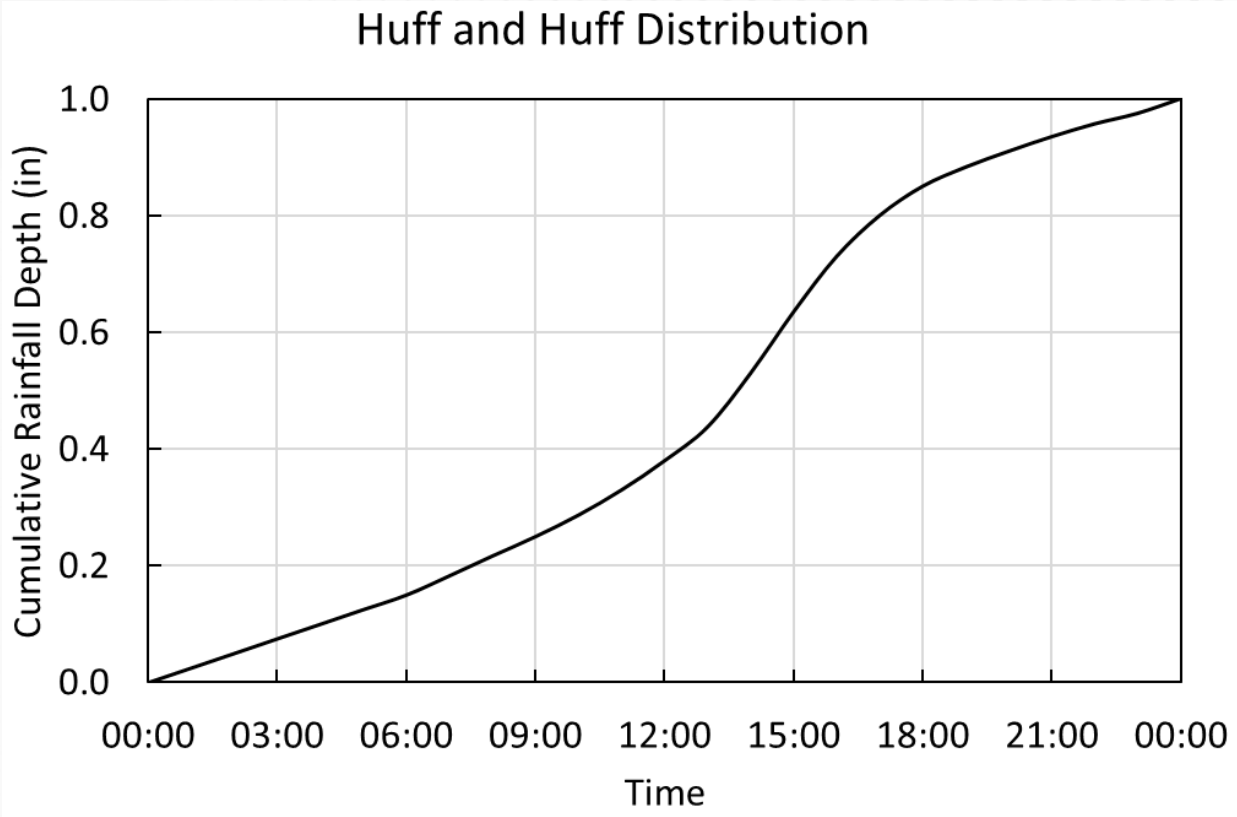
Subbasins Areas, Imperviousness, and Curve Numbers

Year	Category	Area (ac)	% Impervious	Curve Number
2023	Detained to Rain Garden#1	0.29	46%	84
	Detained to Rain Garden#2	0.13	38%	83
	Un-detained	1.21	33%	79
2007	Un-detained	4.64	82%	91

Rainfall and Huff Distribution

Year	Category	Total Rainfall* (in)
2023	Detained to Rain Garden#1	8.57
	Detained to Rain Garden#2	
	Un-detained	
2007	Un-detained	7.58



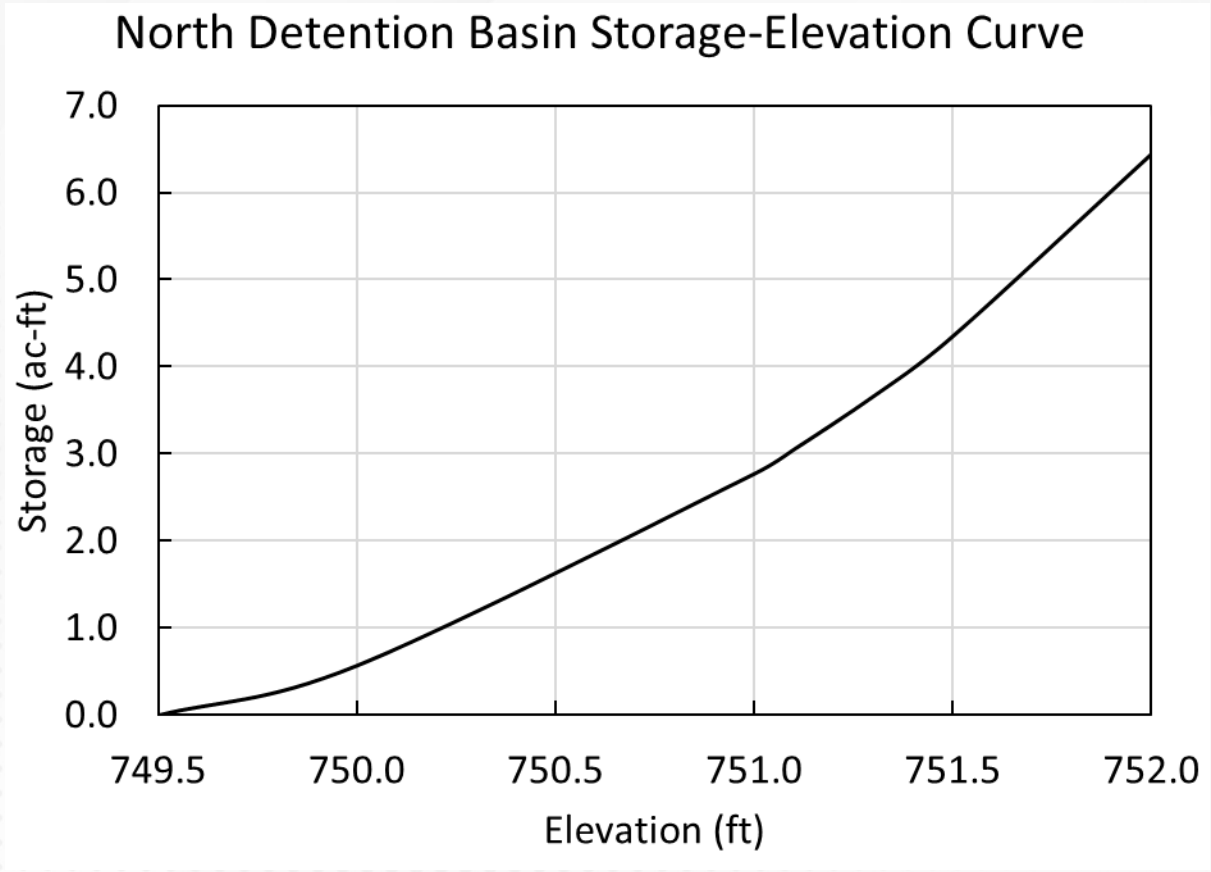
**Bulletin 75 rainfall depths for the 2023 development and Bulletin 70 for the 2007 development.*

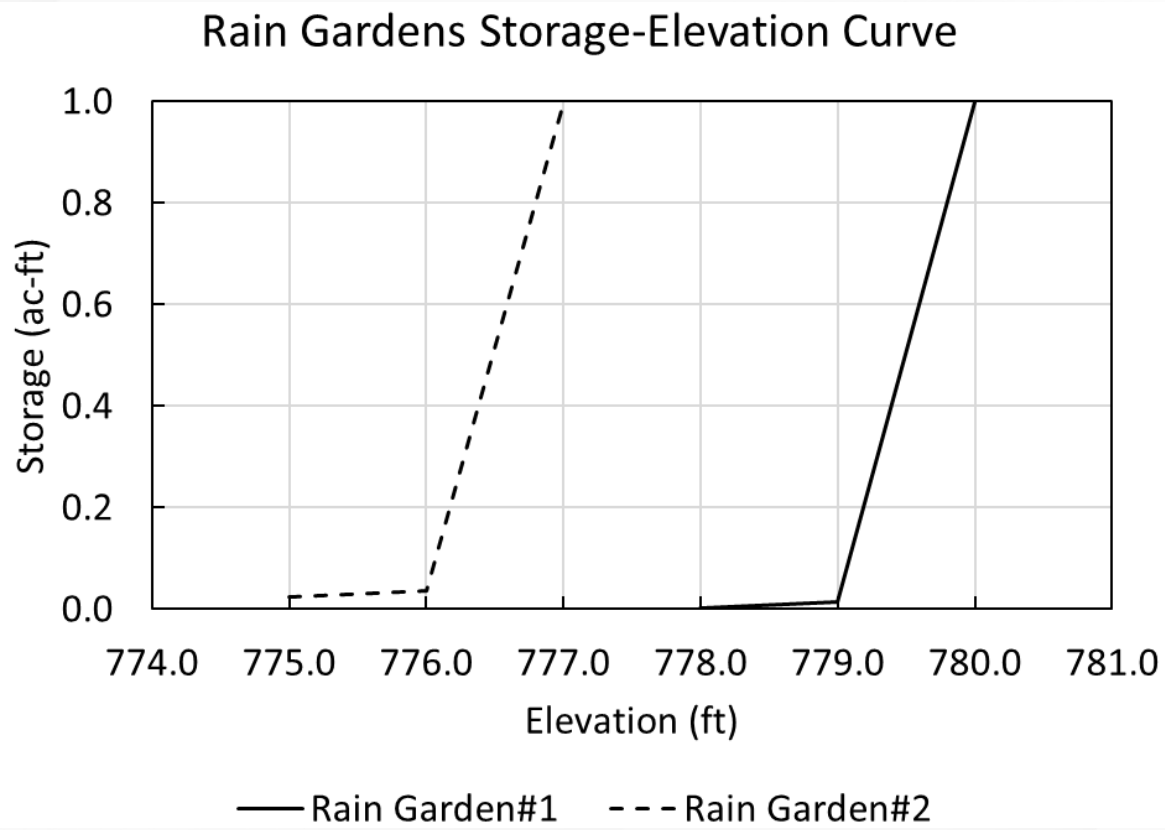
Outlet Structure

- Spillway
  - Length → 400 ft
  - Elevation →751.1 ft

- Orifice outlet
  - Center elevation → 749.5 ft
  - Diameter → 6”

Existing Storage Elevations





**Bulletin 75 rainfall depths for the 2023 development and Bulletin 70 for the 2007 development.*

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Stormwater Modeling Results

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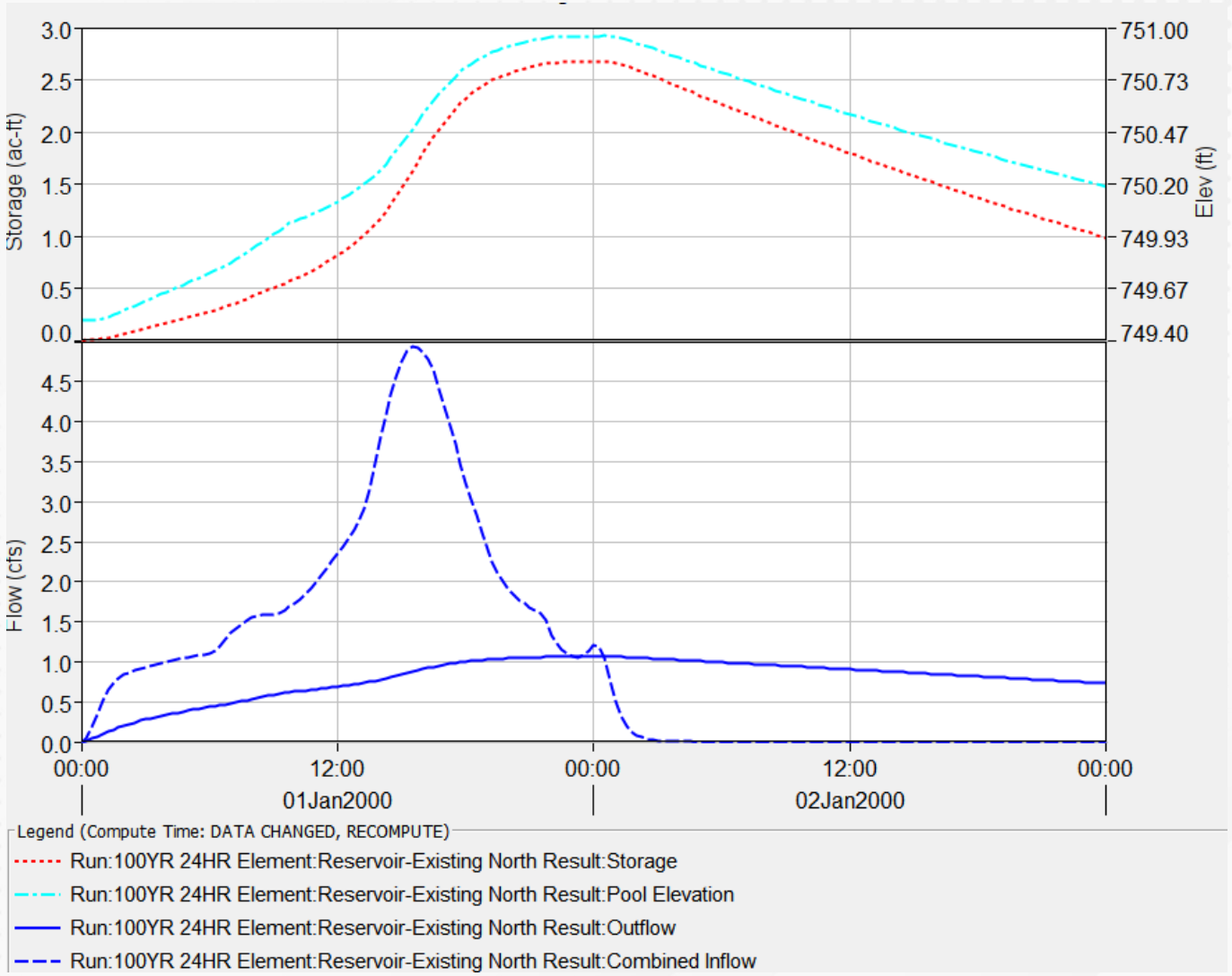
Modeling Results Summary

Kane County Stormwater Ordinance Criteria	Model Performance	Notes
Contain the 100-year storm volume	✓	The model was set to simulate the 100-year event and no overflow occurred.
Allowable Release Rate less than or equal to 0.1 cfs/acre of development plus the previously detained passthrough from the proposed rain gardens (1.087 cfs)	✓	The model peak discharge is 1.06 cfs.
Minimum diameter restrictor orifice of 4”	✓	The proposed orifice diameter is 5.8” versus the existing 6”.
BMP volume = proposed impervious area and 1” rainfall event with no abstractions detained by the BMP	✓	The required storage is 0.023 ac-ft, and the available storage is 0.13 ac-ft.

*The available freeboard is 0.87 ft above the spillway high-water elevation (0.13 ft above the existing top of berm).

Modeling Results Summary

Result	Value	Unit
Peak Inflow	4.938	cfs
Peak Discharge	1.063	cfs
Peak Storage	2.677	ac-ft
Peak Elevation With Proposed Condition	750.96	ft



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Questions?

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