



U.S. Department of Transportation
Federal Highway Administration

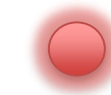
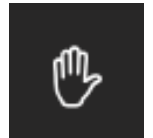
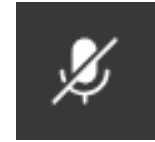
Session 2: Peer Exchange – Resilience Needs and Strategies

August 27, 2020
2-4 pm ET



HOUSEKEEPING

- Keep your lines muted unless speaking
- To ask a question, type into the **chat pod** or “**raise your hand**” using the hand icon in the toolbar to be called on
- Video optional (recommended when speaking)
- Sessions will be recorded



GOALS AND OBJECTIVES

- **Share approaches** for using the MPO planning process to increase natural hazard resilience.
- Ensure all MPOs in the state share an **understanding of approaches and best practices**.
- Create an opportunity for **peer-to-peer collaboration** on how to integrate resilience into planning at individual agencies.

This session: Hear from MPOs on approaches and lessons learned from their experience with resilience challenges

AGENDA

(1) Peer presentations:

- Dave Vautin, Metropolitan Transportation Council (MTC)
- Bill Swiatek, Wilmington Area Planning Council (WILMAPCO)
- David Walker, Rockingham Planning Commission (RPC)

(2) Group discussion

PollEverywhere



QUESTIONS

- What does resilience mean to you in one word?

QUESTIONS

- What was your key takeaway from Session 1: State of the Practice in Florida?

Peer Presentations



DAVE VAUTIN, MTC



David Vautin, AICP is the Assistant Director of Major Plans at the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments, based in San Francisco. Building upon a decade of experience in regional planning, he currently manages **Plan Bay Area 2050**, the Bay Area’s next-generation regional plan for transportation, housing, the economy, and the environment. In 2018 and 2019, he led the innovative **Horizon** initiative, which explored resilient and equitable strategies for an uncertain future through “what if...?” scenario planning. He also created and managed the award-winning **Vital Signs** performance monitoring project from 2014 to 2019, which continues to track a comprehensive suite of regionwide metrics.

Previously, David was the agency lead on performance assessment for **Plan Bay Area** (2013) and **Plan Bay Area 2040** (2017). He received his Master of Science degree from UC Berkeley and his Bachelor of Science degree from Cornell.



PLAN BAY AREA 2050

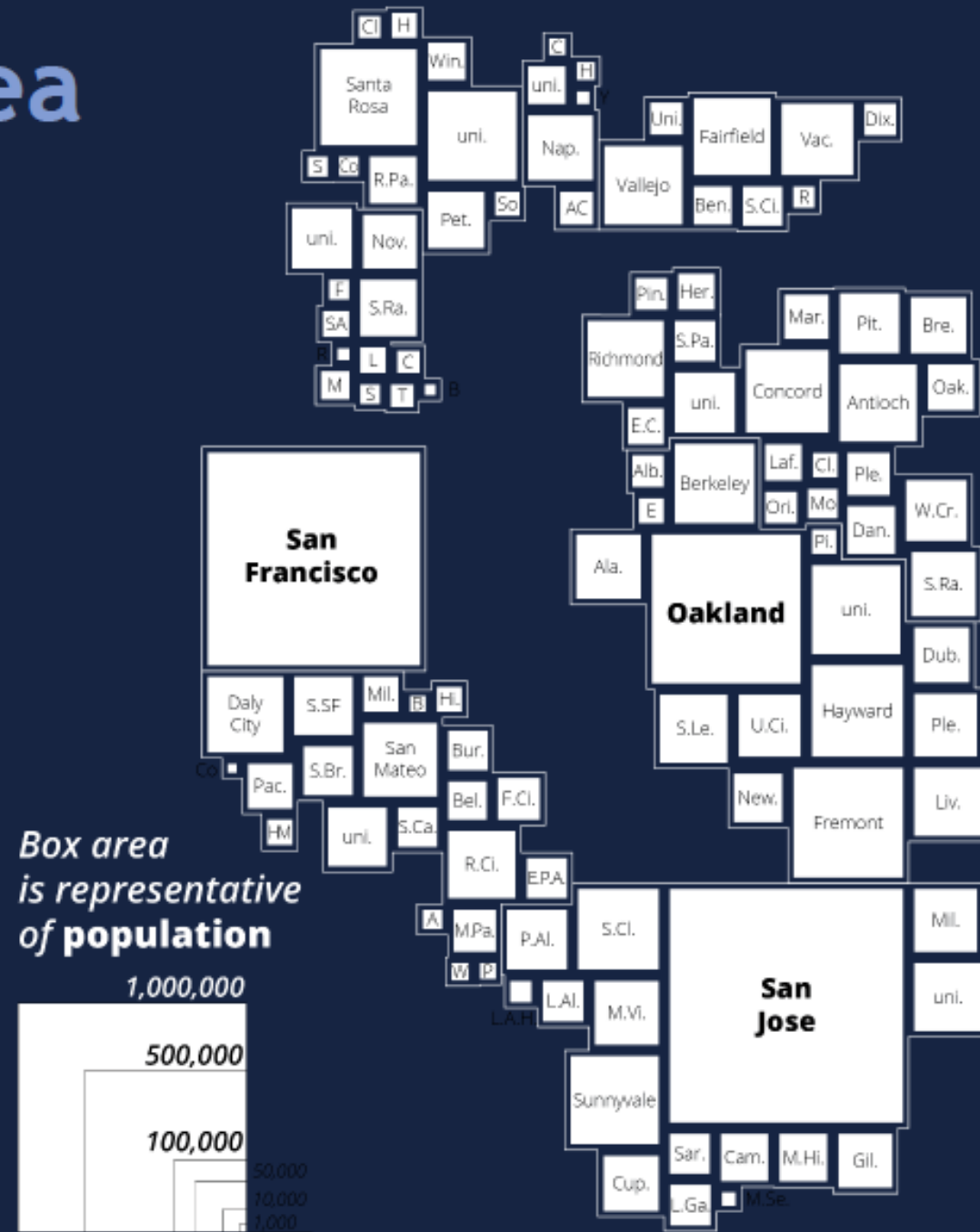
Making Plan Bay Area 2050 Resilient to Sea Level Rise

Dave Vautin, MTC/ABAG

August 27, 2020

The San Francisco Bay Area

- Nearly 8 million people
- Over 4 million jobs
- 9 counties
- 101 cities
- 27 transit agencies
- Largest estuary on West Coast



ABAG

- Council of Governments
- Created in 1961 to help local jurisdictions address shared problems from a regional perspective including:
 - **plans** to address climate change
 - **programs** to preserve the Bay
 - **creative financing** to fund solutions
 - **forecasting models** (pop/jobs/housing)

MTC

- Metropolitan Planning Organization
- Created in 1971 to be the transportation planning, financing and coordinating agency for the Bay Area.
 - **plans** to improve travel in the region.
 - **BATA** (Bay Area Toll Authority) manages 7 transbay bridges and collects tolls.
 - **allocates** over \$1 billion in funding to transportation agencies annually

What is Plan Bay Area?

- The regional plan is a blueprint for growth and infrastructure for the next 30 years.
- The regional plan is updated every four years, with this major update due in 2021.
- The regional plan is a reflection of the shared priorities of the diverse nine-county San Francisco Bay Area.
- The regional plan is fiscally-constrained, even as it aspires to tackle the Bay Area's big challenges with specific strategies.
- The regional plan is not an expenditure plan; it is focused on setting priorities and over the long term and looking holistically across “silos”.



The Plan Bay Area 2050 Blueprint is a package of strategies designed to advance the regional vision.

*Vision: Ensure by the year 2050 that the Bay Area is **affordable**, **connected**, **diverse**, **healthy** and **vibrant** for all.*



- **Transportation** Investments & Strategies
- **Housing** Geographies & Strategies
- **Economic** Geographies & Strategies
- **Environmental** Strategies

What is the Draft Blueprint?

25 Strategies (Draft Blueprint Inputs)

-  **Maintain and Optimize Existing Infrastructure**
-  **Create Healthy and Safe Streets**
-  **Enhance Regional and Local Transit**
-  **Reduce Risks from Hazards**
-  **Reduce Our Impact on the Environment**

-  **Spur Housing Production and Create Inclusive Communities**
-  **Protect, Preserve, and Produce More Affordable Housing**
-  **Improve Economic Mobility**
-  **Shift the Location of Jobs**



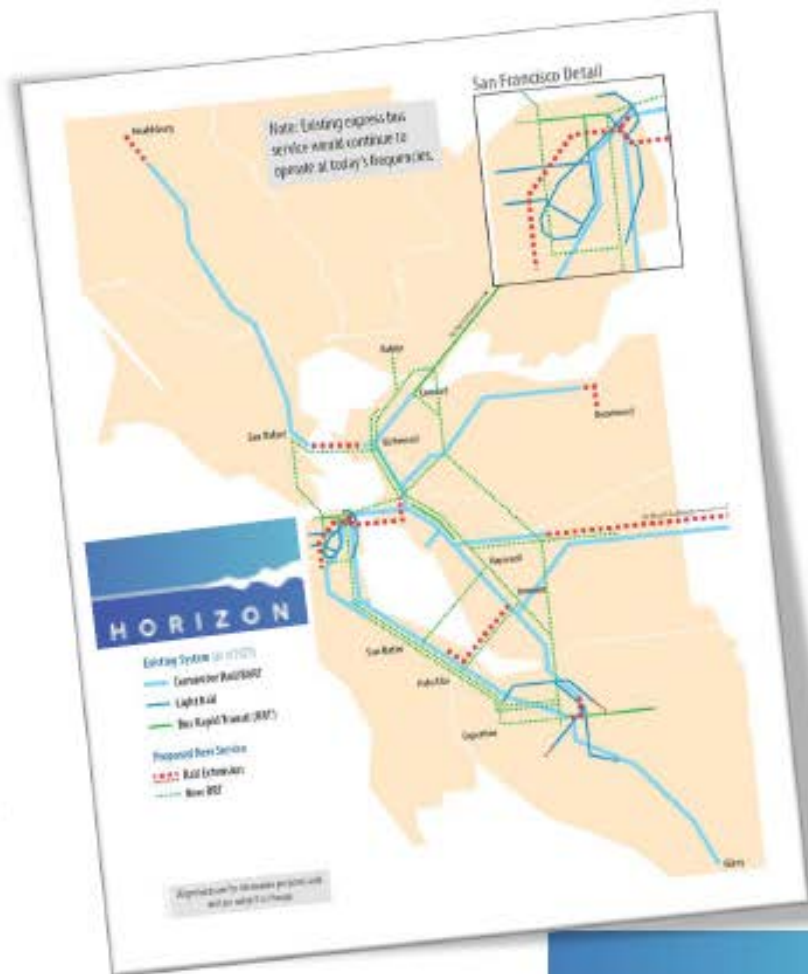
Check out planbayarea.org for more detail on each strategy!

Plan Bay Area 2050 builds upon Horizon, which tested visionary strategies for an uncertain future.



Horizon explored dozens of bold strategies for the region's future, "stress testing" them against a broad range of external forces.

This is the first time MTC identified a comprehensive set of sea level rise impacts and mitigations outside of the EIR process.



Three Futures - “What If?” Scenarios

A



Rising Tides,
Falling
Fortunes

What if... the federal government cuts spending and reduces regulations, leaving more policy decisions to states and regions?

B



Clean
and Green

What if... new technologies and a national carbon tax enabled greater telecommuting and distributed job centers?

C



Back to
the Future

What if... an economic boom and new transportation options spur a new wave of development?

Futures Final Report: Resilient and Equitable Strategies for the Bay Area's Future

The full report highlights the full suite of strategies studied and describes to what extent the region performs better with these strategies.

The report can be found below:

<https://mtc.ca.gov/our-work/plans-projects/horizon/futures-planning>



Horizon Finding - Unmitigated sea level rise impacts would result in significant damage across the region; adaptation measures reduce impacts.

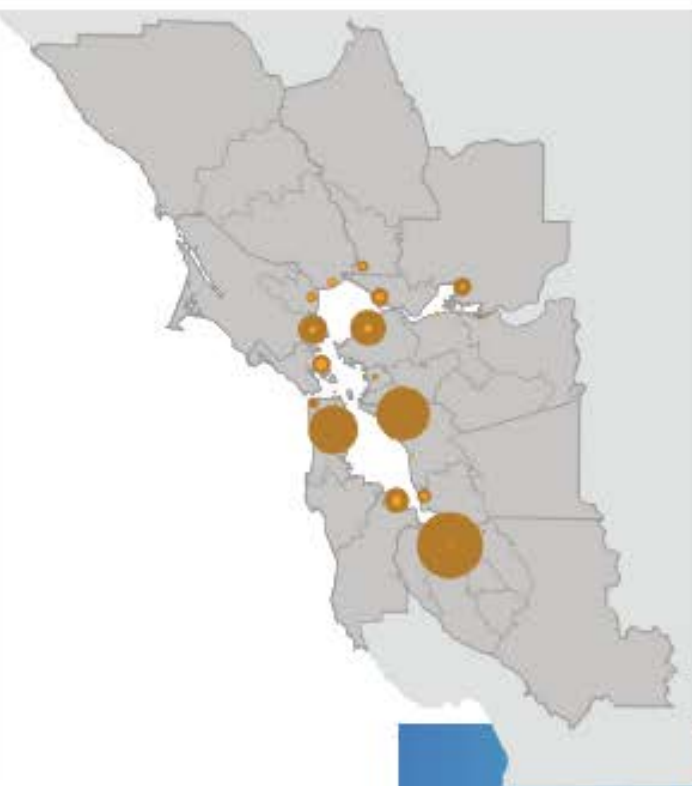
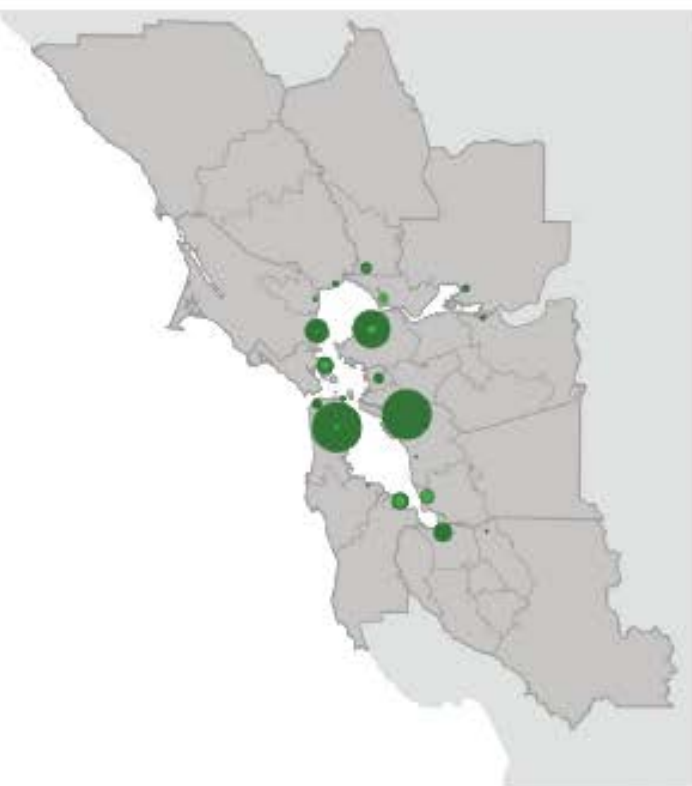
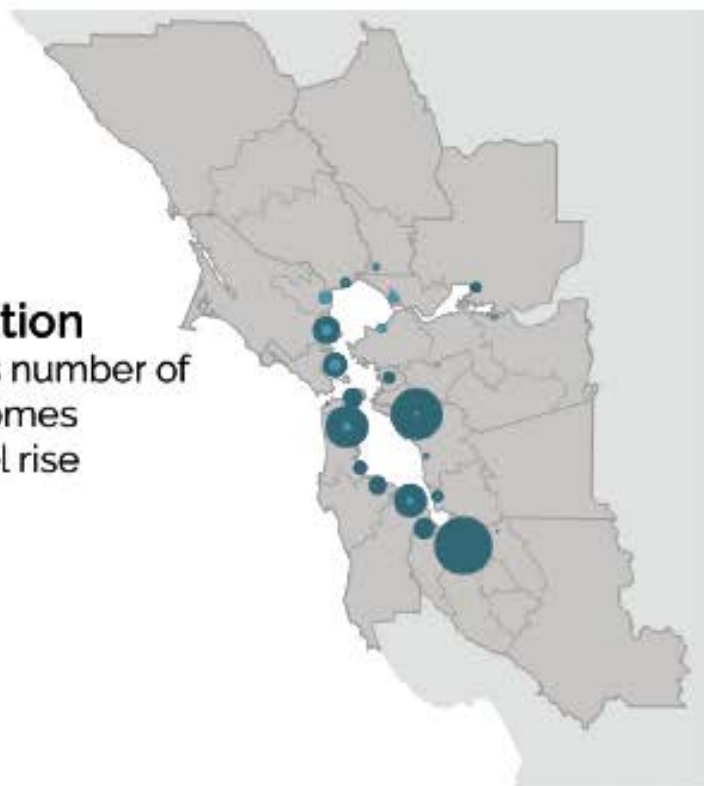
Rising Tides, Falling Fortunes
3 feet of sea level rise by 2050
with partial adaptation in Round 2

Clean and Green
1 foot of sea level rise by 2050
with "full" adaptation in round 2

Back to the Future
2 feet of sea level rise by 2050
with "full" adaptation in round 2

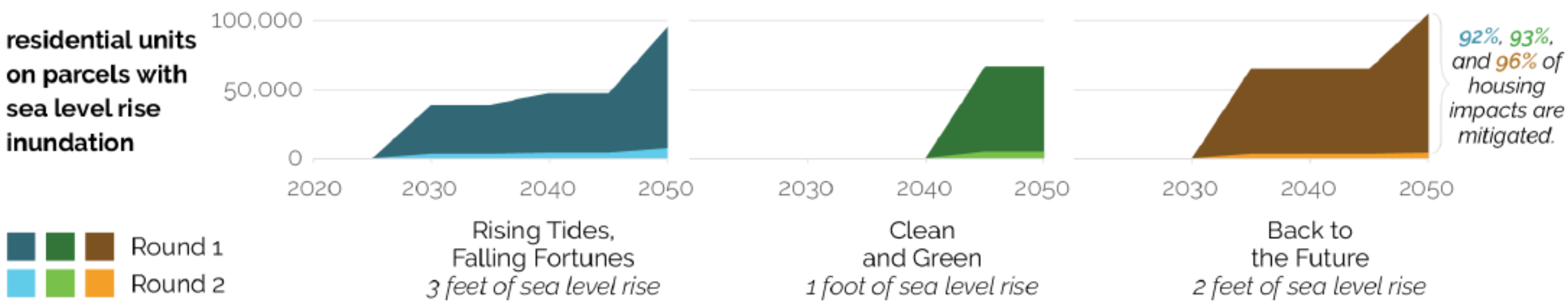
Damage Distribution
circle area represents number of existing and future homes damaged by sea level rise

- 500
- 5,000
- 50,000



Horizon Finding - Unmitigated sea level rise impacts would result in significant damage; adaptation measures reduce impacts.

Residential sea level rise impacts in Futures round 1 (without adaptation) and round 2 (with adaptation)



The Futures Final Report has more information.

Project Performance - Transportation projects were analyzed to determine the effects of near-term sea level rise.



Project Submission



Project Performance (2019)



*Adapt to Sea Level Rise:
Land Use and Transportation
Analysis*

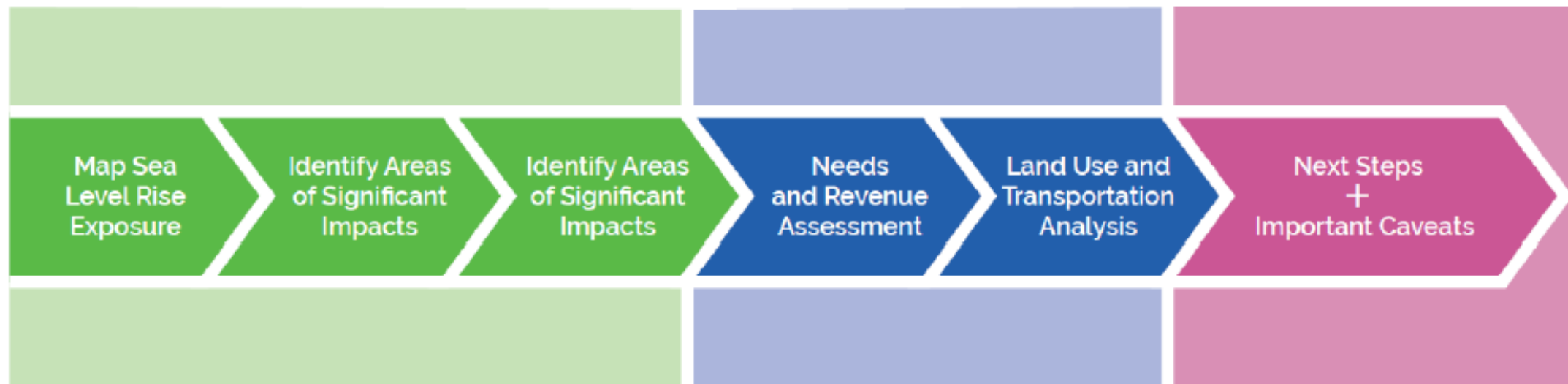


7 major projects were analyzed for sea level rise resilience, including State Route 37, and major sections of Hwy 101

Integrating Sea Level Rise into the Plan

- The strategy “**Adapt to Sea Level Rise**” was developed through extensive analysis in Horizon. Building off of that effort, it was refined through steps shown below for inclusion in the Plan.
- Building upon Horizon, Plan Bay Area 2050 was the first regional plan with an Environment Element, integrating sea level rise strategies into the long-range plan itself.

Steps to Integrating Sea Level Rise into Plan Bay Area 2050



Mapping Sea Level Rise Exposure

- Staff used assumed the region would see 2 feet of permanent inundation by 2050 (reference: OPC)
- 3 feet of inundation risk was assumed to account for king tides and storms
- Critical partnership with the Bay Conservation and Development Commission, whose Adapting to Rising Tides program has developed critical sea level rise research for Plan Bay Area and the region at large
- Exposure assessed with the help of
 - BCDC's Adapting to Rising Tides Bay Shoreline Flood Explorer
 - NOAA's Coastal Flood Exposure Mapper for coastal impacts



Identifying Significant Inundation

Flagged shoreline inundation in significant areas across the region



- Future Areas for Growth
- Socially vulnerable communities
- Transportation corridors with significant volumes
- Existing urban and suburban employment and residential neighborhoods

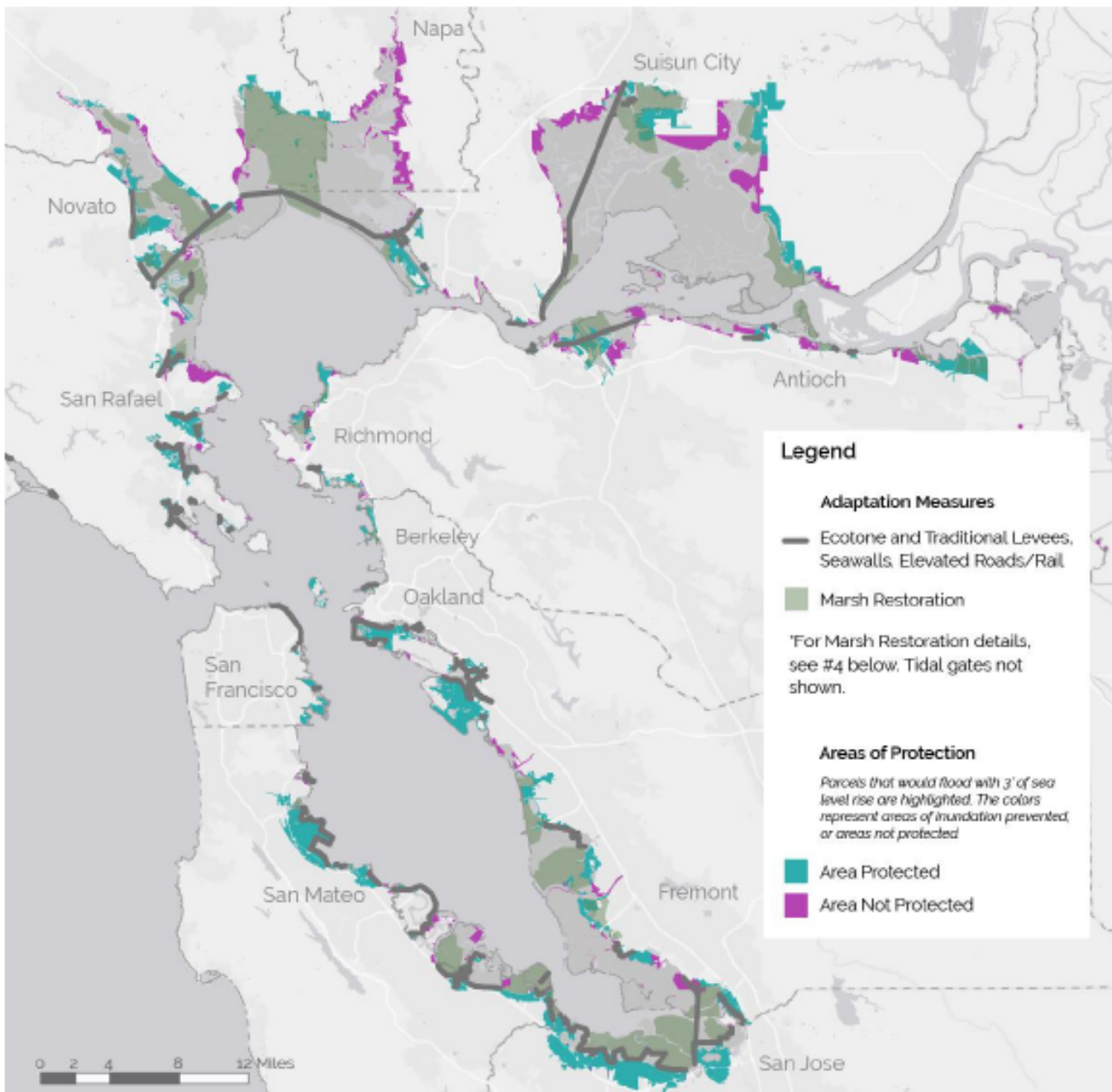


For residential properties not protected under the regional analysis, a managed retreat buyout was costed

Identify and Cost Generic Adaptations

Generic archetype adaptations were used to create high level cost assumptions for the Needs and Revenue Assessment

- Where a current strategy was known, staff integrated it into the plan
- Subject matter expert guidance was used to assume strategies for other parts of the shoreline, including guidance from BCDC and other regional partners



Needs and Revenue Assessment

Objectives: to understand the unconstrained financial needs related to critical expenditure categories for Plan Bay Area 2050, as well as baseline available revenues



Sea Level Rise Outcomes in Plan Bay Area 2050 Draft Blueprint

Plan Bay Area 2050: 2015 to 2050
+89,000 housing units protected



Housing

89,000
units protected

2,000
units still at risk



Jobs

166,000
jobs protected

10,000
jobs still at risk



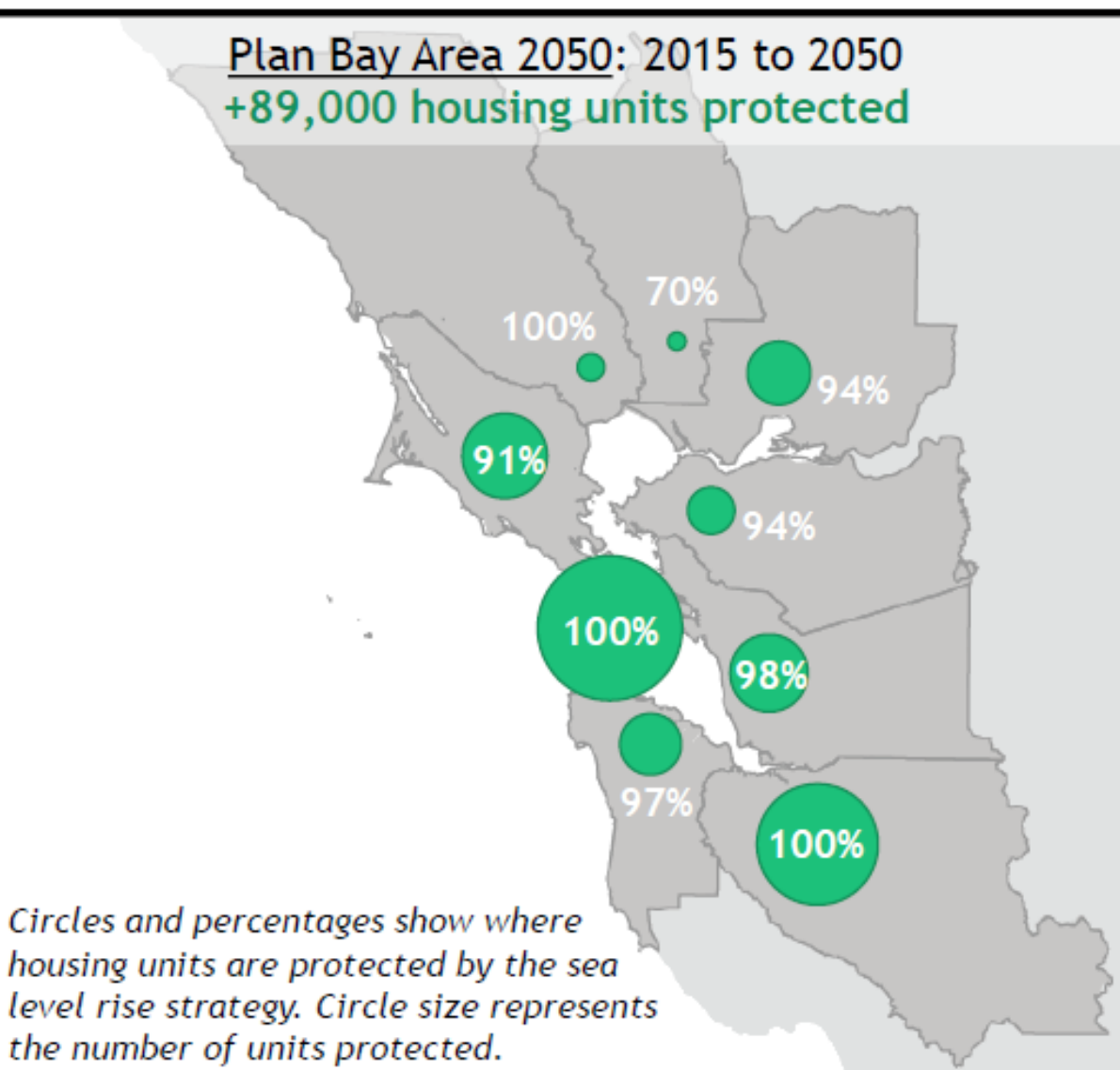
Environment

100,000
acres of marsh adaptation projects



Transportation

All major highway and
 rail corridors protected
 at 2 feet of sea level rise



Circles and percentages show where housing units are protected by the sea level rise strategy. Circle size represents the number of units protected.

Challenges...

- The adaptation included in the plan looks only at near-term sea level rise (through 2050).
- Many local cities have not yet begun shoreline adaptation planning; funding support for advanced adaptation planning is needed to develop community-led, inclusive strategies.
- Using archetype categories obscures many different adaptation approaches, including more nature-based solutions.
- Groundwater, storm flooding, and riverine flooding were not included in the plan due to insufficient regional modeling at the time of analysis.

...and Lessons Learned

- There are a diverse set of stakeholder opinions in the sea level rise field.
- It is difficult to account for the changing science when creating a long-range plan.
- Managed retreat conversations are particularly difficult in the midst of a regional housing crisis.
- Sea level rise resilience is integral to the long-term success of strategies in the Plan.

Looking Ahead

Plan Bay Area 2050 Final Blueprint

Winter 2020/2021

Final analysis on the regional Adapt to Sea Level Rise strategy

Implementation Plan

2021

Highlights actions to advance this bold \$18B vision over the next 4 years. Likely to include:

- (i) advocacy for state funds for inclusive local adaptation planning
- (ii) feasibility and equity study of different regional funding/financing tools

Plan Bay Area Updates

2025+

Future updates will build and expand on this work - recognizing this was the first cycle sea level rise was deeply integrated - ideally addressing many of the challenges on the previous slide.

Questions?

Contact

Dave Vautin, dvautin@bayareametro.gov

Rachael Hartofeils, rhartofelis@bayareametro.gov

POLL EVERYWHERE QUESTION

- Which aspect of the Metropolitan Transportation Council's approach would be most beneficial to your organization?

BILL SWIATEK, WILMAPCO



A principal planner with the Wilmington Area Planning Council (WILMAPCO), Bill lead's the agency's environmental planning efforts. He has completed studies of transportation equity, regional connectivity and accessibility, climate change, air quality, performance measurement, along with master planning and community planning efforts.

Bill's recent work includes highlighting and helping break down the structural racism present in transportation decision-making, building sustained community collaboration into the development and implementation of plans, documenting the impacts of sea-level rise on the transportation network, and leading the development of better regional transportation policy and meaningful performance measurement.

Bill is an active member of the American Planning Association. He served as the Delaware Chapter's President from 2012 to 2014 and is currently the state's liaison with APA National's Transportation Planning Division and chair the Chapter's Membership Committee. Additionally, he sits on the Delaware Public Health Association's Advisory Council. Bill holds a Master of Arts in Geography from the University of Delaware.

RESILIENCE PLANNING

WILMAPCO

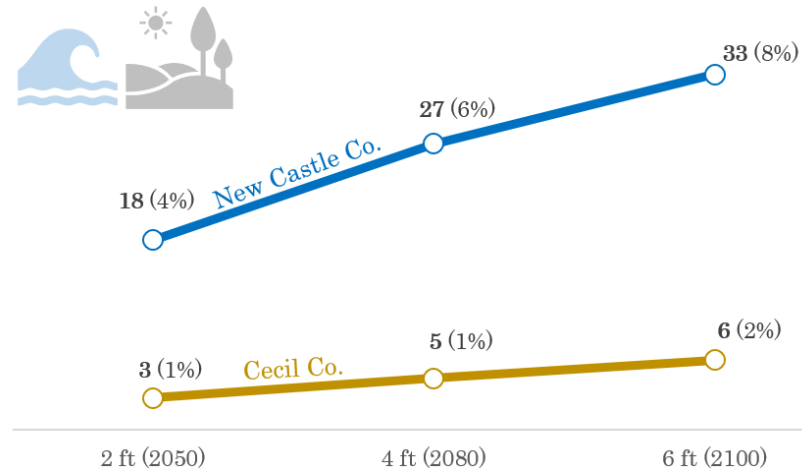
FHWA/FDOT Peer Exchange
August 2020



- New Castle County, Delaware
- Cecil County, Maryland
- Population: 660,000



Land Impacted by SLR, in square miles



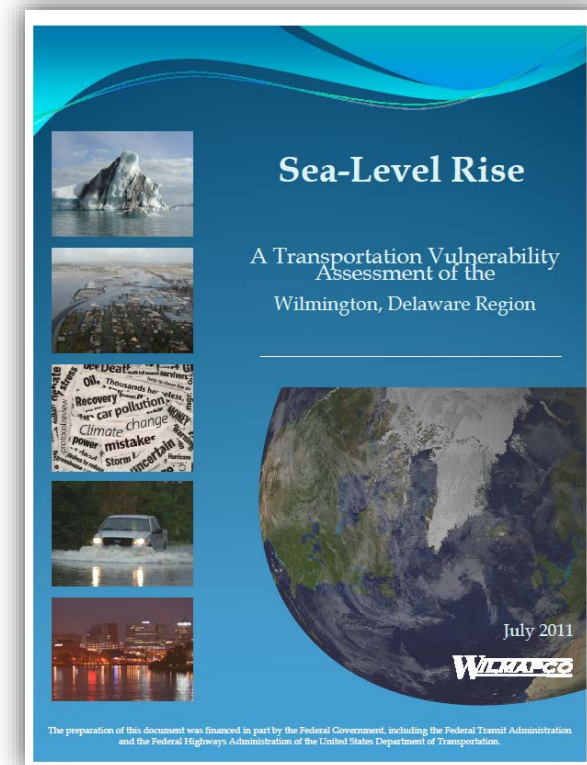
2011 Sea-Level Rise Assessment

Trailblazing study

Transportation and housing impacts

Project impacts monitored afterwards

Refreshed in early 2020



RTP Climate Policy

2011 – “New Initiatives”

2015 – Actions

2019 – Actions w/performance measures



Selected 2050 RTP Actions

Reduce VMT

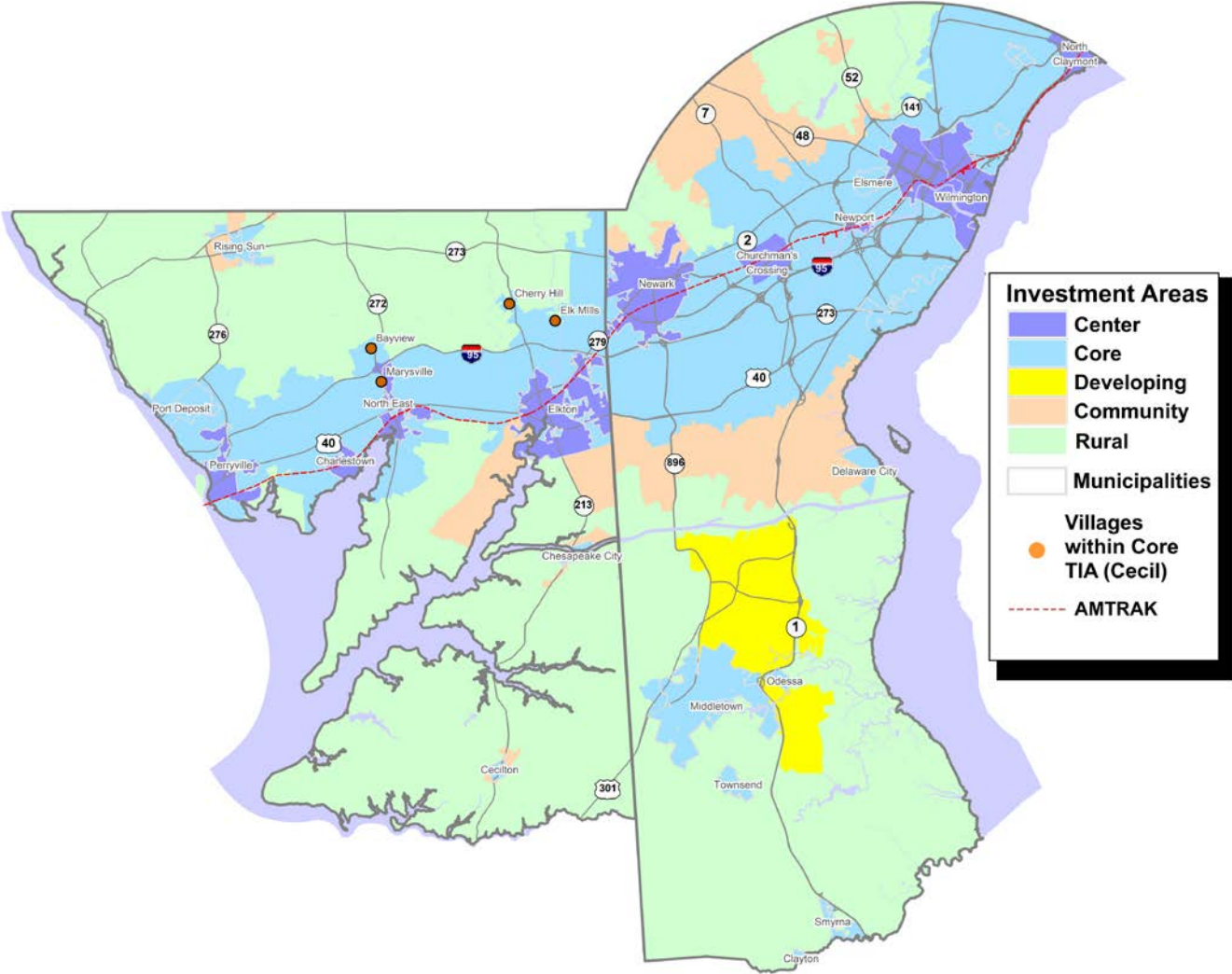
Support cleaner vehicle infrastructure, fuels, and tech

Adapt to SLR, storm flooding, and other environmental challenges

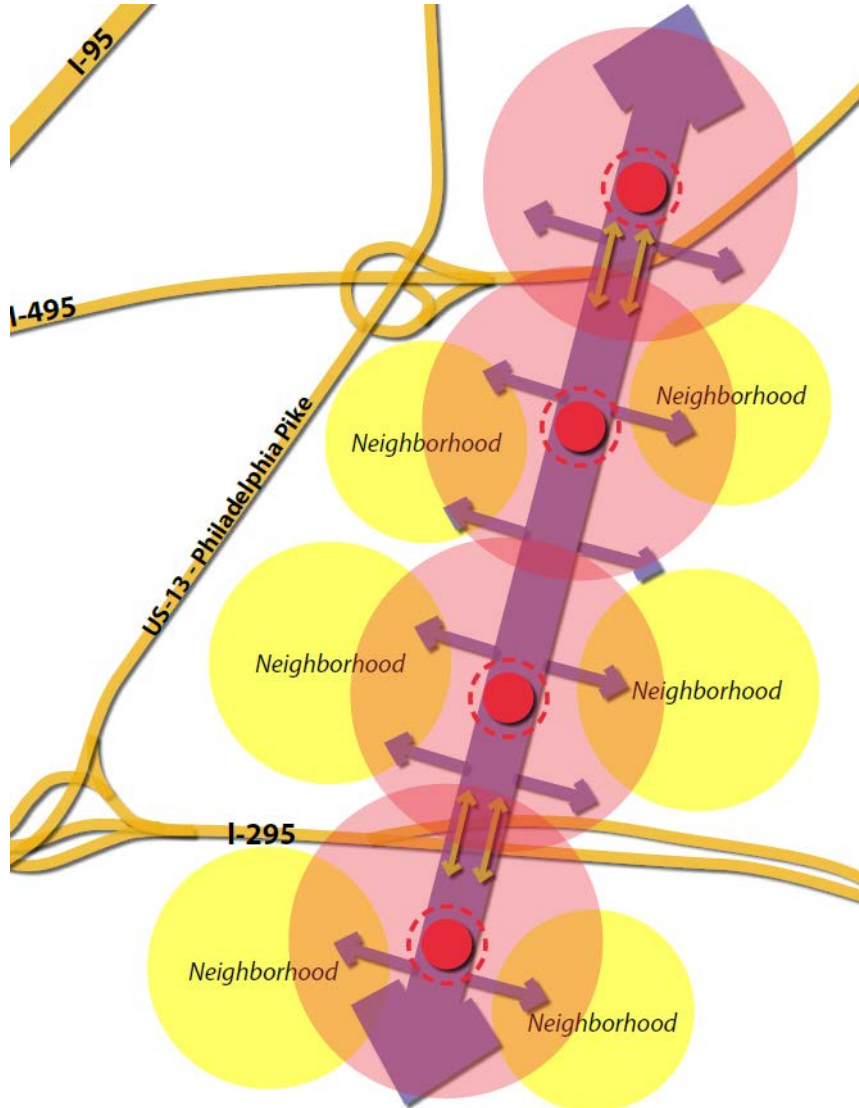
Curbing sprawl

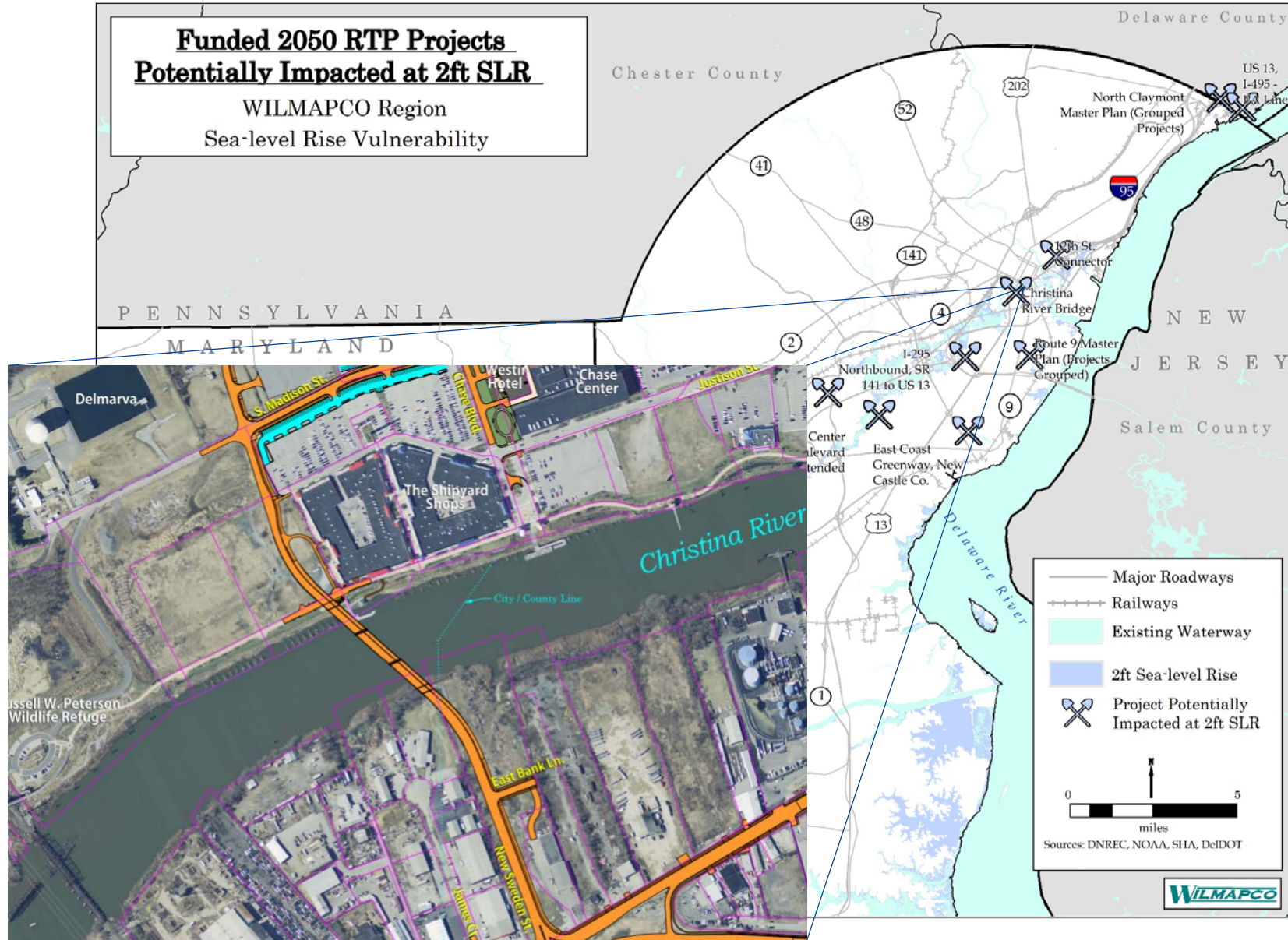


Transportation Investment Areas



Sustainable Suburban Growth

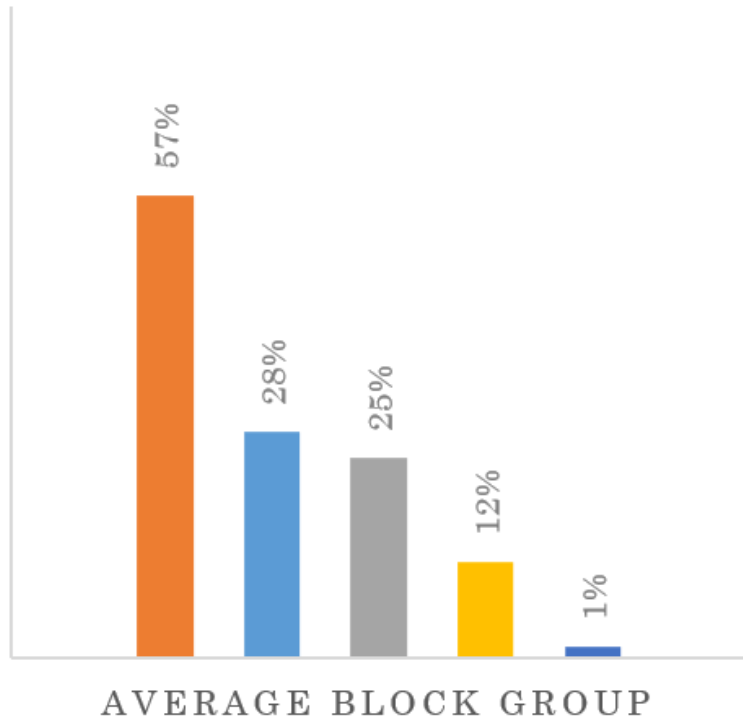




SLR - Social Equity Analysis

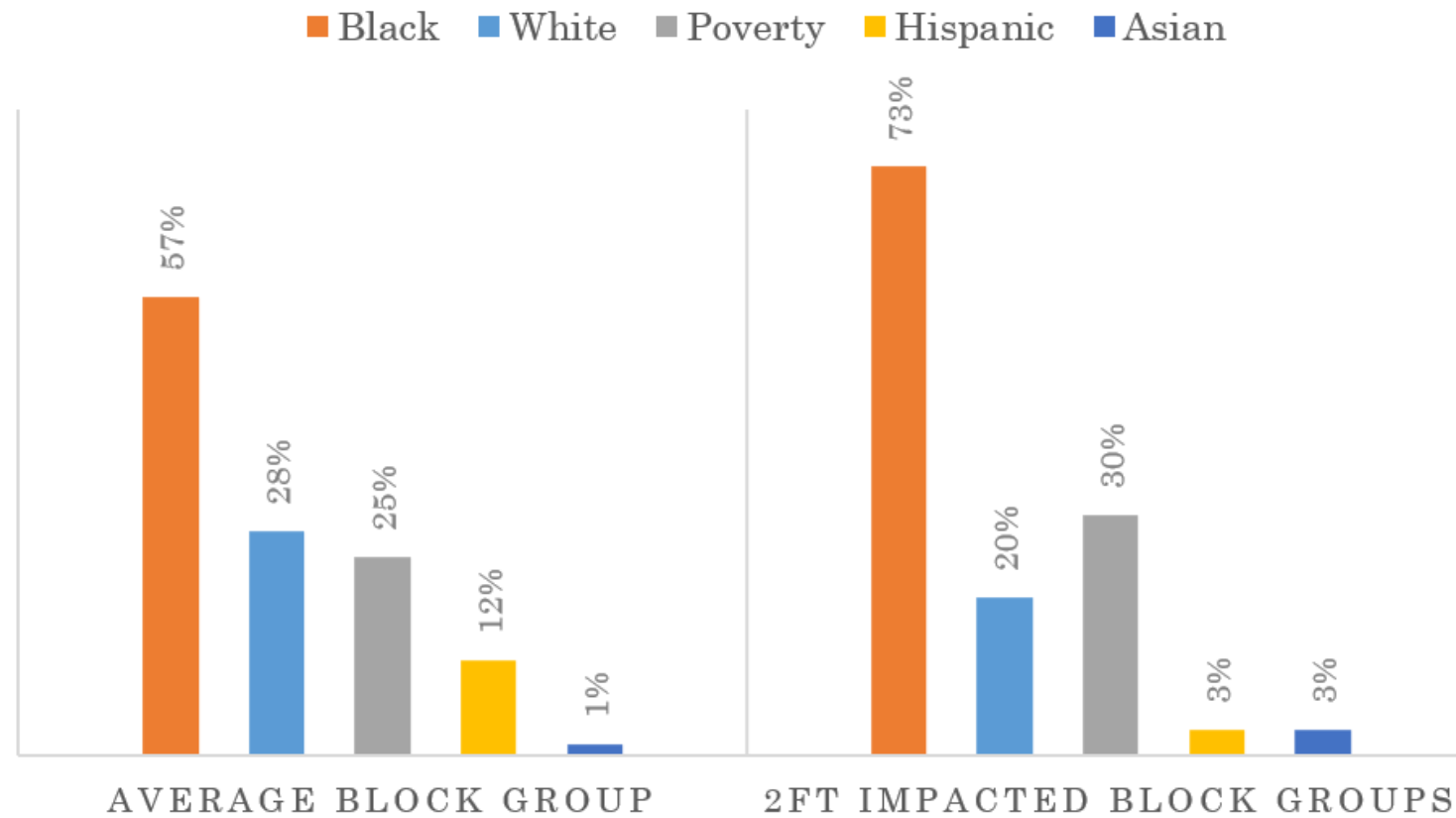
City of Wilmington, Delaware
2013-2017 ACS

■ Black ■ White ■ Poverty ■ Hispanic ■ Asian



SLR - Social Equity Analysis

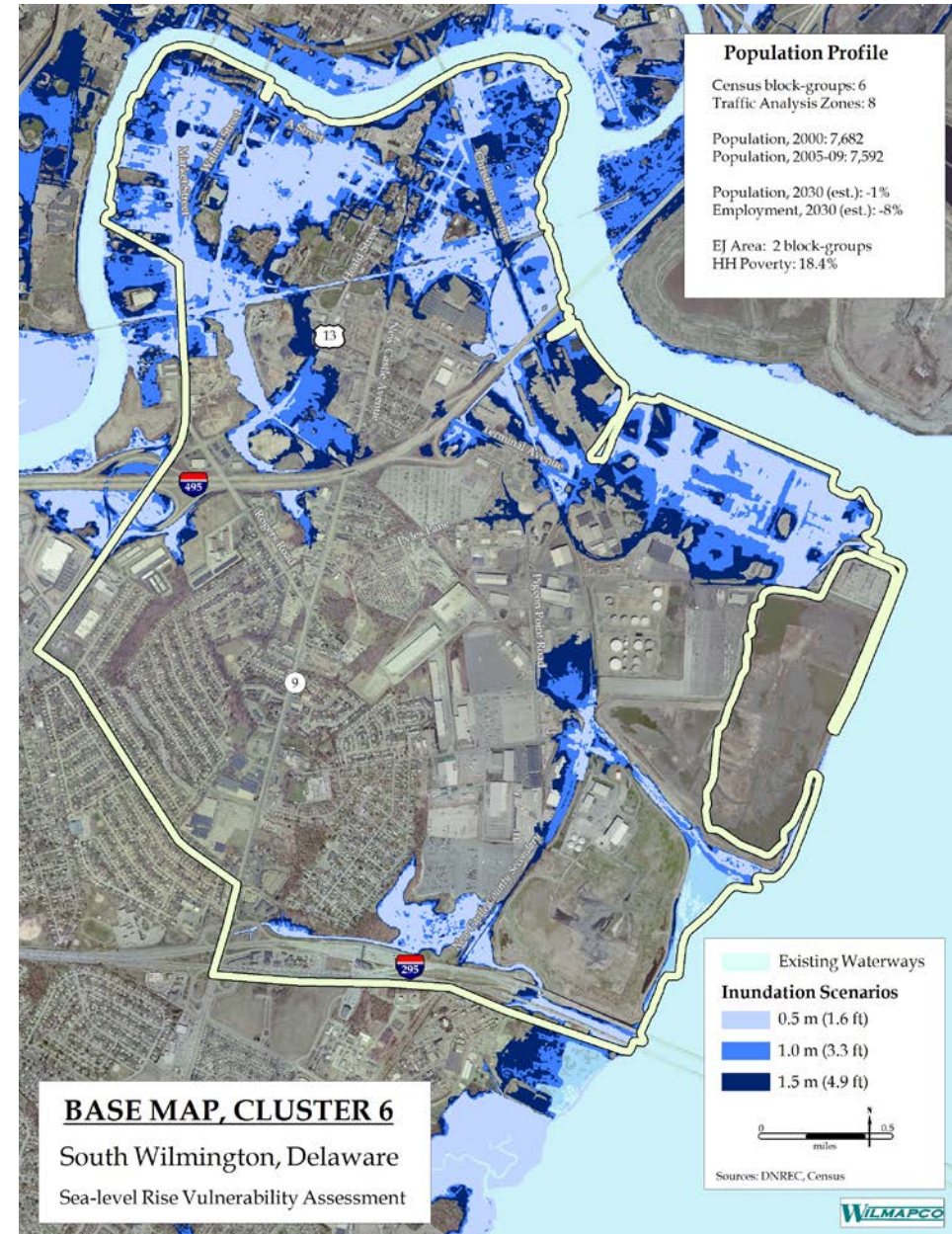
City of Wilmington, Delaware
2013-2017 ACS



Sub-Regional Studies

South Wilmington

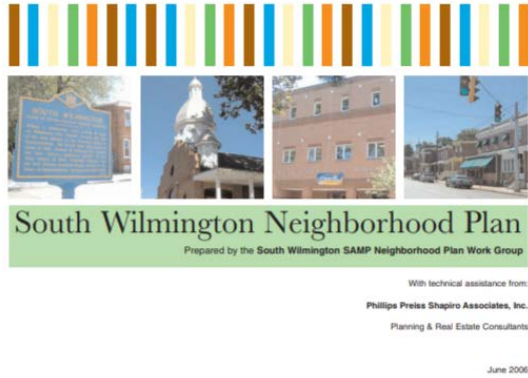
Base SLR Impacts



Sub-Regional Studies



2006



Southbridge Wetland Park

2015



2020 FHWA/FDOT Peer Exchange

2019





City of Wilmington/Oasis Design Group

Southbridge Wetland Park



2020 FHWA/FDOT Peer Exchange

Southbridge Wetland Park



Healthy Communities Delaware 2020
alignment. investment. impact.

Update of the original '06 Plan

*Advance planning for future SLR

Lessons Learned

Seek incremental policy change if necessary

Use scientific public opinion to justify controversial policy

Work alongside local and state partners

Stay in front of trends/introduce new ideas



wilmington.org

Bill Swiatek, AICP

Principal Planner

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302-737-6205 x113

POLL EVERYWHERE

- Which aspect of the Wilmington Area Planning Council's approach would be most beneficial to your organization?

DAVID WALKER, RPC



Dave has been with the Rockingham Planning Commission (RPC) since 2000 and became the Assistant Director in 2018. In addition to his role as Assistant Director, Dave has served as the Transportation Program Manager since 2010. Dave primarily works on the development and management of the Unified Planning Work Program (UPWP), agency transportation planning documents such as the Long Range Transportation Plan and Transportation Improvement Program (TIP), strategic documents such as the Congestion Management Process (CMP) and corridor studies, and technical assistance to communities in the region.

He received a B.A. in Political Science from the University of Vermont and a Masters in Urban and Regional Planning from the University of Hawaii. Dave lives in Exeter with his wife and three children and enjoys mountain biking in his free time.

Integrating Resiliency Into The MPO Planning Process

Dave Walker

Assistant Director

Transportation Program Manager

dwalker@therpc.org



METROPOLITAN
P L A N N I N G
O R G A N I Z A T I O N

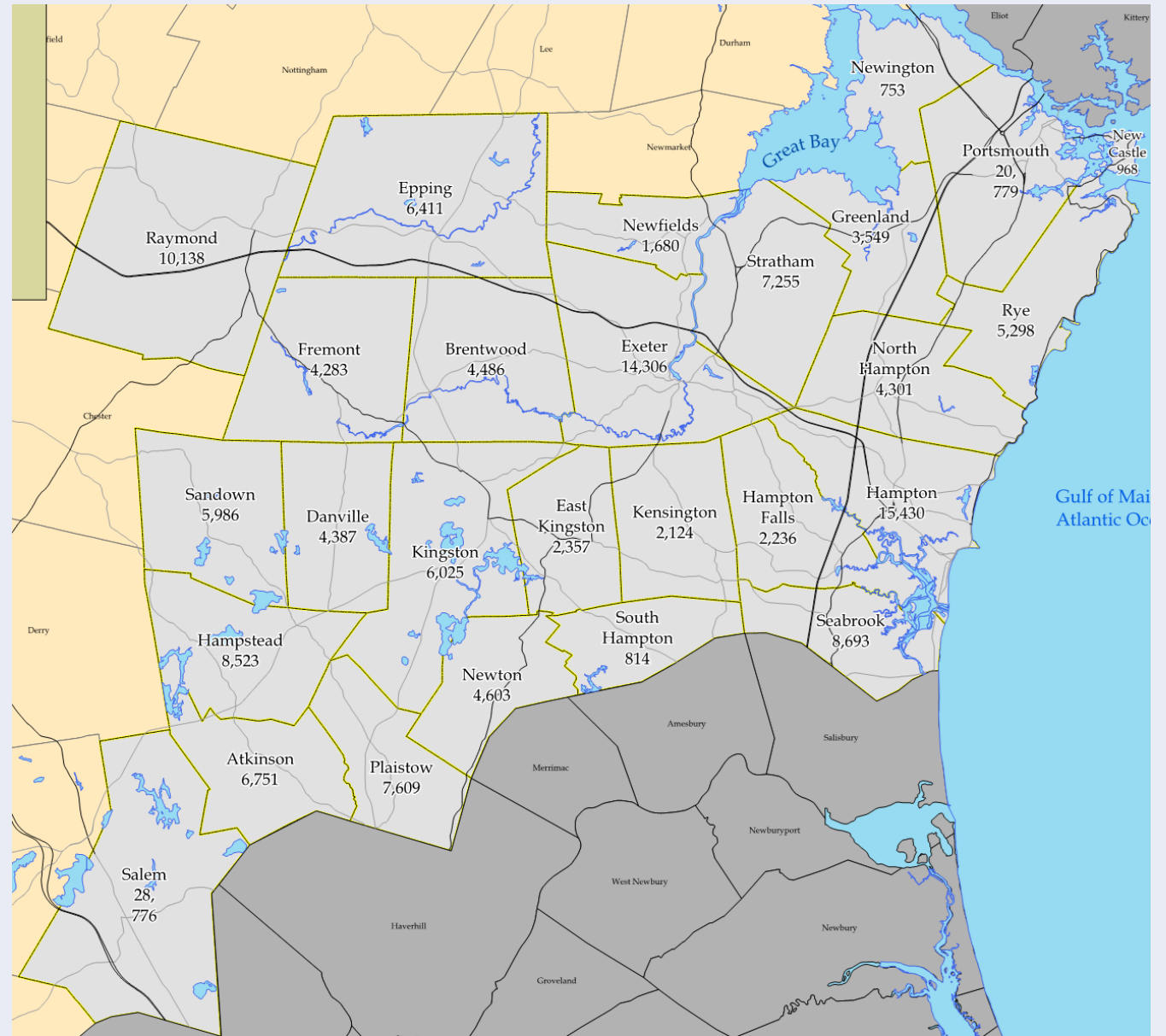
Empowering Communities
theRPC.org

Overview

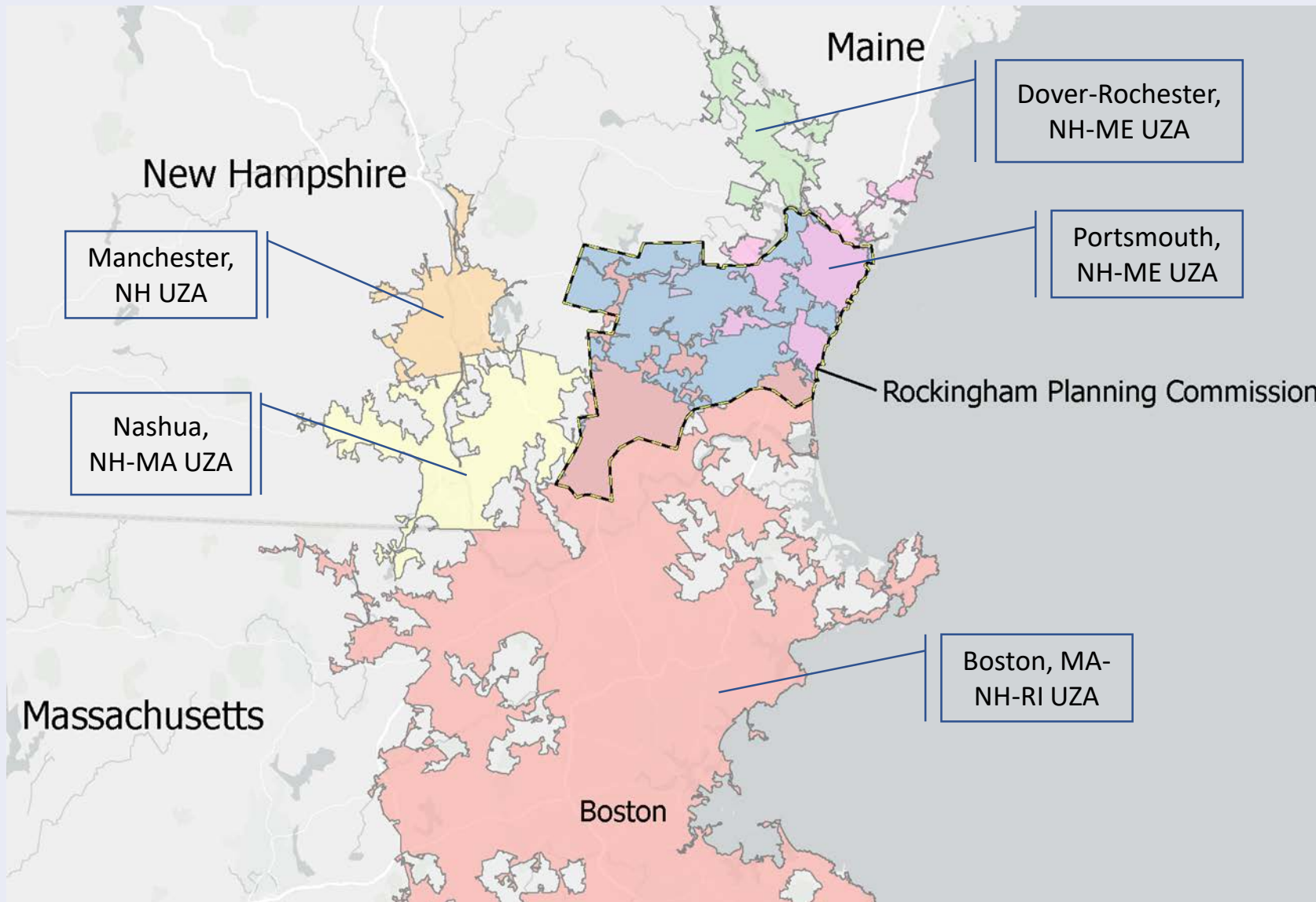
- Regional Context
- Identifying Climate Variables
- Articulating Objectives
- Identifying Relevant Assets
- Integrating into Decision-making
- Collaboration & Education
- Lessons Learned (so far)

Who We Are

- 27 Communities
- Regional Planning Commission
 - Community and Regional Land Use Planning
 - Transportation Planning
 - Environmental Planning
- Population: ~196,500
- Employment: ~120,000



Where we Are



- Designated as an MPO for the Portsmouth, NH Urbanized Area and a portion of the Boston Urbanized Area
- 1 of 4 MPOs in New Hampshire
- 1 of 11 MPOs in the Boston Urbanized Area over 3 States (MA, NH, RI)

Coastal Context

- **18.75 Miles** of Atlantic Shoreline
- **235 Miles** of Estuarine Shoreline
- Recreation Destination
- **5 million** overnight visitors per year
- **\$1.6 billion** in tourism spending



Identifying Climate Variables

- **NH Climate Action Plan (2009)** – Overarching strategies necessary to meet greenhouse gas reduction & climate change related goals. Guidance for research and planning initiatives and policy decisions.
- **Coastal Risks and Hazards Commission (2013-2016)** – Recommended legislation, rules and other actions to prepare for projected sea-level rise and other coastal and coastal watershed hazards.
 - Includes a Science and Technical Advisory Committee that updates science assumptions every 5 years (Most recently 2019).

Preparing New Hampshire for
Projected Storm Surge, Sea-Level Rise,
and Extreme Precipitation



Final Report and Recommendations

November 2016

Identifying Climate Variables

University of New Hampshire Institute for the Study of Earth, Oceans, and Space

- Modeling sea-level rise in coastal NH
- Effects of climate change on pavement & transportation infrastructure
- Impacts of flooding and sea level rise on critical estuaries and river systems

Provide the critical science that backs our planning and assessment work

Table 4.2. Projected local sea-level rise (in feet) estimates above 2000 levels for NH based on K14 and the Seavey Island tide-gauge.

Year	RCP	Central Estimate	Likely Range	1-in-20 Chance	1-in-100 Chance	1-in-200 Chance	1-in-1000 Chance
		50% probability SLR meets or exceeds:	67% probability SLR is between:	5% probability SLR meets or exceeds:	1% probability SLR meets or exceeds:	0.5% probability SLR meets or exceeds:	0.1% probability SLR meets or exceeds:
2030	RCP 4.5*	0.5	0.3 - 0.7	0.9	1.0	1.1	1.3
2050	RCP 4.5*	0.9	0.5 - 1.3	1.6	2.0	2.3	2.9
2100	RCP 2.6	1.4	0.6 - 2.5	3.4	5.0	5.8	8.6
2100	RCP 4.5	1.9	1.0 - 2.9	3.8	5.3	6.2	8.7
2100	RCP 6.0	2.0	0.9 - 3.3	4.3	5.8	6.8	9.4
2100	RCP 8.5	2.6	1.5 - 3.8	4.9	6.5	7.5	10.0
2150	RCP 2.6	2.0	0.9 - 3.4	5.1	8.6	10.7	17.0
2150	RCP 4.5	2.7	1.2 - 4.6	6.4	9.9	11.7	18.1
2150	RCP 6.0**	N/A	N/A	N/A	N/A	N/A	N/A
2150	RCP 8.5	4.0	2.6 - 5.8	7.6	11.4	13.4	19.9

The color in the rows for RCP 4.5 corresponds to the colors shown in Figure 4.5

* The 2050 RSLR projections using the RCP 4.5 scenario are very similar to the projections using the RCP 2.6, RCP 6.0, and RCP 8.5 scenarios. See text and Figure 5 for additional explanation.

** Projections for RSL after 2100 are not available for RCP 6.0.

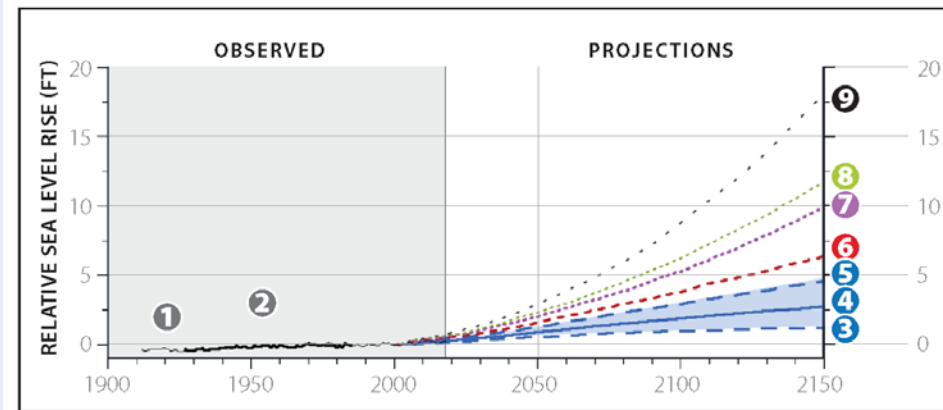


Figure 4.5. Observed and Projected Relative Sea-Level Rise for Seavey Island Tide Gauge K14 Projections | Stabilized Greenhouse Gas Concentrations (RCP 4.5).

- 1 Historical data for Portland, ME (1912-2018; thin black line)
- 2 Historical data for Seavey Island, ME (1927-1986; thick black line)
- 3 Lower end of "likely range"
- 4 Central estimate
- 5 Upper end of "likely range"
- 6 1-in-20 chance estimate
- 7 1-in-100 chance estimate
- 8 1-in-200 chance estimate
- 9 1-in-1000 chance estimate

Source: Wake, C., Knott, J., Lippmann, T., Stampone, M., Ballestero, T., Bjerklie, D., Burakowski, E., Glidden, S., Hosseini-Shakib, I., Jacobs, J. (2019). New Hampshire Coastal Flood Risk Summary – Part I: Science, page 16. Prepared for the New Hampshire Coastal Flood Risk Science and Technical Advisory Panel. Report published by the University of New Hampshire, Durham, NH.

Climate Impacts on Coastal NH

- Estimated **7.5-8.0** inches of Sea Level Rise (SLR) between 1912 and 2018
- **15-38%** increase in magnitude of daily extreme precipitation events since the 1950s
- 67% Probability of **0.5-1.3** feet of SLR between 2000 and 2050.
- Growing frequency of **"Sunny Day"** coastal flooding
- Frequency of extreme precipitation expected to continue to increase over next several decades



Articulating Objectives – Regional Master Plan

- **Vision**

- “Communities are acknowledging and planning for the effects of a changing climate. Anticipated changes include sea-level rise, increasing flood events, more erosion, periods of drought and other natural hazards.”

- **Regional Goal**

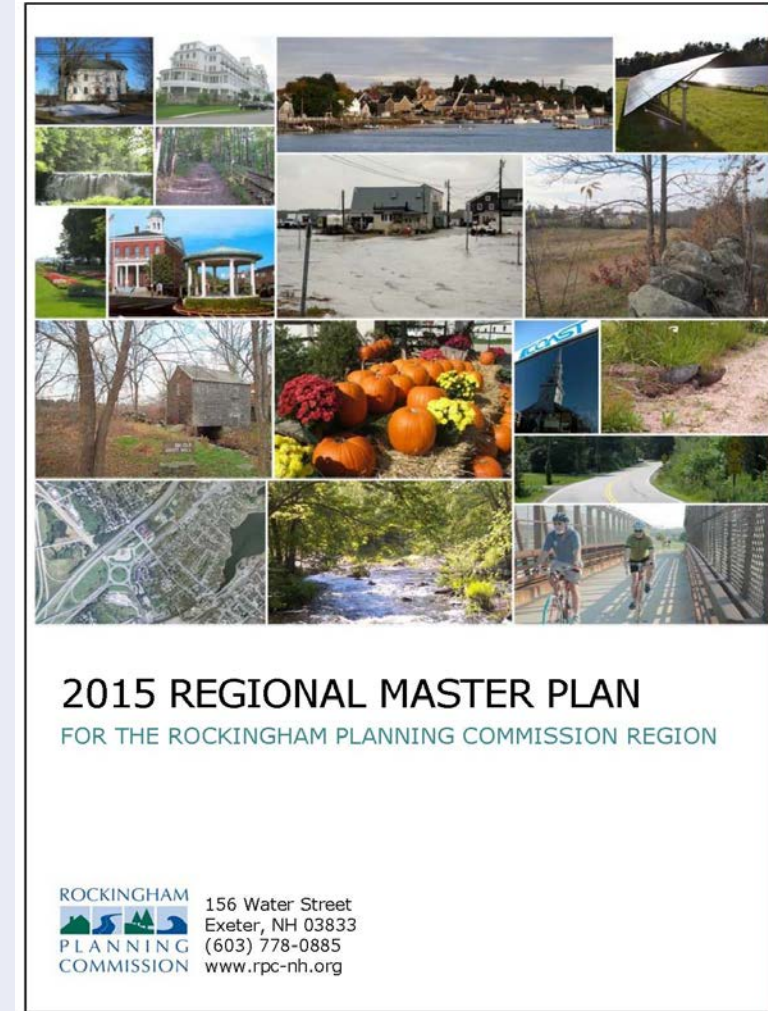
- “...Considers and incorporates climate change into local and regional planning efforts”

- **New Hampshire Livability Principles**

- **Climate Change and Energy Efficiency:** Identify opportunities to...reduce risks to our communities, businesses and citizens...How can we ...reduce impacts to our communities and infrastructure from extreme storms and flooding?

- **Climate Change Chapter (New!)**

- Science based assessment of current and future conditions. Set of 9 recommendations and implementation strategies.



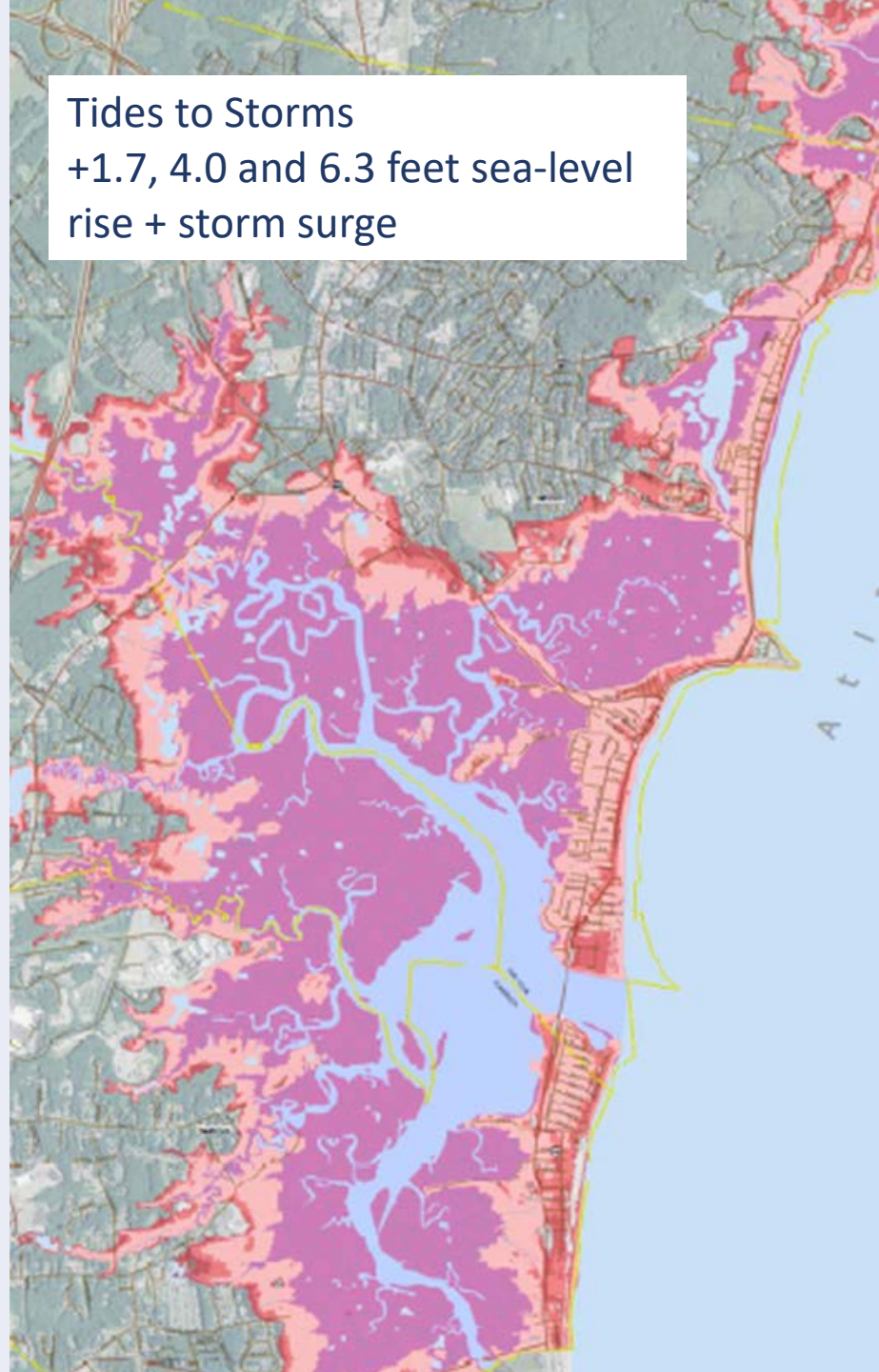
Articulating Objectives – MPO Transportation Plan

- Foundation in the Regional Master Plan
- MAP-21/FAST Act:
 - Resiliency Planning Factor
 - National Performance Goal of Environmental Sustainability
- Transportation Resiliency Goal:
 - “The region’s transportation system is adaptive and resilient to climate change and natural and other hazards.”



Identifying Relevant Assets

- **NHDOT Potential Impacts of Climate Change on Transportation Infrastructure (2014)** – Assessment of vulnerability of, and impacts to, transportation assets, programs, policies, and activities.
- **Tides to Storms (2015)** – Assessment of the vulnerability of coastal communities and infrastructure to flooding from expected increases in flooding due to sea level rise and storm surge.
- **Climate Risk in the Seacoast (2017)** – Assessment of the vulnerability of Great Bay communities and infrastructure to flooding from expected increases in storm surge and rates of sea level rise.



Tides to Storms
+1.7, 4.0 and 6.3 feet sea-level
rise + storm surge

Impacts of Sea Level Rise on Coastal NH

State & Local Roads Impacted by sea-level rise and sea-level rise + storm surge (reported in miles)

Coastal Region	1.7 feet SLR	4.0 feet SLR	6.3 feet SLR	100-year/1% + 1.7 feet SLR	100-year/1% + 4.0 feet SLR	100-year/1% + 6.3 feet SLR
Total Miles	5.2	23.6	43.6	51.5	60.6	76.1

Land and Natural Resources Impacted by Sea-Level Rise and Sea-Level Rise + Storm Surge (reported in acres)

Coastal Region	+ 1.7 feet SLR	+ 4.0 feet SLR	+ 6.3 feet SLR	100-year/1% + 1.7 feet SLR	100-year/1% + 4.0 feet SLR	100-year/1% + 6.3 feet SLR
Upland	1,484.55	2,602.20	3,613.50	3,473.5	4,439.0	5,298.4
Freshwater Wetlands	184.1	396.2	518.7	488.8	592.5	660.6
Tidal Water Wetlands	235.3	257.3	264.2	266.5	268.4	268.6
Conservation and Public Lands	492.7	717.0	873.0	882.6	1,007.0	1,131.0
Agricultural Soils (all types)	122.7	378.1	677.6	620.4	937.0	1,237.5

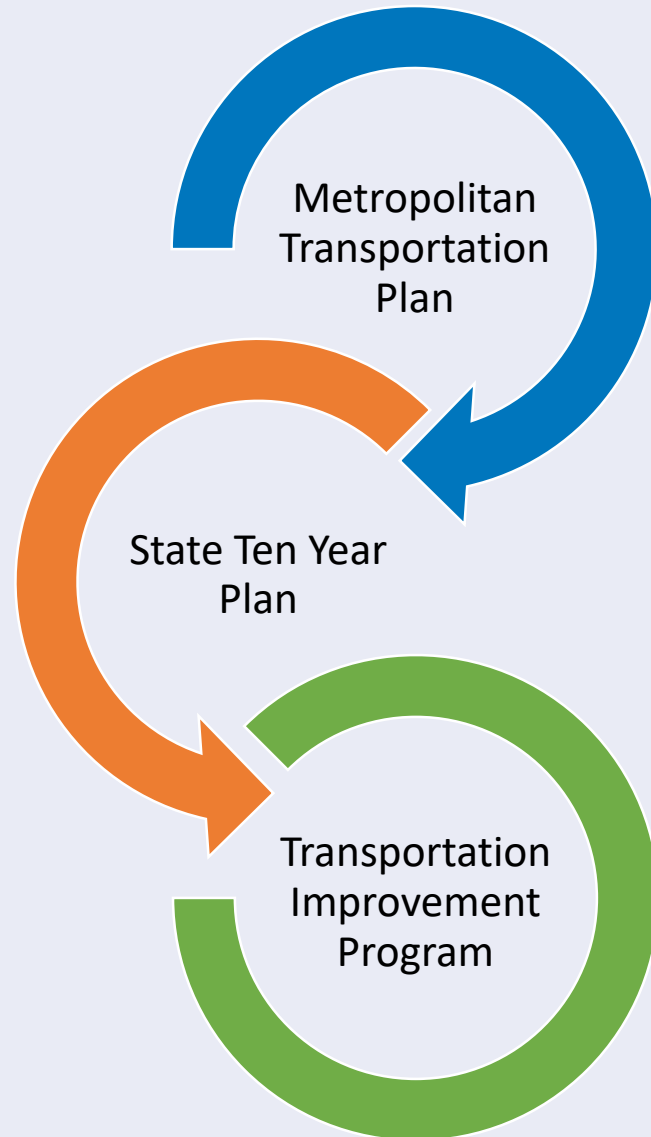
Integrate into Decision-Making – MPO Transportation Plan

- **Assessment of current conditions and concerns** as detailed in various studies
- **Discussions of future conditions and needs** related to **Energy, Environment and Resiliency**
 - Integrated findings from **Tides to Storms** and other studies.
- **Identifies need for analysis** of potential impacts of climate change on coastal roadways.
- **No Specific Project Recommendations**

I-95/ US 1/ NH 1A/1B Coastal Corridors: The coastal roadways in New Hampshire face potential climate change impacts via sea level rise such as increased susceptibility to flooding that will impact the condition of the roadways, access to property, and the safety of residents, employees, and the tourists that visit the area. An analysis of these potential impacts is necessary to more precisely determine the location, potential mitigation measures, and other strategies to ensure access to the coast as conditions change.

Integrate Into Decision-Making – Project Selection

New Hampshire Transportation Planning Process



Project Concepts

- 20+ Year Planning Horizon
- Updated every 4 years
- Prioritize Candidate Projects for State Ten Year Plan

Project Selection and Development

- 10 Year Planning Horizon
- Updated Every 2 Years
- Statewide Queue of Projects
- Regional Priorities Incorporated (Budget Target)

Project Implementation

- 4 Year Horizon
- Updated every 2 years
- Incorporate TAP/CMAQ/HSIP projects

Integrate into Decision-Making – Project Selection

Natural Hazard Resiliency

NH TEN YEAR PLAN
Regional Project Review

Definition: 1) an analysis of the **natural hazard risks** (i.e. flood history) to a transportation facility, and; 2) a forward-looking analysis of how the **natural hazard mitigation** measures proposed as part of a project would reduce hazard risks.

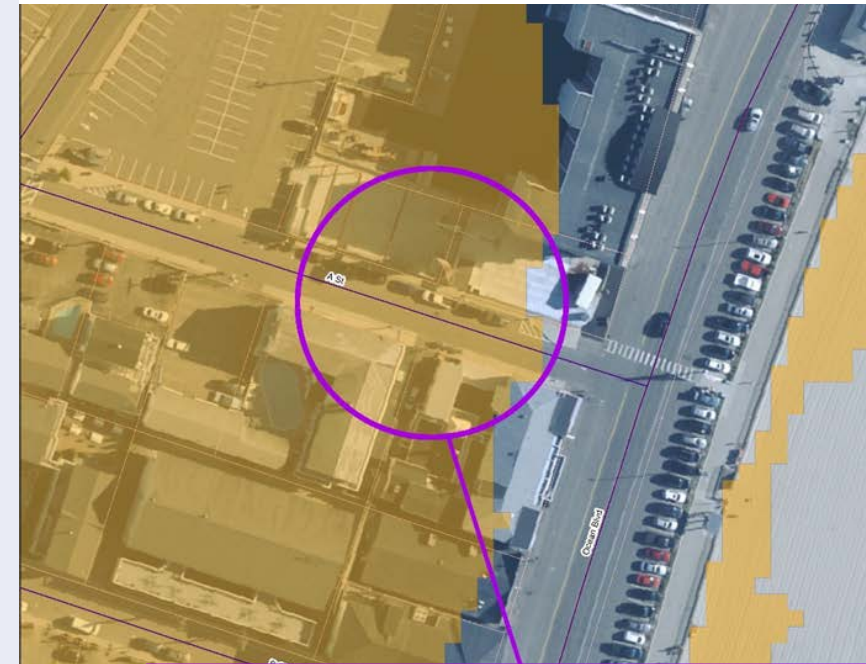
REGIONAL EVALUATION CONSIDERATIONS	POTENTIAL RESOURCES & DATA SOURCES
<p>Natural Hazard Risk NEED</p> <p><u>Hazard Risk</u></p> <ul style="list-style-type: none">Are natural hazards in the project area documented in a plan, study, or database?Have natural hazards previously impacted transportation infrastructure and/or mobility in the project area? How frequently?Are natural hazard risks anticipated to increase in severity/impact (for example, due to anticipated impacts of climate change)?	<p>Resources:</p> <p><u>Hazard Risk</u></p> <ul style="list-style-type: none">Local plans: Hazard Mitigation Plans, Master Plans, Capital Improvement Plans, Emergency Operations Plans, etc.Regional plans: Regional Transportation Plan, Corridor Studies, River Corridor Management Plans, Watershed-Based Plans, Regional Plan, Comprehensive Economic Development Strategy, etc.Local and Regional Vulnerability AssessmentsResults of studies or assessments, such as geotechnical studies, fluvial geomorphology studies, SADES-based assessments, etcHydraulic capacity modeling results/reportsFEMA Flood Hazard MapsRegional studies on anticipated impacts of climate change on natural hazard risk
<p>Natural Hazard Mitigation IMPACT</p> <p><u>Hazard Mitigation - All Projects</u></p> <p>To what extent does the project <u>mitigate</u> or <u>adapt</u> to known natural hazards in the project area? Does the project propose <u>in-kind</u> replacement of hazard-prone infrastructure?</p> <ul style="list-style-type: none">Mitigate (highest score): project eliminates or substantially reduces risk from known natural hazard (e.g., relocates infrastructure away from flood hazard area).Adapt (moderate score): project addresses known natural hazard but does not entirely mitigate risk (e.g., reinforces infrastructure in place).In-kind (lower score): project simply replaces hazard-prone with same/similar infrastructure (e.g., replace stream culvert with culvert of same dimensions). <p><u>Hazard Mitigation - Additional Stream Culvert & Bridge Project Considerations</u></p> <ul style="list-style-type: none">Is the project responsive to stream characteristics, such as flood propensity, slope, bankfull width, and orientation to roadway?	<p>Resources:</p> <p><u>Hazard Mitigation - All Projects</u></p> <ul style="list-style-type: none">RPC review of project scopeSection 6.4 of FHWA's <i>HEC 17: Highways in the River Environment - Floodplains, Extreme Events, Risk, and Resilience</i>, 2nd Edition https://www.fhwa.dot.gov/engineering/hydraulics/pubs/hif16018.pdfSection 3.4 FHWA's <i>HEC 25: Highways in the Coastal Environment: Assessing Extreme Events: Volume 2 - 1st Edition</i> https://www.fhwa.dot.gov/engineering/hydraulics/pubs/nhi14006/nhi14006.pdf <p><u>Hazard Mitigation - Stream Culvert & Bridge Projects</u></p> <ul style="list-style-type: none">NH SADES stream crossing assessment dataHydraulic capacity modeling results/reportsNorth Country Council <i>Stream Crossings for Flood Resiliency & Ecological Health</i>: http://www.nccouncil.org/wp-content/uploads/2019/08/NCC-Stream-Crossing-Guide_FINAL.pdf

- Incorporated into Statewide Project Selection process in 2018 and modified in 2020
- Considers two aspects:
 - Risk
 - To what extent is the project area vulnerable to damage from natural hazards?
 - Mitigation
 - To what extent does the project mitigate or adapt to known natural hazards in the area?

Developing Project Recommendations

- **Seacoast Transportation Corridors Vulnerability Assessment (2021)** – Understand transportation infrastructure potentially impacted by sea level rise and groundwater rise and assess and prioritize needed improvements.
 - Built on results of Tides to Storms (2015) and Climate Risk in the Seacoast (2017)
 - Leveraged mapping of areas projected to be flooded due to sea level rise and photographic evidence from a recent storm.
 - Developing profiles of each impacted location at 1', 1.7' and 4' Sea Level Rise Scenarios

A Street & Ocean Blvd, Hampton – Tides to Storms Flooding Impact Estimates at 4' SLR



A Street & Ocean Blvd, Hampton –
March, 2018

Developing Project Recommendations

- Prioritized set of locations to be addressed
- Detailed assessment of highest priority locations
- Understanding where a roadway improvement may mitigate or eliminate impacts from SLR.
- Conceptual improvements to address SLR impact on roadway infrastructure.
- Recommendations for improving project selection criteria

Inundated Road Segments



Collaboration & Education

- **Coastal Adaptation Workgroup** (2009- Present) – 24 organizations working together to identify climate and resilience projects and opportunities for research, assessment, and planning.
- **High Water Mark Initiative** (2018) – Installed permanent markers and signage at strategic locations showing the elevation and causes of flooding from past and/or future events and climate related conditions.
- **Setting SAIL** (Ongoing) – Providing technical support for municipal implementation of recommendations from the Coastal Risks and Hazards Commission final report.
- All studies have included outreach and education components and often a Citizens Advisory Committee to provide feedback



Lessons Learned So Far

- **Incremental steps** to implement based on capacity
- **Collaborate** with research and planning partners where available
 - CAW brings together State, Regional, and local agencies with researchers and decision-makers.
- **Leverage outside funding** when you can
 - Coastal Zone Program and NOAA funding has been critical to our progress
- **Integrate “real-world”** examples where possible
 - Powerful images of storm surge flooding overlaid on expected SLR flooding areas left lasting impressions and help focus the conversation.

POLL EVERYWHERE

- Which aspect of the Rockingham Planning Commission's approach would be most beneficial to your organization?

Panel Discussion: Challenges and Opportunities



WRAP UP

- **Tomorrow: Session 3 Resilience Investments**
 - Houston-Galveston Area Council (H-GAC)
 - North Jersey Transportation Planning Authority (NJTPA)
 - Volpe Center
 - Hampton Roads TPO
- **Monday: Session 4 Lessons Learned**