



Flood Mitigation CIP Program Performance

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What is a Goal Driven CIP?

- ◁ A decision structure that is used to guide the selection and implementation of capital projects, provide performance feedback and communicate with citizens, leadership and elected officials
- ◁ Charlotte-Mecklenburg has two general categories of capital projects:
 - Flood Mitigation Projects: Acquisition/demolition and in-place techniques
 - Water Quality: Stream Restoration

Making sense of goals ...Strategic Business Plan

- ◁ **Why Statement - *We are passionate about making our environment safe and healthy by reducing flood losses and improving water quality for all.***
- ◁ **County Strategic Business Plan - Goal 3: Enhance Quality of Life Through Environmental Stewardship**
 - **Objective 2: Reduce flood losses making our environment safe and healthy**
 - **Strategy A:** Drive the STW CIP investments towards driving down flood risk toward residual for the major system.
 - **Objective 3: Improve water quality making our environment safe and healthy (a variation to Storm Water's WHY statement)**
 - **Strategy A:** Drive the STW CIP to achieve the Stream Restoration Ranking System (SRRS) Goal for the major system.

A few definitions

◁ Flood Risk Score

- Numeric score assigned to all flood prone buildings in Mecklenburg County
- Ranges from <10 (lowest risk) to >5000 (highest risk)

◁ Residual Flood Risk – aka the stopping point...

- We will not eliminate flood risk in our community
- We allow new development in the floodplain

◁ retroFIT – local program that provides funding for in-place flood mitigation

Current RARR Methodology



Assess Risk

◁ Assess risk based on 17 total risk criteria

- **13 “impact” criteria** – evaluate and assign storm frequency-weighted scores for variety of flood impacts
- **4 “location” criteria** – evaluate additional location-based risk factors and adjust base score

➔ Calculate risk scores



Evaluate Mitigation

- Evaluate 19 risk reduction techniques
 - **Technique “Effectiveness”** – logic tests used to rank each technique as “Not Recommended”, “Further Evaluation Needed”, “Effective”, or “Highly Effective”
 - **“Effectiveness” Criteria** – Yes/No questions used to promote techniques through rankings

➔ Determine “Effectiveness”



Prioritize Mitigation Actions

➔ Calculate Priority scores

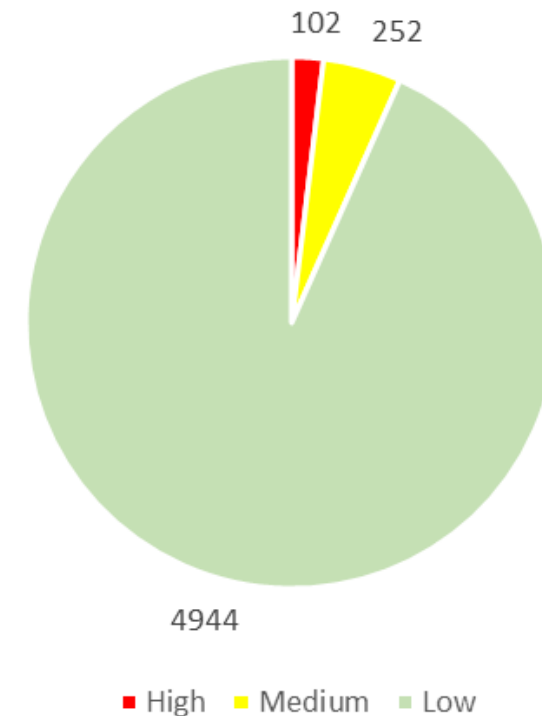
RARR Dataset

◁ Calculated Flood Risk Scores for >5000 structures

- Scores Range from >1000 to <10
- >1000 – High Risk
- 400 – 1000 – Moderate Risk
- <400 – Lower Risk

◁ Together, these scores represent the Flood Risk “Pool”

◁ Currently at 565,000 points



What to do about it...

- ◁ Now we know the scores and what techniques could work...
- ◁ A technique can be effective but is it really the best solution?
 - Acquisition/Demolition works everywhere...
- ◁ **Developed ‘Viability Index’**
 - Practical evaluation taking cost, points and compliance into consideration

What to do about it...

← *Lowest Viability* VIABILITY INDEX *Highest Viability* →

Mitigation Technique Category	RARR Techniques	VIABILITY INDEX									
		10	9	8	7	6	5	4	3	2	1
Removal (Acquisition)	1 - Acquisition / Demolition 3 - Acquisition / Relocation 4 - Acquisition / Removal / Re-Sale	<i>Default</i>	CF AND Cost < \$2M	CF OR Cost < \$1.5M	CF OR Cost < \$1.2M	CF AND Cost < \$1.2K	CF OR Cost < \$800K	CF OR Cost < \$500K	CF OR (Cost < \$250K and BCR >= 0.5)	CF OR (Cost < \$200K and BCR >= 0.8)	CF OR (Cost < \$100K and BCR >= 0.8)
In-Place Mitigation	2 - Demolition / Rebuild 5 - Structure Elevation 6 - Abandon Basement and Fill 7 - Dry Floodproofing 8 - Wet Floodproofing	<i>Default</i>	CF AND Cost < \$300K	CF OR Cost < \$200K	CF OR Cost < \$150K	CF AND Cost < \$150K	CF OR Cost < \$125K	CF OR Cost < \$100K	CF OR Cost < \$75K	CF OR (Cost < \$60K and BCR > 0.8)	CF OR (Cost < \$50K and BCR > 0.8)
Common Factors (CF) Updated	Techniques 1 - 8	<i>Default</i>	((Risk Score > 30 AND Compliant <= 1) OR (Compliant = 1 AND completely surrounded by FEMA floodplain)) AND BCR >= 0.3 OR Mitigation Score > 200 OR \$/Pnt Reduced < 2500	BCR > 0.5 OR Mitigation Score > 250 OR \$/Pnt Reduced < 2000	BCR > 0.8 OR Mitigation Score > 300 OR \$/Pnt Reduced < 1500	BCR > 0.8 OR Mitigation Score > 200 OR \$/Pnt Reduced < 1500	BCR > 1.0 OR Mitigation Score > 400 OR \$/Pnt Reduced < 1200	BCR > 1.3 OR \$/Pnt Reduced < 800	BCR > 1.5 OR \$/Pnt Reduced < 600	BCR > 2.0 OR (\$/Pnt Reduced < 300 and BCR > 0.8)	BCR > 2.5 OR (\$/Pnt Reduced < 150 and BCR > 0.8)

Define Endpoint/Residual Risk

◁ We selected Viability Index value of 5

- Acquisitions costing <\$800K
- In place mitigation <\$125K
- Highly cost effective (will spend more to reduce greater risk)

◁ Technique with highest viability was selected

- Acquisition over-ride...

◁ Once we selected viability index score, we were able determine the total number of projects and total cost to reach the endpoint (residual risk)

5

CF OR Cost < \$800K

CF OR Cost < \$125K

BCR > 1.0

OR

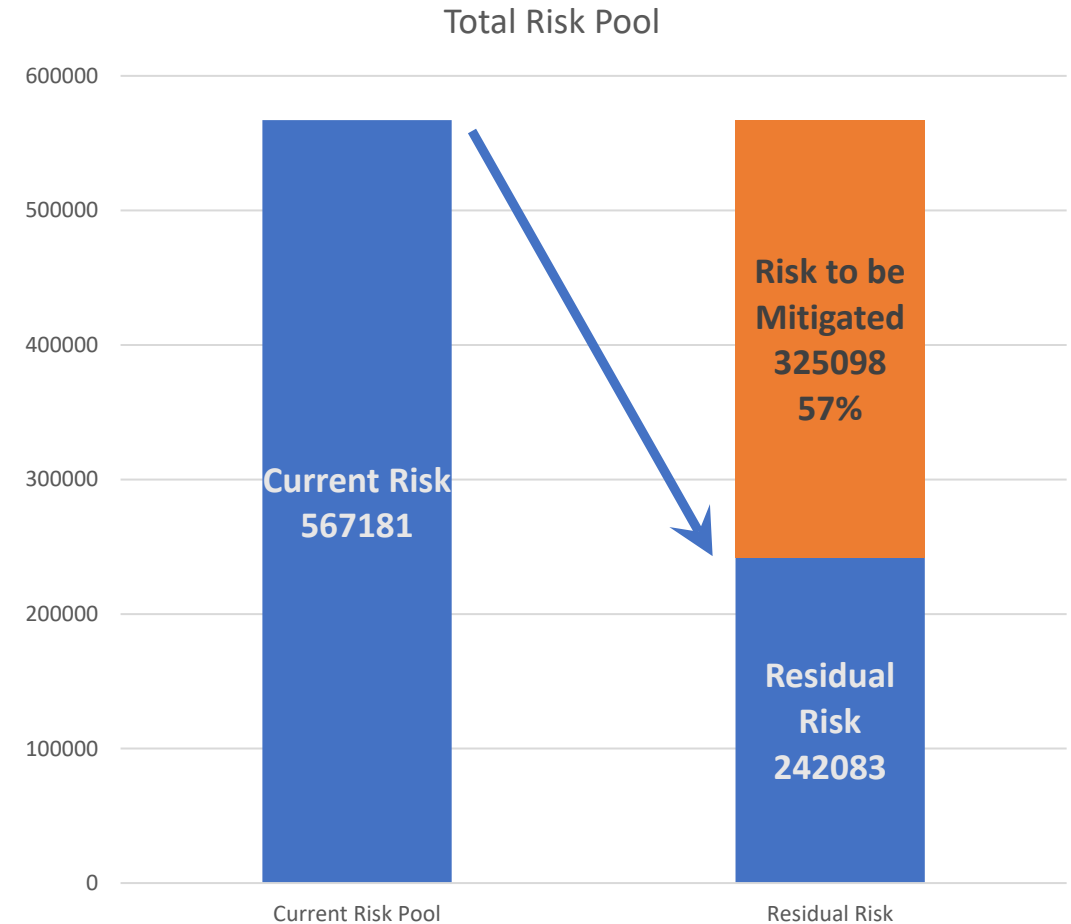
Mitigation Score > 400

OR

\$/Pnt Reduced < 1200

What does the endpoint look like?

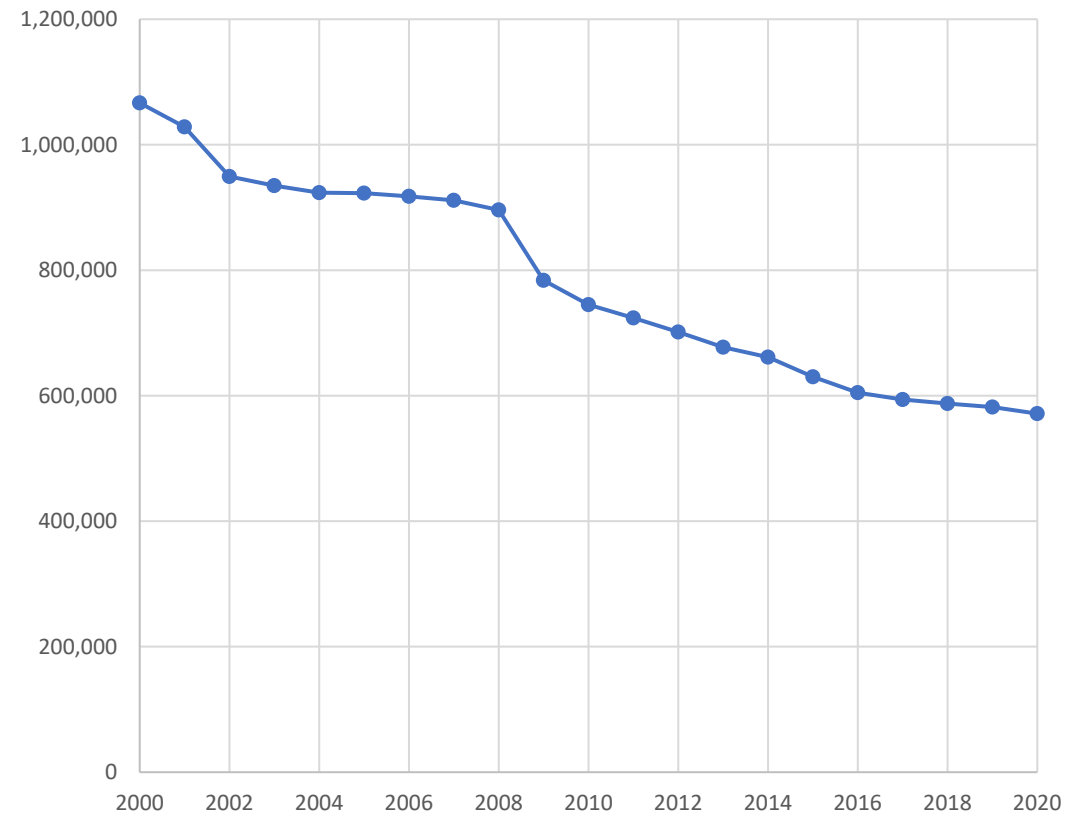
- ◁ **1,064 Projects at a cost of \$180,000,000**
 - Residual risk level of 241,000 Points (reduction of 324,000 points)
 - 571 Acquisitions
 - 210 Wet Floodproofing
 - 128 Protect Service Equipment
 - 26 Elevation
 - 113 Wet Floodproofing
- ◁ **Need to provide context...**
 - What have we done historically
 - Private mitigation?



Historical Flood Risk

- ◁ Back calculated previous mitigation
- ◁ Changes to flood risk pool have been variable over the last 20 years
- ◁ 1,067,000 Risk Points in 2000
- ◁ 571,304 in 2020
- ◁ ~500,000 points mitigated
- ◁ ~25,000 points per year

Changes to Risk Pool Since 2000

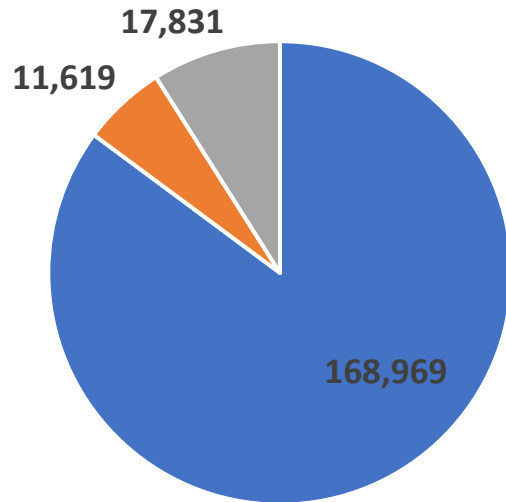


What about work done by others?

- ◁ **We intensively evaluated flood mitigation from the past 10 years**
 - Mecklenburg County Projects
 - City of Charlotte
 - Private
- ◁ **Want to better understand private mitigation and mitigation by other government agencies**

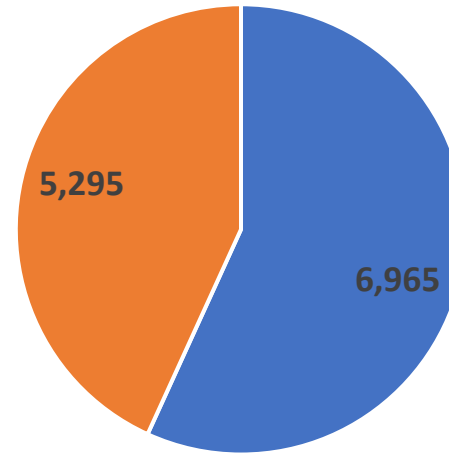
Flood Mitigation – Last 10 Years

Risk Mitigated from 2011 - 2020



- MCSWS Mitigation
- City of Charlotte
- Private - Infill

Risk Added from 2011 - 2020

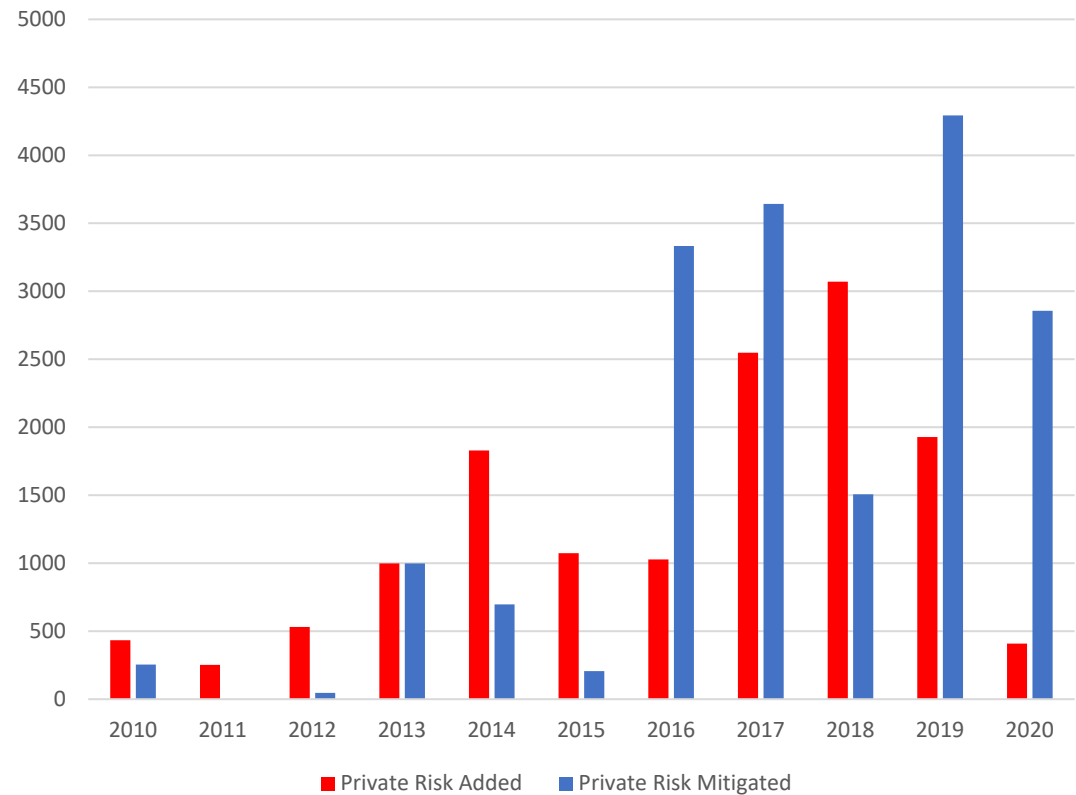


- Infill
- New Construction

Net Improvement of ~19,500 points per year

Private Flood Risk by Year

	Private Flood Risk Points Added	Private Flood Risk Points Reduced	Net Change in Flood Risk Points
2010	433	254	179
2011	252		252
2012	531	46	485
2013	998	998	0
2014	1,829	697	1,132
2015	1,073	206	867
2016	1,028	3,333	(2,305)
2017	2,548	3,642	(1,094)
2018	3,071	1,506	1,565
2019	1,928	4,293	(2,365)
2020	408	2,856	(2,448)
TOTAL			(3,732)



So, what does it all mean?

◁ We know the target (Residual Risk)

- Need to mitigate ~325,000 risk points

◁ For the Utility...

- The low hanging fruit has been picked... the grant eligible, inexpensive, high-risk properties have been mitigated
- Future mitigation will be more expensive as the ROI decreases

◁ To continue past level of service, Mecklenburg will need to focus on

- Increased revenue stream
- Partnerships
- Encouraging private mitigation

Developed 15 Year CIP

◁ Based upon funding allocation

- Includes \$250,000 per year for retroFIT
- Remainder to Acquisition

◁ Developed cost per point for each technique

- Acquisition: \$571/point mitigated
- retroFIT: \$309/point mitigated

◁ Developed annual point goals based upon funding level

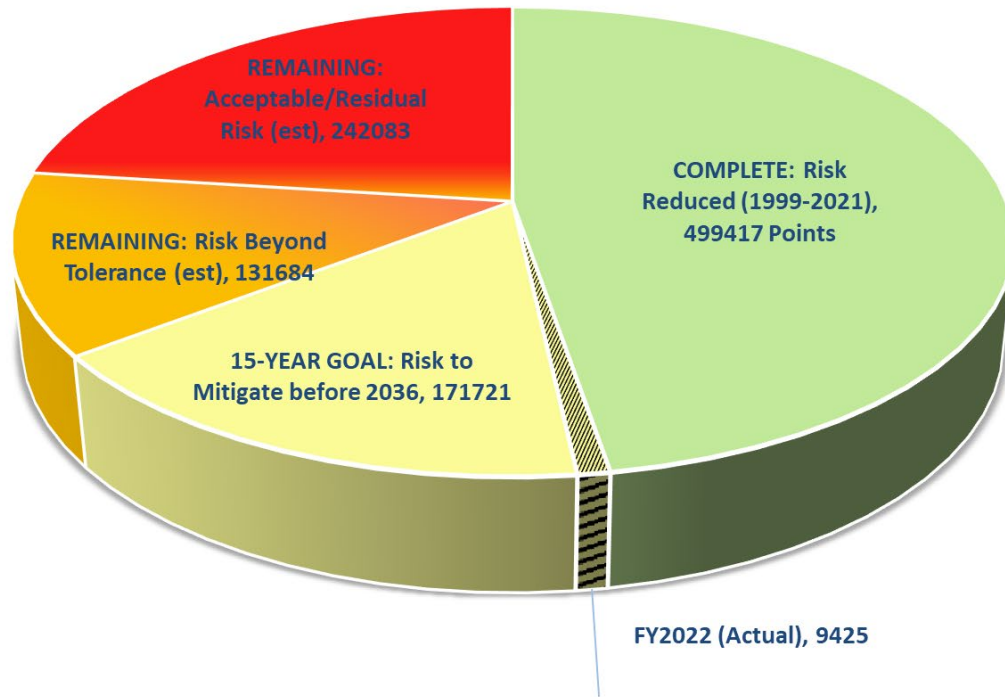
◁ Program performance is based upon risk reduction – not specific project implementation

15 Year CIP

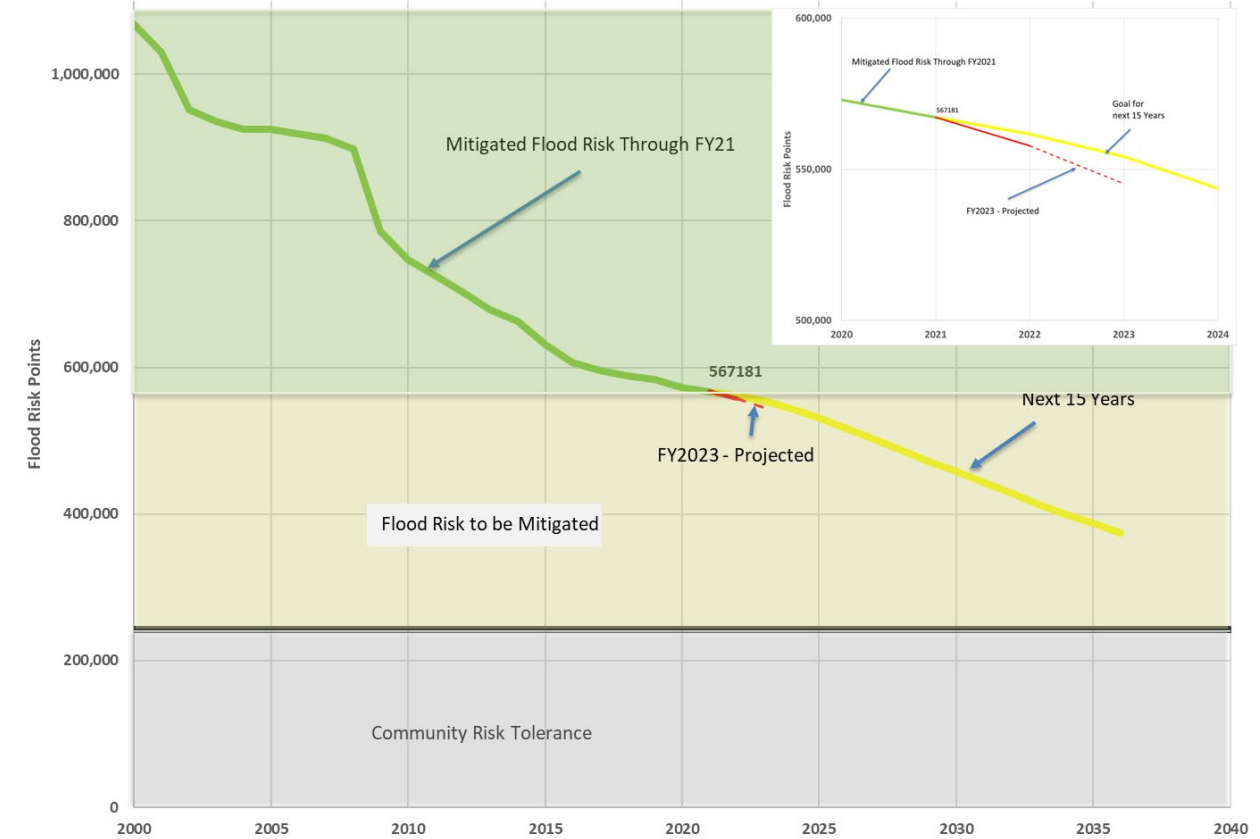
		Financial Projections			Flood Mitigation Goals			
Fiscal Year	Calendar Year	Annual Residual Flood Risk Allocation	Annual Acquisition Allocation	Annual retroFIT/private Allocation	Points to be mitigated via Acquisition	Points to be mitigated via retroFIT/private	Total Points to be Mitigated	Cumulative Points to be mitigated
	2021							
FY22	2022	\$3,000,000	\$2,750,000	\$250,000	4819	809	5628	5628
FY23	2023	\$3,960,000	\$3,710,000	\$250,000	6501	809	7310	12938
FY24	2024	\$5,810,000	\$5,560,000	\$250,000	9742	809	10552	23489
FY25	2025	\$6,980,000	\$6,730,000	\$250,000	11792	809	12602	36091
FY26	2026	\$8,150,000	\$7,900,000	\$250,000	13842	809	14652	50743
FY27	2027	\$8,150,000	\$7,900,000	\$250,000	13842	809	14652	65394
FY28	2028	\$8,150,000	\$7,900,000	\$250,000	13842	809	14652	80046
FY29	2029	\$8,150,000	\$7,900,000	\$250,000	13842	809	14652	94698
FY30	2030	\$8,150,000	\$7,900,000	\$250,000	13842	809	14652	109349
FY31	2031	\$8,150,000	\$7,900,000	\$250,000	13842	809	14652	124001
FY32	2032	\$8,150,000	\$7,900,000	\$250,000	13842	809	14652	138653
FY33	2033	\$8,150,000	\$7,900,000	\$250,000	13842	809	14652	153304
FY34	2034	\$7,420,000	\$7,170,000	\$250,000	12563	809	13373	166677
FY35	2035	\$7,420,000	\$7,170,000	\$250,000	12563	809	13373	180050
FY36	2036	\$7,420,000	\$7,170,000	\$250,000	12563	809	13373	193422

Current State of FM CIP

Flood Risk Point Reduction in Mecklenburg Floodplains

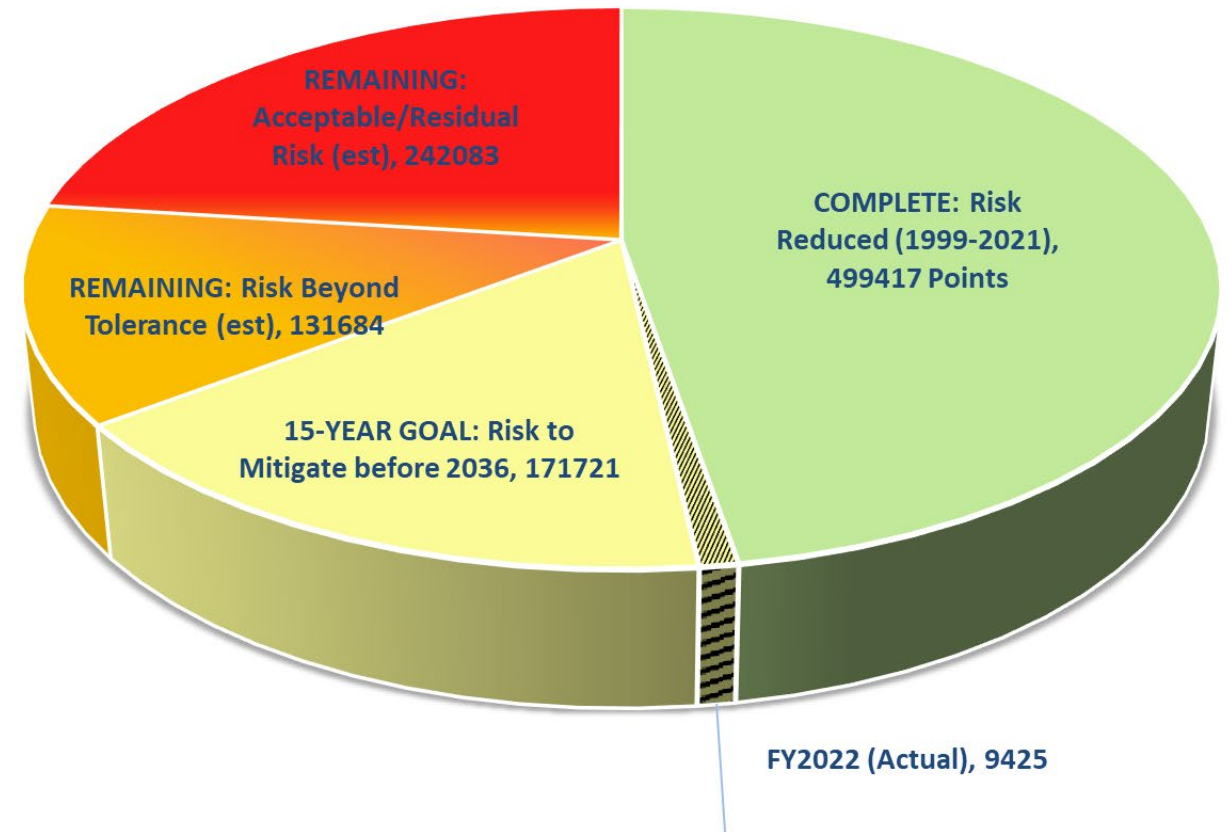


Flood Risk Points Remaining

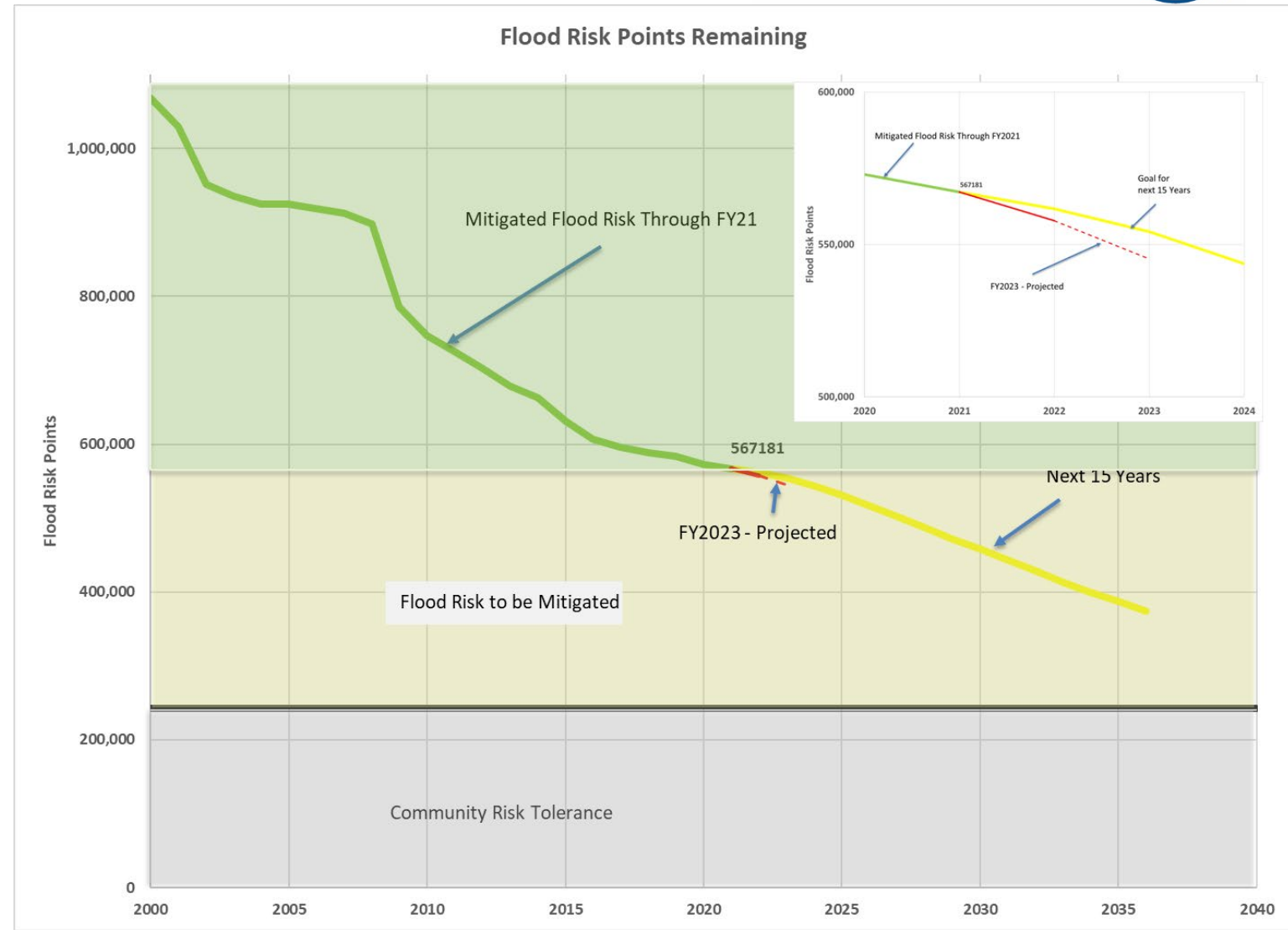


CIP Status 'At a Glance'

Flood Risk Point Reduction in Mecklenburg Floodplains

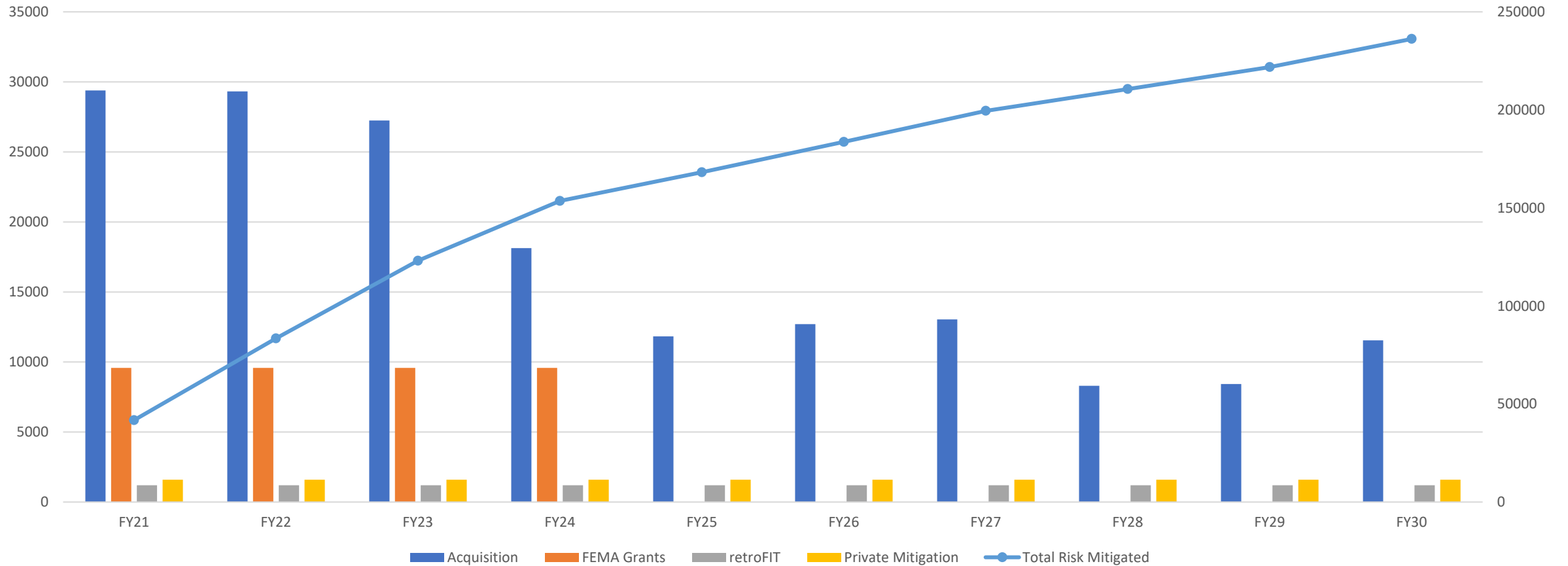


CIP Status “At a Glance”



Projected Annual Mitigation by Category

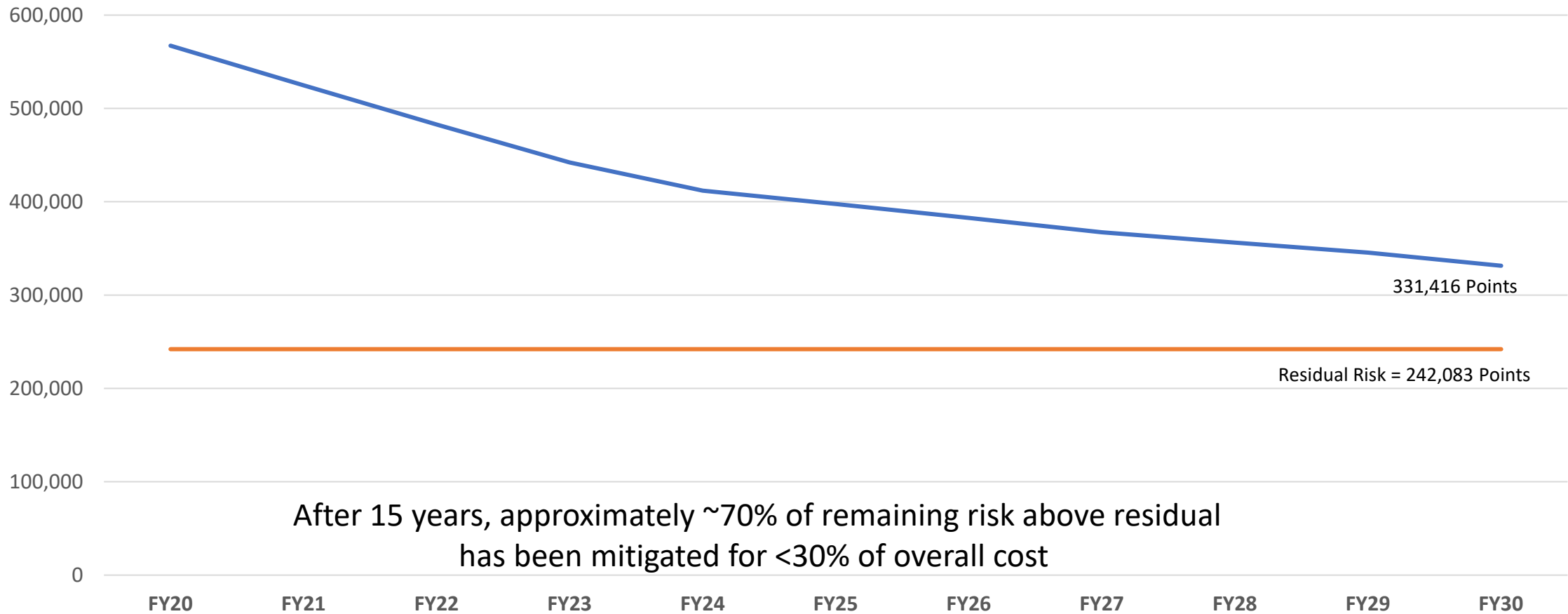
Annual Risk Mitigated by Category



Interim 10-15 Year Goal – Significant Investment



10 Year Scenario - Path to Residual Risk



Goal Driven CIP - Partnerships

- ◁ **Development of programmatic goals, projects and methods allows for development of multi-objective projects and cooperation between agencies**
- ◁ **Little Hope Creek Relief Sewer Project**
 - Charlotte Water (local water/wastewater utility) needed to upgrade sewer along Little Hope Creek
 - Charlotte Storm Water had completed mitigation in the area through acquisition and demolition of several houses
 - Charlotte Water was able to use the acquired properties to facilitate sewer upgrades
 - Additional properties of marginal flood mitigation benefit were acquired with Charlotte Water contributions in lieu of purchasing easements and lay-down areas

Multi-Objective Projects

◁ Kings Branch Stream Restoration

- Several high-risk flood-prone multi-family buildings
 - Too expensive to acquire
- Awarded FEMA funding for restoration
- Remove buildings from floodplain and restore ~1 mile of stream



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Private Mitigation

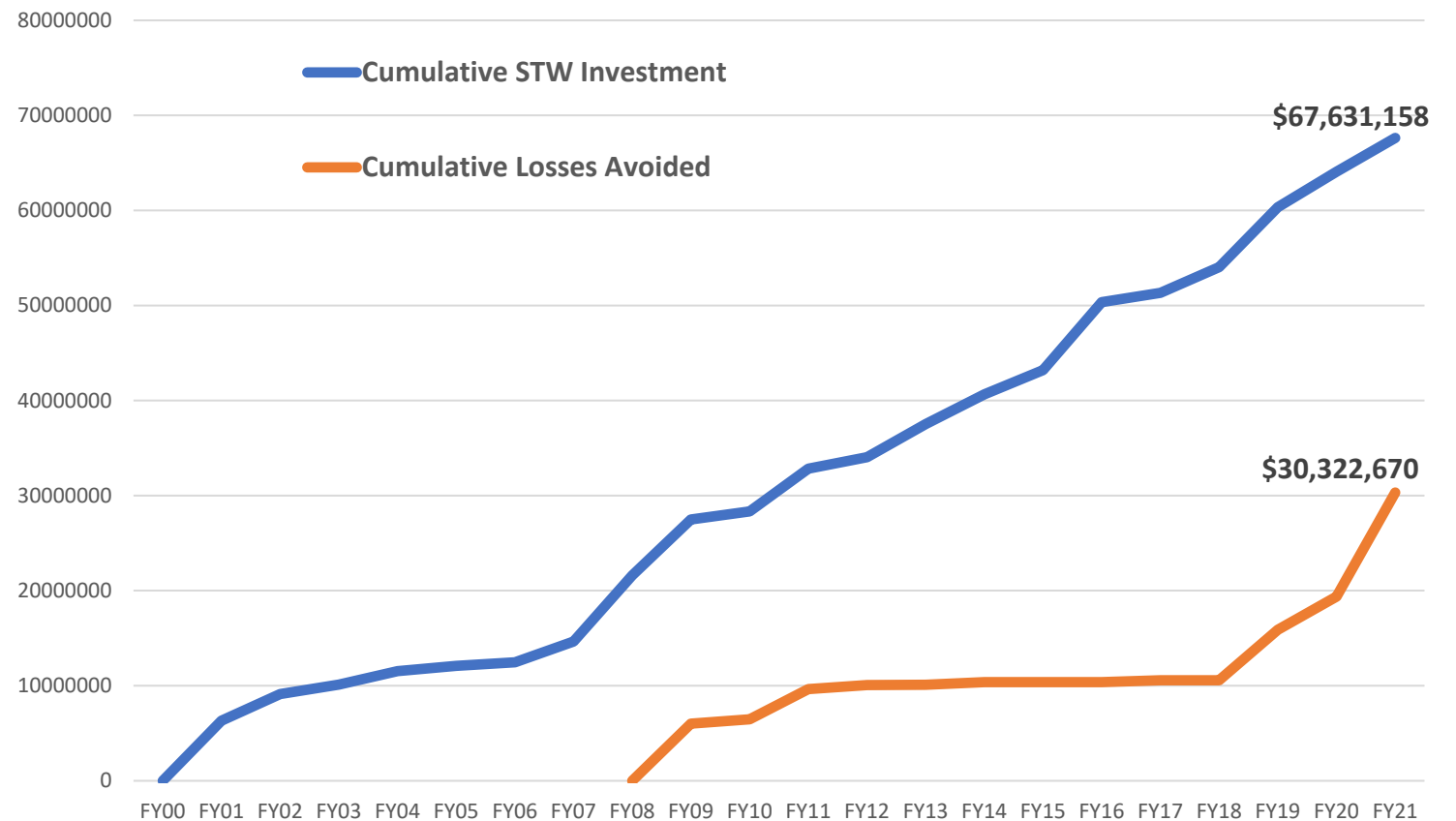


Return on Investment

- ◁ Mecklenburg tracks flood losses avoided
- ◁ Pre-mitigation building elevation data is maintained
- ◁ After a flood event, flood inundation is estimated, and pre-mitigation impacts are calculated based upon depth/damage curves with additional losses for vehicles, emergency responder costs and lot improvements

Losses Avoided

	Est. Annual Losses Avoided
FY09	\$6,010,027
FY10	\$452,344
FY11	\$3,181,759
FY12	\$429,061
FY13	\$26,673
FY14	\$269,885
FY15	\$0
FY16	\$0
FY17	\$196,486
FY18	\$0
FY19	\$5,311,271
FY20	\$3,496,915
FY21	\$10,948,249
Total	\$30,373,545



Dashboard

◁ <https://edmsmapserver.mecklenburgcountync.gov/rarr/v6/#/dashboard>

Conclusions

◀ Development of Goal Driven CIP and performance metrics

- Translated high-level county-wide Goals and Strategic Business Plan to metrics for Flood Mitigation
- Assigned cost estimates to achieve goals and plan objectives
- Developed timeline to reach the goals/objectives using multiple funding scenarios
- Presented annual performance back to Leadership and Elected Officials

◀ All project work is voluntary

- Education of the public is critical element of success

◀ Goal Driven CIP allows us to leverage partnerships to accomplish multiple objectives

- Looks good and allows us to optimize limited funding