

Walker Creek and Beamer Creek Updated Floodplain Mapping



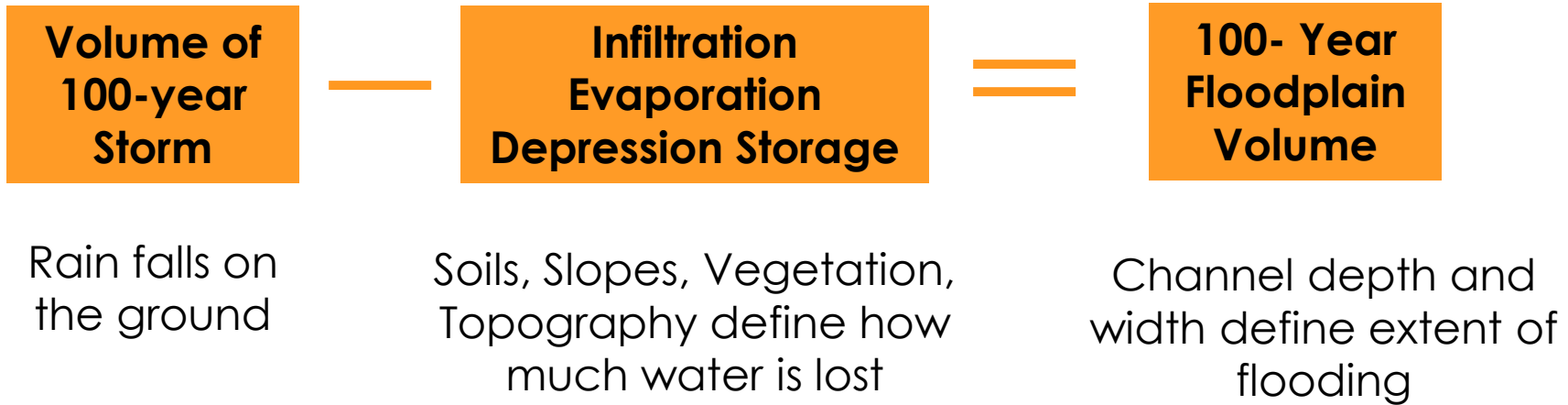
Public Information Session

March 4, 2020

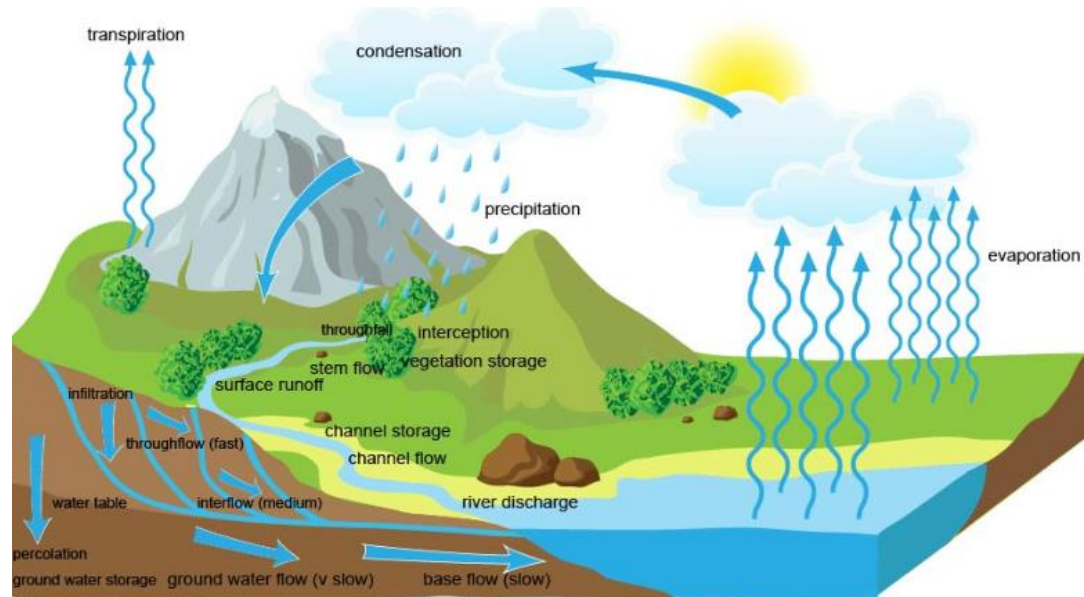
Outlines

1. Conceptual Overview
2. Data Collection
3. Hydrologic Modelling
4. Hydraulic Modelling
5. Results
6. Future Scenario

1. Conceptual Overview

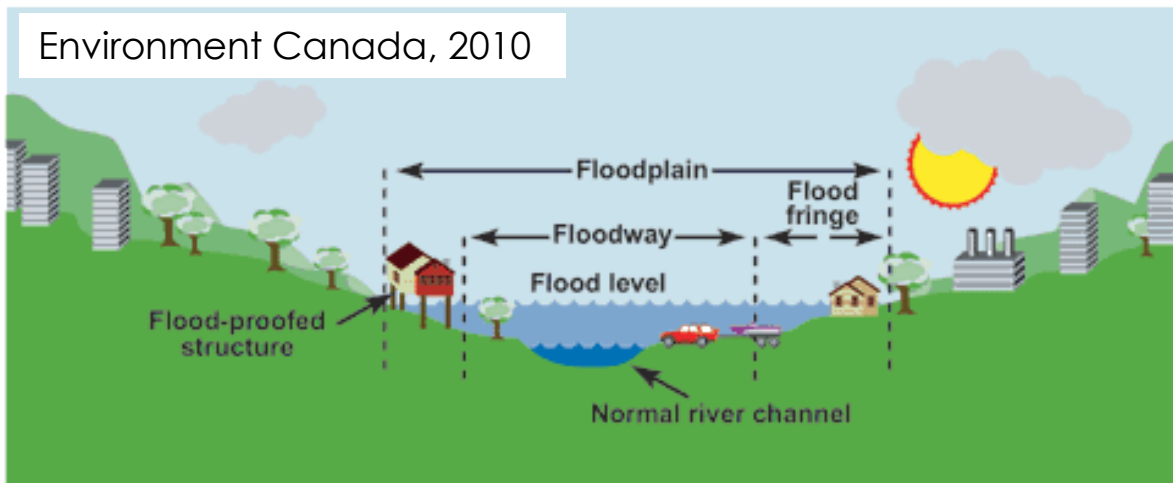
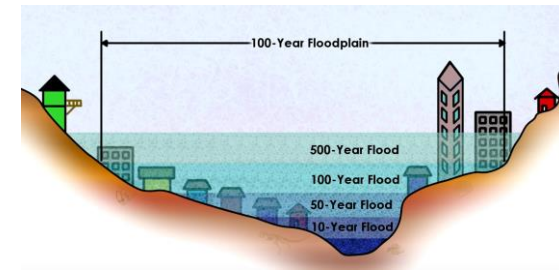


**1987 Floodplain Mapping
of Walker and Beamer
Creeks was updated as
per MNRF and EC Standard
Technical Guidelines**



1. Conceptual Overview

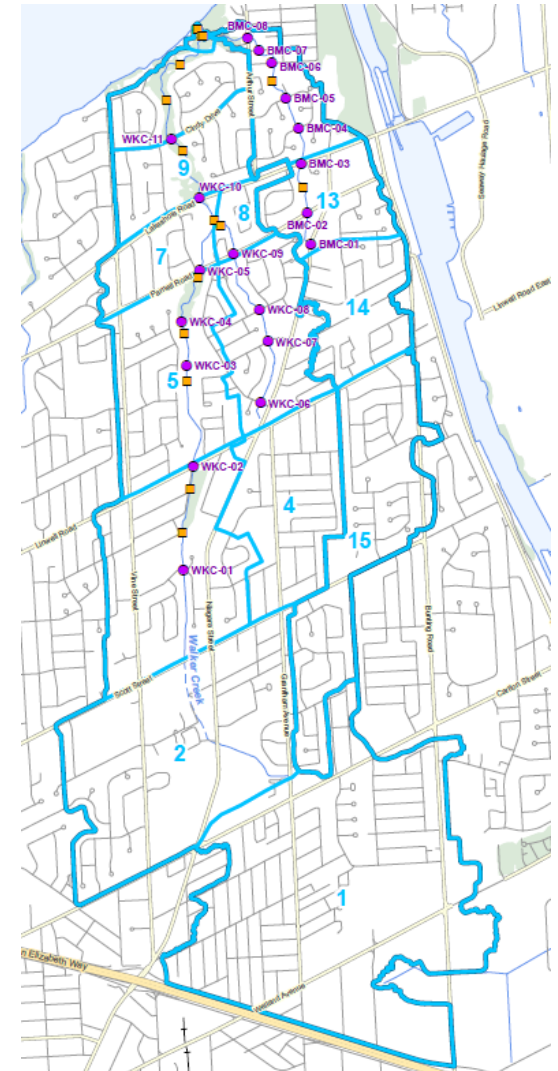
- A floodplain is the relatively flat land beside river, naturally liable to flooding during extreme events. It is a part of the water's living space, a natural extension of the river channel
- Floodplain represents a 100 Year Flood Event
- It is the Minimum Standard in Ontario
- It statistically happens once in 100 years



Recurrence interval (years)	Annual exceedance probability
2	50 %
5	20 %
10	10 %
25	4 %
50	2 %
100	1 %
500	0.2 %

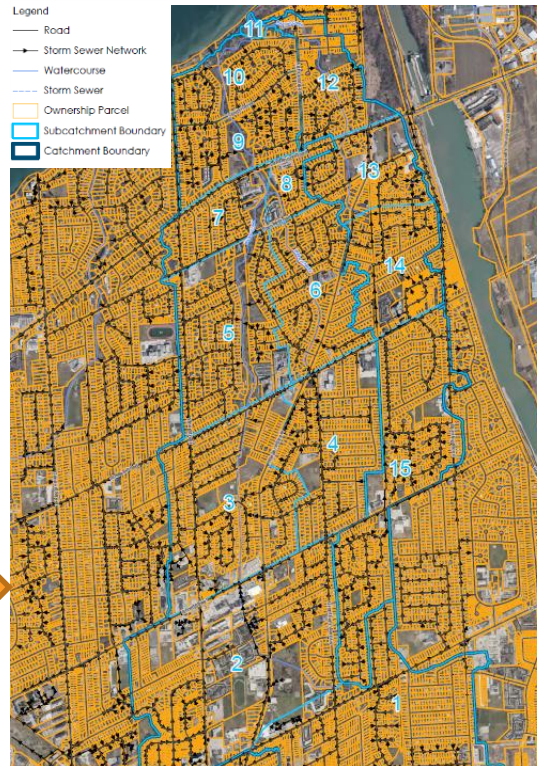
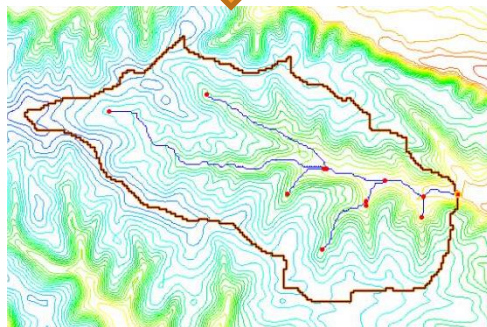
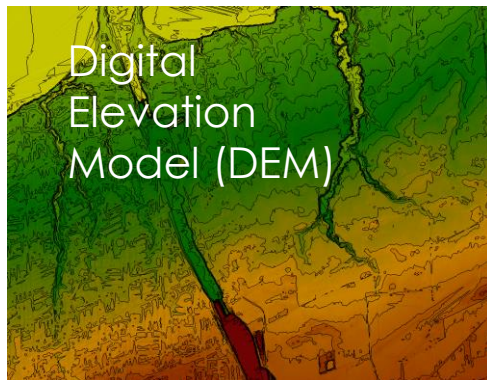
2. Data Collection - Field Survey

- Field Survey in October 2018
- 34 Essential cross-sections and road crossings were surveyed



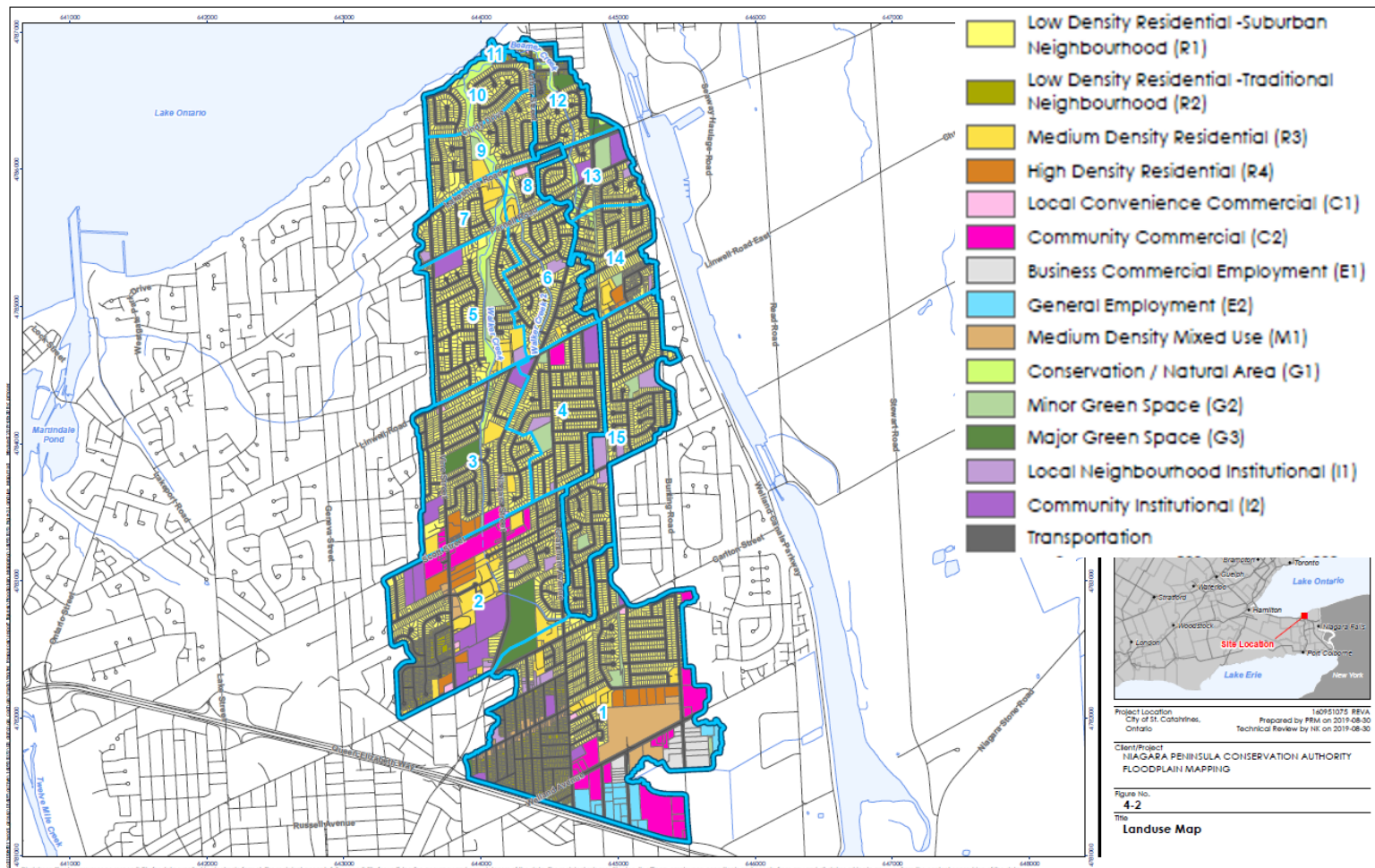
Watershed Delineation

- NPCA 2015 DEM
- Sewer Network Mapping provided by the City



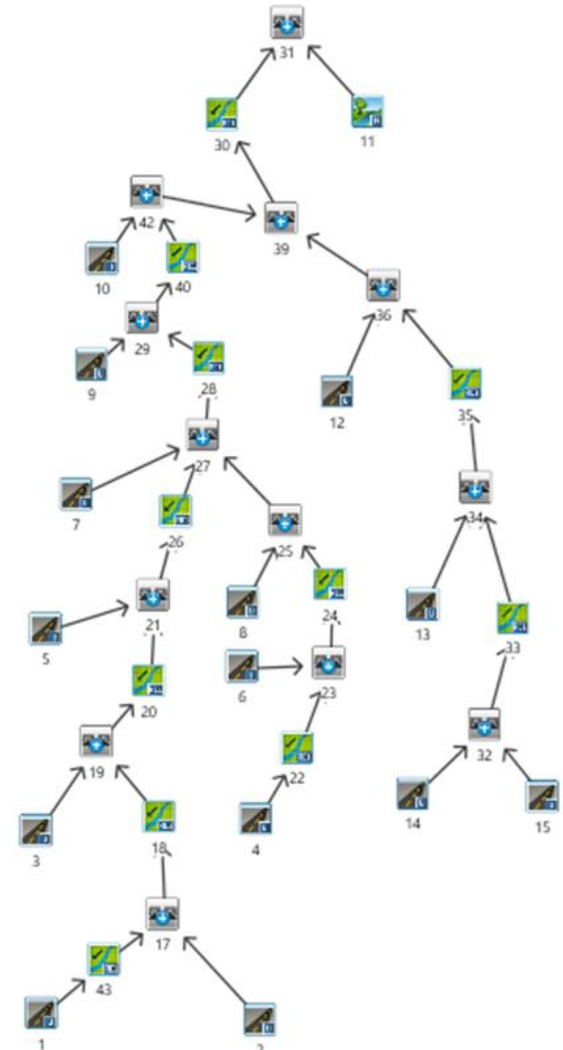
Landuse

- Landuse data provided by the City



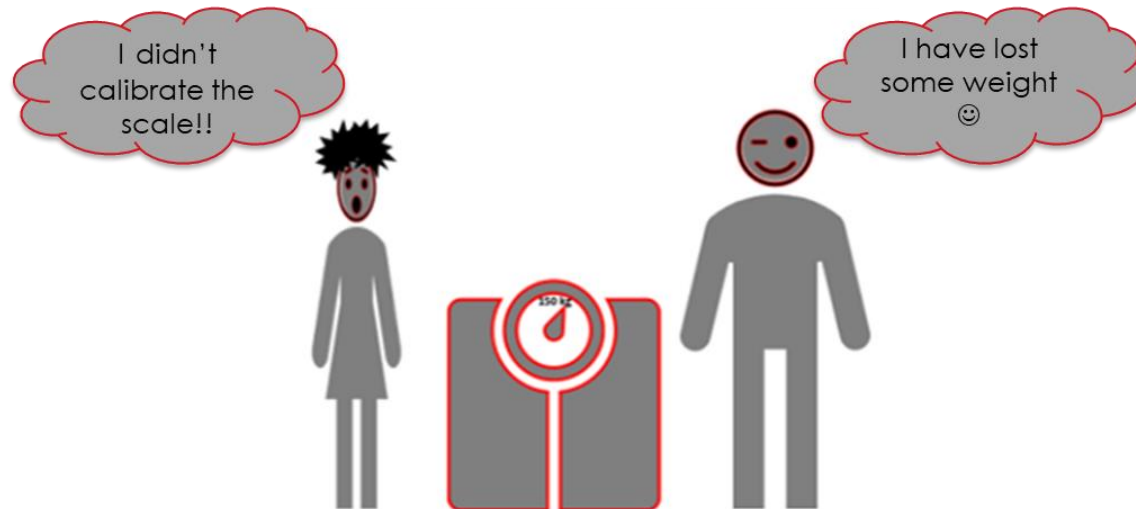
3. Hydrologic Modelling - VO5

- Hydrologic modelling is a simplification of a real-world system. Hydrologic models transform precipitation to surface runoff considering landuse, infiltration, and precipitation.
- Visual OTTHYMO 5 (VO5) was used to model flood flows within the study area.



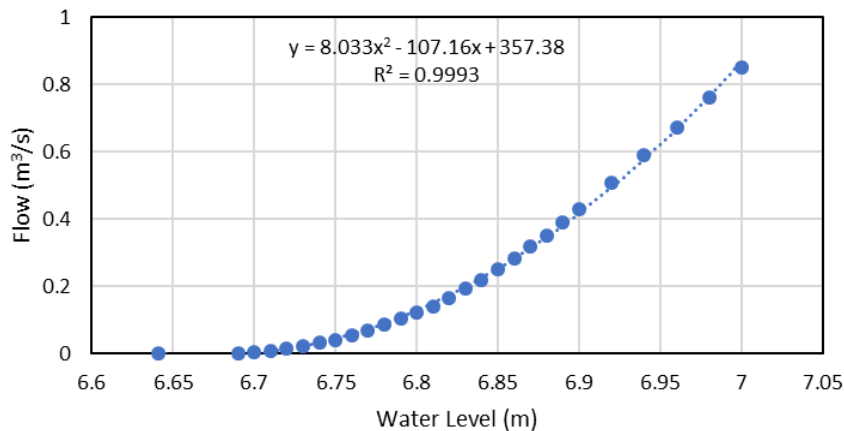
3. Model Calibration and Validation

- Numerical models must be calibrated to real-world events in order to be reliable!
- A long-term water level and flow data have been recorded by NPCA within Walker Creek near Cindy Drive crossing.

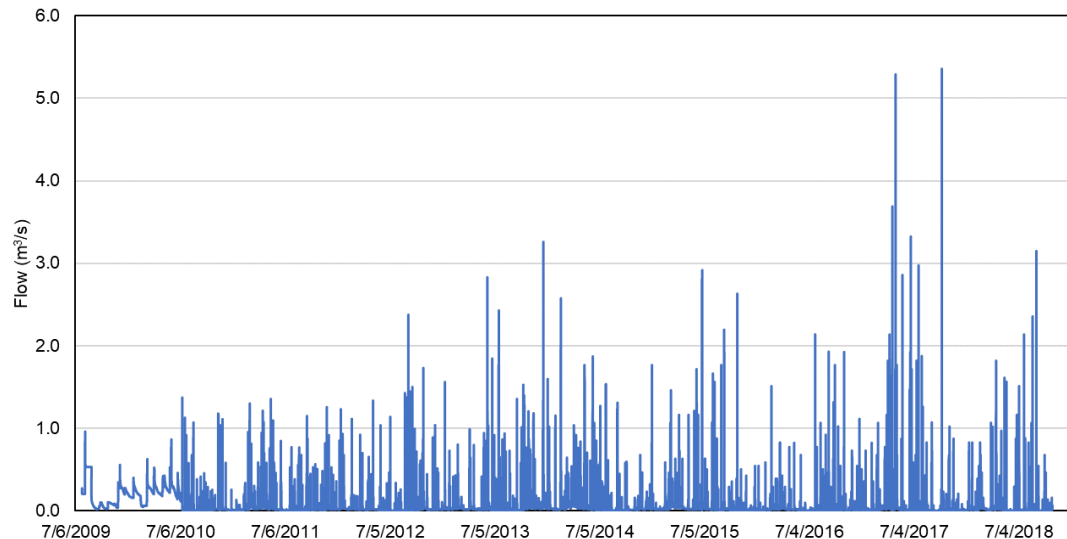
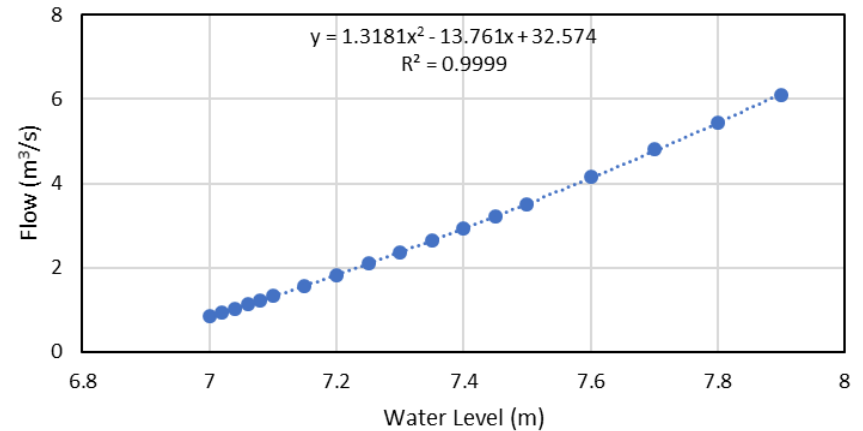


3. Hydrologic Modelling - Water Level Gage on Cindy Dr.

Rating Curve 1

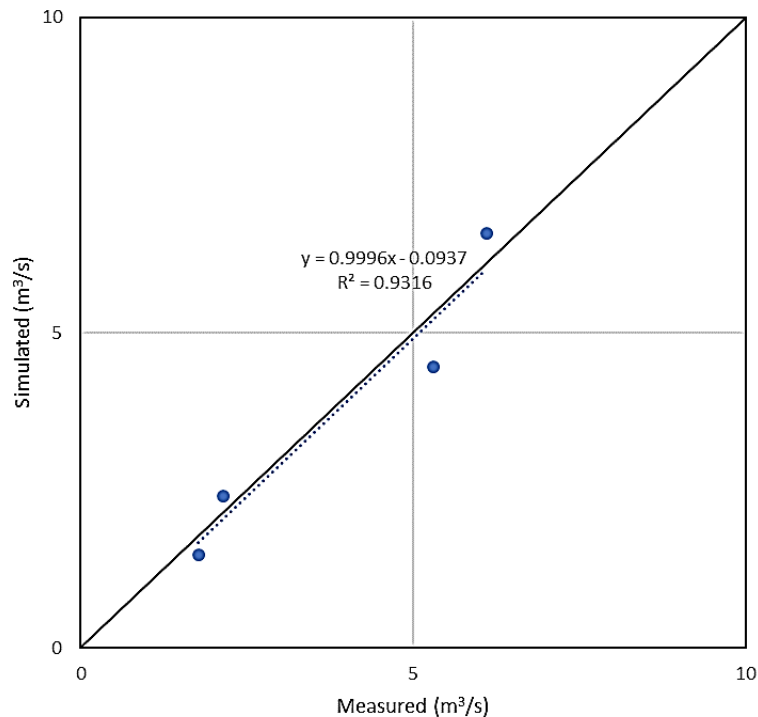


Rating Curve 2



3. Hydrologic Modelling- Calibration and Validation

Measured vs Simulated



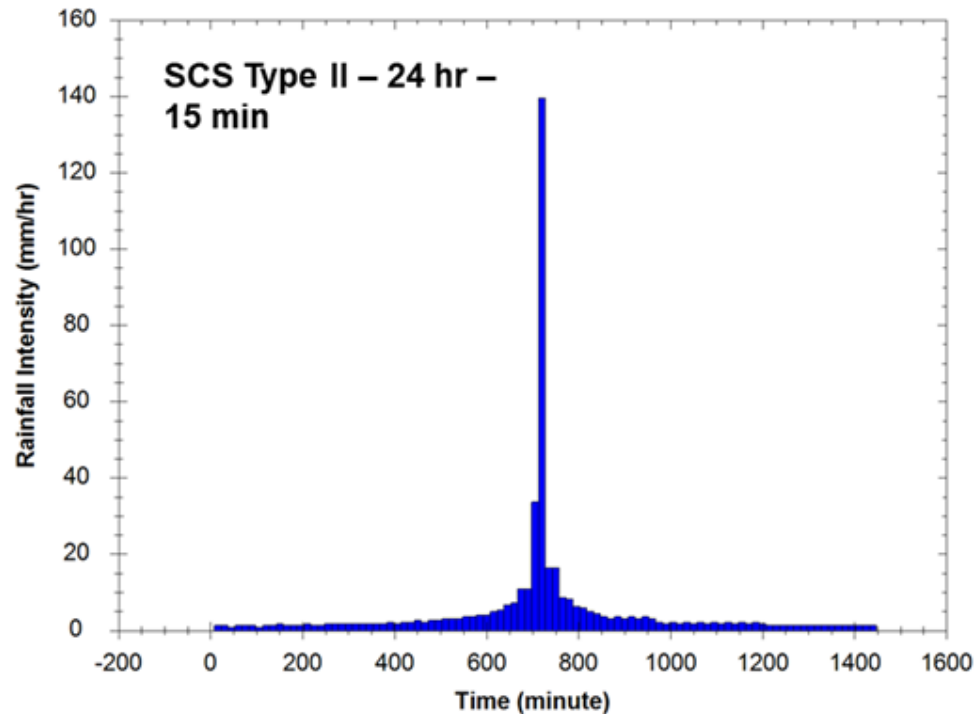
Calibration and Validation Results

Summary of Model Performance for Calibration and Validation Events

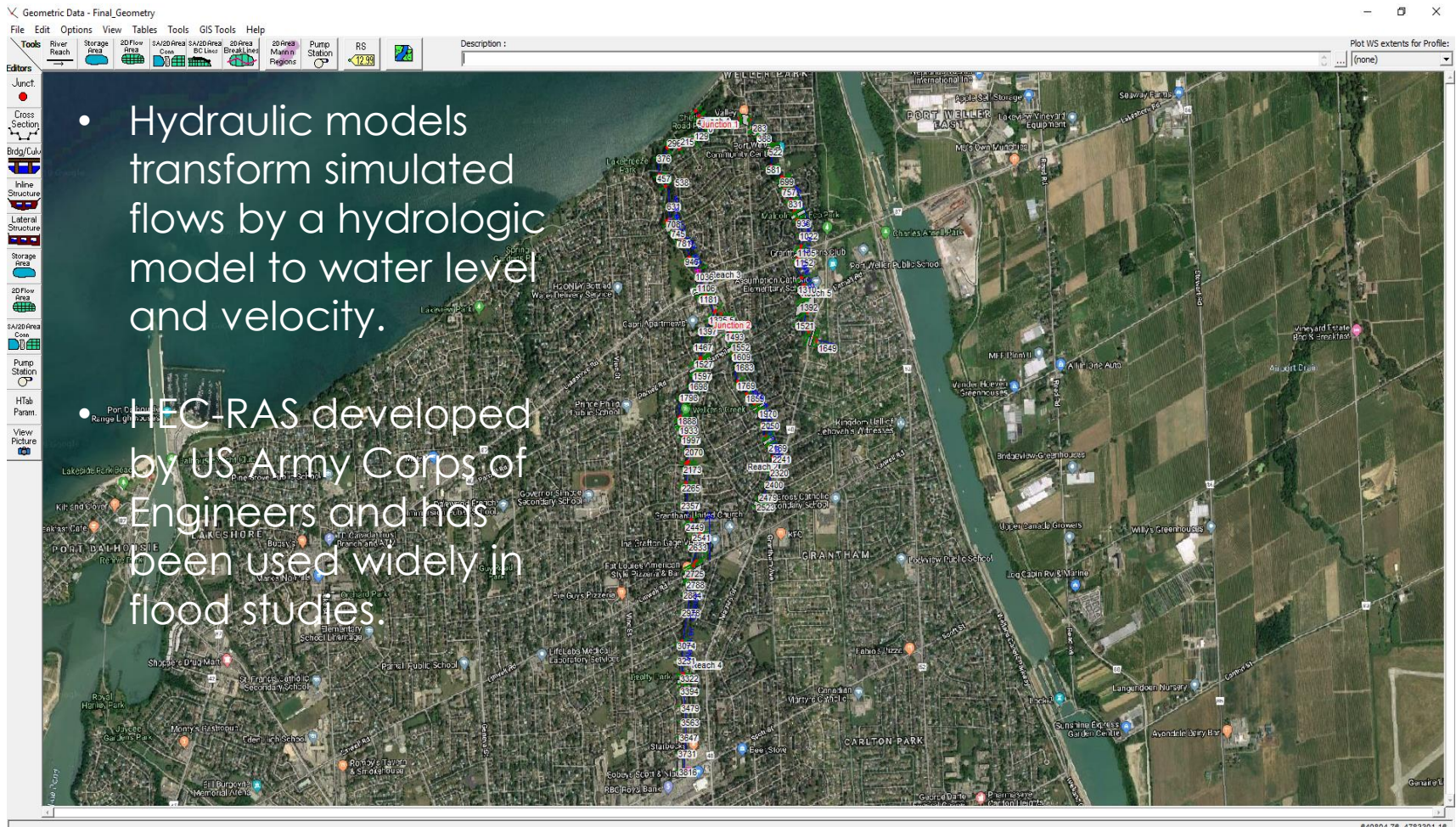
Date	Observed Flow (m³/s)	Simulated Flow (m³/s)	Event	RMSE	Absolute Error
2015-09-02	1.77	1.48	Calibration	14%	16%
2016-07-25	2.14	2.41			13%
2017-05-01	5.3	4.46			16%
2017-10-09	6.1	6.58			8%
2012-09-08	2.8	3.2	Validation	16%	14%
2015-06-27	2.42	2.85			18%

3. Hydrologic Modelling - 100-year Storm

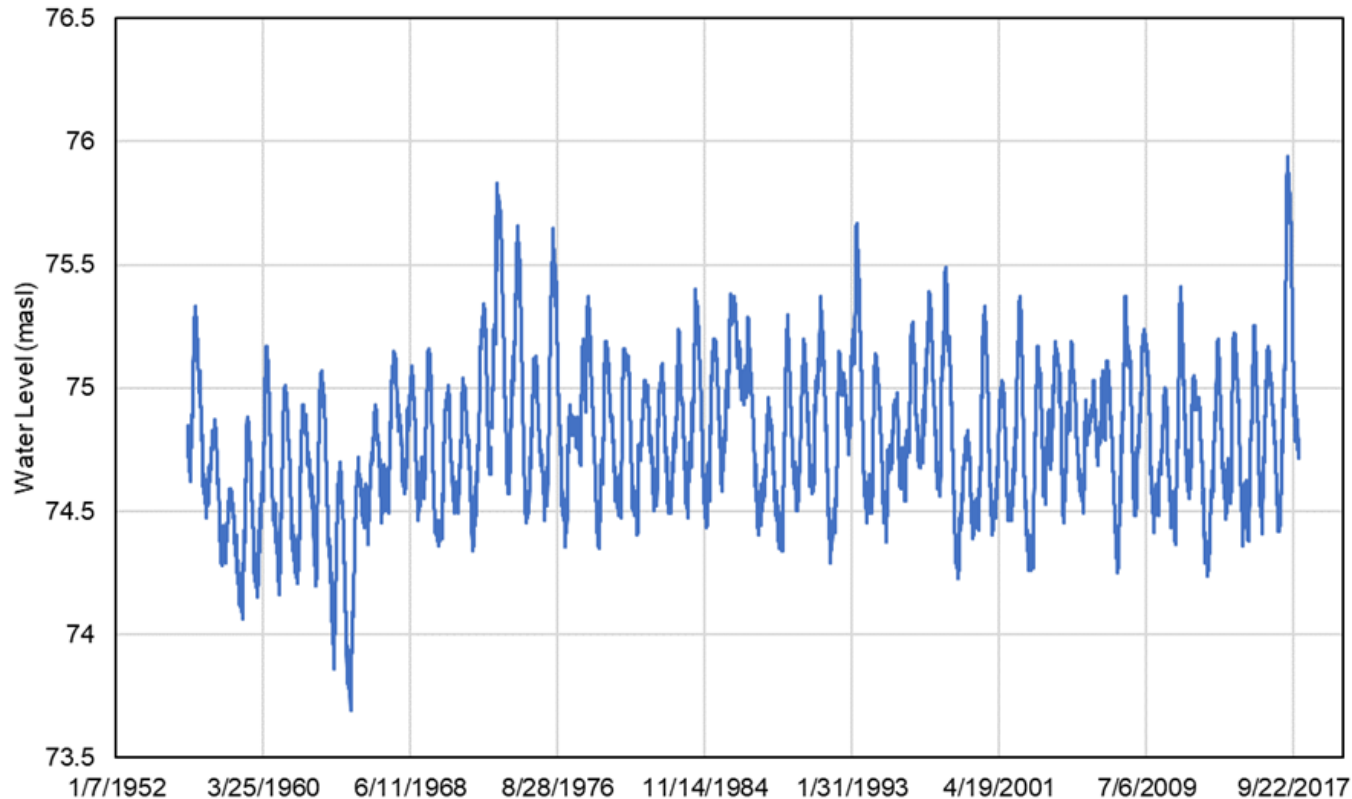
- 100 Year Storm Event was obtained from the City of St. Catharine's Engineering Manual



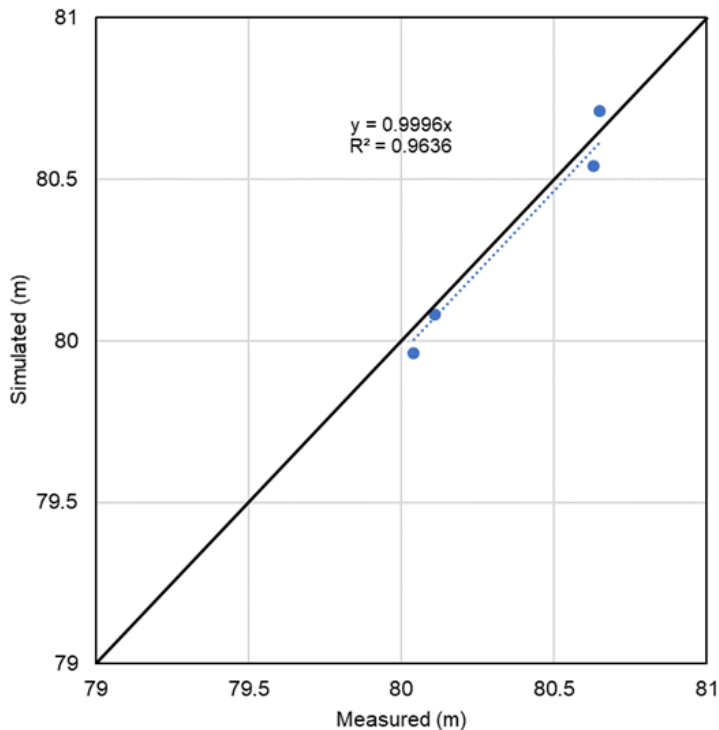
4. Hydraulic Modelling - HEC-RAS Model



4. Hydraulic Modelling - Lake Ontario Water level



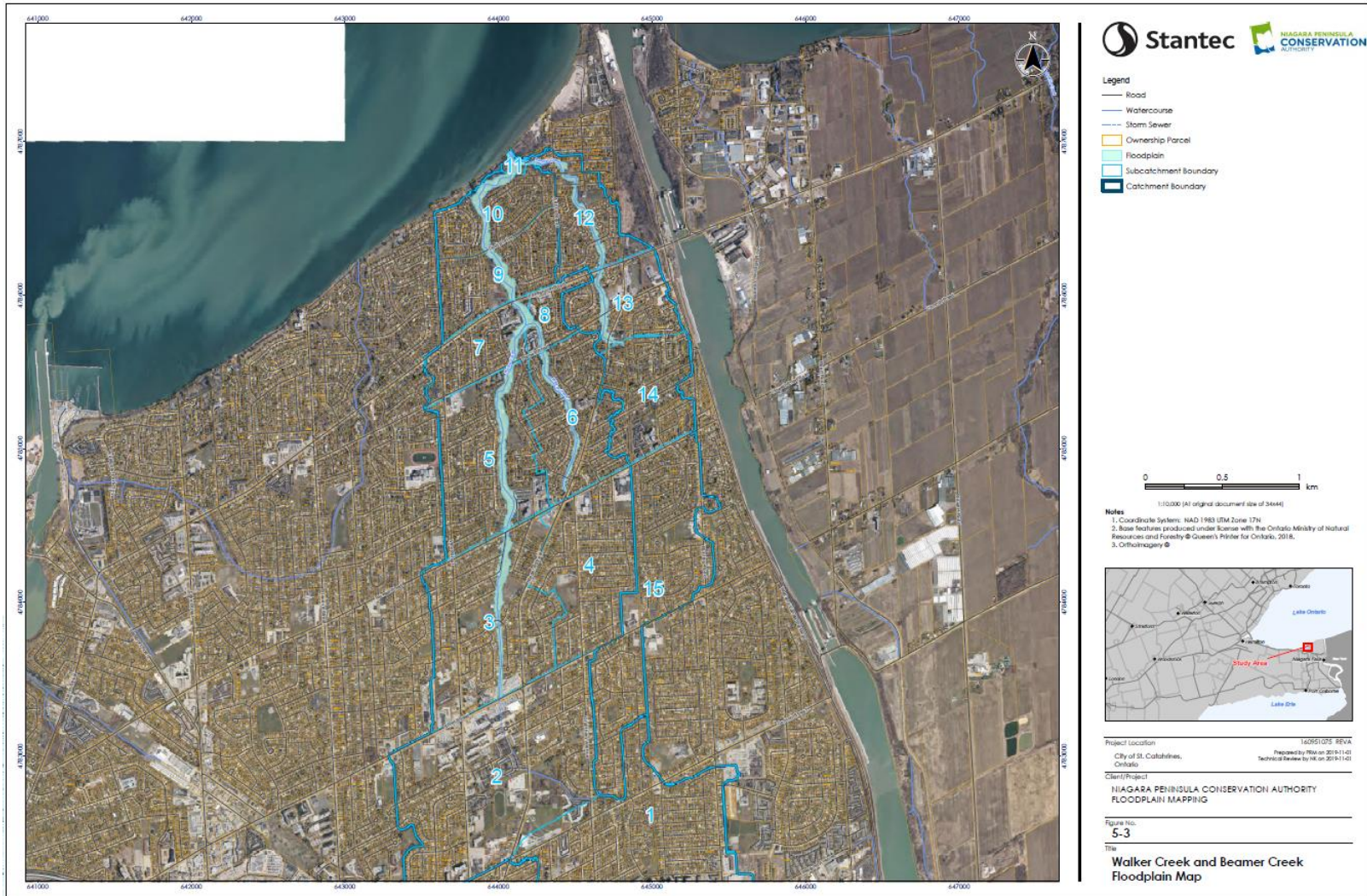
4. Hydraulic Modelling – Calibration and Validation



Calibration and Validation Events Statistics

HEC-RAS Model Performance for Calibration and Validation Events					
Date	Measured WSE (m)	Simulated WSE (m)	Event	RMSE (m)	Absolute Error (m)
2015-09-02	80.04	79.96	Calibration	0.07	0.08
2016-07-25	80.11	80.08			0.03
2017-05-01	80.63	80.59			0.09
2017-10-09	80.65	80.74			0.06
2012-09-08	80.16	80.24	Validation	0.04	0.06
2015-06-27	80.15	80.19			0.01

5. Results - Mapping



5. Results – Affected Properties

Affected Private Properties by 100-Year Flood Along Walker Creek and Beamer Creek

Reach	Number of Affected Private Land Parcels
Walker Creek Between Cindy Drive and mouth of the Creek	4
Walker Creek Between Lake Shore Road and Cindy Drive	5
Walker Creek Between Parnell Drive and Lake Shore Road	9
Walker Creek Between Linwell Road and Parnel Drive	76
Walker Creek Between Scott Street and Linwell Road	35
Beamer creek Between Lake Shore Road and mouth of the creek	21
Beamer Creek Between Parnell Road and Lakeshore Road	8
Beamer creek Between Niagara Street and Parnell Road	11

List of Potentially Affected Public Parks, Institutions and Businesses by 100-Year Flood

Public or Business Name	Reach
Realty Park	Walker Creek Between Scott Street and Linwell Road
Cherie Road Park	Walker and Beamer Creek Near Lake Ontario
Arthur Street Park	Beamer Creek Between Melody Trail and Arthur Street
Bogart Street Park	Beamer Creek Between Corydon Drive and Wildwood Road

List of Habitable Structures Potentially Affected by 100-Year Flood

Reach	Number of habitable structures
Walker Creek Between Scott Street and Linwell Road	5
Walker Creek Between Richelieu Drive and Parnell Road	3
Beamer Creek Between Niagara Street and Lakeshore Road	10

5. Results & Recommendations

Recommendations to Mitigate the 100-Year Flood Effects

Flood Vulnerable Structures	Recommendation
All culverts	Perform annual inspection to assess the effective capacity of the culverts. Perform regular maintenance which includes removing debris and repairing damaged culverts.
Culverts BMC-01, BMC-02, BMC-06, and BMC-07 along Beamer Creek	Although road crossings at BMC-02, BMC-06, and BMC-07 are not overtopped during the 100-year flood, upsizing these culverts can reduce the 100-year flood level along Beamer Creek.
Culverts WKC-01, WKC-06, WKC-07, and WKC-10	Upsizing these culverts can reduce the 100-year flood level along Walker Creek.
Public areas summarized in Table 5-6	A mitigation plan in consultation with the City and NPCA to be developed. In the event of the 100-year flood, adequate warning signages shall be used within these area.
Habitable structures listed in Table 5-7	Structural flood proofing is recommended to mitigate the flood hazard.
All sub-watersheds	Limit development within floodplain limits and use low impact development (LID) practices for any new developments in the watershed (i.e., permeable paving, green roofs, swales, etc.).

6. Future Scenario

- The 100-year flows in the HEC-RAS model were increased by 20% to evaluate changes in the 100-year flood levels.
- Results indicate that a 20% increase in the flood flows will result in increasing flood levels between **0.04 m** and **0.73 m** with an average of **0.2 m**.
- Climate change can increase flood flows and rise flood levels.



THANK YOU

Questions?