APPENDIX I
Detailed Costs

Rough Order of Magnitude Cost Estimate for Treatment at Old Outfall 002 without Iron Removal
Chemours Fayetteville Works, North Carolina

Basis of Cost Estimate (Scope and Assumptions):
Direct Discharge-750 gpm without Iron Removal, No Pre-Fab Building
Scaled costs used from 1000 gpm (Using six-tenths rule of cost estimation)

Item	Qty	Unit	Unit Cost	Total	Notes
Construction Costs					
Influent & Effluent Handling	Process Package		$ 108,000	$ 108,000	
Multi Media Filtration	Process Package		$ 331,000	$ 331,000	
Granular Activated Carbon	Process Package		$ 1,239,000	$ 1,239,000	
Solids Handling and Chemical Precipitation	Process Package		$ 1,074,000	$ 1,074,000	
Prefabricated Building & Containment Structure	Process Package		$ -	$ -	
Land Costs	Package		$ -	$ -	
Raw Construction Costs				$ 2,752,000	
Installation Cost (Construction, Site Preparation, Civil, Structural)	60%	of	Raw Construction Costs	$ 1,700,000	
Anciliary Cost (I&C, Piping-Mechanical & Electrical)	40%	of	Sum of Raw Construction Costs and Installation Cost	$ 1,800,000	
Total Construction Cost	Sum	of	Raw Construction Costs, Installation Cost and Anciliary Cost	$ 6,300,000	
Professional Services Costs					
Engineering and Project Management	12%	of	Total Construction Cost	$ 800,000	
Construction Management, Project Management, General Conditions	8%	of	Sum of Total Construction Cost, Engineering/PM & Contingency Costs	$ 800,000	
Professional Services Subtotal				$ 1,600,000	
Contingency	30%	of	Sum of Total Construction Cost and Engineering/PM cost	$ 2,200,000	
C_0,Construction Cost				**$ 10,100,000**	
+50%				$ 15,150,000	
-30%				$ 7,070,000	
Annual Operations & Maintenance Costs					
Electricity			$ 26,680	$ 26,680	
GAC Usage & Replacement			$ 552,000	$ 552,000	
Chemicals for treatment (Acid, Caustic, Ferric, Polymer)			$ 27,000	$ 27,000	
Solids Disposal			$ 25,000	$ 25,000	
Sampling & Analytical			$ 53,000	$ 53,000	
Operational Labor			$ 450,000	$ 450,000	
Equipment Maintenance			$ 237,000	$ 237,000	
Annual O&M Subtotal				$ 1,400,000	
C,Annual Cost				**$ 1,400,000**	
+50%				$ 2,100,000	
-30%				$ 980,000	
n,Years	**20**				
r,Discount Rate	**3.5%**				
Present Worth Formula	$PV = C_0 + C\left[\frac{(1+r)^n - 1}{r(1+r)^n}\right]$				
Total: Present Worth Value of Construction & Annual O&M Costs over 20 Years				**$ 30,000,000**	
+50%				$ 45,000,000	
-30%				$ 21,000,000	

Costs are rough order of magnitude estimates, and assumed to represent the actual installed cost within a range of -30%/ +50% of the value indicated above. The estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on final approved design, actual labor and material costs, and competitive variable factors. These estimates are not intended for budgetary or future planning purposes; they have been prepared to facilitate an inter-remedial alternative comparison.

Rough Order of Magnitude Cost Estimate for Interim Seep Remedies: Flow Through Cells (Seeps A-C) and French Drain (Seep D)
Chemours Fayetteville Works, North Carolina

Basis of Cost Estimate (Scope and Assumptions):
IM: Seeps A, B, and C Flow Through Structures, and Seep D French Drain capture
See supporting document for treatment scenario, assumptions, and drawing

Item	Qty	Unit	Unit Cost	Total	Notes
Construction Costs					
Flow Through Cells A-C					
Road Installation Along River	1	Lump	$ 500,000	$ 500,000	
Clearing, Grubbing, and Seep Access	3	Seep	$ 10,000	$ 30,000	
Sheet Pile Installation	1,350	ft^2	$ 40	$ 54,000	
Gabion Baskets and Frame (1 frame and 3 baskets per seep)	3	Seep	$ 6,200	$ 18,600	
First Install GAC Seep A	3,742	Pound	$ 1.50	$ 5,613	
First Install GAC Seep B	3,742	Pound	$ 1.50	$ 5,613	
First Install GAC Seep C	3,742	Pound	$ 1.50	$ 5,613	
French Drain D					
Pipeline and Power Installation Along River	2,000	linear ft	$ 29	$ 58,000	
Lift Station at south end	1	lump	$ 25,000	$ 25,000	
Clearing, Grubbing, and Seep Access	1	Seep	$ 10,000	$ 10,000	
French Drain Installation	360	ft^2	$ 42	$ 15,120	
Sump Pump Installation	1	Seep	$ 2,980	$ 2,980	
Feeder Electrical and discharge Line Seep D	910	linear ft	$ 29	$ 26,390	
Raw Construction Costs				$ 756,930	
	Sum	of	Raw Construction Costs, Installation Cost and Anciliary Cost	$ 800,000	
Total Construction Cost					
Professional Services Costs					
Engineering and Project Management	12%	of	Total Construction Cost	$ 100,000	
Construction Management, Project Management, General Conditions	18%	of	Sum of Total Construction Cost, Engineering/PM & Contingency Costs	$ 220,000	
Professional Services Subtotal				$ 320,000	
Contingency	30%	of	Sum of Total Construction Cost and Engineering/PM cost	$ 270,000	
C_0,Construction Cost				**$ 1,400,000**	
+50%				$ 2,100,000	
-30%				$ 980,000	

Rough Order of Magnitude Cost Estimate for Interim Seep Remedies: Flow Through Cells (Seeps A-C) and French Drain (Seep D)
Chemours Fayetteville Works, North Carolina

Annual Operations & Maintenance Costs						
Flow Through Cells A-C						
GAC Usage & Replacement	82,328	pound	$	1.50	$	123,493
GAC Changeout Equipment and Labor	12	event	$	3,200.00	$	38,400
Brush clearing and Path Maintenance	12	monthly	$	2,500	$	30,000
Solids Disposal	4	event	$	640	$	2,560
Sampling & Analytical (monthly performance sampling)	12	month	$	14,800	$	177,600
Operational Labor	4	event	$	7,500	$	30,000
Equipment Maintenance	1	event	$	5,000	$	5,000
Road Maintenance	1	event	$	5,000	$	5,000
Storm Damage Repair and Gabion Replacement	1	event	$	18,600	$	18,600
Annual Data Management and Performance Reporting	1	event	$	35,000	$	35,000
French Drain D						
Electrical Power	1	lump	$	2,500.00	$	2,500
GAC Usage & Replacement	10,000	pound	$	1.50	$	15,000
Brush clearing and Path Maintenance	12	monthly	$	500	$	6,000
Solids Disposal	12	event	$	240	$	2,880
Sampling & Analytical (monthly performance sampling)	12	month	$	4,000	$	48,000
Operational Labor	12	event	$	1,500	$	18,000
Equipment Maintenance	1	event	$	3,000	$	3,000
Road, Pipe, and Power Maintenance	1	event	$	5,000	$	5,000
Storm Damage Repair and Pump Replacement	1	event	$	10,000	$	10,000
Annual O&M Subtotal					$	580,000
C,Annual Cost					**$**	**600,000**
+50%					$	870,000
-30%					$	406,000

Costs are rough order of magnitude estimates, and assumed to represent the actual installed cost within a range of -30%/ +50% of the value indicated above. The estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on final approved design, actual labor and material costs, and competitive variable factors. These estimates are not intended for budgetary or future planning purposes; they have been prepared to facilitate an inter-remedial alternative comparison.

Rough Order of Magnitude Cost Estimate for Low Range Permanent Seep Remedy: Flow Through Cells (Seeps A-C) and French Drain (Seep D)
Chemours Fayetteville Works, North Carolina

Basis of Cost Estimate (Scope and Assumptions):
IM: Seeps A, B, and C Flow Through Structures, and Seep D French Drain capture
See supporting document for treatment scenario, assumptions, and drawing

Item	Qty	Unit	Unit Cost	Total	Notes
Construction Costs					
Flow Through Cells A-C					
Road Installation Along River	1	Lump	$ 500,000	$ 500,000	
Clearing, Grubbing, and Seep Access	3	Seep	$ 10,000	$ 30,000	
Sheet Pile Installation	1,350	ft^2	$ 40	$ 54,000	
Gabion Baskets and Frame (1 frame and 3 baskets per seep)	3	Seep	$ 6,200	$ 18,600	
First Install GAC Seep A	3,742	Pound	$ 1.50	$ 5,613	
First Install GAC Seep B	3,742	Pound	$ 1.50	$ 5,613	
First Install GAC Seep C	3,742	Pound	$ 1.50	$ 5,613	
French Drain D					
Pipeline and Power Installation Along River	2,000	linear ft	$ 29	$ 58,000	
Lift Station at south end	1	lump	$ 25,000	$ 25,000	
Clearing, Grubbing, and Seep Access	1	Seep	$ 10,000	$ 10,000	
French Drain Installation	360	ft^2	$ 42	$ 15,120	
Sump Pump Installation	1	Seep	$ 2,980	$ 2,980	
Feeder Electrical and discharge Line Seep D	910	linear ft	$ 29	$ 26,390	
Raw Construction Costs				$ 756,930	
Total Construction Cost	Sum	of	Raw Construction Costs, Installation Cost and Anciliary Cost	$ 800,000	
Professional Services Costs					
Engineering and Project Management	12%	of	Total Construction Cost	$ 100,000	
Construction Management, Project Management, General Conditions	18%	of	Sum of Total Construction Cost, Engineering/PM & Contingency Costs	$ 220,000	
Professional Services Subtotal				$ 320,000	
Contingency	30%	of	Sum of Total Construction Cost and Engineering/PM cost	$ 270,000	
C_0,Construction Cost				**$ 1,400,000**	
+50%				$ 2,100,000	
-30%				$ 980,000	

Rough Order of Magnitude Cost Estimate for Low Range Permanent Seep Remedy: Flow Through Cells (Seeps A-C) and French Drain (Seep D)
Chemours Fayetteville Works, North Carolina

Annual Operations & Maintenance Costs						
Flow Through Cells A-C						
GAC Usage & Replacement	82,328	pound	$	1.50	$	123,493
GAC Changeout Equipment and Labor	12	event	$	3,200.00	$	38,400
Brush clearing and Path Maintenance	12	monthly	$	2,500	$	30,000
Solids Disposal	4	event	$	640	$	2,560
Sampling & Analytical (monthly performance sampling)	12	month	$	14,800	$	177,600
Operational Labor	4	event	$	7,500	$	30,000
Equipment Maintenance	1	event	$	5,000	$	5,000
Road Maintenance	1	event	$	5,000	$	5,000
Storm Damage Repair and Gabion Replacement	1	event	$	18,600	$	18,600
Annual Data Management and Performance Reporting	1	event	$	35,000	$	35,000
French Drain D						
Electrical Power	1	lump	$	2,500.00	$	2,500
GAC Usage & Replacement	10,000	pound	$	1.50	$	15,000
Brush clearing and Path Maintenance	12	monthly	$	500	$	6,000
Solids Disposal	12	event	$	240	$	2,880
Sampling & Analytical (monthly performance sampling)	12	month	$	4,000	$	48,000
Operational Labor	12	event	$	1,500	$	18,000
Equipment Maintenance	1	event	$	3,000	$	3,000
Road, Pipe, and Power Maintenance	1	event	$	5,000	$	5,000
Storm Damage Repair and Pump Replacement	1	event	$	10,000	$	10,000
Annual O&M Subtotal					$	580,000
C,Annual Cost					**$**	**600,000**
+50%					$	870,000
-30%					$	406,000
n,Years	**20**					
r,Discount Rate	**3.5%**					
Present Worth Formula	$PW = C_{ann} \times C\left[\frac{(1+r)^n - 1}{r(1+r)^n}\right]$					

Total: Present Worth Value of Construction & Annual O&M Costs over 20 Years	**$**	**9,000,000**
+50%	$	13,500,000
-30%	$	6,300,000

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Rough Order of Magnitude Cost Estimate for High Range Permanent Seep Remedy: Ex Situ Capture using French Drains at All Seeps
Chemours Fayetteville Works, North Carolina

Basis of Cost Estimate (Scope and Assumptions):
Seeps A, B, C, and D Capture and Treat using French Drains. Would require dismantling flow through cells at Seeps A-C
See supporting document for treatment scenario, assumptions, and drawing

Item	Qty	Unit		Unit Cost		Total	Notes
Construction Costs							
Deconstruction of Flow Through Cells at Seeps A-C	1	lump	$	100,000	$	100,000	
Treatment Plant Expansion to Handle Additional 300 gpm Flow	1	lump	$	6,800,000	$	6,800,000	
Pipeline and Power Installation Along River	5,900	linear ft	$	29	$	171,100	
Lift Station at south end	1	lump	$	25,000	$	25,000	
Clearing, Grubbing, and Seep Access	3	Seep	$	10,000	$	30,000	
French Drain Installation	1,080	ft^2	$	42	$	45,360	
Sump Pump Installation	3	Seep	$	2,980	$	8,940	
Feeder Electrical and discharge Line Seep A	800	linear ft	$	29	$	23,200	
Feeder Electrical and discharge Line Seep B	720	linear ft	$	29	$	20,880	
Feeder Electrical and discharge Line Seep C	670	linear ft	$	29	$	19,430	
Raw Construction Costs					$	7,243,910	
	Sum	of	Raw Construction Costs, Installation Cost and Anciliary Cost		$	7,300,000	
Total Construction Cost							
Professional Services Costs							
Engineering and Project Management	12%	of	Total Construction Cost		$	900,000	
Construction Management, Project Management, General Conditions	18%	of	Sum of Total Construction Cost, Engineering/PM & Contingency Costs		$	2,000,000	
Professional Services Subtotal					$	2,900,000	
Contingency	30%	of	Sum of Total Construction Cost and Engineering/PM cost		$	2,500,000	
C_0,Construction Cost					**$**	**12,700,000**	
+50%					$	19,050,000	
-30%					$	8,890,000	
Annual Operations & Maintenance Costs							
Electrical Power	1	lump	$	25,000.00	$	25,000	
GAC Usage & Replacement	90,000	pound	$	1.50	$	135,000	
Brush clearing and Path Maintenance	12	monthly	$	2,500	$	30,000	
Solids Disposal	12	event	$	320	$	3,840	
Sampling & Analytical (monthly performance sampling)	12	month	$	17,200	$	206,400	
Operational Labor	12	event	$	7,500	$	90,000	
Equipment Maintenance	1	event	$	11,900	$	11,900	
Road, Pipe, and Power Maintenance	1	event	$	35,000	$	35,000	
Storm Damage Repair and Pump Replacement	1	event	$	21,920	$	21,920	
Annual O&M Subtotal					$	560,000	
Annual Cost					**$**	**560,000**	
+50%					$	840,000	
-30%					$	392,000	
n,Years	**20**						
r,Discount Rate	**3.5%**						
Present Worth Formula	$PW = C_0 + C\left[\frac{(1+r)^n - 1}{r(1+r)^n}\right]$						
Total: Present Worth Value of Construction & Annual O&M Costs over 20 Years					**$**	**21,000,000**	
+50%					$	31,500,000	
-30%					$	14,700,000	

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Rough Order of Magnitude Cost Estimate for Interim Groundwater Extraction from Existing Black Creek Monitoring Wells
Chemours Fayetteville Works, North Carolina

Basis of Cost Estimate (Scope and Assumptions):

Extract GW from seven existing black creek monitoring wells for treatment
- BCA-01, PW-15R, PW-14, BCA-02, PIW-09D, PW-10DR, PW-11
- Assumes OOF2 Treatment Plant has excess capacity
- No NPDES permitting required (covered by OOF2)
- Assumes 2 gpm per well (14 gpm total)

Item	Qty	Unit	Unit Cost	Total	Notes
Construction Costs					
Clearing and Grubbing	1	Acre	$ 10,000	$ 10,000	
Subsurface Trenching/Piping - 0.5-inch (Installed)	850	Feet	$ 22	$ 18,700	
Subsurface Trenching/Piping - 1-inch (Installed)	3950	Feet	$ 24	$ 94,800	
Subsurface Trenching/Piping - 2-inch (Installed)	1900	Feet	$ 29	$ 55,100	
Subsurface Trenching Conduit (Installed)	6700	Feet	$ 6	$ 40,200	
Sumbersible Pumps & Controls (Installed)	7	EA	$ 10,000	$ 70,000	
Valve Boxes/Vaults	7	EA	$ 3,000	$ 3,000	
Total Construction Cost				$ 291,800	
Professional Services Costs					
Engineering and Project Management	12%	of	Total Construction Cost	$ 100,000	
Construction Management, Project Management, General Conditions	18%	of	Sum of Total Construction Cost, Engineering/PM & Contingency Costs	$ 200,000	
Professional Services Subtotal				$ 300,000	
Contingency	30%	of	Sum of Total Construction Cost and Engineering/PM cost	$ 200,000	
C_0,Construction Cost				**$ 800,000**	
+50%				$ 1,200,000	
-30%				$ 560,000	
Annual Operations & Maintenance Costs					
Electricity	LS		$ 5,000	$ 5,000	
Operational Labor	LS		$ 58,240	$ 58,240	
Equipment Maintenance	LS		$ 5,000	$ 5,000	
				$ -	
				$ -	
				$ -	
				$ -	
Annual O&M Subtotal				$ 68,240	
C,Annual Cost				**$ 70,000**	
+50%				$ 102,000	
-30%				$ 48,000	

Costs are rough order of magnitude estimates, and assumed to represent the actual installed cost within a range of -30%/ +50% of the value indicated above. The estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on final approved design, actual labor and material costs, and competitive variable factors. These estimates are not intended for budgetary or future planning purposes; they have been prepared to facilitate an inter-remedial alternative comparison.

Rough Order of Magnitude Cost Estimate for Onsite Barrier Wall and Groundwater Capture (Low Range Scenario)
Chemours Fayetteville Works, North Carolina

Basis of Cost Estimate (Scope and Assumptions) for Low Range Onsite Groundwater Remedy:

Dewind one-pass slurry wall to cut off groundwater-surface water interface, with hydraulic containment behind the wall and ex-situ treatment.
Total impacted riverine length is 8,500 linear feet. Geotechnical predesign investigation every 100 feet.
Average depth of barrier wall to key into the Upper Cape Fear Confining Unit is 50 feet.
Based on numerical model drawdown scenarios, extraction wells will be spaced 200 feet apart and pumping rates will range from 20 to 30 gpm.
A total of 41 wells and 930 gpm (1.3 MGD) would be required for hydraulic containment.
The average PMPA and PFMOAA concentration of the extracted groundwater is estimated to be 8,200 and 150,000 ng/L, respectively.
Wells will convey groundwater under pressure to the new standalone system, with basic heat tracing (no prefabricated building).
Piping will be HDPE and trenches will be approximately 3 feet deep, and reuse of excacated soils as backfill will be permitted.
HDPE pipe sizes range from 2 to 18 inch diameter SDR 11.
Treated groundwater will be discharged to the Cape Fear river.
Includes a 20-year net present value cost with a 3.5% discount factor applied.
Parameters that were estimated using RACER v 11.2.16.0 are identified below, and are fully marked-up costs.

Item	Qty	Unit	Unit Cost	Total	Notes
Construction Costs					
Barrier Wall					
Geotechnical predesign investigation	4,250	LF	$ 100	$ 425,000	Engineer's Estimate
Contractor mob and demob	1	LS	$ 100,000	$ 100,000	Dewind
Site clearing and prep (veg clearing, grading, E&S)	8	ACRE	$ 100,000	$ 780,533	Engineer's Estimate
Utility location (for steel barrier and well locations)	1	LS	$ 10,000	$ 10,000	Engineer's Estimate
Slurry wall installation and key trench	425,000	SF	$ 9.30	$ 3,952,500	Dewind
Site restoration and revegetation	8	ACRE	$ 50,000	$ 390,266	Engineer's Estimate
Sheet Piling Subtotal				$ 5,658,299	
Drilling Costs					
Driller mobilization	1	LS	$ 10,000	$ 10,000	Engineer's Estimate
Extraction Wells drilling and well installation (no appurtenances)	2,050	LF	$ 225	$ 461,250	Engineer's Estimate
Aquifer pump testing on 25% of extraction wells	10	EA	$ 15,000	$ 153,750	Engineer's Estimate
Monitoring Wells drilling and installation	683	LF	$ 75	$ 51,250	Engineer's Estimate
IDW	2,733	LF	$ 10	$ 27,333	Engineer's Estimate
Drilling Subtotal				$ 703,583	
Site Work Costs					
HDPE SDR 11 - 2"	200	LF	$ 1.35	$ 270	Engineer's Estimate
HDPE SDR 11 - 3"	200	LF	$ 2.35	$ 470	Engineer's Estimate
HDPE SDR 11 - 4"	500	LF	$ 3.90	$ 1,949	Engineer's Estimate
HDPE SDR 11 - 6"	700	LF	$ 8.43	$ 5,898	Engineer's Estimate
HDPE SDR 11 - 8"	1,000	LF	$ 14.28	$ 14,280	Engineer's Estimate
HDPE SDR 11 - 10"	1,000	LF	$ 22.18	$ 22,178	Engineer's Estimate
HDPE SDR 11 - 12"	700	LF	$ 31.20	$ 21,840	Engineer's Estimate
HDPE SDR 11 - 14"	1,500	LF	$ 37.61	$ 56,422	Engineer's Estimate
HDPE SDR 11 - 16"	1,500	LF	$ 49.07	$ 73,612	Engineer's Estimate
HDPE SDR 11 - 18"	1,200	LF	$ 62.17	$ 74,609	Engineer's Estimate
HDPE fusing and fittings	1	LS	$ 2,000.00	$ 2,000	Engineer's Estimate
3'x3'x3' Well Vault + H20-Rated Lid (4.5x4.5x4.5)	41	ea	$ 12,993.00	$ 532,713	Engineer's Estimate
Flow Meters, Level and Pressure Transmitters	41	ea	$ 1,603.00	$ 65,723	Engineer's Estimate
Grundfos 3" 15SQ05-110-240V Submersible Pump, fittings, appurtenances	41	ea	$ 2,190.58	$ 89,814	Engineer's Estimate
Power poles, hardware, guy wires, excavation, wiring, transformers	8	ea	$ 30,639.71	$ 245,118	Engineer's Estimate
Local control panels	41	ea	$ 5,000.00	$ 205,000	Engineer's Estimate
Utility Connection to System	1	ea	$ 120,000.00	$ 120,000	Engineer's Estimate
Subcontractor Installation Costs-Piping 2"-6"	1,600	LF	$ 75.00	$ 120,000	Engineer's Estimate
Subcontractor Installation Costs-Piping 8"-14"	4,200	LF	$ 100.00	$ 420,000	Engineer's Estimate
Subcontractor Installation Costs-Piping 16"-18"	2,700	LF	$ 125.00	$ 337,500	Engineer's Estimate
Subcontractor Installation Costs-Well Vault	41	ea	$ 5,000.00	$ 205,000	Engineer's Estimate
Subcontractor Installation Costs-Electrical	1	LS	$ 270,000.00	$ 270,000	Engineer's Estimate
Subcontractor mobilization	5%	of	$ 2,884,395	$ 144,220	Engineer's Estimate
Site Work Subtotal				$ 3,028,615	

Rough Order of Magnitude Cost Estimate for Onsite Barrier Wall and Groundwater Capture (Low Range Scenario)
Chemours Fayetteville Works, North Carolina

930 GPM (1.3 MGD) Treatment Plant Cost						
GW Pipeline	Process Package		$ 440,000	$ 440,000	Parsons	
Influent & Effluent Handling, includes lift stations, EQ tanks, feed forward pumps, discharge pumps	Process Package		$ 71,964	$ 71,964	Parsons	
Multi Media Filtration, includes skids and backwash pumps	Process Package		$ 304,464	$ 304,464	Parsons	
Granular Activated Carbon, includes skid, water suppy tank, backwash waste tank, backwash pumps	Process Package		$ 1,245,536	$ 1,245,536	Parsons	
Solids Handling and Chemical Precipitation, includes feed pumps, clarifiers, sludge pumps, filter press, chemicals	Process Package		$ 996,429	$ 996,429	Parsons	
Enclosures and Heat Tracing	Process Package		$ 393,036	$ 393,036	Parsons	
Installation Cost (Construction, Site Preparation, Civil, Structural)	70%	of	$ 2,618,393	$ 1,900,000	Parsons	
Anciliary Cost (I&C, Piping-Mechanical & Electrical)	30%	of	$ 4,911,429	$ 1,473,429	Parsons	
1.3 MGD Treatment Plant Subtotal				$ 6,824,857		
Total Construction Costs				$ 16,215,355		
Professional Services Costs						
Modeling, Design, Work Planning, and Permitting	10%	of	$ 16,215,355	$ 1,621,535	adapted from EPA Guidance	
Construction Oversight	10%	of	$ 16,215,355	$ 1,621,535	adapted from EPA Guidance	
Project Management	8%	of	$ 16,215,355	$ 1,297,228	adapted from EPA Guidance	
Professional Services Subtotal				$ 4,540,299		
Contingency	30%	of	$ 20,755,654	$ 6,226,696		
Construction Cost				**$ 27,000,000**		
+50%				$ 40,500,000		
-30%				$ 18,900,000		
Annual Operations & Maintenance Costs						
Electricity - Field Equipment	1	LS	$ 53,000	$ 53,000	Engineer's Estimate	
Electricity - Treatment Systems	1	LS	$ 21,589	$ 21,589	Parsons	
GAC Usage & Replacement	1	LS	$ 808,214	$ 808,214	Parsons	
Chemicals for treatment (Acid, Caustic, Ferric, Polymer)	1	LS	$ 24,357	$ 24,357	Parsons	
Solids Disposal	1	LS	$ 22,696	$ 22,696	Parsons	
Sampling & Analytical	1	LS	$ 48,714	$ 48,714	Parsons	
Operational Labor	1	LS	$ 470,536	$ 470,536	Parsons	
Equipment Maintenance	1	LS	$ 221,429	$ 221,429	Parsons	
Annual O&M Subtotal				$ 1,670,536		
Annual Cost				**$ 1,700,000**		
+50%				$ 2,505,804		
-30%				$ 1,169,375		
Years	**20**					
Discount Rate	**3.5%**					
Net Present Value (NPV) of Annual Costs over 20 Years				**$ 24,000,000**		
+50%				$ 36,000,000		
-30%				$ 16,800,000		
Total Cost - Construction and Annual O&M						
Total: Construction + NPV of Annual Costs over 20 Years				**$ 51,000,000**		
+50%				$ 76,500,000		
-30%				$ 35,700,000		

Costs are rough order of magnitude estimates, and assumed to represent the actual installed cost within a range of -30%/ +50% of the value indicated above. The estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on final approved design, actual labor and material costs, and competitive variable factors. These estimates are not intended for budgetary or future planning purposes; they have been prepared to facilitate an inter-remedial alternative comparison.

Rough Order of Magnitude Cost Estimate for Onsite Barrier Wall and Groundwater Capture (High Range Scenario)
Chemours Fayetteville Works, North Carolina

Basis of Cost Estimate (Scope and Assumptions) for High Range Onsite Groundwater Remedy:

Dewind one-pass slurry wall to cut off groundwater-surface water interface, with hydraulic containment behind the wall and ex-situ treatment.
Total impacted riverine length is 8,500 linear feet.
Average depth of barrier wall to key into the Upper Cape Fear Confining Unit is 50 feet.
Based on numerical model drawdown scenarios, extraction wells will be spaced 200 feet apart and pumping rates will range from 20 to 30 gpm.
A total of 41 wells and 930 gpm (1.3 MGD) would be required for hydraulic containment.
The average PMPA and PFMOAA concentration of the extracted groundwater is estimated to be 8,200 and 150,000 ng/L, respectively.
Wells will convey groundwater under pressure to the new standalone system, fully enclosed from the elements.
Piping will be HDPE and trenches will be approximately 3 feet deep, and reuse of excacated soils as backfill will be permitted.
HDPE pipe sizes range from 2 to 18 inch diameter SDR 11.
Treated groundwater will be discharged to the Cape Fear river.
Includes a 20-year net present value cost with a 3.5% discount factor applied.
Parameters that were estimated using RACER v 11.2.16.0 are identified below, and are fully marked-up costs.

Item	Qty	Unit		Unit Cost		Total	Notes
Construction Costs							
Sheet Piling							
Geotechnical predesign investigation	4,250	LF	$	100	$	425,000	Engineer's Estimate
Contractor mob and demob	1	LS	$	200,000	$	200,000	Sevenson
Site clearing and prep (veg clearing, grading, pits, E&S)	10	ACRE	$	30,000	$	292,700	Sevenson
Utility location (for steel barrier and well locations)	1	LS	$	10,000	$	10,000	Engineer's Estimate
Permanent steel sheet piling, 38 psf, furnish and install	425,000	SF	$	37	$	15,725,000	RACER, Sevenson
Site restoration and revegetation	10	ACRE	$	60,000	$	585,399	Engineer's Estimate
Sheet Piling Subtotal					$	17,238,099	
Drilling Costs							
Driller mobilization	1	LS	$	10,000	$	10,000	Engineer's Estimate
Extraction Wells drilling and well installation (no appurtenances)	2,050	LF	$	225	$	461,250	Engineer's Estimate
Aquifer pump testing on 25% of extraction wells	10	EA	$	15,000	$	153,750	Engineer's Estimate
Monitoring Wells drilling and installation	683	LF	$	75	$	51,250	Engineer's Estimate
IDW	2,733	LF	$	10	$	27,333	Engineer's Estimate
Drilling Subtotal					$	703,583	
Site Work Costs							
HDPE SDR 11 - 2"	200	LF	$	1.35	$	270	Engineer's Estimate
HDPE SDR 11 - 3"	200	LF	$	2.35	$	470	Engineer's Estimate
HDPE SDR 11 - 4"	400	LF	$	3.90	$	1,559	Engineer's Estimate
HDPE SDR 11 - 6"	600	LF	$	8.43	$	5,056	Engineer's Estimate
HDPE SDR 11 - 8"	1,000	LF	$	14.28	$	14,280	Engineer's Estimate
HDPE SDR 11 - 10"	1,000	LF	$	22.18	$	22,178	Engineer's Estimate
HDPE SDR 11 - 12"	600	LF	$	31.20	$	18,720	Engineer's Estimate
HDPE SDR 11 - 14"	1,400	LF	$	37.61	$	52,661	Engineer's Estimate
HDPE SDR 11 - 16"	1,400	LF	$	49.07	$	68,704	Engineer's Estimate
HDPE SDR 11 - 18"	1,700	LF	$	62.17	$	105,697	Engineer's Estimate
HDPE fusing and fittings	1	LS	$	2,000.00	$	2,000	Engineer's Estimate
3'x3'x3' Well Vault + H20-Rated Lid (4.5x4.5x4.5)	41	ea	$	12,993.00	$	532,713	Engineer's Estimate
Flow Meters, Level and Pressure Transmitters	41	ea	$	1,603.00	$	65,723	Engineer's Estimate
Grundfos 3" 15SQ05-110-240V Submersible Pump, fittings, appurtenances	41	ea	$	2,190.58	$	89,814	Engineer's Estimate
Power poles, hardware, guy wires, excavation, wiring, transformers	8	ea	$	30,639.71	$	245,118	Engineer's Estimate
Local control panels	41	ea	$	5,000.00	$	205,000	Engineer's Estimate
Utility Connection to System	1	ea	$	120,000.00	$	120,000	Engineer's Estimate
Subcontractor Installation Costs-Piping 2"-6"	1,400	LF	$	75.00	$	105,000	Engineer's Estimate
Subcontractor Installation Costs-Piping 8"-14"	4,000	LF	$	100.00	$	400,000	Engineer's Estimate
Subcontractor Installation Costs-Piping 16"-18"	3,100	LF	$	125.00	$	387,500	Engineer's Estimate
Subcontractor Installation Costs-Well Vault	41	ea	$	5,000.00	$	205,000	Engineer's Estimate
Subcontractor Installation Costs-Electrical	1	LS	$	270,000.00	$	270,000	Engineer's Estimate
Subcontractor mobilization	5%	of	$	2,917,461	$	145,873	Engineer's Estimate
Site Work Subtotal					$	3,063,334	

Rough Order of Magnitude Cost Estimate for Onsite Barrier Wall and Groundwater Capture (High Range Scenario)
Chemours Fayetteville Works, North Carolina

930 GPM (1.3 MGD) Treatment Plant Cost						
GW Pipeline	Process Package		$ 440,000	$ 440,000	Parsons	
Influent & Effluent Handling, includes lift stations, EQ tanks, feed forward pumps, discharge pumps	Process Package		$ 71,964.29	$ 71,964	Parsons	
Multi Media Filtration, includes skids and backwash pumps	Process Package		$ 304,464.29	$ 304,464	Parsons	
Granular Activated Carbon, includes skid, water suppy tank, backwash waste tank, backwash pumps	Process Package		$ 1,245,535.71	$ 1,245,536	Parsons	
Solids Handling and Chemical Precipitation, includes feed pumps, clarifiers, sludge pumps, filter press, chemicals	Process Package		$ 996,428.57	$ 996,429	Parsons	
Prefabricated Building & Containment Structure	Process Package		$ 3,487,500.00	$ 3,487,500	Parsons	
Installation Cost (Construction, Site Preparation, Civil, Structural)	70%	of	$ 2,618,393	$ 1,900,000	Parsons	
Anciliary Cost (I&C, Piping-Mechanical & Electrical)	30%	of	$ 4,518,393	$ 1,400,000	Parsons	
1.3 MGD Treatment Plant Subtotal				$ 9,845,893		
Total Construction Costs				$ 30,850,910		
Professional Services Costs						
Modeling, Design, Work Planning, and Permitting	8%	of	$ 30,850,910	$ 2,468,073	adapted from EPA Guidance	
Construction Oversight	8%	of	$ 30,850,910	$ 2,468,073	adapted from EPA Guidance	
Project Management	6%	of	$ 30,850,910	$ 1,851,055	adapted from EPA Guidance	
Professional Services Subtotal				$ 6,787,200		
Contingency	30%	of	$ 37,638,110	$ 11,291,433		
Construction Cost				**$ 49,000,000**		
+50%				$ 73,500,000		
-30%				$ 34,300,000		
Annual Operations & Maintenance Costs						
Electricity - Field Equipment	1	LS	$ 53,000	$ 53,000	Engineer's Estimate	
Electricity - Treatment Systems	1	LS	$ 21,589	$ 21,589	Parsons	
GAC Usage & Replacement	1	LS	$ 808,214	$ 808,214	Parsons	
Chemicals for treatment (Acid, Caustic, Ferric, Polymer)	1	LS	$ 24,357	$ 24,357	Parsons	
Solids Disposal	1	LS	$ 22,696	$ 22,696	Parsons	
Sampling & Analytical	1	LS	$ 48,714	$ 48,714	Parsons	
Operational Labor	1	LS	$ 470,536	$ 470,536	Parsons	
Equipment Maintenance	1	LS	$ 221,429	$ 221,429	Parsons	
Annual O&M Subtotal				$ 1,670,536		
Annual Cost				**$ 1,700,000**		
+50%				$ 2,505,804		
-30%				$ 1,169,375		
Years	**20**					
Discount Rate	**3.5%**					
Net Present Value (NPV) of Annual Costs over 20 Years				**$ 24,000,000**		
+50%				$ 36,000,000		
-30%				$ 16,800,000		
Total Cost - Construction and Annual O&M						
Total: Construction + NPV of Annual Costs over 20 Years				**$ 73,000,000**		
+50%				$ 109,500,000		
-30%				$ 51,100,000		

Costs are rough order of magnitude estimates, and assumed to represent the actual installed cost within a range of -30%/ +50% of the value indicated above. The estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on final approved design, actual labor and material costs, and competitive variable factors. These estimates are not intended for budgetary or future planning purposes; they have been prepared to facilitate an inter-remedial alternative comparison.