Table 3-1
Baseline Concentrations (mg/L) and Annual Average Loads (lbs/Day)

WPCP		Baseline	
		Annual or Summer (Winter) Concentrations (mg/L)	Loads (Lbs/Day)
Coney Island	Organic Phosphorus	1.60	1,500
	Phosphate (PO_4)	0.99	900
	Organic Nitrogen	5.13	4,400
	Ammonia (NH_4)	13.00	11,200
	Nitrate and Nitrite (NO_2 + NO_3)	0.52	400
	Dissolved Silica (DSi)	7.22	6,600
	Organic Carbon	11.91	11,000
	BOD	7.02	6,500
	DO	3.82	3,500
26th Ward	Organic Phosphorus	0.80	500
	Phosphate (PO_4)	1.78	1,100
	Organic Nitrogen	3.82	2,100
	Ammonia (NH_4)	1.33 (5.15)	1,800
	Nitrate and Nitrite (NO_2 + NO_3)	5.15 (1.33)	1,800
	Dissolved Silica (DSi)	6.96	4,100
	Organic Carbon	15.20	9,000
	BOD	9.99	5,900
	DO	6.15	3,600
Rockaway	Organic Phosphorus	1.08	200
	Phosphate (PO_4)	1.68	400
	Organic Nitrogen	3.94	800
	Ammonia (NH_4)	4.10	900
	Nitrate and Nitrite (NO_2 + NO_3)	5.23	1,100
	Dissolved Silica (DSi)	7.82	1,800
	Organic Carbon	9.96	2,200
	BOD	5.01	1,100
	DO	7.97	1,800
Jamaica	Organic Phosphorus	1.06	800
	Phosphate (PO_4)	2.07	1,600
	Organic Nitrogen	8.29	6,200
	Ammonia (NH_4)	19.10	14,200
	Nitrate and Nitrite (NO_2 + NO_3)	0.40	300
	Dissolved Silica (DSi)	10.03	7,900
	Organic Carbon	19.15	15,200
	BOD	13.00	10,300
	DO	7.46	5,900

Table 3-2
Baseline and Existing Conditions Concentrations (mg/L)

WPCP		Baseline		Existing Conditions	
		Annual / Summer	Winter	Annual / Summer	Winter
Coney Island	Organic Nitrogen	5.13		3.10	
	Ammonia (NH_4)	13.00		5.40	
	Nitrate and Nitrite (NO_2 + NO_3)	0.52		2.40	
26th Ward	Organic Nitrogen	3.82		3.30	
	Ammonia (NH_4)	1.33	5.15	5.40	5.40
	Nitrate and Nitrite (NO_2 + NO_3)	5.15	1.33	1.50	1.50
Rockaway	Organic Nitrogen	3.94		2.30	
	Ammonia (NH_4)	4.10		3.30	
	Nitrate and Nitrite (NO_2 + NO_3)	5.23		6.30	
Jamaica	Organic Nitrogen	8.29		5.00	
	Ammonia (NH_4)	19.10		15.80	
	Nitrate and Nitrite (NO_2 + NO_3)	0.40		1.80	

Table 3-3
Daily Average WPCP Loads (lbs/Day)

Location	System	Existing Conditions	Permit Conditions (Baseline)	1995-96 Conditions
Coney Island	Organic Nitrogen	2,400	4,400	3,400
	NH4	8,200	11,200	10,800
	NO2+NO3	1,800	400	200
	DIN	10,100	11,600	11,100
	TN	12,500	16,100	14,500
26th Ward	Organic Nitrogen	1,500	2,100	4,600
	NH4	2,500	1,800	10,400
	NO2+NO3	700	1,800	1,000
	DIN	3,200	3,500	11,400
	TN	4,800	5,700	16,100
Rockaway	Organic Nitrogen	300	800	700
	NH4	500	900	1,200
	NO2+NO3	1,000	1,100	400
	DIN	1,600	1,900	1,700
	TN	2,000	2,800	2,500
Jamaica	Organic Nitrogen	3,700	6,200	4,900
	NH4	11,800	14,200	13,000
	NO2+NO3	1,300	300	300
	DIN	13,100	14,500	13,300
	TN	16,900	20,600	18,200
Total	Organic Nitrogen	8,100	13,500	13,700
	NH4	23,200	28,100	35,500
	NO2+NO3	5,000	3,600	2,100
	DIN	28,200	31,700	37,700
	TN	36,400	45,300	51,500

Table 4-1: *Treatment Alternatives*

Item	Applied Factors	Level 1 BNR at all 4 Jamaica Bay WPCPs	Full Nitrification at Jamaica+26th Ward at Contract 12 Upgrade	Level 2 Nitrification at Jamaica(Mod Flow Split)+26th Ward at Contract 12 Upgrade	Level 2 BNR at all 4 Jamaica Bay WPCPs	Level 3 BNR at all 4 Jamaica Bay WPCPs	Limit of Technology BNR at all 4 Jamaica Bay WPCPs	Level 2 BNR at Coney Island and Rockaway WPCPs	LOT BNR at 26th Ward and Jamaica WPCPs	Level 2 Nitrification at Jamaica WPCP (Mod Flow Split)+26th Ward WPCP at Contract 12 Upgrade with Carbon Addition
Jamaica WPCP Shaft		0	0	0	0	0	0	0	0	0
26 Ward WPCP Shaft		0	0	0	0	0	0	0	0	0
Rockaway Shaft		0	0	0	0	0	0	0	0	0
Coney Island WPCP Shaft		0	0	0	0	0	0	0	0	0
Barren Island Shaft		0	0	0	0	0	0	0	0	0
Ocean Outfall Shaft		0	0	0	0	0	0	0	0	0
Rockaway Inlet Shaft		0	0	0	0	0	0	0	0	0
Jamaica to Rockaway Tunnel		0	0	0	0	0	0	0	0	0
Jamaica to 26 Ward Tunnel		0	0	0	0	0	0	0	0	0
26 Ward to Rockaway Tunnel		0	0	0	0	0	0	0	0	0
Coney Island to Rockaway Tunnel		0	0	0	0	0	0	0	0	0
Jamaica to Barren Island Tunnel		0	0	0	0	0	0	0	0	0
26 Ward to Barren Island Tunnel		0	0	0	0	0	0	0	0	0
Rockaway to Barren Island Tunnel		0	0	0	0	0	0	0	0	0
Rockaway to Ocean Outfall Tunnel		0	0	0	0	0	0	0	0	0
Barren Island to Rockaway Inlet Tunnel		0	0	0	0	0	0	0	0	0
Diffuser		0	0	0	0	0	0	0	0	0
Rockaway Pump Station Excavation and Soil Stabilization		0	0	0	0	0	0	0	0	0
Barren Island Pump Station Excavation and Soil Stabilization		0	0	0	0	0	0	0	0	0
Warf and Bulkhead-Rockaway		0	0	0	0	0	0	0	0	0
Warf and Bulkhead-26 Ward		0	0	0	0	0	0	0	0	0
Warf and Bulkhead-Barren Island		0	0	0	0	0	0	0	0	0
Sitework		0	0	0	0	0	0	0	0	0
Concrete		0	0	0	0	0	0	0	0	0
Masonry		0	0	0	0	0	0	0	0	0
Metals		0	0	0	0	0	0	0	0	0
Woods and Plastics		0	0	0	0	0	0	0	0	0
Thermal and Moisture Protection		0	0	0	0	0	0	0	0	0
Doors and Windows		0	0	0	0	0	0	0	0	0
Finishes		0	0	0	0	0	0	0	0	0
Specialties		0	0	0	0	0	0	0	0	0
Equipment and Mechanical Systems		0	0	0	0	0	0	0	0	0
Conveying System		0	0	0	0	0	0	0	0	0
Plumbing/HVAC		0	0	0	0	0	0	0	0	0
Force Main/Utility Relocation		0	0	0	0	0	0	0	0	0
Electrical		0	0	0	0	0	0	0	0	0
Electrical Building		0	0	0	0	0	0	0	0	0
Emergency Generator Area Site Work		0	0	0	0	0	0	0	0	0
Primary Power Area Site Work		0	0	0	0	0	0	0	0	0
Emergency Power		0	0	0	0	0	0	0	0	0
Primary Power Switchgear		0	0	0	0	0	0	0	0	0
Grassy Bay Recontouing		0	0	0	0	0	0	0	0	0
Mobilization/Demobilization		0	0	0	0	0	0	0	0	0
Removal of Bottom Muck		0	0	0	0	0	0	0	0	0
Fill		0	0	0	0	0	0	0	0	0
Cross Rockaway Fill Transport (Directional Drill)		0	0	0	0	0	0	0	0	0
Grassy Bay Aeration Headers/Diffusers		0	0	0	0	0	42,242,050	0	0	0
Temporary Treatment During Construction		0	0	0	0	0	0	0	0	0
Avoided UV Disinfection Installation Cost (TBD)		0	0	0	0	0	0	0	0	0
Avoided UV Disinfection Installation Cost (TBD)		0	0	0	0	0	0	0	0	0
BNR Structure		1,982,113	16,955,417	18,737,011	14,880,317	40,783,513	261,570,613	3,116,430	162,009,722	18,737,011
BNR Equipment		18,426,875	31,484,709	40,182,388	116,673,054	247,284,548	273,099,188	26,543,997	168,388,021	41,250,437
Sub-Total		20,408,988	48,440,126	58,919,399	131,553,371	288,068,061	576,911,851	29,660,427	330,397,743	59,987,448
Scope Development (Design) Contingency @	20.0%	4,081,798	9,688,025	11,783,880	26,310,674	57,613,612	115,382,370	5,932,085	66,079,549	11,997,490
Sub-Total		24,490,786	58,128,151	70,703,279	157,864,045	345,681,673	692,294,221	35,592,512	396,477,292	71,984,938
Contract Allowances (BWT Add-Ons) @	7.0%	1,714,355	4,068,971	4,949,230	11,050,483	24,197,717	48,460,595	2,491,476	27,753,410	5,038,946
Sub-Total		26,205,141	62,197,122	75,652,508	168,914,528	369,879,390	740,754,817	38,083,988	424,230,702	77,023,883
General Conditions @	15.0%	3,930,771	9,329,568	11,347,876	25,337,179	55,481,909	111,113,223	5,712,598	63,634,605	11,553,582
Sub-Total		30,135,912	71,526,690	87,000,385	194,251,708	425,361,299	851,868,039	43,796,587	487,865,307	88,577,466
Payment Performance Bonds @	1.5%	452,039	1,072,900	1,305,006	2,913,776	6,380,419	12,778,021	656,949	7,317,980	1,328,662
Sub-Total		30,587,950	72,599,590	88,305,390	197,165,483	431,741,718	864,646,060	44,453,535	495,183,287	89,906,128
Contractor Overhead and Profit @	21.0%	6,423,470	15,245,914	18,544,132	41,404,751	90,665,761	181,575,673	9,335,242	103,988,490	18,880,287
Sub-Total		37,011,420	87,845,504	106,849,522	238,570,235	522,407,479	1,046,221,732	53,788,778	599,171,777	108,786,415
Construction Escalation @	0.0%	0	0	0	0	0	0	0	0	0
Sub-Total		37,011,420	87,845,504	106,849,522	238,570,235	522,407,479	1,046,221,732	53,788,778	599,171,777	108,786,415
Probable Bid Cost Total		**37,011,420**	**87,845,504**	**106,849,522**	**238,570,235**	**522,407,479**	**1,046,221,732**	**53,788,778**	**599,171,777**	**108,786,415**
Construction Reserve (Change Orders) @	10.0%	3,701,142	8,784,550	10,684,952	23,857,023	52,240,748	104,622,173	5,378,878	59,917,178	10,878,641
Sub-total		40,712,562	96,630,055	117,534,475	262,427,258	574,648,227	1,150,843,906	59,167,655	659,088,955	119,665,056
Probable Construction Cost Total (2004 $)		**40,712,562**	**96,630,055**	**117,534,475**	**262,427,258**	**574,648,227**	**1,150,843,906**	**59,167,655**	**659,088,955**	**119,665,056**
Probable Construction Cost Total (2006 $)	**1.18**	**48,040,823**	**114,023,465**	**138,690,880**	**309,664,165**	**678,084,908**	**1,357,995,809**	**69,817,833**	**777,724,967**	**141,204,766**
Soft Costs										
Environ Assesmt/ImpactStmt, Permiting		440,000	660,000	660,000	660,000	880,000	1,320,000	800,000	660,000	660,000
Engineering/Architecture	10.0%	4,804,082	11,402,346	13,869,088	30,966,416	67,808,491	135,799,581	6,981,783	77,772,497	14,120,477
ConstructionManagement	15.0%	7,206,123	17,103,520	20,803,602	46,449,625	101,712,736	203,699,371	10,472,675	116,658,745	21,180,715
Fixed Asset Survey	0.5%	240,204	570,117	693,453	1,548,321	3,390,425	6,789,979	349,089	3,888,625	706,024
Other Professional Fees	3.0%	1,441,225	3,420,704	4,160,720	9,289,925	20,342,547	40,739,874	2,094,535	23,331,749	4,236,143
Subtotal		14,131,635	33,156,687	40,186,844	88,914,287	194,134,199	388,348,805	20,498,083	222,311,616	40,903,358
Soft Cost Contingency	15.0%	2,119,745	4,973,503	6,028,027	13,337,143	29,120,130	58,252,321	3,074,712	33,346,742	6,135,504
Staff Training and Development	LS	440,000	660,000	660,000	660,000	880,000	880,000	400,000	440,000	660,000
Probable Soft Cost Total		**16,691,380**	**38,790,191**	**46,874,870**	**102,911,430**	**224,134,329**	**447,481,126**	**23,972,795**	**256,098,358**	**47,698,862**
Other Costs										
Land Acquisition: Barren Island		0	0	0	0	0	0	0	0	0
Land Acquisition: Knapp Street		0	0	0	0	0	0	0	0	0
Land Acquisition: Jamaica		0	0	0	0	0	0	0	0	0
Land Acquisition: Rockaway		0	0	0	0	0	172,176	0	0	0
Land Acquisition: Coney Island		0	0	0	0	700,184	0	0	0	0
Land Acquisition: 26th Ward (no purchase req.)		0	0	0	0	0	0	0	0	0
Setaside for Art	p	203,563	483,150	587,672	1,312,136	2,873,241	5,754,220	295,838	3,295,445	598,325
Probable Other Cost Total		**203,563**	**483,150**	**587,672**	**1,312,136**	**3,573,425**	**5,926,396**	**295,838**	**3,295,445**	**598,325**
TOTAL CONCEPTUAL PROJECT COST		**64,935,766**	**153,296,806**	**186,153,223**	**413,887,731**	**905,792,662**	**1,811,403,330**	**94,086,467**	**1,037,118,769**	**189,501,953**

I:\Projects\1024\065\cost estimates\[Probable Const. Cost and AEC.xls]C Alternatives

TABLE 5-1
JAMAICA BAY COMPREHENSIVE REPORT
HYDRAULIC SUMMARY - OCEAN OUTFALLS BASED ON 2xDDWF

Alternative Designation	WPCP	Peak Flow (mgd	Total Peak Flow (mgd)	Pump Type/ Number Operating Plus Standby	Pump Capaity (gpm x TDH (ft))	Tunnel Dia (ft) and Length(ft)
1A-1	Jamaica	250	250	CCT/ 7+2	25,000 @62	9.5 x 32,525 9.5 x 24,720
1A-2	Jamaica	250	250	WW-DW/ 7+2	25,000 @62	9.5 x 32,525 9.5 x 24,720
1A-3	Jamaica	250	250	TR/ 3+2	25,000 @ 62	9.5 x 32,525 9.5 x 24,720
2A-1	Jamaica 26th Ward	250 220	470	CCT/ 7+2 CCT/ 6+2	25,000@ 62 25,000@ 62	9.0 x 19,114 14.0 x 25,925 14.0 x 33,380
2A-2	Jamaica 26th Ward	250 220	470	WW-DW/ 7+2 WW-DW/ 6+2	25,000 @ 62 25,500 @ 62	9.0 x 19,114 14.0 x 25,925 14.0 x 33,380
2A-3	Jamaica 26th Ward	250 220	470	TR/ 3+2 TR/ 3+2	25,000 @ 62 25,500 @ 62	9.0 x 19,114 14.0 x 25,925 14.0 x 33,380
2B	Jamaica 26th Ward	250 220	470	MF/ 4+2 at Rockaway	81,600 @ 35	9.0 x 19,114 14.0 x 25,925 14.5 x 33,380
3A-1	Jamaica Rockaway	250 90	340	CCT/ 7+2 CCT/ 2+2	25,000 @ 62 31,250 @ 45	9.5 x 32,525 12.0 x 27,820
3A-2	Jamaica	250		TR/ 7+2	25,000 @ 62 31,250 @ 45	9.5 x 32,525 12.0 x 27,820
3A-3	Jamaica Rockaway	250 90	340	TR/ 3+2 TR/ 3+2	58,000 @ 68 24,000 @ 34	9.5 x 32,525 12.0 x 27,820
3B	Jamaica Rockaway	250 90	340	MF/ 3+2	78,700 @ 31	9.5 x 32,525 12.5 x 27,820
4A-1	Jamaica 26th Ward Rockaway	250 220 90	560	CCT/ 7+2 CCT/ 6+2 CCT/ 2+2	25,000 @ 62 25,000 @ 62 21,250 @ 45	9.0 x 19,114 14.0 x 25,925 15.5 x 40,180
4A-2	Jamaica 26th Ward Rockaway	250 220 90	560	WW-DW/ 7+2 WW-DW/ 6+2 WW-DW/ 2+2	25,000@62 25,000 @62 21,250 @ 45	9.0 x 19,114 14.0 x 25,925 15.5 x 40,180
4A-3	Jamaica 26th Ward Rockaway	250 220 90	560	TR/ 3+2 TR/ 3+2 TR/ 3+2	58,000 @ 68 51,000 @ 54 21,000 @ 34	9.0 x 19,114 14.0 x 25,925 15.5 x 40,180
4B	Jamaica 26th Ward Rockaway	250 220 90	560	M-F/ 5+2	97,300 @ 34	9.0 x 19,114 14.5 x 25,925 16.0 x 40,180
5A-1	Jamaica Coney Island 26th Ward Rockaway	250 220 220 90	780	CCT/ 7+2 CCT/ 6+2 CCT/ 6+2 CCT/ 2+2	25,000 @ 62 25,500 @ 62 25,500 @ 62 32,250 @ 45	9.0 x19,114 9.5 x 27,826 14.5 x 25.925 19.0 x 57,180
5A-2	Jamaica Coney Island 26th Ward Rockaway	250 220 220 90	780	WW-DW/ 7+2 WW-DW/ 6+2 WW-DW/ 6+2 WW-DW/ 2+2	25,000 @ 62 25,500 @ 62 25,500 @ 62 32,250 @ 45	9.0 x19,114 9.5 x 27,826 14.5 x 25.925 19.0 x 57,180
5A-3	Jamaica Coney Island 26th Ward Rockaway	250 220 220 90	780	TR/ 3+2 TR/ 3+2 TR/ 3+2 TR/ 3+2	58,000 @ 68 21,000 @ 73 51,00 @ 54 21,100 @ 34	9.0 x19,114 9.5 x 27,826 14.5 x 25.925 19.0 x 57,180
5B	Jamaica Coney Island 26th Ward Rockaway	250 220 220 90	780	M-F/ 6+2	50,300 @ 34	9.0 x19,114 9.5 x 27,826 15.0 x 25,925 19.5 x 57,180
9A-1	Jamaica Coney Island 26th Ward	250 220 220	690	CCT/ 7+2 CCT/ 6+2 CCT/ 6+2	25,000 @ 62 25,500 @ 62 25,500 @ 62	9.5 x18,550 9.0 x 29,500 16.5 x 25,925 16.5 x 57,180

Notes

CCT	Chloirne Contact Tank
WW-DW	Effluent pump located in wet-well/dry well pumping station
TR	Effluent pumps located in trench type wet wells
	Effluent pumps located in tunnel rise shaft
	Effluent pumps mixed flow type

TABLE 5-2
JAMAICA BAY COMPREHENSIVE REPORT
HYDRAULIC SUMMARY - ROCKAWAY INLET OUTFALLS BASED ON 2xDDWF

Alternative Designation	WPCP	Peak Flow (mgd	Total Peak Flow (mgd)	Pump Type/ Number operating + standby	Pump Capaity (gpm x TDH)	Tunnel Dia & Length
6A-1	Jamaica	250	250	CCT/ 7+2	25,000 @ 62	9.5 X 40,755 9.5 X 15,115
6A-2	Jamaica	250	250	WW-DW/ 7+2	25,000 @ 62	9.5 X 40,755 9.5 X 15,115
6A-3	Jamaica	250	250	TR/ 3+2	25,000 @ 62	9.5 X 40,755 9.5 X 15,115
7A-1	Jamaica 26th Ward	250 220	470	CCT/ 7+2 CCT/ 6+2	25,000 @ 62 25,000 @ 62	9.0 x 19,114 12.5 x 23,910 13.0 x 15,115
7A-2	Jamaica 26th Ward	250 220	470	WW-DW/ 7+2 WW-DW/ 6+2	25,000 @ 62 25,000 @ 62	9.0 x 19,114 12.5 x 23,910 13.0 x 15,115
7A-3	Jamaica 26th Ward	250 220	470	TR/ 3+2 TR/ 3+2	58,000 @ 68 51,000 @ 54	9.0 x 19,114 12.5 x 23,910 13.0 x 15,115
7B	Jamaica 26th Ward	250 220	470	MF/ 4+2 at Barren Island	81,600 x 37	9.0 x 19,114 13.0 x 23,910 13.5 x 15,115

TABLE 5-3
JAMAICA BAY COMPREHENSIVE REPORT
HYDRAULIC SUMMARY - ROCKAWAY INLET OUTFALLS BASED ON 1.5xDDWF

Alternative Designation	WPCP	Peak Flow (mgd	Total Peak Flow (mgd)	Pump Type/ Number operating + standby	Pump Capaity (gpm x TDH)	Tunnel Dia & Length
10	Jamaica 26th Ward Rockaway to Ocean	150 128 67	345	N/A	N/A	10.5 X 18,114 18.5 X 25,925 20.0 X 4,180
11	Jamaica 26th Ward to Ocean	150 168	278	N/A	N/A	10.5 X 19,114 18.0 X 25,925 18.0 X 33,380
12	Jamaica 26th Ward to Rockaway	150 128	352.5	N/A	N/A	10.5 X 19,114 17.0 X 23,910 17.0 X 15,115

Item	Applied Factors	Jamaica to Ocean - Submersible Pumps in CCT	Jamaica to Ocean - Submersible Pumps Wet Well/Dry Well	Jamaica to Ocean - Mixed Flow Pumps Trench Wet Well	Jamaica & 26th Ward to Ocean - Submersible Pumps in CCT	Jamaica & 26th Ward to Ocean - Submersible Pumps Wet Well/Dry Well	Jamaica & 26 Ward to Ocean - Mixed Flow Pumps Trench Wet Well	Jamaica & 26th Ward to Ocean - Cross Bay Siphon, MF Pumps at Rockaway Shaft	Jamaica & Rockaway to Ocean - Submersible Pumps in CCT	Jamaica & Rockaway to Ocean - Submersible Pumps Wet Well/Dry Well	Jamaica & Rockaway to Ocean - Mixed Flow Pumps Trench Wet Well	Jamaica & Rockaway to Ocean Cross Bay Siphon, MF Pumps at Rockaway Shaft	Jamaica, 26th Ward & Rockaway to Ocean - Submersible Pumps in CCT	Jamaica, 26th Ward & Rockaway to Ocean - Submersible Pumps Wet Well/Dry Well	Jamaica, 26th Ward & Rockaway to Ocean - Mixed Flow Pumps Trench Wet Well	Jamaica, 26th Ward & Rockaway to Ocean - Cross Bay Siphon, MF Pumps at Rockaway Shaft	Jamaica, 26th Ward, Coney Island & Rockaway to Ocean - Submersible Pumps in CCT	Jamaica, 26th Ward, Coney Island & Rockaway to Ocean - Submersible Pumps Wet Well/Dry Well
Jamaica WPCP Shaft		2,600,000	2,600,000	2,600,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
26 Ward WPCP Shaft		0	0	0	3,700,000	3,700,000	3,700,000	3,700,000	0	0	0	0	3,700,000	3,700,000	3,700,000	3,700,000	3,800,000	3,800,000
Rockaway Shaft		4,400,000	4,400,000	4,400,000	5,400,000	5,400,000	5,400,000	3,400,000	4,900,000	4,900,000	4,900,000	2,900,000	6,200,000	6,200,000	6,200,000	4,200,000	7,600,000	7,600,000
Coney Island WPCP Shaft		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,200,000	2,200,000
Barren Island Shaft		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ocean Outfall Shaft		6,000,000	6,000,000	6,000,000	7,200,000	7,200,000	7,200,000	7,200,000	6,600,000	6,600,000	6,600,000	6,600,000	7,700,000	7,700,000	7,700,000	7,700,000	9,100,000	9,100,000
Rockaway Inlet Shaft		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jamaica to Rockaway Tunnel		108,958,750	108,958,750	108,958,750	0	0	0	0	108,958,750	108,958,750	108,958,750	108,958,750	0	0	0	0	0	0
Jamaica to 26 Ward Tunnel		0	0	0	63,076,200	63,076,200	63,076,200	63,076,200	0	0	0	0	63,076,200	63,076,200	63,076,200	63,076,200	63,076,200	63,076,200
26 Ward to Rockaway Tunnel		0	0	0	107,588,750	107,588,750	107,588,750	107,588,750	0	0	0	0	102,400,000	107,588,750	107,588,750	110,181,250	110,181,250	110,181,250
Coney Island to Rockaway Tunnel		0	0	0	0	0	0	0	0	0	0	0	107,588,750	0	0	0	93,217,100	93,217,100
Jamaica to Barren Island Tunnel		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 Ward to Barren Island Tunnel		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rockaway to Barren Island Tunnel		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rockaway to Ocean Outfall Tunnel		82,812,000	82,812,000	82,812,000	138,527,000	138,527,000	138,527,000	141,865,000	105,716,000	105,716,000	105,716,000	108,496,000	176,792,000	176,792,000	176,792,000	180,810,000	285,900,000	285,900,000
Barren Island to Rockaway Inlet Tunnel		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diffuser		44,523,000	44,523,000	44,523,000	79,762,300	79,762,300	79,762,300	79,762,300	55,016,226	55,016,226	55,016,226	55,016,226	72,680,234	72,680,234	72,680,234	72,680,234	96,161,509	96,161,509
Rockaway Pump Station Excavation and Soil Stabilization		0	0	0	0	0	0	18,284,900	0	0	0	16,775,700	0	0	0	19,989,500	0	0
Barren Island Pump Station Excavation and Soil Stabilization		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Warf and Bulkhead-Rockaway		10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000
Warf and Bulkhead-26 Ward		0	0	0	10,000,000	10,000,000	10,000,000	10,000,000	0	0	0	0	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000
Warf and Bulkhead-Barren Island		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sitework		1,175,963	4,799,770	3,283,086	2,689,541	9,820,936	6,882,615	2,923,576	2,544,084	8,506,852	6,029,476	2,947,750	4,057,662	13,528,018	9,629,025	4,194,339	9,278,821	18,644,175
Concrete		287,549	4,987,831	3,660,767	664,777	9,921,369	7,214,775	11,510,445	737,714	8,253,192	5,836,866	9,997,466	1,114,942	13,186,730	9,390,874	12,917,045	1,862,111	18,806,742
Masonry		4,384	546,194	0	6,095	1,061,314	0	45,663	7,806	955,984	0	45,663	9,517	1,471,104	0	45,663	12,511	1,986,224
Metals		413,663	462,352	27,868	763,732	904,339	55,736	43,634	580,589	790,780	46,289	41,033	930,658	1,232,767	74,157	43,634	1,408,088	1,698,268
Woods and Plastics		0	25,000	10,000	0	50,000	20,000	15,000	4,550	40,000	20,000	19,550	4,550	65,000	30,000	19,550	4,550	90,000
Thermal and Moisture Protection		3,357	264,263	54,966	5,392	513,310	107,677	158,071	5,548	434,425	86,535	147,778	7,583	683,472	139,246	172,271	18,720	940,041
Doors and Windows		0	67,993	0	0	135,986	0	4,761	0	110,127	0	4,761	0	178,120	0	4,761	0	246,113
Finishes		0	144,779	0	0	281,605	0	7,320	0	229,002	0	7,320	0	365,828	0	7,320	0	502,654
Specialties		0	14,896	0	0	29,792	0	0	0	23,950	0	0	0	38,846	0	0	0	53,742
Equipment and Mechanical Systems		5,069,731	5,578,031	4,859,344	10,375,466	11,209,015	9,612,383	7,200,932	7,453,237	8,380,263	7,133,839	5,755,513	12,758,972	14,011,267	11,886,878	8,780,795	18,787,323	19,270,749
Conveying System		171,236	169,392	0	341,616	337,994	0	0	336,809	334,833	0	0	507,189	503,435	0	0	850,057	672,037
Plumbing/HVAC		142,652	297,740	283,804	284,680	578,180	558,984	408,380	223,784	492,760	473,564	403,380	365,812	773,200	748,744	403,380	508,464	1,053,640
Force Main/Utility Relocation		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electrical		4,494,087	3,004,574	2,366,073	10,386,877	5,854,990	4,519,017	2,853,457	7,705,085	4,866,535	3,980,101	2,592,177	13,597,875	7,716,951	6,133,045	3,291,480	18,091,962	10,554,677
Electrical Building		506,087	0	633,801	1,012,174	0	1,267,602	640,999	942,569	0	1,109,605	574,087	1,448,756	0	1,743,406	658,530	1,954,843	0
Emergency Generator Area Site Work		209,701	211,539	621,070	419,402	423,078	1,242,140	140,511	349,177	423,078	780,460	369,091	558,878	634,617	1,381,530	451,187	768,579	834,731
Primary Power Area Site Work		130,530	132,278	142,621	261,060	264,556	285,242	370,452	261,060	264,556	273,525	370,452	391,590	396,834	416,146	142,226	522,120	529,112
Emergency Power		1,437,301	1,476,805	1,437,301	2,797,942	2,891,845	2,797,942	1,984,214	2,335,534	2,348,619	2,235,899	1,984,214	3,696,175	3,783,859	3,596,540	2,456,126	5,056,816	5,165,374
Primary Power Switchgear		1,001,507	1,062,355	1,001,507	2,003,014	2,131,411	2,003,014	1,034,837	1,959,684	2,035,919	1,931,741	1,001,507	2,961,191	3,104,975	2,933,248	1,081,497	3,962,698	4,145,359
Grassy Bay Recontouing		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mobilization/Demobilization		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Removal of Bottom Muck		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fill		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cross Rockaway Fill Transport (Directional Drill)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grassy Bay Aeration Headers/Diffusers		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Temporary Treatment During Construction		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Avoided UV Disinfection Installation Cost (TBD)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Avoided UV Disinfection Installation Cost (TBD)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BNR Structure		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BNR Equipment		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-Total		274,341,498	282,539,542	277,675,938	459,266,018	473,663,970	463,821,377	476,219,402	318,638,306	331,681,871	323,108,876	337,010,418	604,548,534	521,392,007	507,840,023	519,006,988	756,423,722	778,529,697
Scope Development (Design) Contingency @	20.0%	54,868,300	56,507,908	55,535,188	91,853,204	94,732,794	92,764,275	95,243,880	63,727,661	66,336,374	64,621,775	67,402,084	120,909,707	104,278,401	101,568,005	103,801,398	151,284,744	155,705,939
Sub-Total		329,209,798	339,047,450	333,211,126	551,119,222	568,396,764	556,585,652	571,463,282	382,365,967	398,018,245	387,730,651	404,412,502	725,458,241	625,670,408	609,408,028	622,808,386	907,708,466	934,235,636
Contract Allowances (BWT Add-Ons) @	7.0%	23,044,686	23,733,322	23,324,779	38,578,346	39,787,773	38,960,996	40,002,430	26,765,618	27,861,277	27,141,146	28,308,875	50,782,077	43,796,929	42,658,562	43,596,587	63,539,593	65,396,495
Sub-Total		352,254,483	362,780,772	356,535,904	589,697,567	608,184,537	595,546,648	611,465,712	409,131,585	425,879,522	414,871,797	432,721,377	776,240,318	669,467,337	652,066,590	666,404,973	971,248,059	999,632,131
General Conditions @	15.0%	52,838,173	54,417,116	53,480,386	88,454,635	91,227,681	89,331,997	91,719,857	61,369,738	63,881,928	62,230,770	64,968,207	116,436,048	100,420,101	97,809,988	99,960,746	145,687,209	149,944,820
Sub-Total		405,092,656	417,197,888	410,016,290	678,152,202	699,412,218	684,878,645	703,185,569	470,501,323	489,761,451	477,102,566	497,629,583	892,676,365	769,887,438	749,876,578	766,365,718	1,116,935,268	1,149,576,951
Payment Performance Bonds @	1.5%	6,076,390	6,257,968	6,150,244	10,172,283	10,491,183	10,273,180	10,547,784	7,057,520	7,346,422	7,156,538	7,464,444	13,390,145	11,548,312	11,248,149	11,495,486	16,754,029	17,243,654
Sub-Total		411,169,046	423,455,856	416,166,534	688,324,485	709,903,401	695,151,825	713,733,353	477,558,842	497,107,872	484,259,105	505,094,027	905,066,511	781,435,749	761,124,727	777,861,204	1,133,689,297	1,166,820,605
Contractor Overhead and Profit @	21.0%	86,345,500	88,925,730	87,394,972	144,548,142	149,079,714	145,981,883	149,884,004	100,287,357	104,392,653	101,694,412	106,069,746	190,273,967	164,101,507	159,836,193	163,350,853	238,074,752	245,032,327
Sub-Total		497,514,545	512,381,586	503,561,507	832,872,627	858,983,116	841,133,708	863,617,357	577,846,199	601,500,526	585,953,517	611,163,773	1,095,340,478	945,537,256	920,960,919	941,212,057	1,371,764,049	1,411,852,932
Construction Escalation @	0.0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-Total		497,514,545	512,381,586	503,561,507	832,872,627	858,983,116	841,133,708	863,617,357	577,846,199	601,500,526	585,953,517	611,163,773	1,095,340,478	945,537,256	920,960,919	941,212,057	1,371,764,049	1,411,852,932
Probable Bid Cost Total		**497,514,545**	**512,381,586**	**503,561,507**	**832,872,627**	**858,983,116**	**841,133,708**	**863,617,357**	**577,846,199**	**601,500,526**	**585,953,517**	**611,163,773**	**1,095,340,478**	**945,537,256**	**920,960,919**	**941,212,057**	**1,371,764,049**	**1,411,852,932**
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Construction Reserve (Change Orders) @	10.0%	49,751,455	51,238,159	50,356,151	83,287,263	85,898,312	84,113,371	86,361,736	57,784,620	60,150,053	58,595,352	61,116,377	109,634,048	94,553,726	92,096,092	94,121,206	137,176,405	141,185,293
Sub-total		547,266,000	563,619,744	553,917,657	916,159,890	944,881,427	925,247,079	949,979,092	635,630,819	661,650,578	644,548,868	672,280,150	1,205,974,526	1,040,090,982	1,013,057,011	1,035,333,263	1,508,940,454	1,553,038,225
Probable Construction Cost Total (2004 $)		**547,266,000**	**563,619,744**	**553,917,657**	**916,159,890**	**944,881,427**	**925,247,079**	**949,979,092**	**635,630,819**	**661,650,578**	**644,548,868**	**672,280,150**	**1,205,974,526**	**1,040,090,982**	**1,013,057,011**	**1,035,333,263**	**1,508,940,454**	**1,553,038,225**
Probable Construction Cost Total (2006 $)	**1.18**	**645,773,880**	**665,071,298**	**653,622,836**	**1,081,068,670**	**1,114,960,084**	**1,091,791,553**	**1,120,975,329**	**750,044,367**	**780,747,682**	**760,567,665**	**793,290,577**	**1,423,049,941**	**1,227,307,359**	**1,195,407,273**	**1,221,693,250**	**1,780,549,736**	**1,832,585,106**
Soft Costs			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Environ Assesmt/ImpactStmt, Permiting		1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000
Engineering/Architecture	10.0%	64,577,388	66,507,130	65,362,284	108,106,867	111,496,008	109,179,155	112,097,533	75,004,437	78,074,768	76,056,766	79,329,058	142,304,994	122,730,736	119,540,727	122,169,325	178,054,974	183,258,511
ConstructionManagement	15.0%	96,866,082	99,760,695	98,043,425	162,160,300	167,244,013	163,768,733	168,148,299	112,506,655	117,112,152	114,085,150	118,993,587	213,457,491	184,096,104	179,311,091	183,253,988	267,082,460	274,887,766
Fixed Asset Survey	0.5%	3,228,869	3,325,356	3,268,114	5,405,343	5,574,800	5,458,958	5,604,877	3,750,222	3,903,738	3,802,838	3,966,453	7,115,250	6,136,537	5,977,036	6,108,466	8,902,749	9,162,926
Other Professional Fees	3.0%	19,373,216	19,952,139	19,608,685	32,432,060	33,448,803	32,753,747	33,629,260	22,501,331	23,422,430	22,817,030	23,798,717	42,691,498	36,819,221	35,862,218	36,650,798	53,416,492	54,977,553
Subtotal		185,365,556	190,865,320	187,602,508	309,424,571	319,083,624	312,480,593	320,797,969	215,082,645	223,833,089	218,081,784	227,407,814	406,889,233	351,102,597	342,011,073	349,502,576	508,776,675	523,606,755
Soft Cost Contingency	15.0%	27,804,833	28,629,798	28,140,376	46,413,686	47,862,544	46,872,089	48,119,695	32,262,397	33,574,963	32,712,268	34,111,172	61,033,385	52,665,390	51,301,661	52,425,386	76,316,501	78,541,013
Staff Training and Development	LS	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000
Probable Soft Cost Total		**213,610,389**	**219,935,118**	**216,182,884**	**356,278,257**	**367,386,168**	**359,792,682**	**369,357,664**	**247,785,041**	**257,848,053**	**251,234,052**	**261,958,987**	**468,362,618**	**404,207,987**	**393,752,734**	**402,367,962**	**585,533,176**	**602,587,768**
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Costs			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Land Acquisition: Barren Island		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Land Acquisition: Knapp Street		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Land Acquisition: Jamaica		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Land Acquisition: Rockaway		172,176	172,176	172,176	172,176	172,176	172,176	172,176	172,176	172,176	172,176	172,176	172,176	172,176	172,176	172,176	172,176	172,176
Land Acquisition: Coney Island		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Land Acquisition: 26th Ward (no purchase req.)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Setaside for Art	0.5%	2,736,330	2,818,099	2,769,588	4,580,799	4,724,407	4,626,235	4,749,895	3,178,154	3,308,253	3,222,744	3,361,401	6,029,873	5,200,455	5,065,285	5,176,666	7,544,702	7,765,191
Probable Other Cost Total		**2,908,506**	**2,990,275**	**2,941,764**	**4,752,975**	**4,896,583**	**4,798,411**	**4,922,071**	**3,350,330**	**3,480,429**	**3,394,920**	**3,533,577**	**6,202,049**	**5,372,631**	**5,237,461**	**5,348,842**	**7,716,878**	**7,937,367**
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CONCEPTUAL PROJECT COST		**862,292,775**	**887,996,691**	**872,747,484**	**1,442,099,902**	**1,487,242,835**	**1,456,382,646**	**1,495,255,064**	**1,001,179,738**	**1,042,076,184**	**1,015,196,637**	**1,058,783,140**	**1,897,614,607**	**1,638,887,977**	**1,594,397,468**	**1,629,410,065**	**2,373,799,790**	**2,443,110,241**

Item	Applied Factors	Jamaica, 26th Ward, Coney Island & Rockaway to Ocean - Mixed Flow Pumps Trench Wet Well	Jamaica, 26th Ward, Coney Island & Rockaway to Ocean - Cross Bay Siphon, MF Pumps at Rockaway Shaft	Jamaica to Rockaway Inlet - Submersible Pumps in CCT	Jamaica to Rockaway Inlet- Submersible Pumps Wet Well/Dry Well	Jamaica to Rockaway Inlet - Mixed Flow Pumps Trench Wet Well	Jamaica & 26th Ward to Rockaway Inlet - Submersible Pumps in CCT	Jamaica & 26th Ward to Rockaway Inlet - Submersible Pumps Wet Well/Dry Well	Jamaica & 26 Ward to Rockaway Inlet - Mixed Flow Pumps Trench Wet Well	Jamaica & 26th Ward to Rockaway Inlet - Cross Bay Siphon, MF Pumps at Barren Island Shaft	Jamaica, 26th Ward & Rockaway to Rockaway Inlet - Submersible Pumps in CCT	Jamaica, 26th Ward & Rockaway to Rockaway Inlet - Submersible Pumps Wet Well/Dry Well	Jamaica, 26 Ward & Rockaway to Rockaway Inlet - Mixed Flow Pumps Trench Wet Well	Jamaica, 26th Ward & Rockaway to Rockaway Inlet Cross Bay Siphon, MF Pumps at Barren Island Shaft	Jamaica, 26th Ward & Coney Island to Ocean - Submersible Pumps in CCT, Jamaica & Coney Island to 26th Ward via Open Cut Force Mains, 26th Ward to Ocean	Jamaica, 26th Ward & Coney Island to Ocean - Submersible Pumps in wet well/dry well, Jamaica & Coney Island to 26th Ward via Open Cut Force Mains, 26th Ward to Ocean	Jamaica, 26th Ward & Coney Island to Ocean - Submersible Pumps in Trench wet well, Jamaica & Coney Island to 26th Ward via Open Cut Force Mains, 26th Ward to Ocean	Jamaica, 26th Ward & Rockaway to Ocean - Via Gravity w/ Tunnel @ 1.5 X DDWF	Jamaica and 26th Ward to Ocean - Via Gravity w/ Tunnel @ 1.5 X DDWF	Jamaica and 26th Ward to Rockaway Inlet - Via Gravity w/ Tunnel @ 1.5 X DDWF
Jamaica WPCP Shaft		2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	0	0	0	2,000,000	2,000,000	2,000,000
26 Ward WPCP Shaft		3,900,000	3,900,000	0	0	0	3,700,000	3,700,000	3,700,000	3,700,000	3,700,000	3,700,000	3,700,000	3,700,000	1,700,000	1,700,000	1,700,000	3,700,000	3,700,000	3,700,000
Rockaway Shaft		7,600,000	5,600,000	0	0	0	0	0	0	0	2,300,000	2,300,000	2,300,000	2,300,000	5,600,000	5,600,000	5,600,000	6,200,000	5,400,000	0
Coney Island WPCP Shaft		2,200,000	2,200,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barren Island Shaft		0	0	4,000,000	4,000,000	4,000,000	4,100,000	4,100,000	4,100,000	2,100,000	4,100,000	4,100,000	4,100,000	2,100,000	0	0	0	0	0	4,100,000
Ocean Outfall Shaft		9,100,000	9,100,000	0	0	0	0	0	0	0	0	0	0	0	9,100,000	9,100,000	9,100,000	7,700,000	7,200,000	0
Rockaway Inlet Shaft		0	0	3,200,000	3,200,000	3,200,000	4,300,000	4,300,000	4,300,000	4,300,000	4,300,000	4,300,000	4,300,000	4,300,000	0	0	0	0	0	4,300,000
Jamaica to Rockaway Tunnel		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jamaica to 26 Ward Tunnel		63,076,200	63,076,200	0	0	0	63,076,200	63,076,200	63,076,200	63,076,200	63,076,200	63,076,200	63,076,200	63,076,200	0	0	0	66,899,000	66,899,000	66,899,000
26 Ward to Rockaway Tunnel		110,181,250	111,477,500	0	0	0	0	0	0	0	0	0	0	0	119,255,000	119,255,000	119,255,000	127,032,500	125,736,250	0
Coney Island to Rockaway Tunnel		93,217,100	93,217,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jamaica to Barren Island Tunnel		0	0	136,529,250	136,529,250	136,529,250	0	0	0	0	0	0	0	0	0	0	0	0	0	111,181,500
26 Ward to Barren Island Tunnel		0	0	0	0	0	93,249,000	93,249,000	93,249,000	95,640,000	93,249,000	93,249,000	93,249,000	93,249,000	0	0	0	0	0	0
Rockaway to Barren Island Tunnel		0	0	0	0	0	0	0	0	0	39,323,500	39,323,500	39,323,500	39,990,000	0	0	0	0	0	0
Rockaway to Ocean Outfall Tunnel		285,900,000	291,618,000	0	0	0	0	0	0	0	0	0	0	0	263,028,000	263,028,000	263,028,000	208,936,000	161,893,000	0
Barren Island to Rockaway Inlet Tunnel		0	0	50,635,250	50,635,250	50,635,250	60,460,000	60,460,000	60,460,000	61,215,750	64,994,500	64,994,500	64,994,500	66,506,000	0	0	0	0	0	70,284,750
Diffuser		96,161,509	96,161,509	5,994,016	5,994,016	5,994,016	9,923,645	9,923,645	9,923,645	9,923,645	11,325,077	11,325,077	11,325,077	11,325,077	85,073,027	85,073,027	85,073,027	72,680,234	79,782,300	9,923,645
Rockaway Pump Station Excavation and Soil Stabilization		0	21,700,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barren Island Pump Station Excavation and Soil Stabilization		0	0	0	0	0	0	0	0	19,989,500	0	0	0	15,252,000	0	0	0	0	0	0
Warf and Bulkhead-Rockaway		10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	0	0	0	0	0	0	0	0	6,250,000	6,250,000	6,250,000	10,000,000	10,000,000	0
Warf and Bulkhead-26 Ward		10,000,000	10,000,000	0	0	0	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	0	0	0	0	0	10,000,000
Warf and Bulkhead-Barren Island		0	0	0	0	0	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	0	0	0	0	0	10,000,000
Sitework		13,193,970	4,846,676	1,175,963	4,799,770	3,283,086	2,689,541	9,820,936	6,882,615	2,958,312	4,057,862	13,528,018	9,629,025	4,265,751	48,537,358	52,044,946	50,823,329	8,851,758	7,039,029	7,039,029
Concrete		13,483,395	14,398,066	287,549	4,987,831	3,650,767	664,777	9,921,369	7,214,775	11,784,029	1,114,942	13,188,730	9,390,874	13,630,245	2,407,844	16,537,279	12,283,184	0	0	0
Masonry		0	45,663	4,384	546,194	0	6,095	1,061,314	0	45,663	9,517	1,471,104	0	45,663	9,089	1,034,624	0	0	0	0
Metals		102,025	43,634	413,663	462,352	27,868	763,732	904,339	55,736	43,634	930,858	1,232,767	74,157	43,634	1,456,415	1,587,093	300,857	0	0	0
Woods and Plastics		40,000	19,550	0	25,000	10,000	0	50,000	20,000	15,000	4,550	65,000	30,000	19,550	4,550	75,000	30,000	0	0	0
Thermal and Moisture Protection		199,324	195,245	3,357	264,263	54,986	5,392	513,310	107,677	159,078	7,583	683,472	139,246	175,254	17,586	790,879	167,755	0	0	0
Doors and Windows		0	4,781	0	67,993	0	0	135,986	0	4,781	0	178,120	0	4,781	0	202,979	0	0	0	0
Finishes		0	7,320	0	144,779	0	0	281,605	0	7,320	0	365,828	0	7,320	0	418,431	0	0	0	0
Specialties		0	0	0	14,696	0	0	29,792	0	0	0	38,846	0	0	0	44,688	0	0	0	0
Equipment and Mechanical Systems		16,435,369	10,813,728	5,069,731	5,578,031	4,859,344	10,375,466	11,209,015	9,612,383	7,242,832	12,758,972	14,011,267	11,886,878	8,852,077	16,403,817	18,468,497	14,160,874	0	0	0
Conveying System		0	0	171,236	169,392	0	341,616	337,994	0	0	507,189	503,435	0	0	884,484	506,596	0	0	0	0
Plumbing/HVAC		1,023,924	403,380	142,652	297,740	283,804	284,680	578,180	558,984	403,380	365,812	773,200	746,744	403,380	427,332	856,620	834,164	0	0	0
Force Main/Utility Relocation		0	0	0	0	0	0	0	0	0	0	0	0	0	21,119,454	21,119,454	21,119,454	0	0	0
Electrical		8,481,569	4,101,480	4,494,087	3,004,574	2,366,073	10,386,877	5,854,990	4,519,017	2,882,541	13,597,875	7,716,951	6,133,045	3,290,880	14,880,964	8,892,716	6,867,541	0	0	0
Electrical Building		2,377,207	717,751	506,087	0	633,801	1,012,174	0	1,267,602	640,999	1,448,756	0	1,743,406	658,530	1,518,261	0	1,901,403	0	0	0
Emergency Generator Area Site Work		2,002,600	465,712	209,701	211,539	621,070	419,402	423,078	1,242,140	140,511	558,878	634,617	1,381,530	465,712	629,103	623,192	1,883,210	0	0	0
Primary Power Area Site Work		558,767	142,182	130,530	132,278	142,821	261,060	264,556	285,242	370,452	391,590	396,834	418,146	142,226	381,590	427,863	0	0	0	0
Emergency Power		5,033,841	2,456,126	1,437,301	1,476,605	1,437,301	2,797,942	2,891,845	2,797,942	1,984,214	3,696,175	3,763,659	3,596,540	2,456,126	4,158,583	4,293,560	4,235,245	0	0	0
Primary Power Switchgear		3,934,755	1,081,497	1,001,507	1,062,355	1,001,507	2,003,014	2,131,411	2,003,014	1,034,837	2,961,191	3,104,975	2,933,248	1,081,497	3,904,521	3,171,795	3,004,521	0	0	0
Grassy Bay Recontouring		0	39,742,751	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mobilization/Demobilization		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Removal of Bottom Muck		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fill		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cross Rockaway Fill Transport (Directional Drill)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grassy Bay Aeration Headers/Diffusers		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Temporary Treatment During Construction		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Avoided UV Disinfection Installation Cost (TBD)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Avoided UV Disinfection Installation Cost (TBD)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BNR Structure		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BNR Equipment		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-Total		760,182,805	799,535,911	227,406,264	235,604,308	230,740,704	292,820,813	307,218,585	297,375,972	311,692,656	350,779,827	370,023,100	356,471,116	359,340,883	605,858,978	618,852,210	607,825,435	523,999,492	479,829,579	299,427,924
Scope Development (Design) Contingency @	20.0%	152,036,561	159,907,182	45,481,253	47,120,862	46,148,141	58,564,123	61,443,713	59,475,194	62,338,531	70,155,925	74,004,620	71,294,223	71,868,177	121,131,796	123,770,442	121,565,087	104,799,898	95,925,916	59,885,585
Sub-Total		912,219,366	959,443,093	272,887,517	282,725,170	276,888,845	351,384,736	368,662,278	356,851,166	374,031,187	420,935,752	444,027,720	427,765,339	431,209,060	726,990,774	742,622,652	729,390,522	628,799,390	575,555,495	359,313,509
Contract Allowances (BWT Add-Ons) @	7.0%	63,855,356	67,161,017	19,102,126	19,790,762	19,382,219	24,596,931	25,806,359	24,979,582	26,182,183	29,465,489	31,081,940	29,943,574	30,184,634	50,875,354	51,963,586	51,057,337	44,015,957	40,288,885	25,151,946
Sub-Total		976,074,722	1,026,604,110	291,989,643	302,515,931	296,271,064	375,981,667	394,468,637	381,830,748	400,213,370	450,401,041	475,109,660	457,708,913	461,393,694	777,866,128	794,586,238	780,447,859	672,815,348	615,844,379	384,465,454
General Conditions @	15.0%	146,411,208	153,990,616	43,798,446	45,377,390	44,440,660	56,397,250	59,170,296	57,274,612	60,032,006	67,560,156	71,266,449	68,656,337	69,208,054	116,649,919	119,190,936	117,067,179	100,922,302	92,376,657	57,669,818
Sub-Total		1,122,485,930	1,180,594,726	335,788,089	347,893,321	340,711,724	432,378,917	453,638,933	439,105,360	460,245,376	517,961,197	546,376,109	526,365,250	530,602,748	894,516,047	913,797,173	897,515,037	773,737,650	708,221,036	442,135,273
Payment Performance Bonds @	1.5%	16,837,289	17,708,921	5,036,821	5,218,400	5,110,676	6,485,684	6,804,584	6,586,580	6,903,681	7,769,418	8,195,642	7,895,479	7,956,041	13,414,741	13,706,958	13,462,726	11,606,065	10,623,316	6,532,029
Sub-Total		1,139,323,219	1,198,303,647	340,824,911	353,111,721	345,822,399	438,864,601	460,443,517	445,691,941	467,149,056	525,730,615	554,571,751	534,260,729	538,561,789	907,730,788	927,504,131	910,977,763	785,343,715	718,844,352	448,767,302
Contractor Overhead and Profit @	21.0%	239,257,875	251,643,786	71,573,231	74,153,461	72,622,704	92,161,566	96,693,139	93,595,308	98,101,302	110,403,429	116,460,068	112,184,753	113,087,876	190,523,485	194,775,867	191,305,330	164,922,180	150,957,314	94,241,133
Sub-Total		1,378,581,095	1,449,947,413	412,398,142	427,265,182	418,445,103	531,026,167	557,136,656	539,287,248	565,250,358	636,134,044	671,031,819	646,455,482	651,649,765	1,098,254,253	1,122,279,998	1,102,283,093	950,265,895	869,801,666	543,008,435
Construction Escalation @	0.0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-Total		1,378,581,095	1,449,947,413	412,398,142	427,265,182	418,445,103	531,026,167	557,136,656	539,287,248	565,250,358	636,134,044	671,031,819	646,455,482	651,649,765	1,098,254,253	1,122,279,998	1,102,283,093	950,265,895	869,801,666	543,008,435
Probable Bid Cost Total		**1,378,581,095**	**1,449,947,413**	**412,398,142**	**427,265,182**	**418,445,103**	**531,026,167**	**557,136,656**	**539,287,248**	**565,250,358**	**636,134,044**	**671,031,819**	**646,455,482**	**651,649,765**	**1,098,254,253**	**1,122,279,998**	**1,102,283,093**	**950,265,895**	**869,801,666**	**543,008,435**
Construction Reserve (Change Orders) @	10.0%	137,858,109	144,994,741	41,239,814	42,726,518	41,844,510	53,102,617	55,713,666	53,928,725	56,525,036	63,613,404	67,103,182	64,645,548	65,165,976	109,835,425	112,228,000	110,228,309	95,026,589	86,980,167	54,300,844
Sub-total		1,516,439,204	1,594,942,154	453,637,956	469,991,701	460,289,614	584,128,784	612,850,321	593,215,973	621,775,394	699,747,449	738,135,001	711,101,030	716,815,741	1,208,189,678	1,234,507,998	1,212,511,402	1,045,292,484	956,781,832	597,309,279
Probable Construction Cost Total (2004 $)		1,516,439,204	1,594,942,154	453,637,956	469,991,701	460,289,614	584,128,784	612,850,321	593,215,973	621,775,394	699,747,449	738,135,001	711,101,030	716,815,741	1,208,189,678	1,234,507,998	1,212,511,402	1,045,292,484	956,781,832	597,309,279
Probable Construction Cost Total (2006 $)	1.18	1,789,398,261	1,882,031,742	535,292,788	554,590,207	543,141,744	689,271,865	723,183,378	699,994,848	733,894,965	825,701,990	870,999,301	839,099,215	845,854,375	1,425,563,920	1,456,719,438	1,430,763,456	1,233,445,131	1,129,002,962	704,824,949
Soft Costs																				
Environ Assesmt/ImpactStmt, Permiting		1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000	1,320,000
Engineering/Architecture	10.0%	178,939,826	188,203,174	53,529,279	55,459,021	54,314,174	68,927,198	72,316,338	69,999,485	73,389,497	82,570,199	87,099,930	83,909,922	84,585,437	142,586,392	145,671,944	143,076,345	123,344,513	112,900,256	70,482,495
ConstructionManagement	15.0%	268,409,739	282,304,761	80,293,918	83,188,531	81,471,262	103,390,795	108,474,507	104,999,227	110,054,245	123,855,298	130,649,895	125,864,882	126,878,156	213,849,573	218,507,916	214,614,518	185,016,770	169,350,384	105,723,742
Fixed Asset Survey	0.5%	8,946,991	9,410,159	2,676,464	2,772,951	2,715,709	3,446,360	3,615,817	3,499,974	3,668,475	4,128,510	4,354,997	4,195,496	4,229,272	7,128,319	7,283,587	7,153,817	6,167,226	5,645,013	3,524,125
Other Professional Fees	3.0%	53,681,948	56,460,952	16,058,784	16,637,706	16,294,252	20,678,159	21,694,901	20,999,845	22,010,849	24,771,060	26,129,979	25,172,976	25,375,631	42,769,915	43,701,583	42,922,904	37,003,354	33,870,077	21,144,748
Subtotal		511,298,504	537,699,046	153,878,445	159,378,209	156,115,397	197,762,510	207,421,563	200,818,532	210,423,065	236,645,067	248,554,801	240,463,276	242,388,497	407,634,189	416,485,040	408,087,585	352,851,862	323,085,730	202,195,110
Soft Cost Contingency	15.0%	76,694,776	80,654,857	23,081,767	23,906,731	23,417,310	29,664,376	31,113,234	30,122,780	31,563,460	35,496,760	37,453,220	36,069,491	36,358,275	61,145,128	62,472,756	61,363,138	52,927,779	48,462,860	30,329,267
Staff Training and Development	LS	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000	440,000
Probable Soft Cost Total		**588,433,280**	**618,793,903**	**177,409,211**	**183,724,940**	**179,972,707**	**227,866,886**	**238,974,797**	**231,381,311**	**242,426,526**	**273,581,827**	**287,428,021**	**276,972,768**	**279,186,771**	**469,219,317**	**479,397,796**	**470,890,722**	**406,219,642**	**371,988,590**	**232,964,377**
Other Costs																				
Land Acquisition: Barren Island		0	0	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	0	0	0	0	0	500,000
Land Acquisition: Knapp Street		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Land Acquisition: Jamaica		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Land Acquisition: Rockaway		172,176	172,176	0	0	0	0	0	0	0	0	0	0	0	172,176	172,176	172,176	172,176	172,176	0
Land Acquisition: Coney Island		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Land Acquisition: 26th Ward (no purchase req.)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Setaside for Art	p	7,582,196	7,974,711	2,268,190	2,349,959	2,301,448	2,920,544	3,064,252	2,966,080	3,108,877	3,498,737	3,690,675	3,555,505	3,584,129	6,040,946	6,172,540	6,062,557	5,226,462	4,783,909	2,986,546
Probable Other Cost Total		**7,754,372**	**8,146,887**	**2,768,190**	**2,849,959**	**2,801,448**	**3,420,544**	**3,564,252**	**3,466,080**	**3,608,877**	**3,998,737**	**4,190,675**	**4,055,505**	**4,084,129**	**6,213,124**	**6,344,716**	**6,234,733**	**5,398,638**	**4,956,085**	**3,486,546**
TOTAL CONCEPTUAL PROJECT COST		**2,386,685,913**	**2,509,972,532**	**716,461,190**	**741,165,106**	**725,915,899**	**920,669,495**	**985,702,428**	**934,842,240**	**979,739,367**	**1,102,282,584**	**1,162,617,997**	**1,120,127,488**	**1,129,125,375**	**1,901,096,262**	**1,942,461,950**	**1,907,888,910**	**1,648,063,412**	**1,505,947,237**	**941,275,872**

Table 5-5
Listing of Applicable Permits

Agency/Authority	Permit/Approval/Review	Regulated Activity
Federal		
CEQ	National Environmental Policy Act (NEPA)	Review of environmental impacts associated with federally approved or funded actions.
USACOE	Section 404 of the Clean Water Act (Joint Application) Section 103 of the Marine Protection, Research and Sanctuaries Act (MPRSA)	Discharge of dredged or fill material into waters of the United States (including non-isolated and tidal wetlands). Requires federal delineation of affected wetland areas. Transportation of material for the purpose of ocean dumping.
USACOE	Section 10 of the Rivers & Harbors Act of 1899 (Joint Application)	Work within navigable waters of the United States.
USEPA	Section 403 of the Clean Water Act	Potential impacts from point source discharges on marine resources (for discharges to territorial seas and beyond).
NMFS & USFWS	Endangered Species Act	Potential impacts to endangered and threatened species.
US Coast Guard	Private Aids to Navigation (33 CFR 66)	Activities and/or placement of temporary or permanent structures potentially affecting navigation. May also require USACOE approval (see NWP No. 1) and "Notice to Mariners".
NPS	National Natural Landmarks	Potential impacts to federally designated nationally significant natural areas. Extension of utilities on NPS lands will also require consultation with the NPS.
State		
NYSDEC	Freshwater Wetlands (6 NYCRR Part 663) (6 NYCRR Part 664) (Joint Application)	Activities within State-regulated freshwater wetlands and buffer areas (100 – 300 feet). See NYSDEC maps. May include development of mitigation plan.
NYSDEC	Tidal Wetlands (6 NYCRR Part 661) (Joint Application)	Activities within State-regulated tidal wetlands and buffer areas (100 – 300 feet). See NYSDEC maps. May include development of mitigation plan.

Table 5-5
Listing of Applicable Permits (contd).

Agency/Authority	Permit/Approval/Review	Regulated Activity
NYSDEC	Protection of Waters (6 NYCRR Part 608) (Joint Application)	Work within navigable water bodies or disturbance to the bed or banks of protected streams.
NYSDEC	Coastal Erosion Hazard Area (6 NYCRR Part 505) (Joint Application)	Coastal Erosion Hazard Area permits are required along sensitive shorelines in structural hazard areas or natural protective feature areas, which are indicated on Coastal Erosion Hazard Area Maps.
NYSDEC	Section 401 of the Clean Water Act (Joint Application)	Certification is used to ensure that federal agencies issuing permits or carrying out direct actions which may result in a discharge to the waters of the United States do not violate New York State's water quality standards or impair designated uses.
NYSDEC	State Pollutant Discharge Elimination System General Permit (GP-02-01)	Storm water discharges from construction phase activities that exceed one acre. Includes development of Storm Water Pollution Prevention Plan.
NYSDEC	State Pollutant Discharge Elimination System Permit (6 NYCRR 751) (Section 402 of the Clean Water Act)	Control of wastewater discharges in accordance with Federal Clean Water Act. Also regulates thermal discharges (6 NYCRR 704). May require fisheries impact evaluation. See also Section 403 of the Clean Water Act.
NYSDEC	Approval of Plans and Specifications (6 NYCRR 652)	Approval of plans for wastewater disposal systems (BSP-5 and San 65 Forms).
NYSOPRHP	Federal & State Preservation Laws (Section 106 of NHPA) (9 NYCRR 428)	Activities affecting historic, architectural, archaeological or cultural resources.
NYSDOS	Waterfront Revitalization and Coastal Resources Consistency Review (CZMA) (19 NYCRR 600)	Review to determine project's consistency with State's federally approved Coastal Management Program and local waterfront revitalization program (if available).
NYSOGS	Underwater Land Grant/Easement	New York State is sovereign owner of the beds of numerous bodies of water in the State. Various activities relating to the use of this land under water require permission from the State. May also require

Table 5-5
Listing of Applicable Permits (contd).

Agency/Authority	Permit/Approval/Review	Regulated Activity
		grant of easement from NYSOPRHP to permit public utilities to pass over, through or under property under the jurisdiction of Office of Parks, Recreation and Historic Preservation. **(NPS oversees lands under Jamaica Bay. Federal marine waters and lands underwater outside 3-mile State limit [continental shelf] are managed by USDOI. Lands underwater inside 3-mile State limit [with exception of Jamaica Bay] are managed by NYSOGS.)**
NYSDOT	Highway Work Permit	Work within NYS highway rights-of-way.
EFC	State Funding – State Revolving Fund	State funding will trigger reviews under SEQRA and funding-specific requirements (*i.e.*, SERP).
Local		
Lead Agency (NYCDEP)	SEQRA (6 NYCRR 617) CEQR (RCNY, Title 62, Chapter 5) ULURP (NYC Code, Section 197-c	Environmental review of potential environmental and socio-economic impacts. Federal funding/permits may require NEPA review and "Environmental Justice" issues. Requires review of site selection for capital projects, or changing of zoning districts, or acquisition of real property by the City.
NYC	Floodplain Development (6 NYCRR 500)	Construction in a 100-year floodplain.
NYC	Miscellaneous	Substantive compliance with NYC code requirements, work within street rights-of-way, etc.

Table 5-5
Listing of Applicable Permits (contd).

Agency/Authority	Permit/Approval/Review	Regulated Activity
NYC Department of Business Services	1. Waterfront Area Construction Permit 2. Excavation & Fill Permit 3. Certification of Completion	Waterfront construction or repairs.
NYC Building Department	1. Building & Foundation Excavation 2. Architectural & Structural Steel 3. Standpipe & System Plumping 4. Ventilation System 5. Building Certificate of Completion	Review of construction plans for compliance with Building Code and current safety and zoning requirements.
NYC Department of Planning	1. ULURP 2. Local Waterfront Revitalization	See items 20 and 24.
NYC Department of Transportation	1. Sidewalk Construction, Street Closing & Detour Permits	Construction or repairs.
NYCDEP	1. Construction Permit for Sewer or Drain 2. City Water Connection	Installation or repair.
NYC Board of Standards & Appeals/City Planning Commission	1. Zoning Resolution/Variance Approval	Zoning special permits.
NYC Bureau of Electrical Control	1. Advisory Board Approval	Alterations or repairs.
Con Edison	1. Approval of Contract Plans	Approval of plans.
NYC Art Commission	1. Approval	Review and approval of works of art, architecture, and landscape architecture on City-owned property.

Table 5-5
Listing of Applicable Permits (contd).

Notes

1. Approximate agency review timeframes based on receipt of complete application.
2. USACOE has discretion to require project specific permit. Likelihood that USACOE will exercise discretion increases with larger projects that have greater potential to impact environment. Timelines increase for project specific permits.
3. Actual acquisition of permits from other New York City Departments may not be necessary. However, inter-department consultation and substantive compliance with local regulations and codes is necessary.

Sources

1. OPAL – New York State's Comprehensive Site For Online Permit Assistance and Licensing (http://www.nys-permits.org/)
2. NYCDEP – Long Outfall Alternatives, Development and Feasibility Evaluation, Issues Identification Workshop for NYCDEP Stakeholders, May 3, 2001.

Abbreviations/Acronyms

BTU – British Thermal Unit
CEQ – Council on Environmental Quality
CEQR – City Environmental Quality Review
CFR – Code of Federal Regulations
CZMA – Coastal Zone Management Act of 1972
EDA – Economic Development Administration (US Department of Commerce)
EFC – Environmental Facilities Corporation
GML – General Municipal Law
GP – General Permit
GPD – gallons per day
MPRSA – Marine Protection, Research and Sanctuaries Act
NEPA – National Environmental Policy Act
NHPA – National Historic Preservation Act of 1966
NMFS – National Marine Fisheries Service
NPS – National Park Service
NWP – Nationwide Permit
NYC – New York City

Table 5-5
Listing of Applicable Permits (contd).

Abbreviations/Acronyms continued

NYCRR – New York Code, Rules & Regulations
NYSDOH – New York State Department of Health
NYSDOS – New York State Department of State
NYSDOT – New York State Department of Transportation
NYSDEC – New York State Department of Environmental Conservation
NYSOGS – New York State Office of General Services
NYSOPRHP – New York State Office of Parks, Recreation and Historic Preservation
RCNY – Rules of the City of New York
SEQRA – State Environmental Quality Review Act
SERP – State Environmental Review Process
SPCC – Spill Prevention, Control & Countermeasure
SPR – Spill Prevention Report
SRF – State Revolving Fund
ULURP – Uniform Land Use Review Procedure
USACOE – United States Army Corps of Engineers
USDOI – United States Department of the Interior
USEPA – United States Environmental Protection Agency
USFWS – United States Fish & Wildlife Service
ZBA – Zoning Board of Appeals

TABLE 5-6
Essential Fish Habitat Species at Rockaway Inlet

Species	Life Stage	Temp. °C	Salinity °/oo	Depth m	Seasonal Occurrence	Habitat	Comments
Finfish							
Merluccius bilinearis (whiting/silver hake)	Eggs	<20		50-150	Yearly Peaks June to Oct.	Surface Waters	
	Larvae	<20		50-130	Yearly Peaks July to Sep.	Surface Waters	
	Juveniles	<21	>20	20-270		Bottom habitats of all substrates.	
Urophycis chuss (red hake)	Eggs	<10	<25		May to November Peaks June and July	Surface waters of the inner continental shelf.	New larvae need shelter, including live sea scallops, floating or mid-water objects.
	Larvae	<19	>0.5	<200	May to December Peaks Sep. and Oct.	Surface Waters	
	Juveniles	<16	31-33	<100		Bottom habitats w/ shell substrate, incl. areas with many live scallops.	
Pseudopleuronectes americanus (winter flounder)	Eggs	<10	10-30	<5	Feb. to June	Bottom habitats, substrate of sand, muddy sand, mud, and gravel.	
	Larvae	<15	4-30	<6	March to July	Pelagic and bottom waters.	
	Juveniles (YOY)	<28	5-33	0.1-10		Bottom habitats, substrate of mud or fine-grained sand.	Major prey: amphipods, copepods, polychaetes, bivalve siphons.
	Juveniles (Age 1+)	<25	10-30	1-50		Bottom habitats, substrate of mud or fine-grained sand.	Major prey: amphipods, copepods, polychaetes, bivalve siphons.
	Adults	<25	15-33	1-100		Bottom habitats, incl. estuaries w/ substrate of mud, sand, gravel.	Major prey: amphipods, polychaetes, bivalve siphons, crustaceans.
	Spawning Adults	<15	5.5-36	<6	Feb. to June	Bottom habitats, incl. estuaries w/ substrate of mud, sand, gravel.	
Scophthalmus aquosus (windowpane)	Eggs	<20	-	<70	Feb. to Nov. Peaks May & Oct. (MAB)	Surface Waters	
	Larvae	<20	-	<70	Feb. to Nov. Peaks May & Oct. (MAB)	Pelagic Waters	
	Juveniles	<25	5.5-36	1-100	-	Bottom habitats-mud, fine-grained sand.	
	Adults	<25	5.5-36	1-75	-	Bottom habitats-mud, fine-grained sand.	
	Spawning Adults	<21	5.5-36	1-75	Feb. to Dec. Peak in May (MAB)	Bottom habitats-mud, fine-grained sand.	

TABLE 5-6
Essential Fish Habitat Species at Rockaway Inlet (contd).

Species	Life Stage	Temp. °C	Salinity °/oo	Depth m	Seasonal Occurrence	Habitat	Comments
Clupea harengus (Atlantic sea herring)	Juveniles	<10	26-32	15-135	-	Pelagic waters & bottom habitats.	
	Adults	<10	>28	20-130	-	Pelagic waters & bottom habitats.	
	Spawning Adults	<15	32-33	20-80	July through Nov.	Bottom habitats-gravel, sand, cobble and shell. Also on aquatic macrophytes.	
Lophius americanus (monkfish)	Eggs	<18	-	15-1000	Mar. to Sep.	Surface Waters	Eggs in long mucus veils floating near surface.
	Larvae	15	-	25-1000	Mar. to Sep.	Pelagic Waters	
Pomatomus saltatrix (bluefish)	Juveniles	19-24	23-36	-	May to Oct.	Pelagic Waters	Estuaries as nursery.
	Adults	14-16	>25		April to Oct.	Pelagic Waters	Highly migratory, major prey fish.
Peprilus triacanthus (Atlantic butterfish)	Larvae	9-19	6.4-37	10-1829	Summer and Fall	Pelagic Waters	
	Juveniles	3-28	3-37	10-365 (most <120)	Winter-shelf Summer to Fall-estuaries	Pelagic Waters Larger fish-sandy, muddy substrates.	
	Adults	3-28	4-26	10-365 (most <120)	Winter-shelf Summer to Fall-estuaries	Pelagic Waters (schools over sandy, sandy-silt, muddy substrates)	
Scomber scombrus (Atlantic mackerel)	Juveniles	4-22	>25	0-320	-	Pelagic Waters	
	Adults	4-16	>25	0-380	-	Pelagic Waters	Opportunistic feeders-filter or select prey. Major prey: crustaceans, pelagic mollusks, polychaetes, squid, fish.
Paralichthys dentatus (summer flounder)	Larvae	9-12	23-33 fresh in Hudson, Raritan	10-70	Sep. to Feb. (MAB)	Pelagic Waters-larvae mostly 19-83km offshore.	High use of tidal creeks and creek mouths.
	Juveniles	>11	10-30	0.5-5 in estuary	-	Demersal Waters, muddy substrate but prefer sand; lower estuary flats, channels, slat marsh creeks and eelgrass.	HAPC-macroalgae, seagrasses, fw & tidal macrophytes-any size bed & loose aggregations, within adult & juv. EFH. Major prey: mysid, shrimp.
	Adults	-	-	0-25	Warmer months-shallow coast & estuarine, offshore in colder months.	Demersal waters and estuaries.	HAPC-macroalgae, seagrasses, fw & tidal macrophytes-any size bed & loose aggregations, within adult & juv. EFH. Major prey: fish, shrimp, squid, polychaetes.
Stenotomus chrysops (scup)	Eggs	13-23	>15	<30	May to August	Pelagic waters in estuaries.	
	Larvae	13-23	>15	<20	May to Sep.	Pelagic waters in estuaries.	

TABLE 5-6
Essential Fish Habitat Species at Rockaway Inlet (contd).

Species	Life Stage	Temp. °C	Salinity °/oo	Depth m	Seasonal Occurrence	Habitat	Comments
	Juveniles	>7	>15	0-38	Spring, Summer-estuaries, bays.	Demersal waters; inshore sands, mud, mussel & eelgrass substrates.	
	Adults	>7	>15	2-185	Adults winter offshore south of NY.	Demersal waters, inshore estuaries on various substrates.	Spawn <30m during inshore migration May-Aug. Prey: small benthic invertebrates.
Centropristis striata (black sea bass)	Eggs	-	-	0-200	May to October	Water Column (coastal MAB)	
	Juveniles	>6	>18	1-38	Apr. to Dec., peak June to Nov.-coastal. Winter offshore south of NJ. Summer & Spring-estuaries.	Rough bottom, shellfish, eelgrass beds; man-made structures-sandy-shelly areas, offshore clam beds, shell patches-wintering.	YOY use salt marsh edges, channels-high habitat fidelity.
	Adults	>6	>20	20-50	May to Oct.-inshore, estuaries. Winter offshore south of NY.	Structured habitats (natural & man-made); sand & shell preferred.	Spawn in coastal bays, change sex to males with growth. Prey: benthic, near-bottom inverts, squid, small fish.
Scomberomorus cavalla (king mackerel)	Eggs Larvae Juveniles Adults	>20	>30	-	-	Sandy shoals of capes, offshore bars; high profile rock bottoms, barrier island oceanside waters from surf to shelf from Gulfstream shoreward; high salinity bays, estuaries, seagrass habitats.	All coastal inlets. Life stages not separated.
Scomberomorus maculatus (Spanish mackerel)	Eggs Larvae Juveniles Adults	>20	>30	-	-	Sandy shoals of capes, offshore bars; high profile rock bottoms, barrier island oceanside waters from surf to shelf from Gulfstream shoreward; high salinity bays, estuaries, seagrass habitats.	All coastal inlets. Life stages not separated.
Rachycentron canadum (cobia)	Eggs Larvae Juveniles Adults	>20	>25	-	-	Sandy shoals of capes, offshore bars; high profile rock bottoms, barrier island oceanside waters from surf to shelf from Gulfstream shoreward; high salinity bays, estuaries, seagrass habitats.	All coastal inlets. Life stages not separated.
Odontaspis taurus (sand tiger shark)	Larvae	-	-	-	-	-	-
Charcharinus obscurus (dusky shark)	Larvae	-	-	-	-	-	-
Charcharinus plumbeus (sandbar shark)	Larvae Juveniles Adults	-	-	-	-	-	-
Squalus acanthias	Eggs	n/a	n/a	n/a	n/a	n/a	

TABLE 5-6
Essential Fish Habitat Species at Rockaway Inlet (contd).

Species	Life Stage	Temp. °C	Salinity °/oo	Depth m	Seasonal Occurrence	Habitat	Comments
(spiny dogfish)	Larvae						
Invertebrates							
Loligo pealei (long finned squid)	Eggs	>8	30-32	<50	May-spawn July-hatch	Demersal egg masses-sandy/mud bottom, usually attached to rocks, pilings, algae.	Continental Shelf; Planktonic feeding when young, switch to crustaceans, small fish. Preyed on by fish, mammals, diving birds.
	Larvae	10-26	31.5-34.	Near Surface	n/a	Pelagic, near surface, move deeper as grow.	
Ilex illecebrosus (short finned squid)	Eggs	n/a	n/a	Midwater	n/a	Pelagic, midwater near pycnocline.	Continental Shelf; No wild caught, all lab-reared.
	Larvae	5-20: most >16.5.	35-37	Offshore-shelf to 360.	All seasons; most abundant late Jan. to Feb. in warm water above thermocline.	Gulf Stream and Slope Water convergence-high nutrients.	
Spisula solidissima (surf clam)	Eggs	6-24	>22	Shelf: lower edge of intertidal to 160	Major:July to mid-August Spawning. Minor: mid-Oct.	Open beaches and open ocean bottoms, generally absent from bays and estuaries. Prefer coarse sand/gravel.	Offshore, EEZ (Adults)
	Larvae	14-30; Optimum=22	8-30		Spring larvae from inshore clams; Fall larvae from offshore.		Planktivorous siphon feeders. Heavy predation. Susceptible to low dissolved oxygen.
Arctica islandica (ocean quahog)	Eggs	n/a	n/a	n/a	Spawn May to Dec.	n/a	
	Larvae	14-18	oceanic	Most at 25-61	Spawn May to Dec.		

Sources of Information: www.nmfs.noaa.gov
www.nefsc.noaa.gov

n/a = no information available.

TABLE 5-7
Essential Fish Habitat Species Located Offshore of Rockaway Beach

Species	Life Stage	Temp. °C	Salinity °/oo	Depth m	Seasonal Occurrence	Habitat	Comments
Finfish							
Carcharodon charcharias (white shark)	Juveniles	Temperate Subtropical	-	Average =20	-	Inshore, surfline, shallow bays, continental coastal waters.	Highly migratory.
Carcharinus obscurus (dusky shark)	Larvae Juveniles	Warm, Temperate	-	0-25	-	Inlets, estuaries and shallow coastal waters.	Highly migratory. Prey- small schooling fish.
Carcharinus plumbeus (sandbar shark)	Larvae Juveniles Adults	-	-	0-25	-	Shallow, coastal waters; submerged flats (1-4m).	Highly migratory.
Centropristis striata (black sea bass)	Eggs	-	-	0-200	May to October	Water Column (coastal MAB)	Not much known.
	Larvae	-	-	0-51	June to November	Pelagic, then become demersal.	Not much known.
	Juveniles	>6	>18	<10	Apr. to Dec.,peak June to Nov.-coastal. Winter-offshore south of NJ. Summer & Spring-estuaries.	Rough bottom, shellfish, eelgrass beds; man-made structures-sandy-shelly areas, offshore clam beds, shell patches-wintering.	YOY use salt marsh edges, channels-high habitat fidelity.
	Adults	>6	>20	10-20	May to Oct.-inshore, estuaries. Winter offshore south of NY.	Structured habitats (natural & man-made); sand & shell preferred.	Spawn in coastal bays, change sex to males with growth. Prey: benthic, near-bottom inverts, squid, small fish.
Clupea harengus (Atlantic sea herring)	Larvae	22-24	1.4-60; prefer 10-20	Surface		May associate with vegetation.	Major prey: copepod nauplii and copepodites. Diurnal vertical migrations to move into estuaries.
	Juveniles	<10	26-32	15-135	-	Pelagic waters & bottom habitats.	School, negative response to light, feed on zooplankton.
	Adults	<10	>28	20-130	-	Pelagic waters & bottom habitats.	Selective feeding on zooplankton.
	Spawning Adults	<15	32-33	20-80	July through Nov.	Bottom habitats-gravel, sand, cobble and shell. Also on aquatic macrophytes.	Overwinter after spawning.
Gadus morhua (Atlantic cod)	Adults	<10	Oceanic	40-130	Spawn winter and early spring.	On/near bottom on rocky slopes and ledges, coarse sediments. Avoids finer sediments.	Food varies, mostly invertebrates and some fish. Diel vertical migrations.

TABLE 5-7
Essential Fish Habitat Species Located Offshore of Rockaway Beach (contd).

Species	Life Stage	Temp. °C	Salinity °/oo	Depth m	Seasonal Occurrence	Habitat	Comments
Galeocerdo cuvieri (tiger shark)	Larvae	-	-	0-25	-	Shallow coastal areas to 200m isobath.	Highly migratory. Dangerous.
Glyptocephalus cynoglussus (witch flounder)	Eggs	4-17	-	10-1250, most 30-90	Spawning May-June. Eggs collected February to October.	Pelagic, deep water fish, spawn near bottom, buoyant eggs rise.	
	Larvae	4-20	-	Pelagic 10-210	Larvae collected March to November.	-	
Isurus oxyrhyncus (shortfin mako shark)	Larvae Juveniles	Rare <16; Prefer 17-22	-	Pelagic, 0-500	-	Tropical and temperate offshore waters.	Highly migratory. One of fastest. Preys on squid, bony fishes.
Katsuwonus pelamis (skipjack tuna)	Adults	Warm, tropical waters.	-	-	-	25 to 200m isobath.	Highly migratory. Spawn year-round in tropical oceans.
Lophius americanus (monkfish/goosefish)	Eggs	<18	-	15-1000	March to September	Surface Waters	Eggs in long mucus veils floating near surface.
	Larvae	15	-	25-1000	March to September	Pelagic Waters	
	Juveniles	3-13	-	>20	Spawn spring through early fall; peak May-June.	Bottom.	Partially bury to ambush prey. Opportunistic feeders on benthic and pelagic species.
	Adults	0-24	3 0-36	Prefer 50-99	-	Open, hard sand, pebbly-gravel, mixed sand/shell and mud bottoms.	
Macrozoarces americanus (ocean pout)	Eggs	-	-	-	Fall spawning, mid-winter hatching.	Demersal, gelatinous masses, sheltered, rocky crevices.	Eggs guarded by parent.
	Larvae	-	>25	Benthic	Winter, Spring	Near nest shelter.	Rarely collected.
	Juveniles	3-14	-	<100	Winter, Spring	Shallow, coastal waters around rocks and attached algae.	Feed by sorting mouthfuls of sediment for infauna. Ambush predator. Major prey is sand dollar. Susceptible to anoxia.
	Adults	3-25, prefer 3-14.	-	Intertidal to 200m.	Winter, Spring	Demersal. MAB: warm, shallow to mid-depth. Rocky habitats-reefs and wrecks. Found on most sediment types.	
Merluccius bilinearis (whiting/silver hake)	Eggs	<20	-	50-150	Yearly; Peaks June to Oct.	Surface Waters	
	Larvae	<20	-	50-130	Yearly; Peaks July to Sep.	Surface Waters	
	Juveniles	<21	>20	20-270		Bottom habitats of all substrates.	Feed on fish, crustaceans, squid.
	Adults	3-19	-	5-400	Spring and Fall	Continental shelf.	

TABLE 5-7
Essential Fish Habitat Species Located Offshore of Rockaway Beach (contd).

Species	Life Stage	Temp. °C	Salinity °/oo	Depth m	Seasonal Occurrence	Habitat	Comments
Odontaspis taurus (sand tiger shark)	Larvae	-	-	-	-	Shallow coastal waters, bottom or dermersal. Sandy coastal waters, shallow bays, estuaries and rocky or tropical reefs	Highly migratory. Feeds on fish, small sharks, rays, squid, crustaceans.
Paralichthys dentatus (summer flounder/fluke)	Larvae	9-12	23-33 fresh in Hudson, Raritan	1-70	Sep. to Feb. (MAB)	Pelagic Waters-larvae mostly 19-83km offshore.	High use of tidal creeks and creek mouths.
	Juveniles	>11	10-30	1-70; 0.5-5 in estuary	-	Demersal Waters, muddy substrate but prefer sand; lower estuary flats, channels, slat marsh creeks and eelgrass.	HAPC-macroalgae, seagrasses, fw & tidal macrophytes-any size bed & loose aggregations, within adult & juv. EFH. Major prey: mysid, shrimp.
	Adults	-	-	1-360	Warmer months-shallow coast & estuarine, offshore in colder months.	Demersal waters and estuaries.	HAPC-macroalgae, seagrasses, fw & tidal macrophytes-any size bed & loose aggregations, within adult & juv. EFH. Major prey: fish, shrimp, squid, polychaetes.
Peprilus triacanthus (Atlantic butterfish)	Eggs	6-26; prefer 11-17	25-33.	<200	-	Pelagic. Surface waters, continental shelf, estuaries and bays.	
	Larvae	9-19	6.4-37	10-1829	Summer and Fall	Pelagic Waters	
	Juveniles	3-28	3-37	10-365 (most <120)	Winter-shelf Summer to Fall-estuaries	Pelagic Waters Larger fish-sandy, muddy substrates.	
	Adults	3-28	4-26	10-365 (most <120)	Winter-shelf Summer to Fall-estuaries	Pelagic Waters (schools over sandy, sandy-silt, muddy substrates)	
Pleuronectes ferruginea (yellowtail flounder)	Eggs	2-15	32.44-33.49	10-750; most 30-90	Spawn March-to August.	Pelagic, nearshore, continental shelf waters.	
	Larvae	5-17	32.44-33.49	10-1250; most 10-90	NYB: March to April	Pelagic, limited to water current.	
	Juveniles	2-18	32.44-33.49	9-287; most 20-50	Yearly	Sand or sand and mud.	

TABLE 5-7
Essential Fish Habitat Species Located Offshore of Rockaway Beach (contd).

Species	Life Stage	Temp. °C	Salinity °/oo	Depth m	Seasonal Occurrence	Habitat	Comments
	Adults	2-17	32.44-33.49	9-238; most 37-73.	Yearly	Sand or sand and mud.	Feed on benthic macrofauna.
Pollachius virens (pollock)	Juveniles	0-15.6	29-32	5-250; most 25-75	July to November	Inshore, sand, mud, rocky or aquatic vegetation bottoms. Shallow intertidal.	Intertidal important nursery. Major prey is crustaceans.
Pomatomus saltatrix (bluefish)	Eggs	MAB: 18-22	MAB: >31	-	Spawn late Spring to mid-August.	Open ocean.	
	Larvae	18-24	30-32	-	Summer	Open ocean, edge and mid-continental shelf.	Feed on copepods. Migrate vertically, surface at night.
	Juveniles	19-24	23-36	-	May to Oct.	Pelagic waters, ubiquitous in mixing and seawater zones. Seldom found beyond Continental Shelf. Shallow nearshore habitats. Estuaries as nursery.	Highly migratory, major prey fish. Visual feeders on polychaetes, crustaceans, fish. Can change depths rapidly-secretes gas into swim bladder fastest rate known.
	Adults	14-16	>25		April to Oct.		
Prionace glauca (blue shark)	Larvae Adults	10-20	-	Surface in water depths >200.	Summer and Fall	Inshore and offshore, near surface.	Highly migratory. Feed on fish, squid and seals.
Pseudopleuronectes americanus (winter flounder)	Eggs	<10: spawn at 3	10-32	Inshore 0.3-4.5	February to June	Bottom habitats, substrate of sand, mud, gravel, algae.	Demersal, adhesive eggs.
	Larvae	<15; most 2-15	3.2-30	Inshore 1-4.5	March to July	Pelagic and bottom waters. Fine sand, gravel.	Feed on copepods and phytoplankton.
	Juveniles (YOY)	2-29.4; prefer 19.5	5-33	Inshore 0.5-12	Yearly, abundant summer and fall.	Benthic substrate near shallow natal waters. Mud, sand with shell/leaf litter. Ulva, eelgrass.	Feed on copepods nauplii, polychaetes, nemerteans, ostracods.
	Juveniles (Age 1+)	10-25	10-30	<200; LIS: 18-27	Yearly, abundant spring, winter and fall.	Bottom habitats, substrate of mud, fine-grained sand, silt, shell.	Major prey: amphipods, copepods, polychaetes, bivalve siphons.
	Adults	0.6-23; prefer 12-15	15-33	1-100	Yearly, abundant spring, winter and fall.	Inshore waters, estuaries. Bottom habitats,of mud.	Major prey: annelids, cnidarians and mollusks.

TABLE 5-7
Essential Fish Habitat Species Located Offshore of Rockaway Beach (contd).

Species	Life Stage	Temp. °C	Salinity °/oo	Depth m	Seasonal Occurrence	Habitat	Comments
	Spawning Adults	<25	5.5-36; most 31-32.5	Inshore 1-30	February to June	Inshore waters, estuaries. Bottom habitats,of mud, sand, gravel, cobble, rock.	
Rachycentron canadum (cobia)	Eggs Larvae Juveniles Adults	>20	>25	-	-	Sandy shoals of capes, offshore bars; high profile rock bottoms, barrier island oceanside waters from surf to shelf from Gulfstream shoreward; high salinity bays, estuaries, seagrass habitats.	All coastal inlets. Life stages not separated.
Salmo salar (Atlantic salmon)	Adults	4.4-32; prefer 16	Fresh and seawater.	-	Spawn mid-October to mid-November.	Fine sand, coarse sand and cobble.	Anadromous. Feed on invertebrate drift in river.
Scomber scombrus (Atlantic mackerel)	Eggs	5-23; most 7-16	18-30; prefer >25	10-325; most 30-70	April to August. Highest May-June	Pelagic, surface waters above thermocline. Bays and estuaries.	
	Larvae	6-22; most 8-13	Most >30	10-130; most >50	May to August.	Offshore, some in bays and estuaries.	Feed on copepods, fish larvae.
	Juveniles	4-22; most 10.	>25	0-320	Year round.	Pelagic Waters	
	Adults	4-16	>25	0-380	Year-round.	One group overwinters in deep shelf waters. Spring move inshore, summer shelf edge.	Opportunistic feeders-filter or select prey. Major prey: crustaceans, pelagic mollusks, polychaetes, squid, fish.
Scomberomorus cavalla (king mackerel)	Eggs Larvae Juveniles Adults	>20	>30	-	-	Sandy shoals of capes, offshore bars; high profile rock bottoms, barrier island oceanside waters from surf to shelf from Gulfstream shoreward; high salinity bays, estuaries, seagrass habitats.	All coastal inlets. Life stages not separated.

TABLE 5-7
Essential Fish Habitat Species Located Offshore of Rockaway Beach (contd).

Species	Life Stage	Temp. °C	Salinity °/oo	Depth m	Seasonal Occurrence	Habitat	Comments
Scomberomorus maculatus (Spanish mackerel)	Eggs Larvae Juveniles Adults	>20	>30	Through-out water column, outer estuary.	-	Sandy shoals of capes, offshore bars; high profile rock bottoms, barrier island oceanside waters from surf to shelf from Gulfstream shoreward; high salinity bays, estuaries, seagrass habitats.	All coastal inlets. Life stages not separated.
Scophthalmus aquosus (windowpane)	Eggs	<20	-	<70	Feb. to Nov. Peaks May & Oct. (MAB)	Surface Waters	
	Larvae	<20	-	<70	Feb. to Nov. Peaks May & Oct. (MAB)	Pelagic Waters	
	Juveniles	<25	5.5-36	1-100	-	Bottom habitats-mud, fine-grained sand.	
	Adults	<25	5.5-36	1-75	-		
	Spawning Adults	<21	5.5-36	1-75	Feb. to Dec. Peak in May (MAB)		
Sebastes fasciatus (redfish)	Eggs	n/a (larvae 3-15)	n/a	n/a (larvae upper 10)	n/a (larvae Mar. to Oct.)	n/a (larvae on northeast Continental Shelf)	
Squalus acanthias (spiny dogfish)	Eggs Larvae	n/a (Juv 1-28)	n/a	n/a (Juv 5-481)	n/a	n/a	Juveniles and adults prey on fish, crabs, squids.
Stenotomus chrysops (scup)	Eggs	13-23	>15	<30	May to August	Pelagic waters in estuaries.	
	Larvae	13-23	>15	<20	May to September	Pelagic waters in estuaries.	
	Juveniles	>7	>15	0-38	Spring, Summer-estuaries, bays.	Demersal waters; inshore sands, mud, mussel & eelgrass substrates.	
	Adults	>7	>15	2-185	Adults winter offshore south of NY.	Demersal waters, inshore estuaries on various substrates.	Spawn <30m during inshore migration May-Aug. Prey: small benthic invertebrates.

TABLE 5-7
Essential Fish Habitat Species Located Offshore of Rockaway Beach (contd).

Species	Life Stage	Temp. °C	Salinity °/oo	Depth m	Seasonal Occurrence	Habitat	Comments
Thunnus thynnus (bluefin tuna)	Juveniles Adults	Temperate Tropical	-	27-183	MAB: Aug. to Oct. Spawn Apr. to June in Florida.	Nearshore to 200m isobath.	Highly migratory. Spawn in warm waters, feed in temperate regions. Prey on fish, squid, octopus. "Giants"
Urophycis chuss (red hake)	Eggs	<10	<25		May to November Peaks June and July	Surface waters of the inner continental shelf.	New larvae need shelter, including live sea scallops, floating or mid-water objects.
	Larvae	<19	>0.5	<200	May to December Peaks September/October	Surface Waters	
	Juveniles	2-22; most 3-16	>22; most 31-33	<100	Year round.	Bottom habitats w/ shell substrate, incl. areas with many live scallops. Estuaries, outer shelf.	Feed on crustaceans, polychaetes, amphipods.
	Adults	2-22; most 8-10	>20; most 33-34	5-300+; prefer 30-130	Year round.		Feed on fish and crustaceans.
Invertebrates							
Loligo pealei (long finned squid)	Eggs	>8	30-32	<50	May-spawn. July-hatch.	Demersal egg masses-sandy/mud bottom, usually attached to rocks, pilings, algae.	Continental Shelf; Planktonic feeding when young, switch to crustaceans, small fish. Preyed on by fish, mammals, diving birds.
	Larvae	10-26	31.5-34.	Near Surface	n/a	Pelagic, near surface, move deeper as grow.	
Ilex illecebrosus (short finned squid)	Eggs	n/a	n/a	Midwater	n/a	Pelagic, midwater near pycnocline.	Continental Shelf; No wild caught, all lab-reared.
	Larvae	5-20: most >16.5.	35-37	Offshore-shelf to 360.	All seasons; most abundant late Jan. to Feb. in warm water above thermocline.	Gulf Stream and Slope Water convergence-high nutrients.	
Spisula solidissima (surf clam)	Eggs	6-24	>22	Shelf: lower edge of intertidal to 160	Major:July to mid-August Spawning. Minor: mid-Oct.	Open beaches and open ocean bottoms, generally absent from bays and estuaries. Prefer coarse	Offshore, EEZ (Adults)

TABLE 5-7
Essential Fish Habitat Species Located Offshore of Rockaway Beach (contd).

Species	Life Stage	Temp. °C	Salinity °/oo	Depth m	Seasonal Occurrence	Habitat	Comments
	Larvae	14-30; Optimum= 22	8-30		Spring larvae from inshore clams; Fall larvae from offshore.		Planktivorous siphon feeders. Heavy predation. Susceptible to low dissolved oxygen.
Arctica islandica (ocean quahog)	Eggs	n/a	n/a	n/a	Spawn May to December	n/a	
	Larvae	14-18 Prefer 13-15	Oceanic	1-40	Spawn May to December	Medium to fine grain sand, sandy mud, silty sand.	Planktotrophic
	Adults	<20; prefer 6-16	Oceanic	Most at 25-61		Medium to fine grain sand, sandy mud, silty sand.	Suspension feed on phytoplankton. One of longest-lived bivalves.
	Spawning Adults	Spawn at 13.5	n/a		Extended spawning May to December.	Medium to fine grain sand, sandy mud, silty sand.	

n/a = no information available.