

CITY OF WHEATON FLOOD RESILIENCY INVESTIGATION

Flood Protection Program Discussion Part 2

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Department of Engineering

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CITY OF WHEATON FLOOD RESILIENCY INVESTIGATION

PART 1

- Why does Wheaton FLOOD
- Where is the FLOODING



Flood Protection Program Discussion Part 1 RECAP

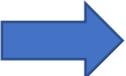
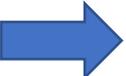


- Water Must go Somewhere when it rains.
 - Back in history the locations prone to flooding were not a problem because they were just wetlands, ponds, or other natural areas
- Flooding is not a problem – Flood Damages are a problem
- Flood damages occur because development happened in the areas where stormwater must go BEFORE there were regulations to prevent that development from occurring.
 - The structures installed did not take into account the fact that stormwater flows to these areas and as such structures resilient to that risk were not constructed.

(Most of the City was built before Stormwater Regulations)

Flood Protection Program Discussion Part 1 RECAP



- Wheaton has a long history of Flood Protection Projects
 - Flood Protection Projects have been installed in the majority of the Flood Prone Areas in the past (Late 50's & Early 60's).
 - Flood Protection Projects constructed were always Capital Improvement Projects designed based on the prevailing thought of the times and the known 100 storm of the times
- The 100-year storm keeps increasing!
5.9" over 24 hours  7.58" over 24 hours  8.59" over 24 hours
- Overland Flooding Mitigation Action Plan of 2010

VARIOUS RAIN EVENT CHEAT SHEET (STORM FREQUENCY)						
YEAR STORM	100	50	25	10	5	1
CHANCE PER YEAR	1%	2%	4%	10%	20%	100%

2010

2010 STRATEGIC INITIATIVE

“Provide an understanding of the contributing variables causing OVERLAND FLOODING during various rain events of PRINCIPLE STRUCTURES in flood prone and floodplain areas”

OVERLAND FLOODING: FLOODING THAT OCCURS WHEN WATER DIRECTLY ENTERS A STRUCTURE THROUGH A DOOR, A WINDOW, OVER THE TOP OF FOUNDATION, OR OVER A WINDOW WELL



IN ORDER TO DETERMINE **OVERLAND FLOODING** YOU NEED:

- 1) ELEVATION OF THE WATER
- 2) ELEVATION OF THE STRUCTURES



- 1) PROJECTS TO DECREASE OVERLAND FLOODING
- 2) METRIC TO EQUITABLY WEIGH PROJECTS (Damages)

Floodplain	Flood Prone	Site Specific Flooding
Water Elevation Known	Water Elevation Unknown	Not Applicable
Structure Elevation Unknown	Structure Elevation Unknown	Not Applicable
Damages Unknown	Damages Unknown	Not Applicable

WHERE IS THE FLOODING?

2010 Projected Results	Floodplain	Flood Prone	Site Specific Flooding
Resident Reported Overland Flooding	5	15	93
Estimated Overland Flooding	123	127	No Estimate
Percent of Total Estimated	35.9%	37.0%	27.1%

2020 Confirmed Results	Floodplain	Flood Prone	Site Specific Flooding
Confirmed Overland Flooding	69	246	145
Percent of Total	15.0%	53.5%	31.5%

WILL LOCATION DATA CHANGE FURTHER?

FLOODPLAIN : DATA COLLECTION HAS 56 COMMERCIAL, MULTIFAMILY, OR SCHOOL PROPERTIES THAT COULD STILL BE SURVEYED TO COMPLETE

FLOODPRONE : COMPLETE FOR PREVIOUS RAINFALL DATA / NOT COMPLETE FOR NEW 2019 RAINFALL DATA

SITE SPECIFIC : NUMBER WILL CONTINUE TO RISE AS DRAINAGE REVIEW PROGRAM CONTINUES TO BRING THESE PROPERTIES TO LIGHT

CITY OF WHEATON FLOOD RESILIENCY INVESTIGATION

PART 1

- Why does Wheaton FLOOD
- Where is the FLOODING

PART 2



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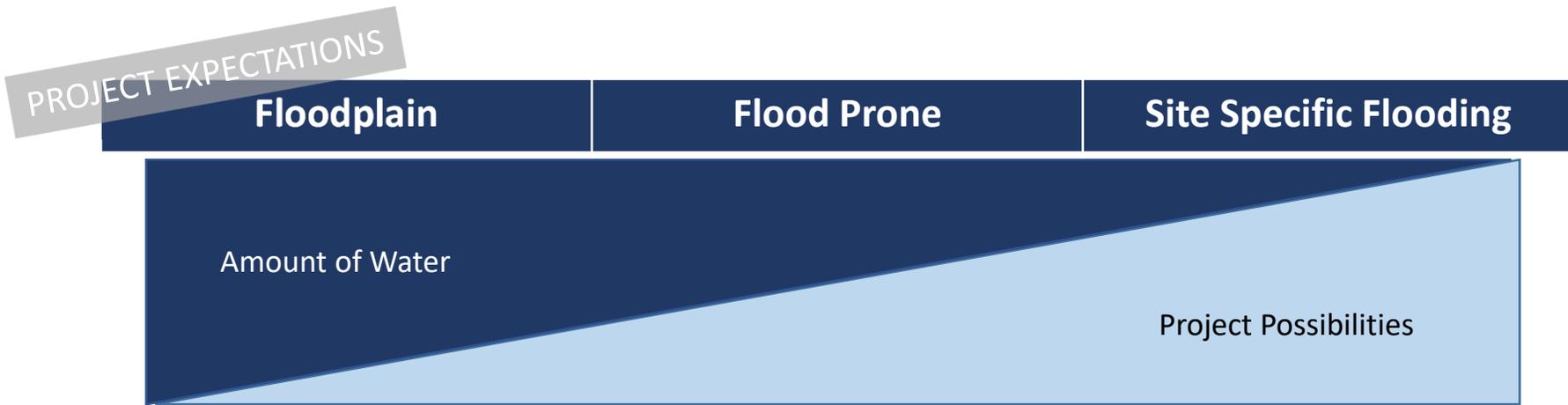
- What can be done to increase FLOOD RESILENCY
- Continue Discussion towards the creation of a
FLOOD PROTECTION PROGRAM



PART 2 PRESENTATION OUTLINE



THERE ARE 3 DISTINCT AREAS OF OVERLAND FLOODING AND EACH AREA MUST BE INVESTIGATED INDIVIDUALLY BASED ON PROJECT POSSIBILITY



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Floodplain

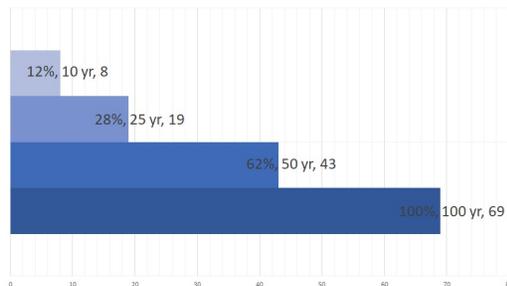
Flood Prone

Site Specific Flooding

CHART FOR FREQUENCY OF FLOODING

(What storms homes flood in)

FLOODPLAIN - STRUCTURE FLOODING PER FREQUENCY



FLOOD RESILIENCY TOOLKIT

(What projects can be done)



METRIC TO WEIGH OPTIONS

(Help to decide between projects)



TOTAL COST EXPOSURE

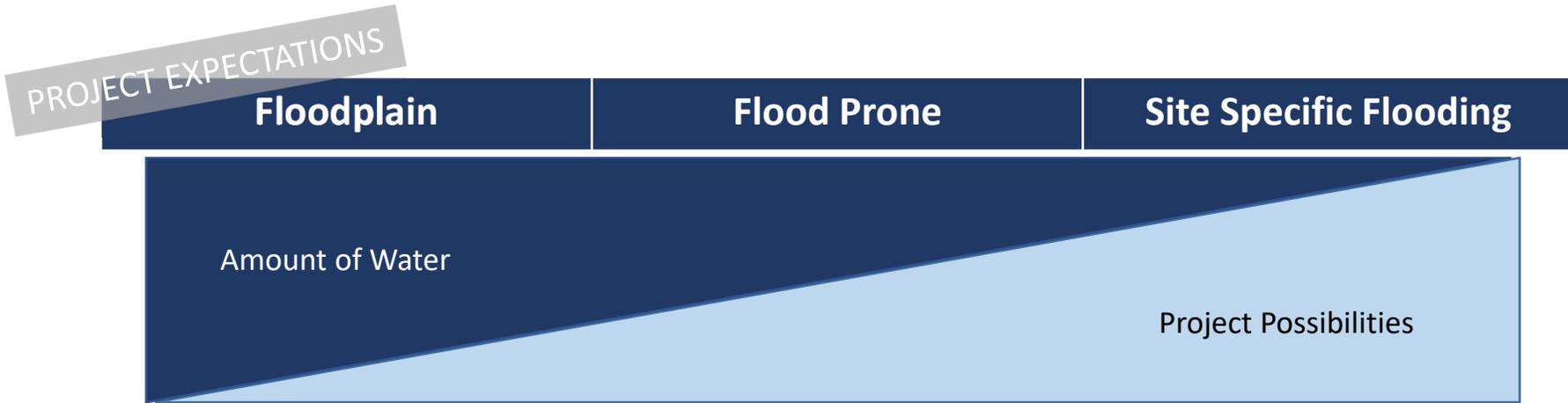
(Cost to 100 year storm level)



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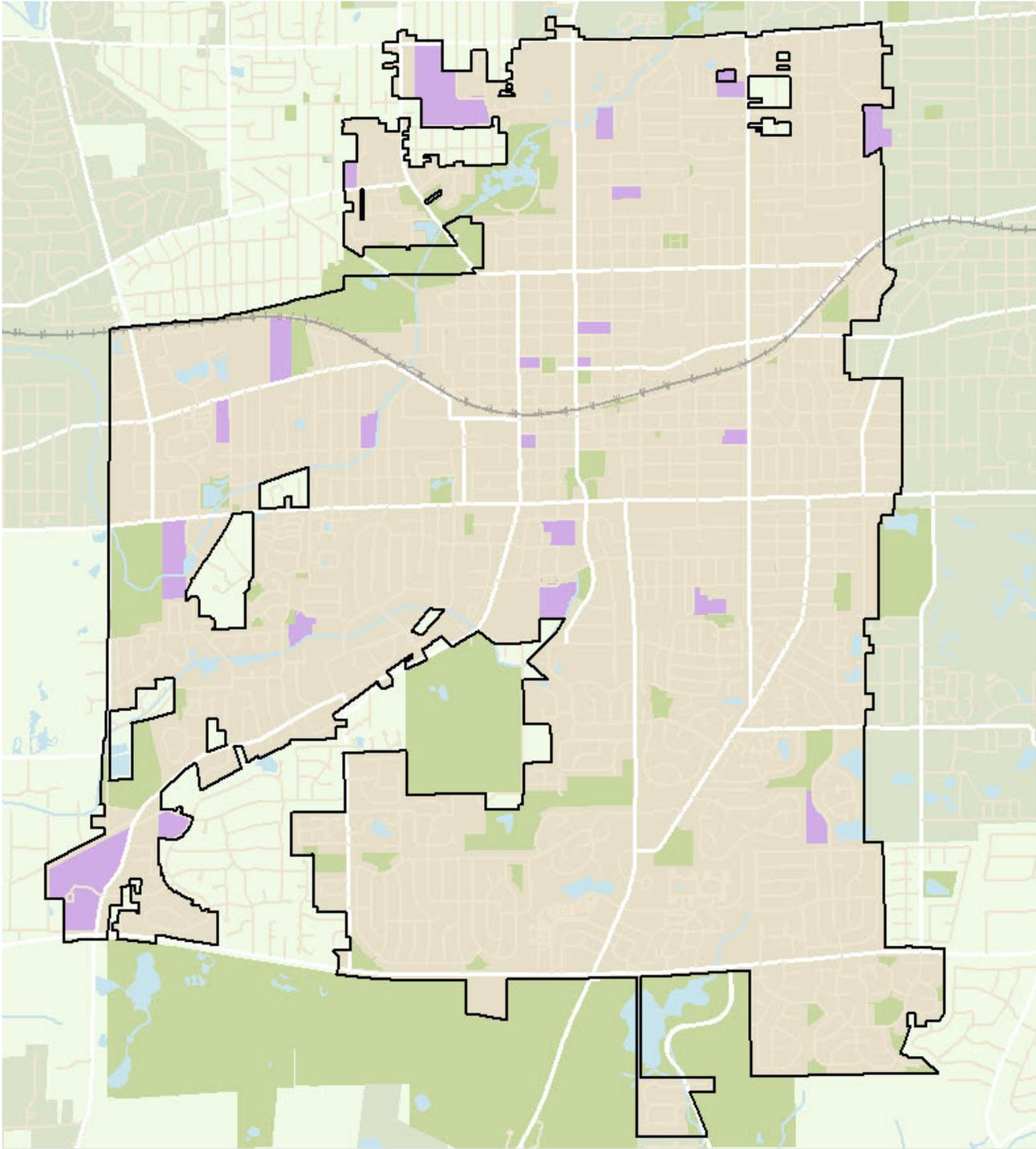


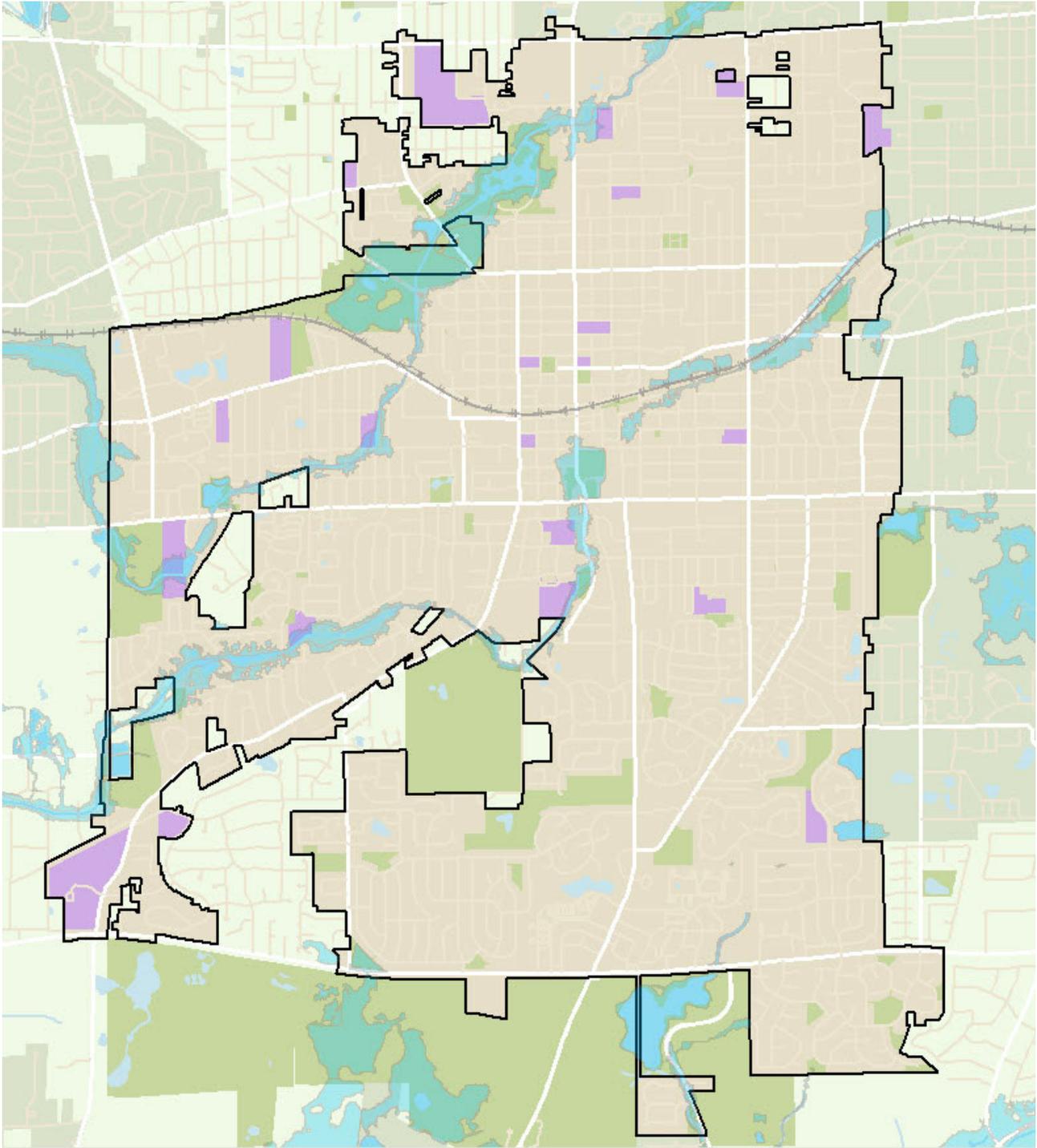
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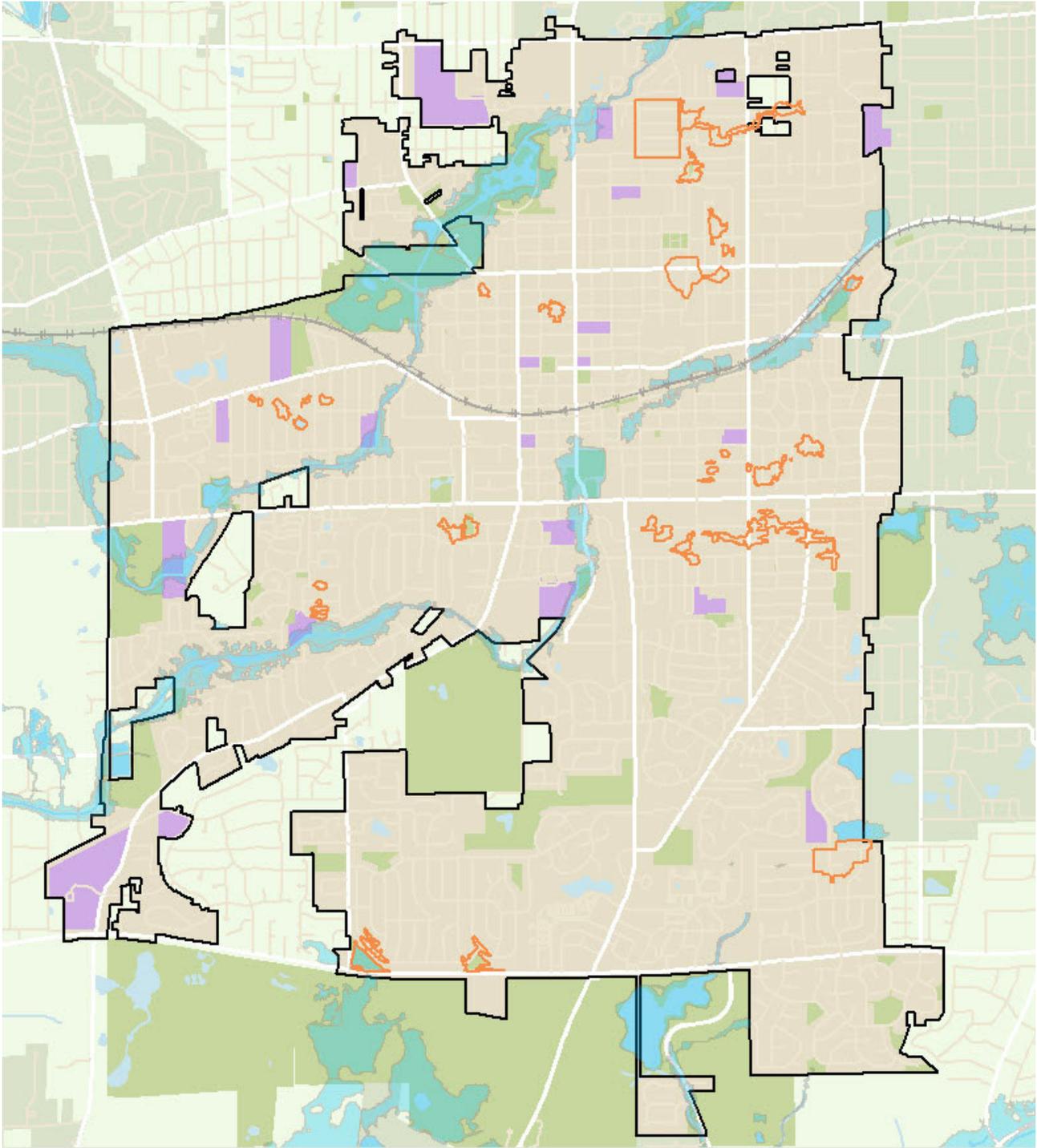


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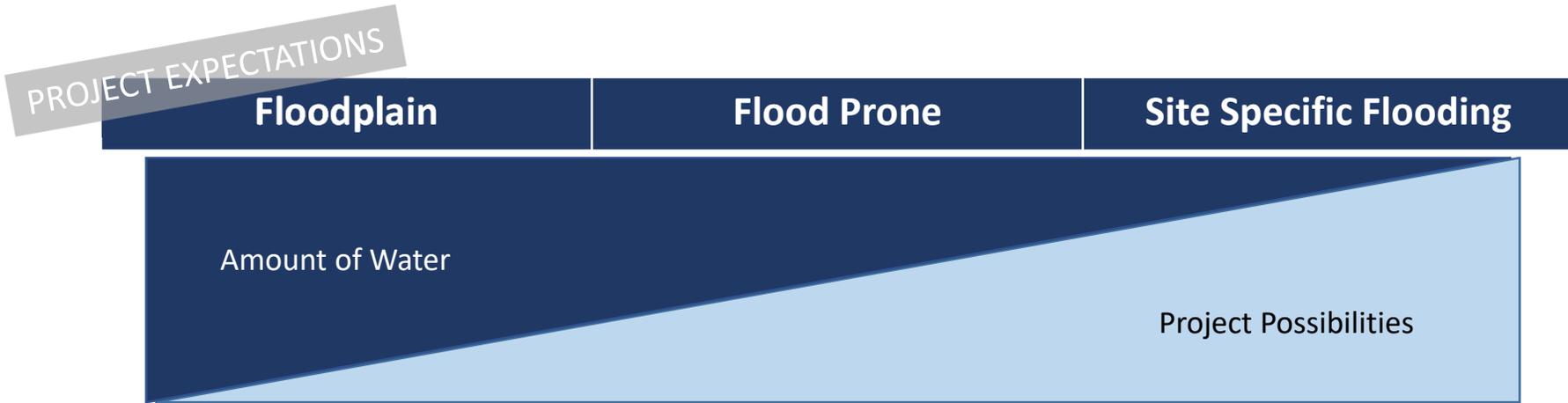




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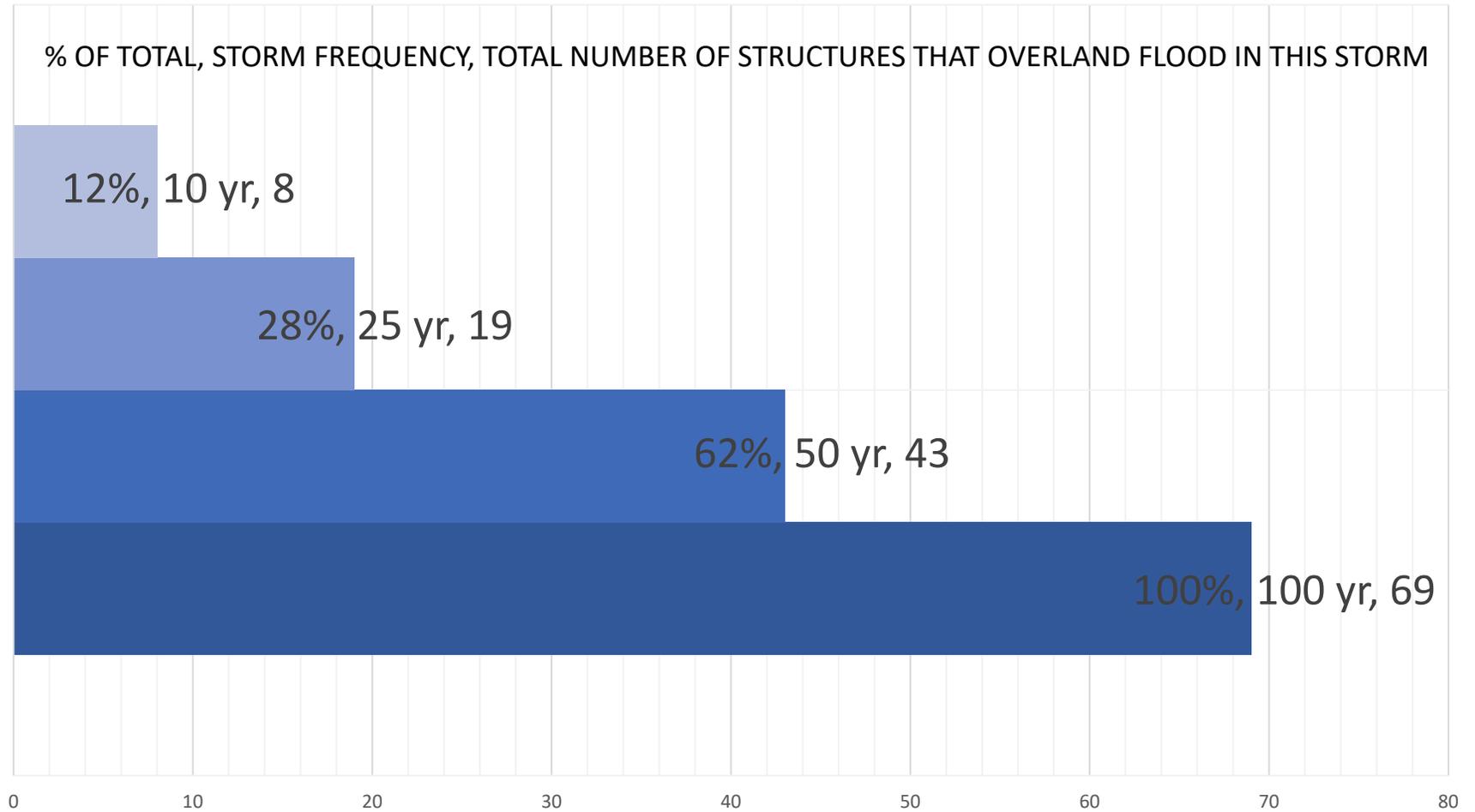
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FLOODPLAIN - STRUCTURE FLOODING PER FREQUENCY



WHAT PROJECTS ARE POSSIBLE?

2020 Confirmed Results	Floodplain
Confirmed Overland Flooding	69



1) PROJECTS TO DECREASE OVERLAND FLOODING

Buyouts	Floodproofing	Capital Improvement Project
Buy and Demolish Structure	Elevate Structure or Raise Low Entry Point (LEP) -Raise Window Wells -Eliminate Doors	Large Pipes, Detention, Street Reconstruction, Etc.

WHAT PROJECTS ARE POSSIBLE?



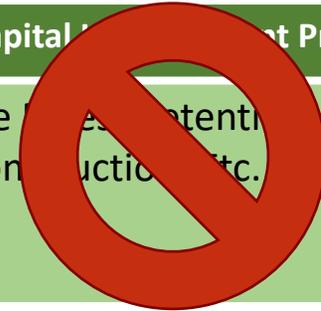
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1) PROJECTS TO DECREASE OVERLAND FLOODING

Buyouts	Floodproofing	Capital Investment Project
Buy and Demolish Structure	Elevate Structure or Raise Low Entry Point (LEP) -Raise Window Wells -Eliminate Doors	Large Scale Infrastructure Street Reconstruction, etc.



WHAT PROJECTS ARE POSSIBLE?

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1) PROJECTS TO DECREASE OVERLAND FLOODING

Buyouts	Floodproofing
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2) METRIC TO FAIRLY AND EQUITABLY WEIGH PROJECTS (Damages)



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**NOT COMPLETED
YET**

WHAT PROJECTS ARE POSSIBLE?

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1) PROJECTS TO DECREASE OVERLAND FLOODING

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2) COST OF PROJECTS

Buyouts	Floodproofing
\$24,500,000	\$4,500,000

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GENERAL RESULTS FOR FLOODPLAIN AREAS

Buyouts	Floodproofing
<p>LIKELY NOT OUR BEST TOOL</p> <ul style="list-style-type: none"> - More Expensive - Program Available via DuPage County 	<p>WOULD HAVE BETTER BCA</p> <ul style="list-style-type: none"> - Less Expensive - Possible Substantial Improvement requirements

WHAT PROJECTS ARE POSSIBLE?

2020 Confirmed Results

Confirmed **Overland** Flooding

Flood Prone

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Buyouts	Floodproofing	Capital Improvement Project
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2) METRIC TO FAIRLY AND EQUITABLY WEIGH PROJECTS (Damages)



FEMA SOFTWARE that takes the WATER ELEVATION and the STRUCTURE ELEVATION data and provides the projected BENEFITS over a required timespan, such as 100 years for a Buyout Project.

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BENEFITS = DAMAGES

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2) METRIC TO FAIRLY AND EQUITABLY WEIGH PROJECTS (Damages)



FEMA SOFTWARE that takes the WATER ELEVATION and the STRUCTURE ELEVATION data and provides the projected **DAMAGES** over a required timespan, such as 100 years for a Buyout Project.

$$\text{BENEFITS} = \text{DAMAGES}$$

HOW DOES THE FEMA BENEFIT COST ANALYSIS WORK?



TOTAL DAMAGES

25 YEAR = \$25,000 x 4 FLOODS PER TIMESPAN = \$100,000

50 YEAR = \$30,000 x 2 FLOODS PER TIMESPAN = \$60,000

100 YEAR = \$75,000 X 1 FLOOD PER TIMESPAN = \$75,000

\$235,000



FEMA BCA NOTES

- 1) REQUIRED TO BE USED TO SUBMIT FOR ANY FEDERAL FEMA FUNDING ASSISTANCE
- 2) EVERYTHING WE KNEW ABOUT BCA CHANGED IN 2019 WHEN IT CHANGED TO A NEW VERSION
- 3) BCA IS NOT A PERFECT TOOL / MAY STILL BE SOME BUGS TO WORK OUT IN THE NEW VERSION

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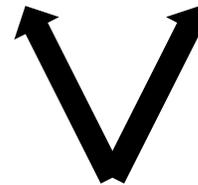
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 **FEMA**
Benefit-Cost Analysis

DAMAGES



HOW DO WE QUANTIFY DAMAGES? / THE WHAT, THE FREQUENCY, THE COST

2020 Confirmed Results

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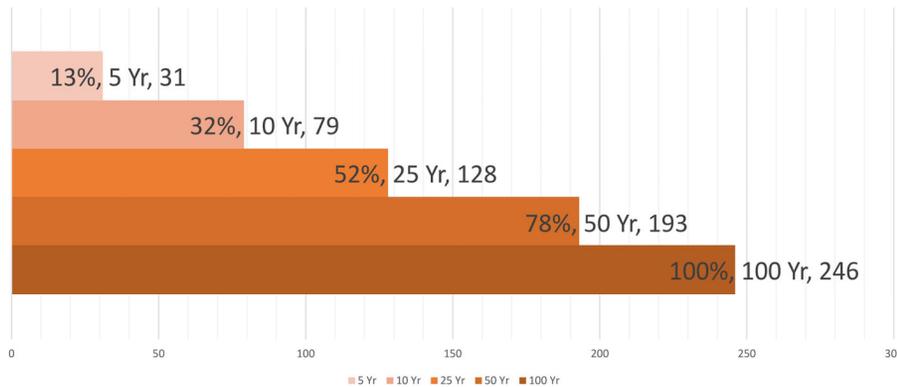
DAMAGES

THE WHAT

- DAMAGES : A SIMPLE NUMBER ON THE SCREEN
- : HORRIBLE COST BORN BY THE RESIDENTS OF THE CITY OF WHEATON
- : MONETARY DESTRUCTION OF FAMILIES
- : CURRENCY FOR THE CITY TO TRY TO GAIN FEDERAL AID

THE FREQUENCY

FLOOD PRONE - STRUCTURE FLOODING PER FREQUENCY



Flood Prone Overland Flooding – Increase per Frequency

5 Year	10 Year	25 Year	50 Year	100 Year
31	48	49	65	53

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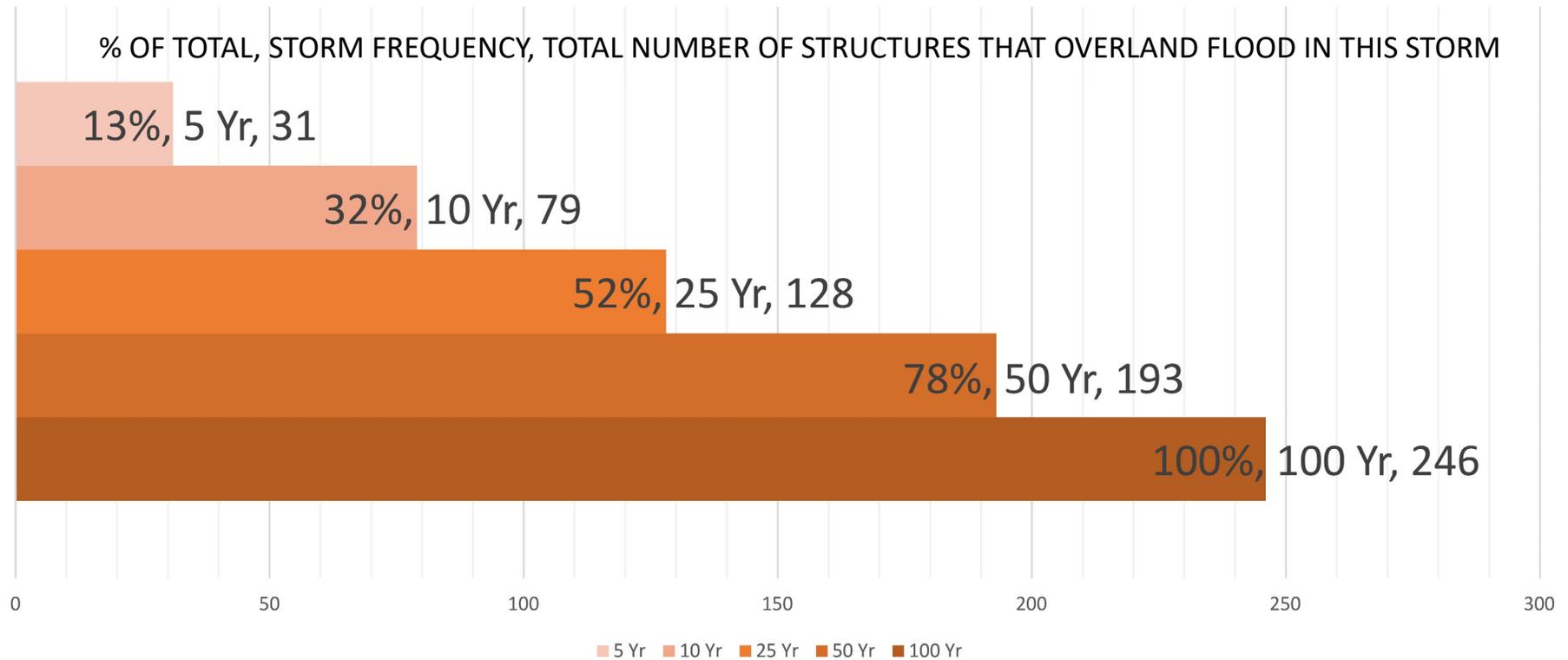
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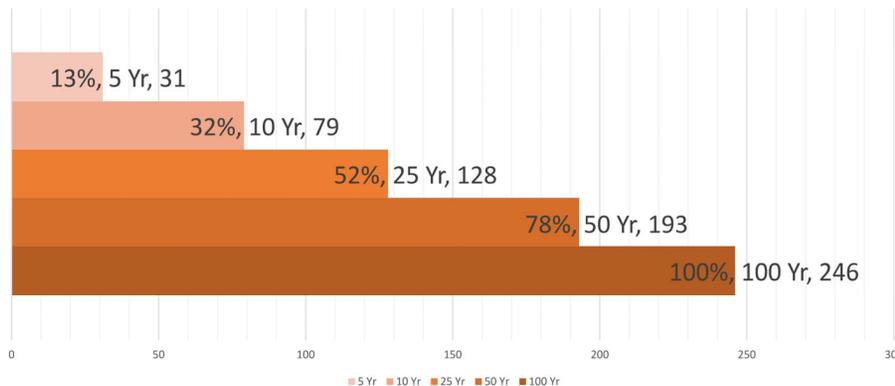
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FLOOD PRONE - STRUCTURE DAMAGES PER FREQUENCY



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Flood Prone Overland Flooding – Damage Increase per Frequency

5 Year	10 Year	25 Year	50 Year	100 Year
\$15,022,776	\$39,495,903	\$8,511,822	\$8,187,085	\$4,797,510

HOW DO WE QUANTIFY DAMAGES? / THE WHAT, THE FREQUENCY, THE COST

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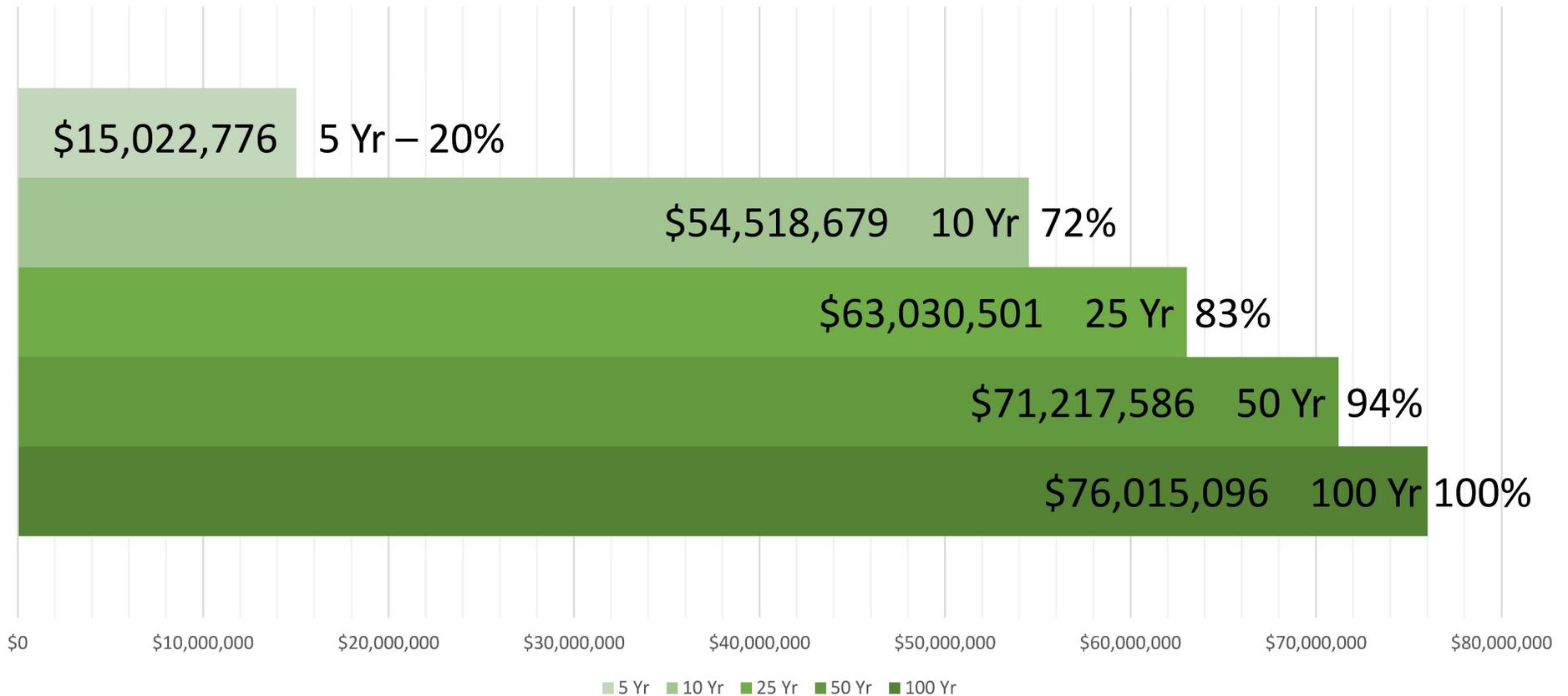
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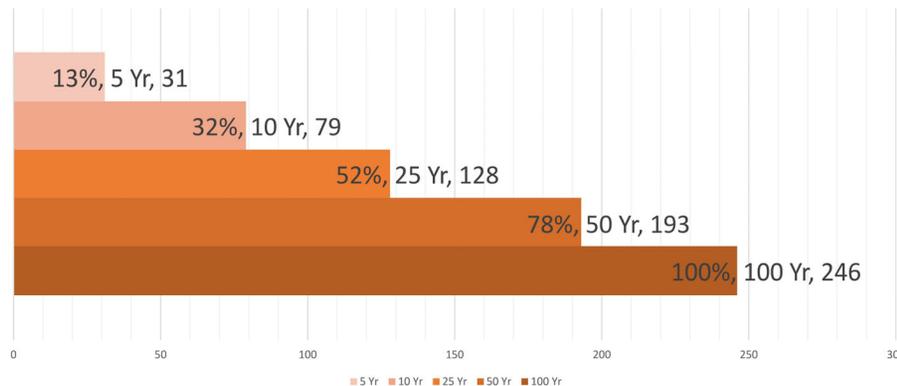
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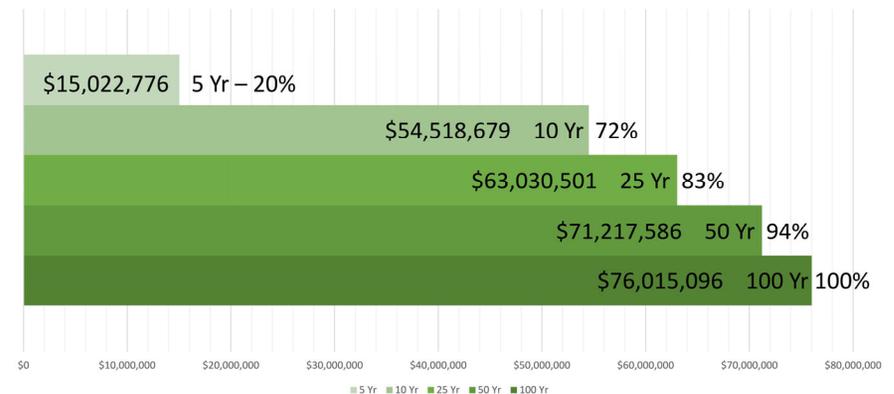
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WHAT PROJECTS ARE SPECIFICALLY POSSIBLE? / WHAT IS IN THE STUDIES?

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Removes Flood Damages Removes Tax Base Maintenance Cost Forever Expensive	Removes Flood Damages Keeps Tax Base No Maintenance Less Expensive	Removes Flood Damages Keeps Tax Base Maintenance Cost Forever Expensive

REMINDER

TRYS TO CHANGE THE STRUCTURES TO MATCH THAT OF THE FLOODING THAT EXISTS

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ALL PROJECTS THAT CAME OUT OF THE 17 FLOODPRONE AREA STUDIES HAVE BEEN WEIGHED BY BCA. THIS USES THE DAMAGES FROM EACH AREA (BENEFITS) AND COMPARES THE COST OF THE PROJECTS (COSTS) TO EQUALLY AND FAIRLY RANK THE PROJECTS

FOR THE DISCUSSION TONIGHT WE ARE USING THE ALREADY ESTABLISHED BAR SET BY FEMA OF A PROJECT SHOULD HAVE A BCA ABOVE 1 TO BE CONSIDERED FOR FUNDING USING PUBLIC MONEY

Area	Project	Cost	Benefits	BCA	Flooding Structures Eliminated - 100 yr
Briarcliffe					
	Acq 100 yr - Buyout	\$14,481,204	\$11,052,365	0.76	42 out of 42
	Box Culvert Conveyance	\$11,530,000	\$11,052,365	0.96	42 out of 42
	Floodproofing	\$2,940,000	\$11,052,365	3.76	42 out of 42
Thomas					
	Acq 100 yr - Buyout	\$3,614,610	\$4,643,092	1.28	8 out of 8
	Detention + Pipe + 100 Year Buy Out	\$2,455,758	\$4,643,092	1.89	8 out of 8
	Floodproofing	\$620,000	\$4,643,092	7.49	8 out of 8
Wakeman					
	Acq 100 yr - Buyout	\$3,625,890	\$340,149	0.09	10 out of 10
	Pipe + 100 Year Buy Out	\$2,235,094	\$396,002	0.18	10 out of 10
	Thomas + Wakeman (Required to Function)	\$4,690,852	\$4,983,241	1.06	18 out of 18
	Floodproofing	\$820,000	\$340,149	0.41	10 out of 10
TCR					
	Acq 100 yr - Buyout	\$5,774,730	\$1,653,278	0.29	14 out of 14
	Roadway Conveyance	\$1,267,558	\$1,653,278	1.30	14 out of 14
	Floodproofing	\$680,000	\$1,653,278	2.43	14 out of 14
TCR Local					
	Acq 100 yr - Buyout	\$3,176,520	\$17,386,958	5.47	12 out of 12
	Sideyard Swales - Floodproofing	\$50,000	\$17,386,958	347.74	12 out of 12
Pershing West					
	Acq 100 yr - Buyout	\$1,811,820	\$1,408,557	0.78	6 out of 6
	Pipe Conveyance + Detention	\$2,827,500	\$1,078,365	0.38	5 out of 6
	Floodproofing	\$239,000	\$1,408,557	5.89	6 out of 6
	100% Pipe Conveyance + Detention + Floodproofing	\$2,827,500	\$1,408,557	0.50	6 out of 6
Pershing East					
	Acq 100 yr - Buyout	\$8,897,670	\$5,361,997	0.60	32 out of 32
	Pipe Conveyance + Lake A Storage	\$11,437,260	\$4,937,501	0.43	30 out of 32
	Pipe Conveyance + Private Prop Storage	\$6,734,100	\$4,524,382	0.67	27 out of 32
	Roadway Conveyance + Lake A Storage	\$3,500,000	\$4,987,594	1.43	26 out of 32
	100% Pipe Conveyance + Lake A Storage + Floodproofing	\$11,462,300	\$5,361,997	0.47	32 out of 32
	100% Pipe Conveyance + Private Prop Storage + Floodproofing	\$6,781,300	\$5,361,997	0.79	32 out of 32
	100% Roadway Conveyance + Lake A Storage + Floodproofing	\$3,642,240	\$5,361,997	1.47	32 out of 32
	Floodproofing	\$1,133,040	\$5,361,997	4.73	32 out of 32

Harrison					
	Acq 100 yr - Buyout	\$9,337,350	\$13,770,448	1.47	24 out of 24
	Conveyance + Cherry S of Harrison Storage	\$10,632,500	\$18,359,146	1.73	43 out of 43
	Conveyance + Cherry S + Cherry N of Forest Storage	\$13,541,500	\$18,359,146	1.36	43 out of 43
	Conveyance + Cherry N of Forest Storage	\$6,832,000	\$18,359,146	2.69	43 out of 43
	Floodproofing	\$3,614,400	\$18,359,146	5.08	43 out of 43
Erie					
	Acq 100 yr - Buyout	\$3,562,275	\$1,969,071	0.55	13 out of 13
	West Conveyance + Storage (Alt 1)	\$588,600	\$1,387,717	2.36	2 out of 2
	West Storage (alt 2)	\$704,200	\$1,387,717	1.97	2 out of 2
	Central/East Conveyance + Storage (Alt 1)	\$1,303,900	\$745,004	0.57	9 out of 9
	Central/East Storage (Alt 2)	\$2,436,300	\$745,004	0.31	9 out of 9
	Floodproofing	\$652,000	\$1,969,071	3.02	13 out of 13
	Central/East Conveyance + Storage + Floodproofing	\$1,308,900	\$794,782	0.61	11 out of 11
	Central/East Storage + Floodproofing	\$2,441,300	\$794,782	0.33	11 out of 11
Mayo					
	Acq 100 yr - Buyout	\$3,802,095	\$1,567,320	0.41	11 out of 11
	Private Property Storage (Alt 2)	\$3,176,800	\$1,567,320	0.49	11 out of 11
	Conveyance + Private Property Storage(Alt 3)	\$537,000	\$1,567,320	2.92	11 out of 11
	Public Property Storage (Alt 4)	\$140,700	\$69,072	0.49	3 out of 11
	Floodproofing	\$346,000	\$1,567,320	4.53	11 out of 11
Jefferson					
	Acq 100 yr - Buyout	\$2,996,610	\$2,866,670	0.96	6 out of 6
	Storage	\$2,600,000	\$2,866,670	1.10	6 out of 6
	Floodproofing + Storm Service	\$576,100	\$2,866,670	4.98	6 out of 6
	Floodproofing	\$546,000	\$2,866,670	5.25	6 out of 6
Delles / Prairie Path Park					
	Acq 100 yr - Buyout	\$2,384,640	\$331,605	0.14	6 out of 6
	Delles Storage	\$953,550	\$192,667	0.20	5 out of 6
	Park Storage	\$200,000	\$183,845	0.92	1 out of 6
	Floodproofing	\$600,000	\$331,605	0.55	6 out of 6

Glendale					
	Acq 100 yr - Buyout	\$1,220,865	\$571,497	0.47	3 out of 3
	Swale Conveyance	\$132,600	\$571,497	4.31	3 out of 3
	Pipe Conveyance	\$170,600	\$571,497	3.35	3 out of 3
	Floodproofing	\$210,000	\$571,497	2.72	3 out of 3
Dorset					
	Acq 100 yr - Buyout	\$2,167,305	\$555,018	0.26	5 out of 5
	Rear Yard Storm Sewer	\$56,456	\$221,473	3.92	4 out of 5
	Pipe Conveyance	\$374,400	\$555,018	1.48	5 out of 5
	Swales and Pipe Conveyance	\$330,900	\$555,018	1.68	5 out of 5
	Rear Yard Storm Sewer + Buyout	\$438,200	\$555,018	1.27	5 out of 5
	Floodproofing	\$50,000	\$555,018	11.10	5 out of 5
Cherry					
	Acq 100 yr - Buyout	\$5,627,745	\$4,588,698	0.82	19 out of 19
	See Harrison Avenue Alterantives				
Williston					
	Acq 100 yr - Buyout	\$10,529,379	\$7,948,373	0.75	36 out of 36
	Structure Buyout + New Storage (Alt 3)	\$6,000,000	\$7,076,691	1.18	21 out of 36
	Structure Buyout + New Storage + Lake A Storage (Alt 4)	\$7,000,000	\$7,894,565	1.13	33 out of 36
	Conveyance + Lake A Storage (Alt 2)	\$4,300,000	\$588,001	0.14	15 out of 36
	Structure Buyout + Conveyance+ Lake A Storage (Alt 5)	\$10,000,000	\$7,904,937	0.79	34 out of 36
	Floodproofing	\$1,800,000	\$7,948,373	4.42	36 out of 36
Madison	No Damages in 100 year storm				
Dorset at Ridge Park	No Damages in 100 year storm				
	Total Acquisition	\$83,010,708	\$76,015,096		
	Total Floodproofing	\$14,300,440			
	Total Cheapest Capitol	\$41,591,700			
	Recommended blend	\$13,397,054			

FLOOD PRONE AREA PROJECTS RANKED BY BCA

Area	Project	Cost	Benefits	BCA	Flooding Structures Eliminated - 100 yr
TCR Local	Sideyard Swales - Floodproofing	\$50,000	\$17,386,958	347.74	12 out of 12
Thomas	Floodproofing	\$620,000	\$4,643,092	7.49	8 out of 8
Pershing West	Floodproofing	\$239,000	\$1,408,557	5.89	6 out of 6
TCR Local	Acq 100 yr - Buyout	\$3,176,520	\$17,386,958	5.47	12 out of 12
Jefferson	Floodproofing	\$546,000	\$2,866,670	5.25	6 out of 6
Harrison	Floodproofing	\$3,614,400	\$18,359,146	5.08	43 out of 43
Jefferson	Floodproofing + Storm Service	\$576,100	\$2,866,670	4.98	6 out of 6
Pershing East	Floodproofing	\$1,133,040	\$5,361,997	4.73	32 out of 32
Mayo	Floodproofing	\$346,000	\$1,567,320	4.53	11 out of 11
Williston	Floodproofing	\$1,800,000	\$7,948,373	4.42	36 out of 36
Glendale	Swale Conveyance	\$132,600	\$571,497	4.31	3 out of 3
Dorset	Floodproofing	\$140,000	\$555,018	3.96	5 out of 5
Dorset	Rear Yard Storm Sewer	\$56,456	\$221,473	3.92	4 out of 5
Briarcliffe	Floodproofing	\$2,940,000	\$11,052,365	3.76	42 out of 42
Glendale	Pipe Conveyance	\$170,600	\$571,497	3.35	3 out of 3
Erie	Floodproofing	\$652,000	\$1,969,071	3.02	13 out of 13
Mayo	Conveyance + Private Property Storage(Alt 3)	\$537,000	\$1,567,320	2.92	11 out of 11
Glendale	Floodproofing	\$210,000	\$571,497	2.72	3 out of 3
Harrison	Conveyance + Cherry N of Forest Storage	\$6,832,000	\$18,359,146	2.69	43 out of 43
TCR	Floodproofing	\$680,000	\$1,653,278	2.43	14 out of 14
Erie	West Conveyance + Storage (Alt 1)	\$588,600	\$1,387,717	2.36	2 out of 2
Erie	West Storage (alt 2)	\$704,200	\$1,387,717	1.97	2 out of 2
Thomas	Detention + Pipe + 100 Year Buy Out	\$2,455,758	\$4,643,092	1.89	8 out of 8
Harrison	Conveyance + Cherry S of Harrison Storage	\$10,632,500	\$18,359,146	1.73	43 out of 43
Dorset	Swales and Pipe Conveyance	\$330,900	\$555,018	1.68	5 out of 5
Dorset	Pipe Conveyance	\$374,400	\$555,018	1.48	5 out of 5
Harrison	Acq 100 yr - Buyout	\$9,337,350	\$13,770,448	1.47	24 out of 24
Pershing East	100% Roadway Conveyance + Lake A Storage + Floodproofing	\$3,642,240	\$5,361,997	1.47	32 out of 32
Pershing East	Roadway Conveyance + Lake A Storage	\$3,500,000	\$4,987,594	1.43	26 out of 32
Harrison	Conveyance + Cherry S + Cherry N of Forest Storage	\$13,541,500	\$18,359,146	1.36	43 out of 43
TCR	Roadway Conveyance	\$1,267,558	\$1,653,278	1.30	14 out of 14
Thomas	Acq 100 yr - Buyout	\$3,614,610	\$4,643,092	1.28	8 out of 8
Dorset	Rear Yard Storm Sewer + Buyout	\$438,200	\$555,018	1.27	5 out of 5
Williston	Structure Buyout + New Storage (Alt 3)	\$6,000,000	\$7,076,691	1.18	21 out of 36
Williston	Structure Buyout + New Storage + Lake A Storage (Alt 4)	\$7,000,000	\$7,894,565	1.13	33 out of 36
Jefferson	Storage	\$2,600,000	\$2,866,670	1.10	6 out of 6
Wakeman	Thomas + Wakeman (Required to Function)	\$4,690,852	\$4,983,241	1.06	18 out of 18
Briarcliffe	Box Culvert Conveyance	\$11,530,000	\$11,052,365	0.96	42 out of 42
Jefferson	Acq 100 yr - Buyout	\$2,996,610	\$2,866,670	0.96	6 out of 6

FLOOD PRONE AREA PROJECTS RANKED BY BCA

Area	Project	Cost	Benefits	BCA	Flooding Structures Eliminated - 100 yr
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Pershing West	Floodproofing	\$239,000	\$1,408,557	5.89	6 out of 6
TCR Local	Acq 100 yr - Buyout	\$3,176,520	\$17,386,958	5.47	12 out of 12
Jefferson	Floodproofing	\$546,000	\$2,866,670	5.25	6 out of 6
Harrison	Floodproofing	\$3,614,400	\$18,359,146	5.08	43 out of 43
Jefferson	Floodproofing + Storm Service	\$576,100	\$2,866,670	4.98	6 out of 6
Pershing East	Floodproofing	\$1,133,040	\$5,361,997	4.73	32 out of 32
Mayo	Floodproofing	\$346,000	\$1,567,320	4.53	11 out of 11
Williston	Floodproofing	\$1,800,000	\$7,948,373	4.42	36 out of 36
Glendale	Swale Conveyance	\$132,600	\$571,497	4.31	3 out of 3
Dorset	Floodproofing	\$140,000	\$555,018	3.96	5 out of 5
Dorset	Rear Yard Storm Sewer	\$56,456	\$221,473	3.92	4 out of 5
Briarcliffe	Floodproofing	\$2,940,000	\$11,052,365	3.76	42 out of 42
Glendale	Pipe Conveyance	\$170,600	\$571,497	3.35	3 out of 3
Erie	Floodproofing	\$652,000	\$1,969,071	3.02	13 out of 13
Mayo	Conveyance + Private Property Storage(Alt 3)	\$537,000	\$1,567,320	2.92	11 out of 11
Glendale	Floodproofing	\$210,000	\$571,497	2.72	3 out of 3
Harrison	Conveyance + Cherry N of Forest Storage	\$6,832,000	\$18,359,146	2.69	43 out of 43
TCR	Floodproofing	\$680,000	\$1,653,278	2.43	14 out of 14
Erie	West Conveyance + Storage (Alt 1)	\$588,600	\$1,387,717	2.36	2 out of 2
Erie	West Storage (alt 2)	\$704,200	\$1,387,717	1.97	2 out of 2
Thomas	Detention + Pipe + 100 Year Buy Out	\$2,455,758	\$4,643,092	1.89	8 out of 8
Harrison	Conveyance + Cherry S of Harrison Storage	\$10,632,500	\$18,359,146	1.73	43 out of 43
Dorset	Swales and Pipe Conveyance	\$330,900	\$555,018	1.68	5 out of 5
Dorset	Pipe Conveyance	\$374,400	\$555,018	1.48	5 out of 5
Harrison	Acq 100 yr - Buyout	\$9,337,350	\$13,770,448	1.47	24 out of 24
Pershing East	100% Roadway Conveyance + Lake A Storage + Floodproofing	\$3,642,240	\$5,361,997	1.47	32 out of 32
Pershing East	Roadway Conveyance + Lake A Storage	\$3,500,000	\$4,987,594	1.43	26 out of 32
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TCR	Roadway Conveyance	\$1,267,558	\$1,653,278	1.30	14 out of 14
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Williston	Structure Buyout + New Storage (Alt 3)	\$6,000,000	\$7,076,691	1.18	21 out of 36
Williston	Structure Buyout + New Storage + Lake A Storage (Alt 4)	\$7,000,000	\$7,894,565	1.13	33 out of 36
Jefferson	Storage	\$2,600,000	\$2,866,670	1.10	6 out of 6
Wakeman	Thomas + Wakeman (Required to Function)	\$4,690,852	\$4,983,241	1.06	18 out of 18
Briarcliffe	Box Culvert Conveyance	\$11,530,000	\$11,052,365	0.96	42 out of 42
Jefferson	Acq 100 yr - Buyout	\$2,996,610	\$2,866,670	0.96	6 out of 6

FLOOD PRONE AREA PROJECTS RANKED BY BCA

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Briarcliffe	Box Culvert Conveyance	\$11,530,000	\$11,052,365	0.96	42 out of 42
Jefferson	Acq 100 yr - Buyout	\$2,996,610	\$2,866,670	0.96	6 out of 6
Delles / Prairie Path Park	Park Storage	\$200,000	\$183,845	0.92	1 out of 6
Cherry	Acq 100 yr - Buyout	\$5,627,745	\$4,588,698	0.82	19 out of 19
Pershing East	100% Pipe Conveyance + Private Prop Storage + Floodproofing	\$6,781,300	\$5,361,997	0.79	32 out of 32
Williston	Structure Buyout + Conveyance+ Lake A Storage (Alt 5)	\$10,000,000	\$7,904,937	0.79	34 out of 36
Pershing West	Acq 100 yr - Buyout	\$1,811,820	\$1,408,557	0.78	6 out of 6
Briarcliffe	Acq 100 yr - Buyout	\$14,481,204	\$11,052,365	0.76	42 out of 42
Williston	Acq 100 yr - Buyout	\$10,529,379	\$7,948,373	0.75	36 out of 36
Pershing East	Pipe Conveyance + Private Prop Storage	\$6,734,100	\$4,524,382	0.67	27 out of 32
Erie	Central/East Conveyance + Storage + Floodproofing	\$1,308,900	\$794,782	0.61	11 out of 11
Pershing East	Acq 100 yr - Buyout	\$8,897,670	\$5,361,997	0.60	32 out of 32
Erie	Central/East Conveyance + Storage (Alt 1)	\$1,303,900	\$745,004	0.57	9 out of 9
Erie	Acq 100 yr - Buyout	\$3,562,275	\$1,969,071	0.55	13 out of 13
Delles / Prairie Path Park	Floodproofing	\$600,000	\$331,605	0.55	6 out of 6
Pershing West	100% Pipe Conveyance + Detention + Floodproofing	\$2,827,500	\$1,408,557	0.50	6 out of 6
Mayo	Private Property Storage (Alt 2)	\$3,176,800	\$1,567,320	0.49	11 out of 11
Mayo	Public Property Storage (Alt 4)	\$140,700	\$69,072	0.49	3 out of 11
Glendale	Acq 100 yr - Buyout	\$1,220,865	\$571,497	0.47	3 out of 3
Pershing East	100% Pipe Conveyance + Lake A Storage + Floodproofing	\$11,462,300	\$5,361,997	0.47	32 out of 32
Pershing East	Pipe Conveyance + Lake A Storage	\$11,437,260	\$4,937,501	0.43	30 out of 32
Wakeman	Floodproofing	\$820,000	\$340,149	0.41	10 out of 10
Mayo	Acq 100 yr - Buyout	\$3,802,095	\$1,567,320	0.41	11 out of 11
Pershing West	Pipe Conveyance + Detention	\$2,827,500	\$1,078,365	0.38	5 out of 6
Erie	Central/East Storage + Floodproofing	\$2,441,300	\$794,782	0.33	11 out of 11
Erie	Central/East Storage (Alt 2)	\$2,436,300	\$745,004	0.31	9 out of 9
TCR	Acq 100 yr - Buyout	\$5,774,730	\$1,653,278	0.29	14 out of 14
Dorset	Acq 100 yr - Buyout	\$2,167,305	\$555,018	0.26	5 out of 5
Delles / Prairie Path Park	Delles Storage	\$953,550	\$192,667	0.20	5 out of 6
Wakeman	Pipe + 100 Year Buy Out	\$2,235,094	\$396,002	0.18	10 out of 10
Delles / Prairie Path Park	Acq 100 yr - Buyout	\$2,384,640	\$331,605	0.14	6 out of 6
Williston	Conveyance + Lake A Storage (Alt 2)	\$4,300,000	\$588,001	0.14	15 out of 36
Wakeman	Acq 100 yr - Buyout	\$3,625,890	\$340,149	0.09	10 out of 10
	Total Acquisition	\$83,010,708	\$76,015,096		
	Total Floodproofing	\$14,300,440			
	Total Cheapest Capitol	\$41,591,700			
	Recommended blend	\$13,397,054			

FLOOD PRONE AREA PROJECTS RANKED BY BCA

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Cherry	Acq 100 yr - Buyout	\$5,627,745	\$4,588,698	0.82	19 out of 19
Pershing East	100% Pipe Conveyance + Private Prop Storage + Floodproofing	\$6,781,300	\$5,361,997	0.79	32 out of 32
Williston	Structure Buyout + Conveyance+ Lake A Storage (Alt 5)	\$10,000,000	\$7,904,937	0.79	34 out of 36
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Pershing West	Pipe Conveyance + Detention	\$2,827,500	\$1,078,365	0.38	5 out of 6
Erie	Central/East Storage + Floodproofing	\$2,441,300	\$794,782	0.33	11 out of 11
Erie	Central/East Storage (Alt 2)	\$2,436,300	\$745,004	0.31	9 out of 9
TCR	Acq 100 yr - Buyout	\$5,774,730	\$1,653,278	0.29	14 out of 14
Dorset	Acq 100 yr - Buyout	\$2,167,305	\$555,018	0.26	5 out of 5
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Delles / Prairie Path Park	Acq 100 yr - Buyout	\$2,384,640	\$331,605	0.14	6 out of 6
Williston	Conveyance + Lake A Storage (Alt 2)	\$4,300,000	\$588,001	0.14	15 out of 36
Wakeman	Acq 100 yr - Buyout	\$3,625,890	\$340,149	0.09	10 out of 10
	Total Acquisition	\$83,010,708	\$76,015,096		
	Total Floodproofing	\$14,300,440			
	Total Cheapest Capitol	\$41,591,700			
	Recommended blend	\$13,397,054			

WHAT PROJECTS ARE SPECIFICALLY POSSIBLE? / WHAT IS IN THE STUDIES?

2020 Confirmed Results

Confirmed **Overland** Flooding

Flood Prone

246

Buyouts	Floodproofing	Capital Improvement Project
Buy and Demolish Structure	Elevate Structure or Raise Low Entry Point (LEP) -Raise Window Wells -Eliminate Doors	Large Pipes, Detention, Street Reconstruction, Etc.
Removes Flood Damages Removes Tax Base Maintenance Cost Forever Expensive	Removes Flood Damages Keeps Tax Base No Maintenance Less Expensive	Removes Flood Damages Keeps Tax Base Maintenance Cost Forever Expensive

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ADDITIONAL OVERRIDING ABSOLUTE CONSIDERATION – THIS IS NOT YOUR LAND

ALMOST ALL FLOOD PROTECTION PROJECTS OCCUR ON **PRIVATE PROPERTY** AND AS SUCH CANNOT OCCUR WITHOUT PUBLIC SUPPORT AND CONSENT!

ONLY TWO PROJECTS THAT ARE LOCATED ENTIRELY IN THE PUBLIC RIGHT OF WAY!
(AND THAT INCLUDES ALL FLOOD PRONE, FLOODPLAIN, AND SITE SPECIFIC AREAS!)

WHAT PROJECTS ARE SPECIFICALLY POSSIBLE? / WHAT IS IN THE STUDIES?

2020 Confirmed Results

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Flood Prone

Buyouts

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AND SITE SPECIFIC AREAS!)

FLOOD PRONE AREA PROJECTS RANKED BY BCA					Flooding Structures Eliminated - 100 yr
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Jefferson	Floodproofing	\$546,000	\$2,866,670	5.25	6 out of 6
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Dorset	Rear Yard Storm Sewer	\$56,456	\$221,473	3.92	4 out of 5
Briarcliffe	Floodproofing	\$2,940,000	\$11,052,365	3.76	42 out of 42
Glendale	Pipe Conveyance	\$170,600	\$571,497	3.35	3 out of 3
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Mayo	Conveyance + Private Property Storage(Alt 3)	\$537,000	\$1,567,320	2.92	11 out of 11
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Dorset	Pipe Conveyance	\$374,400	\$555,018	1.48	5 out of 5
Harrison	Acq 100 yr - Buyout	\$9,337,350	\$13,770,448	1.47	24 out of 24
Pershing East	100% Roadway Conveyance + Lake A Storage + Floodproofing	\$3,642,240	\$5,361,997	1.47	32 out of 32
Pershing East	Roadway Conveyance + Lake A Storage	\$3,500,000	\$4,987,594	1.43	26 out of 32
Harrison	Conveyance + Cherry S + Cherry N of Forest Storage	\$13,541,500	\$18,359,146	1.36	43 out of 43
TCR	Roadway Conveyance	\$1,267,558	\$1,653,278	1.30	14 out of 14
Thomas	Acq 100 yr - Buyout	\$3,614,610	\$4,643,092	1.28	8 out of 8
Dorset	Rear Yard Storm Sewer + Buyout	\$438,200	\$555,018	1.27	5 out of 5
Williston	Structure Buyout + New Storage (Alt 3)	\$6,000,000	\$7,076,691	1.18	21 out of 36
Williston	Structure Buyout + New Storage + Lake A Storage (Alt 4)	\$7,000,000	\$7,894,565	1.13	33 out of 36
Jefferson	Storage	\$2,600,000	\$2,866,670	1.10	6 out of 6
Wakeman	Thomas + Wakeman (Required to Function)	\$4,690,852	\$4,983,241	1.06	18 out of 18
Briarcliffe	Box Culvert Conveyance	\$11,530,000	\$11,052,365	0.96	42 out of 42
Jefferson	Acq 100 yr - Buyout	\$2,996,610	\$2,866,670	0.96	6 out of 6

FLOOD PRONE AREA PROJECTS RANKED BY BCA

Area	Project	Cost	Benefits	BCA	Flooding Structures Eliminated - 100 yr
TCR Local	Sideyard Swales - Floodproofing	\$50,000	\$17,386,958	347.74	12 out of 12
Jefferson	Floodproofing + Storm Service	\$576,100	\$2,866,670	4.98	6 out of 6
Glendale	Swale Conveyance	\$132,600	\$571,497	4.31	3 out of 3
Dorset	Rear Yard Storm Sewer	\$56,456	\$221,473	3.92	4 out of 5
Glendale	Pipe Conveyance	\$170,600	\$571,497	3.35	3 out of 3
Mayo	Conveyance + Private Property Storage(Alt 3)	\$537,000	\$1,567,320	2.92	11 out of 11
Harrison	Conveyance + Cherry N of Forest Storage	\$6,832,000	\$18,359,146	2.69	43 out of 43
Erie	West Conveyance + Storage (Alt 1)	\$588,600	\$1,387,717	2.36	2 out of 2
Erie	West Storage (alt 2)	\$704,200	\$1,387,717	1.97	2 out of 2
Thomas	Detention + Pipe + 100 Year Buy Out	\$2,455,758	\$4,643,092	1.89	8 out of 8
Harrison	Conveyance + Cherry S of Harrison Storage	\$10,632,500	\$18,359,146	1.73	43 out of 43
Dorset	Swales and Pipe Conveyance	\$330,900	\$555,018	1.68	5 out of 5
Dorset	Pipe Conveyance	\$374,400	\$555,018	1.48	5 out of 5
Pershing East	100% Roadway Conveyance + Lake A Storage + Floodproofing	\$3,642,240	\$5,361,997	1.47	32 out of 32
Pershing East	Roadway Conveyance + Lake A Storage	\$3,500,000	\$4,987,594	1.43	26 out of 32
Harrison	Conveyance + Cherry S + Cherry N of Forest Storage	\$13,541,500	\$18,359,146	1.36	43 out of 43
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Jefferson	Storage	\$2,600,000	\$2,866,670	1.10	6 out of 6
Wakeman	Thomas + Wakeman (Required to Function)	\$4,690,852	\$4,983,241	1.06	18 out of 18

TCR Local	Acq 100 yr - Buyout	\$3,176,520	\$17,386,958	5.47	12 out of 12
Harrison	Acq 100 yr - Buyout	\$9,337,350	\$13,770,448	1.47	24 out of 24
Thomas	Acq 100 yr - Buyout	\$3,614,610	\$4,643,092	1.28	8 out of 8

Thomas	Floodproofing	\$620,000	\$4,643,092	7.49	8 out of 8
Pershing West	Floodproofing	\$239,000	\$1,408,557	5.89	6 out of 6
Jefferson	Floodproofing	\$546,000	\$2,866,670	5.25	6 out of 6
Harrison	Floodproofing	\$3,614,400	\$18,359,146	5.08	43 out of 43
Pershing East	Floodproofing	\$1,133,040	\$5,361,997	4.73	32 out of 32
Mayo	Floodproofing	\$346,000	\$1,567,320	4.53	11 out of 11
Williston	Floodproofing	\$1,800,000	\$7,948,373	4.42	36 out of 36
Dorset	Floodproofing	\$140,000	\$555,018	3.96	5 out of 5
Briarcliffe	Floodproofing	\$2,940,000	\$11,052,365	3.76	42 out of 42
Erie	Floodproofing	\$652,000	\$1,969,071	3.02	13 out of 13
Glendale	Floodproofing	\$210,000	\$571,497	2.72	3 out of 3
TCR	Floodproofing	\$680,000	\$1,653,278	2.43	14 out of 14

- No Floodproofing for Cherry as it is a part of the Harrison calculations
- No Floodproofing for Madison and Dorset at Ridge Park as there are no 100 year damages
- Floodproofing at Delles/Prairie Path Park and Wakeman had a BCA of less than 1

FLOOD PRONE AREA PROJECTS RANKED BY BCA

Area	Project	Cost	Benefits	BCA	Flooding Structures Eliminated - 100 yr
TCR Local	Sideyard Swales - Floodproofing	\$50,000	\$17,386,958	347.74	12 out of 12
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Briarcliffe	Floodproofing	\$2,940,000	\$11,052,365	3.76	42 out of 42
Erie	Floodproofing	\$652,000	\$1,969,071	3.02	13 out of 13
Glendale	Floodproofing	\$210,000	\$571,497	2.72	3 out of 3
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- No Floodproofing for Cherry as it is a part of the Harrison calculations
- No Floodproofing for Madison and Dorset at Ridge Park as there are no 100 year damages
- Floodproofing at Delles/Prairie Path Park and Wakeman had a BCA of less than 1

WHAT PROJECTS ARE SPECIFICALLY POSSIBLE? / WHAT IS IN THE STUDIES?

2020 Confirmed Results

Confirmed **Overland** Flooding

Flood Prone

246

Buyouts	Floodproofing	Capital Improvement Project
Buy and Demolish Structure	Elevate Structure or Raise Low Entry Point (LEP) -Raise Window Wells -Eliminate Doors	Large Pipes, Detention, Street Reconstruction, Etc.
Removes Flood Damages Removes Tax Base Maintenance Cost Forever Expensive	Removes Flood Damages Keeps Tax Base No Maintenance Less Expensive	Removes Flood Damages Keeps Tax Base Maintenance Cost Forever Expensive

ADDITIONAL OVERRIDING ABSOLUTE CONSIDERATION – THIS IS NOT YOUR LAND

ALMOST ALL FLOOD PROTECTION PROJECTS OCCUR ON PRIVATE PROPERTY AND AS SUCH CANNOT OCCUR WITHOUT PUBLIC SUPPORT AND CONSENT!

ONLY TWO PROJECTS THAT ARE LOCATED ENTIRELY IN THE PUBLIC RIGHT OF WAY!
(AND THAT INCLUDES ALL FLOOD PRONE, FLOODPLAIN, AND SITE SPECIFIC AREAS!)

WHAT PROJECTS ARE SPECIFICALLY POSSIBLE? / WHAT IS IN THE STUDIES?

2020 Confirmed Results

Confirmed **Overland** Flooding

Flood Prone

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Buyouts	Floodproofing	Capital Improvement Project
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Removes Flood Damages Removes Tax Base Maintenance Cost Forever Expensive	Removes Flood Damages Keeps Tax Base No Maintenance Less Expensive	Removes Flood Damages Keeps Tax Base Maintenance Cost Forever Expensive

GENERAL RESULTS FOR FLOOD PRONE AREAS WHEN LOOKING AT THE BCA DATA

Buyouts	Floodproofing	Capital Improvement Project
NOT OUR BEST TOOL - Only Viable in 3 Areas and all 3 have more beneficial projects	RANKS VERY HIGH IN BCA - Applicable to Individual Locations and Highly Adaptive - Viable in 14 Areas - Designed for Current Code	MID RANGE IN BCA - Specific Projects, Rigid - Viable in 12 Areas - Some Not Palatable to Public - Designed for Specific Storm

WHAT PROJECTS ARE SPECIFICALLY POSSIBLE? / WHAT IS IN THE STUDIES?

2020 Confirmed Results

Confirmed **Overland** Flooding

Flood Prone

246

Buyouts	Floodproofing	Capital Improvement Project
Buy and Demolish Structure	Elevate Structure or Raise Low Entry Point (LEP) -Raise Window Wells -Eliminate Doors	Large Pipes, Detention, Street Reconstruction, Etc.
Removes Flood Damages Removes Tax Base Maintenance Cost Forever Expensive	Removes Flood Damages Keeps Tax Base No Maintenance Less Expensive	Removes Flood Damages Keeps Tax Base Maintenance Cost Forever Expensive

GENERAL RESULTS FOR FLOOD PRONE AREAS WHEN LOOKING AT THE BCA DATA

Buyouts	Floodproofing	Capital Improvement Project
NOT OUR BEST TOOL - Only Viable in 3 Areas and all 3 have more beneficial projects	RANKS VERY HIGH IN BCA - Applicable to Individual Locations and Highly Adaptive - Viable in 15 Areas - Designed for Current Code	MID RANGE IN BCA - Specific Projects, Rigid - Viable in 12 Areas - Some Not Palatable to Public - Designed for Specific Storm
\$83,010,708	\$15,560,440	\$41,591,700

USING MIX OF BEST BCA PROJECT (ASSUMING BCA OVER ONE), TOTAL COST = \$13,017,054

WHAT PROJECTS ARE POSSIBLE?

2020 Confirmed Results

Confirmed **Overland** Flooding

Site Specific Flooding

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WHAT PROJECTS ARE POSSIBLE?

2020 Confirmed Results

Confirmed **Overland** Flooding

Site Specific Flooding

145



1) PROJECTS TO DECREASE OVERLAND FLOODING

Buyouts	Floodproofing	Capital Improvement Project
Buy and Demolish Structure	Elevate Structure or Raise Low Entry Point (LEP) -Raise Window Wells -Eliminate Doors	Large Pipes, Detention, Street Reconstruction, Etc.

WHAT PROJECTS ARE POSSIBLE?

2020 Confirmed Results

Confirmed **Overland** Flooding

Site Specific Flooding

145



1) PROJECTS TO DECREASE OVERLAND FLOODING

Buyouts	Floodproofing	Capital Improvement Project
Buy and Demolish Structure	Elevate Structure or Raise Low Entry Point (LEP) -Raise Window Wells -Eliminate Doors	Large Scale Street Reconstruction, etc.



WHAT PROJECTS ARE POSSIBLE?

2020 Confirmed Results

Confirmed **Overland** Flooding

Site Specific Flooding

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1) PROJECTS TO DECREASE OVERLAND FLOODING

Buyouts	Floodproofing	Small Scale Regrading Project
Buy and Demolish Structure	Elevate Structure or Raise Low Entry Point (LEP) -Raise Window Wells -Eliminate Doors	Regrade single private lot so water flows past the home instead of into it.

WHAT PROJECTS ARE POSSIBLE?

2020 Confirmed Results

Confirmed **Overland** Flooding

Site Specific Flooding

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1) PROJECTS TO DECREASE OVERLAND FLOODING

	Floodproofing	Small Scale Regrading Project
Buy and Elevate Fish Structure	Elevate Structure or Raise Low Entry Point (LEP) -Raise Window Wells -Eliminate Doors	Regrade single private lot so water flows past the home instead of into it.

WHAT PROJECTS ARE POSSIBLE?

2020 Confirmed Results

Confirmed **Overland** Flooding

Site Specific Flooding

145



1) PROJECTS TO DECREASE OVERLAND FLOODING

Floodproofing	Small Scale Regrading Project
Raise Low Entry Point (LEP) -Raise Window Wells -Eliminate Doors	Regrade single private lot so water flows past the home instead of into it.

WHAT PROJECTS ARE POSSIBLE?

2020 Confirmed Results

Confirmed **Overland** Flooding

Site Specific Flooding

145



1) PROJECTS TO DECREASE OVERLAND FLOODING

Floodproofing	Small Scale Regrading Project
Raise Low Entry Point (LEP) -Raise Window Wells -Eliminate Doors	Regrade single private lot so water flows past the home instead of into it.

2) METRIC TO FAIRLY AND EQUITABLY WEIGH PROJECTS (Damages)



WHAT PROJECTS ARE POSSIBLE?

2020 Confirmed Results

Confirmed **Overland** Flooding

Site Specific Flooding

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1) PROJECTS TO DECREASE OVERLAND FLOODING

Floodproofing	Small Scale Regrading Project
Raise Low Entry Point (LEP) -Raise Window Wells -Eliminate Doors	Regrade single private lot so water flows past the home instead of into it.

2) METRIC TO FAIRLY AND EQUITABLY WEIGH PROJECTS (Damage^{cost})



**NOT COMPLETED
(AND NOT WORTH THE MONEY)**

BUT....

FLOOD PRONE AREA PROJECTS RANKED BY BCA

Area	Project	Cost	Benefits	BCA	Flooding Structures Eliminated - 100 yr
TCR Local	Sideyard Swales	\$50,000	\$18,108,914	262.18	12
Dorset	Rear Yard Storm Sewer	\$56,456	\$563,862	362.18	4
Glendale	Swale Conveyance	\$132,600	\$591,523	4.46	3
Mayo	Conveyance + Private Property Storage(Alt 3)	\$537,000	\$2,170,228	4.04	12
Glendale	Pipe Conveyance	\$170,600	\$591,523	3.47	3
Harrison	Conveyance + Cherry N of Forest Storage	\$6,832,000	\$19,151,038	2.80	43
Dorset	Swales and Pipe Conveyance	\$330,900	\$897,407	2.71	5
Dorset	Pipe Conveyance	\$374,400	\$897,407	2.40	5
Erie	West Conveyance + Storage (Alt 1)	\$588,600	\$1,387,717	2.36	2
Dorset	Rear Yard Storm Sewer + Buyout	\$438,200	\$897,407	2.05	5
Erie	West Storage (alt 2)	\$704,200	\$1,387,717	1.97	2
Thomas	Detention + Pipe + 100 Year Buy Out	\$2,455,758	\$4,643,092	1.89	8
Harrison	Conveyance + Cherry S of Harrison Storage	\$10,632,500	\$19,151,038	1.80	43
Pershing East	100% Roadway Conveyance + Lake A Storage + Floodproofing	\$3,642,240	\$5,903,166	1.62	32
Pershing East	Roadway Conveyance + Lake A Storage	\$3,500,000	\$5,528,763	1.58	26
TCR	Roadway Conveyance	\$1,267,558	\$1,906,808	1.50	14
Harrison	Conveyance + Cherry S + Cherry N of Forest Storage	\$13,541,500	\$19,151,038	1.41	43
Williston	Structure Buyout + New Storage (Alt 3)	\$6,000,000	\$7,076,691	1.18	21
Williston	Structure Buyout + New Storage + Lake A Storage (Alt 4)	\$7,000,000	\$7,894,565	1.13	33
Jefferson	Storage	\$2,600,000	\$2,872,531	1.10	6
Wakeman	Thomas + Wakeman (Required to Function)	\$4,690,852	\$5,039,094	1.07	18

TCR Local	Acq 100 yr	\$3,176,520	\$17,386,958	5.47	12
Harrison	Acq 100 yr	\$9,337,350	\$13,770,448	1.47	24
Thomas	Acq 100 yr	\$3,614,610	\$4,643,092	1.28	8

Thomas	Floodproofing	\$620,000	\$4,643,092	7.49	8
Pershing West	Floodproofing	\$239,000	\$1,408,557	5.89	6
Harrison	Floodproofing	\$3,614,400	\$18,359,146	5.08	43
Mayo	Floodproofing	\$346,000	\$1,737,992	5.02	12
Pershing East	Floodproofing	\$1,133,040	\$5,390,042	4.76	32
Jefferson	Floodproofing	\$646,000	\$2,866,670	4.44	6
Williston	Floodproofing	\$1,800,000	\$7,948,373	4.42	36
Jefferson	Floodproofing + Storm Service	\$676,100	\$2,866,670	4.24	6
Briarcliffe	Floodproofing	\$2,940,000	\$11,052,365	3.76	45
Erie	Floodproofing	\$652,000	\$1,969,071	3.02	13

- No Floodproofing for Glendale, Dorset at Dorset Park as cost exceeds project costs
- No Floodproofing for Madison and Dorset at Ridge Park as there are no 100 year damages
- Floodproofing at Delles/Prairie Path Park and Wakeman had a BCA of less than 1

WHAT PROJECTS ARE POSSIBLE?

2020 Confirmed Results

Confirmed **Overland** Flooding

Site Specific Flooding

145



1) PROJECTS TO DECREASE OVERLAND FLOODING

Floodproofing	Small Scale Regrading Project
Raise Low Entry Point (LEP) -Raise Window Wells -Eliminate Doors	Regrade single private lot so water flows past the home instead of into it.

2) COST OF PROJECTS

Floodproofing	Small Scale Regrading Project
\$1,450,000	\$725,000

GENERAL RESULTS FOR SITE SPECIFIC AREAS

Floodproofing	Small Scale Regrading Project
- Less Expensive - Would be very HIGH BCA	- Even Less Expensive - BCA would be EVEN HIGHER

IN CONCLUSION

2020 Confirmed Results	Floodplain	Flood Prone	Site Specific Flooding
Confirmed Overland Flooding	69	246	145

GENERAL RESULTS FOR FLOODPLAIN AREAS

Buyouts	Floodproofing
<p>LIKELY NOT OUR BEST TOOL</p> <ul style="list-style-type: none"> - More Expensive - Program Available via DuPage County 	<p>WOULD HAVE BETTER BCA</p> <ul style="list-style-type: none"> - Less Expensive

GENERAL RESULTS FOR FLOOD PRONE AREAS WHEN LOOKING AT THE BCA DATA

Buyouts	Floodproofing	Capital Improvement Project
<p>NOT OUR BEST TOOL</p> <ul style="list-style-type: none"> - Only Viable in 3 Areas and all 3 have more beneficial projects 	<p>RANKS VERY HIGH IN BCA</p> <ul style="list-style-type: none"> - Applicable to Individual Locations and Highly Adaptive - Viable in 15 Areas - Designed for Current Code 	<p>MID RANGE IN BCA</p> <ul style="list-style-type: none"> - Specific Projects, Rigid - Viable in 12 Areas - Some Not Palatable to Public - Designed for Specific Storm

GENERAL RESULTS FOR SITE SPECIFIC AREAS

Floodproofing	Small Scale Regrading Project
<ul style="list-style-type: none"> - Less Expensive - Would be very HIGH BCA 	<ul style="list-style-type: none"> - Even Less Expensive - BCA would be EVEN HIGHER

IN CONCLUSION

2020 Confirmed Results	Floodplain	Flood Prone	Site Specific Flooding
Confirmed Overland Flooding	69	246	145

GENERAL RESULTS FOR FLOODPLAIN AREAS

Buyouts	Floodproofing
\$24,500,000	\$4,500,000

GENERAL RESULTS FOR FLOOD PRONE AREAS WHEN LOOKING AT THE BCA DATA

Buyouts	Floodproofing	Capital Improvement Project
\$83,010,708	\$15,560,440	\$41,591,700

USING MIX OF BEST BCA PROJECT (ASSUMING BCA OVER ONE), TOTAL COST = \$13,017,054

GENERAL RESULTS FOR SITE SPECIFIC AREAS

Floodproofing	Small Scale Regrading Project
\$1,450,000	\$725,000

IN CONCLUSION

2020 Confirmed Results	Floodplain	Flood Prone	Site Specific Flooding
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GENERAL RESULTS FOR FLOODPLAIN AREAS

Buyouts	Floodproofing
\$24,500,000	\$4,500,000

GENERAL RESULTS FOR FLOOD PRONE AREAS WHEN LOOKING AT THE BCA DATA

Buyouts	Floodproofing	Capital Improvement Project
\$83,010,708	\$15,560,440	\$41,591,700

GENERAL RESULTS FOR SITE SPECIFIC AREAS

Floodproofing	Small Scale Regrading Project
\$1,450,000	\$725,000

Total	Total	Total
\$107,510,708	\$21,510,440	\$42,316,700

TOTAL MINIMUM PRELIMINARY EXPOSURE USING BEST BCA PROJECTS = \$18,500,000.00
 TO MITIGATE OVER \$76,000,000.00 OF DAMAGES IN FLOODPRONE AREAS AS WELL AS
 ADDITIONAL DAMAGES IN FLOODPLAIN AND SITE SPECIFIC DAMAGES NOT YET CALCULATED

IN CONCLUSION

2020 Confirmed Results	Floodplain	Flood Prone	Site Specific Flooding
Confirmed Overland Flooding	69	246	145

GENERAL RESULTS FOR **OVERLAND FLOODING**

Buyouts	Floodproofing	Capital Improvement Project
\$107,510,708	\$21,510,440	\$42,316,700
Removes Flood Damages Removes Tax Base Maintenance Cost Forever Expensive Protection Cannot be exceeded Poor BCA	Removes Flood Damages Keeps Tax Base No Maintenance Less Expensive Protection is way above 100yr Good BCA	Removes Flood Damages Keeps Tax Base Maintenance Cost Forever Expensive Protection is to 100 yr Mid Range BCA

ADDITIONAL CONSIDERATIONS BESIDES **OVERLAND FLOODING**

No Seepage Flooding No Sanitary Backups No Sump Pump Failure /Power Outage Problem	Seepage Flooding Risk Remains Sanitary Backup Risk Remains Sump Pump Failure / Power Outage Risk Remains	Seepage Flooding Risk Remains Sanitary Backup Risk Remains Sump Pump Failure / Power Outage Risk Remains
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IN CONCLUSION

2020 Confirmed Results	Floodplain	Flood Prone	Site Specific Flooding
Confirmed Overland Flooding	69	246	145

TAKEAWAYS

- FLOODING IS A DIFFICULT, COMPLEX PROBLEM. FOR WHEATON IT IS ONE THAT MUST COMPENSATE FOR DEVELOPMENT THAT OCCURRED BEFORE STORMWATER REGULATIONS.
- THERE IS A DIRECT CORRELATION BETWEEN THE NUMBER OF STRUCTURES THAT EXPERIENCE DAMAGE AS A RESULT OF OVERLAND FLOODING AND THE FREQUENCY OF RAIN EVENT.
- TO ADDRESS OVERLAND FLOODING, THREE SPECIFIC OPTIONS HAVE BEEN PRESENTED: BUYOUTS, FLOODPROOFING, AND CAPITAL IMPROVEMENT PROJECTS.
- ADDRESSING OVERLAND FLOODING REQUIRES A PARTNERSHIP BETWEEN THE CITY AND THE PRIVATE PROPERTY OWNERS.

CITY OF WHEATON

FLOOD RESILIENCY INVESTIGATION

Recommendation

- 1) Since Floodproofing is a viable and cost-effective solution, yet one that requires significant private property owner buy in, it would be beneficial to develop further information and specific detail on what flood proofing looks like. To that end, staff proposes developing and presenting what Floodproofing would look like for a few structures in one or two of our Floodprone Areas.
- 2) Return to Council with the Floodproofing information package, an outside grant funding discussion, and response to specific Council questions and/or need for additional information in what would be Flood Protection Program Discussion PART 3.



CITY OF WHEATON FLOOD RESILIENCY INVESTIGATION

Flood Protection Program Discussion Part 2

Joseph Tebrugge – Director of Engineering

Kris Dunn – Project Engineer Stormwater

Department of Engineering

August 31st, 2020

THANK YOU
ANY QUESTIONS?

