

Prepared for
Narragansett Bay
Commission

CSO Control Facilities Phase III Reevaluation IPF: Alternative Plans & Affordability

4 December 2014

Providence

Rumford

East Providence

Edgewood Lake

Edgewood Yacht Club

Fav Memorial Field



MWH

BUILDING A BETTER WORLD



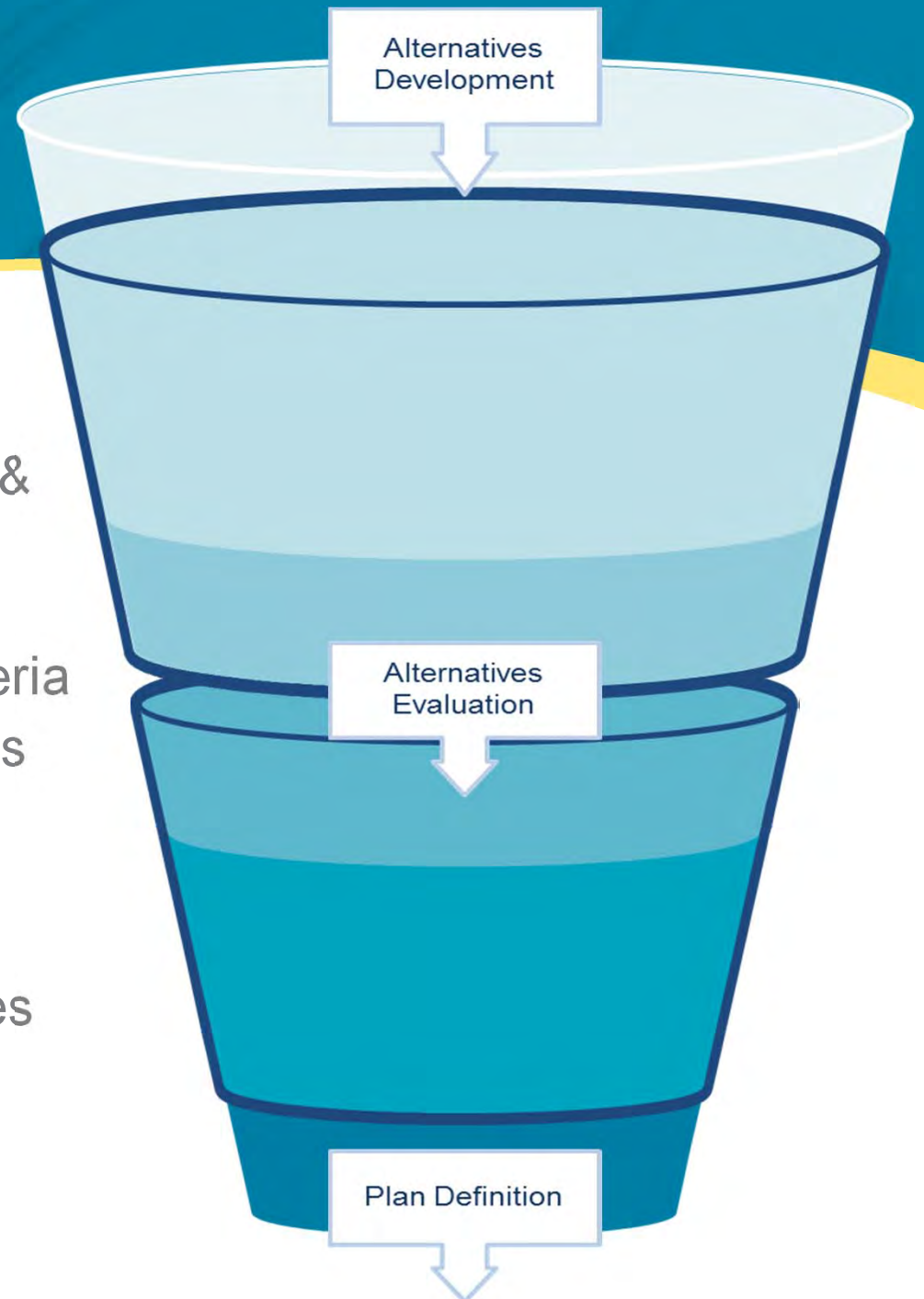
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Outline

- Alternative Plans
- Alternative Plan Comparisons
 - CSO volumes / water quality
 - Affordability
- Conclusions

Development & Evaluation Process

- Alternatives Development
 - April 10 & May 22, Grey & Green Infrastructure
- Alternatives Evaluation
 - June 19, Evaluation Criteria
 - September 4, Alternatives Analysis Workshop
- Plan Definition
 - October 23, IPF: Affordability & Alternatives Costs
 - December 4, Alternative Plans & Affordability



Alternative Plans



BUILDING A BETTER WORLD

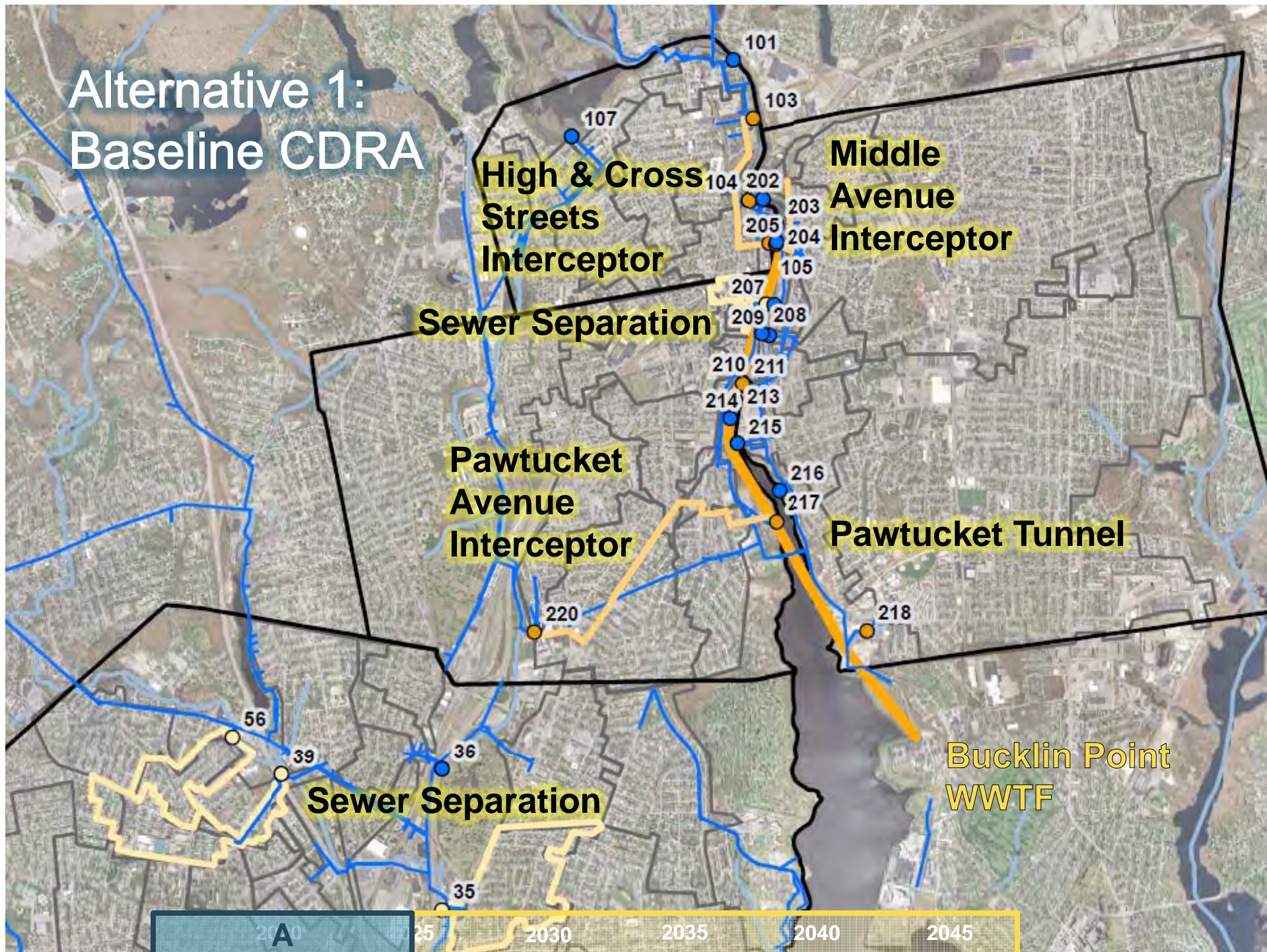


Alternative Plans

- Alternative 1: Baseline CDRA
 - One phase
 - Complete 2025
- Alternative 2: Modified Baseline with Phased Implementation
 - Four phases
 - Complete 2038
- Alternative 3: Modified & Phased Baseline with Extended Schedule & Interim Water Quality Projects
 - Six phases
 - Complete 2047
- Alternative 4: BPWWTF Storage & Treatment (No Tunnel)
 - Different design goal
 - Four phases
 - Complete 2038

**Alternative 1:
Baseline CDRA**

Alternative 1: Baseline CDRA



Alternative 1: Baseline CDRA Timeline

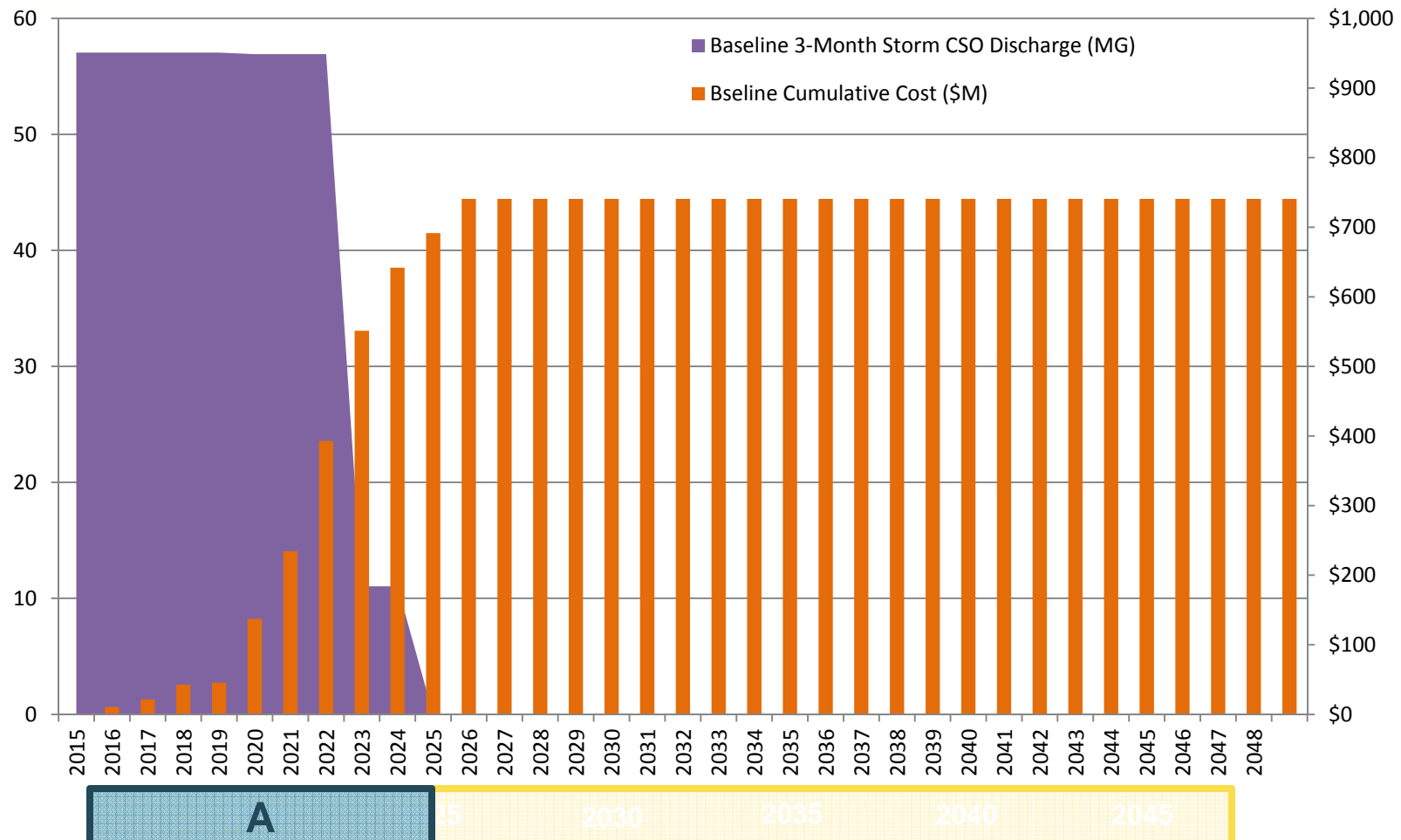
One Phase

- 2015 – 2018: Regulatory Review, Design, Bidding
- 2019 – 2023: Tunnel; 206 Separation; & Pawtucket Avenue Interceptor
- 2024 – 2025: High & Middle Street Interceptors; 035, 039, 056 Separation

Completion: end of 2025

Cumulative Costs and CSO Volume Reductions

Alternative 1: Baseline CDRA Scenario



Subsystem Alternatives Analysis Conclusion

Revised Phase III

High & Cross Streets Interceptor

Middle Street Interceptor

Hybrid GSI/Sewer Separation

GSI in Targeted Areas

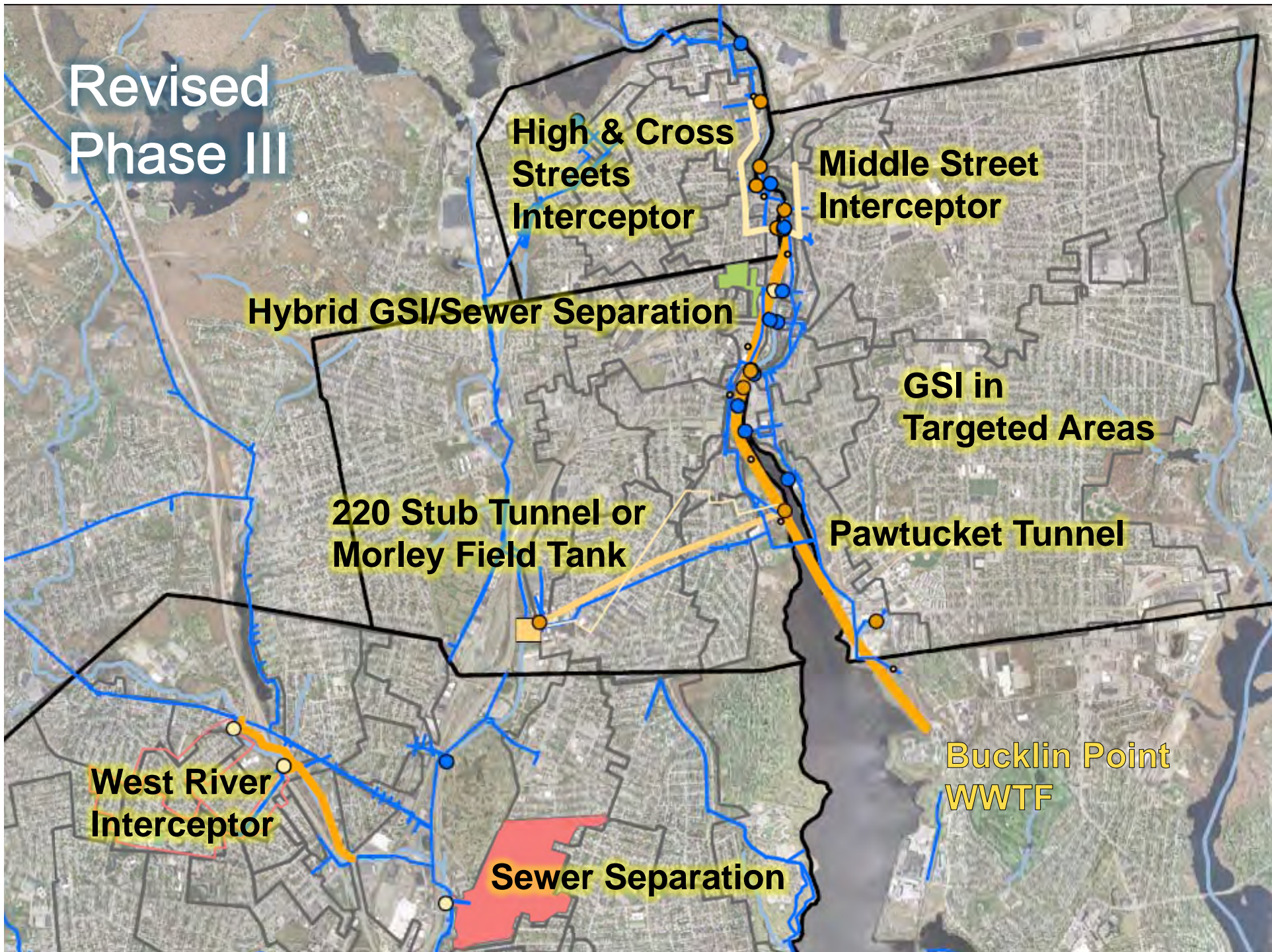
220 Stub Tunnel or Morley Field Tank

Pawtucket Tunnel

West River Interceptor

Bucklin Point WWTF

Sewer Separation



Subsystem Alternative Analysis Conclusion

- Baseline components confirmed as preferable
 - Pawtucket Tunnel
 - High Street Interceptor / Middle Street Interceptor
 - 035 Sewer Separation
- Baseline components altered
 - 206 Hybrid Separation (\$1.6M savings vs. Sewer Separation)
 - West River Interceptor (\$6.3M savings vs. 035-056 Separation)
 - 220 Stub Tunnel (adds \$33.5M cost vs. Pawtucket Ave Interceptor)
- New components introduced
 - Green Stormwater Infrastructure
 - Consideration for interim disinfection projects

Alternative 2: Modified Baseline with Phased Implementation

Alternative 2: Modified & Phased Baseline

High & Cross
Streets
Interceptor

Middle Street
Interceptor

Hybrid GSI/Sewer Separation

GSI in
Targeted Areas

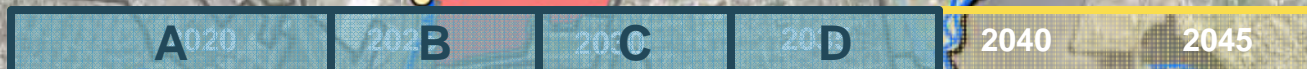
220 Stub Tunnel or
Morley Field Tank

Pawtucket Tunnel

West River
Interceptor

Sewer
Separation

Bucklin Point
WWTF



Alternative 2: Modified & Phased Baseline Timeline

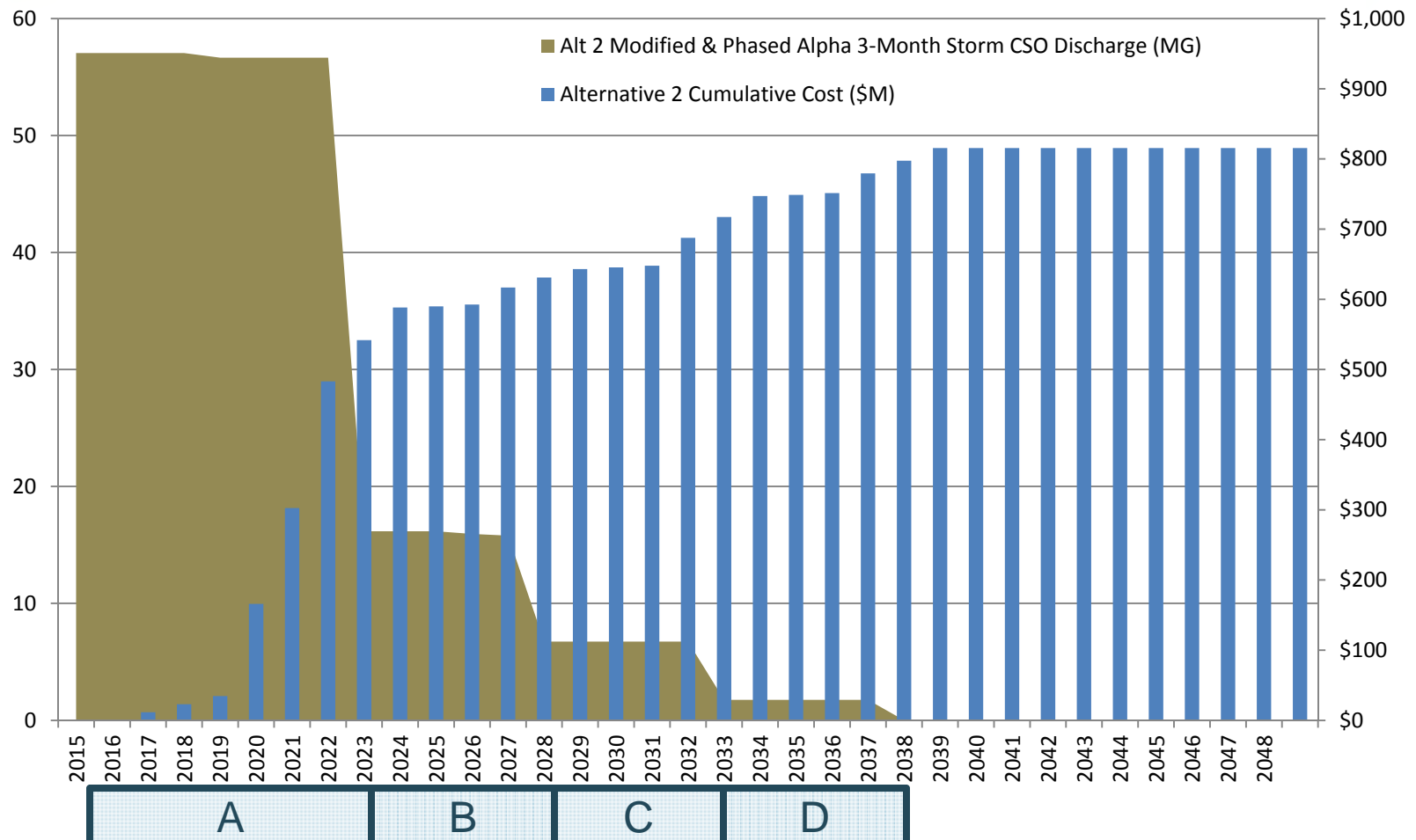
Four Phases – Design & review follows construction of previous phase

- 2015: Concept Review
- 2016: Phase III-A – Pawtucket Tunnel, Drop Shafts & Regulator Modifications; GSI in 212, 213, 214
- 2024: Phase III-B – High & Cross Street Interceptor; Middle Street Interceptor; 206 Hybrid Separation; GSI in 101, 104, 105
- 2029: Phase III-C – 220 Stub Tunnel; GSI in 216, 217
- 2034: Phase III-D – West River Interceptor; 035 Separation; GSI in 201 thru 204

Complete at end of 2038

Cumulative Costs and CSO Volume Reductions

Alternative 2: Modified & Phased Baseline



Potential Optimization

Extend Tunnel
~~High & Cross~~
Streets
Interceptor

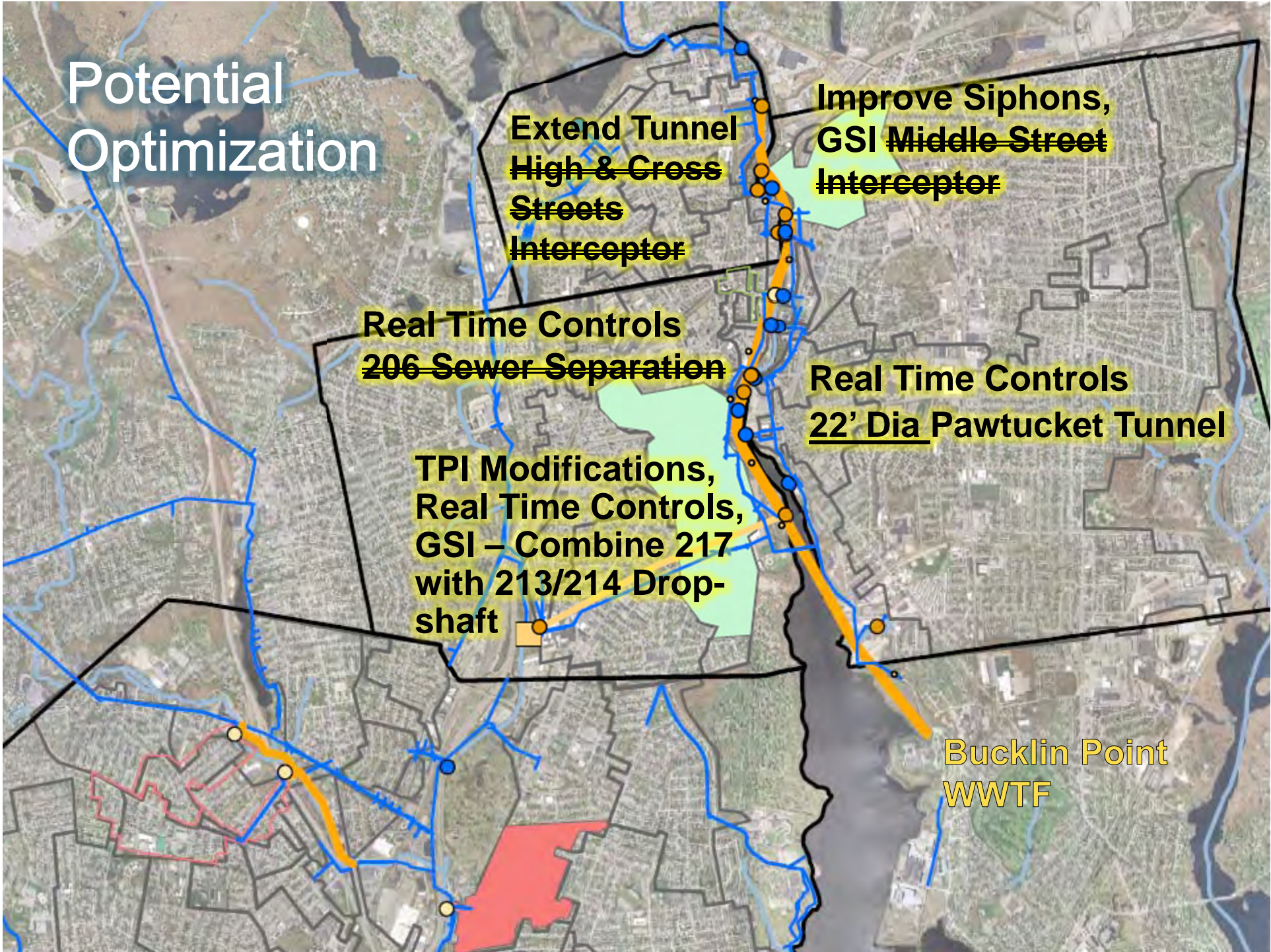
Improve Siphons,
~~GSI Middle Street~~
Interceptor

Real Time Controls
~~206 Sewer Separation~~

Real Time Controls
22' Dia Pawtucket Tunnel

TPI Modifications,
Real Time Controls,
GSI – Combine 217
with 213/214 Drop-
shaft

Bucklin Point
WWTF



Potential System Optimization

- Concepts:
 - GSI reduces grey infrastructure size / cost
 - Increase siphon capacity
 - Eliminate / Alter Middle Street Interceptor
 - Modify Taft-Pleasant Interceptor
 - Combine drop shafts for 217 and 213/214
 - Eliminate sewer separation component of 206
 - Extend tunnel to 103 and eliminate High & Cross Street Interceptor
 - Introduce Real Time Controls (RTC) / “smart system”
 - 23’ diameter tunnel (standard transit tunnel size)
 - 20’ diameter Pawtucket & 220 Stub tunnel (same volume)
 - 220 Tank options
- Potential program cost reduction of \$50M to \$100
- **Require additional investigation for confirmation**
- **Not included in affordability analysis**

Potential Alternative 1 Optimization

- Add 1 to 2 years and cost to Phase III-A
 - Siphon work
 - Taft-Pleasant work
 - Real time controls
 - Longer tunnel, 23-foot diameter, 5 drop shafts (combines 213/14 with 217, adds 103)
 - Or 20-foot diameter main & stub tunnels, 6 drop shafts (includes 220)
- Eliminate Phases III-B and/or III-C
 - Delete High & Cross St Interceptor, Middle St Interceptor, 206 separation
 - Combine stub tunnel into main tunnel contract
 - Cost savings
 - Schedule shortening
- Overall completion: 2031 - 2035

**Alternative 3: Modified & Phased
Baseline with Extended Schedule &
Interim Water Quality Projects**

Alternative 3: Modified, Extended & Augmented Baseline

High & Cross
Streets
Interceptor

Middle Street
Interceptor

Hybrid GSI/Sewer Separation

GSI in
Targeted Areas

220 Stub Tunnel

Pawtucket Tunnel

220 Disinfection

218 – BPWWTF
Interceptor

Bucklin Point
WWTF

West River
Interceptor

Sewer
Separation



Alternative 3: Modified, Extended & Augmented Baseline Timeline

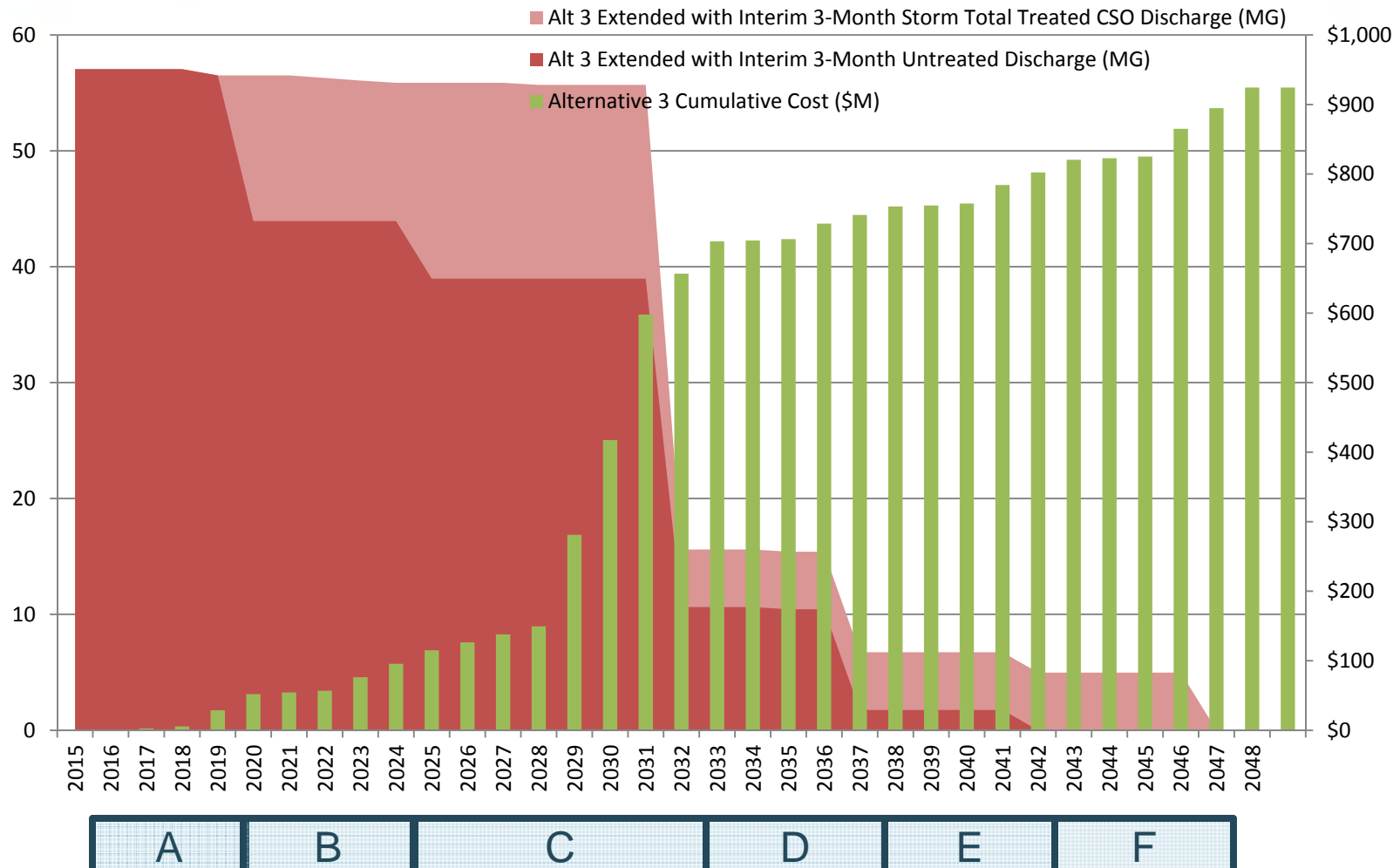
Six Phases – Design & review follows construction of previous phase

- 2015: Concept Review
- 2016: Phase III-A – 218-BPWWTF Wet Weather Interceptor; 206 Hybrid Separation; GSI in 212, 213, 214
- 2020: Phase III-B – 220 Screening & Disinfection; GSI in 101, 104, 105, 216, 217, 201 thru 204 (Note: this phase could be extended)
- 2025: Phase III-C – Pawtucket Tunnel, Drop Shafts & Regulator Modifications; GSI in 215 (218-BPWWTF off-line)
- 2033: Phase III-D – High & Cross Street Interceptor; Middle Street Interceptor; GSI in 205
- 2034: Phase III-E – West River Interceptor; 035 Separation; GSI in 205
- 2038: Phase III-F – 220 Stub Tunnel; GSI in 205 (220 Disinfection off-line)

Complete at end of 2047

Cumulative Costs and CSO Volume Reductions

Alternative 3: Modified, Augmented & Extended Baseline



**Alternative 4:
BPWWTF Storage & Treatment
(No Tunnel)**

BPWWTF Storage & Treatment (No Tunnel)

**High & Cross
Streets
Interceptor**

**Middle Street
Interceptor**

**GSI in
Targeted Areas**

**218 to 205
Interceptor**

**220 Small
NSS Tank**

**West River
Interceptor**

**Sewer
Separation**

**218 – BPWWTF
Interceptor, NSS Tank**

id
Model Tunnel Links



BPWWTF Storage & Treatment (No Tunnel) Timeline

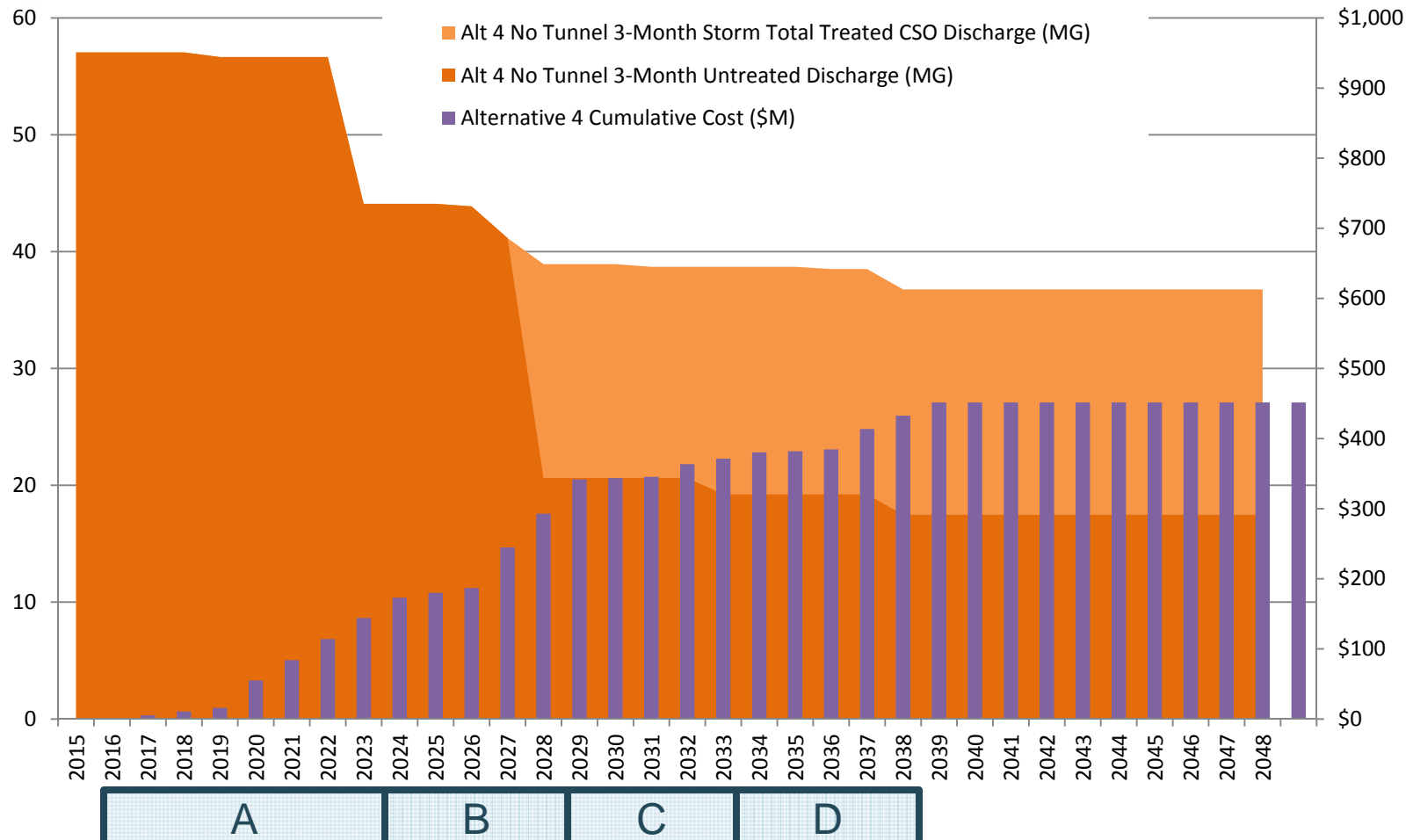
Four Phases – Design & review follows construction of previous phase

- 2015: Concept Review
- 2016: Phase III-A – 218 Interceptor, 14MG BP tank, 21MG BP disinfection; GSI in 212, 213, 214
- 2024: Phase III-B – 220 2.7 MG NSS tank; 218 to 205 Interceptor; GSI in 101, 104, 105
- 2029: Phase III-C – High & Cross Street Interceptor; Middle Street Interceptor; GSI in 216, 217
- 2034: Phase III-D – West River Interceptor; 035 Separation; GSI in 201 thru 204

Complete at end of 2038

Cumulative Costs and CSO Volume Reductions

Alternative 4: BPWWTF Storage & Treatment (No Tunnel)



BPWWTF Storage & Treatment (No Tunnel) Optimization

- Requires additional investigations
- Refinement of interceptor & tank design
- Pumping assumptions
- Additional modeling & cost estimation

Alternative Plan Comparisons



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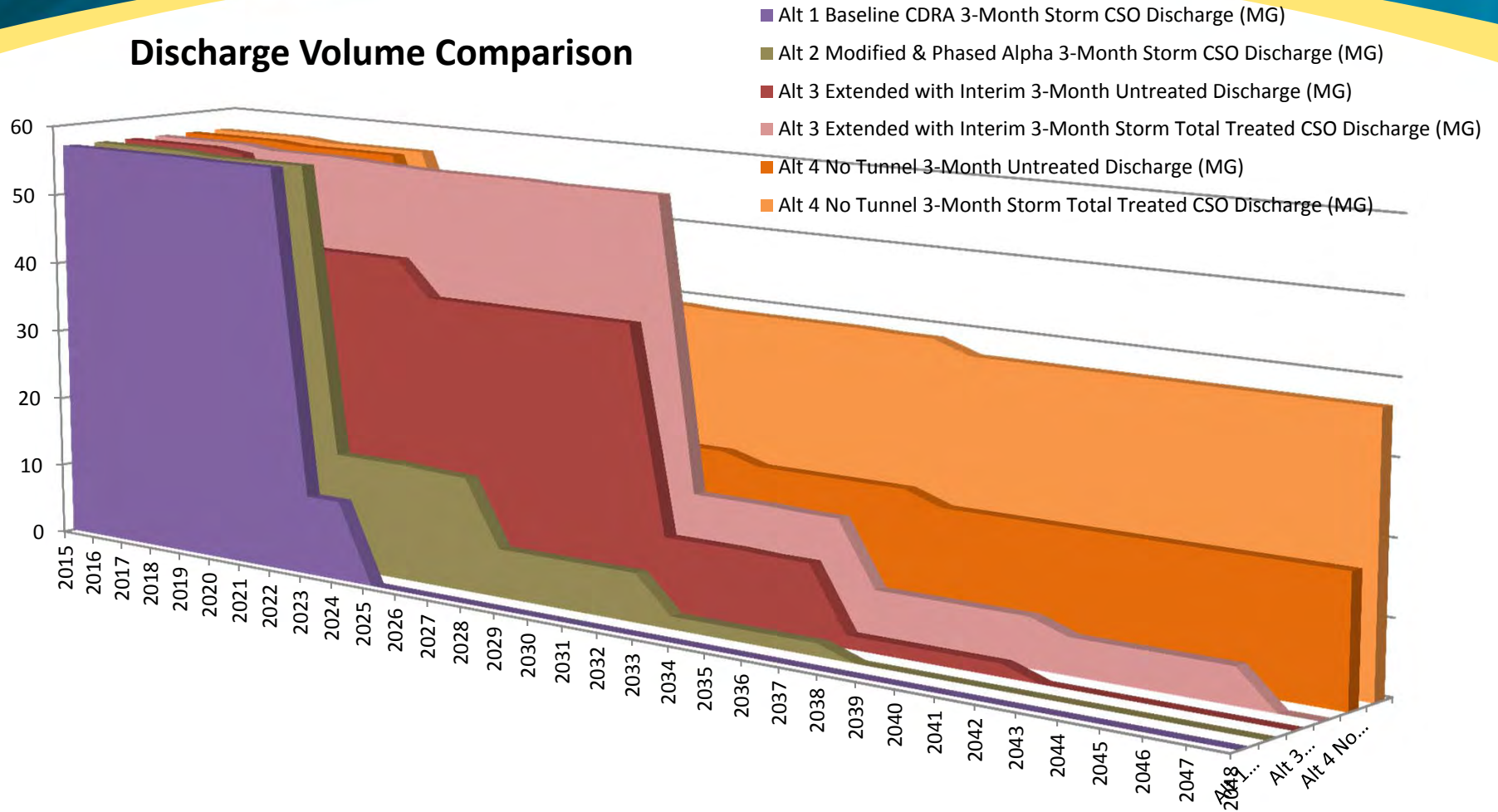


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CSO Volumes

Alternative Plan Comparison

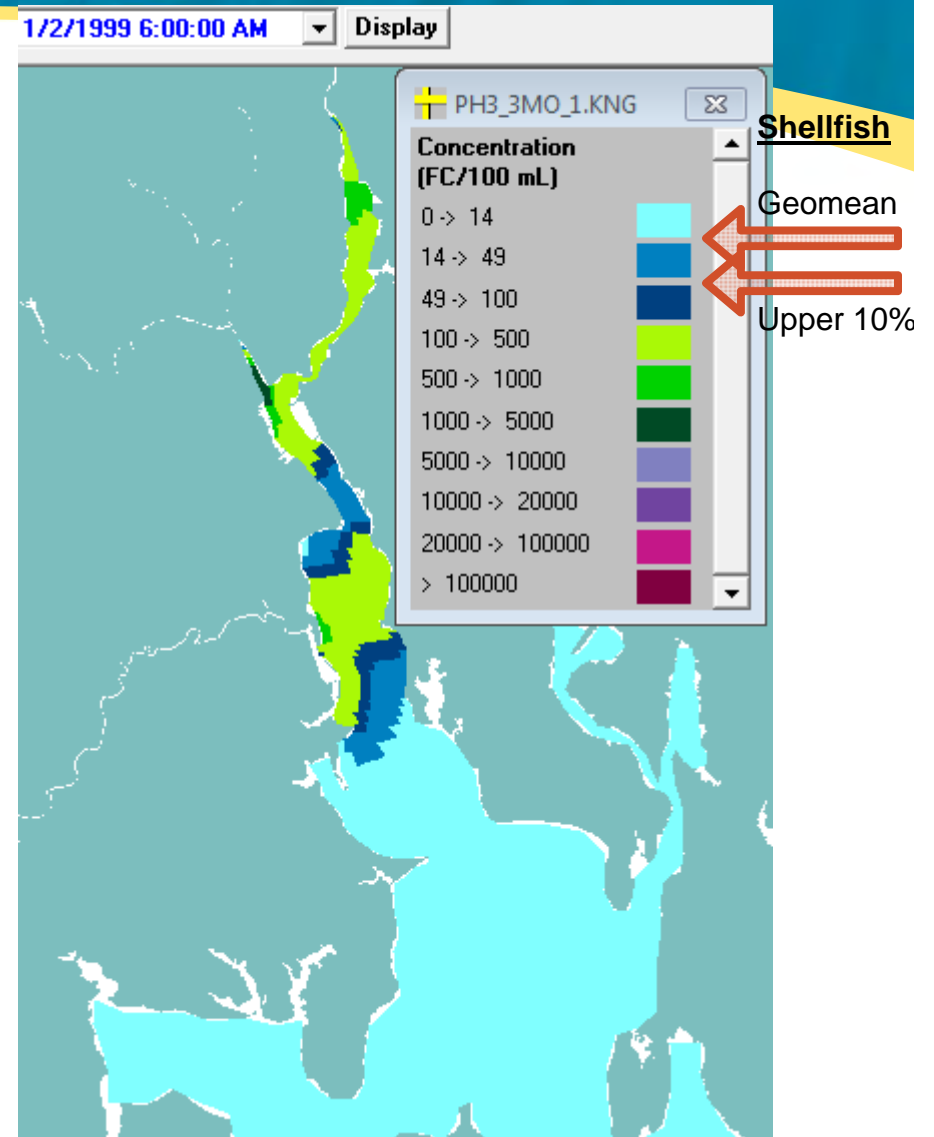
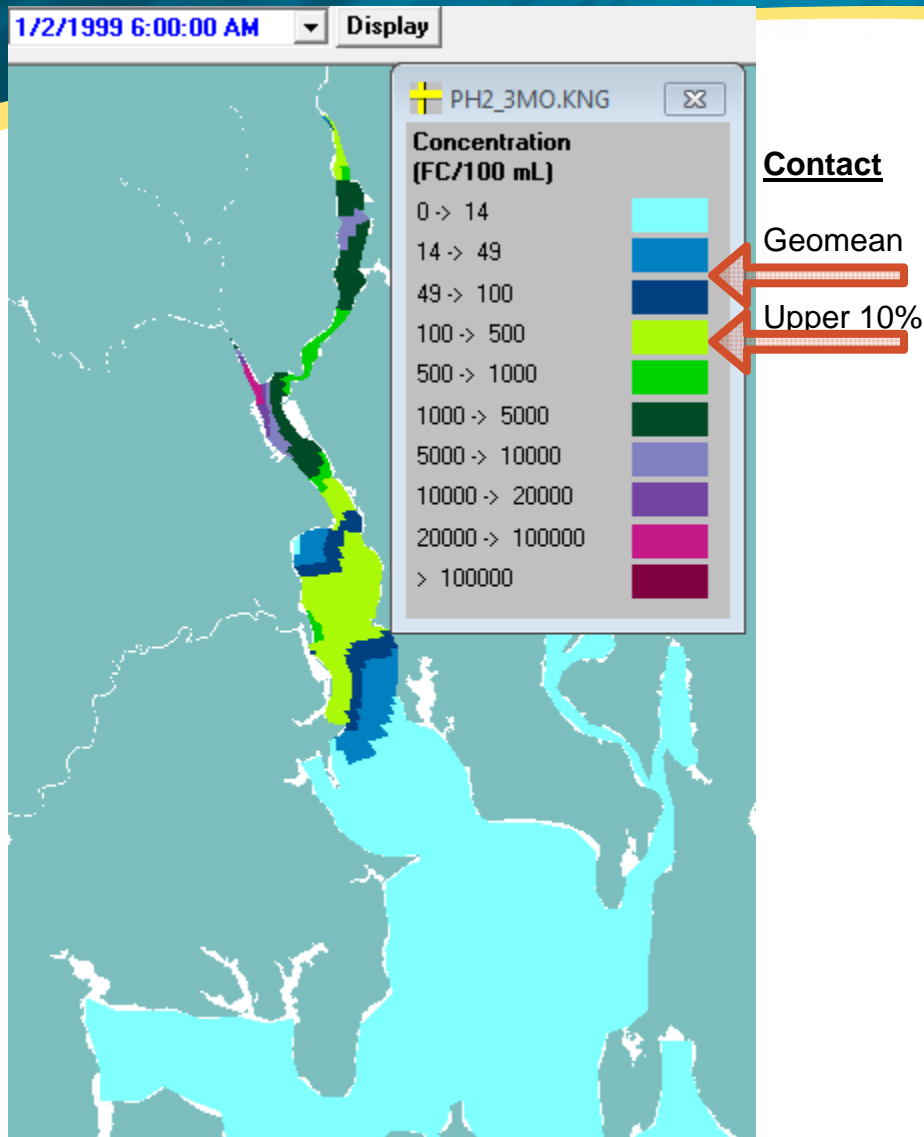
Discharge Volume Comparison



Narragansett Bay Water Quality Day 2

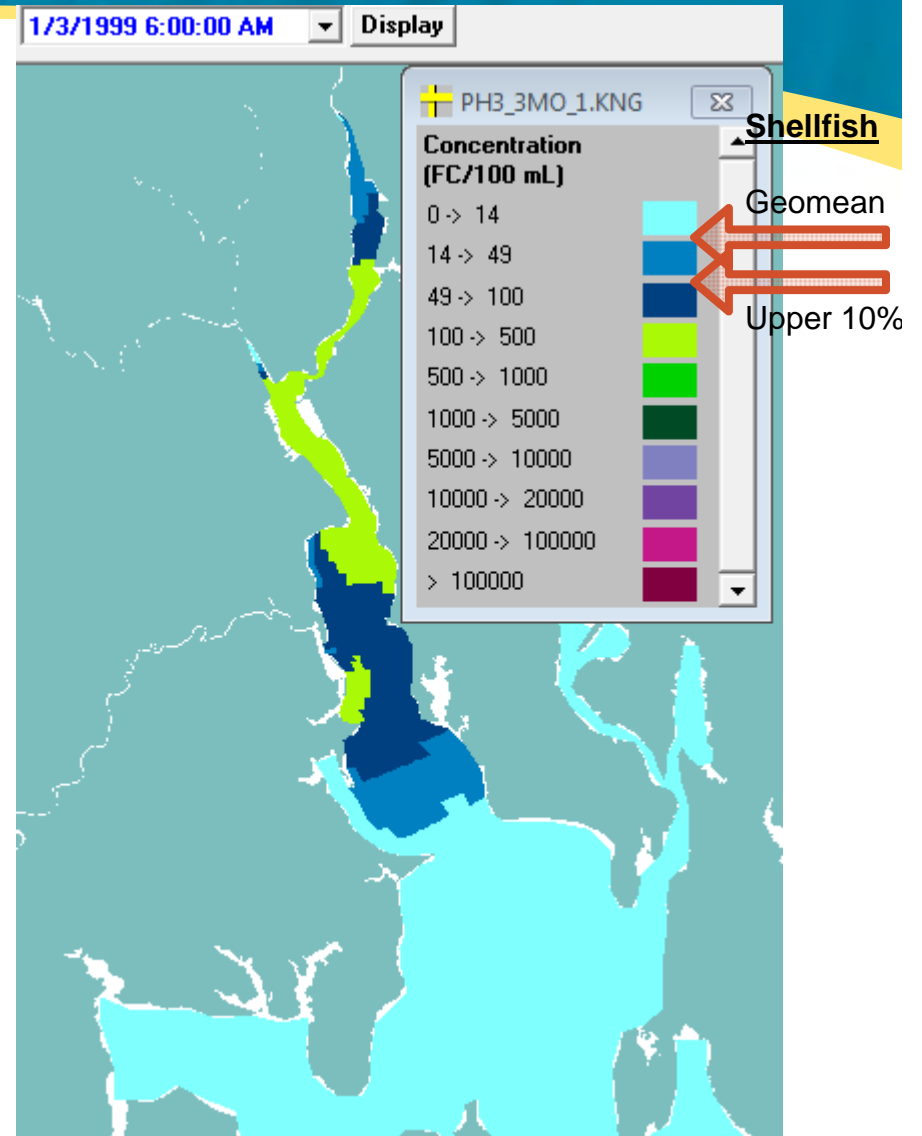
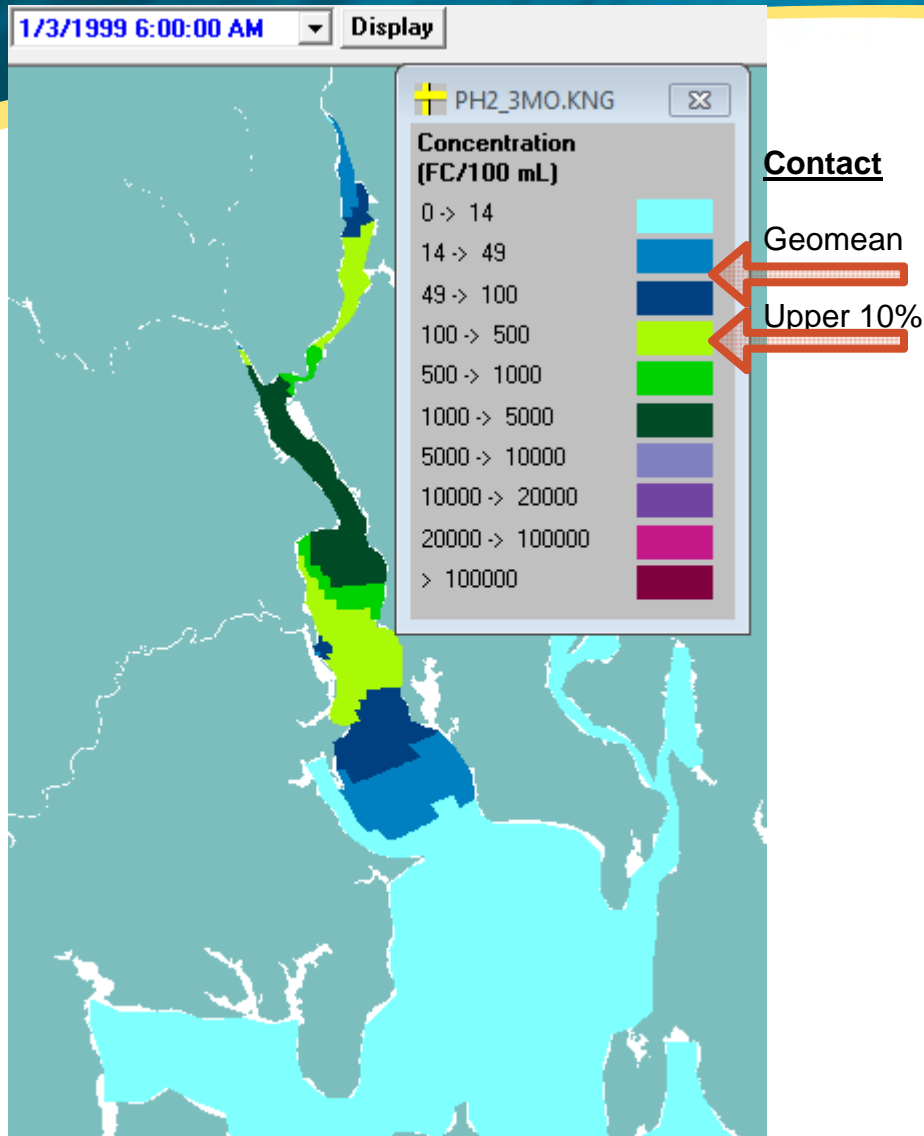
Phase II

Phase III



Narragansett Bay Water Quality Day 3

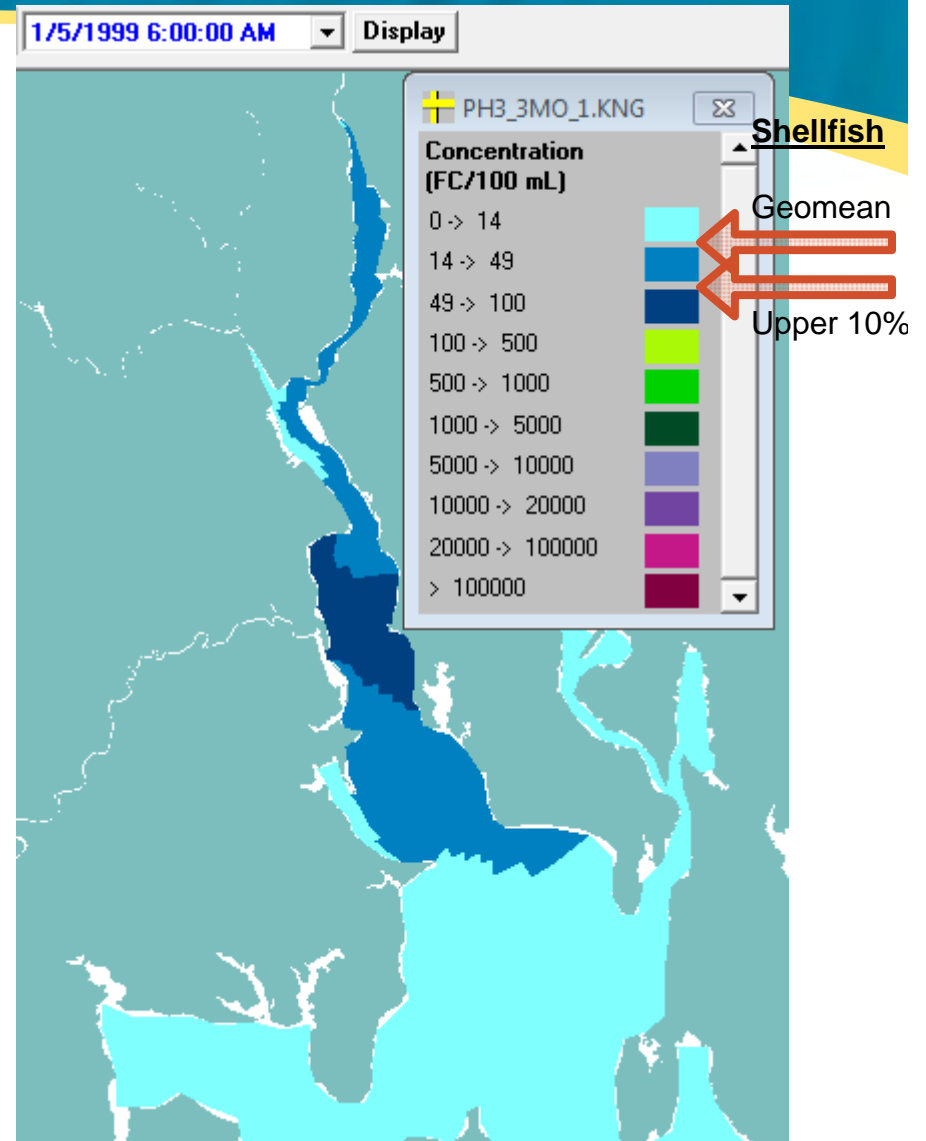
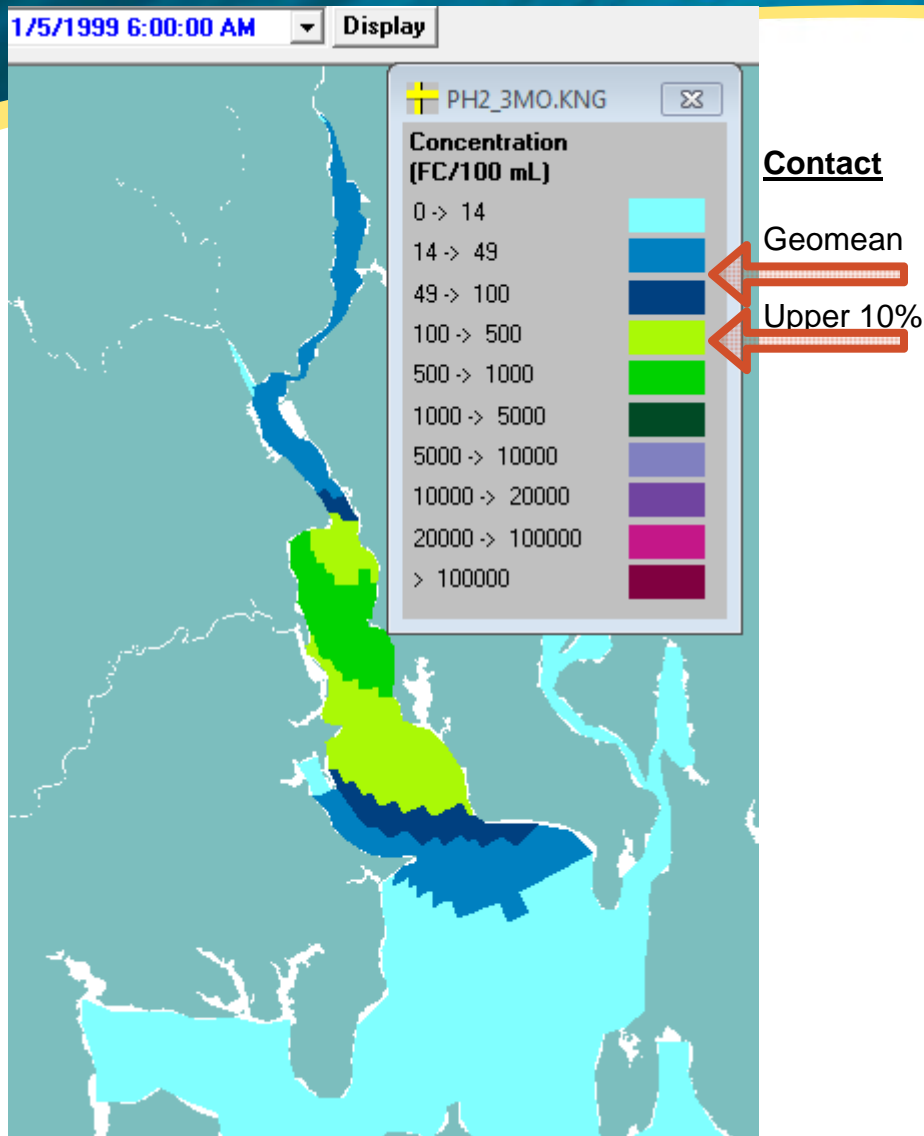
Phase II Phase III



Narragansett Bay Water Quality Day 5

Phase II

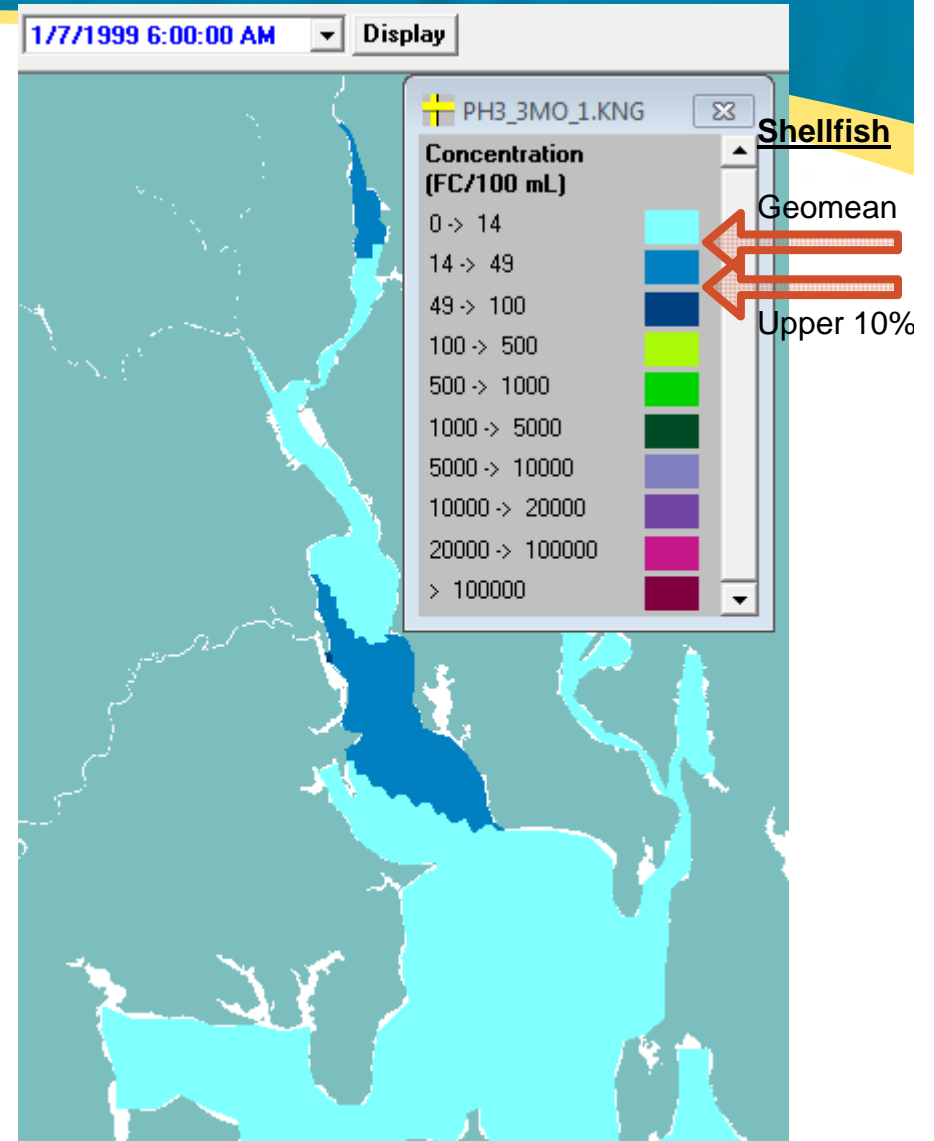
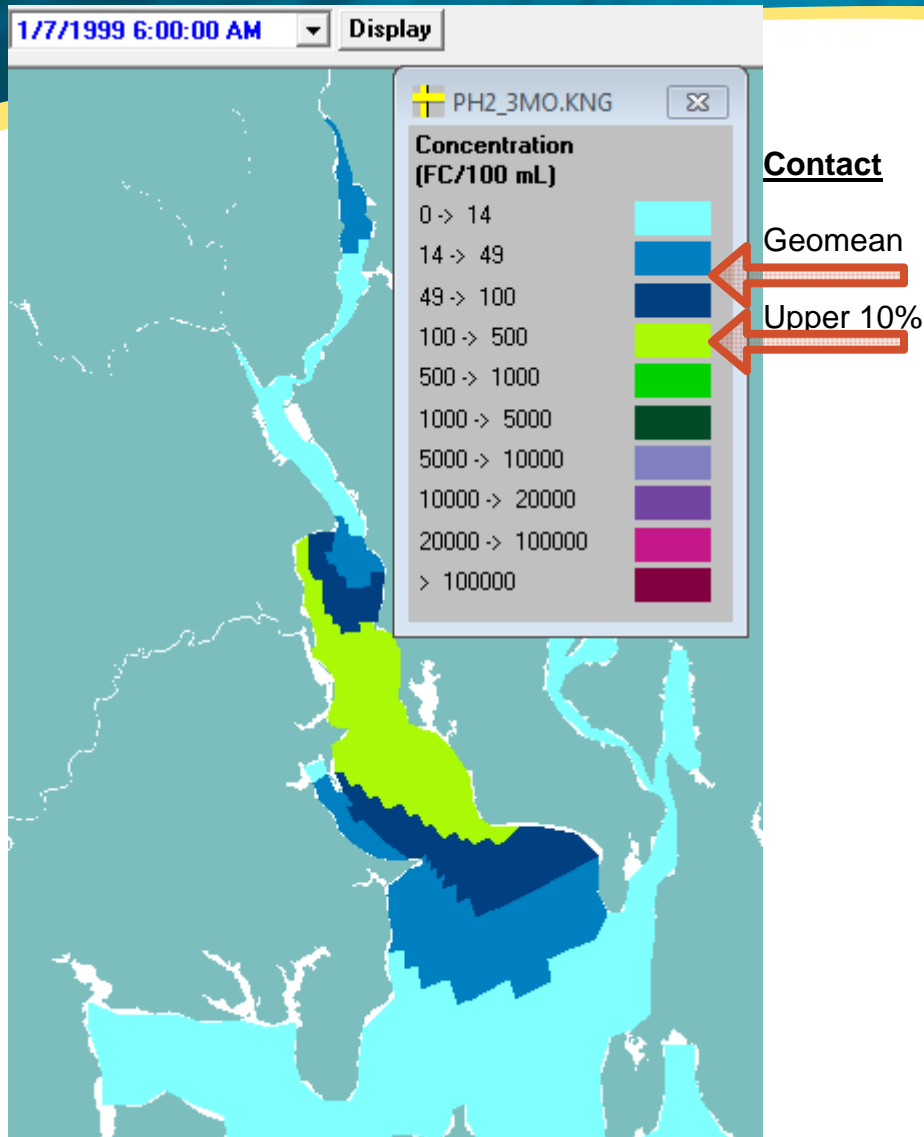
Phase III



Narragansett Bay Water Quality Day 7

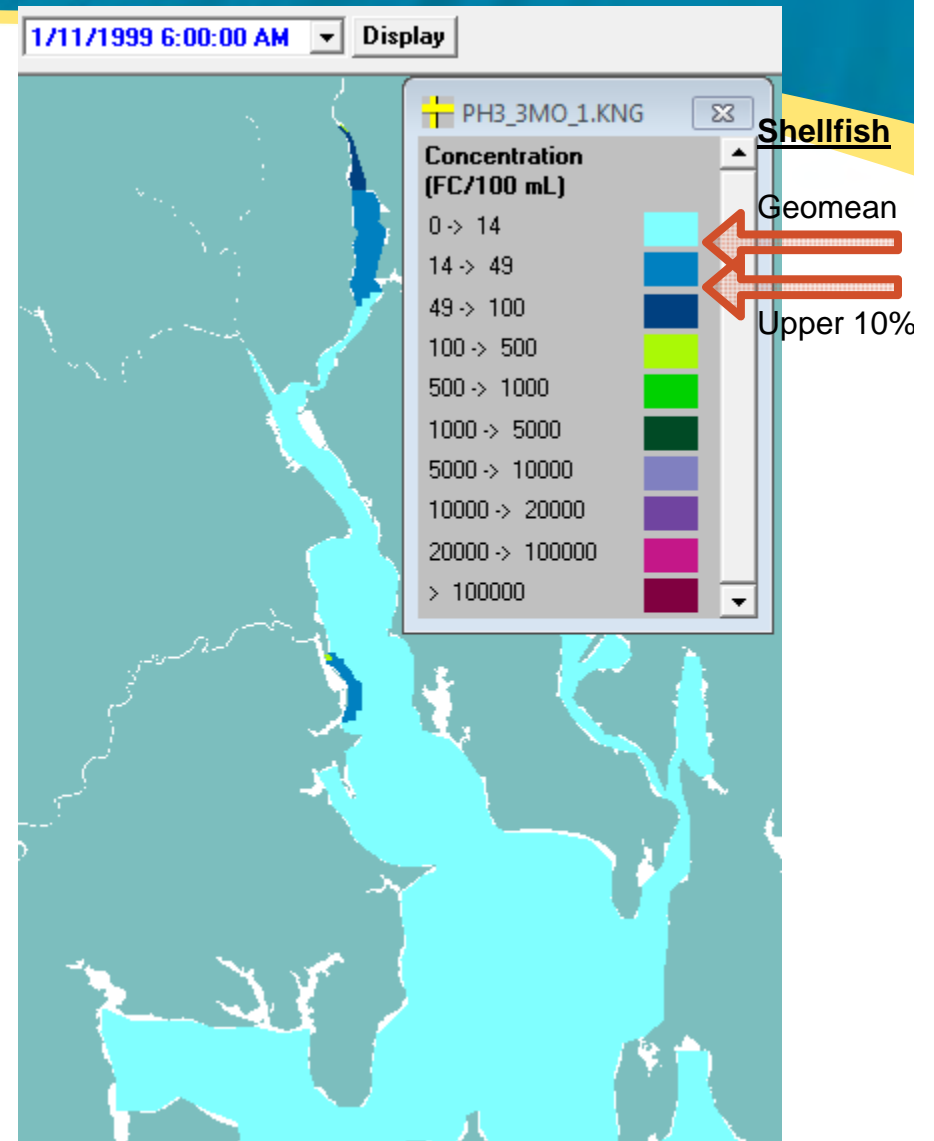
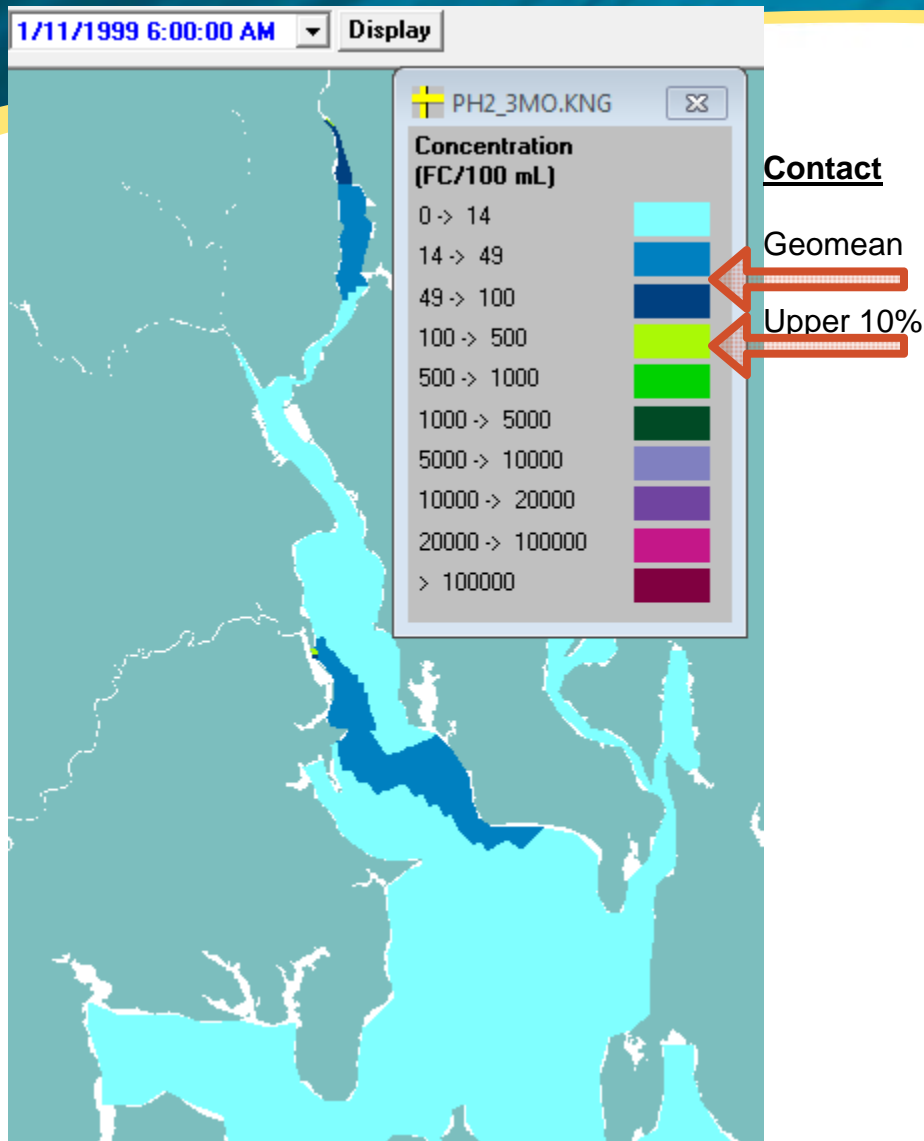
Phase II

Phase III



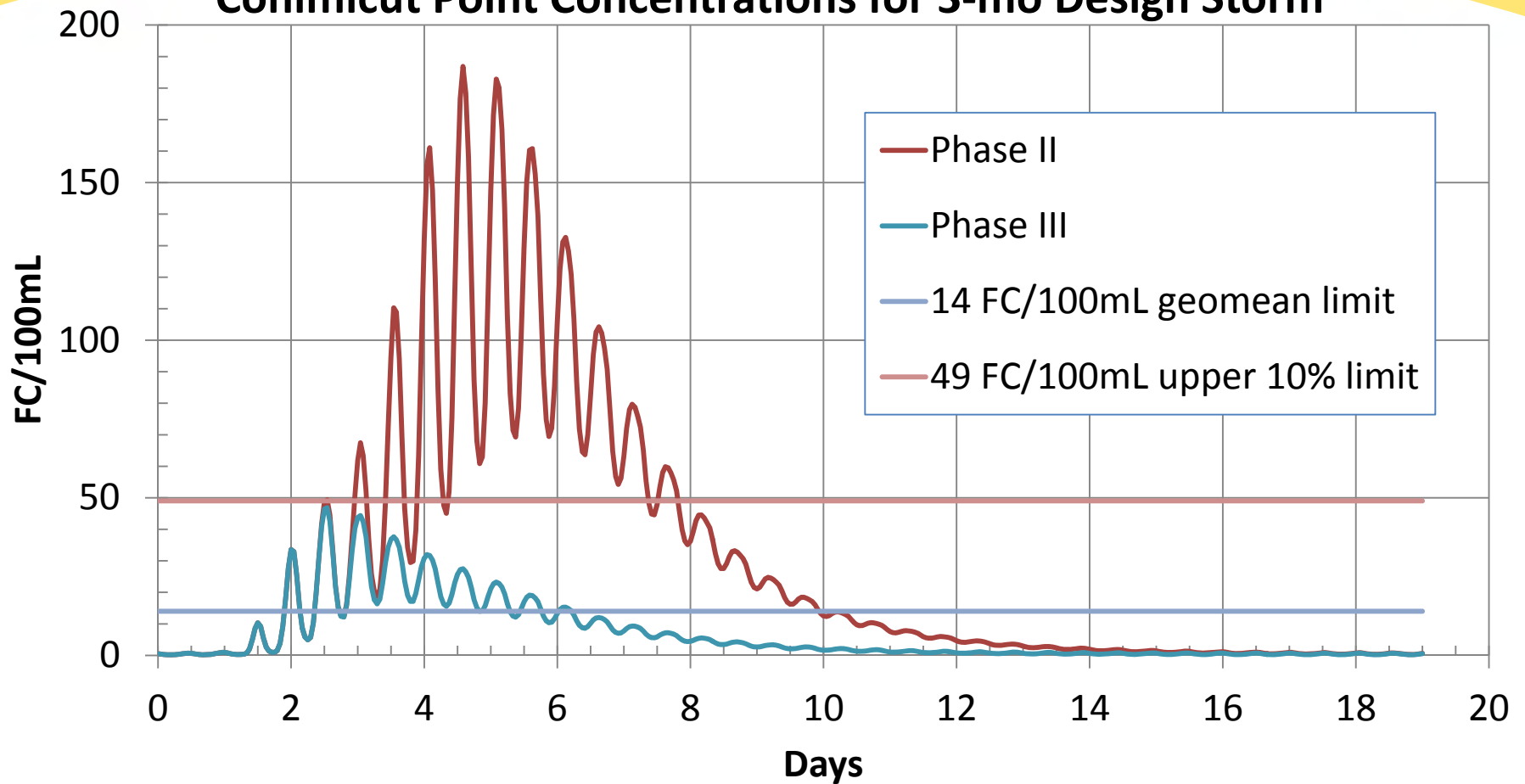
Narragansett Bay Water Quality Day 11

Phase II Phase III



Narragansett Bay Water Quality

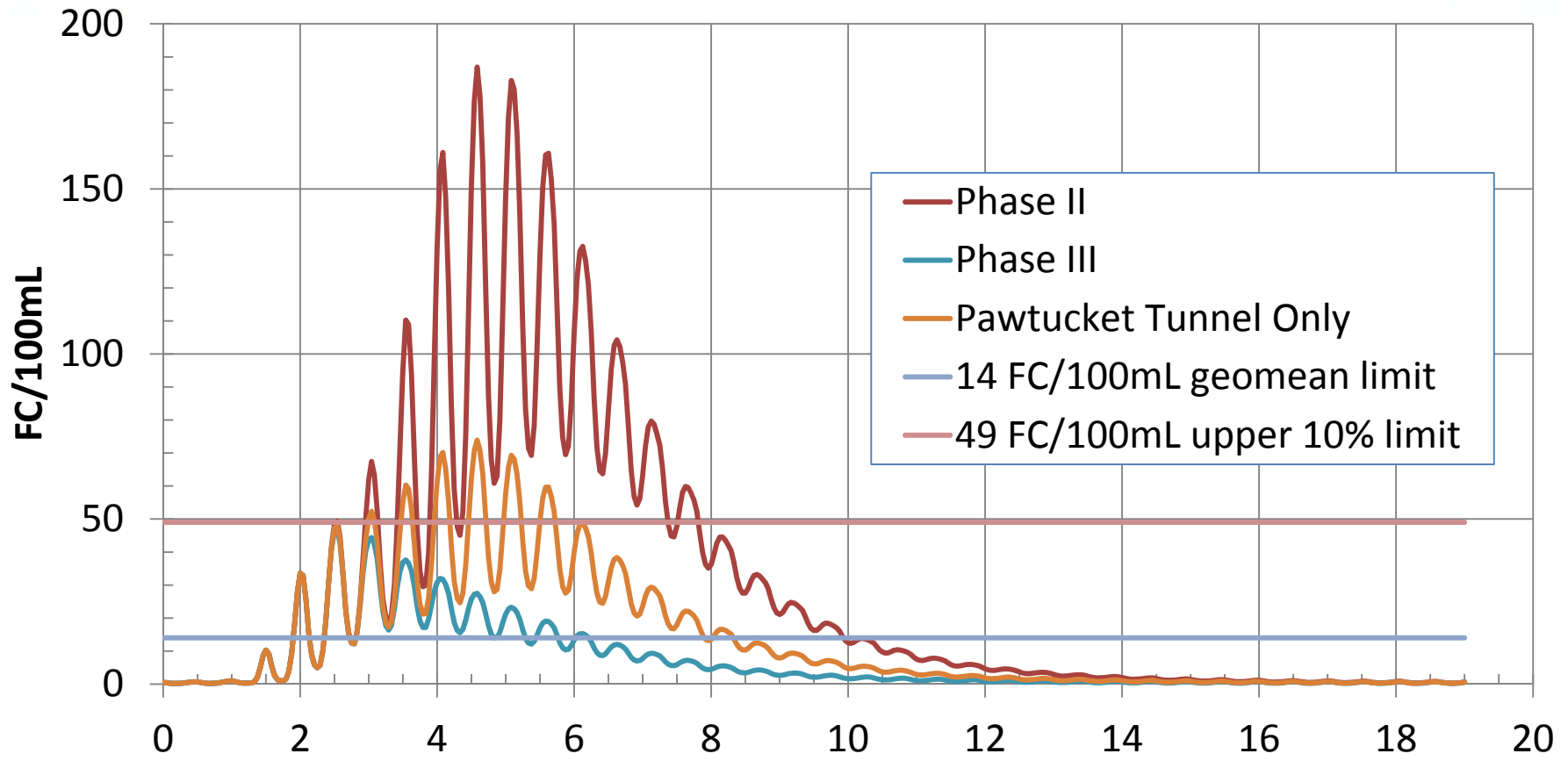
Conimicut Point Concentrations for 3-mo Design Storm



- Draft results subject to change

Narragansett Bay Water Quality

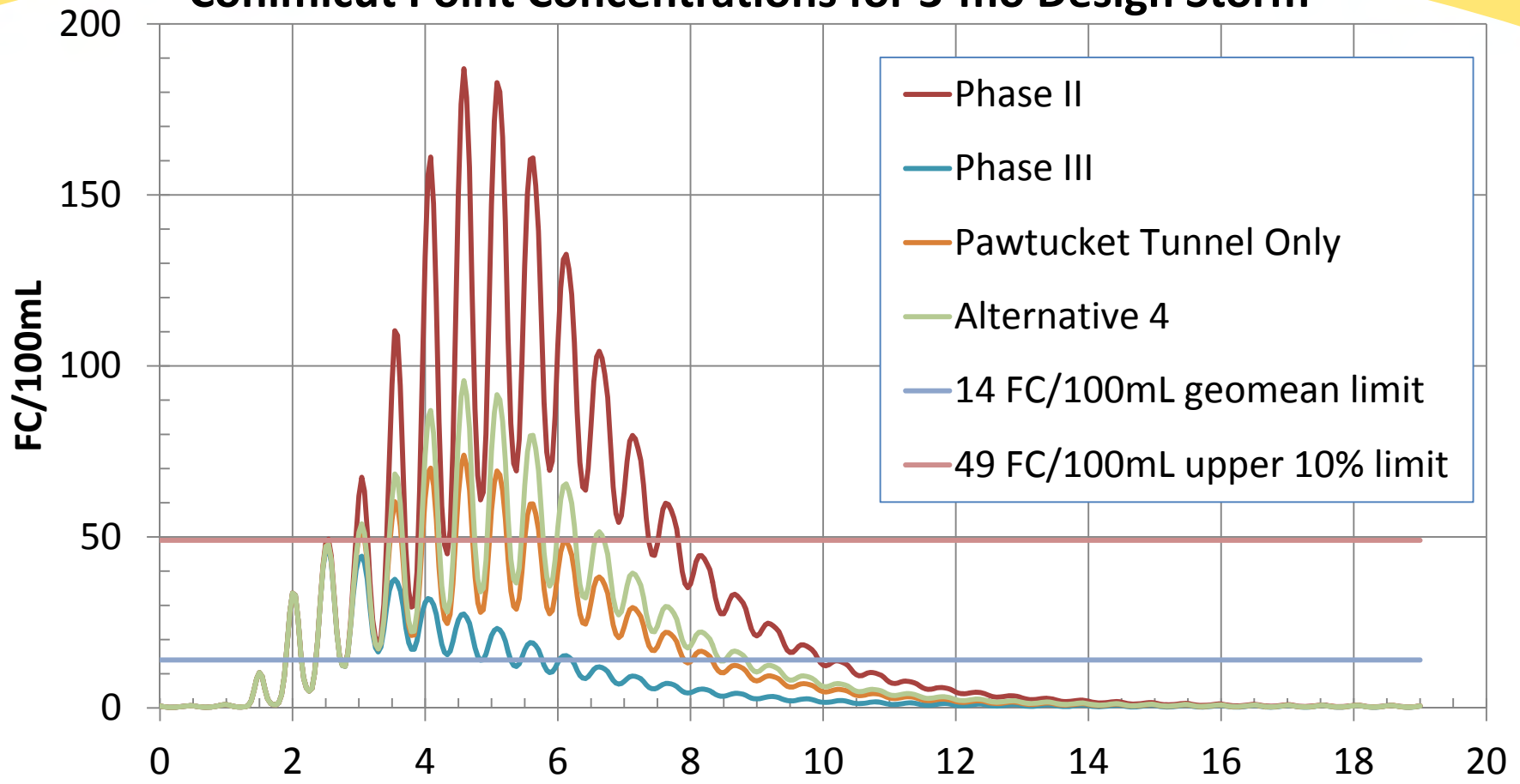
Conimicut Point Concentrations for 3-mo Design Storm



• Draft results subject to change

Narragansett Bay Water Quality

Conimicut Point Concentrations for 3-mo Design Storm

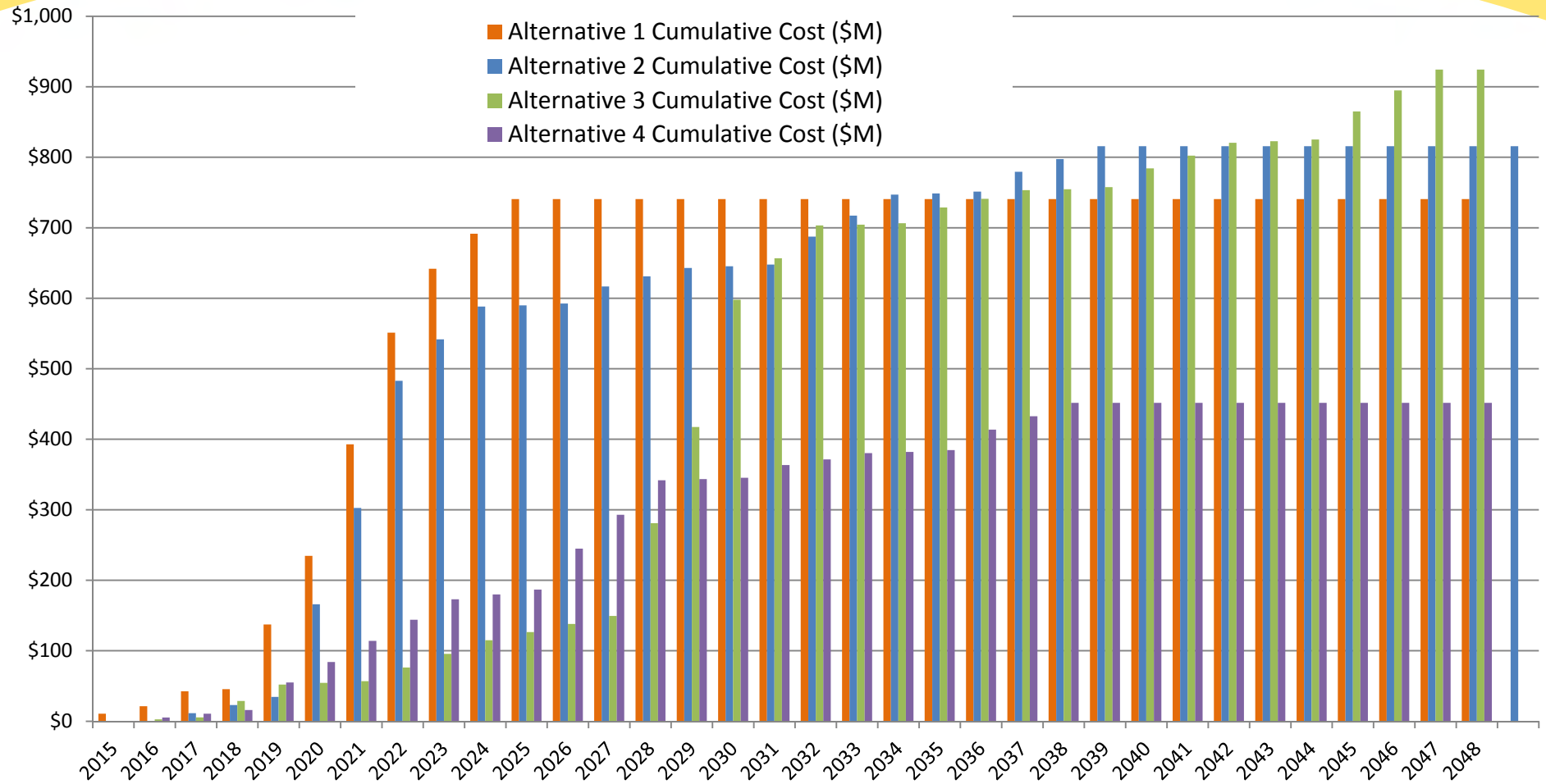


• Draft results subject to change

Costs & Rates

Cumulative Costs

Cost Comparison

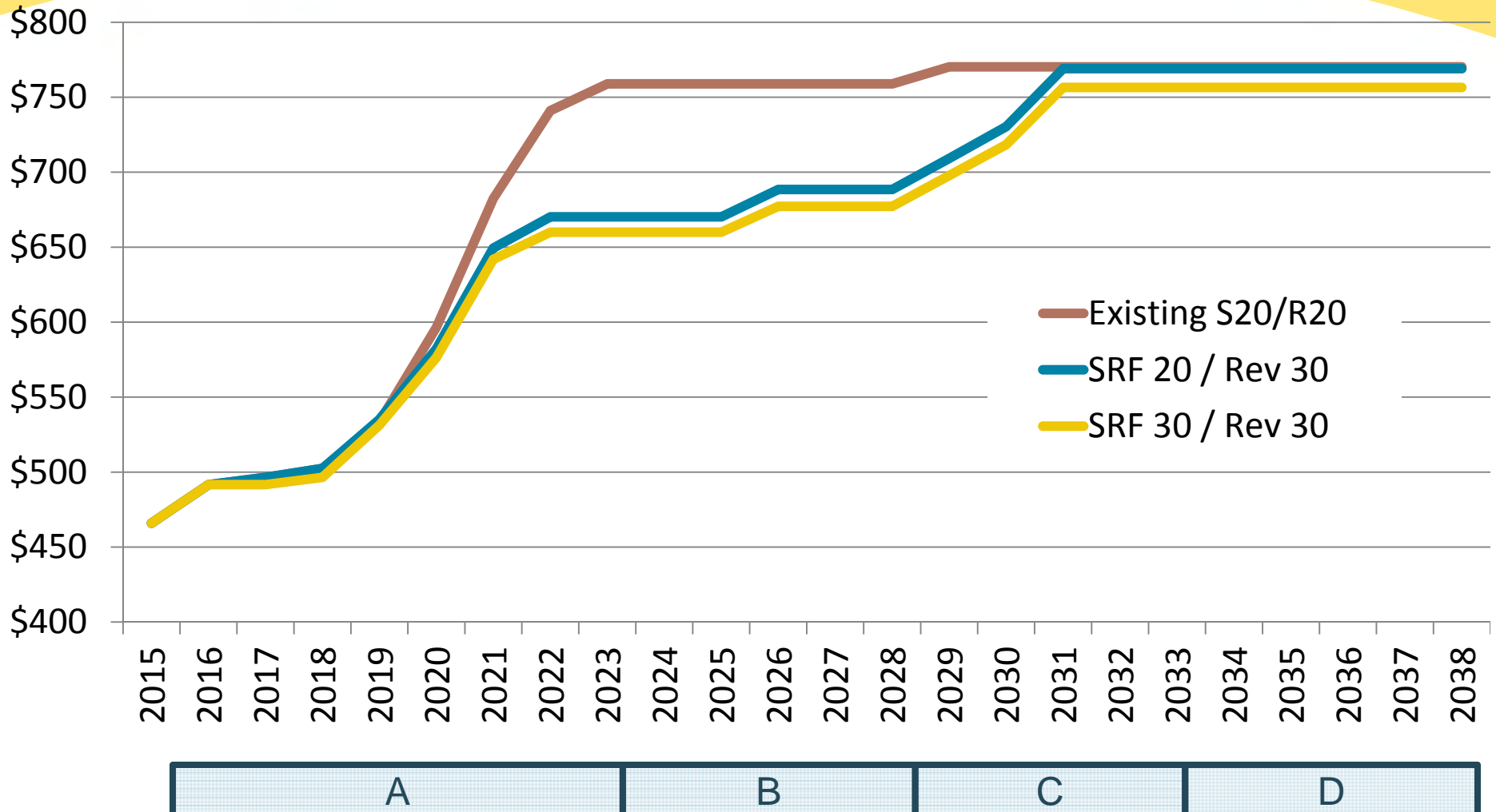


Financing Assumptions

- Previous presentation – “SRF 20 / Rev 20”
 - Annual availability of \$25M from RICWFA SRF for 20 years at 2.5%
 - Remainder from revenue bond for 20 years at 5%
- New Alternative – “SRF 20 / Rev 30”
 - Annual availability of \$25M from RICWFA SRF for 20 years at 2.5%
 - Remainder from revenue bond for **30** years at 5%
 - “**Wrap**” debt (interest only for first 10 years)
- New Alternative – “SRF 30 / Rev 30”
 - Annual availability of \$25M from RICWFA SRF for **30** years at **3.3%**
 - Remainder from revenue bond for 30 years at 5%
 - “Wrap” debt (interest only for first 10 years)

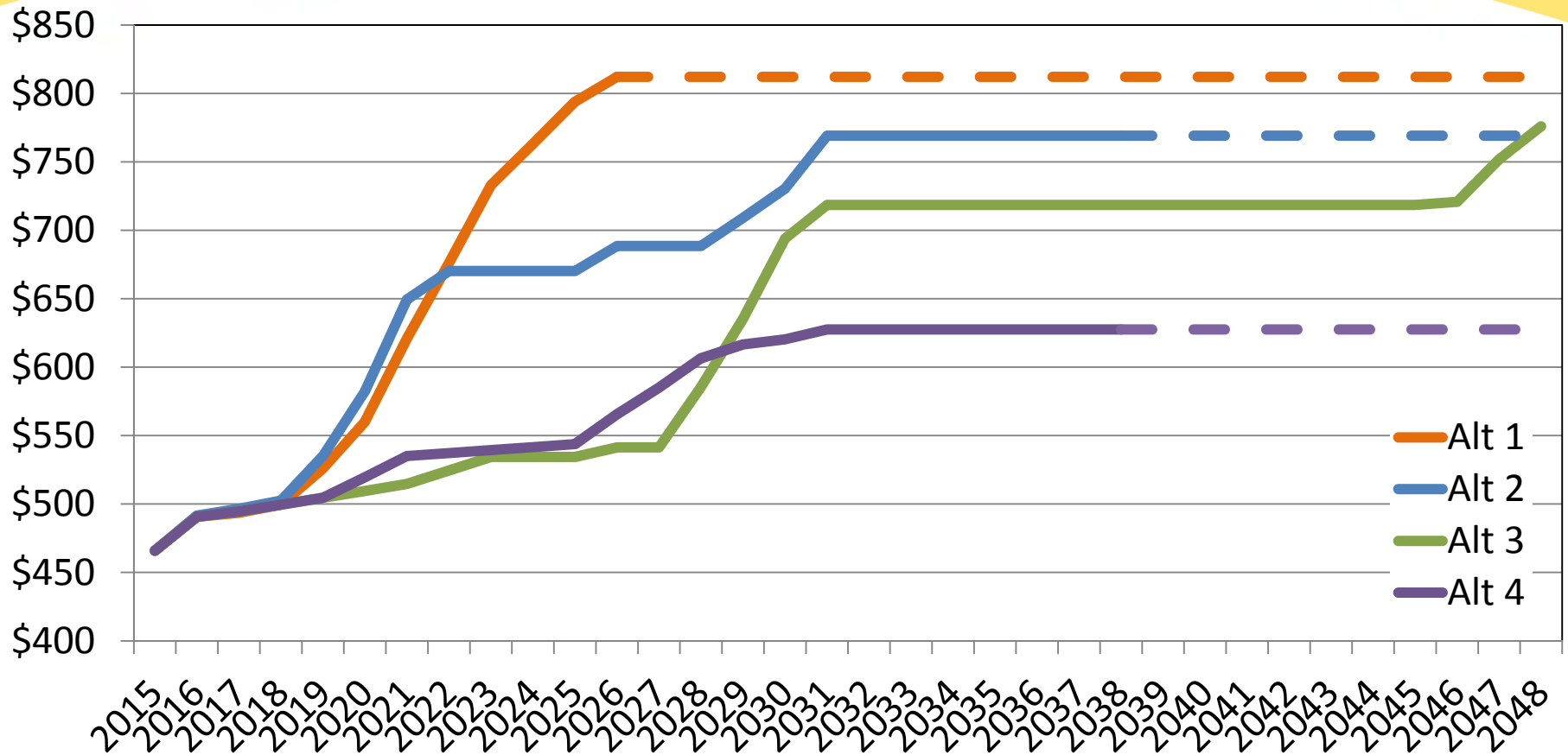
Alternative 2: Modified & Phased Baseline Rate Impacts for Different Financing

Projected Average Bills



Projected Bills

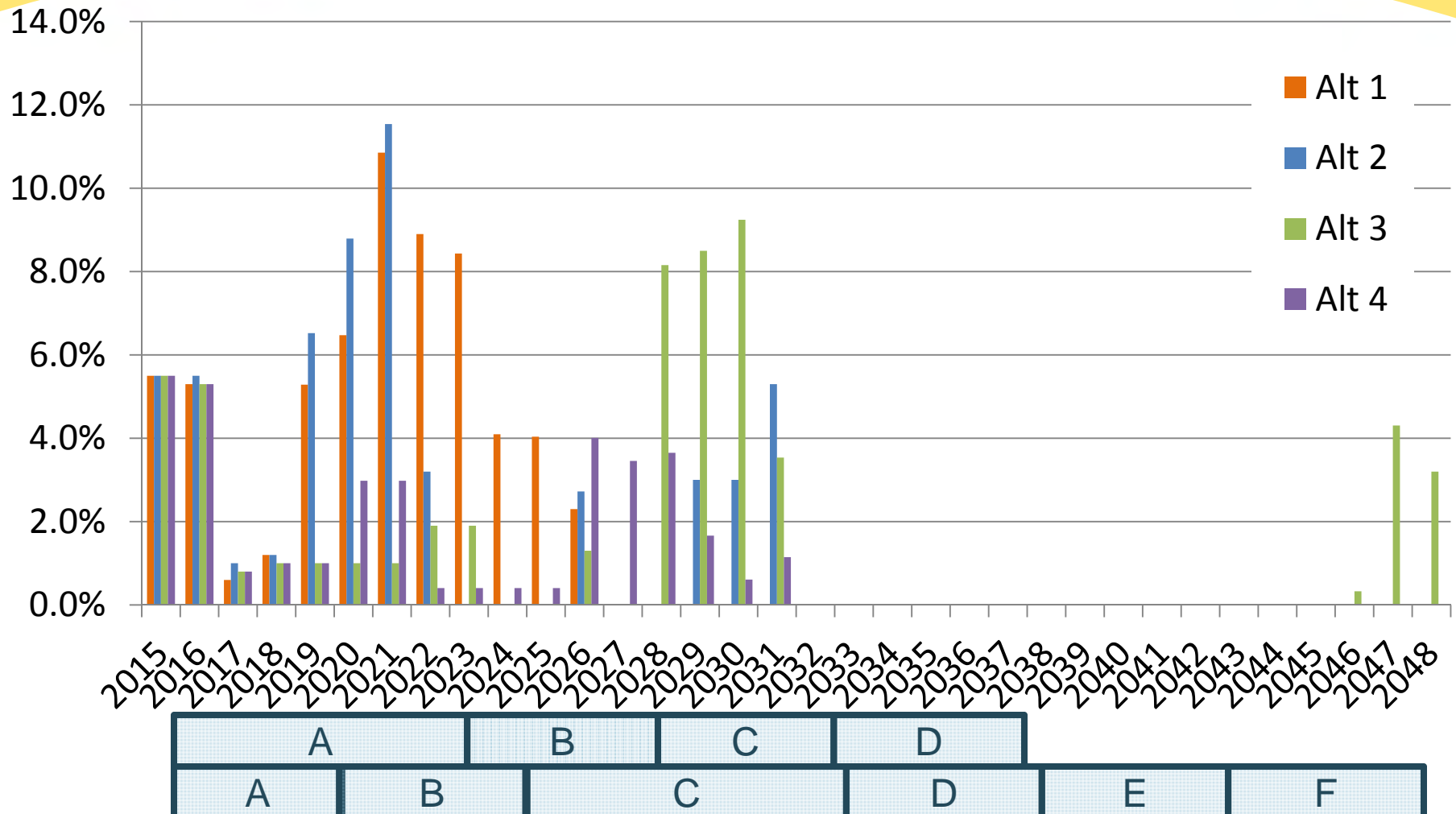
Projected Average Bills



A		B		C		D	
A	B	C		D	E	F	

Rate Increases

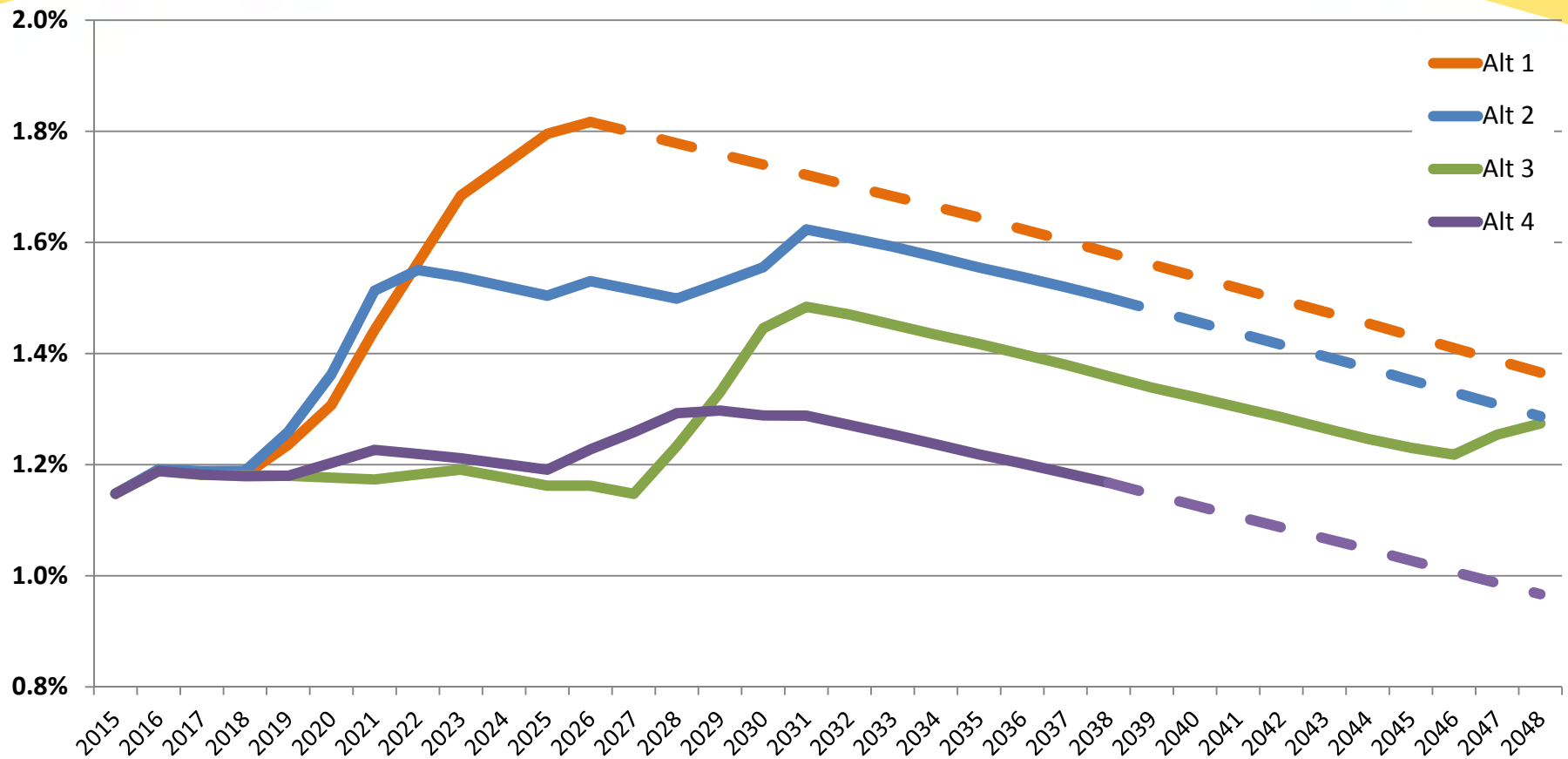
Projected Rate Increases



Affordability vs. 2% MHI

– NBC Service Area, NBC Costs

Projected Affordability



Affordability Pre-Phase III

2015

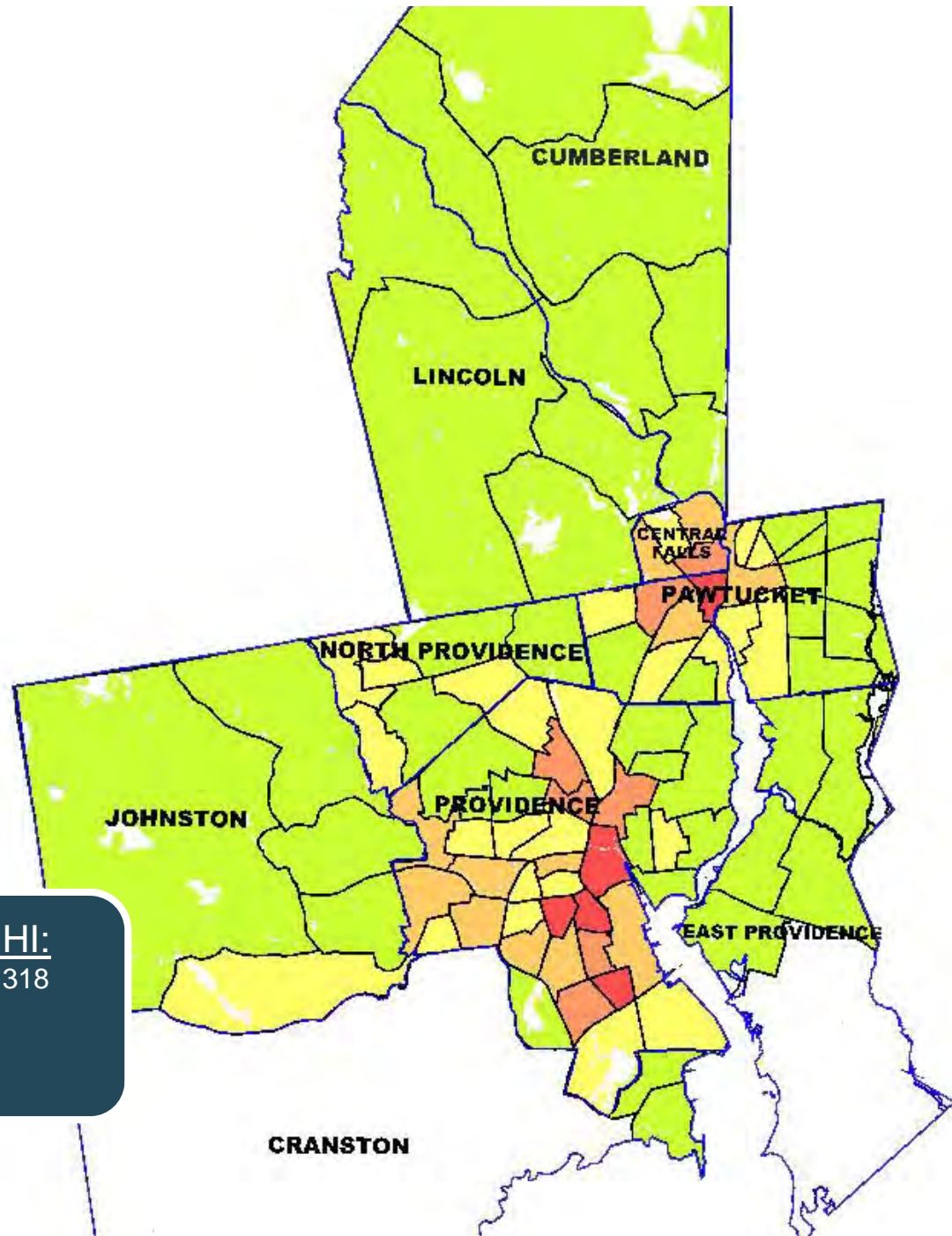
Households > 2% of MHI:

Entire NBC Service Area = 45,318

City of Providence = 21,905

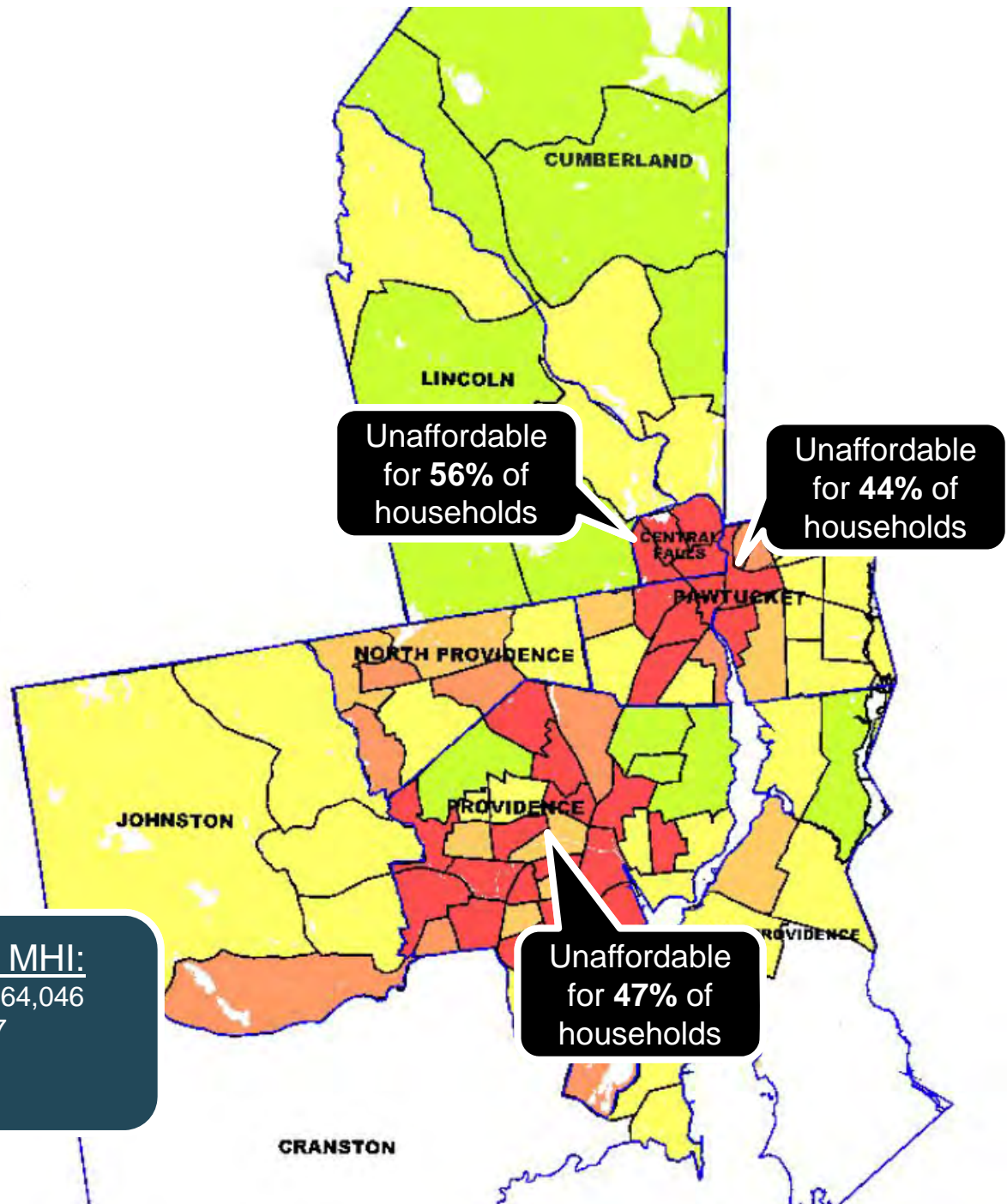
City of Pawtucket = 8,027

City of Central Fall = 2,924



Affordability Alternative 1 - Baseline

2026



Households > 2% of MHI:

Entire NBC Service Area = 64,046

City of Providence = 29,067

City of Pawtucket = 12,894

City of Central Fall = 3,723

Affordability Alternative 2 – Modified & Phased Baseline

2031

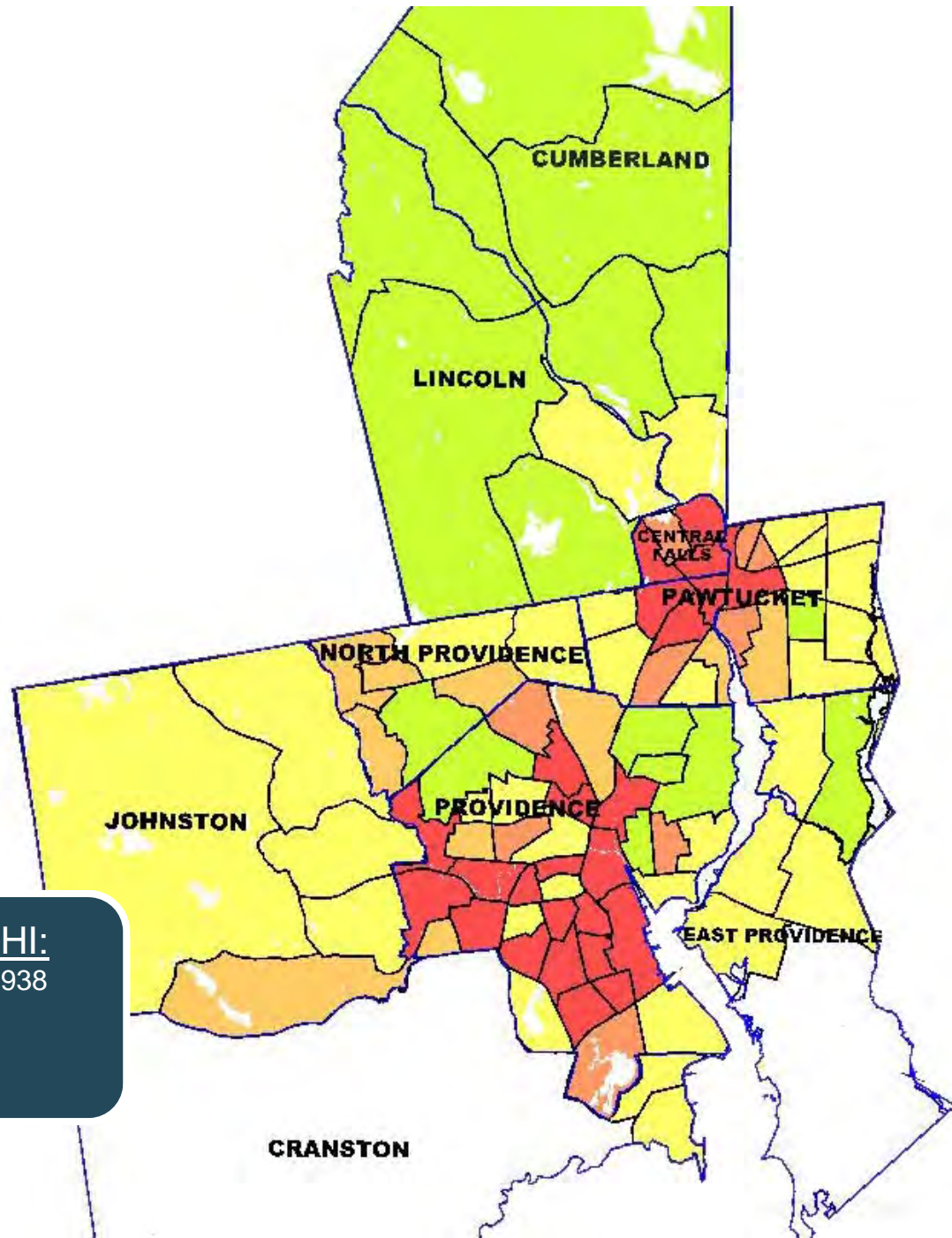
Households > 2% of MHI:

Entire NBC Service Area = 58,938

City of Providence = 27,198

City of Pawtucket = 11,057

City of Central Fall = 3,569



Alternative 2 Affordability – 2% MHI

Percentage of Households

	2015	2023	2031	2038
Service Area	29%	36%	38%	35%
Providence	36%	43%	45%	42%
Central Falls	44%	51%	54%	51%
Pawtucket	28%	38%	38%	38%

Affordability Alternative 3 – Modified, Augmented & Extended Baseline

2031

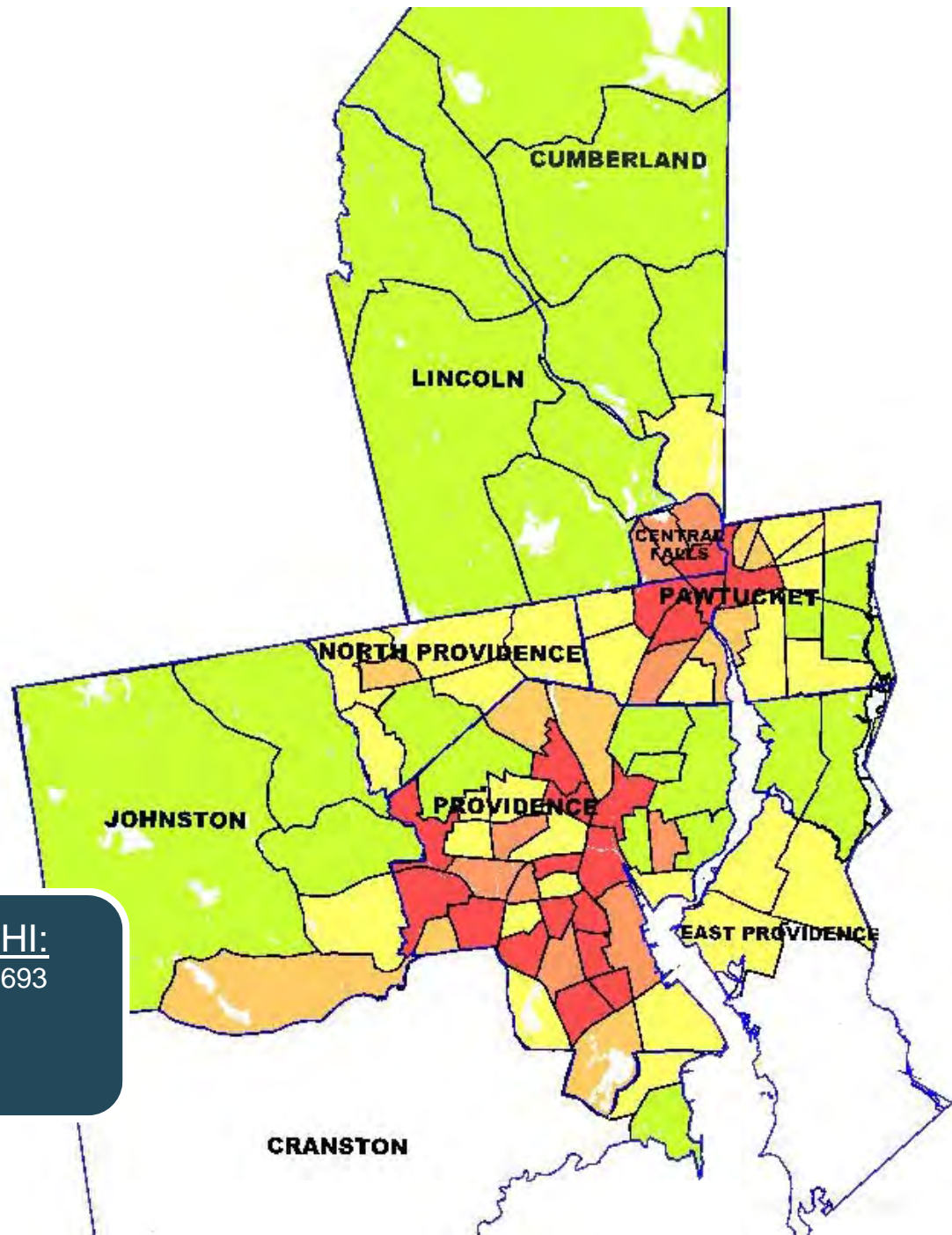
Households > 2% of MHI:

Entire NBC Service Area = 55,693

City of Providence = 25,545

City of Pawtucket = 10,979

City of Central Fall = 3,352



Alternative 3 Affordability – 2% MHI

	Percentage of Households				
	2015	2023	2031	2038	2048
Service Area	29%	30%	35%	32%	31%
Providence	36%	36%	41%	39%	37%
Central Falls	44%	44%	51%	46%	44%
Pawtucket	28%	32%	38%	32%	32%

Affordability Alternative 4 – No Tunnel

2029

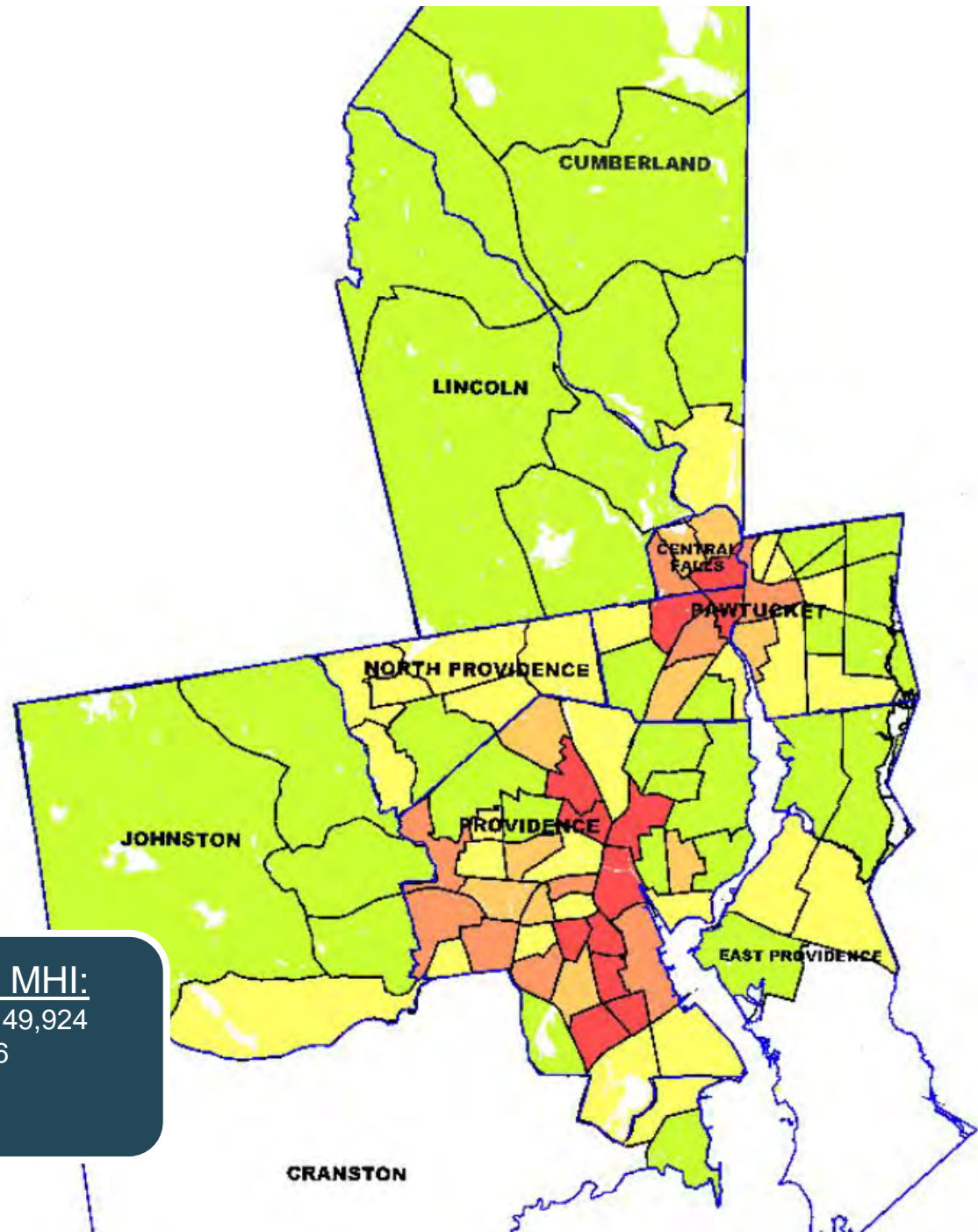
Households > 2% of MHI:

Entire NBC Service Area = 49,924

City of Providence = 23,746

City of Pawtucket = 9,346

City of Central Fall = 2,924



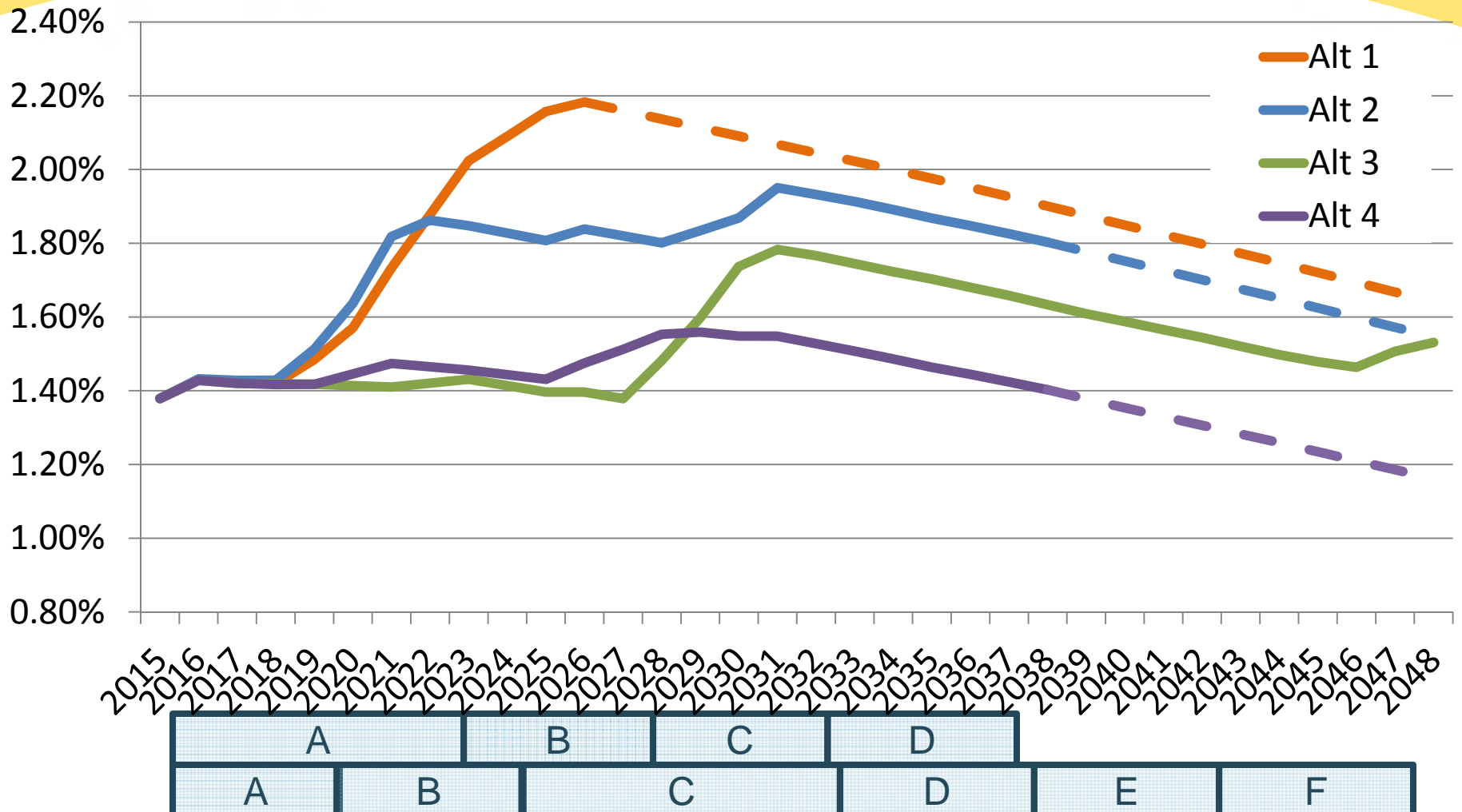
Alternative 4 Affordability – 2% MHI

	Percentage of Households			
	2015	2023	2031	2038
Service Area	29%	30%	31%	29%
Providence	36%	36%	38%	36%
Central Falls	44%	44%	44%	44%
Pawtucket	28%	32%	32%	29%

Affordability vs. 2% MHI

– City of Providence, NBC Costs

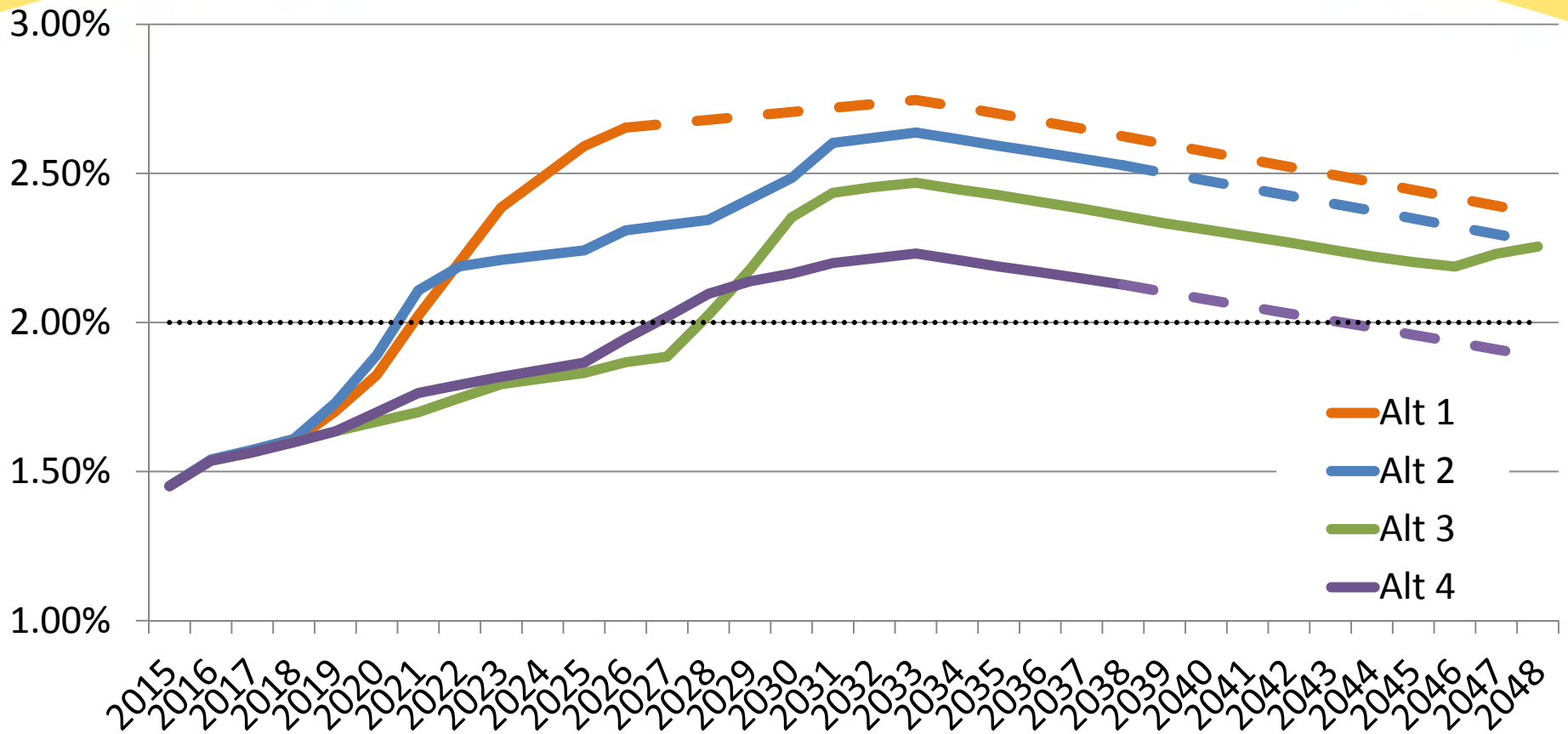
Projected Affordability - NBC Costs Only



Affordability vs. 2% MHI

– City of Providence, NBC Costs + Collection System CIP

Projected Affordability - NBC + Providence Costs



A		B		C		D		
A	B		C			D	E	F

Conclusions



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Alternative Plan Evaluation

	1 – Baseline CDRA	2 – Modified & Phased	3 – Extended & Augmented	4 – No Tunnel
Total Cost	\$750M	\$710M to \$810M	\$825M to \$925M	\$450M
2025 Rates	\$812	\$670	\$534	\$544
2035 Rates	\$812	\$769	\$719	\$627
2047 Rates	\$812	\$769	\$776	\$627
2025 Volume Captured	100%	72%	32%	23%
2035 Volume Captured	100%	97%	82%	32% (70%)
Compliance	2025	2038	2047	N/A

Alternatives Compared to Baseline CDRA

	2 – Modified & Phased	3 – Extended & Augmented	4 – No Tunnel
Total Cost	5% less to 8% more	10% to 23% more	40% less
2025 Rates	17% lower	34% lower	33% lower
2035 Rates	5% lower	11% lower	23% lower
2047 Rates	5% lower	4% lower	23% lower
2025 Volume Captured	28% less	68% less	77% less
2035 Volume Captured	3% less	18% less	68% less
Compliance	13 years longer	22 years longer	N/A

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4 December 2014

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