

After the Break...

Subsystem Alternatives Evaluation



BUILDING A BETTER WORLD



039 056 Subsystem

Alternatives evaluation by subsystem

039 056

035

206

101 103

104 105

201 202

203 204 205

207 thru 211

213 – 214

217

107 220

212 215 216 218

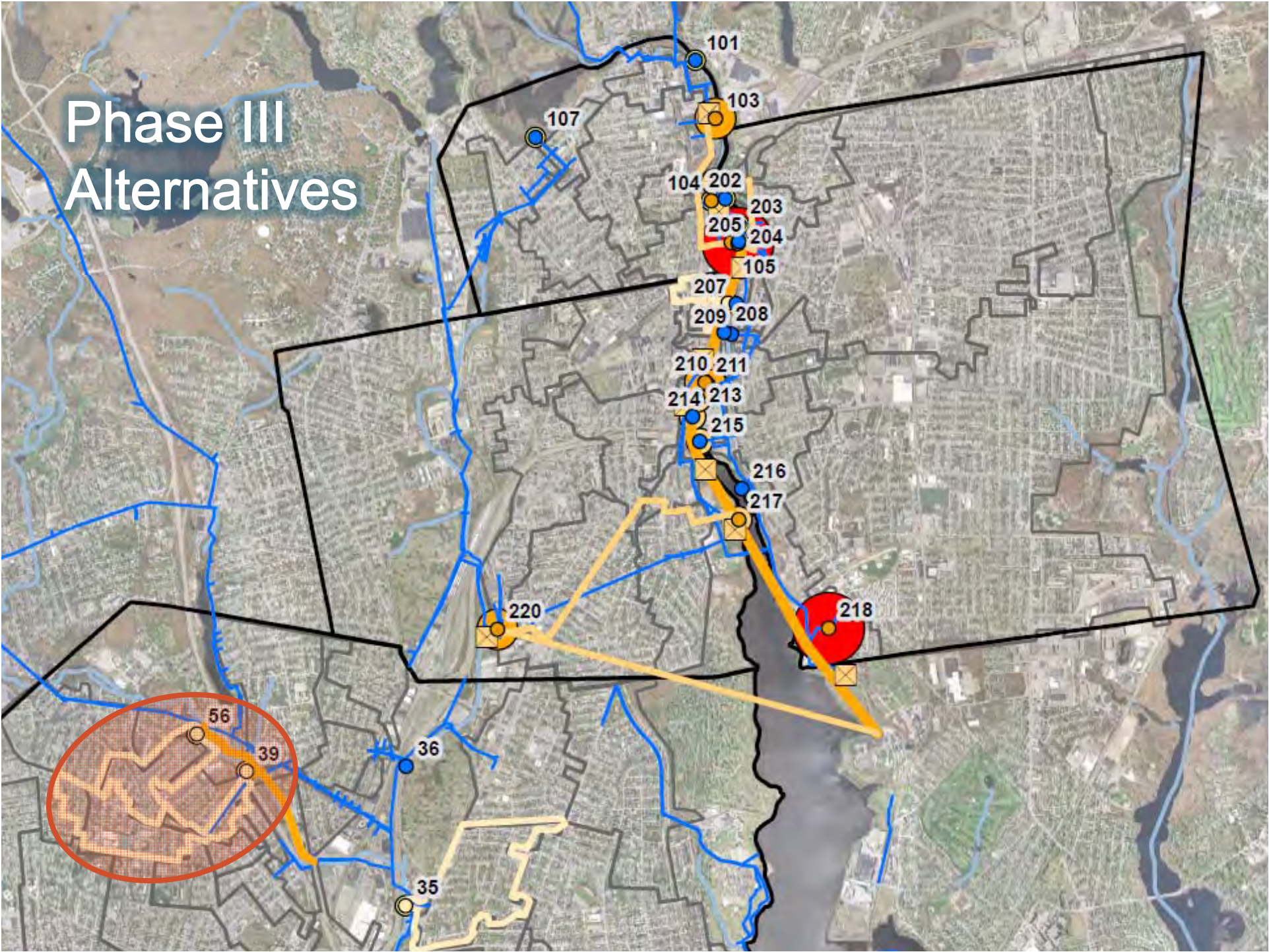


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Phase II Alternatives



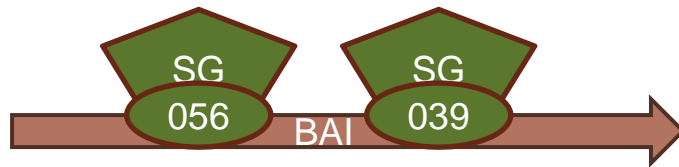
039 056 Alternatives

BPSA

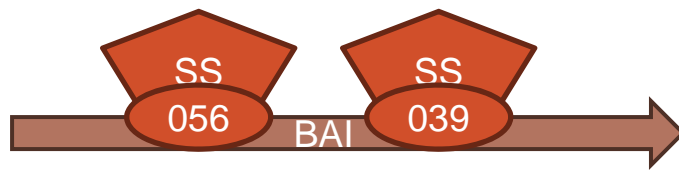
FPSA



- Alternative 2 – West River Interceptor

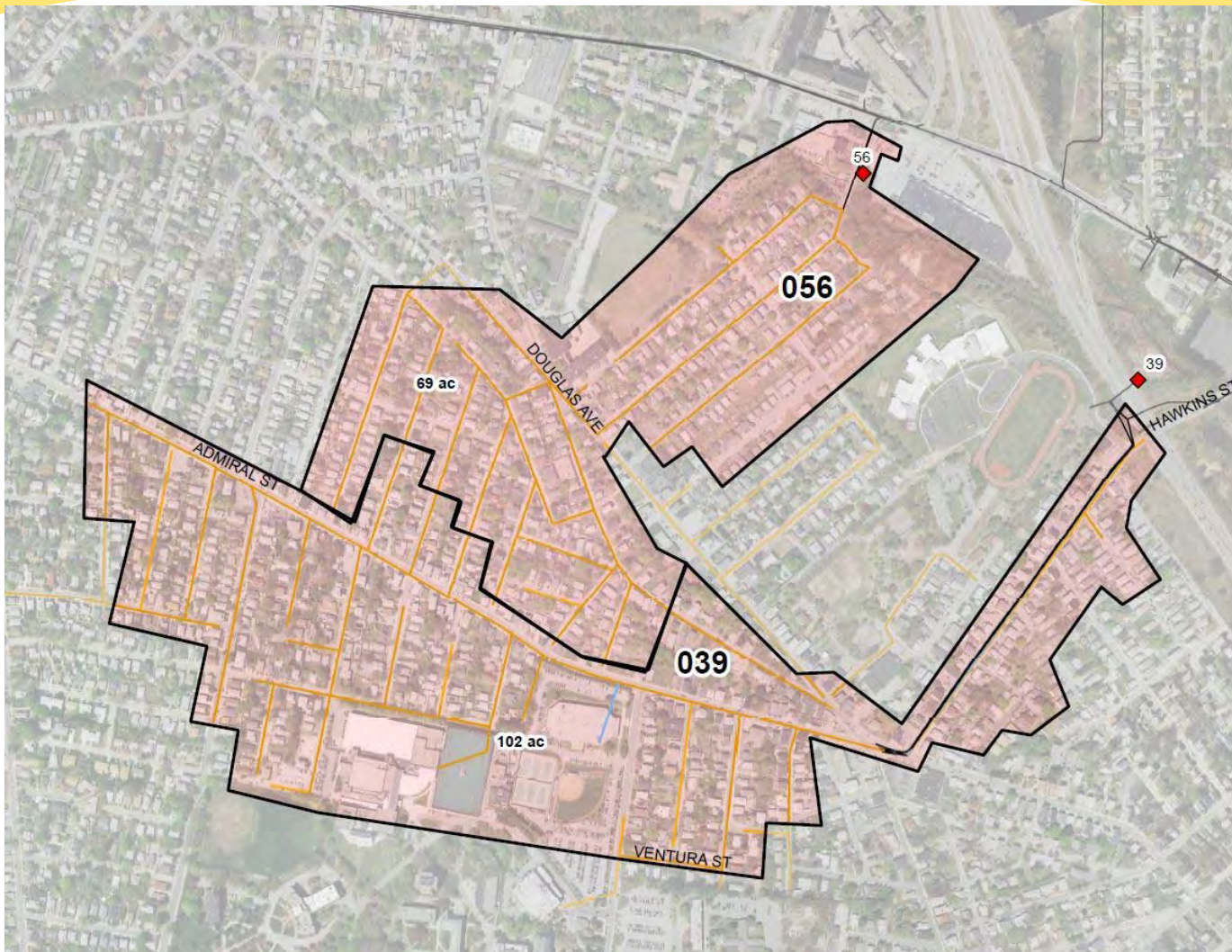


- Alternative 1 – Hybrid Sewer Separation & GSI

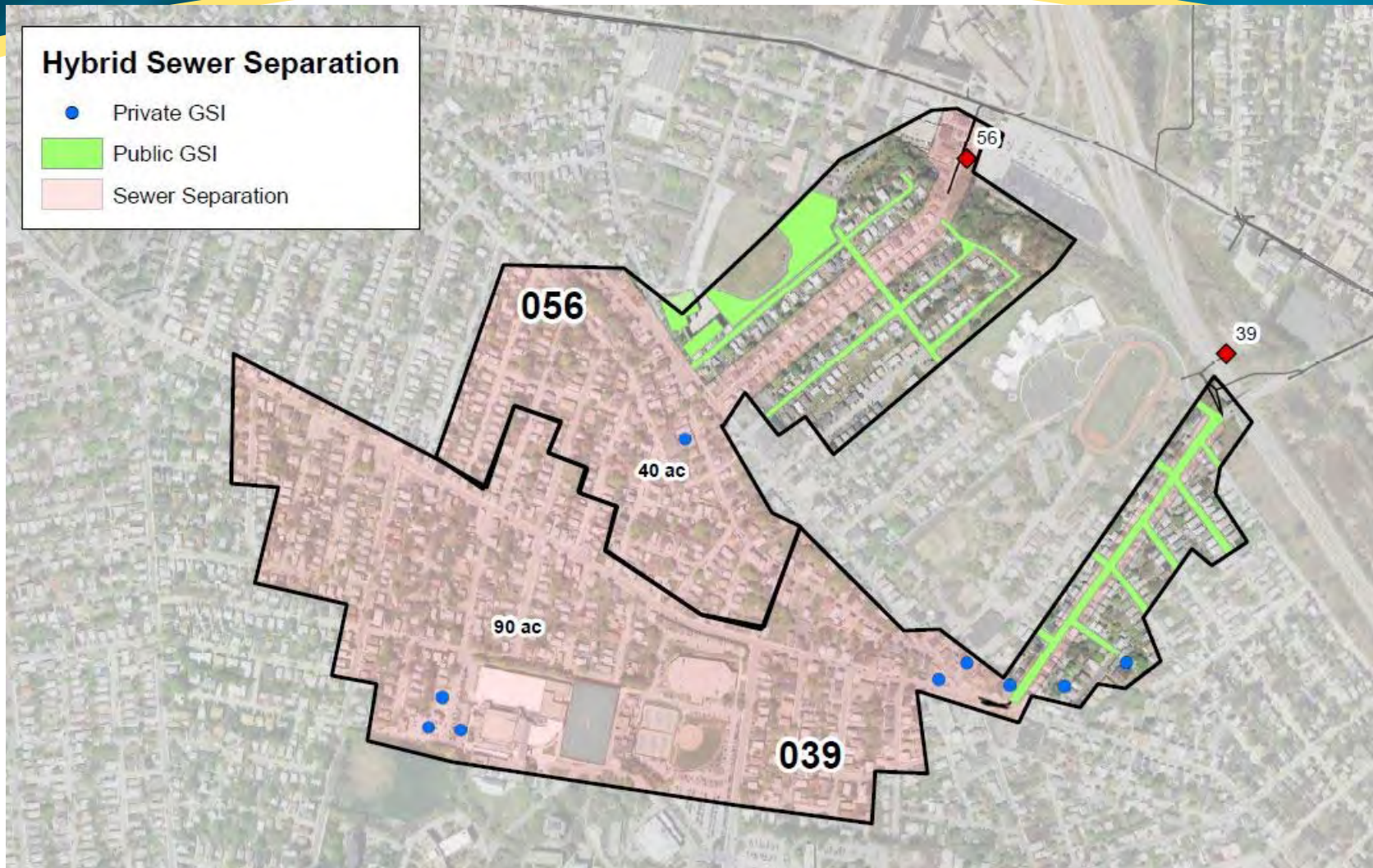


- Baseline – Sewer Separation

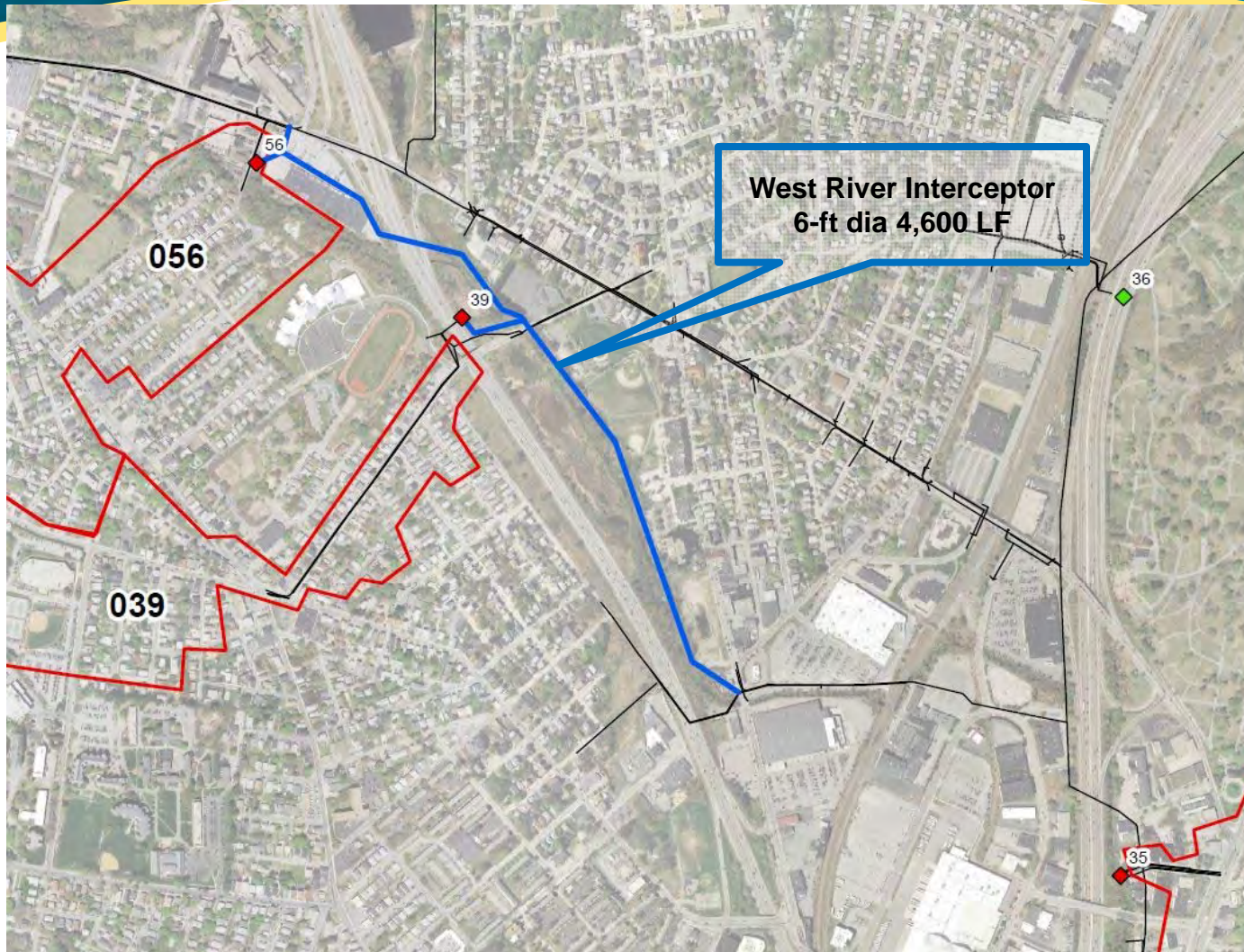
039 056 Sewer Separation



039 056 Hybrid Sewer Separation / GSI



039 056 West River Interceptor



039 056 Alternatives Evaluation

			056, 039	
Volume Captured:		0.88	0.88	0.88
		039 Sewer separation	Hybrid GSI / Sewer separation	West River Interceptor
Evaluation Criteria	Factor			
Environmental Criteria				
Water quality (bacteria) impacts	14%	0.5	0.5	0.5
Water quality (nutrients) impacts	7%	1	2	6
Flooding risks from stormwater systems	7%	0	3.5	6
Scalability & adaptability	7%	5	6.5	6
Economic Criteria				
Capital costs	14%			
Operations & Maintenance costs	8%	9	4	7
Constructability / Construction-phase risks	3%	1	1	2
Cost per gallon captured	3%			
Operational flexibility for optimization	3%	5	5.5	7
Social Criteria				
Fishable, shellfishable & swimmable waters	6%	0.5	0.5	0.5
Co-benefits & quality of life	5%	8	8.5	5
Operations & maintenance impacts and risks	4%	4	3.5	4
Construction-phase disruptions	4%	0	1.5	2
Implementation Criteria				
Administrative / Institutional considerations	7%	3	2.5	5
System reliability / Operational robustness	5%	7	5	7
Climate change resiliency & recovery	5%	5	5.5	6
Composite Rating & Ranking:		2.7	2.7	3.6

Alternatives evaluation by
subsystem

039 056

035

206

101 103

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207 thru 211

213 – 214

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035 Subsystem



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035 Alternatives

BPSA

FPSA

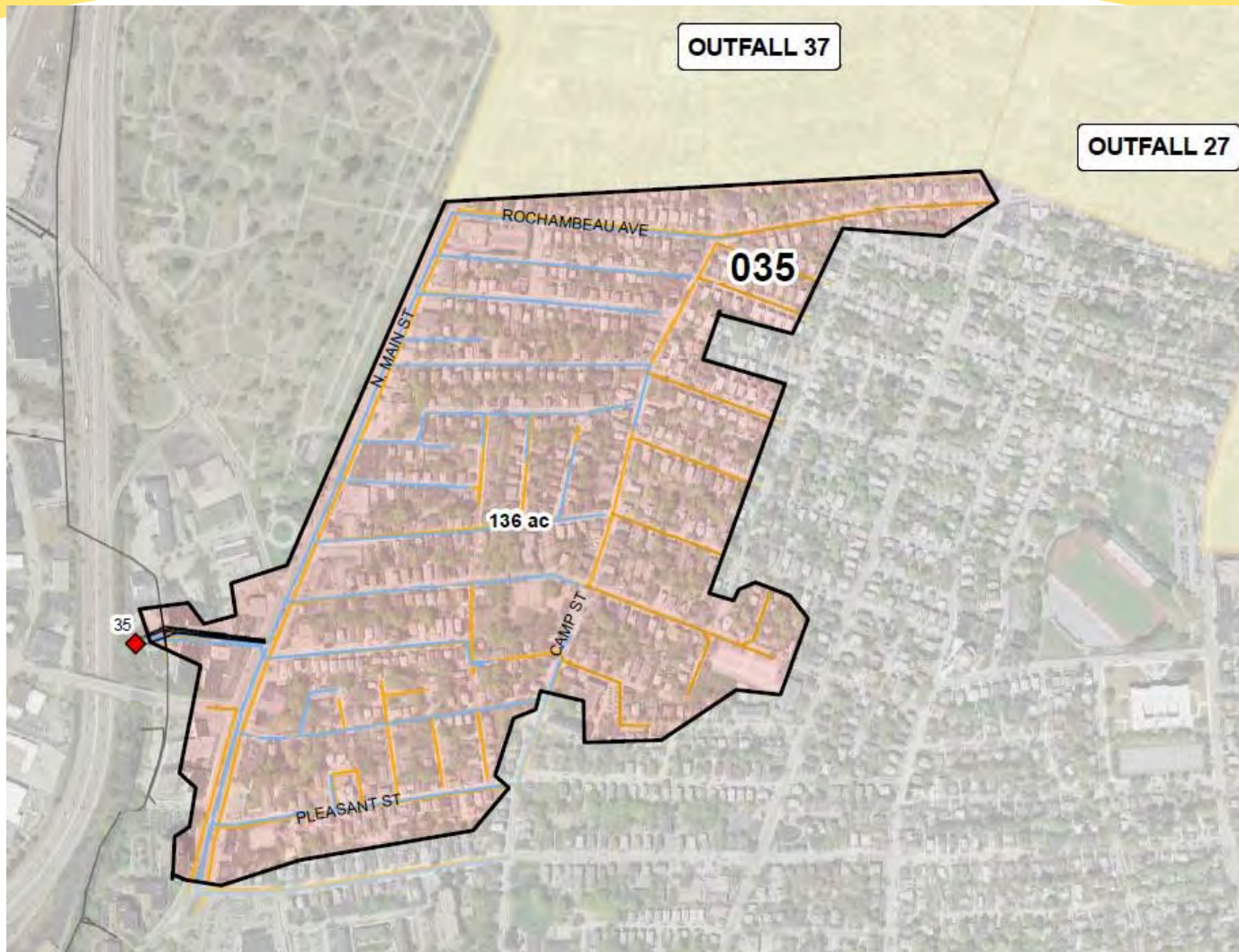


- Alternative 1 – Stormwater control & storage

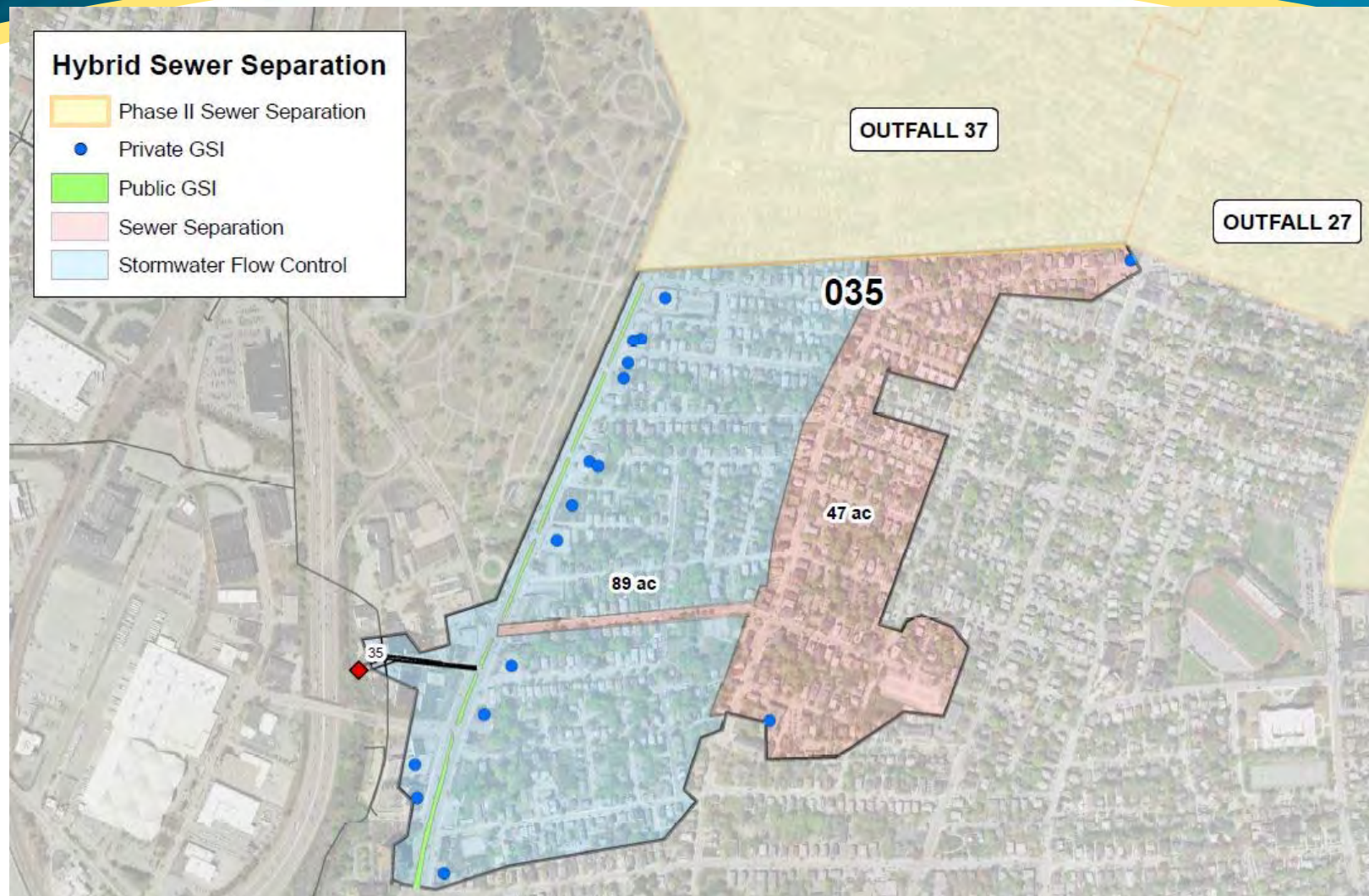


- Baseline – Sewer Separation

035 Sewer Separation



035 Stormwater Control & Storage



035 Alternatives Evaluation

			035
Volume Captured:		0.77	0.77
Evaluation Criteria	Factor	035 Sewer separation	Hybrid GSI / SW Tank / Sewer separation
Environmental Criteria			
Water quality (bacteria) impacts	14%	0.5	0.5
Water quality (nutrients) impacts	7%	1	4
Flooding risks from stormwater systems	7%	0	3.5
Scalability & adaptability	7%	5	6.5
Economic Criteria			
Capital costs	14%		
Operations & Maintenance costs	8%	9	4
Constructability / Construction-phase risks	3%	1	3
Cost per gallon captured	3%		
Operational flexibility for optimization	3%	5	5.5
Social Criteria			
Fishable, shellfishable & swimmable waters	6%	0.5	0.5
Co-benefits & quality of life	5%	8	8.5
Operations & maintenance impacts and risks	4%	4	3.5
Construction-phase disruptions	4%	0	1.5
Implementation Criteria			
Administrative / Institutional considerations	7%	3	2.5
System reliability / Operational robustness	5%	7	5
Climate change resiliency & recovery	5%	5	5.5
Composite Rating & Ranking:		2.7	2.9

206 Subsystem

Alternatives evaluation by subsystem

039 056

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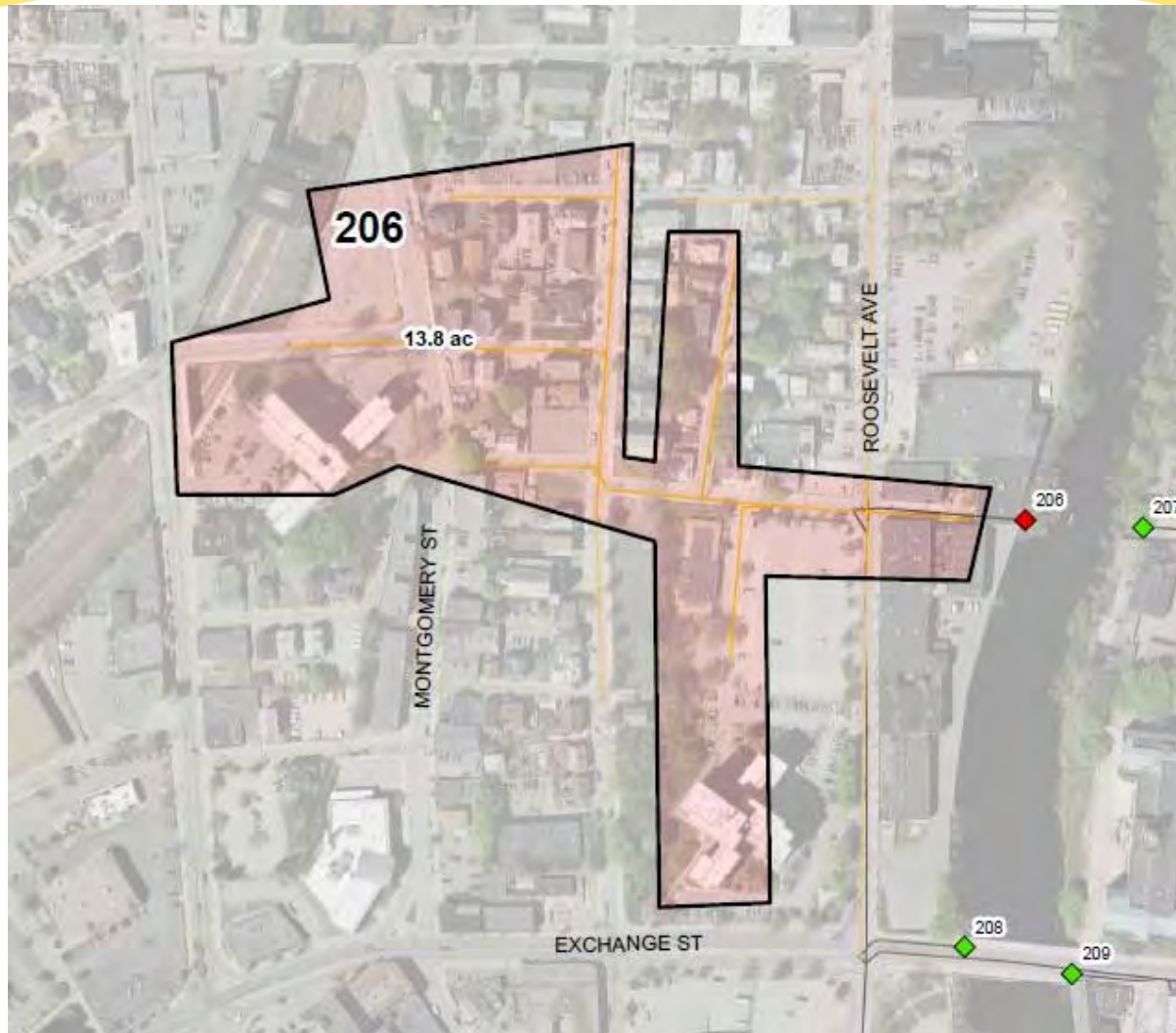
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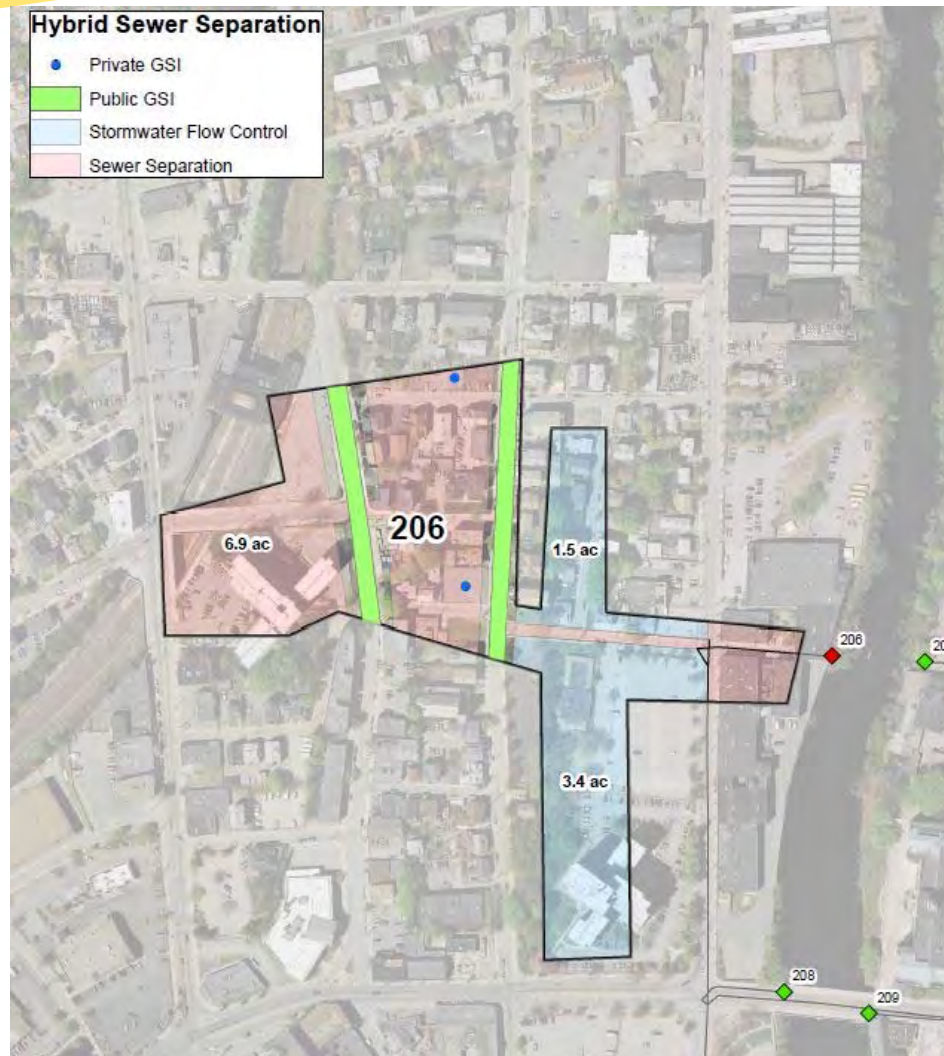
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206 Sewer Separation



206 Stormwater Control & Storage



206 Alternatives Evaluation

			206
Volume Captured:		0.14	0.14
Evaluation Criteria	Factor	206 Sewer separation	Hybrid GSI / Parking lot stormwater tanks
Environmental Criteria			
Water quality (bacteria) impacts	14%	0.5	0.5
Water quality (nutrients) impacts	7%	3	7
Flooding risks from stormwater systems	7%	0	8
Scalability & adaptability	7%	5	7
Economic Criteria			
Capital costs	14%		
Operations & Maintenance costs	8%	9	6
Constructability / Construction-phase risks	3%	1	2
Cost per gallon captured	3%		
Operational flexibility for optimization	3%	5	7
Social Criteria			
Fishable, shellfishable & swimmable waters	6%	0.5	0.5
Co-benefits & quality of life	5%	8	10
Operations & maintenance impacts and risks	4%	4	2
Construction-phase disruptions	4%	0	1
Implementation Criteria			
Administrative / Institutional considerations	7%	3	0
System reliability / Operational robustness	5%	7	2
Climate change resiliency & recovery	5%	5	6
Composite Rating & Ranking:		2.8	3.3

101 103 Subsystem

Alternatives evaluation by subsystem

039 056

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101 103

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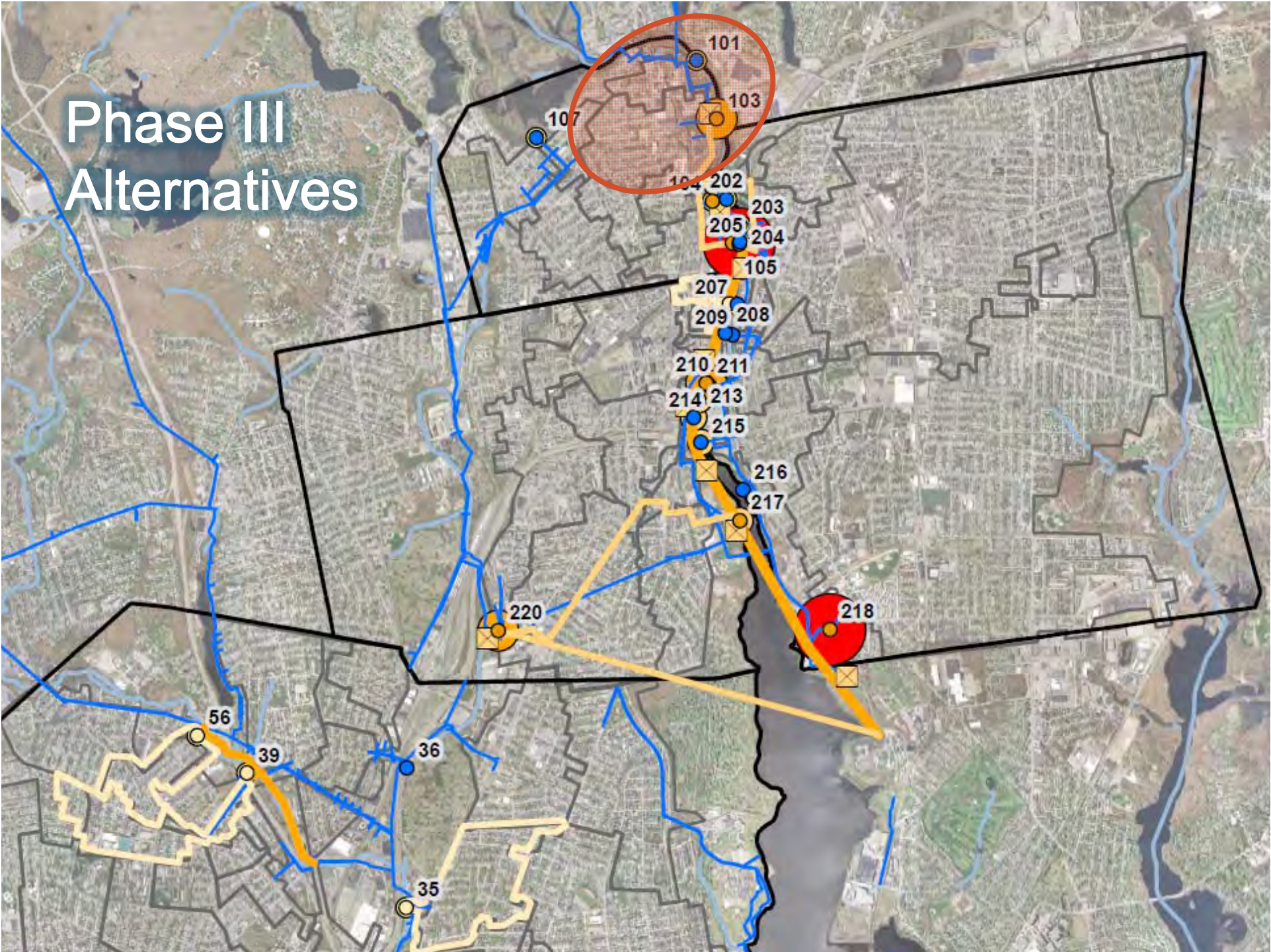


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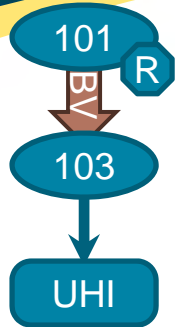
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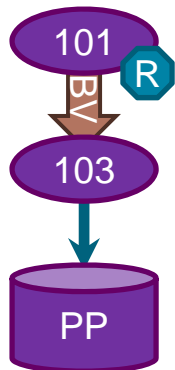
Phase II Alternatives



101 103 Alternatives

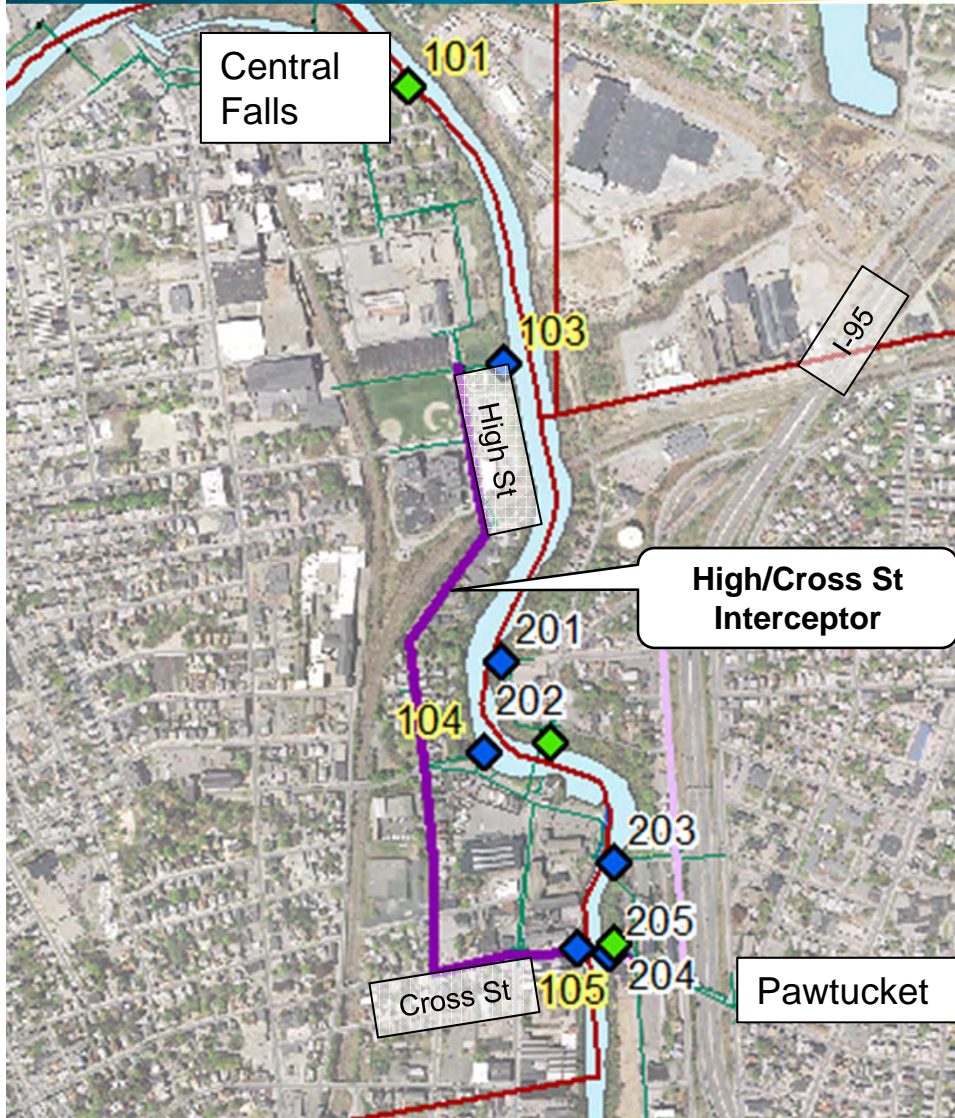


- Baseline – Upper High & Cross Street interceptor to Pawtucket Tunnel

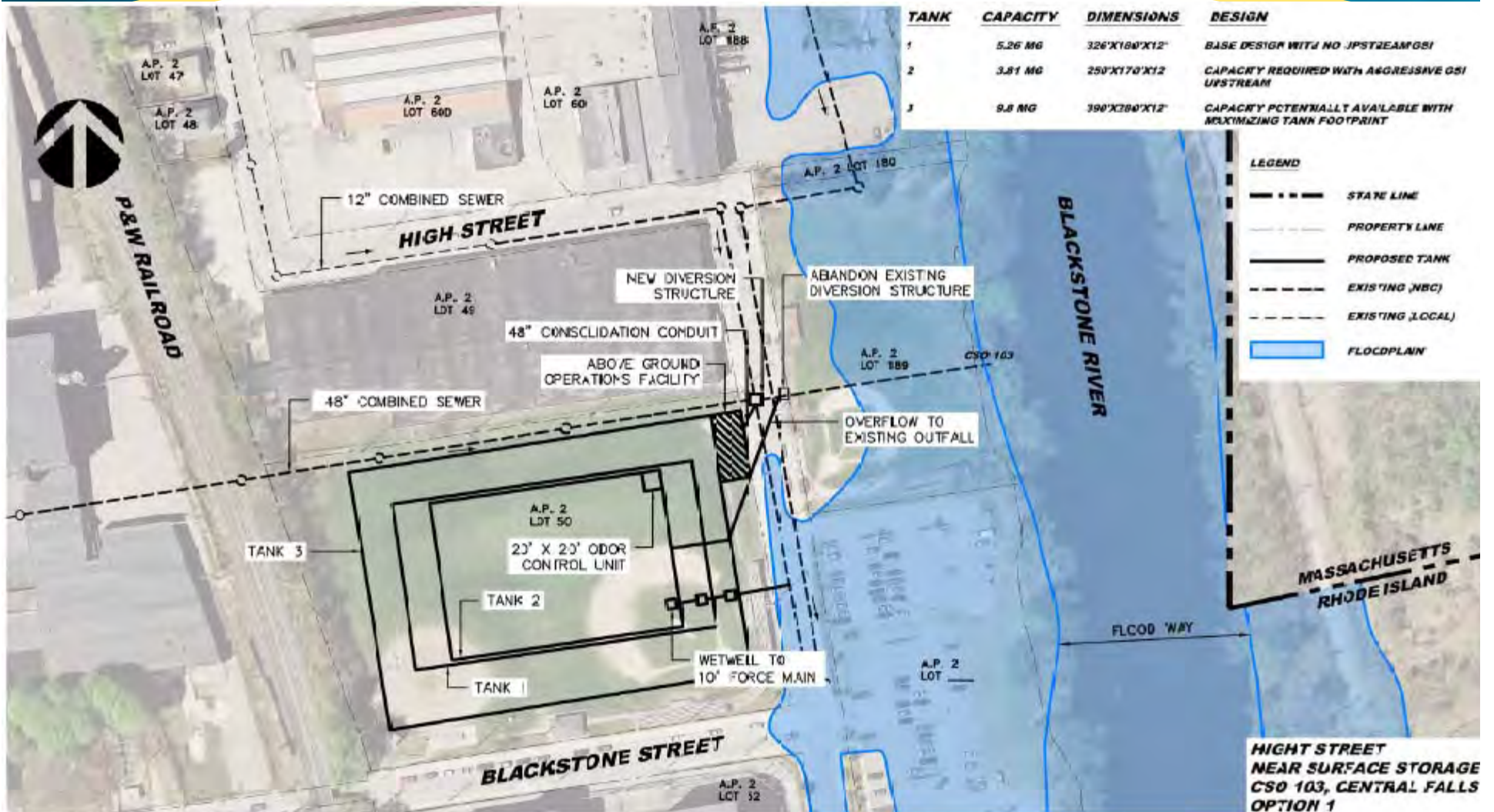


- Alternative 1 – Pierce Park Combined Volume Tank
- GSI can optimize tank sizing
- Treatment & discharge not compatible with available site

High & Cross Streets Interceptor



High Street Tank – Option A



High Street Tank – Option B



101 103 Alternatives Evaluation

			101, 103
Volume Captured:		5.26	5.26
		Upper High & Cross St interceptor	High Street Tank
Evaluation Criteria	Factor		
Environmental Criteria			
Water quality (bacteria) impacts	14%	3	3
Water quality (nutrients) impacts	7%	6	6
Flooding risks from stormwater systems	7%	5	5
Scalability & adaptability	7%	6	6
Economic Criteria			
Capital costs	14%		
Operations & Maintenance costs	8%	6	4
Constructability / Construction-phase risks	3%	1	2
Cost per gallon captured	3%		
Operational flexibility for optimization	3%	7	7
Social Criteria			
Fishable, shellfishable & swimmable waters	6%	3	3
Co-benefits & quality of life	5%	5	5
Operations & maintenance impacts and risks	4%	5	3
Construction-phase disruptions	4%	3	3
Implementation Criteria			
Administrative / Institutional considerations	7%	6	3
System reliability / Operational robustness	5%	7	3
Climate change resiliency & recovery	5%	6	6
Composite Rating & Ranking:		4.1	3.5

104 105 Subsystem

Alternatives evaluation by subsystem

039 056

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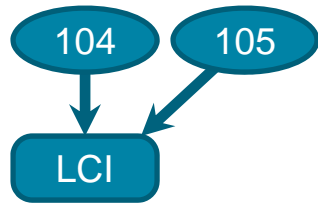
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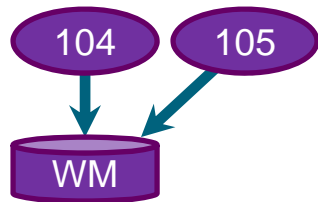
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104 105 Alternatives



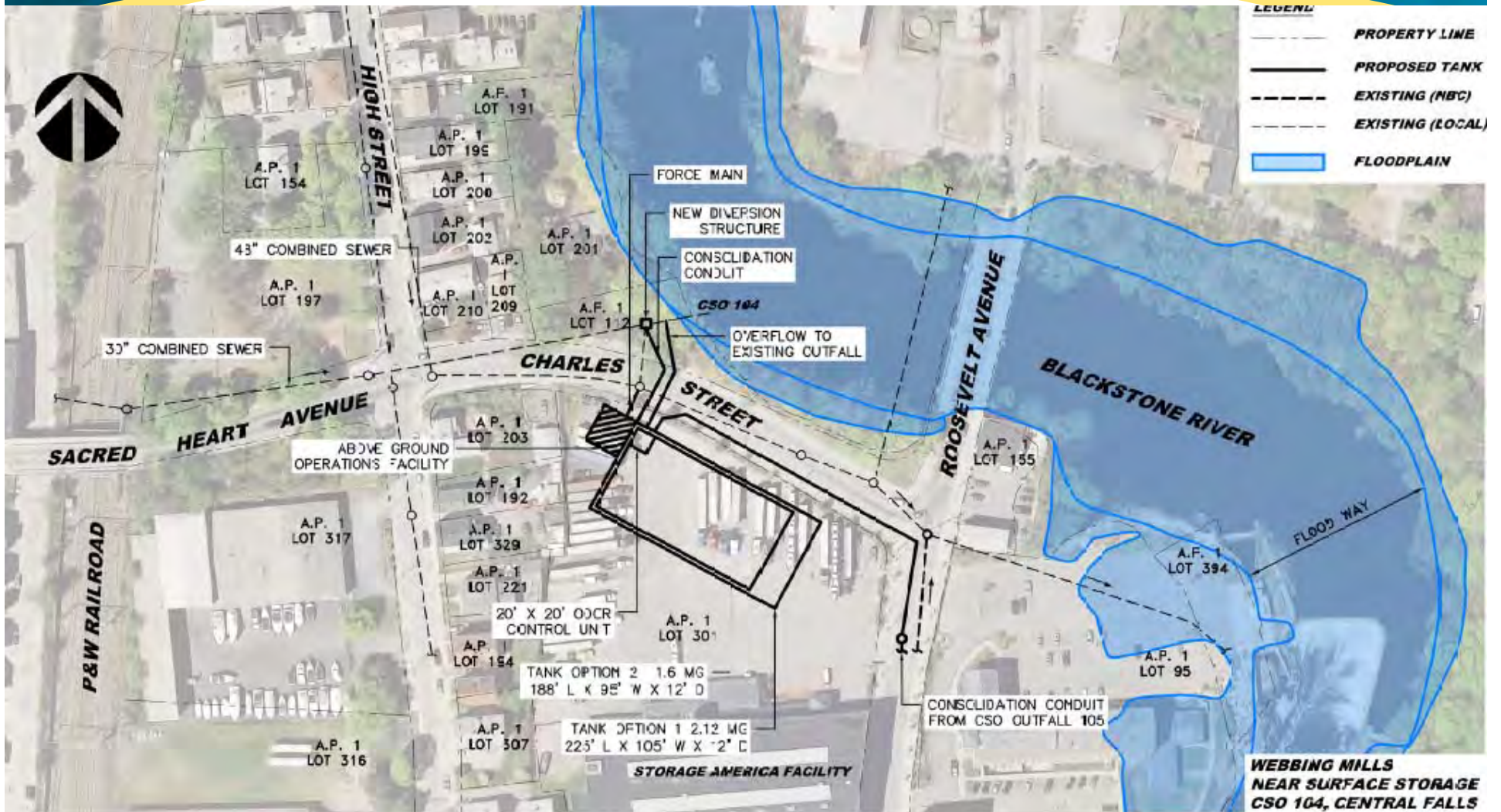
- Baseline – Lower High & Cross Street interceptor to Pawtucket Tunnel



- Alternative 1 – Webbing Mills Combined Volume Tank

- GSI can optimize tank sizing
- Treatment & discharge not compatible with available site
- Requires Pierce Park Tank for 101 103

Webbing Mills Tank



104 105 Alternatives Evaluation

			104, 105
Volume Captured:		2.12	2.12
		Lower High & Cross St interceptor	Webbing Mills Tank
Evaluation Criteria	Factor		
Environmental Criteria			
Water quality (bacteria) impacts	14%	2	2
Water quality (nutrients) impacts	7%	6	6
Flooding risks from stormwater systems	7%	5	5
Scalability & adaptability	7%	6	6
Economic Criteria			
Capital costs	14%		
Operations & Maintenance costs	8%	6	4
Constructability / Construction-phase risks	3%	2	2
Cost per gallon captured	3%		
Operational flexibility for optimization	3%	7	7
Social Criteria			
Fishable, shellfishable & swimmable waters	6%	2	2
Co-benefits & quality of life	5%	5	5
Operations & maintenance impacts and risks	4%	5	3
Construction-phase disruptions	4%	3	3
Implementation Criteria			
Administrative / Institutional considerations	7%	6	3
System reliability / Operational robustness	5%	7	3
Climate change resiliency & recovery	5%	6	6
Composite Rating & Ranking:		3.9	3.3

201 202 Subsystem

Alternatives evaluation by subsystem

039 056

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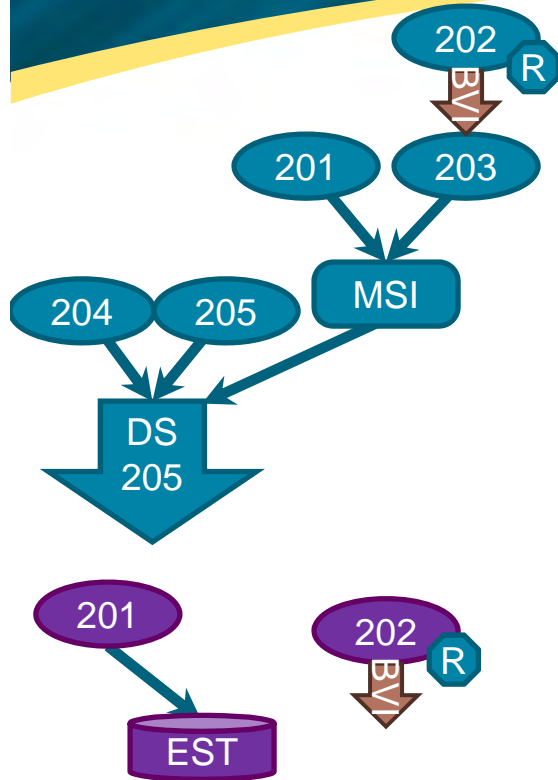


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201 202 Alternatives



- Baseline – Middle Street Interceptor to Pawtucket Tunnel via the drop shaft near 205

- Alternative 1 – East Street Combined Volume Tank
- GSI can optimize tank sizing
- Treatment & discharge not compatible with available site

East Street Tank



201 202 Alternatives Evaluation

			201, 202
Volume Captured:		1.51	1.51
		Middle St interceptor	East Street Tank (Viper VoIP Corporation)
Evaluation Criteria	Factor		
Environmental Criteria			
Water quality (bacteria) impacts	14%	1	1
Water quality (nutrients) impacts	7%	6	6
Flooding risks from stormwater systems	7%	5	5
Scalability & adaptability	7%	6	6
Economic Criteria			
Capital costs	14%		
Operations & Maintenance costs	8%	7	4
Constructability / Construction-phase risks	3%	3	2
Cost per gallon captured	3%		
Operational flexibility for optimization	3%	7	7
Social Criteria			
Fishable, shellfishable & swimmable waters	6%	1	1
Co-benefits & quality of life	5%	5	5
Operations & maintenance impacts and risks	4%	5	4
Construction-phase disruptions	4%	3	4
Implementation Criteria			
Administrative / Institutional considerations	7%	6	3
System reliability / Operational robustness	5%	7	3
Climate change resiliency & recovery	5%	6	6
Composite Rating & Ranking:		3.8	3.1

203 204 205 Subsystem

Alternatives evaluation by subsystem

039 056

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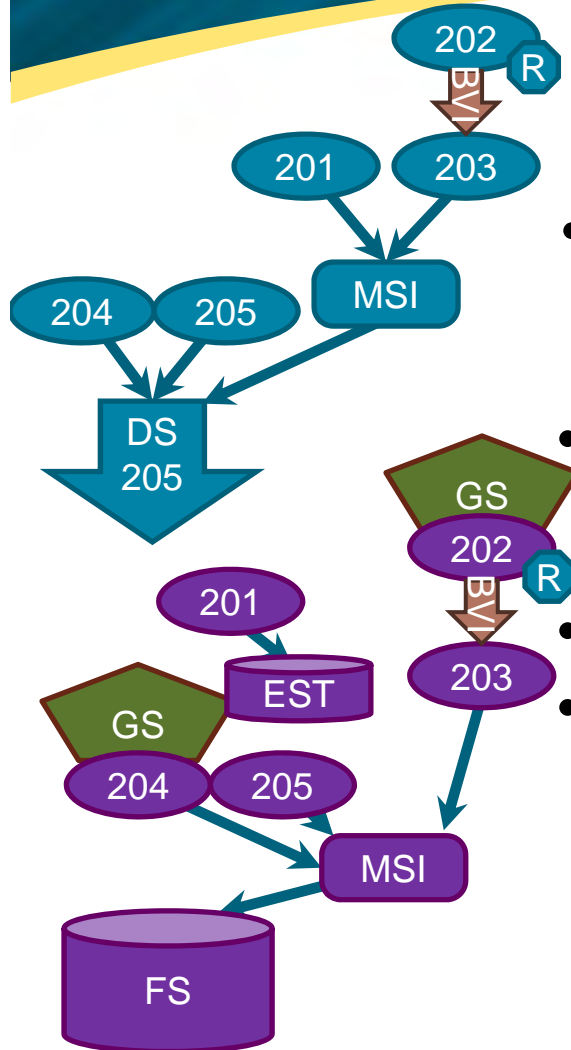
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203 204 205 Alternatives

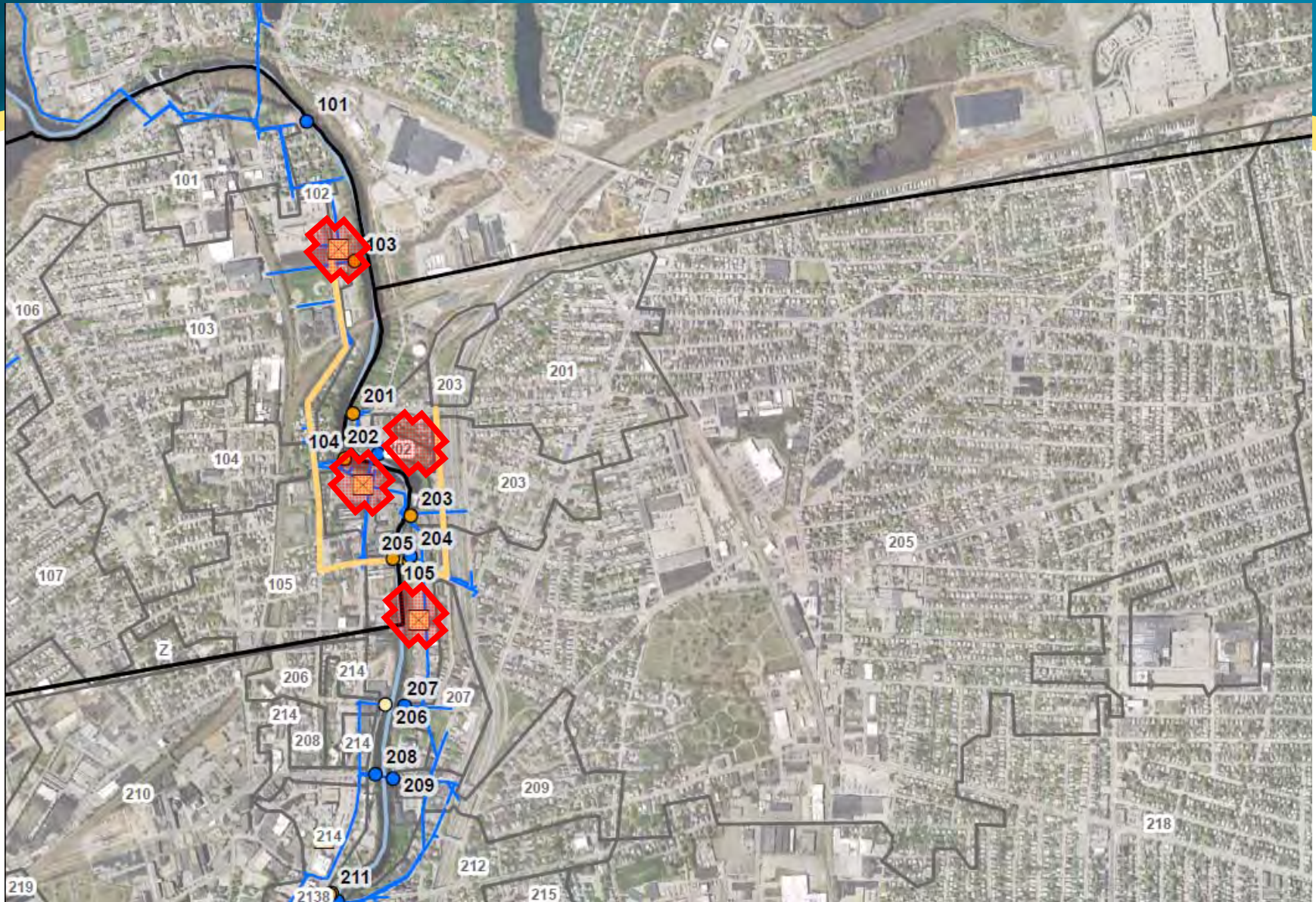


- Baseline – Middle Street Interceptor & Pawtucket Tunnel Drop Shaft 205
- Alternative 1 – GSI throughout 201 – 205 + Front Street Combined Volume Tank
- GSI required due to Front Street site constraints
- Upstream Pierce Park, Webbing Mills & East Street tanks required due to Front Street site constraints
- Alternative 2 – Screening & Disinfection

Front Street Tank



Alternative 2 – Screening & Disinfection



203 204 205 Alternatives Evaluation

		203	204	205
Volume Captured:		13.37	13.37	22.01
Evaluation Criteria	Factor	Drop shaft 205 & conduit	Front St Tank with GSI	Front St Screening & Disinfection
Environmental Criteria				
Water quality (bacteria) impacts	14%	10	10	5
Water quality (nutrients) impacts	7%	10	10	6
Flooding risks from stormwater systems	7%	5	6.5	5.0
Scalability & adaptability	7%	6	6.5	7
Economic Criteria				
Capital costs	14%			
Operations & Maintenance costs	8%	8	2	1
Constructability / Construction-phase risks	3%	5	2	2
Cost per gallon captured	3%			
Operational flexibility for optimization	3%	7	7	7
Social Criteria				
Fishable, shellfishable & swimmable waters	6%	10	10	5
Co-benefits & quality of life	5%	5	7.5	2
Operations & maintenance impacts and risks	4%	5	3	1
Construction-phase disruptions	4%	4	2.5	2
Implementation Criteria				
Administrative / Institutional considerations	7%	7	1.5	1
System reliability / Operational robustness	5%	8	2.5	1
Climate change resiliency & recovery	5%	7	6	7
Composite Rating & Ranking:		6.3	5.1	3.3

207 thru 211 Subsystem

Alternatives evaluation by subsystem

039 056

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201 202

203 204 205

207 thru 211

213 – 214

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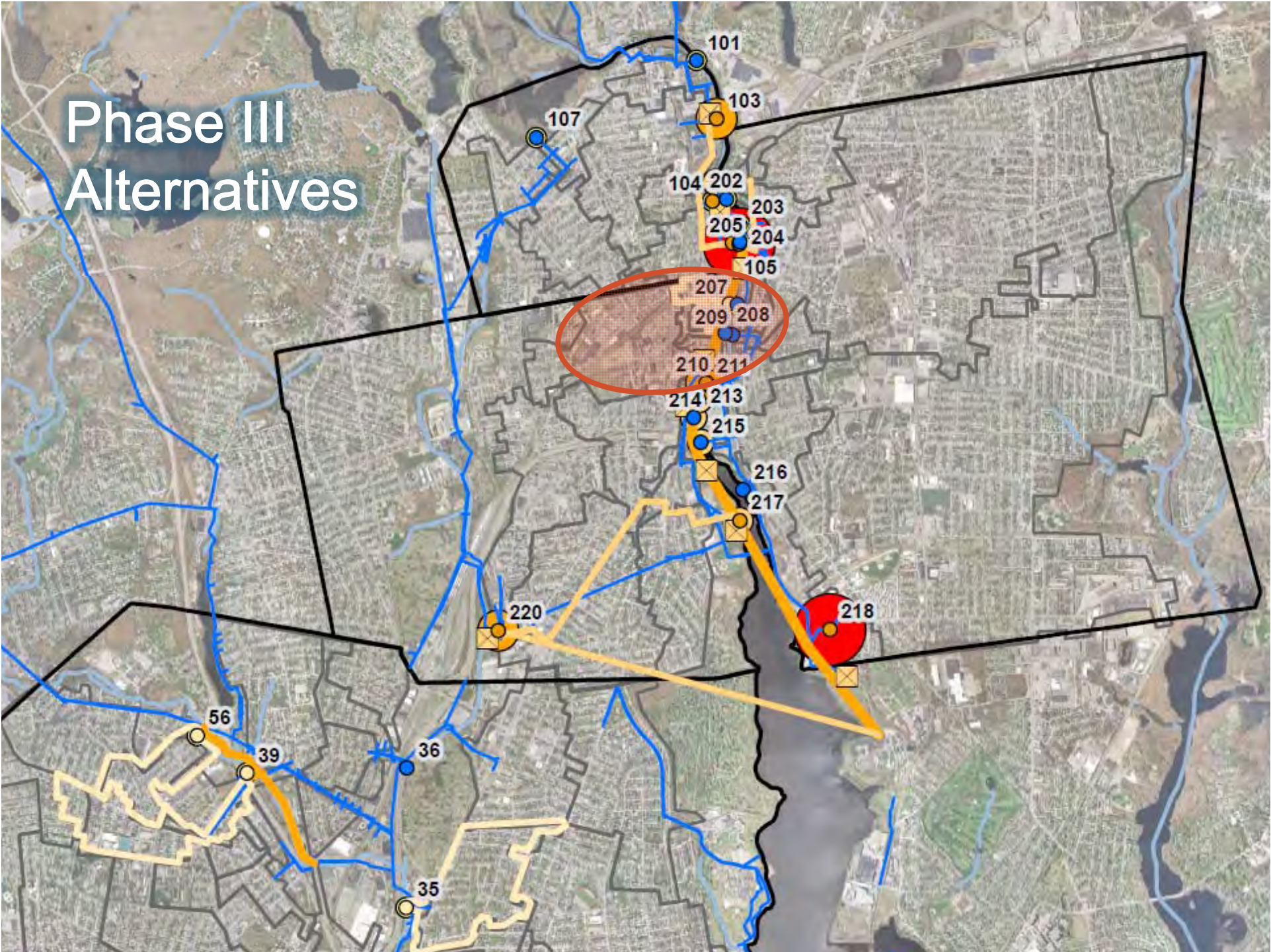
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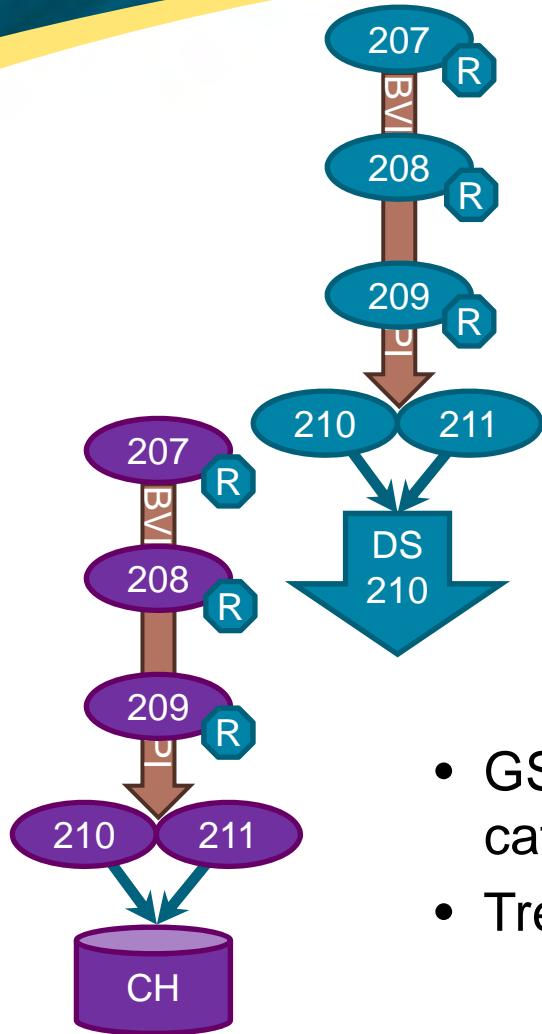
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Phase II Alternatives



207 – 211 Alternatives

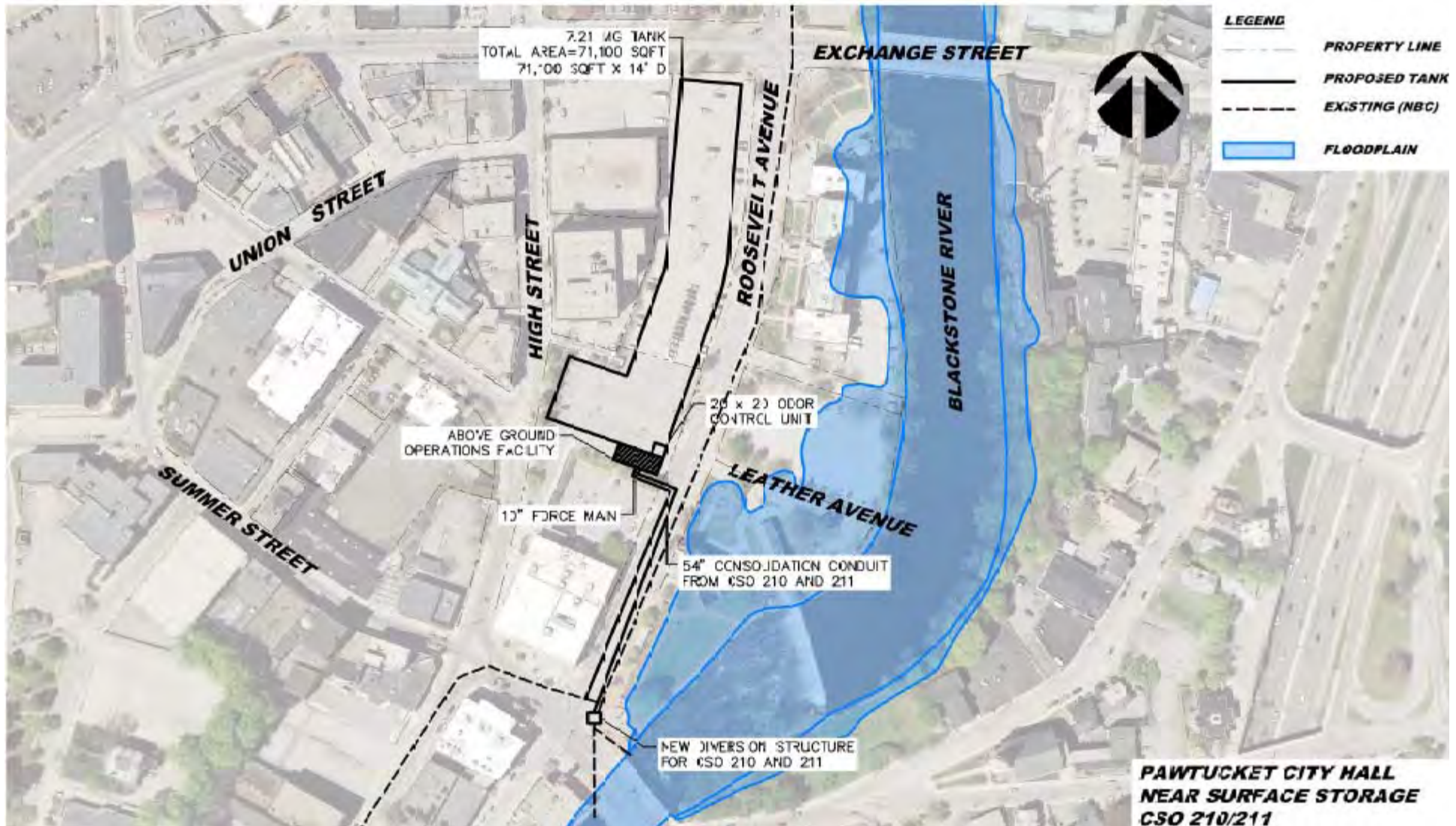


- Baseline –Pawtucket Tunnel Drop Shaft 210/211

- Alternative 1 – City Hall Combined Volume Tank

- GSI can optimize tank sizing; however, potential in these catchments is low due to soil constraints
- Treatment & discharge not compatible with available site

“City Hall” Tank



207 – 211 Alternatives Evaluation

			207, 208, 209, 210, 211
Volume Captured:		7.21	7.21
		Drop shaft 210/211 & conduit	City Hall Tank
Evaluation Criteria	Factor		
Environmental Criteria			
Water quality (bacteria) impacts	14%	5	5
Water quality (nutrients) impacts	7%	7	7
Flooding risks from stormwater systems	7%	5	5
Scalability & adaptability	7%	6	6
Economic Criteria			
Capital costs	14%		
Operations & Maintenance costs	8%	8	4
Constructability / Construction-phase risks	3%	4	1
Cost per gallon captured	3%		
Operational flexibility for optimization	3%	7	7
Social Criteria			
Fishable, shellfishable & swimmable waters	6%	5	5
Co-benefits & quality of life	5%	5	5
Operations & maintenance impacts and risks	4%	5	4
Construction-phase disruptions	4%	4	4
Implementation Criteria			
Administrative / Institutional considerations	7%	7	3
System reliability / Operational robustness	5%	8	3
Climate change resiliency & recovery	5%	7	6
Composite Rating & Ranking:		5.0	4.0

213 – 214 Subsystem

Alternatives evaluation by subsystem

039 056

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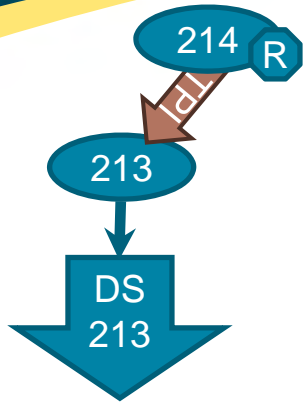
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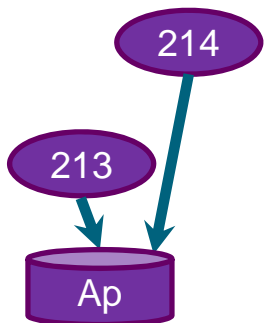
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213 – 214 Alternatives



- Baseline –Pawtucket Tunnel Drop Shaft 213



- Alternative 1 – 213 Combined Volume Tank
- GSI can optimize tank sizing
- Treatment & discharge not compatible with available site

213 Tank



**TAFT STREET
NEAR SURFACE STORAGE
CSO 213;214, PAWTUCKET**

213 – 214 Alternatives Evaluation

			213, 214
Volume Captured:		3.24	3.24
		Drop shaft 213 & conduit	213 Tank
Evaluation Criteria	Factor		
Environmental Criteria			
Water quality (bacteria) impacts	14%	3	3
Water quality (nutrients) impacts	7%	6	6
Flooding risks from stormwater systems	7%	5	5
Scalability & adaptability	7%	6	6
Economic Criteria			
Capital costs	14%		
Operations & Maintenance costs	8%	8	4
Constructability / Construction-phase risks	3%	4	3
Cost per gallon captured	3%		
Operational flexibility for optimization	3%	7	7
Social Criteria			
Fishable, shellfishable & swimmable waters	6%	3	3
Co-benefits & quality of life	5%	5	5
Operations & maintenance impacts and risks	4%	5	4
Construction-phase disruptions	4%	4	4
Implementation Criteria			
Administrative / Institutional considerations	7%	7	3
System reliability / Operational robustness	5%	8	3
Climate change resiliency & recovery	5%	7	6
Composite Rating & Ranking:		4.5	3.6

Alternatives evaluation by
subsystem

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217 Subsystem



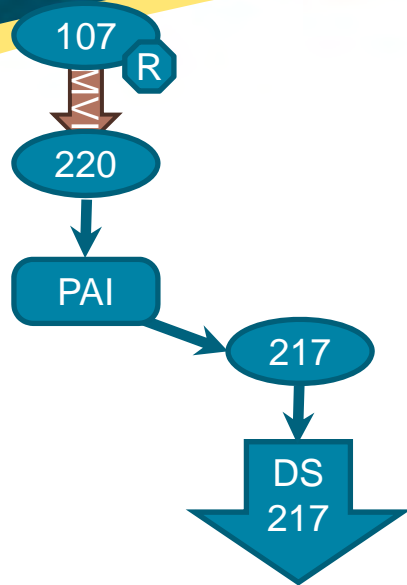
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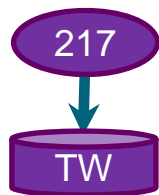
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217 Alternatives

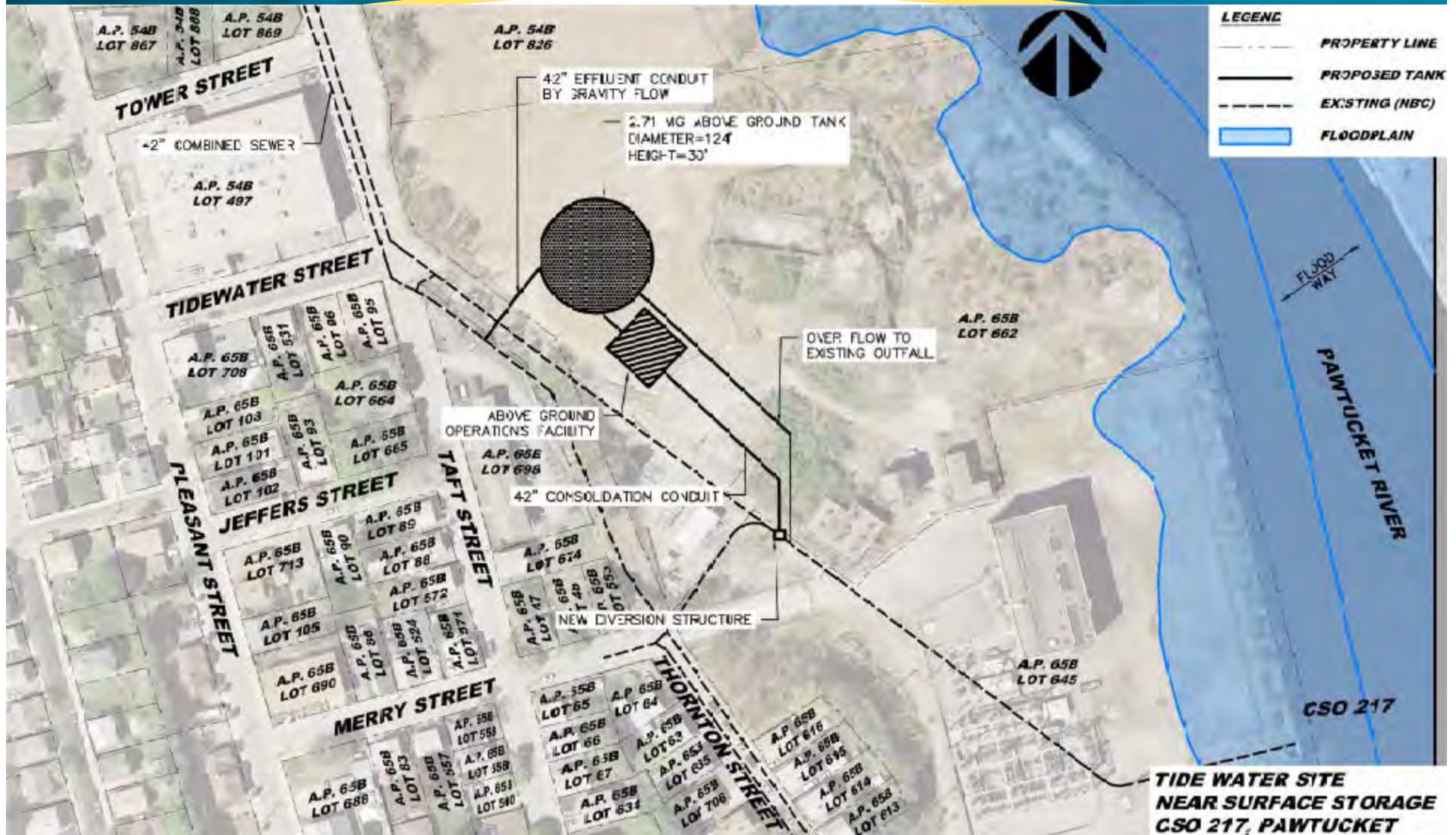


- Baseline – Pawtucket Tunnel Drop Shaft 217
 - Note: Receives flow from 220 via Pawtucket Ave Interceptor



- Alternative 1 – Tidewater Combined Volume Tank
 - GSI can optimize tank sizing
 - Treatment & discharge could be evaluated as alternative
 - Requires separate 220 solution

Tidewater Tank



217 Alternatives Evaluation

			217
Volume Captured:		2.71	2.71
Evaluation Criteria	Factor	Drop shaft 217 & conduit	Tidewater Tank / T&D
Environmental Criteria			
Water quality (bacteria) impacts	14%	2	2
Water quality (nutrients) impacts	7%	6	6
Flooding risks from stormwater systems	7%	5	5
Scalability & adaptability	7%	6	6
Economic Criteria			
Capital costs	14%		
Operations & Maintenance costs	8%	8	3
Constructability / Construction-phase risks	3%	3	2
Cost per gallon captured	3%		
Operational flexibility for optimization	3%	7	7
Social Criteria			
Fishable, shellfishable & swimmable waters	6%	2	2
Co-benefits & quality of life	5%	5	5
Operations & maintenance impacts and risks	4%	5	4
Construction-phase disruptions	4%	4	4
Implementation Criteria			
Administrative / Institutional considerations	7%	7	3
System reliability / Operational robustness	5%	8	3
Climate change resiliency & recovery	5%	7	6
Composite Rating & Ranking:		4.3	3.3

107 220 Subsystem

Alternatives evaluation by subsystem

039 056

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107 220

212 215 216 218



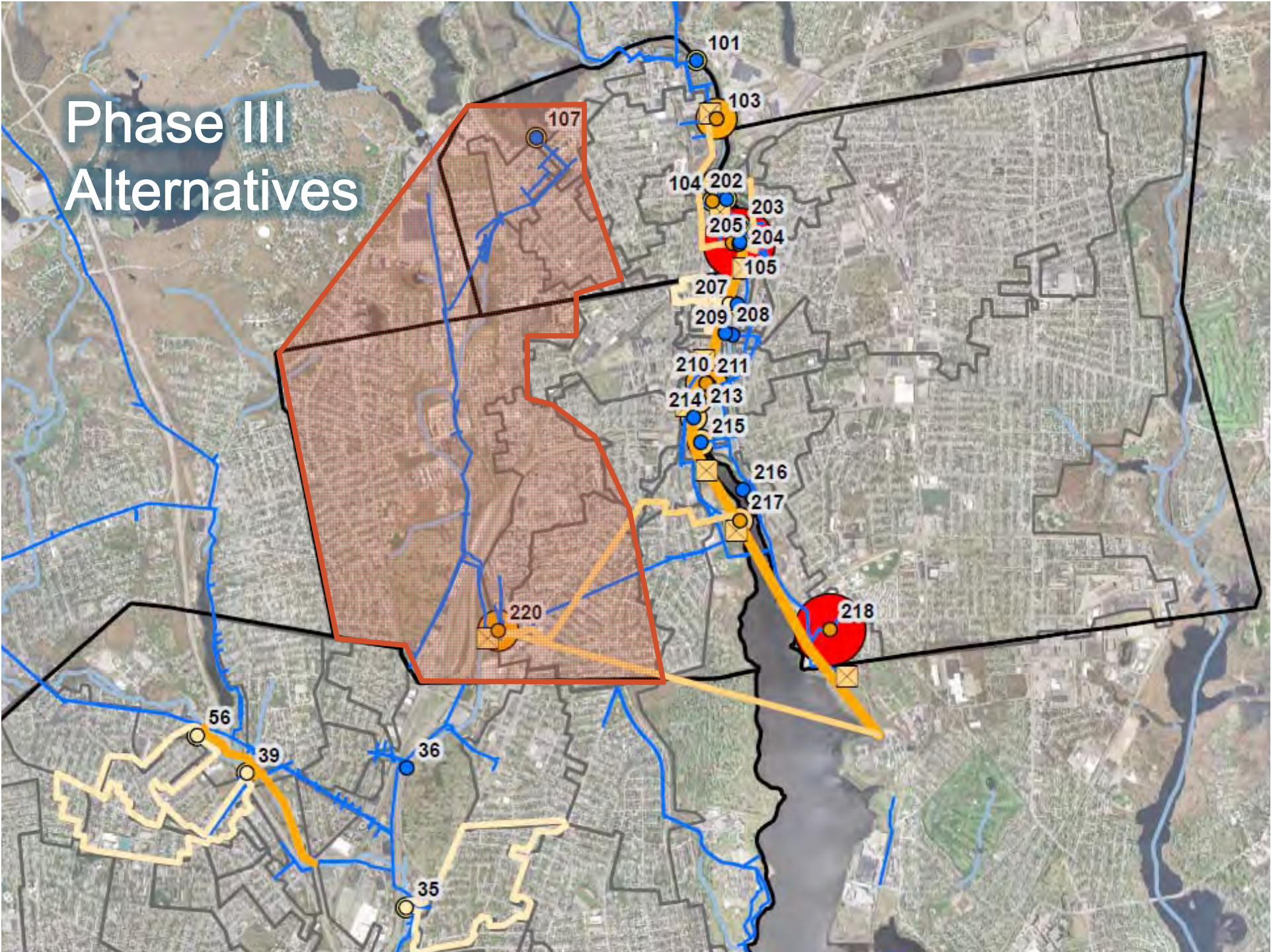
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The PARE CORPORATION logo features a stylized white 'P' with a horizontal line through its center, set against a dark blue background. Below the 'P' is the word 'PARE' in a bold, sans-serif font, and 'CORPORATION' in a smaller, all-caps sans-serif font below it.

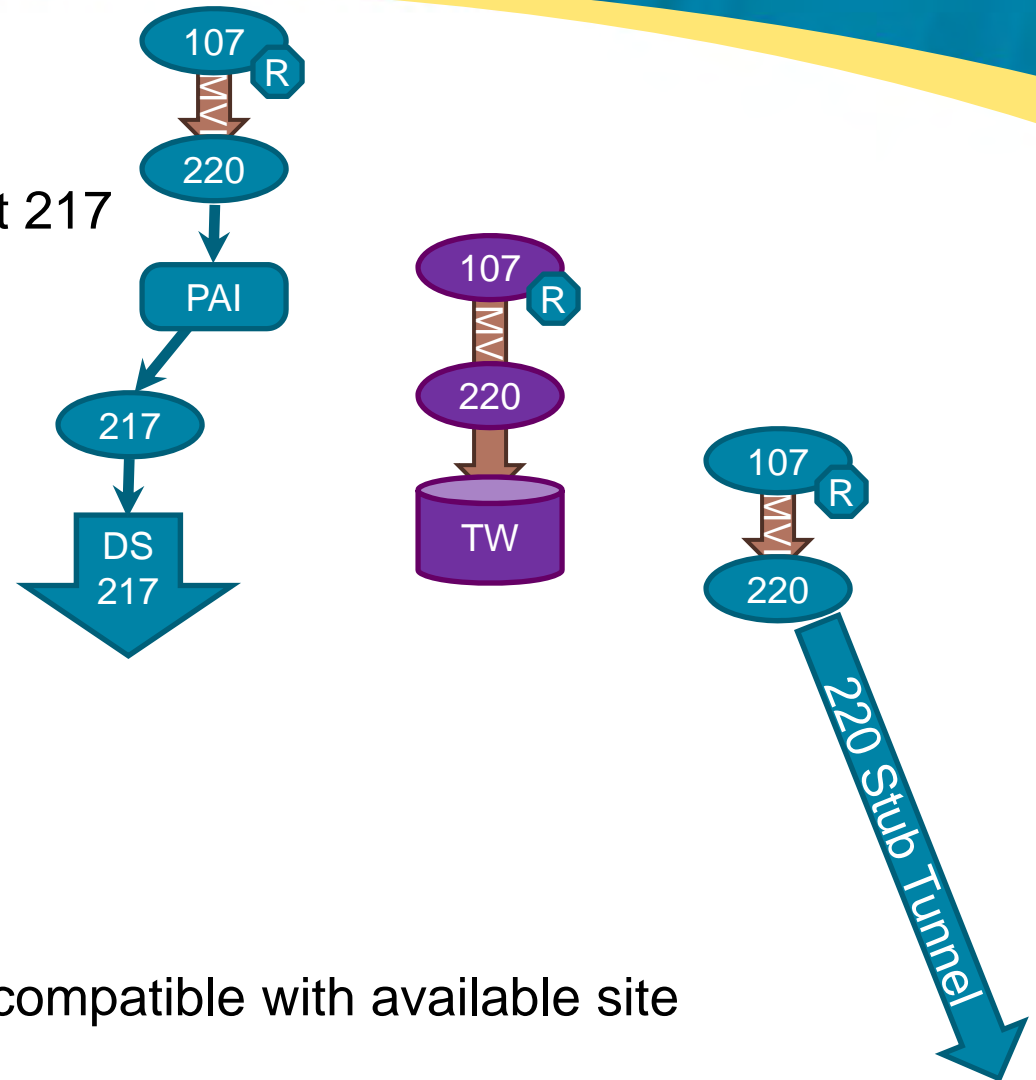
PARE
CORPORATION

Phase II Alternatives

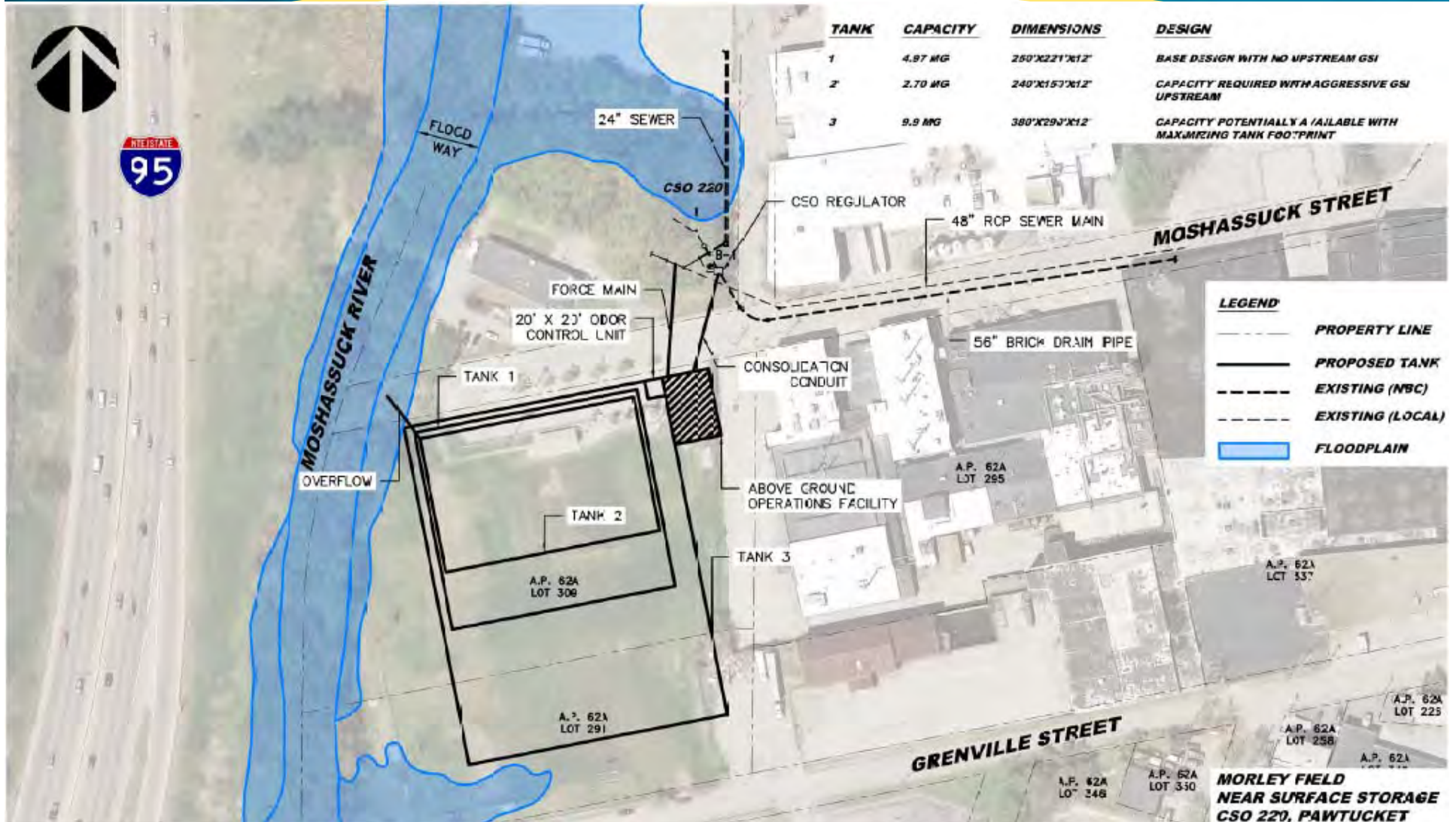


107 220 Alternatives

- Baseline – Pawtucket Avenue Interceptor to Tunnel Drop Shaft 217
- Alternative 1 – Morley Field Combined Volume Tank
- Alternative 1A – Morley Field Screening & Disinfection
- Alternative 2 – Stub Tunnel
- GSI can optimize tank sizing
- Treatment & discharge may be compatible with available site



Morley Field Tank



107 220 Alternatives Evaluation

			107, 220		
Volume Captured:		4.97	4.97	4.97	4.97
		Pawtucket Ave interceptor	Morley Field tank	Morley Field Screening & Disinfection	220 Stub Tunnel
Evaluation Criteria	Factor				
Environmental Criteria					
Water quality (bacteria) impacts	14%	3	3	1	3
Water quality (nutrients) impacts	7%	6	6	4	6
Flooding risks from stormwater systems	7%	5	5	5.0	5
Scalability & adaptability	7%	6	6	7	6
Economic Criteria					
Capital costs	14%				
Operations & Maintenance costs	8%	6	4	1	7
Constructability / Construction-phase risks	3%	1	2	2	4
Cost per gallon captured	3%				
Operational flexibility for optimization	3%	7	7	7	7
Social Criteria					
Fishable, shellfishable & swimmable waters	6%	3	3	1	3
Co-benefits & quality of life	5%	5	5	2	5
Operations & maintenance impacts and risks	4%	5	4	1	5
Construction-phase disruptions	4%	3	4	2	4
Implementation Criteria					
Administrative / Institutional considerations	7%	6	3	1	7
System reliability / Operational robustness	5%	7	3	1	8
Climate change resiliency & recovery	5%	6	6	7	7
Composite Rating & Ranking:		4.1	3.5	2.3	4.4

Alternatives evaluation by
subsystem

039 056

035

206

101 103

104 105

201 202

203 204 205

207 thru 211

213 – 214

217

107 220

212 215 216 218

212 215 216 218 Subsystem

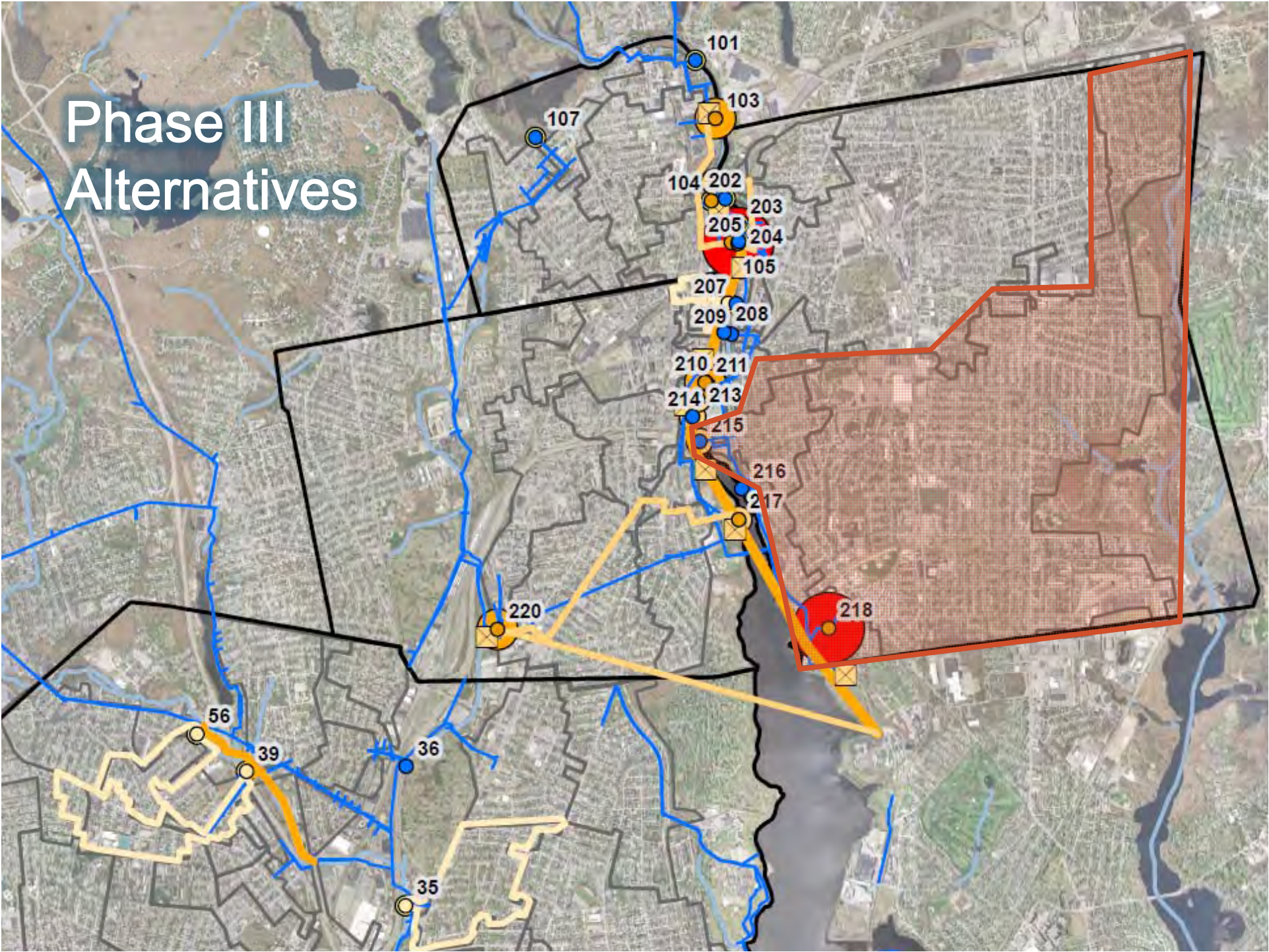


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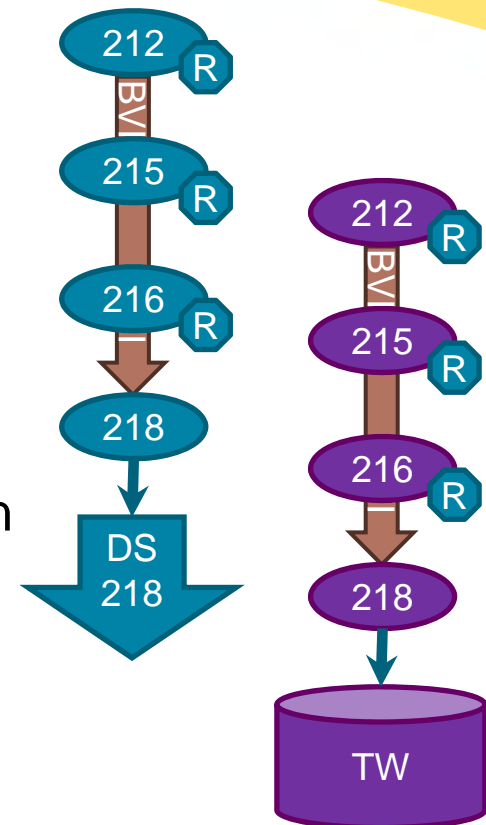

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Phase II Alternatives



212 215 216 218 Alternatives

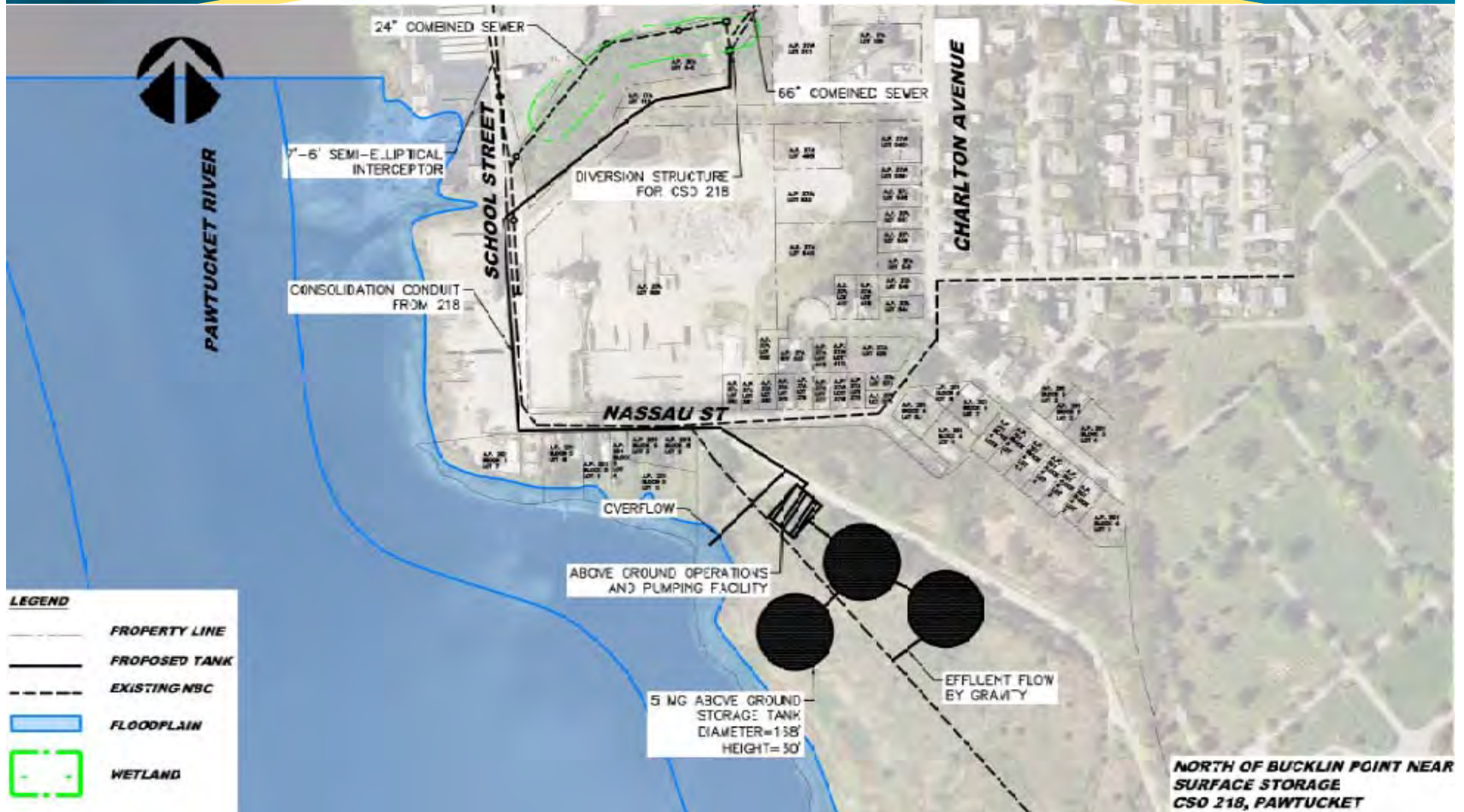
- Baseline – Pawtucket Tunnel Drop Shaft 218
- Alternative 1 – Bucklin Point Combined Volume Tank
- Alternative 1A – Bucklin Point Screening & Disinfection
- Alternative 2 – 220 Stub Tunnel
- GSI can optimize tank sizing
- Treatment & discharge could be evaluated as alternative



Bucklin Point Tank



Bucklin Point Tank – Above Ground Alternate



212 215 216 218 Alternatives Evaluation

			212, 215, 216, 218	
Volume Captured:		14.76	14.76	14.76
Evaluation Criteria	Factor	Drop shaft 218 & conduit	Bucklin Point landfill tank / T&D	Bucklin Point Screening & Disinfection
Environmental Criteria				
Water quality (bacteria) impacts	14%	10	10	5
Water quality (nutrients) impacts	7%	10	10	6
Flooding risks from stormwater systems	7%	5	5	5.0
Scalability & adaptability	7%	6	6	7
Economic Criteria				
Capital costs	14%			
Operations & Maintenance costs	8%	8	4	2
Constructability / Construction-phase risks	3%	4	3	3
Cost per gallon captured	3%			
Operational flexibility for optimization	3%	7	7	7
Social Criteria				
Fishable, shellfishable & swimmable waters	6%	10	10	5
Co-benefits & quality of life	5%	5	5	2
Operations & maintenance impacts and risks	4%	5	4	1
Construction-phase disruptions	4%	4	4	2
Implementation Criteria				
Administrative / Institutional considerations	7%	7	3	1
System reliability / Operational robustness	5%	8	3	1
Climate change resiliency & recovery	5%	7	6	7
Composite Rating & Ranking:		6.2	5.3	3.4

Alternatives development & screening review
Evaluation criteria
CSO needs analysis & hydraulic model results
Alternatives analysis: Subsystem delineations
Alternatives evaluation by subsystem
Alternatives analysis conclusions

Alternatives Analysis Conclusions



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Next Meeting

23 October 2014, 9:00AM

Integrated Planning Framework

Project Prioritization & Sequencing