City of Wood Dale Ward 2 & 3 Stormwater Improvements







#### Localized Flooding

• Repetitive localized flooding during moderate and large rainfall events

 Flood water inundates readways, parking lots, and resident's homes

Roadways nearly impassable
 (Concern for Emergency Services)



## Flooding Areas Identified



May 2018

#### **Contributing Factors**

- Built Prior to Stormwater Regulations
- Undersized Storm Sewers
- Lack of Overland Flood Routes
- Large Tributary Area



#### Drainage Areas





## Ward 3 Flooding May 2018

Region received highest monthly rainfall total on record for May.



**3.4" in 90 minutes** across 215 acres resulted in approximately **19,850,000 gallons** of water being dropped on the area. This occurred at an average pace of **220,500 gallons per minute**.

May 30<sup>th</sup> event was estimated to be a 50-yr (B-70) recurrence event. (25-YR, B-75)



## Ward 3 Flooding May 2018

#### Prospect & Potter Intersection





Prospect Low Point 600' North of Intersection

### Ward 3 Flooding June 2018

**Prospect & Potter Intersection** 





### Flooding Along Prospect Ave.

Approximate 50-year rainfall event (B-70) (25-year event B-75)



### Steps to Address Flooding

- Develop Multi-Year Master Plan
- Identify Improvements
  - Squaw Creek / Dalewood
  - Prospect Ave. / Potter St.
    - Underground Storage
  - Westview School
    - Underground Storage
- Develop Hydraulic Model
  - Ensure No Increase in
     Downstream Flow



#### Steps to Address Flooding

- Prioritize Projects Downstream to Upstream
- Determine Funding Sources
  - General Funds
  - Bond Issue
  - IEPA Low Interest Loan
  - ➤Water Quality Grant (DuPage Co.)
- Implement Construction

Overriding Goal = Providing protection below damage elevation while reducing street ponding



## Hydraulic Modeling – Approach

- Base Model Provided by Client (XP-SWMM)
  - Compared to Autodesk's Storm and Sanitary Analysis (SSA) Model – can convert between the two
  - Selected XP-SWMM
  - Bulletin 70 Rainfall Data\*
  - Critical Duration = 2-hour (Provided and Verified)
  - Identified Areas Requiring More Detail
  - Obtained Field Survey (Storm Sewers and Overland Flow Routes)
  - Updated/Expanded Areas per Field Data
  - Existing vs. Proposed (Alternatives)



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## Hydraulic Modeling - Basics

#### • XP-SWMM Basics

- Uses Links and Nodes
  - Links (Conduits, Pumps, Orifices, Weirs, Etc.)
    - Conduit Examples
      - Storm Sewers
      - Overland Flow Routes (Road or Yard)
      - Natural Channels
  - Nodes (Manholes, Catch Basins, Inlets, Outfalls, Storage Areas)
- Runoff and Hydraulics Modes
  - Runoff (Catchments, Routing Method (e.g., SCS Hydrology), CNs, Tc's, Etc.)
  - Hydraulics (Elevation Data, Pipe Sizes, Slopes, Cross-sections, Storage Data, Etc.)
- Rainfall Data (Bulletin 75, Huff Distributions, Time Step, Etc.)
- 2-Dimensional Flow Capability (Not Used)





## Hydraulic Modeling – Added Details



# Hydraulic Modeling – Existing Conditions

#### Existing Conditions Model Critical Duration = 2-hour





# Existing Conditions



Approximate inundation area for 100-yr storm based on Bulletin 75 rainfall data 100-yr HWL = 691.18 50-yr HWL = 690.8832'' - 25-yr HWL = 690.24

# Hydraulic Modeling

- Areas of Concern
- Project Areas
- Engineer Client Communication
  - Reports, Videos, Photos, Historical, PW
  - Modeling Experience
  - Listen and Inform





# Hydraulic Modeling – Proposed Conditions

- Proposed Conditions Modeling
- Over 36 Major
   Alternatives and
   Many More Minor
   Alternatives Analyzed
- Design Plans Begun
- But...





# Hydraulic Modeling – Enter New Challenge

- March 2019
- December 2019
- March 2020
- More Questions
- More Results

#### Frequency Distributions of Heavy Precipitation in Illinois: Updated Bulletin 70

James Angel and Momcilo Markus

March 2019



#### ISWS Bulletin 75

#### **Precipitation Frequency Study for Illinois**

James R. Angel and Momcilo Markus

Contributing Authors:

Kexuan Ariel Wang, Brian M. Kerschner, and Shailendra Singh

Illinois State Water Survey University of Illinois at Urbana-Champaign



Frequency Distributions of Heavy Precipitation in Illinois:

**Spatio-Temporal Analysis** 

Momcilo Markus, James Angel, Kexuan Wang,

Brian Kerschner, and Shailendra Singh

March 2020

## Hydraulic Modeling – Results

- Alternatives, etc.
- Results Communication from Modeler
  - To Project Manager
    - To Client
      - Client Direction Back
    - Repeat Many Times
  - Decisions Made
- Design / Construction / Many \$
- City's Residents in View Throughout
- Goal in View Throughout
  - Providing protection below damage elevation

#### XP-SWMM RESULTS COMPARISON

City of Wood Dale - Ward 3 (Area 1)

Alternative (Design Level)	Location	XP-SWMM	Existing	ł	IGL/HWL Elev.	for Storm Eve	nt	Ponding Depth for Storm Event			
		Model	Low Rim	(ft)			(ft above Low Rim Elev.)				
		Node ID		10-Year	25-Year	50-Year	100-Year	10-Year	25-Year	50-Year	100-Year
EXISTING	1) 253 Prospect (Low Point)	526	687.62	689.60	690.45	690.98	691.22	1.98	2.83	3.36	3.60
	2) Potter / Prospect Intersection	750	688.89	690.29	690.46	690.98	691.22	1.40	1.57	2.09	2.33
	3) 386 Gilbert (Low Point)	382	677.27	679.72	680.40	680.55	680.66	2.45	3.13	3.28	3.39
Model = "EXISTING12"	4) Lincoln Ct cul-de-sac	Jun-15	692.64	693.52	693.96	694.06	694.13	0.88	1.32	1.42	1.49
	5) Irmen Dr / Prospect Intersection	752	689.39	690.53	690.65	690.99	691.23	1.14	1.26	1.60	1.84
	6) Sarah Dr / Prospect Intersection	753	690.47	691.37	691.43	691.48	691.53	0.90	0.96	1.01	1.06
	7) Miller Ln (W. of Squaw Creek)	148	683.75	686.00	686.38	686.56	686.82	2.25	2.63	2.81	3.07
	8) Victoria Ln (Low Point - mid-block))	708	695.64	696.43	696.98	697.27	697.46	0.79	1.34	1.63	1.82
	9) Arlene Dr (Low Point - mid-block)	732	697.66	698.55	699.03	699.41	699.78	0.89	1.37	1.75	2.12
	10) Mary Jane Ln (Low Point - mid)	738	697.22	698.58	699.01	699.30	699.63	1.36	1.79	2.08	2.41
	11) Orchard Lk Detention HWL	1112	-	687.84	688.33	688.88	689.69	-	-	-	-
	Flow Location	Link ID		Discharge Q (cfs)							
	1) Upstream side of Dalewood Av	Link 855	-	76.9	114.6	150.0	208.7		-	-	
	2) Downstream side of Dalewood Av	Link 859	-	80.1	119.1	156.6	217.0	-	-	-	-
	3) Upstream side of Irving Park Rd	Link 838	-	82.7	123.0	161.4	221.6	-	-	-	-
	4) Irving Park Rd Box Culvert (8' x 4')	17	-	85.2	126.5	166.0	211.0				-
	5) Irving Park Rd Culvert (36")	Link 863	-	27.0	35.9	41.1	41.7	-	-	-	-
	6) Salt Creek - North Outlet	2047	-	111.3	145.1	187.4	247.8		-	-	
	7) Salt Creek - South Outlet	Link-01	-	78.9	94.2	125.0	162.9	-	-	-	-
PROPOSED	1) 253 Prospect (Low Point)	526	687.62	680.54	684.88	687.30	688.73	0	0	0	1.11
North = 14.067 ac-ft	2) Potter / Prospect Intersection	750	688.89	680.54	684.88	687.31	688.73	0	0	0	0
South = 8 ac-ft	3) 386 Gilbert (Low Point)	382	677.27	676.13	676.55	677.34	678.35	0	0	0.07	1.08
N Pipes - Inv=661.85	4) Lincoln Ct cul-de-sac	Jun-15	692.64	689.91	690.08	690.23	690.57	0	0	0	0
S Vault Height = 15'	5) Irmen Dr / Prospect Intersection	752	689.39	687.16	688.10	689.45	690.49	0	0	0.06	1.10
Inlcudes:	6) Sarah Dr / Prospect Intersection	753	690.47	687.36	688.61	690.39	691.34	0	0	0	0.87
1) North Pipes 14.067 ac-ft	7) Miller Ln (W. of Squaw Creek)	148	683.75	683.32	683.95	684.26	685.13	0	0.20	0.51	1.38
2) South Vault 8 ac-ft	8) Victoria Ln (Low Point - mid-block))	708	695.64	690.59	690.83	692.19	695.00	0	0	0	0
3) Lincoln Ct 24" bypass	9) Arlene Dr (Low Point - mid-block)	732	697.66	694.25	694.45	694.69	695.23	0	0	0	0
4) Gilbert Stm. Improve	10) Mary Jane Ln (Low Point - mid)	738	697.22	694.00	694.60	695.34	696.23	0	0	0	0
5) Addison Connect Stm.	11) Orchard Lk Detention HWL	1112		685.59	685.92	687.32	688.73	-2.25	-2.41	-1.56	-0.96
6) Updated inflow pipes	12) Proposed North Stor HWL	N-777	686.94*	680.54	684.89	687.31	688.73	-2.46	1.89	4.31	5.73
7) Dalewood "As-Built"	13) Proposed South Vault HWL	S-STOR	693.3*	687.48	689.87	692.18	694.81	-5.82	-3.43	-1.12	1.51
Model = "P-38"	Flow Location	Link ID		Discharge Q (cfs)			Difference from Existing (cfs)				
	1) Upstream side of Dalewood Av	SQC-60	1.1	70.4	91.2	99.4	107.2	-6.5	-23.4	-50.6	-101.5
	2) Downstream side of Dalewood Av	SQC-37	-	81.2	106.2	119.0	142.3	1.1	-12.9	-37.6	-74.7
	3) Upstream side of Irving Park Rd	IRV-17	-	85.1	112.3	128.0	151.8	2.4	-10.7	-33.4	-69.8
	4) Irving Park Rd Box Culvert (8' x 4')	17	-	90.7	121.4	143.1	164.3	5.5	-5.1	-22.9	-46.7
	5) Irving Park Rd Culvert (36")	Link 863	-	27.0	35.8	41.3	42.2	0.0	-0.1	0.2	0.5
	6) Salt Creek - North Outlet	2047	-	116.5	156.4	185.9	212.4	5.2	11.3	-1.5	-35.4
	7) Salt Creek - South Outlet	Link-01	-	63.0	83.2	106.7	140.0	-15.9	-11.0	-18.3	-22.9

\* Inside top of vault, not ground (rim Prenared by: UD

Filename: RESULTS\_09-27-19\_rev-38.xls Date Printed: 9/27/2019

Robinson



# Proposial Conditions



Approximate inundation area for 100-yr storm based on Bulletin 75 rainfall data
Northern UDS = 7.7 ac-ft
(Close to prior 100-year storm)
50-yr HWL = 689.88



## **Proposed Conditions**



Approximate inundation area for 100-yr storm based on Bulletin 75 rainfall data

Northern UDS = 7.7 ac-ft Westview School UDS = 6.8 ac-ft

(Close to B70 100-year storm) **50-yr HWL = 688.60** 



## **Proposed Conditions**



Approximate inundation area for 100-yr storm based on Bulletin 75 rainfall data

Northern UDS = 7.7 ac-ft Westview School UDS = 6.8 ac-ft

(21" Reduction in Ponding Depth; 6" FB) **100-yr HWL = 689.40** 



#### Squaw Creek Enhancements





#### Squaw Creek Enhancements



#### Underground Storage

- Storage required to provide benefit
- Possible locations:
  - ComEd right-of-way
  - Purchase homes
  - Below townhome parking lots/commercial center
  - Below City streets
- Below City streets to minimize costs and to preserve homes
- Precast concrete box culvert



#### Underground Storage



ek Green

- Potter Street
  - Limited services and utilities
  - Allowed Twin 10' x 10' Box
    - Construction Between Curbs

- Westview Elementary School
  - Large grassy area Reduced Costs
  - Required Easement Agreements

#### Potential Future Storage

![](_page_26_Picture_1.jpeg)

#### Prospect Avenue

![](_page_27_Picture_1.jpeg)

#### Underground Detention Potter Street Cross Section

![](_page_28_Figure_1.jpeg)

POTTER STREET (TYP.)

![](_page_28_Picture_3.jpeg)

#### Potter Street

![](_page_29_Picture_1.jpeg)

#### Construction Timelapse Video

![](_page_30_Picture_1.jpeg)

![](_page_31_Figure_0.jpeg)

![](_page_31_Figure_1.jpeg)

WESTVIEW ELEMENTARY SCHOOL (TYP)

#### Westview Elementary School

#### **Construction Costs**

- Squaw Creek / Dalewood Outfall Piping
   ▶ \$800K / \$1.1M (2019 2020)
- Prospect Ave. / Potter St. Underground Storage
  ▶ \$ 9.1M (2020 2021) 7.7 Ac-Ft
- Westview School Underground Storage
  - > \$ 5.0M Construction (Jun 2021 Aug 2021) 6.8 Ac-Ft

#### TOTAL CONSTRUCTION COST = \$16 M

![](_page_33_Picture_6.jpeg)

## **Project Recognition by ASCE**

#### Outstanding Engineering Achievement Award Under \$10 Million

#### Prospect Ave. / Potter St. - Underground Storage

Between August 2020 and August 2021

Criteria Included:

- Contribution to the well-being of people and communities.
- Resourcefulness in planning and in the solutions for the design problems.
- Innovations in construction materials and methods
- Impact on the physical environment, unusual aspects, and aesthetic values.

**Outstanding Engineering Achievement Award** 

![](_page_34_Picture_10.jpeg)

![](_page_34_Picture_11.jpeg)

#### Robinson Engineering, Ltd. https://www.reltd.com

![](_page_35_Picture_1.jpeg)

![](_page_35_Picture_2.jpeg)