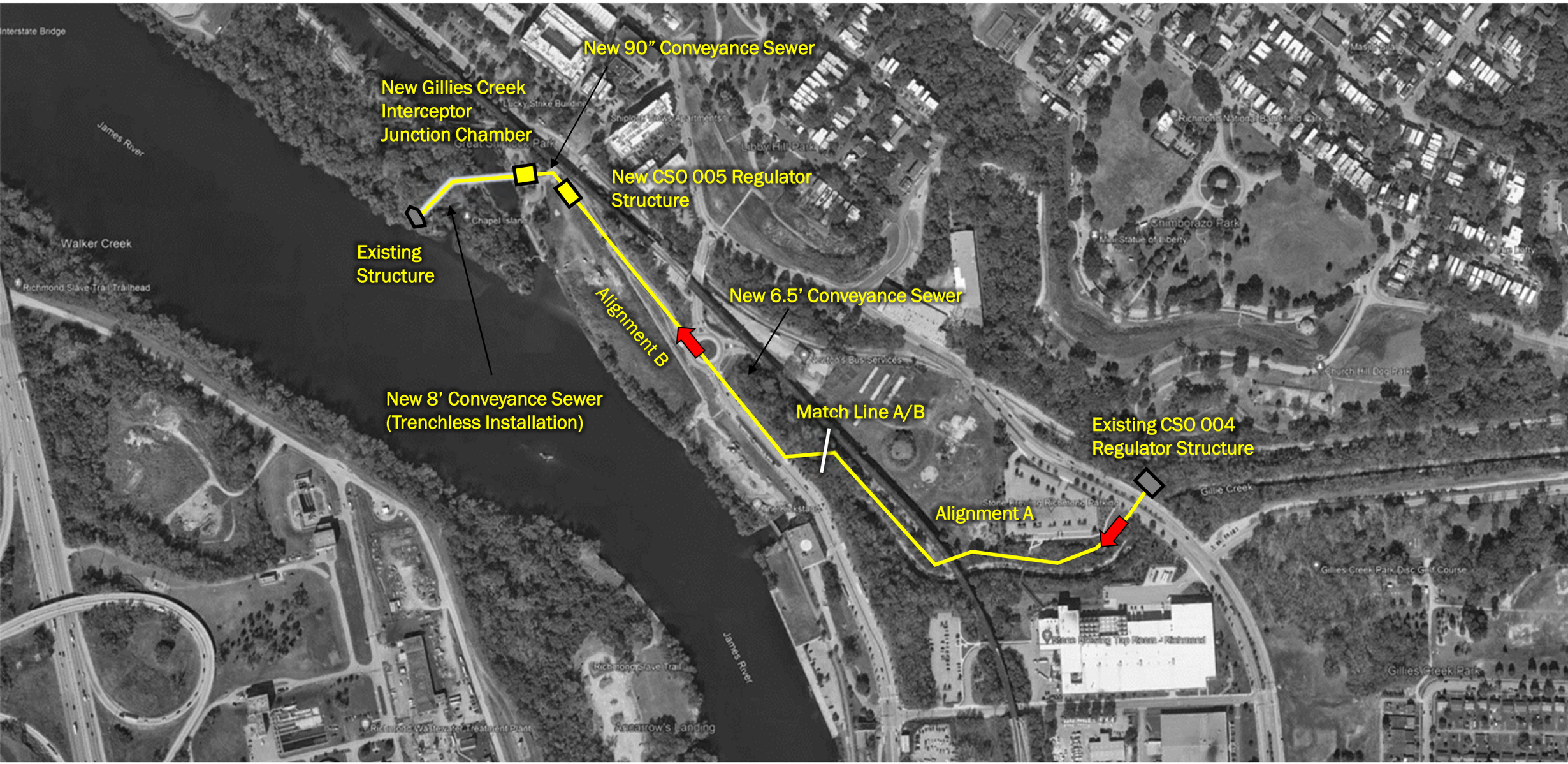
1. Special Order Project #13
2. Special Order Project #15
3. Special Order Project #19
4. Shockoe #1
5. Shockoe #2
6. Shockoe #3
7. Shockoe #4
8. Shockoe #5
9. Southside #1
10. Southside #2
11. Southside #3
12. Southside #4
13. Southside #5
14. Southside #6
15. Gillies Creek #1
16. Gillies Creek #2
17. Gillies Creek #3
18. Gillies Creek #4
19. Northside #1
20. Northside #2
21. Northside #3
22. Dock Street #1
23. Hilton Street #1

Special Order Project #13

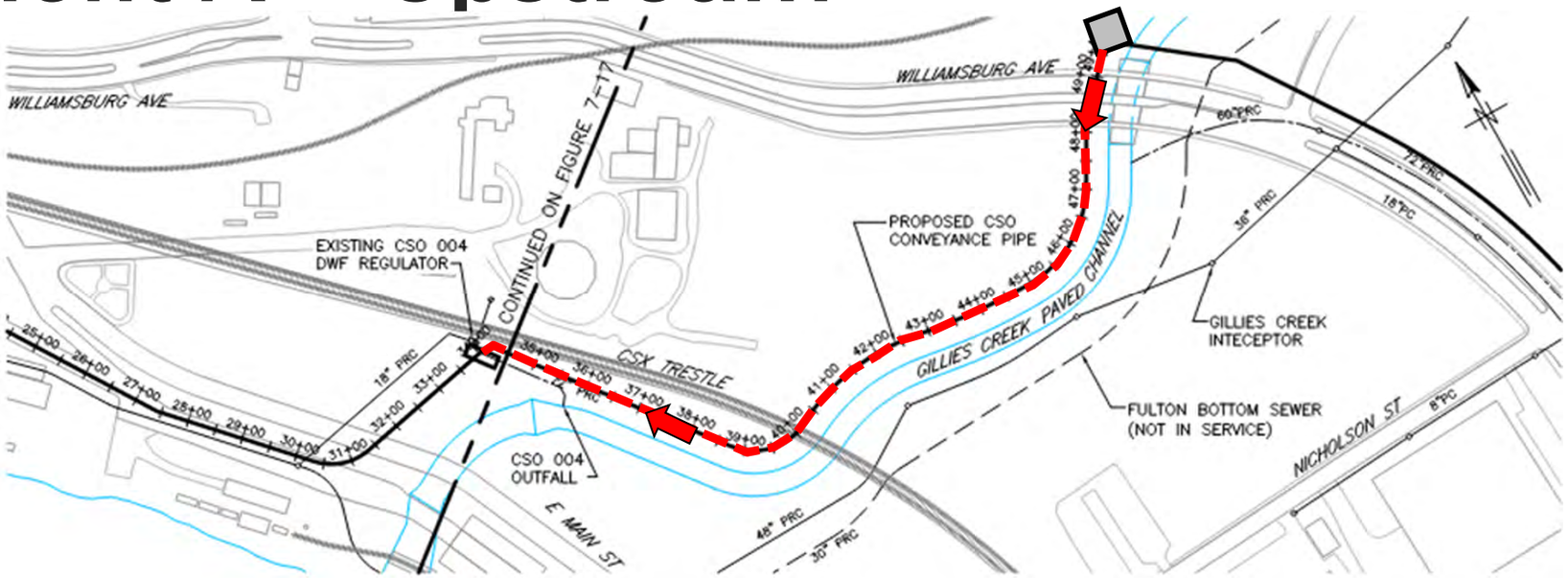
Special Order Project #13

Lower Gillies Creek Conveyance Sewer

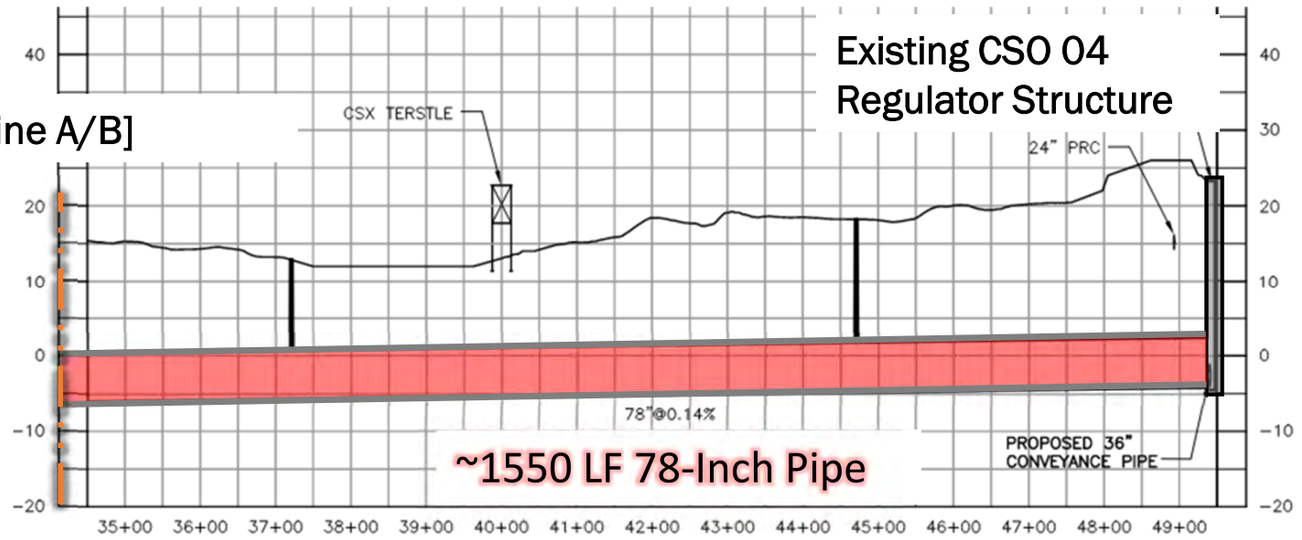


Alignment A – Upstream

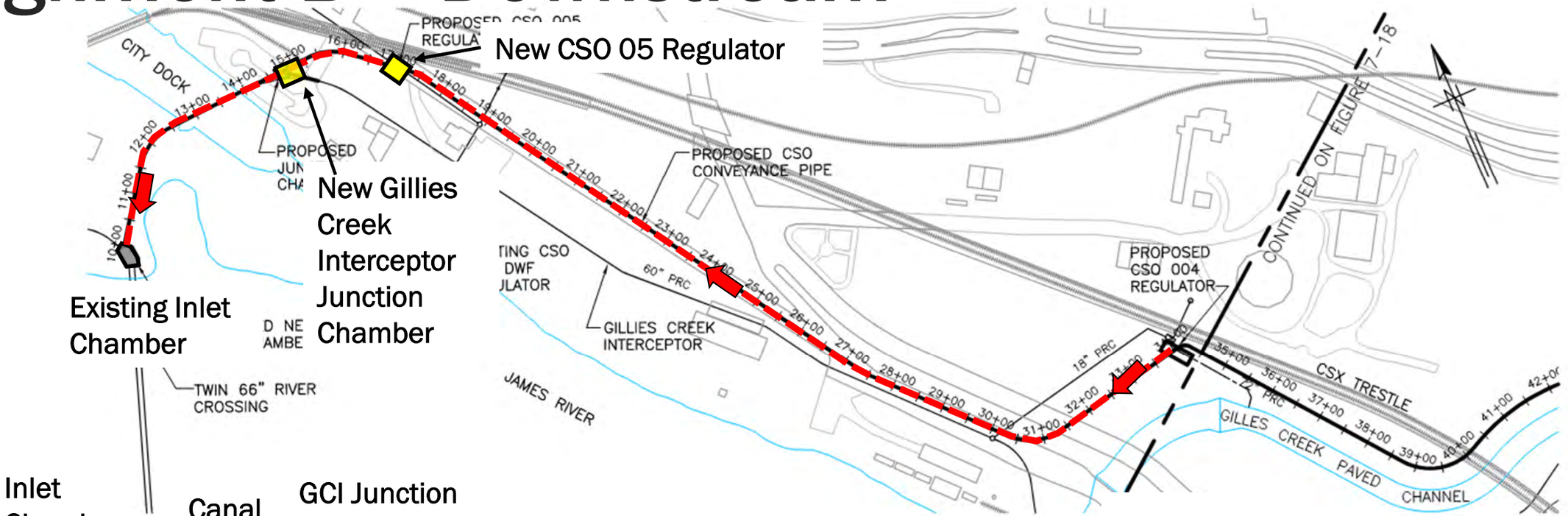
Existing CSO 04
Regulator Structure

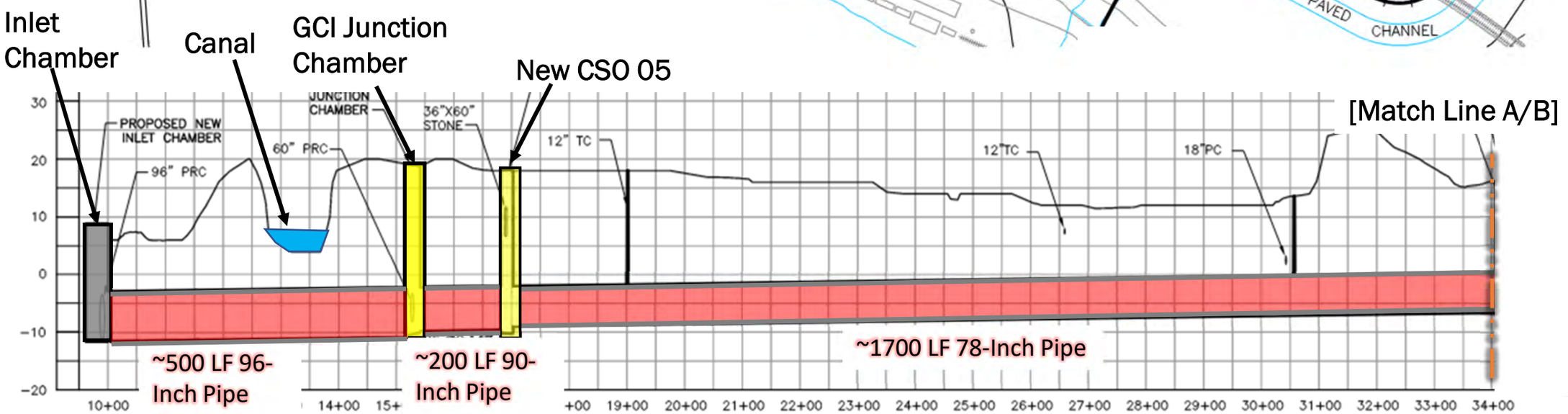


[Match Line A/B]



Alignment B – Downstream





City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
SO Project #13: Lower Gillies Creek Conveyance Sewer
Conceptual Design

Item	Unit	Quantity	Unit Cost	Total Amount
0. Structure Dimensions				
a. CSO 005 Regulator Structure				
i. Length	LF	20		
ii. Width	LF	20		
iii. Depth	LF	30		
b. Gillies Creek Interceptor Junction Structure				
i. Length	LF	20		
ii. Width	LF	20		
iii. Depth	LF	30		
1. General				
a. Site Prep	ACRE	4	$500,000.00	$2,000,000.00
			General Subtotal	$2,000,000
2. Excavation for Structures				
a. Support of Excavation				
i. Sheeting				
CSO 005 Regulator Excavation Vertical Area	SF	7,548	$45.00	$339,660
Excavation Length	LF	34		
Excavation Width	LF	34		
Excavation Depth	LF	37		
GCI Junction Chamber Excavation Vertical Area	SF	7,548	$45.00	$339,660
Excavation Length	LF	34		
Excavation Width	LF	34		
Excavation Depth	LF	37		
b. Soil				
i. Excavate and Dispose of Soil	CY	3,168	$90.00	$285,147
			Excavation for Structures Subtotal	$964,467
3. Structural				
a. CSO 005 Regulator Structure				
i. 20'L x 20'W x 30'D				
Concrete Base Slab	CY	75	$775.00	$58,211
Base Slab Thickness	LF	3		
Base Slab Length	LF	26		
Base Slab Width	LF	26		
Concrete Exterior Walls	CY	307	$1,500.00	$460,000
Exterior Wall Thickness	LF	3		
Exterior Wall Length	LF	92		
Exterior Wall Height	LF	30		
Concrete Top Slab	CY	50	$1,500.00	$75,111
Top Slab Thickness	LF	2		
Top Slab Length	LF	26		
Top Slab Width	LF	26		
b. Gillies Creek Interceptor Junction Structure				
i. 20'L x 20'W x 30'D				
Concrete Base Slab	CY	75	$775.00	$58,211
Base Slab Thickness	LF	3		
Base Slab Length	LF	26		
Base Slab Width	LF	26		
Concrete Exterior Walls	CY	307	$1,500.00	$460,000
Exterior Wall Thickness	LF	3		
Exterior Wall Length	LF	92		
Exterior Wall Height	LF	30		
Concrete Top Slab	CY	50	$1,500.00	$75,111
Top Slab Thickness	LF	2		
Top Slab Length	LF	26		
Top Slab Width	LF	26		
			Structural Subtotal	$1,186,644
4. Civil				
a. Pipe				
i. Furnish and Install 96" Fiber Reinforced Sewer Pipe (Trenchless)	LF	550	$7,800.00	$4,290,000
ii. Furnish and Install 90" Fiber Reinforced Sewer Pipe	LF	200	$1,800.00	$360,000
iii. Furnish and Install 78" Fiber Reinforced Sewer Pipe	LF	3,250	$1,500.00	$4,875,000

	b.		Excavation				
		i.	Excavation for 90" Fiber Reinforced Sewer Pipe (20' Average Depth)	CY	1,704	$90.00	$153,333
			Excavation Length	LF	200		
			Excavation Width	LF	12		
			Excavation Depth	LF	20		
		ii.	Excavation for 78" Fiber Reinforced Sewer Pipe (20' Average Depth)	CY	25,278	$90.00	$2,275,000
			Excavation Length	LF	3,250		
			Excavation Width	LF	11		
			Excavation Depth	LF	20		
	c.		Trenchless Utility Installation				
		i.	96" Fiber Reinforced Sewer Pipe Trenchless Installation				
			Jacking Pit Excavation	CY	889	$90.00	$80,000
			Excavation Length	LF	40		
			Excavation Width	LF	20		
			Excavation Depth	LF	30		
			Receiving Pit Excavation	CY	444	$90.00	$40,000
			Excavation Length	LF	20		
			Excavation Width	LF	20		
			Excavation Depth	LF	30		
	d.		Support of Excavation				
		i.	Sheeting				
			90" Fiber Reinforced Sewer Pipe Excavation Vertical Area	SF	13,200	$45.00	$594,000
			Excavation Length	LF	200		
			Excavation Depth	LF	22		
			78" Fiber Reinforced Sewer Pipe Excavation Vertical Area	SF	214,500	$45.00	$9,652,500
			Excavation Length	LF	3,250		
			Excavation Depth	LF	22		
			Jacking Pit Excavation Vertical Area	SF	5,400	$45.00	$243,000
			Receiving Pit Excavation Vertical Area	SF	3,600	$45.00	$162,000
						Civil Subtotal	$22,724,833
5.			Construction Total				
	a.		Subtotal A				$26,875,944
	b.		Design Contingency	LS	1	40%	*$10,750,378*
	c.		Subtotal B	LS	1		$37,626,322
	d.		General Conditions, Overhead and Profit	LS	1	50%	*$18,813,161*
	e.		Subtotal C	LS	1		$56,439,483
	f.		Bonds and Insurance	LS	1	3%	*$1,693,185*
						Total Estimated Construction Cost	**$58,132,668**

6.			Capital Total				
	a.		Construction Cost Total				$58,132,668
	b.		Capital Contingency	LS	1	50%	*$29,066,334*
						Total Estimated Capital Cost	**$87,199,002**

7.			Annual Operations and Maintainence Costs				
	a.		Labor				
		i.	Pipe Cleaning (Once every 5 years)	LF	4,000	$30.00	$24,000
		ii.	Structure Cleaning (Once per year)	EA	1	$10,000.00	$10,000
	b.		Maintenance of Pipe				
		i.	Maintain Pipe	LS	1%	$9,525,000.00	$95,250
	c.		Maintenance of Structures				
		i.	Maintain Structures	LS	1%	$1,186,644.44	$11,866
						Annual Operations and Maintainence Costs Subtotal	**$141,116**

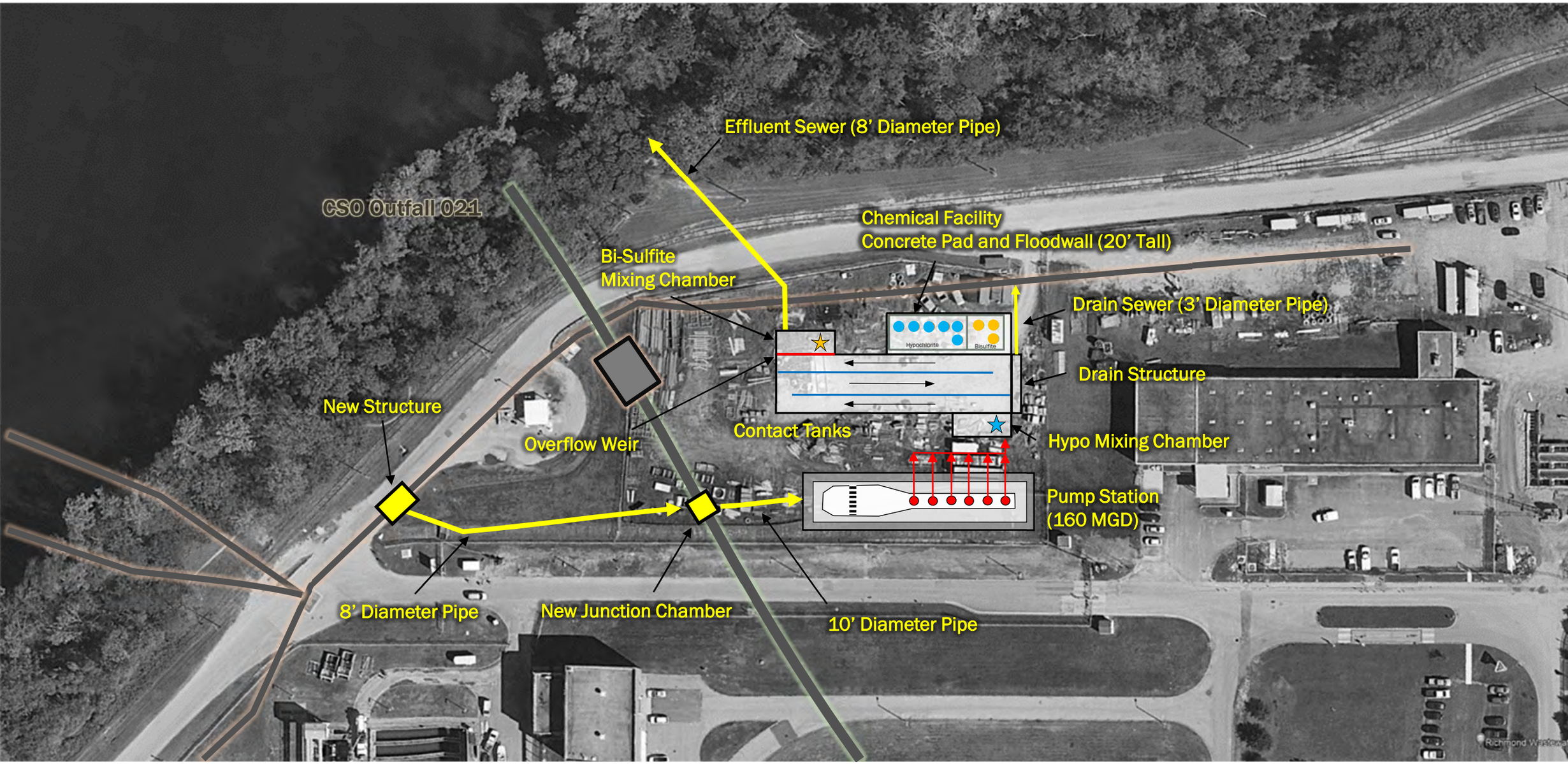
8.			15-Year Replacement Costs				
	a.		Electrical and Instrumentation and Control				
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	$0.00	$0
	b.		Meters				
		i.	Furnish and Install Replacement Meters	EA	2	$7,500.00	$15,000
						15-Year Replacement Costs Subtotal	**$15,000**

					SO #13	
					Gillies Creek Conveyance	
Category	**Topic**	**Weight**	**Score**	**Criteria**	**Unweighted Score**	**Weighted Score**
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	**2.3**	**2**	<4 Year project schedule with minimal risks for schedule extension	1	2.3
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	**1.8**	**2**	None/Minor conflicts	1	1.8
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	**2**	**2**	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	1	2
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	**2.3**	**2**	Construction easements or none required	1	2.3
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	**1.3**	**2**	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	1	1.3
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	**2.5**	**2**	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	2	5
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	**1.8**	**2**	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	2	3.6
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	**2.9**	**2**	Signficant reduction in US/DS HGL as compared to the existing condition	0	0
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	**1.1**	**2**	>2 other similar facilties/equipment that are currently operated and maintained at the City	2	2.2
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	**1.6**	**2**	No new staff is required for operation and maintenace	2	3.2
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	**3.4**	**2**	Project supports future improvements or is foundational for future improvements	2	6.8
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	**4.4**	**2**	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	2	8.8
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	**3.4**	**2**	Protected against a 100-year flood	2	6.8
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	**2.3**	**2**	High potential for known near term (<5 years) future development	2	4.6
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	**2**	**2**	No federal or state permits required	0	0
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	**3.3**	**2**	Located outside of the Resource Manangement Area (RMA)	0	0
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	**0.8**	**2**	Minimal modifications would be required for the City's VPDES permit	2	1.6
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	**3.5**	**2**	Yes	1	3.5
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	**2.9**	**2**	Yes	2	5.8
			1	Adjacent		
			0	No		
	Impacts to community during construction	**2.1**	**2**	Minimal impacts to the community during construction	0	0
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	**2.3**	**2**	Minimal tree removal/mitigation (<0.2 acres) is required	1	2.3
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		**64**

Special Order Project #15

Special Order Project #15

High-Rate Disinfection at WWTP (160 MGD)



City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
SO Project #15: WWTP High Rate Disinfection
Conceptual Design

Item	Unit	Quantity	Unit Cost	Total Amount
0. Structure Dimensions				
a. Structure #1				
i. Length	LF	20		
ii. Width	LF	30		
iii. Depth	LF	30		
b. Structure #2				
i. Length	LF	20		
ii. Width	LF	30		
iii. Depth	LF	30		
c. Hypo Mixing Chamber				
i. Length	LF	20		
ii. Width	LF	50		
iii. Depth	LF	20		
d. Contact Tanks (uncovered)				
i. Length	LF	200		
ii. Width	LF	50		
iii. Depth	LF	20		
e. Bi-Sulfite Mixing Chamber				
i. Length	LF	20		
ii. Width	LF	50		
iii. Depth	LF	20		
f. Chemical Facility Pad				
i. Length	LF	30		
ii. Width	LF	100		
iii. Depth	LF	20		
1. General				
a. Site Prep	ACRE	2	$250,000.00	$500,000.00
			General Subtotal	$500,000
2. Excavation for Structures				
a. Support of Excavation				
i. Sheeting				
Structure #1	SF	5,476	$45.00	$246,420
Excavation Length	LF	32		
Excavation Width	LF	42		
Excavation Depth	LF	37		
Excavation Depth in Rock	LF	7		
Structure #2	SF	5,476	$45.00	$246,420
Excavation Length	LF	32		
Excavation Width	LF	42		
Excavation Depth	LF	37		
Excavation Depth in Rock	LF	7		
HRD and Chemical Facility	SF	26,880	$45.00	$1,209,600
Excavation Perimeter	LF	640		
Excavation Area	SF	15,000		
Excavation Depth	LF	28		
Excavation Depth in Rock	LF	0		
b. Soil				
i. Excavate and Dispose of Soil	CY	18,542	$90.00	$1,668,800
c. Rock				
i. Excavate and Dispose of Rock	CY	697	$300.00	$209,067
			Excavation for Structures Subtotal	$3,580,307
3. Structural				
a. Structure #1				
i. 20'L x 30'W x 30'D				
Concrete Base Slab	CY	91	$775.00	$70,267
Base Slab Thickness	LF	3		
Base Slab Length	LF	24		
Base Slab Width	LF	34		
Concrete Walls	CY	240	$1,500.00	$360,000
Exterior Wall Thickness	LF	2		
Exterior Wall Length	LF	108		
Exterior Wall Height	LF	30		
Concrete Top Slab	CY	60	$1,500.00	$90,667
Top Slab Thickness	LF	2		
Top Slab Length	LF	24		
Top Slab Width	LF	34		
b. Structure #2				

		i.	20'L x 30'W x 30'D				
			Concrete Base Slab	CY	91	$775.00	$70,267
			Base Slab Thickness	LF	3		
			Base Slab Length	LF	24		
			Base Slab Width	LF	34		
			Concrete Walls	CY	240	$1,500.00	$360,000
			Exterior Wall Thickness	LF	2		
			Exterior Wall Length	LF	108		
			Exterior Wall Height	LF	30		
			Concrete Top Slab	CY	60	$1,500.00	$90,667
			Top Slab Thickness	LF	2		
			Top Slab Length	LF	24		
			Top Slab Width	LF	34		
	c.	HRD and Chemical Facility					
		i.	200'L x 50'W x 20'D				
			Concrete Base Slab	CY	2,222	$775.00	$1,722,222
			Base Slab Thickness	LF	4		
			Base Slab Area	SF	15,000		
			Concrete Walls	CY	1,881	$1,500.00	$2,822,222
			Exterior Wall Thickness	LF	2		
			Exterior Wall Length	LF	1,270		
			Exterior Wall Height	LF	20		
			Concrete Top Slab	CY	1,111	$1,500.00	$1,666,667
			Top Slab Thickness	LF	2		
			Base Slab Area	SF	15,000		
						Structural Subtotal	$7,252,978
4.	Civil						
	a.	Pipe					
		i.	Furnish and Install 96" Fiber Reinforced Sewer Pipe (25' Depth)	LF	250	$2,000.00	$500,000
		ii.	Furnish and Install 96" Fiber Reinforced Sewer Pipe (20' Depth)	LF	250	$2,000.00	$500,000
		iii.	Furnish and Install 120" Fiber Reinforced Sewer Pipe (35' Depth)	LF	50	$2,500.00	$125,000
		iv.	Furnish and Install 36" Fiber Reinforced Sewer Pipe (10' Depth)	LF	50	$850.00	$42,500
	b.	Excavation					
		i.	Excavation for 96" Fiber Reinforced Sewer Pipe (25' Average Depth)	CY	3,000	$90.00	$270,000
			Excavation Length	LF	250		
			Excavation Width	LF	12		
			Excavation Depth	LF	27		
		ii.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Max Depth)	CY	2,444	$90.00	$220,000
			Excavation Length	LF	250		
			Excavation Width	LF	12		
			Excavation Depth	LF	22		
		iii.	Excavation for 120" Fiber Reinforced Sewer Pipe (35' Max Depth)	CY	778	$90.00	$70,000
			Excavation Length	LF	50		
			Excavation Width	LF	14		
			Excavation Depth	LF	37		
			Excavation Depth in Rock	LF	7		
			Rock Excavation	CY	181	$300.00	$54,444
		iv.	Excavation for 36" Fiber Reinforced Sewer Pipe (10' Max Depth)	CY	156	$90.00	$14,000
			Excavation Length	LF	50		
			Excavation Width	LF	7		
			Excavation Depth	LF	12		
	c.	Support of Excavation					
		i.	Sheeting				
			96" Fiber Reinforced Sewer Pipe (25') Excavation Vertical Area	SF	20,250	$45.00	$911,250
			Excavation Length	LF	250		
			Excavation Depth	LF	27		
			96" Fiber Reinforced Sewer Pipe (20') Excavation Vertical Area	SF	16,500	$45.00	$742,500
			Excavation Length	LF	250		
			Excavation Depth	LF	22		
			120" Fiber Reinforced Sewer Pipe Excavation Vertical Area	SF	5,550	$45.00	$249,750
			Excavation Length	LF	50		
			Excavation Depth	LF	37		
			36" Fiber Reinforced Sewer Pipe Excavation Vertical Area	SF	1,800	$45.00	$81,000
			Excavation Length	LF	50		
			Excavation Depth	LF	12		
						Civil Subtotal	$3,780,444
5.	Mechanical						
	a.	Pump Station					
		i.	New Pump Station and Screening Facility	MGD	160	$300,000.00	$48,000,000
	b.	HRD Chemical Facility					
		i.	New HRD Facility and Equipment	MGD	160	$15,000.00	$2,400,000
	c.	Tipping Troughs					
		i.	Furnish and Install Tipping Troughs	EA	4	$75,000.00	$300,000
	d.	Drain Gates					
		i.	Furnish and Install Drain Gates	EA	4	$37,500.00	$150,000

						Mechanical Subtotal	$50,850,000
6.	Electrical and I&C						
	a.	Miscellaneous Electrical and I&C					
		i.	Furnish and Install Electrical and I&C (Other)	LS	1	$180,000.00	$180,000
						Electrical and I&C Subtotal	$180,000
7.	Construction Total						
	a.	Subtotal A					$66,143,729
	b.	Design Contingency		LS	1	40%	*$26,457,492*
	c.	Subtotal B		LS	1		$92,601,220
	d.	General Conditions, Overhead and Profit		LS	1	50%	*$46,300,610*
	e.	Subtotal C		LS	1		$138,901,831
	f.	Bonds and Insurance		LS	1	3%	*$4,167,055*
						Total Estimated Construction Cost	**$143,068,886**

8.	Capital Total						
	a.	Construction Cost Total					$143,068,886
	b.	Capital Contingency		LS	1	50%	*$71,534,443*
						Total Estimated Capital Cost	**$214,603,328**

9.	Annual Operations and Maintainence Costs						
	a.	Labor					
		i.	Daily Check (365 Days, 1 Hr/Ea)	HR	365	$50.00	$18,250
		ii.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	$50.00	$10,400
		iii.	Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	$50.00	$4,800
		iv.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	$50.00	$9,600
		v.	Continuous Staffing (365 Days, 24 Hrs/Ea)	HR	8,760	$50.00	$438,000
	b.	Maintenance of Structures					
		i.	Maintain Structures	LS	0.2%	$7,252,977.78	$14,506
	c.	Maintenance of Pipe					
		i.	Maintain Pipe	LS	1%	$0.00	$0
	d.	Maintenance of Mechanical					
		i.	Maintain Tipping Troughs	LS	3%	$300,000.00	$9,000
		ii.	Maintain Drain Gates	LS	3%	$150,000.00	$4,500
		iii.	Maintain HRD Chemical Facility	LS	3%	$2,400,000.00	$72,000
		iv.	Maintain Pump Station	LS	3%	$48,000,000.00	$1,440,000
	e.	Maintenance of Instrumentation and Control					
		i.	Maintain I&C	LS	3%	$180,000.00	$5,400
	f.	Operation of HRD Chemical Facility					
		i.	Sodium Hypochlorite				
			Dose	mg/L	10		
			Volume	MGY	285		
			Quantity	LBS	23763	$2.00	$47,527
		ii.	Sodium Bisulfite				
			Dose	mg/L	3		
			Volume	MGY	285		
			Quantity	LBS	5941	$2.00	$11,882
	g.	Operation of Influent Pump Station					
		i.	Pump Station Electricity Cost				
			Flowrate of Pump Station	MGD	160		
			Annual Volume	MGY	285		
			Total Dynamic Head	ft	55		
			Pump Efficiency		0.6		
			Motor Efficiency		0.9		
			Annual Energy Usage	KW-HR	91139	$0.06	$5,468
						Annual Operations and Maintainence Costs Subtotal	**$2,091,333**

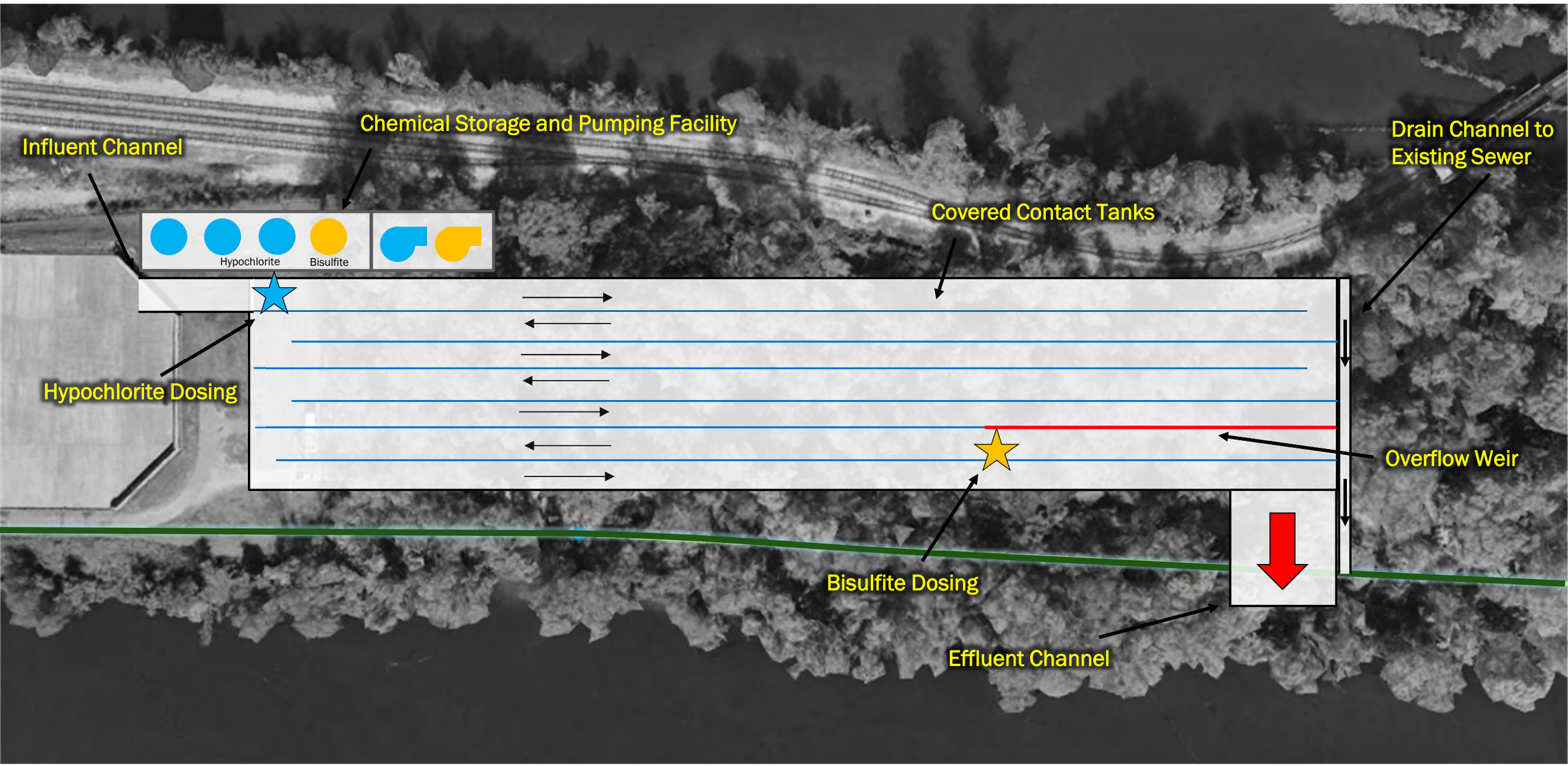
10.	15-Year Replacement Costs						
	a.	Electrical and Instrumentation and Control					
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	$10,260,000.00	$10,260,000
	b.	Meters					
		i.	Furnish and Install Replacement Meters	EA	4	$7,500.00	$30,000
						15-Year Replacement Costs Subtotal	**$10,290,000**

					SO #15	
					WWTP HRD	
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Score
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2	<4 Year project schedule with minimal risks for schedule extension	1	2.3
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	1.8	2	None/Minor conflicts	1	1.8
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	2	2	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	0	0
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	2.3	2	Construction easements or none required	2	4.6
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	1.3	2	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	0	0
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	2.5	2	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	2	5
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	1.8	2	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	0	0
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	2.9	2	Signficant reduction in US/DS HGL as compared to the existing condition	1	2.9
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	1.1	2	>2 other similar facilties/equipment that are currently operated and maintained at the City	0	0
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	1.6	2	No new staff is required for operation and maintenace	1	1.6
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	3.4	2	Project supports future improvements or is foundational for future improvements	2	6.8
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	4.4	2	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	2	8.8
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	3.4	2	Protected against a 100-year flood	1	3.4
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	2.3	2	High potential for known near term (<5 years) future development	0	0
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	2	2	No federal or state permits required	0	0
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	3.3	2	Located outside of the Resource Manangement Area (RMA)	1	3.3
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	0.8	2	Minimal modifications would be required for the City's VPDES permit	0	0
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	3.5	2	Yes	2	7
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	2.9	2	Yes	0	0
			1	Adjacent		
			0	No		
	Impacts to community during construction	2.1	2	Minimal impacts to the community during construction	2	4.2
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	2.3	2	Minimal tree removal/mitigation (<0.2 acres) is required	2	4.6
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		56

Special Order Project #19

Special Order Project #19

High-Rate Disinfection Facility at Shockoe (3,300 MGD)



City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
SO Project #19: 3300 MGD Shockoe High Rate Disinfection
Conceptual Design

Item				Unit	Quantity	Unit Cost	Total Amount
0.	Structure Dimensions						
	a.	Influent Channel					
		i.	Length	LF	150		
		ii.	Width	LF	30		
		iii.	Depth	LF	20		
	b.	Contact Tanks (Covered)					
		i.	Length	LF	925		
		ii.	Width	LF	220		
		iii.	Depth	LF	20		
	c.	Effluent Channel					
		i.	Length	LF	100		
		ii.	Width	LF	90		
		iii.	Depth	LF	8		
	d.	Drain Channel					
		i.	Length	LF	320		
		ii.	Width	LF	10		
		iii.	Depth	LF	20		
	e.	Chemical Facility					
		i.	Length	LF	300		
		ii.	Width	LF	50		
		iii.	Depth	LF	25		
1.	General						
	a.	Site Prep		ACRE	4	$500,000.00	$2,000,000.00
						General Subtotal	$2,000,000
2.	Excavation for Structures						
	a.	Support of Excavation					
		i.	Sheeting				
			HRD Facility Vertical Area	SF	92,070	$45.00	$4,143,150
			Excavation Perimeter	LF	2,790		
			Excavation Area	SF	219,200		
			Excavation Depth	LF	22		
			Chemical Facility Excavation Vertical Area	SF	30,456	$45.00	$1,370,520
			Excavation Length	LF	314		
			Excavation Width	LF	62		
			Excavation Depth	LF	27		
	b.	Soil					
		i.	Excavate and Dispose of Soil	CY	198,075	$90.00	$17,826,787
						Excavation for Structures Subtotal	$23,340,457
3.	Structural						
	a.	Influent Channel					
		i.	150'L x30'W x 16'D				
			Concrete Base Slab	CY	582	$775.00	$450,878
			Base Slab Thickness	LF	3		
			Base Slab Length	LF	154		
			Base Slab Width	LF	34		
			Concrete Walls	CY	456	$1,500.00	$684,444
			Exterior Wall Thickness	LF	2		
			Exterior Wall Length	LF	308		
			Exterior Wall Height	LF	20		
			Concrete Top Slab	CY	388	$1,500.00	$581,778
			Top Slab Thickness	LF	2		
			Top Slab Length	LF	154		
			Top Slab Width	LF	34		
	b.	Contact Tanks					
		i.	925'L x 220'W x 20'D				
			Concrete Base Slab	CY	30,723	$775.00	$23,810,296
			Base Slab Thickness	LF	4		
			Base Slab Length	LF	929		
			Base Slab Width	LF	224		

				Concrete Walls	CY	3,404	$1,500.00	$5,106,667
				Exterior Wall Thickness	LF	2		
				Exterior Wall Length	LF	2,298		
				Exterior Wall Height	LF	20		
				Concrete Walls	CY	8,000	$1,500.00	$12,000,000
				Interior Wall Thickness	LF	2		
				Interior Wall Length	LF	5,400		
				Interior Wall Height	LF	20		
				Concrete Top Slab	CY	15,415	$1,500.00	$23,121,778
				Top Slab Thickness	LF	2		
				Top Slab Length	LF	929		
				Top Slab Width	LF	224		
	c.		Effluent Channel					
		i.	100'L x 90'W x 8'D					
				Concrete Base Slab	CY	1,448	$775.00	$1,122,430
				Base Slab Thickness	LF	4		
				Base Slab Length	LF	104		
				Base Slab Width	LF	94		
				Concrete Walls	CY	123	$1,500.00	$184,889
				Exterior Wall Thickness	LF	2		
				Exterior Wall Length	LF	208		
				Exterior Wall Height	LF	8		
				Concrete Top Slab	CY	724	$1,500.00	$1,086,222
				Top Slab Thickness	LF	2		
				Top Slab Length	LF	104		
				Top Slab Width	LF	94		
	d.		Drain Channel					
		i.	320'L x 10'W x 20'D					
				Concrete Base Slab	CY	504	$775.00	$390,600
				Base Slab Thickness	LF	3		
				Base Slab Length	LF	324		
				Base Slab Width	LF	14		
				Concrete Exterior Walls	CY	960	$1,500.00	$1,440,000
				Exterior Wall Thickness	LF	2		
				Exterior Wall Length	LF	648		
				Exterior Wall Height	LF	20		
				Concrete Top Slab	CY	336	$1,500.00	$504,000
				Top Slab Thickness	LF	2		
				Top Slab Length	LF	324		
				Top Slab Width	LF	14		
	e.		Chemical Facility					
		i.	300'L x 50'W x 25'D					
				Concrete Base Slab	CY	1,824	$775.00	$1,413,600
				Base Slab Thickness	LF	3		
				Base Slab Length	LF	304		
				Base Slab Width	LF	54		
				Concrete Exterior Walls	CY	1,311	$1,500.00	$1,966,667
				Exterior Wall Thickness	LF	2		
				Exterior Wall Length	LF	708		
				Exterior Wall Height	LF	25		
				Concrete Top Slab	CY	1,216	$1,500.00	$1,824,000
				Top Slab Thickness	LF	2		
				Top Slab Length	LF	304		
				Top Slab Width	LF	54		
							Structural Subtotal	$75,688,248
4.	Civil							
	a.		Civil Improvements		LS	1	$2,000,000.00	$2,000,000
							Civil Subtotal	$2,000,000
5.	Mechanical							
	a.		HRD Chemical Facility					
		i.	New HRD Facility and Equipment		MGD	1,500	$15,000.00	$22,500,000
	b.		Tipping Troughs					
		i.	Furnish and Install Tipping Troughs		EA	32	$75,000.00	$2,400,000
	c.		Drain Gates					
		i.	Furnish and Install Drain Gates		EA	16	$37,500.00	$600,000
	d.		Tide Gates					
		i.	Furnish and Install Tide Gates		EA	5	$100,000.00	$500,000

						Mechanical Subtotal	$26,000,000
6.	Electrical and I&C						
	a.	Miscellaneous Electrical and I&C					
		i.	Furnish and Install Electrical and I&C (Other)	LS	1	$1,200,000.00	$1,200,000
						Electrical and I&C Subtotal	$1,200,000
7.	Other Improvements						
	a.	Aeration Improvements at the SRB		LS	1	$10,000,000.00	$10,000,000
	b.	Other Improvements at the SRB		LS	1	$15,000,000.00	$15,000,000
						Other Improvements Subtotal	$25,000,000
8.	Construction Total						
	a.	Subtotal A					$155,228,705
	b.	Design Contingency		LS	1	40%	*$62,091,482*
	c.	Subtotal B		LS	1		$217,320,187
	d.	General Conditions, Overhead and Profit		LS	1	50%	*$108,660,093*
	e.	Subtotal C		LS	1		$325,980,280
	f.	Bonds and Insurance		LS	1	3%	*$9,779,408*
						Total Estimated Construction Cost	**$335,759,689**

9.	Capital Total						
	a.	Construction Cost Total					$335,759,689
	b.	Capital Contingency		LS	1	50%	*$167,879,844*
						Total Estimated Capital Cost	**$503,639,533**

10.	Annual Operations and Maintainence Costs						
	a.	Labor					
		i.	Daily Check (365 Days, 1 Hr/Ea)	HR	365	$50.00	$18,250
		ii.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	$50.00	$10,400
		iii.	Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	$50.00	$4,800
		iv.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	$50.00	$9,600
		v.	Continuous Staffing (365 Days, 24 Hrs/Ea)	HR	8,760	$50.00	$438,000
	b.	Maintenance of Structures					
		i.	Maintain Structures	LS	0.2%	$75,688,248.15	$151,376
	c.	Maintenance of Mechanical					
		i.	Maintain Tipping Troughs	LS	3%	$2,400,000.00	$72,000
		ii.	Maintain Drain Gates	LS	3%	$600,000.00	$18,000
		iii.	Maintain HRD Chemical Facility	LS	3%	$22,500,000.00	$675,000
	d.	Maintenance of Instrumentation and Control					
		i.	Maintain I&C	LS	3%	$1,200,000.00	$36,000
	e.	Operation of HRD Chemical Facility					
		i.	Sodium Hypochlorite				
			Dose	mg/L	10		
			Volume	MGY	1308		
			Quantity	LBS	109089	$2.00	$218,178
		ii.	Sodium Bisulfite				
			Dose	mg/L	3		
			Volume	MGY	1308		
			Quantity	LBS	32727	$2.00	$65,453
						Annual Operations and Maintainence Costs Subtotal	**$1,717,057**

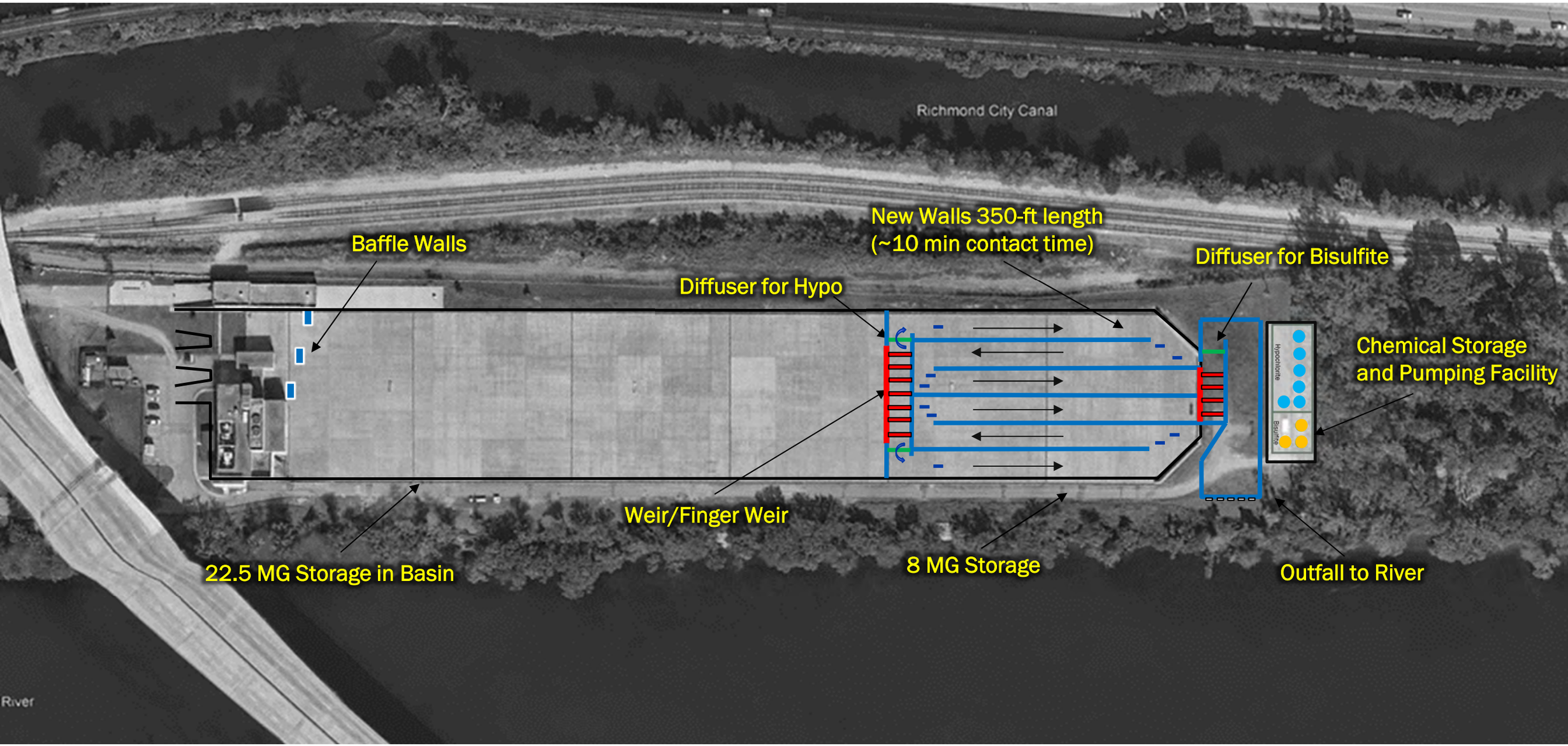
11.	15-Year Replacement Costs						
	a.	Electrical and Instrumentation and Control					
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	$5,700,000.00	$5,700,000
	b.	Meters					
		i.	Furnish and Install Replacement Meters	EA	6	$7,500.00	$45,000
						15-Year Replacement Costs Subtotal	**$5,745,000**

					SO #19	
					HRD at Shockoe	
Category	**Topic**	**Weight**	**Score**	**Criteria**	**Unweighted Score**	**Weighted Score**
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	**2.3**	**2**	<4 Year project schedule with minimal risks for schedule extension	**1**	**2.3**
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	**1.8**	**2**	None/Minor conflicts	**2**	**3.6**
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	**2**	**2**	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	**2**	**4**
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	**2.3**	**2**	Construction easements or none required	**2**	**4.6**
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	**1.3**	**2**	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	**2**	**2.6**
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	**2.5**	**2**	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	**2**	**5**
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	**1.8**	**2**	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	**0**	**0**
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	**2.9**	**2**	Signficant reduction in US/DS HGL as compared to the existing condition	**1**	**2.9**
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	**1.1**	**2**	>2 other similar facilties/equipment that are currently operated and maintained at the City	**0**	**0**
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	**1.6**	**2**	No new staff is required for operation and maintenace	**1**	**1.6**
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	**3.4**	**2**	Project supports future improvements or is foundational for future improvements	**1**	**3.4**
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	**4.4**	**2**	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	**2**	**8.8**
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	**3.4**	**2**	Protected against a 100-year flood	**1**	**3.4**
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	**2.3**	**2**	High potential for known near term (<5 years) future development	**2**	**4.6**
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	**2**	**2**	No federal or state permits required	**0**	**0**
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	**3.3**	**2**	Located outside of the Resource Manangement Area (RMA)	**0**	**0**
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	**0.8**	**2**	Minimal modifications would be required for the City's VPDES permit	**0**	**0**
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	**3.5**	**2**	Yes	**2**	**7**
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	**2.9**	**2**	Yes	**2**	**5.8**
			1	Adjacent		
			0	No		
	Impacts to community during construction	**2.1**	**2**	Minimal impacts to the community during construction	**1**	**2.1**
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	**2.3**	**2**	Minimal tree removal/mitigation (<0.2 acres) is required	**0**	**0**
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		**62**

Shockoe #1

Shockoe #1

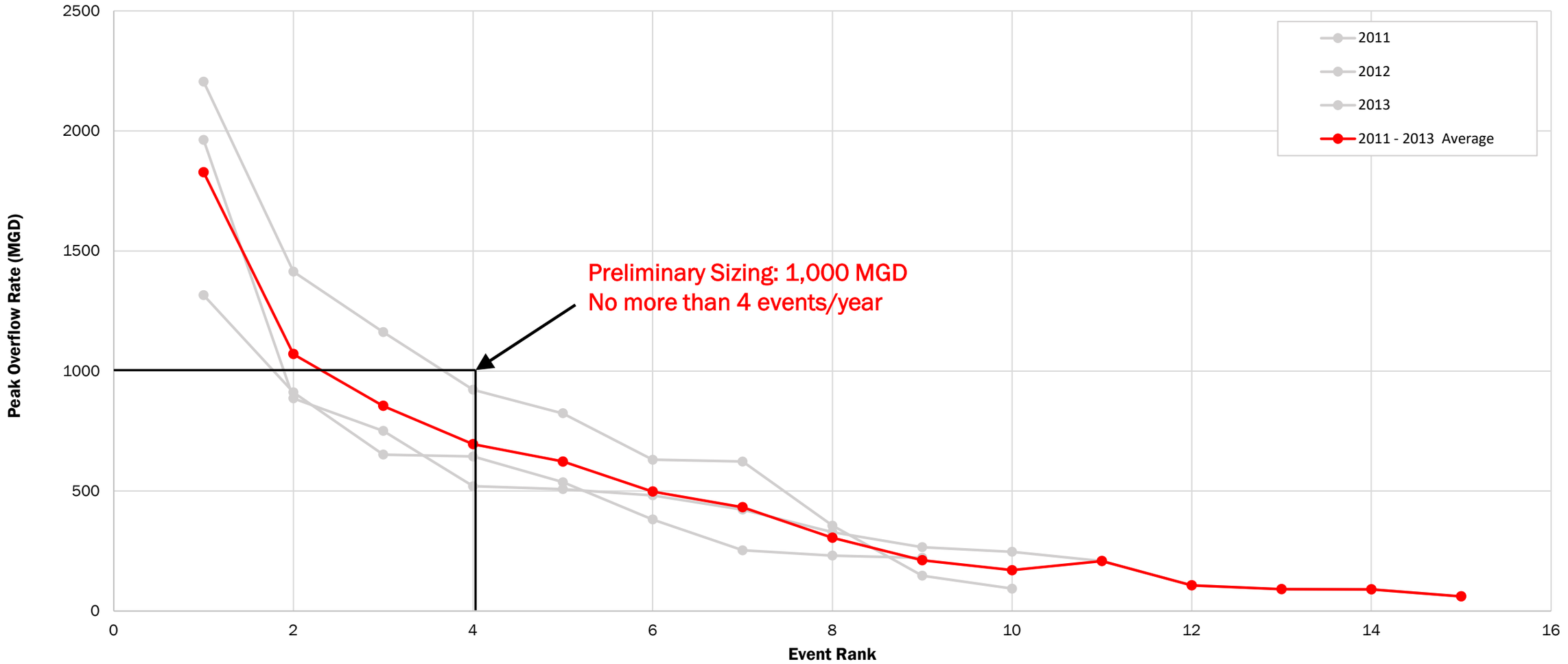
Convert SRB to a High-Rate Disinfection Facility (1,000 MGD)



Shockoe #1

Convert SRB to a High-Rate Disinfection Facility (1,000 MGD)

Existing CSO at Outfall 006 for Hydrologic Evaluation Period



City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
Shockoe #1: 1000 MGD High Rate Disinfection in Modified Shockoe Retention Basin
Conceptual Design

Item	Unit	Quantity	Unit Cost	Total Amount
0. Structure Dimensions				
a. Chemical Facility				
i. Length	LF	200		
ii. Width	LF	50		
iii. Depth	LF	25		
b. Dechlorination Tank				
i. Length	LF	225		
ii. Width	LF	80		
iii. Depth	LF	20		
c. New Separating Walls				
i. Length	LF	2,700		
ii. Width	LF	2		
iii. Depth	LF	20		
1. General				
a. Site Prep	ACRE	1.5	$250,000.00	$375,000.00
			General Subtotal	$375,000
2. Excavation for Structures				
a. Support of Excavation				
i. Sheeting				
Chemical Facility Excavation Vertical Area	SF	26,304	$45.00	$1,183,680
Excavation Length	LF	212		
Excavation Width	LF	62		
Excavation Depth	LF	32		
Dechlorination Tank Excavation Vertical Area	SF	26,649	$45.00	$1,199,205
Excavation Length	LF	237		
Excavation Width	LF	92		
Excavation Depth	LF	27		
b. Soil				
i. Excavate and Dispose of Soil	CY	37,382	$90.00	$3,364,387
			Excavation for Structures Subtotal	$5,747,272
3. Structural				
a. Chemical Facility				
i. 200'L x 50'W x 25'D				
Concrete Base Slab	CY	1,224	$775.00	$948,600
Base Slab Thickness	LF	3		
Base Slab Length	LF	204		
Base Slab Width	LF	54		
Concrete Walls	CY	941	$1,500.00	$1,411,111
Exterior Wall Thickness	LF	2		
Exterior Wall Length	LF	508		
Exterior Wall Height	LF	25		
Concrete Top Slab	CY	816	$1,500.00	$1,224,000
Top Slab Thickness	LF	2		
Top Slab Length	LF	204		
Top Slab Width	LF	54		
b. Dechlorination Tank				
i. 225'L x 80'W x 20'D				
Concrete Base Slab	CY	2,137	$775.00	$1,656,433
Base Slab Thickness	LF	3		
Base Slab Length	LF	229		
Base Slab Width	LF	84		
Concrete Walls	CY	916	$1,500.00	$1,373,333
Exterior Wall Thickness	LF	2		
Exterior Wall Length	LF	618		
Exterior Wall Height	LF	20		
Concrete Top Slab	CY	1,425	$1,500.00	$2,137,333
Top Slab Thickness	LF	2		
Top Slab Length	LF	229		
Top Slab Width	LF	84		

	c.		New Chlorine Contact Walls				
		i.	3200'L x 2'W x 20'D				
			Concrete Walls	CY	4,741	$1,500.00	$7,111,111
			Interior Wall Thickness	LF	2		
			Interior Wall Length	LF	3,200		
			Interior Wall Height	LF	20		
	e.		Demolition				
		i.	East Wall and SRB Interior	LS	1		$2,000,000
						Structural Subtotal	$17,861,922
4.			Civil				
	a.		Civil Improvements	LS	1	$2,000,000.00	$2,000,000
						Civil Subtotal	$2,000,000
5.			Mechanical				
	a.		HRD Chemical Facility				
		i.	New HRD Facility and Equipment	MGD	1,000	$15,000.00	$15,000,000
	b.		Tipping Troughs				
		i.	Furnish and Install Tipping Troughs	EA	16	$75,000.00	$1,200,000
	c.		Drain Gates				
		i.	Furnish and Install Drain Gates	EA	16	$37,500.00	$600,000
	d.		Tide Gates				
		i.	Furnish and Install Tide Gates	EA	5	$100,000.00	$500,000
						Mechanical Subtotal	$17,300,000
6.			Electrical and I&C				
	a.		Miscellaneous Electrical and I&C				
		i.	Furnish and Install Electrical and I&C (Other)	LS	1	$720,000.0	$720,000
						Electrical and I&C Subtotal	$720,000
7.			Other Improvements				
	a.		Aeration Improvements at the SRB	LS	1	$10,000,000.00	$10,000,000
	b.		Other Improvements at the SRB	LS	1	$15,000,000.00	$15,000,000
						Other Improvements Subtotal	$25,000,000
7.			Construction Total				
	a.		Subtotal A				$69,004,194
	b.		Design Contingency	LS	1	40%	*$27,601,678*
	c.		Subtotal B	LS	1		$96,605,871
	d.		General Conditions, Overhead and Profit	LS	1	50%	*$48,302,936*
	e.		Subtotal C	LS	1		$144,908,807
	f.		Bonds and Insurance	LS	1	3%	*$4,347,264*
						Total Estimated Construction Cost	**$149,256,071**

8.			Capital Total				
	a.		Construction Cost Total				$149,256,071
	b.		Capital Contingency	LS	1	50%	*$74,628,036*
						Total Estimated Capital Cost	**$223,884,107**

9.			Annual Operations and Maintainence Costs				
	a.		Labor				
		i.	Daily Check (365 Days, 1 Hr/Ea)	HR	365	$50.00	$18,250
		ii.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	$50.00	$10,400
		iii.	Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	$50.00	$4,800
		iv.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	$50.00	$9,600
		v.	Continuous Staffing (365 Days, 24 Hrs/Ea)	HR	8,760	$50.00	$438,000
	b.		Maintenance of Structures				
		i.	Maintain Structures	LS	0.2%	$17,861,922.22	$35,724
	c.		Maintenance of Mechanical				
		i.	Maintain Tipping Troughs	LS	3%	$1,200,000.00	$36,000
		ii.	Maintain Drain Gates	LS	3%	$600,000.00	$18,000
		iii.	Maintain HRD Chemical Facility	LS	3%	$15,000,000.00	$450,000
	d.		Maintenance of Instrumentation and Control				
		i.	Maintain I&C	LS	3%	$720,000.00	$21,600
	e.		Operation of HRD Chemical Facility				
		i.	Sodium Hypochlorite				
			Dose	mg/L	10		
			Volume	MGY	1100		

				Quantity	LBS	91718	$2.00	$183,436
		ii.	Sodium Bisulfite					
				Dose	mg/L	3		
				Volume	MGY	1100		
				Quantity	LBS	27515	$2.00	$55,031
	f.	Additional SRB Solids Hauling						
		i.	Labor					
				Cleaning after Wet Weather Events (100 Events, 48 Hr/Ea)	HR	4,800	$50.00	$240,000
		ii.	Solids Hauling		DT/Y	1568	$130.00	$203,775
				TSS	mg/L	75		
				Volume	MGY	1100		
							Annual Operations and Maintainence Costs Subtotal	**$1,724,616**

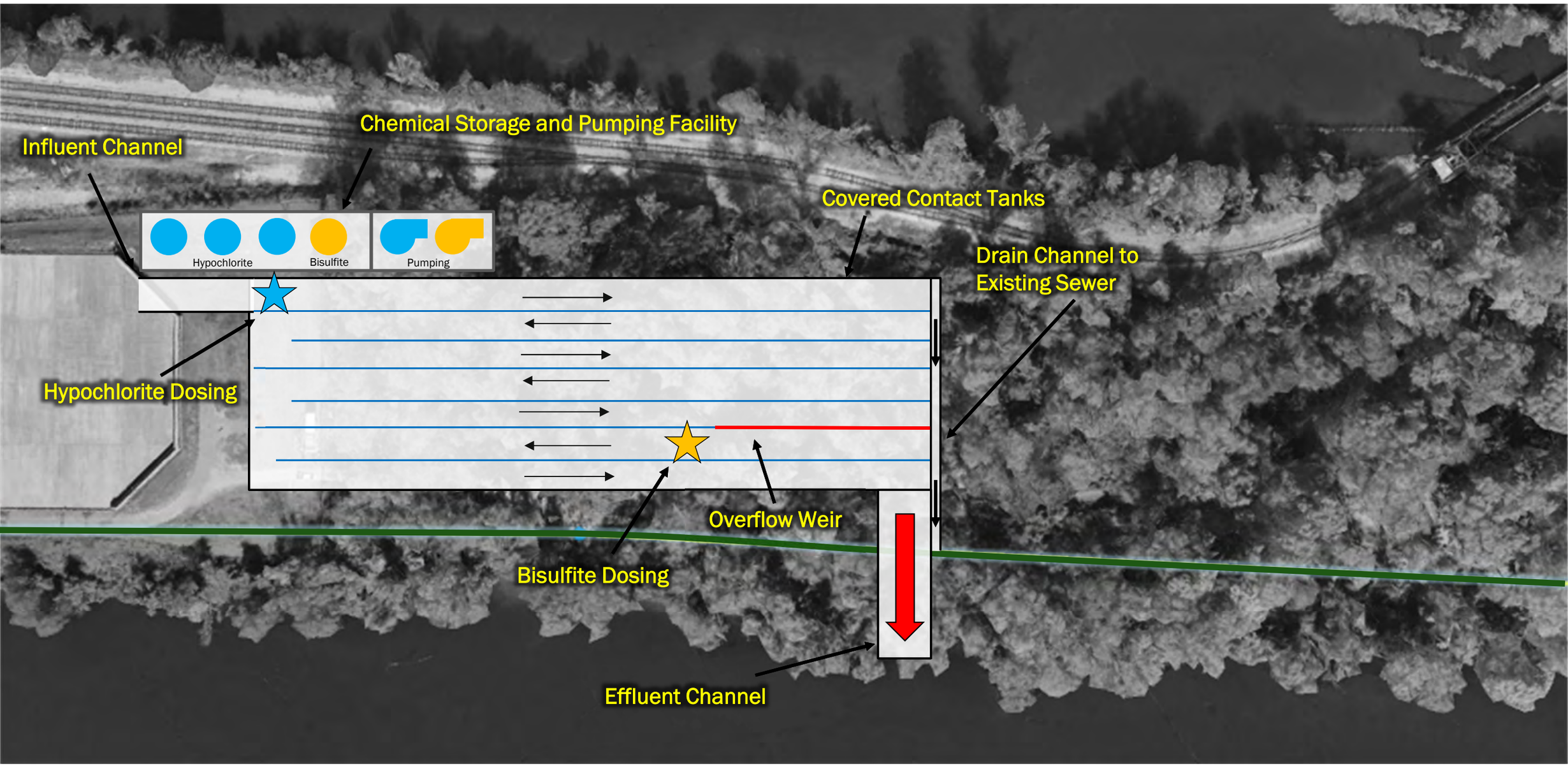
10.	15-Year Replacement Costs							
	a.	Electrical and Instrumentation and Control						
		i.	Furnish and Install Replacement Electrical and I&C		LS	100%	$3,720,000.00	$3,720,000
	b.	Meters						
		i.	Furnish and Install Replacement Meters		EA	6	$7,500.00	$45,000
							15-Year Replacement Costs Subtotal	**$3,765,000**

					Shockoe #1	
					SRB to HRD	
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Score
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2	<4 Year project schedule with minimal risks for schedule extension	1	2.3
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	1.8	2	None/Minor conflicts	2	3.6
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	2	2	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	2	4
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	2.3	2	Construction easements or none required	2	4.6
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	1.3	2	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	2	2.6
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	2.5	2	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	2	5
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	1.8	2	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	0	0
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	2.9	2	Signficant reduction in US/DS HGL as compared to the existing condition	1	2.9
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	1.1	2	>2 other similar facilties/equipment that are currently operated and maintained at the City	0	0
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	1.6	2	No new staff is required for operation and maintenace	1	1.6
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	3.4	2	Project supports future improvements or is foundational for future improvements	1	3.4
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	4.4	2	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	2	8.8
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	3.4	2	Protected against a 100-year flood	1	3.4
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	2.3	2	High potential for known near term (<5 years) future development	2	4.6
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	2	2	No federal or state permits required	0	0
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	3.3	2	Located outside of the Resource Manangement Area (RMA)	0	0
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	0.8	2	Minimal modifications would be required for the City's VPDES permit	0	0
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	3.5	2	Yes	2	7
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	2.9	2	Yes	2	5.8
			1	Adjacent		
			0	No		
	Impacts to community during construction	2.1	2	Minimal impacts to the community during construction	2	4.2
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	2.3	2	Minimal tree removal/mitigation (<0.2 acres) is required	2	4.6
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		68

Shockoe #2

Shockoe #2

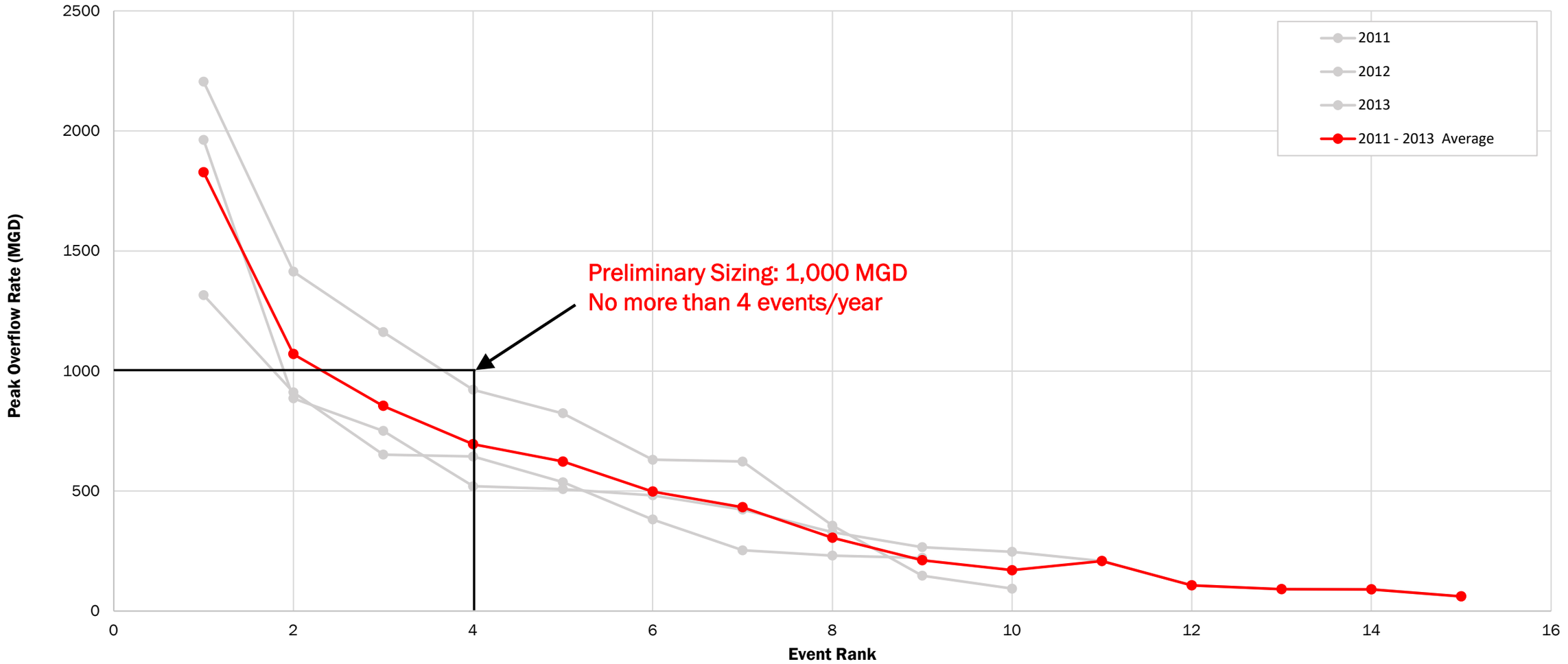
New High-Rate Disinfection Facility at Shockoe (1,000 MGD)



Shockoe #2

New High-Rate Disinfection Facility at Shockoe (1,000 MGD)

Existing CSO at Outfall 006 for Hydrologic Evaluation Period



City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
Shockoe #2: 1000 MGD New Shockoe High Rate Disinfection
Conceptual Design

Item	Unit	Quantity	Unit Cost	Total Amount
0. Structure Dimensions				
a. Influent Channel				
i. Length	LF	150		
ii. Width	LF	16		
iii. Depth	LF	16		
b. Contact Tanks (Covered)				
i. Length	LF	550		
ii. Width	LF	220		
iii. Depth	LF	20		
c. Effluent Channel				
i. Length	LF	100		
ii. Width	LF	30		
iii. Depth	LF	8		
d. Drain Channel				
i. Length	LF	220		
ii. Width	LF	10		
iii. Depth	LF	20		
e. Chemical Facility				
i. Length	LF	200		
ii. Width	LF	50		
iii. Depth	LF	25		
1. General				
a. Site Prep	ACRE	2.5	$500,000.00	$1,250,000.00
			General Subtotal	$1,250,000
2. Excavation for Structures				
a. Support of Excavation				
i. Sheeting				
HRD Facility Vertical Area	SF	69,300	$45.00	$3,118,500
Excavation Perimeter	LF	2,100		
Excavation Area	SF	130,600		
Excavation Depth	LF	22		
Chemical Facility Excavation Vertical Area	SF	27,522	$45.00	$1,238,490
Excavation Length	LF	216		
Excavation Width	LF	62		
Excavation Depth	LF	33		
b. Soil				
i. Excavate and Dispose of Soil	CY	122,783	$90.00	$11,050,453
			Excavation for Structures Subtotal	$15,407,443
3. Structural				
a. Influent Channel				
i. 150'L x 16'W x 16'D				
Concrete Base Slab	CY	342	$775.00	$265,222
Base Slab Thickness	LF	3		
Base Slab Length	LF	154		
Base Slab Width	LF	20		
Concrete Walls	CY	365	$1,500.00	$547,556
Exterior Wall Thickness	LF	2		
Exterior Wall Length	LF	308		
Exterior Wall Height	LF	16		
Concrete Top Slab	CY	228	$1,500.00	$342,222
Top Slab Thickness	LF	2		
Top Slab Length	LF	154		
Top Slab Width	LF	20		
b. Contact Tanks				
i. 550'L x 220'W x 20'D				
Concrete Base Slab	CY	18,341	$775.00	$14,214,074
Base Slab Thickness	LF	4		
Base Slab Length	LF	554		
Base Slab Width	LF	224		
Concrete Walls	CY	7,004	$1,500.00	$10,506,667
Exterior Wall Thickness	LF	2		

			Exterior Wall Length	LF	4,728		
			Exterior Wall Height	LF	20		
			Concrete Top Slab	CY	9,192	$1,500.00	$13,788,444
			Top Slab Thickness	LF	2		
			Top Slab Length	LF	554		
			Top Slab Width	LF	224		
	c.	Effluent Channel					
		i.	100'L x 90'W x 8'D				
			Concrete Base Slab	CY	393	$775.00	$304,489
			Base Slab Thickness	LF	3		
			Base Slab Length	LF	104		
			Base Slab Width	LF	34		
			Concrete Exterior Walls	CY	123	$1,500.00	$184,889
			Exterior Wall Thickness	LF	2		
			Exterior Wall Length	LF	208		
			Exterior Wall Height	LF	8		
			Concrete Top Slab	CY	262	$1,500.00	$392,889
			Top Slab Thickness	LF	2		
			Top Slab Length	LF	104		
			Top Slab Width	LF	34		
	d.	Drain Channel					
		i.	220'L x 10'W x 20'D				
			Concrete Base Slab	CY	348	$775.00	$270,044
			Base Slab Thickness	LF	3		
			Base Slab Length	LF	224		
			Base Slab Width	LF	14		
			Concrete Exterior Walls	CY	332	$1,500.00	$497,778
			Exterior Wall Thickness	LF	2		
			Exterior Wall Length	LF	224		
			Exterior Wall Height	LF	20		
			Concrete Top Slab	CY	232	$1,500.00	$348,444
			Top Slab Thickness	LF	2		
			Top Slab Length	LF	224		
			Top Slab Width	LF	14		
	e.	Chemical Facility					
		i.	200'L x 50'W x 25'D				
			Concrete Base Slab	CY	1,632	$775.00	$1,264,800
			Base Slab Thickness	LF	4		
			Base Slab Length	LF	204		
			Base Slab Width	LF	54		
			Concrete Exterior Walls	CY	941	$1,500.00	$1,411,111
			Exterior Wall Thickness	LF	2		
			Exterior Wall Length	LF	508		
			Exterior Wall Height	LF	25		
			Concrete Top Slab	CY	816	$1,500.00	$1,224,000
			Top Slab Thickness	LF	2		
			Top Slab Length	LF	204		
			Top Slab Width	LF	54		
						Structural Subtotal	$45,562,630
4.	Civil						
	a.	Civil Improvements		LS	1	$2,000,000.00	$2,000,000
						Civil Subtotal	$2,000,000
5.	Mechanical						
	a.	HRD Chemical Facility					
		i.	New HRD Facility and Equipment	MGD	1,000	$15,000.00	$15,000,000
	b	Tipping Troughs					
		i.	Furnish and Install Tipping Troughs	EA	16	$75,000.00	$1,200,000
	c.	Drain Gates					
		i.	Furnish and Install Drain Gates	EA	16	$37,500.00	$600,000
	d.	Tide Gates					
		i.	Furnish and Install Tide Gates	EA	5	$100,000.00	$500,000
						Mechanical Subtotal	$17,300,000
6.	Electrical and I&C						
	a.	Miscellaneous Electrical and I&C					
		i.	Furnish and Install Electrical and I&C (Other)	LS	1	$720,000.00	$720,000
						Electrical and I&C Subtotal	$720,000
7.	Other Improvements						

	a.	Aeration Improvements at the SRB	LS	1	$10,000,000.00	$10,000,000
	b.	Other Improvements at the SRB	LS	1	$15,000,000.00	$15,000,000
					Other Improvements Subtotal	$25,000,000
8.	Construction Total					
	a.	Subtotal A				$107,240,073
	b.	Design Contingency	LS	1	40%	*$42,896,029*
	c.	Subtotal B	LS	1		$150,136,102
	d.	General Conditions, Overhead and Profit	LS	1	50%	*$75,068,051*
	e.	Subtotal C	LS	1		$225,204,153
	f.	Bonds and Insurance	LS	1	3%	*$6,756,125*
					Total Estimated Cost	**$231,960,278**

9.	Capital Total					
	a.	Construction Cost Total				$231,960,278
	b.	Capital Contingency	LS	1	50%	*$115,980,139*
					Total Estimated Capital Cost	**$347,940,417**

10.	Annual Operations and Maintainence Costs					
	a.	Labor				
		i. Daily Check (365 Days, 1 Hr/Ea)	HR	365	$50.00	$18,250
		ii. Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	$50.00	$10,400
		iii. Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	$50.00	$4,800
		iv. Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	$50.00	$9,600
		v. Continuous Staffing (365 Days, 24 Hrs/Ea)	HR	8,760	$50.00	$438,000
	b.	Maintenance of Structures				
		i. Maintain Structures	LS	0.2%	$45,562,629.63	$91,125
	c.	Maintenance of Mechanical				
		i. Maintain Tipping Troughs	LS	3%	$1,200,000.00	$36,000
		ii. Maintain Drain Gates	LS	3%	$600,000.00	$18,000
		iii. Maintain HRD Chemical Facility	LS	3%	$15,000,000.00	$450,000
	d.	Maintenance of Instrumentation and Control				
		i. Maintain I&C	LS	3%	$720,000.00	$21,600
	e.	Operation of HRD Chemical Facility				
		i. Sodium Hypochlorite				
		Dose	mg/L	10		
		Volume	MGY	1208		
		Quantity	LBS	100695	$2.00	$201,390
		ii. Sodium Bisulfite				
		Dose	mg/L	3		
		Volume	MGY	1208		
		Quantity	LBS	30209	$2.00	$60,417
	f.	Additional SRB Solids Hauling				
		i. Labor				
		Cleaning after Wet Weather Events (100 Events, 48 Hr/Ea)	HR	4,800	$50.00	$240,000
		ii. Solids Hauling	DT/Y	1721	$130.00	$223,720
		TSS	mg/L	75		
		Volume	MGY	1208		
					Annual Operations and Maintainence Costs Subtotal	**$1,823,303**

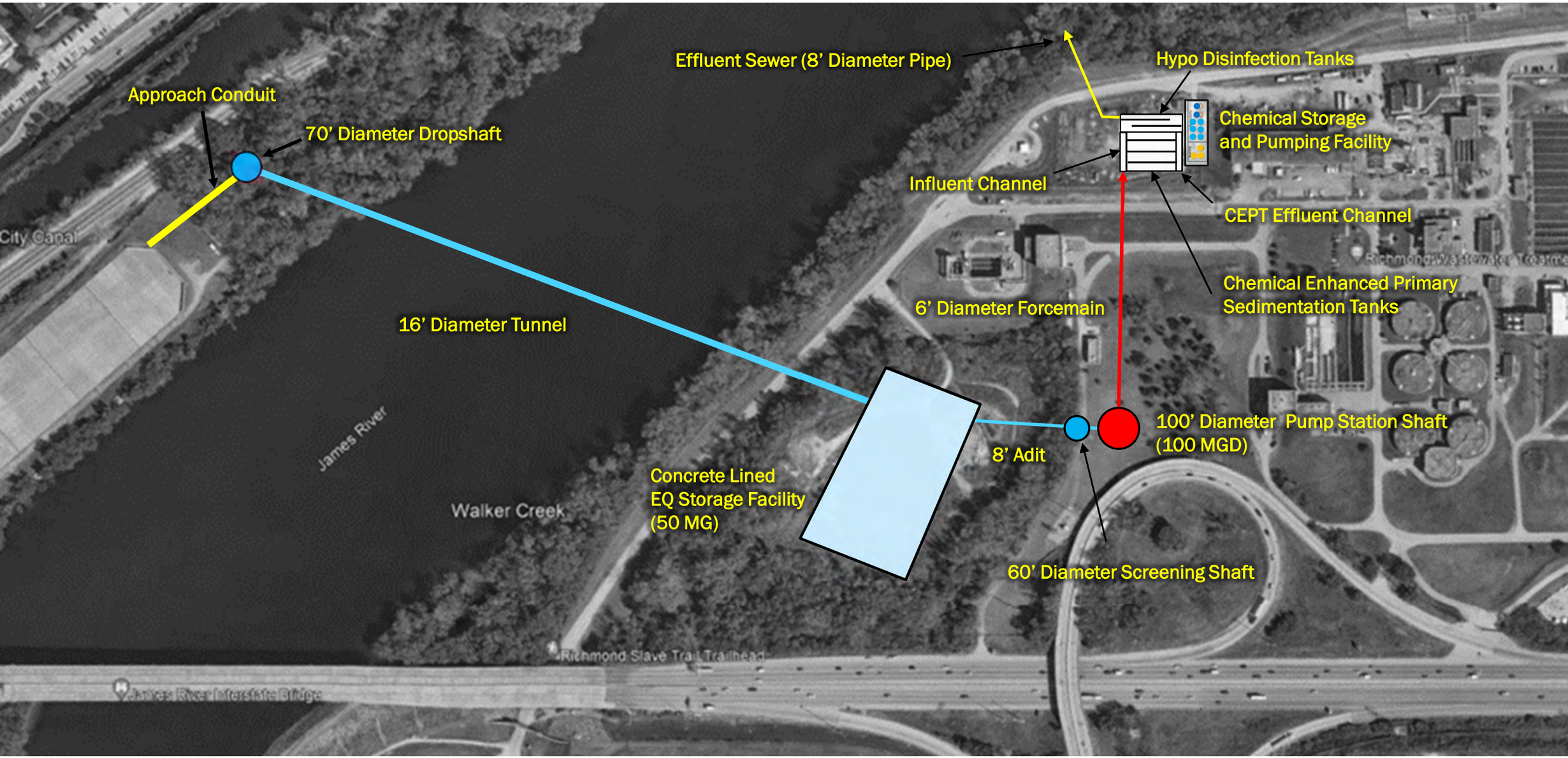
11.	15-Year Replacement Costs					
	a.	Electrical and Instrumentation and Control				
		i. Furnish and Install Replacement Electrical and I&C	LS	100%	$3,720,000.00	$3,720,000
	b.	Meters				
		i. Furnish and Install Replacement Meters	EA	6	$7,500.00	$45,000
					15-Year Replacement Costs Subtotal	**$3,765,000**

					Shockoe #2	
					HRD at Shockoe	
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Score
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2	<4 Year project schedule with minimal risks for schedule extension	1	2.3
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	1.8	2	None/Minor conflicts	2	3.6
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	2	2	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	2	4
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	2.3	2	Construction easements or none required	2	4.6
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	1.3	2	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	2	2.6
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	2.5	2	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	2	5
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	1.8	2	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	0	0
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	2.9	2	Signficant reduction in US/DS HGL as compared to the existing condition	1	2.9
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	1.1	2	>2 other similar facilties/equipment that are currently operated and maintained at the City	0	0
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	1.6	2	No new staff is required for operation and maintenace	1	1.6
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	3.4	2	Project supports future improvements or is foundational for future improvements	1	3.4
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	4.4	2	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	2	8.8
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	3.4	2	Protected against a 100-year flood	1	3.4
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	2.3	2	High potential for known near term (<5 years) future development	2	4.6
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	2	2	No federal or state permits required	0	0
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	3.3	2	Located outside of the Resource Manangement Area (RMA)	0	0
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	0.8	2	Minimal modifications would be required for the City's VPDES permit	0	0
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	3.5	2	Yes	2	7
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	2.9	2	Yes	2	5.8
			1	Adjacent		
			0	No		
	Impacts to community during construction	2.1	2	Minimal impacts to the community during construction	2	4.2
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	2.3	2	Minimal tree removal/mitigation (<0.2 acres) is required	0	0
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		64

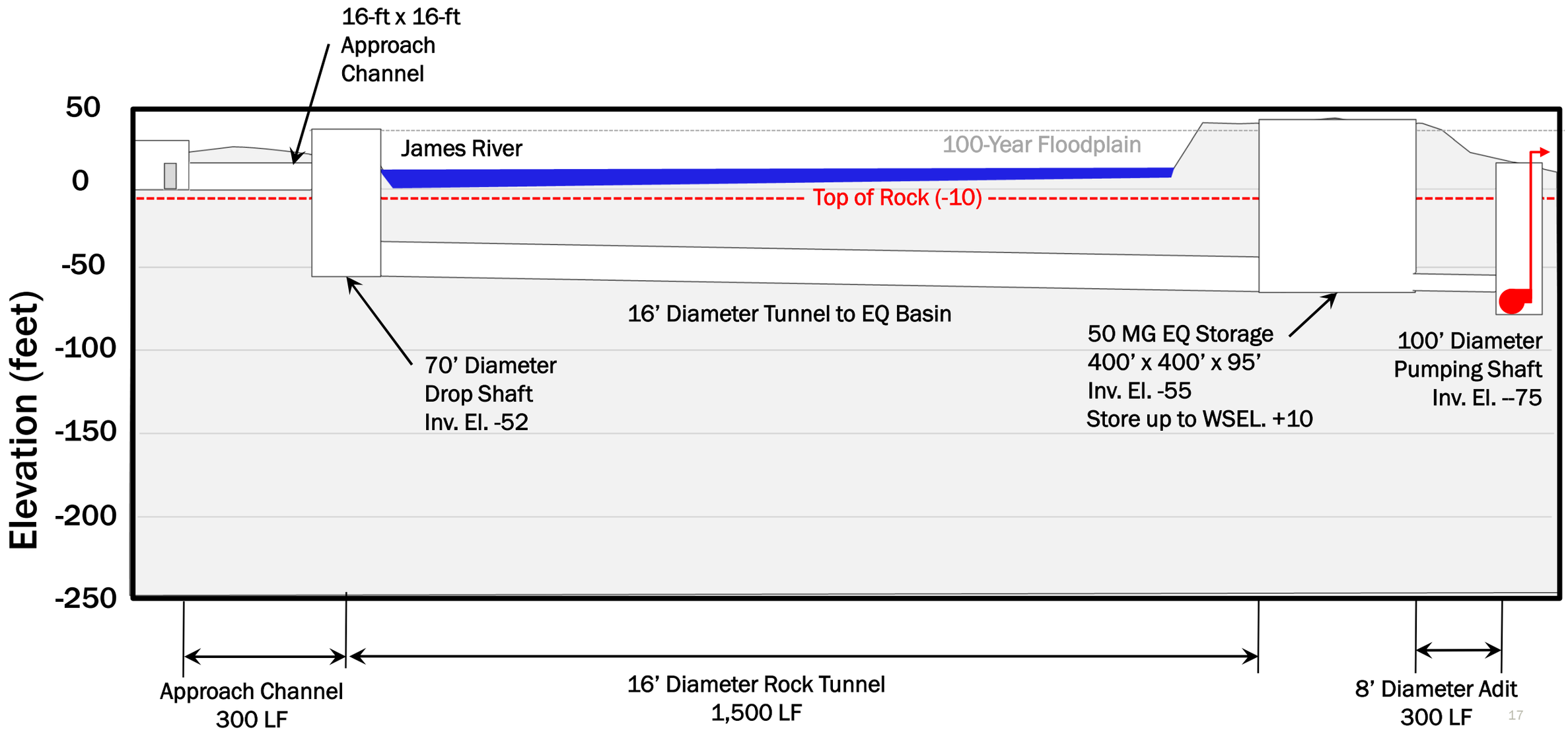
Shockoe #3

Shockoe #3

EQ Storage Basin (50 MG) and High-Rate Treatment Facility (100 MGD)



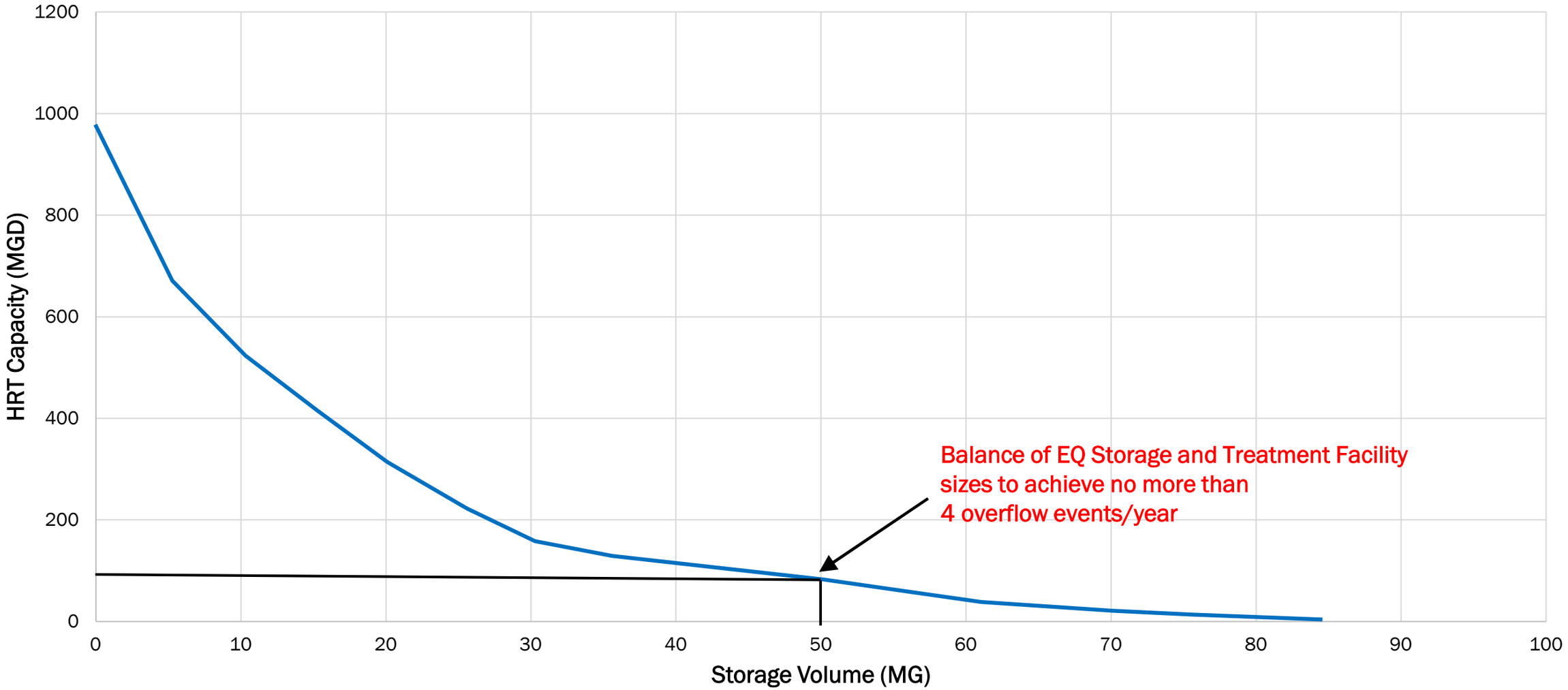
Tunnel and EQ Basin Profile



Shockoe #3

EQ Storage Basin (50 MG) and High-Rate Treatment Facility (100 MGD)

Existing CSO at Outfall 006 for Hydrologic Evaluation Period



City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
Shockoe #3: WWTP High Rate Disinfection and EQ
Conceptual Design

Item	Unit	Quantity	Unit Cost	Total Amount
0. Structure Dimensions				
a. Approach Channel				
i. Length	LF	300		
ii. Width	LF	16		
iii. Depth	LF	16		
b. EQ Basin				
i. Length	LF	300		
ii. Width	LF	500		
iii. Depth	LF	85		
c. Treatment Tanks				
i. Length	LF	155		
ii. Width	LF	145		
iii. Depth	LF	20		
d. Chemical Facility Pad				
i. Length	LF	160		
ii. Width	LF	80		
iii. Depth	LF	3		
e. Chemical Facility Floodwall				
i. Length	LF	480		
ii. Width	LF	0		
iii. Depth	LF	20		
f. Dropshaft				
i. Diameter	LF	70		
iii. Depth	LF	80		
g. Screening Shaft				
i. Diameter	LF	60		
iii. Depth	LF	85		
h. Pumping Shaft				
i. Diameter	LF	100		
iii. Depth	LF	95		
1. General				
a. Site Prep	ACRE	8	$250,000.00	$2,000,000.00
			General Subtotal	$2,000,000
2. Excavation for Structures				
a. Support of Excavation				
i. Sheeting				
Approach Channel	SF	24,480	$45.00	$1,101,600
Excavation Length	LF	312		
Excavation Width	LF	28		
Excavation Depth	LF	24		
Excavation Depth in Rock	LF	0		
Treatment Tanks	SF	24,300	$45.00	$1,093,500
Excavation Length	LF	167		
Excavation Width	LF	157		
Excavation Depth	LF	25		
Excavation Depth in Rock	LF	0		
Chemical Facility Pad	SF	0	$45.00	$0
Excavation Length	LF	168		
Excavation Width	LF	88		
Excavation Depth	LF	8		
Chemical Facility Floodwall	SF	0	$45.00	$0
Excavation Length	LF	480		
Excavation Width	LF	14		
Excavation Depth	LF	20		
Excavation Depth in Rock	LF	0		
ii. Secant Piling	SF	0		$0
Dropshaft	SF	7,917	$190.00	$1,504,195
Excavation Diameter	LF	84		
Excavation Depth	LF	91		
Screening Shaft	SF	6,974	$190.00	$1,325,124
Excavation Diameter	LF	74		
Excavation Depth	LF	96		
Pumping Shaft	SF	10,744	$190.00	$2,041,407
Excavation Diameter	LF	114		
Excavation Depth	LF	106		

	b.	Soil					
		i.	Excavate and Dispose of Soil	CY	41,400	$90.00	$3,726,037
		ii.	Excavate and Dispose of Dropshaft Overburden	CY	22,277	$180.00	$4,009,929
		iii.	Excavate and Dispose of Soil - EQ Basin	CY	400,000	$90.00	$36,000,000
	c.	Rock					
		i.	Excavate and Dispose of Dropshaft Rock	CY	51,764	$300.00	$15,529,311
		ii.	Excavate and Dispose of Rock - EQ Basin	CY	250,000	$300.00	$75,000,000
						Excavation for Structures Subtotal	$141,331,102
3.	Structural						
	a.	Approach Channel					
		i.	300'L x 16'W x 16'D				
			Concrete Base Slab	CY	901	$775.00	$698,074
			Base Slab Thickness	LF	4		
			Base Slab Length	LF	304		
			Base Slab Width	LF	20		
			Concrete Exterior Walls	CY	721	$1,500.00	$1,080,889
			Exterior Wall Thickness	LF	2		
			Exterior Wall Length	LF	608		
			Exterior Wall Height	LF	16		
			Concrete Interior Walls	CY	0	$1,500.00	$0
			Interior Wall Thickness	LF	0		
			Interior Wall Length	LF	0		
			Interior Wall Height	LF	0		
			Concrete Top Slab	CY	450	$1,500.00	$675,556
			Top Slab Thickness	LF	2		
			Top Slab Length	LF	304		
			Top Slab Width	LF	20		
	b.	EQ Basin					
		i.	300'L x 500'W x850'D				
			Concrete Base Slab	CY	36,667	$775.00	$28,416,667
			Base Slab Thickness	LF	4		
			Base Slab Area	SF	247,500		
	c.	Treatment Tanks					
		i.	155'L x 145'W x 20'D				
			Concrete Base Slab	CY	2,632	$775.00	$2,040,058
			Base Slab Thickness	LF	3		
			Base Slab Length	LF	159		
			Base Slab Width	LF	149		
			Concrete Exterior Walls	CY	901	$1,500.00	$1,351,111
			Exterior Wall Thickness	LF	2		
			Exterior Wall Length	LF	608		
			Exterior Wall Height	LF	20		
			Concrete Interior Walls	CY	1,333	$1,500.00	$2,000,000
			Interior Wall Thickness	LF	2		
			Interior Wall Length	LF	900		
			Interior Wall Height	LF	20		
			Concrete Top Slab	CY	0	$1,500.00	$0
			Top Slab Thickness	LF	0		
			Top Slab Length	LF	159		
			Top Slab Width	LF	149		
	d.	Chemical Facility Pad					
		i.	160'L x 80'W x 3'D				
			Concrete Base Slab	CY	1,422	$775.00	$1,102,222
			Base Slab Thickness	LF	3		
			Base Slab Length	LF	160		
			Base Slab Width	LF	80		
	e.	Chemical Facility Floodwall					
		i.	480'L x 3'W x 20'D				
			Concrete Exterior Walls	CY	1,067	$1,500.00	$1,600,000
			Exterior Wall Thickness	LF	3		
			Exterior Wall Length	LF	480		
			Exterior Wall Height	LF	20		
	f.	Dropshaft					
		i.	70' Dia x 80' Depth				
			Concrete Base Slab	CY	1,414	$1,100	$1,555,088
			Base Slab Thickness	LF	6		
			Base Slab Diameter	LF	90		
			Concrete Exterior Walls	CY	2,039	$2,100	$4,280,944
			Exterior Wall Thickness	LF	3		
			Exterior Wall Annular Area	SF	688		
			Exterior Wall Height	LF	80		
			Concrete Top Slab	CY	707	$1,500	$1,060,288
			Top Slab Thickness	LF	3		
			Top Slab Diameter	LF	90		
	g.	Screening Shaft					

		i.	60' Dia x 85' Depth				
			Concrete Base Slab	CY	760	$1,100	$836,292
			Base Slab Thickness	LF	6		
			Base Slab Diameter	LF	66		
			Concrete Exterior Walls	CY	1,869	$2,100	$3,925,420
			Exterior Wall Thickness	LF	3		
			Exterior Wall Annular Area	SF	594		
			Exterior Wall Height	LF	85		
			Concrete Top Slab	CY	380	$1,500	$570,199
			Top Slab Thickness	LF	3		
			Top Slab Diameter	LF	66		
	h.	Pumping Shaft					
		i.	100' Dia x 95' Depth				
			Concrete Base Slab	CY	1,961	$1,100	$2,157,157
			Base Slab Thickness	LF	6		
			Base Slab Diameter	LF	106		
			Concrete Exterior Walls	CY	3,416	$2,100	$7,172,780
			Exterior Wall Thickness	LF	3		
			Exterior Wall Annular Area	SF	971		
			Exterior Wall Height	LF	95		
			Concrete Top Slab	CY	981	$1,500	$1,470,789
			Top Slab Thickness	LF	3		
			Top Slab Diameter	LF	106		
						Structural Subtotal	$61,993,533
4.	Civil						
	a.	Pipe					
		i.	Furnish and Install 72" Ductile Iron Sewer Pipe (30' Depth)	LF	600	$1,400.00	$840,000
		ii.	Furnish and Install 96" Fiber Reinforced Sewer Pipe (20' Depth)	LF	250	$2,000.00	$500,000
	b.	Excavation					
		i.	Excavation for 72" Ductile Iron Sewer Pipe (30' Depth)	CY	6,667	$90.00	$600,000
			Excavation Length	LF	600		
			Excavation Width	LF	10		
			Excavation Depth	LF	32		
			Excavation Depth in Rock	LF	2		
			Rock Excavation	LF	444	$300.00	$133,333
		ii.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Max Depth)	CY	2,444	$90.00	$220,000
			Excavation Length	LF	250		
			Excavation Width	LF	12		
			Excavation Depth	LF	22		
			Excavation Depth in Rock	LF	0		
			Rock Excavation	LF	0	$300.00	$0
	c.	Support of Excavation					
		i.	Sheeting				
			72" Ductile Iron Sewer Pipe (30' Depth) Excavation Vertical Area	SF	57,600	$45.00	$2,592,000
			Excavation Length	LF	600		
			Excavation Depth	LF	32		
			96" Fiber Reinforced Sewer Pipe (20') Excavation Vertical Area	SF	16,500	$45.00	$742,500
			Excavation Length	LF	250		
			Excavation Depth	LF	22		
	d.	Tunnel Excavation and Lining					
		i.	16' Lined Tunnel with TBM	LF	1,500	$14,880.00	$22,320,000
		ii.	96" Adit to Tunnel with TBM	LF	300	$7,200.00	$2,160,000
						Civil Subtotal	$30,107,833
5.	Mechanical						
	a.	Tunnel Dewatering PS and Screening Facility					
		i.	New TDPS and Screening Facility	MGD	100	$450,000.00	$45,000,000
	b.	HRT Chemical Facility					
		i.	New HRT Facility and Equipment	MGD	100	$60,000.00	$6,000,000
	c	Tipping Troughs					
		i.	Furnish and Install Tipping Troughs	EA	10	$75,000.00	$750,000
	d.	Drain Gates					
		i.	Furnish and Install Drain Gates	EA	10	$37,500.00	$375,000
						Mechanical Subtotal	$52,130,000
6.	Electrical and I&C						
	a.	Miscellaneous Electrical and I&C					
		i.	Furnish and Install Electrical and I&C (Other)	LS	1	$450,000.00	$450,000
						Electrical and I&C Subtotal	$450,000
7.	Construction Total						
	a.	Subtotal A					$288,012,469
	b.	Design Contingency		LS	1	40%	*$115,204,987*
	c.	Subtotal B		LS	1		$403,217,456

	d.	General Conditions	LS	1	50%	*$201,608,728*
	e.	Subtotal C	LS	1		$604,826,184
	f.	Bonds and Insurance	LS	1	3%	*$18,144,786*
					Total Estimated Cost	**$622,970,970**

8.	Capital Total				
	a.	Construction Cost Total			$622,970,970
	b.	Capital Contingency	LS	1	50%	*$311,485,485*
					Total Estimated Capital Cost	**$934,456,454**

9.	Annual Operations and Maintainence Costs						
	a.	Labor					
		i.	Daily Check (365 Days, 1 Hr/Ea)	HR	365	$50.00	$18,250
		ii.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	$50.00	$10,400
		iii.	Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	$50.00	$4,800
		iv.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	$50.00	$9,600
		v.	Continuous Staffing (365 Days, 24 Hrs/Ea)	HR	8,760	$50.00	$438,000
	b.	Maintenance of Structures					
		i.	Maintain Structures	LS	0.2%	$61,993,533.11	$123,987
	c.	Maintenance of Pipe					
		i.	Maintain Pipe	LS	1%	$1,340,000.00	$13,400
	d.	Maintenance of Tunnel					
		i.	Maintain Tunnels and Adits	LS	1%	$24,480,000.00	$244,800
	e.	Maintenance of Mechanical					
		i.	Maintain Tipping Troughs	LS	3%	$750,000.00	$22,500
		ii.	Maintain Drain Gates	LS	3%	$375,000.00	$11,250
		iii.	Maintain HRT Chemical Facility	LS	3%	$6,000,000.00	$180,000
		iv.	Maintain Deep Tunnel Pump Station	LS	3%	$45,000,000.00	$1,350,000
	f.	Maintenance of Instrumentation and Control					
		i.	Maintain I&C	LS	3%	$450,000.00	$13,500
	g.	Operation of HRD Chemical Facility					
		i.	Sodium Hypochlorite				
			Dose	mg/L	10		
			Volume	MGY	1499		
			Quantity	LBS	125014	$2.00	$250,029
		ii.	Sodium Bisulfite				
			Dose	mg/L	3		
			Volume	MGY	1499		
			Quantity	LBS	37504	$2.00	$75,009
		iii.	PACl				
			Dose	mg/L	30		
			Volume	MGY	1499		
			Quantity	LBS	375043	$2.00	$750,086
	h.	Operation of Influent Pump Station					
		i.	Pump Station Electricity Cost				
			Flowrate of Pump Station	MGD	100		
			Annual Volume	MGY	1499		
			Total Dynamic Head	ft	115		
			Pump Efficiency		0.6		
			Motor Efficiency		0.9		
			Annual Energy Usage	KW-HR	1002524	$0.06	$60,151
	i.	Additional SRB Solids Hauling					
		i.	Solids Hauling	DT/Y	2137	$130.00	$277,752
			TSS	mg/L	75		
			Volume	MGY	1499		
						Annual Operations and Maintainence Costs Subtotal	**$3,853,514**

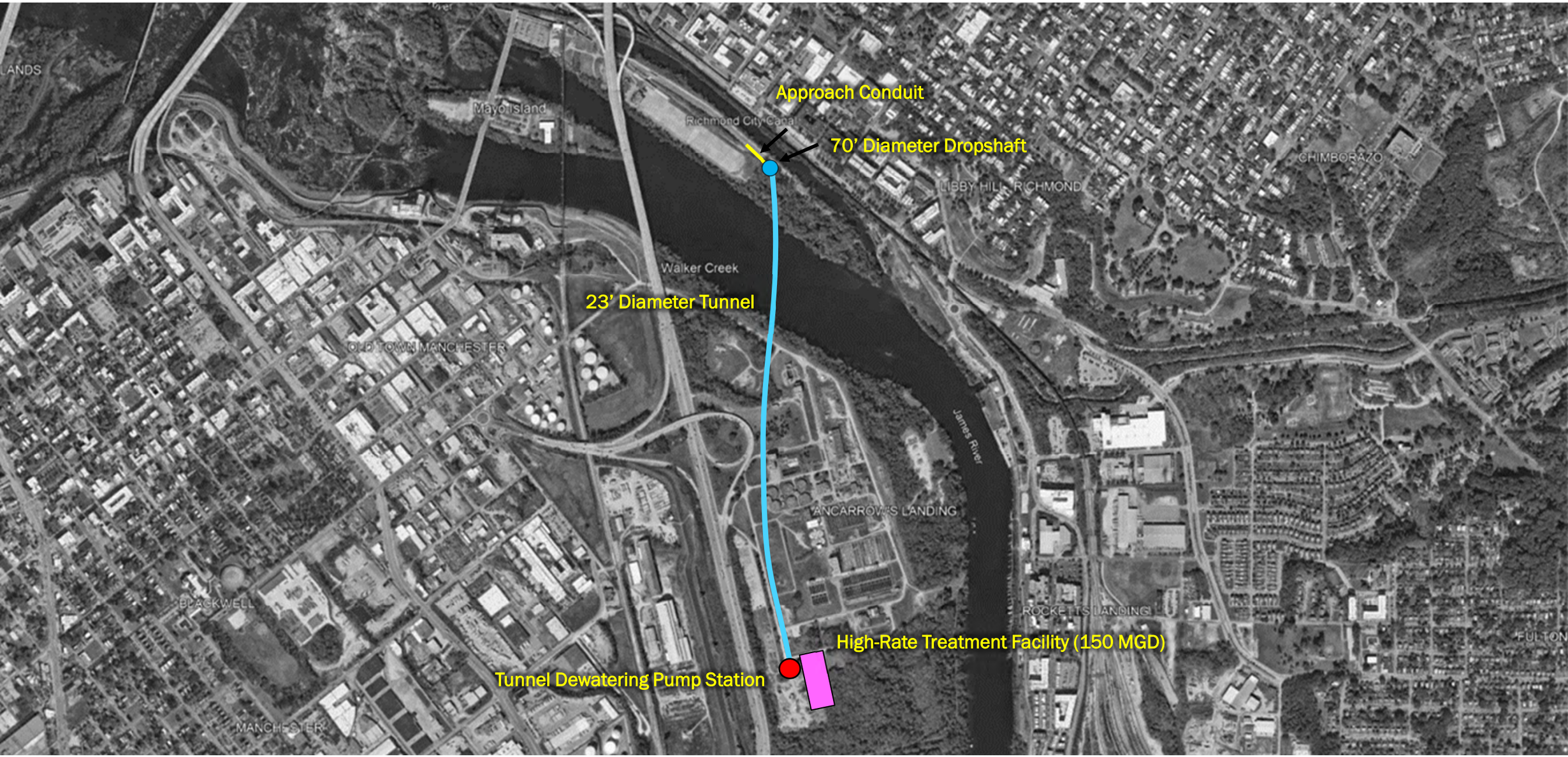
10.	15-Year Replacement Costs					
	a.	Electrical and Instrumentation and Control				
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	$10,650,000.00	$10,650,000
	b.	Meters					
		i.	Furnish and Install Replacement Meters	EA	8	$7,500.00	$60,000
						15-Year Replacement Costs Subtotal	**$10,710,000**

					Shockoe #3	
					EQ Storage and HRT	
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Score
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2	<4 Year project schedule with minimal risks for schedule extension	0	0
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	1.8	2	None/Minor conflicts	1	1.8
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	2	2	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	0	0
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	2.3	2	Construction easements or none required	2	4.6
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	1.3	2	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	0	0
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	2.5	2	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	2	5
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	1.8	2	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	0	0
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	2.9	2	Signficant reduction in US/DS HGL as compared to the existing condition	2	5.8
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	1.1	2	>2 other similar facilties/equipment that are currently operated and maintained at the City	0	0
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	1.6	2	No new staff is required for operation and maintenace	1	1.6
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	3.4	2	Project supports future improvements or is foundational for future improvements	2	6.8
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	4.4	2	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	2	8.8
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	3.4	2	Protected against a 100-year flood	1	3.4
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	2.3	2	High potential for known near term (<5 years) future development	0	0
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	2	2	No federal or state permits required	0	0
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	3.3	2	Located outside of the Resource Manangement Area (RMA)	0	0
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	0.8	2	Minimal modifications would be required for the City's VPDES permit	0	0
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	3.5	2	Yes	2	7
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	2.9	2	Yes	0	0
			1	Adjacent		
			0	No		
	Impacts to community during construction	2.1	2	Minimal impacts to the community during construction	2	4.2
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	2.3	2	Minimal tree removal/mitigation (<0.2 acres) is required	0	0
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		49

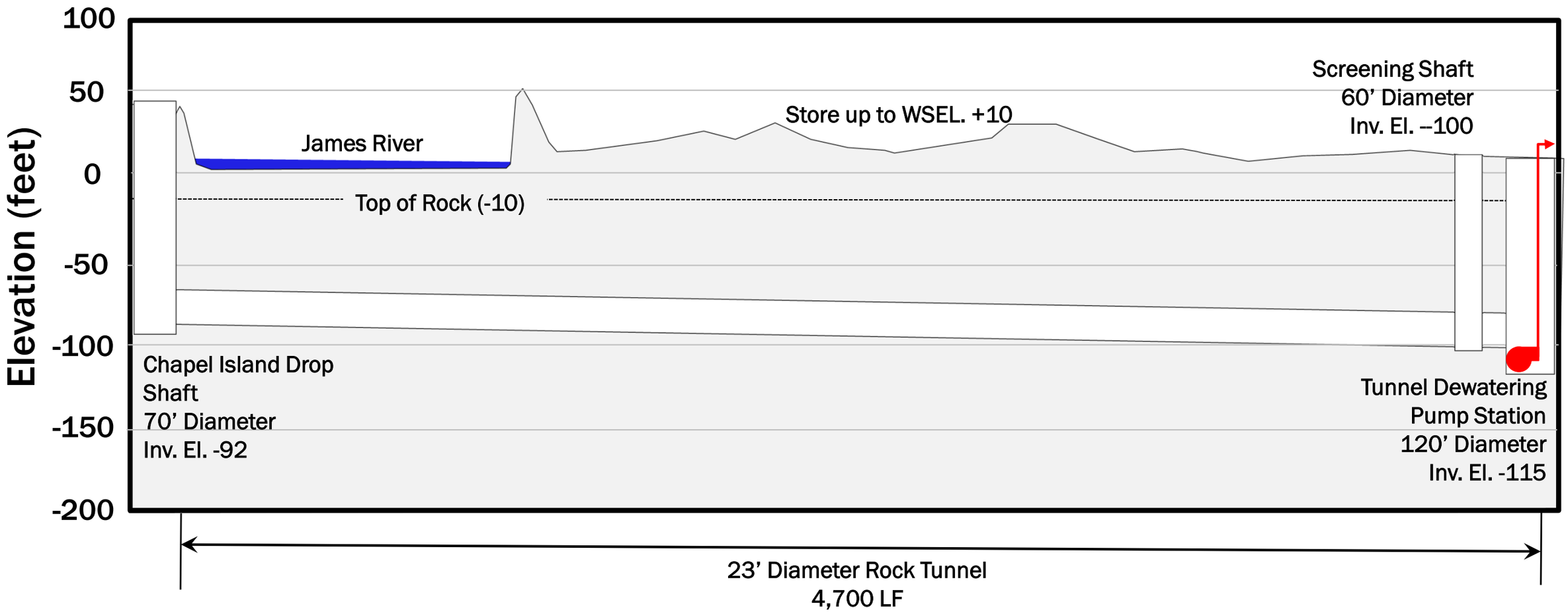
Shockoe #4

Shockoe #4

Storage Tunnel (30 MG) and High-Rate Treatment Facility (150 MGD)

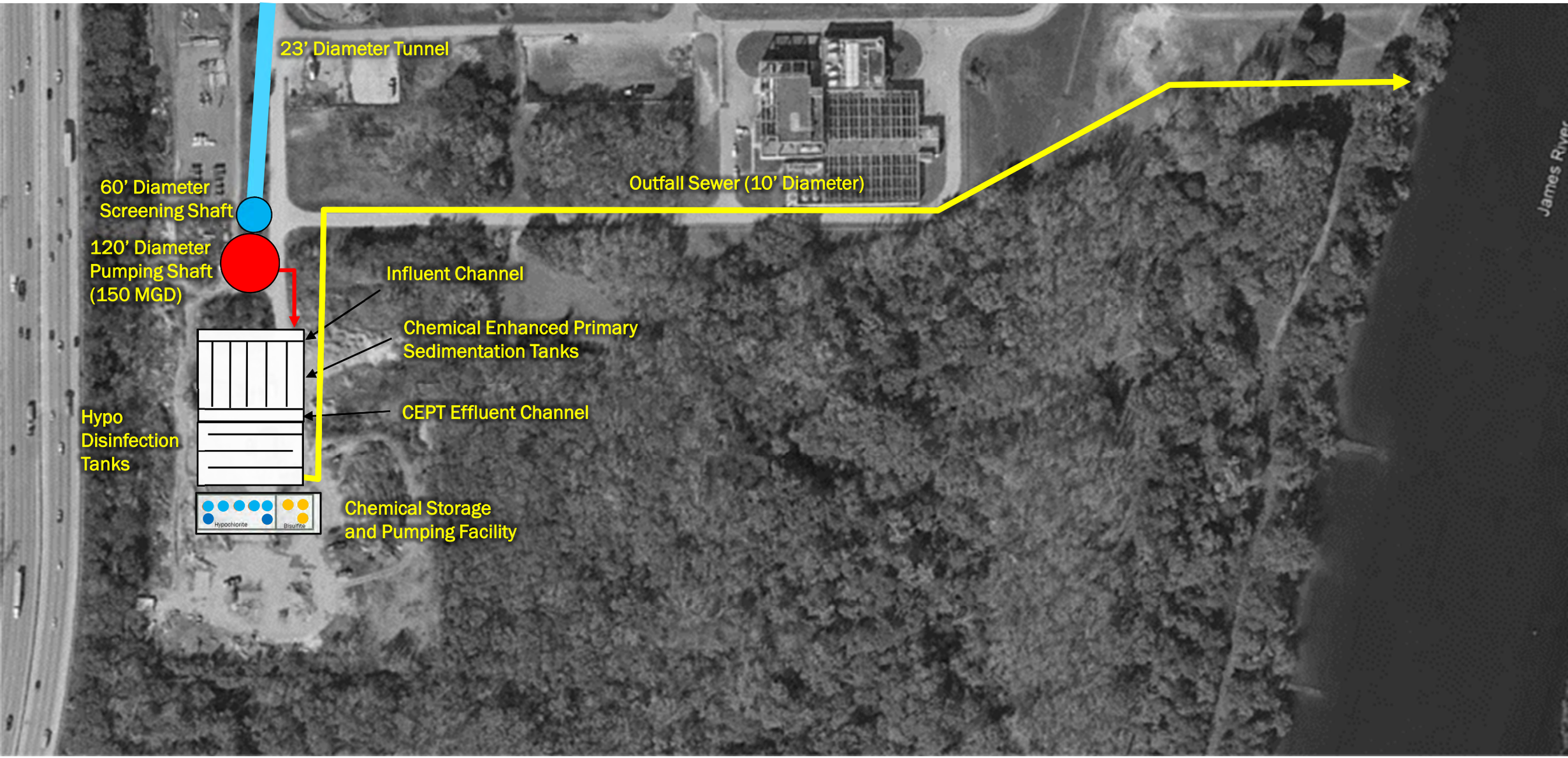


Storage Tunnel Profile



Shockoe #4

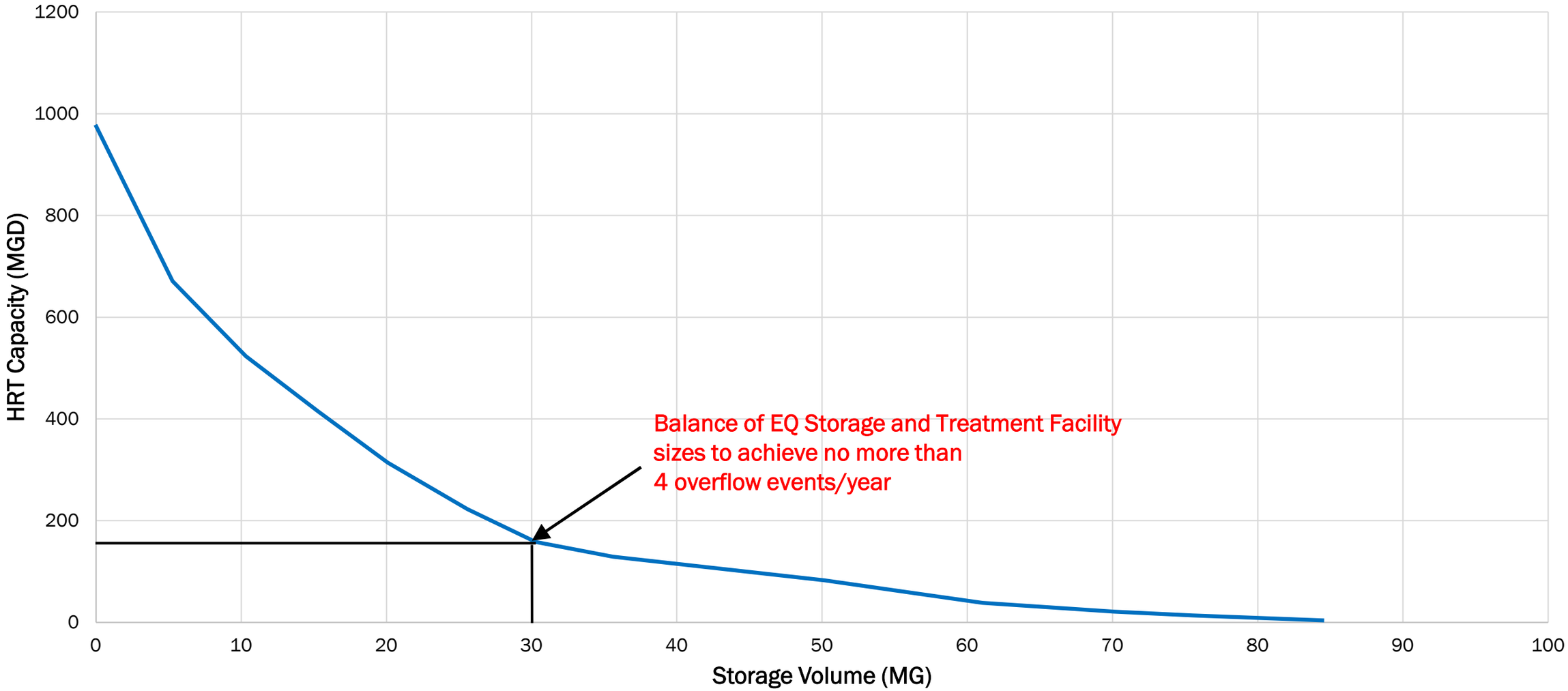
Storage Tunnel (30 MG) and High-Rate Treatment Facility (150 MGD)



Shockoe #4

Storage Tunnel (30 MG) and High-Rate Treatment Facility (150 MGD)

Existing CSO at Outfall 006 for Hydrologic Evaluation Period



City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
Shockoe #4: WWTP High Rate Disinfection and Storage Tunnel
Conceptual Design

Item				Unit	Quantity	Unit Cost	Total Amount
0.	Structure Dimensions						
	a.	Approach Channel					
		i.	Length	LF	300		
		ii.	Width	LF	16		
		iii.	Depth	LF	16		
	b.	Treatment Tanks					
		i.	Length	LF	335		
		ii.	Width	LF	150		
		iii.	Depth	LF	20		
	c.	Chemical Facility Pad					
		i.	Length	LF	240		
		ii.	Width	LF	80		
		iii.	Depth	LF	3		
	d.	Chemical Facility Floodwall					
		i.	Length	LF	640		
		ii.	Width	LF	0		
		iii.	Height	LF	20		
	e.	Dropshaft					
		i.	Diameter	LF	70		
		iii.	Depth	LF	120		
	f.	Pumping Shaft					
		i.	Diameter	LF	120		
		iii.	Depth	LF	135		
	g.	Screening Shaft					
		i.	Diameter	LF	60		
		iii.	Depth	LF	120		
1.	General						
	a.	Site Prep		ACRE	6	$250,000.00	$1,500,000.00
						General Subtotal	$1,500,000
2.	Excavation for Structures						
	a.	Support of Excavation					
		i.	Sheeting				
			Approach Channel	SF	23,460	$45.00	$1,055,700
			Excavation Length	LF	312		
			Excavation Width	LF	28		
			Excavation Depth	LF	23		
			Excavation Depth in Rock	LF	0		
			Treatment Tanks	SF	39,702	$45.00	$1,786,590
			Excavation Length	LF	347		
			Excavation Width	LF	162		
			Excavation Depth	LF	26		
			Excavation Depth in Rock	LF	0		
			Chemical Facility Pad	SF	0	$45.00	$0
			Excavation Length	LF	248		
			Excavation Width	LF	88		
			Excavation Depth	LF	8		
			Excavation Depth in Rock	LF	0		
			Chemical Facility Floodwall	SF	0	$45.00	$0
			Excavation Length	LF	640		
			Excavation Width	LF	14		
			Excavation Depth	LF	20		
			Excavation Depth in Rock	LF	0		
		ii.	Secant Piling				
			Dropshaft	SF	7,634	$190.00	$1,450,473
			Excavation Diameter	LF	81		
			Excavation Depth	LF	131		
			Pumping Shaft	SF	12,346	$190.00	$2,345,827
			Excavation Diameter	LF	131		
			Excavation Depth	LF	146		

			Screening Shaft	SF	6,974	$190.00	$1,325,124
			Excavation Diameter	LF	74		
			Excavation Depth	LF	128		
	b.	Soil					
		i.	Excavate and Dispose of Soil	CY	74,677	$90.00	$6,720,947
		ii.	Excavate and Dispose of Dropshaft Overburden	CY	25,480	$180.00	$4,586,411
	c.	Rock					
		i.	Excavate and Dispose of Rock	CY	0		$0
		i.	Excavate and Dispose of Dropshaft Rock	CY	92,793	$300.00	$27,837,871
						Excavation for Structures Subtotal	$47,108,943
3.	Structural						
	a.	Approach Channel					
		i.	300'L x 16'W x 16'D				
			Concrete Base Slab	CY	676	$775.00	$523,556
			Base Slab Thickness	LF	3		
			Base Slab Length	LF	304		
			Base Slab Width	LF	20		
			Concrete Exterior Walls	CY	721	$1,500.00	$1,080,889
			Exterior Wall Thickness	LF	2		
			Exterior Wall Length	LF	608		
			Exterior Wall Height	LF	16		
			Concrete Top Slab	CY	450	$1,500.00	$675,556
			Top Slab Thickness	LF	2		
			Top Slab Length	LF	304		
			Top Slab Width	LF	20		
	b.	Treatment Tanks					
		i.	335'L x 150'W x 20'D				
			Concrete Base Slab	CY	7,734	$775.00	$5,994,022
			Base Slab Thickness	LF	4		
			Base Slab Length	LF	339		
			Base Slab Width	LF	154		
			Concrete Exterior Walls	CY	1,449	$1,500.00	$2,173,333
			Exterior Wall Thickness	LF	2		
			Exterior Wall Length	LF	978		
			Exterior Wall Height	LF	20		
			Concrete Interior Walls	CY	1,926	$1,500.00	$2,888,889
			Interior Wall Thickness	LF	2		
			Interior Wall Length	LF	1,300		
			Interior Wall Height	LF	20		
	c.	Chemical Facility Pad					
		i.	240'L x 80'W x 3'D				
			Concrete Base Slab	CY	2,133	$775.00	$1,653,333
			Base Slab Thickness	LF	3		
			Base Slab Length	LF	240		
			Base Slab Width	LF	80		
	d.	Chemical Facility Floodwall					
		i.	640'L x 3'W x 20'D				
			Concrete Exterior Walls	CY	1,422	$1,500.00	$2,133,333
			Exterior Wall Thickness	LF	3		
			Exterior Wall Length	LF	640		
			Exterior Wall Height	LF	20		
	e.	Dropshaft					
		i.	70' Dia x 120' Depth				
			Concrete Base Slab	CY	1,321	$1,100	$1,453,144
			Base Slab Thickness	LF	6		
			Base Slab Diameter	LF	87		
			Concrete Exterior Walls	CY	3,058	$2,100.00	$6,421,415
			Exterior Wall Thickness	LF	3		
			Exterior Wall Annular Area	SF	688		
			Exterior Wall Height	LF	120		
			Concrete Top Slab	CY	661	$1,500	$990,780
			Top Slab Thickness	LF	3		
			Top Slab Diameter	LF	87		
	f.	Pumping Shaft					
		i.	120' Dia x 135' Depth				
			Concrete Base Slab	CY	2,771	$1,100	$3,047,973
			Base Slab Thickness	LF	6		
			Base Slab Diameter	LF	126		

				Concrete Exterior Walls	CY	5,796	$2,100.00	$12,172,101
				Exterior Wall Thickness	LF	3		
				Exterior Wall Annular Area	SF	1,159		
				Exterior Wall Height	LF	135		
				Concrete Top Slab	CY	1,385	$1,500	$2,078,164
				Top Slab Thickness	LF	3		
				Top Slab Diameter	LF	126		
	g.		Screening Shaft					
		i.	60' Dia x 120' Depth					
				Concrete Base Slab	CY	760	$1,100	$836,292
				Base Slab Thickness	LF	6		
				Base Slab Diameter	LF	66		
				Concrete Exterior Walls	CY	2,639	$2,100.00	$5,541,769
				Exterior Wall Thickness	LF	3		
				Exterior Wall Annular Area	SF	594		
				Exterior Wall Height	LF	120		
				Concrete Top Slab	CY	380	$1,500	$570,199
				Top Slab Thickness	LF	3		
				Top Slab Diameter	LF	66		
							Structural Subtotal	$50,234,748
4.	Civil							
	a.		Pipe					
		i.	Furnish and Install 120" Fiber Reinforced Sewer Pipe (20' Depth)		LF	2,200	$2,500.00	$5,500,000
	b.		Excavation					
		i.	Excavation for 120" Fiber Reinforced Sewer Pipe (20' Depth)		CY	25,096	$90.00	$2,258,667
				Excavation Length	LF	2,200		
				Excavation Width	LF	14		
				Excavation Depth	LF	22		
				Excavation Depth in Rock	LF	0		
				Rock Excavation	LF	0	$300.00	$0
	c.		Support of Excavation					
		i.	Sheeting					
				120" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Vertical Ar	SF	145,200	$45.00	$6,534,000
				Excavation Length	LF	2,200		
				Excavation Depth	LF	22		
							Civil Subtotal	$14,292,667
5.	Mechanical							
	a.		Tunnel Dewatering PS and Screening Facility					
		i.	New TDPS and Screening Facility		MGD	150	$450,000.00	$67,500,000
	b.		HRT Chemical Facility					
		i.	New HRT Facility and Equipment		MGD	150	$60,000.00	$9,000,000
	f.		Tipping Troughs					
		i.	Furnish and Install Tipping Troughs		EA	10	$75,000.00	$750,000
	g.		Drain Gates					
		i.	Furnish and Install Drain Gates		EA	10	$37,500.00	$375,000
							Mechanical Subtotal	$77,630,000
6.	Electrical and I&C							
	a.		Miscellaneous Electrical and I&C					
		i.	Furnish and Install Electrical and I&C (Other)		LS	1	$450,000.00	$450,000
							Electrical and I&C Subtotal	$450,000
7.	Construction Total							
	a.		Subtotal A					$191,216,357
	b.		Design Contingency		LS	1	40%	*$76,486,543*
	c.		Subtotal B		LS	1		$267,702,900
	d.		General Conditions		LS	1	50%	*$133,851,450*
	e.		Subtotal C		LS	1		$401,554,350
	f.		Bonds and Insurance		LS	1	3%	*$12,046,631*
							Total Estimated Cost	**$413,600,981**

8.	Capital Total					
	a.	Construction Cost Total				$413,600,981
	b.	Capital Contingency	LS	1	50%	*$206,800,490*

					Total Estimated Capital Cost	**$620,401,471**

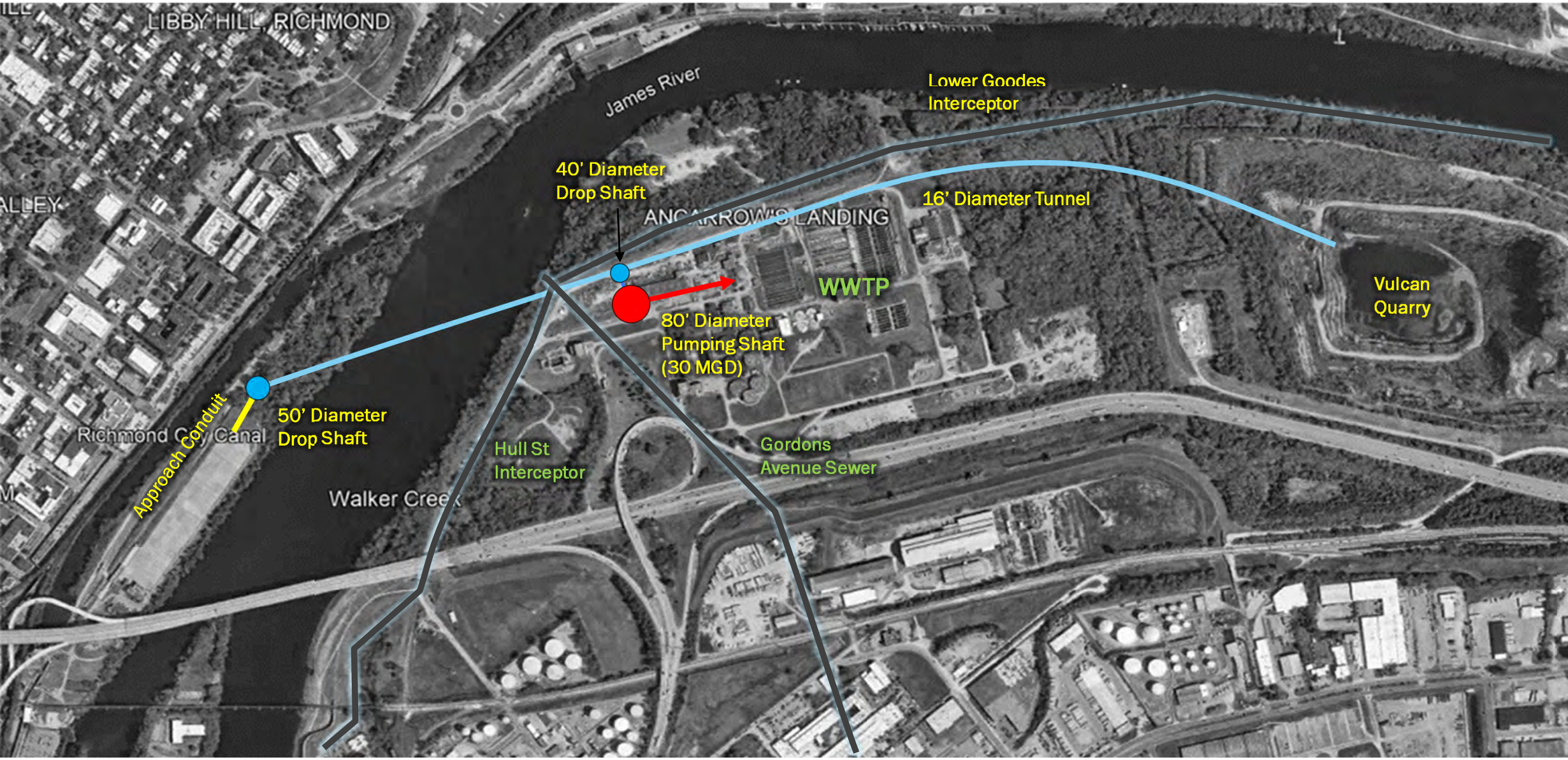
9.	Annual Operations and Maintainence Costs						
	a.	Labor					
		i.	Daily Check (365 Days, 1 Hr/Ea)	HR	365	$50.00	$18,250
		ii.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	$50.00	$10,400
		iii.	Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	$50.00	$4,800
		iv.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	$50.00	$9,600
		v.	Continuous Staffing (365 Days, 24 Hrs/Ea)	HR	8,760	$50.00	$438,000
	b.	Maintenance of Structures					
		i.	Maintain Structures	LS	0.2%	$50,234,747.90	$100,469
	c.	Maintenance of Pipe					
		i.	Maintain Pipe	LS	1%	$5,500,000.00	$55,000
	d.	Maintenance of Tunnel					
		i.	Maintain Tunnels and Adits	LS	1%	$0.00	$0
	e.	Maintenance of Mechanical					
		i.	Maintain Tipping Troughs	LS	3%	$750,000.00	$22,500
		ii.	Maintain Drain Gates	LS	3%	$375,000.00	$11,250
		iii.	Maintain HRT Chemical Facility	LS	3%	$9,000,000.00	$270,000
		iv.	Maintain Deep Tunnel Pump Station	LS	3%	$67,500,000.00	$2,025,000
	f.	Maintenance of Instrumentation and Control					
		i.	Maintain I&C	LS	3%	$450,000.00	$13,500
	g.	Operation of HRD Chemical Facility					
		i.	Sodium Hypochlorite				
			Dose	mg/L	10		
			Volume	MGY	1596		
			Quantity	LBS	133047	$2.00	$266,093
		ii.	Sodium Bisulfite				
			Dose	mg/L	3		
			Volume	MGY	1596		
			Quantity	LBS	39914	$2.00	$79,828
		iii.	PACl				
			Dose	mg/L	30		
			Volume	MGY	1596		
			Quantity	LBS	399223	$2.00	$798,447
	h.	Operation of Influent Pump Station					
		i.	Pump Station Electricity Cost				
			Flowrate of Pump Station	MGD	150		
			Annual Volume	MGY	1596		
			Total Dynamic Head	ft	155		
			Pump Efficiency		0.6		
			Motor Efficiency		0.9		
			Annual Energy Usage	KW-HR	1438345	$0.06	$86,301
	i.	Additional SRB Solids Hauling					
		i.	Solids Hauling	DT/Y	2274	$130.00	$295,659
			TSS	mg/L	75		
			Volume	MGY	1596		
						Annual Operations and Maintainence Costs Subtotal	**$4,505,097**

10.	15-Year Replacement Costs						
	a.	Electrical and Instrumentation and Control					
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	$15,750,000.00	$15,750,000
	b.	Meters					
		i.	Furnish and Install Replacement Meters	EA	8	$7,500.00	$60,000
						15-Year Replacement Costs Subtotal	**$15,810,000**

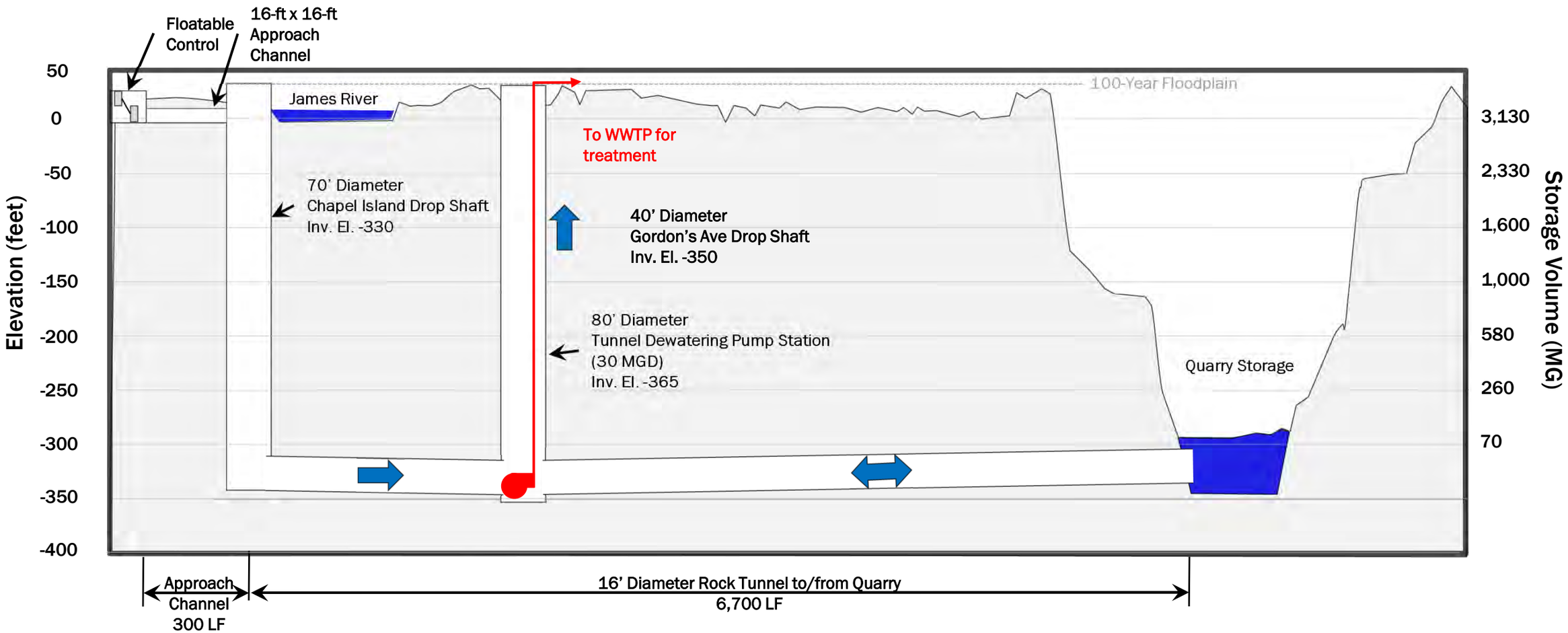
					Shockoe #4	
					Tunnel and HRT	
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Score
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2	<4 Year project schedule with minimal risks for schedule extension	0	0
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	1.8	2	None/Minor conflicts	2	3.6
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	2	2	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	0	0
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	2.3	2	Construction easements or none required	2	4.6
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	1.3	2	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	0	0
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	2.5	2	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	2	5
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	1.8	2	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	0	0
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	2.9	2	Signficant reduction in US/DS HGL as compared to the existing condition	2	5.8
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	1.1	2	>2 other similar facilties/equipment that are currently operated and maintained at the City	0	0
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	1.6	2	No new staff is required for operation and maintenace	1	1.6
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	3.4	2	Project supports future improvements or is foundational for future improvements	2	6.8
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	4.4	2	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	2	8.8
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	3.4	2	Protected against a 100-year flood	1	3.4
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	2.3	2	High potential for known near term (<5 years) future development	0	0
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	2	2	No federal or state permits required	0	0
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	3.3	2	Located outside of the Resource Manangement Area (RMA)	0	0
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	0.8	2	Minimal modifications would be required for the City's VPDES permit	0	0
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	3.5	2	Yes	2	7
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	2.9	2	Yes	0	0
			1	Adjacent		
			0	No		
	Impacts to community during construction	2.1	2	Minimal impacts to the community during construction	2	4.2
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	2.3	2	Minimal tree removal/mitigation (<0.2 acres) is required	1	2.3
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		53

Shockoe #5

Shockoe #5
Tunnel to Quarry



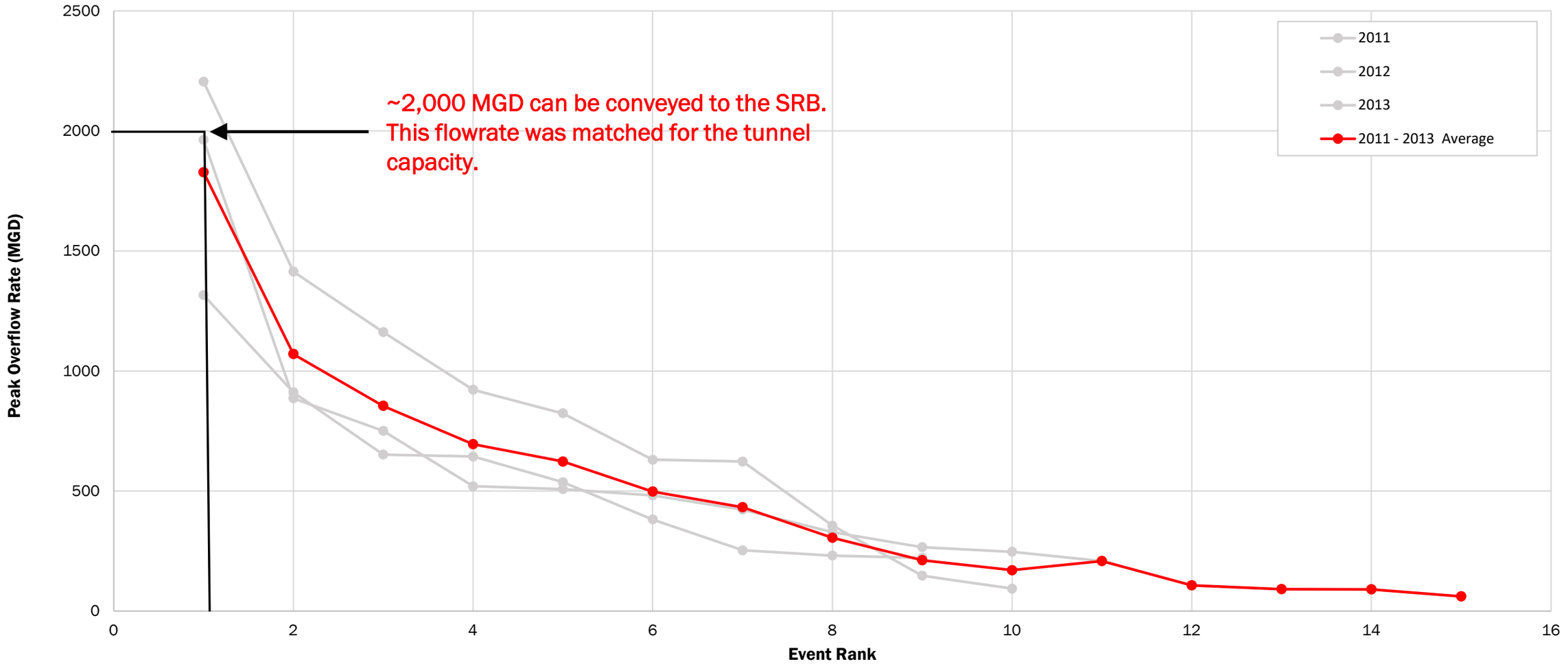
Tunnel and Quarry Storage Profile



Shockoe #5

Tunnel to Quarry

Existing CSO at Outfall 006 for Hydrologic Evaluation Period



City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
Shockoe #5: Tunnel to Quarry Storage
Conceptual Design

Item				Unit	Quantity	Unit Cost	Total Amount
0.	Structure Dimensions						
	a.	Approach Channel					
		i.	Length	LF	300		
		ii.	Width	LF	16		
		iii.	Depth	LF	16		
	b.	Dropshaft #1					
		i.	Diameter	LF	50		
		ii.	Depth	LF	350		
	c.	Pumping Shaft					
		i.	Diameter	LF	80		
		ii.	Depth	LF	385		
	d.	Screening Shaft					
		i.	Diameter	LF	40		
		ii.	Depth	LF	370		
1.	General						
	a.	Site Prep		ACRE	10	$500,000.00	$5,000,000.00
						General Subtotal	$5,000,000
2.	Excavation for Structures						
	a.	Support of Excavation					
		i.	Sheeting				
			Approach Channel	SF	23,460	$45.00	$1,055,700
			Excavation Length	LF	312		
			Excavation Width	LF	28		
			Excavation Depth	LF	23		
			Excavation Depth in Rock	LF	0		
		ii.	Secant Piling				
			Dropshaft	SF	5,278	$190.00	$1,002,796
			Excavation Diameter	LF	56		
			Excavation Depth	LF	365		
			Pumping Shaft	SF	8,105	$190.00	$1,540,009
			Excavation Diameter	LF	86		
			Excavation Depth	LF	400		
			Screening Shaft	SF	4,335	$190.00	$823,726
			Excavation Diameter	LF	46		
			Excavation Depth	LF	385		
	b.	Soil					
		i.	Excavate and Dispose of Soil	CY	7,442	$90.00	$669,760
		ii.	Excavate and Dispose of Dropshaft Overburden	CY	11,037	$180.00	$1,986,743
	c.	Rock					
		i.	Excavate and Dispose of Rock	CY	0		$0
		ii.	Excavate and Dispose of Dropshaft Rock	CY	132,013	$300.00	$39,603,790
						Excavation for Structures Subtotal	$46,682,524
3.	Structural						
	a.	Approach Channel					
		i.	300'L x 16'W x 16'D				
			Concrete Base Slab	CY	676	$775.00	$523,556
			Base Slab Thickness	LF	3		
			Base Slab Length	LF	304		
			Base Slab Width	LF	20		
			Concrete Exterior Walls	CY	721	$1,500.00	$1,080,889
			Exterior Wall Thickness	LF	2		
			Exterior Wall Length	LF	608		
			Exterior Wall Height	LF	16		
			Concrete Top Slab	CY	450	$1,500.00	$675,556
			Top Slab Thickness	LF	2		
			Top Slab Length	LF	304		
			Top Slab Width	LF	20		
	b.	Dropshaft #1					
		i.	50' Dia x 350' Depth				
			Concrete Base Slab	CY	1,118	$1,100.00	$1,229,992
			Base Slab Thickness	LF	10		
			Base Slab Diameter	LF	62		

			Concrete Exterior Walls	CY	6,475	$2,100	$13,597,860
			Exterior Wall Thickness	LF	3		
			Exterior Wall Annular Area	SF	500		
			Exterior Wall Height	LF	350		
			Concrete Top Slab	CY	335	$1,500.00	$503,178
			Top Slab Thickness	LF	3		
			Top Slab Diameter	LF	62		
	c.	Pumping Shaft					
		i.	80' Dia x 385' Depth				
			Concrete Base Slab	CY	2,151	$1,100.00	$2,366,550
			Base Slab Thickness	LF	10		
			Base Slab Diameter	LF	86		
			Concrete Exterior Walls	CY	11,154	$2,100.00	$23,424,238
			Exterior Wall Thickness	LF	3		
			Exterior Wall Annular Area	SF	782		
			Exterior Wall Height	LF	385		
			Concrete Top Slab	CY	645	$1,500.00	$968,134
			Top Slab Thickness	LF	3		
			Top Slab Diameter	LF	86		
	d.	Screening Shaft					
		i.	40' Dia x 370' Depth				
			Concrete Base Slab	CY	616	$1,100.00	$677,071
			Base Slab Thickness	LF	10		
			Base Slab Diameter	LF	46		
			Concrete Exterior Walls	CY	5,554	$2,100.00	$11,662,639
			Exterior Wall Thickness	LF	3		
			Exterior Wall Annular Area	SF	405		
			Exterior Wall Height	LF	370		
			Concrete Top Slab	CY	185	$1,500.00	$276,984
			Top Slab Thickness	LF	3		
			Top Slab Diameter	LF	46		
	e.	Quarry Improvements					
		i.	Quarry Site Improvements	LS	1	$50,000,000.00	$50,000,000
						Structural Subtotal	$106,986,647
4.	Civil						
	a.	Tunnel Excavation and Lining					
		i.	16' Lined Tunnel with TBM	LF	6,700	$15,000.00	$100,500,000
		ii.	10' Lined Adit to Tunnel with TBM	LF	100	$9,000.00	$900,000
						Civil Subtotal	$101,400,000
5.	Mechanical/Electrical/I&C						
	a.	Tunnel Dewatering PS and Screening Facility					
		i.	New TDPS and Screening Facility	MGD	30	$900,000.00	$27,000,000
						Mechanical/Electrical/I&C Subtotal	$27,000,000
7.	Construction Total						
	a.	Subtotal A					$287,069,171
	b.	Design Contingency		LS	1	40%	*$114,827,668*
	c.	Subtotal B		LS	1		$401,896,839
	d.	General Conditions		LS	1	50%	*$200,948,420*
	e.	Subtotal C		LS	1		$602,845,259
	f.	Bonds and Insurance		LS	1	3%	*$18,085,358*
	g.	Subtotal E		LS	1		$620,930,616
	h.	Quarry Aquisition Price		LS	1	$150,000,000	$150,000,000
						Total Estimated Cost	**$770,930,616**

9.	Capital Total						
	a.	Construction Cost Total					$770,930,616
	b.	Capital Contingency		LS	1	50%	*$385,465,308*
						Total Estimated Capital Cost	**$1,156,395,925**

10.	Annual Operations and Maintainence Costs						
	a.	Labor					
		i.	Daily Check (365 Days, 1 Hr/Ea)	HR	365	$50.00	$18,250
		ii.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	$50.00	$10,400
		iii.	Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	$50.00	$4,800
		iv.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	$50.00	$9,600
		v.	Continuous Staffing (365 Days, 24 Hrs/Ea)	HR	8,760	$50.00	$438,000

	b.	Maintenance of Structures					
		i.	Maintain Structures	LS	0.2%	$106,986,647.27	$213,973
	d.	Maintenance of Tunnel					
		i.	Maintain Tunnels and Adits	LS	1%	$101,400,000.00	$1,014,000
	e.	Maintenance of Mechanical					
		i.	Maintain Deep Tunnel Pump Station	LS	3%	$27,000,000.00	$810,000
	f.	Maintenance of Instrumentation and Control					
		i.	Maintain I&C	LS	3%	$0.00	$0
	g.	Operation of Influent Pump Station					
		i.	Pump Station Electricity Cost				
			Flowrate of Pump Station	MGD	30		
			Annual Volume	MGY	2741		
			Total Dynamic Head	ft	405		
			Pump Efficiency		0.6		
			Motor Efficiency		0.9		
			Annual Energy Usage	KW-HR	6454501	$0.06	$387,270
	h.	Additional Treated Volume at WWTP					
		i.	Additional Treated Volume	MGY	2741	$210.00	$575,610
	i.	Additional SRB Solids Hauling					
		i.	Solids Hauling	DT/Y	3906	$130.00	$507,770
			TSS	mg/L	75		
			Volume	MGY	2741		
						Annual Operations and Maintainence Costs Subtotal	**$3,989,674**

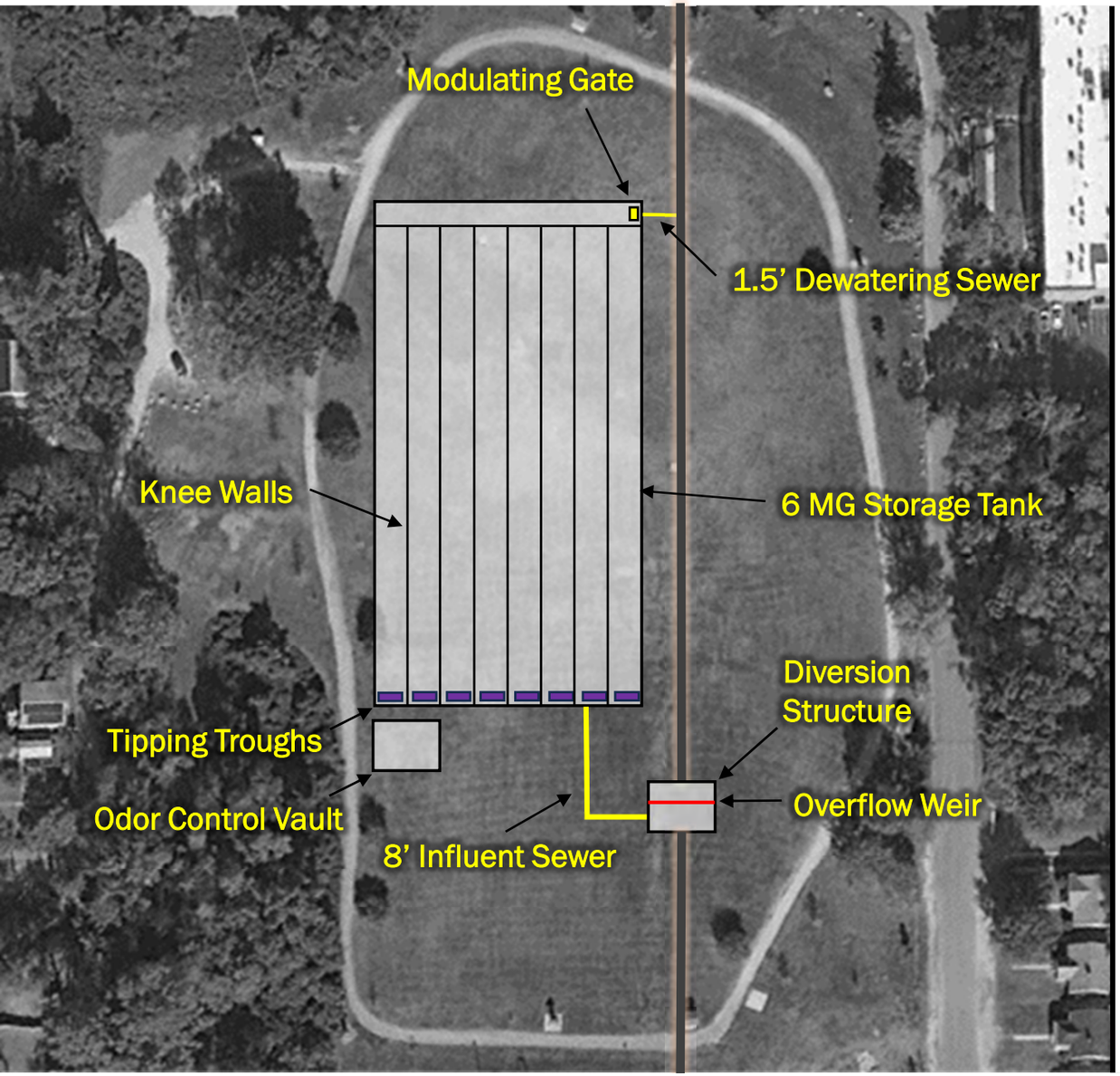
11.	15-Year Replacement Costs						
	a.	Electrical and Instrumentation and Control					
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	$5,400,000.00	$5,400,000
	b.	Meters					
		i.	Furnish and Install Replacement Meters	EA	6	$7,500.00	$45,000
						15-Year Replacement Costs Subtotal	**$5,445,000**

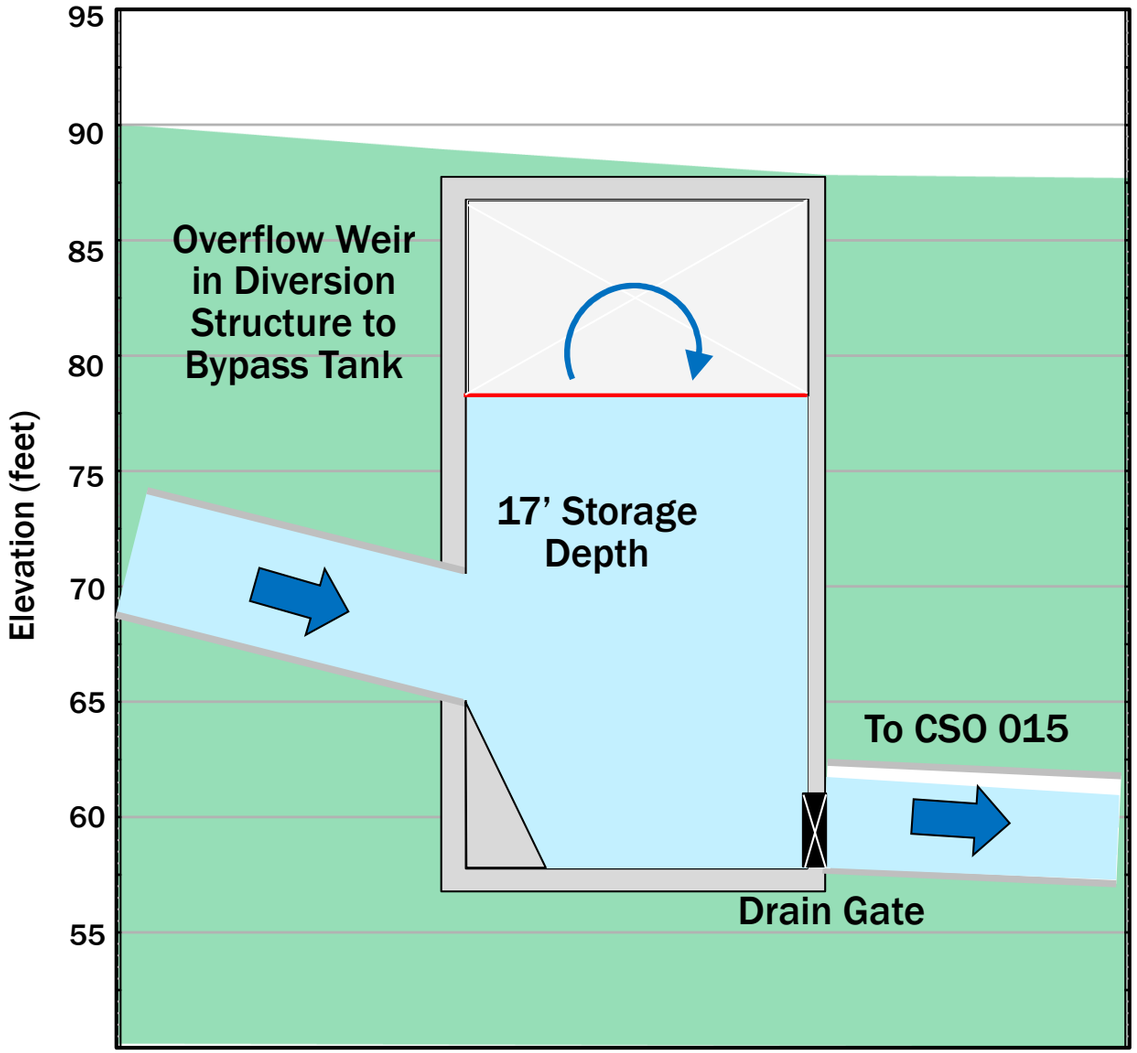
					Shockoe #5 Quarry	
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Score
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2	<4 Year project schedule with minimal risks for schedule extension	0	0
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	1.8	2	None/Minor conflicts	0	0
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	2	2	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	0	0
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	2.3	2	Construction easements or none required	0	0
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	1.3	2	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	0	0
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	2.5	2	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	2	5
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	1.8	2	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	1	1.8
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	2.9	2	Signficant reduction in US/DS HGL as compared to the existing condition	2	5.8
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	1.1	2	>2 other similar facilties/equipment that are currently operated and maintained at the City	1	1.1
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	1.6	2	No new staff is required for operation and maintenace	1	1.6
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	3.4	2	Project supports future improvements or is foundational for future improvements	2	6.8
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	4.4	2	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	2	8.8
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	3.4	2	Protected against a 100-year flood	1	3.4
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	2.3	2	High potential for known near term (<5 years) future development	0	0
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	2	2	No federal or state permits required	0	0
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	3.3	2	Located outside of the Resource Manangement Area (RMA)	0	0
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	0.8	2	Minimal modifications would be required for the City's VPDES permit	0	0
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	3.5	2	Yes	2	7
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	2.9	2	Yes	1	2.9
			1	Adjacent		
			0	No		
	Impacts to community during construction	2.1	2	Minimal impacts to the community during construction	2	4.2
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	2.3	2	Minimal tree removal/mitigation (<0.2 acres) is required	1	2.3
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		51

Southside #1

Southside #1 (Recommended Project)

Canoe Run Park Storage Tank

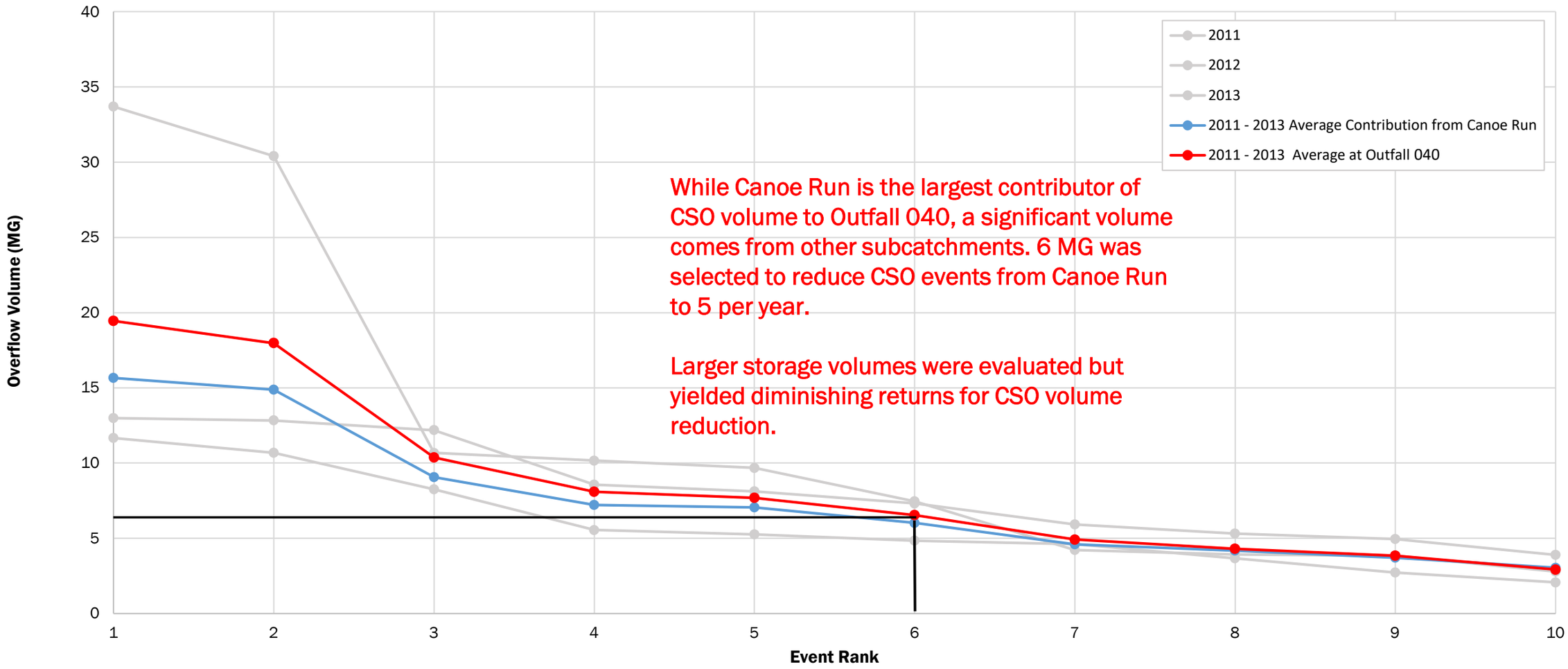




Southside #1

Canoe Run Storage Tank (6 MG)

Existing CSO at Outfall 040 for Hydrologic Evaluation Period



City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
Southside #1: Canoe Run Park CSS Equilization Storage Tank
Conceptual Design

Item	Unit	Quantity	Unit Cost	Total Amount
0. Structure Dimensions				
a. Canoe Run Park Tank				
i. Length	LF	360		
ii. Width	LF	160		
iii. Depth	LF	30		
b. Odor Control Vault				
i. Length	LF	30		
ii. Width	LF	40		
iii. Depth	LF	20		
c. Diversion Structure				
i. Length	LF	30		
ii. Width	LF	40		
iii. Depth	LF	30		
1. General				
a. Site Prep	ACRE	2	$250,000.00	$500,000.00
			General Subtotal	$500,000
2. Excavation for Structures				
a. Support of Excavation				
i. Sheeting				
Storage Tank Excavation Vertical Area	SF	60,828	$45.00	$2,737,260
Excavation Length	LF	374		
Excavation Width	LF	174		
Excavation Depth	LF	37		
Odor Control Vault Excavation Vertical Area	SF	7,896	$45.00	$355,320
Excavation Length	LF	42		
Excavation Width	LF	52		
Excavation Depth	LF	28		
Diversion Structure Excavation Vertical Area	SF	10,878	$45.00	$489,510
Excavation Length	LF	44		
Excavation Width	LF	54		
Excavation Depth	LF	37		
b. Contaminated Material				
i. Excavate and Dispose of Soil	CY	75,759	$90.00	$6,818,336
ii. Excavate and Dispose of Contaminated Material	CY	18,940	$200.00	$3,787,964
			Excavation for Structures Subtotal	$10,400,426
3. Structural				
a. Canoe Run Park Storage Tank				
i. 360'L x 160'W x 30'D				
Concrete Base Slab	CY	6,751	$775.00	$5,231,767
Base Slab Thickness	LF	3		
Base Slab Length	LF	366		
Base Slab Width	LF	166		
Concrete Exterior Walls	CY	3,507	$1,500.00	$5,260,000
Exterior Wall Thickness	LF	3		
Exterior Wall Length	LF	1,052		
Exterior Wall Height	LF	30		
Concrete Top Slab	CY	4,500	$1,500.00	$6,750,667
Top Slab Thickness	LF	2		
Top Slab Length	LF	366		
Top Slab Width	LF	166		
b. Odor Control Vault				
i. 30'L x 40'W x 20'D				
Concrete Base Slab	CY	222	$775.00	$171,763
Base Slab Thickness	LF	4		
Base Slab Length	LF	34		
Base Slab Width	LF	44		
Concrete Exterior Walls	CY	219	$1,500.00	$328,889
Exterior Wall Thickness	LF	2		
Exterior Wall Length	LF	148		
Exterior Wall Height	LF	20		

				Concrete Top Slab	CY	111	$1,500.00	$166,222
				Top Slab Thickness	LF	2		
				Top Slab Length	LF	34		
				Top Slab Width	LF	44		
	c.		Diversion Structure					
		i.	30'L x 40'W x 30'D					
				Concrete Base Slab	CY	184	$775.00	$142,600
				Base Slab Thickness	LF	3		
				Base Slab Length	LF	36		
				Base Slab Width	LF	46		
				Concrete Exterior Walls	CY	507	$1,500.00	$760,000
				Exterior Wall Thickness	LF	3		
				Exterior Wall Length	LF	152		
				Exterior Wall Height	LF	30		
				Concrete Top Slab	CY	123	$1,500.00	$184,000
				Top Slab Thickness	LF	2		
				Top Slab Length	LF	36		
				Top Slab Width	LF	46		
							Structural Subtotal	$18,995,907
4.	Civil							
	a.		Pipe					
		i.	Furnish and Install 96" Fiber Reinforced Sewer Pipe		LF	100	$2,000.00	$200,000
		ii.	Furnish and Install 18" Fiber Reinforced Sewer Pipe		LF	20	$600.00	$12,000
	b.		Excavation in Soil					
		i.	Excavation for 96" Fiber Reinforced Sewer Pipe (25' Depth)		CY	889	$90.00	$80,000
				Excavation Length	LF	100		
				Excavation Width	LF	12		
				Excavation Depth	LF	25		
				Contaminated Excavation	CY	222	$200.00	$44,444
		ii.	Excavation for 18" Fiber Reinforced Sewer Pipe (30' Depth)		CY	98	$90.00	$8,800
				Excavation Length	LF	20		
				Excavation Width	LF	6		
				Excavation Depth	LF	30		
				Contaminated Excavation	CY	24	$200.00	$4,889
	c.		Support of Excavation					
		i.	Sheeting					
				96" Fiber Reinforced Sewer Pipe Excavation Vertical Area	SF	8,100	$45.00	$364,500
				Excavation Length	LF	100		
				Excavation Depth	LF	27		
				18" Fiber Reinforced Sewer Pipe Excavation Vertical Area	SF	1,920	$45.00	$86,400
				Excavation Length	LF	20		
				Excavation Depth	LF	32		
							Civil Subtotal	$801,033
5.	Mechanical							
	a.		Tipping Troughs					
		i.	Furnish and Install Tipping Troughs		EA	12	$75,000.00	$900,000
	b.		Drain Gates					
		i.	Furnish and Install Drain Gates		EA	2	$37,500.00	$75,000
	c.		Odor Control					
		i.	Exhaust Fans and Carbon Adsorber		CFM	28,800	$50.00	$1,440,000
							Mechanical Subtotal	$2,420,000
6.	Electrical and I&C							
	a.		Miscellaneous Electrical and I&C					
		i.	Furnish and Install Electrical and I&C (Other)		LS	1	$968,000.00	$968,000
							Electrical and I&C Subtotal	$968,000
7.	Construction Total							
	a.		Subtotal A					$34,085,367
	b.		Design Contingency		LS	1	40%	*$13,634,147*
	c.		Subtotal B		LS	1		$47,719,513
	d.		General Conditions		LS	1	50%	*$23,859,757*
	e.		Subtotal C		LS	1		$71,579,270
	f.		Bonds and Insurance		LS	1	3%	*$2,147,378*
							Total Estimated Cost	**$73,726,648**

8.	Capital Total						
	a.	Construction Cost Total					$73,726,648
	b.	Capital Contingency		LS	1	50%	*$36,863,324*
						Total Estimated Capital Cost	**$110,589,972**

9.	Annual Operations and Maintainence Costs						
	a.	Labor					
		i.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	$50.00	$10,400
		ii.	Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	$50.00	$4,800
		iii.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	$50.00	$9,600
	b.	Maintenance of Structures					
		i.	Maintain Structures	LS	0.2%	$18,995,907.41	$37,992
	c.	Maintenance of Pipe					
		i.	Maintain Pipe	LS	1.0%	$212,000.00	$2,120
	d.	Maintenance of Mechanical					
		i.	Maintain Tipping Troughs	LS	3%	$900,000.00	$27,000
		ii.	Maintain Drain Gates	LS	3%	$75,000.00	$2,250
		iii.	Maintain Odor Control Facility	LS	3%	$1,440,000.00	$43,200
	e.	Maintenance of Instrumentation and Control					
		i.	Maintain I&C	LS	3%	$968,000.00	$29,040
						Annual Operations and Maintainence Costs Subtotal	**$166,402**

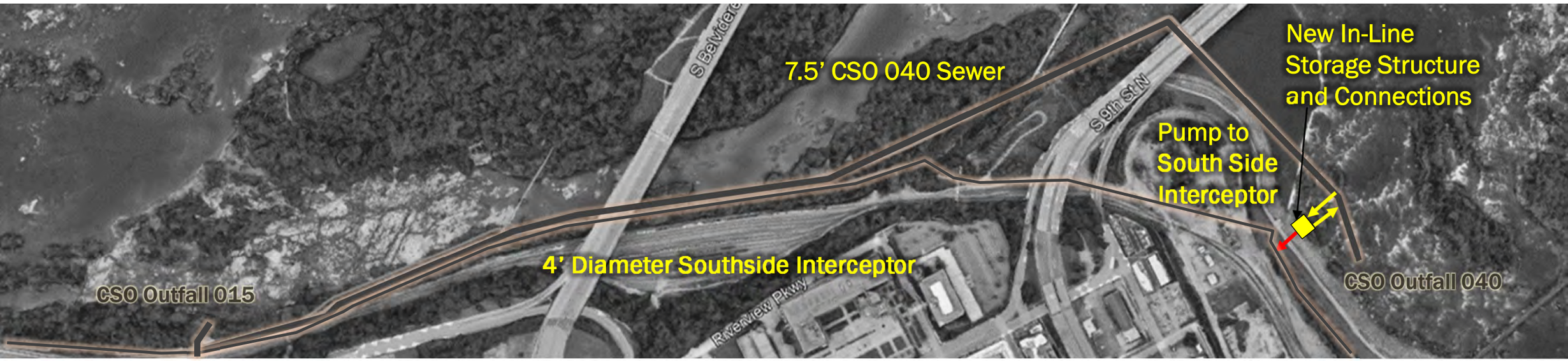
10.	15-Year Replacement Costs						
	a.	Electrical and Instrumentation and Control					
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	$968,000.00	$968,000
	b.	Meters					
		i.	Furnish and Install Replacement Meters	EA	3	$7,500.00	$22,500
						15-Year Replacement Costs Subtotal	**$990,500**

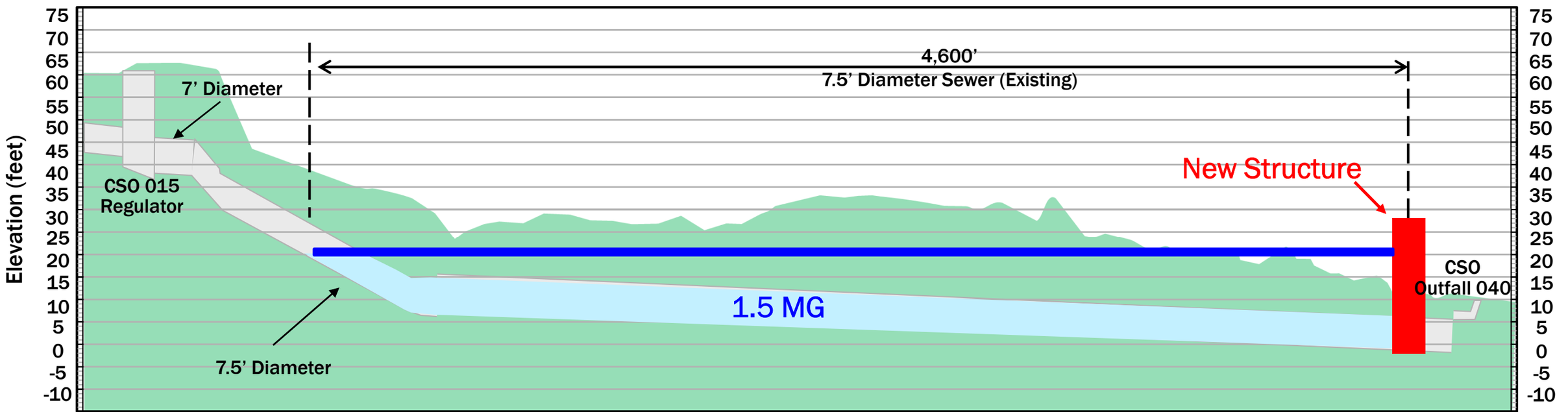
					Southside #1 Canoe Run Tank	
Category	**Topic**	**Weight**	**Score**	**Criteria**	**Unweighted Score**	**Weighted Score**
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	**2.3**	**2**	<4 Year project schedule with minimal risks for schedule extension	**1**	**2.3**
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	**1.8**	**2**	None/Minor conflicts	**2**	**3.6**
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	**2**	**2**	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	**0**	**0**
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	**2.3**	**2**	Construction easements or none required	**2**	**4.6**
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	**1.3**	**2**	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	**1**	**1.3**
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	**2.5**	**2**	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	**2**	**5**
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	**1.8**	**2**	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	**2**	**3.6**
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	**2.9**	**2**	Signficant reduction in US/DS HGL as compared to the existing condition	**1**	**2.9**
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	**1.1**	**2**	>2 other similar facilties/equipment that are currently operated and maintained at the City	**2**	**2.2**
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	**1.6**	**2**	No new staff is required for operation and maintenace	**2**	**3.2**
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	**3.4**	**2**	Project supports future improvements or is foundational for future improvements	**1**	**3.4**
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	**4.4**	**2**	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	**1**	**4.4**
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	**3.4**	**2**	Protected against a 100-year flood	**1**	**3.4**
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	**2.3**	**2**	High potential for known near term (<5 years) future development	**2**	**4.6**
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	**2**	**2**	No federal or state permits required	**2**	**4**
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	**3.3**	**2**	Located outside of the Resource Manangement Area (RMA)	**2**	**6.6**
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	**0.8**	**2**	Minimal modifications would be required for the City's VPDES permit	**2**	**1.6**
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	**3.5**	**2**	Yes	**2**	**7**
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	**2.9**	**2**	Yes	**2**	**5.8**
			1	Adjacent		
			0	No		
	Impacts to community during construction	**2.1**	**2**	Minimal impacts to the community during construction	**0**	**0**
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	**2.3**	**2**	Minimal tree removal/mitigation (<0.2 acres) is required	**2**	**4.6**
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		**74**

Southside #2

Southside #2

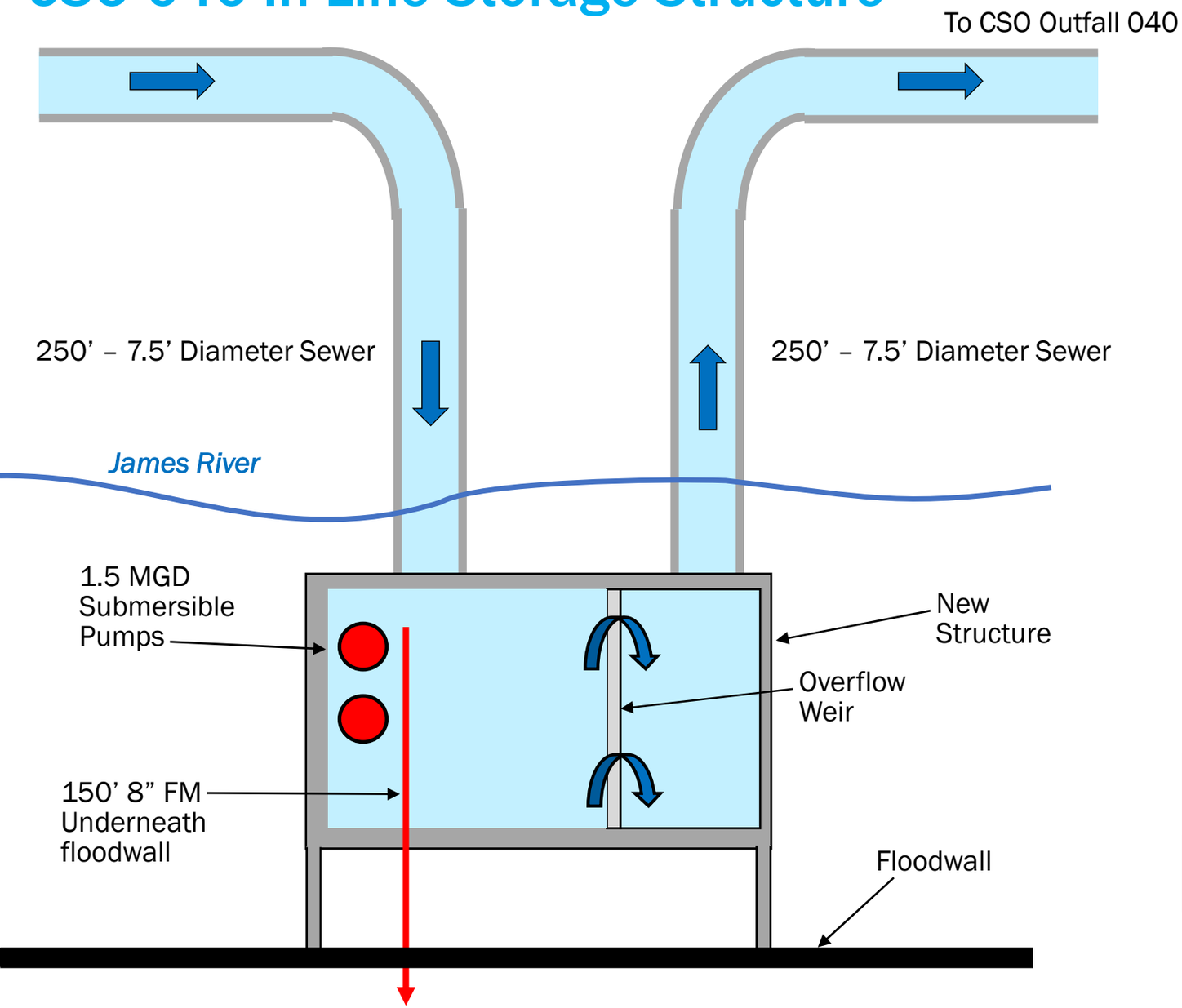
CSO 040 In-Line Storage Structure (1.5 MG)

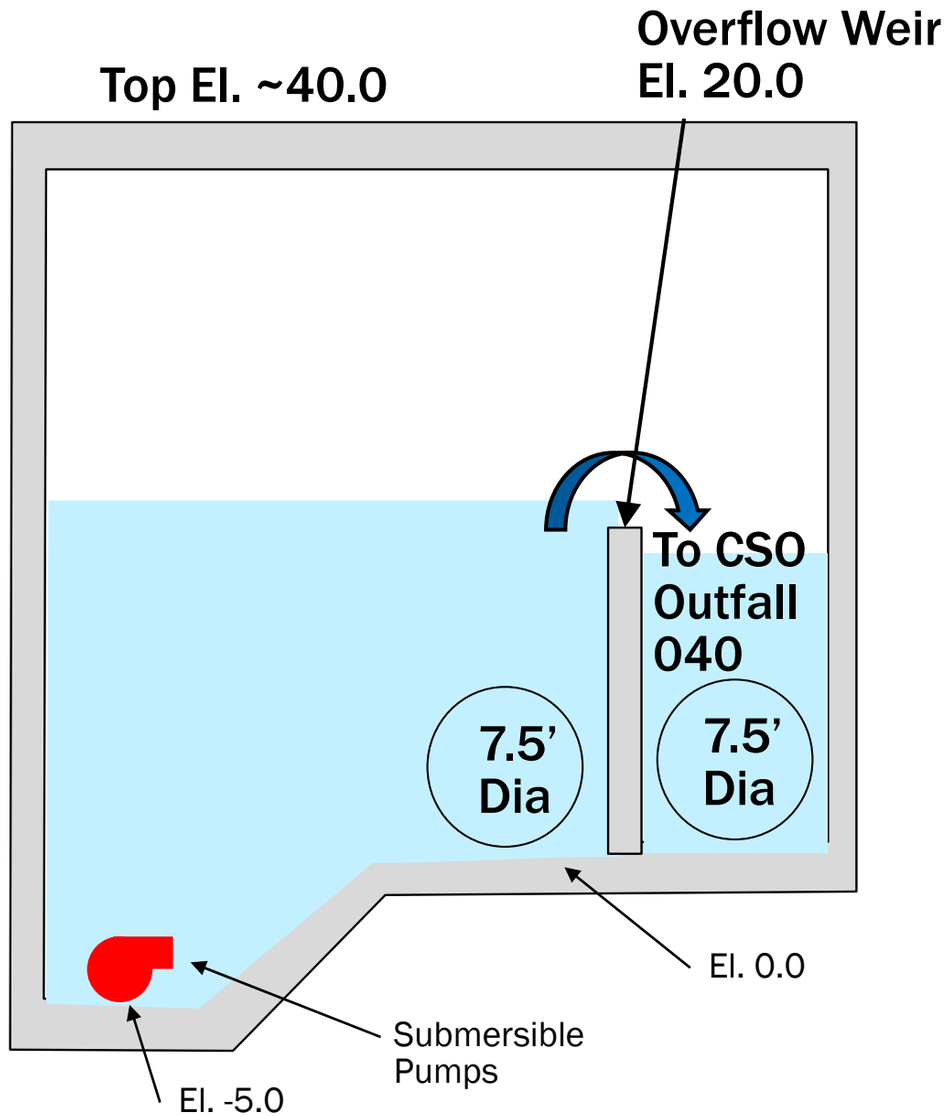




Southside #2

CSO 040 In-Line Storage Structure





City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
Southside #2: CSO 040 In-Line Storage Structure
Conceptual Design

Item	Unit	Quantity	Unit Cost	Total Amount
0. Structure Dimensions				
a. In-Line Structure				
i. Length	LF	20		
ii. Width	LF	30		
iii. Depth	LF	45		
1. General				
a. Site Prep and Coordination with Floodwall	ACRE	1	$2,000,000.00	$2,000,000.00
			General Subtotal	$2,000,000
2. Excavation for Structures				
a. Support of Excavation				
i. Secant Piling	SF	2,960	$190.00	$562,400
Excavation Length	LF	32		
Excavation Width	LF	42		
Excavation Depth	LF	20		
b. Rock				
i. Excavate and Dispose of Rock	CY	996	$300.00	$298,667
			Excavation for Structures Subtotal	$861,067
3. Structural				
a. In-Line Structure				
i. 20'L x 30'W x 45'D				
Concrete Base Slab	CY	91	$775.00	$70,267
Base Slab Thickness	LF	3		
Base Slab Length	LF	24		
Base Slab Width	LF	34		
Concrete Exterior Walls	CY	360	$1,500.00	$540,000
Exterior Wall Thickness	LF	2		
Exterior Wall Length	LF	108		
Exterior Wall Height	LF	45		
Concrete Top Slab	CY	60	$1,500.00	$90,667
Top Slab Thickness	LF	2		
Top Slab Length	LF	24		
Top Slab Width	LF	34		
			Structural Subtotal	$700,933
4. Civil				
a. Pipe				
i. Furnish and Install 90" Fiber Reinforced Sewer Pipe	LF	500	$1,800.00	$900,000
ii. Furnish and Install 8" Ductile Iron Pipe	LF	150	$70.00	$10,500
b. Excavation				
i. Rock Excavation for 90" Fiber Reinforced Sewer Pipe (10' Depth, in River)	CY	2,130	$300.00	$638,889
Excavation Length	LF	500		
Excavation Width	LF	12		
Excavation Depth	LF	10		
ii. Excavation for 8" Ductile Iron Sewer Pipe (20' Depth, Crossing Floodwall)	CY	528	$90.00	$47,500
Excavation Length	LF	150		
Excavation Width	LF	5		
Excavation Depth	LF	20		
c. Support of Excavation				
i. Sheeting				
8" Ductile Iron Sewer Pipe (20' Depth, Crossing Floodwall) Excavation Vertical Area	SF	9,900	$45.00	$445,500
Excavation Length	LF	150		
Excavation Depth	LF	22		
d. Cofferdam				
i. Cofferdam for 90" Fiber Reinforced Sewer Pipe (10' Depth, in River)	LF	700	$3,000.00	$2,100,000
			Civil Subtotal	$4,142,389
5. Mechanical				
a. Pumps				
i. Dewatering Pumps	MGD	3	$75,000.00	$225,000
			Mechanical Subtotal	$230,000
6. Electrical and I&C				
a. Miscellaneous Electrical and I&C				
i. Furnish and Install Electrical and I&C (Other)	LS	1	$115,000.00	$115,000

					Electrical and I&C Subtotal	$115,000
7.	Construction Total					
	a.	Subtotal A				$8,049,389
	b.	Design Contingency	LS	1	40%	*$3,219,756*
	c.	Subtotal B	LS	1		$11,269,144
	d.	General Conditions	LS	1	50%	*$5,634,572*
	e.	Subtotal C	LS	1		$16,903,717
	f.	Bonds and Insurance	LS	1	3%	*$507,112*
					Total Estimated Cost	**$17,410,828**

8.	Capital Total					
	a.	Construction Cost Total				$17,410,828
	b.	Capital Contingency	LS	1	50%	*$8,705,414*
					Total Estimated Capital Cost	**$26,116,242**

9.	Annual Operations and Maintainence Costs						
	a.	Labor					
		i.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	$50.00	$10,400
		ii.	Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	$50.00	$4,800
		iii.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	$50.00	$9,600
	b.	Maintenance of Structures					
		i.	Maintain Structures	LS	0.2%	$700,933.33	$1,402
	c.	Maintenance of Pipe					
		i.	Maintain Pipe	LS	1.0%	$910,500.00	$9,105
	d.	Maintenance of Mechanical					
		i.	Maintain Pumps	LS	3%	$225,000.00	$6,750
	e.	Maintenance of Instrumentation and Control					
		i.	Maintain I&C	LS	3%	$115,000.00	$3,450
						Annual Operations and Maintainence Costs Subtotal	**$45,507**

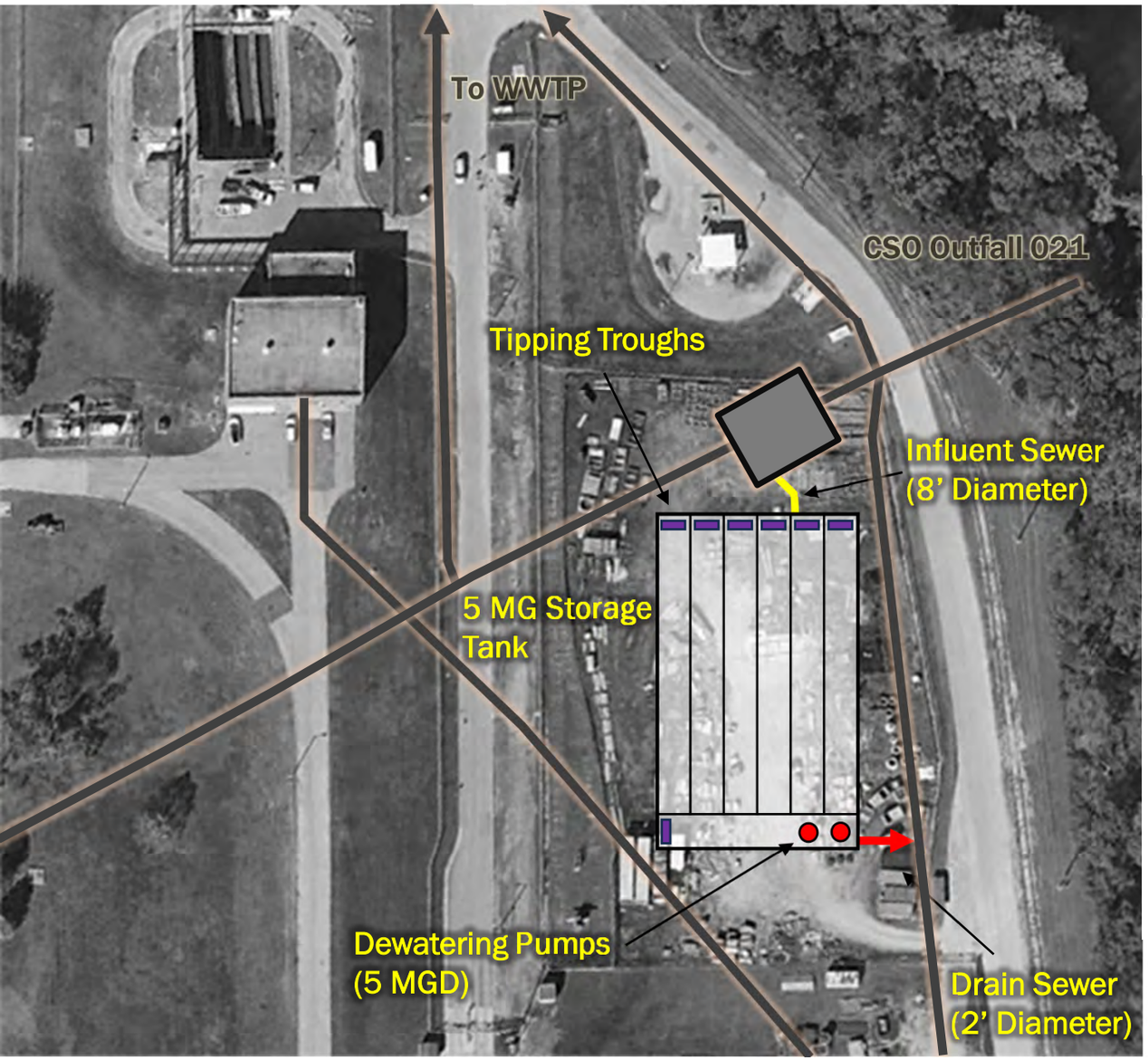
10.	15-Year Replacement Costs						
	a.	Electrical and Instrumentation and Control					
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	$115,000.00	$115,000
	b.	Meters					
		i.	Furnish and Install Replacement Meters	EA	3	$7,500.00	$22,500
						15-Year Replacement Costs Subtotal	**$137,500**

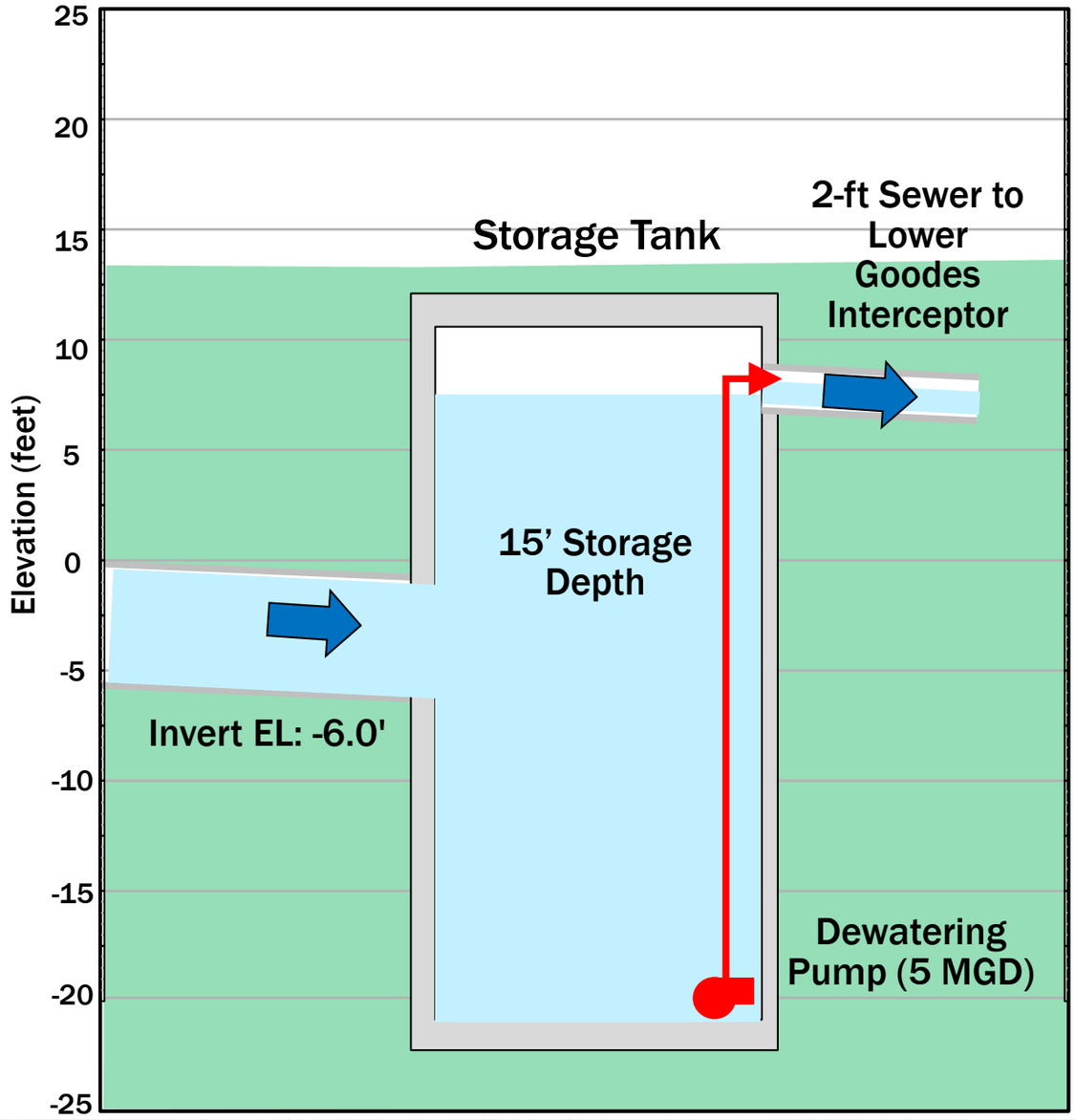
					Southside #2	
					Canoe Run Tank and ILS	
Category	**Topic**	**Weight**	**Score**	**Criteria**	**Unweighted Score**	**Weighted Score**
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	**2.3**	**2**	<4 Year project schedule with minimal risks for schedule extension	1	2.3
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	**1.8**	**2**	None/Minor conflicts	0	0
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	**2**	**2**	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	0	0
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	**2.3**	**2**	Construction easements or none required	1	2.3
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	**1.3**	**2**	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	1	1.3
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	**2.5**	**2**	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	2	5
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	**1.8**	**2**	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	1	1.8
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	**2.9**	**2**	Signficant reduction in US/DS HGL as compared to the existing condition	1	2.9
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	**1.1**	**2**	>2 other similar facilties/equipment that are currently operated and maintained at the City	2	2.2
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	**1.6**	**2**	No new staff is required for operation and maintenace	2	3.2
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	**3.4**	**2**	Project supports future improvements or is foundational for future improvements	2	6.8
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	**4.4**	**2**	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	1	4.4
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	**3.4**	**2**	Protected against a 100-year flood	1	3.4
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	**2.3**	**2**	High potential for known near term (<5 years) future development	2	4.6
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	**2**	**2**	No federal or state permits required	0	0
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	**3.3**	**2**	Located outside of the Resource Manangement Area (RMA)	0	0
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	**0.8**	**2**	Minimal modifications would be required for the City's VPDES permit	2	1.6
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	**3.5**	**2**	Yes	2	7
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	**2.9**	**2**	Yes	2	5.8
			1	Adjacent		
			0	No		
	Impacts to community during construction	**2.1**	**2**	Minimal impacts to the community during construction	0	0
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	**2.3**	**2**	Minimal tree removal/mitigation (<0.2 acres) is required	2	4.6
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		**59**

Southside #3

Southside #3
CSO 021 Storage Tank

<u>Sizing Note:</u> Paired with the Shockoe #1 Project a 5 MG Tank results in 4 or less overflow events/year (2011-2013)





City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
Southside #3: WWTP Equilization Storage Tank
Conceptual Design

				Item	Unit	Quantity	Unit Cost	Total Amount
0.	Structure Dimensions							
	a.	Storage Tank						
		i.		Length	LF	200		
		ii.		Width	LF	120		
		iii.		Depth	LF	35		
1.	General							
	a.	Site Prep			ACRE	2	$250,000.00	$500,000.00
							General Subtotal	$500,000
2.	Excavation for Structures							
	a.	Support of Excavation						
		i.		Sheeting				
				Storage Tank Excavation Vertical Area	SF	31,320	$45.00	$1,409,400
				Excavation Length	LF	214		
				Excavation Width	LF	134		
				Excavation Depth in Soil	LF	30		
		ii.		Secant Piling	SF	15,660	$190.00	$2,975,400
				Excavation Length	LF	214		
				Excavation Width	LF	134		
				Excavation Depth in Rock	LF	15		
	b.	Soil						
		i.		Excavate and Dispose of Soil	CY	31,862	$90.00	$2,867,600
	c.	Rock						
		i.		Excavate and Dispose of Rock	CY	15,931	$300.00	$4,779,333
							Excavation for Structures Subtotal	$12,031,733
3.	Structural							
	a.	Storage Tank						
		i.		200'L x 120'W x 35'D				
				Concrete Base Slab	CY	3,845	$775.00	$2,980,133
				Base Slab Thickness	LF	4		
				Base Slab Length	LF	206		
				Base Slab Width	LF	126		
				Concrete Exterior Walls	CY	2,536	$1,500.00	$3,803,333
				Exterior Wall Thickness	LF	3		
				Exterior Wall Length	LF	652		
				Exterior Wall Height	LF	35		
				Concrete Top Slab	CY	1,923	$1,500.00	$2,884,000
				Top Slab Thickness	LF	2		
				Top Slab Length	LF	206		
				Top Slab Width	LF	126		
							Structural Subtotal	$9,667,467
4.	Civil							
	a.	Pipe						
		i.		Furnish and Install 96" Fiber Reinforced Sewer Pipe	LF	50	$2,000.00	$100,000
		ii.		Furnish and Install 24" Fiber Reinforced Sewer Pipe	LF	50	$650.00	$32,500
	b.	Excavation						
		i.		Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth)	CY	444	$90.00	$40,000
				Excavation Length	LF	50		
				Excavation Width	LF	12		
				Excavation Depth	LF	20		
		ii.		Excavation for 24" Fiber Reinforced Sewer Pipe (10' Depth)	CY	111	$90.00	$10,000
				Excavation Length	LF	50		
				Excavation Width	LF	6		
				Excavation Depth	LF	10		
	c.	Support of Excavation						
		i.		Sheeting				
				96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Vertical Area	SF	3,000	$45.00	$135,000
				Excavation Length	LF	50		
				Excavation Depth	LF	20		
				24" Fiber Reinforced Sewer Pipe (10' Depth) Excavation Vertical Area	SF	1,500	$45.00	$67,500
				Excavation Length	LF	50		
				Excavation Depth	LF	10		
							Civil Subtotal	$385,000
5.	Mechanical							

	a.		Tipping Troughs				
		i.	Furnish and Install Tipping Troughs	EA	6	$75,000.00	$450,000
	b.		Drain Gates				
		i.	Furnish and Install Drain Gates	EA	1	$37,500.00	$37,500
	c.		Pumps				
		i.	Dewatering Pumps	MGD	5	$75,000.00	$375,000
						Mechanical Subtotal	$870,000
6.			Electrical and I&C				
	a.		Miscellaneous Electrical and I&C				
		i.	Furnish and Install Electrical and I&C (Other)	LS	1	$348,000.00	$348,000
						Electrical and I&C Subtotal	$348,000
7.			Construction Total				
	a.		Subtotal A				$23,802,200
	b.		Design Contingency	LS	1	40%	*$9,520,880*
	c.		Subtotal B	LS	1		$33,323,080
	d.		General Conditions, Overhead and Profit	LS	1	50%	*$16,661,540*
	e.		Subtotal C	LS	1		$49,984,620
	f.		Bonds and Insurance	LS	1	3%	*$1,499,539*
						Total Estimated Cost	**$51,484,159**

8.			Capital Total				
	a.		Construction Cost Total				$51,484,159
	b.		Capital Contingency	LS	1	50%	*$25,742,079*
						Total Estimated Capital Cost	**$77,226,238**

9.			Annual Operations and Maintainence Costs				
	a.		Labor				
		i.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	$50.00	$10,400
		ii.	Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	$50.00	$4,800
		iii.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	$50.00	$9,600
	b.		Maintenance of Structures				
		i.	Maintain Structures	LS	0.2%	$9,667,466.67	$19,335
	c.		Maintenance of Pipe				
		i.	Maintain Pipe	LS	1.0%	$132,500.00	$1,325
	d.		Maintenance of Mechanical				
		i.	Maintain Tipping Troughs	LS	3%	$450,000.00	$13,500
		ii.	Maintain Drain Gates	LS	3%	$37,500.00	$1,125
		iii.	Maintain Pumps	LS	3%	$375,000.00	$11,250
	e.		Maintenance of Instrumentation and Control				
		i.	Maintain I&C	LS	3%	$348,000.00	$10,440
						Annual Operations and Maintainence Costs Subtotal	**$81,775**

10.			15-Year Replacement Costs				
	a.		Electrical and Instrumentation and Control				
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	$348,000.00	$348,000
	b.		Meters				
		i.	Furnish and Install Replacement Meters	EA	3	$7,500.00	$22,500
						15-Year Replacement Costs Subtotal	**$370,500**

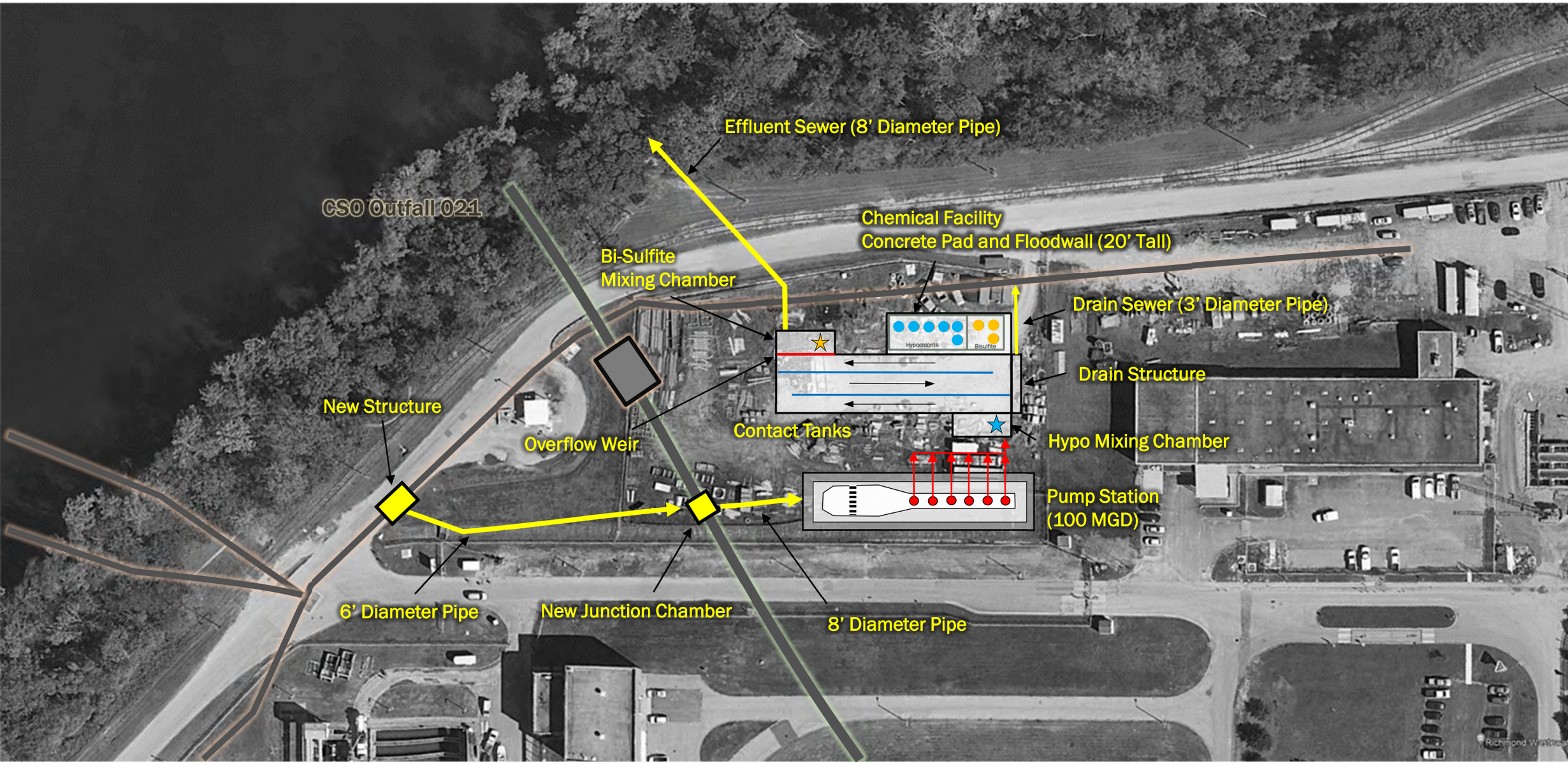
					Southside #3	
					CSO 021 Storage Tank	
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Score
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2	<4 Year project schedule with minimal risks for schedule extension	1	2.3
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	1.8	2	None/Minor conflicts	1	1.8
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	2	2	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	0	0
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	2.3	2	Construction easements or none required	2	4.6
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	1.3	2	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	1	1.3
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	2.5	2	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	2	5
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	1.8	2	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	1	1.8
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	2.9	2	Signficant reduction in US/DS HGL as compared to the existing condition	1	2.9
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	1.1	2	>2 other similar facilties/equipment that are currently operated and maintained at the City	2	2.2
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	1.6	2	No new staff is required for operation and maintenace	2	3.2
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	3.4	2	Project supports future improvements or is foundational for future improvements	2	6.8
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	4.4	2	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	2	8.8
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	3.4	2	Protected against a 100-year flood	0	0
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	2.3	2	High potential for known near term (<5 years) future development	0	0
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	2	2	No federal or state permits required	1	2
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	3.3	2	Located outside of the Resource Manangement Area (RMA)	1	3.3
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	0.8	2	Minimal modifications would be required for the City's VPDES permit	2	1.6
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	3.5	2	Yes	2	7
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	2.9	2	Yes	0	0
			1	Adjacent		
			0	No		
	Impacts to community during construction	2.1	2	Minimal impacts to the community during construction	2	4.2
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	2.3	2	Minimal tree removal/mitigation (<0.2 acres) is required	2	4.6
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		63

Southside #4

Southside #4

CSO 021 High-Rate Disinfection (100 MGD)

Sizing Note: Paired with the Shockoe #1 Project a 100 MGD HRD results in 4 or less overflow events/year (2011-2013)



City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
Southside #4: CSO 021 High Rate Disinfection
Conceptual Design

Item	Unit	Quantity	Unit Cost	Total Amount
0. Structure Dimensions				
a. Structure #1				
i. Length	LF	20		
ii. Width	LF	30		
iii. Depth	LF	30		
b. Structure #2				
i. Length	LF	20		
ii. Width	LF	30		
iii. Depth	LF	30		
c. Hypo Mixing Chamber				
i. Length	LF	20		
ii. Width	LF	50		
iii. Depth	LF	20		
d. Contact Tanks (uncovered)				
i. Length	LF	200		
ii. Width	LF	30		
iii. Depth	LF	20		
e. Bi-Sulfite Mixing Chamber				
i. Length	LF	20		
ii. Width	LF	50		
iii. Depth	LF	20		
f. Chemical Facility Pad				
i. Length	LF	30		
ii. Width	LF	75		
iii. Depth	LF	20		
1. General				
a. Site Prep	ACRE	2	$250,000.00	$500,000.00
			General Subtotal	$500,000
2. Excavation for Structures				
a. Support of Excavation				
i. Sheeting				
Structure #1	SF	8,214	$45.00	$369,630
Excavation Length	LF	32		
Excavation Width	LF	42		
Excavation Depth	LF	37		
Excavation Depth in Rock	LF	7		
Structure #2	SF	8,214	$45.00	$369,630
Excavation Length	LF	32		
Excavation Width	LF	42		
Excavation Depth	LF	37		
Excavation Depth in Rock	LF	7		
HRD and Chemical Facility	SF	19,800	$45.00	$891,000
Excavation Perimeter	LF	600		
Excavation Area	SF	10,100		
Excavation Depth	LF	22		
Excavation Depth in Rock	LF	0		
b. Soil				
i. Excavate and Dispose of Soil	CY	11,216	$90.00	$1,009,467
c. Rock				
i. Excavate and Dispose of Rock	CY	697	$300.00	$209,067
			Excavation for Structures Subtotal	$2,848,793
3. Structural				
a. Structure #1				
i. 20'L x 30'W x 30'D				
Concrete Base Slab	CY	91	$775.00	$70,267
Base Slab Thickness	LF	3		
Base Slab Length	LF	24		
Base Slab Width	LF	34		
Concrete Exterior Walls	CY	240	$1,500.00	$360,000
Exterior Wall Thickness	LF	2		
Exterior Wall Length	LF	108		
Exterior Wall Height	LF	30		

			Concrete Top Slab	CY	60	$1,500.00	$90,667
			Top Slab Thickness	LF	2		
			Top Slab Length	LF	24		
			Top Slab Width	LF	34		
	b.	Structure #2					
		i.	20'L x 30'W x 30'D				
			Concrete Base Slab	CY	91	$775.00	$70,267
			Base Slab Thickness	LF	3		
			Base Slab Length	LF	24		
			Base Slab Width	LF	34		
			Concrete Exterior Walls	CY	240	$1,500.00	$360,000
			Exterior Wall Thickness	LF	2		
			Exterior Wall Length	LF	108		
			Exterior Wall Height	LF	30		
			Concrete Top Slab	CY	60	$1,500.00	$90,667
			Top Slab Thickness	LF	2		
			Top Slab Length	LF	24		
			Top Slab Width	LF	34		
	d.	HRD and Chemical Facility					
		i.	200'L x 30'W x 20'D				
			Concrete Base Slab	CY	1,496	$775.00	$1,159,630
			Base Slab Thickness	LF	4		
			Base Slab Area	SF	10,100		
			Concrete Exterior Walls	CY	1,726	$1,500.00	$2,588,889
			Exterior Wall Thickness	LF	2		
			Exterior Wall Length	LF	1,165		
			Exterior Wall Height	LF	20		
			Concrete Top Slab	CY	0	$1,500.00	$0
			Top Slab Thickness	LF	0		
			Base Slab Area	SF	10,100		
						Structural Subtotal	$4,790,385
4.	Civil						
	a.	Pipe					
		i.	Furnish and Install 96" Fiber Reinforced Sewer Pipe (20' Depth)	LF	250	$2,000.00	$500,000
		ii.	Furnish and Install 72" Fiber Reinforced Sewer Pipe (30' Depth)	LF	250	$1,400.00	$350,000
		iii.	Furnish and Install 96" Fiber Reinforced Sewer Pipe (35' Depth)	LF	50	$2,000.00	$100,000
		iv.	Furnish and Install 36" Fiber Reinforced Sewer Pipe (10' Depth)	LF	50	$850.00	$42,500
	b.	Excavation in Rock					
		i.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth)	CY	2,444	$90.00	$220,000
			Excavation Length	LF	250		
			Excavation Width	LF	12		
			Excavation Depth	LF	22		
		ii.	Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth)	CY	2,500	$90.00	$225,000
			Excavation Length	LF	250		
			Excavation Width	LF	10		
			Excavation Depth	LF	27		
		iii.	Excavation for 96" Fiber Reinforced Sewer Pipe (35' Max Depth)	CY	667	$90.00	$60,000
			Excavation Length	LF	50		
			Excavation Width	LF	12		
			Excavation Depth	LF	37		
			Excavation Depth in Rock	LF	7		
			Rock Excavation	CY	156	$300.00	$46,667
		ii.	Excavation for 36" Fiber Reinforced Sewer Pipe (10' Max Depth)	CY	156	$90.00	$14,000
			Excavation Length	LF	50		
			Excavation Width	LF	7		
			Excavation Depth	LF	12		
	c.	Support of Excavation					
		i.	Sheeting				
			96" Fiber Reinforced Sewer Pipe (20' Max Depth) Excavation Vertical Area	SF	16,500	$45.00	$742,500
			Excavation Length	LF	250		
			Excavation Depth	LF	22		
			72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Vertical Area	SF	20,250	$45.00	$911,250
			Excavation Length	LF	250		
			Excavation Depth	LF	27		
			96" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Vertical Area	SF	5,550	$45.00	$249,750
			Excavation Length	LF	50		
			Excavation Depth	LF	37		
			36" Fiber Reinforced Sewer Pipe (10' Max Depth) Excavation Vertical Area	SF	1,800	$45.00	$81,000
			Excavation Length	LF	50		
			Excavation Depth	LF	12		

						Civil Subtotal	$3,542,667
5.	Mechanical						
	a.	Pump Station					
		i.	New Pump Station (including excavation and structure)	MGD	100	$300,000.00	$30,000,000
	b.	HRD Chemical Facility					
		i.	New HRD Facility and Equipment	MGD	100	$15,000.00	$1,500,000
	c	Tipping Troughs					
		i.	Furnish and Install Tipping Troughs	EA	4	$75,000.00	$300,000
	g.	Drain Gates					
		i.	Furnish and Install Drain Gates	EA	4	$37,500.00	$150,000
						Mechanical Subtotal	$31,950,000
6.	Electrical and I&C						
	a.	Miscellaneous Electrical and I&C					
		i.	Furnish and Install Electrical and I&C (Other)	LS	1	$180,000.00	$180,000
						Electrical and I&C Subtotal	$180,000
7.	Construction Total						
	a.	Subtotal A					$43,811,845
	b.	Design Contingency		LS	1	40%	*$17,524,738*
	c.	Subtotal B		LS	1		$61,336,583
	d.	General Conditions		LS	1	50%	*$30,668,292*
	e.	Subtotal C		LS	1		$92,004,875
	f.	Bonds and Insurance		LS	1	3%	*$2,760,146*
						Total Estimated Cost	**$94,765,021**

8.	Capital Total						
	a.	Construction Cost Total					$94,765,021
	b.	Capital Contingency		LS	1	50%	*$47,382,511*
						Total Estimated Capital Cost	**$142,147,532**

9.	Annual Operations and Maintainence Costs						
	a.	Labor					
		i.	Daily Check (365 Days, 1 Hr/Ea)	HR	365	$50.00	$18,250
		ii.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	$50.00	$10,400
		iii.	Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	$50.00	$4,800
		iv.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	$50.00	$9,600
		v.	Continuous Staffing (365 Days, 24 Hrs/Ea)	HR	8,760	$50.00	$438,000
	b.	Maintenance of Structures					
		i.	Maintain Structures	LS	0.2%	$4,790,385.19	$9,581
	c.	Maintenance of Pipe					
		i.	Maintain Pipe	LS	1%	$992,500.00	$9,925
	d.	Maintenance of Mechanical					
		i.	Maintain Tipping Troughs	LS	3%	$300,000.00	$9,000
		ii.	Maintain Drain Gates	LS	3%	$150,000.00	$4,500
		iii.	Maintain HRD Chemical Facility	LS	3%	$1,500,000.00	$45,000
		iv.	Maintain Pump Station	LS	3%	$30,000,000.00	$900,000
	e.	Maintenance of Instrumentation and Control					
		i.	Maintain I&C	LS	3%	$180,000.00	$5,400
	f.	Operation of HRD Chemical Facility					
		i.	Sodium Hypochlorite				
			Dose	mg/L	10		
			Volume	MGY	102		
			Quantity	LBS	8477	$2.00	$16,954
		ii.	Sodium Bisulfite				
			Dose	mg/L	3		
			Volume	MGY	102		
			Quantity	LBS	2543	$2.00	$5,086
	g.	Operation of Influent Pump Station					
		i.	Pump Station Electricity Cost				
			Flowrate of Pump Station	MGD	100		
			Annual Volume	MGY	102		
			Total Dynamic Head	ft	55		
			Pump Efficiency		1		
			Motor Efficiency		1		
			Annual Energy Usage	KW-HR	32512	$0.06	$1,951
						Annual Operations and Maintainence Costs Subtotal	**$1,488,447**

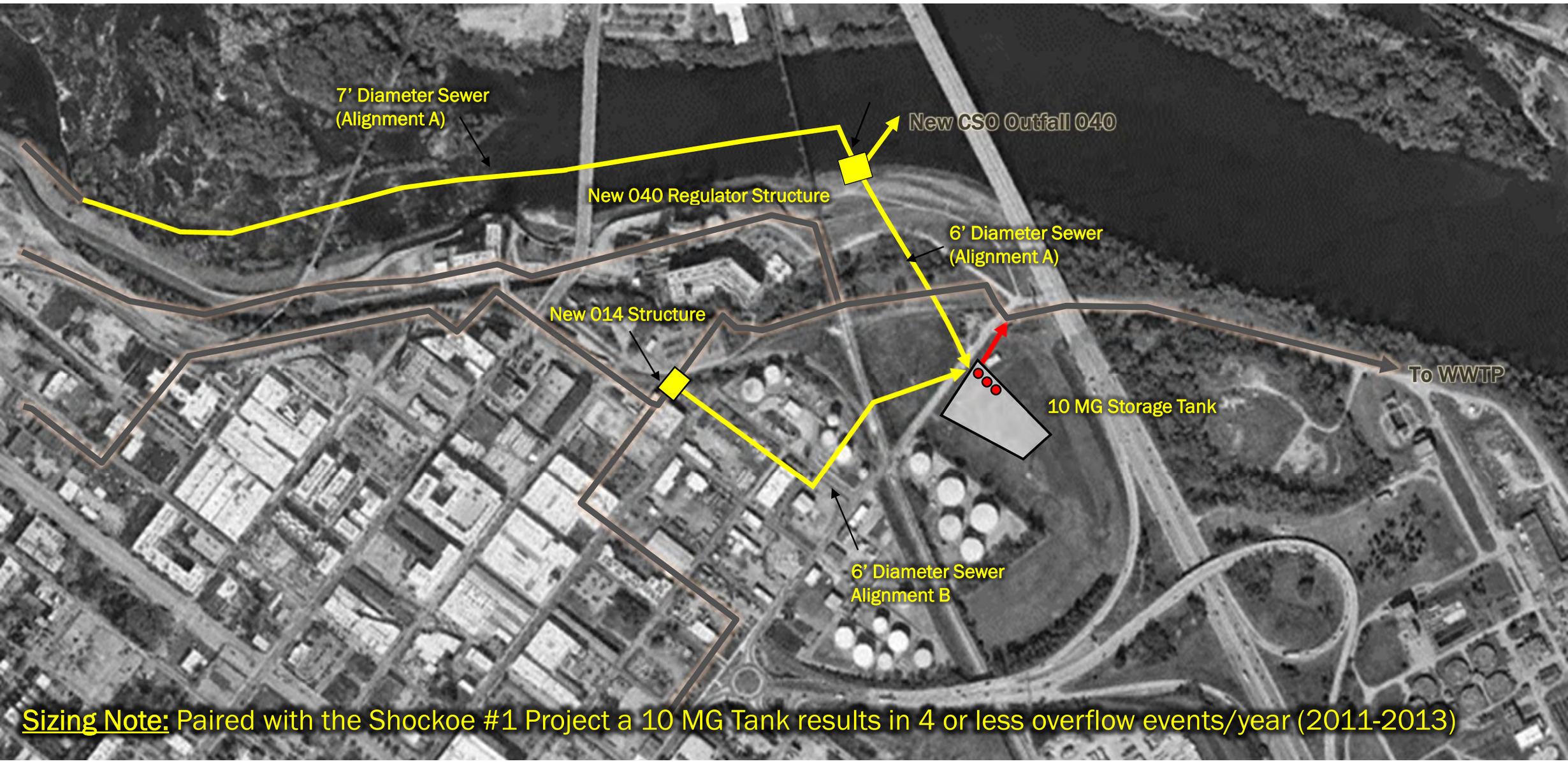
10.	15-Year Replacement Costs						
	a.	Electrical and Instrumentation and Control					
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	$6,480,000.00	$6,480,000
	b.	Meters					
		i.	Furnish and Install Replacement Meters	EA	3	$7,500.00	$22,500
						15-Year Replacement Costs Subtotal	**$6,502,500**

					Southside #4	
					CSO 021 HRD	
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Score
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2	<4 Year project schedule with minimal risks for schedule extension	1	2.3
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	1.8	2	None/Minor conflicts	1	1.8
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	2	2	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	0	0
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	2.3	2	Construction easements or none required	2	4.6
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	1.3	2	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	0	0
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	2.5	2	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	2	5
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	1.8	2	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	0	0
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	2.9	2	Signficant reduction in US/DS HGL as compared to the existing condition	1	2.9
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	1.1	2	>2 other similar facilties/equipment that are currently operated and maintained at the City	0	0
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	1.6	2	No new staff is required for operation and maintenace	1	1.6
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	3.4	2	Project supports future improvements or is foundational for future improvements	2	6.8
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	4.4	2	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	2	8.8
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	3.4	2	Protected against a 100-year flood	1	3.4
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	2.3	2	High potential for known near term (<5 years) future development	0	0
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	2	2	No federal or state permits required	0	0
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	3.3	2	Located outside of the Resource Manangement Area (RMA)	1	3.3
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	0.8	2	Minimal modifications would be required for the City's VPDES permit	0	0
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	3.5	2	Yes	2	7
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	2.9	2	Yes	0	0
			1	Adjacent		
			0	No		
	Impacts to community during construction	2.1	2	Minimal impacts to the community during construction	2	4.2
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	2.3	2	Minimal tree removal/mitigation (<0.2 acres) is required	2	4.6
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		56

Southside #5

Southside #5

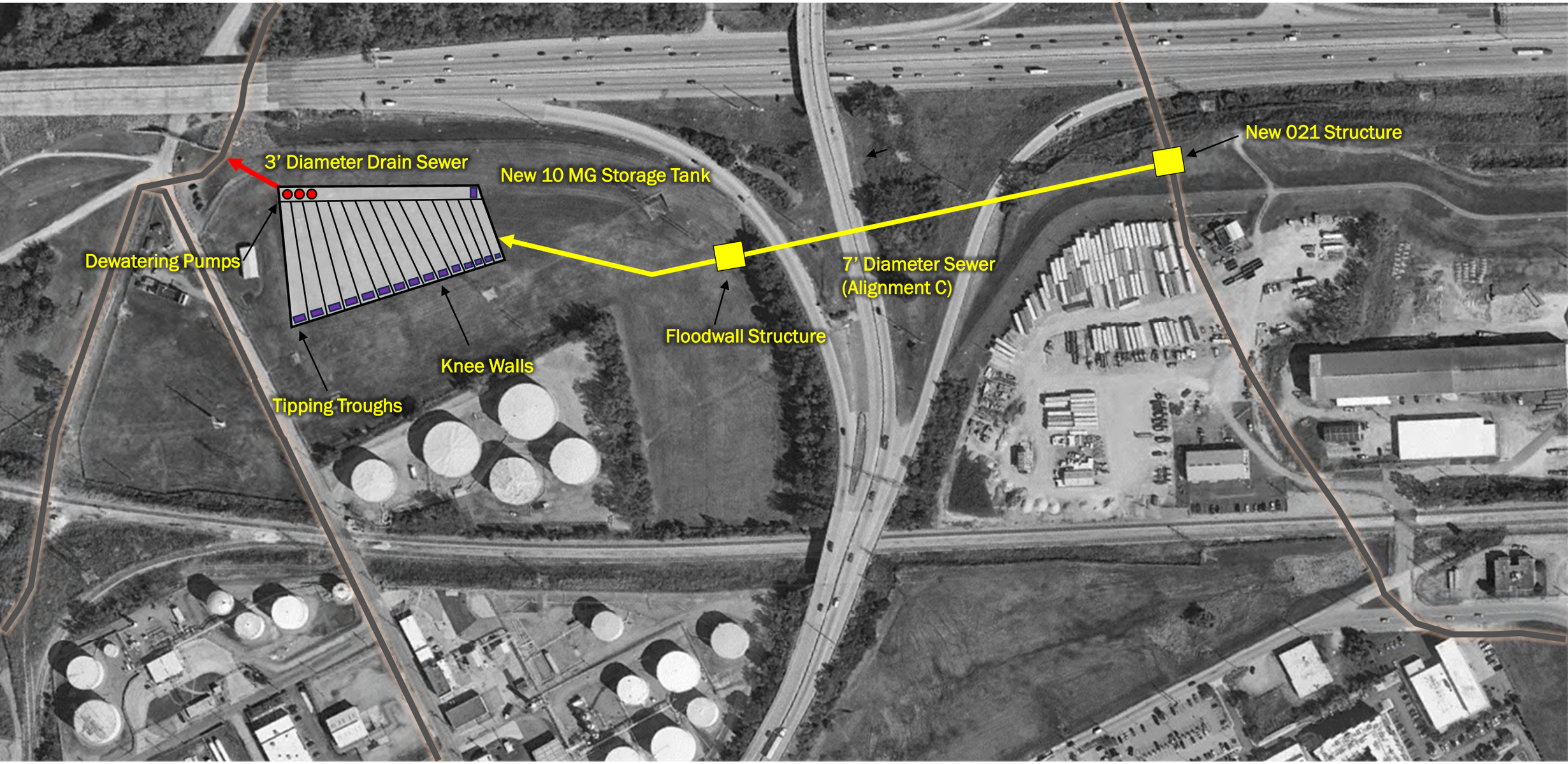
CSO 021 Storage Tank (10 MG) and CSO 014/040 Conveyance Sewer



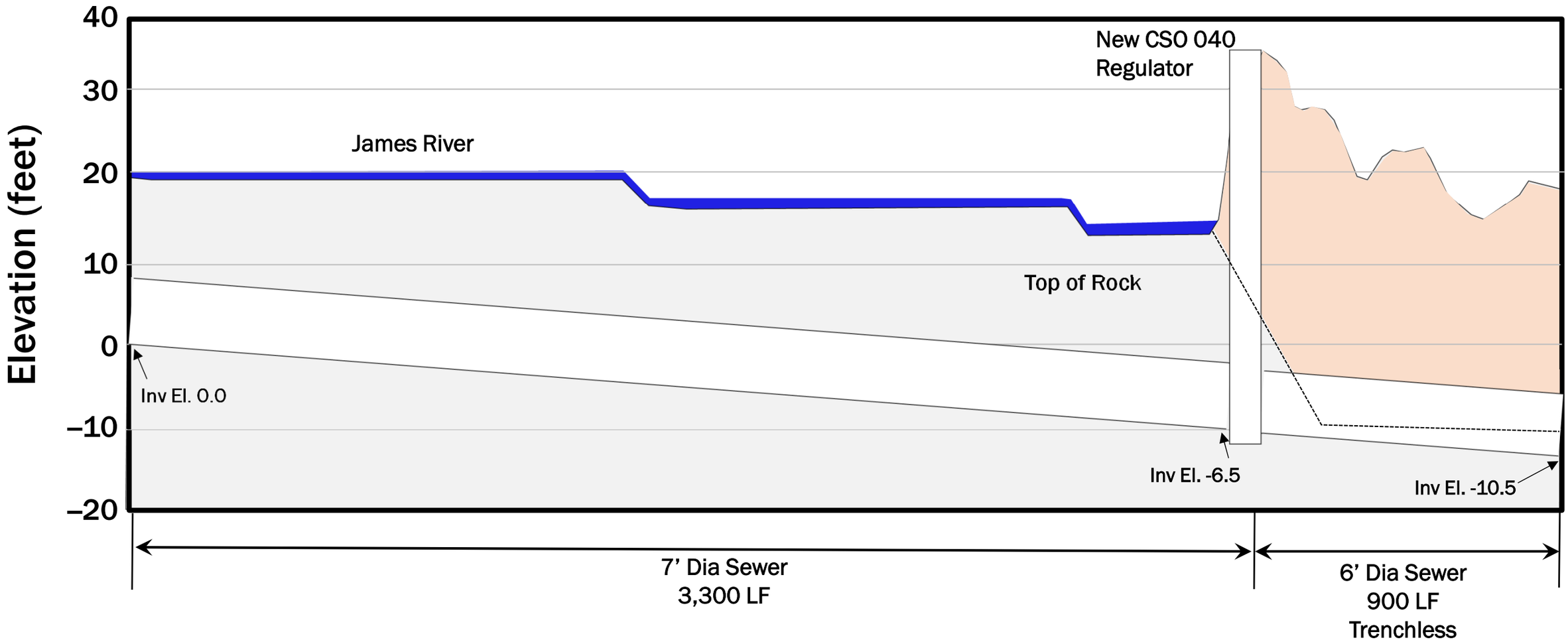
Sizing Note: Paired with the Shockoe #1 Project a 10 MG Tank results in 4 or less overflow events/year (2011-2013)

Southside #5

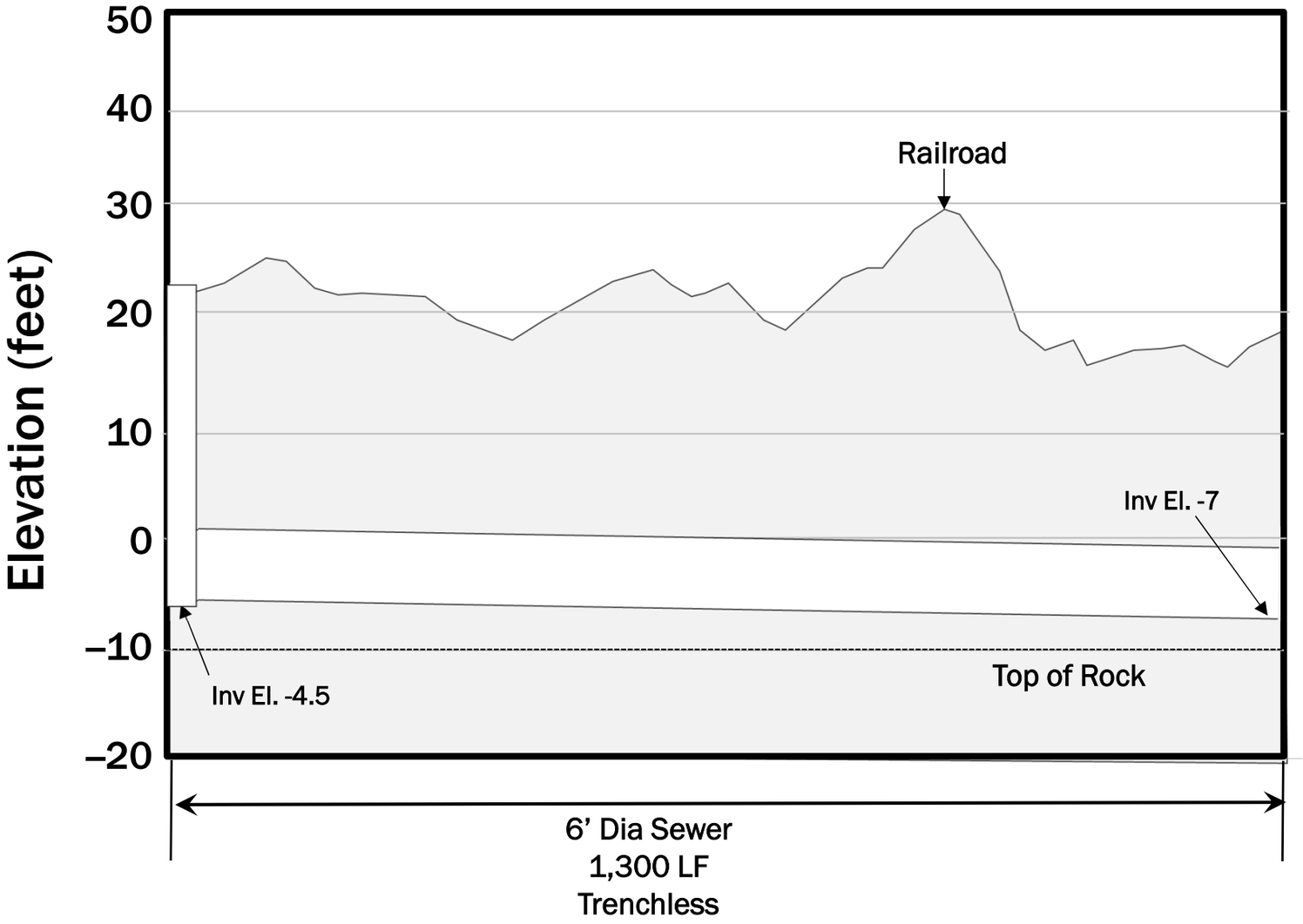
CSO 021 Storage Tank and CSO 014/040 Conveyance Sewer



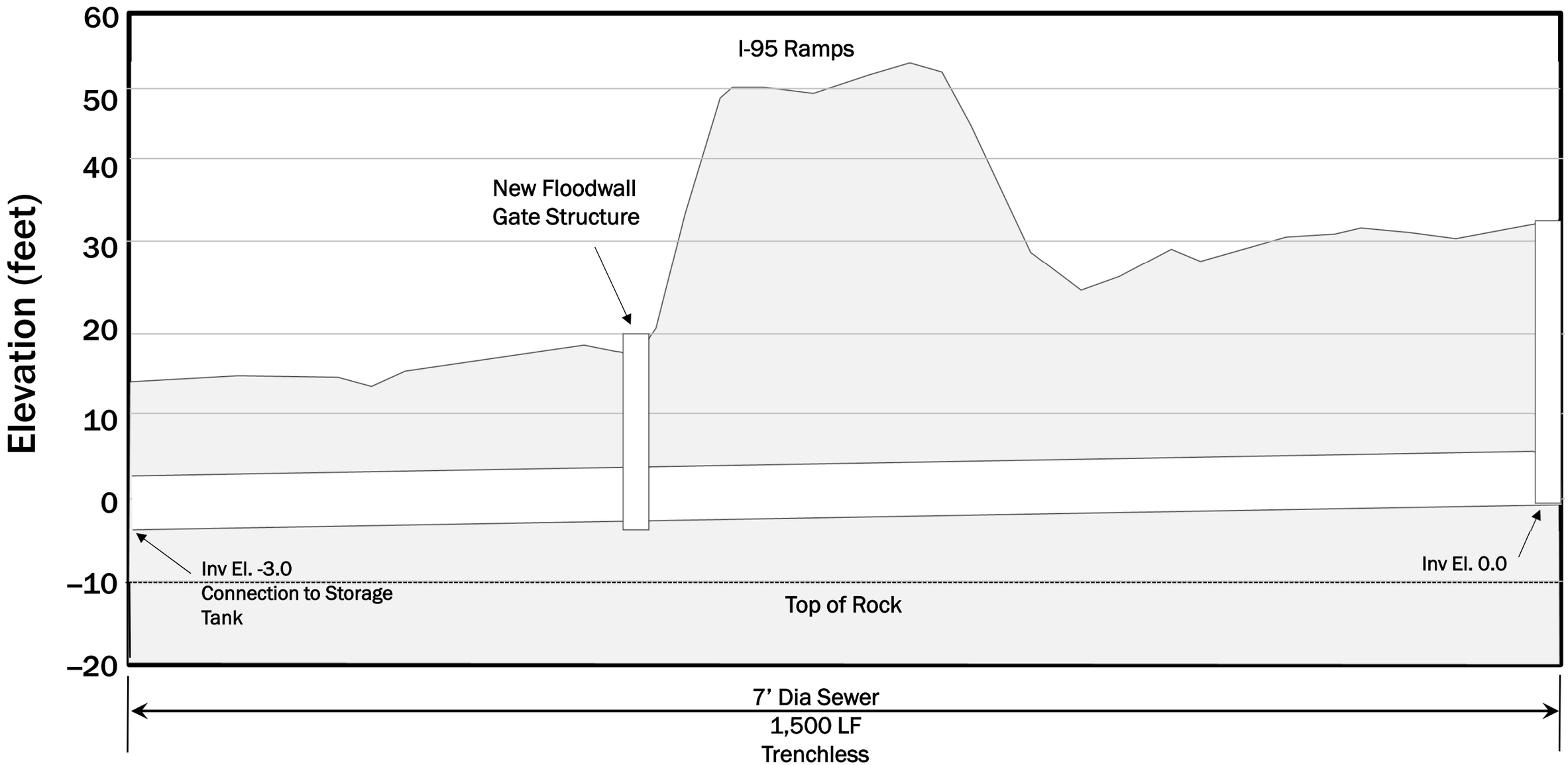
Alignment A - Profile



Alignment B - Profile



Alignment C - Profile



City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
Southside #5: WWTP EQ Tank and CSO 014/040 Conveyance Sewer
Conceptual Design

Item	Unit	Quantity	Unit Cost	Total Amount
0. Structure Dimensions				
a. New 040 Regulator Structure				
i. Length	LF	30		
ii. Width	LF	40		
iii. Depth	LF	40		
b. New 014 Regulator Structure				
i. Length	LF	30		
ii. Width	LF	40		
iii. Depth	LF	25		
c. New 021 Structure				
i. Length	LF	20		
ii. Width	LF	20		
iii. Depth	LF	30		
d. Storage Tank (covered)				
i. Length	LF	300		
ii. Width	LF	300		
iii. Depth	LF	25		
e. Floodwall Structure				
i. Length	LF	15		
ii. Width	LF	15		
iii. Depth	LF	25		
1. General				
a. Site Prep	ACRE	4	$250,000.00	$1,000,000.00
			General Subtotal	$1,000,000
2. Excavation for Structures				
a. Support of Excavation				
i. Sheeting/Secant Piles				
New 040 Regulator Structure	SF	10,098	$45.00	$454,410
Excavation Length	LF	46		
Excavation Width	LF	56		
Excavation Depth	LF	48		
Excavation Depth in Rock	LF	15		
New 014 Regulator Structure	SF	6,016	$45.00	$270,720
Excavation Length	LF	42		
Excavation Width	LF	52		
Excavation Depth	LF	32		
New 021 Regulator Structure	SF	7,548	$45.00	$339,660
Excavation Length	LF	34		
Excavation Width	LF	34		
Excavation Depth	LF	37		
Storage Tank	SF	61,776	$45.00	$2,779,920
Excavation Length	LF	312		
Excavation Width	LF	312		
Excavation Depth	LF	33		
Floodwall Structure	SF	5,184	$45.00	$233,280
Excavation Length	LF	27		
Excavation Width	LF	27		
Excavation Depth	LF	32		
b. Soil				
i. Excavate and Dispose of Soil	CY	127,161	$90.00	$11,444,493
c. Rock				
i. Excavate and Dispose of Rock	CY	1,431	$300.00	$429,333
			Excavation for Structures Subtotal	$15,951,817
3. Structural				
a. New CSO 040 Structure				
i. 30'L x 40'W x 40'D				
Concrete Base Slab	CY	270	$775.00	$209,422
Base Slab Thickness	LF	4		
Base Slab Length	LF	38		
Base Slab Width	LF	48		
Concrete Exterior Walls	CY	924	$1,500.00	$1,386,667
Exterior Wall Thickness	LF	4		
Exterior Wall Length	LF	156		
Exterior Wall Height	LF	40		
Concrete Top Slab	CY	135	$1,500.00	$202,667
Top Slab Thickness	LF	2		
Top Slab Length	LF	38		
Top Slab Width	LF	48		

	b.	New 014 Structure					
		i.	30'L x 40'W x 25'D				
			Concrete Base Slab	CY	166	$775.00	$128,822
			Base Slab Thickness	LF	3		
			Base Slab Length	LF	34		
			Base Slab Width	LF	44		
			Concrete Exterior Walls	CY	274	$1,500.00	$411,111
			Exterior Wall Thickness	LF	2		
			Exterior Wall Length	LF	148		
			Exterior Wall Height	LF	25		
			Concrete Top Slab	CY	111	$1,500.00	$166,222
			Top Slab Thickness	LF	2		
			Top Slab Length	LF	34		
			Top Slab Width	LF	44		
	c.	New 021 Structure					
		i.	20'L x 20'W x 30'D				
			Concrete Base Slab	CY	75	$775.00	$58,211
			Base Slab Thickness	LF	3		
			Base Slab Length	LF	26		
			Base Slab Width	LF	26		
			Concrete Exterior Walls	CY	307	$1,500.00	$460,000
			Exterior Wall Thickness	LF	3		
			Exterior Wall Length	LF	92		
			Exterior Wall Height	LF	30		
			Concrete Top Slab	CY	50	$1,500.00	$75,111
			Top Slab Thickness	LF	2		
			Top Slab Length	LF	26		
			Top Slab Width	LF	26		
	d.	Storage Tank					
		i.	300'L x 300'W x 25'D				
			Concrete Base Slab	CY	13,691	$775.00	$10,610,726
			Base Slab Thickness	LF	4		
			Base Slab Length	LF	304		
			Base Slab Width	LF	304		
			Concrete Exterior Walls	CY	2,237	$1,500.00	$3,355,556
			Exterior Wall Thickness	LF	2		
			Exterior Wall Length	LF	1,208		
			Exterior Wall Height	LF	25		
			Concrete Top Slab	CY	6,846	$1,500.00	$10,268,444
			Top Slab Thickness	LF	2		
			Top Slab Length	LF	304		
			Top Slab Width	LF	304		
	e.	Floodwall Structure					
		i.	15'L x 15'W x 25'D				
			Concrete Base Slab	CY	40	$775.00	$31,086
			Base Slab Thickness	LF	3		
			Base Slab Length	LF	19		
			Base Slab Width	LF	19		
			Concrete Exterior Walls	CY	126	$1,500.00	$188,889
			Exterior Wall Thickness	LF	2		
			Exterior Wall Length	LF	68		
			Exterior Wall Height	LF	25		
			Concrete Top Slab	CY	71	$1,500.00	$106,778
			Top Slab Thickness	LF	2		
			Top Slab Length	LF	31		
			Top Slab Width	LF	31		
						Structural Subtotal	$27,659,712
4.	Civil						
	a.	Pipe					
		i.	Furnish and Install 84" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth, in River)	LF	3,300	$1,600.00	$5,280,000
		ii.	Furnish and Install 72" Fiber Reinforced Sewer Pipe (Sewer A, Trenchless)	LF	900	$5,600.00	$5,040,000
		iii.	Furnish and Install 96" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth)	LF	50	$2,000.00	$100,000
		iv.	Furnish and Install 72" Fiber Reinforced Sewer Pipe (Sewer B, Trenchless)	LF	1,300	$5,600.00	$7,280,000
		v.	Furnish and Install 84" Fiber Reinforced Sewer Pipe (Sewer C, Trenchless)	LF	1,500	$6,600.00	$9,900,000
		vi.	Furnish and Install 36" Fiber Reinforced Sewer Pipe (Drain Sewer, 15' Depth)	LF	100	$850.00	$85,000
	b.	Excavation					
		i.	Rock Excavation for 84" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth, in River)	CY	20,167	$300.00	$6,050,000
			Excavation Length	LF	3,300		
			Excavation Width	LF	11		
			Excavation Depth in Rock	LF	15		
		ii.	Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth)	CY	333	$90.00	$30,000
			Excavation Length	LF	50		
			Excavation Width	LF	12		
			Excavation Depth	LF	15		
		iii.	Excavation for 36" Fiber Reinforced Sewer Pipe (Drain Sewer, 15 Depth)	CY	441	$90.00	$39,667
			Excavation Length	LF	100		
			Excavation Width	LF	7		

				Excavation Depth	LF	17		
	c.		Trenchless Utility Installation					
		i.	72" Fiber Reinforced Sewer Pipe (Sewer A, 40'/Trenchless) Trenchless Installation					
				Jacking Pit Excavation	CY	444	$90.00	$40,000
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	40		
				Excavation Depth in Rock	LF	25		
				Rock Excavation	CY	741	$300.00	$222,222
				Receiving Pit Excavation	CY	444	$90.00	$40,000
				Excavation Length	LF	20		
				Excavation Width	LF	20		
				Excavation Depth	LF	30		
				Excavation Depth in Rock	LF	0		
				Rock Excavation	CY	0	$300.00	$0
		ii.	72" Fiber Reinforced Sewer Pipe (Sewer B, 25'/Trenchless) Trenchless Installation					
				Jacking Pit Excavation	CY	741	$90.00	$66,667
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	25		
				Excavation Depth in Rock	LF	0		
				Rock Excavation	CY	0	$300.00	$0
				Intermediate Pit (#1) Excavation	CY	741	$90.00	$66,667
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	25		
				Excavation Depth in Rock	LF	0		
				Rock Excavation	CY	0	$250.00	$0
				Intermediate Pit (#2) Excavation	CY	741	$90.00	$66,667
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	25		
				Excavation Depth in Rock	LF	0		
				Rock Excavation	CY	0	$300.00	$0
				Receiving Pit Excavation	CY	370	$90.00	$33,333
				Excavation Length	LF	20		
				Excavation Width	LF	20		
				Excavation Depth	LF	25		
				Excavation Depth in Rock	LF	0		
				Rock Excavation	CY	0	$300.00	$0
		iii.	84" Fiber Reinforced Sewer Pipe (Sewer C, 30'/Trenchless) Trenchless Installation					
				Jacking Pit Excavation	CY	889	$90.00	$80,000
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	35		
				Excavation Depth in Rock	LF	5		
				Rock Excavation	CY	148	$300.00	$44,444
				Intermediate Pit (#1) Excavation	CY	741	$90.00	$66,667
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	25		
				Excavation Depth in Rock	LF	0		
				Rock Excavation	CY	0	$300.00	$0
				Receiving Pit Excavation	CY	296	$90.00	$26,667
				Excavation Length	LF	20		
				Excavation Width	LF	20		
				Excavation Depth	LF	20		
				Excavation Depth in Rock	LF	0		
				Rock Excavation	CY	0	$300.00	$0
	d.		Support of Excavation					
		i.	Sheeting					
				96" Fiber Reinforced Sewer Pipe (Sewer A, 20' Depth) Excavation Vertical Area	SF	2,250	$45.00	$101,250
				Excavation Length	LF	50		
				Excavation Depth	LF	15		
				36" Fiber Reinforced Sewer Pipe (Drain Sewer, 15 Depth) Excavation Vertical Area	SF	5,100	$45.00	$229,500
				Excavation Length	LF	100		
				Excavation Depth	LF	17		
				Jacking Pit Excavation Vertical Area	SF	18,000	$45.00	$810,000
				Intermediate Pit Excavation Vertical Area	SF	13,500	$45.00	$607,500
				Receiving Pit Excavation Vertical Area	SF	9,000	$45.00	$405,000
	e.		Cofferdam					
		i.	Cofferdam for 84" Fiber Reinforced Sewer Pipe (Sewer A, 20' Depth, in River)		LF	3,500	$3,000.00	$10,500,000
							Civil Subtotal	$47,211,250
5.	Mechanical							
	a.		Tipping Troughs					
		i.	Furnish and Install Tipping Troughs		EA	16	$75,000.00	$1,200,000
	b.		Drain Gates					

		i.	Furnish and Install Drain Gates	EA	1	$37,500.00	$37,500
	c.	Pumps					
		i.	Dewatering Pumps	MGD	10	$75,000.00	$750,000
						Mechanical Subtotal	$1,990,000
6.	Electrical and I&C						
	a.	Miscellaneous Electrical and I&C					
		i.	Furnish and Install Electrical and I&C (Other)	LS	1	$796,000.00	$796,000
						Electrical and I&C Subtotal	$796,000
7.	Construction Total						
	a.	Subtotal A					$94,608,779
	b.	Design Contingency		LS	1	40%	*$37,843,511*
	c.	Subtotal B		LS	1		$132,452,290
	d.	General Conditions		LS	1	50%	*$66,226,145*
	e.	Subtotal C		LS	1		$198,678,435
	f.	Bonds and Insurance		LS	1	3%	*$5,960,353*
						Total Estimated Cost	**$204,638,788**

8.	Capital Total						
	a.	Construction Cost Total					$204,638,788
	b.	Capital Contingency		LS	1	50%	*$102,319,394*
						Total Estimated Capital Cost	**$306,958,183**

9.	Annual Operations and Maintainence Costs						
	a.	Labor					
		i.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	$50.00	$10,400
		ii.	Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	$50.00	$4,800
		iii.	Pipe Cleaning (Once every 5 years)	LF	7,150	$30.00	$42,900
		iv.	Structure Cleaning (Once per year)	EA	1	$10,000.00	$10,000
		v.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	$50.00	$9,600
	b.	Maintenance of Structures					
		i.	Maintain Structures	LS	0.2%	$27,659,712.04	$55,319
	c.	Maintenance of Pipe					
		i.	Maintain Pipe	LS	1.0%	$27,685,000.00	$276,850
	d.	Maintenance of Mechanical					
		i.	Maintain Tipping Troughs	LS	3%	$1,200,000.00	$36,000
		ii.	Maintain Drain Gates	LS	3%	$37,500.00	$1,125
		iii.	Maintain Pumps	LS	3%	$750,000.00	$22,500
	e.	Maintenance of Instrumentation and Control					
		i.	Maintain I&C	LS	3%	$796,000.00	$23,880
						Annual Operations and Maintainence Costs Subtotal	**$493,374**

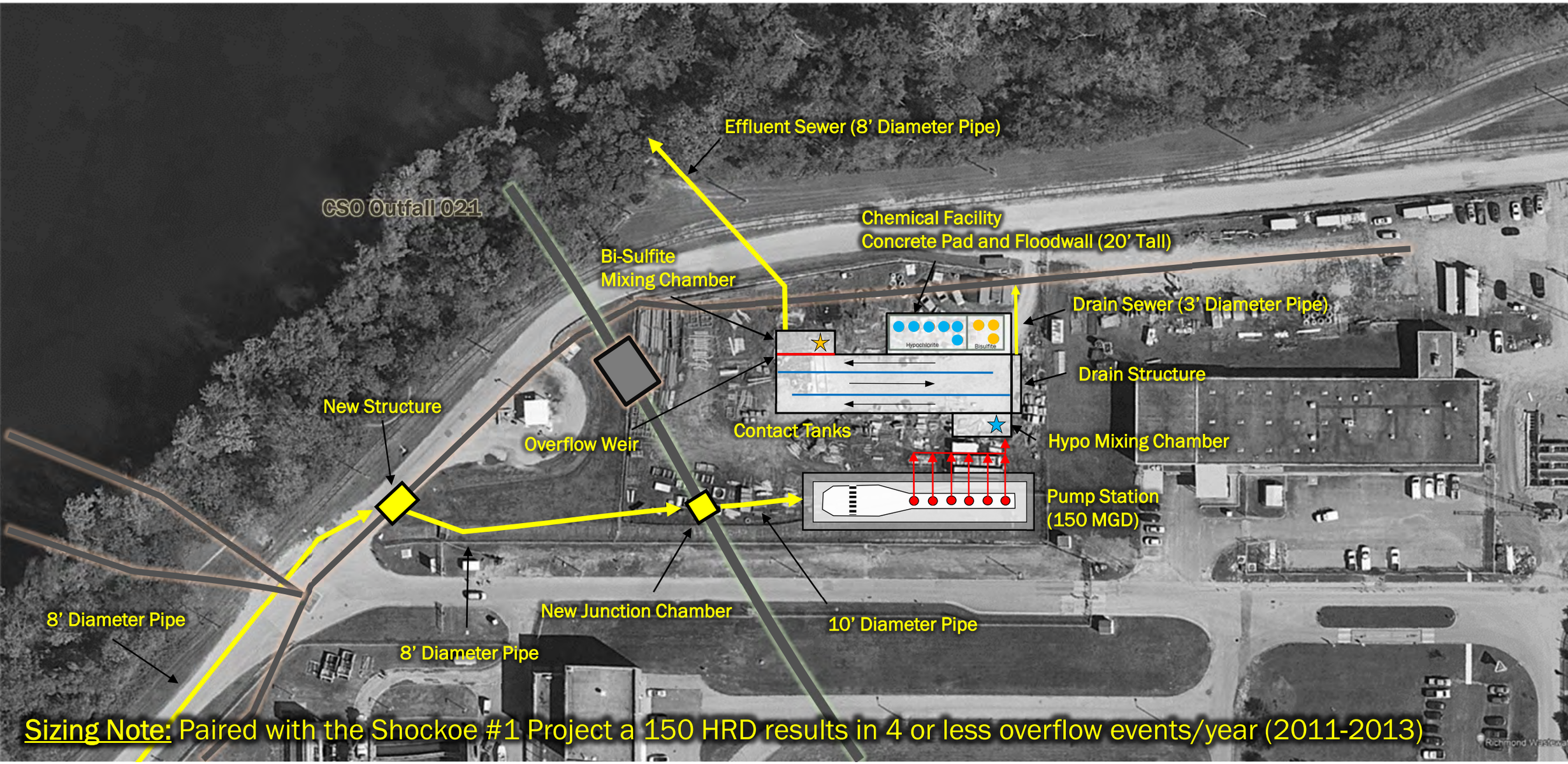
10.	15-Year Replacement Costs						
	a.	Electrical and Instrumentation and Control					
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	$796,000.00	$796,000
	b.	Meters					
		i.	Furnish and Install Replacement Meters	EA	5	$7,500.00	$37,500
						15-Year Replacement Costs Subtotal	**$833,500**

					Southside #5	
					CSO 040 Sewer and Tank	
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Score
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2	<4 Year project schedule with minimal risks for schedule extension	1	2.3
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	1.8	2	None/Minor conflicts	0	0
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	2	2	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	0	0
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	2.3	2	Construction easements or none required	1	2.3
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	1.3	2	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	1	1.3
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	2.5	2	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	2	5
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	1.8	2	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	1	1.8
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	2.9	2	Signficant reduction in US/DS HGL as compared to the existing condition	1	2.9
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	1.1	2	>2 other similar facilties/equipment that are currently operated and maintained at the City	2	2.2
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	1.6	2	No new staff is required for operation and maintenace	2	3.2
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	3.4	2	Project supports future improvements or is foundational for future improvements	2	6.8
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	4.4	2	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	1	4.4
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	3.4	2	Protected against a 100-year flood	1	3.4
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	2.3	2	High potential for known near term (<5 years) future development	2	4.6
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	2	2	No federal or state permits required	0	0
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	3.3	2	Located outside of the Resource Manangement Area (RMA)	0	0
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	0.8	2	Minimal modifications would be required for the City's VPDES permit	2	1.6
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	3.5	2	Yes	2	7
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	2.9	2	Yes	0	0
			1	Adjacent		
			0	No		
	Impacts to community during construction	2.1	2	Minimal impacts to the community during construction	1	2.1
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	2.3	2	Minimal tree removal/mitigation (<0.2 acres) is required	1	2.3
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		53

Southside #6

Southside #6

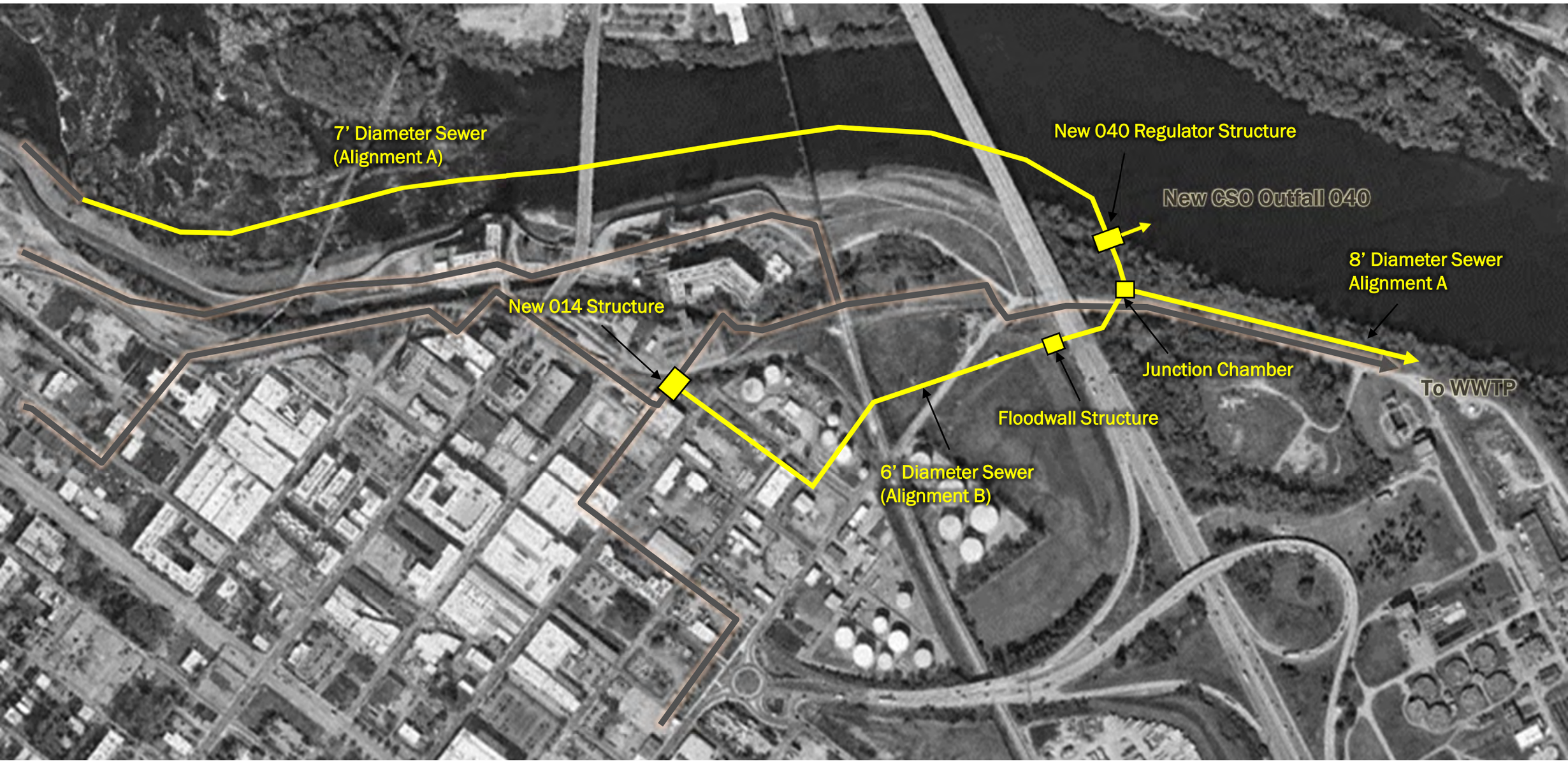
CSO 014/040 Conveyance Sewer and High-Rate Disinfection at WWTP



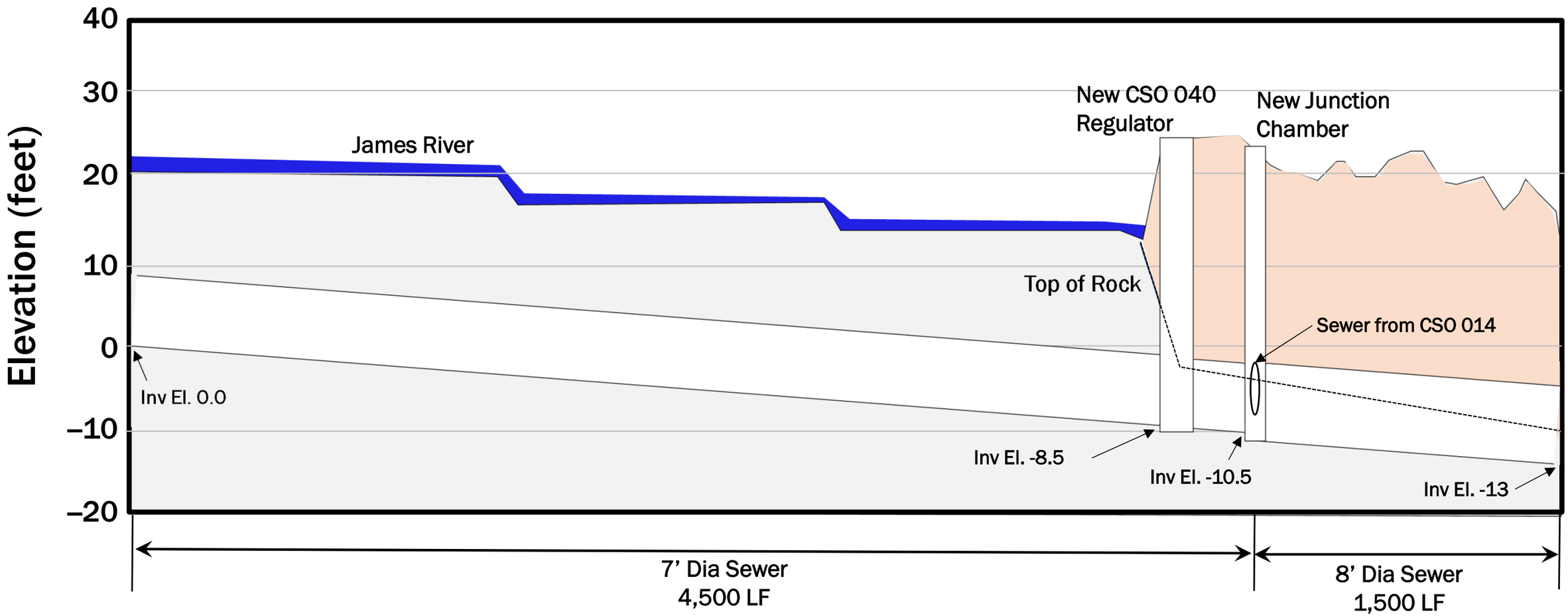
Sizing Note: Paired with the Shockoe #1 Project a 150 HRD results in 4 or less overflow events/year (2011-2013)

Southside #6

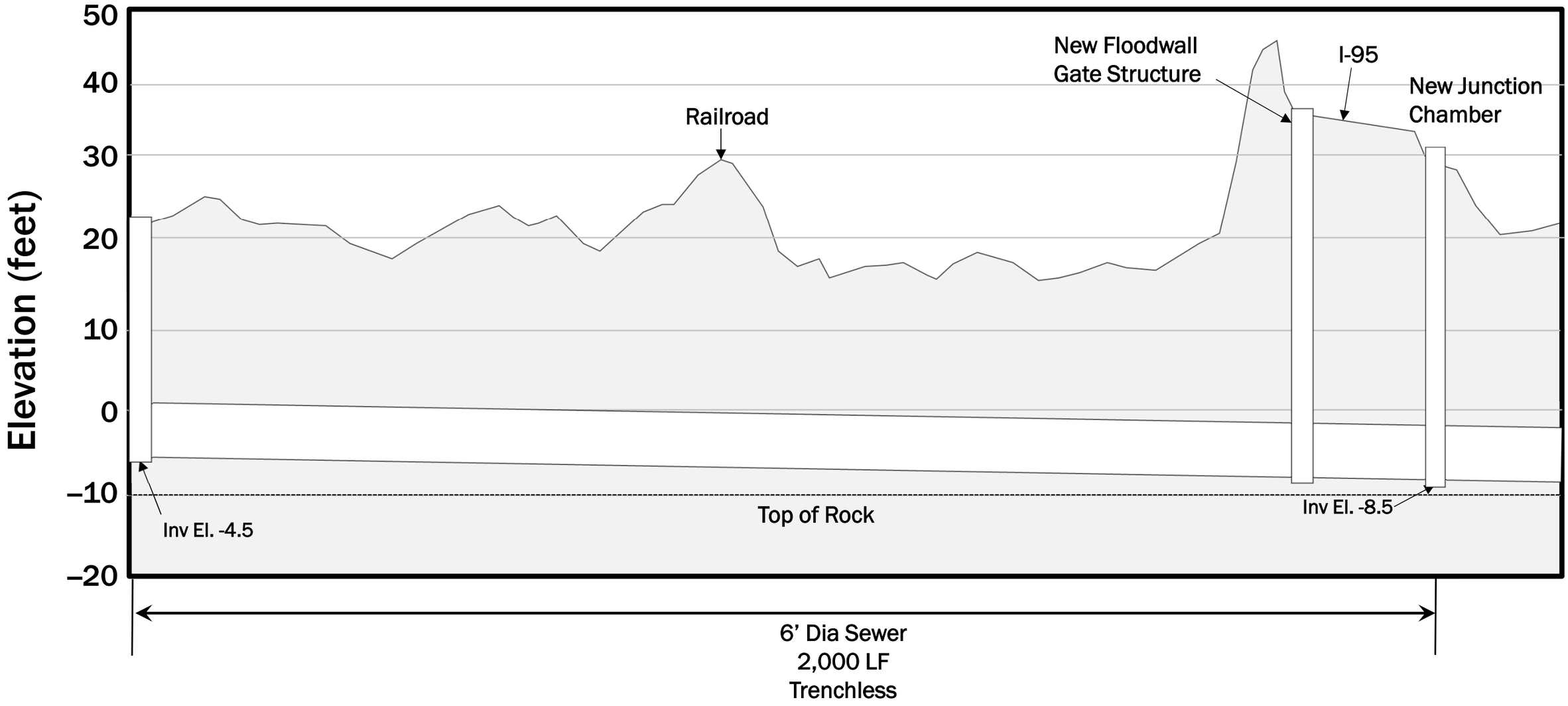
CSO 021 HRD (150 MGD) and CSO 014/040 Conveyance Sewer



Alignment A - Profile



Alignment B - Profile



City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
Southside #6: WWTP HRD Facility and CSO 014/040 Conveyance Sewer
Conceptual Design

Item				Unit	Quantity	Unit Cost	Total Amount
0.	Structure Dimensions						
	a.	Structure #1					
		i.	Length	LF	20		
		ii.	Width	LF	30		
		iii.	Depth	LF	30		
	b.	Structure #2					
		i.	Length	LF	20		
		ii.	Width	LF	30		
		iii.	Depth	LF	30		
	c.	Hypo Mixing Chamber					
		i.	Length	LF	20		
		ii.	Width	LF	50		
		iii.	Depth	LF	20		
	d.	Contact Tanks (uncovered)					
		i.	Length	LF	200		
		ii.	Width	LF	50		
		iii.	Depth	LF	20		
	e.	Bi-Sulfite Mixing Chamber					
		i.	Length	LF	20		
		ii.	Width	LF	50		
		iii.	Depth	LF	20		
	f.	Chemical Facility Pad					
		i.	Length	LF	30		
		ii.	Width	LF	100		
		iii.	Depth	LF	3		
	g.	New 040 Regulator Structure					
		i.	Length	LF	30		
		ii.	Width	LF	40		
		iii.	Depth	LF	35		
	h.	New 014 Regulator Structure					
		i.	Length	LF	30		
		ii.	Width	LF	40		
		iii.	Depth	LF	25		
	i.	Junction Chamber					
		i.	Length	LF	15		
		ii.	Width	LF	15		
		iii.	Depth	LF	30		
	j.	Floodwall Structure					
		i.	Length	LF	10		
		ii.	Width	LF	15		
		iii.	Depth	LF	45		
1.	General						
	a.	Site Prep		ACRE	3	$250,000.00	$750,000.00
						General Subtotal	$750,000
2.	Excavation for Structures						
	a.	Support of Excavation					
		i.	Sheeting				
			Structure #1	SF	8,436	$45.00	$379,620
			Excavation Length	LF	32		
			Excavation Width	LF	42		
			Excavation Depth	LF	38		
			Excavation Depth in Rock	LF	8		
			Structure #2	SF	8,436	$45.00	$379,620
			Excavation Length	LF	32		
			Excavation Width	LF	42		
			Excavation Depth	LF	38		
			Excavation Depth in Rock	LF	8		
			HRD and Chemical Facility	SF	26,880	$45.00	$1,209,600
			Excavation Perimeter	LF	640		
			Excavation Area	LF	15,000		
			Excavation Depth	LF	28		
			Excavation Depth in Rock	LF	0		
			New 040 Regulator Structure	SF	13,158	$45.00	$592,110
			Excavation Length	LF	46		
			Excavation Width	LF	56		
			Excavation Depth	LF	43		
			Excavation Depth in Rock	LF	15		
			New 014 Regulator Structure	SF	9,024	$45.00	$406,080
			Excavation Length	LF	42		

				Excavation Width	LF	52		
				Excavation Depth	LF	32		
				Junction Chamber	SF	6,612	$45.00	$297,540
				Excavation Length	LF	29		
				Excavation Width	LF	29		
				Excavation Depth	LF	38		
				Floodwall Structure	SF	7,791	$45.00	$350,595
				Excavation Length	LF	22		
				Excavation Width	LF	27		
				Excavation Depth	LF	53		
				Excavation Depth in Rock	LF	23		
		b.	Soil					
			i.	Excavate and Dispose of Soil	CY	25,646	$90.00	$2,308,113
		c.	Rock					
			i.	Excavate and Dispose of Rock	CY	2,734	$300.00	$820,067
							Excavation for Structures Subtotal	$6,743,345
3.			Structural					
		a.	Structure #1					
			i.	20'L x 30'W x 30'D				
				Concrete Base Slab	CY	121	$775.00	$93,689
				Base Slab Thickness	LF	4		
				Base Slab Length	LF	24		
				Base Slab Width	LF	34		
				Concrete Exterior Walls	CY	240	$1,500.00	$360,000
				Exterior Wall Thickness	LF	2		
				Exterior Wall Length	LF	108		
				Exterior Wall Height	LF	30		
				Concrete Top Slab	CY	60	$1,500.00	$90,667
				Top Slab Thickness	LF	2		
				Top Slab Length	LF	24		
				Top Slab Width	LF	34		
		b.	Structure #2					
			i.	20'L x 30'W x 30'D				
				Concrete Base Slab	CY	121	$775.00	$93,689
				Base Slab Thickness	LF	4		
				Base Slab Length	LF	24		
				Base Slab Width	LF	34		
				Concrete Exterior Walls	CY	240	$1,500.00	$360,000
				Exterior Wall Thickness	LF	2		
				Exterior Wall Length	LF	108		
				Exterior Wall Height	LF	30		
				Concrete Top Slab	CY	60	$1,500.00	$90,667
				Top Slab Thickness	LF	2		
				Top Slab Length	LF	24		
				Top Slab Width	LF	34		
		c.	HRD and Chemical Facility					
			i.	200'L x 50'W x 20'D				
				Concrete Base Slab	CY	2,222	$775.00	$1,722,222
				Base Slab Thickness	LF	4		
				Base Slab Area	SF	15,000		
				Concrete Walls	CY	3,010	$1,500.00	$4,515,556
				Exterior Wall Thickness	LF	2		
				Exterior Wall Length	LF	1,270		
				Exterior Wall Height	LF	32		
				Concrete Top Slab	CY	0	$1,500.00	$0
				Top Slab Thickness	LF	0		
				Base Slab Area	SF	15,000		
		d.	New CSO 040 Structure					
			i.	30'L x 40'W x 35'D				
				Concrete Base Slab	CY	270	$775.00	$209,422
				Base Slab Thickness	LF	4		
				Base Slab Length	LF	38		
				Base Slab Width	LF	48		
				Concrete Exterior Walls	CY	809	$1,500.00	$1,213,333
				Exterior Wall Thickness	LF	4		
				Exterior Wall Length	LF	156		
				Exterior Wall Height	LF	35		
				Concrete Top Slab	CY	135	$1,500.00	$202,667
				Top Slab Thickness	LF	2		
				Top Slab Length	LF	38		
				Top Slab Width	LF	48		
		e.	New 014 Structure					
			i.	30'L x 40'W x 25'D				
				Concrete Base Slab	CY	166	$775.00	$128,822
				Base Slab Thickness	LF	3		
				Base Slab Length	LF	34		
				Base Slab Width	LF	44		
				Concrete Exterior Walls	CY	274	$1,500.00	$411,111

				Exterior Wall Thickness	LF	2		
				Exterior Wall Length	LF	148		
				Exterior Wall Height	LF	25		
				Concrete Top Slab	CY	111	$1,500.00	$166,222
				Top Slab Thickness	LF	2		
				Top Slab Length	LF	34		
				Top Slab Width	LF	44		
		f.	Junction Chamber					
			i.	15'L x 15'W x 30'D				
				Concrete Base Slab	CY	65	$775.00	$50,633
				Base Slab Thickness	LF	4		
				Base Slab Length	LF	21		
				Base Slab Width	LF	21		
				Concrete Exterior Walls	CY	240	$1,500.00	$360,000
				Exterior Wall Length	LF	72		
				Exterior Wall Height	LF	30		
				Concrete Top Slab	CY	33	$1,500.00	$49,000
				Top Slab Thickness	LF	2		
				Top Slab Length	LF	21		
				Top Slab Width	LF	21		
		g.	Floodwall Structure					
			i.	10'L x 15'W x 45'D				
				Concrete Base Slab	CY	39	$775.00	$30,541
				Base Slab Thickness	LF	4		
				Base Slab Length	LF	14		
				Base Slab Width	LF	19		
				Concrete Exterior Walls	CY	193	$1,500.00	$290,000
				Exterior Wall Thickness	LF	2		
				Exterior Wall Length	LF	58		
				Exterior Wall Height	LF	45		
				Concrete Top Slab	CY	20	$1,500.00	$29,556
				Top Slab Thickness	LF	2		
				Top Slab Length	LF	14		
				Top Slab Width	LF	19		
							Structural Subtotal	$10,467,796
4.	Civil							
	a.	Pipe						
		i.		Furnish and Install 84" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth, in River)	LF	4,500	$1,600.00	$7,200,000
		ii.		Furnish and Install 96" Fiber Reinforced Sewer Pipe (Sewer A, Trenchless)	LF	1,500	$7,800.00	$11,700,000
		iii.		Furnish and Install 96" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth)	LF	50	$2,000.00	$100,000
		iv.		Furnish and Install 72" Fiber Reinforced Sewer Pipe (Sewer B, Trenchless)	LF	2,000	$5,600.00	$11,200,000
		v.		Furnish and Install 96" Fiber Reinforced Sewer Pipe (Sewer C, 30' Depth)	LF	250	$2,000.00	$500,000
		vi.		Furnish and Install 120" Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth)	LF	50	$2,500.00	$125,000
		vii.		Furnish and Install 96" Fiber Reinforced Sewer Pipe (Sewer C, 20' Depth)	LF	250	$2,000.00	$500,000
		viii.		Furnish and Install 36" Fiber Reinforced Sewer Pipe (Sewer C, 10' Depth)	LF	50	$850.00	$42,500
	b.	Excavation						
		i.		Excavation for 84" Fiber Reinforced Sewer Pipe (Sewer A, 20' Depth, in River)	CY	0	$90.00	$0
				Excavation Length	LF	4,500		
				Excavation Width	LF	11		
				Excavation Depth	LF	17		
				Excavation Depth in Rock	LF	17		
				Rock Excavation	CY	31,167	$300.00	$9,350,000
		ii.		Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer A, 20' Depth)	CY	378	$90.00	$34,000
				Excavation Length	LF	50		
				Excavation Width	LF	12		
				Excavation Depth	LF	17		
				Excavation Depth in Rock	LF	0		
				Rock Excavation	CY	0	$300.00	$0
		iii.		Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth)	CY	3,000	$90.00	$270,000
				Excavation Length	LF	250		
				Excavation Width	LF	12		
				Excavation Depth	LF	27		
		iv.		Excavation for 120" Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth)	CY	778	$90.00	$70,000
				Excavation Length	LF	50		
				Excavation Width	LF	14		
				Excavation Depth	LF	37		
				Excavation Depth in Rock	LF	7		
				Rock Excavation	CY	181	$300.00	$54,444
		v.		Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer C, 20' Depth)	CY	2,444	$90.00	$220,000
				Excavation Length	LF	250		
				Excavation Width	LF	12		
				Excavation Depth	LF	22		
		vi.		Excavation for 36" Fiber Reinforced Sewer Pipe (Sewer C, 10 Depth)	CY	156	$90.00	$14,000
				Excavation Length	LF	50		
				Excavation Width	LF	7		
				Excavation Depth	LF	12		
	c.	Trenchless Utility Installation						
		i.		96" Fiber Reinforced Sewer Pipe (Sewer A, Trenchless) Trenchless Installation				

				Jacking Pit Excavation	CY	889	$90.00	$80,000
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	30		
				Intermediate Pit Excavation	CY	889	$90.00	$80,000
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	30		
				Receiving Pit Excavation	CY	444	$90.00	$40,000
				Excavation Length	LF	20		
				Excavation Width	LF	20		
				Excavation Depth	LF	30		
			ii.	72" Fiber Reinforced Sewer Pipe (Sewer B, Trenchless) Trenchless Installation				
				Jacking Pit Excavation	CY	741	$90.00	$66,667
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	25		
				Intermediate Pit (#1) Excavation	CY	741	$90.00	$66,667
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	25		
				Intermediate Pit (#2) Excavation	CY	741	$90.00	$66,667
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	25		
				Receiving Pit Excavation	CY	519	$90.00	$46,667
				Excavation Length	LF	20		
				Excavation Width	LF	20		
				Excavation Depth	LF	35		
		d.		Support of Excavation				
			i.	Sheeting				
				96" Fiber Reinforced Sewer Pipe (Sewer C, 15' Depth) Excavation Vertical Area	SF	2,550	$45.00	$114,750
				Excavation Length	LF	50		
				Excavation Depth	LF	17		
				96" Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Vertical Area	SF	20,250	$45.00	$911,250
				Excavation Length	LF	250		
				Excavation Depth	LF	27		
				120" Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth)) Excavation Vertical Area	SF	5,550	$45.00	$249,750
				Excavation Length	LF	50		
				Excavation Depth	LF	37		
				96" Fiber Reinforced Sewer Pipe (Sewer C, 20' Depth) Excavation Vertical Area	SF	16,500	$45.00	$742,500
				Excavation Length	LF	250		
				Excavation Depth	LF	22		
				36" Fiber Reinforced Sewer Pipe (Sewer C, 10 Depth) Excavation Vertical Area	SF	1,800	$45.00	$81,000
				Excavation Length	LF	50		
				Excavation Depth	LF	12		
				Jacking Pit Excavation Vertical Area	SF	6,600	$45.00	$297,000
				Intermediate Pit Excavation Vertical Area	SF	9,600	$45.00	$432,000
				Receiving Pit Excavation Vertical Area	SF	5,200	$45.00	$234,000
		e.		Cofferdam				
			i.	Cofferdam for 84" Fiber Reinforced Sewer Pipe (Sewer A, 20' Depth, in River)	LF	5,000	$3,000.00	$15,000,000
							Civil Subtotal	$59,888,861
5.				Mechanical				
		a.		Pump Station				
			i.	New Pump Station (including excavation and structure)	MGD	150	$300,000.00	$45,000,000
		b.		HRD Chemical Facility				
			i.	New HRD Facility and Equipment	MGD	150	$15,000.00	$2,250,000
		c.		Tipping Troughs				
			i.	Furnish and Install Tipping Troughs	EA	4	$75,000.00	$300,000
		d.		Drain Gates				
			i.	Furnish and Install Drain Gates	EA	4	$37,500.00	$150,000
							Mechanical Subtotal	$47,700,000
6.				Electrical and I&C				
		a.		Miscellaneous Electrical and I&C				
			i.	Furnish and Install Electrical and I&C (Other)	LS	1	$180,000.00	$180,000
							Electrical and I&C Subtotal	$180,000
7.				Construction Total				
		a.		Subtotal A				$125,730,002
		b.		Design Contingency	LS	1	40%	*$50,292,001*
		c.		Subtotal B	LS	1		$176,022,003
		d.		General Conditions	LS	1	50%	*$88,011,002*
		e.		Subtotal C	LS	1		$264,033,005
		f.		Bonds and Insurance	LS	1	3%	*$7,920,990*
							Total Estimated Cost	**$271,953,995**

8.	Capital Total						
	a.	Construction Cost Total					$271,953,995
	b.	Capital Contingency			LS	1	50% $135,976,998
						Total Estimated Capital Cost	**$407,930,993**

9.	Annual Operations and Maintainence Costs						
	a.	Labor					
		i.	Daily Check (365 Days, 1 Hr/Ea)		HR	365	$28.15 $10,275
		ii.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)		HR	208	$28.15 $5,855
		iii.	Monthly Inspections (12 Months, 8 Hrs/Ea)		HR	96	$28.15 $2,702
		iv.	Pipe Cleaning (Once every 5 years)		LF	8,650	$30.00 $51,900
		v.	Structure Cleaning (Once per year)		EA	2	$10,000.00 $20,000
		vi.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)		HR	192	$28.15 $5,405
		vii.	Continuous Staffing (365 Days, 24 Hrs/Ea)		HR	8,760	$28.15 $246,594
	b.	Maintenance of Structures					
		i.	Maintain Structures		LS	0.2%	$10,467,796.30 $20,936
	c.	Maintenance of Pipe					
		i.	Maintain Pipe		LS	1%	$31,367,500.00 $313,675
	d.	Maintenance of Mechanical					
		i.	Maintain Tipping Troughs		LS	3%	$300,000.00 $9,000
		ii.	Maintain Drain Gates		LS	3%	$150,000.00 $4,500
		iii.	Maintain HRD Chemical Facility		LS	3%	$2,250,000.00 $67,500
		iv.	Maintain Pump Station		LS	3%	$45,000,000.00 $1,350,000
	e.	Maintenance of Instrumentation and Control					
		i.	Maintain I&C		LS	3%	$180,000.00 $5,400
	f.	Operation of HRD Chemical Facility					
		i.	Sodium Hypochlorite				
				Dose	mg/L	10	
				Volume	MGY	285	
				Quantity	LBS	23736	$2.00 $47,471
		ii.	Sodium Bisulfite				
				Dose	mg/L	3	
				Volume	MGY	285	
				Quantity	LBS	7121	$2.00 $14,241
	g.	Operation of Influent Pump Station					
		i.	Pump Station Electricity Cost				
				Flowrate of Pump Station	MGD	160	
				Annual Volume	MGY	285	
				Total Dynamic Head	ft	55	
				Pump Efficiency		1	
				Motor Efficiency		1	
				Annual Energy Usage	KW-HR	91033	$0.06 $5,462
						Annual Operations and Maintainence Costs Subtotal	**$2,180,916**

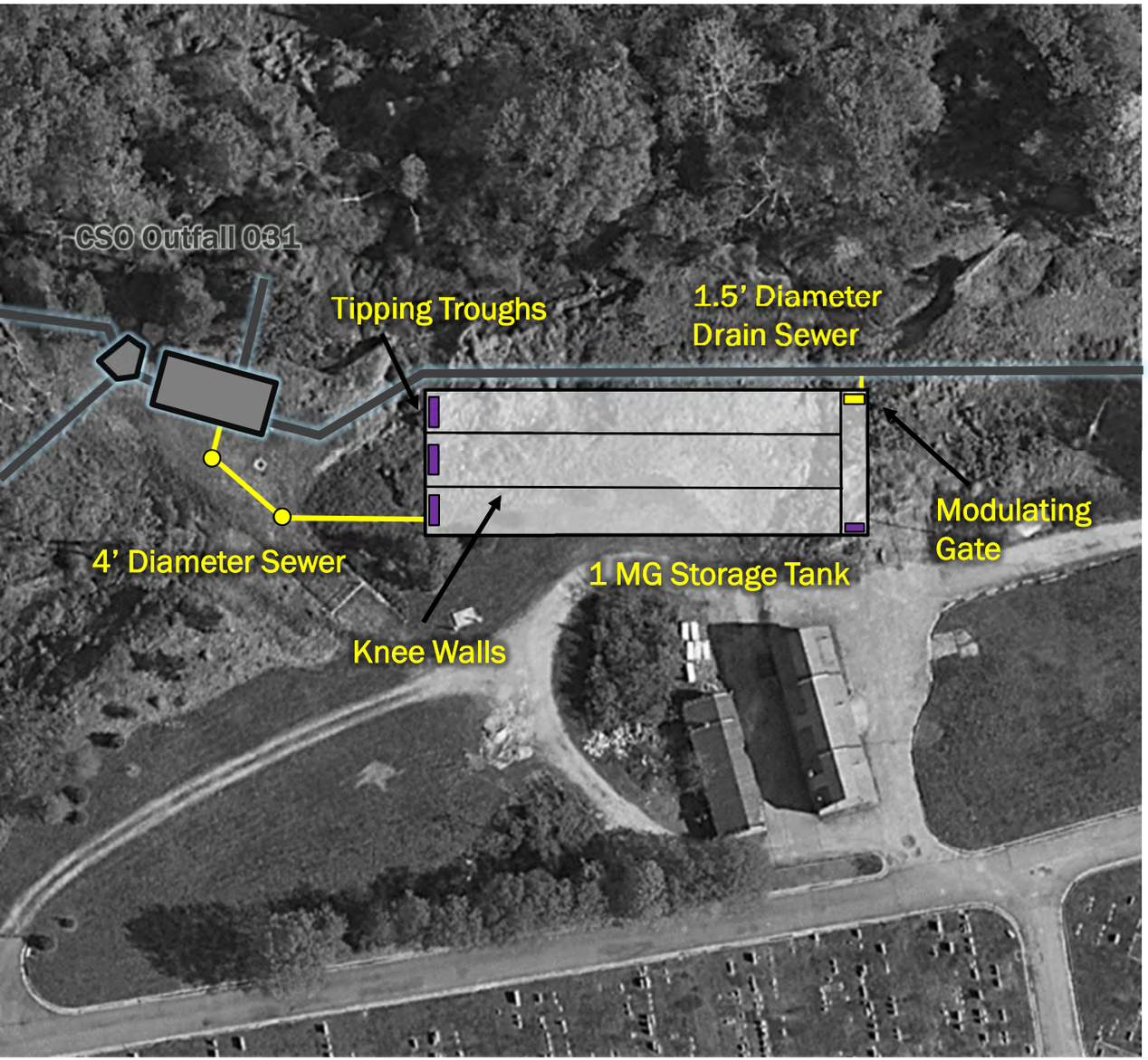
10.	15-Year Replacement Costs						
	a.	Electrical and Instrumentation and Control					
		i.	Furnish and Install Replacement Electrical and I&C		LS	100%	$9,630,000.00 $9,630,000
	b.	Meters					
		i.	Furnish and Install Replacement Meters		EA	8	$7,500.00 $60,000
						15-Year Replacement Costs Subtotal	**$9,690,000**

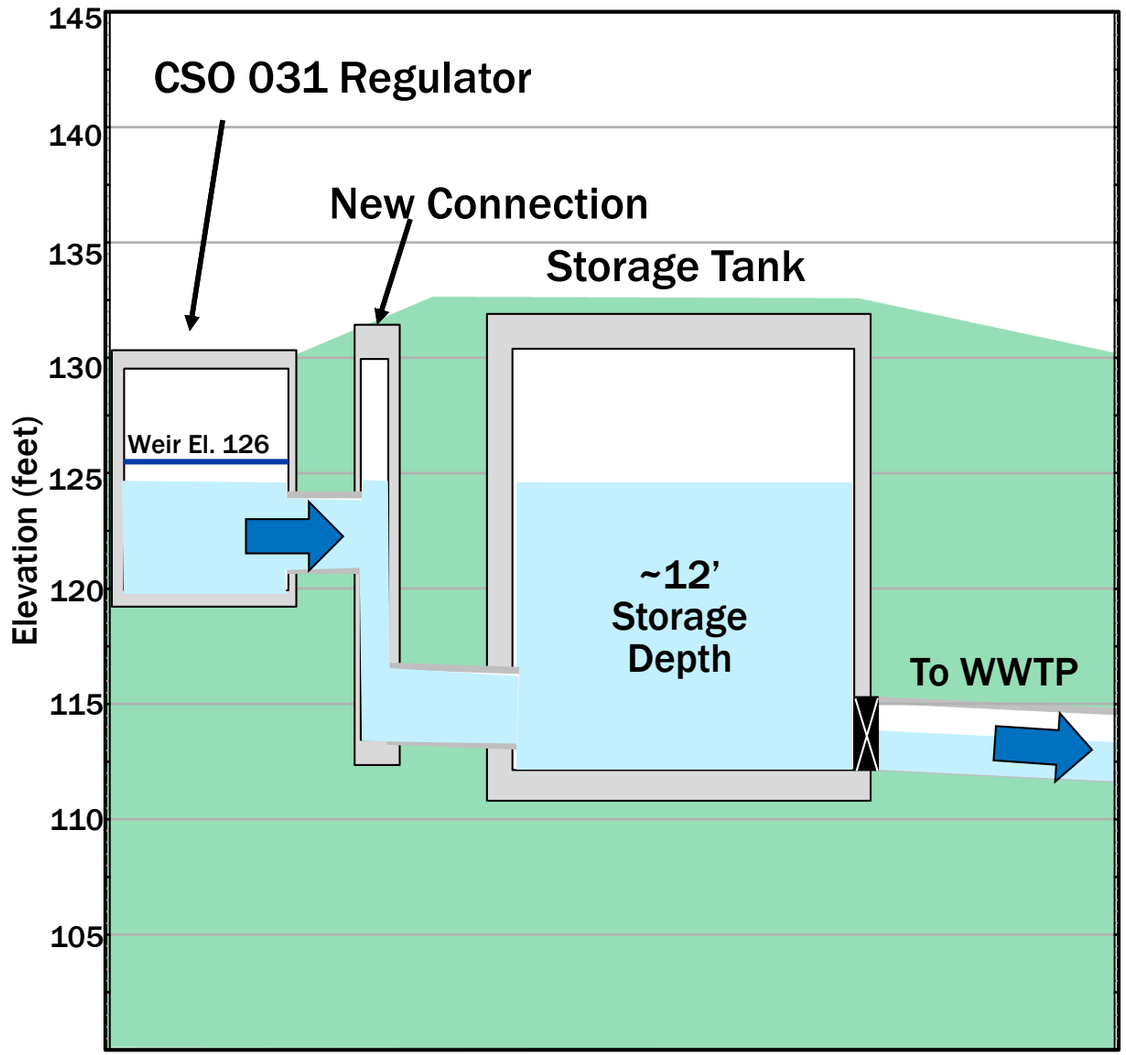
					Southside #6	
					CSO 040 Sewer and HRD	
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Score
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2	<4 Year project schedule with minimal risks for schedule extension	1	2.3
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	1.8	2	None/Minor conflicts	0	0
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	2	2	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	0	0
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	2.3	2	Construction easements or none required	1	2.3
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	1.3	2	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	0	0
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	2.5	2	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	2	5
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	1.8	2	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	0	0
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	2.9	2	Signficant reduction in US/DS HGL as compared to the existing condition	1	2.9
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	1.1	2	>2 other similar facilties/equipment that are currently operated and maintained at the City	0	0
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	1.6	2	No new staff is required for operation and maintenace	1	1.6
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	3.4	2	Project supports future improvements or is foundational for future improvements	2	6.8
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	4.4	2	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	1	4.4
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	3.4	2	Protected against a 100-year flood	1	3.4
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	2.3	2	High potential for known near term (<5 years) future development	2	4.6
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	2	2	No federal or state permits required	0	0
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	3.3	2	Located outside of the Resource Manangement Area (RMA)	0	0
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	0.8	2	Minimal modifications would be required for the City's VPDES permit	0	0
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	3.5	2	Yes	2	7
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	2.9	2	Yes	0	0
			1	Adjacent		
			0	No		
	Impacts to community during construction	2.1	2	Minimal impacts to the community during construction	1	2.1
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	2.3	2	Minimal tree removal/mitigation (<0.2 acres) is required	1	2.3
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		45

Gillies Creek #1

Gillies Creek #1 (Recommended Project)

CSO 031 Storage Tank (1 MG)

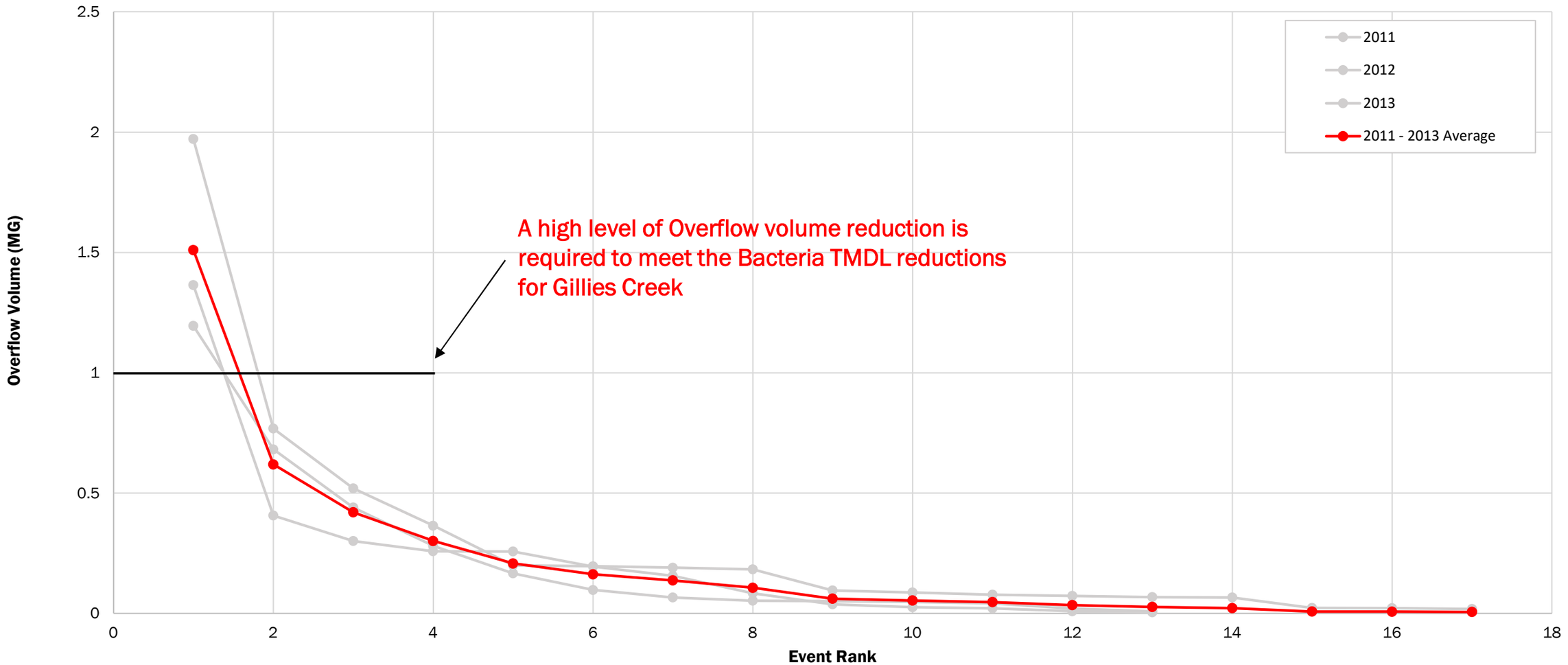




Gillies Creek #1

CSO 031 Storage Tank (1 MG)

Existing CSO at Outfall 031 for Hydrologic Evaluation Period



City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
Gillies Creek #1: Oakwood Cemetery CSS Equilization Storage Tank
Conceptual Design

Item	Unit	Quantity	Unit Cost	Total Amount
0. Structure Dimensions				
a. Oakwood Cemetery Tank				
i. Length	LF	240		
ii. Width	LF	55		
iii. Depth	LF	25		
1. General				
a. Site Prep	ACRE	1	$250,000.00	$250,000.00
			General Subtotal	$250,000
2. Excavation for Structures				
a. Support of Excavation				
i. Sheeting				
Storage Tank Excavation Vertical Area	SF	30,624	$45.00	$1,378,080
Excavation Length	LF	252		
Excavation Width	LF	67		
Excavation Depth	LF	32		
b. Soil				
i. Excavate and Dispose of Soil	CY	20,011	$90.00	$1,800,960
			Excavation for Structures Subtotal	$3,179,040
3. Structural				
a. Oakwood Cemetery Storage Tank'				
i. 225'L x 50'W x 30'D				
Concrete Base Slab	CY	1,600	$775.00	$1,239,656
Base Slab Thickness	LF	3		
Base Slab Length	LF	244		
Base Slab Width	LF	59		
Concrete Exterior Walls	CY	664	$1,500.00	$996,667
Exterior Wall Thickness	LF	2		
Exterior Wall Length	LF	598		
Exterior Wall Height	LF	15		
Concrete Top Slab	CY	1,066	$1,500.00	$1,599,556
Top Slab Thickness	LF	2		
Top Slab Length	LF	244		
Top Slab Width	LF	59		
			Structural Subtotal	$3,835,878
4. Civil				
a. Pipe				
i. Furnish and Install 48" Fiber Reinforced Sewer Pipe	LF	100	$950.00	$95,000
ii. Furnish and Install 18" Fiber Reinforced Sewer Pipe	LF	20	$600.00	$12,000
b. Excavation				
i. Excavation for 48" Fiber Reinforced Sewer Pipe (20' Depth)	CY	652	$90.00	$58,667
Excavation Length	LF	100		
Excavation Width	LF	8		
Excavation Depth	LF	22		
ii. Excavation for 18" Fiber Reinforced Sewer Pipe (15' Depth)	CY	69	$90.00	$6,233
Excavation Length	LF	20		
Excavation Width	LF	6		
Excavation Depth	LF	17		
c. Support of Excavation				
i. Sheeting				
48" Fiber Reinforced Sewer Pipe Excavation Vertical Area	SF	6,600	$45.00	$297,000
Excavation Length	LF	100		
Excavation Depth	LF	22		
18" Fiber Reinforced Sewer Pipe Excavation Vertical Area	SF	1,020	$45.00	$45,900
Excavation Length	LF	20		
Excavation Depth	LF	17		

						Civil Subtotal	$514,800
5.	Mechanical						
	f.	Tipping Troughs					
		i.	Furnish and Install Tipping Troughs	EA	4	$75,000.00	$300,000
	g.	Drain Gates					
		i.	Furnish and Install Drain Gates	EA	2	$37,500.00	$75,000
						Mechanical Subtotal	$380,000
6.	Electrical and I&C						
	a.	Miscellaneous Electrical and I&C					
		i.	Furnish and Install Electrical and I&C (Other)	LS	1	$152,000.00	$152,000
						Electrical and I&C Subtotal	$152,000
7.	Construction Total						
	a.	Subtotal A					$8,311,718
	b.	Design Contingency		LS	1	40%	*$3,324,687*
	c.	Subtotal B		LS	1		$11,636,405
	d.	General Conditions		LS	1	50%	*$5,818,202*
	e.	Subtotal C		LS	1		$17,454,607
	f.	Bonds and Insurance		LS	1	3%	*$523,638*
						Total Estimated Cost	**$17,978,246**

8.	Capital Total						
	a.	Construction Cost Total					$17,978,246
	b.	Capital Contingency		LS	1	50%	*$8,989,123*
						Total Estimated Capital Cost	**$26,967,368**

9.	Annual Operations and Maintainence Costs						
	a.	Labor					
		i.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	$50.00	$10,400
		ii.	Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	$50.00	$4,800
		iii.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	$50.00	$9,600
	b.	Maintenance of Structures					
		i.	Maintain Structures	LS	0.2%	$3,835,877.78	$7,672
	c.	Maintenance of Pipe					
		i.	Maintain Pipe	LS	1.0%	$107,000.00	$1,070
	d.	Maintenance of Mechanical					
		i.	Maintain Tipping Troughs	LS	3%	$300,000.00	$9,000
		ii.	Maintain Drain Gates	LS	3%	$75,000.00	$2,250
	e.	Maintenance of Instrumentation and Control					
		i.	Maintain I&C	LS	3%	$152,000.00	$4,560
						Annual Operations and Maintainence Costs Subtotal	**$49,352**

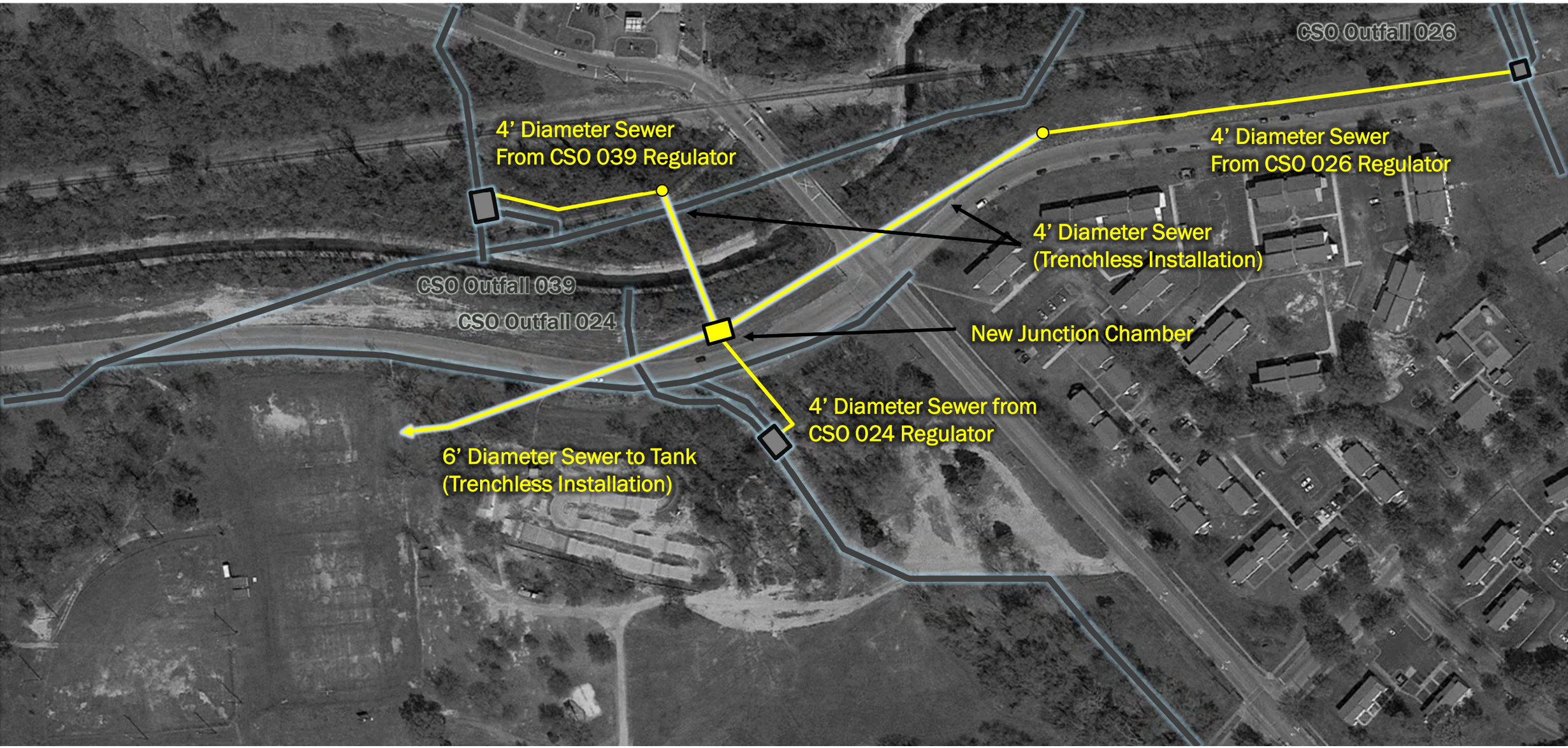
10.	15-Year Replacement Costs						
	a.	Electrical and Instrumentation and Control					
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	$152,000.00	$152,000
	b.	Meters					
		i.	Furnish and Install Replacement Meters	EA	3	$7,500.00	$22,500
						15-Year Replacement Costs Subtotal	**$174,500**

					Gillies Creek #1 CSO 031 Tank	
Category	**Topic**	**Weight**	**Score**	**Criteria**	**Unweighted Score**	**Weighted Score**
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	**2.3**	**2**	<4 Year project schedule with minimal risks for schedule extension	2	4.6
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	**1.8**	**2**	None/Minor conflicts	2	3.6
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	**2**	**2**	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	0	0
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	**2.3**	**2**	Construction easements or none required	2	4.6
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	**1.3**	**2**	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	2	2.6
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	**2.5**	**2**	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	2	5
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	**1.8**	**2**	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	2	3.6
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	**2.9**	**2**	Signficant reduction in US/DS HGL as compared to the existing condition	1	2.9
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	**1.1**	**2**	>2 other similar facilties/equipment that are currently operated and maintained at the City	2	2.2
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	**1.6**	**2**	No new staff is required for operation and maintenace	2	3.2
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	**3.4**	**2**	Project supports future improvements or is foundational for future improvements	2	6.8
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	**4.4**	**2**	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	2	8.8
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	**3.4**	**2**	Protected against a 100-year flood	2	6.8
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	**2.3**	**2**	High potential for known near term (<5 years) future development	2	4.6
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	**2**	**2**	No federal or state permits required	0	0
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	**3.3**	**2**	Located outside of the Resource Manangement Area (RMA)	0	0
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	**0.8**	**2**	Minimal modifications would be required for the City's VPDES permit	2	1.6
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	**3.5**	**2**	Yes	2	7
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	**2.9**	**2**	Yes	2	5.8
			1	Adjacent		
			0	No		
	Impacts to community during construction	**2.1**	**2**	Minimal impacts to the community during construction	2	4.2
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	**2.3**	**2**	Minimal tree removal/mitigation (<0.2 acres) is required	2	4.6
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		**83**

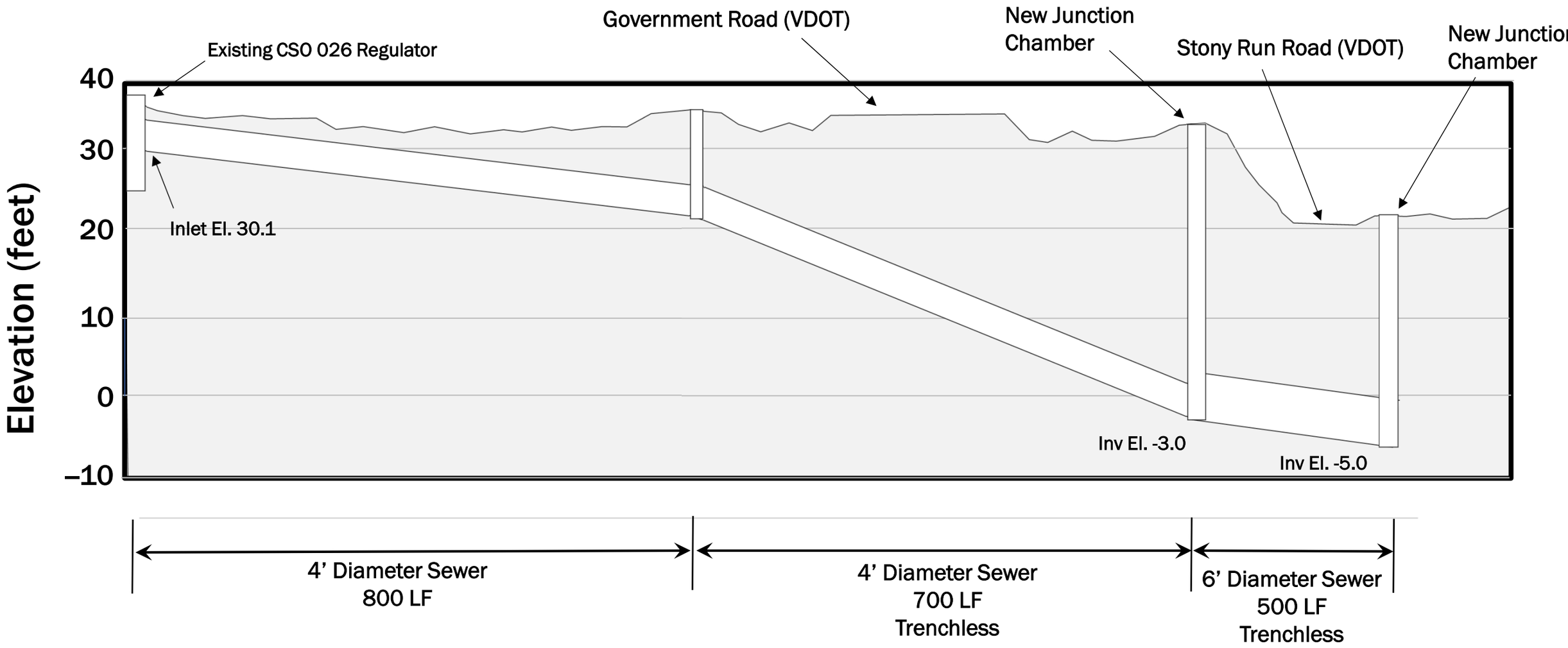
Gillies Creek #2

Gillies Creek #2

CSO 024, 026, and 039 Conveyance Sewer and Storage Tank

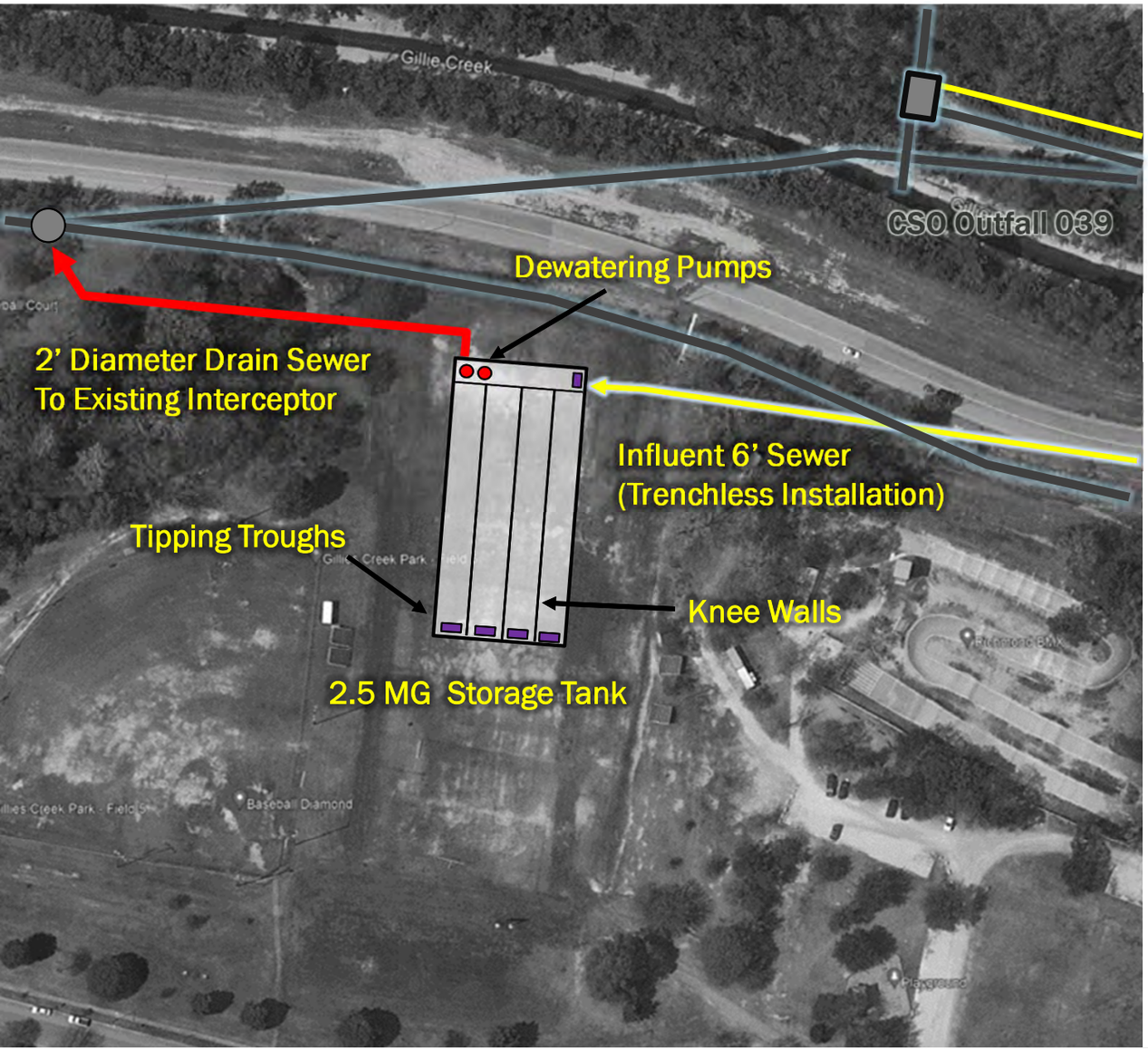


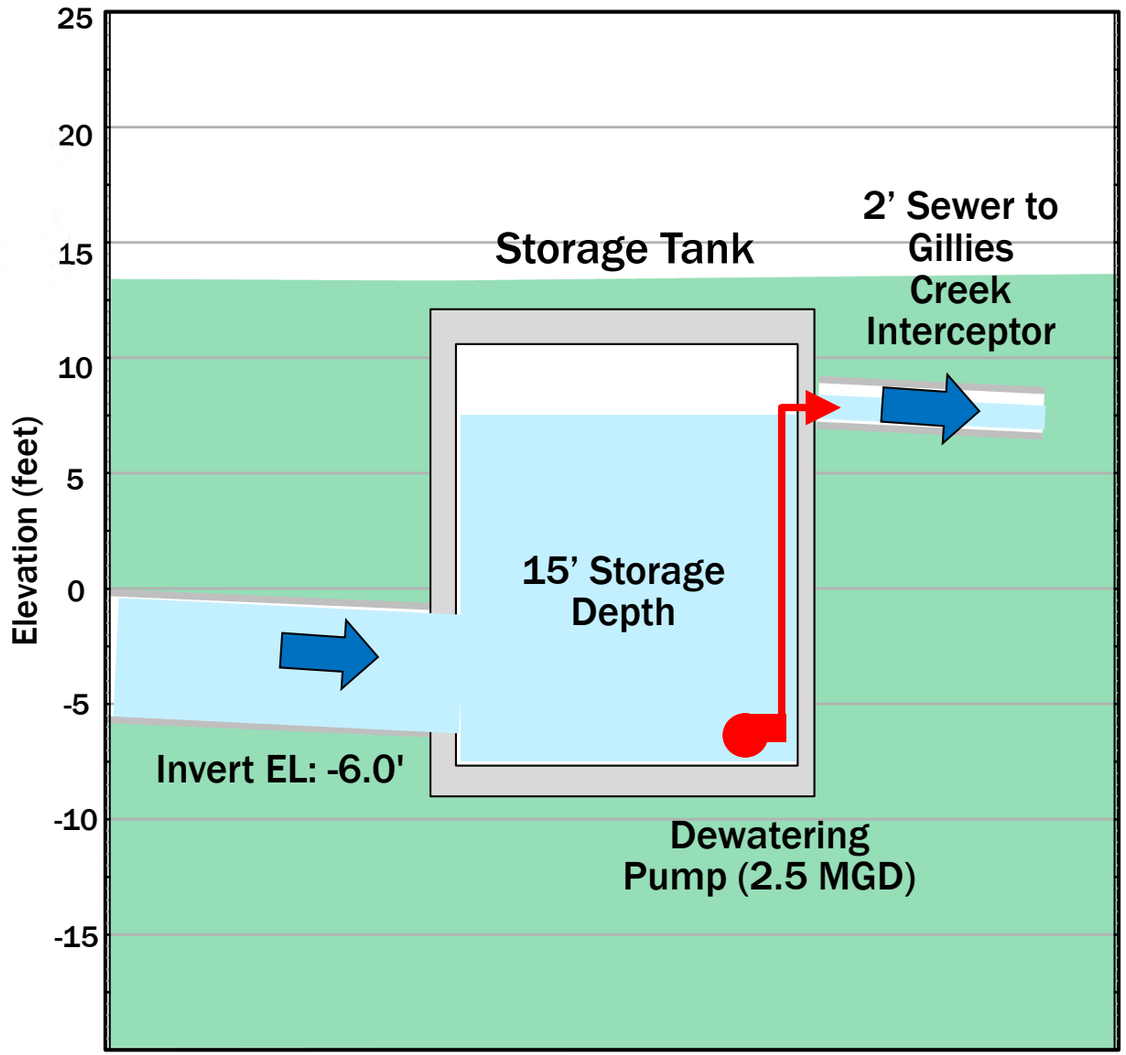
Profile


Existing CSO 026 Regulator
Government Road (VDOT)
New Junction Chamber
Stony Run Road (VDOT)
New Junction Chamber
Elevation (feet)
40
30
20
10
0
–10
Inlet El. 30.1
Inv El. -3.0
Inv El. -5.0
4’ Diameter Sewer
800 LF
4’ Diameter Sewer
700 LF
Trenchless
6’ Diameter Sewer
500 LF
Trenchless

Gillies Creek #2

CSO 024, 026, and 039 Conveyance Sewer and Storage Tank

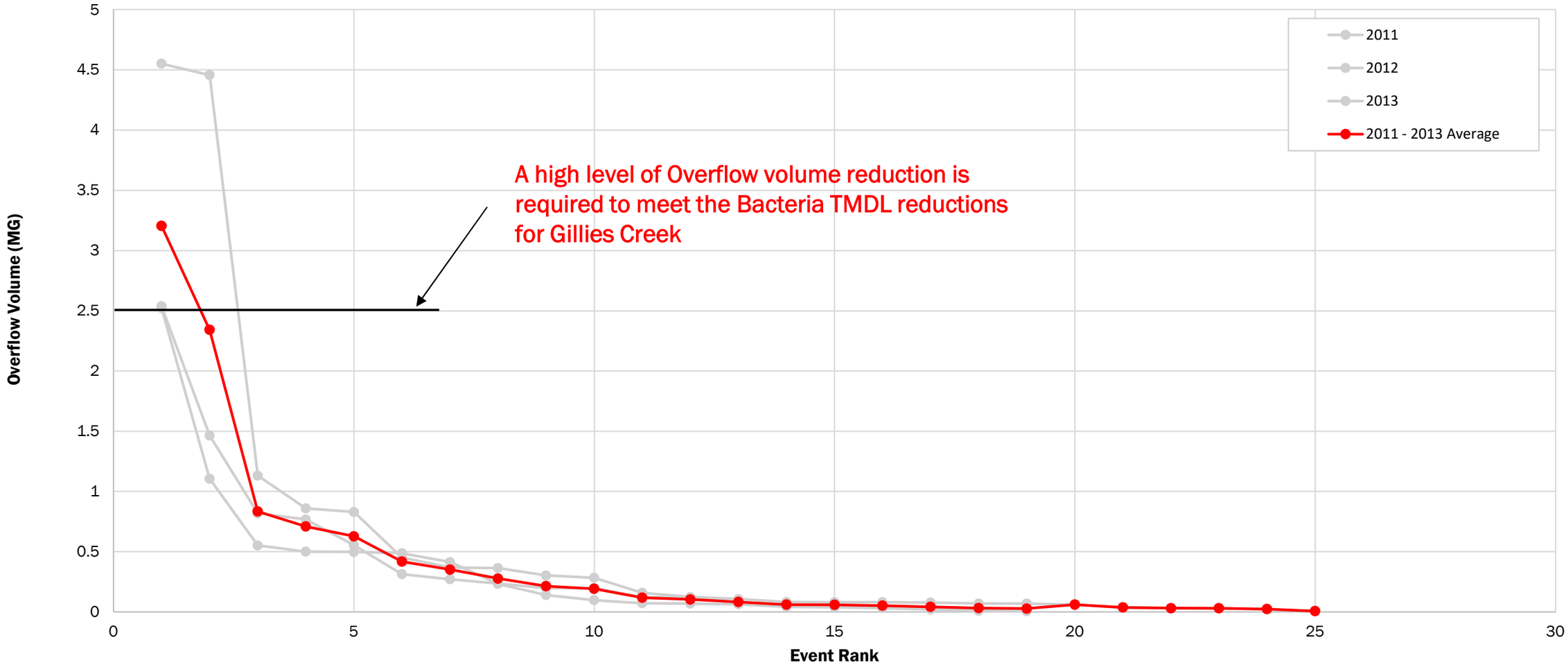




Gillies Creek #2

CSO 026, 024, and 039 Conveyance Sewer and Storage Tank

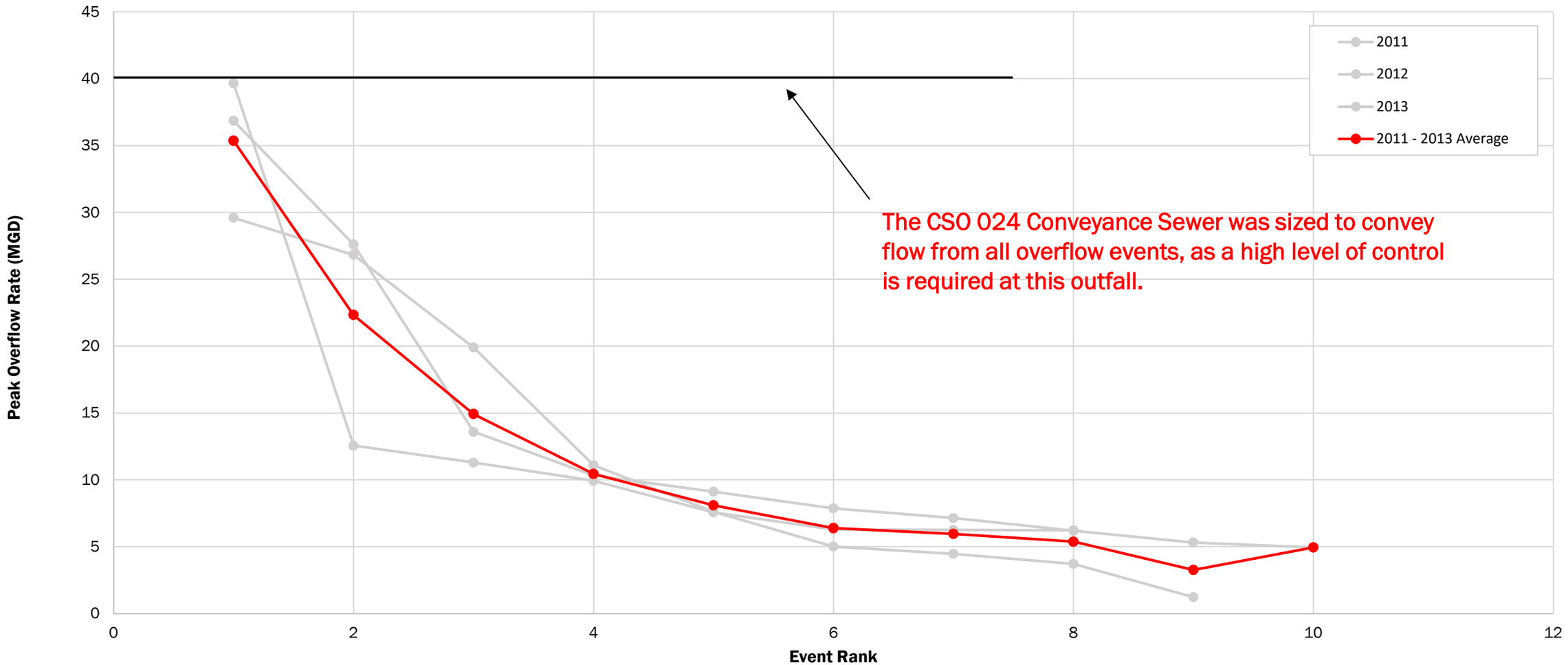
Combined Existing CSO at Outfalls 024, 026, and 039 for Hydrologic Evaluation Period



Gillies Creek #2

CSO 026, 024, and 039 Conveyance Sewer and Storage Tank

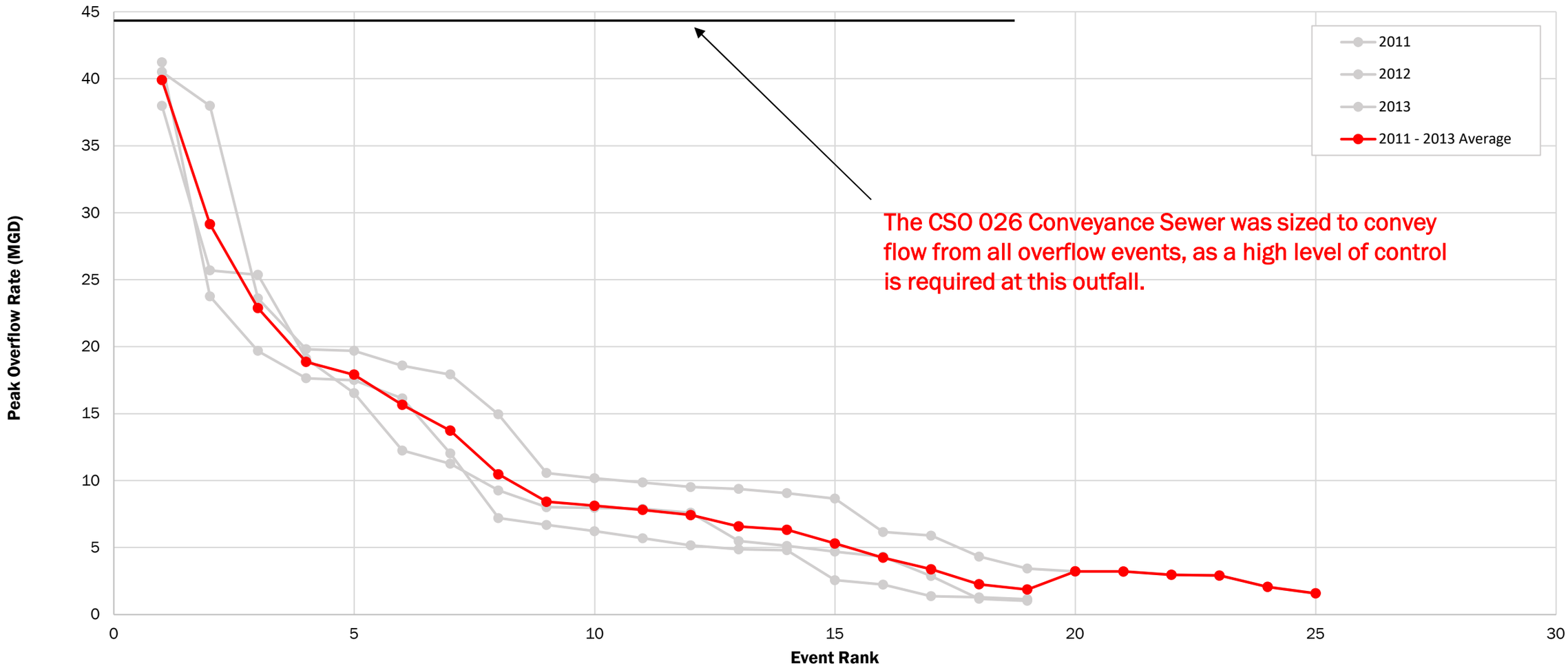
Existing CSO at Outfall 024 for Hydraulic Evaluation Period



Gillies Creek #2

CSO 026, 024, and 039 Conveyance Sewer and Storage Tank

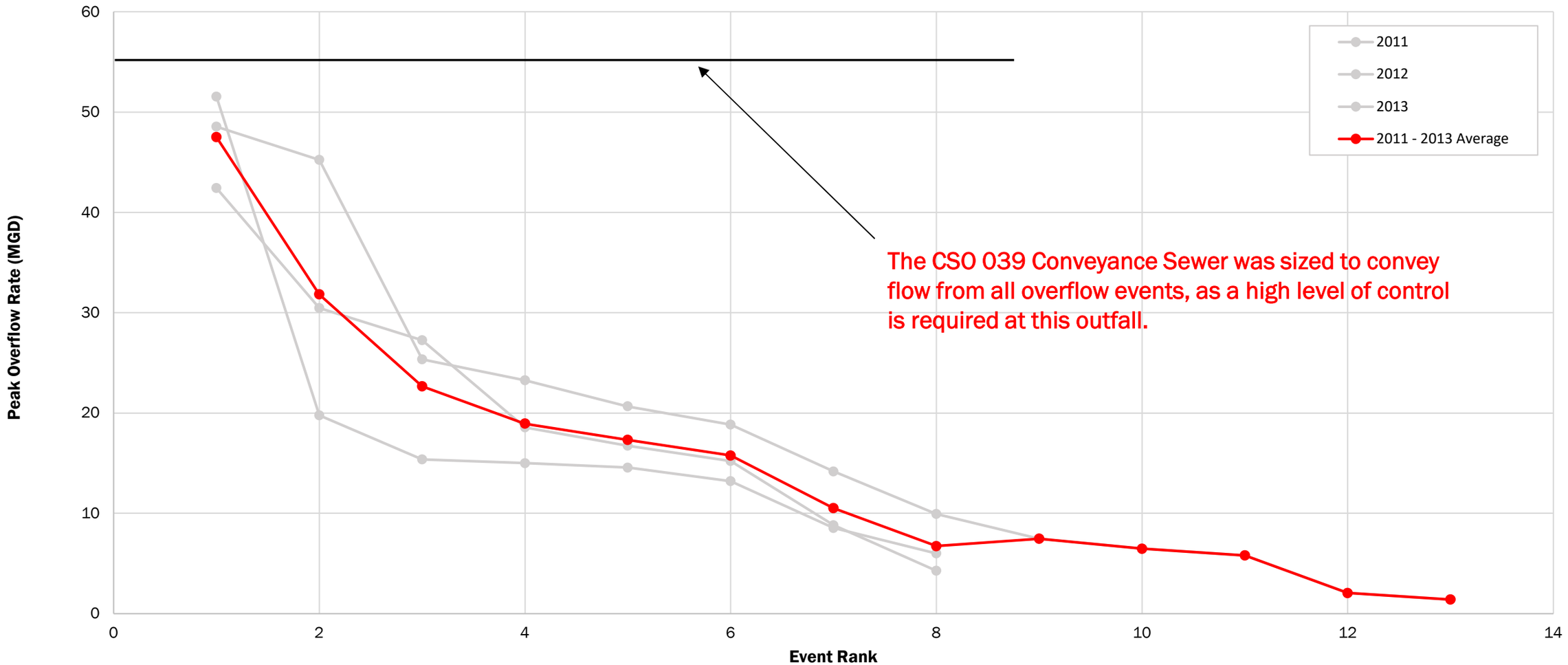
Existing CSO at Outfall 026 for Hydraulic Evaluation Period



Gillies Creek #2

CSO 026, 024, and 039 Conveyance Sewer and Storage Tank

Existing CSO at Outfall 039 for Hydraulic Evaluation Period



City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
Gillies Creek #2: Gillies Creek Park EQ Tank and CSO 024/026/039 Conveyance Sewer
Conceptual Design

Item	Unit	Quantity	Unit Cost	Total Amount
0. Structure Dimensions				
a. New Junction Chamber				
i. Length	LF	15		
ii. Width	LF	15		
iii. Depth	LF	40		
b. Storage Tank (covered)				
i. Length	LF	220		
ii. Width	LF	100		
iii. Depth	LF	25		
c. Odor Control Vault				
i. Length	LF	30		
ii. Width	LF	40		
iii. Depth	LF	20		
1. General				
a. Site Prep	ACRE	3	$250,000.00	$750,000.00
			General Subtotal	$750,000
2. Excavation for Structures				
a. Support of Excavation				
i. Sheeting				
New Junction Chamber	SF	8,928	$45.00	$401,760
Excavation Length	LF	31		
Excavation Width	LF	31		
Excavation Depth	LF	48		
Storage Tank (covered)	SF	33,024	$45.00	$1,486,080
Excavation Length	LF	232		
Excavation Width	LF	112		
Excavation Depth	LF	32		
Odor Control Vault Excavation Vertical Area	SF	7,614	$45.00	$342,630
Excavation Length	LF	42		
Excavation Width	LF	52		
Excavation Depth	LF	27		
b. Soil				
i. Excavate and Dispose of Soil	CY	34,688	$90.00	$3,121,947
			Excavation for Structures Subtotal	$5,352,417
3. Structural				
a. New Junction Chamber				
i. 15'L x 15'W x 40'D				
Concrete Base Slab	CY	78	$775.00	$60,737
Base Slab Thickness	LF	4		
Base Slab Length	LF	23		
Base Slab Width	LF	23		
Concrete Exterior Walls	CY	450	$1,500.00	$675,556
Exterior Wall Thickness	LF	4		
Exterior Wall Length	LF	76		
Exterior Wall Height	LF	40		
Concrete Top Slab	CY	39	$1,500.00	$58,778
Top Slab Thickness	LF	2		
Top Slab Length	LF	23		
Top Slab Width	LF	23		
b. Storage Tank (covered)				
i. 220'L x 100'W x 25'D				
Concrete Base Slab	CY	2,588	$775.00	$2,006,044
Base Slab Thickness	LF	3		
Base Slab Length	LF	224		
Base Slab Width	LF	104		
Concrete Exterior Walls	CY	1,200	$1,500.00	$1,800,000
Exterior Wall Thickness	LF	2		
Exterior Wall Length	LF	648		
Exterior Wall Height	LF	25		
Concrete Top Slab	CY	1,726	$1,500.00	$2,588,444
Top Slab Thickness	LF	2		
Top Slab Length	LF	224		
Top Slab Width	LF	104		
c. Odor Control Vault				
i. 30'L x 40'W x 20'D				
Concrete Base Slab	CY	166	$775.00	$128,822

				Base Slab Thickness	LF	3		
				Base Slab Length	LF	34		
				Base Slab Width	LF	44		
				Concrete Exterior Walls	CY	219	$1,500.00	$328,889
				Exterior Wall Thickness	LF	2		
				Exterior Wall Length	LF	148		
				Exterior Wall Height	LF	20		
				Concrete Top Slab	CY	111	$1,500.00	$166,222
				Top Slab Thickness	LF	2		
				Top Slab Length	LF	34		
				Top Slab Width	LF	44		
							Structural Subtotal	$7,813,493
4.	Civil							
	a.	Pipe						
		i.		Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 026, 15' Depth)	LF	800	$950.00	$760,000
		ii.		Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 026, Trenchless)	LF	700	$4,200.00	$2,940,000
		iii.		Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 024, 20' Depth)	LF	200	$950.00	$190,000
		iv.		Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 039, 25' Depth)	LF	200	$950.00	$190,000
		v.		Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 039, Trenchless)	LF	250	$4,200.00	$1,050,000
		vi.		Furnish and Install 72" Fiber Reinforced Sewer Pipe (Storage Tank, Trenchless)	LF	500	$5,600.00	$2,800,000
		vii.		Furnish and Install 24" Fiber Reinforced Sewer Pipe (Drain Pipe, 10' Depth)	LF	300	$650.00	$195,000
	b.	Excavation						
		i.		Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 026, 15' Depth)	CY	3,556	$90.00	$320,000
				Excavation Length	LF	800		
				Excavation Width	LF	8		
				Excavation Depth	LF	15		
		ii.		Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 024, 20' Depth)	CY	1,185	$90.00	$106,667
				Excavation Length	LF	200		
				Excavation Width	LF	8		
				Excavation Depth	LF	20		
		iii.		Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 039, 30' Depth)	CY	1,481	$90.00	$133,333
				Excavation Length	LF	200		
				Excavation Width	LF	8		
				Excavation Depth	LF	25		
		iv.		Excavation for 24" Fiber Reinforced Sewer Pipe (Drain Pipe, 10' Depth)	CY	667	$90.00	$60,000
				Excavation Length	LF	300		
				Excavation Width	LF	6		
				Excavation Depth	LF	10		
	c.	Trenchless Utility Installation						
		i.		48" Fiber Reinforced Sewer Pipe (CSO 026) Trenchless Installation				
				Jacking Pit Excavation	CY	444	$90.00	$40,000
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	15		
				Receiving Pit Excavation	CY	222	$90.00	$20,000
				Excavation Length	LF	20		
				Excavation Width	LF	20		
				Excavation Depth	LF	15		
		ii.		48" Fiber Reinforced Sewer Pipe (CSO 039) Trenchless Installation				
				Jacking Pit Excavation	CY	889	$90.00	$80,000
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	30		
				Receiving Pit Excavation	CY	444	$90.00	$40,000
				Excavation Length	LF	20		
				Excavation Width	LF	20		
				Excavation Depth	LF	30		
		ii.		72" Fiber Reinforced Sewer Pipe (Storage Tank) Trenchless Installation				
				Jacking Pit Excavation	CY	444	$90.00	$40,000
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	15		
				Receiving Pit Excavation	CY	222	$90.00	$20,000
				Excavation Length	LF	20		
				Excavation Width	LF	20		
				Excavation Depth	LF	15		
	d.	Support of Excavation						
		i.		Sheeting				
				48" Fiber Reinforced Sewer Pipe (CSO 026, 15' Depth) Excavation Vertical Area	SF	36,000	$45.00	$1,620,000
				Excavation Length	LF	800		
				Excavation Depth	LF	15		
				48" Fiber Reinforced Sewer Pipe (CSO 024, 20' Depth) Excavation Vertical Area	SF	12,000	$45.00	$540,000
				Excavation Length	LF	200		
				Excavation Depth	LF	20		
				48" Fiber Reinforced Sewer Pipe (CSO 039, 30' Depth) Excavation Vertical Area	SF	15,000	$45.00	$675,000

				Excavation Length	LF	200		
				Excavation Depth	LF	25		
				24" Fiber Reinforced Sewer Pipe (Drain Pipe, 10' Depth) Excavation Vertical Area	SF	9,000	$45.00	$405,000
				Excavation Length	LF	300		
				Excavation Depth	LF	10		
				Jacking Pit Excavation Vertical Area	SF	10,800	$45.00	$486,000
				Receiving Pit Excavation Vertical Area	SF	7,200	$45.00	$324,000
							Civil Subtotal	$13,035,000
5.	Mechanical							
	a.	Tipping Troughs						
		i.		Furnish and Install Tipping Troughs	EA	4	$75,000.00	$300,000
	b.	Pumps						
		i.		Dewatering Pumps	MGD	3	$75,000.00	$187,500
	c.	Odor Control						
		i.		Exhaust Fans and Carbon Adsorber	CFM	9,167	$50.00	$458,333
							Mechanical Subtotal	$950,000
6.	Electrical and I&C							
	a.	Miscellaneous Electrical and I&C						
		i.		Furnish and Install Electrical and I&C (Other)	LS	1	$380,000.00	$380,000
							Electrical and I&C Subtotal	$380,000
7.	Construction Total							
	a.	Subtotal A						$28,280,909
	b.	Design Contingency			LS	1	40%	*$11,312,364*
	c.	Subtotal B			LS	1		$39,593,273
	d.	General Conditions			LS	1	50%	*$19,796,636*
	e.	Subtotal C			LS	1		$59,389,909
	f.	Bonds and Insurance			LS	1	3%	*$1,781,697*
							Total Estimated Cost	**$61,171,607**

8.	Capital Total							
	a.	Construction Cost Total						$61,171,607
	b.	Capital Contingency			LS	1	50%	*$30,585,803*
							Total Estimated Capital Cost	**$91,757,410**

9.	Annual Operations and Maintainence Costs							
	a.	Labor						
		i.		Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	$50.00	$10,400
		ii.		Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	$50.00	$4,800
		iii.		Pipe Cleaning (Once every 5 years)	LF	2,950	$30.00	$17,700
		iv.		Structure Cleaning (Once per year)	EA	1	$10,000.00	$10,000
		v.		Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	$50.00	$9,600
	b.	Maintenance of Structures						
		i.		Maintain Structures	LS	0.2%	$7,813,492.59	$15,627
	c.	Maintenance of Pipe						
		i.		Maintain Pipe	LS	1.0%	$8,125,000.00	$81,250
	d.	Maintenance of Mechanical						
		i.		Maintain Tipping Troughs	LS	3%	$300,000.00	$9,000
		ii.		Maintain Pumps	LS	3%	$187,500.00	$5,625
		iii.		Maintain Odor Control Facility	LS	3%	$458,333.33	$13,750
	e.	Maintenance of Instrumentation and Control						
		i.		Maintain I&C	LS	3%	$380,000.00	$11,400
							Annual Operations and Maintainence Costs Subtotal	**$189,152**

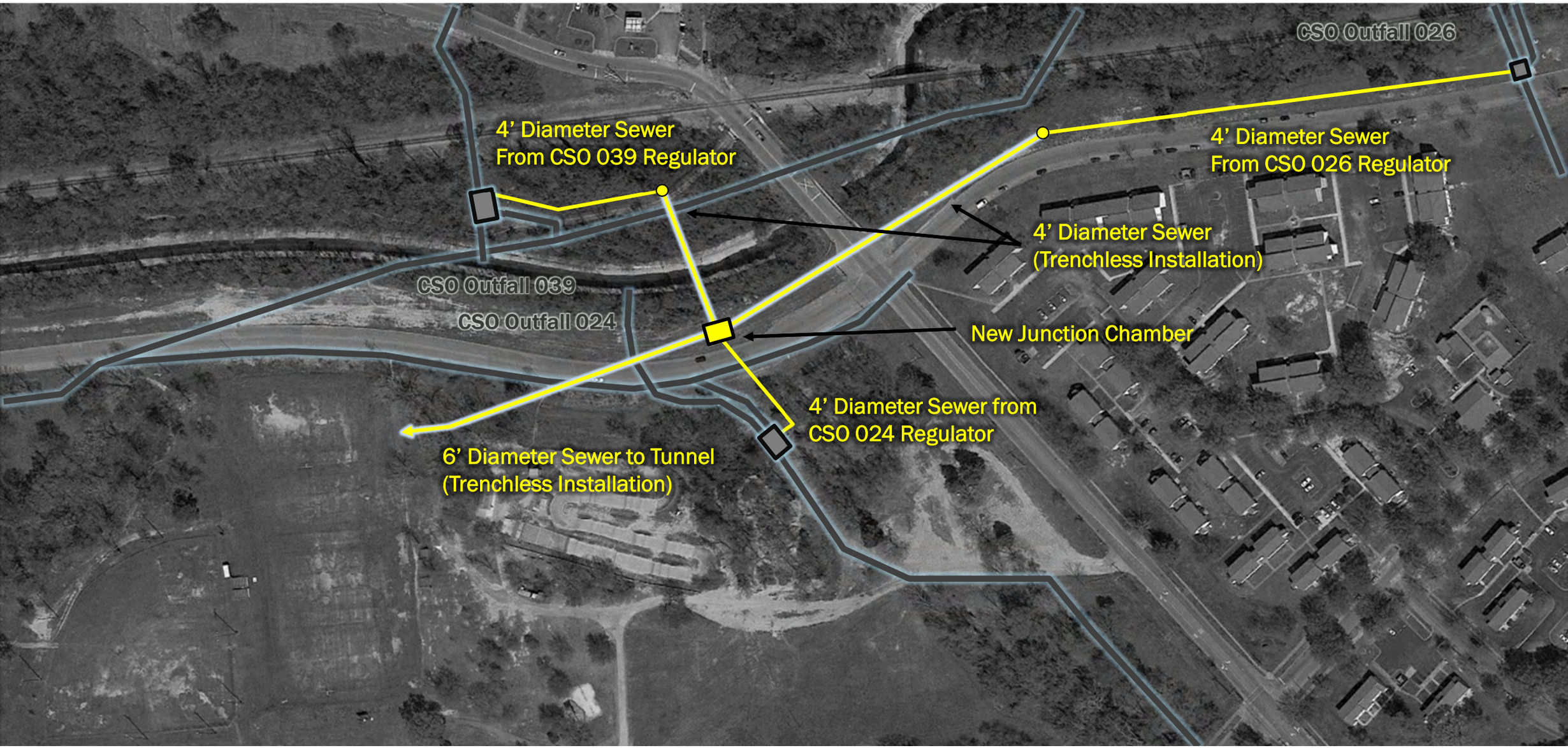
10.	15-Year Replacement Costs							
	a.	Electrical and Instrumentation and Control						
		i.		Furnish and Install Replacement Electrical and I&C	LS	100%	$380,000.00	$380,000
	b.	Meters						
		i.		Furnish and Install Replacement Meters	EA	3	$7,500.00	$22,500
							15-Year Replacement Costs Subtotal	**$402,500**

					Gillies Creek #2	
					Gillies Creek Sewer and Tank	
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Score
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2	<4 Year project schedule with minimal risks for schedule extension	1	2.3
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	1.8	2	None/Minor conflicts	1	1.8
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	2	2	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	1	2
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	2.3	2	Construction easements or none required	2	4.6
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	1.3	2	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	1	1.3
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	2.5	2	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	2	5
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	1.8	2	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	1	1.8
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	2.9	2	Signficant reduction in US/DS HGL as compared to the existing condition	1	2.9
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	1.1	2	>2 other similar facilties/equipment that are currently operated and maintained at the City	2	2.2
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	1.6	2	No new staff is required for operation and maintenace	2	3.2
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	3.4	2	Project supports future improvements or is foundational for future improvements	2	6.8
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	4.4	2	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	2	8.8
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	3.4	2	Protected against a 100-year flood	1	3.4
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	2.3	2	High potential for known near term (<5 years) future development	2	4.6
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	2	2	No federal or state permits required	1	2
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	3.3	2	Located outside of the Resource Manangement Area (RMA)	1	3.3
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	0.8	2	Minimal modifications would be required for the City's VPDES permit	2	1.6
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	3.5	2	Yes	2	7
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	2.9	2	Yes	2	5.8
			1	Adjacent		
			0	No		
	Impacts to community during construction	2.1	2	Minimal impacts to the community during construction	0	0
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	2.3	2	Minimal tree removal/mitigation (<0.2 acres) is required	1	2.3
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		73

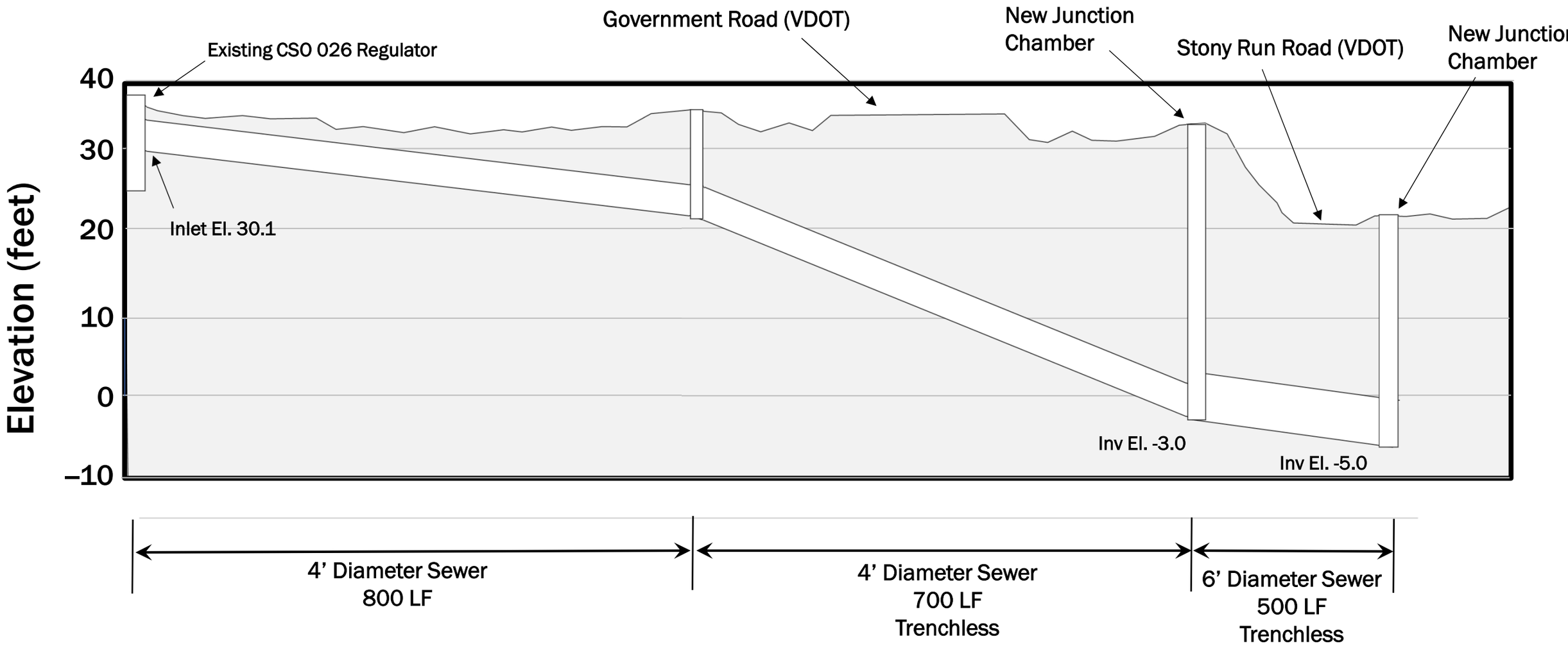
Gillies Creek #3

Gillies Creek #3

CSO 024, 026, and 039 Conveyance Sewer and Tunnel

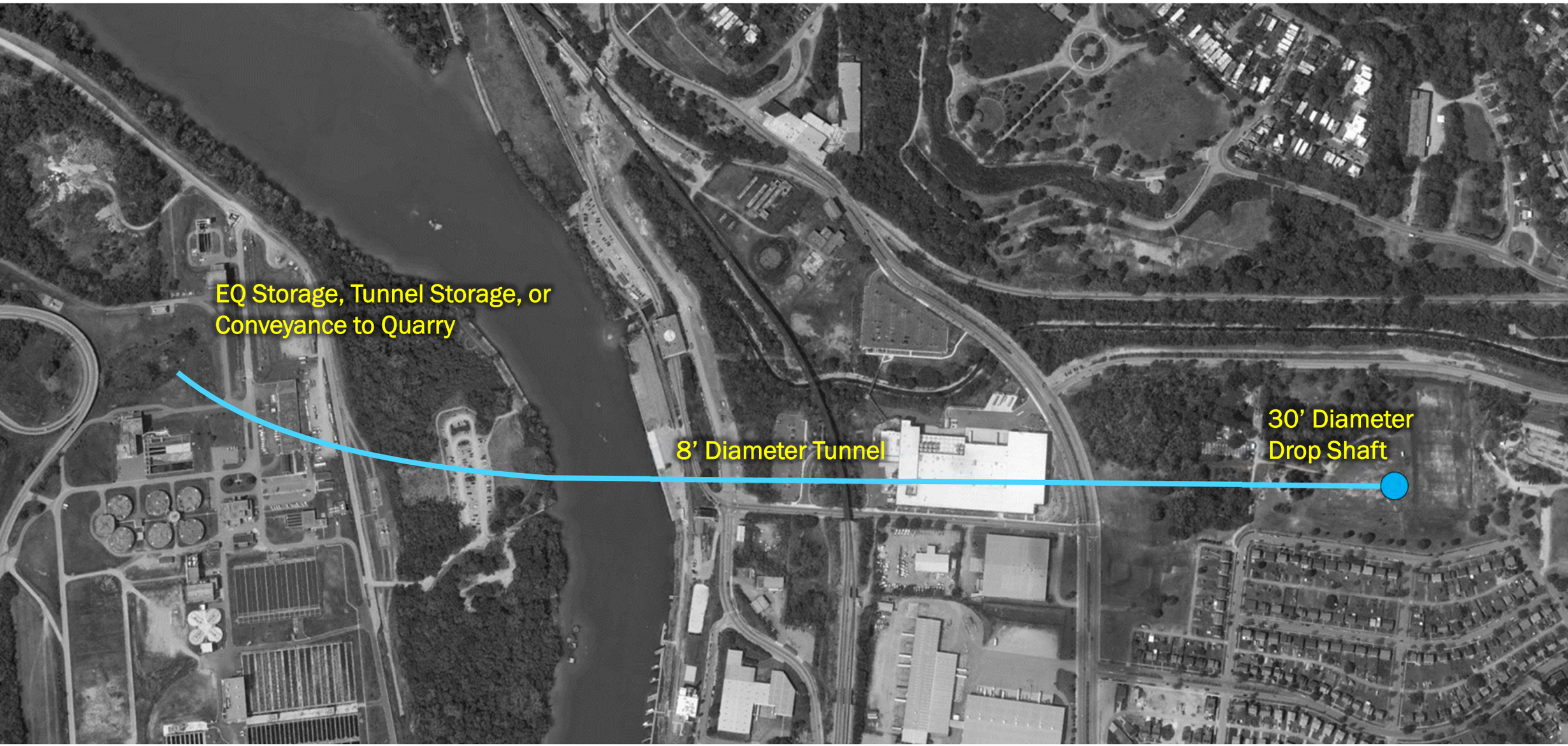


Conveyance Sewer Profile

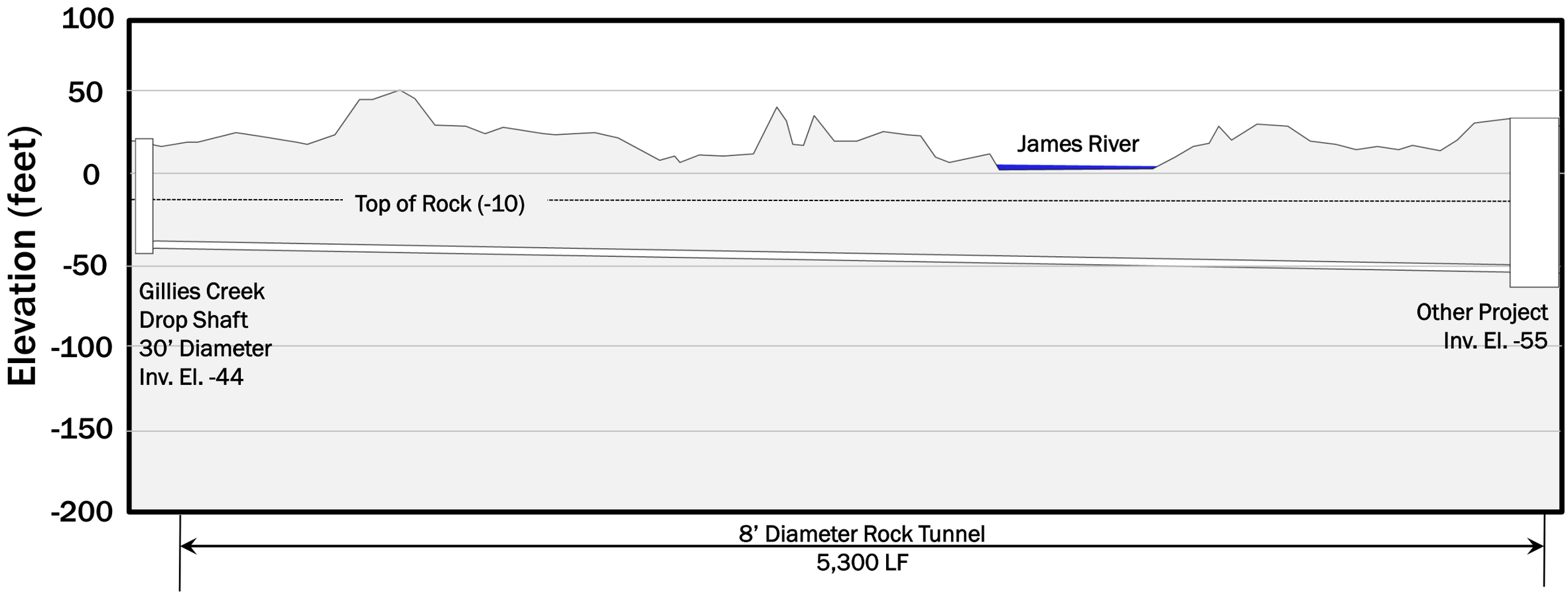


Gillies Creek #3

CSO 026, 024 and 039 Conveyance Sewer and Storage Tunnel (2.5 MG)

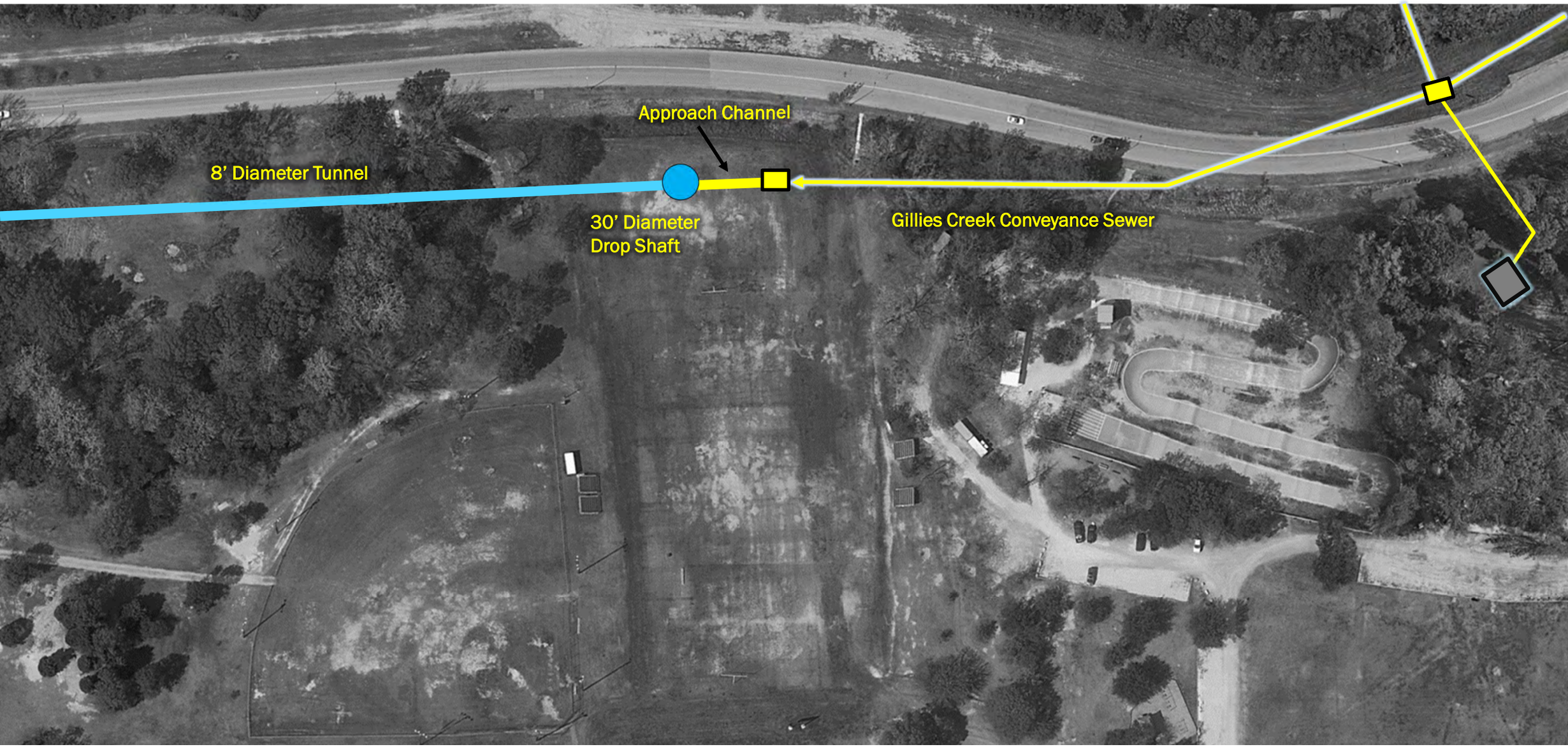


Tunnel Profile



Gillies Creek #3

CSO 026, 024 and 039 Conveyance Sewer and Storage Tunnel (2.5 MG)



City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
Gillies Creek #3: Conveyance Tunnel and CSO 024/026/039 Conveyance Sewer
Conceptual Design

Item	Unit	Quantity	Unit Cost	Total Amount
0. Structure Dimensions				
a. New Junction Chamber				
i. Length	LF	15		
ii. Width	LF	15		
iii. Depth	LF	40		
b. Approach Channel				
i. Length	LF	50		
ii. Width	LF	8		
iii. Depth	LF	8		
c. Dropshaft				
i. Diameter	LF	30		
iii. Depth	LF	70		
1. General				
a. Site Prep	ACRE	3	$250,000.00	$750,000.00
			General Subtotal	$750,000
2. Excavation for Structures				
a. Support of Excavation				
i. Sheeting				
New Junction Chamber	SF	8,928	$45.00	$401,760
Excavation Length	LF	31		
Excavation Width	LF	31		
Excavation Depth	LF	48		
Storage Tank (covered)	SF	3,744	$45.00	$168,480
Excavation Length	LF	60		
Excavation Width	LF	18		
Excavation Depth	LF	16		
ii. Secant Piling				
Dropshaft	SF	11,335	$190.00	$2,153,625
Excavation Diameter	LF	44		
Excavation Depth	LF	82		
b. Soil				
i. Excavate and Dispose of Soil	CY	2,348	$90.00	$211,360
ii. Excavate and Dispose of Dropshaft Overburden	CY	2,534	$180.00	$456,159
c. Rock				
i. Excavate and Dispose of Rock	CY	0	$300.00	$0
ii. Excavate and Dispose of Dropshaft Rock	CY	2,084	$300.00	$625,107
			Excavation for Structures Subtotal	$4,016,491
3. Structural				
a. New Junction Chamber				
i. 15'L x 15'W x 40'D				
Concrete Base Slab	CY	78	$775.00	$60,737
Base Slab Thickness	LF	4		
Base Slab Length	LF	23		
Base Slab Width	LF	23		
Concrete Exterior Walls	CY	450	$1,500.00	$675,556
Exterior Wall Thickness	LF	4		
Exterior Wall Length	LF	76		
Exterior Wall Height	LF	40		
Concrete Top Slab	CY	39	$1,500.00	$58,778
Top Slab Thickness	LF	2		
Top Slab Length	LF	23		
Top Slab Width	LF	23		
b. Approach Channel				
i. 50'L x 8'W x 8'D				
Concrete Base Slab	CY	77	$775.00	$59,704
Base Slab Thickness	LF	4		
Base Slab Length	LF	52		
Base Slab Width	LF	10		
Concrete Exterior Walls	CY	36	$1,500.00	$53,333
Exterior Wall Thickness	LF	1		
Exterior Wall Length	LF	120		
Exterior Wall Height	LF	8		
Concrete Top Slab	CY	39	$1,500.00	$57,778
Top Slab Thickness	LF	2		
Top Slab Length	LF	52		
Top Slab Width	LF	10		
c. Dropshaft				
i. 30' Dia x 70' Depth				

				Concrete Base Slab	CY	253	$1,100.00	$278,764
				Base Slab Thickness	LF	8		
				Base Slab Diameter	LF	33		
				Concrete Exterior Walls	CY	806	$2,100.00	$1,693,318
				Exterior Wall Thickness	LF	3		
				Exterior Wall Annular Area	SF	311		
				Exterior Wall Height	LF	70		
				Concrete Top Slab	CY	63	$1,500.00	$95,033
				Top Slab Thickness	LF	2		
				Top Slab Diameter	LF	33		
							Structural Subtotal	$3,033,001
4.	Civil							
	a.	Pipe						
		i.		Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 026, 15' Depth)	LF	800	$950.00	$760,000
		ii.		Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 026, Trenchless)	LF	700	$4,200.00	$2,940,000
		iii.		Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 024, 20' Depth)	LF	200	$950.00	$190,000
		iv.		Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 039, 25' Depth)	LF	200	$950.00	$190,000
		v.		Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 039, Trenchless)	LF	250	$4,200.00	$1,050,000
		vi.		Furnish and Install 72" Fiber Reinforced Sewer Pipe (to Tunnel, Trenchless)	LF	500	$5,600.00	$2,800,000
	b.	Excavation						
		i.		Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 026, 15' Depth)	CY	3,556	$90.00	$320,000
				Excavation Length	LF	800		
				Excavation Width	LF	8		
				Excavation Depth	LF	15		
		ii.		Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 024, 20' Depth)	CY	1,185	$90.00	$106,667
				Excavation Length	LF	200		
				Excavation Width	LF	8		
				Excavation Depth	LF	20		
		iii.		Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 039, 30' Depth)	CY	1,481	$90.00	$133,333
				Excavation Length	LF	200		
				Excavation Width	LF	8		
				Excavation Depth	LF	25		
	c.	Trenchless Utility Installation						
		i.		48" Fiber Reinforced Sewer Pipe (CSO 026, Trenchless) Trenchless Installation				
				Jacking Pit Excavation	CY	444	$90.00	$40,000
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	15		
				Receiving Pit Excavation	CY	222	$90.00	$20,000
				Excavation Length	LF	20		
				Excavation Width	LF	20		
				Excavation Depth	LF	15		
		ii.		48" Fiber Reinforced Sewer Pipe (CSO 039, Trenchless) Trenchless Installation				
				Jacking Pit Excavation	CY	889	$90.00	$80,000
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	30		
				Receiving Pit Excavation	CY	444	$90.00	$40,000
				Excavation Length	LF	20		
				Excavation Width	LF	20		
				Excavation Depth	LF	30		
		iii.		48" Fiber Reinforced Sewer Pipe (to Tunnel, Trenchless) Trenchless Installation				
				Jacking Pit Excavation	CY	444	$90.00	$40,000
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	15		
				Receiving Pit Excavation	CY	222	$90.00	$20,000
				Excavation Length	LF	20		
				Excavation Width	LF	20		
				Excavation Depth	LF	15		
	d.	Support of Excavation						
		i.		Sheeting				
				48" Fiber Reinforced Sewer Pipe (CSO 026, 15' Depth) Excavation Vertical Area	SF	36,000	$45.00	$1,620,000
				Excavation Length	LF	800		
				Excavation Depth	LF	15		
				48" Fiber Reinforced Sewer Pipe (CSO 024, 20' Depth) Excavation Vertical Area	SF	12,000	$45.00	$540,000
				Excavation Length	LF	200		
				Excavation Depth	LF	20		
				48" Fiber Reinforced Sewer Pipe (CSO 039, 30' Depth) Excavation Vertical Area	SF	15,000	$45.00	$675,000
				Excavation Length	LF	200		
				Excavation Depth	LF	25		
				Jacking Pit Excavation Vertical Area	SF	10,800	$45.00	$486,000
				Receiving Pit Excavation Vertical Area	SF	7,200	$45.00	$324,000
	e.	Tunnel Excavation and Lining						
		i.		8' Lined Tunnel with TBM	LF	5,300	$7,200.00	$38,160,000
							Civil Subtotal	$50,535,000
5.	Construction Total							

	a.		Subtotal A				$58,334,492
	b.		Design Contingency	LS	1	40%	*$23,333,797*
	c.		Subtotal B	LS	1		$81,668,288
	d.		General Conditions	LS	1	50%	*$40,834,144*
	e.		Subtotal C	LS	1		$122,502,433
	f.		Bonds and Insurance	LS	1	3%	*$3,675,073*
						Total Estimated Cost	**$126,177,506**

8.			Capital Total				
	a.		Construction Cost Total				$126,177,506
	b.		Capital Contingency	LS	1	50%	*$63,088,753*
						Total Estimated Capital Cost	**$189,266,259**

9.			Annual Operations and Maintainence Costs				
	a.		Labor				
		i.	Monthly Inspections (12 Months, 4 Hrs/Ea)	HR	480	$50.00	$24,000
		ii.	Quarterly Cleaning (4 Quarters, 80 Hrs/Ea)	HR	320	$50.00	$16,000
	b.		Maintenance of Pipe				
		i.	Maintain Pipe	LS	1%	$7,930,000.00	$79,300
	c.		Maintenance of Tunnel				
		i.	Maintenance of Tunnel	LS	1%	$38,160,000.00	$381,600
	d.		Maintenance of Structure				
		i.	Maintenance of Structure	LS	1%	$3,033,000.79	$30,330
						Annual Operations and Maintainence Costs Subtotal	**$531,230**

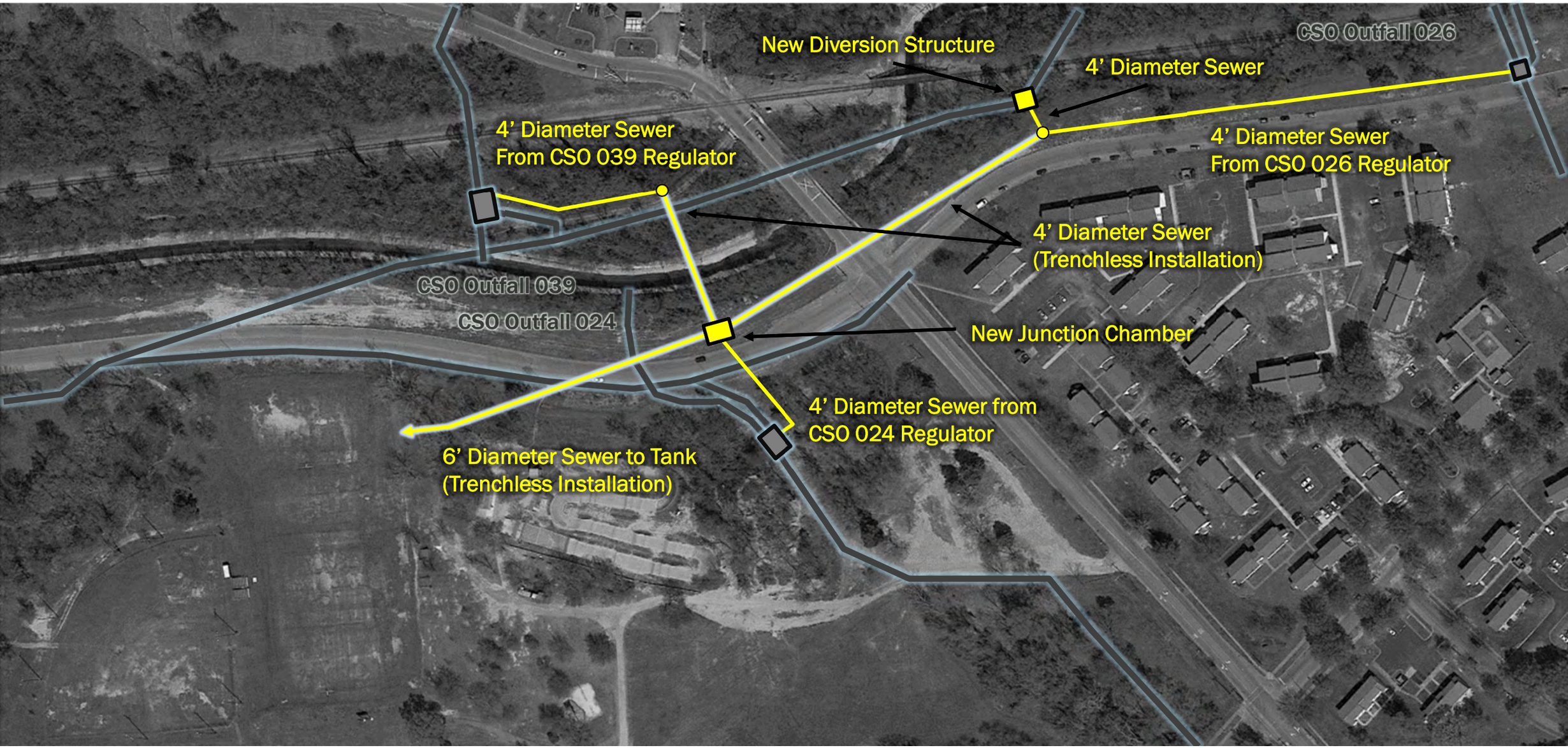
10.			15-Year Replacement Costs				
	a.		Electrical and Instrumentation and Control				
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	$0.00	$0
	b.		Meters				
		i.	Furnish and Install Replacement Meters	EA	3	$7,500.00	$22,500
						15-Year Replacement Costs Subtotal	**$22,500**

					Gillies Creek #3	
					Gillies Creek Sewer and Tunnel	
Category	**Topic**	**Weight**	**Score**	**Criteria**	**Unweighted Score**	**Weighted Score**
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	**2.3**	**2**	<4 Year project schedule with minimal risks for schedule extension	**1**	**2.3**
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	**1.8**	**2**	None/Minor conflicts	**1**	**1.8**
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	**2**	**2**	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	**1**	**2**
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	**2.3**	**2**	Construction easements or none required	**1**	**2.3**
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	**1.3**	**2**	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	**0**	**0**
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	**2.5**	**2**	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	**2**	**5**
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	**1.8**	**2**	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	**1**	**1.8**
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	**2.9**	**2**	Signficant reduction in US/DS HGL as compared to the existing condition	**1**	**2.9**
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	**1.1**	**2**	>2 other similar facilties/equipment that are currently operated and maintained at the City	**1**	**1.1**
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	**1.6**	**2**	No new staff is required for operation and maintenace	**2**	**3.2**
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	**3.4**	**2**	Project supports future improvements or is foundational for future improvements	**2**	**6.8**
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	**4.4**	**2**	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	**2**	**8.8**
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	**3.4**	**2**	Protected against a 100-year flood	**1**	**3.4**
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	**2.3**	**2**	High potential for known near term (<5 years) future development	**2**	**4.6**
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	**2**	**2**	No federal or state permits required	**0**	**0**
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	**3.3**	**2**	Located outside of the Resource Manangement Area (RMA)	**1**	**3.3**
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	**0.8**	**2**	Minimal modifications would be required for the City's VPDES permit	**1**	**0.8**
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	**3.5**	**2**	Yes	**2**	**7**
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	**2.9**	**2**	Yes	**2**	**5.8**
			1	Adjacent		
			0	No		
	Impacts to community during construction	**2.1**	**2**	Minimal impacts to the community during construction	**0**	**0**
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	**2.3**	**2**	Minimal tree removal/mitigation (<0.2 acres) is required	**1**	**2.3**
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		**65**

Gillies Creek #4

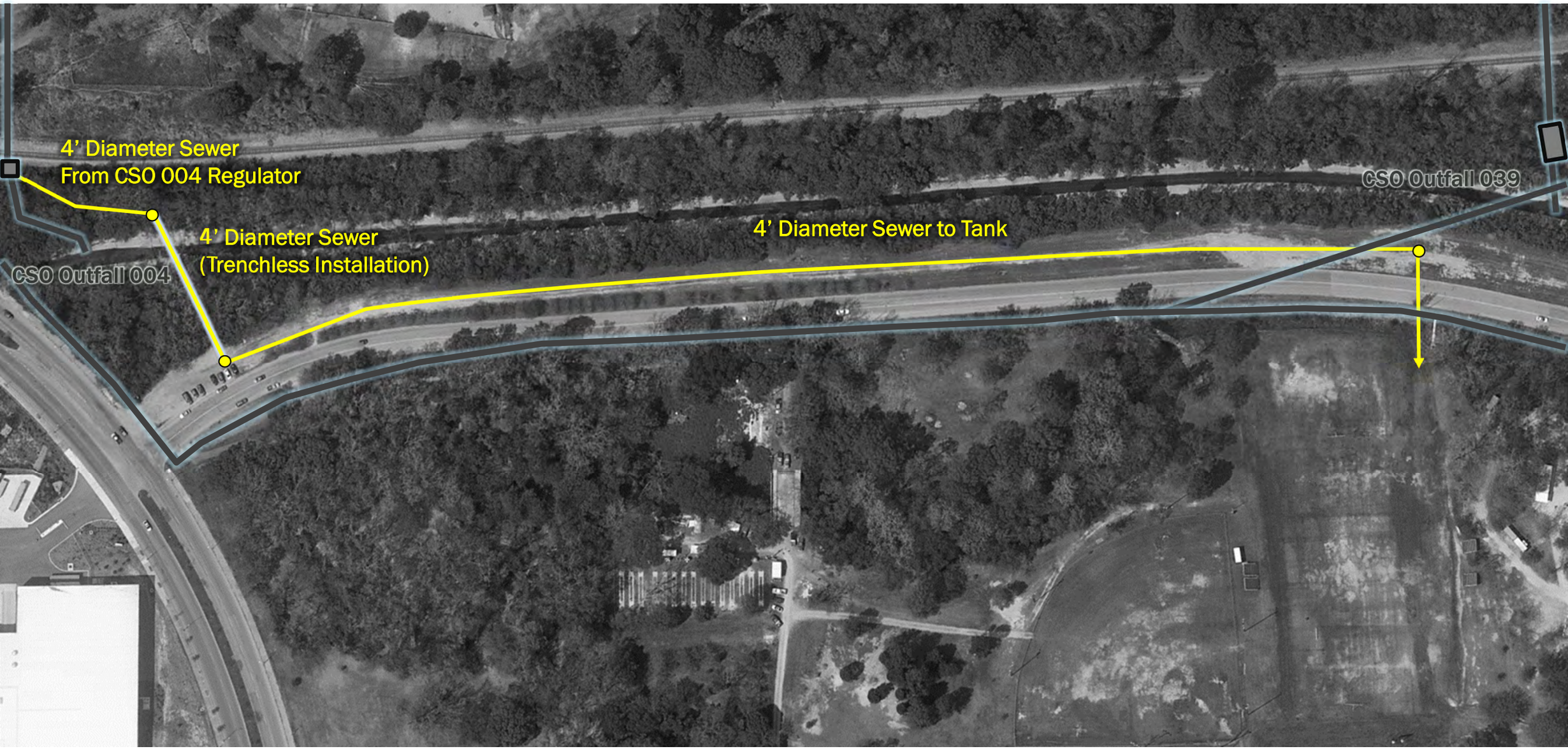
Gillies Creek #4

CSO 004, 024, 025, 026, and 039 Conveyance Sewer and Storage Tank

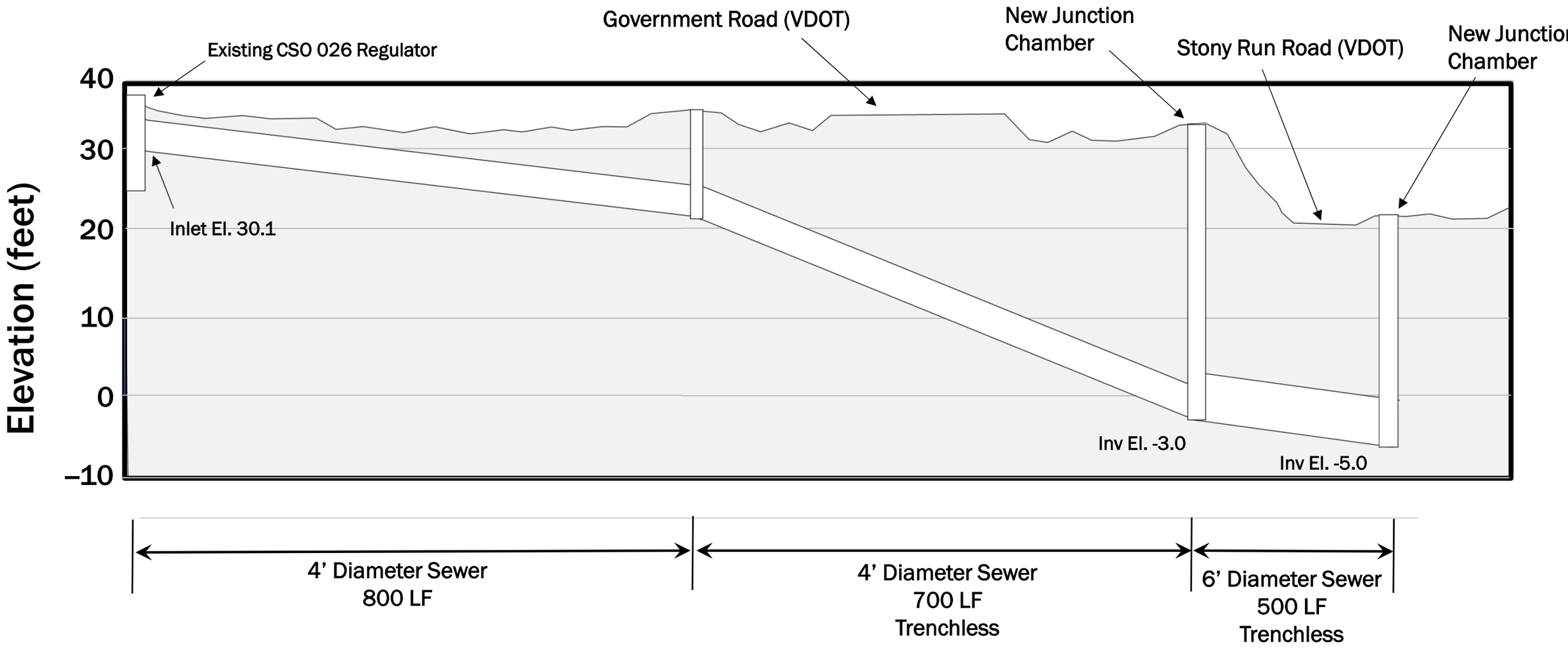


Gillies Creek #4

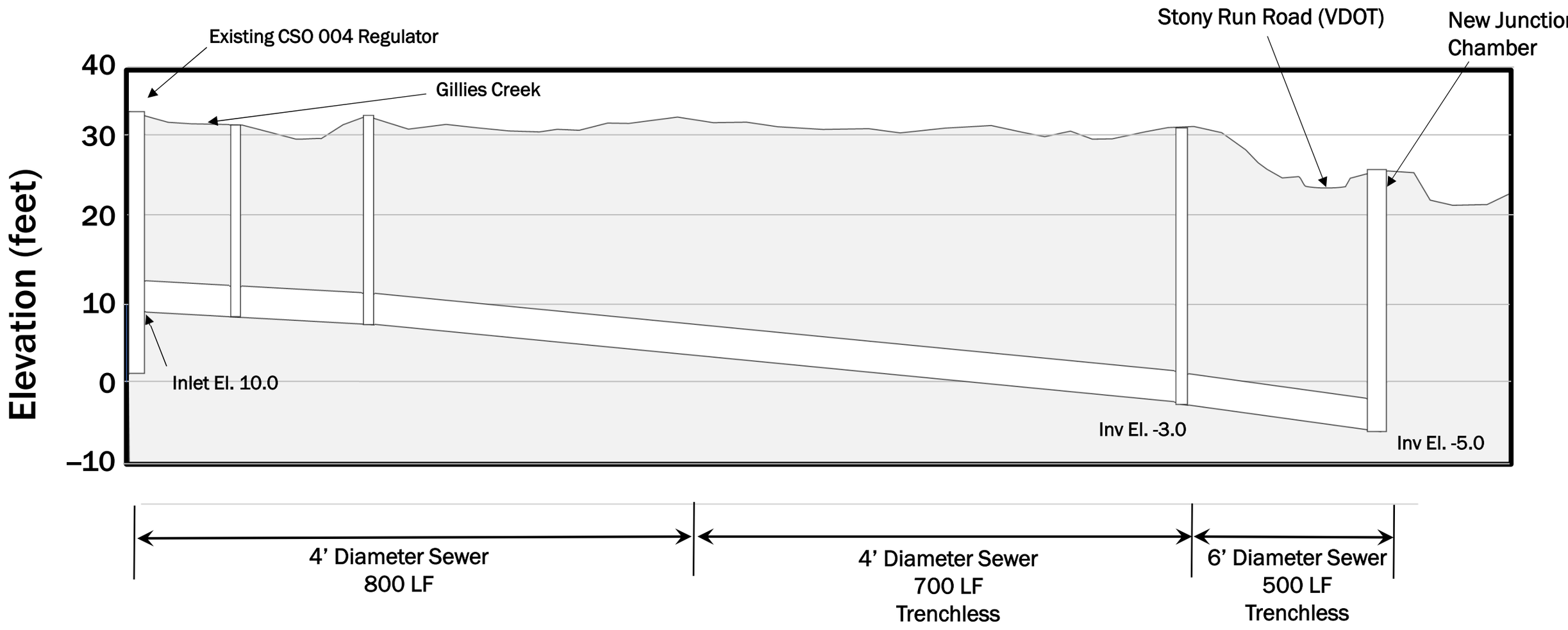
CSO 004, 024, 026, and 039 Conveyance Sewer and Storage Tank



Conveyance Sewer Profile

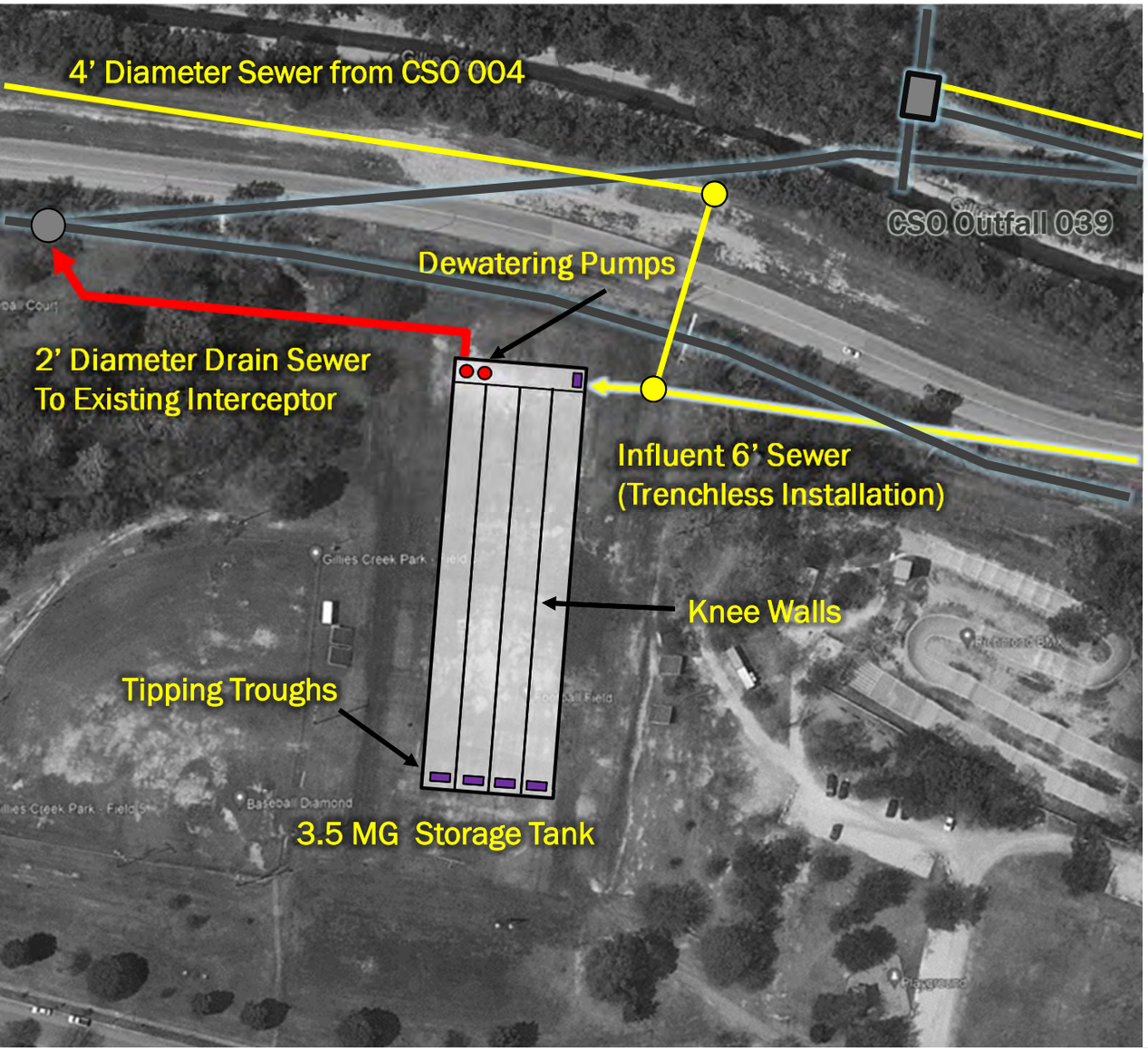


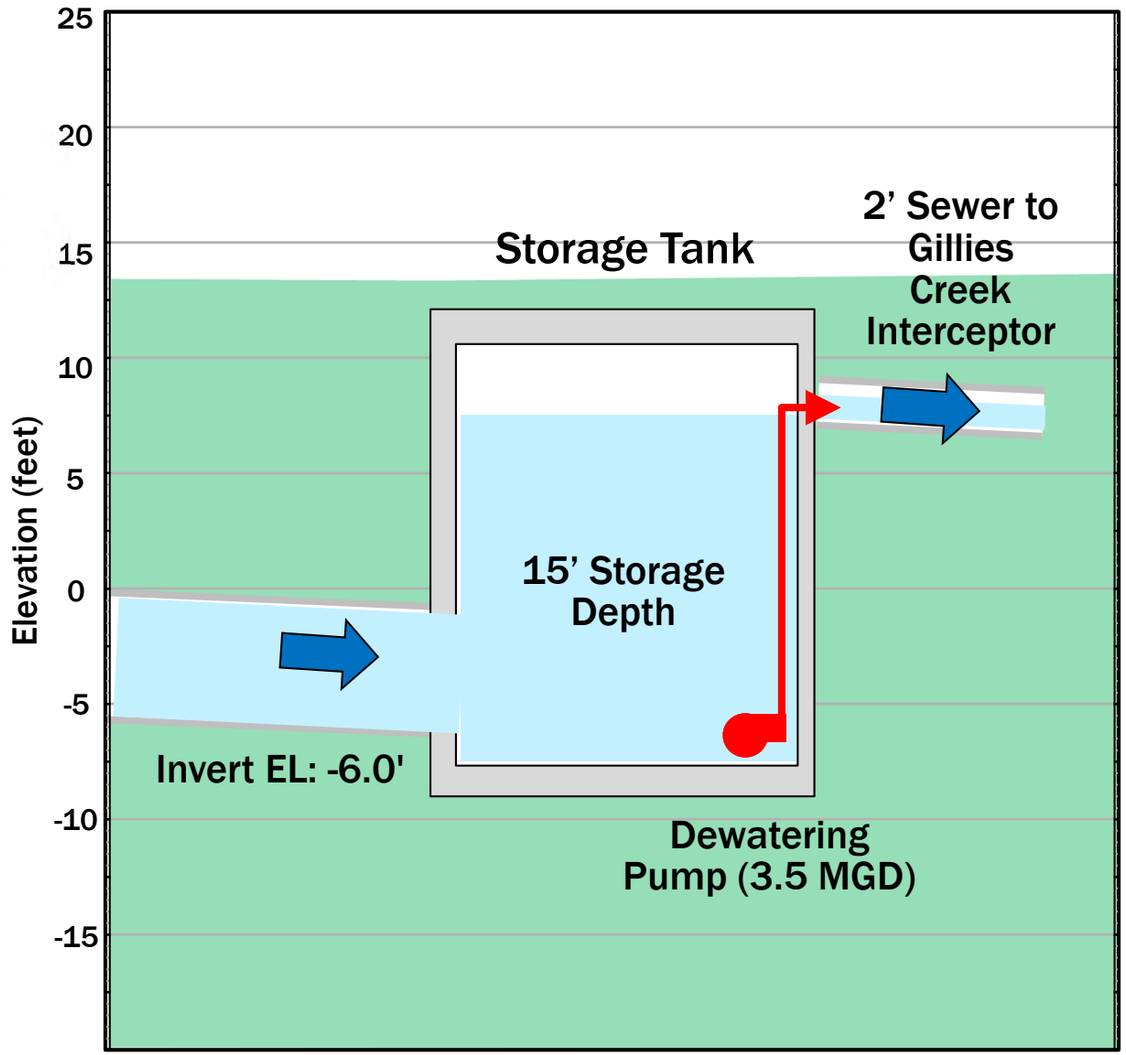
CSO 004 Conveyance Sewer Profile



Gillies Creek #4

CSO 004, 024, 026, and 039 Conveyance Sewer and Storage Tank

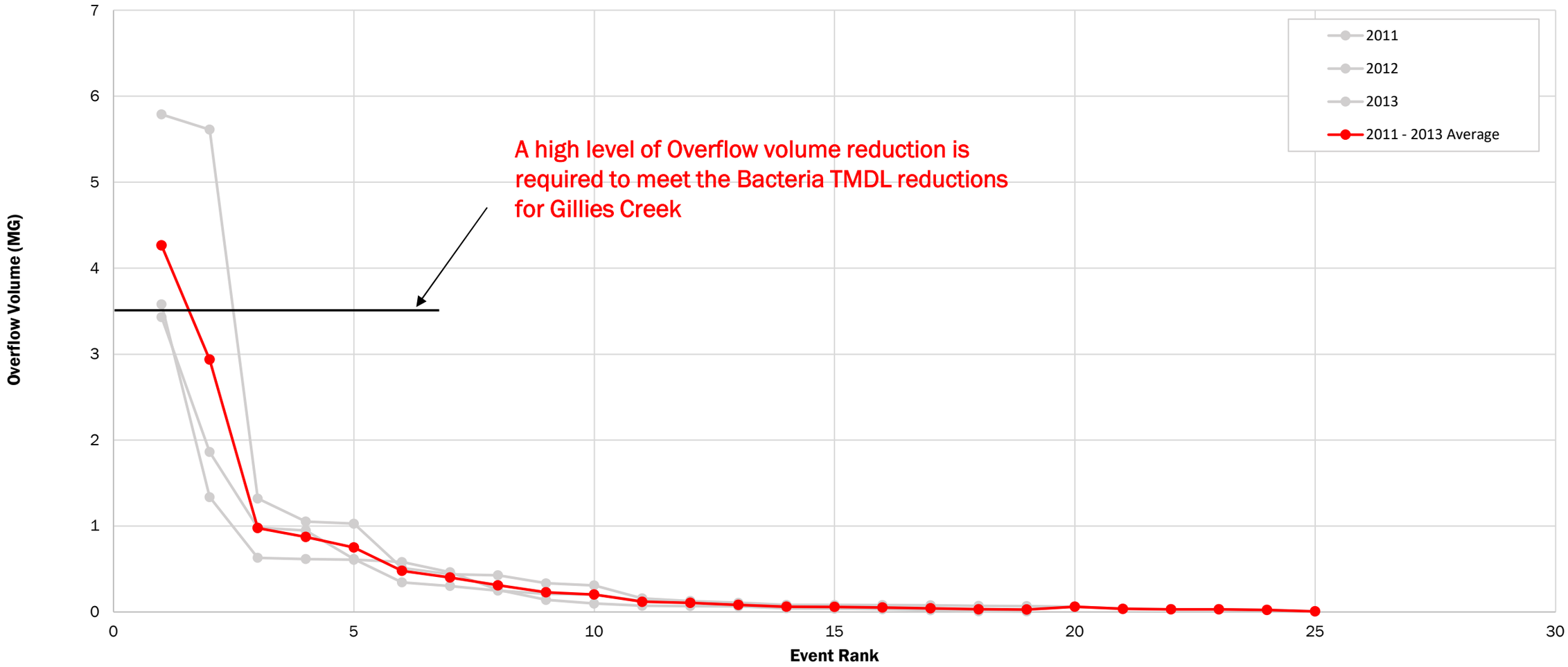




Gillies Creek #4

CSO 004, 024, 025, 026, and 039 Conveyance Sewer and Storage Tank (3.5 MG)

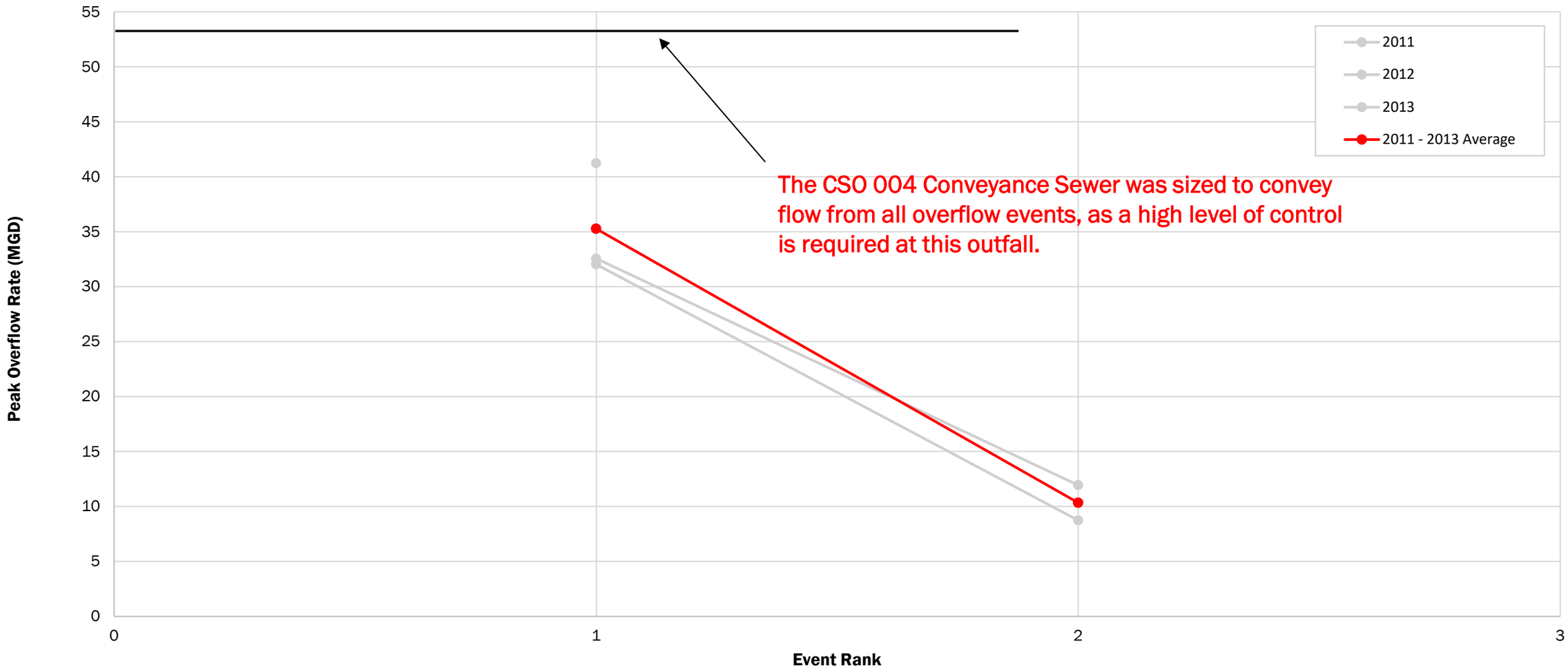
Combined Existing CSO at Outfalls 004, 024, 025, 026, and 039 for Hydrologic Evaluation Period



Gillies Creek #4

CSO 004, 024, 025, 026, and 039 Conveyance Sewer and Storage Tank (3.5 MG)

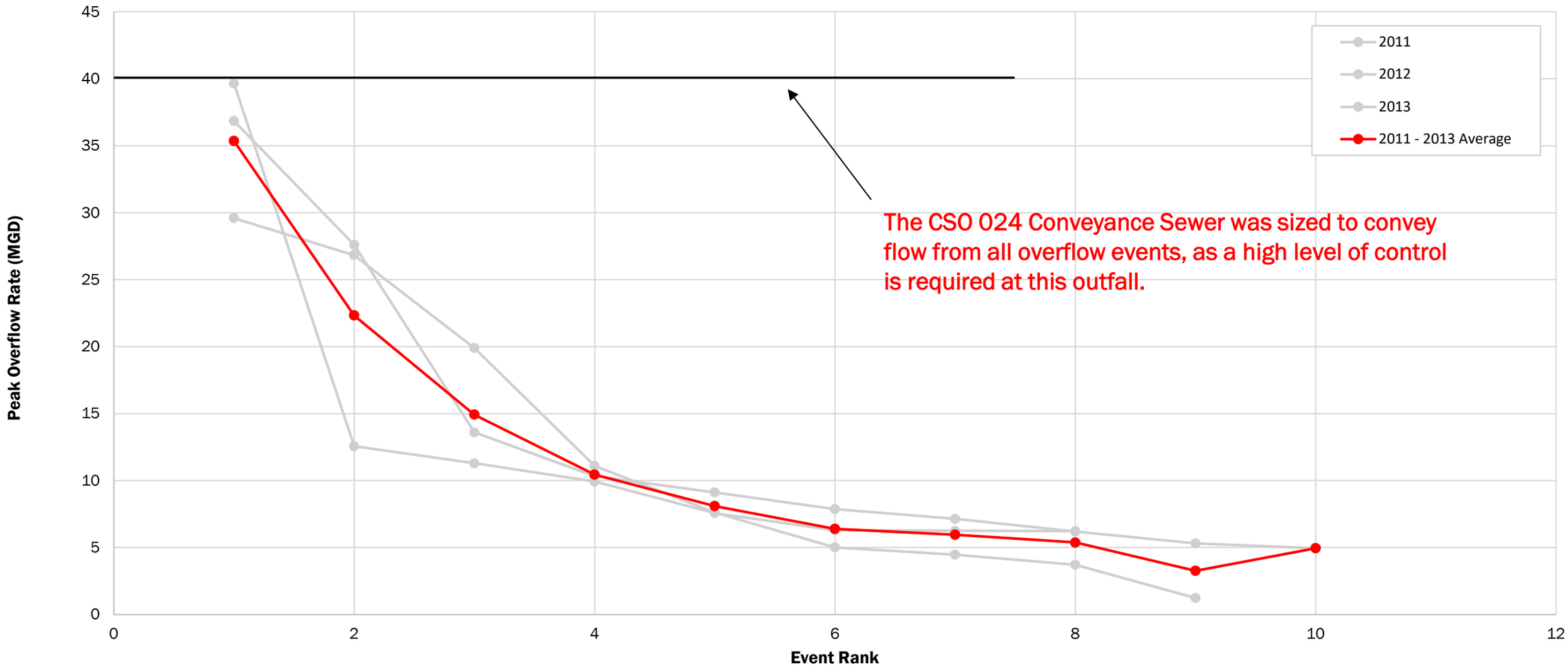
Existing CSO at Outfall 004 for Hydraulic Evaluation Period



Gillies Creek #4

CSO 004, 024, 025, 026, and 039 Conveyance Sewer and Storage Tank (3.5 MG)

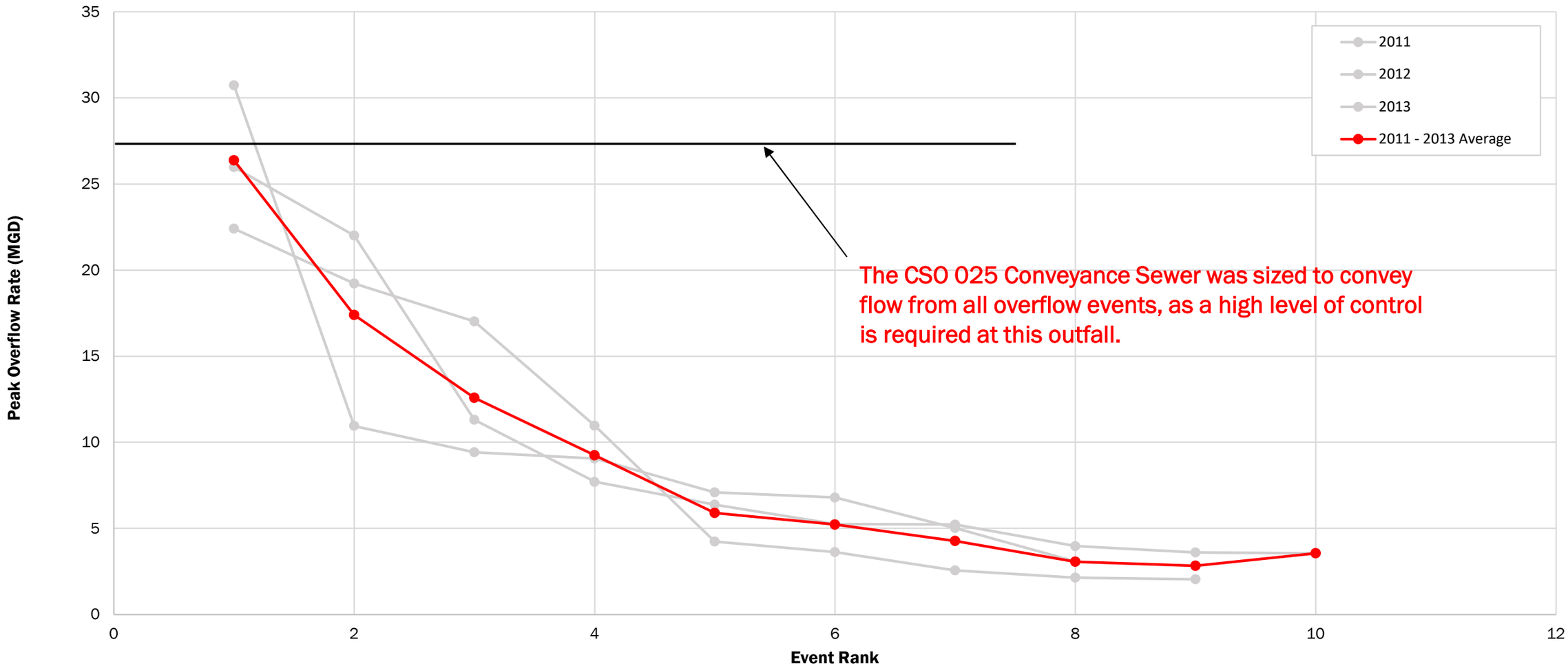
Existing CSO at Outfall 024 for Hydraulic Evaluation Period



Gillies Creek #4

CSO 004, 024, 025, 026, and 039 Conveyance Sewer and Storage Tank (3.5 MG)

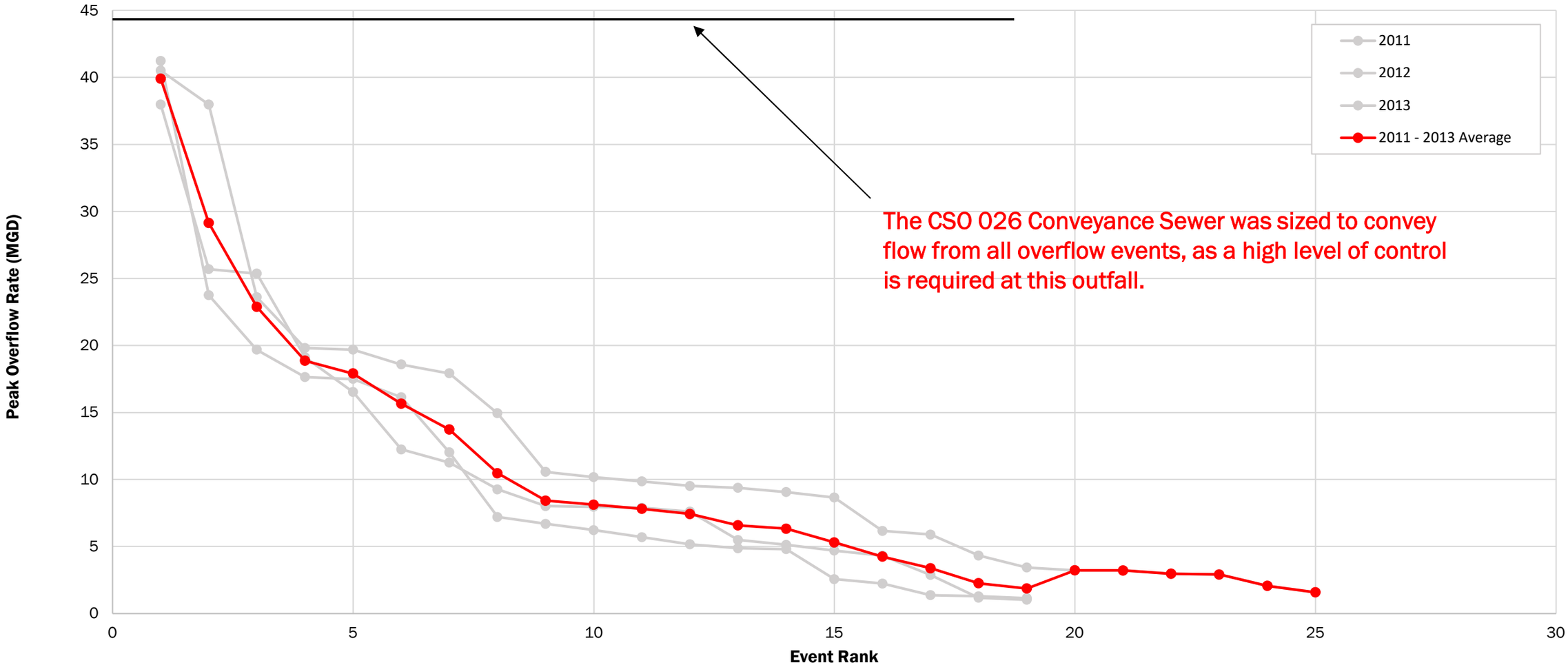
Existing CSO at Outfall 025 for Hydraulic Evaluation Period



Gillies Creek #4

CSO 004, 024, 025, 026, and 039 Conveyance Sewer and Storage Tank (3.5 MG)

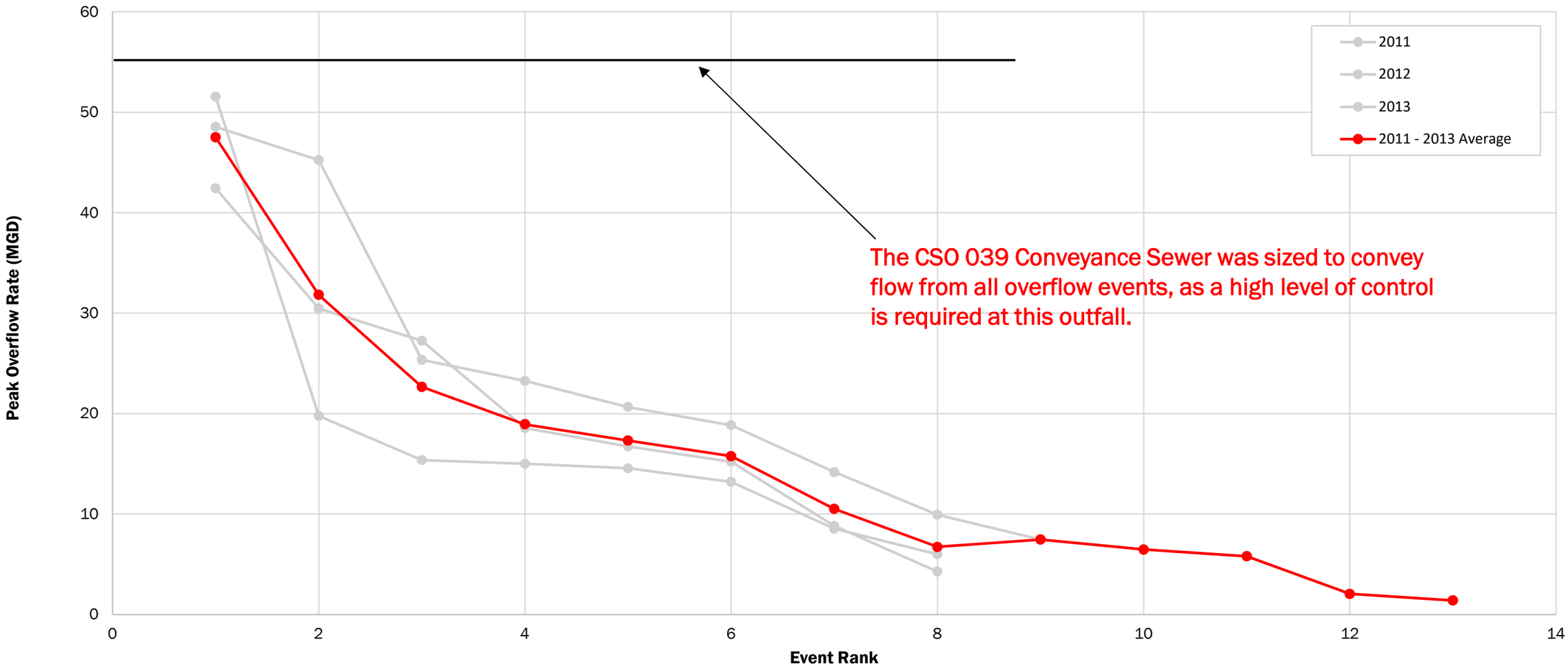
Existing CSO at Outfall 026 for Hydraulic Evaluation Period



Gillies Creek #4

CSO 004, 024, 025, 026, and 039 Conveyance Sewer and Storage Tank (3.5 MG)

Existing CSO at Outfall 039 for Hydraulic Evaluation Period



City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
Gillies Creek #4: Gillies Creek Park EQ Tank and CSO 004/024/025/026/039 Conveyance Sewer
Conceptual Design

Item	Unit	Quantity	Unit Cost	Total Amount
0. Structure Dimensions				
a. New Junction Chamber				
i. Length	LF	15		
ii. Width	LF	15		
iii. Depth	LF	40		
b. Storage Tank (covered)				
i. Length	LF	320		
ii. Width	LF	100		
iii. Depth	LF	25		
c. New 025 Diversion Structure				
i. Length	LF	15		
ii. Width	LF	15		
iii. Depth	LF	25		
d. Odor Control Vault				
i. Length	LF	30		
ii. Width	LF	40		
iii. Depth	LF	20		
1. General				
a. Site Prep	ACRE	4	$250,000.00	$1,000,000.00
			General Subtotal	$1,000,000
2. Excavation for Structures				
a. Support of Excavation				
i. Sheeting				
New Junction Chamber	SF	8,352	$45.00	$375,840
Excavation Length	LF	29		
Excavation Width	LF	29		
Excavation Depth	LF	48		
Storage Tank (covered)	SF	43,956	$45.00	$1,978,020
Excavation Length	LF	332		
Excavation Width	LF	112		
Excavation Depth	LF	33		
New 025 Diversion Structure	SF	5,184	$45.00	$233,280
Excavation Length	LF	27		
Excavation Width	LF	27		
Excavation Depth	LF	32		
Odor Control Vault Excavation Vertical Area	SF	9,024	$45.00	$406,080
Excavation Length	LF	42		
Excavation Width	LF	52		
Excavation Depth	LF	32		
b. Soil				
i. Excavate and Dispose of Soil	CY	50,395	$90.00	$4,535,520
			Excavation for Structures Subtotal	$7,528,740
3. Structural				
a. New Junction Chamber				
i. 15'L x 15'W x 40'D				
Concrete Base Slab	CY	65	$775.00	$50,633
Base Slab Thickness	LF	4		
Base Slab Length	LF	21		
Base Slab Width	LF	21		
Concrete Exterior Walls	CY	320	$1,500.00	$480,000
Exterior Wall Thickness	LF	3		
Exterior Wall Length	LF	72		
Exterior Wall Height	LF	40		
Concrete Top Slab	CY	33	$1,500.00	$49,000
Top Slab Thickness	LF	2		
Top Slab Length	LF	21		
Top Slab Width	LF	21		
b. Storage Tank (covered)				
i. 320'L x 100'W x 25'D				
Concrete Base Slab	CY	4,992	$775.00	$3,868,800
Base Slab Thickness	LF	4		
Base Slab Length	LF	324		
Base Slab Width	LF	104		
Concrete Exterior Walls	CY	1,570	$1,500.00	$2,355,556
Exterior Wall Thickness	LF	2		
Exterior Wall Length	LF	848		
Exterior Wall Height	LF	25		
Concrete Top Slab	CY	2,496	$1,500.00	$3,744,000
Top Slab Thickness	LF	2		

			Top Slab Length	LF	324		
			Top Slab Width	LF	104		
	c.		New 025 Diversion Structure				
		i.	15'L x 15'W x 25'D				
			Concrete Base Slab	CY	40	$775.00	$31,086
			Base Slab Thickness	LF	3		
			Base Slab Length	LF	19		
			Base Slab Width	LF	19		
			Concrete Exterior Walls	CY	126	$1,500.00	$188,889
			Exterior Wall Thickness	LF	2		
			Exterior Wall Length	LF	68		
			Exterior Wall Height	LF	25		
			Concrete Top Slab	CY	27	$1,500.00	$40,111
			Top Slab Thickness	LF	2		
			Top Slab Length	LF	19		
			Top Slab Width	LF	19		
	d.		Odor Control Vault				
		i.	30'L x 40'W x 20'D				
			Concrete Base Slab	CY	166	$775.00	$128,822
			Base Slab Thickness	LF	3		
			Base Slab Length	LF	34		
			Base Slab Width	LF	44		
			Concrete Exterior Walls	CY	219	$1,500.00	$328,889
			Exterior Wall Thickness	LF	2		
			Exterior Wall Length	LF	148		
			Exterior Wall Height	LF	20		
			Concrete Top Slab	CY	111	$1,500.00	$166,222
			Top Slab Thickness	LF	2		
			Top Slab Length	LF	34		
			Top Slab Width	LF	44		
						Structural Subtotal	$11,432,008
4.			Civil				
	a.		Pipe				
		i.	Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 026, 15' Depth)	LF	800	$950.00	$760,000
		ii.	Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 026, Trenchless)	LF	700	$4,200.00	$2,940,000
		iii.	Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 024, 20' Depth)	LF	200	$950.00	$190,000
		iv.	Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 039, 25' Depth)	LF	200	$950.00	$190,000
		v.	Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 039, Trenchless)	LF	250	$4,200.00	$1,050,000
		vi.	Furnish and Install 72" Fiber Reinforced Sewer Pipe (Storage Tank, Trenchless)	LF	500	$5,600.00	$2,800,000
		v.	Furnish and Install 24" Fiber Reinforced Sewer Pipe (Drain Pipe, 10' Depth)	LF	300	$650.00	$195,000
		vi.	Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 004, 20' Depth)	LF	100	$950.00	$95,000
		vii.	Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 004, Trenchless)	LF	150	$4,200.00	$630,000
		viii.	Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 004, 20' Depth)	LF	1,750	$950.00	$1,662,500
		ix.	Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 025, 15' Depth)	LF	100	$950.00	$95,000
	b.		Excavation				
		i.	Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 026, 15' Depth)	CY	3,556	$90.00	$320,000
			Excavation Length	LF	800		
			Excavation Width	LF	8		
			Excavation Depth	LF	15		
		ii.	Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 024, 20' Depth)	CY	1,185	$90.00	$106,667
			Excavation Length	LF	200		
			Excavation Width	LF	8		
			Excavation Depth	LF	20		
		iii.	Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 039, 25' Depth)	CY	1,481	$90.00	$133,333
			Excavation Length	LF	200		
			Excavation Width	LF	8		
			Excavation Depth	LF	25		
		iv.	Excavation for 24" Fiber Reinforced Sewer Pipe (Drain Pipe, 10' Depth)	CY	667	$90.00	$60,000
			Excavation Length	LF	300		
			Excavation Width	LF	6		
			Excavation Depth	LF	10		
		v.	Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 004, 20' Depth)	CY	593	$90.00	$53,333
			Excavation Length	LF	100		
			Excavation Width	LF	8		
			Excavation Depth	LF	20		
		vi.	Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 004, 20' Depth)	CY	10,370	$90.00	$933,333
			Excavation Length	LF	1,750		
			Excavation Width	LF	8		
			Excavation Depth	LF	20		
		vii.	Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 025, 15' Depth)	CY	444	$90.00	$40,000
			Excavation Length	LF	100		
			Excavation Width	LF	8		
			Excavation Depth	LF	15		
	c.		Trenchless Utility Installation				
		i.	48" Fiber Reinforced Sewer Pipe (CSO 026, Trenchless) Trenchless Installation				
			Jacking Pit Excavation	CY	444	$90.00	$40,000
			Excavation Length	LF	40		
			Excavation Width	LF	20		

				Excavation Depth	LF	15		
				Receiving Pit Excavation	CY	222	$90.00	$20,000
				Excavation Length	LF	20		
				Excavation Width	LF	20		
				Excavation Depth	LF	15		
			ii.	48" Fiber Reinforced Sewer Pipe (CSO 039, Trenchless) Trenchless Installation				
				Jacking Pit Excavation	CY	889	$90.00	$80,000
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	30		
				Receiving Pit Excavation	CY	444	$90.00	$40,000
				Excavation Length	LF	20		
				Excavation Width	LF	20		
				Excavation Depth	LF	30		
			iii.	72" Fiber Reinforced Sewer Pipe (Storage Tank, Trenchless) Trenchless Installation				
				Jacking Pit Excavation	CY	444	$90.00	$40,000
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	15		
				Receiving Pit Excavation	CY	222	$90.00	$20,000
				Excavation Length	LF	20		
				Excavation Width	LF	20		
				Excavation Depth	LF	15		
			iv.	48" Fiber Reinforced Sewer Pipe (CSO 004, Trenchless) Trenchless Installation				
				Jacking Pit Excavation	CY	741	$90.00	$66,667
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	25		
				Receiving Pit Excavation	CY	444	$90.00	$40,000
				Excavation Length	LF	20		
				Excavation Width	LF	20		
				Excavation Depth	LF	30		
		d.		Support of Excavation				
			i.	Sheeting				
				48" Fiber Reinforced Sewer Pipe (CSO 026, 15' Depth) Excavation Vertical Area	SF	40,800	$45.00	$1,836,000
				Excavation Length	LF	800		
				Excavation Depth	LF	17		
				48" Fiber Reinforced Sewer Pipe (CSO 024, 20' Depth) Excavation Vertical Area	SF	46,200	$45.00	$2,079,000
				Excavation Length	LF	700		
				Excavation Depth	LF	22		
				48" Fiber Reinforced Sewer Pipe (CSO 039, 25' Depth) Excavation Vertical Area	SF	16,200	$45.00	$729,000
				Excavation Length	LF	200		
				Excavation Depth	LF	27		
				24" Fiber Reinforced Sewer Pipe (Drain Pipe, 10' Depth) Excavation Vertical Area	SF	10,800	$45.00	$486,000
				Excavation Length	LF	300		
				Excavation Depth	LF	12		
				48" Fiber Reinforced Sewer Pipe (CSO 004, 20' Depth) Excavation Vertical Area	SF	6,600	$45.00	$297,000
				Excavation Length	LF	100		
				Excavation Depth	LF	22		
				48" Fiber Reinforced Sewer Pipe (CSO 004, 20' Depth) Excavation Vertical Area	SF	115,500	$45.00	$5,197,500
				Excavation Length	LF	1,750		
				Excavation Depth	LF	22		
				48" Fiber Reinforced Sewer Pipe (CSO 025, 15' Depth) Excavation Vertical Area	SF	5,100	$45.00	$229,500
				Excavation Length	LF	100		
				Excavation Depth	LF	17		
				Jacking Pit Excavation Vertical Area	SF	15,300	$45.00	$688,500
				Receiving Pit Excavation Vertical Area	SF	10,800	$45.00	$486,000
							Civil Subtotal	$24,629,333
5.				Mechanical				
	a.			Tipping Troughs				
			i.	Furnish and Install Tipping Troughs	EA	6	$75,000.00	$450,000
	b.			Pumps				
			i.	Dewatering Pumps	MGD	4	$75,000.00	$262,500
	c.			Odor Control				
			i.	Exhaust Fans and Carbon Adsorber	CFM	13,333	$50.00	$666,667
							Mechanical Subtotal	$1,380,000
6.				Electrical and I&C				
	a.			Miscellaneous Electrical and I&C				
			i.	Furnish and Install Electrical and I&C (Other)	LS	1	$552,000.00	$552,000
							Electrical and I&C Subtotal	$552,000
7.				Construction Total				
	a.			Subtotal A				$46,522,082
	b.			Design Contingency	LS	1	40%	*$18,608,833*
	c.			Subtotal B	LS	1		$65,130,914
	d.			General Conditions	LS	1	50%	*$32,565,457*

	e.	Subtotal C		LS	1		$97,696,372
	f.	Bonds and Insurance		LS	1	3%	*$2,930,891*
						Total Estimated Cost	**$100,627,263**

8.	Capital Total						
	a.	Construction Cost Total					$100,627,263
	b.	Capital Contingency		LS	1	50%	*$50,313,631*
						Total Estimated Capital Cost	**$150,940,894**

9.	Annual Operations and Maintainence Costs						
	a.	Labor					
		i.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	$50.00	$10,400
		ii.	Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	$50.00	$4,800
		iii.	Pipe Cleaning (Once every 5 years)	LF	5,050	$30.00	$30,300
		iv.	Structure Cleaning (Once per year)	EA	2	$10,000.00	$20,000
		v.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	$50.00	$9,600
	b.	Maintenance of Structures					
		i.	Maintain Structures	LS	0.2%	$11,432,008.33	$22,864
	c.	Maintenance of Pipe					
		i.	Maintain Pipe	LS	1.0%	$10,607,500.00	$106,075
	d.	Maintenance of Mechanical					
		i.	Maintain Tipping Troughs	LS	3%	$450,000.00	$13,500
		ii.	Maintain Pumps	LS	3%	$262,500.00	$7,875
		iii.	Maintain Odor Control Facility	LS	3%	$666,666.67	$20,000
	e.	Maintenance of Instrumentation and Control					
		i.	Maintain I&C	LS	3%	$552,000.00	$16,560
						Annual Operations and Maintainence Costs Subtotal	**$261,974**

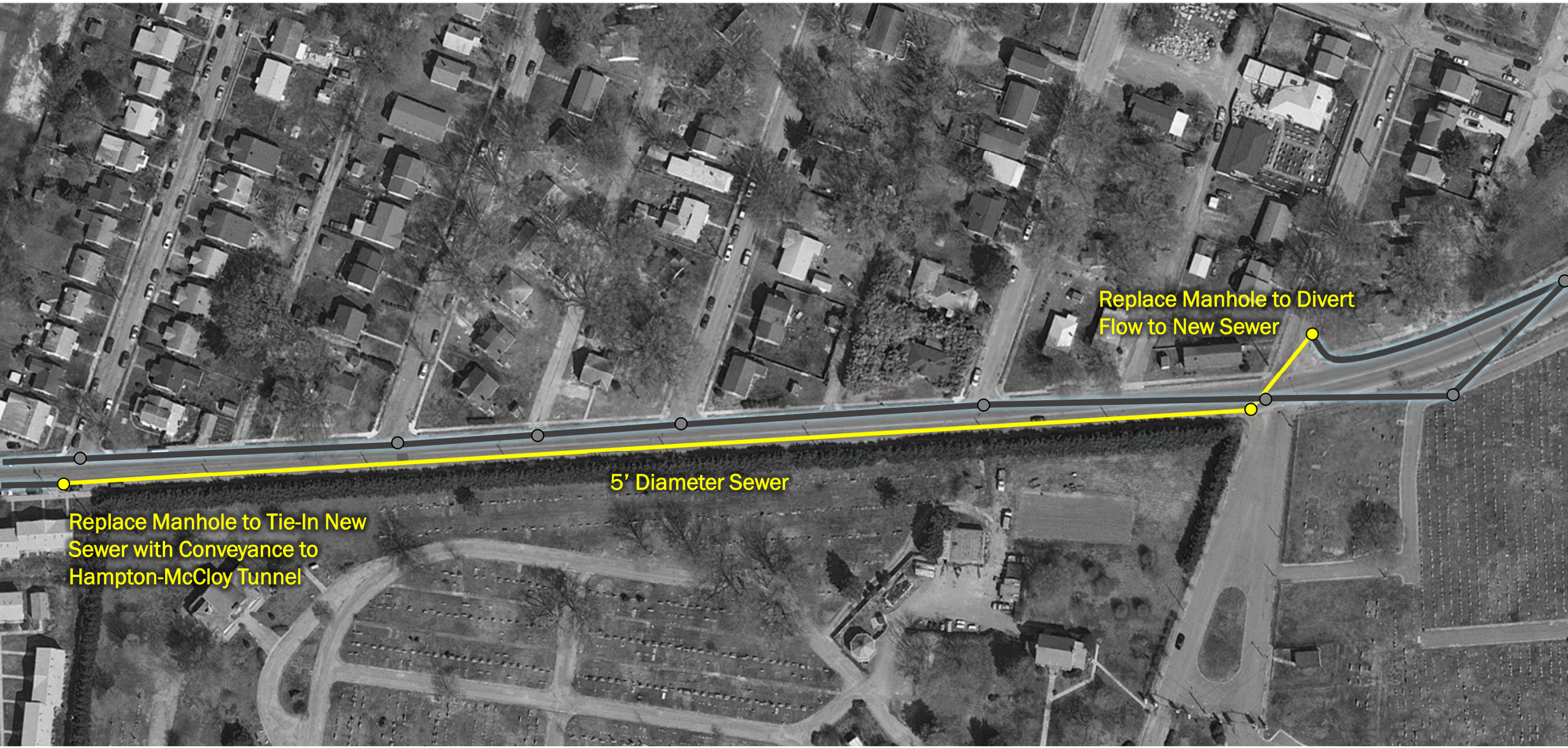
10.	15-Year Replacement Costs						
	a.	Electrical and Instrumentation and Control					
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	$552,000.00	$552,000
	b.	Meters					
		i.	Furnish and Install Replacement Meters	EA	5	$7,500.00	$37,500
						15-Year Replacement Costs Subtotal	**$589,500**

					Gillies Creek #4	
					Gillies Creek Sewer and Tank	
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Score
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2	<4 Year project schedule with minimal risks for schedule extension	1	2.3
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	1.8	2	None/Minor conflicts	1	1.8
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	2	2	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	1	2
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	2.3	2	Construction easements or none required	2	4.6
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	1.3	2	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	1	1.3
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	2.5	2	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	2	5
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	1.8	2	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	1	1.8
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	2.9	2	Signficant reduction in US/DS HGL as compared to the existing condition	1	2.9
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	1.1	2	>2 other similar facilties/equipment that are currently operated and maintained at the City	2	2.2
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	1.6	2	No new staff is required for operation and maintenace	2	3.2
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	3.4	2	Project supports future improvements or is foundational for future improvements	2	6.8
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	4.4	2	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	2	8.8
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	3.4	2	Protected against a 100-year flood	1	3.4
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	2.3	2	High potential for known near term (<5 years) future development	2	4.6
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	2	2	No federal or state permits required	0	0
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	3.3	2	Located outside of the Resource Manangement Area (RMA)	0	0
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	0.8	2	Minimal modifications would be required for the City's VPDES permit	2	1.6
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	3.5	2	Yes	2	7
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	2.9	2	Yes	2	5.8
			1	Adjacent		
			0	No		
	Impacts to community during construction	2.1	2	Minimal impacts to the community during construction	0	0
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	2.3	2	Minimal tree removal/mitigation (<0.2 acres) is required	0	0
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		65

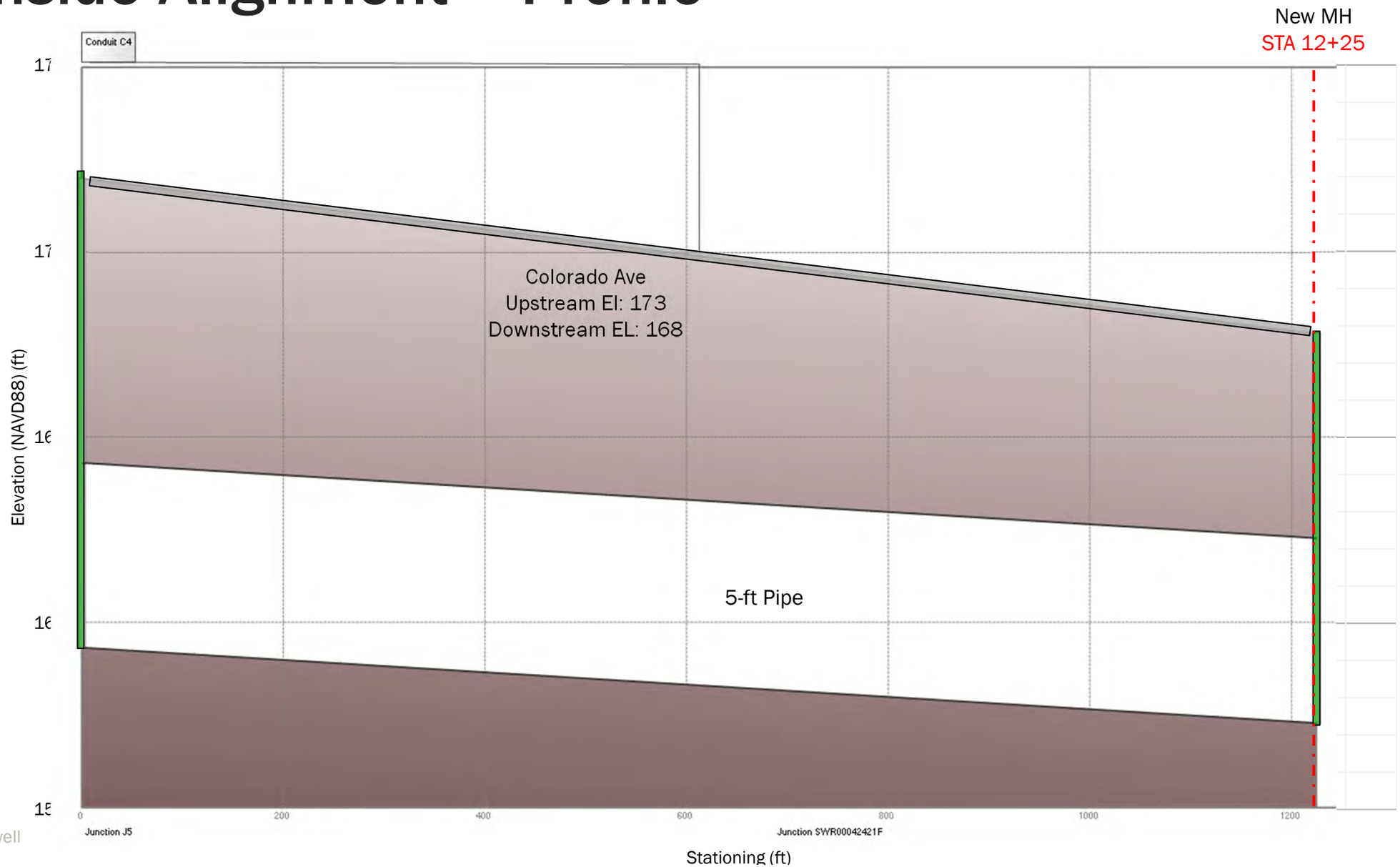
Northside #1

Northside #1

CSO 011 Conveyance Sewer



Northside Alignment – Profile



City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
Northside #1: CSO 011 Conveyance Sewer
Conceptual Design

Item	Unit	Quantity	Unit Cost	Total Amount
0. Structure Dimensions				
a. Structure				
1. General				
a. Site Prep	ACRE	1	$250,000.00	$250,000.00
General Subtotal				$250,000
2. Civil				
a. Pipe				
i. Furnish and Install 60" Fiber Reinforced Sewer Pipe (15' Depth)	LF	1,225	$1,200.00	$1,470,000
b. Excavation				
i. Excavation for 60" Fiber Reinforced Sewer Pipe (15' Depth)	CY	6,125	$90.00	$551,250
Excavation Length	LF	1,225		
Excavation Width	LF	9		
Excavation Depth	LF	15		
c. Support of Excavation				
i. Sheeting				
60" Fiber Reinforced Sewer Pipe (15' Depth) Excavation Vertical Area	SF	62,475	$45.00	$2,811,375
Excavation Length	LF	1,225		
Excavation Depth	LF	17		
Civil Subtotal				$4,832,625
3. Construction Total				
a. Subtotal A				$5,082,625
b. Design Contingency	LS	1	40%	*$2,033,050*
c. Subtotal B	LS	1		$7,115,675
d. General Conditions	LS	1	50%	*$3,557,838*
e. Subtotal C	LS	1		$10,673,513
f. Bonds and Insurance	LS	1	3%	*$320,205*
Total Estimated Cost				**$10,993,718**

4. Capital Total				
a. Construction Cost Total				$10,993,718
b. Capital Contingency	LS	1	50%	*$5,496,859*
Total Estimated Capital Cost				**$16,490,577**

5. Annual Operations and Maintainence Costs				
a. Labor				
i. Pipe Cleaning (Once every 5 years)	LF	1,225	$30.00	$7,350
ii. Structure Cleaning (Once per year)	EA	0	$10,000.00	$0
b. Maintenance of Pipe				
i. Maintain Pipe	LS	1%	$1,470,000.00	$14,700
Annual Operations and Maintainence Costs Subtotal				**$22,050**

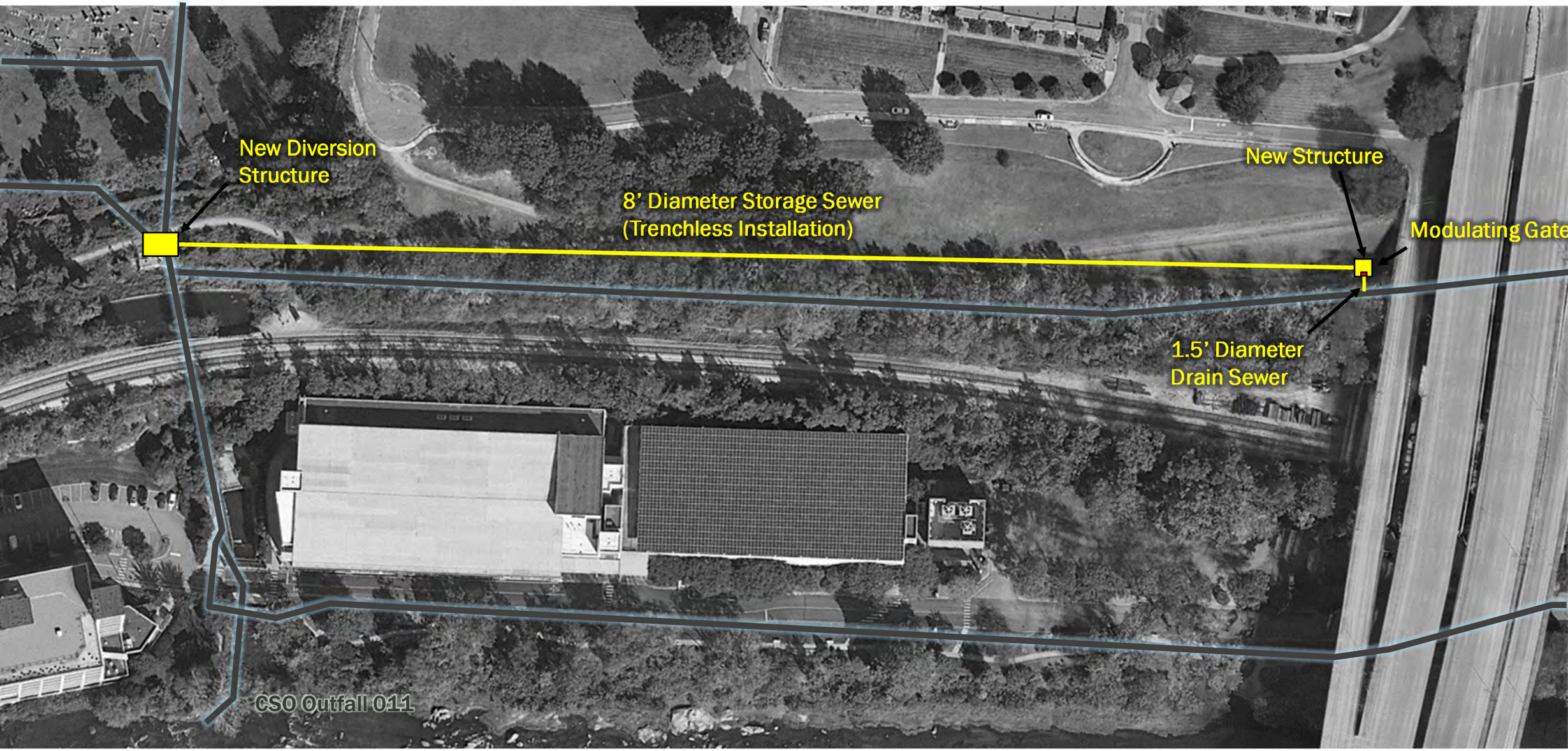
6. 15-Year Replacement Costs				
a. Electrical and Instrumentation and Control				
i. Furnish and Install Replacement Electrical and I&C	LS	100%	$0.00	$0
b. Meters				
i. Furnish and Install Replacement Meters	EA	3	$7,500.00	$22,500
15-Year Replacement Costs Subtotal				**$22,500**

					Northside #1 Diversion Sewer	
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Score
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2	<4 Year project schedule with minimal risks for schedule extension	2	4.6
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	1.8	2	None/Minor conflicts	2	3.6
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	2	2	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	0	0
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	2.3	2	Construction easements or none required	1	2.3
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	1.3	2	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	2	2.6
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	2.5	2	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	2	5
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	1.8	2	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	2	3.6
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	2.9	2	Signficant reduction in US/DS HGL as compared to the existing condition	0	0
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	1.1	2	>2 other similar facilties/equipment that are currently operated and maintained at the City	2	2.2
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	1.6	2	No new staff is required for operation and maintenace	2	3.2
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	3.4	2	Project supports future improvements or is foundational for future improvements	1	3.4
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	4.4	2	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	1	4.4
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	3.4	2	Protected against a 100-year flood	2	6.8
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	2.3	2	High potential for known near term (<5 years) future development	1	2.3
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	2	2	No federal or state permits required	2	4
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	3.3	2	Located outside of the Resource Manangement Area (RMA)	2	6.6
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	0.8	2	Minimal modifications would be required for the City's VPDES permit	2	1.6
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	3.5	2	Yes	2	7
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	2.9	2	Yes	0	0
			1	Adjacent		
			0	No		
	Impacts to community during construction	2.1	2	Minimal impacts to the community during construction	0	0
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	2.3	2	Minimal tree removal/mitigation (<0.2 acres) is required	2	4.6
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		68

Northside #2

Northside #2

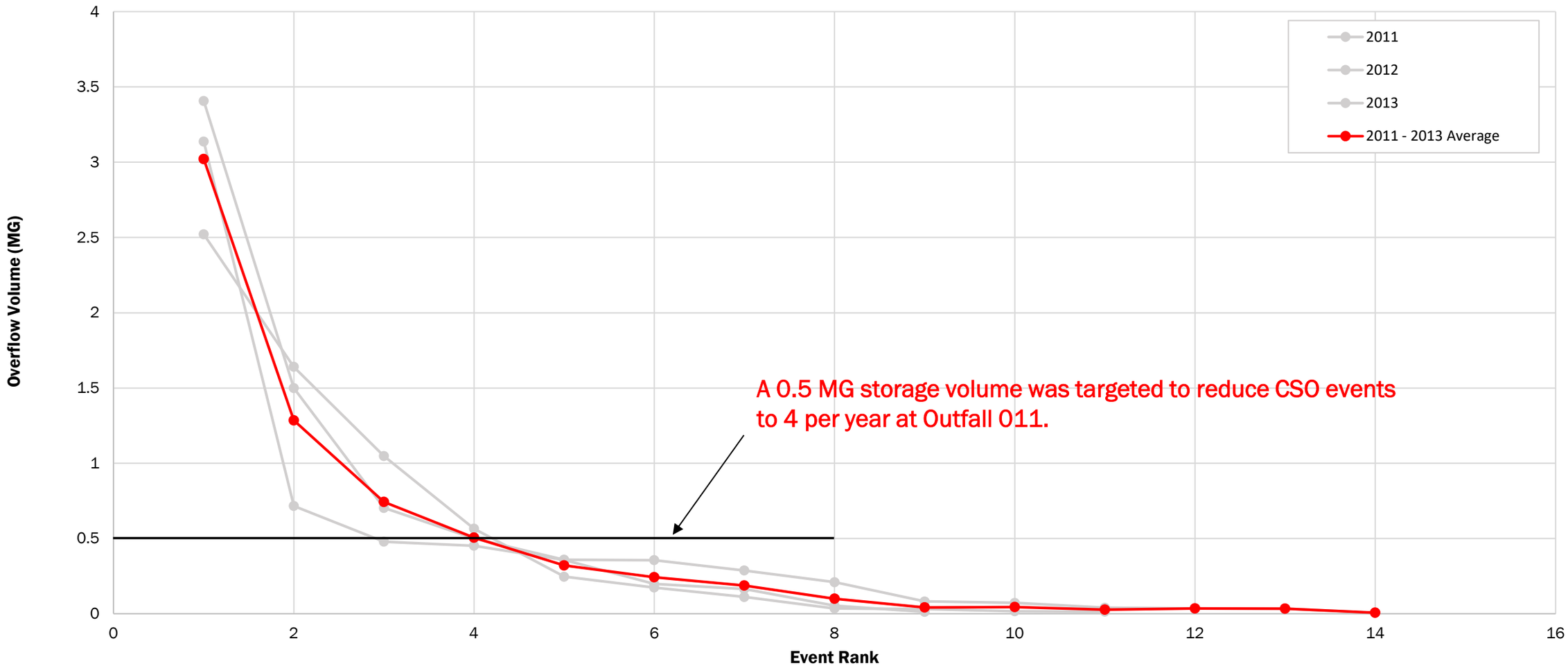
CSO 011 Storage Sewer (0.5 MG)



Northside #2

CSO 011 Storage Sewer (0.5 MG)

Existing CSO at Outfall 011 for Hydrologic Evaluation Period



City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
Northside #2: CSO 011 Storage Pipe
Conceptual Design

Item					Unit	Quantity	Unit Cost	Total Amount
0.	Structure Dimensions							
	a.	New Diversion Structure						
		i.	Length		LF	20		
		ii.	Width		LF	30		
		iii.	Depth		LF	30		
	b.	New Junction Chamber						
		i.	Length		LF	15		
		ii.	Width		LF	15		
		iii.	Depth		LF	50		
1.	General							
	a.	Site Prep			ACRE	1	$250,000.00	$250,000.00
							General Subtotal	$250,000
2.	Excavation for Structures							
	a.	Support of Excavation						
		i.	Sheeting					
				New Diversion Structure Excavation Vertical Area	SF	8,658	$45.00	$389,610
				Excavation Length	LF	34		
				Excavation Width	LF	44		
				Excavation Depth	LF	37		
				New Junction Chamber Excavation Vertical Area	SF	10,788	$45.00	$485,460
				Excavation Length	LF	31		
				Excavation Width	LF	31		
				Excavation Depth	LF	58		
	b.	Soil						
		i.	Excavate and Dispose of Soil		CY	4,114	$90.00	$370,300
							Excavation for Structures Subtotal	$1,245,370
3.	Structural							
	a.	New Diversion Structure						
		i.	20'L x 30'W x 30'D					
				Concrete Base Slab	CY	104	$775.00	$80,600
				Base Slab Thickness	LF	3		
				Base Slab Length	LF	26		
				Base Slab Width	LF	36		
				Concrete Exterior Walls	CY	373	$1,500.00	$560,000
				Exterior Wall Thickness	LF	3		
				Exterior Wall Length	LF	112		
				Exterior Wall Height	LF	30		
				Concrete Top Slab	CY	69	$1,500.00	$104,000
				Top Slab Thickness	LF	2		
				Top Slab Length	LF	26		
				Top Slab Width	LF	36		
	b.	New Junction Chamber						
		i.	15'L x 15'W x 50'D					
				Concrete Base Slab	CY	78	$775.00	$60,737
				Base Slab Thickness	LF	4		
				Base Slab Length	LF	23		
				Base Slab Width	LF	23		
				Concrete Exterior Walls	CY	563	$1,500.00	$844,444
				Exterior Wall Thickness	LF	4		
				Exterior Wall Length	LF	76		
				Exterior Wall Height	LF	50		
				Concrete Top Slab	CY	39	$1,500.00	$58,778
				Top Slab Thickness	LF	2		
				Top Slab Length	LF	23		
				Top Slab Width	LF	23		
							Structural Subtotal	$1,708,559
4.	Civil							
	a.	Pipe						
		i.	Furnish and Install 96" Fiber Reinforced Sewer Pipe (30'/Trenchless)		LF	1,100	$7,800.00	$8,580,000
		ii.	Furnish and Install 18" Fiber Reinforced Sewer Pipe (40' Depth)		LF	20	$600.00	$12,000
	b.	Excavation						
		i.	Excavation for 18" Fiber Reinforced Sewer Pipe (40' Max Depth)		CY	171	$90.00	$15,400
				Excavation Length	LF	20		
				Excavation Width	LF	6		

				Excavation Depth	LF	42		
	c.		Trenchless Utility Installation					
		i.	96" Fiber Reinforced Sewer Pipe Trenchless Installation					
				Jacking Pit Excavation	CY	889	$90.00	$80,000
				Excavation Length	LF	40		
				Excavation Width	LF	20		
				Excavation Depth	LF	30		
				Receiving Pit Excavation	CY	741	$90.00	$66,667
				Excavation Length	LF	20		
				Excavation Width	LF	20		
				Excavation Depth	LF	50		
	d.		Support of Excavation					
		i.	Sheeting					
				18" Fiber Reinforced Sewer Pipe Excavation Vertical Area	SF	2,520	$45.00	$113,400
				Excavation Length	LF	20		
				Excavation Depth	LF	42		
				Jacking Pit Excavation Vertical Area	SF	5,400	$45.00	$243,000
				Receiving Pit Excavation Vertical Area	SF	6,000	$45.00	$270,000
							Civil Subtotal	$9,380,467
5.			Mechanical					
	g.		Drain Gates					
		i.	Furnish and Install Drain Gates		EA	2	$37,500.00	$75,000
							Mechanical Subtotal	$80,000
6.			Electrical and I&C					
	a.		Miscellaneous Electrical and I&C					
		i.	Furnish and Install Electrical and I&C (Other)		LS	1	$50,000.00	$50,000
							Electrical and I&C Subtotal	$50,000
7.			Construction Total					
	a.		Subtotal A					$12,634,396
	b.		Design Contingency		LS	1	40%	*$5,053,758*
	c.		Subtotal B		LS	1		$17,688,154
	d.		General Conditions		LS	1	50%	*$8,844,077*
	e.		Subtotal C		LS	1		$26,532,231
	f.		Bonds and Insurance		LS	1	3%	*$795,967*
							Total Estimated Cost	**$27,328,198**

8.			Capital Total					
	a.		Construction Cost Total					$27,328,198
	b.		Capital Contingency		LS	1	50%	*$13,664,099*
							Total Estimated Capital Cost	**$40,992,298**

9.			Annual Operations and Maintainence Costs					
	a.		Labor					
		i.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)		HR	208	$50.00	$10,400
		ii.	Monthly Inspections (12 Months, 8 Hrs/Ea)		HR	96	$50.00	$4,800
		iii.	Pipe Cleaning (Once every 5 years)		LF	1,120	$30.00	$6,720
		iv.	Structure Cleaning (Once per year)		EA	2	$10,000.00	$20,000
		v.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)		HR	192	$50.00	$9,600
	b.		Maintenance of Structures					
		i.	Maintain Structures		LS	0.2%	$1,708,559.26	$3,417
	c.		Maintenance of Pipe					
		i.	Maintain Pipe		LS	1.0%	$8,592,000.00	$85,920
	d.		Maintenance of Mechanical					
		i.	Maintain Drain Gates		LS	3%	$75,000.00	$2,250
	e.		Maintenance of Instrumentation and Control					
		i.	Maintain I&C		LS	3%	$50,000.00	$1,500
							Annual Operations and Maintainence Costs Subtotal	**$144,607**

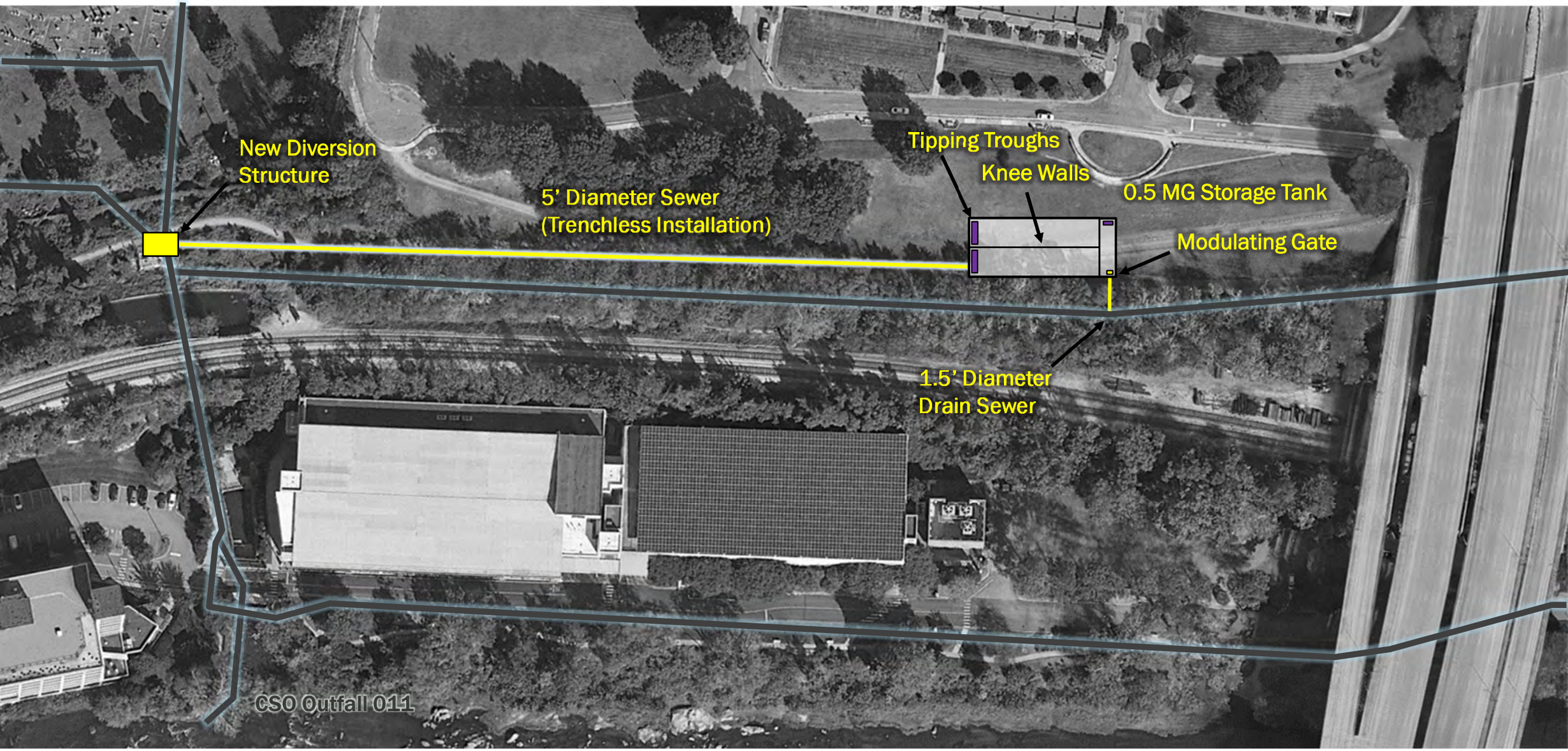
10.			15-Year Replacement Costs					
	a.		Electrical and Instrumentation and Control					
		i.	Furnish and Install Replacement Electrical and I&C		LS	100%	$50,000.00	$50,000
	b.		Meters					
		i.	Furnish and Install Replacement Meters		EA	3	$7,500.00	$22,500
							15-Year Replacement Costs Subtotal	**$72,500**

					Northside #2	
					Storage Pipe	
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Score
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2	<4 Year project schedule with minimal risks for schedule extension	2	4.6
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	1.8	2	None/Minor conflicts	1	1.8
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	2	2	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	0	0
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	2.3	2	Construction easements or none required	2	4.6
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	1.3	2	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	0	0
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	2.5	2	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	2	5
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	1.8	2	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	1	1.8
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	2.9	2	Signficant reduction in US/DS HGL as compared to the existing condition	1	2.9
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	1.1	2	>2 other similar facilties/equipment that are currently operated and maintained at the City	2	2.2
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	1.6	2	No new staff is required for operation and maintenace	2	3.2
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	3.4	2	Project supports future improvements or is foundational for future improvements	1	3.4
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	4.4	2	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	2	8.8
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	3.4	2	Protected against a 100-year flood	2	6.8
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	2.3	2	High potential for known near term (<5 years) future development	1	2.3
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	2	2	No federal or state permits required	1	2
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	3.3	2	Located outside of the Resource Manangement Area (RMA)	1	3.3
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	0.8	2	Minimal modifications would be required for the City's VPDES permit	2	1.6
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	3.5	2	Yes	2	7
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	2.9	2	Yes	2	5.8
			1	Adjacent		
			0	No		
	Impacts to community during construction	2.1	2	Minimal impacts to the community during construction	1	2.1
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	2.3	2	Minimal tree removal/mitigation (<0.2 acres) is required	1	2.3
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		72

Northside #3

Northside #3

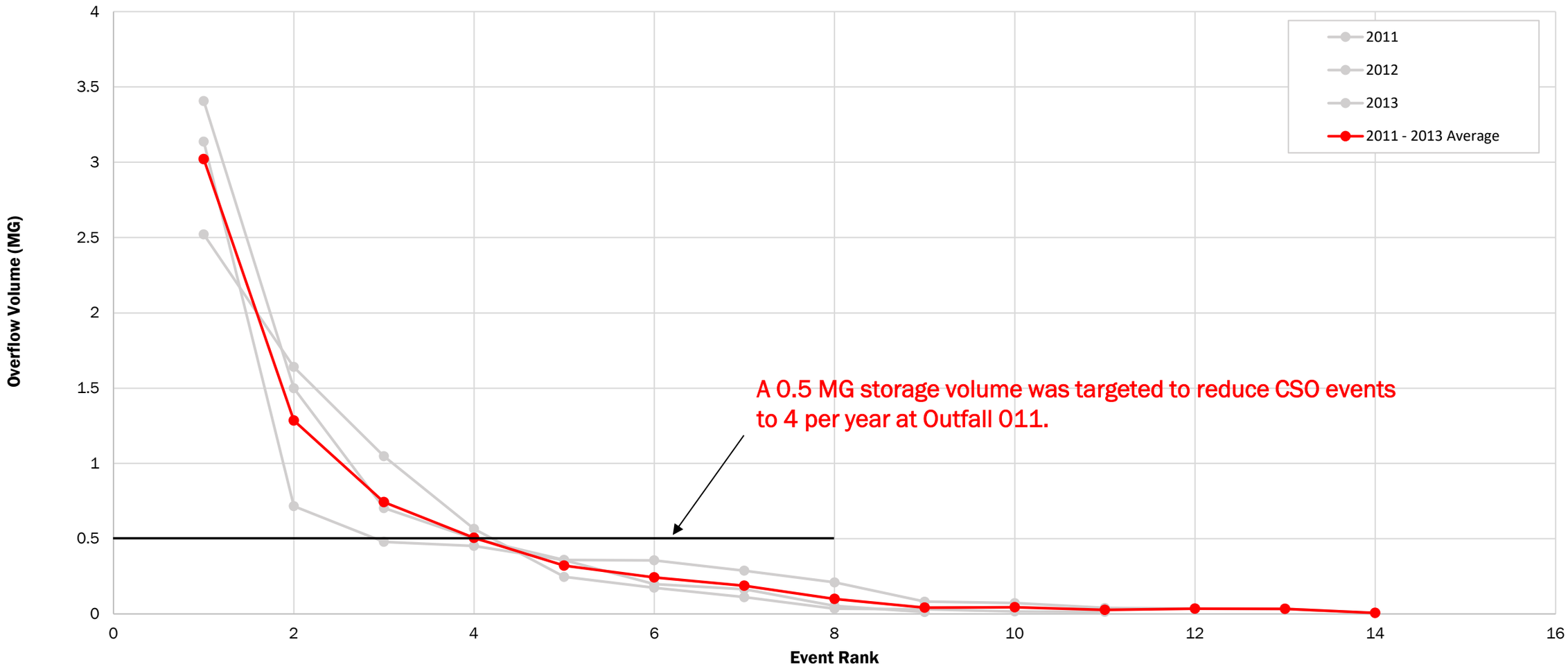
CSO 011 Storage Tank (0.5 MG)



Northside #3

CSO 011 Storage Tank (0.5 MG)

Existing CSO at Outfall 011 for Hydrologic Evaluation Period



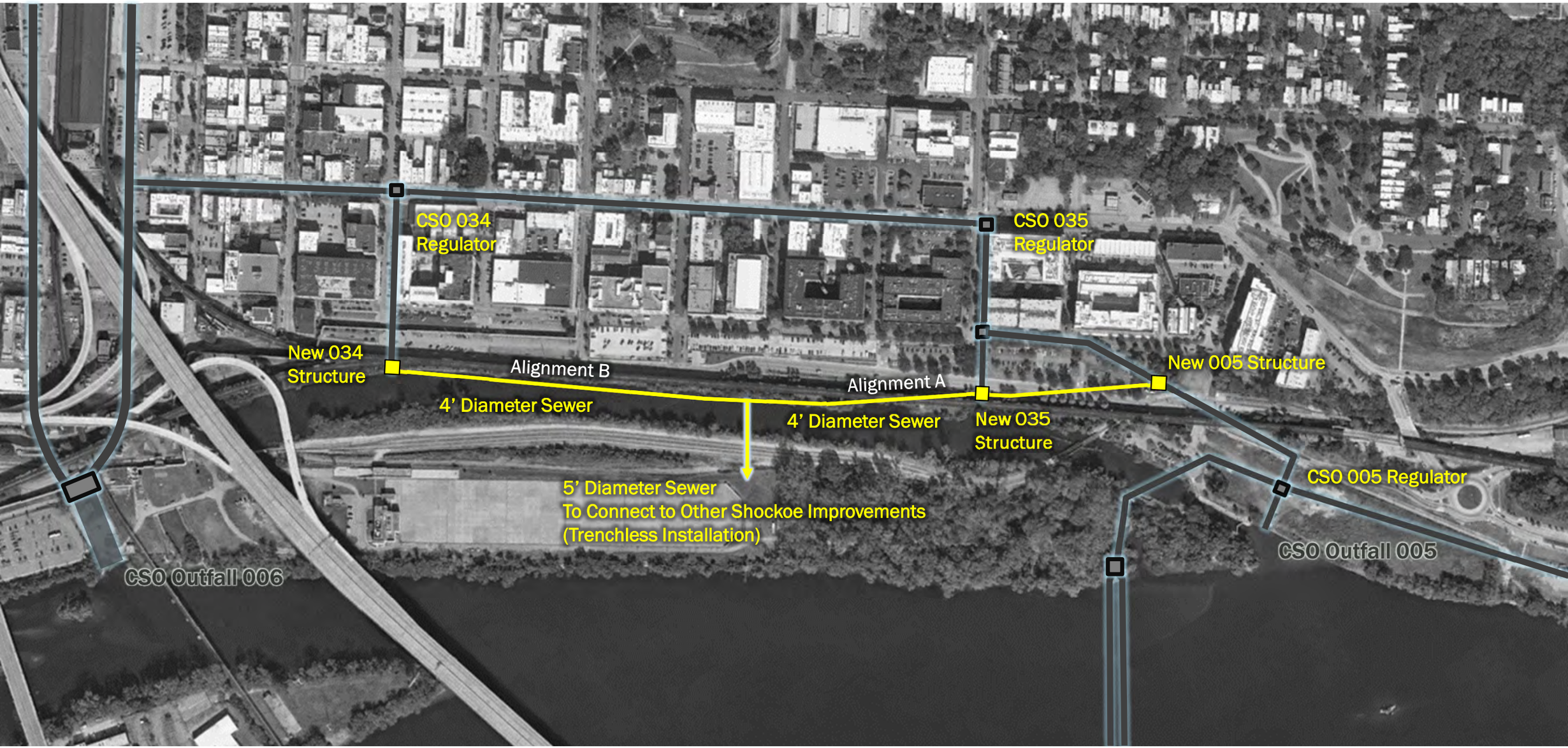
					Northside #3 Storage Tank	
Category	**Topic**	**Weight**	**Score**	**Criteria**	**Unweighted Score**	**Weighted Score**
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	**2.3**	**2**	<4 Year project schedule with minimal risks for schedule extension	1	2.3
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	**1.8**	**2**	None/Minor conflicts	1	1.8
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	**2**	**2**	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	0	0
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	**2.3**	**2**	Construction easements or none required	2	4.6
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	**1.3**	**2**	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	0	0
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	**2.5**	**2**	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	2	5
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	**1.8**	**2**	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	1	1.8
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	**2.9**	**2**	Signficant reduction in US/DS HGL as compared to the existing condition	1	2.9
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	**1.1**	**2**	>2 other similar facilties/equipment that are currently operated and maintained at the City	2	2.2
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	**1.6**	**2**	No new staff is required for operation and maintenace	2	3.2
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	**3.4**	**2**	Project supports future improvements or is foundational for future improvements	1	3.4
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	**4.4**	**2**	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	2	8.8
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	**3.4**	**2**	Protected against a 100-year flood	2	6.8
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	**2.3**	**2**	High potential for known near term (<5 years) future development	1	2.3
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	**2**	**2**	No federal or state permits required	1	2
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	**3.3**	**2**	Located outside of the Resource Manangement Area (RMA)	1	3.3
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	**0.8**	**2**	Minimal modifications would be required for the City's VPDES permit	2	1.6
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	**3.5**	**2**	Yes	2	7
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	**2.9**	**2**	Yes	2	5.8
			1	Adjacent		
			0	No		
	Impacts to community during construction	**2.1**	**2**	Minimal impacts to the community during construction	0	0
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	**2.3**	**2**	Minimal tree removal/mitigation (<0.2 acres) is required	1	2.3
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		**67**

Dock Street #1

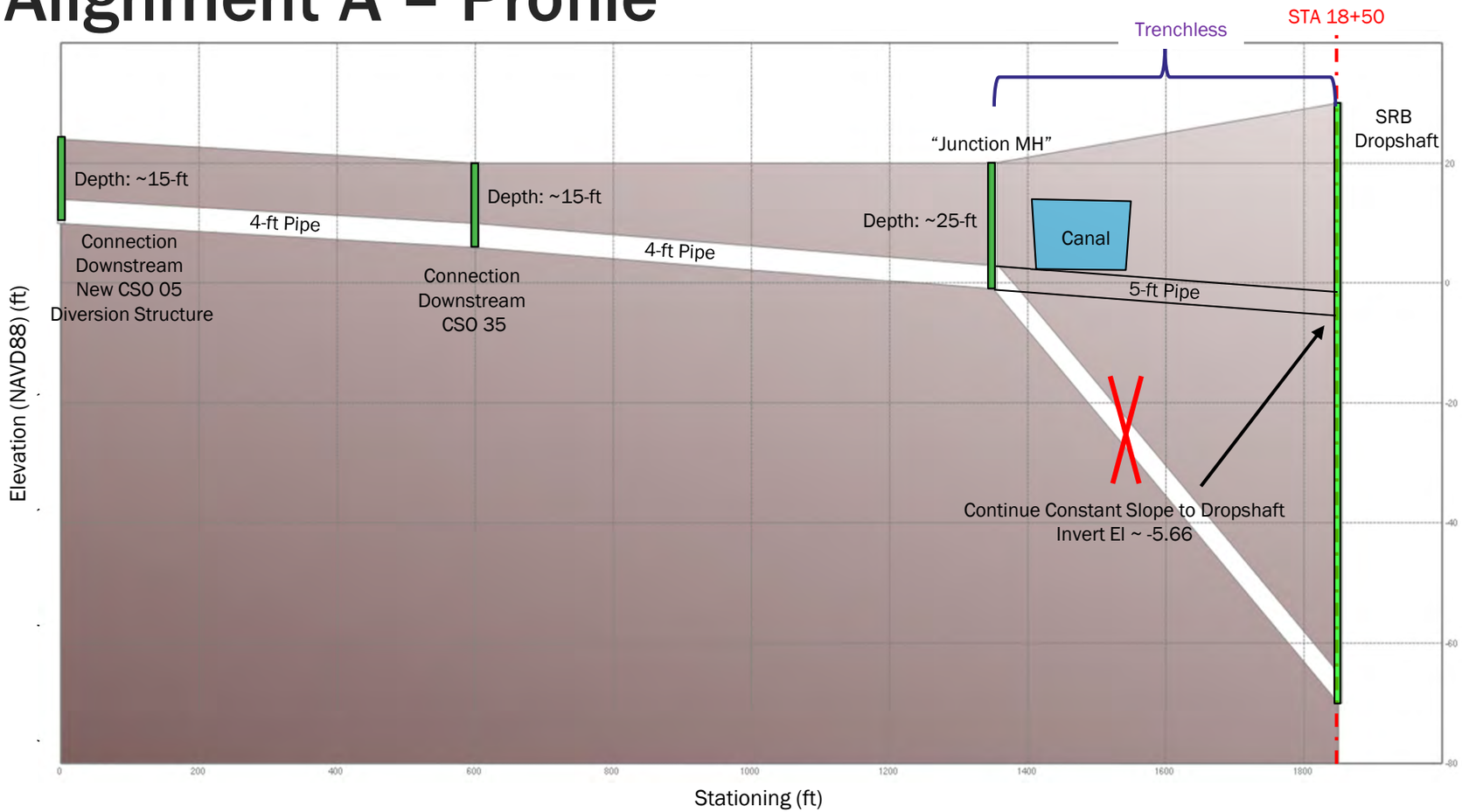
Dock Street #1

CSO 005, 034, and 035 Conveyance Sewer

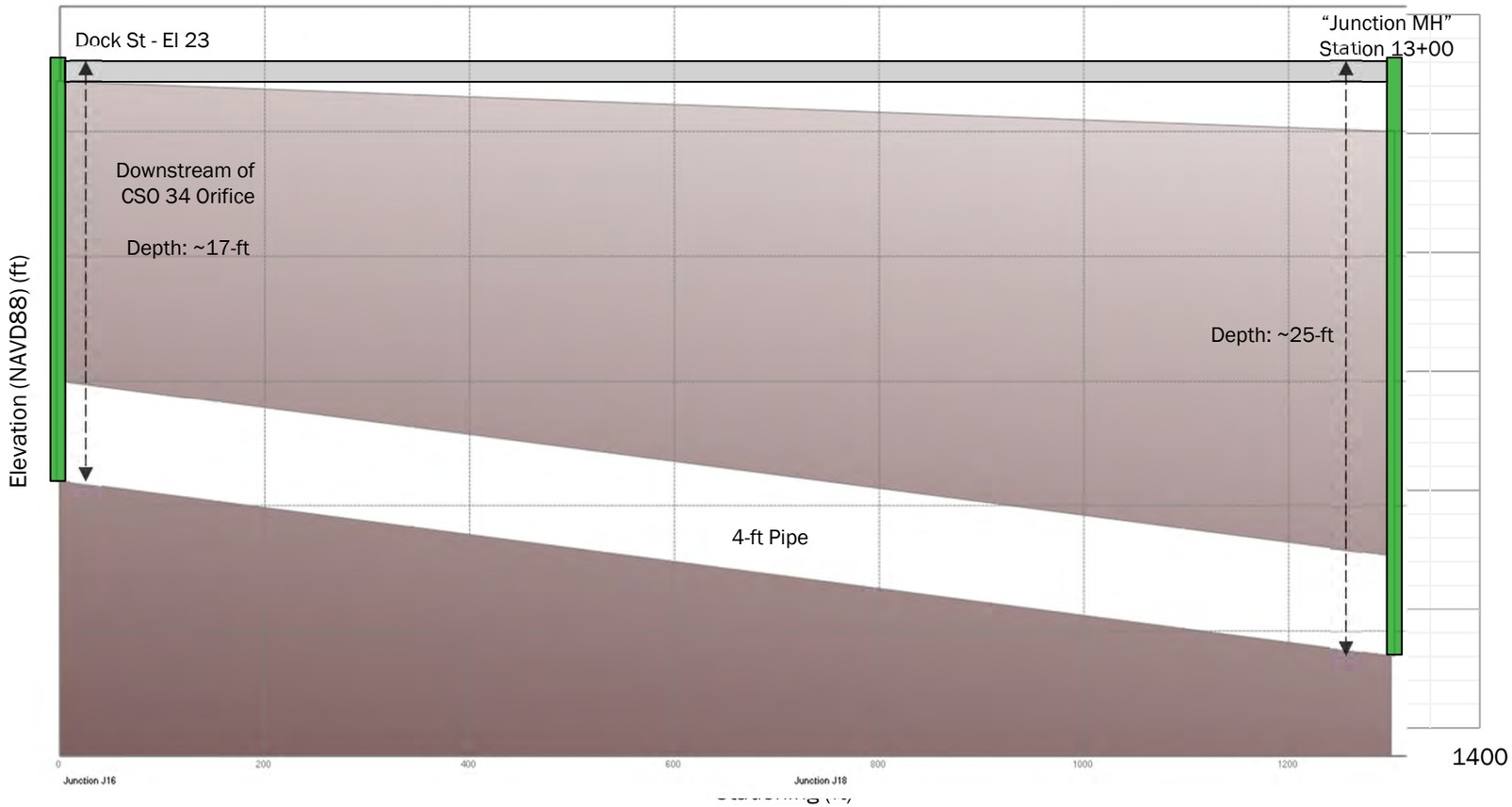
<u>Sizing Note:</u> 4-ft diameter sewers resulted in 0 overflow events per year (2011-2013) at Outfall 005, 034 and 035.



Alignment A – Profile



Alignment B – Profile



City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
Northside #3: CSO 011 Storage Tank
Conceptual Design

Item	Unit	Quantity	Unit Cost	Total Amount
0. Structure Dimensions				
a. New Diversion Structure				
i. Length	LF	20		
ii. Width	LF	30		
iii. Depth	LF	30		
b. Storage Tank (Covered)				
i. Length	LF	50		
ii. Width	LF	125		
iii. Depth	LF	50		
c. Odor Control Vault				
i. Length	LF	30		
ii. Width	LF	30		
iii. Depth	LF	20		
1. General				
a. Site Prep	ACRE	0.5	$250,000.00	$125,000.00
			General Subtotal	$125,000
2. Excavation for Structures				
a. Support of Excavation				
i. Sheeting				
New Diversion Structure Excavation Vertical Area	SF	8,658	$45.00	$389,610
Excavation Length	LF	34		
Excavation Width	LF	44		
Excavation Depth	LF	37		
Storage Tank (Covered) Excavation Vertical Area	SF	36,018	$45.00	$1,620,810
Excavation Length	LF	66		
Excavation Width	LF	141		
Excavation Depth	LF	58		
Odor Control Vault Excavation Vertical Area	SF	5,544	$45.00	$249,480
Excavation Length	LF	42		
Excavation Width	LF	42		
Excavation Depth	LF	22		
b. Soil				
i. Excavate and Dispose of Soil	CY	23,478	$90.00	$2,113,027
			Excavation for Structures Subtotal	$4,372,927
3. Structural				
a. New Diversion Structure				
i. 20'L x 30'W x 30'D				
Concrete Base Slab	CY	104	$775.00	$80,600
Base Slab Thickness	LF	3		
Base Slab Length	LF	26		
Base Slab Width	LF	36		
Concrete Exterior Walls	CY	373	$1,500.00	$560,000
Exterior Wall Thickness	LF	3		
Exterior Wall Length	LF	112		
Exterior Wall Height	LF	30		
Concrete Top Slab	CY	69	$1,500.00	$104,000
Top Slab Thickness	LF	2		
Top Slab Length	LF	26		
Top Slab Width	LF	36		
b. Storage Tank (Covered)				
i. 50'L x 125'W x 50'D				
Concrete Base Slab	CY	1,143	$775.00	$885,681
Base Slab Thickness	LF	4		
Base Slab Length	LF	58		
Base Slab Width	LF	133		
Concrete Exterior Walls	CY	2,711	$1,500.00	$4,066,667
Exterior Wall Thickness	LF	4		
Exterior Wall Length	LF	366		
Exterior Wall Height	LF	50		
Concrete Top Slab	CY	571	$1,500.00	$857,111
Top Slab Thickness	LF	2		
Top Slab Length	LF	58		

			Top Slab Width	LF	133		
	c.	Odor Control Vault					
		i.	30'L x 30'W x 20'D				
			Concrete Base Slab	CY	128	$775.00	$99,544
			Base Slab Thickness	LF	3		
			Base Slab Length	LF	34		
			Base Slab Width	LF	34		
			Concrete Exterior Walls	CY	190	$1,500.00	$284,444
			Exterior Wall Thickness	LF	2		
			Exterior Wall Length	LF	128		
			Exterior Wall Height	LF	20		
			Concrete Top Slab	CY	86	$1,500.00	$128,444
			Top Slab Thickness	LF	2		
			Top Slab Length	LF	34		
			Top Slab Width	LF	34		
						Structural Subtotal	$7,066,493
4.	Civil						
	a.	Pipe					
		i.	Furnish and Install 60" Fiber Reinforced Sewer Pipe (Trenchless)	LF	700	$4,800.00	$3,360,000
		ii.	Furnish and Install 18" Fiber Reinforced Sewer Pipe (40' Depth)	LF	50	$600.00	$30,000
	b.	Excavation					
		i.	Excavation for 18" Fiber Reinforced Sewer Pipe (40' Max Depth)	CY	428	$90.00	$38,500
			Excavation Length	LF	50		
			Excavation Width	LF	6		
			Excavation Depth	LF	42		
	c.	Trenchless Utility Installation					
		i.	96" Fiber Reinforced Sewer Pipe Trenchless Installation				
			Jacking Pit Excavation	CY	889	$90.00	$80,000
			Excavation Length	LF	40		
			Excavation Width	LF	20		
			Excavation Depth	LF	30		
			Receiving Pit Excavation	CY	593	$90.00	$53,333
			Excavation Length	LF	20		
			Excavation Width	LF	20		
			Excavation Depth	LF	40		
	d.	Support of Excavation					
		i.	Sheeting				
			18" Fiber Reinforced Sewer Pipe Excavation Vertical Area	SF	6,300	$45.00	$283,500
			Excavation Length	LF	50		
			Excavation Depth	LF	42		
			Jacking Pit Excavation Vertical Area	SF	5,400	$45.00	$243,000
			Receiving Pit Excavation Vertical Area	SF	4,800	$45.00	$216,000
						Civil Subtotal	$4,304,333
5.	Mechanical						
	a.	Tipping Troughs					
		i.	Furnish and Install Tipping Troughs	EA	2	$75,000.00	$150,000
	b.	Drain Gates					
		i.	Furnish and Install Drain Gates	EA	2	$37,500.00	$75,000
	c.	Odor Control					
		i.	Exhaust Fans and Carbon Adsorber	CFM	5,208	$50.00	$260,417
						Mechanical Subtotal	$490,000
6.	Electrical and I&C						
	a.	Miscellaneous Electrical and I&C					
		i.	Furnish and Install Electrical and I&C (Other)	LS	1	$196,000.00	$196,000
						Electrical and I&C Subtotal	$196,000
7.	Construction Total						
	a.	Subtotal A					$16,554,753
	b.	Design Contingency		LS	1	40%	*$6,621,901*
	c.	Subtotal B		LS	1		$23,176,654
	d.	General Conditions		LS	1	50%	*$11,588,327*
	e.	Subtotal C		LS	1		$34,764,980
	f.	Bonds and Insurance		LS	1	3%	*$1,042,949*
						Total Estimated Cost	**$35,807,930**

8.	Capital Total					
	a.	Construction Cost Total				$35,807,930
	b.	Capital Contingency	LS	1	50%	*$17,903,965*

						Total Estimated Capital Cost	**$53,711,895**

9.	Annual Operations and Maintainence Costs						
	a.	Labor					
		i.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	$50.00	$10,400
		ii.	Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	$50.00	$4,800
		iii.	Pipe Cleaning (Once every 5 years)	LF	750	$30.00	$4,500
		iv.	Structure Cleaning (Once per year)	EA	2	$10,000.00	$20,000
		v.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	$50.00	$9,600
	b.	Maintenance of Structures					
		i.	Maintain Structures	LS	0.2%	$7,066,492.59	$14,133
	c.	Maintenance of Pipe					
		i.	Maintain Pipe	LS	1.0%	$3,390,000.00	$33,900
	d.	Maintenance of Mechanical					
		i.	Maintain Tipping Troughs	LS	3%	$150,000.00	$4,500
		ii.	Maintain Drain Gates	LS	3%	$75,000.00	$2,250
		iii.	Maintain Odor Control Facility	LS	3%	$260,416.67	$7,813
	e.	Maintenance of Instrumentation and Control					
		i.	Maintain I&C	LS	3%	$196,000.00	$5,880
						Annual Operations and Maintainence Costs Subtotal	**$117,775**

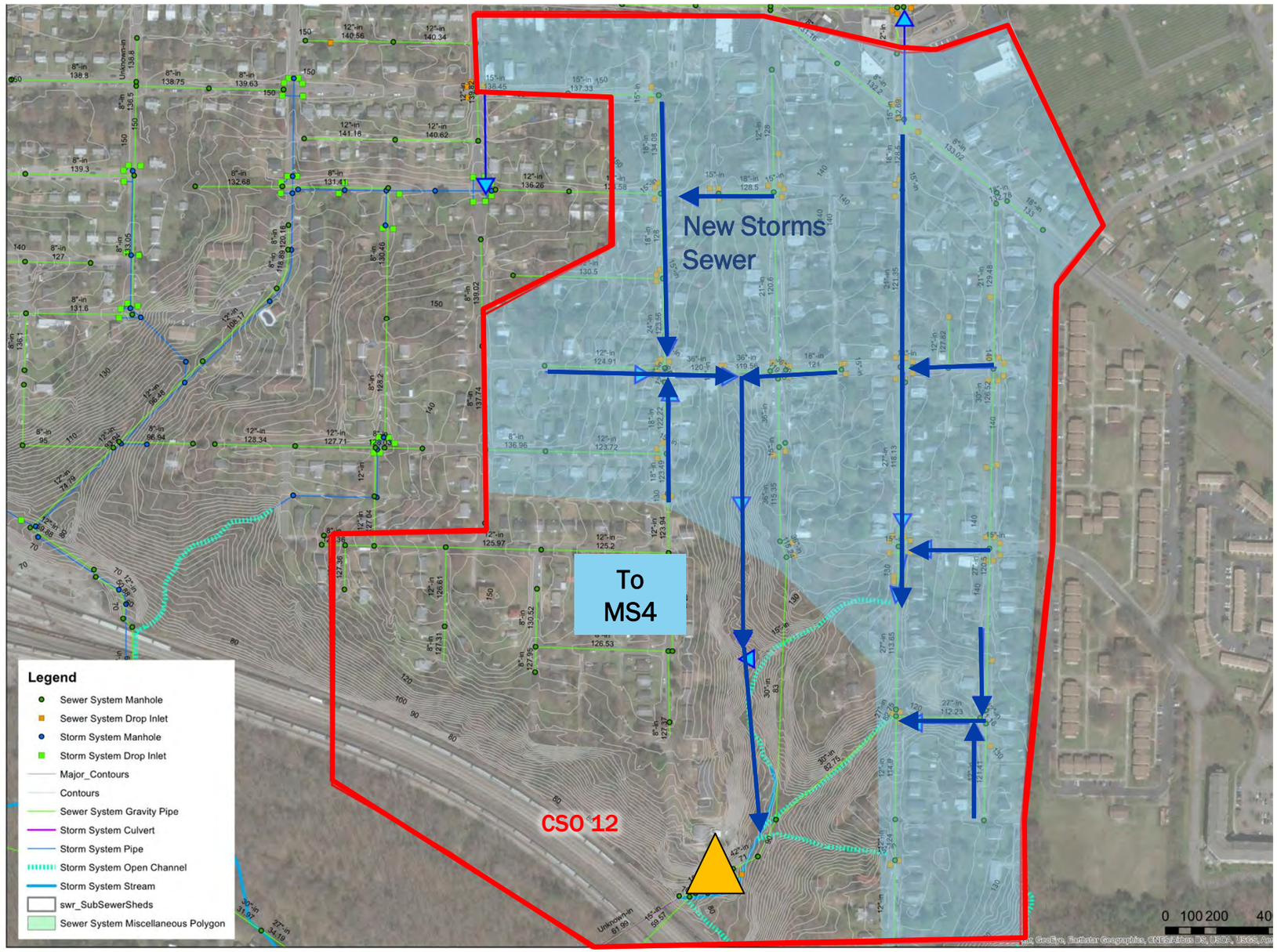
10.	15-Year Replacement Costs						
	a.	Electrical and Instrumentation and Control					
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	$196,000.00	$196,000
	b.	Meters					
		i.	Furnish and Install Replacement Meters	EA	3	$7,500.00	$22,500
						15-Year Replacement Costs Subtotal	**$218,500**

					Dock Street #1	
					New Sewer	
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Score
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2	<4 Year project schedule with minimal risks for schedule extension	2	4.6
			1	4-8 Year project schedule		
			0	>8 Years project schedule with moderate to severe risks for schedule extension		
	Conflicts with aboveground and/or subsurface features/utilities	1.8	2	None/Minor conflicts	1	1.8
			1	Moderate conflicts resolvable through reloactions, reconstruction		
			0	Major conflicts requiring significant disruption and/or signficant relocations		
	Improvements to existing assets	2	2	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	1	2
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	2.3	2	Construction easements or none required	1	2.3
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	1.3	2	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	1	1.3
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	2.5	2	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	2	5
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	1.8	2	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	2	3.6
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
			0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
	Opportunity to improve sewer system performance	2.9	2	Signficant reduction in US/DS HGL as compared to the existing condition	0	0
			1	Moderate reduction in US/DS HGL as compared to the existing condition		
			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	1.1	2	>2 other similar facilties/equipment that are currently operated and maintained at the City	2	2.2
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
	Additional staff required for operations and maintenace	1.6	2	No new staff is required for operation and maintenace	2	3.2
			1	1-2 new employees are required for the operation and maintenace		
			0	>2 new employees are required for operations and maintenace		
Adaptability and Resiliency	Ability to support and work in coordination with future combined sewer system improvements	3.4	2	Project supports future improvements or is foundational for future improvements	2	6.8
			1	Additional modifications needed to support future improvements		
			0	Project will be obsolete or unnecessary after Long Term Plan is implemented		
	Resiliency to potential climate change impacts	4.4	2	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	2	8.8
			1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios		
			0	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		
	Resiliency to potential river floods	3.4	2	Protected against a 100-year flood	2	6.8
			1	Protected against a 25-year flood		
			0	Not protected against a 25-year flood		
Land Use and Permitting	Opportunites to Coordinate with Future Development	2.3	2	High potential for known near term (<5 years) future development	2	4.6
			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	2	2	No federal or state permits required	0	0
			1	Federal/state nationwide/general permits required		
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
	Project located in Environmentally sensitive areas	3.3	2	Located outside of the Resource Manangement Area (RMA)	0	0
			1	Located within the RMA		
			0	Located within the Resource Protection Area (RPA)		
	Required VPDES permitting modifications	0.8	2	Minimal modifications would be required for the City's VPDES permit	2	1.6
			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	3.5	2	Yes	1	3.5
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	2.9	2	Yes	2	5.8
			1	Adjacent		
			0	No		
	Impacts to community during construction	2.1	2	Minimal impacts to the community during construction	0	0
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
	Tree Removal/Mitigation	2.3	2	Minimal tree removal/mitigation (<0.2 acres) is required	1	2.3
			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		66

Hilton Street #1

Hilton Street #1

Separation



City of Richmond Department of Public Utilities
Final Plan RT-DSS Project
Hilton Street #1: Separation

			Item	Unit	Quantity	Unit Cost	Total Amount
0.	Structure Dimensions						
	a.	Stucture					
1.	General						
	a.	Site Prep		ACRE	3	$250,000.00	$750,000.00
						General Subtotal	$750,000
2.	Civil						
	a.	Separation					
		i.	Separation of CSS Drainage Area	ACRE	50	$175,000.00	$8,750,000
						Civil Subtotal	$8,750,000
3.	Construction Total						
	a.	Subtotal A					$9,500,000
	b.	Design Contingency		LS	1	40%	*$3,800,000*
	c.	Subtotal B		LS	1		$13,300,000
	d.	General Conditions		LS	1	50%	*$6,650,000*
	e.	Subtotal C		LS	1		$19,950,000
	f.	Bonds and Insurance		LS	1	3%	*$598,500*
						Total Estimated Cost	**$20,548,500**

			Item	Unit	Quantity	Unit Cost	Total Amount
4.	Annual Operations and Maintainence Costs						
	a.	Labor					
		i.	Pipe Cleaning (Once every 5 years)	LF	3,000	$30.00	$18,000
	b.	Maintenance of Pipe					
		i.	Maintain Pipe	LS	1%	$2,625,000.00	$26,250
						Annual Operations and Maintainence Costs Subtotal	$44,250

			Item	Unit	Quantity	Unit Cost	Total Amount
5.	15-Year Replacement Costs						
	a.	Electrical and Instrumentation and Control					
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	$0.00	$0
	b.	Meters					
		i.	Furnish and Install Replacement Meters	EA	2	$7,500.00	$15,000
						15-Year Replacement Costs Subtotal	$15,000

					Hilton Street #1 New Sewer	
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Score
Constructability	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2	<4 Year project schedule with minimal risks for schedule extension	2	4.6
			1	4-8 Year project schedule		
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	Conflicts with aboveground and/or subsurface features/utilities	1.8	2	None/Minor conflicts	1	1.8
			1	Moderate conflicts resolvable through reloactions, reconstruction		
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	Improvements to existing assets	2	2	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years	2	4
			1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		
			0	Improvements to existing assets not identified for replacement within next 10 years		
	Required land acquisition or construction easements	2.3	2	Construction easements or none required	1	2.3
			1	Permanent easements required		
			0	Land acquisition required		
	Risk of construction means and methods	1.3	2	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	2	2.6
			1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
O&M	Risk of sewer system flooding due to equipment failures	2.5	2	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition	2	5
			1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		
			0	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition		
	New Facility/Equipment maintenance requirements	1.8	2	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended	2	3.6
			1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		
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	Opportunity to improve sewer system performance	2.9	2	Signficant reduction in US/DS HGL as compared to the existing condition	2	5.8
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			0	No reduction in US/DS HGL as compared to the existing condition		
	Familiarity with new Facilities/Equipment	1.1	2	>2 other similar facilties/equipment that are currently operated and maintained at the City	2	2.2
			1	1-2 other similar facilities/equipment that are currently operated and maintained at the City		
			0	No other similar facilities/equipment that are currently operated and maintained at the City		
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			1	Moderate potential for known near term long term (>5 years) future development		
			0	No known or potential development in next 10 years		
	Required Fed/State Permits/Coordination	2	2	No federal or state permits required	2	4
			1	Federal/state nationwide/general permits required		
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	Project located in Environmentally sensitive areas	3.3	2	Located outside of the Resource Manangement Area (RMA)	2	6.6
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			1	Moderate modifications would be required for the City's VPDES permit		
			0	Significant modifications would be required for the City's VPDES permit		
Community	Opportunites for Water Quality Improvements in Environmental Justice Areas	3.5	2	Yes	2	7
			1	Adjacent		
			0	No		
	Opportunity to provide community give back (public space improvements)	2.9	2	Yes	2	5.8
			1	Adjacent		
			0	No		
	Impacts to community during construction	2.1	2	Minimal impacts to the community during construction	0	0
			1	Moderate impacts (traffic detours and/or noise in residential areas) during construction		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
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			1	Moderate tree removal/mitigation (0.2-1 acres) is required		
			0	Signficant tree removal/mitigation (>1 acres) is required		
				SUM		87