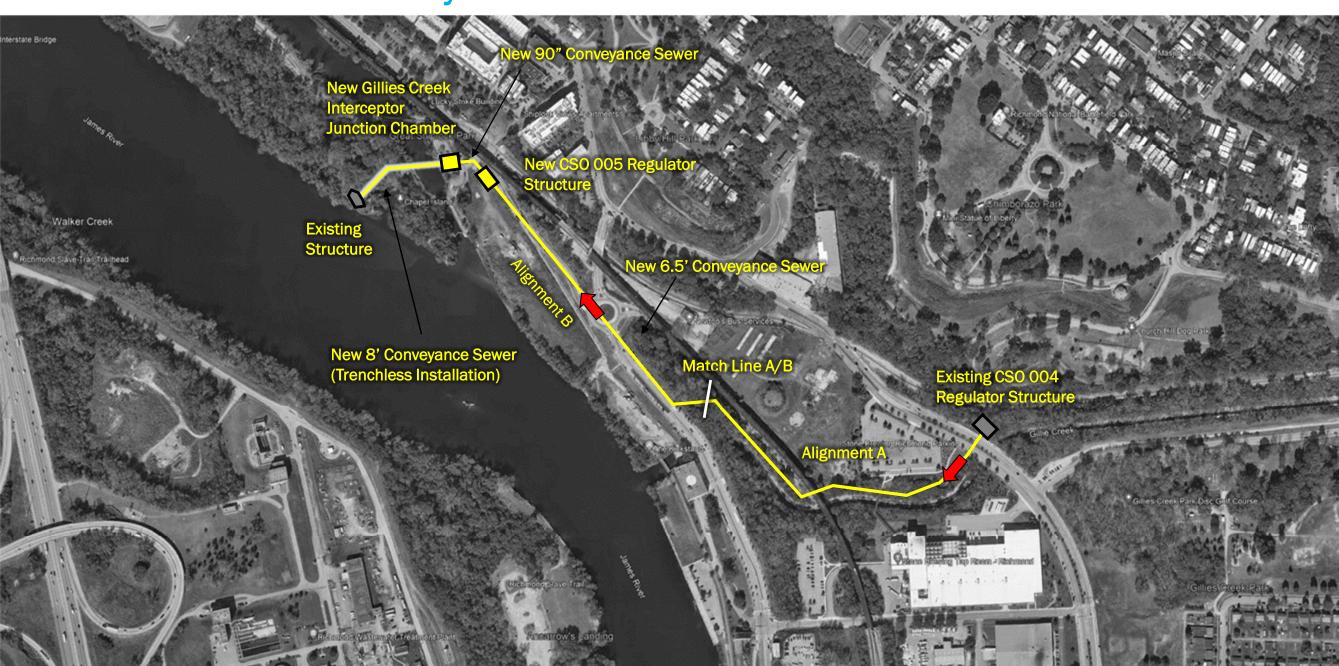
- 1. Special Order Project #13
- 2. Special Order Project #15
- 3. Special Order Project #19
- 4. Shockoe #1
- 5. Shockoe #2
- 6. Shockoe #3
- 7. Shockoe #4
- 8. Shockoe #5
- 9. Southside #1
- 10.Southside #2
- 11.Southside #3
- 12.Southside #4
- 13. Southside #5
- 14. Southside #6
- 15. Gillies Creek #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

Lower Gillies Creek Conveyance Sewer



Existing CSO 04 Alignment A – Upstream **Regulator Structure** WILLIAMSBURG AVE WILLIAMSBURG AVE PROPOSED CSO CONVEYANCE PIPE EXISTING CSO 004 DWF REGULATOR 7 -GILLIES CREEK INTECEPTOR FULTON BOTTOM SEWER (NOT IN SERVICE) CSO 004 Existing CSO 04 **Regulator Structure** CSX TERSTLE . [Match Line A/B] 78 90.14% -10 PROPOSED 36" ~1550 LF 78-Inch Pipe 35+00 36+00 37+00 38+00 39+00 40+00 41+00 42+00 43+00 44+00 45+00 46+00 47+00 48+00 49+00

Alignment B - Downstream PROPOSED CSO OOS New CSO 05 Regulator PROPOSED PROPOSED CSO CONVEYANCE PIPE New Gillies Creek TING CSO PROPOSED Interceptor DWF CSO 004 **JLATOR** REGULATOR **Junction Existing Inlet** D NE Chamber GILLIES CREEK Chamber INTERCEPTOR JAMES RIVER TWIN 66" RIVER 0 GILLES CREEK PAVED CROSSING Inlet **GCI Junction** Canal Chamber Chamber **New CSO 05** CHAMBER -[Match Line A/B] 36"X60" PROPOSED NEW INLET CHAMBER STONE-12" TC 60" PRC-18 PC 12TC 20 10 -10 ~1700 LF 78-Inch Pipe ~200 LF 90-~500 LF 96-Inch Pipe -20Inch Pipe 14+00 15+ 10+00 +00 19+00 20+00 21+00 22+00 23+00 24+00 25+00 26+00 27+00 28+00 29+00 30+00 31+00 32+00 33+00 34+00

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
Section Sect	0.	Stru	uctı					
Bit Worth		a.	CS	0 005 Regulator Structure				
			i.	Length	LF	20		
D. Gilles Creek Interceptor Junction Structure			ii.	Width	LF	20		
Length			iii.	Depth	LF	30		
I. Width I.F 30		b.	Gill	ies Creek Interceptor Junction Structure				
			i.	Length	LF	20		
Second			ii.	Width	LF	20		
ACRE 4 \$500,000.00 \$2,000,000.00			iii.	Depth	LF	30		
ACRE 4 \$500,000.00 \$2,000,000.00								
2.		a.	Site	e Prep	ACRE	4	\$500,000.00	\$2,000,000.00
2.								
B. Support of Excavation							General Subtotal	\$2,000,000
						1		
CSO 005 Regulator Ecovation Vertical Area		_	_					
			i.				*	
							\$45.00	\$339,660
	\vdash							
GCJ Junction Chamber Excavation Vertical Area	\vdash							
	\vdash			•			* 45.00	****
	\vdash						\$45.00	\$339,660
Description Life 37 Life 37 Life 37 Life								
D. Soil Excevate and Dispose of Soil CY 3,168 \$90.00 \$285,147	\vdash							
		l.	0 - :		LF	31		
Signatural		_			0)/	2.400	#00.00	#005 447
Structural			l.	Excavate and Dispose of Soil	CY	3,168	\$90.00	\$285,147
Structural						Excavation for	Structures Subtotal	\$964.467
0. (SO 005 Regulator Structure	3	Stri	ucti	ıral		Excavation for	oti dotares odbiotar	Ψ30-1,-101
					<u> </u>	I		
Base Slab Thickness		_						
Base Slab Length				Concrete Base Slab	CY	75	\$775.00	\$58,211
Base Slab Width				Base Slab Thickness	LF	3		
Concrete Exterior Walls				Base Slab Length	LF	26		
Exterior Wall Thickness				Base Slab Width	LF	26		
Exterior Wall Length				Concrete Exterior Walls	CY	307	\$1,500.00	\$460,000
Exterior Wall Height				Exterior Wall Thickness	LF	3		
Concrete Top Slab					LF	92		
Top Slab Thickness					LF	30		
Top Slab Length				·			\$1,500.00	\$75,111
Top Slab Width				·				
b. Gillies Creek Interceptor Junction Structure								
I. 20'L x 20'W x 30'D	Ш			·	LF	26		
Concrete Base Slab		_						
Base Slab Thickness	\vdash		1.		CV	75	¢775.00	¢E0 011
Base Slab Length	\vdash		H				\$115.00	\$50,∠II
Base Slab Width	\vdash		H					
Concrete Exterior Walls	\vdash		H					
Exterior Wall Thickness	H		H				\$1 500 00	\$460,000
Exterior Wall Length	\vdash		H				¥1,500.00	¥+00,000
Exterior Wall Height	H		H					
Concrete Top Slab	H		H	1				
Top Slab Thickness	H		H	•			\$1.500.00	\$75,111
Top Slab Length	H						,========	+
Top Slab Width	H							
Structural Subtotal \$1,186,644	H							
4. Civil a. Pip	H				-			
4. Civil	├				1	<u> </u>	Structural Subtotal	\$1,186,644
a. Pipe	4.	Civi	il					
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		_	_	e				
ii. Furnish and Install 90" Fiber Reinforced Sewer Pipe LF 200 \$1,800.00 \$360,000		_	_		LF	550	\$7,800.00	\$4,290,000
iii. Furnish and Install 78" Fiber Reinforced Sewer Pipe LF 3,250 \$1,500.00 \$4,875,000	Ħ		ii.	Furnish and Install 90" Fiber Reinforced Sewer Pipe	LF	200	\$1,800.00	\$360,000
	П		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 Dep	th) 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 Dep	th) 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
	1 1	<u> </u>		Civil Subtotal	\$22,724,833
5. Co	onstruction Total				
a.	. Subtotal A				\$26,875,944
b.	. Design Contingency	LS	1	40%	\$10,750,378
c.		LS	1		\$37,626,322
	General Conditions, Overhead and Profit	LS	1	50%	\$18,813,161
_	. Subtotal C	LS	1		\$56,439,483
f.	Bonds and Insurance	LS	1	3%	\$1,693,185
			rotal 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									

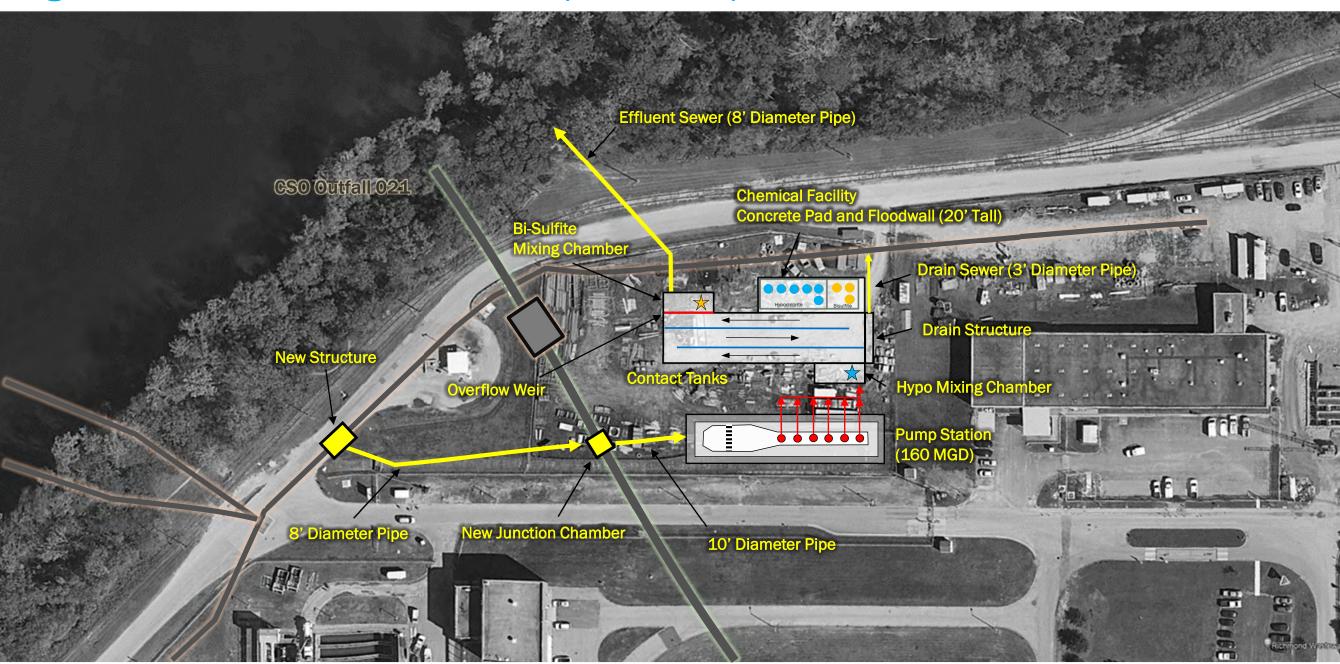
7. Annual Operations and Maintainence Costs										
	a. Labor									
		i.	Pipe Cleaning (Once every 5 years)	LF	4,000	\$30.00	\$24,000			
		ii.	Structure Cleaning (Once per year)	EA	1	\$10,000.00	\$10,000			
	b.	Ма	intenance of Pipe							
		i.	Maintain Pipe	LS	1%	\$9,525,000.00	\$95,250			
	c.	Ма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

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.	Ме	eters						
		i.	Furnish and Install Replacement Meters	EA	2	\$7,500.00	\$15,000		
15-Year Replacement Costs Subtotal									

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

SO #13

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

Structure Priembons				Item	Unit	Quantity	Unit Cost	Total Amount
a. Structure #1.	0.	Str	uct		Onic	Quantity	OTHE GOOD	Total Allount
In			_					
Big Denth LF S0 LF LF LF LF LF LF LF L			i.	Length	LF	20		
D. Sinchure #2			ii.	Width	LF	30		
Langth			iii.	Depth	LF	30		
		b.	Str	ructure #2				
Depth			_					
C. Dyspo Maing Chamber			_					
The content of the			_	I :	LF	30		
Simple S		c.	_					
Depth				_				
Commart Tamins (uncovered)			_					
		ч	_	1 - 1	LF	20		
		u.	_		I E	200		
Part								
S. Studine Moning Chamber			_					
		e.	_	I :		20		
Image: Comparison of the com		0.	_		LF	20		
Recompanies Left			_					
			_	Depth				
		f.	Ch	emical Facility Pad				
			_		LF	30		
1. General			ii.	Width	LF	100		
A Site Prep			iii.	Depth	LF	20		
A Site Prep								
	1.	Ge	ner	al				
2. Excavation for Structures a. Support of Excavation i. Isheeting i.		a.	Sit	e Prep	ACRE	2	\$250,000.00	\$500,000.00
2. Excavation for Structures a. Support of Excavation i. Isheeting i.								
a. Support of Excavation							General Subtotal	\$500,000
	2.	_	_					
Structure #1		a.	_					
Excavation Length			i.	_	0.5	F 470	*45.00	#040.400
			_				\$45.00	\$246,420
Excavation Depth in Rock				_				
Excavation Depth in Rock								
Structure #2 SF 5,476 \$45.00 \$246,420 Excavation Length				1				
Excavation Length							\$45.00	\$246.420
Excavation Width		_	_				Ψ-0.00	Ψ240,420
Excavation Depth LF 37								
Excavation Depth in Rock								
HRD and Chemical Facility				Excavation Depth in Rock				
Excavation Perimeter				-			\$45.00	\$1,209,600
Excavation Depth				Excavation Perimeter	LF	640	·	
Excavation Depth in Rock				Excavation Area	SF	15,000		
b. Soi				Excavation Depth	LF	28		
1 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 Excavation for Structures Subtotal 3. Structure #1 Image: Structure #1 </td <td></td> <td></td> <td></td> <td>Excavation Depth in Rock</td> <td>LF</td> <td>0</td> <td></td> <td></td>				Excavation Depth in Rock	LF	0		
c. Rock CY 697 \$300.00 \$209,067 Excavate and Dispose of Rock CY 697 \$300.00 \$209,067 Excavation for Structures Subtotal \$3,580,307 3. Structural Structure #1 Structure #		b.	So					
I. Excavate and Dispose of Rock			i.	Excavate and Dispose of Soil	CY	18,542	\$90.00	\$1,668,800
Structure		c.	Ro	•				
3. Structure #1			i.	Excavate and Dispose of Rock	CY			
a. Structure #1	Ļ.,	_				Excavation fo	r Structures Subtotal	\$3,580,307
i. 20'L x 30'W x 30'D CY 91 \$775.00 \$70,267 i. Concrete Base Slab CY 91 \$775.00 \$70,267 i. Base Slab Thickness LF 3 3 i. Base Slab Length LF 24 4 i. Base Slab Width LF 34 34 i. Concrete Walls CY 240 \$1,500.00 \$360,000 i. Exterior Wall Thickness LF 2 2 i. Exterior Wall Length LF 108 4 i. Exterior Wall Height LF 30 30 i. Concrete Top Slab CY 60 \$1,500.00 \$90,667 i. Top Slab Thickness LF 2 2 i. Top Slab Length LF 24 4 i. Top Slab Width LF 24 4	3.					, ,		
Concrete Base Slab CY 91 \$775.00 \$70,267 Base Slab Thickness LF 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 4 <		a.	Str i					
Base Slab Thickness			1.		CV	01	\$775.00	\$70.267
Base Slab Length			 				\$115.00	φ10,201
Base Slab Width			H					
Concrete Walls CY 240 \$1,500.00 \$360,000 Exterior Wall Thickness LF 2 2 Exterior Wall Length LF 108 30 Exterior Wall Height LF 30 30 Concrete Top Slab CY 60 \$1,500.00 \$90,667 Top Slab Thickness LF 2 2 Top Slab Length LF 24 34 Top Slab Width LF 34 34			-					
Exterior Wall Thickness			H				\$1.500.00	\$360.000
Exterior Wall Length			H				, 1,000.00	4555,500
Exterior Wall Height			H					
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			H					
Top Slab Thickness LF 2 Top Slab Length LF 24 Top Slab Width LF 34			T				\$1,500.00	\$90,667
Top Slab Length			T				. ,	,
Top Slab Width LF 34			T					
		b.	Str	ructure #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.	HR	D 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.	Civ	il					
	_	Pip	ne e				
	T	-	Furnish and Install 96" Fiber Reinforced Sewer Pipe (25' Depth)	LF	250	\$2,000.00	\$500,000
			Furnish and Install 96" Fiber Reinforced Sewer Pipe (20' Depth)	LF	250	\$2,000.00	\$500,000
		_	Furnish and Install 120" Fiber Reinforced Sewer Pipe (35' Depth)	LF	50	\$2,500.00	\$125,000
			Furnish and Install 36" Fiber Reinforced Sewer Pipe (10' Depth)	LF	50	\$850.00	\$42,500
	b.	_	cavation	-	30	Ψ000.00	Ψ+2,000
	٠.	i	Excavation for 96" Fiber Reinforced Sewer Pipe (25' Average Depth)	CY	3,000	\$90.00	\$270,000
		Ë	Excavation Length	LF	250	Ψ30.00	Ψ210,000
			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
		11.		LF	250	\$90.00	\$220,000
	-		Excavation Length				
	-		Excavation Width	LF	12		
	_		Excavation Depth	LF	22	***	A=0.000
		iii.	1 1 1	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.		CY	156	\$90.00	\$14,000
			Excavation Length	LF	50		
			Excavation Width	LF	7		
		Ш	Excavation Depth	LF	12		
	c.	Sup	pport of Excavation				
		i.	Sheeting				
		Ш	96" Fiber Reinforced Sewer Pipe (25') Excavation Vertical Area	SF	20,250	\$45.00	\$911,250
	L	الل	Excavation Length	LF	250		
_	L	LĪ	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		
		Ħ	Excavation Depth	LF	37		
	T	П	36" Fiber Reinforced Sewer Pipe Excavation Vertical Area	SF	1,800	\$45.00	\$81,000
	t	H	Excavation Length	LF	50		,
		H	Excavation Depth	LF	12	+	
				_			
	-		<u> </u>	1	!	Civil Subtotal	\$3,780,444
5.	Me	cha	nical				,-,,
	-		mp Station				
	m	i	New Pump Station and Screening Facility	MGD	160	\$300,000.00	\$48,000,000
	b.	HR	D Chemical Facility			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
	٠.	_	New HRD Facility and Equipment	MGD	160	\$15,000.00	\$2,400,000
	C.	_	ping Troughs	IVIGD	100	Ψ10,000.00	Ψ2,400,000
	u.	_	Furnish and Install Tipping Troughs	EA	4	\$75,000.00	\$300,000
	Ч	-		LX	4	φ13,000.00	φ300,000
	u.	_	ain Gates	F.4	1	607 500 00	\$4E0.000
	1	i.	Furnish and Install Drain Gates	EA	4	\$37,500.00	\$150,000

	d.	General Conditions, Overhead and Profit Subtotal C	LS LS	1	50%	\$46,300,610 \$138,901,831			
	_	Design Contingency Subtotal B	LS LS	1	40%	\$26,457,492 \$92,601,220			
	a.	Subtotal A				\$66,143,729			
7.	Co	struction Total		Liecti	icai and two Subtotal	\$180,000			
	i. Furnish and Install Electrical and I&C (Other) LS 1 \$180,000.00 Electrical and I&C Subtotal								
	a.	Miscellaneous Electrical and I&C			*400.000.00	\$180,000			
6.	6. Electrical and I&C								
	<u> </u>				Mechanical Subtotal	\$50,850,000			

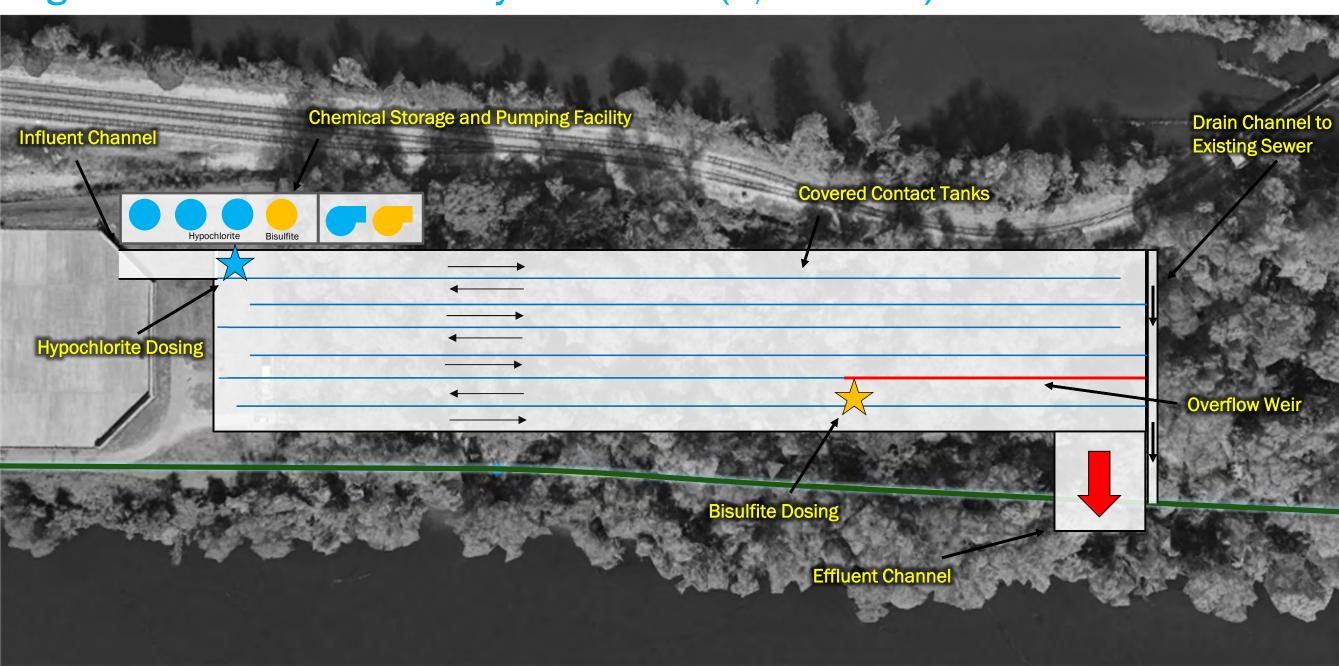
8.	Capital Total								
	a.	Construction Cost Total				\$143,068,886			
	b.	Capital Contingency	LS	1	50%	\$71,534,443			
	Total Estimated Capital Cost								

	_	I Operations and Maintainence Costs				
a.	La					
	i.	Daily Check (365 Days, 1 Hr/Ea)	HR	365	\$50.00	\$18,25
	ii.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	\$50.00	\$10,40
		Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	\$50.00	\$4,80
		Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	\$50.00	\$9,60
	٧.	Continuous Staffing (365 Days, 24 Hrs/Ea)	HR	8,760	\$50.00	\$438,00
b.	Ma	aintenance of Structures				
	i.	Maintain Structures	LS	0.2%	\$7,252,977.78	\$14,5
c.	Ma	aintenance of Pipe				
	i.	Maintain Pipe	LS	1%	\$0.00	;
d.	Ma	aintenance of Mechanical				
	i.	Maintain Tipping Troughs	LS	3%	\$300,000.00	\$9,00
	ii.	Maintain Drain Gates	LS	3%	\$150,000.00	\$4,50
	iii.	Maintain HRD Chemical Facility	LS	3%	\$2,400,000.00	\$72,00
	iv.	Maintain Pump Station	LS	3%	\$48,000,000.00	\$1,440,00
e.	Ma	aintenance of Instrumentation and Control				
	i.	Maintain I&C	LS	3%	\$180,000.00	\$5,40
f.	Op	peration of HRD Chemical Facility				
	i.	Sodium Hypochlorite				
		Dose	mg/L	10		
		Volume	MGY	285		
		Quantity	LBS	23763	\$2.00	\$47,5
	ii.	Sodium Bisulfite				
		Dose	mg/L	3		
		Volume	MGY	285		
		Quantity	LBS	5941	\$2.00	\$11,8
g.	Op	peration of Influent Pump Station				
	i.	Pump Station Electricity Cost				
		Flowrate of Pump Station	MGD	160		
		Annual Volume	MGY	285		
		Total Dynamic Head	ft	55		
	1	Pump Efficiency		0.6		
	1	Motor Efficiency		0.9		
		Annual Energy Usage	KW-HR	91139	\$0.06	\$5,4
			Annual Operation	s and Maintair	nence Costs Subtotal	\$2,091,3

10.	0. 15-Year Replacement Costs								
	a.	Ele	ctrical and Instrumentation and Control						
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	\$10,260,000.00	\$10,260,000		
	b.	Me	ters						
		i.	Furnish and Install Replacement Meters	EA	4	\$7,500.00	\$30,000		
	15-Year Replacement Costs Subtotal								

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

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.	Str	uctu	ure Dimensions				
	a.	Infl	uent Channel				
			Length	LF	150		
		ii.	Width	LF	30		
		iii.	Depth	LF	20		
	b.	Coı	ntact Tanks (Covered)				
		i.	Length	LF	925		
		ii.	Width	LF	220		
		iii.	Depth	LF	20		
	c.	Effl	luent Channel				
		i.	Length	LF	100		
		ii.	Width	LF	90		
		iii.	Depth	LF	8		
	d.	Dra	ain Channel				
			Length	LF	320		
			Width	LF	10		
			Depth	LF	20		
			emical Facility		20		
	0.	i.	Length	LF	300		
		ii.	Width	LF	50		
			Depth	LF	25		
		111.	Бери	LF	25		
1.	Gar	nera					
_	_	_		ACDE	1 4	\$500,000,00	\$2,000,000.00
	a.	SILE	e Prep I	ACRE	4	\$500,000.00	\$2,000,000.00
						0	\$0,000,000
_	_					General Subtotal	\$2,000,000
	_	_	ation for Structures				
	a.	_	pport 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.	Soi	1				
		i.	Excavate and Dispose of Soil	CY	198,075	\$90.00	\$17,826,787
				•	Excavation for	Structures Subtotal	\$23,340,457
3.	Str	uctu	ural				
	a.		uent 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.	Coi	ntact Tanks		J.		
		i.	925'L x 220'W x 20'D				
			Concrete Base Slab	CY	30,723	\$775.00	\$23,810,296
							,
			Base Slab Thickness	l LF	4	l l	
			Base Slab Thickness Base Slab Length	LF LF	929		

	T	Concrete Walls	CY	3.404	\$1,500.00	\$5,106,667
		Exterior Wall Thickness	LF	2	\$2,000.00	+0,200,00.
		Exterior Wall Length	LF	2,298		
		Exterior Wall Height	LF	20		
		Concrete Walls	CY	8,000	\$1,500.00	\$12,000,000
	1	Interior Wall Thickness	LF	2		
	1	Interior Wall Length	LF	5.400		
	1	Interior Wall Height	LF	20		
		Concrete Top Slab	CY	15,415	\$1,500.00	\$23,121,778
	+	Top Slab Thickness	LF	2	\$2,000.00	+20,222,110
	1	Top Slab Length	LF	929		
	1	Top Slab Width	LF	224		
C.	Eff	luent Channel		224		
		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	, , , , , , ,	,
	1	Exterior Wall Length	LF	208		
	1	Exterior Wall Height	LF	8		
	+-	Concrete Top Slab	CY	724	\$1,500.00	\$1,086,222
	+-	Top Slab Thickness	LF	2	\$1,500.00	Ψ1,000,222
	+	Top Slab Length	LF	104		
	+	Top Slab Width	LF	94		
d.	Dr	ain Channel	LF	94		
u.	i	320'L x 10'W x 20'D				
	†	Concrete Base Slab	CY	504	\$775.00	\$390.600
	1	Base Slab Thickness	LF	3	4110.00	+000,000
	+	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	\$1,500.00	\$1,440,000
	-	Exterior Wall Length			-	
	+-	_	LF	648		
	+-	Exterior Wall Height	LF OY	20	\$4.500.00	\$504.000
	+-	Concrete Top Slab	CY	336	\$1,500.00	\$504,000
		Top Slab Thickness	LF	2		
		Top Slab Length	LF	324		
	Ol-	Top Slab Width	LF	14		
e.	i.	emical Facility 1300'L x 50'W x 25'D				
	÷	Concrete Base Slab	CY	1,824	\$775.00	\$1,413,600
	+	Base Slab Thickness	LF		\$115.00	Ψ1,413,000
	+-		-	3		
	-	Base Slab Length	LF	304	-	
	1	Base Slab Width	LF	54	\$4 F00 00	\$4.000.00T
	+	Concrete Exterior Walls	CY	1,311	\$1,500.00	\$1,966,667
	-	Exterior Wall Thickness	LF	2	-	
	-	Exterior Wall Length	LF	708	\vdash	
	1	Exterior Wall Height	LF	25		
	1	Concrete Top Slab	CY	1,216	\$1,500.00	\$1,824,000
	1	Top Slab Thickness	LF	2		
	1_	Top Slab Length	LF	304		
		Top Slab Width	LF	54		
					Structural Subtotal	\$75,688,248
4. Ci	_					
a.	Civ	vil Improvements	LS	1	\$2,000,000.00	\$2,000,000
					Civil Subtotal	\$2,000,000
	_	anical				
a.	HR	D Chemical Facility				
	i.	New HRD Facility and Equipment	MGD	1,500	\$15,000.00	\$22,500,000
b.		ping Troughs				
	i.	Furnish and Install Tipping Troughs	EA	32	\$75,000.00	\$2,400,000
C.	Dra	ain Gates				
	i.	Furnish and Install Drain Gates	EA	16	\$37,500.00	\$600,000
d.	Tic	le Gates				
	i.	Furnish and Install Tide Gates	EA	5	\$100,000.00	\$500,000

				ı	Mechanical Subtotal	\$26,000,000
6.	Ele	ctrical 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
				Flectric	cal and I&C Subtotal	\$1,200,000
7.	Oth	ner Improvements		LICCUIT	cai and icc Subtotal	\$1,200,000
	_	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 Imp	provements Subtotal	\$25,000,000
8.	Co	nstruction 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 Estimator	d Construction Cost	\$335,759,689

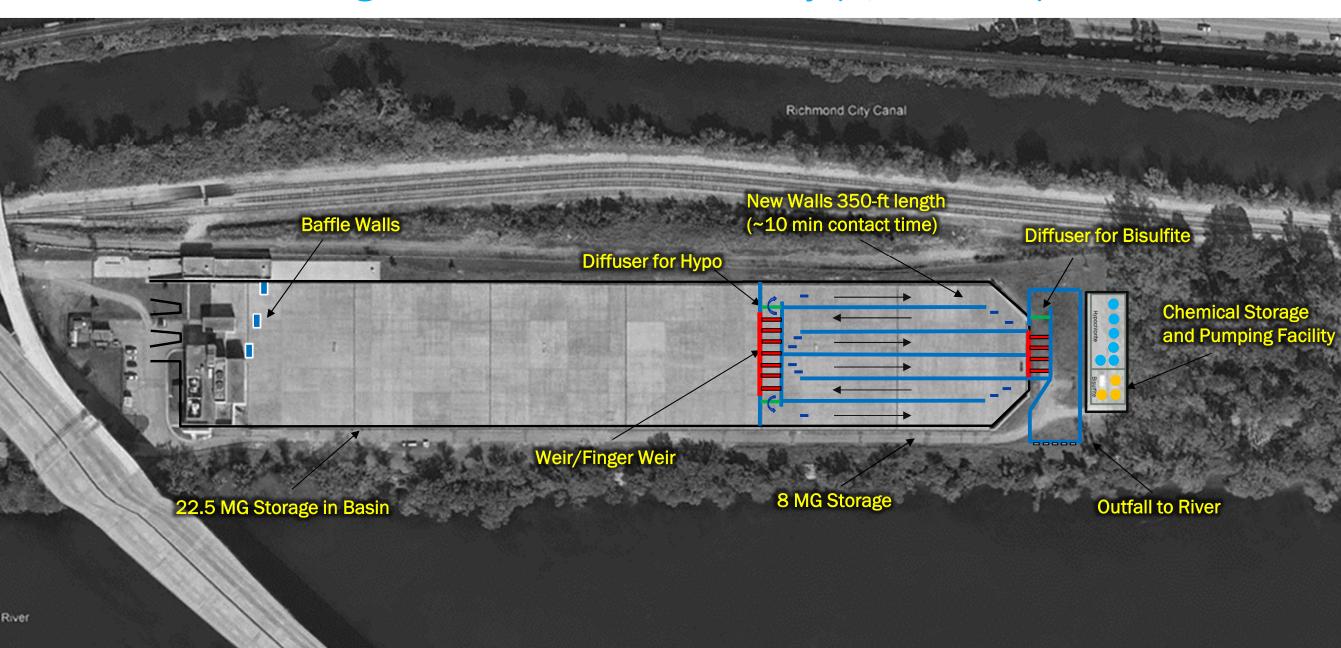
9.	D. Capital Total								
	a.	Construction Cost Total				\$335,759,689			
	b.	Capital Contingency	LS	1	50%	\$167,879,844			
	Total Estimated Capital Cost								

10.	An	nua	I Operations and Maintainence Costs				
	a.	La	bor				
		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
		٧.	Continuous Staffing (365 Days, 24 Hrs/Ea)	HR	8,760	\$50.00	\$438,000
	b.	Ma	aintenance of Structures				
		i.	Maintain Structures	LS	0.2%	\$75,688,248.15	\$151,376
	c.	Ma	aintenance 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.	Ma	aintenance 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.	11. 15-Year Replacement Costs								
	a.	Ele	ctrical 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								

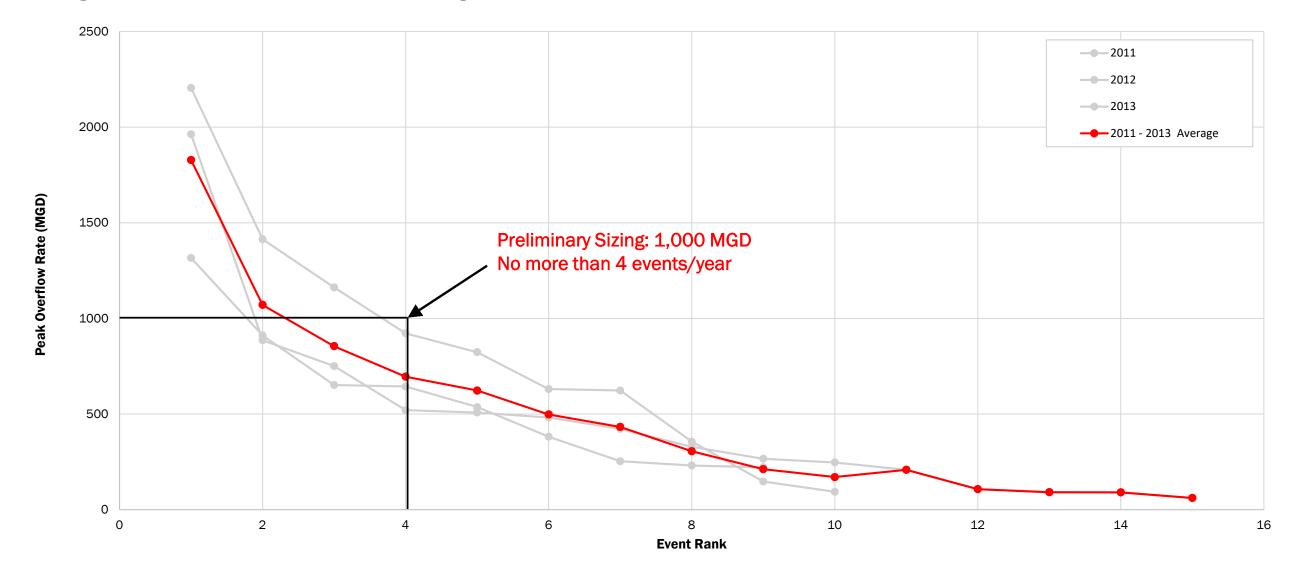
						0 #19 t Shockoe
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Scor
	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2	<4 Year project schedule with minimal risks for schedule extension 4-8 Year project schedule	1	2.3
	Conflicts with aboveground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

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



Shockoe #1Convert 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.	Str	uctı	ure Dimensions	_	•		
	a.	Che	emical Facility				
			Length	LF	200		
		_	Width	LF	50		
		iii.	Depth	LF	25		
	b.	_	chlorination Tank				
		_	Length	LF	225		
			Width	LF	80		
		_	Depth	LF	20		
	C.		w Separating Walls				
		_	Length	LF	2,700		
		_	Width	LF	2		
		III.	Depth	LF	20		
1	Co	n o r	NI .				
1.	-	nera	e Prep	ACRE	1.5	\$250,000.00	\$375,000.00
	a.	Oitt	СТЕР	AONE	1.5	Ψ230,000.00	ψ373,000.00
	1				1	General Subtotal	\$375,000
2.	Exc	cava	tion for Structures				, , 500
	+	_	pport of Excavation				
		i.	Sheeting				
	t		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.	Soi	l				
		i.	Excavate and Dispose of Soil	CY	37,382	\$90.00	\$3,364,387
•	١				Excavation fo	or Structures Subtotal	\$5,747,272
3.		uctu	ıral emical Facility		1		
	a.		200'L x 50'W x 25'D				
		<u> </u>	Concrete Base Slab	CY	1,224	\$775.00	\$948,600
			Base Slab Thickness	LF	3	***************************************	70.0,000
			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.	De	chlorination Tank				
		i.	225'L x 80'W x 20'D				·
	<u> </u>		Concrete Base Slab	CY	2,137	\$775.00	\$1,656,433
			Base Slab Thickness	LF	3		
	<u> </u>		Base Slab Length	LF	229		
	<u> </u>		Base Slab Width	LF	84	A	**
	1	_	Concrete Walls	CY	916	\$1,500.00	\$1,373,333
	<u> </u>	_	Exterior Wall Thickness	LF	2		
	₽	_	Exterior Wall Lleight	LF	618		
	<u> </u>		Exterior Wall Height	LF	20	¢4 500 00	¢0.407.000
	1	_	Concrete Top Slab	CY	1,425	\$1,500.00	\$2,137,333
	<u> </u>		Top Slab Longth	LF	2		
	<u> </u>	_	Top Slab Length	LF	229		
		ı	Top Slab Width	LF	84		

	C.	Nev	w 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.	Dei	molition				
		i.	East Wall and SRB Interior	LS	1		\$2,000,000
						Structural Subtotal	\$17,861,922
4.	Civ	il					
	a.	Civ	il Improvements	LS	1	\$2,000,000.00	\$2,000,000
						Civil Subtotal	\$2,000,000
5.	Me	cha	nical			,	
	a.	HR	D Chemical Facility				
		i.	New HRD Facility and Equipment	MGD	1,000	\$15,000.00	\$15,000,000
	-	_	ping Troughs				
	1		Furnish and Install Tipping Troughs	EA	16	\$75,000.00	\$1,200,000
	c.	-	in Gates			, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	. , ,
	Ť	i.	Furnish and Install Drain Gates	EA	16	\$37,500.00	\$600,000
	d.	_	e Gates			73.753333	*****
	1		Furnish and Install Tide Gates	EA	5	\$100,000.00	\$500,000
	\vdash	·-	Turnish and motali had dates	L/(<u> </u>	\$100,000.00	Ψ000,000
	<u> </u>					Mechanical Subtotal	\$17,300,000
6.	Ele	ctric	cal and I&C				
	a.	Mis	scellaneous Electrical and I&C				
		i.	Furnish and Install Electrical and I&C (Other)	LS	1	\$720,000.0	\$720,000
						, ,,,,,,,,	,
	-			l l	Elect	rical and I&C Subtotal	\$720,000
7.	Oth	ner I	mprovements			<u> </u>	
	a.	Aer	ation Improvements at the SRB	LS	1	\$10,000,000.00	\$10,000,000
	b.	Oth	er Improvements at the SRB	LS	1	\$15,000,000.00	\$15,000,000
			•				
	<u> </u>				Other In	nprovements Subtotal	\$25,000,000
7.	Co	nstr	uction Total			·	<u> </u>
	a.	Sub	ototal A				\$69,004,194
	b.	Des	sign Contingency	LS	1	40%	\$27,601,678
	C.	Sub	ototal B	LS	1		\$96,605,871
	d.	Gei	neral Conditions, Overhead and Profit	LS	1	50%	\$48,302,936
	e.	Sub	ototal C	LS	1		\$144,908,807
	f.	Bor	nds and Insurance	LS	1	3%	\$4,347,264
					Total Estimat	ed Construction Cost	\$149,256,071

8.	3. Capital Total									
	a.	Construction Cost Total				\$149,256,071				
	b. Capital Contingency		LS	1	50%	\$74,628,036				
	Total Estimated Capital Cost									

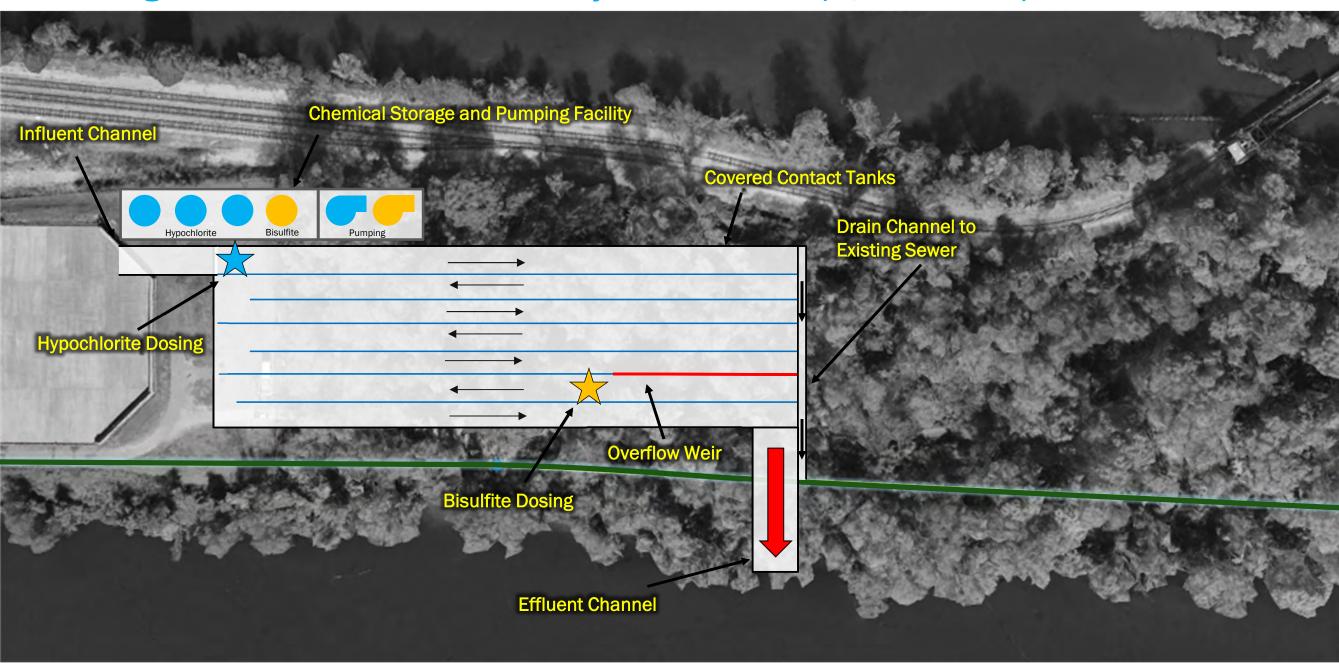
9.	Anı	nua	Operations and Maintainence Costs				
	a.	Lat	oor				
		i.	Daily Check (365 Days, 1 Hr/Ea)	HR	365	\$50.00	\$18,250
		ii.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	\$50.00	\$10,400
		iii.	Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	\$50.00	\$4,800
		iv.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	\$50.00	\$9,600
		٧.	Continuous Staffing (365 Days, 24 Hrs/Ea)	HR	8,760	\$50.00	\$438,000
	b.	Ма	intenance of Structures				
		i.	Maintain Structures	LS	0.2%	\$17,861,922.22	\$35,724
	c.	Ма	intenance 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.	Ма	intenance of Instrumentation and Control				
		i.	Maintain I&C	LS	3%	\$720,000.00	\$21,600
	e.	Ор	eration of HRD Chemical Facility				
		i.	Sodium Hypochlorite				
			Dose	mg/L	10		
			Volume	MGY	1100		

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

10.	0. 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										

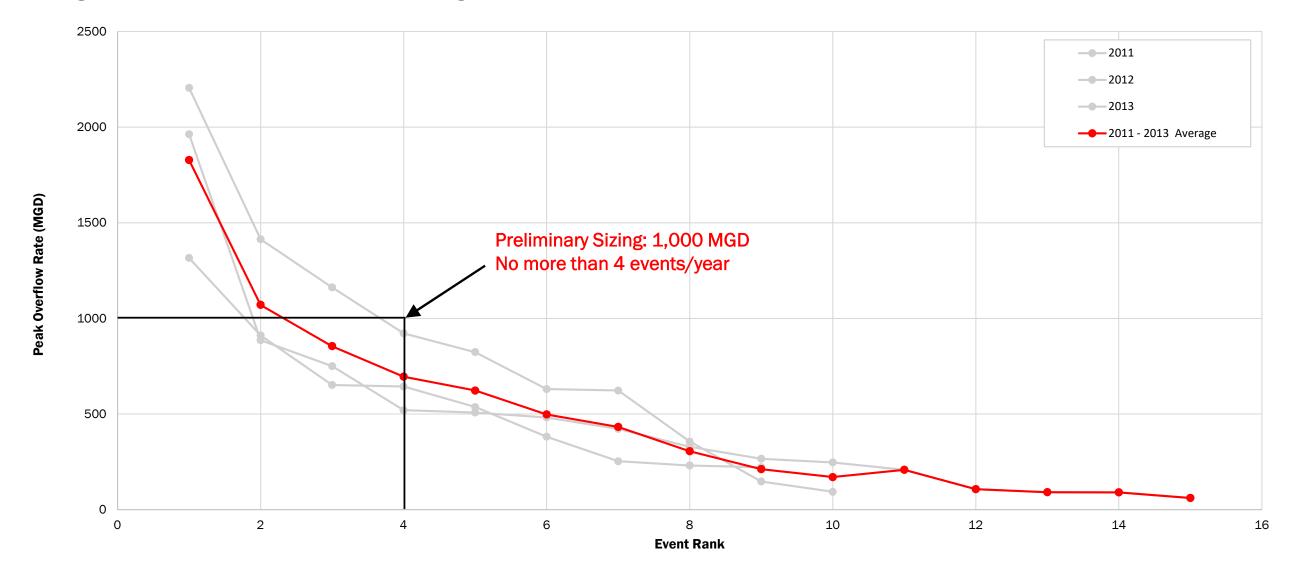
Category	Topic					
	τορισ	Weight	Score	Criteria	Unweighted Score	Weighted Score
	ated Project Schedule (Design, Permitting, Procurement, cruction) Schedule	2.3	2 1 0	<4 Year project schedule with minimal risks for schedule extension 4-8 Year project schedule >8 Years project schedule with moderate to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

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



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
S ^t	_	ure Dimensions				
a.	. In	luent Channel				
	i.	Length	LF	150		
	ii.		LF	16		
	iii.	Depth	LF	16		
b.	. Co	intact Tanks (Covered)				
	i.	Length	LF	550		
П	ii.	Width	LF	220		
T	iii.	Depth	LF	20		
c.	. Ef	fluent Channel				
T	i.	Length	LF	100		
十	ii.	Width	LF	30		
十	iii.	Depth	LF	8		
d.	_	ain Channel				
+	i.		LF	220		
+		Width	LF	10		
+		Depth	LF	20		
	_	pemical Facility	LF	20		
e.	_	-	1.5	000		
+	i.	Length	LF	200		
4	ii.		LF	50		
	iii.	Depth	LF	25		
_	iene			, ,		
a.	. Si	e Prep	ACRE	2.5	\$500,000.00	\$1,250,000.0
					General Subtotal	\$1,250,00
E	xcav	ation for Structures				
a.	. Sı	pport of Excavation				
	i.	Sheeting				
		HRD Facility Vertical Area	SF	69,300	\$45.00	\$3,118,50
T		Excavation Perimeter	LF	2,100		
十		Excavation Area	SF	130,600		
十		Excavation Depth	LF	22		
十		Chemical Facility Excavation Vertical Area	SF	27,522	\$45.00	\$1,238,49
+	+	Excavation Length	LF	216	* 12.22	, ,,,,,,,,
+		Excavation Width	LF	62		
+	+	Excavation Depth	LF	33		
b.	. So		Li	33		
U.	. 30	Excavate and Dispose of Soil	CY	122,783	\$90.00	\$11,050,45
+	1.	Excavate and bispose of son	C1	122,703	\$90.00	\$11,050,45
				Excavation for	Structures Subtotal	\$15.407.44
S	truc	lural		Excavation for	Structures Subtotal	\$15,407,44
	truc			Excavation for	Structures Subtotal	\$15,407,44
. St		luent Channel		Excavation for	Structures Subtotal	\$15,407,44
			CV			
		Tuent Channel 150'L x 16'W x 16'D Concrete Base Slab	CY	342	Structures Subtotal	
		Tuent Channel 150'L x 16'W x 16'D Concrete Base Slab Base Slab Thickness	LF	342		
		Tuent Channel 150'L x 16'W x 16'D Concrete Base Slab Base Slab Thickness Base Slab Length	LF LF	342 3 154		
		Tuent Channel 150'L x 16'W x 16'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width	LF LF LF	342 3 154 20	\$775.00	\$265,22
		Tuent Channel 150'L x 16'W x 16'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Walls	LF LF LF CY	342 3 154 20 365		\$265,22
		Tuent Channel 150'L x 16'W x 16'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Walls Exterior Wall Thickness	LF LF CY LF	342 3 154 20 365 2	\$775.00	\$265,22
		Tuent Channel 150'L x 16'W x 16'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Walls Exterior Wall Thickness Exterior Wall Length	LF LF CY LF LF	342 3 154 20 365 2 308	\$775.00	\$265,22
		Tuent Channel 150'L x 16'W x 16'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height	LF LF CY LF LF LF LF	342 3 154 20 365 2 308 16	\$775.00 \$1,500.00	\$265,22 \$547,55
		Tuent Channel 150'L x 16'W x 16'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab	LF LF CY LF LF LF CY CY	342 3 154 20 365 2 308 16 228	\$775.00	\$265,22 \$547,55
		Tuent Channel 150'L x 16'W x 16'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness	LF LF CY LF LF CY LF LF LF LF	342 3 154 20 365 2 308 16 228	\$775.00 \$1,500.00	\$265,22 \$547,55
		Tuent Channel 150'L x 16'W x 16'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length	LF LF CY LF LF CY LF LF LF CY LF	342 3 154 20 365 2 308 16 228	\$775.00 \$1,500.00	\$265,22 \$547,58
	. In	Tuent Channel 150'L x 16'W x 16'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Length Top Slab Length Top Slab Width	LF LF CY LF LF CY LF LF LF LF	342 3 154 20 365 2 308 16 228	\$775.00 \$1,500.00	\$265,22 \$547,58
	. In	Tuent Channel 150'L x 16'W x 16'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length Top Slab Width	LF LF CY LF LF CY LF LF LF CY LF	342 3 154 20 365 2 308 16 228 2 154	\$775.00 \$1,500.00	\$265,22 \$547,58
a.	. In	Tuent Channel 150'L x 16'W x 16'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length Top Slab Length Top Slab Length Top Slab Width Itact Tanks	LF LF CY LF LF CY LF LF LF CY LF	342 3 154 20 365 2 308 16 228 2 154	\$775.00 \$1,500.00	\$265,22 \$547,58 \$342,22
a.	. In	Tuent Channel 150'L x 16'W x 16'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length Top Slab Length Top Slab Length Top Slab Width Itact Tanks 550'L x 220'W x 20'D Concrete Base Slab	LF LF CY LF LF CY LF LF LF CY LF	342 3 154 20 365 2 308 16 228 2 154	\$775.00 \$1,500.00	\$265,22 \$547,58 \$342,22
a.	. In	Tuent Channel 150'L x 16'W x 16'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length Top Slab Length Top Slab Length Top Slab Width Itact Tanks	LF LF CY LF CY LF LF LF CY LF	342 3 154 20 365 2 308 16 228 2 154 20	\$775.00 \$1,500.00 \$1,500.00	\$265,22 \$547,58 \$342,22
a.	. In	Tuent Channel 150'L x 16'W x 16'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length Top Slab Length Top Slab Length Top Slab Width Itact Tanks 550'L x 220'W x 20'D Concrete Base Slab	LF LF CY LF CY LF LF CY LF CY CY CY	342 3 154 20 365 2 308 16 228 2 154 20	\$775.00 \$1,500.00 \$1,500.00	\$265,22 \$547,58 \$342,22
a.	. In	Tuent Channel 150'L x 16'W x 16'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length Top Slab Length Top Slab Width Top Slab Concrete Top Slab Top Slab Length Top Slab Length Top Slab Width Itact Tanks 550'L x 220'W x 20'D Concrete Base Slab Base Slab Thickness	LF LF CY LF CY LF CY LF CY LF CY LF LF LF LF LF	342 3 154 20 365 2 308 16 228 2 154 20 18,341 4	\$775.00 \$1,500.00 \$1,500.00	\$265,22 \$547,55 \$342,22
a.	. In	Tuent Channel 150'L x 16'W x 16'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length Top Slab Length Top Slab Width Top Slab Width Top Slab Width Top Slab Slab Units Top Slab Width Top Slab Slab Thickness 550'L x 220'W x 20'D Concrete Base Slab Base Slab Thickness Base Slab Length	LF LF CY LF CY LF CY LF CY LF LF LF LF LF LF	342 3 154 20 365 2 308 16 228 2 154 20 18,341 4 554	\$775.00 \$1,500.00 \$1,500.00	\$15,407,44 \$265,22 \$547,55 \$342,22 \$14,214,07

			Exterior Wall Langth	1 .5	4.700		
			Exterior Wall Height	LF	4,728		
			Exterior Wall Height Concrete Top Slab	LF CY	9,192	\$1,500.00	¢42.700.444
-	_		Top Slab Thickness	LF	9,192	\$1,500.00	\$13,788,444
			Top Slab Length	LF	554		
			Top Slab Width	LF	224		
	c.	Effl	luent Channel		224		
	-	_	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.	Dra	ain 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.	Che	emical 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.	Civi	I					
	a.	Civ	il Improvements	LS	1	\$2,000,000.00	\$2,000,000
						Civil Subtotal	\$2,000,000
5.	Me	cha	nical				
i	a.	HR	D Chemical Facility				
		i.	New HRD Facility and Equipment	MGD	1,000	\$15,000.00	\$15,000,000
I			ping Troughs				
		i.	Furnish and Install Tipping Troughs	EA	16	\$75,000.00	\$1,200,000
	c.	Dra	ain Gates				
		i.	Furnish and Install Drain Gates	EA	16	\$37,500.00	\$600,000
	d.	Tid	e Gates				
		ij	Furnish and Install Tide Gates	EA	5	\$100,000.00	\$500,000
						Mechanical Subtotal	\$17,300,000
6.	_		cal and I&C				
ē	a.	_	scellaneous Electrical and I&C				
		i.	Furnish and Install Electrical and I&C (Other)	LS	1	\$720,000.00	\$720,000
					Electri	cal and I&C Subtotal	\$720,000
7.	Oth	er I	mprovements				

	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 Imp	rovements Subtotal	\$25,000,000
8.	Co	nstruction 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
				To	otal Estimated Cost	\$231,960,278

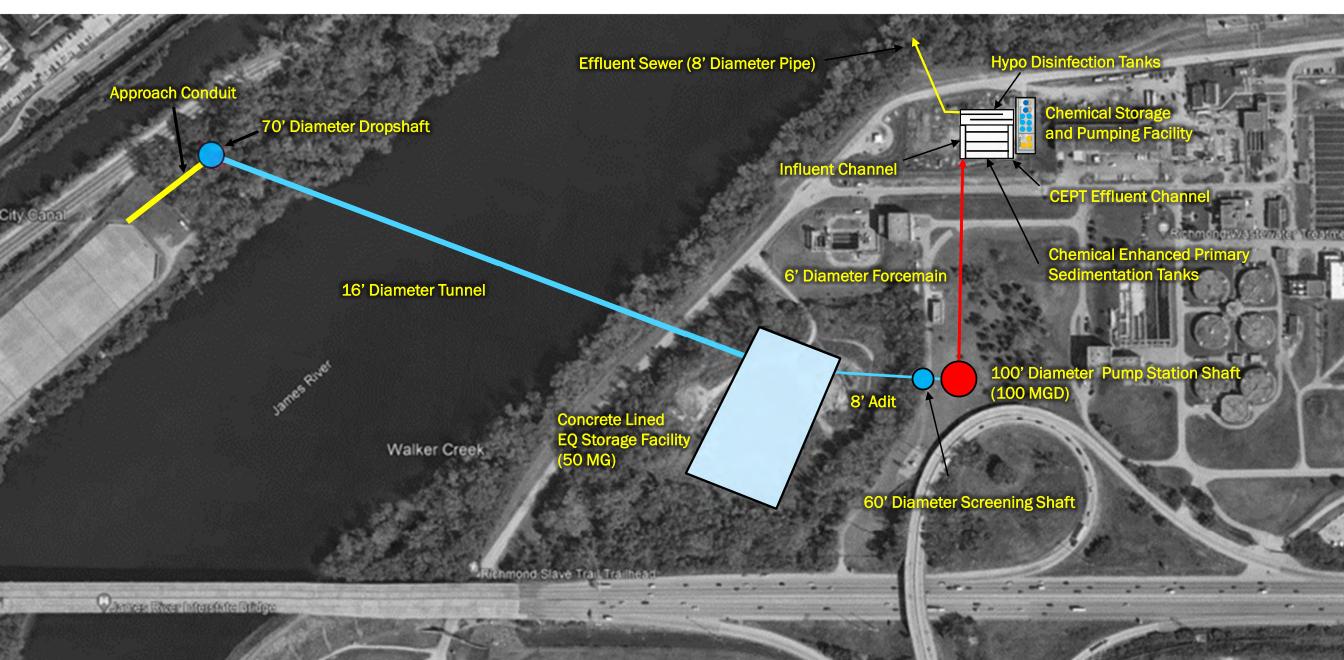
9.	9. Capital Total									
	a.	Construction Cost Total				\$231,960,278				
	b.	Capital Contingency	LS	1	50%	\$115,980,139				
	Total Estimated Capital Cost									

b. I	i. ii. iii. iv. v. Ma	Daily Check (365 Days, 1 Hr/Ea) Weekly Inspections (52 Weeks, 4 Hrs/Ea) Monthly Inspections (12 Months, 8 Hrs/Ea) Quarterly Cleaning (4 Quarters, 48 Hrs/Ea) Continuous Staffing (365 Days, 24 Hrs/Ea) intenance of Structures Maintain Structures intenance of Mechanical	HR HR HR HR	365 208 96 192 8,760	\$50.00 \$50.00 \$50.00 \$50.00 \$50.00	\$18,250 \$10,400 \$4,800 \$9,600 \$438,000
b. I	ii. iv. v. Ma i. Ma i.	Weekly Inspections (52 Weeks, 4 Hrs/Ea) Monthly Inspections (12 Months, 8 Hrs/Ea) Quarterly Cleaning (4 Quarters, 48 Hrs/Ea) Continuous Staffing (365 Days, 24 Hrs/Ea) iintenance of Structures Maintain Structures	HR HR HR	208 96 192 8,760	\$50.00 \$50.00 \$50.00	\$10,400 \$4,800 \$9,600
b. I	iii. iv. v. Ma i. Ma	Monthly Inspections (12 Months, 8 Hrs/Ea) Quarterly Cleaning (4 Quarters, 48 Hrs/Ea) Continuous Staffing (365 Days, 24 Hrs/Ea) iintenance of Structures Maintain Structures	HR HR HR	96 192 8,760	\$50.00 \$50.00	\$4,800 \$9,600
b. I	iv. v. Ma i. Ma i.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea) Continuous Staffing (365 Days, 24 Hrs/Ea) intenance of Structures Maintain Structures	HR HR	192 8,760	\$50.00	\$9,600
b. I c. I	v. Ma i. Ma i.	Continuous Staffing (365 Days, 24 Hrs/Ea) intenance of Structures Maintain Structures	HR	8,760		
b. I	Ma i. Ma i.	initenance of Structures Maintain Structures			\$50.00	\$438,000
c. I	i. Ma i.	Maintain Structures	LS			,
c. I	Ma i.		LS			
	i.	intenance of Mechanical		0.2%	\$45,562,629.63	\$91,125
	::	Maintain Tipping Troughs	LS	3%	\$1,200,000.00	\$36,000
į į	111.	Maintain Drain Gates	LS	3%	\$600,000.00	\$18,000
T i	iii.	Maintain HRD Chemical Facility	LS	3%	\$15,000,000.00	\$450,000
d.	Ма	sintenance of Instrumentation and Control				
T i	i.	Maintain I&C	LS	3%	\$720,000.00	\$21,600
е. (Ор	eration of HRD Chemical Facility				
	i.	Sodium Hypochlorite				
		Dose	mg/L	10		
		Volume	MGY	1208		
		Quantity	LBS	100695	\$2.00	\$201,390
i	ii.	Sodium Bisulfite				
		Dose	mg/L	3		
		Volume	MGY	1208		
		Quantity	LBS	30209	\$2.00	\$60,417
f.	Ade	ditional SRB Solids Hauling				
li	i.	Labor				
		Cleaning after Wet Weather Events (100 Events, 48 Hr/Ea)	HR	4,800	\$50.00	\$240,000
l	ii.	Solids Hauling	DT/Y	1721	\$130.00	\$223,720
		TSS	mg/L	75		
		Volume	MGY	1208		
		Ann	ual Operations	and Maintainer	nce Costs Subtotal	\$1,823,303

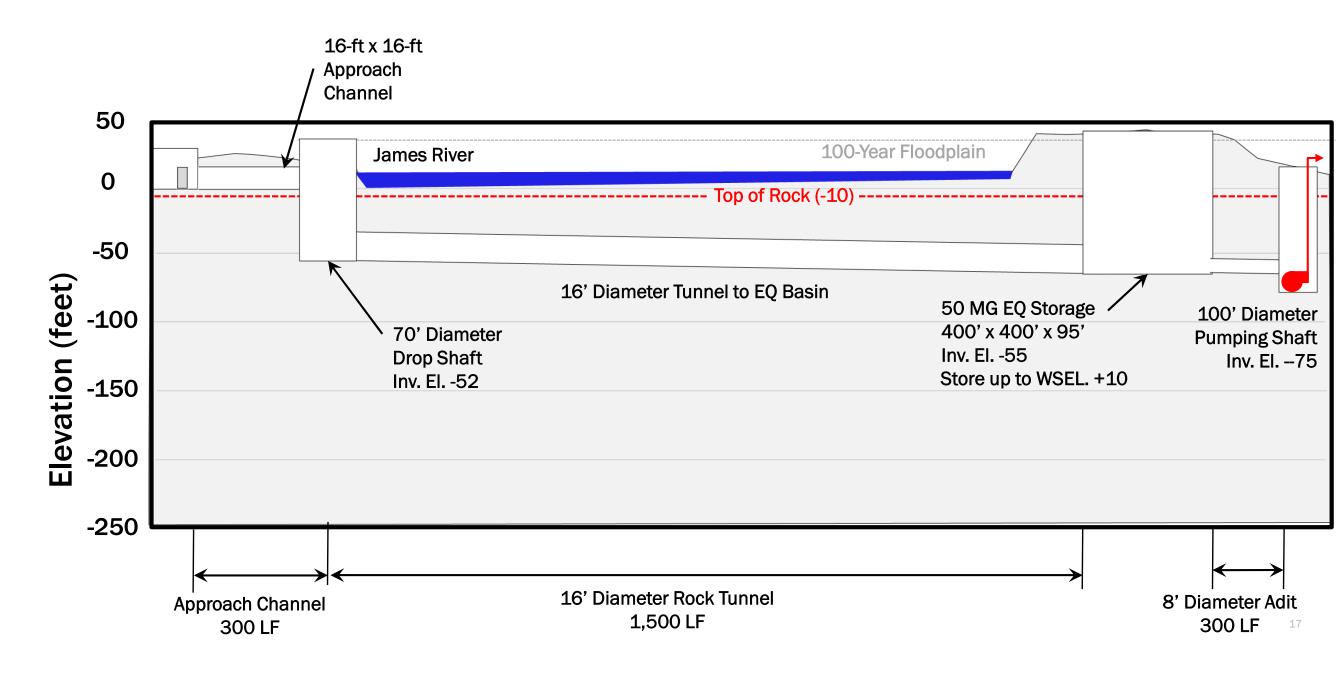
11. 15-Year Replacement Costs								
	a.	Ele	ctrical and Instrumentation and Control					
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	\$3,720,000.00	\$3,720,000	
	b. Meters							
		i.	Furnish and Install Replacement Meters	EA	6	\$7,500.00	\$45,000	
	15-Year Replacement Costs Subtotal							

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

Shockoe #3 EQ Storage Basin (50 MG) and High-Rate Treatment Facility (100 MGD)

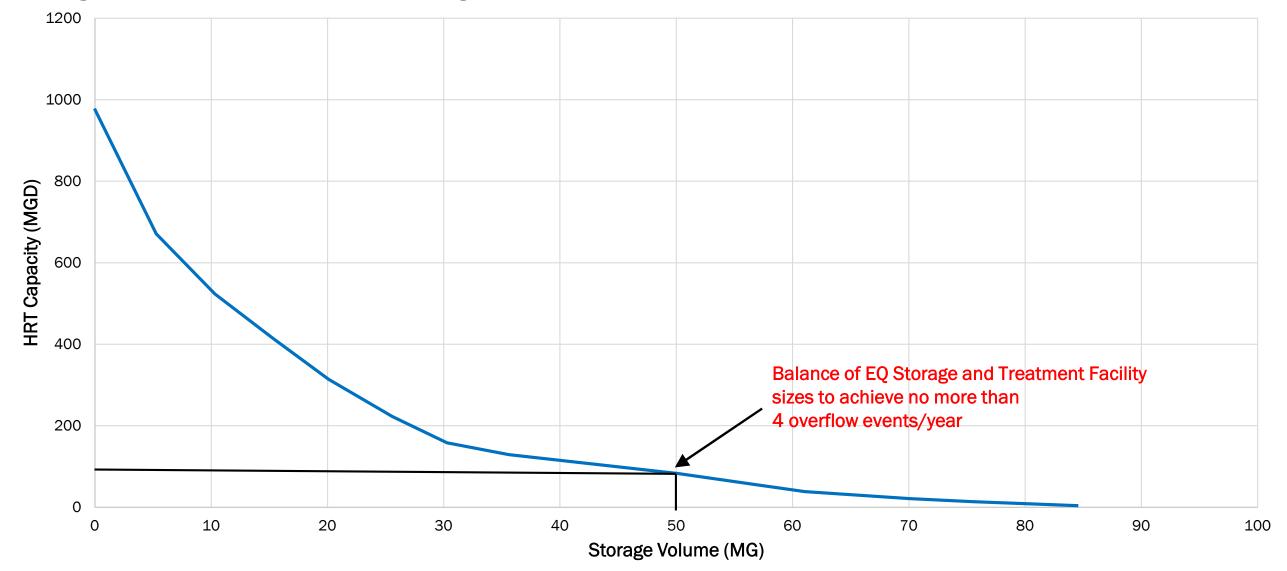


Tunnel and EQ Basin Profile



Shockoe #3EQ 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
		ture Dimensions				
a.	. Ap	oproach Channel				
	i.	Length	LF	300		
	ii.		LF	16		
	iii.	II .	LF	16		
b.	_	Q Basin				
	i.	Length	LF	300		
	ii.		LF	500		
	_	Depth	LF	85		
C.	_	reatment Tanks				
	_	Length	LF	155		
		Width	LF	145		
		Depth	LF	20		
d.	_	hemical Facility Pad				
	i.		LF	160		
	ii.		LF	80		
	_	Depth	LF	3		
e.	_	hemical Facility Floodwall		400		
	i.	Length	LF	480		
	ii.		LF	0		
	_	Depth	LF	20		
f.	_	ropshaft		70		
	i.	Diameter	LF	70		
	_	Depth	LF	80		
g.	_	creening Shaft		00		
	i.	Diameter	LF	60		
	_	Depth	LF	85		
h.	_	umping Shaft				
	i.	Diameter	LF	100		
	iii.	Depth	LF	95		
4 0						
	ener	te Prep	ACRE	8	\$250,000.00	\$2,000,000.00
a.	. 311	te Fieb	ACKL	8	\$230,000.00	\$2,000,000.00
				l	General Subtotal	\$2,000,000
2. E	xcav	vation for Structures			donoral odototal	\$2,000,000
	_	upport of Excavation				
	i.	Sheeting				
		Approach Channel	SF	24,480	\$45.00	\$1,101,600
		Excavation Length	LF	312		
	1	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		
	1	Excavation Depth	LF	25		
	1	Excavation Depth in Rock	LF	0		
	T	Chemical Facility Pad	SF	0	\$45.00	\$0
	1	Excavation Length	LF	168		
	T	Excavation Width	LF	88		
		Excavation Depth	LF	8		l
	\vdash	Excavation Depth Chemical Facility Floodwall			\$45.00	\$0
-			LF	8	\$45.00	\$0
		Chemical Facility Floodwall	LF SF	8	\$45.00	\$0
		Chemical Facility Floodwall Excavation Length	LF SF LF	8 0 480	\$45.00	\$0
		Chemical Facility Floodwall Excavation Length Excavation Width	LF SF LF LF	8 0 480 14	\$45.00	\$0
	ii.	Chemical Facility Floodwall Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock	LF SF LF LF	8 0 480 14 20	\$45.00	\$0 \$0
	ii.	Chemical Facility Floodwall Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock	LF SF LF LF LF	8 0 480 14 20	\$45.00 \$190.00	
	ii.	Chemical Facility Floodwall Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Secant Piling	LF SF LF LF LF SF	8 0 480 14 20 0		\$0
	ii.	Chemical Facility Floodwall Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Secant Piling Dropshaft	LF SF LF LF SF SF	8 0 480 14 20 0 0 7,917		\$0
	ii.	Chemical Facility Floodwall Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Secant Piling Dropshaft Excavation Diameter	LF SF LF LF LF SF SF LF	8 0 480 14 20 0 0 7,917 84		\$0
	ii.	Chemical Facility Floodwall Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Secant Piling Dropshaft Excavation Diameter Excavation Depth	LF SF LF LF LF SF SF SF LF LF	8 0 480 14 20 0 0 7,917 84 91	\$190.00	\$0 \$1,504,195
	ii.	Chemical Facility Floodwall Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Secant Piling Dropshaft Excavation Diameter Excavation Depth Screening Shaft	LF SF LF LF LF LF LF SF SF SF LF LF SF	8 0 480 14 20 0 0 7,917 84 91 6,974	\$190.00	\$0 \$1,504,195
	ii.	Chemical Facility Floodwall Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Secant Piling Dropshaft Excavation Diameter Excavation Depth Screening Shaft Excavation Diameter	LF SF LF LF LF SF SF LF	8 0 480 14 20 0 0 7,917 84 91 6,974 74	\$190.00	\$0 \$1,504,195
	ii.	Chemical Facility Floodwall Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Secant Piling Dropshaft Excavation Diameter Excavation Depth Screening Shaft Excavation Diameter Excavation Diameter Excavation Depth	LF SF LF LF SF SF LF	8 0 480 14 20 0 0 7,917 84 91 6,974 74	\$190.00 \$190.00	\$0 \$1,504,195 \$1,325,124
	ii.	Chemical Facility Floodwall Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Secant Piling Dropshaft Excavation Diameter Excavation Depth Screening Shaft Excavation Diameter Excavation Diameter Excavation Diameter Excavation Diameter Excavation Diameter Excavation Diameter Excavation Depth Pumping Shaft	LF SF LF LF SF LF LF LF SF SF LF LF SF SF LF SF SF	8 0 480 14 20 0 0 7,917 84 91 6,974 74 96 10,744	\$190.00 \$190.00	\$0 \$1,504,195 \$1,325,124

h		2 o i	1				
b	_	Soi	Excavate and Dispose of Soil	07	41,400	400.00	¢2 700 007
	i.	_	Excavate and Dispose of Soil Excavate and Dispose of Dropshaft Overburden	CY		\$90.00	\$3,726,037
	_	_		CY	22,277	\$180.00	\$4,009,929
_	_		Excavate and Dispose of Soil - EQ Basin	CY	400,000	\$90.00	\$36,000,000
C.	_	Roc					
	i.	_	Excavate and Dispose of Dropshaft Rock	CY	51,764	\$300.00	\$15,529,311
	ii	i.	Excavate and Dispose of Rock - EQ Basin	CY	250,000	\$300.00	\$75,000,000
					Excavation fo	r Structures Subtotal	\$141,331,102
			ıral				
а	_		proach Channel				
	I.		300'L x 16'W x 16'D				
	4		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	7-,000	
	+		Interior Wall Length	LF	0		
	+	_	Interior Wall Height	LF LF	0		
	+	_				A4 = 22 25	A077 7-1
	4		Concrete Top Slab	CY	450	\$1,500.00	\$675,556
	1		Top Slab Thickness	LF	2		
	1		Top Slab Length	LF	304		
			Top Slab Width	LF	20		
b	. E	_	Basin				
	į.		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.	. Т	Tre	atment Tanks				
	i.	.	155'L x 145'W x 20'D				
	1		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		
	+	_				#4 500 00	* 4.054.444
	_		Concrete Exterior Walls	CY	901	\$1,500.00	\$1,351,111
	4		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
	1		Top Slab Thickness	LF	0		
	+		Top Slab Length	LF	159		
	+	-	Top Slab Width	LF	149		
Ч	. (Cha	emical Facility Pad	LI	143		
a	li		160'L x 80'W x 3'D				
-	+		Concrete Base Slab	CY	1,422	\$775.00	\$1,102,222
-+	+	-	Base Slab Thickness	LF	3	Ψ175.00	¥1,102,222
	+	_					
_	+	_	Base Slab Length	LF	160		
- 1.	1	∩L	Base Slab Width	LF	80		
е	. (Jne	emical Facility Floodwall				
	I.		480'L x 3'W x 20'D		4.00=	A. =c	******
	4	_	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.	. [pshaft				
	i.	.]	70' Dia x 80' Depth				
	⅃		Concrete Base Slab	CY	1,414	\$1,100	\$1,555,088
	Τ	٦	Base Slab Thickness	LF	6		
	T		Base Slab Diameter	LF	90		
	+		Concrete Exterior Walls	CY	2,039	\$2,100	\$4,280,944
\dashv	+		Exterior Wall Thickness	LF	3	,	. ,,
-	+	-	Exterior Wall Annular Area	SF	688		
+	+	-	Exterior Wall Height	LF	80	+	
	+	-				#4.500	#4 000 000
\neg			Concrete Top Slab	CY	707	\$1,500	\$1,060,288
_	+						
			Top Slab Thickness	LF	3		
			Top Slab Thickness Top Slab Diameter reening Shaft	LF LF	90		

		1:	COLDia :: OF Domah		1	1	
	-	I.	60' Dia x 85' Depth Concrete Base Slab	0)/	700	44.400	#020.000
	-	H		CY	760	\$1,100	\$836,292
	-	H	Base Slab Thickness	LF	6		
		┡	Base Slab Diameter	LF	66	40.400	*******
		┡	Concrete Exterior Walls	CY	1,869	\$2,100	\$3,925,420
	-	H	Exterior Wall Thickness Exterior Wall Annular Area	LF	3		
				SF	594		
		<u> </u>	Exterior Wall Height	LF	85		
<u> </u>		<u> </u>	Concrete Top Slab	CY	380	\$1,500	\$570,199
			Top Slab Thickness	LF	3		
			Top Slab Diameter	LF	66		
	h.		mping Shaft				
<u> </u>		I.	100' Dia x 95' Depth				
		<u> </u>	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		
		H	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		100		
		<u> </u>				Structural Subtotal	\$61,993,533
4.	Civ	/il					, 12,300,000
		Pip	pe e				
		_	Furnish and Install 72" Ductile Iron Sewer Pipe (30' Depth)	LF	600	\$1,400.00	\$840,000
-	H	_	Furnish and Install 96" Fiber Reinforced Sewer Pipe (20' Depth)	LF	250	\$2,000.00	\$500,000
	b.	-	cavation		250	φ∠,000.00	φ300,000
	υ.	_	•	0\/	0.007	¢00.00	¢000,000
		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		
		H	Excavation Width	LF	12		
			Excavation Depth	LF	22		
	-	-	Excavation Depth in Rock	LF	0		
		┢	·			****	**
		_	Rock Excavation	LF	0	\$300.00	\$0
	C.	_	pport 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.	Tu	nnel Excavation and Lining				
	Г	_	16' Lined Tunnel with TBM	LF	1,500	\$14,880.00	\$22,320,000
	H	_	96" Adit to Tunnel with TBM	LF	300	\$7,200.00	\$2,160,000
\vdash	H	Ë				\$1,200.00	,2,200,000
					I	Civil Subtotal	\$30,107,833
5.	Me	ch:	anical			S.T.I. Subtotul	+00,201,000
	-		nnel Dewatering PS and Screening Facility				
	u.	_	New TDPS and Screening Facility	MGD	100	\$450,000.00	\$45,000,000
	h	_		WIGD	100	\$450,000.00	φ 4 0,000,000
	υ.	_	RT Chemical Facility	1.0-	105	400 555 50	******
		_	New HRT Facility and Equipment	MGD	100	\$60,000.00	\$6,000,000
	С		pping Troughs				
<u> </u>		_	Furnish and Install Tipping Troughs	EA	10	\$75,000.00	\$750,000
	d.	Dr	ain Gates				
		i.	Furnish and Install Drain Gates	EA	10	\$37,500.00	\$375,000
						Mechanical Subtotal	\$52,130,000
6.	Ele	ectr	ical and I&C				
	a.	_	scellaneous Electrical and I&C				
	Ĺ	i.	Furnish and Install Electrical and I&C (Other)	LS	1	\$450,000.00	\$450,000
							-
					Elect	rical and I&C Subtotal	\$450,000
7.	Co	nst	ruction Total				
	a.	Su	btotal A				\$288,012,469
	b.	De	esign Contingency	LS	1	40%	\$115,204,987
	c.	Su	btotal B	LS	1		\$403,217,456

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

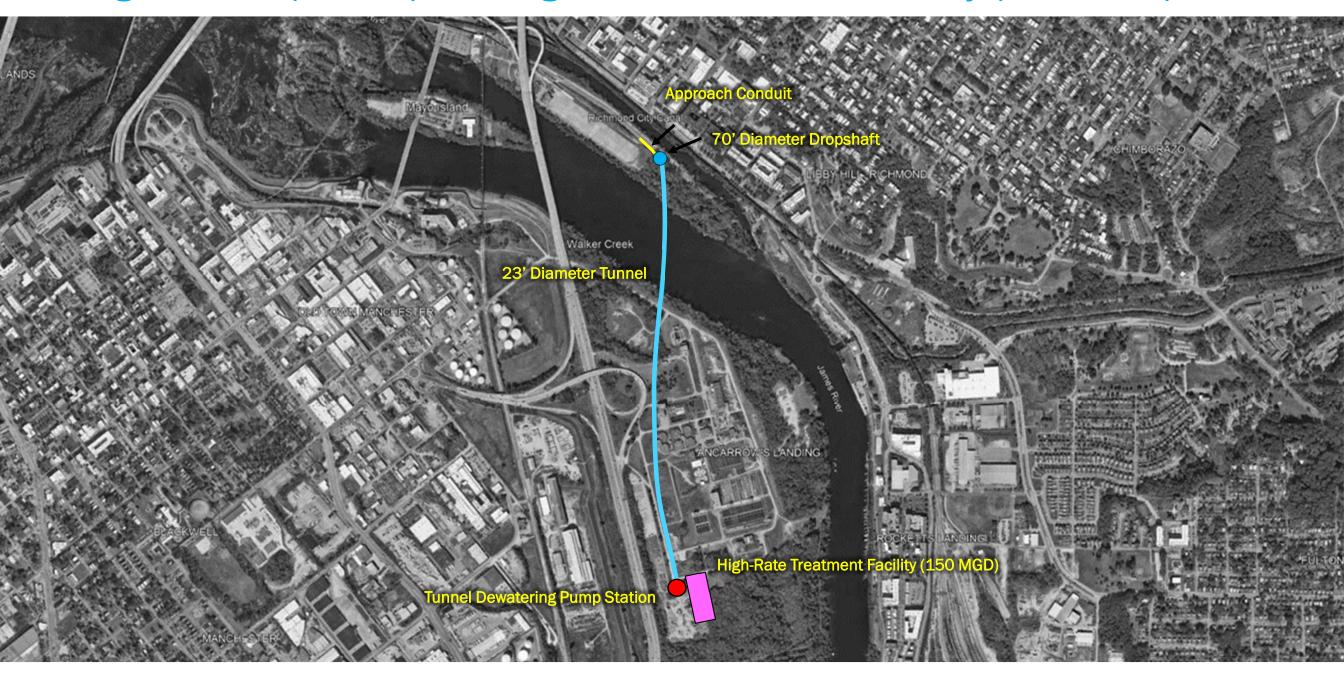
8.	. Capital Total								
	a.	Construction Cost Total				\$622,970,970			
	b.	Capital Contingency	LS	1	50%	\$311,485,485			
	Total Estimated Capital Cost								

	_	l Operations and Maintainence Costs				
a.	La					
	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
	٧.	Continuous Staffing (365 Days, 24 Hrs/Ea)	HR	8,760	\$50.00	\$438,000
b.	Ma	aintenance of Structures				
	i.	Maintain Structures	LS	0.2%	\$61,993,533.11	\$123,987
C.	Ma	aintenance of Pipe				
	i.	Maintain Pipe	LS	1%	\$1,340,000.00	\$13,400
d.	Ma	aintenance of Tunnel				
	i.	Maintain Tunnels and Adits	LS	1%	\$24,480,000.00	\$244,800
e.	Ma	aintenance of Mechanical				
	i.	Maintain Tipping Troughs	LS	3%	\$750,000.00	\$22,500
	ii.	Maintain Drain Gates	LS	3%	\$375,000.00	\$11,250
		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.	+-	nintenance of Instrumentation and Control			* ***,*********************************	1=,000,000
-	i	Maintain I&C	LS	3%	\$450,000.00	\$13,500
g.	Ωn	eration of HRD Chemical Facility		0,0	4 100,000.00	¥20,000
ъ.	i	Sodium Hypochlorite				
	Ë	Dose	mg/L	10		
-	+	Volume	MGY	1499		
-	+	Quantity	LBS	125014	\$2.00	\$250,029
	-	Sodium Bisulfite	LDS	125014	\$2.00	\$250,028
	111.	Dose	# //	2		
-	+	Volume	mg/L	3 1499		
-	+		MGY		* 0.00	475.00
-		Quantity	LBS	37504	\$2.00	\$75,009
-	III.	PACI				
	1	Dose	mg/L	30		
		Volume	MGY	1499		
	_	Quantity	LBS	375043	\$2.00	\$750,086
h.	Op	eration 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.	Ad	ditional SRB Solids Hauling				
	i.	Solids Hauling	DT/Y	2137	\$130.00	\$277,752
		TSS	mg/L	75		
		Volume	MGY	1499		
1						
	-	•	Annual Operation	ns and Maintain	ence Costs Subtotal	\$3,853,514

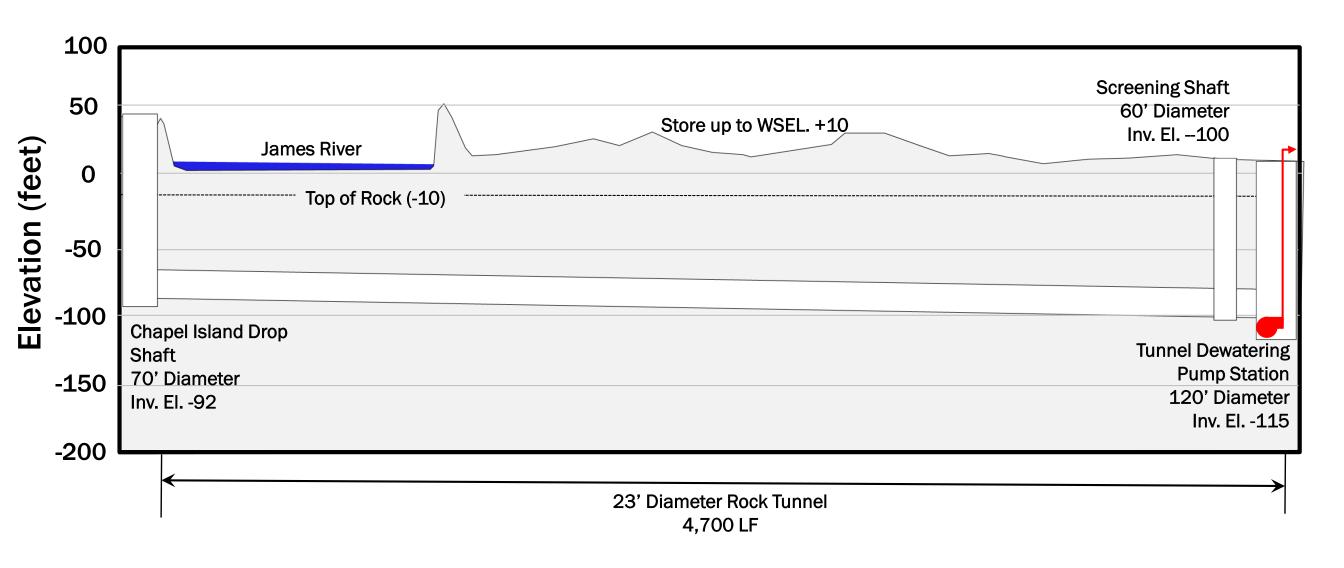
10. 15-Year Replacement Costs							
	a.	Ele	ectrical and Instrumentation and Control				
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	\$10,650,000.00	\$10,650,000
	b.	Me	eters				
		i.	Furnish and Install Replacement Meters	EA	8	\$7,500.00	\$60,000
	15-Year Replacement Costs Subtotal						

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

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



Storage Tunnel Profile

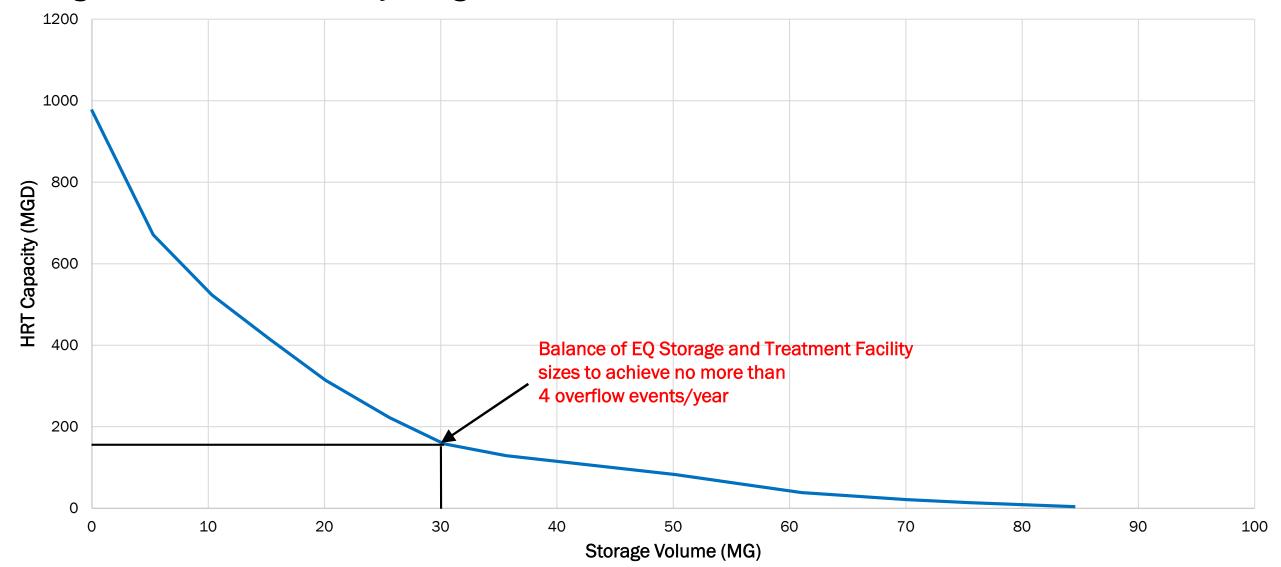


Storage Tunnel (30 MG) and High-Rate Treatment Facility (150 MGD)



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. 8	Struc	cture Dimensions				
a	a. A	pproach Channel				
	i.	-	LF	300		
	_	Width	LF	16		
	ii	i. Depth	LF	16		
t). T	reatment Tanks				
	i.		LF	335		
	_	. Width	LF	150		
	_	i. Depth	LF	20		
C	_	Chemical Facility Pad				
	j.		LF	240		
	_	. Width	LF	80		
	_	i. Depth	LF	3		
C	_	Chemical Facility Floodwall				
	j.		LF	640		
	_	. Width	LF	0		
	_	i. Height	LF	20		
E	-	Propshaft				
	i.		LF	70		
	_	i. Depth	LF	120		
f	-	Pumping Shaft				
	j.		LF	120		
		i. Depth	LF	135		
٤	g. S	creening Shaft				
	j.		LF	60		
	ii	i. Depth	LF	120		
	Gene			1		
		ito Pron				\$1,500,000.00
_	a. S	lite Prep	ACRE	6	\$250,000.00	\$1,300,000.00
_	a. S	Петер	ACRE	0		
a			ACRE	0	General Subtotal	
2. E	Exca	vation for Structures	ACRE			
2. E	Exca	vation for Structures support of Excavation	AURE			
2. E	Exca	vation for Structures support of Excavation Sheeting			General Subtotal	\$1,500,000
2. E	Exca	vation for Structures support of Excavation Sheeting Approach Channel	SF	23,460		\$1,500,000
2. E	Exca	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length	SF LF	23,460	General Subtotal	\$1,500,000
2. E	Exca	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Width	SF LF LF	23,460 312 28	General Subtotal	\$1,500,000
2. E	Exca	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Width Excavation Depth	SF LF LF LF	23,460 312 28 23	General Subtotal	\$1,500,000
2. E	Exca	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock	SF LF LF LF LF	23,460 312 28 23 0	General Subtotal	\$1,500,000 \$1,055,700
2. E	Exca	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Treatment Tanks	SF LF LF LF LF SF	23,460 312 28 23 0 39,702	General Subtotal	\$1,500,000 \$1,055,700
2. E	Exca	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Treatment Tanks Excavation Length	SF LF LF LF LF SF	23,460 312 28 23 0 39,702 347	General Subtotal	\$1,500,000 \$1,055,700
2. E	Exca	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Length Excavation Width	SF LF LF LF LF LF LF	23,460 312 28 23 0 39,702 347 162	General Subtotal	\$1,500,000 \$1,055,700
2. E	Exca	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Length Excavation Depth	SF LF LF LF LF LF LF LF	23,460 312 28 23 0 39,702 347 162 26	General Subtotal	\$1,500,000 \$1,055,700
2. E	Exca	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth	SF LF LF LF LF LF LF LF LF	23,460 312 28 23 0 39,702 347 162 26 0	\$45.00 \$45.00	\$1,500,000 \$1,055,700 \$1,786,590
2. E	Exca	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Length Excavation Depth in Rock Chemical Facility Pad	SF LF LF LF LF LF LF LF LF LF SF	23,460 312 28 23 0 39,702 347 162 26 0	General Subtotal	\$1,500,000 \$1,055,700 \$1,786,590
2. E	Exca	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Depth Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Depth Excavation Depth Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Chemical Facility Pad Excavation Length	SF	23,460 312 28 23 0 39,702 347 162 26 0 0 248	\$45.00 \$45.00	\$1,500,000 \$1,055,700 \$1,786,590
2. E	Exca	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Depth Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Depth Excavation Depth Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Chemical Facility Pad Excavation Length Excavation Length Excavation Length Excavation Width	SF LF	23,460 312 28 23 0 39,702 347 162 26 0 0 248 88	\$45.00 \$45.00	\$1,500,000 \$1,055,700 \$1,786,590
2. E	Exca	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Depth Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Length Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Chemical Facility Pad Excavation Length Excavation Length Excavation Depth Excavation Depth Excavation Depth	SF LF LF LF LF LF LF LF LF LF	23,460 312 28 23 0 39,702 347 162 26 0 0 248 88 8	\$45.00 \$45.00	\$1,500,000 \$1,055,700 \$1,786,590
2. E	Exca	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Depth Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Depth Excavation Depth Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Chemical Facility Pad Excavation Length Excavation Length Excavation Depth	SF LF LF LF LF LF LF LF LF LF	23,460 312 28 23 0 39,702 347 162 26 0 0 248 88 8	\$45.00 \$45.00	\$1,500,000 \$1,055,700 \$1,786,590 \$0
2. E	Exca	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Depth Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Chemical Facility Pad Excavation Length Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Chemical Facility Floodwall	SF LF LF LF LF LF LF LF LF LF	23,460 312 28 23 0 39,702 347 162 26 0 0 248 88 8 0 0	\$45.00 \$45.00	\$1,500,000 \$1,055,700 \$1,786,590 \$0
2. E	Exca	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Depth Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Chemical Facility Pad Excavation Length Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Chemical Facility Floodwall Excavation Length	SF LF LF LF LF LF LF LF LF LF	23,460 312 28 23 0 39,702 347 162 26 0 0 248 88 8 0 0 640	\$45.00 \$45.00	\$1,500,000 \$1,055,700 \$1,786,590 \$0
2. E	Exca	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Depth Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Depth in Rock Treatment Tanks Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Chemical Facility Pad Excavation Length Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Chemical Facility Floodwall Excavation Length Excavation Length Excavation Length Excavation Length Excavation Length Excavation Width	SF LF	23,460 312 28 23 0 39,702 347 162 26 0 0 248 88 8 0 0 640 14	\$45.00 \$45.00	\$1,500,000 \$1,055,700 \$1,786,590 \$0
2. E	Exca	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Depth Excavation Depth Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Length Excavation Depth Excavation Depth in Rock Chemical Facility Pad Excavation Length Excavation Length Excavation Depth in Rock Chemical Facility Floodwall Excavation Length Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth	SF LF	23,460 312 28 23 0 39,702 347 162 26 0 0 248 88 8 0 0 640 14 20	\$45.00 \$45.00	\$1,500,000 \$1,055,700 \$1,786,590 \$0
2. E	Exca a. S i.	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Depth Excavation Depth Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Length Excavation Depth Excavation Depth in Rock Chemical Facility Pad Excavation Length Excavation Utoth Excavation Depth in Rock Chemical Facility Floodwall Excavation Length Excavation Depth	SF LF	23,460 312 28 23 0 39,702 347 162 26 0 0 248 88 8 0 0 640 14	\$45.00 \$45.00	\$1,500,000 \$1,055,700 \$1,786,590 \$0
2. E	Exca a. S i.	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Depth Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Depth in Rock Chemical Facility Pad Excavation Length Excavation Depth in Rock Chemical Facility Pad Excavation Length Excavation Length Excavation Depth in Rock Chemical Facility Pad Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Chemical Facility Floodwall Excavation Length Excavation Depth in Rock	SF	23,460 312 28 23 0 39,702 347 162 26 0 0 248 88 8 0 0 640 14 20 0	\$45.00 \$45.00 \$45.00	\$1,500,000 \$1,055,700 \$1,786,590 \$0
2. E	Exca a. S i.	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Depth Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Depth in Rock Chemical Facility Pad Excavation Length Excavation Depth in Rock Chemical Facility Pad Excavation Width Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Width Excavation Depth Excavation Depth in Rock Chemical Facility Floodwall Excavation Length Excavation Depth in Rock	SF LF LF LF LF LF LF LF LF LF	23,460 312 28 23 0 39,702 347 162 26 0 0 248 88 8 0 0 640 14 20 0	\$45.00 \$45.00	\$1,500,000 \$1,055,700 \$1,786,590 \$0
2. E	Exca a. S i.	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Depth Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Depth in Rock Chemical Facility Pad Excavation Length Excavation Depth in Rock Chemical Facility Pad Excavation Width Excavation Width Excavation Depth Excavation Depth Excavation Depth Excavation Width Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Chemical Facility Floodwall Excavation Length Excavation Depth in Rock Secant Piling Dropshaft Excavation Diameter	SF LF LF LF LF LF LF LF LF LF	23,460 312 28 23 0 39,702 347 162 26 0 0 248 88 8 0 0 640 14 20 0	\$45.00 \$45.00 \$45.00	\$1,500,000 \$1,055,700 \$1,786,590 \$0
2. E	Exca a. S i.	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Depth Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Depth in Rock Chemical Facility Pad Excavation Length Excavation Depth in Rock Chemical Facility Pad Excavation Depth in Rock Chemical Facility Floodwall Excavation Length Excavation Depth	SF LF LF LF LF LF LF LF LF LF	23,460 312 28 23 0 39,702 347 162 26 0 0 248 88 8 0 0 640 14 20 0 7,634 81 131	\$45.00 \$45.00 \$45.00 \$190.00	\$1,500,000 \$1,055,700 \$1,786,590 \$0 \$0 \$1,450,473
2. E	Exca a. S i.	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Depth Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Depth in Rock Chemical Facility Pad Excavation Length Excavation Depth in Rock Chemical Facility Pad Excavation Width Excavation Depth in Rock Chemical Facility Floodwall Excavation Length Excavation Depth Pumping Shaft	SF LF LF SF LF LF LF LF LF LF	23,460 312 28 23 0 39,702 347 162 26 0 0 248 88 8 0 0 640 14 20 0 7,634 81 131 12,346	\$45.00 \$45.00 \$45.00	\$1,500,000 \$1,055,700 \$1,786,590 \$0 \$1,450,473
2. E	Exca a. S i.	vation for Structures support of Excavation Sheeting Approach Channel Excavation Length Excavation Depth Excavation Depth in Rock Treatment Tanks Excavation Length Excavation Depth in Rock Chemical Facility Pad Excavation Length Excavation Depth in Rock Chemical Facility Pad Excavation Depth in Rock Chemical Facility Floodwall Excavation Length Excavation Depth	SF LF LF LF LF LF LF LF LF LF	23,460 312 28 23 0 39,702 347 162 26 0 0 248 88 8 0 0 640 14 20 0 7,634 81 131	\$45.00 \$45.00 \$45.00 \$190.00	\$1,500,000 \$1,500,000 \$1,055,700 \$1,786,590 \$0 \$0 \$1,450,473 \$2,345,827

		Screening Shaft	SF	6,974	\$190.00	\$1,325,124
		Excavation Diameter	LF	74		
		Excavation Depth	LF	128		
b.	. So	il				
	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.	Ro	ck				
	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
	tructi	ural proach Channel				
a.	i Ap	300'L x 16'W x 16'D				
	"	Concrete Base Slab	CY	676	\$775.00	\$523,556
		Base Slab Thickness	LF	3	Ţ1.0.00	¥020,000
	+	Base Slab Length	LF	304		
	+	Base Slab Width	LF	20		
	+	Concrete Exterior Walls	CY	721	\$1,500.00	\$1,080,889
	1	Exterior Wall Thickness	LF	2	7 = ,0 0 0 10 0	+=,+++,++
		Exterior Wall Length	LF	608		
	1	Exterior Wall Height	LF	16		
	+	Concrete Top Slab	CY	450	\$1,500.00	\$675,556
	1	Top Slab Thickness	LF	2		
		Top Slab Length	LF	304		
		Top Slab Width	LF	20		
b.	. Tre	eatment 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		
	Oh	Interior Wall Height	LF	20		
C.	i.	emical Facility Pad 240'L x 80'W x 3'D				
	+-	Concrete Base Slab	CY	2,133	\$775.00	\$1,653,333
		Base Slab Thickness	LF	3	Ψ110.00	Ψ1,000,000
		Base Slab Length	LF	240		
	+	Base Slab Width	LF	80		
d.	. Ch	emical Facility Floodwall				
	i.	640'L x 3'W x 20'D				
	$oldsymbol{\mathbb{I}}$	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.	_	ppshaft				
	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 OV	87	40.400.00	40.401.1
_	_	Concrete Exterior Walls	CY	3,058	\$2,100.00	\$6,421,415
_	-	Exterior Wall Thickness	LF	3		
	+	Exterior Wall Height	SF	688		
_	-	Exterior Wall Height	LF CV	120	64 500	4000 700
	-	Concrete Top Slab	CY	661	\$1,500	\$990,780
	-	Top Slab Thickness Top Slab Diameter	LF	3		
f.	Pii	mping Shaft	LF	87		
- 1'-	i.	120' Dia x 135' Depth				
-	Ť	Concrete Base Slab	CY	2,771	\$1,100	\$3,047,973
	1	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	Ψ2,100.00	Ψ12,172,101
		Exterior Wall Annular Area	SF	1,159		
		Exterior Wall Height	LF	135		
		Concrete Top Slab	CY	1,385	\$1,500	\$2,078,164
					\$1,500	\$2,078,162
		Top Slab Thickness	LF . –	3		
	0	Top Slab Diameter	LF	126		
g.		reening Shaft				
	i.	60' Dia x 120' Depth		700	** ***	****
		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		
		Top Glab Blameter		00		
	<u> </u>				Structural Subtotal	\$50,234,748
4. Civ	/il				Structurar Subtotar	ψ30,23 1 ,7 40
	Pip	oe l				
	<u> </u>	Furnish and Install 120" Fiber Reinforced Sewer Pipe (20' Depth)	LF	2,200	\$2,500.00	\$5,500,000
b.	_	cavation		_,	7-,000	**,****
	i.	Excavation for 120" Fiber Reinforced Sewer Pipe (20' Depth)	CY	25,096	\$90.00	\$2,258,667
	<u> </u> '-	Excavation Length	LF	2,200	Ψ30.00	Ψ2,230,007
		Excavation Width				
			LF	14		
		Excavation Depth	LF	22		
		Excavation Depth in Rock	LF	0		
		Rock Excavation	LF	0	\$300.00	\$0
c.	Su	pport 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. Me	echa	anical				
a.	Tur	nnel Dewatering PS and Screening Facility				
	i.	New TDPS and Screening Facility	MGD	150	\$450,000.00	\$67,500,000
b.	HR	T Chemical Facility				
	i.	New HRT Facility and Equipment	MGD	150	\$60,000.00	\$9,000,000
f.	_	ping Troughs			·	
		Furnish and Install Tipping Troughs	EA	10	\$75,000.00	\$750,000
ď		ain Gates		20	\$10,000.00	¥.00,000
g.	_	Furnish and Install Drain Gates	EA	10	\$37,500.00	\$375,000
	١.	Furnish and histali Diani dates	EA	10	\$37,500.00	\$375,000
	<u> </u>	<u> </u>		<u> </u>	Mechanical Subtotal	\$77,630,000
6. Ele	ectri	cal and I&C				. ,,
a.	Mis	scellaneous Electrical and I&C				
	i.	Furnish and Install Electrical and I&C (Other)	LS	1	\$450,000.00	\$450,000
		·		Electi	rical and I&C Subtotal	\$450,000
		ruction Total				
		btotal A				\$191,216,35
b.	Des	sign Contingency	LS	1	40%	\$76,486,543
C.	Sul	btotal B	LS	1		\$267,702,900
d.	Ge	neral Conditions	LS	1	50%	\$133,851,450
e.	Sul	btotal C	LS	1		\$401,554,350
f.	Boı	nds and Insurance	LS	1	3%	\$12,046,631
				1		
					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			

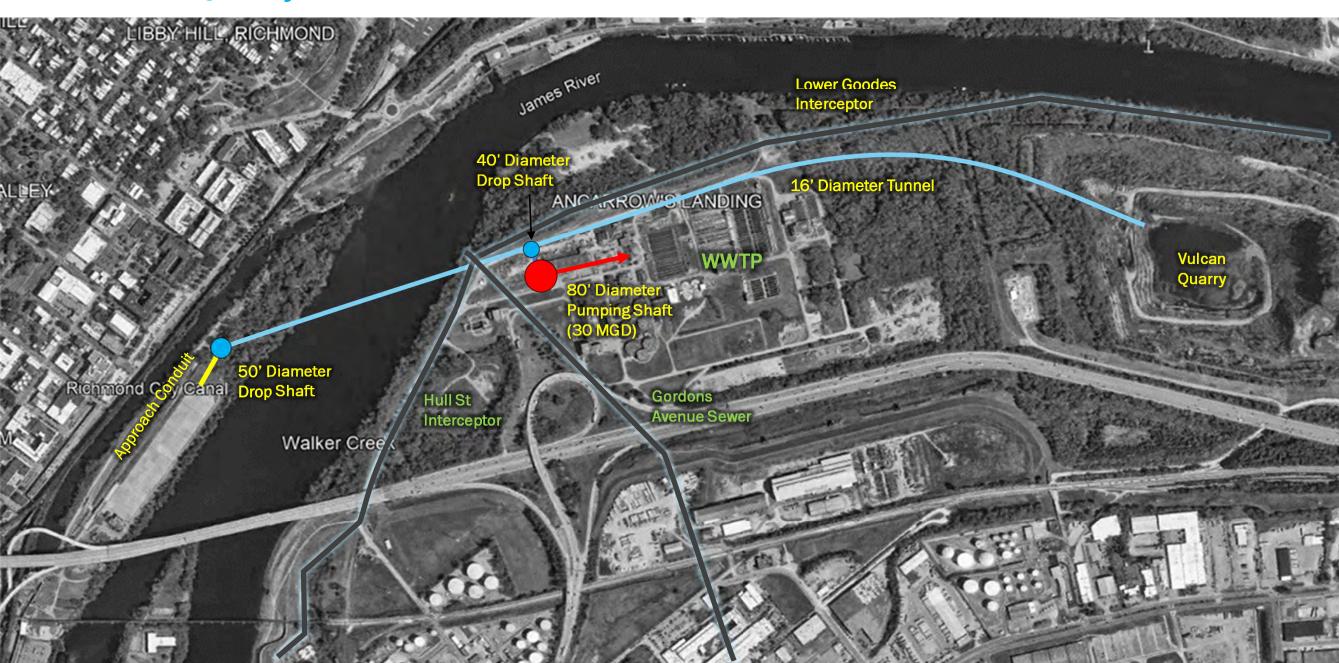
Total Estimated Capital Cost	\$620,401,471
i utai Estilliateu Gabitai Gost	#UZU.4UI.4/II

9.	Anr	nual	Operations and Maintainence Costs				
	a.	Lab	oor				
		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
		٧.	Continuous Staffing (365 Days, 24 Hrs/Ea)	HR	8,760	\$50.00	\$438,000
	b.	Ма	intenance of Structures				
		i.	Maintain Structures	LS	0.2%	\$50,234,747.90	\$100,469
	c.	Ма	intenance of Pipe				
		i.	Maintain Pipe	LS	1%	\$5,500,000.00	\$55,000
	d.	Ма	intenance of Tunnel				
		i.	Maintain Tunnels and Adits	LS	1%	\$0.00	\$0
	e.	Ма	intenance 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.	Ма	intenance of Instrumentation and Control				
		i.	Maintain I&C	LS	3%	\$450,000.00	\$13,500
	g.	αO	eration of HRD Chemical Facility			. ,	· · ·
			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
	1	iii	PACI	250	3302.	42.00	4.0,020
			Dose	mg/L	30		
			Volume	MGY	1596		
			Quantity	LBS	399223	\$2.00	\$798,447
	h.	On	eration of Influent Pump Station	250	000220	Ψ2.00	ψ100,441
	···	i	Pump Station Electricity Cost				
		<u> </u>	Flowrate of Pump Station	MGD	150		
			Annual Volume	MGY	1596		
	-		Total Dynamic Head	ft	155		
			Pump Efficiency		0.6		
	1		Motor Efficiency		0.9		
	1		Annual Energy Usage	KW-HR	1438345	\$0.06	\$86,301
	i.	Αdα	ditional SRB Solids Hauling	1111	12.030.10	Ψ0.00	\$50,501
	<u> </u>	i	Solids Hauling	DT/Y	2274	\$130.00	\$295,659
	1	-	TSS	mg/L	75	\$100.00	Ψ200,000
	1	-	Volume	MGY	1596		
	1			ividi	1000		
	<u> </u>	<u> </u>		Annual Operation	e and Maintain	ence Costs Subtotal	\$4,505,097
				Ailliual Operation	o anu Mannalli	cince costs Subtotal	φ -1 ,303,097

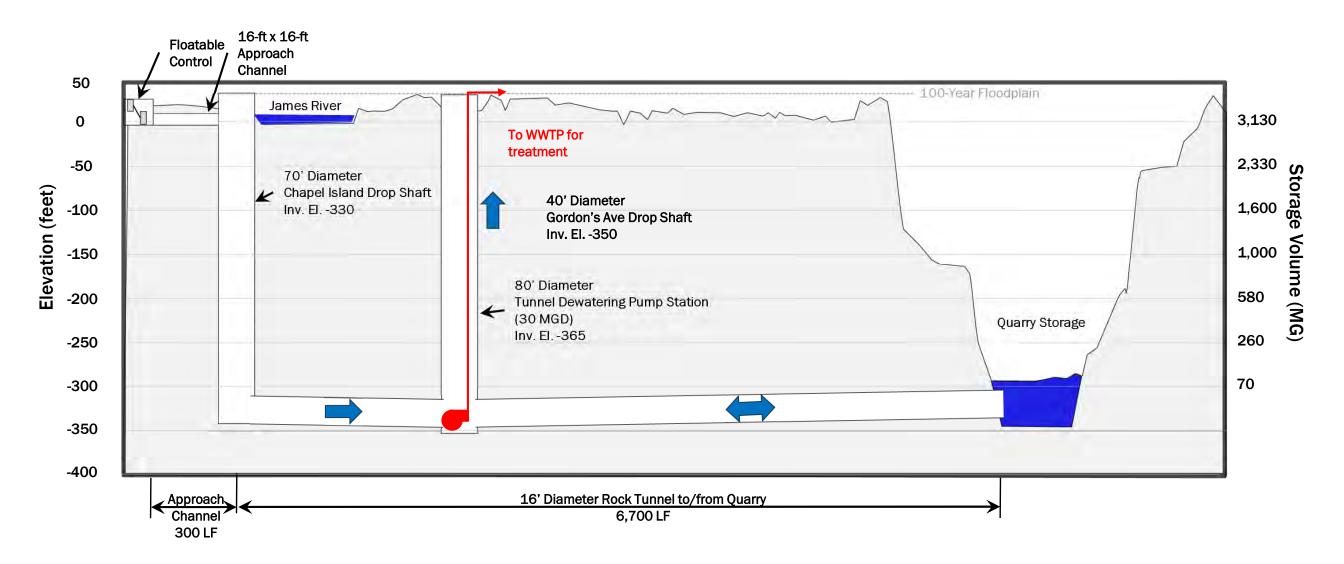
10.	15	-Yea	ar Replacement Costs				
	a.	Ele	ctrical and Instrumentation and Control				
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	\$15,750,000.00	\$15,750,000
	b.	Ме	eters				
		i.	Furnish and Install Replacement Meters	EA	8	\$7,500.00	\$60,000
	15-Year Replacement Costs Subtotal						

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

Shockoe #5 Tunnel to Quarry

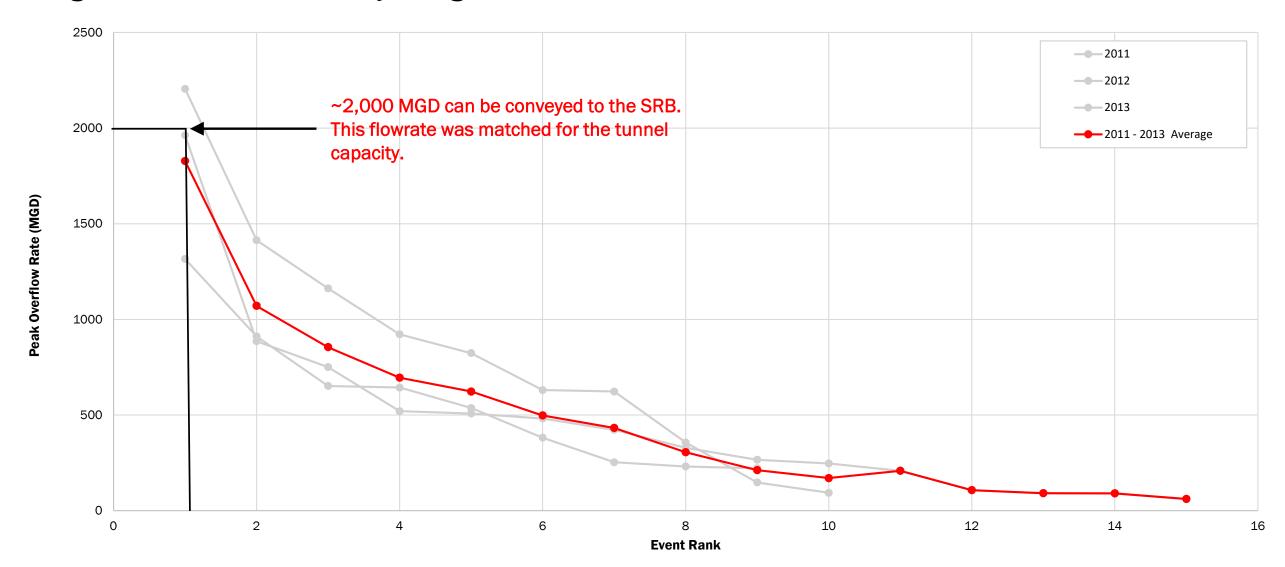


Tunnel and Quarry Storage Profile



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. St	tru	cture Dimensions				
a.	. А	Approach Channel				
	i.	Length	LF	300		
	ii	i. Width	LF	16		
	ii	ii. Depth	LF	16		
b.	. [Dropshaft #1				
	i.	. Diameter	LF	50		
	ii	i. Depth	LF	350		
c.	F	Pumping Shaft				
	-	Diameter	LF	80		
	ii	i. Depth	LF	385		
d.	_	Screening Shaft				
	i.	Diameter	LF	40		
	ii	i. Depth	LF	370		
	-		1			
1. G	ene	eral				
a.	. 8	Site Prep	ACRE	10	\$500,000.00	\$5,000,000.00
	T					
			•		General Subtotal	\$5,000,000
2. Ex	хса	avation for Structures				
a.	_	Support of Excavation				
	i.	Sheeting				
	T	Approach Channel	SF	23,460	\$45.00	\$1,055,700
	\dagger	Excavation Length	LF	312		, ,,.
	Ť	Excavation Width	LF	28		
	Ť	Excavation Depth	LF	23		
	T	Excavation Depth in Rock	LF	0		
	ii	i. Secant Piling				
	Ť	Dropshaft	SF	5,278	\$190.00	\$1,002,796
	t	Excavation Diameter	LF	56	, = , , , ,	7-,,
	$^{+}$	Excavation Depth	LF	365		
	Ŧ	Pumping Shaft	SF	8,105	\$190.00	\$1,540,009
	+	Excavation Diameter	LF	86	Ψ130.00	Ψ1,040,000
	+	Excavation Depth	LF	400		
	+	Screening Shaft	SF	4,335	\$190.00	\$823,726
-	+	Excavation Diameter	LF	46	Ψ130.00	Ψ025,720
-	+	Excavation Depth	LF	385		
b.	c	Soil	LF	363		
D.	. 0	Excavate and Dispose of Soil	CY	7,442	\$90.00	\$669,760
	1.	i. Excavate and Dispose of Son	CY	11,037	\$180.00	\$1,986,743
_	_		Cf	11,037	\$180.00	\$1,980,743
c.	_	Rock Tryonyate and Diagona of Book	CV	0		Φ.
-	_	Excavate and Dispose of Rock	CY	132,013	\$300.00	\$0 \$39,603,790
	- "	i. Excavate and Dispose of Dropshaft Rock	Cf	132,013	\$300.00	\$39,003,790
	<u> </u>			Excavation for	Structures Subtotal	\$46,682,524
3 C+	tru	ctural		LACGVACION TO	Graciales Subtotal	φ40,002,024
		Approach Channel	1	1 1		
		. 300'L x 16'W x 16'D				
	Ť	Concrete Base Slab	CY	676	\$775.00	\$523,550
_	\dagger	Base Slab Thickness	LF	3	·	,
-	\dagger	Base Slab Length	LF	304		
-	\dagger	Base Slab Width	LF	20		
-	+	Concrete Exterior Walls	CY	721	\$1,500.00	\$1,080,88
-	+	Exterior Wall Thickness	LF	2	,000.00	¥±,000,00
\dashv	+	Exterior Wall Length	LF	608		
\dashv	+	Exterior Wall Height	LF	16		
	+	Concrete Top Slab	CY	450	\$1,500.00	\$675,55
	+	Top Slab Thickness	LF	2	ΨΞ,000.00	ψ010,00
+	+	Top Slab Unitariess Top Slab Length	LF	304		
_	+	Top Slab Width	LF	20		
h	Г	Dropshaft #1	Lr	20		
D.		. 50' Dia x 350' Depth				
-	+	Concrete Base Slab	CY	1,118	\$1,100.00	\$1,229,99
+	+	Base Slab Thickness	LF	10	Ψ1,100.00	Ψ1,223,99.
	+	Base Slab Diameter	1		-	
		Edde Oldo Eldifictel	LF	62		

		Concrete Exterior Walls	CY	6,475	\$2,100	\$13,597,860
	+	Exterior Wall Thickness	LF	3	\$2,100	Ψ13,391,600
	+	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	\$1,500.00	\$303,170
	+	Top Slab Diameter	LF	62		
C.	Pi	umping Shaft	LF	62		
0.	 	80' Dia x 385' Depth				
	Ë	Concrete Base Slab	CY	2,151	\$1,100.00	\$2,366,550
	+	Base Slab Thickness	LF	10	ψ1,100.00	Ψ2,000,000
	+	Base Slab Diameter	LF	86		
	+	Concrete Exterior Walls	CY	11,154	\$2,100.00	\$23,424,238
	+	Exterior Walls Exterior Walls	LF	3	\$2,100.00	\$23,424,230
	+	Exterior Wall Annular Area		782		
	+		SF			
	+	Exterior Wall Height	LF	385	4	*****
	+	Concrete Top Slab	CY	645	\$1,500.00	\$968,134
	1	Top Slab Thickness	LF	3		
	Ļ	Top Slab Diameter	LF	86		
a.	50	creening Shaft				
	١.	40' Dia x 370' Depth Concrete Base Slab	01/	C4.C	#4.400.00	AC77 074
	+		CY	616	\$1,100.00	\$677,071
	1	Base Slab Thickness	LF	10		
	1	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.	_	uarry Improvements				
	i.	Quarry Site Improvements	LS	1	\$50,000,000.00	\$50,000,000
					Structural Subtotal	\$106,986,647
4. Ci	_					
a.	Τι	unnel 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
		nanical/Electrical/I&C				
a.	Τι	unnel Dewatering PS and Screening Facility				
	i.	New TDPS and Screening Facility	MGD	30	\$900,000.00	\$27,000,000
		•	<u>.</u>	Mechanical/E	ectrical/I&C Subtotal	\$27,000,000
		truction Total				
	_	ubtotal A				\$287,069,171
	_	esign Contingency	LS	1	40%	\$114,827,668
c.		ubtotal B	LS	1		\$401,896,839
		eneral Conditions	LS	1	50%	\$200,948,420
e.	_	ubtotal C	LS	1		\$602,845,259
f.	_	onds and Insurance	LS	1	3%	\$18,085,358
g.		ubtotal E	LS	1		\$620,930,616
h.	Q	uarry Aquisition Price	LS	1	\$150,000,000	\$150,000,000
L	1]		Ame
					Total Estimated Cost	\$770,930,616

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

10	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	\$810,00
f.	Maintenance of Instrumentation and Control				
	i. Maintain I&C	LS	3%	\$0.00	\$(
g.	Operation of Influent Pump Station				
	j. 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				
	j. Solids Hauling	DT/Y	3906	\$130.00	\$507,770
	TSS	mg/L	75		
	Volume	MGY	2741		
Ш	Anr	ual Operations	and Maintain	ence Costs Subtotal	\$3,989,67

			·			,	* 10,000	
		i.	Furnish and Install Replacement Meters	EA	6	\$7,500.00	\$45,000	
	b. Meters							
	i. Furnish and Install Replacement Electrical and I&C				100%	\$5,400,000.00	\$5,400,000	
	a. Electrical and Instrumentation and Control							
11.	. 15-Year Replacement Costs							

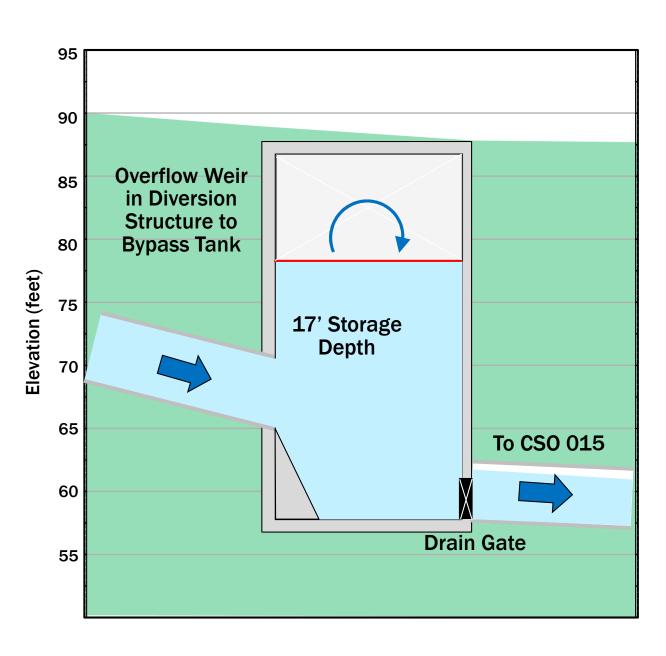
						ckoe #5 uarry
Category	Торіс	Weight	Score	Criteria	Unweighted Score	Weighted Scor
	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	1	<4 Year project schedule with minimal risks for schedule extension 4-8 Year project schedule SP Year project schedule with mederate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

Southside #1

Southside #1 (Recommended Project)

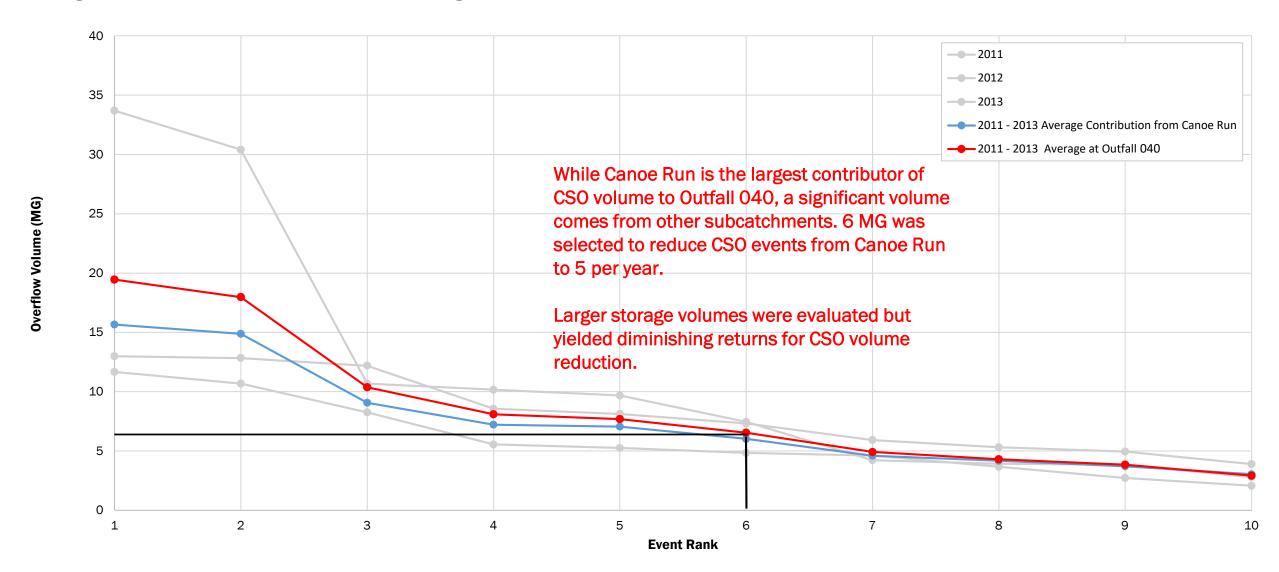
Canoe Run Park Storage Tank





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. S	tru	ctu	ure Dimensions				
а	. (Car	noe Run Park Tank				
	i		Length	LF	360		
	i	i.	Width	LF	160		
	i	ii.	Depth	LF	30		
b	. (Odo	or Control Vault				
	i		Length	LF	30		
	i	i.	Width	LF	40		
	i	ii.	Depth	LF	20		
C.	. [Div	ersion Structure				
	i		Length	LF	30		
	i	i.	Width	LF	40		
	i	ii.	Depth	LF	30		
				•		•	
1. G	ien	era	al				
а	. (Site	e Prep	ACRE	2	\$250,000.00	\$500,000.00
						General Subtotal	\$500,000
	_		ation for Structures			1	
а	-		pport of Excavation				
	ļi	i.	Sheeting				
	4		Storage Tank Excavation Vertical Area	SF	60,828	\$45.00	\$2,737,260
	4		Excavation Length	LF	374		
	4		Excavation Width	LF	174		
	4		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	. (Cor	ntaminated Material				
	i	i.	Excavate and Dispose of Soil	CY	75,759	\$90.00	\$6,818,336
	į	i.	Excavate and Dispose of Contaminated Material	CY	18,940	\$200.00	\$3,787,964
					Excavation for	Structures Subtotal	\$10,400,426
			ıral				
а	. (Car	noe Run Park Storage Tank				
	ļ	i	360'L x 160'W x 30'D				
	4		Concrete Base Slab	CY	6,751	\$775.00	\$5,231,767
	4		Base Slab Thickness	LF	3		
	4		Base Slab Length	LF	366		
	4		Base Slab Width	LF	166	1	
	_		Concrete Exterior Walls	CY	3,507	\$1,500.00	\$5,260,000
	4		Exterior Wall Thickness	LF	3		
_	_		Exterior Wall Length	LF	1,052		
	4		Exterior Wall Height	LF	30		
	4		Concrete Top Slab	CY	4,500	\$1,500.00	\$6,750,667
			Top Slab Thickness	LF	2		
	4		Top Slab Length	LF	366		
			Top Slab Width	LF	166		
b	-		or Control Vault				
-	4	i.	30'L x 40'W x 20'D	01/	202	A77E 00	¢474 700
_	+	_	Concrete Base Slab	CY	222	\$775.00	\$171,763
	+	_	Base Slab Thickness	LF	4		
	4		Base Slab Length	LF	34		
	4		Base Slab Width	LF	44	A · ·	
	_		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		

C.		Too Clab Thisleress				
-		Top Slab Thickness	LF	2		
C		Top Slab Length	LF	34		
C		Top Slab Width	LF	44		
0.		version 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	44 500 00	*10100
		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		
					Church well Cubbatel	\$40.00F.007
4. Civi	il				Structural Subtotal	\$18,995,907
	II Pip					
	_	Furnish and Install 96" Fiber Reinforced Sewer Pipe	LF	100	\$2,000.00	\$200,000
	\vdash	Furnish and Install 18" Fiber Reinforced Sewer Pipe	LF	20	\$600.00	\$12,000
-	_	cavation in Soil	LI*	20	φου.υυ	Ψ12,000
Б.		Excavation for 96" Fiber Reinforced Sewer Pipe (25' Depth)	CY	889	\$90.00	\$80,000
		Excavation Length	LF	100	Ψ30.00	Ψ00,000
		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	\$50.00	Ψ0,000
		Excavation Width	LF	6		
		Excavation Depth	LF	30		
		Contaminated Excavation	CY	24	\$200.00	\$4,889
c.	Sur	pport of Excavation			4200.00	¥ 1,000
	-	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. Me	cha	nical				
a.	Tip	ping Troughs				
		Furnish and Install Tipping Troughs	EA	12	\$75,000.00	\$900,000
b.	Dra	ain Gates				
	_	Furnish and Install Drain Gates	EA	2	\$37,500.00	\$75,000
c.	Odd	or Control				
	i.	Exhaust Fans and Carbon Adsorber	CFM	28,800	\$50.00	\$1,440,000
					Mechanical Subtotal	\$2,420,000
	_	cal and I&C		1		
a.		scellaneous Electrical and I&C			4000 000 00	4000 000
	I.	Furnish and Install Electrical and I&C (Other)	LS	1	\$968,000.00	\$968,000
	Ш			Floated	and ISC Cubtate!	\$968,000
7 Cor	netr	uction Total		Electric	cal and I&C Subtotal	φ908,00C
		btotal A				\$34,085,367
		sign Contingency	LS	1	40%	\$13,634,147
		btotal B	LS	1	.5.3	\$47,719,513
		neral Conditions	LS	1	50%	\$23,859,757
e.	Sub	btotal C	LS	1		\$71,579,270
f.	Bor	nds and Insurance	LS	1	3%	\$2,147,378
				Te	otal Estimated Cost	\$73,726,648

8.	. Capital Total								
	a. Construction Cost Total								
	b.	Capital Contingency	LS	1	50%	\$36,863,324			
Total Estimated Capital Cost									

9.	Anı	nua	I Operations and Maintainence Costs				
	a.	Lal	oor				
		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.	Ма	intenance of Structures				
		i.	Maintain Structures	LS	0.2%	\$18,995,907.41	\$37,992
	c.	Ма	intenance of Pipe				
		i.	Maintain Pipe	LS	1.0%	\$212,000.00	\$2,120
	d.	Ма	intenance 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.	e. Maintenance of Instrumentation and Control					
		i.	Maintain I&C	LS	3%	\$968,000.00	\$29,040
			 Ann	ual Operations	and Maintaine	nce Costs Subtotal	\$166,402

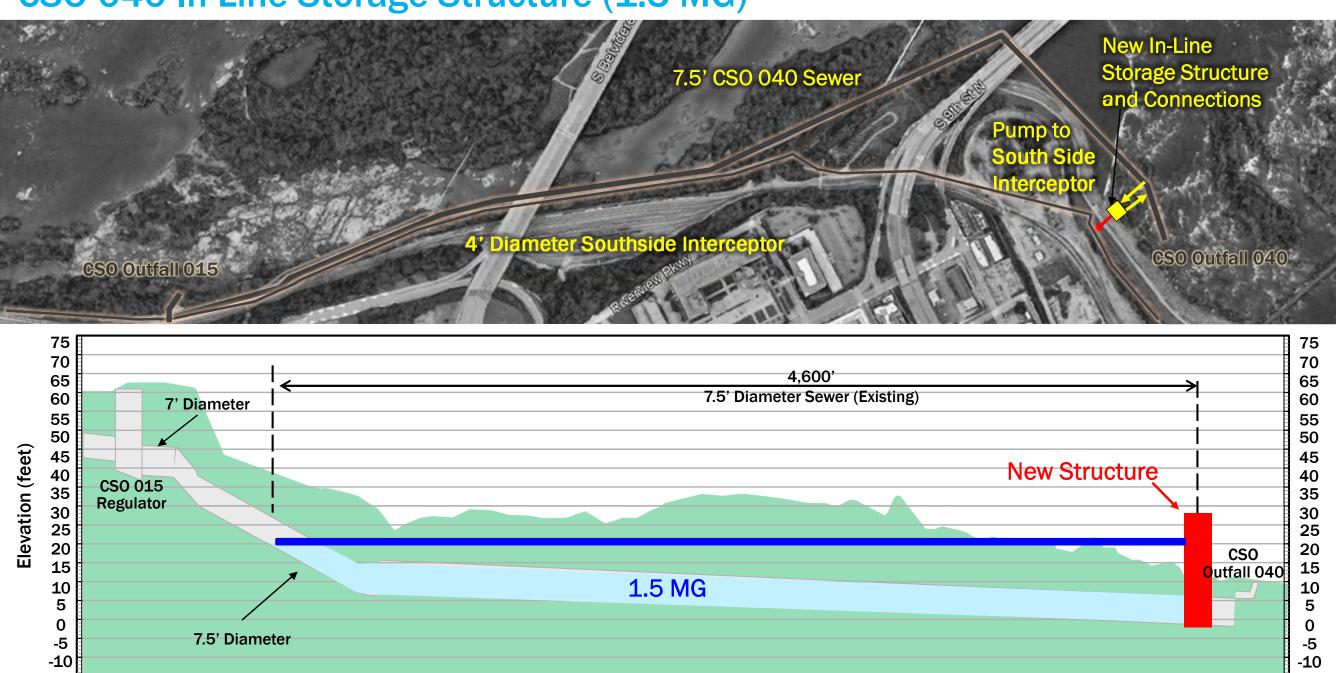
10. 15-Year Replacement Costs							
	a. Electrical and Instrumentation and Control						
	i. Furnish and Install Replacement Electrical and I&C LS 100% \$968,000.00						
	b. Meters						
	i. Furnish and Install Replacement Meters EA 3 \$7,500.00						
15-Year Replacement Costs Subtotal						\$990,500	

Content you for the carbon process of the ca						Southside #1 Canoe Run Tank	
Continue to the decoration of the decoration o	Category	Topic	Weight	Score	Criteria	Unweighted	Weighted Scor
Continue till aborgonuce and per appuration for datasequalities. 1.6 1.0			2.3	1	4-8 Year project schedule	1	2.3
Constructability Projectments to south in gazdes 2		,	1.8	1	None/Minor conflicts Moderate conflicts resolvable through reloactions, reconstruction	2	3.6
Community Adaptability and Beautiful Sea of Position (Continue) and Continue (Continue) and Continue) and Continue (Continue) and Contin	Constructability	Improvements to existing assets	2	2	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years	0	0
Part of construction means and methods 1.3 2 No control recognition of control types appropriate types appropriate types appropriate types appropriate types appropriate types appropriate the control types appropriate types ap		Required land acquisition or construction easements	2.3	1	Construction easements or none required Permanent easements required	2	4.6
Community Comm		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 Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required	1	1.3
New Facility/Equipment maintenance requirements 1.8 2.1 1.4 1.5 1.5 1.5 1.5 1.5 1.5 1		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 Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition	2	5
O&M Openhanity to irregrave sever system performance 1.1 Moderave selection in US/DE IRIE, as companed to the escaling condition 1.2 1.72 contrained in US/DE IRIE, as companed to the escaling condition 1.2 2.72 contrained in US/DE IRIE, as companed to the escaling condition 1.3 2.72 contrained in US/DE IRIE, as companed to the escaling condition 1.4 2.72 contrained in US/DE IRIE, as companed to the escaling condition 1.5 2.72 contrained in US/DE IRIE, as companed to the escaling condition 1.6 2.72 contrained in US/DE IRIE, as companed to the escaling condition 1.6 2.72 contrained in US/DE IRIE, as companed to the escaling condition 1.6 2.72 contrained in US/DE IRIE, as companed to the escaling condition 1.6 2.72 contrained in US/DE IRIE, as companed to the escaling condition 1.7		0 Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition 2 Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended		2	3.6		
Familiarity with now Facilities/Equipment 1.1 2 0 No reduction in US/DS NGL as compared to the existing condition 2 1 2 other smiles foliation, registered until vision of the minimal foliation of the control of the minimal foliation of the minimal foliation of the compared and maintained at the City Additional staff required for operations and maintained at the City 1 2 new employees are required for the operation and maintained at the City 2 2 Figure applyone are required for the operation and maintained at the City 2 3 Project applyone or required for the operation and maintained at the City 3 4 2 Project applyone or required for the operation and maintained at the City 4 2 Project applyone or required for the operation and maintained at the City 4 2 Project applyone or required for the operation and maintained at the City 4 2 Project applyone or required for the operation and maintained at the City 4 2 Project applyone or required for the operation and maintained at the City 4 2 Project applyone or required for the operation and maintained at the City 5 2 Project applyone or required for the operation and maintained at the City 6 2 Project applyone or required for the operation and maintained at the City 7 2 Project applyone or required for the operation and maintained at the City 8 2 Project applyone or required for the operation and maintained at the City 8 2 Project applyone or required for the operation and maintained at the City 9 2 Project applyone or required for the operation and maintained at the City 9 2 Project applyone or required for	O&M		0.0	0 2	Significant regular maintenance (Weekly) is required for the equipment to operate as intended Significant reduction in US/DS HGL as compared to the existing condition		2.9
Additional staff required for operations and maintenance Additional maintenance required in the proper requirements Additional maintenance and maintenance Additional maintenance and maintenance Additional maintenance requirements Additional maintenance and maintenance Additional maintenance and maintenance and maintenance Additional maintenance and maintenance and maintenance and maintenance Additional maintenance and maintenance and maintenance Additional maintenance and maintenance an		Familiarity with new Facilities/Equipment 1.1 No reduction in US/DS HGL as compared to the existing condition 2 other similar facilities/equipment that are currently operated and maintained at the City 1 1-2 other similar facilities/equipment that are currently operated and maintained at the City No other similar facilities/equipment that are currently operated and maintained at the City		No reduction in US/DS HGL as compared to the existing condition >2 other similar facilities/equipment that are currently operated and maintained at the City			
Adaptability and Resiliency Resiliency to potential river floods Adaptability and Resiliency Adaptability and Resiliency Resiliency to potential river floods Adaptability and Resiliency Adaptability and Resiliency Resiliency to potential river floods Adaptability and Resiliency Adaptability and Resiliency Adaptability and Resiliency Resiliency to potential river floods Adaptability and Resiliency Adaptabilit				No other similar facilities/equipment that are currently operated and maintained at the City No new staff is required for operation and maintenace		2.2	
Adaptability and Resillency to potential climate change impacts Resillency to potential climate change impacts Adaptability and Resillency to potential climate change impacts Resillency to potential climate change impacts Adaptability and Resillency to potential climate change impacts Adaptability and Resillency to potential climate change impacts Adaptability and the second of the change impacts Adaptability and the second of the change impacts Adaptability and the second of the change impacts Resillency to potential river floods Adaptability and the second of the change impacts Adaptability and the second of the change impacts Adaptability and the second of the change impacts Adaptability and the second of the second of the change impacts of the second of the s				0 2	>2 new employees are required for operations and maintenace Project supports future improvements or is foundational for future improvements	2	3.2
Resiliency Resiliency in potential climate change impacts Resiliency to potential climate change scenarios Resiliency to potential mixer floods Resiliency to potential mixer floods 3.4 1 Protected against a 10-year flood Resiliency to potential mixer floods 3.4 1 Protected against a 25-year flood Resiliency to potential mixer floods 0 Protected against a 25-year flood 0 Protected against		sewer system improvements		0 2	Project will be obsolete or unnecessary after Long Term Plan is implemented Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	1	3.4
Opportunites to Coordinate with Future Development 2.3 High potential for known near term (5-5 years) future development 2.4 High potential for known near term (5-5 years) future development 2.5 High potential for known near term (5-5 years) future development 2.6 No known or potential development in near 1.0 years 2.7 No federal or state permits required 2.8 No federal or state permits required 2.9 No federal or state permits required 2.0 Federal/state individual permits required 2.1 Federal/state individual permits required 2.2 Located outside of the Resource Manangement Area (RMA) 2.3 Minimal modifications would be required for the City's VPDES permit 2.4 Minimal modifications would be required for the City's VPDES permit 2.5 Minimal fine removal/mitigation y provide community give back (public space improvements) 3.5 1 Adjacent 3.6 2 Yes 3.7 Yes 3.8 Minimal impacts to the community during construction 3.9 Minimal impacts (stores and of course, sequired) 3.9 Minimal impacts (stores and of no sequired in residential areas) during construction 3.9 Minimal impacts (stores and of no sequired) 3.0 Minimal impacts (stores and of no sequired) 3.1 Moderate modifications (stores and of no sequired) 3.2 Minimal impacts (stores and of no sequired) 3.3 Minimal impacts (stores and of no sequired) 3.4 Minimal impacts (stores and of no sequired) 3.5 Minimal impacts (stores and of no sequired) 3.6 Minimal impacts (stores and of no sequired) 3.7 Minimal impacts (stores and of no sequired) 3.8 Minimal impacts (stores and of no sequired) 3.9 Minimal impacts (stores and of no sequired) 3.9 Minimal impacts (stores and of no sequired) 3.0 Minimal impacts (stores and of no sequired) 3.0 Minimal impacts (stores and of no sequired) 3.1 Moderate tree removal/mitigation (<0.2 acres) is required 3.1 Moderate tree removal/mitigation (<0.2 acres) is required 3.1 Moderate tree re				0 2	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios Protected against a 100-year flood	1	4.4
No No known or potential development in next 10 years Required Fed/State Permits/Coordination 2		, , , , , , , , , , , , , , , , , , ,		0 2	Not protected against a 25-year flood High potential for known near term (<5 years) future development	_	3.4
Tommunity Community Commu				0 2	No known or potential development in next 10 years No federal or state permits required		4.6
Community Community Community Community during construction Construction	nd Use and Permitting			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required	2	4
Required VPDES permitting modifications 0.8 1		Project located in Environmentally sensitive areas	3.3	0	Located within the Resource Protection Area (RPA)	2	6.6
Community Community Justice Areas 3.5 1 Adjacent 2		Required VPDES permitting modifications	0.8	1 0	Moderate modifications would be required for the City's VPDES permit Significant modifications would be required for the City's VPDES permit	2	1.6
Community Community Diporturing to provide community give back (public space improvements) 2.9			3.5	1	Adjacent	2	7
Impacts to community during construction 2.1 Moderate impacts (traffic detours and/or noise in residential areas) during construction 0 0 0 0 0 0 0 0 0	Community		2.9	1 0	Adjacent No	2	5.8
Tree Removal/Mitigation 2.3 1 Moderate tree removal/mitigation (0.2-1 acres) is required 2		Impacts to community during construction	2.1	1 0	Moderate impacts (traffic detours and/or noise in residential areas) during construction Significant impacts (road closures, park closures, significant noise in residential areas) during construction	0	0
O Signficant tree removal/mitigation (>1 acres) is required		Tree Removal/Mitigation	2.3	1	Moderate tree removal/mitigation (0.2-1 acres) is required	2	4.6

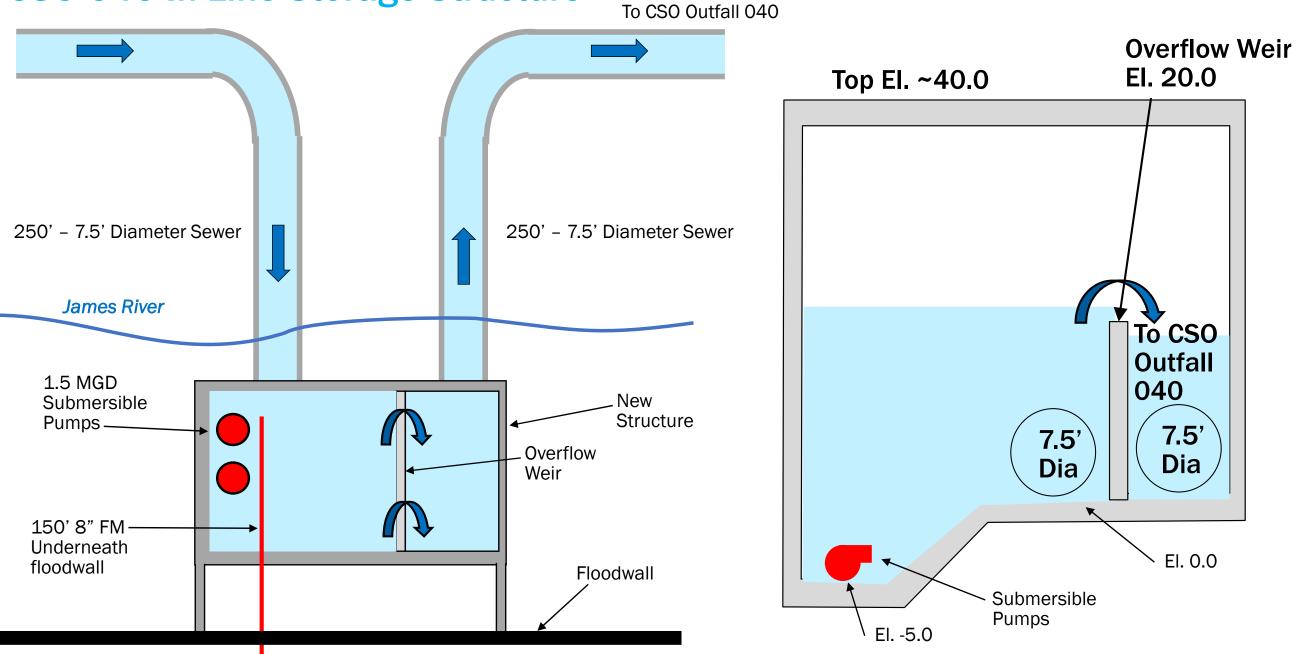
Southside #2

Southside #2

CSO 040 In-Line Storage Structure (1.5 MG)



Southside #2CSO 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. S	Stru	icture Dimensions				
а	ı. I	In-Line Structure				
	li	i. Length	LF	20		
	Ti	ii. Width	LF	30		
	_	iii. Depth	LF	45		
		··· ···	1			
1. G	ìen	neral				
а	i. (Site Prep and Coordination with Floodwall	ACRE	1	\$2,000,000.00	\$2,000,000.00
					General Subtotal	\$2,000,000
		avation for Structures				
а	i. \$	Support of Excavation				
	j	i. Secant Piling	SF	2,960	\$190.00	\$562,400
		Excavation Length	LF	32		
		Excavation Width	LF	42		
	T	Excavation Depth	LF	20		
b). I	Rock				
	li	i. Excavate and Dispose of Rock	CY	996	\$300.00	\$298,667
	T					
		•	E	xcavation for S	tructures Subtotal	\$861,067
3. S	Stru	ictural				
		In-Line Structure				
	Ţ	i. 20'L x 30'W x 45'D				
	T	Concrete Base Slab	CY	91	\$775.00	\$70,267
	T	Base Slab Thickness	LF	3		
	T	Base Slab Length	LF	24		
	T	Base Slab Width	LF	34		
	7	Concrete Exterior Walls	CY	360	\$1,500.00	\$540,000
	1	Exterior Wall Thickness	LF	2	1 -, 1 1 1 1 1	77.17,777
	+	Exterior Wall Length	LF	108		
	\dashv	Exterior Wall Height	LF	45		
	+	Concrete Top Slab	CY	60	\$1,500.00	¢00.667
	+		LF	2	\$1,500.00	\$90,667
	4	Top Slab Thickness				
	4	Top Slab Length	LF	24		
	4	Top Slab Width	LF	34		
						*=00.000
4 10	· · · · · ·				tructural Subtotal	\$700,933
	civil		1		1	
а	_	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				
	j	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		
	_Ti	ii. Excavation for 8" Ductile Iron Sewer Pipe (20' Depth, Crossing Floodwall)	CY	528	\$90.00	\$47,500
	J	Excavation Length	LF	150		
	T	Excavation Width	LF	5		
	T	Excavation Depth	LF	20		
С		Support of Excavation				
	_	i. Sheeting				
\vdash	7	8" Ductile Iron Sewer Pipe (20' Depth, Crossing Floodwall) Excavation Vertical Area	SF	9,900	\$45.00	\$445,500
\vdash	+	Excavation Length	LF	150		,
H	+	Excavation Depth	LF	22		
d	1. (Cofferdam				
	_	i. Cofferdam for 90" Fiber Reinforced Sewer Pipe (10' Depth, in River)	LF	700	\$3,000.00	\$2,100,000
\vdash	ť	22 25 Control Cont	-	. 00	\$3,000.00	+ 2,100,000
					Civil Subtotal	\$4,142,389
5. N	/ler	chanical				, ,,566
	_	Pumps				
- a	_	i. Dewatering Pumps	MGD	3	\$75,000.00	\$225,000
H	+	- Source in B Lambo	11100	3	ψ10,000.00	Ψ225,000
			1	I Ma	echanical Subtotal	\$230,000
6. E	ler	etrical and I&C		IVIC	Jonathour Subtotal	Ψ230,000
	_	Miscellaneous Electrical and I&C				
d	4	i. Furnish and Install Electrical and I&C (Other)	LS	1	\$115,000.00	\$115,000
\vdash	+	i dinion and install Licothical and lico (Other)	LO		φ113,000.00	φ110,000
		•		1	1	

				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
				Tota	al Estimated Cost	\$17,410,828

8.	Ca	pital Total				
	a.	Construction Cost Total				\$17,410,828
	b.	Capital Contingency	LS	1	50%	\$8,705,414
				Total Estima	ated Capital Cost	\$26,116,242

9.	Anr	nual Operations and Maintainence Costs				
	a.	Labor				
		j. 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				
		j. Maintain I&C	LS	3%	\$115,000.00	\$3,450
		Annual (Operations a	nd Maintainend	ce Costs Subtotal	\$45,507

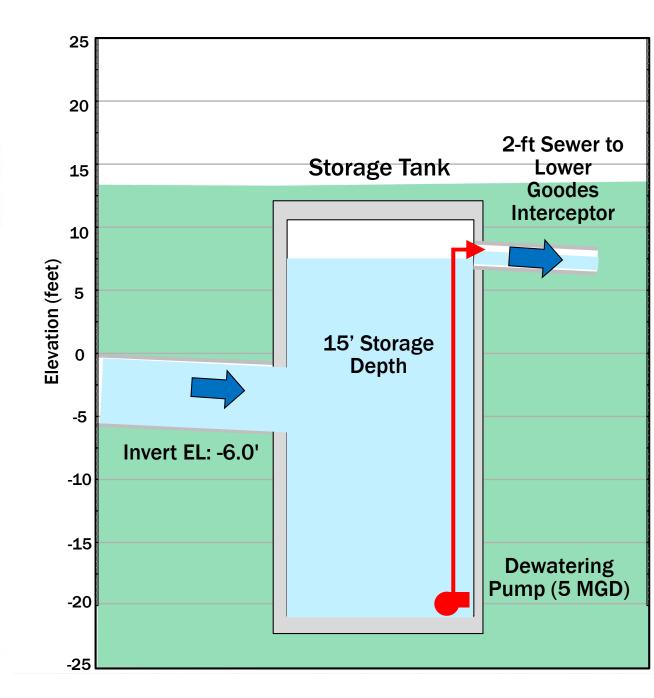
10.	15-	Year Replacement Costs				
	a.	Electrical and Instrumentation and Control				
		i. Furnish and Install Replacement Electrical and I&C	LS	100%	\$115,000.00	\$115,000
	b.	Meters				
		i. Furnish and Install Replacement Meters	EA	3	\$7,500.00	\$22,500
	•	<u> </u>	15-Ye	ar Replaceme	nt Costs Subtotal	\$137,500

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

Southside #3 CSO 021 Storage Tank

CSO Outfall 021 Tipping Troughs fluent Sewer 8' Diameter **Dewatering Pumps** (5 MGI

<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
	_	ure Dimensions		ı	1	
a.		orage Tank Length	1.5	200		
		Width	LF LF	200 120		
		Depth	LF	35		
-	1111.	Бери		35		
Ge	enera	al				
		e Prep	ACRE	2	\$250,000.00	\$500,000.
			•	•	General Subtotal	\$500,0
Ex	cava	ation for Structures				
a.	Su	pport of Excavation				
	i.	Sheeting				
		Storage Tank Excavation Vertical Area	SF	31,320	\$45.00	\$1,409,4
		Excavation Length	LF	214		
		Excavation Width	LF	134		
		Excavation Depth in Soil	LF	30		
-	ii.	Secant Piling	SF	15,660	\$190.00	\$2,975,4
		Excavation Length	LF	214		
		Excavation Width	LF	134		
		Excavation Depth in Rock	LF	15		
L	C					
b.		Il Excavate and Dispose of Soil	CY	31,862	\$90.00	¢0.007.0
_	_	· ·	CY	31,862	\$90.00	\$2,867,6
c.			CY	15,931	\$300.00	\$4,779,3
	ı.	Excavate and Dispose of Rock	CY	15,931	\$300.00	\$4,779,3
				Excavation for	Structures Subtotal	\$12,031,7
St	ructi	ıral		Excavación for	Oli detares odistotar	Ψ12,001,1
		orage Tank	1	1	I I	
	i.	200'L x 120'W x 35'D				
		Concrete Base Slab	CY	3,845	\$775.00	\$2,980,2
		Base Slab Thickness	LF	4		
		Base Slab Length	LF	206		
		Base Slab Width	LF	126		
		Concrete Exterior Walls	CY	2,536	\$1,500.00	\$3,803,3
		Exterior Wall Thickness	LF	3		
		Exterior Wall Length	LF	652		
		Exterior Wall Height	LF	35		
		Concrete Top Slab	CY	1,923	\$1,500.00	\$2,884,0
		Top Slab Thickness	LF	2		
		Top Slab Length	LF	206		
		Top Slab Width	LF	126		
					Structural Subtotal	\$9,667,4
Ci	_					
a.	_					
_	_	Furnish and Install 96" Fiber Reinforced Sewer Pipe	LF	50	\$2,000.00	\$100,0
	_	Furnish and Install 24" Fiber Reinforced Sewer Pipe	LF	50	\$650.00	\$32,5
b.	Exc	cavation				
-	i.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth)	CY	444	\$90.00	\$40,0
-	-	Excavation Length	LF	50		
+	1	Excavation Width	LF	12		
-	ļ	Excavation Depth	LF	20	***	A
+	ii.	Excavation for 24" Fiber Reinforced Sewer Pipe (10' Depth)	CY	111	\$90.00	\$10,0
+	-	Excavation Length	LF	50		
+	-	Excavation Width	LF	6		
+	C.	Excavation Depth	LF	10		
C.		pport of Excavation Sheeting				
+	i.	96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Vertical Area	CF	2.000	645.00	\$40F
+	-		SF LF	3,000 50	\$45.00	\$135,0
+	+	Excavation Length				
+	-	Excavation Depth 24" Fiber Pointered Sower Bine (10" Depth) Executation Vertical Area	LF	20	645.00	AC7
	-	24" Fiber Reinforced Sewer Pipe (10' Depth) Excavation Vertical Area	SF	1,500	\$45.00	\$67,
- 1	-	Excavation Length Excavation Depth	LF LF	50	 	
-		Excavation Depth	l LF	10		
-						

	a.	Tipping Troughs				
		j. Furnish and Install Tipping Troughs	EA	6	\$75,000.00	\$450,000
	b.	Drain Gates			110,000.00	*,
		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.	Ele	ctrical 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
			<u>'</u>	Electri	cal and I&C Subtotal	\$348,000
7.	Co	nstruction Total				
	a.	Subtotal A				\$23,802,200
		Design Contingency	LS	1	40%	\$9,520,880
	c.	Subtotal B	LS	1		\$33,323,080
		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
	<u> </u>			Т	otal Estimated Cost	\$51,484,159

8.	Ca	pital Total				
	a.	Construction Cost Total				\$51,484,159
	b.	Capital Contingency	LS	1	50%	\$25,742,079
				Total Esti	mated Capital Cost	\$77,226,238

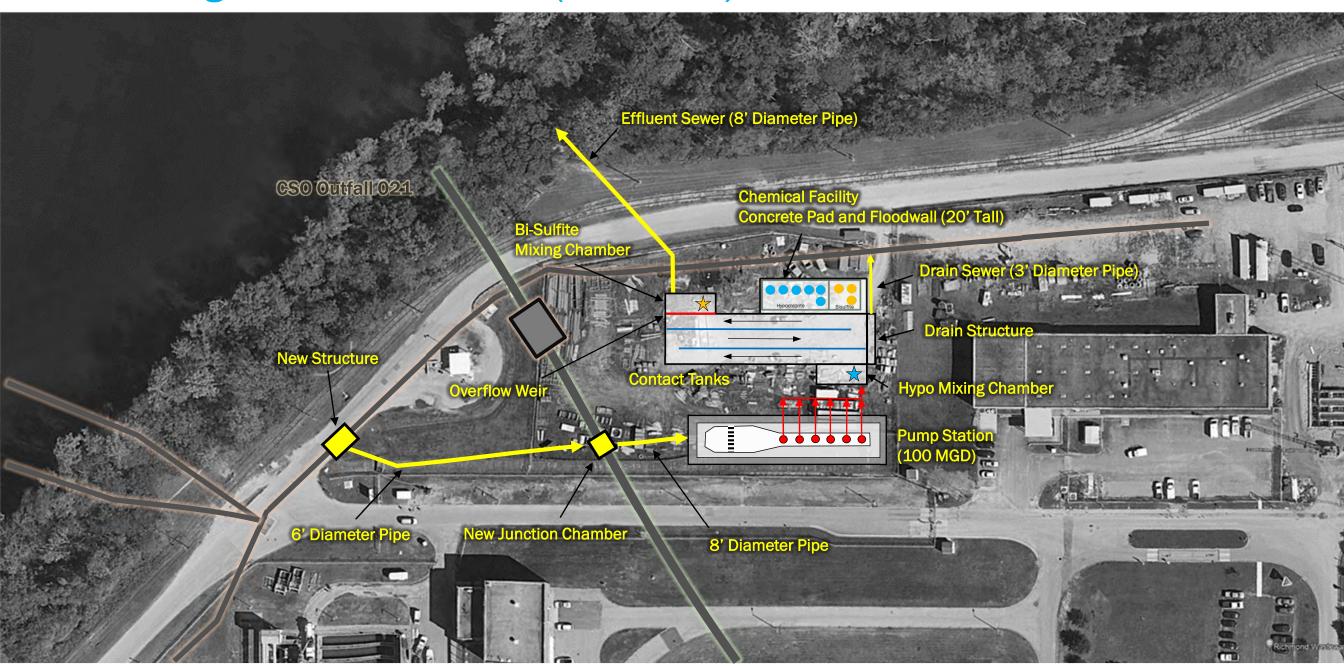
9.	Ann	ual Operations and Maintainence Costs				
	a.	Labor				
		i. Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	\$50.00	\$10,400
		ii. Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	\$50.00	\$4,800
		iii. Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	\$50.00	\$9,600
	b.	Maintenance of Structures				
		j. 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
		Annu	l al Operations	and Maintaine	nce Costs Subtotal	\$81,775

10. 1	5-1	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.	. 1	Meters				
	i	Furnish and Install Replacement Meters	EA	3	\$7,500.00	\$22,500
			15-	Year Replacem	ent Costs Subtotal	\$370,500

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

Southside #4CSO 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
. S	Stru	ucture Dimensions				
а	a. S	Structure #1				
	i.	i. Length	LF	20		
	ii	ii. Width	LF	30		
	ii	iii. Depth	LF	30		
b). S	Structure #2				
	_	i. Length	LF	20		
	li	ii. Width	LF	30		
+		iii. Depth	LF	30		
С	_	Hypo Mixing Chamber				
Ť	_	i. Length	LF	20		
1		ii. Width	LF	50		
+		iii. Depth	LF	20		
Ч	_	Contact Tanks (uncovered)		20		
Ť	_	i. Length	LF	200		
_		ii. Width	LF	30		
+	_	iii. Depth	LF	20		
_	_	Bi-Sulfite Mixing Chamber	Li	20		
е	_		1.5	00		
_		i. Length	LF	20		
_	_	ii. Width	LF	50		
1	_	iii. Depth	LF	20		
f.	_	Chemical Facility Pad				
	_	i. Length	LF	30		
	_	ii. Width	LF	75		
	ii	iii. Depth	LF	20		
_	_	neral				
а	i. S	Site Prep	ACRE	2	\$250,000.00	\$500,000.00
					General Subtotal	\$500,000
. E	хса	avation for Structures				
а	ı. S	Support of Excavation				
	i.	i. Sheeting				
		Structure #1	SF	8,214	\$45.00	\$369,630
		Excavation Length	LF	32		
	_					
		Excavation Width	LF	42		
		Excavation Width Excavation Depth		42 37		
			LF			
		Excavation Depth	LF LF	37 7	\$45.00	\$369,630
		Excavation Depth Excavation Depth in Rock Structure #2	LF LF LF SF	37 7 8,214	\$45.00	\$369,630
		Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length	LF LF SF LF	37 7 8,214 32	\$45.00	\$369,630
		Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width	LF LF LF SF LF	37 7 8,214 32 42	\$45.00	\$369,630
		Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth	LF LF SF LF LF LF	37 7 8,214 32 42 37	\$45.00	\$369,630
		Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock	LF LF SF LF LF LF LF	37 7 8,214 32 42 37 7		
		Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock HRD and Chemical Facility	LF LF SF LF LF LF SF SF	37 7 8,214 32 42 37 7 19,800	\$45.00 \$45.00	
		Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter	LF LF SF LF LF LF LF LF LF	37 7 8,214 32 42 37 7 19,800 600		
		Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Area	LF LF SF LF LF LF LF SF SF	37 7 8,214 32 42 37 7 19,800 600 10,100		
		Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Depth Excavation Area Excavation Depth	LF LF SF LF LF LF LF SF LF	37 7 8,214 32 42 37 7 19,800 600 10,100 22		
		Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Depth Excavation Depth Excavation Area Excavation Depth Excavation Depth Excavation Depth	LF LF SF LF LF LF LF SF SF	37 7 8,214 32 42 37 7 19,800 600 10,100		
b	_	Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Area Excavation Depth Excavation Depth Excavation Depth	LF	37 7 8,214 32 42 37 7 19,800 600 10,100 22 0	\$45.00	\$891,000
	i.	Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Area Excavation Depth in Rock	LF LF SF LF LF LF LF SF LF	37 7 8,214 32 42 37 7 19,800 600 10,100 22		\$891,000
b	i.	Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Area Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock	LF LF SF LF LF SF LF CY	37 7 8,214 32 42 37 7 19,800 600 10,100 22 0	\$45.00 \$90.00	\$891,000 \$1,009,467
	i.	Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Area Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth	LF	37 7 8,214 32 42 37 7 19,800 600 10,100 22 0	\$45.00	\$891,000 \$1,009,467
	i.	Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Area Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock	LF LF SF LF LF SF LF CY	37 7 8,214 32 42 37 7 19,800 600 10,100 22 0	\$45.00 \$90.00 \$300.00	\$891,000 \$1,009,467 \$209,067
C	i. F. i.	Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Area Excavation Depth in Rock Soil i. Excavate and Dispose of Rock i. Excavate and Dispose of Rock	LF LF SF LF LF SF LF CY	37 7 8,214 32 42 37 7 19,800 600 10,100 22 0	\$45.00 \$90.00	\$891,000 \$1,009,467 \$209,067
. S	i. c. F	Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Area Excavation Depth Excavation Depth Excavation Popth Excavation Popth Excavation Depth Excavation Depth Excavation Depth in Rock Soil i. Excavate and Dispose of Soil Rock i. Excavate and Dispose of Rock	LF LF SF LF LF SF LF CY	37 7 8,214 32 42 37 7 19,800 600 10,100 22 0	\$45.00 \$90.00 \$300.00	\$891,000 \$1,009,467 \$209,067
. S	i. F. F. i.	Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Area Excavation Depth Excavation Depth Excavation Popth Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Soil i. Excavate and Dispose of Soil Rock i. Excavate and Dispose of Rock	LF LF SF LF LF LF CY CY	37 7 8,214 32 42 37 7 19,800 600 10,100 22 0	\$45.00 \$90.00 \$300.00	\$891,000 \$1,009,467 \$209,067
. S	i. F. F. i.	Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Perhimeter Excavation Depth Excavatio	LF LF LF LF LF CY CY	37 7 8,214 32 42 37 7 19,800 600 10,100 22 0 11,216 697	\$45.00 \$90.00 \$300.00 Structures Subtotal	\$1,009,467 \$209,067 \$2,848,793
. S	i. F. F. i.	Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Perth Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Perimeter Excavation Perimeter Excavation Depth Excavation Depth Excavation Depth in Rock Soil i. Excavate and Dispose of Soil Rock i. Excavate and Dispose of Rock Justicural Structure #1 i. 20'L x 30'W x 30'D Concrete Base Slab	LF LF LF LF LF LF CY CY	37 7 8,214 32 42 37 7 19,800 600 10,100 22 0 11,216 697 Excavation for \$	\$45.00 \$90.00 \$300.00	\$1,009,467 \$209,067 \$2,848,793
. S	i. F. F. i.	Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Perth Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Perth Excavation Depth Excavation Depth in Rock Soil i. Excavate and Dispose of Soil Rock i. Excavate and Dispose of Rock Jactural Structure #1 i. 20'L x 30'W x 30'D Concrete Base Slab Base Slab Thickness	LF LF LF LF LF LF CY CY LF LF CY CY LF	37 7 8,214 32 42 37 7 19,800 600 10,100 22 0 11,216 697 Excavation for \$\frac{9}{2}\$	\$45.00 \$90.00 \$300.00 Structures Subtotal	\$1,009,467 \$209,067 \$2,848,793
. S	i. F. F. i.	Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Perimeter Excavation Depth Excavation Depth in Rock Soil i. Excavate and Dispose of Soil Rock i. Excavate and Dispose of Rock Jactural Structure #1 i. 20'L x 30'W x 30'D Concrete Base Slab Base Slab Thickness Base Slab Length	LF LF LF LF LF LF CY CY LF LF CY LF LF CY CY LF	37 7 8,214 32 42 37 7 19,800 600 10,100 22 0 11,216 697 Excavation for \$\frac{3}{2}\$	\$45.00 \$90.00 \$300.00 Structures Subtotal	\$1,009,467 \$209,067 \$2,848,793
. S	i. F. F. i.	Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Soil i. Excavate and Dispose of Soil Rock i. Excavate and Dispose of Rock Jactural Structure #1 i. 20'L x 30'W x 30'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width	LF LF LF LF LF LF CY CY LF LF LF LF LF LF LF LF LF L	37 7 8,214 32 42 37 7 19,800 600 10,100 22 0 11,216 697 Excavation for \$ 91 3 24 34	\$45.00 \$90.00 \$300.00 Structures Subtotal	\$1,009,467 \$209,067 \$2,848,793
. S	i. F. F. i.	Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Depth Excavation Depth Excavation Depth in Rock Soil i. Excavation Depth in Rock Soil i. Excavate and Dispose of Soil Rock ii. Excavate and Dispose of Rock Jactural Structure #1 ii. 20'L x 30'W x 30'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls	LF LF LF LF LF LF CY CY LF LF CY CY LF LF CY	37 7 8,214 32 42 37 7 19,800 600 10,100 22 0 11,216 697 Excavation for \$\frac{1}{2}\$ 91 3 24 34 240	\$45.00 \$90.00 \$300.00 Structures Subtotal	\$1,009,467 \$209,067 \$2,848,793
. S	i. F. F. i.	Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Soil i. Excavate and Dispose of Soil Rock i. Excavate and Dispose of Rock structural Structure #1 i. 20'L x 30'W x 30'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls Exterior Wall Thickness	LF LF LF LF LF CY CY LF LF CY LF	37 7 8,214 32 42 37 7 19,800 600 10,100 22 0 11,216 697 Excavation for \$ 91 3 24 34	\$45.00 \$90.00 \$300.00 Structures Subtotal	\$1,009,467 \$209,067 \$2,848,793
. S	i. F. F. i.	Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Depth Excavation Depth Excavation Depth in Rock Soil i. Excavation Depth in Rock Soil i. Excavate and Dispose of Soil Rock ii. Excavate and Dispose of Rock Jactural Structure #1 ii. 20'L x 30'W x 30'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls	LF LF LF LF LF LF CY CY LF LF CY CY LF LF CY	37 7 8,214 32 42 37 7 19,800 600 10,100 22 0 11,216 697 Excavation for \$\frac{1}{2}\$ 91 3 24 34 240	\$45.00 \$90.00 \$300.00 Structures Subtotal	\$369,630 \$891,000 \$1,009,467 \$209,067 \$2,848,793 \$70,267

		Concrete Top Slab	CY	60	\$1,500.00	\$90,667
		Top Slab Thickness	LF	2	, =,000.00	,,,,,,,
		Top Slab Length	LF	24		
\neg		Top Slab Width	LF	34		
b.	. St	ructure #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	\$90,66
		Top Slab Thickness	LF	2		
		Top Slab Length	LF	24		
$\neg \vdash$		Top Slab Width	LF	34		
d.	. HI	RD and Chemical Facility				
	i.	200'L x 30'W x 20'D				
		Concrete Base Slab	CY	1,496	\$775.00	\$1,159,63
		Base Slab Thickness	LF	4		
\dashv		Base Slab Area	SF	10,100		
\dashv	T	Concrete Exterior Walls	CY	1,726	\$1,500.00	\$2,588,889
+	+	Exterior Wall Thickness	LF	2	, _,, , , , , , ,	,_ 55,50
+	+	Exterior Wall Length	LF	1.165		
-+		Exterior Wall Height	LF	20		
\dashv	+	Concrete Top Slab	CY	0	\$1,500.00	\$(
		Top Slab Thickness	LF	0	\$1,500.00	Φ
-		Base Slab Area		10,100		
-		base Sidu Alea	SF	10,100		
L						
4 10	is 411				Structural Subtotal	\$4,790,385
	ivil		1	T	1	
a.	. Pi	·			40.000.00	
_	_	Furnish and Install 96" Fiber Reinforced Sewer Pipe (20' Depth)	LF	250	\$2,000.00	\$500,000
	_	Furnish and Install 72" Fiber Reinforced Sewer Pipe (30' Depth)	LF	250	\$1,400.00	\$350,000
	_	Furnish and Install 96" Fiber Reinforced Sewer Pipe (35' Depth)	LF	50	\$2,000.00	\$100,000
	_	Furnish and Install 36" Fiber Reinforced Sewer Pipe (10' Depth)	LF	50	\$850.00	\$42,50
lb.						
~~	. Ex	cavation in Rock				
Ĩ	i.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth)	CY	2,444	\$90.00	\$220,000
	i.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length	CY LF	2,444 250	\$90.00	\$220,000
	i.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth)			\$90.00	\$220,000
	i.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length	LF	250	\$90.00	\$220,000
	i.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth	LF LF	250 12	\$90.00	
	i.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth	LF LF LF	250 12 22		
	i.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth)	LF LF LF CY	250 12 22 2,500		
	i.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length	LF LF LF CY LF	250 12 22 2,500 250		
	i.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Width	LF LF CY LF	250 12 22 2,500 250 10		\$225,000
	i.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Width Excavation Depth Excavation For 96" Fiber Reinforced Sewer Pipe (35' Max Depth)	LF LF CY LF LF CY CY CF CY	250 12 22 2,500 250 10 27 667	\$90.00	\$225,00
	i.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Width Excavation Depth	LF LF CY LF LF CY LF LF LF LF CY	250 12 22 2,500 250 10 27 667 50	\$90.00	\$225,00
	i.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Width Excavation Depth Excavation for 96" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Length Excavation for 96" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Length Excavation Width	LF LF CY LF LF CY LF LF LF LF CY LF	250 12 22 2,500 250 10 27 667 50	\$90.00	\$225,00
	i.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Width Excavation Depth Excavation for 96" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation for 96" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Length Excavation Length Excavation Width Excavation Depth	LF LF CY LF LF CY LF LF LF LF LF LF LF	250 12 22 2,500 250 10 27 667 50 12 37	\$90.00	\$225,00
	i.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Width Excavation Depth Excavation for 96" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Length Excavation for 96" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock	LF LF CY LF LF CY LF LF LF LF LF LF LF LF	250 12 22 2,500 250 10 27 667 50 12 37	\$90.00	\$225,00 \$60,00
	i.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Width Excavation Depth Excavation Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Length Excavation Length Excavation Length Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation	LF LF CY LF LF CY LF LF CY LF CY LF CY CY CY CF CY CF CY	250 12 22 2,500 250 10 27 667 50 12 37 7 156	\$90.00	\$225,00 \$60,00 \$46,66
	i.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Width Excavation Depth Excavation for 96" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Length Excavation Length Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation for 36" Fiber Reinforced Sewer Pipe (10' Max Depth)	LF LF CY LF LF CY LF CY CY CY CY CY CY	250 12 22 2,500 250 10 27 667 50 12 37 7 156 156	\$90.00	\$225,00 \$60,00 \$46,66
	i.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Width Excavation Depth Excavation For 96" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Length Excavation Length Excavation Width Excavation Width Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation for 36" Fiber Reinforced Sewer Pipe (10' Max Depth) Excavation Length	LF LF CY LF CY LF CY CY LF CY CY LF LF CY LF	250 12 22 2,500 250 10 27 667 50 12 37 7 156 156 50	\$90.00	\$225,00 \$60,00 \$46,66
	i.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Length Excavation Length Excavation Fy6" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation Fy6" Fiber Reinforced Sewer Pipe (10' Max Depth) Excavation Length Excavation Length Excavation Width	LF LF CY LF LF CY LF LF CY LF	250 12 22 2,500 250 10 27 667 50 12 37 7 156 156 50 7	\$90.00	\$225,00 \$60,00 \$46,66
	ii.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Length Excavation Length Excavation Length Excavation Length Excavation Length Excavation Depth Excavation Depth in Rock Rock Excavation Excavation for 36" Fiber Reinforced Sewer Pipe (10' Max Depth) Excavation Length Excavation Length Excavation Length Excavation Length Excavation Length Excavation Depth Excavation Depth Excavation Depth	LF LF CY LF CY LF CY CY LF CY CY LF LF CY LF	250 12 22 2,500 250 10 27 667 50 12 37 7 156 156 50	\$90.00	\$225,00 \$60,00 \$46,66
C. C.	ii.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Width Excavation Depth Excavation Length Excavation For 96" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Length Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation for 36" Fiber Reinforced Sewer Pipe (10' Max Depth) Excavation Length Excavation Length Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Depth Excavation Depth	LF LF CY LF LF CY LF LF CY LF	250 12 22 2,500 250 10 27 667 50 12 37 7 156 156 50 7	\$90.00	\$225,00 \$60,00 \$46,66
	ii.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Width Excavation Depth Excavation for 96" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Length Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation for 36" Fiber Reinforced Sewer Pipe (10' Max Depth) Excavation Length Excavation Length Excavation Width Excavation Width Excavation Depth Excavation Depth Excavation Depth Sheeting	LF LF CY LF LF LF CY LF CY LF	250 12 22 2,500 250 10 27 667 50 12 37 7 156 156 50 7	\$90.00 \$90.00 \$90.00 \$300.00	\$225,00 \$60,00 \$46,66 \$14,00
	ii.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Width Excavation Depth Excavation For 96" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Length Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation For 36" Fiber Reinforced Sewer Pipe (10' Max Depth) Excavation Length Excavation Length Excavation Depth Depth Excavation Width Excavation Depth Excavation Depth Excavation Depth Sheeting 96" Fiber Reinforced Sewer Pipe (20' Max Depth) Excavation Vertical Area	LF LF CY LF	250 12 22 2,500 250 10 27 667 50 12 37 7 156 156 50 7 12	\$90.00	\$225,00 \$60,00 \$46,66 \$14,00
	ii.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Width Excavation Depth Excavation for 96" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Length Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation for 36" Fiber Reinforced Sewer Pipe (10' Max Depth) Excavation Length Excavation Length Excavation Width Excavation Width Excavation Depth D	LF LF CY LF	250 12 22 2,500 250 10 27 667 50 12 37 7 156 156 50 7 12 16,500 250	\$90.00 \$90.00 \$90.00 \$300.00	\$225,000 \$60,000 \$46,666 \$14,000
	ii.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Width Excavation Depth Excavation For 96" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Length Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation For 36" Fiber Reinforced Sewer Pipe (10' Max Depth) Excavation Length Excavation Length Excavation Depth Depth Excavation Width Excavation Depth Excavation Depth Excavation Depth Sheeting 96" Fiber Reinforced Sewer Pipe (20' Max Depth) Excavation Vertical Area	LF LF CY LF	250 12 22 2,500 250 10 27 667 50 12 37 7 156 156 50 7 12	\$90.00 \$90.00 \$90.00 \$300.00	\$225,00 \$60,00 \$46,66 \$14,00
	ii.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Width Excavation Length Excavation Width Excavation Width Excavation Depth Excavation Depth Excavation Depth Excavation Depth In Rock Rock Excavation Excavation Length Excavation For 36" Fiber Reinforced Sewer Pipe (10' Max Depth) Excavation Length Excavation Depth Sheeting 96" Fiber Reinforced Sewer Pipe (20' Max Depth) Excavation Vertical Area Excavation Length Excavation Depth Sheeting	LF LF CY LF LF CY LF	250 12 22 2,500 250 10 27 667 50 12 37 7 156 156 50 7 12 16,500 250	\$90.00 \$90.00 \$90.00 \$300.00	\$225,00 \$60,00 \$46,66 \$14,00
	ii.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Width Excavation Depth Excavation for 96" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Length Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation Fiber Reinforced Sewer Pipe (10' Max Depth) Excavation Length Excavation Width Excavation Width Excavation Width Excavation Depth Excavation Length Excavation Depth	LF LF CY LF	250 12 22 2,500 250 10 27 667 50 12 37 7 156 156 50 7 12 16,500 250 22	\$90.00 \$90.00 \$300.00 \$90.00	\$225,00 \$60,00 \$46,66 \$14,00
	ii.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Width Excavation Length Excavation Width Excavation Width Excavation Depth Excavation Depth Excavation Depth Excavation Depth In Rock Rock Excavation Excavation Length Excavation For 36" Fiber Reinforced Sewer Pipe (10' Max Depth) Excavation Length Excavation Depth Sheeting 96" Fiber Reinforced Sewer Pipe (20' Max Depth) Excavation Vertical Area Excavation Length Excavation Depth Sheeting	LF LF CY LF LF CY LF	250 12 22 2,500 250 10 27 667 50 12 37 7 156 156 50 7 12 250 250 22 20,250	\$90.00 \$90.00 \$300.00 \$90.00	\$225,000 \$60,000 \$46,66 \$14,000
	ii.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Width Excavation Depth Excavation for 96" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Length Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation for 36" Fiber Reinforced Sewer Pipe (10' Max Depth) Excavation Length Excavation Length Excavation Width Excavation Width Excavation Depth Sexevation Width Excavation Sewer Pipe (10' Max Depth) Excavation Depth Excavation Depth Excavation Depth Excavation Depth Sheeting 96" Fiber Reinforced Sewer Pipe (20' Max Depth) Excavation Vertical Area Excavation Length Excavation Depth 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Vertical Area Excavation Length	LF LF CY LF	250 12 22 2,500 250 10 27 667 50 12 37 7 156 156 50 7 12 250 250 250 250	\$90.00 \$90.00 \$300.00 \$90.00	\$225,00 \$60,00 \$46,66 \$14,00 \$742,50
	ii.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Width Excavation Depth Excavation Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Length Excavation Width Excavation Width Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation Fiber Reinforced Sewer Pipe (10' Max Depth) Excavation Length Excavation Width Excavation Width Excavation Depth Excavation Depth Excavation Width Excavation Width Excavation Depth Excavation Depth Texavation Depth Fiber Reinforced Sewer Pipe (20' Max Depth) Excavation Vertical Area Excavation Length Excavation Depth 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Vertical Area Excavation Length Excavation Length Excavation Length Excavation Length Excavation Length	LF LF CY LF	250 12 22 2,500 250 10 27 667 50 12 37 7 156 156 50 7 12 250 250 250 27	\$90.00 \$90.00 \$90.00 \$300.00 \$90.00 \$45.00	\$225,00 \$60,00 \$46,66 \$14,00 \$742,50
	ii.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Depth Excavation Depth Excavation Friber Reinforced Sewer Pipe (35' Max Depth) Excavation Length Excavation Length Excavation Length Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation Friber Reinforced Sewer Pipe (10' Max Depth) Excavation Length Excavation Width Excavation Width Excavation Depth Pixeravation Width Excavation For 36" Fiber Reinforced Sewer Pipe (10' Max Depth) Excavation Length Excavation Depth Pixeravation Depth Pixeravation Sheeting 96" Fiber Reinforced Sewer Pipe (20' Max Depth) Excavation Vertical Area Excavation Length Excavation Depth 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Vertical Area Excavation Length Excavation Depth Pof" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Vertical Area	LF L	250 12 22 2,500 250 10 27 667 50 12 37 7 156 156 50 7 12 16,500 250 22 20,250 27 5,550	\$90.00 \$90.00 \$90.00 \$300.00 \$90.00 \$45.00	\$225,00 \$60,00 \$46,66 \$14,00 \$742,50
	ii.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation For 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Length Excavation Length Excavation Length Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation Length Excavation For 36" Fiber Reinforced Sewer Pipe (10' Max Depth) Excavation Length Excavation Width Excavation Width Excavation Depth Poport of Excavation Sheeting 96" Fiber Reinforced Sewer Pipe (20' Max Depth) Excavation Vertical Area Excavation Depth 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Vertical Area Excavation Length Excavation Depth 96" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Vertical Area Excavation Length	LF L	250 12 22 2,500 250 10 27 667 50 12 37 7 156 156 50 7 12 250 250 27 5,550 50 37	\$90.00 \$90.00 \$90.00 \$300.00 \$90.00 \$45.00	\$225,00 \$60,00 \$46,66 \$14,00 \$742,50 \$911,25
	ii.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation For 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Length Excavation Length Excavation Length Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation Sa" Fiber Reinforced Sewer Pipe (10' Max Depth) Excavation Length Excavation Length Excavation Width Excavation Width Excavation Depth Paravation Depth Excavation Depth Fiber Reinforced Sewer Pipe (20' Max Depth) Excavation Vertical Area Excavation Length Excavation Depth 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Vertical Area Excavation Length Excavation Length Excavation Depth 96" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Vertical Area Excavation Length Excavation Depth 96" Fiber Reinforced Sewer Pipe (10' Max Depth) Excavation Vertical Area Excavation Length Excavation Depth Solution Sewer Pipe (10' Max Depth) Excavation Vertical Area Excavation Length Excavation Depth	LF LF LF CY LF	250 12 22 2,500 250 10 27 667 50 12 37 7 156 156 50 7 12 250 250 27 5,550 50 37 1,800	\$90.00 \$90.00 \$90.00 \$300.00 \$90.00 \$45.00	\$225,000 \$60,000 \$46,66 \$14,000 \$742,500 \$911,250
	ii. iii. iii. iii.	Excavation for 96" Fiber Reinforced Sewer Pipe (20' Depth) Excavation Length Excavation Width Excavation For 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Length Excavation Length Excavation Length Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation Length Excavation For 36" Fiber Reinforced Sewer Pipe (10' Max Depth) Excavation Length Excavation Width Excavation Width Excavation Depth Poport of Excavation Sheeting 96" Fiber Reinforced Sewer Pipe (20' Max Depth) Excavation Vertical Area Excavation Depth 72" Fiber Reinforced Sewer Pipe (25' Max Depth) Excavation Vertical Area Excavation Length Excavation Depth 96" Fiber Reinforced Sewer Pipe (35' Max Depth) Excavation Vertical Area Excavation Length	LF L	250 12 22 2,500 250 10 27 667 50 12 37 7 156 156 50 7 12 250 250 27 5,550 50 37	\$90.00 \$90.00 \$90.00 \$300.00 \$90.00 \$45.00	\$220,000 \$225,000 \$60,000 \$46,66° \$14,000 \$742,500 \$911,250 \$249,750

					Civil Subtotal	\$3,542,667		
5.	Me	chanical						
	a.	Pump Station						
		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		
	С	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		
		<u> </u>		ı	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		
		<u> </u>		Electric	cal and I&C Subtotal	\$180,000		
7.	Co	nstruction 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		
<u> </u>					1			
				Te	otal Estimated Cost	\$94,765,021		

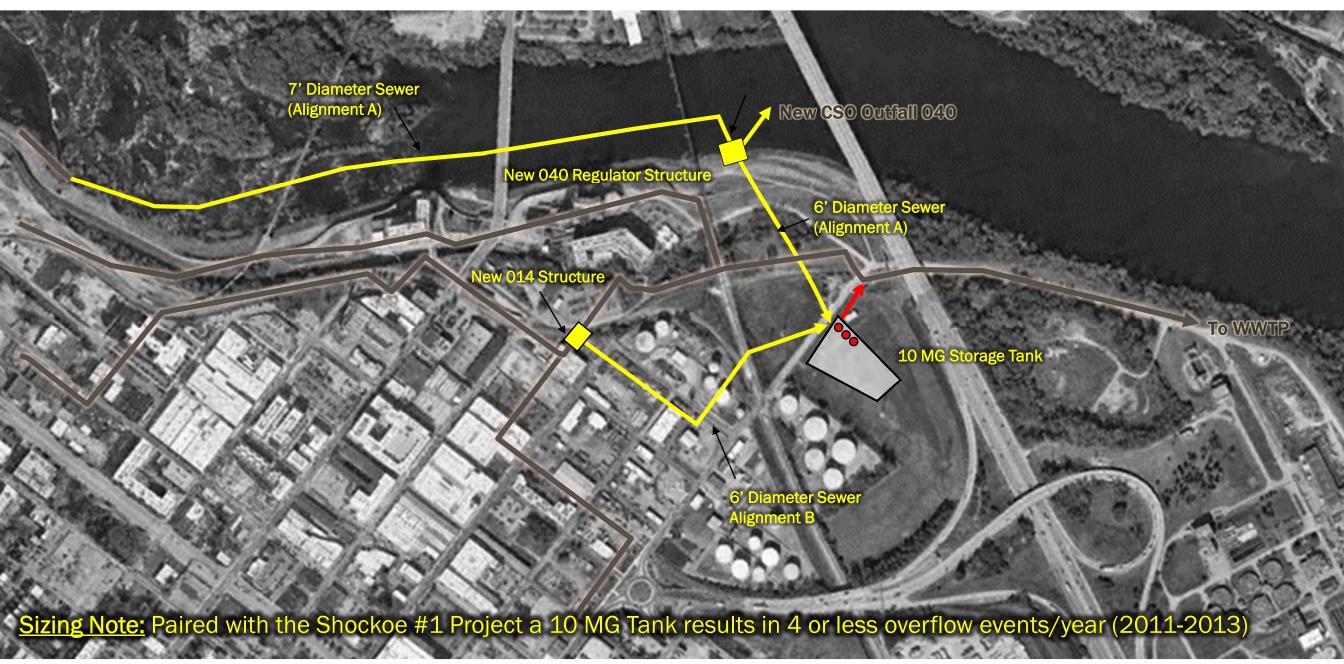
8.	Ca	pital Total				
	a.	Construction Cost Total				\$94,765,021
	b.	Capital Contingency	LS	1	50%	\$47,382,511
				Total Estir	nated Capital Cost	\$142,147,532

		I Operations and Maintainence Costs				
a.	La					
	i.	Daily Check (365 Days, 1 Hr/Ea)	HR	365	\$50.00	\$18,250
		Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	\$50.00	\$10,400
		Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	\$50.00	\$4,800
		Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	\$50.00	\$9,600
		Continuous Staffing (365 Days, 24 Hrs/Ea)	HR	8,760	\$50.00	\$438,000
b.	Ma	aintenance of Structures				
	i.	Maintain Structures	LS	0.2%	\$4,790,385.19	\$9,581
c.	Ma	aintenance of Pipe				
	i.	Maintain Pipe	LS	1%	\$992,500.00	\$9,925
d.	Ma	aintenance 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.	Ma	aintenance of Instrumentation and Control				
	i.	Maintain I&C	LS	3%	\$180,000.00	\$5,400
f.	Op	eration 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.	Op	eration 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
	<u> </u>		Annual Operations	and Maintaine	ance Costs Subtotal	\$1,488,447
			ramaar operadoris	and Manidalic	nico ococo ococotal	# ±, 700,74

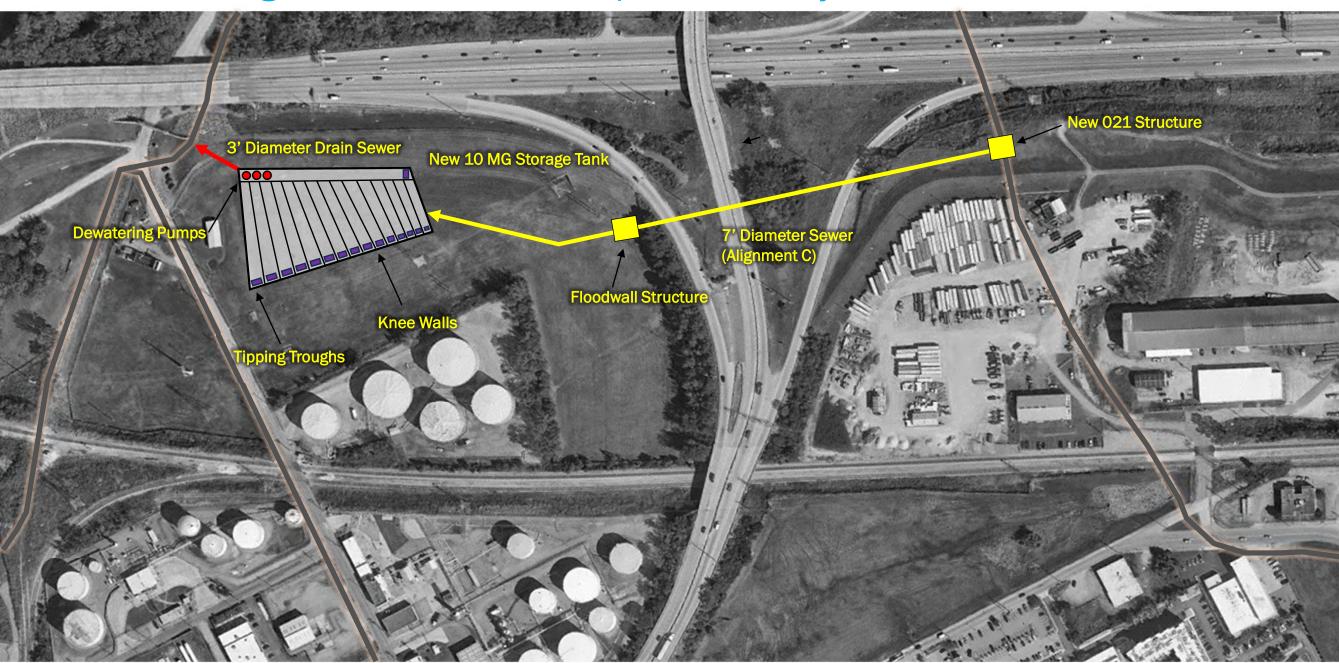
10.	15-	5-Year Replacement Costs					
	a.	Electrical and Instrumentation and Control					
		i. Furnish and Install Replacement Electrical and I&C	LS	100%	\$6,480,000.00	\$6,480,000	
	b.	Meters					
		i. Furnish and Install Replacement Meters	EA	3	\$7,500.00	\$22,500	
	15-Year Replacement Costs Subtotal						

						nside #4 D21 HRD
Category	Торіс	Weight	Score	Criteria	Unweighted Score	Weighted Scor
	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2	<4 Year project schedule with minimal risks for schedule extension 4-8 Year project schedule	1	2.3
	Conflicts with aboveground and/or subsurface features/utilities	1.8	0 2 1	>8 Years project schedule with moderate to severe risks for schedule extension None/Minor conflicts Moderate conflicts resolvable through reloactions, reconstruction	1	1.8
Constructability	Improvements to existing assets	2	0 2 1	Major conflicts requiring significant disruption and/or significant relocations Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years	0	0
	Required land acquisition or construction easements	2.3	0 2 1 0	Improvements to existing assets not identified for replacement within next 10 years Construction easements or none required Permanent easements required Land acquisition required	2	4.6
	Risk of construction means and methods	1.3	2 1 0	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required	0	0
	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 Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition	2	5
	New Facility/Equipment maintenance requirements	1.8	0 2 1	Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended Moderate regular maintenance (Monthly) is required for the equipment to operate as intended	0	0
O&M	Opportunity to improve sewer system performance 2.9 Moderate reduction in US/DS HGL as compared to the existing condition Moderate reduction in US/DS HGL as compared to the existing condition No reduction in US/DS HGL as compared to the existing condition No reduction in US/DS HGL as compared to the existing condition No reduction in US/DS HGL as compared to the existing condition 2 of the similar facilities/equipment that are currently operated and maintained at the City	Significant regular maintenance (Weekly) is required for the equipment to operate as intended Significant reduction in US/DS HGL as compared to the existing condition	1	2.9		
		No reduction in US/DS HGL as compared to the existing condition >2 other similar facilities/equipment that are currently operated and maintained at the City				
	Familiarity with new Facilities/Equipment	1.1	1 0 2	1-2 other similar facilities/equipment that are currently operated and maintained at the City No other similar facilities/equipment that are currently operated and maintained at the City No new staff is required for operation and maintenace	0	0
	Additional staff required for operations and maintenace Ability to support and work in coordination with future combined	1.6	1 0 2	1-2 new employees are required for the operation and maintenace >2 new employees are required for operations and maintenace Project supports future improvements or is foundational for future improvements	1	1.6
Adaptability and	sewer system improvements	3.4	1 0 2	Additional modifications needed to support future improvements Project will be obsolete or unnecessary after Long Term Plan is implemented Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios	2	6.8
Resiliency	Resiliency to potential climate change impacts	4.4	0 2	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios Significant performance impacts (>4 additional overflow events) in projected climate change scenarios Protected against a 100-year flood	2	8.8
	Resiliency to potential river floods	3.4	1 0 2	Protected against a 25-year flood Not protected against a 25-year flood High potential for known near term (<5 years) future development	1	3.4
	Opportunites to Coordinate with Future Development	2.3	1 0 2	Moderate potential for known near term long term (>5 years) future development No known or potential development in next 10 years No federal or state permits required Federal (state actionuide (federal) permits required	0	0
and Use and Permitting	Required Fed/State Permits/Coordination	2	1 0 2	Federal/state nationwide/general permits required Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required Located outside of the Resource Manangement Area (RMA)	0	0
	Project located in Environmentally sensitive areas	3.3	0 2	Located within the RMA Located within the Resource Protection Area (RPA) Minimal modifications would be required for the City's VPDES permit	1	3.3
	Required VPDES permitting modifications	0.8	1 0	Moderate modifications would be required for the City's VPDES permit Significant modifications would be required for the City's VPDES permit	0	0
	Opportunites for Water Quality Improvements in Environmental Justice Areas	3.5	2 1 0	Yes Adjacent No	2	7
Community	Opportunity to provide community give back (public space improvements)	2.9	2 1 0	Yes Adjacent No	0	0
	Impacts to community during construction	2.1	2 1 0	Minimal impacts to the community during construction Moderate impacts (traffic detours and/or noise in residential areas) during construction Signficant impacts (road closures, park closures, significant noise in residential areas) during construction	2	4.2
	Tree Removal/Mitigation	2.3	2 1 0	Minimal tree removal/mitigation (<0.2 acres) is required Moderate tree removal/mitigation (0.2-1 acres) is required Signficant tree removal/mitigation (>1 acres) is required	2	4.6
					JM	56

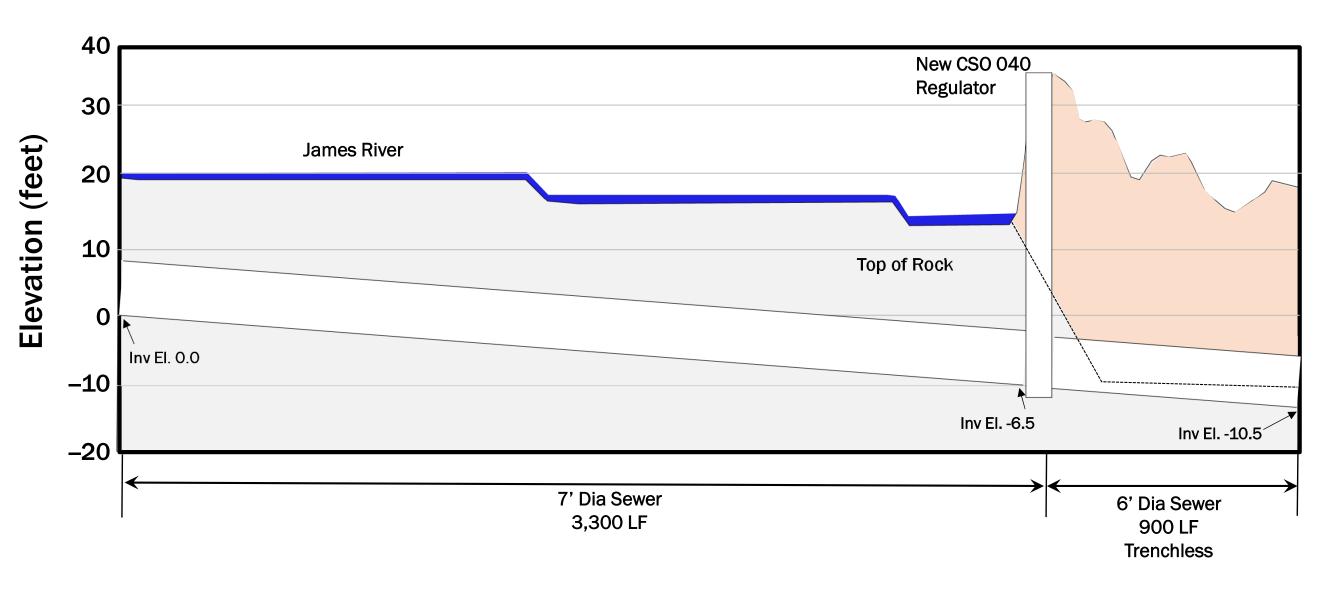
Southside #5CSO 021 Storage Tank (10 MG) and CSO 014/040 Conveyance Sewer



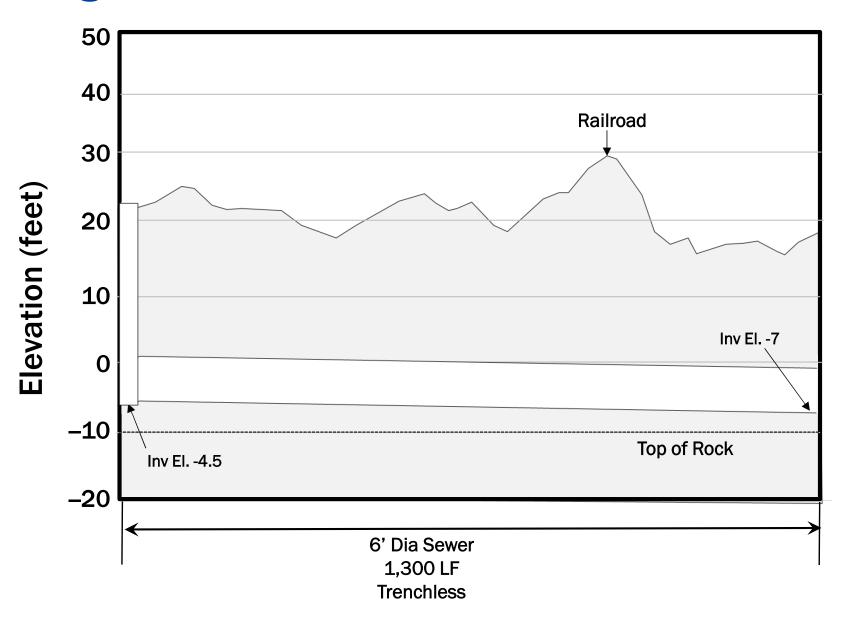
CSO 021 Storage Tank and CSO 014/040 Conveyance Sewer



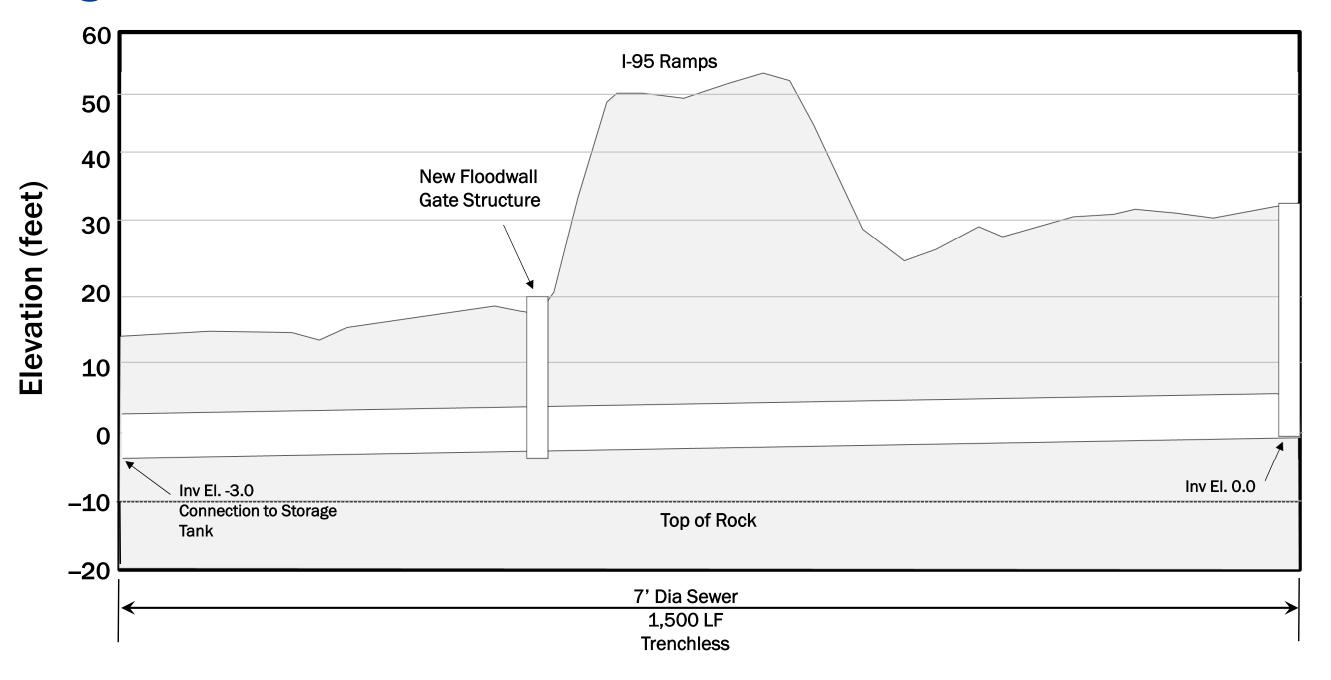
Alignment A - Profile



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

2. New 404 Regulator Structure			Item	Unit	Quantity	Unit Cost	Total Amount
L. Longer LF 300	0.	Stru	ucture Dimensions				
III Depth	â	э.	New 040 Regulator Structure				
Bill Depth			=	LF	30		
b. Nov (14 Regulator Structure LF 30 l. North LF 40 l. Windh LF 40 l. Upstrin LF 40 l. Lorder LF 20 l. Vision LF 20 l. Windh LF 20 l. North LF 20 l. North LF 300 l. North LF 350 l. North LF 350 l. North LF 350 l. North LF 35 l. North LF 35 l. North LF 35 l. North LF 35 l. North LF </td <td></td> <td>_</td> <td></td> <td></td> <td>40</td> <td></td> <td></td>		_			40		
L. Langth L. F			iii. Depth	LF	40		
II. Wich	I	Э.					
But Depth		_					
C. New 023 Shructure		_					
Langth L		_		LF	25		
But Worth F	(_					
But Depth LF 30		_			_		
Description		_					
I. Length		_		LF	30		
II. Windth							
Image: Comparison Imag							
E. Floodwell Structure							
L. Length		_		LF	25		
II. Worth		_					
Incomparison Inco							
Second		_					
B. Site Prep			iii. Depth	LF	25		
B. Site Prep	4 1	٠.					
		_		ACDE	1 4	¢250,000,00	£1,000,000,00
2.	•	1.	эле глер	ACRE	4	\$250,000.00	\$1,000,000.00
2.						General Subtotal	\$1,000,000
Support of Excavation	2	Eyr:	avation for Structures			deneral oubtotal	Ψ1,000,000
Sheeting/Secant Piles		_					
New O40 Regulator Structure	-	۷.					
Excavation Length		+		QF.	10.098	\$45.00	\$454.410
		+	-			Ψ45.00	Ψ -
		+	_				
Excavation Depth in Rock		+					
New O14 Regulator Structure		+	·				
Excavation Length		+		_		\$45.00	\$270.720
Excavation Width		+				Ψ-10.00	Ψ210,120
Excavation Depth		+					
New 021 Regulator Structure		+					
Excavation Length		+	·			\$45.00	\$339,660
Excavation Width		+				Ψ-0.00	Ψ000,000
Excavation Depth		+		_			
Storage Tank		+					
Excavation Length		+				\$45.00	\$2 779 920
Excavation Width		+				Ψ43.00	Ψ2,113,320
Excavation Depth		+	-				
Floodwall Structure		+					
Excavation Length		Ħ		_		\$45.00	\$233,280
Excavation Width	H	+				Ţ.0.50	, 200,200
Excavation Depth	\vdash	+	=				
D. Soi	\vdash	7					
i. Excavate and Dispose of Soil CY 127,161 \$90.00 \$11,444,493 c. Rock CY 1,431 \$300.00 \$429,333 Excavation for Structures Subtotal \$15,951,817 3. Structural a. New CSO 040 Structure Excavation for Structures Subtotal \$15,951,817 b. 30°L x 40°W x 40°D CY 270 \$775.00 \$209,422 c. Base Slab Thickness LF 4 4 4 c. Base Slab Length LF 38 4		o. :					
c. Rock Rock CY 1,431 \$300.00 \$429,333 Excavation for Structures Subtotal \$15,951,817 3. Structural a. New CSO 040 Structure		_		CY	127,161	\$90.00	\$11,444,493
i. Excavate and Dispose of Rock CY 1,431 \$300.00 \$429,333 Excavation for Structures Subtotal \$15,951,817 3. Structural a. New CS0 040 Structure		_				, , , , ,	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
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 Base Slab Thickness LF Base Slab Length LF Base Slab Width LF Concrete Exterior Walls Concrete Exterior Wall Thickness LF Exterior Wall Length Exterior Wall Height Concrete Top Slab Length CY 150 Slab Length LF 40 Concrete Top Slab Length CY CONCRETE Top Slab Le		_		CY	1,431	\$300.00	\$429,333
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 Concrete Exterior Walls Concrete Exterior Wall Length Exterior Wall Length LF 4 Concrete Exterior Wall Length LF 4 Exterior Wall Length LF 4 Concrete Exterior Wall Length LF 4 Concrete Top Slab CY 135 \$1,500.00 \$202,667 CY 135 \$1,500.00 \$202,667 CY 135 \$1,500.00 \$202,667 CY 135 \$1,500.00 \$202,667		T		1			,
a. New CSO 040 Structure I. 30°L x 40°W x 40°D X I. 30°L x 40°W x 40°D X X I. Base Slab Ease Slab CY 270 \$775.00 \$209,422 I. Base Slab Thickness LF 4 4 I. Base Slab Length LF 38 38 I. Base Slab Width LF 48 4 I. Concrete Exterior Walls CY 924 \$1,500.00 \$1,386,667 I. Exterior Wall Length LF 4 4 4 I. Exterior Wall Length LF 156 4			•		Excavation for	Structures Subtotal	\$15,951,817
i. 30'L x 40'W x 40'D Concrete Base Slab CY 270 \$775.00 \$209,422 Base Slab Thickness LF 4							
Concrete Base Slab CY 270 \$775.00 \$209,422 Base Slab Thickness LF 4 4 Base Slab Length LF 38 38 Base Slab Width LF 48	é	а.					
Base Slab Thickness	Щ	_ļ					
Base Slab Length		_				\$775.00	\$209,422
Base Slab Width	Ш	_					
Concrete Exterior Walls CY 924 \$1,500.00 \$1,386,667 Exterior Wall Thickness LF 4 4 Exterior Wall Length LF 156 4 Exterior Wall Height LF 40 4 Concrete Top Slab CY 135 \$1,500.00 \$202,667 Top Slab Thickness LF 2 2 Top Slab Length LF 38 38	igspace	J					
Exterior Wall Thickness		_					
Exterior Wall Length	igsqcut	_				\$1,500.00	\$1,386,667
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		_[
Concrete Top Slab CY 135 \$1,500.00 \$202,667 Top Slab Thickness LF 2 Top Slab Length LF 38	Щ	Ţ					
Top Slab Thickness LF 2 Top Slab Length LF 38	Ш	_		_			
Top Slab Length LF 38						\$1,500.00	\$202,667
			·				
Top Slab Width LF 48				LF	38		
	آليا	$oldsymbol{ol}}}}}}}}}}}}}}}}$	Top Slab Width	LF	48		

b. N	New 014 Structure				
j.	. 30'L x 40'W x 25'D				
	Concrete Base Slab	CY	166	\$775.00	\$128,822
	Base Slab Thickness	LF	3	4110.00	\$120,022
		LF	34		
	Base Slab Length		_		
	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
	·			\$1,500.00	\$100,222
	Top Slab Thickness	LF	2		
	Top Slab Length	LF	34		
	Top Slab Width	LF	44		
c. N	New 021 Structure				
i.	. 20'L x 20'W x 30'D				
	Concrete Base Slab	CY	75	\$775.00	\$58,211
		+		Ψ110.00	Ψ00,211
	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	 	
\perp	Exterior Wall Height	LF	30		
1 🕇	Concrete Top Slab	CY	50	\$1,500.00	\$75,111
	Top Slab Thickness	LF	2		
\neg	Top Slab Length	LF	26		
-++	Top Slab Width	LF	26	+	
	•	Lr	20		
	Storage Tank				
j.	. 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		
				\$4 F00 00	440,000,444
	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. F	Floodwall Structure				
i.	. 15'L x 15'W x 25'D				
	Concrete Base Slab	CY	40	\$775.00	\$31,086
	Base Slab Thickness			Ψ110.00	401,000
		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			+	
$-\mu$	<u> </u>	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	 	
-++	1 0				
$-\!\!+\!\!\!+$	Top Slab Width	LF	31	-	
				1	
_			_	Structural Subtotal	\$27,659,712
4. Civil					
a. P					
u. F		LF	2.200	¢4 600 00	\$5,280,000
I.	Furnish and Install 84" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth, in River)		3,300	\$1,600.00	
ii.		LF	900	\$5,600.00	\$5,040,000
iii	ii. Furnish and Install 96" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth)	LF	50	\$2,000.00	\$100,000
	v. Furnish and Install 72" Fiber Reinforced Sewer Pipe (Sewer B, Trenchless)	LF	1,300	\$5,600.00	\$7,280,000
iν		LF	1,500	\$6,600.00	\$9,900,000
-++	Furnish and Install 84" Fiber Reinforced Sewer Pine (Sewer C. Trenchless)		1,500		
v.			100	\$0F0 00'	\$85,000
v.	ri. Furnish and Install 36" Fiber Reinforced Sewer Pipe (Drain Sewer, 15' Depth)	LF	100	\$850.00	
v.	ri. Furnish and Install 36" Fiber Reinforced Sewer Pipe (Drain Sewer, 15' Depth) Excavation	LF			
v.	ri. Furnish and Install 36" Fiber Reinforced Sewer Pipe (Drain Sewer, 15' Depth) Excavation		100 20,167	\$850.00 \$300.00	\$6,050,000
v. vi b. E	ri. Furnish and Install 36" Fiber Reinforced Sewer Pipe (Drain Sewer, 15' Depth) Excavation	LF			\$6,050,000
v. vi b. E	i. Furnish and Install 36" Fiber Reinforced Sewer Pipe (Drain Sewer, 15' Depth) Excavation Rock Excavation for 84" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth, in River) Excavation Length	LF CY LF	20,167 3,300		\$6,050,000
v. vi b. E	i. Furnish and Install 36" Fiber Reinforced Sewer Pipe (Drain Sewer, 15' Depth) Excavation Rock Excavation for 84" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth, in River) Excavation Length Excavation Width	CY LF LF	20,167 3,300 11		\$6,050,000
v. vi b. E	i. Furnish and Install 36" Fiber Reinforced Sewer Pipe (Drain Sewer, 15' Depth) Excavation Rock Excavation for 84" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth, in River) Excavation Length Excavation Width Excavation Depth in Rock	CY LF LF	20,167 3,300 11 15	\$300.00	
v. vi b. E	ii. Furnish and Install 36" Fiber Reinforced Sewer Pipe (Drain Sewer, 15' Depth) Excavation Rock Excavation for 84" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth, in River) Excavation Length Excavation Width Excavation Depth in Rock Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth)	LF CY LF LF CY CY	20,167 3,300 11 15 333		
v. vi b. E	i. Furnish and Install 36" Fiber Reinforced Sewer Pipe (Drain Sewer, 15' Depth) Excavation Rock Excavation for 84" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth, in River) Excavation Length Excavation Width Excavation Depth in Rock	CY LF LF	20,167 3,300 11 15	\$300.00	
v. vi b. E	ii. Furnish and Install 36" Fiber Reinforced Sewer Pipe (Drain Sewer, 15' Depth) Excavation Rock Excavation for 84" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth, in River) Excavation Length Excavation Width Excavation Depth in Rock Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth)	LF CY LF LF CY CY	20,167 3,300 11 15 333 50	\$300.00	
v. vi b. E	ii. Furnish and Install 36" Fiber Reinforced Sewer Pipe (Drain Sewer, 15' Depth) Excavation Rock Excavation for 84" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth, in River) Excavation Length Excavation Width Excavation Depth in Rock Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth) Excavation Length Excavation Width	LF CY LF LF CY LF LF CY LF	20,167 3,300 11 15 333 50	\$300.00	
v. vi b. E	ii. Furnish and Install 36" Fiber Reinforced Sewer Pipe (Drain Sewer, 15' Depth) Excavation Rock Excavation for 84" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth, in River) Excavation Length Excavation Width Excavation Depth in Rock Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth) Excavation Length Excavation Length Excavation Width Excavation Depth	LF CY LF LF CY LF LF LF LF LF LF LF	20,167 3,300 11 15 333 50 12	\$300.00	\$30,000
v. vi b. E	ii. Furnish and Install 36" Fiber Reinforced Sewer Pipe (Drain Sewer, 15' Depth) Excavation Rock Excavation for 84" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth, in River) Excavation Length Excavation Depth in Rock ii. Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth) Excavation Length Excavation Width Excavation Width Excavation Width Excavation Depth Excavation Depth Excavation Depth Excavation Depth	LF CY LF LF CY LF CY LF CY CY CY CF CY	20,167 3,300 11 15 333 50 12 15 441	\$300.00	\$30,000
v. vi b. E	ii. Furnish and Install 36" Fiber Reinforced Sewer Pipe (Drain Sewer, 15' Depth) Excavation Rock Excavation for 84" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth, in River) Excavation Length Excavation Width Excavation Depth in Rock Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer A, 15' Depth) Excavation Length Excavation Length Excavation Width Excavation Depth	LF CY LF LF CY LF LF LF LF LF LF LF	20,167 3,300 11 15 333 50 12	\$300.00	\$6,050,000 \$30,000 \$39,667

			Excavation Depth	LF	17		
	c.	Tre	enchless 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		
	<u> </u>	1	Excavation Depth	LF	25		
<u></u>	L	\vdash	Excavation Depth in Rock	LF 01/	0	****	
			Rock Excavation	CY	0	\$300.00	\$0
	<u> </u>	1	Receiving Pit Excavation	CY	296	\$90.00	\$26,667
<u> </u>	-	<u> </u>	Excavation Length	LF	20		
<u> </u>		<u> </u>	Excavation Width	LF	20		
			Excavation Depth	LF	20		
<u> </u>	-	<u> </u>	Excavation Depth in Rock	LF	0	****	4 -
<u> </u>	_	C	Rock Excavation	CY	0	\$300.00	\$0
<u> </u>	d.	Su	pport of Excavation				
		i.	Sheeting				
<u> </u>		<u> </u>	96" Fiber Reinforced Sewer Pipe (Sewer A, 20' Depth) Excavation Vertical Area	SF	2,250	\$45.00	\$101,250
			Excavation Length	LF	50		
<u> </u>		<u> </u>	Excavation Depth	LF	15	A45.00	#000 F00
	<u> </u>	⊢	36" Fiber Reinforced Sewer Pipe (Drain Sewer, 15 Depth) Excavation Vertical Area	SF	5,100	\$45.00	\$229,500
			Excavation Length	LF	100		
<u> </u>		<u> </u>	Excavation Depth	LF	17	A45.00	# 040.000
<u> </u>	-	<u> </u>	Jacking Pit Excavation Vertical Area	SF	18,000	\$45.00	\$810,000
<u> </u>		<u> </u>	Intermediate Pit Excavation Vertical Area	SF	13,500	\$45.00	\$607,500
	_	C .	Receiving Pit Excavation Vertical Area	SF	9,000	\$45.00	\$405,000
	e.	COI	fferdam		0.701	40.0	A40 =0
<u> </u>	<u> </u>	I.	Cofferdam for 84" Fiber Reinforced Sewer Pipe (Sewer A, 20' Depth, in River)	LF	3,500	\$3,000.00	\$10,500,000
<u> </u>	L	<u> </u>		L		0::0:0:1:::	¢47.044.0E0
5	N4-	ob-	popinal			Civil Subtotal	\$47,211,250
5.	_	_	anical ping Troughs				
	a.	i	Furnish and Install Tipping Troughs	EA	16	\$75,000.00	\$1,200,000
	h	I.	ain Gates	EA	10	φ15,000.00	φ1,∠00,000
	υ.	אוט	am dates				

	_	· F · · · · · · · · · · · · · · · · · ·		4	407 500 00	407.500	
	_	i. Furnish and Install Drain Gates	EA	1	\$37,500.00	\$37,500	
(Э.	Pumps					
		i. Dewatering Pumps	MGD	10	\$75,000.00	\$750,000	
Mechanical Subtot:							
6. I	Ele	ctrical and I&C					
â	а.	Miscellaneous Electrical and I&C					
		i. Furnish and Install Electrical and I&C (Other)	LS	1	\$796,000.00	\$796,000	
				Electric	al and I&C Subtotal	\$796,000	
7.	Cor	struction Total					
ā	э.	Subtotal A				\$94,608,779	
	Э.	Design Contingency	LS	1	40%	\$37,843,511	
(Э.	Subtotal B	LS	1		\$132,452,290	
(j.	General Conditions	LS	1	50%	\$66,226,145	
	€.	Subtotal C	LS	1		\$198,678,435	
1		Bonds and Insurance	LS	1	3%	\$5,960,353	
				To	otal Estimated Cost	\$204,638,788	

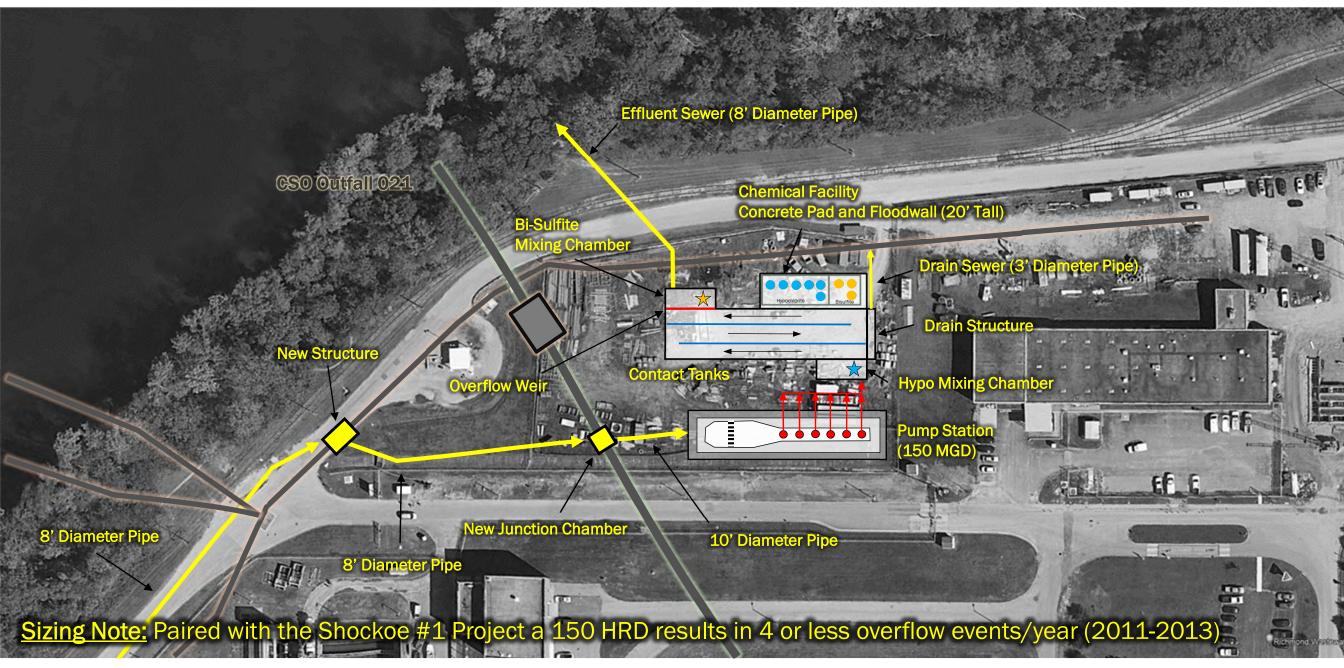
8.	Capital Total					
	a. Construction Cost Total				\$204,638,788	
	b. Capital Contingency	LS	1	50%	\$102,319,394	
	Total Estimated Capital Cost					

9. Aı	าทนส	al Operations and Maintainence Costs				
a.	La	abor				
	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
	٧.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	\$50.00	\$9,600
b.	M	aintenance of Structures				
	i.	Maintain Structures	LS	0.2%	\$27,659,712.04	\$55,319
c.	M	aintenance of Pipe				
	i.	Maintain Pipe	LS	1.0%	\$27,685,000.00	\$276,850
d.	M	aintenance 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.	M	aintenance of Instrumentation and Control				
	i.	Maintain I&C	LS	3%	\$796,000.00	\$23,880
		Annua	Operations	and Maintaine	ence Costs Subtotal	\$493,374

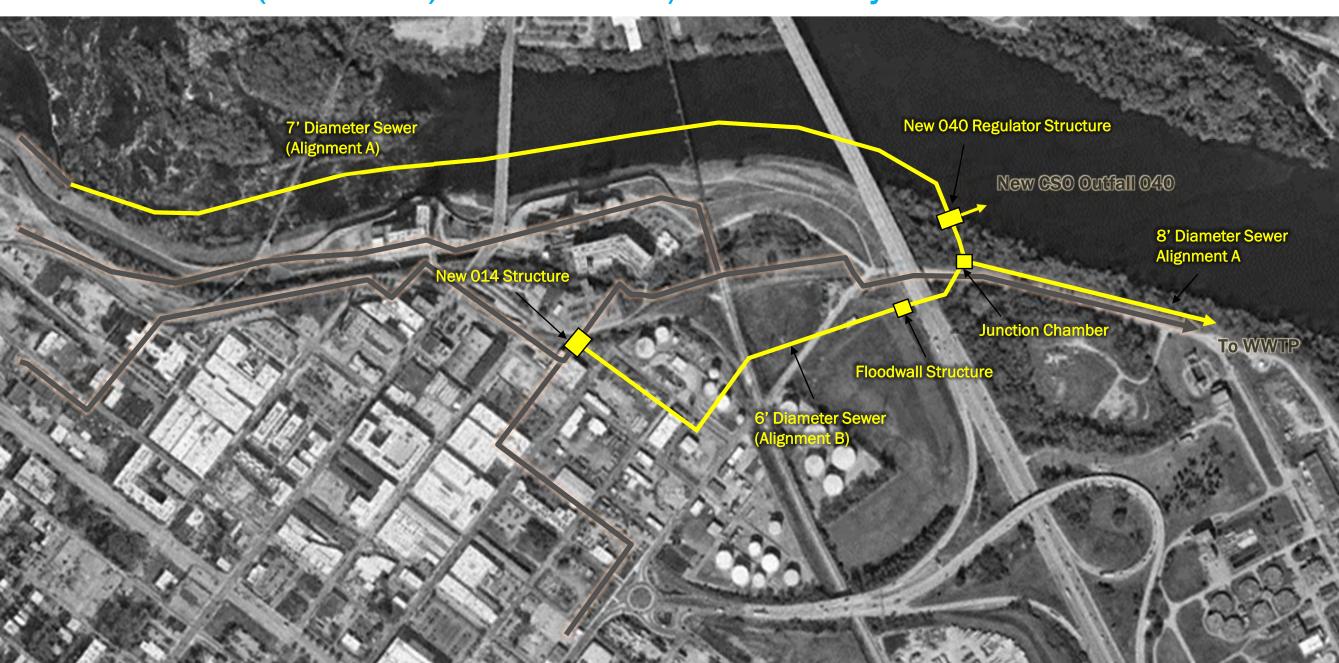
10. 15-Year Replacement Costs						
	a.	Electrical and Instrumentation and Control				
		i. Furnish and Install Replacement Electrical and I&C	LS	100%	\$796,000.00	\$796,000
	b.	Meters				
		i. Furnish and Install Replacement Meters	EA	5	\$7,500.00	\$37,500
15-Year Replacement Costs Subtotal					\$833,500	

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

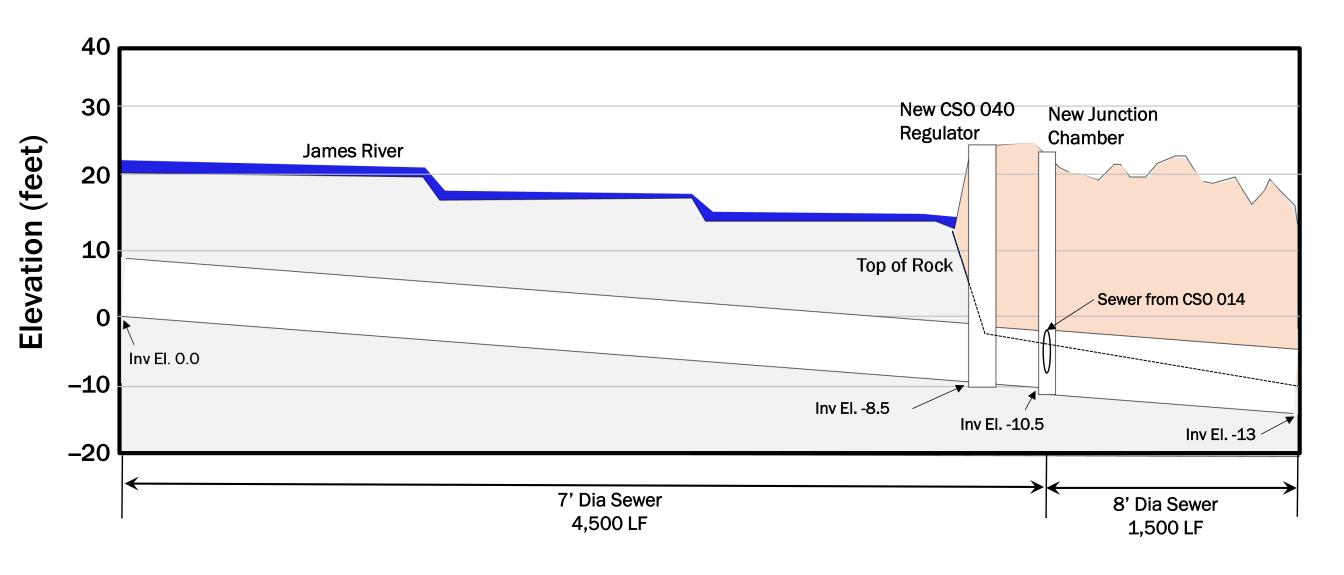
Southside #6CSO 014/040 Conveyance Sewer and High-Rate Disinfection at WWTP



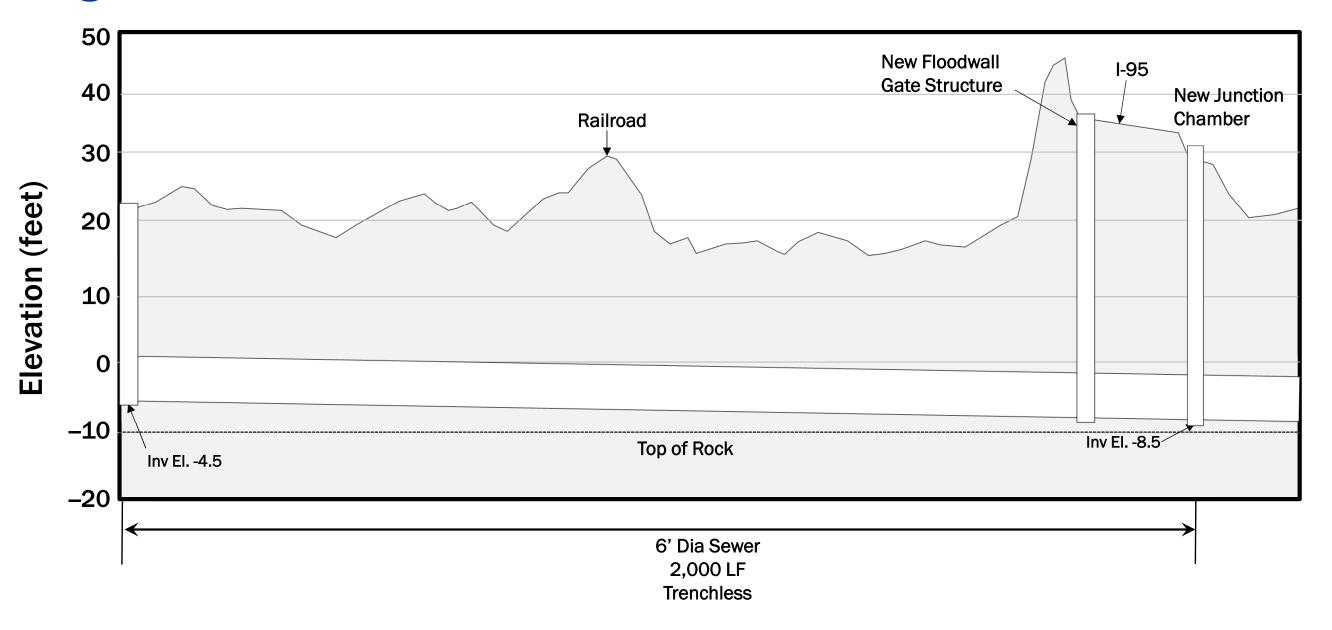
Southside #6 CSO 021 HRD (150 MGD) and CSO 014/040 Conveyance Sewer



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. St	ructi	ure Dimensions				
a.	Str	ucture #1				
	i.	Length	LF	20		
	ii.	Width	LF	30		
	_	Depth	LF	30		
b.		ucture #2	_			
~.	i.	Length	LF	20		
	ii.	Width	LF	30		
		Depth	LF			
			LF	30		
c.		po Mixing Chamber				
	i.	Length	LF	20		
		Width	LF	50		
		Depth	LF	20		
d.	roO	ntact Tanks (uncovered)				
	i.	Length	LF	200		
	ii.	Width	LF	50		
	iii.	Depth	LF	20		
e.	Bi-9	Sulfite Mixing Chamber				
	i.	Length	LF	20		
-	ii.	Width	LF	50		
		Depth				
			LF	20		
f.	_	emical Facility Pad				
	i.	Length	LF	30	ļ	
	ii.	Width	LF	100		
		Depth	LF	3		
g.	Ne	w 040 Regulator Structure				
	i.	Length	LF	30		
	ii.	Width	LF	40		
		Depth	LF	35		
h	_	w 014 Regulator Structure		33		
h.	i.		LF	30		
		Length				
	ii.	Width	LF	40		
	iii.	Depth	LF	25		
i.	Jun	nction Chamber				
	i.	Length	LF	15		
	ii.	Width	LF	15		
	iii.	Depth	LF	30		
i.	Flo	odwall Structure				
Ť	i.	Length	LF	10		
-	ii.	Width	LF	15		
-	_	Depth	LF	45		
	iii.	рер ит	LF	45		
	enera			ı		
a.	Site	e Prep	ACRE	3	\$250,000.00	\$750,000.00
					General Subtotal	\$750,000
2. Ex	cava	ation for Structures				
a.	Su	pport of Excavation				
- 1	i.	Sheeting				
+	i.	Sheeting	SF	8,436	\$45.00	\$379.620
	i.	Sheeting Structure #1	SF	8,436 32	\$45.00	\$379,620
	i.	Structure #1 Excavation Length	LF	32	\$45.00	\$379,620
	i.	Sheeting Structure #1 Excavation Length Excavation Width	LF LF	32 42	\$45.00	\$379,620
	i.	Sheeting Structure #1 Excavation Length Excavation Width Excavation Depth	LF LF LF	32 42 38	\$45.00	\$379,620
	i.	Sheeting Structure #1 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock	LF LF LF	32 42 38 8		
	i.	Sheeting Structure #1 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Structure #2	LF LF LF LF SF	32 42 38 8 8,436	\$45.00 \$45.00	
	i.	Sheeting Structure #1 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length	LF LF LF SF	32 42 38 8		
	i.	Sheeting Structure #1 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Structure #2	LF LF LF LF SF	32 42 38 8 8,436		
	i.	Sheeting Structure #1 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length	LF LF LF SF	32 42 38 8 8,436 32		
	i.	Sheeting Structure #1 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width	LF LF LF SF LF	32 42 38 8 8,436 32 42		
	i.	Sheeting Structure #1 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Depth	LF LF SF LF LF LF LF LF	32 42 38 8 8,436 32 42 38 8	\$45.00	\$379,620
		Sheeting Structure #1 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock HRD and Chemical Facility	LF LF SF LF LF LF SF SF SF	32 42 38 8 8,436 32 42 38 8 26,880		\$379,620
		Sheeting Structure #1 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter	LF LF SF LF LF LF SF LF LF LF LF LF LF LF	32 42 38 8 8,436 32 42 38 8 26,880 640	\$45.00	\$379,620
		Sheeting Structure #1 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Area	LF LF SF LF	32 42 38 8 8,436 32 42 38 8 26,880 640 15,000	\$45.00	\$379,620
		Sheeting Structure #1 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Area Excavation Depth	LF LF SF LF	32 42 38 8 8,436 32 42 38 8 26,880 640 15,000 28	\$45.00	\$379,620
		Sheeting Structure #1 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Perimeter Excavation Perimeter Excavation Depth in Rock	LF L	32 42 38 8 8,436 32 42 38 8 26,880 640 15,000 28	\$45.00 \$45.00	\$379,620 \$1,209,600
		Sheeting Structure #1 Excavation Length Excavation Depth Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Length Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Area Excavation Depth in Rock New 040 Regulator Structure	LF SF LF	32 42 38 8 8,436 32 42 38 8 26,880 640 15,000 28 0	\$45.00	\$379,620 \$1,209,600
		Sheeting Structure #1 Excavation Length Excavation Width Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Length Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Perimeter Excavation Perimeter Excavation Depth in Rock	LF L	32 42 38 8 8,436 32 42 38 8 26,880 640 15,000 28	\$45.00 \$45.00	\$379,620 \$1,209,600
		Sheeting Structure #1 Excavation Length Excavation Depth Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Length Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Area Excavation Depth in Rock New 040 Regulator Structure	LF SF LF	32 42 38 8 8,436 32 42 38 8 26,880 640 15,000 28 0	\$45.00 \$45.00	\$379,620 \$1,209,600
		Sheeting Structure #1 Excavation Length Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Length Excavation Depth in Rock Structure #2 Excavation Length Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Pepth Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock New 040 Regulator Structure Excavation Length	LF L	32 42 38 8 8,436 32 42 38 8 26,880 640 15,000 28 0	\$45.00 \$45.00	\$379,620 \$1,209,600
		Sheeting Structure #1 Excavation Length Excavation Depth Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Length Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Depth in Rock New O40 Regulator Structure Excavation Depth in Rock New O40 Regulator Structure Excavation Length Excavation Width Excavation Depth	LF LF SF LF	32 42 38 8 8,436 32 42 38 8 26,880 640 15,000 28 0 13,158 46 56 43	\$45.00 \$45.00	\$379,620 \$1,209,600
		Sheeting Structure #1 Excavation Length Excavation Width Excavation Depth in Rock Structure #2 Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Depth Excavation Depth in Rock New 040 Regulator Structure Excavation Length Excavation Depth in Rock New 040 Regulator Structure Excavation Length Excavation Depth Excavation Depth in Rock	LF	32 42 38 8 8,436 32 42 38 8 26,880 640 15,000 28 0 13,158 46 56 43 15	\$45.00 \$45.00 \$45.00	\$379,620 \$379,620 \$1,209,600 \$592,110
		Sheeting Structure #1 Excavation Length Excavation Depth Excavation Depth Excavation Depth in Rock Structure #2 Excavation Length Excavation Length Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Depth Excavation Depth in Rock HRD and Chemical Facility Excavation Perimeter Excavation Depth in Rock New O40 Regulator Structure Excavation Depth in Rock New O40 Regulator Structure Excavation Length Excavation Width Excavation Depth	LF LF SF LF	32 42 38 8 8,436 32 42 38 8 26,880 640 15,000 28 0 13,158 46 56 43	\$45.00 \$45.00	\$379,620 \$1,209,600

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			Excavation Width	LF	52		
LΤ	_ [LĪ	Excavation Depth	LF	32		
			Junction Chamber	SF	6,612	\$45.00	\$297,540
			Excavation Length	LF	29		
H			Excavation Width	LF	29		
\vdash	_		Excavation Depth	LF			
⊢ ∔			· · · · · · · · · · · · · · · · · · ·		38	445.00	****
			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		
-		Soil	Executation Department		25		
	υ.	-	F		0.010	400.00	*******
		i.	Excavate and Dispose of Soil	CY	25,646	\$90.00	\$2,308,113
	c.	Roc	k .				
		i.	Excavate and Dispose of Rock	CY	2,734	\$300.00	\$820,067
				•	Excavation for	Structures Subtotal	\$6,743,345
3.	Stri	uctu	ıral				
			ucture #1				
		i	20'L x 30'W x 30'D				
			Concrete Base Slab	CY	121	\$775.00	\$93,689
-						Ψ113.00	Ψ33,003
L			Base Slab Thickness	LF	4		
ш		Ш	Base Slab Length	LF	24		
Ш			Base Slab Width	LF	34		
ΙŢ	٦		Concrete Exterior Walls	CY	240	\$1,500.00	\$360,000
ΙŢ			Exterior Wall Thickness	LF	2		
\vdash	-	Н	Exterior Wall Length	LF	108		
$\vdash \vdash$	-	Н	-			+	
${oxdot}$	_	Ш	Exterior Wall Height	LF	30		
Ш			Concrete Top Slab	CY	60	\$1,500.00	\$90,667
ĹĹ∫		LÌ	Top Slab Thickness	LF	2	<u> </u>	
			Top Slab Length	LF	24		
			Top Slab Width	LF	34		
-	h	Stru	ucture #2		0.		
- 1	v.	i	20'L x 30'W x 30'D				
\vdash		<u>. </u>	Concrete Base Slab	CY	121	\$77F.00	¢02.000
-						\$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	. ,	, ,
\vdash			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		
- 1 .	^	ПВГ	D and Chemical Facility	L	34		
	С.	:	200'L x 50'W x 20'D				
-		1.				4=== 00	4. ====
			Concrete Base Slab	CY	2,222	\$775.00	\$1,722,222
			Base Slab Thickness	LF	4		
ΙŢ	Ī		Base Slab Area	SF	15,000		·
	П		Concrete Walls	CY	3,010	\$1,500.00	\$4,515,556
H	7		Exterior Wall Thickness	LF	2		
\vdash	-	Н	Exterior Wall Length	LF	1,270		
\mapsto	_	Н	Exterior Wall Height				
${oxdot}$	_	Ш		LF	32	 	
			Concrete Top Slab	CY	0	\$1,500.00	\$0
Lſ	_ [LÌ	Top Slab Thickness	LF	0	<u> </u>	
	П		Base Slab Area	SF	15,000		_
	d.	Nev	v CSO 040 Structure				
		i.	30'L x 40'W x 35'D				
H	7		Concrete Base Slab	CY	270	\$775.00	\$209,422
\vdash	-	H	Base Slab Thickness	LF	4	7	,,,
$\vdash \vdash$	-	Н					
$\vdash \downarrow$	_	Щ	Base Slab Length	LF	38		
Ш			Base Slab Width	LF	48		
L J		L	Concrete Exterior Walls	CY	809	\$1,500.00	\$1,213,333
П	П		Exterior Wall Thickness	LF	4		
			Exterior Wall Length	LF	156		
H	7	Н	Exterior Wall Height	LF	35		
$\vdash \vdash$	-	H	Concrete Top Slab	CY	135	£1 E00 00	¢000 007
$\vdash \downarrow$	_	Ш				\$1,500.00	\$202,667
ш		Ш	Top Slab Thickness	LF	2		
L I		L	Top Slab Length	LF	38	<u> </u>	
			Top Slab Width	LF	48		
_ l	e.	Nev	v 014 Structure				
		i.	30'L x 40'W x 25'D				
\vdash	-	Н	Concrete Base Slab	CY	166	\$775.00	\$128,822
$\vdash \vdash$	-	Н	Base Slab Thickness			Ψ173.00	¥120,022
$\vdash \downarrow$	_	Ш		LF	3		
Ш			Base Slab Length	LF	34		
ĹĹ∫		LÌ	Base Slab Width	LF	44	<u> </u>	
			Concrete Exterior Walls	CY	274	\$1,500.00	\$411,111

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			Exterior Wall Thickness	LF	2		
	L	$oldsymbol{ol}}}}}}}}}}}}}}}}}}$	Exterior Wall Length	LF	148		
			Exterior Wall Height	LF	25		
			Concrete Top Slab	CY	111	\$1,500.00	\$166,222
	1		Top Slab Thickness	LF	2		
	+		Top Slab Length	LF	34		
	-						
	_	ļ	Top Slab Width	LF	44		
	t.	Jun	ction 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		
	1		Base Slab Width	LF	21		
	+	-	Concrete Exterior Walls			\$4.500.00	4000 000
				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		
	1		Top Slab Length	LF	21		
	-	-					
		_	Top Slab Width	LF	21		
	g.	Floc	dwall Structure				
		i.	10'L x 15'W x 45'D				
			Concrete Base Slab	CY	39	\$775.00	\$30,541
			Base Slab Thickness	LF	4		
	t		Base Slab Length	LF	14		
	-		3				
<u> </u>	1	<u> </u>	Base Slab Width	LF	19		46
	<u> </u>		Concrete Exterior Walls	CY	193	\$1,500.00	\$290,000
L	L	┗ ¯	Exterior Wall Thickness	LF	2		
	Γ		Exterior Wall Length	LF	58		
			Exterior Wall Height	LF	45		
	1		Concrete Top Slab	CY	20	\$1,500.00	\$29,556
	-					\$1,500.00	\$29,000
			Top Slab Thickness	LF	2		
			Top Slab Length	LF	14		
			Top Slab Width	LF	19		
						Structural Subtotal	\$10,467,796
4	Civ	ril					
···	_						
	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
-	1	٧.	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.	Exc	avation				
	1	i	Excavation for 84" Fiber Reinforced Sewer Pipe (Sewer A, 20' Depth, in River)	CY	0	\$90.00	\$0
	1	Ë	Excavation Length	LF		Ψ30.00	Ψ0
	-	-	<u> </u>		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
	1	ii.	Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer A, 20' Depth)	CY	378	\$90.00	\$34,000
\vdash	+		Excavation Length			\$30.00	454,000
<u> </u>	1	┞		LF	50		
	<u> </u>		Excavation Width	LF	12		
L	L	L	Excavation Depth	LF	17		
	Г		Excavation Depth in Rock				
			Excavation Depth in Nock	LF	0		
			Rock Excavation		0	\$300.00	\$0
\vdash			Rock Excavation	CY	0	\$300.00	
		iii.	Rock Excavation Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth)	CY CY	0 3,000	\$300.00 \$90.00	\$0 \$270,000
		iii.	Rock Excavation Excavation for 96° Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length	CY CY LF	0 3,000 250		
		iii.	Rock Excavation Excavation for 96° Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length Excavation Width	CY CY	0 3,000		
		iii.	Rock Excavation Excavation for 96° Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length	CY CY LF	0 3,000 250		
		iii.	Rock Excavation Excavation for 96° Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length Excavation Width Excavation Depth	CY CY LF LF	0 3,000 250 12	\$90.00	\$270,000
			Rock Excavation Excavation for 96° Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 120° Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth)	CY CY LF LF CY	0 3,000 250 12 27 778		
			Rock Excavation Excavation for 96° Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 120° Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth) Excavation Length	CY CY LF LF CY LF	0 3,000 250 12 27 778 50	\$90.00	\$270,000
			Rock Excavation Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 120" Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth) Excavation Length Excavation Width	CY CY LF LF CY LF LF CY LF	0 3,000 250 12 27 778 50	\$90.00	\$270,000
			Rock Excavation Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length Excavation Width Excavation Depth Excavation or 120" Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth) Excavation Length Excavation Width Excavation Depth	CY CY LF LF CY LF LF CY LF LF LF	0 3,000 250 12 27 778 50 14 37	\$90.00	\$270,000
			Rock Excavation Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 120" Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth) Excavation Length Excavation Width	CY CY LF LF CY LF LF CY LF	0 3,000 250 12 27 778 50	\$90.00	\$270,000
			Rock Excavation Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length Excavation Width Excavation Depth Excavation or 120" Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth) Excavation Length Excavation Width Excavation Depth	CY CY LF LF CY LF LF CY LF LF LF	0 3,000 250 12 27 778 50 14 37	\$90.00	\$270,000
		iv.	Rock Excavation Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length Excavation Width Excavation Depth Excavation T120" Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth) Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation	CY CY LF LF LF LF CY LF LF CY LF CY CY CF CF CY	0 3,000 250 12 27 778 50 14 37 7	\$90.00 \$90.00 \$300.00	\$270,000 \$70,000 \$54,444
			Rock Excavation Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length Excavation Width Excavation Depth Excavation T20" Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth) Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation Fiber Reinforced Sewer Pipe (Sewer C, 20' Depth)	CY	0 3,000 250 12 27 778 50 14 37 7 181 2,444	\$90.00	\$270,000 \$70,000
		iv.	Rock Excavation Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length Excavation Width Excavation Depth Excavation T 120" Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth) Excavation Length Excavation Width Excavation Width Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation F 16" Fiber Reinforced Sewer Pipe (Sewer C, 20' Depth) Excavation Length	CY	0 3,000 250 12 27 778 50 14 37 7 181 2,444 250	\$90.00 \$90.00 \$300.00	\$270,000 \$70,000 \$54,444
		iv.	Rock Excavation Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 120" Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth) Excavation Length Excavation Undth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer C, 20' Depth) Excavation Length Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer C, 20' Depth) Excavation Length Excavation Length Excavation Width	CY	0 3,000 250 12 27 778 50 14 37 7 181 2,444 250	\$90.00 \$90.00 \$300.00	\$270,000 \$70,000 \$54,444
		iv.	Rock Excavation Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length Excavation Width Excavation Depth Excavation T 120" Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth) Excavation Length Excavation Width Excavation Width Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation F 16" Fiber Reinforced Sewer Pipe (Sewer C, 20' Depth) Excavation Length	CY	0 3,000 250 12 27 778 50 14 37 7 181 2,444 250	\$90.00 \$90.00 \$300.00	\$270,000 \$70,000 \$54,444
		iv.	Rock Excavation Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 120" Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth) Excavation Length Excavation Undth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer C, 20' Depth) Excavation Length Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer C, 20' Depth) Excavation Length Excavation Length Excavation Width	CY	0 3,000 250 12 27 778 50 14 37 7 181 2,444 250	\$90.00 \$90.00 \$300.00	\$270,000 \$70,000 \$54,444
		iv.	Rock Excavation Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length Excavation Width Excavation Depth Excavation for 120" Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth) Excavation Length Excavation Under the Excavation Depth Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation for 96" Fiber Reinforced Sewer Pipe (Sewer C, 20' Depth) Excavation Length Excavation Length Excavation Length Excavation Width Excavation Depth	CY	0 3,000 250 12 27 778 50 14 37 7 181 2,444 250 12	\$90.00 \$90.00 \$300.00 \$90.00	\$270,000 \$70,000 \$54,444 \$220,000
		iv.	Rock Excavation Excavation for 96° Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length Excavation Width Excavation Depth Excavation Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth) Excavation Length Excavation Width Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation Fiber Reinforced Sewer Pipe (Sewer C, 20' Depth) Excavation for 96° Fiber Reinforced Sewer Pipe (Sewer C, 20' Depth) Excavation Width Excavation Width Excavation Depth Excavation Fiber Reinforced Sewer Pipe (Sewer C, 20' Depth) Excavation Fiber Reinforced Sewer Pipe (Sewer C, 20' Depth)	CY CY LF LF LF CY LF LF LF LF LF CY CY LF LF CY CY CY LF LF LF CY CY LF	0 3,000 250 12 27 778 50 14 37 7 181 2,444 250 12 22 156 50	\$90.00 \$90.00 \$300.00 \$90.00	\$270,000 \$70,000 \$54,444 \$220,000
		iv.	Rock Excavation Excavation for 96° Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length Excavation Depth Excavation Depth Excavation Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth) Excavation Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth) Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation Fiber Reinforced Sewer Pipe (Sewer C, 20' Depth) Excavation Length Excavation Undth Excavation Depth Excavation Depth Excavation For 36° Fiber Reinforced Sewer Pipe (Sewer C, 20' Depth) Excavation For S6° Fiber Reinforced Sewer Pipe (Sewer C, 10 Depth) Excavation For 36° Fiber Reinforced Sewer Pipe (Sewer C, 10 Depth) Excavation For S6° Fiber Reinforced Sewer Pipe (Sewer C, 10 Depth) Excavation Length Excavation Width	CY CY LF LF LF CY LF LF CY LF LF CY CY LF LF CY CY LF	0 3,000 250 12 27 778 50 14 37 7 181 2,444 250 12 22 156 50 7	\$90.00 \$90.00 \$300.00 \$90.00	\$270,000 \$70,000 \$54,444 \$220,000
		iv.	Rock Excavation Excavation for 96° Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length Excavation Depth Excavation Depth Excavation Piper Reinforced Sewer Pipe (Sewer C, 35' Depth) Excavation Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth) Excavation Depth Excavation Depth in Rock Rock Excavation Excavation Depth in Rock Rock Excavation Excavation Length Excavation Length Excavation Length Excavation Length Excavation Of 36° Fiber Reinforced Sewer Pipe (Sewer C, 20' Depth) Excavation Fiber Reinforced Sewer Pipe (Sewer C, 10 Depth) Excavation Length Excavation Length Excavation Length Excavation Length Excavation Depth	CY CY LF LF LF CY LF LF LF LF LF CY CY LF LF CY CY CY LF LF LF CY CY LF	0 3,000 250 12 27 778 50 14 37 7 181 2,444 250 12 22 156 50	\$90.00 \$90.00 \$300.00 \$90.00	\$270,000 \$70,000 \$54,444 \$220,000
	c.	iv. v.	Rock Excavation Excavation for 96° Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length Excavation Width Excavation Depth Excavation Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth) Excavation Length Excavation Depth Excavation Depth Excavation Depth in Rock Rock Excavation Excavation For 96° Fiber Reinforced Sewer Pipe (Sewer C, 20' Depth) Excavation Length Excavation Length Excavation Length Excavation Depth	CY CY LF LF LF CY LF LF CY LF LF CY CY LF LF CY CY LF	0 3,000 250 12 27 778 50 14 37 7 181 2,444 250 12 22 156 50 7	\$90.00 \$90.00 \$300.00 \$90.00	\$270,000 \$70,000 \$54,444 \$220,000
	C.	iv. v.	Rock Excavation Excavation for 96° Fiber Reinforced Sewer Pipe (Sewer C, 25' Depth) Excavation Length Excavation Depth Excavation Depth Excavation Piper Reinforced Sewer Pipe (Sewer C, 35' Depth) Excavation Fiber Reinforced Sewer Pipe (Sewer C, 35' Depth) Excavation Depth Excavation Depth in Rock Rock Excavation Excavation Depth in Rock Rock Excavation Excavation Length Excavation Length Excavation Length Excavation Length Excavation Of 36° Fiber Reinforced Sewer Pipe (Sewer C, 20' Depth) Excavation Fiber Reinforced Sewer Pipe (Sewer C, 10 Depth) Excavation Length Excavation Length Excavation Length Excavation Length Excavation Depth	CY CY LF LF LF CY LF LF CY LF LF CY CY LF LF CY CY LF	0 3,000 250 12 27 778 50 14 37 7 181 2,444 250 12 22 156 50 7	\$90.00 \$90.00 \$300.00 \$90.00	\$270,000 \$70,000 \$54,444 \$220,000

Total Estimated Capital Cost						
	b.	Capital Contingency	LS	1	50%	\$135,976,998
	a.	Construction Cost Total				\$271,953,995
8.	Cap	oital Total				

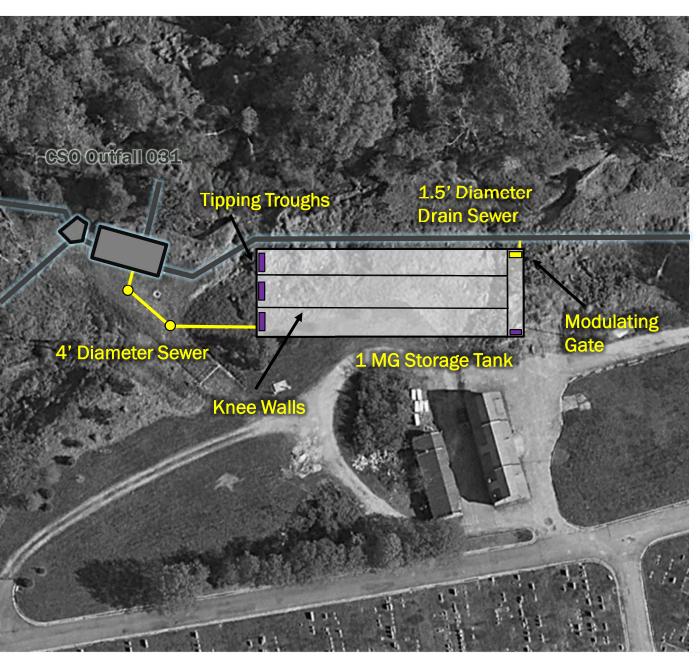
		l Operations and Maintainence Costs				
a.	Lat	oor				
	i.	Daily Check (365 Days, 1 Hr/Ea)	HR	365	\$28.15	\$10,275
	ii.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	\$28.15	\$5,855
	iii.	Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	\$28.15	\$2,702
	iv.	Pipe Cleaning (Once every 5 years)	LF	8,650	\$30.00	\$51,900
	٧.	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.	Ма	intenance of Structures				
	i.	Maintain Structures	LS	0.2%	\$10,467,796.30	\$20,936
c.	Ма	intenance of Pipe				
	i.	Maintain Pipe	LS	1%	\$31,367,500.00	\$313,675
d.	Ма	intenance 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.	Ма	intenance of Instrumentation and Control				
	i.	Maintain I&C	LS	3%	\$180,000.00	\$5,400
f.	Ор	eration 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.	Ope	eration 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 Maintaine	ence Costs Subtotal	\$2,180,916

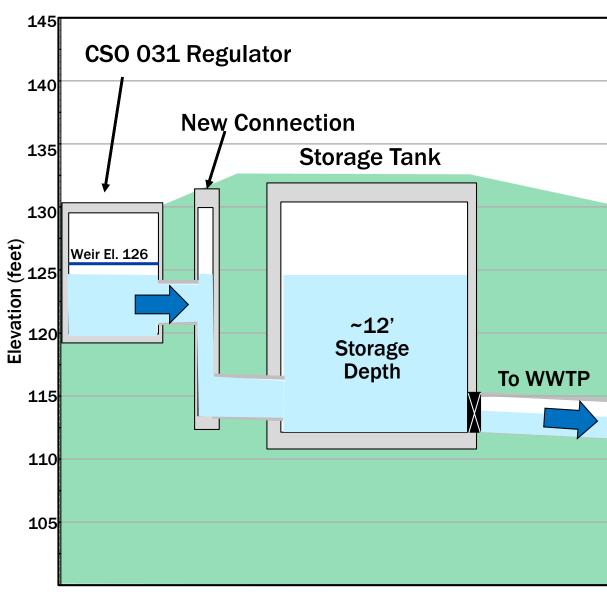
10. 15-Year Replacement Costs							
	a.	Electrical and Instrumentation and Control					
		i. Furnish and Install Replacement Electrical and I&C	LS	100%	\$9,630,000.00	\$9,630,000	
	b.	Meters					
		j. Furnish and Install Replacement Meters	EA	8	\$7,500.00	\$60,000	
15-Year Replacement Costs Subtotal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

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

Gillies Creek #1 (Recommended Project)

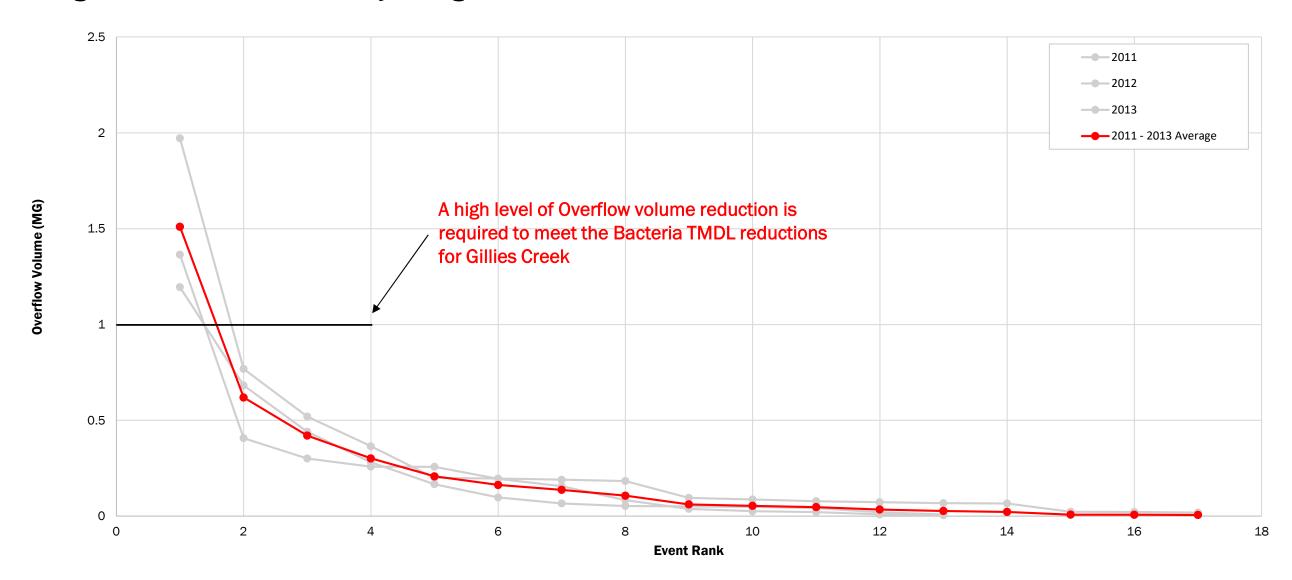
CSO 031 Storage Tank (1 MG)





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

lles Creek #1: Oakwood Cemetery CSS Equilization Storage Tank Conceptual Design

			Item	Unit	Quantity	Unit Cost	Total Amount
0.	Str	uctı	ure Dimensions	•			
	a.	Oal	kwood Cemetery Tank				
		i.	Length	LF	240		
		ii.	Width	LF	55		
		iii.	Depth	LF	25		
1.		nera		•	_		
	a.	Site	e Prep	ACRE	1	\$250,000.00	\$250,000.00
						General Subtotal	\$250,000
2.		_	ation for Structures	1		1	
	a.	_	pport of Excavation				
		i.	Sheeting	0.5	00.004	* 45.00	* 4 0 7 0 0 0 0
			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.	Soi					
		i.	Excavate and Dispose of Soil	CY	20,011	\$90.00	\$1,800,960
					voovation for S	tructures Subtotal	\$3,179,040
3.	Str	ucti	ural		Acavation for 5	tructures Subtotal	Ψ5,179,040
<u> </u>			kwood Cemetery Storage Tank'				
	_		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	\$1,000.00	Ψ1,000,000
			Top Slab Length	LF	244		
			Top Slab Width	LF	59		
			Top olds Middle		- 00		
					S	tructural Subtotal	\$3,835,878
4.	Civ	il					. , ,
	a.	Pip	e				
		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.	Exc	cavation				
		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.	Sur	pport of Excavation				
		_	Sheeting				
			48" Fiber Reinforced Sewer Pipe Excavation Vertical Area	SF	6,600	\$45.00	\$297,000
	\vdash		Excavation Length	LF	100	\$ 10.00	+_01,000
	1		Excavation Depth	LF	22		
			•	SF	1,020	\$45.00	\$45,90
			1 18" Fiber Reinforced Sewer Pibe Excavation Vertical Area				
			18" Fiber Reinforced Sewer Pipe Excavation Vertical Area Excavation Length	_		,	, , , , , , ,
			Excavation Length Excavation Depth	LF LF	20		¥ 10,000

						Civil Subtotal	\$514,800
5.	Me	echa	anical				
	f.	Tip	pping Troughs				
		i.	Furnish and Install Tipping Troughs	EA	4	\$75,000.00	\$300,000
	g.	Dra	ain Gates				
		i.	Furnish and Install Drain Gates	EA	2	\$37,500.00	\$75,000
Mechanical Subtotal							
6.	Ele	ctri	ical 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.			ruction Total				
	a.	Su	btotal A				\$8,311,718
	b.		sign Contingency	LS	1	40%	\$3,324,687
	_		btotal B	LS	1		\$11,636,405
	_	_	neral Conditions	LS	1	50%	\$5,818,202
	e. Subtotal C		LS	1		\$17,454,607	
	f.	Во	nds and Insurance	LS	1	3%	\$523,638
					Total	al Estimated Cost	\$47.079.046
					100	ai Estimated Cost	\$17,978,246

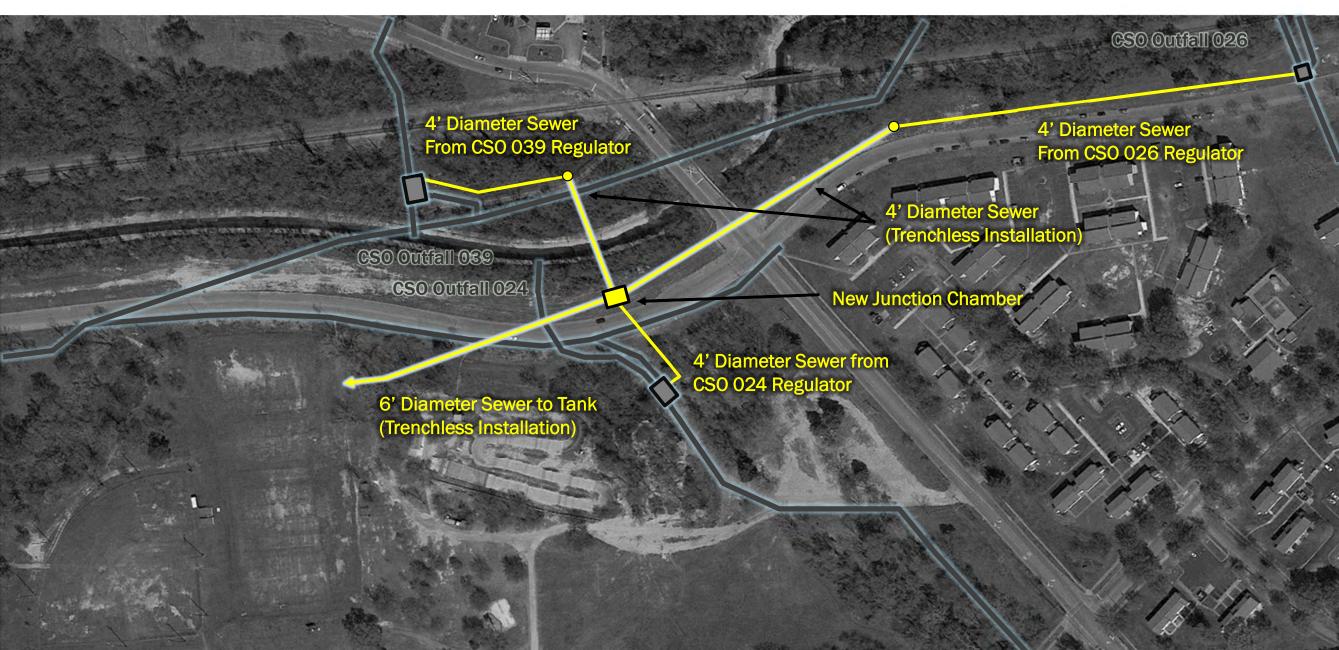
8.	8. Capital Total									
	a.	Construction Cost Total				\$17,978,246				
	b.	Capital Contingency	LS	1	50%	\$8,989,123				
	Total Estimated Capital Cost									

9.	Anı	nua	Operations and Maintainence Costs				
	a.	Lat	oor				
		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.	Ма	intenance 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.	Ма	intenance 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.	Ма	intenance of Instrumentation and Control				
		i.	Maintain I&C	LS	3%	\$152,000.00	\$4,560
			Appuel	Operations of	d Maintainan	ce Costs Subtotal	\$49.352

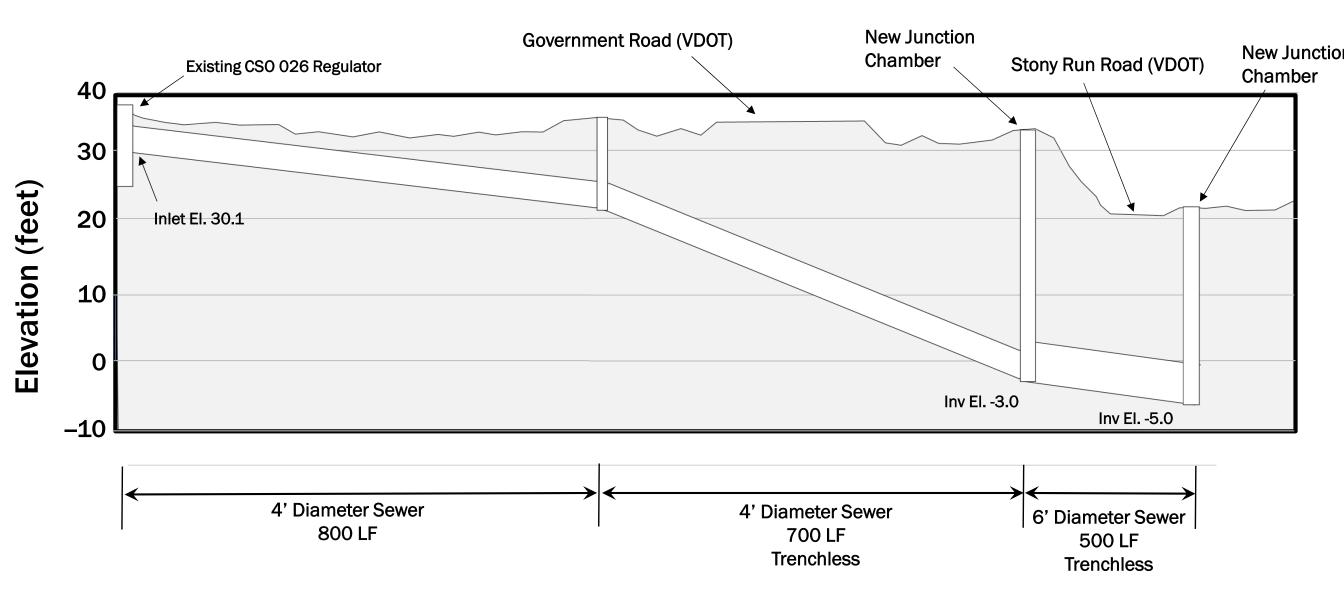
	15-Year Replacement Costs Subtotal						
		i. Furnish and Install Replacement Meters		EA	3	\$7,500.00	\$22,500
	b. Meters						
		i.	Furnish and Install Replacement Electrical and I&C	LS	100%	\$152,000.00	\$152,000
	a.	Ele	ctrical and Instrumentation and Control				
10. 15-Year Replacement Costs							

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

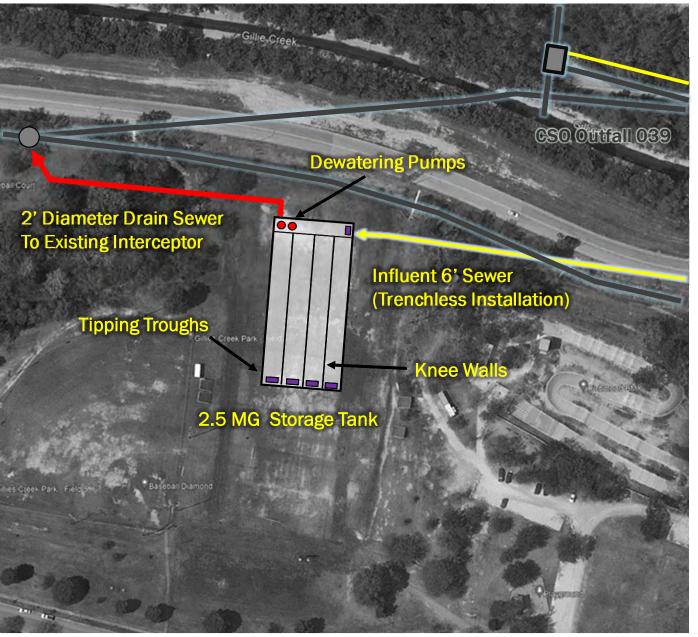
Gillies Creek #2 CSO 024, 026, and 039 Conveyance Sewer and Storage Tank

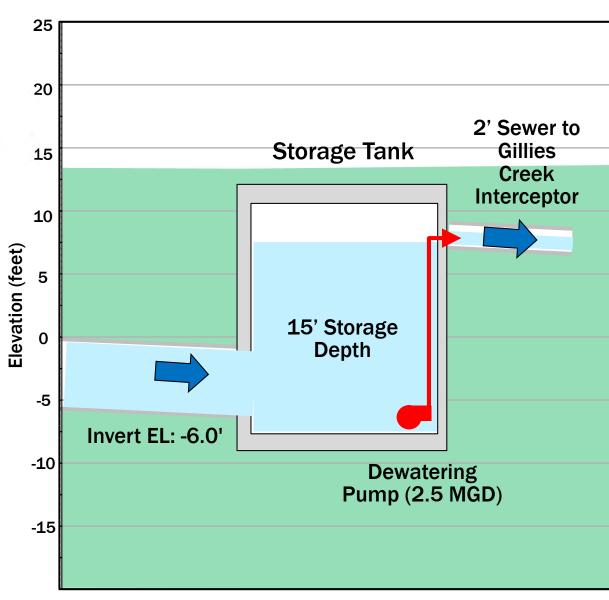


Profile



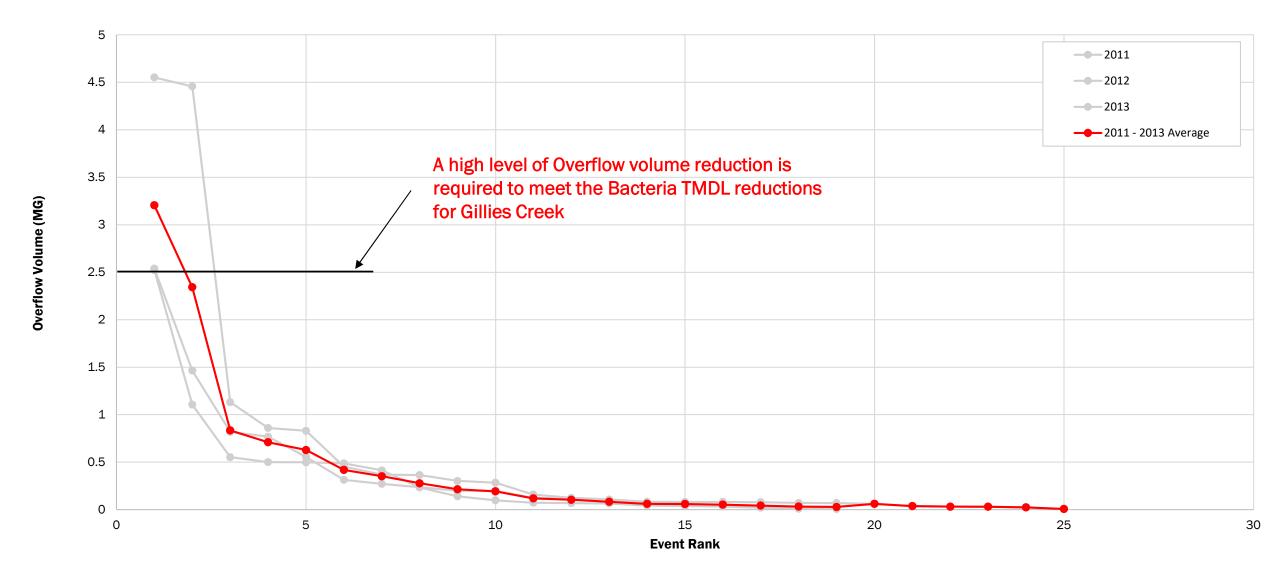
Gillies Creek #2 CSO 024, 026, and 039 Conveyance Sewer and Storage Tank





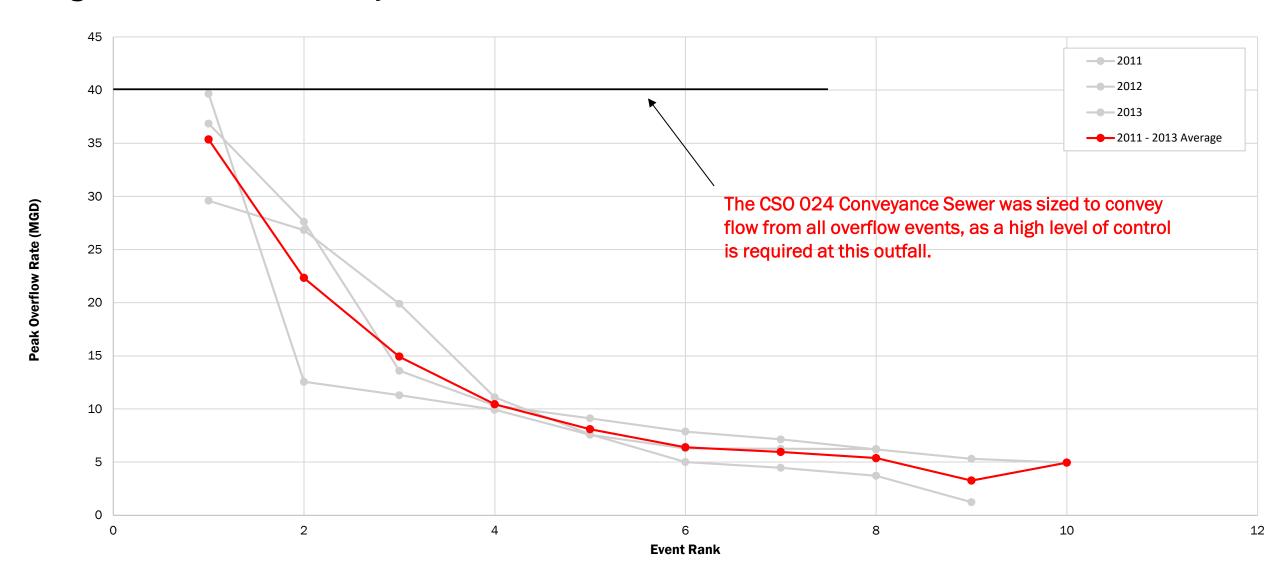
Gillies Creek #2 CSO 026, 024, and 039 Conveyance Sewer and Storage Tank

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



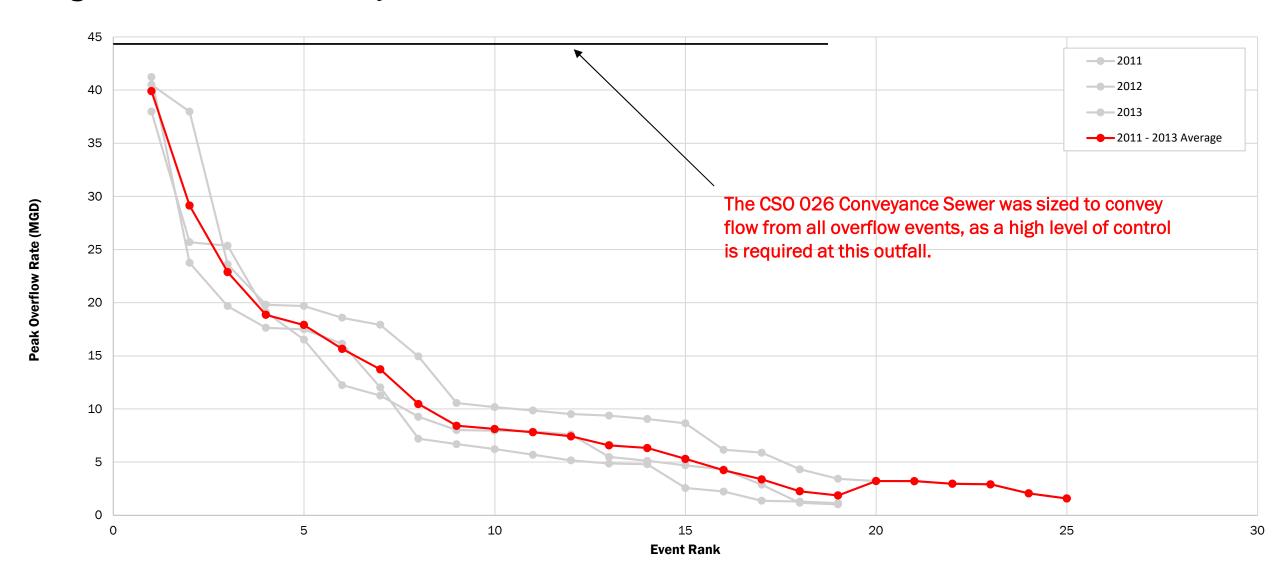
CSO 026, 024, and 039 Conveyance Sewer and Storage Tank

Existing CSO at Outfall 024 for Hydraulic Evaluation Period



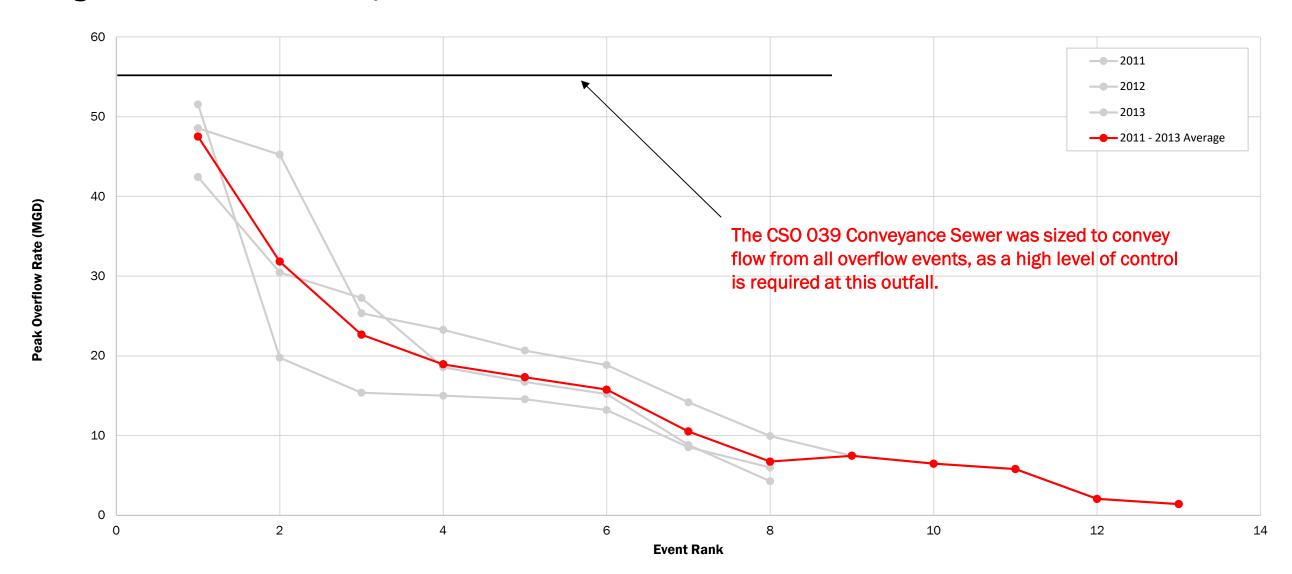
CSO 026, 024, and 039 Conveyance Sewer and Storage Tank

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

		ltem	Unit	Quantity	Unit Cost	Total Amount
	_	ure Dimensions				
a.	Ne	ew Junction Chamber				
	i.	Length	LF	15		
	ii.	Width	LF	15		
-	_	Depth	LF	40		
b.	St	orage Tank (covered)				
	i.	Length	LF	220		
	ii.	Width	LF	100		
	_	Depth	LF	25		
C.	00	for Control Vault				
	i.	Length	LF	30		
	ii.	Width	LF	40		
	iii.	Depth	LF	20		
	ener		1	_	ı	
a.	Sit	e Prep	ACRE	3	\$250,000.00	\$750,000.00
					General Subtotal	\$750,000
. Ex	cav	ation for Structures				
a.	Sı	pport of Excavation				
	i.	Sheeting				
	L	New Junction Chamber	SF	8,928	\$45.00	\$401,760
$oldsymbol{ol{ol{ol}}}}}}}}}}}}}}}}}$	Ţ	Excavation Length	LF	31		
	Γ	Excavation Width	LF	31		
	Ι	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.	Sc	il				
	i.	Excavate and Dispose of Soil	CY	34,688	\$90.00	\$3,121,947
				,,,,,	,	
	-			Excavation for S	tructures Subtotal	\$5,352,417
s. St	ruct	ural				
a.	Ne	ew 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		
1	Ť	Exterior Wall Height	LF	40		
+	t	Concrete Top Slab	CY	39	\$1,500.00	\$58,778
\dashv	t	Top Slab Thickness	LF	2		
+	t	Top Slab Length	LF	23		
+	t	Top Slab Width	LF	23		
b.	St	orage Tank (covered)				
Ť	i.	220'L x 100'W x 25'D		1		
1	Ť	Concrete Base Slab	CY	2,588	\$775.00	\$2,006,04
1	Ť	Base Slab Thickness	LF	3		
十	T	Base Slab Length	LF	224		
+	\dagger	Base Slab Width	LF	104		
+	\dagger	Concrete Exterior Walls	CY	1,200	\$1,500.00	\$1,800,00
\dashv	+	Exterior Wall Thickness	LF	2	,	, _,500,50
\dashv	+	Exterior Wall Length	LF	648		
+	+	Exterior Wall Beight	LF	25		
	+	Concrete Top Slab	CY	1,726	\$1,500.00	¢0 E00 44
+	+	Top Slab Thickness	LF	1,726	φ1,500.00	\$2,588,44
+	+	Top Slab Length				
+	+		LF	224		
	_	Top Slab Width for Control Vault	LF	104		
c.	1					
C.	i.	30'L x 40'W x 20'D Concrete Base Slab	CY	166	\$775.00	\$128,82

			Dana Clah Thialinana				
-	4	+	Base Slab Thickness	LF	3		
	+	4	Base Slab Length	LF	34		
	+	4	Base Slab Width	LF	44	44 500 00	****
	4	_	Concrete Exterior Walls	CY	219	\$1,500.00	\$328,889
	4	4	Exterior Wall Thickness	LF	2		
	4	4	Exterior Wall Length	LF	148		
	4		Exterior Wall Height	LF	20		
	4		Concrete Top Slab	CY	111	\$1,500.00	\$166,222
	_	4	Top Slab Thickness	LF	2		
			Top Slab Length	LF	34		
			Top Slab Width	LF	44		
L.,						Structural Subtotal	\$7,813,493
	Civil					<u> </u>	
ē	ı. F	÷					
	i.	_	Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 026, 15' Depth)	LF	800	\$950.00	\$760,000
	_	_	Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 026, Trenchless)	LF	700	\$4,200.00	\$2,940,000
	_	_	Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 024, 20' Depth)	LF	200	\$950.00	\$190,000
	i	٧.	Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 039, 25' Depth)	LF	200	\$950.00	\$190,000
	ν	<i>'</i> .	Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 039, Trenchless)	LF	250	\$4,200.00	\$1,050,000
	٧	ί.	Furnish and Install 72" Fiber Reinforced Sewer Pipe (Storage Tank, Trenchless)	LF	500	\$5,600.00	\$2,800,000
	٧	/ii.	Furnish and Install 24" Fiber Reinforced Sewer Pipe (Drain Pipe, 10' Depth)	LF	300	\$650.00	\$195,000
t). E	хса	avation				
	i.	. [Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 026, 15' Depth)	CY	3,556	\$90.00	\$320,000
	T	T	Excavation Length	LF	800		
	Ť	7	Excavation Width	LF	8		
\vdash	十	\dashv	Excavation Depth	LF	15		
	ji	1	Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 024, 20' Depth)	CY	1,185	\$90.00	\$106,667
\vdash	+"	+	Excavation Length	LF	200	\$50.00	+100,001
\vdash	+	+	Excavation Width	LF	8	+	
	+	+	Excavation Depth	LF	20		
-	-	.				***	\$400.000
		II.	Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 039, 30' Depth)	CY	1,481	\$90.00	\$133,333
	4		Excavation Length	LF	200		
			Excavation Width	LF	8		
			Excavation Depth	LF	25		
	i	٧.	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	:. Т	rer	nchless Utility Installation				
	i.	. 1	48" Fiber Reinforced Sewer Pipe (CSO 026) Trenchless Installation				
	+	1	Jacking Pit Excavation	CY	444	\$90.00	\$40,000
	+	+	Excavation Length	LF	40		, ,,,,,,
	+	+	Excavation Width	LF	20		
	+	+	Excavation Depth	LF	15		
	+	+		CY	222	\$90.00	\$20,000
	+	4	Receiving Pit Excavation			\$90.00	\$20,000
	4	4	Excavation Length	LF	20		
	4	4	Excavation Width	LF	20		
	_	4	Excavation Depth	LF	15		
	ii	i.	48" Fiber Reinforced Sewer Pipe (CSO 039) Trenchless Installation				
	\perp		Jacking Pit Excavation	CY	889	\$90.00	\$80,000
$oxedsymbol{oxedsymbol{oxed}}{oxedsymbol{oxed}}{oxedsymbol{oxed}}$	ſ	_[Excavation Length	LF	40		
	Т	T	Excavation Width	LF	20		
	T	T	Excavation Depth	LF	30		-
	T	T	Receiving Pit Excavation	CY	444	\$90.00	\$40,000
	T	T	Excavation Length	LF	20		
	\dagger	7	Excavation Width	LF	20		
H	\dagger	+	Excavation Depth	LF	30		
	ii	1	72" Fiber Reinforced Sewer Pipe (Storage Tank) Trenchless Installation			+	
+	+	+	Jacking Pit Excavation	CY	444	\$90.00	\$40,000
\vdash	+	+	Excavation Length	LF	40	Ψ30.00	Ψ+0,000
 -⊦	+	+	Excavation Width			+	
\dashv	+	+		LF	20		
	+	4	Excavation Depth	LF 2)/	15	***	**
	\downarrow	4	Receiving Pit Excavation	CY	222	\$90.00	\$20,000
	_	_	Excavation Length	LF	20		
	ļ		Excavation Width	LF	20		
	\perp		Excavation Depth	LF	15		
C	i. S	_	oport of Excavation				
	Ţi.		Sheeting				
	T	T	48" Fiber Reinforced Sewer Pipe (CSO 026, 15' Depth) Excavation Vertical Area	SF	36,000	\$45.00	\$1,620,000
	1	T	Excavation Length	LF	800		
	T	7	Excavation Depth	LF	15		
-t	十	\dashv	48" Fiber Reinforced Sewer Pipe (CSO 024, 20' Depth) Excavation Vertical Area	SF	12,000	\$45.00	\$540,000
-	$^{+}$	+	Excavation Length	LF	200	*	
\dashv	+	\dashv	Excavation Depth	LF	200	 	
+	+	+	48" Fiber Reinforced Sewer Pipe (CSO 039, 30' Depth) Excavation Vertical Area	SF	15,000	\$45.00	\$675,000
, !		- 1	TO THE INTERIOR OF WELLING (USO USE, SU DEPUL) EXCAVABION VEHICAL AIRA	J	10,000	φ+5.00	JUU,C104

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				100	ai Esuillateu Cost	φυτ,111,001
				Tot	tal Estimated Cost	\$61,171,607
f	.	Bonds and Insurance	LS	1	3%	\$1,781,697
e		Subtotal C	LS	1		\$59,389,909
C	d. (General Conditions	LS	1	50%	\$19,796,636
c). S	Subtotal B	LS	1		\$39,593,27
t). I	Design Contingency	LS	1	40%	\$11,312,364
		Subtotal A				\$28,280,90
. (Con	struction Total				, , , , , , ,
			1	Electrica	al and I&C Subtotal	\$380,000
_}	+	I umish and mstan Electrical and two (Other)	LS	1	\$380,000.00	\$380,000
â	1.	i, Furnish and Install Electrical and I&C (Other)	LS	4	\$200,000,00	\$380.000
		Miscellaneous Electrical and I&C			T T	
. le	-1	ctrical and I&C		M	echanical Subtotal	\$950,000
				<u> </u>		*****
	i	i. Exhaust Fans and Carbon Adsorber	CFM	9,167	\$50.00	\$458,333
C). (Odor Control				
	i	i. Dewatering Pumps	MGD	3	\$75,000.00	\$187,500
t). I	Pumps				
	į	i. Furnish and Install Tipping Troughs	EA	4	\$75,000.00	\$300,000
a	a. '	Tipping Troughs				
		chanical	<u>_</u>			
					Civil Subtotal	\$13,035,000
	T					
		Receiving Pit Excavation Vertical Area	SF	7,200	\$45.00	\$324,000
	T	Jacking Pit Excavation Vertical Area	SF	10,800	\$45.00	\$486,000
	t	Excavation Depth	LF	10		
1	T	Excavation Length	LF	300		
1	T	24" Fiber Reinforced Sewer Pipe (Drain Pipe, 10' Depth) Excavation Vertical Area	SF	9,000	\$45.00	\$405,00
	T	Excavation Depth	LF	25		
		Excavation Length	LF	200		

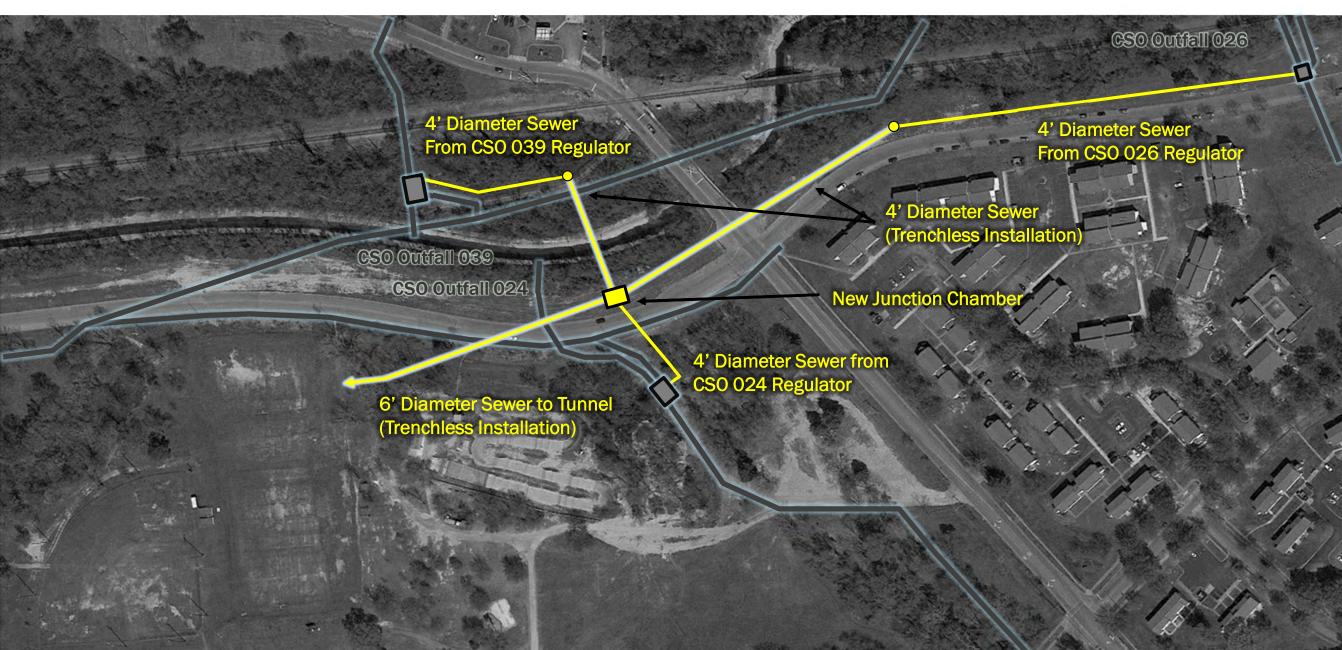
8. Capital Total							
	a.	Construction Cost Total				\$61,171,607	
	b.	Capital Contingency	LS	1	50%	\$30,585,803	
	Total Estimated Capital Cost						

9. An	nua	al Operations and Maintainence Costs				
a.	La	abor				
	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
	٧.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	\$50.00	\$9,600
b.	М	laintenance of Structures				
	i.	Maintain Structures	LS	0.2%	\$7,813,492.59	\$15,627
c.	М	laintenance of Pipe				
	i.	Maintain Pipe	LS	1.0%	\$8,125,000.00	\$81,250
d.	М	laintenance 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.	М	laintenance of Instrumentation and Control				
	i.	Maintain I&C	LS	3%	\$380,000.00	\$11,400
			Annual Operations a	nd Maintaine	nce Costs Subtotal	\$189,152

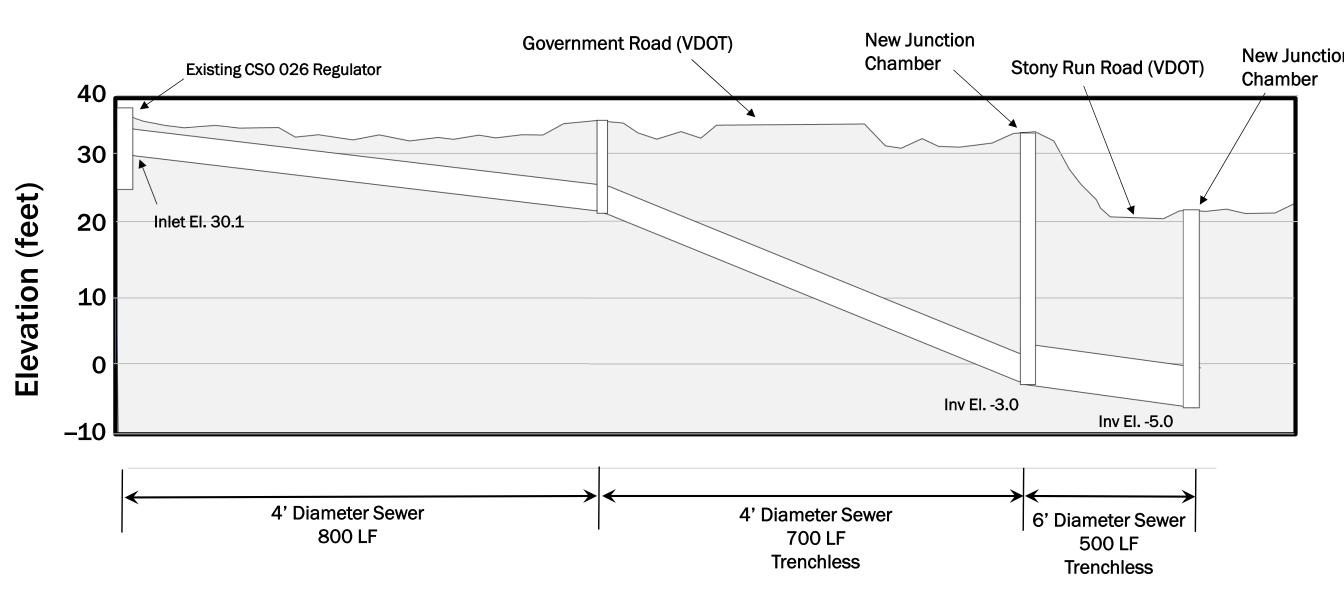
10. 15-Year Replacement Costs						
	a.	Electrical and Instrumentation and Control				
		j. Furnish and Install Replacement Electrical and I&C	LS	100%	\$380,000.00	\$380,000
	b.	Meters				
		j. Furnish and Install Replacement Meters	EA	3	\$7,500.00	\$22,500
	15-Year Replacement Costs Subtotal					\$402,500

					Gillies Creek	Sewer and Tank
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Sco
	Estimated Project Schedule (Design, Permitting, Procurement,		2	<4 Year project schedule with minimal risks for schedule extension	_	
	Construction) Schedule	2.3	0	4-8 Year project schedule >8 Years project schedule with moderate to severe risks for schedule extension	1	2.3
			2	None/Minor conflicts		
	Conflicts with aboveground and/or subsurface features/utilities	1.8	1	Moderate conflicts resolvable through reloactions, reconstruction	1	1.8
			0	Major conflicts requiring significant disruption and/or signficant relocations Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years		
Constructability	Improvements to existing assets	2	1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years	1	2
·	and the state of t	_	0	Improvements to existing assets not identified for replacement within next 10 years	_	_
			2	Construction easements or none required		4.0
	Required land acquisition or construction easements	2.3	0	Permanent easements required Land acquisition required		4.6
			2	No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required		
	Risk of construction means and methods	1.3	1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required	1	2.3 1.8 2 4.6 1.3 5 1.8 2.9 2.2 3.2 6.8 8.8 3.4 4.6 2 3.3 1.6 7 5.8
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required		
	Risk of sewer system flooding due to equipment failures	2.5	1	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition		5
	Thisk of sewer system flooding due to equipment failures	2.0	0	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition	1 2 1 1 2 1 1 2 2 2 1 1 2 2 1 1 1 2 2 1	
			2	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended		Score Weighted Sc 1 2.3 1 1.8 1 2 2 4.6 1 1.3 2 5 1 1.8 1 2.9 2 2.2 2 3.2 2 6.8 2 8.8 1 3.4 2 4.6 1 2 1 3.3 2 1.6 2 7
	New Facility/Equipment maintenance requirements	1.8	1	Moderate regular maintenance (Monthly) is required for the equipment to operate as intended	1	1.8
	3/ 4/ h		0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended		
0014			2	Signficant reduction in US/DS HGL as compared to the existing condition		
O&M	Opportunity to improve sewer system performance	2.9	1	Moderate reduction in US/DS HGL as compared to the existing condition	1	2.9
			0	No reduction in US/DS HGL as compared to the existing condition		
			2	>2 other similar facilties/equipment that are currently operated and maintained at the City		
	Familiarity with new Facilities/Equipment	1.1	0	1-2 other similar facilities/equipment that are currently operated and maintained at the City No other similar facilities/equipment that are currently operated and maintained at the City	2	2.2
			2	No new staff is required for operation and maintenace		
	Additional staff required for operations and maintenace	1.6	1	1-2 new employees are required for the operation and maintenace	2	3.2
			0	>2 new employees are required for operations and maintenace		
	Ability to support and work in coordination with future combined	0.4	2	Project supports future improvements or is foundational for future improvements Additional modifications needed to support future improvements		0.0
	sewer system improvements	3.4	0	Project will be obsolete or unnecessary after Long Term Plan is implemented	2	6.8
Adaptability and			2	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios		
	Resiliency to potential climate change impacts	4.4	1	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios	2	8.8
Resiliency			0 2	Significant performance impacts (>4 additional overflow events) in projected climate change scenarios Protected against a 100-year flood		
	Resiliency to potential river floods	3.4	1	Protected against a 25-year flood Protected against a 25-year flood	1	3.4
	The second of the percentage in the second of the second o	U.	0	Not protected against a 25-year flood	2	
			2	High potential for known near term (<5 years) future development		
	Opportunites to Coordinate with Future Development	2.3	1	Moderate potential for known near term long term (>5 years) future development No known or potential development in next 10 years	2	4.6
			2	No federal or state permits required		
	Required Fed/State Permits/Coordination	2	1	Federal/state nationwide/general permits required	1	2
			0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		
nd Use and Permitting			2	Located outside of the Resource Manangement Area (RMA)		
	Project located in Environmentally sensitive areas	3.3	1	Located within the RMA	1	3.3
			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		1.6
	Required VPDES permitting modifications	0.8	0	Moderate modifications would be required for the City's VPDES permit Significant modifications would be required for the City's VPDES permit		1.0
			2	Yes		
	Opportunites for Water Quality Improvements in Environmental	3.5	1	Adjacent Adjacent	2	7
	Justice Areas		0	No No		
	Opportunity to provide community give back (public space		2	Yes		
	improvements)	2.9	1	Adjacent	2	5.8
Community	p		0	No Minimal impacts to the community during construction		
	Impacts to community during construction	2.1	1	Minimal impacts to the community during construction Moderate impacts (traffic detours and/or noise in residential areas) during construction		0
	ming saming samed addition	_,_	0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		
			2	Minimal tree removal/mitigation (<0.2 acres) is required		
	Tree Removal/Mitigation	2.3	1	Moderate tree removal/mitigation (0.2-1 acres) is required	1	2.3
			0	Signficant tree removal/mitigation (>1 acres) is required		73

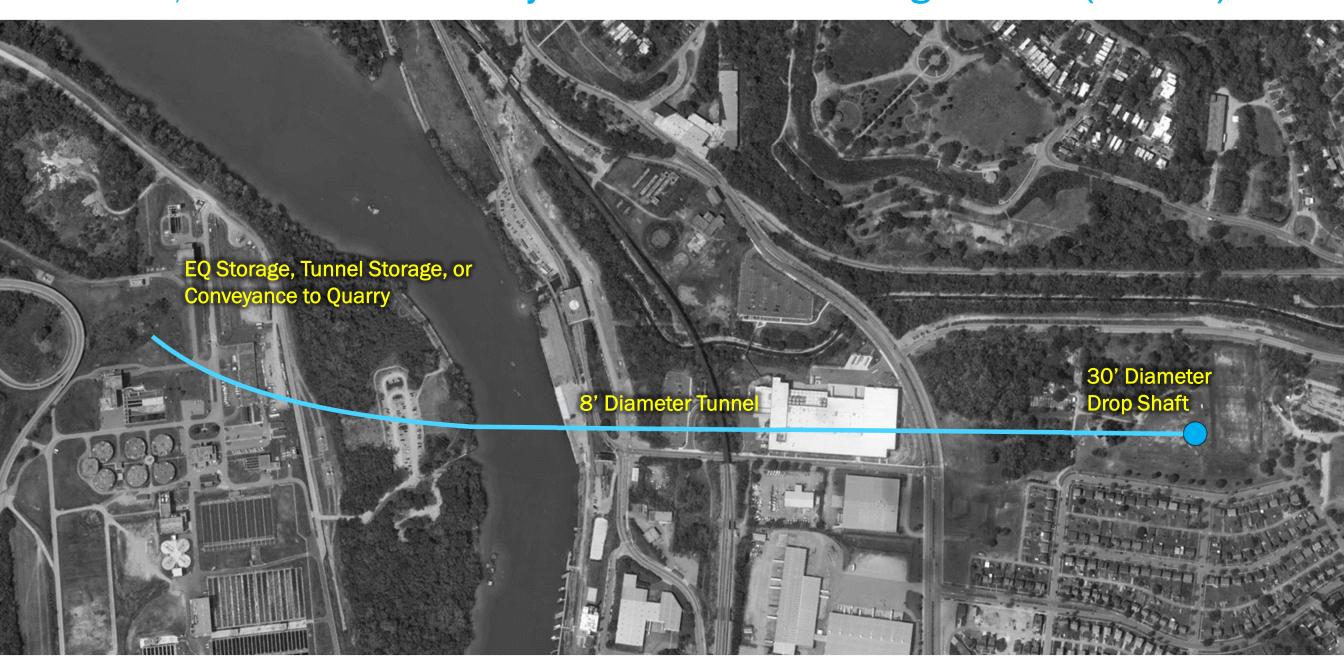
Gillies Creek #3 CSO 024, 026, and 039 Conveyance Sewer and Tunnel



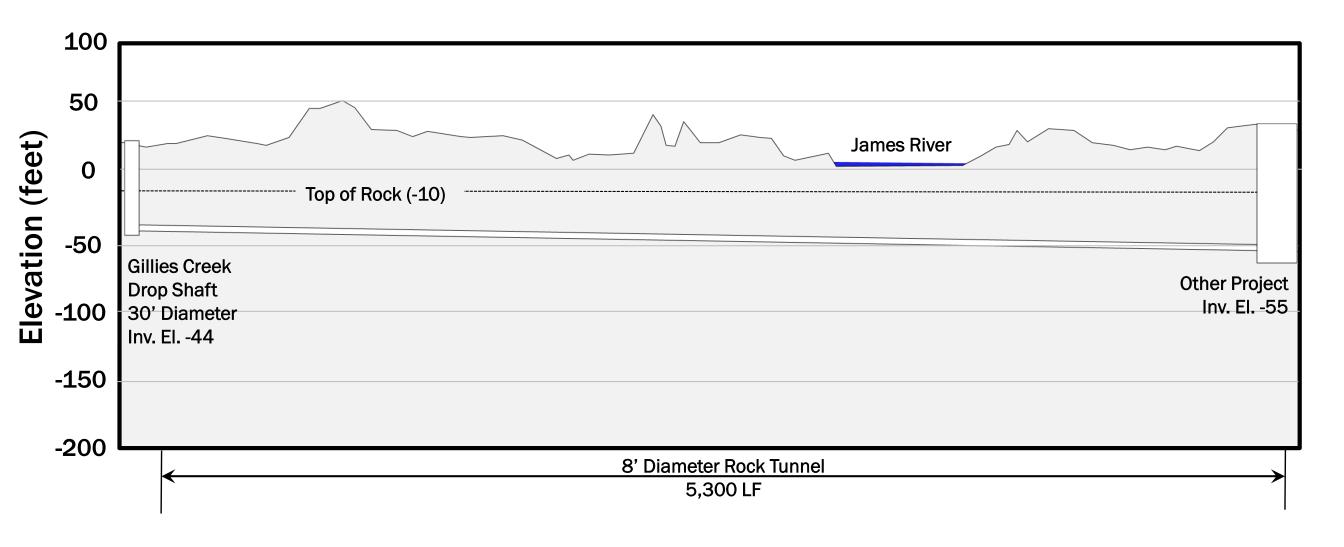
Conveyance Sewer Profile



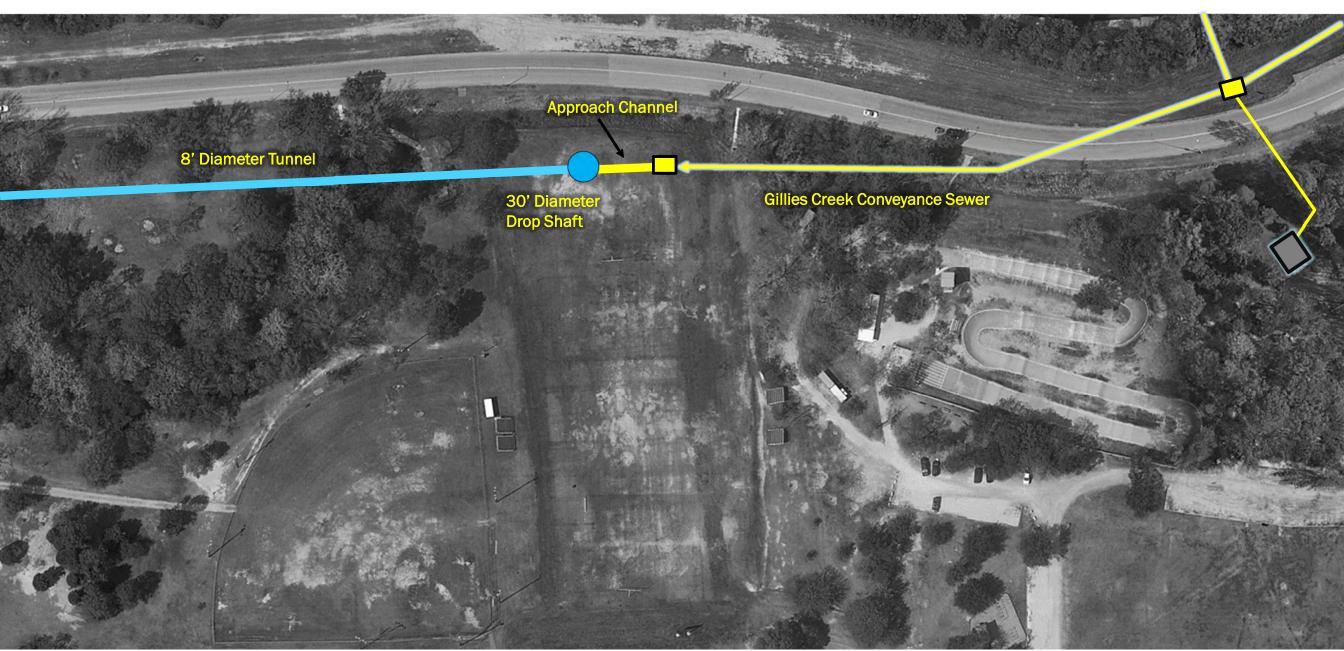
Gillies Creek #3 CSO 026, 024 and 039 Conveyance Sewer and Storage Tunnel (2.5 MG)



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.	Stru	uctu	ure Dimensions				
	_	_	w Junction Chamber				
		i.	Length	LF	15		
		ii.	Width	LF	15		
		iii.	Depth	LF	40		
ŀ	b.	App	proach Channel				
		i.	Length	LF	50		
		ii.	Width	LF	8		
		iii.	Depth	LF	8		
C	С.	Dro	pshaft				
			Diameter	LF	30		
		iii.	Depth	LF	70		
1. (Ger	nera					
á	а.	Site	e Prep	ACRE	3	\$250,000.00	\$750,000.00
						General Subtotal	\$750,000
2. I	Exc	ava	tion for Structures				
á	а.	_	oport 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		
ŀ	b.	Soil					
			Excavate and Dispose of Soil	CY	2,348	\$90.00	\$211,360
	_	_	Excavate and Dispose of Dropshaft Overburden	CY	2,534	\$180.00	\$456,159
(_	Roc					
	_	-	Excavate and Dispose of Rock	CY	0	\$300.00	\$0
		ii.	Excavate and Dispose of Dropshaft Rock	CY	2,084	\$300.00	\$625,107
						0	* 4 0 4 0 4 0 4
2 (`+		······l		Excavation for	Structures Subtotal	\$4,016,491
		uctu	v Junction Chamber		ı	1	
- 1	۵.		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	7=,000	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
\vdash	+	Ħ	Exterior Wall Length	LF	76		
\vdash		Ħ	Exterior Wall Height	LF	40		
\vdash		Ħ	Concrete Top Slab	CY	39	\$1,500.00	\$58,778
\vdash	+	Ħ	Top Slab Thickness	LF	2	,200.00	130,. 70
\vdash		Ħ	Top Slab Length	LF	23		
\vdash	7	Ħ	Top Slab Width	LF	23		
ŀ	o.	App	proach Channel				
			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		
		T	Base Slab Width	LF	10		
			Concrete Exterior Walls	CY	36	\$1,500.00	\$53,333
			Exterior Wall Thickness	LF	1		
Ħ		Ħ	Exterior Wall Length	LF	120		
	7	T	Exterior Wall Height	LF	8		
	7	T	Concrete Top Slab	CY	39	\$1,500.00	\$57,778
		Ħ	Top Slab Thickness	LF	2		
	7	T	Top Slab Length	LF	52		
	7	T	Top Slab Width	LF	10		
-	`	Dro	pshaft				
(٠.						

		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		
	1	Concrete Top Slab	CY	63	\$1,500.00	\$95,033
	+	Top Slab Thickness	LF	2		
		Top Slab Diameter	LF	33	Characterial Corbatatal	\$2,022,004
1 Ci	vil				Structural Subtotal	\$3,033,001
	Pi	ing.				
a.	i.	Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 026, 15' Depth)	LF	800	\$950.00	\$760,000
	ii.		LF	700	\$4,200.00	\$2,940,000
	_	Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 024, 20' Depth)	LF	200	\$950.00	\$190,000
	_	Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 039, 25' Depth)	LF	200	\$950.00	\$190,000
	٧.		LF	250	\$4,200.00	\$1,050,000
	_	Furnish and Install 72" Fiber Reinforced Sewer Pipe (to Tunnel, Trenchless)	LF	500	\$5,600.00	\$2,800,000
b.	_	cavation				
	_	Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 026, 15' Depth)	CY	3,556	\$90.00	\$320,000
	T	Excavation Length	LF	800		
	T	Excavation Width	LF	8		
	T	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.	Tr	renchless 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				
	1	Jacking Pit Excavation	CY	889	\$90.00	\$80,000
	1	Excavation Length	LF	40		
	1	Excavation Width	LF	20		
	+	Excavation Depth	LF	30	***	* 40.000
	+	Receiving Pit Excavation	CY	444	\$90.00	\$40,000
	+	Excavation Length Excavation Width	LF	20		
_	+	Excavation Width Excavation Depth	LF	20		
-	iii.		LF	30	 	
+	111.	Jacking Pit Excavation	CY	444	\$90.00	\$40,000
+	+	Excavation Length	LF	40	φ30.00	φ40,000
	+	Excavation Width	LF	20		
-+	+	Excavation Depth	LF	15		
+	t	Receiving Pit Excavation	CY	222	\$90.00	\$20,000
-	t	Excavation Length	LF	20		, _ 0,000
\neg	t	Excavation Width	LF	20		
\dashv	t	Excavation Depth	LF	15		
d.	Sı	upport of Excavation				
	i.	Sheeting				
	t	48" Fiber Reinforced Sewer Pipe (CSO 026, 15' Depth) Excavation Vertical Area	SF	36,000	\$45.00	\$1,620,000
	T	Excavation Length	LF	800		
	Т	Excavation Depth	LF	15		
	Ţ	48" Fiber Reinforced Sewer Pipe (CSO 024, 20' Depth) Excavation Vertical Area	SF	12,000	\$45.00	\$540,000
	Ι	Excavation Length	LF	200		
		Excavation Depth	LF	20		
	Ι	48" Fiber Reinforced Sewer Pipe (CSO 039, 30' Depth) Excavation Vertical Area	SF	15,000	\$45.00	\$675,000
	Ι	Excavation Length	LF	200		
	L	Excavation Depth	LF	25		
	Ι	Jacking Pit Excavation Vertical Area	SF	10,800	\$45.00	\$486,000
	Ĺ	Receiving Pit Excavation Vertical Area	SF	7,200	\$45.00	\$324,000
e.	Τι	unnel Excavation and Lining				
	i.	8' Lined Tunnel with TBM	LF	5,300	\$7,200.00	\$38,160,000
						1=
					Civil Subtotal	\$50,535,000
E 10		truction Total				

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

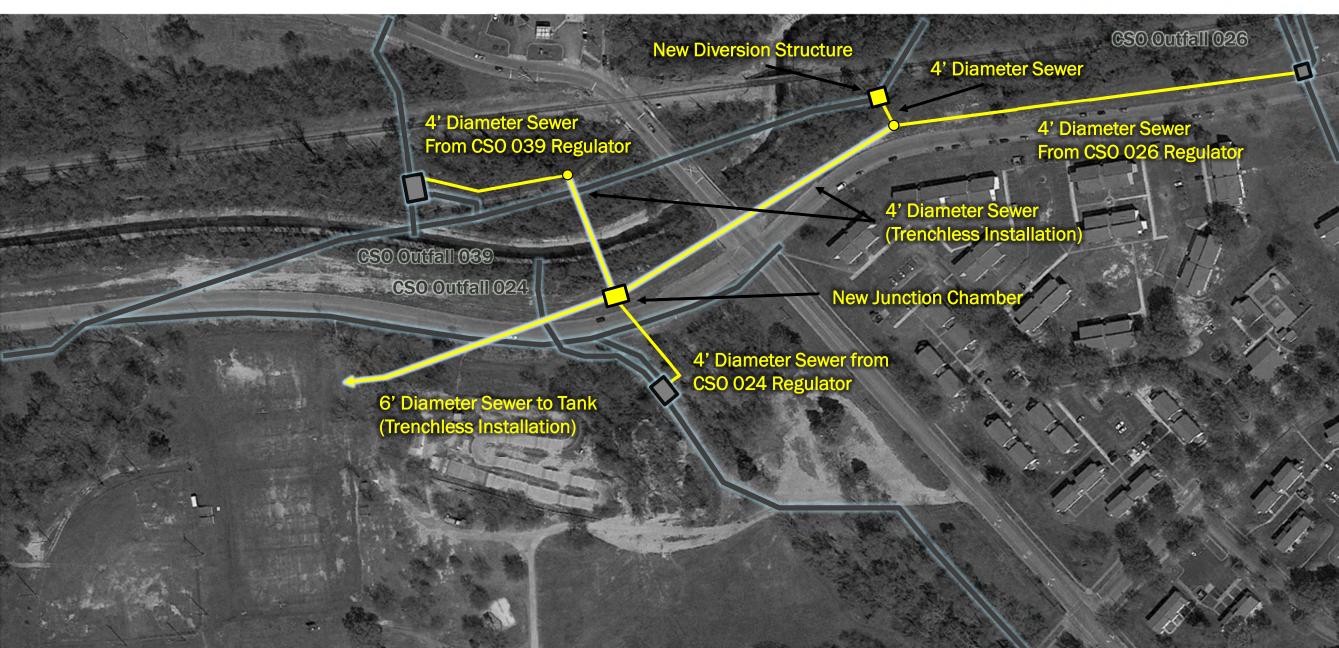
8. (3. Capital Total							
á	a.	Construction Cost Total				\$126,177,506		
ŀ	b.	Capital Contingency	LS	1	50%	\$63,088,753		
Total Estimated Capital Cost					\$189,266,259			

9. Annual Operations and Maintainence Costs						
a.	La	abor				
	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.	М	laintenance of Pipe				
	i.	Maintain Pipe	LS	1%	\$7,930,000.00	\$79,300
c.	M	laintenance of Tunnel				
	i.	Maintenance of Tunnel	LS	1%	\$38,160,000.00	\$381,600
d.	M	laintenance of Structure				
	i.	Maintenance of Structure	LS	1%	\$3,033,000.79	\$30,330
	Annual Operations and Maintainence Costs Subtotal					

10. 1	.5-Year Replacement Costs				
а	. 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 Sewer and Tunnel				
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Score		
	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2 1	<4 Year project schedule with minimal risks for schedule extension 4-8 Year project schedule	1	2.3		
	Constituction) 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 Moderate conflicts resolvable through reloactions, reconstruction	_ 1	Weighted Score		
	oonnote with aboveground unity of Substitutes reactives, utilities	1.0	0	Major conflicts requiring significant disruption and/or significant relocations	-	1.0		
Constructshility		_	2	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years		_		
Constructability	Improvements to existing assets	2	0	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years Improvements to existing assets not identified for replacement within next 10 years	_ 1	2		
			2	Construction easements or none required				
	Required land acquisition or construction easements	2.3	1	Permanent easements required	1 2.3 0 0 2 5 1 1.8 1 2.9 1 1.1 2 3.2 2 6.8 2 8.8	2.3		
			0 2	Land acquisition required No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required		2.3 1.8 2 2.3 0 5 1.8 2.9 1.1 3.2 6.8 8.8 3.4 4.6 0 3.3 0.8 7 5.8 0 2.3		
	Risk of construction means and methods	1.3	1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required	1 2.3 1 1.8 1 2.3 1 2.3 1 2.3 0 0 0 2 5 1 1.8 1 2.9 1 1.1 2 3.2 2 6.8 2 8.8 1 3.4 2 4.6 0 0 0 1 3.3	0		
			0	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required				
			2	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition		2 5		
	Risk of sewer system flooding due to equipment failures	2.5	1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition	Unweighted Score Weighted Score 1 2.3 1 1.8 1 2.3 0 0 2 5 1 1.8 1 2.9 1 1.1 2 6.8 2 6.8 2 8.8 1 3.4 2 4.6 0 0 1 3.3 1 0.8 2 7			
			0	nical equipment failure could severely impact US/DS HGL as compared to the existing condition al regular maintenance (Quarterly) is required for the equipment to operate as intended				
	New Facility/Equipment maintenance requirements	1.8	1	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended Moderate regular maintenance (Monthly) is required for the equipment to operate as intended		1 8		
	new racinty/ Equipment maintenance requirements	1.0	0	Significant regular maintenance (Weekly) is required for the equipment to operate as intended	-	1.0		
			2	Significant reduction in US/DS HGL as compared to the existing condition				
O&M	Opportunity to improve sewer system performance	2.9	1	Moderate reduction in US/DS HGL as compared to the existing condition	1	2.9		
			0	No reduction in US/DS HGL as compared to the existing condition				
			2	>2 other similar facilities/equipment that are currently operated and maintained at the City		1.1		
	Familiarity with new Facilities/Equipment	1.1	0	1-2 other similar facilities/equipment that are currently operated and maintained at the City No other similar facilities/equipment that are currently operated and maintained at the City	1	1.1		
			2	No new staff is required for operation and maintenace				
	Additional staff required for operations and maintenace	1.6	1	1-2 new employees are required for the operation and maintenace	2	3.2		
			0 2	>2 new employees are required for operations and maintenace Project supports future improvements or is foundational for future improvements				
	Ability to support and work in coordination with future combined	3.4	1	Additional modifications needed to support future improvements	_ 2	6.8		
	sewer system improvements		0	Project will be obsolete or unnecessary after Long Term Plan is implemented	2 6.8			
Adaptability and	Dayling and a startist allowed a large transfer	4.4	2	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios		0.0		
Resiliency	Resiliency to potential climate change impacts	4.4	0	Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios Significant performance impacts (>4 additional overflow events) in projected climate change scenarios		8.8		
			2	Protected against a 100-year flood				
	Resiliency to potential river floods	3.4	1	Protected against a 25-year flood	1	3.4		
			0 2	Not protected against a 25-year flood High potential for known near term (<5 years) future development				
	Opportunites to Coordinate with Future Development	2.3	1	Moderate potential for known near term long term (>5 years) future development	2	4.6		
			0	No known or potential development in next 10 years				
	Required Fed/State Permits/Coordination	2	2	No federal or state permits required Federal/state nationwide/general permits required		0		
	nequired real state remitts/ coordination	2	0	Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required		v		
and Use and Permitting			2	Located outside of the Resource Manangement Area (RMA)				
	Project located in Environmentally sensitive areas	3.3	1	Located within the RMA	1	3.3		
			0	Located within the Resource Protection Area (RPA)				
			2	Minimal modifications would be required for the City's VPDES permit				
	Required VPDES permitting modifications	0.8	1	Moderate modifications would be required for the City's VPDES permit	_ 1	0.8		
			0	Significant modifications would be required for the City's VPDES permit Yes				
	Opportunites for Water Quality Improvements in Environmental	3.5	1	Adjacent	2	7		
	Justice Areas	21.0	0	No No				
	Opportunity to provide community give back (public space		2	Yes				
	improvements)	2.9	1	Adjacent	2	5.8		
Community			0 2	No Minimal impacts to the community during construction				
	Impacts to community during construction	2.1	1	Moderate impacts (traffic detours and/or noise in residential areas) during construction	0	0		
			0	Signficant impacts (road closures, park closures, significant noise in residential areas) during construction				
	Tree Removal/Mitigation	2.3	1	Minimal tree removal/mitigation (<0.2 acres) is required Moderate tree removal/mitigation (0.2-1 acres) is required	⊣ ₁	2.2		
	1100 Holliovaly initigation	2.0	0	Signficant tree removal/mitigation (>1 acres) is required	┪ ¹	2.0		
	·			SU	И	65		

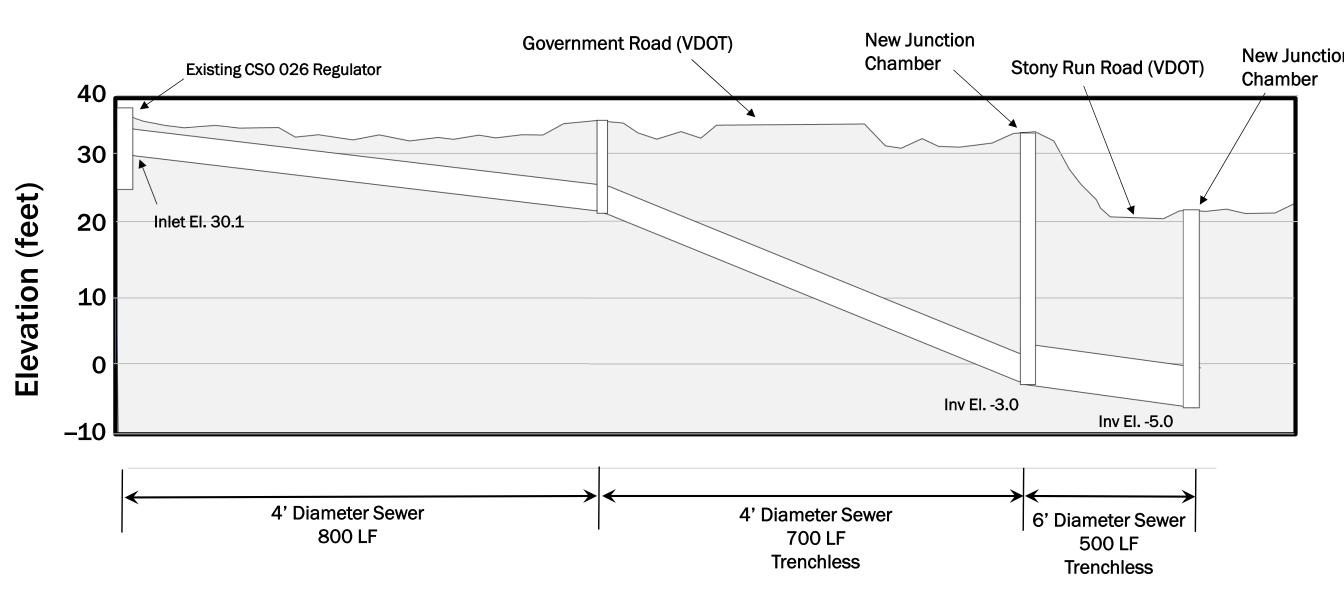
Gillies Creek #4 CSO 004, 024, 025, 026, and 039 Conveyance Sewer and Storage Tank



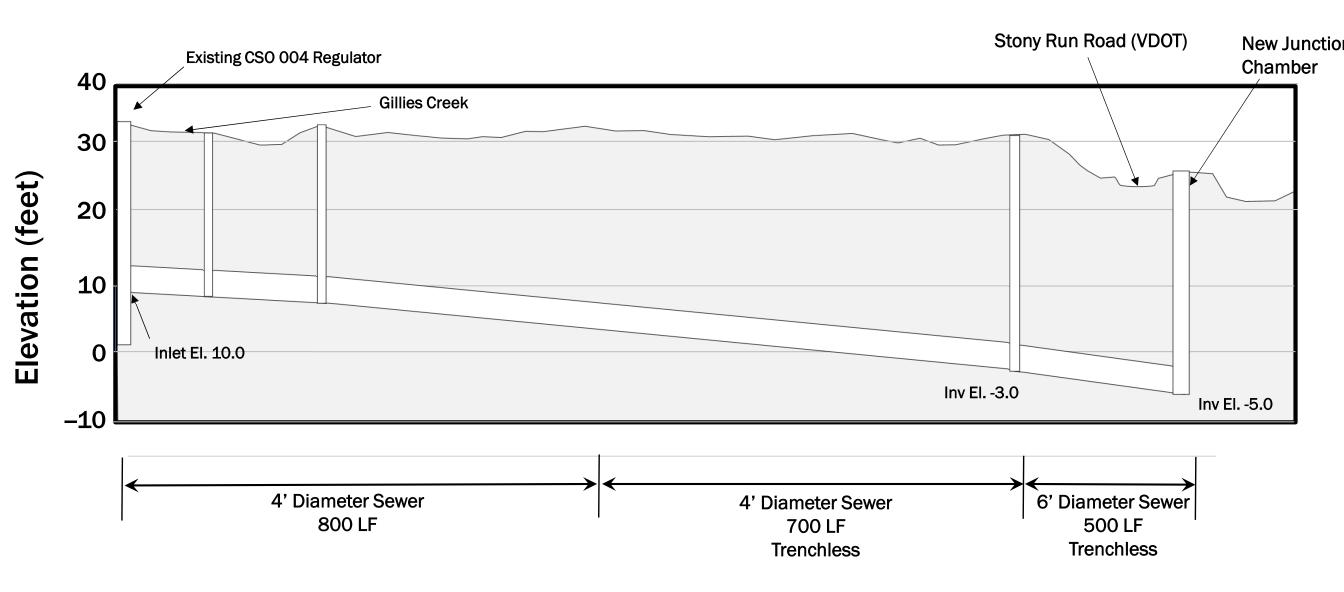
Gillies Creek #4 CSO 004, 024, 026, and 039 Conveyance Sewer and Storage Tank



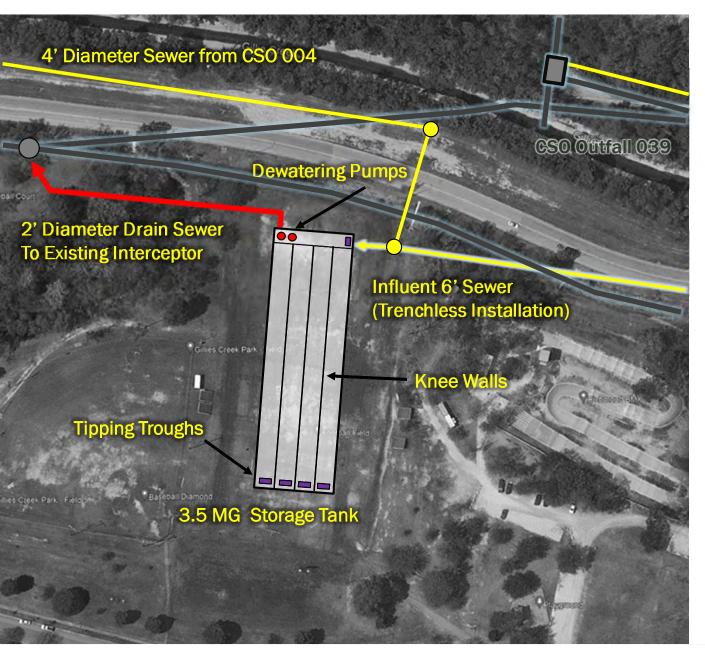
Conveyance Sewer Profile

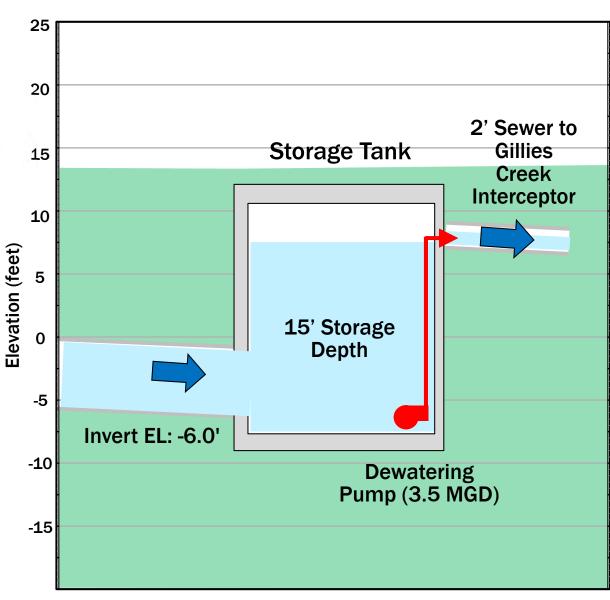


CSO 004 Conveyance Sewer Profile



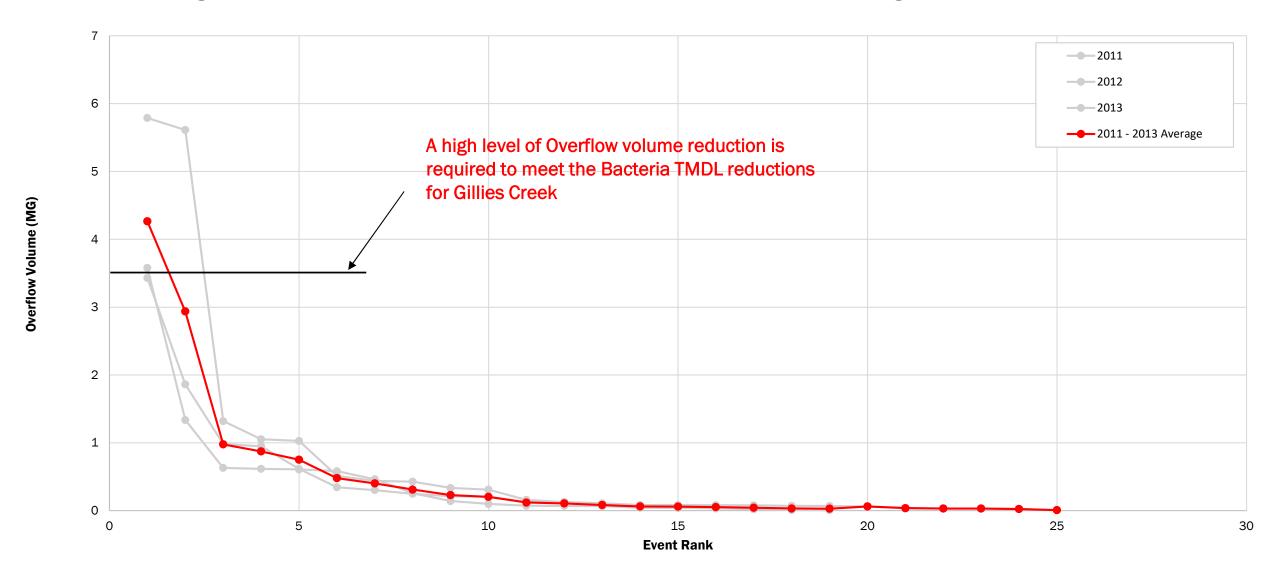
CSO 004, 024, 026, and 039 Conveyance Sewer and Storage Tank





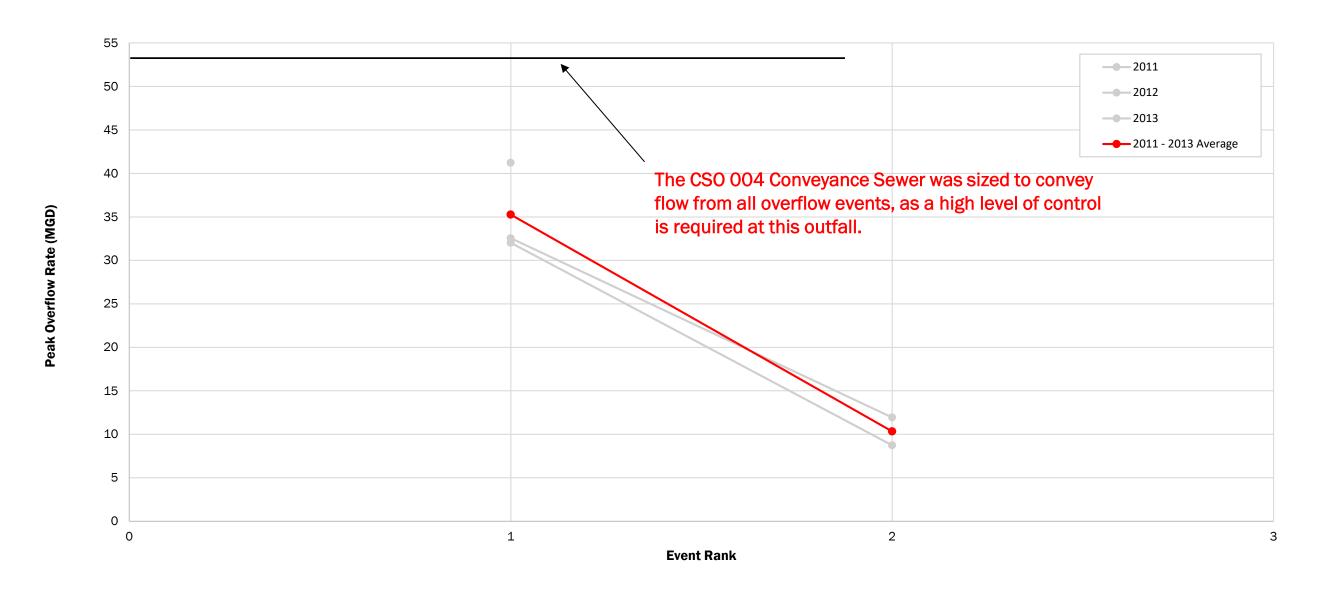
Gillies Creek #4CSO 004, 024, 025, 026, and 039 Conveyance Sewer and Storage Tank (3.5 MG)

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

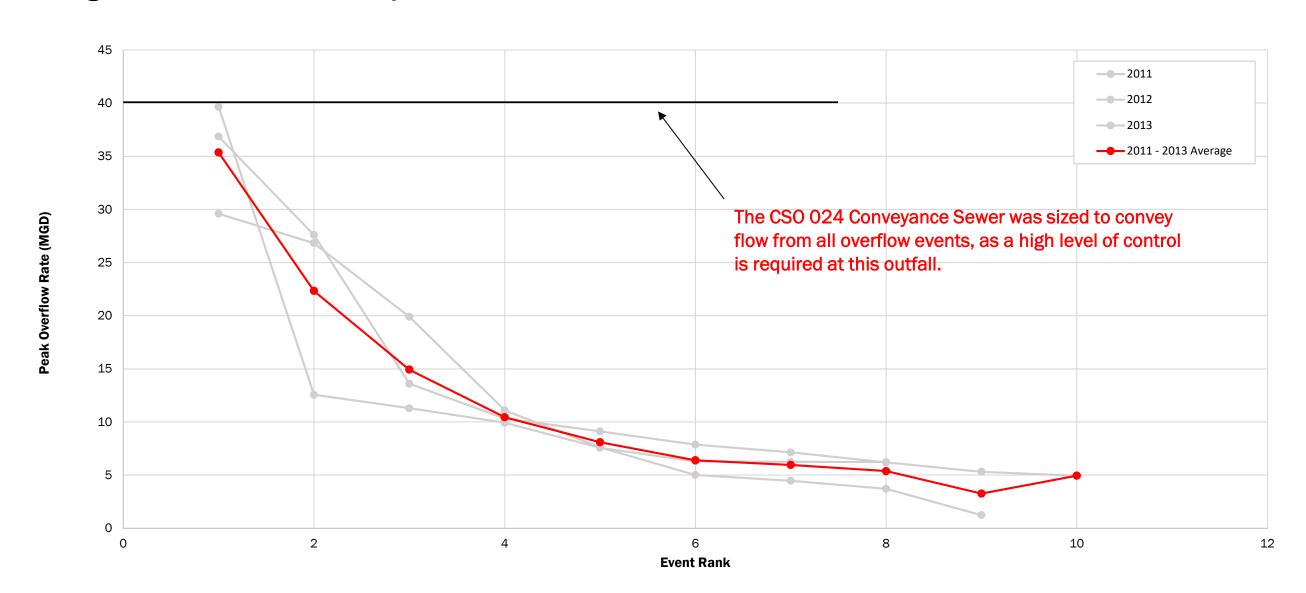


Gillies Creek #4 CSO 004, 024, 025, 026, and 039 Conveyance Sewer and Storage Tank (3.5 MG)

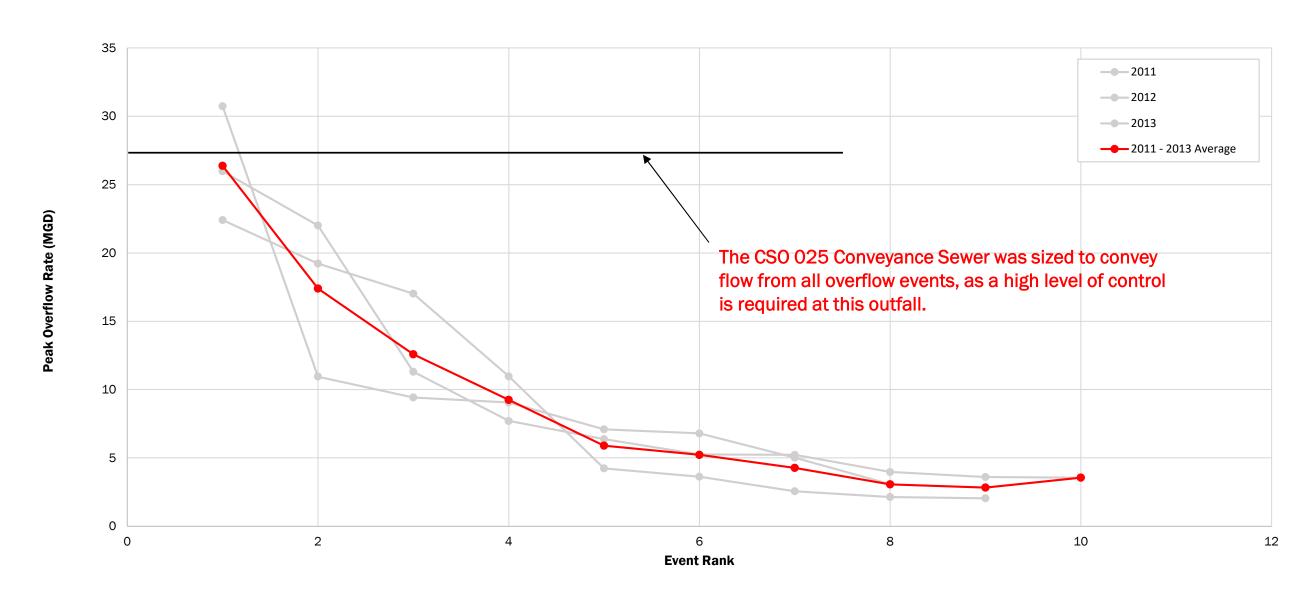
Existing CSO at Outfall 004 for Hydraulic Evaluation Period



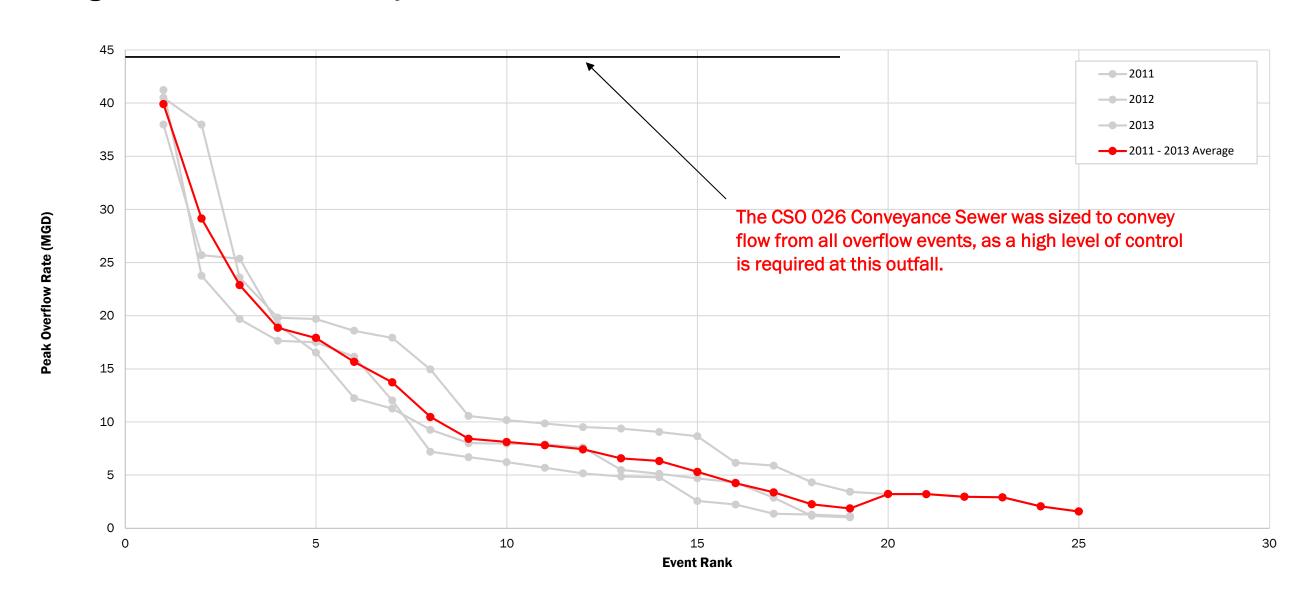
Existing CSO at Outfall 024 for Hydraulic Evaluation Period



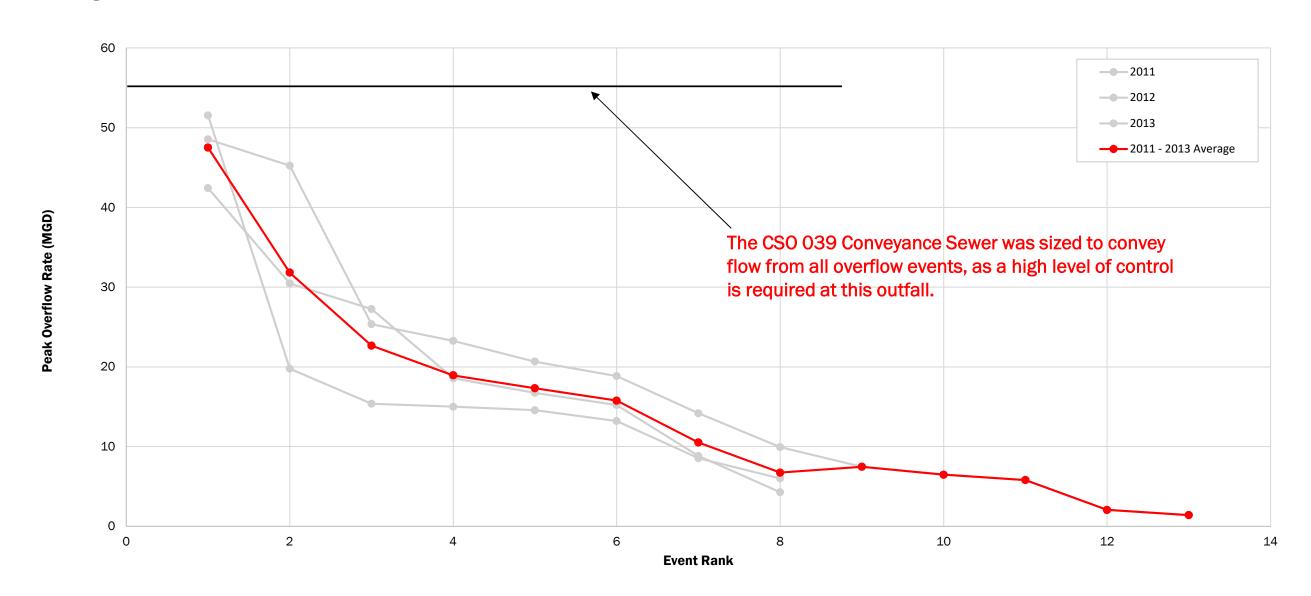
Existing CSO at Outfall 025 for Hydraulic Evaluation Period



Existing CSO at Outfall 026 for Hydraulic Evaluation Period



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
	_	ure Dimensions				
a.	. Ne	w Junction Chamber				
	i.	Length	LF	15		
	ii.	Width	LF	15		
	iii.	Depth	LF	40		
b.	. Sto	rage Tank (covered)				
	i.	Length	LF	320		
	ii.	Width	LF	100		
	iii.	Depth	LF	25		
c.	. Ne	w 025 Diversion Structure				
	i.	Length	LF	15		
	ii.	Width	LF	15		
	iii.	Depth	LF	25		
d.	. Od	or Control Vault				
	i.	Length	LF	30		
	ii.	Width	LF	40		
	iii.	Depth	LF	20		
1. G	enera					
a.	. Site	e Prep	ACRE	4	\$250,000.00	\$1,000,000.00
	_				General Subtotal	\$1,000,000
2. E	xcava	tion for Structures				
a.	. Su	oport 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
	1	Excavation Length	LF	332	,	7-,0:,
		Excavation Width	LF	112		
		Excavation Depth	LF	33		
	+	New 025 Diversion Structure	SF	5,184	\$45.00	\$233,280
	+	Excavation Length	LF	27	\$45.00	\$233,260
	+	Excavation Width	LF	27		
	+-	Excavation Depth	LF	32		
	-	·	_		445.00	* 400 000
		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.	. Soi					
	i.	Excavate and Dispose of Soil	CY	50,395	\$90.00	\$4,535,520
3. St				Excavation for	Structures Subtotal	\$1,526,140
1-	tructi			Excavation for	Structures Subtotal	\$1,526,140
a.		w Junction Chamber		Excavation for	Structures Subtotal	\$1,526,140
a.		w Junction Chamber 15'L x 15'W x 40'D	CV			
a.		w Junction Chamber 15'L x 15'W x 40'D Concrete Base Slab	CY	65	\$775.00	
a.		w Junction Chamber 15'L x 15'W x 40'D Concrete Base Slab Base Slab Thickness	LF	65 4		
a.		w Junction Chamber 15'L x 15'W x 40'D Concrete Base Slab Base Slab Thickness Base Slab Length	LF LF	65 4 21		
a.		w Junction Chamber 15'L x 15'W x 40'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width	LF LF LF	65 4 21 21	\$775.00	\$50,633
a.		w Junction Chamber 15°L x 15°W x 40°D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls	LF LF CY	65 4 21 21 320		\$50,633
a.		w Junction Chamber 15°L x 15°W x 40°D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls Exterior Wall Thickness	LF LF CY LF	65 4 21 21 320 3	\$775.00	\$50,633
a.		w Junction Chamber 15°L x 15°W x 40°D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls Exterior Wall Thickness Exterior Wall Length	LF LF CY LF	65 4 21 21 320 3 72	\$775.00	\$50,633
a.		w Junction Chamber 15°L x 15°W x 40°D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height	LF LF CY LF LF LF	65 4 21 21 320 3 72 40	\$775.00 \$1,500.00	\$50,633 \$480,000
a.		w Junction Chamber 15'L x 15'W x 40'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab	LF LF CY LF LF CY	65 4 21 21 320 3 72 40	\$775.00	\$50,633 \$480,000
a.		w Junction Chamber 15°L x 15°W x 40°D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness	LF LF CY LF CY LF LF CY LF	65 4 21 21 320 3 72 40 33 2	\$775.00 \$1,500.00	\$50,633 \$480,000
a.		w Junction Chamber 15°L x 15°W x 40°D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length	LF LF CY LF LF CY LF LF LF CY LF LF LF CY LF	65 4 21 21 320 3 72 40 33 2	\$775.00 \$1,500.00	\$50,633 \$480,000
	. Net i.	w Junction Chamber 15°L x 15°W x 40°D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length Top Slab Width	LF LF CY LF CY LF LF CY LF	65 4 21 21 320 3 72 40 33 2	\$775.00 \$1,500.00	\$50,633 \$480,000
	. Net i.	w Junction Chamber 15°L x 15°W x 40°D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls Exterior Wall Thickness Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length Top Slab Width Top Slab Width	LF LF CY LF LF CY LF LF LF CY LF LF LF CY LF	65 4 21 21 320 3 72 40 33 2	\$775.00 \$1,500.00	\$50,633 \$480,000
	. Net i.	w Junction Chamber 15°L x 15°W x 40°D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length Top Slab Budth Top Slab Width rage Tank (covered) 320°L x 100°W x 25°D	LF LF CY LF LF CY LF LF LF LF CY LF LF LF LF	65 4 21 21 320 3 72 40 33 2 21	\$1,500.00 \$1,500.00	\$50,633 \$480,000 \$49,000
	. Net i.	w Junction Chamber 15°L x 15°W x 40°D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length Top Slab Length Top Slab Width rage Tank (covered) 320°L x 100°W x 25°D Concrete Base Slab	LF LF CY LF LF LF CY LF CY CY CY	65 4 21 21 320 3 72 40 33 2 21 21	\$775.00 \$1,500.00	\$50,633 \$480,000 \$49,000
	. Net i.	w Junction Chamber 15°L x 15°W x 40°D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls Exterior Wall Thickness Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length Top Slab Width rage Tank (covered) 320°L x 100°W x 25°D Concrete Base Slab Base Slab Thickness	LF LF CY LF CY LF CY LF CY LF CY LF	65 4 21 21 320 3 72 40 33 2 21 21 21	\$1,500.00 \$1,500.00	\$50,633 \$480,000 \$49,000
	. Net i.	w Junction Chamber 15°L x 15°W x 40°D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls Exterior Wall Thickness Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length Top Slab Width Top Slab Slab Hength Base Slab Thickness	LF LF CY LF CY LF CY LF CY LF LF CY LF	65 4 21 21 320 3 72 40 33 2 21 21 21 4,992 4	\$1,500.00 \$1,500.00	\$50,633 \$480,000 \$49,000
	. Net i.	w Junction Chamber 15°L x 15°W x 40°D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls Exterior Wall Thickness Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Thickness Top Slab Length Top Slab Width Top Slab Slab Width Tage Tank (covered) 320°L x 100°W x 25°D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Length	LF LF CY LF CY LF CY LF LF CY LF	65 4 21 21 320 3 72 40 33 2 21 21 21 4,992 4 324	\$1,500.00 \$1,500.00 \$1,500.00	\$50,633 \$480,000 \$49,000 \$3,868,800
	. Net i.	w Junction Chamber 15°L x 15°W x 40°D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length Top Slab Udith Top Slab Width Top Slab Slab Length Base Slab Thickness Base Slab Thickness Base Slab Thickness	LF LF CY LF CY LF CY CY LF LF CY	65 4 21 21 320 3 72 40 33 2 21 21 21 4,992 4 324 104 1,570	\$1,500.00 \$1,500.00	\$50,633 \$480,000 \$49,000 \$3,868,800
	. Net i.	w Junction Chamber 15°L x 15°W x 40°D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls Exterior Wall Thickness Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length Top Slab Width Top Slab Width Top Slab Width Top Slab Width Tage Tank (covered) 32°U x 10°W x 25°D Concrete Base Slab Thickness Base Slab Length Base Slab Length Base Slab Length Concrete Exterior Walls Exterior Wall Thickness	LF LF CY LF CY LF CY LF LF CY LF	65 4 21 21 320 3 72 40 33 2 21 21 21 4,992 4 324	\$1,500.00 \$1,500.00 \$1,500.00	\$50,633 \$480,000 \$49,000 \$3,868,800
	. Net i.	w Junction Chamber 15°L x 15°W x 40°D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Wall Thickness Exterior Wall Thickness Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length Top Slab Width rage Tank (covered) 320°L x 100°W x 25°D Concrete Base Slab Base Slab Thickness Base Slab Uength Base Slab Length Concrete Exterior Walls Exterior Wall Exterior Walls Exterior Wall Exterior Walls Exterior Wall Thickness	LF LF CY LF CY LF CY CY LF LF CY	65 4 21 21 320 3 72 40 33 2 21 21 21 4,992 4 324 104 1,570	\$1,500.00 \$1,500.00 \$1,500.00	\$50,633 \$480,000 \$49,000 \$3,868,800
	. Net i.	w Junction Chamber 15°L x 15°W x 40°D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls Exterior Wall Thickness Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length Top Slab Width Top Slab Width Top Slab Width Top Slab Width Tage Tank (covered) 32°U x 10°W x 25°D Concrete Base Slab Thickness Base Slab Length Base Slab Length Base Slab Length Concrete Exterior Walls Exterior Wall Thickness	LF LF CY LF CY LF LF LF CY LF	65 4 21 21 320 3 72 40 33 2 21 21 21 4,992 4 324 104 1,570 2	\$1,500.00 \$1,500.00 \$1,500.00	\$50,633 \$480,000 \$49,000 \$3,868,800
	. Net i.	w Junction Chamber 15°L x 15°W x 40°D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Wall Thickness Exterior Wall Thickness Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length Top Slab Width rage Tank (covered) 320°L x 100°W x 25°D Concrete Base Slab Base Slab Thickness Base Slab Uength Base Slab Length Concrete Exterior Walls Exterior Wall Exterior Walls Exterior Wall Exterior Walls Exterior Wall Thickness	LF LF CY LF CY LF LF LF CY LF LF LF LF CY LF	65 4 21 21 320 3 72 40 33 2 21 21 21 4,992 4 324 104 1,570 2 848	\$1,500.00 \$1,500.00 \$1,500.00	\$7,528,740 \$50,633 \$480,000 \$49,000 \$3,868,800 \$2,355,556

П		Top Slab Length	LF	324		
		Top Slab Width	LF	104		
С	Nev	w 025 Diversion Structure				
	i.	15'L x 15'W x 25'D				
		Concrete Base Slab	CY	40	\$775.00	\$31,086
-		Base Slab Thickness Base Slab Length	LF LF	3 19		
	+	Base Slab Width	LF	19	 	
		Concrete Exterior Walls	CY	126	\$1,500.00	\$188,889
		Exterior Wall Thickness	LF	2	7-,555	+===,===
		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	. Odd	or Control Vault				
	I.	30'L x 40'W x 20'D Concrete Base Slab	CY	166	\$77E.00	¢100 000
-		Base Slab Thickness	LF	3	\$775.00	\$128,822
-	+-	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	7-,555	77=0,000
\vdash		Exterior Wall Length	LF	148		
口		Exterior Wall Height	LF	20		
	1	Concrete Top Slab	CY	111	\$1,500.00	\$166,222
	I	Top Slab Thickness	LF	2		
		Top Slab Length	LF	34		
		Top Slab Width	LF	44		
					Structural Subtotal	\$11,432,008
	ivil			1	T T	
а	Pip		1.5	000	#0F0.00	\$700,000
-	i. ii.	Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 026, 15' Depth) Furnish and Install 48" Fiber Reinforced Sewer Pipe (CSO 026, Trenchless)	LF LF	800 700	\$950.00 \$4,200.00	\$760,000 \$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
	٧.	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
	٧.	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	. Exc	avation				
	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 Excavation Depth	LF	8		
	ii.	Excavation Depth Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 024, 20' Depth)	LF CY	15 1,185	\$90.00	\$106,667
-	11.	Excavation Length	LF	200	\$90.00	\$100,007
-		Excavation Width	LF	8		
\vdash	+	Excavation Depth	LF	20	 	
\vdash	iii.	Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 039, 25' Depth)	CY	1,481	\$90.00	\$133,333
\vdash	+	Excavation Length	LF	200	12222	
口		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		
Ш		Excavation Width	LF	6		
$\sqcup \bot$		Excavation Depth	LF	10		
$\vdash \vdash$	٧.	Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 004, 20' Depth)	CY	593	\$90.00	\$53,333
$\vdash \vdash$	1	Excavation Length	LF	100		
$\vdash \vdash$	+	Excavation Width	LF	8		
\vdash	v.	Excavation Depth Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 004, 20' Depth)	LF CY	20	\$00.00	¢022 222
\vdash	vi.	Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 004, 20" Depth) Excavation Length	LF	10,370 1,750	\$90.00	\$933,333
\vdash	+	Excavation Width	LF	8		
\vdash	+	Excavation Depth	LF	20		
\vdash	vii.	Excavation for 48" Fiber Reinforced Sewer Pipe (CSO 025, 15' Depth)	CY	444	\$90.00	\$40,000
\sqcap	1	Excavation Length	LF	100		. 2,230
\vdash		Excavation Width	LF	8		
1 1						
$\exists \dagger$		Excavation Depth	LF	15		
С	Tre	Excavation Depth nchless Utility Installation	LF	15		
С	Tre	nchless Utility Installation 48° Fiber Reinforced Sewer Pipe (CSO 026, Trenchless) Trenchless Installation	LF			
С	Tre i.	nchless Utility Installation 48" Fiber Reinforced Sewer Pipe (CSO 026, Trenchless) Trenchless Installation Jacking Pit Excavation	CY	444	\$90.00	\$40,000
С	Tre i.	nchless Utility Installation 48° Fiber Reinforced Sewer Pipe (CSO 026, Trenchless) Trenchless Installation			\$90.00	\$40,000

	Т	Excavation Depth	LF	15		
	+	Receiving Pit Excavation	CY	222	\$90.00	\$20,000
+	+	Excavation Length	LF	20	ψ30.00	420,000
-+	+	-				
\vdash	_	Excavation Width	LF	20		
$\vdash \!$	4	Excavation Depth	LF	15		
$\vdash \downarrow$	ii.	48" Fiber Reinforced Sewer Pipe (CSO 039, Trenchless) Trenchless Installation				
$\sqcup \bot$	_	Jacking Pit Excavation	CY	889	\$90.00	\$80,000
$\sqcup \!\!\! \perp$		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
\vdash	+	Excavation Length	LF	40	ψ50.00	Ψ+0,000
\vdash	+	Excavation Width	LF	20		
\vdash	+		LF			
\vdash	_	Excavation Depth		15	400.00	****
$\sqcup \!\!\! \perp$	_	Receiving Pit Excavation	CY	222	\$90.00	\$20,000
Ш		Excavation Length	LF	20		
		Excavation Width	LF	20		
		Excavation Depth	LF	15		
	iv.	48" Fiber Reinforced Sewer Pipe (CSO 004, Trenchless) Trenchless Installation				
	T	Jacking Pit Excavation	CY	741	\$90.00	\$66,667
	T	Excavation Length	LF	40		* *
\vdash	\top	Excavation Width	LF	20		
H	\top	Excavation Depth	LF	25		
$\vdash \vdash$	+	Receiving Pit Excavation	CY	444	\$90.00	\$40,000
\vdash	+	=	LF	20	\$90.00	\$40,000
\vdash	+	Excavation Length				
$\vdash \vdash$	_	Excavation Width	LF	20		
$\sqcup \!\!\! \perp$		Excavation Depth	LF	30		
d	l. Sı	upport 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		
	1	48" Fiber Reinforced Sewer Pipe (CSO 024, 20' Depth) Excavation Vertical Area	SF	46,200	\$45.00	\$2,079,000
H	\top	Excavation Length	LF	700	7.0.00	,
	+	Excavation Depth	LF	22		
\vdash	+	·	SF		¢45.00	\$720,000
\vdash	+	48" Fiber Reinforced Sewer Pipe (CSO 039, 25' Depth) Excavation Vertical Area		16,200	\$45.00	\$729,000
$\vdash \vdash$	_	Excavation Length	LF	200		
Щ		Excavation Depth	LF	27		
Ш		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	¥ 10.00	40,101,000
$\vdash \vdash$	+	Excavation Depth	LF	22	-	
$\vdash \vdash$	+				A45.00	\$000 FCC
$\vdash \vdash$	+	48" Fiber Reinforced Sewer Pipe (CSO 025, 15' Depth) Excavation Vertical Area	SF	5,100	\$45.00	\$229,500
$\vdash \vdash$	4	Excavation Length	LF	100		
\sqcup	1	Excavation Depth	LF	17		
\sqcup		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. N	/lech	anical				
а	. Ti	pping Troughs				
	i.	Furnish and Install Tipping Troughs	EA	6	\$75,000.00	\$450,000
b	. Pı	imps				
	i	Dewatering Pumps	MGD	4	\$75,000.00	\$262,500
-		dor Control	WIGE	-	ψ10,000.00	Ψ202,000
-	. 00	Exhaust Fans and Carbon Adsorber	CFM	13,333	\$50.00	\$666,667
\vdash	- 1.	Extraust Fairs and Carbon Adsorber	CFIVI	15,555	\$50.00	\$600,007
$\vdash \vdash$	_				ļ .	
ш				l	1	A. 27 :
L-					Mechanical Subtotal	\$1,380,000
	_	ical and I&C				
а	. M	iscellaneous Electrical and I&C				
LT	i.	Furnish and Install Electrical and I&C (Other)	LS	1	\$552,000.00	\$552,000
			•	Electric	cal and I&C Subtotal	\$552,000
7. C	onst	ruction Total				
		ubtotal A				\$46,522,082
b		esign Contingency	LS	1	40%	\$18,608,833
С	_	ubtotal B	LS	1		\$65,130,914
d		eneral Conditions	LS	1	50%	\$32,565,457

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

8.	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. Ar	nnual	Operations and Maintainence Costs				
a.	Lab	or				
	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
	٧.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	\$50.00	\$9,600
b.	Mai	ntenance of Structures				
	i.	Maintain Structures	LS	0.2%	\$11,432,008.33	\$22,864
c.	Mai	ntenance of Pipe				
	i.	Maintain Pipe	LS	1.0%	\$10,607,500.00	\$106,075
d.	Mai	ntenance 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.	Mai	ntenance of Instrumentation and Control				
	i.	Maintain I&C	LS	3%	\$552,000.00	\$16,560
		Annua	l Operations	and Maintaine	nce Costs Subtotal	\$261.974

10. 15-Year Replacement Costs							
a.	Ele	ctrical and Instrumentation and Control					
	i.	Furnish and Install Replacement Electrical and I&C	LS	100%	\$552,000.00	\$552,000	
b.	b. Meters						
	i.	Furnish and Install Replacement Meters	EA	5	\$7,500.00	\$37,500	
15-Year Replacement Costs Subtotal					\$589.500		

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

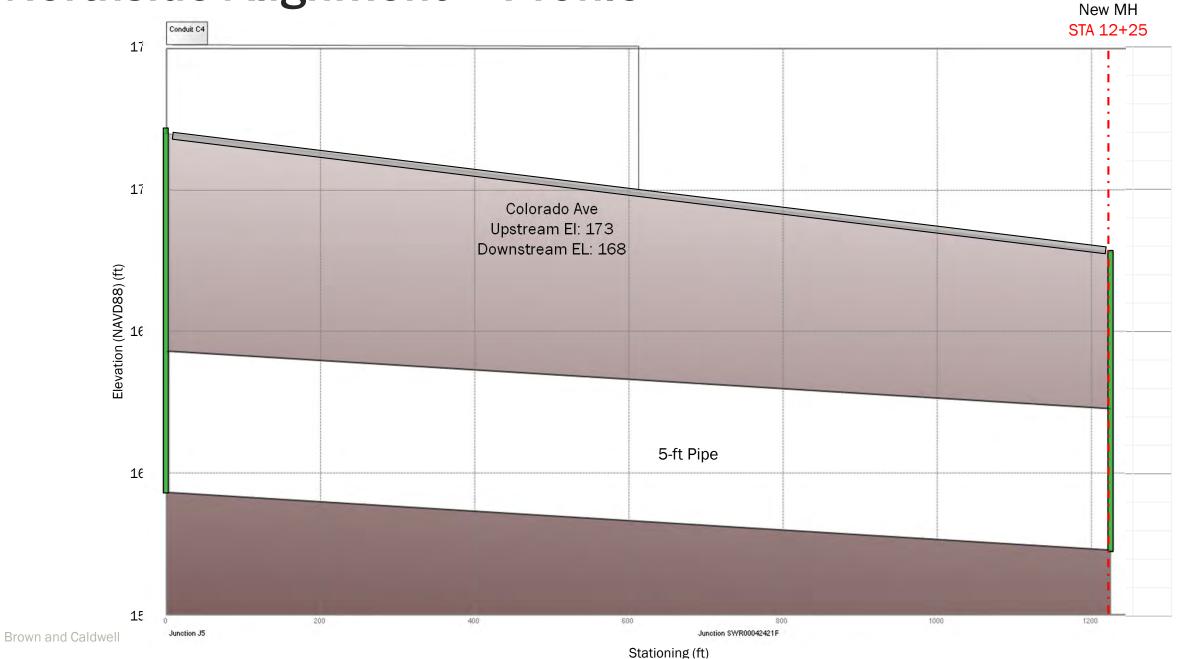
Gillies Creek #4

Northside #1

Northside #1 CSO 011 Conveyance Sewer



Northside Alignment - Profile



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

		ltem	Unit	Quantity	Unit Cost	Total Amount
0.	Str	ucture Dimensions				
	a.	Structure				
			•			
1.	Ge	neral				
	a.	Site Prep	ACRE	1	\$250,000.00	\$250,000.00
					General Subtotal	\$250,000
2.	Civ	il				
	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.		nstruction Total				
		Subtotal A				\$5,082,625
		Design Contingency	LS	1	40%	\$2,033,050
	-	Subtotal B	LS	1	F00/	\$7,115,675
		General Conditions	LS	1	50%	\$3,557,838
		Subtotal C Bonds and Insurance	LS	1	3%	\$10,673,513 \$320,205
	1.	DUTIUS ATTU TITSUTATIVE	LS	1	3%	φ3∠U,2U5
-	1			To	tal Estimated Cost	\$10,993,718
Щ				10	itai Estilliateu COST	\$10,883,718

4.	Cap	pital Total				
	a.	Construction Cost Total				\$10,993,718
	b.	Capital Contingency	LS	1	50%	\$5,496,859
	Total Estimated Capital Cost					

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.	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

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

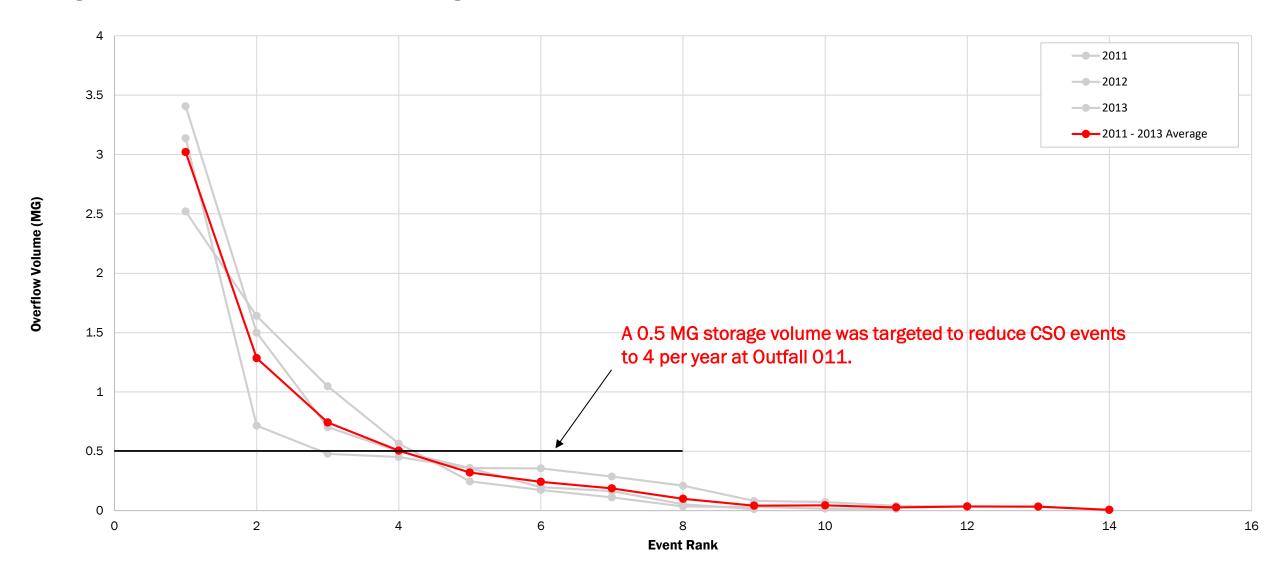
Northside #2

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.	Str	ruct	ure Dimensions				
	a.	_	w Diversion Structure				
		_	Length	LF	20		
			Width	LF	30		
	la.	_	Depth Chartes Chartes	LF	30		
	b.		w Junction Chamber Length	LF	15		
		_	Width	LF	15		
			Depth	LF	50		
		1					
1.	Ge	ener	ral				
	a.	Sit	e Prep	ACRE	1	\$250,000.00	\$250,000.00
						General Subtotal	\$250,000
2.	Exc	cava	ation for Structures				
	a.	Su	pport of Excavation				
		i.	Sheeting		0.050	445.00	4000 040
			New Diversion Structure Excavation Vertical Area	SF	8,658	\$45.00	\$389,610
		-	Excavation Length Excavation Width	LF LF	34 44		
		-	Excavation Depth	LF	37		
			New Junction Chamber Excavation Vertical Area	SF	10,788	\$45.00	\$485,460
		 	Excavation Length	LF	31	Ψ43.00	Ψ+05,+00
		1	Excavation Width	LF	31		
			Excavation Depth	LF	58		
	b.	So					
		i.	Excavate and Dispose of Soil	CY	4,114	\$90.00	\$370,300
				E	xcavation for S	tructures Subtotal	\$1,245,370
3.			ural			•	
	a.	Ne	w Diversion Structure 20'L x 30'W x 30'D				
		١.	Concrete Base Slab	CY	104	\$775.00	\$80,600
		1	Base Slab Thickness	LF	3	ψ110.00	Ψ00,000
		1	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		
		<u> </u>	Concrete Top Slab	CY	69	\$1,500.00	\$104,000
		<u> </u>	Top Slab Thickness	LF	2		
		-	Top Slab Length	LF	26		
	b.	Ne	Top Slab Width	LF	36		
	U.	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		
	Ĺ	Ĺ	Concrete Exterior Walls	CY	563	\$1,500.00	\$844,444
			Exterior Wall Thickness	LF	4		
	_	_	Exterior Wall Length	LF	76		
-	<u> </u>	1	Exterior Wall Height	LF OV	50	A4 500 55	*== ===
-	\vdash	1	Concrete Top Slab Top Slab Thickness	CY	39	\$1,500.00	\$58,778
	-	1	Top Slab Length	LF LF	2 23	 	
	H	1	Top Slab Width	LF	23		
-	H			Li	20		
	_	1	1			Structural Subtotal	\$1,708,559
4.	Civ	vil					, ,. 12,100
	_	Pip	De .				
		_	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.	Ex	cavation				
		i.	Excavation for 18" Fiber Reinforced Sewer Pipe (40' Max Depth)	CY	171	\$90.00	\$15,400
	<u> </u>	1	Excavation Length	LF	20		
Щ			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
	-		l .	I	Civil Subtotal	\$9,380,467
5.	Me	lechanical				
	g.	. Drain Gates				
		i. Furnish and Install Drain Gates	EA	2	\$37,500.00	\$75,000
			•	Me	echanical Subtotal	\$80,000
6.	Ele	lectrical 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
				Electrica	l and I&C Subtotal	\$50,000
7.		onstruction Total				
		. Subtotal A				\$12,634,396
		. Design Contingency	LS	1	40%	\$5,053,758
			LS	1		\$17,688,154
	_	General Conditions	LS	1	50%	\$8,844,077
	e.		LS	1		\$26,532,231
	f.	Bonds and Insurance	LS	1	3%	\$795,967
				<u> </u>	al Fatimata d O	407 000 100
Щ.				Tota	al 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							

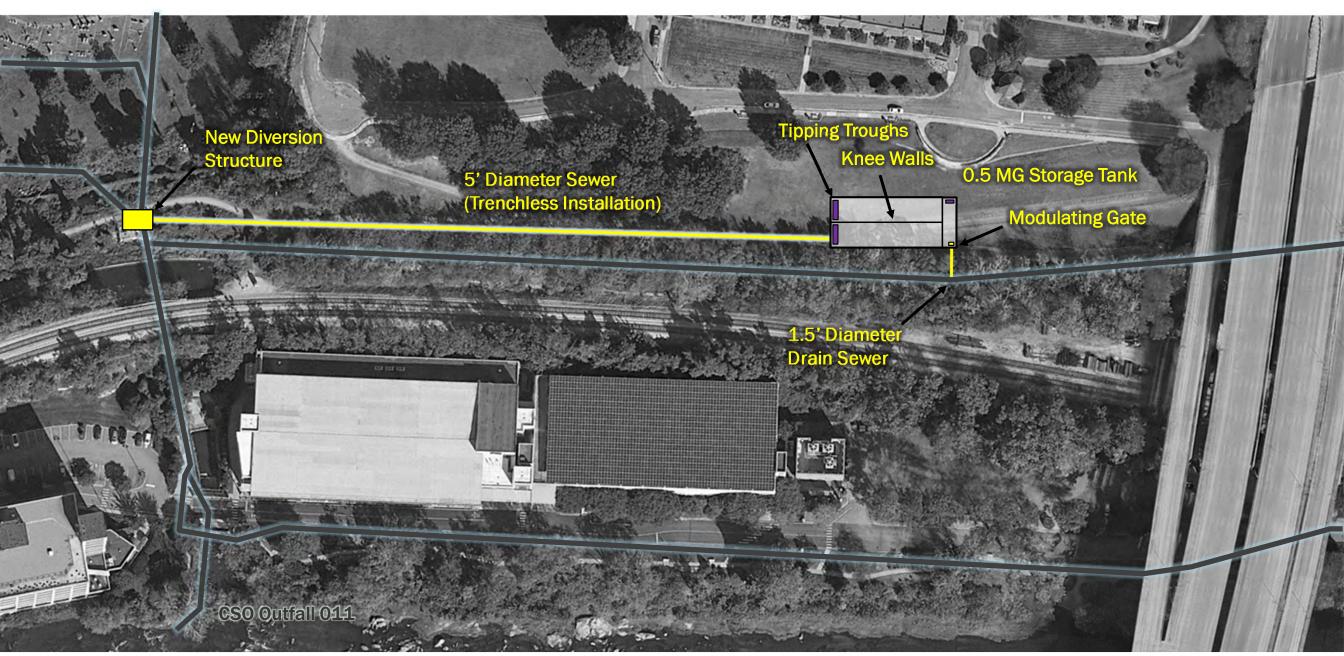
9.	An	nua	al Operations and Maintainence Costs				
	a.	Lal	bor				
		i.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	\$50.00	\$10,400
		ii.	Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	\$50.00	\$4,800
		iii.	Pipe Cleaning (Once every 5 years)	LF	1,120	\$30.00	\$6,720
		iv.	Structure Cleaning (Once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

10.	15-	Yea	ar 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

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

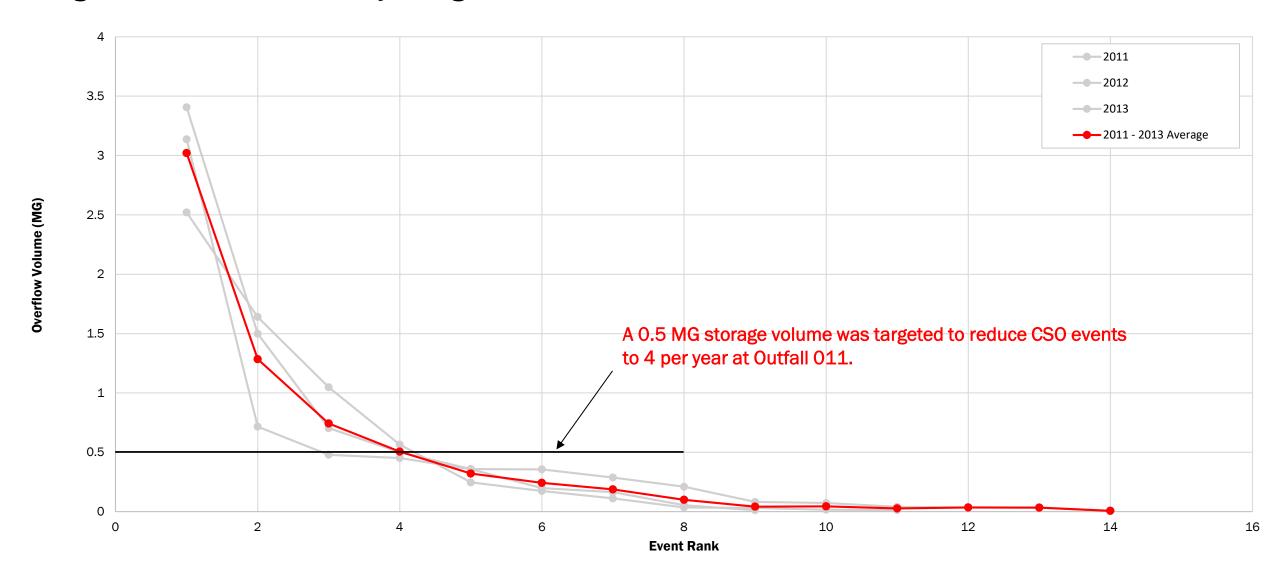
Northside #3

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



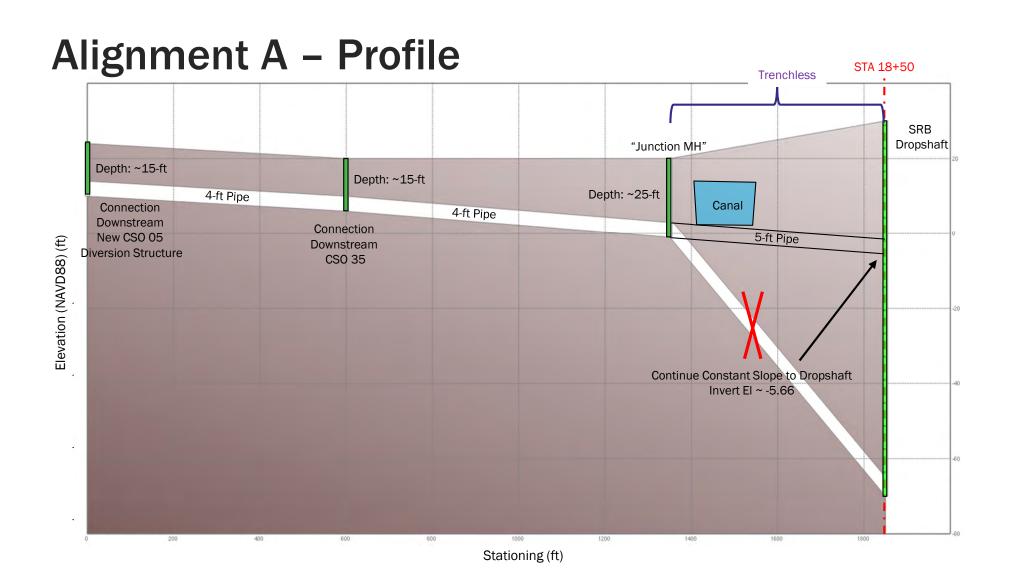
Contention Topic Weight Sone Chine							side #3 ge Tank
1	Category	Topic	Weight	Score	Criteria	Unweighted	Weighted Scor
Construction Cons			2.3	1	4-8 Year project schedule	1	2.3
Controlling		Conflicts with aboveground and/or subsurface features/utilities	1.8	1	None/Minor conflicts Moderate conflicts resolvable through reloactions, reconstruction Major conflicts requiring significant disruption and/or significant relocations	1	1.8
	Constructability	Improvements to existing assets	2	1	Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years	0	0
Relian or construction matters cannot excluded. 1.3 1 1 Colonial drive excessional (20-05) (if it required and/or moderned issues purpling 10° or formation in recursive) 1.5 1 Colonial drive excessional (20-05) (if it required and/or moderned issues purpling 10° or formation is required. 1.6 Colonial drive excessional (20-05) (if it required and/or moderned issues purpling 10° or formation is required to make a few purpling 10° or formation in the control or formation is required to make a few purpling 10° or formation in the control or formation of the control or formation or formation in the control or formation or formation in the control or formation or formation or formation in the control or formation or formation or formation in the control or formation or formation or formation in the control or formation or formation or formation in the control or formation or formation or formation or formation or formation or formation in the control or formation or formation or formation in the control or formation or formation or formation in the control or formation i		Required land acquisition or construction easements	2.3	1	Permanent easements required Land acquisition required	2	4.6
Pair of severe sestem flooding Que se equipment failures 2.5 1		Risk of construction means and methods	1.3	1	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required	0	0
Adaptability and Resillency Adaptability and Resillency and Adaptability and Resillency and Adaptable and Ada		Risk of sewer system flooding due to equipment failures	2.5	1	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition	2	5
OBM Openturally to improve severe system performance 2.9 Signment recursion in 15/05 folds as compand to the easting condition 1 2.9 An included the easting condition 1 1 2.9 An included in the easting condition 1 1 2.9 And probability and familiarity with more Socialized, Equipment And probability and Realized to east on the easting condition Adoptional staff required for operations and maintenance 1.6 1 1.7 in the system while Folds in system wh		New Facility/Equipment maintenance requirements	1.8	2	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended Moderate regular maintenance (Monthly) is required for the equipment to operate as intended	1	1.8
Familiarity with new Facilities/Equipment 1.1 2 2 2 come simular facilities/equipment that are currently operation and maintained at the City 2 2 2 2 2 2 2 come simular facilities/equipment that are currently operated and maintained at the City 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	O&M	Opportunity to improve sewer system performance	2.9	2	Signficant reduction in US/DS HGL as compared to the existing condition Moderate reduction in US/DS HGL as compared to the existing condition	1	2.9
Additional staff required for operations and maintenance 2 3.0 new staff is required for operations and maintenance 3 3.2 new employees are required for the prestions and maintenance 4 3.2 new employees are required for the prestions and maintenance 5 3.2 new employees are required for the prestions and maintenance 6 3.1 2.2 new employees are required for the prestions and maintenance 7 3.4		Familiarity with new Facilities/Equipment	1.1	2	>2 other similar facilities/equipment that are currently operated and maintained at the City 1-2 other similar facilities/equipment that are currently operated and maintained at the City	2	2.2
Adaptability and Resiliency Adaptability and Resiliency to potential climate change scenarios Adaptability and Provided adaptive for the Conference impacts (2-4 adaptional overflow events) in projected climate change scenarios Adaptability and Provided adaptive a 2-2 year floor Adaptability and Resiliency to potential river floods Adaptability and Provided adaptive a 2-2 year flood Adaptability and Resiliency to potential river floods Adaptability and Resiliency to potential river floods and resilience floods and res		Additional staff required for operations and maintenace	1.6	2	No new staff is required for operation and maintenace 1-2 new employees are required for the operation and maintenace	2	3.2
Adaptability and Resiliency to potential climate change impacts 4.4 Moderate performance impacts (2.4 additional overflow events) in projected climate change scenarios 2 8.8 Resiliency to potential climate change impacts 3.4 Moderate maptable (2.4 additional overflow events) in projected climate change scenarios 2 8.8 Resiliency to potential river floods 3.4 1 Moderate magnitus 2.5 year flood 2 6.8 Protected against a 2.5 year flood 2 7.8 Opportunities to Coordinate with Future Development 2.3 2 High potential for known rask ream; cl. Syears) future development 2.3 2 High potential for known rask ream; cl. Syears) future development 2.3 2.3 Required Fed/State Permits/Coordination 2 1 Federal/state at anomaly development 2.3 2 Federal/state 2 Federal/state 2 Federal/state 2 Federal/state 2 Federal/state 2 Federal/stat			3.4	2	Project supports future improvements or is foundational for future improvements Additional modifications needed to support future improvements	1	3.4
Resiliency to potential river floods Resiliency to potential river floods 1 Protected against a 25-year flood Not protected against a 25-year flood Not protected against a 25-year flood Protected against a 25-year flood Not protected against a 25-year flood Protected against a 25-year flo		Resiliency to potential climate change impacts	4.4	1	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios	2	8.8
Opportunites to Coordinate with Future Development 2.3 1 Moderate potential for known near term long term (>5 years) future development 1 2.3 No known or potential development in next 10 years Project located in Environmentally sensitive areas 3.3 1 Located within the RMA 1 3.3 1 Located within the Resource Protection Area (RPA) Project located in Environmentally sensitive areas 3.3 1 Located within the Resource Protection Area (RPA) 1 Moderate primits required, species studies/relocation required, stream/wetlands mitigation required 1 2.3 A Located within the Resource Protection Area (RPA) 1 Located within the Resource Protection Area (RPA) 2 Minimal modifications would be required for the City's VPDES permit 2 Yes Opportunities for Water Quality Improvements in Environmental Justice Areas Opportunity of provide community give back (public space improvements) 1 Adjacent 2 Yes 1 Adjacent 2 Yes Opportunity of provide community give back (public space improvements) 1 Adjacent 2 Minimal impacts to the community during construction Tree Removal/Mitigation 2 Minimal reversion and/or noise in residential areas) during construction Tree Removal/Mitigation 2 Minimal reversion required. Species studies/relocation required. Springers primits required for the City's VPDES permit 2 Yes 2 Yes 2 Yes 2 Yes 3 Adjacent 2 Yes 3 Adjacent 3 Adjacent 4 Adjacent 5 Adjacent 5 Adjacent 6 Oportunity or provide community give back (public space improvements) 1 Adjacent 2 Yes 3 Adjacent 4 Adjacent 5 Adjacent 6 Oportunity or provide community give back (public space improvements) 1 Adjacent 2 Yes 3 Adjacent 4 Adjacent 5 Adjacent 6 Oportunity or provide community during construction 7 Adjacent 8 Adjacent 9 Adjacent		Resiliency to potential river floods	3.4	1	Protected against a 25-year flood Not protected against a 25-year flood	2	6.8
Required Fed/State Permits/Coordination 2		Opportunites to Coordinate with Future Development	2.3	0	Moderate potential for known near term long term (>5 years) future development No known or potential development in next 10 years	1	2.3
Project located in Environmentally sensitive areas 3.3 1 Located within the RMA 1 3.3 0 Located within the Resource Protection Area (RPA) Required VPDES permitting modifications	nd Hoo and Darmitting		2	1 0	Federal/state nationwide/general permits required Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required	1	2
Required VPDES permitting modifications 0.8 1	id ose and Fermitting		3.3	1	Located within the RMA	1	3.3
Community Community Commu		Required VPDES permitting modifications	0.8	1	Moderate modifications would be required for the City's VPDES permit	2	1.6
Community Opportunity to provide community give back (public space improvements) 2.9 1 Adjacent 2 5.8			3.5	1	Yes Adjacent	2	7
Impacts to community during construction 2.1 2 Minimal impacts to the community during construction 1 Moderate impacts (traffic detours and/or noise in residential areas) during construction 0 0 0	Community		2.9	2	Yes	2	5.8
Tree Removal/Mitigation 2.3 1 Moderate tree removal/mitigation (0.2-1 acres) is required 1 2.3	Community	Impacts to community during construction	2.1	2 1 0	Moderate impacts (traffic detours and/or noise in residential areas) during construction Significant impacts (road closures, park closures, significant noise in residential areas) during construction	0	0
		Tree Removal/Mitigation	2.3	1	Moderate tree removal/mitigation (0.2-1 acres) is required	1	2.3

Dock Street #1

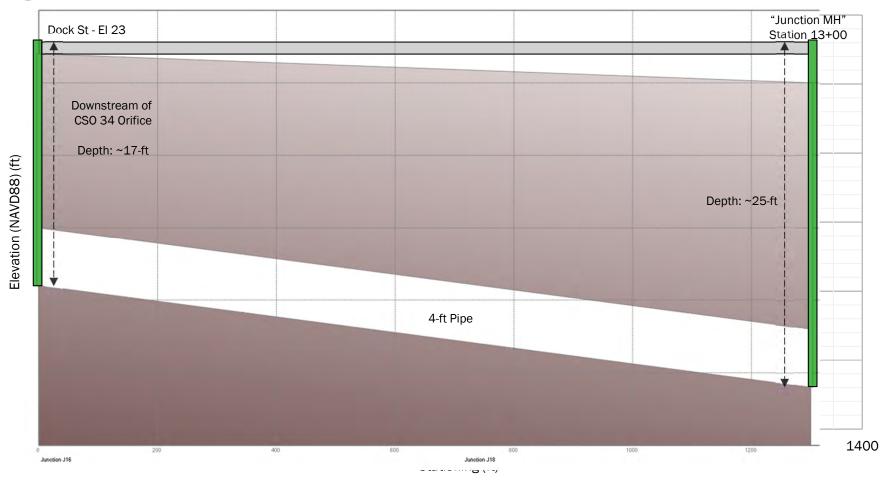
Dock Street #1 CSO 005, 034, and 035 Conveyance Sewer

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





Alignment B - Profile



Brown and Caldwell

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. S	tru	ructure Dimensions	-			
а	. [New Diversion Structure				
	i	i. Length	LF	20		
	Ţ	ii. Width	LF	30		
	i	iii. Depth	LF	30		
b	. 5	Storage Tank (Covered)				
	i	i. Length	LF	50		
	i	ii. Width	LF	125		
	l	iii. Depth	LF	50		
С	. (Odor Control Vault				
	l	i. Length	LF	30		
	Ti	ii. Width	LF	30		
	- i	iii. Depth	LF	20		
•						
1. G	en	eneral				
а		Site Prep	ACRE	0.5	\$250,000.00	\$125,000.00
	T					
•					General Subtotal	\$125,000
2. E	xca	cavation for Structures				
а		Support of Excavation				
	li	i. Sheeting				
	T	New Diversion Structure Excavation Vertical Area	SF	8,658	\$45.00	\$389,610
	T	Excavation Length	LF	34		
	1	Excavation Width	LF	44		
	7	Excavation Depth	LF	37		
	T	Storage Tank (Covered) Excavation Vertical Area	SF	36,018	\$45.00	\$1,620,810
	+	Excavation Length	LF	66	\$10.00	¥2,020,020
-+	+	Excavation Width	LF	141		
-+	+	Excavation Depth	LF	58		
	+	Odor Control Vault Excavation Vertical Area	SF	5,544	\$45.00	\$249,480
	+	Excavation Length			\$45.00	ΨZ49,40U
	+	Excavation Length Excavation Width	LF	42		
	+		LF	42		
	۷,	Excavation Depth	LF	22		
b	. 3	<u> </u>	01/	00.470	***	40.110.007
	- '	i. Excavate and Dispose of Soil	CY	23,478	\$90.00	\$2,113,027
				vocustion for C	tructures Subtotal	\$4,372,927
3. S	tru	ructural		.xcavation for 5	tructures Subtotai	Ψ4,512,921
		New Diversion Structure		1		
	Ť	i. 20'L x 30'W x 30'D				
	7	Concrete Base Slab	CY	104	\$775.00	\$80,600
	T	Base Slab Thickness	LF	3	7	,,,,,,,
	T	Base Slab Length	LF	26		
	+	Base Slab Width	LF	36		
	+	Concrete Exterior Walls	CY	373	\$1,500.00	\$560,000
\vdash	+	Exterior Wall Thickness	LF	3	¥±,500.00	¥500,000
H	+	Exterior Wall Length	LF	112		
\vdash	+	Exterior Wall Height	LF	30	 	
\vdash	+	Concrete Top Slab		69	\$1 500 00	\$104.000
\vdash	+	Top Slab Thickness	CY		\$1,500.00	\$104,000
\vdash	+	•	LF LF	2		
\vdash	+	Top Slab Length Top Slab Width		26		
b		<u> </u>	LF	36		
D	· `	i. 50'L x 125'W x 50'D				
	ď	Concrete Base Slab	CY	1,143	\$775.00	\$885,681
	H	Base Slab Thickness	LF	4	\$115.00	Ψ000,001
	+	Base Slab Length	LF	58		
	+	Base Slab Width	LF	133	 	
	+	Concrete Exterior Walls		2,711	\$1 500 00	\$4 OSS SS7
\vdash	+	Exterior Wall Thickness	CY LF	4	\$1,500.00	\$4,066,667
	4					
-+	+	Exterior Wall Length	LF	366		
	+	Exterior Wall Height		EO		
	1	Exterior Wall Height	LF OV	50	A4 F00 0	40== 111
		Concrete Top Slab	CY	571	\$1,500.00	\$857,111
		_			\$1,500.00	\$857,111

2

4. Civil a. Pip ii. b. Exc c. Tre	Top Slab Width or Control Vault 30'L x 30'W x 20'D Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness Top Slab Length	CY LF LF CY LF LF CY LF CY CY	133 128 3 34 34 190 2 128	\$775.00 \$1,500.00	\$99,544 \$284,444
4. Civil a. Pipu ii. b. Exc i. C. Tre	Concrete Base Slab Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness	LF LF CY LF LF LF LF	3 34 34 190 2 128		
a. Pip i. ii. b. Exc i. c. Tre	Base Slab Thickness Base Slab Length Base Slab Width Concrete Exterior Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness	LF LF CY LF LF LF LF	3 34 34 190 2 128		
a. Pip i. ii. b. Exc i. c. Tre	Base Slab Length Base Slab Width Concrete Exterior Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness	LF CY LF LF	34 34 190 2 128	\$1,500.00	\$284,444
a. Pip i. i. b. Exc i. c. Tre	Base Slab Width Concrete Exterior Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness	LF CY LF LF	34 190 2 128	\$1,500.00	\$284,444
a. Pip i. i. b. Exc i. c. Tre	Concrete Exterior Walls Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness	CY LF LF LF	190 2 128	\$1,500.00	\$284,444
a. Pip i. ii. b. Exc i. c. Tre	Exterior Wall Thickness Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness	LF LF LF	2 128	\$1,500.00	\$284,444
a. Pip i. ii. b. Exc i. c. Tre	Exterior Wall Length Exterior Wall Height Concrete Top Slab Top Slab Thickness	LF LF	128		
a. Pip i. ii. b. Exc i. c. Tre	Exterior Wall Height Concrete Top Slab Top Slab Thickness	LF			
a. Pip i. ii. b. Exc i. c. Tre	Concrete Top Slab Top Slab Thickness				
a. Pipi i. ii. b. Exc i. c. Tre	Top Slab Thickness	CY	20		
a. Pipi i. ii. b. Exc i. c. Tre	-		86	\$1,500.00	\$128,444
a. Pipi i. ii. b. Exc i. c. Tre	Ton Slah Longth	LF	2		
a. Pipi i. ii. b. Exc i. c. Tre	10h olan relikili	LF	34		
a. Pipi i. ii. b. Exc i. c. Tre	Top Slab Width	LF	34		
a. Pipi i. ii. b. Exc i. c. Tre					
a. Pipi i. ii. b. Exc i. c. Tre				Structural Subtotal	\$7,066,493
i. ii. b. Exc					
b. Exc					
b. Exc	Furnish and Install 60" Fiber Reinforced Sewer Pipe (Trenchless)	LF	700	\$4,800.00	\$3,360,000
i.	Furnish and Install 18" Fiber Reinforced Sewer Pipe (40' Depth)	LF	50	\$600.00	\$30,000
c. Tre	cavation				
	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		
i.	enchless Utility Installation				
	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		
$\sqcup \sqcup \sqcup$	Excavation Depth	LF	40		
	pport of Excavation				
i.	Sheeting				
$\sqcup \sqcup \sqcup$	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
			L	0: ::0	* 4 00 4 000
- 1.4				Civil Subtotal	\$4,304,333
5. Mecha					
	ping Troughs Teurnish and Install Tipping Troughs	F.A.	^	¢75.000.00	¢450.000
	Furnish and Install Tipping Troughs	EA	2	\$75,000.00	\$150,000
	ain Gates	ΕΛ.	2	\$27 F00 00	↑ 75,000
	Furnish and Install Drain Gates or Control	EA	2	\$37,500.00	\$75,000
1 1 1 1		OFM	5,000	\$50.00	#000 447
	Exhaust Fans and Carbon Adsorber	CFM	5,208	\$50.00	\$260,417
			l Na	achanical Subtatal	\$400,000
6. Electric	cal and I&C		IVIE	echanical Subtotal	\$490,000
	scellaneous Electrical and I&C				
	Furnish and Install Electrical and I&C (Other)	LS	1	\$196,000.00	\$196,000
	Turnish and histail Electrical and 1&0 (Other)	LS		\$190,000.00	\$190,000
	<u> </u>		Flectrica	I and I&C Subtotal	\$196,000
7. Constru	ruction Total		Liccuid	. and ido oublotal	Ψ130,000
	btotal A				\$16,554,753
	sign Contingency	LS	1	40%	\$6,621,901
d. Ger	btotal B	LS	1		\$23,176,654
e. Sub	btotal B neral Conditions	LS LS	1	50%	\$23,176,654 \$11,588,327
f. Bor				50%	\$11,588,327
	neral Conditions	LS	1	50%	\$11,588,327
	neral Conditions btotal C	LS LS	1 1		\$34,764,980

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

		Total Estima	ted Capital Cost	\$53,711,895

). Ar	Annual Operations and Maintainence Costs									
a.	La	bor								
	i.	Weekly Inspections (52 Weeks, 4 Hrs/Ea)	HR	208	\$50.00	\$10,40				
	ii.	Monthly Inspections (12 Months, 8 Hrs/Ea)	HR	96	\$50.00	\$4,80				
	iii.	Pipe Cleaning (Once every 5 years)	LF	750	\$30.00	\$4,50				
	iv.	Structure Cleaning (Once per year)	EA	2	\$10,000.00	\$20,00				
	٧.	Quarterly Cleaning (4 Quarters, 48 Hrs/Ea)	HR	192	\$50.00	\$9,60				
b.	Ma	aintenance of Structures								
	i.	Maintain Structures	LS	0.2%	\$7,066,492.59	\$14,13				
c.	Ma	aintenance of Pipe								
	i.	Maintain Pipe	LS	1.0%	\$3,390,000.00	\$33,90				
d.	Ma	aintenance of Mechanical								
	i.	Maintain Tipping Troughs	LS	3%	\$150,000.00	\$4,50				
	ii.	Maintain Drain Gates	LS	3%	\$75,000.00	\$2,25				
	iii.	Maintain Odor Control Facility	LS	3%	\$260,416.67	\$7,81				
e.	e. Maintenance of Instrumentation and Control									
	i.	Maintain I&C	LS	3%	\$196,000.00	\$5,880				
			Annual Operations an	d Maintainene	Coete Subtotal	\$117.77!				

10.	. 15-Year Replacement Costs						
	a. Electrical and Instrumentation and Control						
	j. Furnish and Install Replacement Electrical and I&C				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

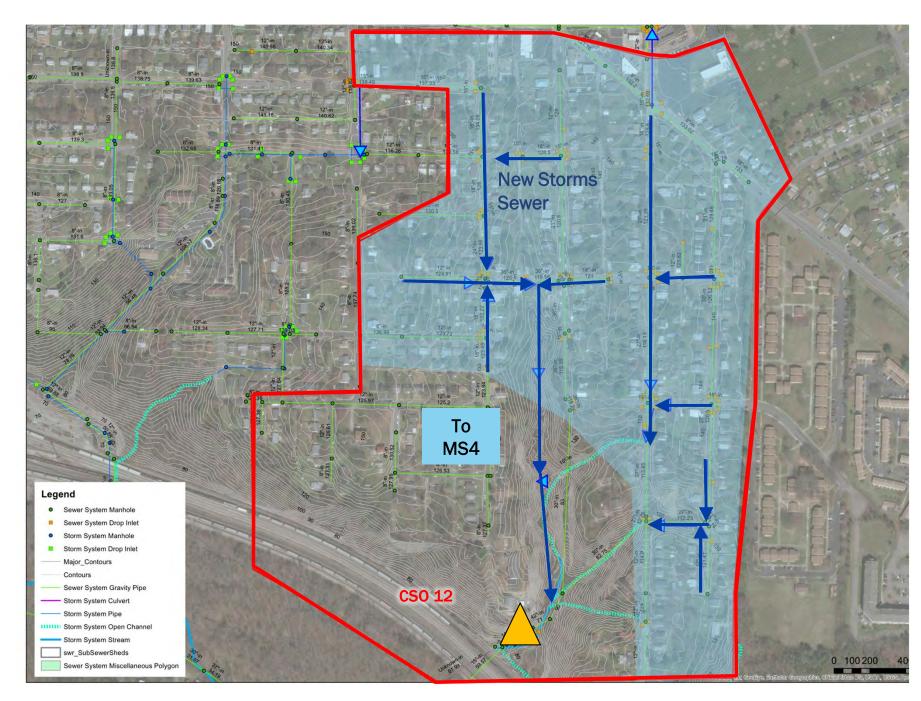
					New	v Sewer	
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Score	
	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2 1	<4 Year project schedule with minimal risks for schedule extension 4-8 Year project schedule	2	4.6	
	Conflicts with aboveground and/or subsurface features/utilities	1.8	0 2 1	>8 Years project schedule with moderate to severe risks for schedule extension None/Minor conflicts Moderate conflicts resolvable through reloactions, reconstruction	1	1.8	
Constructability	Improvements to existing assets	2	0 2 1	Major conflicts requiring significant disruption and/or significant relocations Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years	1	2	
	Required land acquisition or construction easements	2.3	0 2 1	Improvements to existing assets not identified for replacement within next 10 years Construction easements or none required Permanent easements required	1	2.3	
	Risk of construction means and methods	1.3	0 2 1	Land acquisition required No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required	1	1.3	
			0 2	Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition		1.5	
	Risk of sewer system flooding due to equipment failures	2.5	0	Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition	2	5	
	New Facility/Equipment maintenance requirements	1.8	1 0	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended Moderate regular maintenance (Monthly) is required for the equipment to operate as intended Significant regular maintenance (Weekly) is required for the equipment to operate as intended	2	3.6	
O&M	Opportunity to improve sewer system performance	2.9	2 1 0	Signficant reduction in US/DS HGL as compared to the existing condition Moderate reduction in US/DS HGL as compared to the existing condition No reduction in US/DS HGL as compared to the existing condition	0	0	
	Familiarity with new Facilities/Equipment	1.1	2 1 0	>2 other similar facilities/equipment that are currently operated and maintained at the City 1-2 other similar facilities/equipment that are currently operated and maintained at the City No other similar facilities/equipment that are currently operated and maintained at the City	2	2.2	
	Additional staff required for operations and maintenace	1.6	2 1 0	No new staff is required for operation and maintenace 1-2 new employees are required for the operation and maintenace >2 new employees are required for operations and maintenace	2	3.2	
	Ability to support and work in coordination with future combined sewer system improvements	3.4	2 1 0	Project supports future improvements or is foundational for future improvements Additional modifications needed to support future improvements Project will be obsolete or unnecessary after Long Term Plan is implemented	2	6.8	
Adaptability and Resiliency	Resiliency to potential climate change impacts	4.4	2 1 0	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios Significant performance impacts (>4 additional overflow events) in projected climate change scenarios	2	8.8	
	Resiliency to potential river floods	3.4	2 1 0	Protected against a 100-year flood Protected against a 25-year flood Not protected against a 25-year flood	2	6.8	
	Opportunites to Coordinate with Future Development	2.3	2 1	High potential for known near term (<5 years) future development Moderate potential for known near term long term (>5 years) future development No known or potential development in next 10 years	2	4.6	
	Required Fed/State Permits/Coordination	2	2 1 0	No federal or state permits required Federal/state nationwide/general permits required Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required	0	0	
and Use and Permitting	Project located in Environmentally sensitive areas	3.3	2 1 0	Located outside of the Resource Manangement Area (RMA) Located within the RMA Located within the Resource Protection Area (RPA)	0	0	
	Required VPDES permitting modifications	0.8	2 1 0	Minimal modifications would be required for the City's VPDES permit Moderate modifications would be required for the City's VPDES permit Significant modifications would be required for the City's VPDES permit	2	1.6	
	Opportunites for Water Quality Improvements in Environmental Justice Areas	3.5	2 1 0	Yes Adjacent No	1	3.5	
Community	Opportunity to provide community give back (public space improvements)	2.9	2 1 0	Yes Adjacent No	2	5.8	
Community	Impacts to community during construction	2.1	2 1 0	Minimal impacts to the community during construction Moderate impacts (traffic detours and/or noise in residential areas) during construction Signficant impacts (road closures, park closures, significant noise in residential areas) during construction	0	0	
	Tree Removal/Mitigation	2.3	2 1 0	Minimal tree removal/mitigation (<0.2 acres) is required Moderate tree removal/mitigation (0.2-1 acres) is required Signficant tree removal/mitigation (>1 acres) is required	1	2.3	
			<u> </u>		SUM	66	

Dock Street #1

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	<u> </u>			
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
		<u> </u>		
		IC	otal Estimated Cost	\$20,548,500
4. Annual Operations and Maintainence Costs				
a. Labor				
i. Pipe Cleaning (Once every 5 years)	LF	3,000	\$30.00	\$18,000

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

5.	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	

					New Sewer		
Category	Topic	Weight	Score	Criteria	Unweighted Score	Weighted Score	
	Estimated Project Schedule (Design, Permitting, Procurement, Construction) Schedule	2.3	2 1	<4 Year project schedule with minimal risks for schedule extension 4-8 Year project schedule	2	4.6	
	Conflicts with aboveground and/or subsurface features/utilities	1.8	0 2 1	>8 Years project schedule with moderate to severe risks for schedule extension None/Minor conflicts Moderate conflicts resolvable through reloactions, reconstruction	1	1.8	
Constructability	Improvements to existing exects	2	0 2 1	Major conflicts requiring significant disruption and/or significant relocations Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5 years Improvements to existing assets on CIP or otherwise identified for rehab/replacement in next 5-10 years		4	
Constituctability	Improvements to existing assets	2	0 2	Improvements to existing assets on CIP of otherwise identified for replacement within next 10 years Construction easements or none required	2	4	
	Required land acquisition or construction easements	2.3	1 0 2	Permanent easements required Land acquisition required No deep excavation (<20-ft) is required and/or limited bypass pumping (<3 months) is required	1	2.3	
	Risk of construction means and methods	1.3	1 0	Moderate deep excavation (20-40-ft) is required and/or moderate bypass pumping (3-6 months) is required Tunneling or deep excavation (>40-ft deep) is required and/or extensive bypass pumping (>6 months) is required	2	2.6	
	Risk of sewer system flooding due to equipment failures	2.5	2 1 0	Mechanical equipment failure will not impact US/DS HGL as compared to the existing condition Mechanical equipment failure could moderately impact US/DS HGL as compared to the existing condition Mechanical equipment failure could severely impact US/DS HGL as compared to the existing condition	2	5	
	New Facility/Equipment maintenance requirements	1.8	2 1 0	Minimal regular maintenance (Quarterly) is required for the equipment to operate as intended Moderate regular maintenance (Monthly) is required for the equipment to operate as intended Significant regular maintenance (Weekly) is required for the equipment to operate as intended	2	3.6	
O&M	Opportunity to improve sewer system performance	2.9	2 1 0	Signficant reduction in US/DS HGL as compared to the existing condition Moderate reduction in US/DS HGL as compared to the existing condition No reduction in US/DS HGL as compared to the existing condition	2	5.8	
	Familiarity with new Facilities/Equipment	1.1	2 1 0	>2 other similar facilities/equipment that are currently operated and maintained at the City 1-2 other similar facilities/equipment that are currently operated and maintained at the City No other similar facilities/equipment that are currently operated and maintained at the City	2	2.2	
	Additional staff required for operations and maintenace	1.6	2 1 0	No new staff is required for operation and maintenace 1-2 new employees are required for the operation and maintenace >2 new employees are required for operations and maintenace	2	3.2	
	Ability to support and work in coordination with future combined sewer system improvements	3.4	2 1 0	Project supports future improvements or is foundational for future improvements Additional modifications needed to support future improvements Project will be obsolete or unnecessary after Long Term Plan is implemented	2	6.8	
Adaptability and Resiliency	Resiliency to potential climate change impacts	4.4	2 1 0	Minimal performance impacts (0-1 additional overflow events) in projected climate change scenarios Moderate performance impacts (2-4 additional overflow events) in projected climate change scenarios Significant performance impacts (>4 additional overflow events) in projected climate change scenarios	2	8.8	
	Resiliency to potential river floods	3.4	2 1 0	Protected against a 100-year flood Protected against a 25-year flood Not protected against a 25-year flood	2	6.8	
	Opportunites to Coordinate with Future Development	2.3	2 1 0	High potential for known near term (<5 years) future development Moderate potential for known near term long term (>5 years) future development No known or potential development in next 10 years	1	2.3	
	Required Fed/State Permits/Coordination	2	2 1 0	No federal or state permits required Federal/state nationwide/general permits required Federal/state individual permits required, species studies/relocation required, stream/wetlands mitigation required	2	4	
and Use and Permitting	Project located in Environmentally sensitive areas	3.3	2 1 0	Located outside of the Resource Manangement Area (RMA) Located within the RMA Located within the Resource Protection Area (RPA)	2	6.6	
	Required VPDES permitting modifications	0.8	2 1 0	Minimal modifications would be required for the City's VPDES permit Moderate modifications would be required for the City's VPDES permit Significant modifications would be required for the City's VPDES permit	2	1.6	
	Opportunites for Water Quality Improvements in Environmental Justice Areas	3.5	2 1 0	Yes Adjacent No	2	7	
Community	Opportunity to provide community give back (public space improvements)	2.9	2 1 0	Yes Adjacent No	2	5.8	
Community	Impacts to community during construction	2.1	2 1 0	Minimal impacts to the community during construction Moderate impacts (traffic detours and/or noise in residential areas) during construction Signficant impacts (road closures, park closures, significant noise in residential areas) during construction		0	
	Tree Removal/Mitigation	2.3	2 1 0	Minimal tree removal/mitigation (<0.2 acres) is required Moderate tree removal/mitigation (0.2-1 acres) is required Signficant tree removal/mitigation (>1 acres) is required	1	2.3	
					SUM	87	

Hilton Street #1