

Compliments of
**THE UNITED NEW YORK
SANDY HOOK PILOTS
BENEVOLENT ASSOCIATION**
and
**THE UNITED NEW JERSEY
SANDY HOOK PILOTS
BENEVOLENT ASSOCIATION**

201 Edgewater Street
Staten Island, N.Y. 10305
www.sandyhookpilots.com



**Masters and Agents are requested to provide 24-hours
notice of arrival and advise Pilots of any change no
less than 6 hours in advance of scheduled ETA**

New York Pilots 718.448.3900
New Jersey Pilots 718.448.3900
Hell Gate Pilots 718.448.3900
Long Island Sound Pilots 718.448.3900
Hudson River Pilots 718.815.4316
Dispatch Email Dispatchers@sandyhookpilots.com
General Info Email Info@sandyhookpilots.com
Fax 1.718.442.2190

ORDERS CANNOT BE ACCEPTED BY EMAIL

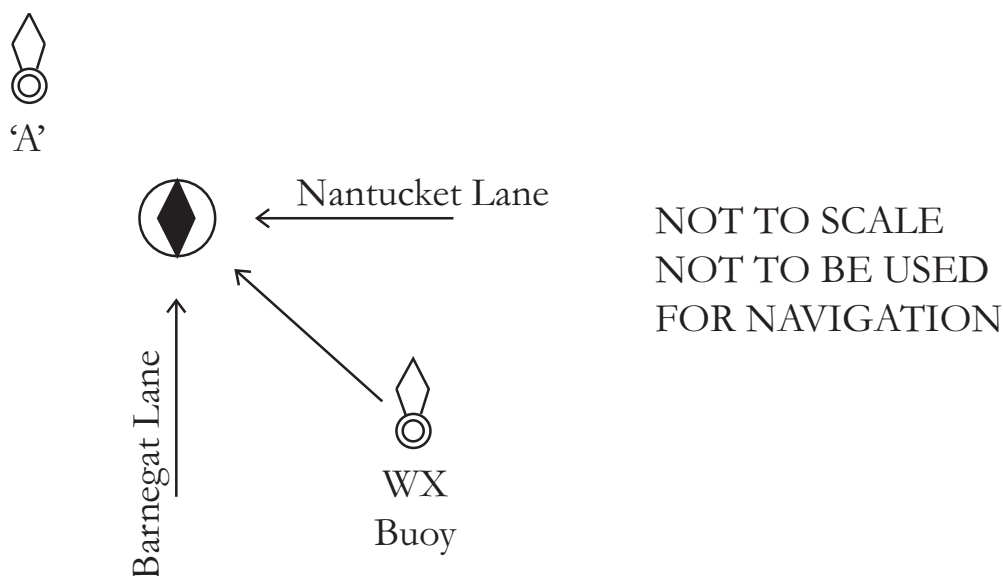
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Arrival and Pilot Embarkation at Ambrose Pilot Station

The Sandy Hook Pilots maintain a pilot vessel on station year round. Either the Pilot Boat New York or Pilot Boat New Jersey will be “On Station” and monitoring VHF channels 13, 16 and 73. Both vessels are equipped with AIS. Using a 53ft (16m) aluminum launch, the pilot will be embarked from this vessel. The pilot launch carries the same lights as the pilot boats on station.

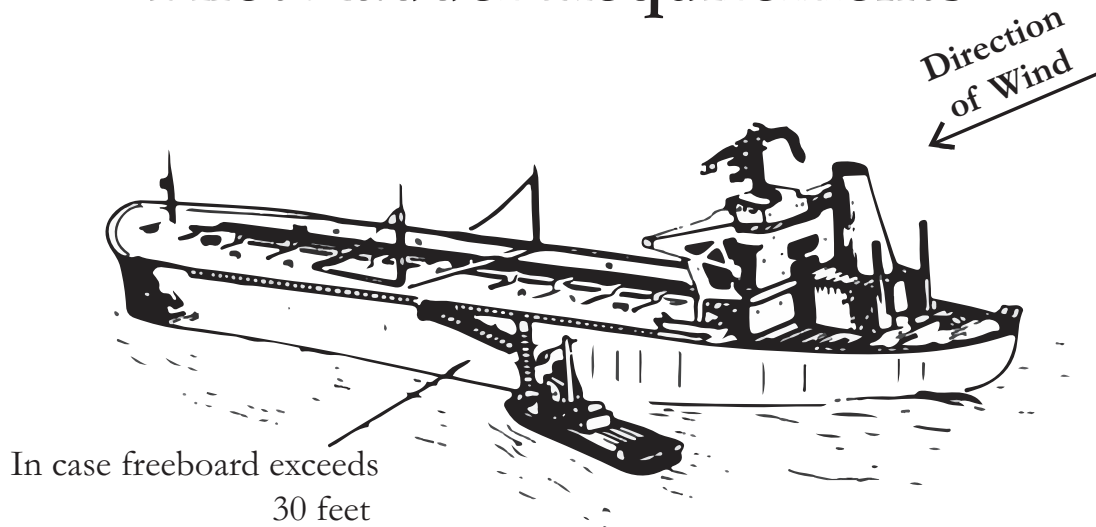
Vessels approaching the Ambrose Pilot Station from sea should give the pilot boat a minimum of three hours advance notice. Vessels should make a second call to the pilot boat when they are one hour from the sea buoy. Pilot boarding side will be given at that time.



Important Information Your Pilot Will Need

It is imperative that you brief your pilot about any automatic engine monitoring systems that could potentially shut down or would significantly reduce the power of the main propulsion engine system without substantial warning. If possible, these systems should be overridden for transiting New York Harbor pilotage waters. Please advise your pilot if any unusual problem with the ship's control or navigational systems have occurred in the last month.

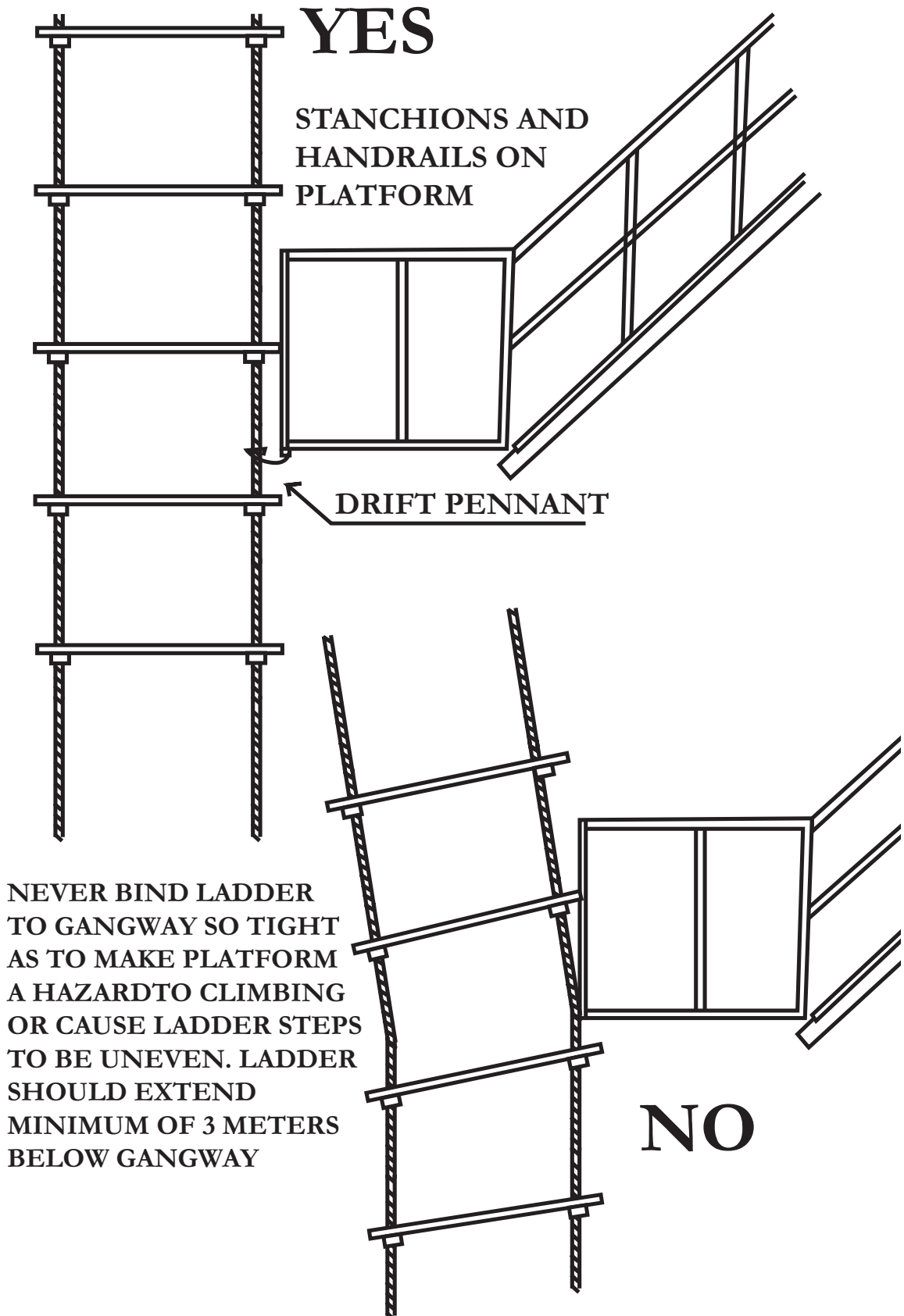
Pilot Ladder Requirements



Requirements:

- 1 - Rigging of the ladder, along with embarking and disembarking of pilot, must be under the supervision of a licensed officer.
- 2 - The ladder must be made in one length and not consist of two lengths shackled or lashed together, and should be equipped with spreaders about 10 feet (3m) apart.
- 3 - The area of the deck where the pilot boards must be well lighted and must be clear of obstructions to ensure a safe passage for the pilot.
- 4 - Trailing lines or retrieving lines should not be attached to the lower ends of the ladder.
- 5 - Ladders must be rigged well clear of water and discharge outlets and at a place near midship.
- 6 - Vessels must comply with the new SOLAS Chapter V regulations.
- 7 - Rig the ladder 1.5 meters above the water. A heaving line must be available.

Pilot Ladder Requirements



Useful Telephone Numbers

Pilots

Sandy Hook Pilots Association.....(718) 448-3900
Dispatch / Operational Issues : Dispatch@sandyhookpilots.com
General Information : Info@sandyhookpilots.com
Hudson River Pilots Association (718) 815-4316
Long Island/Block Island Sound Pilots (401) 847-9050
dispatch@nemarinepilots.com

Tug Companies

Moran Towing (VHF Ch. 7A)..... (203) 442-2825
McAllister Towing and Transportation (VHF Ch. 10).....(718) 273-6300
Hornbeck Offshore (718) 625-0743
Reinauer (VHF Ch. 80A)..... (718) 816-8167
Bouchard Transportation (VHF Ch. 10).....(631) 390-4900
Henry Marine Services (VHF Ch. 74)..... (718) 966-6193
Weeks Marine..... (908) 272-4010
Harley Marine Services (VHF Ch. 79A)..... (718) 875-7000
Kirby Marine (VHF Ch. 18A)..... (718) 720-7207

Launch Services

Miller's Launch (718) 727-7303
Reynold's Launch..... (718) 981-2804

United States Coast Guard

Vessel Traffic Service (VTS) (718) 354-4088
VTS Fax (718) 354-4096
First USCG District Bridges (212) 668-7021

Regulatory/Governmental

NYPD Harbor Unit (718) 765-4100
National Weather Service (516) 924-0517
Physical, Oceanographic Real Time System (PORTS) (718) 815-9668

US Army Corp of Engineers

To report dangerous debris (201) 333-1170

Linehandlers

Bayonne Line Boat Service (201) 436-8109

Bridge Phone Numbers

Lehigh Valley RR Bridge (973) 690-2344
Lincoln Highway (973) 589-5143
Path Control (201) 216-6552
Triple Bridges (973) 690-2609
Witt Penn Bridge (201) 795-0631
Lower Hackensack Bridge (201) 714-2958
Lower Hack Bridge Superintendent (973) 879-2967
Raritan River Railroad Bridge (973) 690-2344

Useful Websites

USCG Sector NY.....<http://homeport.uscg.mil/newyork>
Port Authority:.....www.panynj.gov
Notice to Mariners..navcen.uscg.gov/?pagename=lnmDistrict®ion=1
NY Marine Weather.....www.erh.noaa.gov/okx.marine.shtml

Tides and Currents

PORTS.....tidesandcurrents.noaa.gov/ports/index.shtml?port=ny
Maritime Center.....hudson.dl.stevens-tech.edu/maritimeforecast/

Bridge Air Gaps

Verrazano and Bayonne Bridge:
<http://www.tidesandcurrents.noaa.gov/ports.html>

Seaman's Institute

118 Export St., Newark, NJ 07114
(973) 589-5828
www.seamanschurch.org

Seafarers and International House

123 East 15th St., New York, NY 10003
(212) 677-4800
www.sihnyc.org

Distances North Way from Ambrose Sea Buoy

UPPER BAY & HUDSON RIVER

Name	Distance
Verrazano Bridge.....	13.6M
26 Buoy.....	15.5M
off Pier #1 Brooklyn Army Base.....	16.2M
off 35th Street Gowanus	17.5M
Bayonne Terminal Dock.....	17.5M
#28 Buoy Abeam	17.9M
off Entrance Atlantic Basin	19.3M
Channel junction off Battery	19.3M
Pier #40 Abeam	21.3M
Turn off Bethlehem Steel, Hoboken.....	23.9M
Passenger Ship Terminal.....	24.5M
George Washington Bridge.....	29.4M
Pilot Station, Yonkers Abeam	35.1M

KILL VAN KULL & ARTHUR KILL

off IMTT Con Hook.....	17.6M
off Exxon Bayonne.....	18.7M
Howland Hook Container Terminal.....	22.5M
Bayway.....	23.6M
Tremley Point C/S & BP Docks.....	25.5M
Rahway River.....	26.1M
Tufts Point.....	28.3M

NEWARK BAY

Bergen Point junction.....	21.0M
Port Eliz. Entrance.....	22.9M
Port New'k. Entrance.....	23.7M
Tenaco Newark.....	25.0M
Koppers Koke.....	28.5M

Distances South Way from Sandy Hook Scotland Buoy

S.W. Spit Buoy Junction Chapel Hill	07.0M
Leonardo Dock.....	07.5M
Princess Bay.....	15.0M
Beacon #9.....	16.3M
Anaconda Dock Raritan River.....	19.3M
Hess Reserve Raritan River	20.0M
Titanium Dock Raritan River	21.3M
Perth Amboy Anchorage.....	17.5M
off 6 Buoy Sewarren.....	20.6M
off Beacon 14 Hess Pt. Reading.....	21.7M
Tufts Point.....	23.0M
Rahway River.....	25.3M
Bayway.....	27.5M

Principal Bridges in the Port of New York

Dis- tance	Name or Location	Type of Bridge	Horizontal Clearance	Vert Clearance at Mean H.W.
EAST RIVER				
1.2	Brooklyn	Sus.	1350'	38.71M - 127'
1.5	Manhattan	Sus.	1200'	40.84M - 134'
2.5	Williamsburg	Sus.	1536'	40.54M - 133'
5.3	Queensborough	F. West Span	900'	39.93M - 131'
5.6	Roosevelt Island	V. L. E. Chan.	403'	12.19M-30.18M 40'-99' open
7.3	Triborough	Sus.	Unobstructed	42.06M - 138'
7.5	Hell Gate	Sus.	830'	40.84 - 134'
12.4	Whitestone	Sus.	2265'	41.15M - 135'
--	Throgsneck	Sus.	1711'	42.06M - 138'
HUDSON RIVER AND NEW YORK HARBOR				
9.6	Geo. Washington	Sus.	3169'	64.92M - 213' East 59.44M - 195'
11.5	Narrows	Sus.	4000'	60.35M - 198' Mid 2000'
			Note: Bridge can flex substantially based upon temperature and load. Clearance observations available at http://www.tidesandcurrents.noaa.gov/ports/index.shtml?port=ny	
KILL VAN KULL AND ARTHUR KILL				
3.5	Bayonne	F.	800'	215' - 65.5M
6.2	B. & O. R.R.	V. L.	500'	9.44 - 41.15M - 31' - 135' open
6.3	Goethals	F.	617'	140' - 42.6M
14.6	Outerbridge Crossing	F.	675'	43.59M - 143'
	Newark Bay			
3.5	N.J. Turnpike	F.	550'	41.15M - 135'
3.7	Lehigh Valley R.R.	V. L.	300'	10.67 - 41.15M - 35' - 135' open
PASSIC RIVER				
5.2	Conrail	Sw.	100'	7.62M - 25'
5.8	Lincoln Highway	V. L.	300'	12.19 - 41.15M - 35'-135' open
6.0	Pulaski Skyway	F.	520'	41.15 - 135'
6.4	Point No Point	Sw.	103'	4.87M - 16'
6.5	N.J. Turnpike	F.	319'	30.4M - 100'
HACKENSACK RIVER				
5.7	Lincoln Highway	V. L.	200'	10.67 - 41.15M - 35' - 135' open
6.1	Pulaski Skyway	F.	300'	41.15M - 135'
6.8	Penn Passenger	V. L.	168'	12.19 - 41.15M - 40'-135' open
6.8	Penn Freight	V. L.	158'	3.35 - 41.14M - 11' - 135' open
6.8	Route 10 H'way	V. L.	158'	10.67 - 41.15M - 35' - 135' open
7.1	D.L. & W. R. R.	V. L.	150'	12.19 - 41.15M - 40' - 135' open
RARITAN RIVER				
2.6	C.R.R. of N.J.	Sw.	N.S. 124' S.S. 125'	2.43M - 8'
2.6	Victory Bridge	Sw.	140'	8.53M - 28'
4.0	Thomas Edison	F.	200'	41.15M - 135'
	Garden State Pkway.	F.	200'	41.15M - 135'

SYMBOLS: F - FIXED / SUS. - SUSPENSION / SW - SWING / V.L. - VERTICAL LIFT

**(TRAVELING PLATFORM REDUCED CLEARANCE BY 15 FEET)

SPECIAL NOTATION

Vessels navigating in the Vicinity of Rikers Island with a mast height of over 125 ft. should use caution when crossing La Guardia Airport flight approaches. # 718-779-1220/nite 718-779-7901.

This is a listing of the various marine terminals, bridges and landmarks in relationship to each other, which a vessel will pass in transiting the East River. The mileage given is the distance for west-bound vessels from Execution Rocks to the Battery and for east-bound vessels from the Battery to Execution Rocks.

Vessels navigating in the vicinity of Rikers Island with a mast height of over 125' should use caution when crossing LaGuardia Airport flight approaches.

West Bound Mileage	LONG ISLAND SOUND	Vertical Clearance	Width	East Bound Mileage
00.0	Execution Rocks - Sands Point			20.0
03.3	City Island -Stepping Stones LT - Kings Pt.			16.7
05.5	Throgs Neck Bridge - Fort Schuyler	138'	1711'	14.5
07.2	Bronx Whitestone Bridge	135'	2265'	12.8
09.2	Hunts Pt. - LaGuardia Airport			10.8
11.0	Castle Oil & Orion Power - Astoria			11.0
10.1	Oak Pt. - Castle Oil Bronx Tiffany St.			09.9
10.5	149th St., Cirillo Bros.- Cibro			09.5
10.7	138th St., Metropolitan Oil			09.3
11.8	Wards Island Sewer Treatment Plant			08.2
12.0	Hell Gate Railroad Bridge	134'	830'	08.0
12.3	Triborough Bridge	138'	Unlimited	07.7
12.7	Hell Gate - Harlem Riv - Mill Rk. - Hallets Pt.			07.3
14.3	Queensborough (59th St.) Bridge	131'	900'	05.7
15.9	National Cincrete, Long Island City			04.6
16.3	Pepsi Cola, Long Island			05.0
16.1	Green St. Lumber Term., Green Point			03.9
16.9	Nepco Oil Terminal, North 1st St.			03.1
17.1	Amstar Sugar House, South 2nd St.			02.9
17.3	Williamsburg Bridge	133'	1536'	02.7
17.7	Brooklyn Navy Yard			02.3
18.0	Con Edison, Hudson Ave.			02.0
18.1	Piers 42 & 36, East River			01.9
18.4	Manhattan Bridge	134'	1200'	01.6
18.7	Brooklyn Bridge	127'	1350'	01.3
18.9	Piers 1 to 5, Brooklyn			01.1
20.0	BATTERY			00.0

East River and Long Island Sound Distance from Junction off Battery

Location	Distance	Location	Distance
Bkly'n Navy Yard.....	02.6	Northport.....	42.0
Poor House Flats.....	3.75	Bridgeport Entrance Buoys.....	49.7
Pepsi Cola L. I. C.....	05.2	Port Jefferson Sea Buoy.....	52.8
Hell Gate.....	07.5	New Haven Sea Buoy.....	65.3
Oak Point.....	10.0	Northville.....	72.0
Throgs Neck.....	15.0	New London Entrance Buoys...	101.7
City Island.....	17.5	Montauk Channel.....	116.0
Execution Rocks.....	20.4	Point Judith.....	127.0

Times of High & Low Water Off Battery

	H.W.	L.W.	Mean	Spring
Battery	0:00	0:00	4.5	5.4
Bklyn. Navy Yard	+0:50	+0:35	4.1	4.9
Hell Gate - Hallets Pt.	+2:00	+2:04	5.1	6.1
Port Morris - Stoney Pt.	+3:23	+3:46	6.3	7.4
Hunts Point	+3:18	+3:45	6.9	8.1
Willets Point	+3:10	+3:30	7.1	8.3
Execution Rocks	+3:04	+3:22	7.3	8.6
Bridgeport	+2:52	+2:50	6.7	7.7
Port Jefferson	+2:58	+2:53	6.6	7.6
New Haven (City Dock)	+2:54	+2:47	6.0	6.9
New London (State Pier)	+1:09	+1:15	2.6	3.1

Times of High & Low Water Slack Off Narrows

	H.W.	L.W.	Mean	Spring
Narrows	0:00	0:00	1.7	2.0
Hell Gate	+0:16	- 0:17	3.4	4.6
Throgs Neck	+0:02	- 1:24	0.6	0.8
The Race	+1:55	+1:30	2.9	3.5

Hudson River Drafts

Maximum Air Draft - 132'

Upper Hudson River North of Kingston

Maximum Draft - 30' (Fresh Water Draft)

Vessels transiting the Upper Hudson River with drafts of 27' to 30' must be set up for the correct stage of a rising tide.

Daylight transits only north of Kingston.

Lower Hudson River South of Kingston

Maximum Draft- 33' (Salt Water Draft)

Vessels transiting the Lower Hudson River with drafts of 31' to 33' must be set up for the correct stage of a rising tide.

Daylight transits only north of Kingston.

Vessels with a draft of 31' or less may transit the Lower River any time.

All vessel draft information is subject to existing weather conditions at the time of transit.

Please call our Dispatchers for assistance in setting Hudson River transits or with any other questions.

Hudson River Pilots - 718-815-4316.

www.HudsonRiverPilots.com

Distance From Junction off Battery to Locations on the Hudson River

Location	Distances	Location	Distances
Yonkers	15.5	Hess Roseton	55.5
Hastings	18.5	Milton	64.0
Irvington	21.5	Poughkeepsie	65.5
Grassy Pt.	33.0	Kingston	78.5
Tompkins Cove	35.5	Saugerties	86.5
Peekskill	38.0	Hudson	100
Texaco Newburgh	52.5	Albany & Rensselaer	124

**Distances from New York
to Points on the Hudson River**

Location	Nautical Miles	Statute Miles
Yonkers	15.5	18.0
Tarrytown and Nyack	24.0	27.5
Ossining	28.5	32.5
Haverstraw	32.5	37.0
Stony Point	35.0	40.0
Peekskill	38.0	43.5
West Point	45.0	52.0
Cold Spring	47.0	54.0
Cornwall	49.5	57.0
Hyde Park to Albany	52.0	
Newburgh and Fishkill	52.5	60.5
Yonkers to Hyde Park	56.0	
Poughkeepsie	65.5	75.5
Kingston	78.5	90.5
Saugerties	86.5	99.5
Catskill	96.0	110.5
Hudson and Athens	100.0	115.0
Coxsackie	105.5	121.5
Stuyvesant	108.0	124.0
New Baltimore	111.5	128.5
Coeymans	113.0	130.0
Castleton	116.5	134.0
Albany & Rensselaer	124.0	142.5
Troy & Watervliet	129.5	149.0
Troy Lock	131.0	151.0

**Note: Distances are measured to and between
points inmidchannel abreast the various towns.**

SQUAT

$$S_{(\text{FEET})} = C_b \times \frac{V^2}{30}$$

S = SINKAGE IN FEET

C_b = BLOCK COEFFICIENT

V = SPEED IN KNOTS

In Shallow / Confined Waters Sinkage - 2 x S

INCREASE IN DRAFT DUE TO PITCH (IN FEET)

Length	0.5°	1.0°	2.0°
500'	2.18	4.36	8.72
600'	2.62	5.23	10.46
700'	3.05	6.10	12.21
800'	3.49	6.98	13.96
900'	3.92	7.85	15.70
1000'	4.36	8.73	17.45

Table assumes tipping center is at mid-point

INCREASE IN DRAFT DUE TO HEEL (IN FEET) (BEAM/2 X Sine of Angle)

Beam	5°	10°
40'	1.74	3.47
60'	2.61	5.21
80'	3.48	6.95
100'	4.35	8.68
150'	6.54	13.02
200'	8.72	17.36

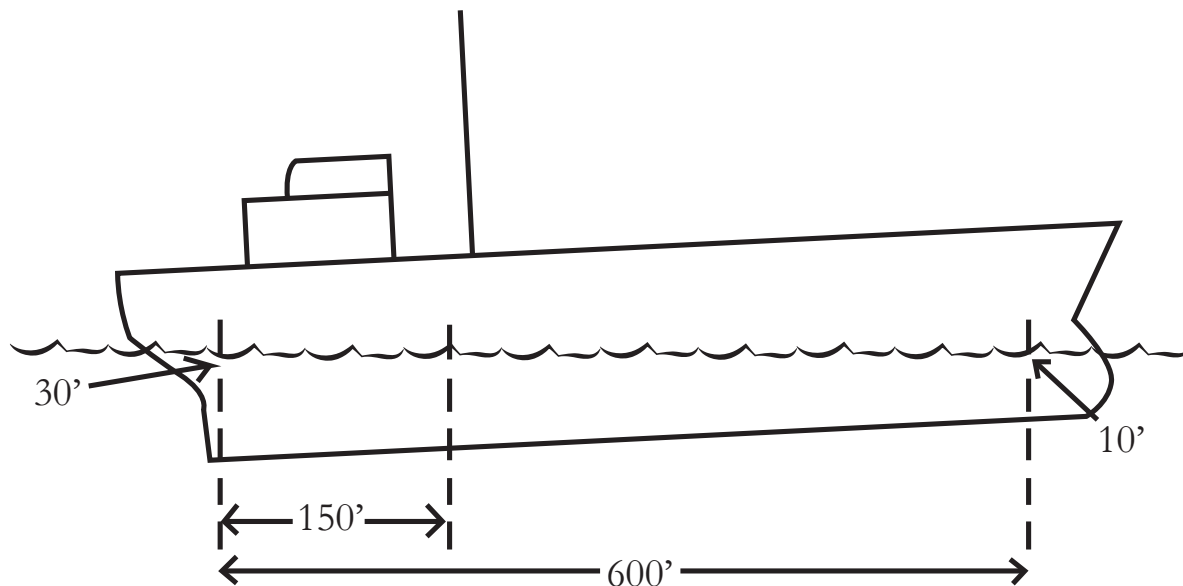
BLOCK CO - EF	SQUAT IN FEET										
	5k.	6k.	7k.	8k.	9k.	10k.	11k.	12k.	13k.	14k.	15k.
0.50	0.8	1.2	1.6	2.1	2.7	3.3	4.0	4.7	5.5	6.4	7.4
0.55	0.9	1.3	1.8	2.3	2.9	3.6	4.4	5.2	6.1	7.1	8.1
0.60	1.0	1.4	1.9	2.5	3.2	3.9	4.8	5.7	6.7	7.7	8.9
0.65	1.1	1.5	2.1	2.7	3.5	4.3	5.2	6.1	7.2	8.4	9.6
0.70	1.1	1.7	2.3	2.9	3.7	4.6	5.6	6.6	7.8	9.0	10.3
0.75	1.2	1.8	2.4	3.1	4.0	4.9	6.0	7.1	8.3	9.6	11.1
0.80	1.3	1.9	2.6	3.4	4.3	5.2	6.4	7.6	8.9	10.3	11.8
0.85	1.4	2.0	2.7	3.6	4.5	5.6	6.7	8.0	9.4	10.9	12.5
0.90	1.5	2.1	2.9	3.8	4.8	5.9	7.1	8.5	10.0	11.6	13.3
0.95	1.6	2.2	3.1	4.0	5.0	6.2	7.5	9.0	10.5	12.2	14.0
1.00	1.6	2.4	3.2	4.2	5.3	6.6	7.9	9.4	11.1	12.9	14.8

Determining the Air Draft of a Ship Not on Even Keel

HEIGHT OF THE MAST is the distance from the keel to the top of the mast.

AIR DRAFT is the distance from the waterline to the top of the mast.

To determine the air draft of a ship not on even keel take the difference in draft fore and aft, **DIVIDE** by the Length Between Perpendiculars, **TIMES** the Distance from the deepest perpendicular to the mast. This is the increase in Air Draft above that determined by subtracting the deepest draft from the height of the mast.



$$\frac{20}{600} \times \frac{150}{1} = 5$$

OR

$$30 - 10 = 20$$

$$(20 / 600) \times 150 = 5 \text{ FEET}$$

Actual air draft is 5 feet more than if
using deepest draft

[illegible]

Principal Light and Fog Signals in the Port of New York

Name	Light	Fog Signal
Scotland Lighted.....	Morse "A".....	1 Bl. ev. 30 sec.
Horn Buoy S.....		Racon Signal M.
Sandy Hook Pt. Lt.....	Iso., W. 6 sec.....	1 Str. ev. 10 sec.
Sandy Hook Lt.....	FW	
Romer Shoal Lt.....	Fl. (2) W. 15 sec.....	1 Bl. ev. 15 sec.
	Emerg. Lt. - Fl. W. 6 sec.	
	when main Lt. exting.	
West Bank Front Lt.....	Iso., W. sector, 6 sec.....	2 Bl. ev. 20 sec.
Coney Island Lt.....	Fl. R. 5 sec	
Verrazano Narrows Br		1 Bl. ev. 15 sec.
Robbins Reef Lt.....	Fl. G. 6 sec	1 Bl. ev. 10 sec.
Gov. Is. Ext. Lt.....	FR.....	1 Bl. ev. 15 sec.
Gov. Is. Lt.....	2 FR.....	2 Bl. ev. 20 sec.
Outerbridge Crossing.....		1 Bl. ev. 15 sec.
Hell Gate Lt. 15.....	Fl. G. 2.5 sec	
N. Brothers Is. N. Lt. 9.....	Fl. G. 4 sec	
Whitestone Pt. Lt. 1.....	F. G.	
Throgs Neck Lt.....	F. R	
Throgs Neck Bridge.....		2 Bl. ev. 20 sec.
Stepping Stones Lt.....	Oc. G. 4 sec.....	1 Bl. ev. 15 sec.
Hart Island Lt. 46.....	Fl. R. 4 sec	
Execution Rock Lt.....	Fl. W. 10 sec.....	1 Bl. ev. 15 sec.

Ranges and Bearings in the Port New York / New Jersey

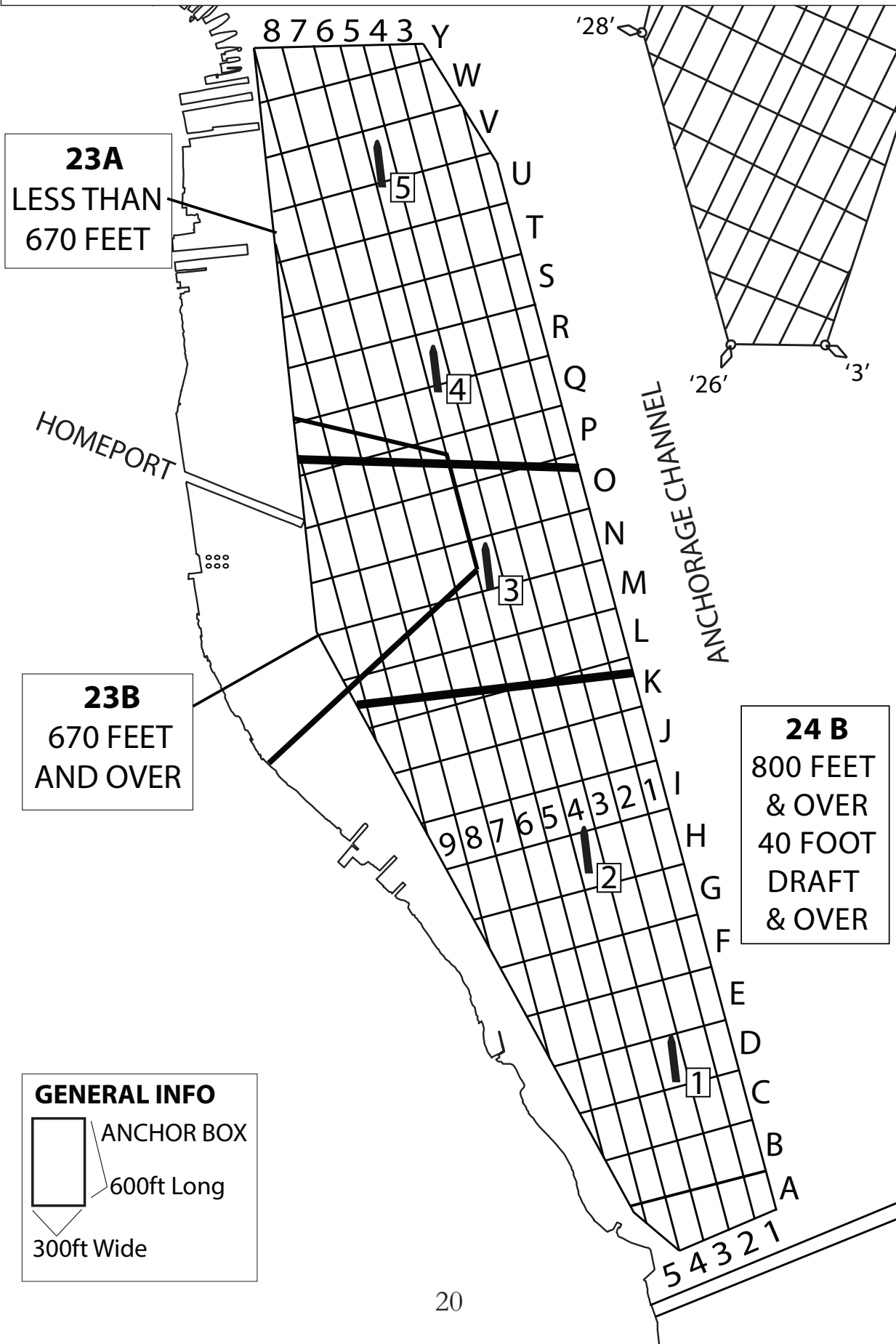
Range	Bearing
Poorhouse Flats Range.....	341.0
Buttermilk.....	069.0
Romer with Main Hook.....	170.5
Ambrose Channel.....	297.0
Swash Channel.....	305.0
Leonardo Range.....	207.5
Constable Hook.....	290.0
Pralls Island.....	185.0
Outerbridge Reach.....	351.5
Sandy Hook Channel (East).....	308.0
Sandy Hook (West).....	067.5

RACON Buoys in the Port of New York / New Jersey

Ambrose Lighted Whistle Buoy A:	—●
Scotland Light Whistle Buoy S:	— —
Sandy Hook Channel Front Range Light:	—●—●
KVK Channel Junction LWB KV:	—●—
Center of Outerbridge Crossing:	— — —

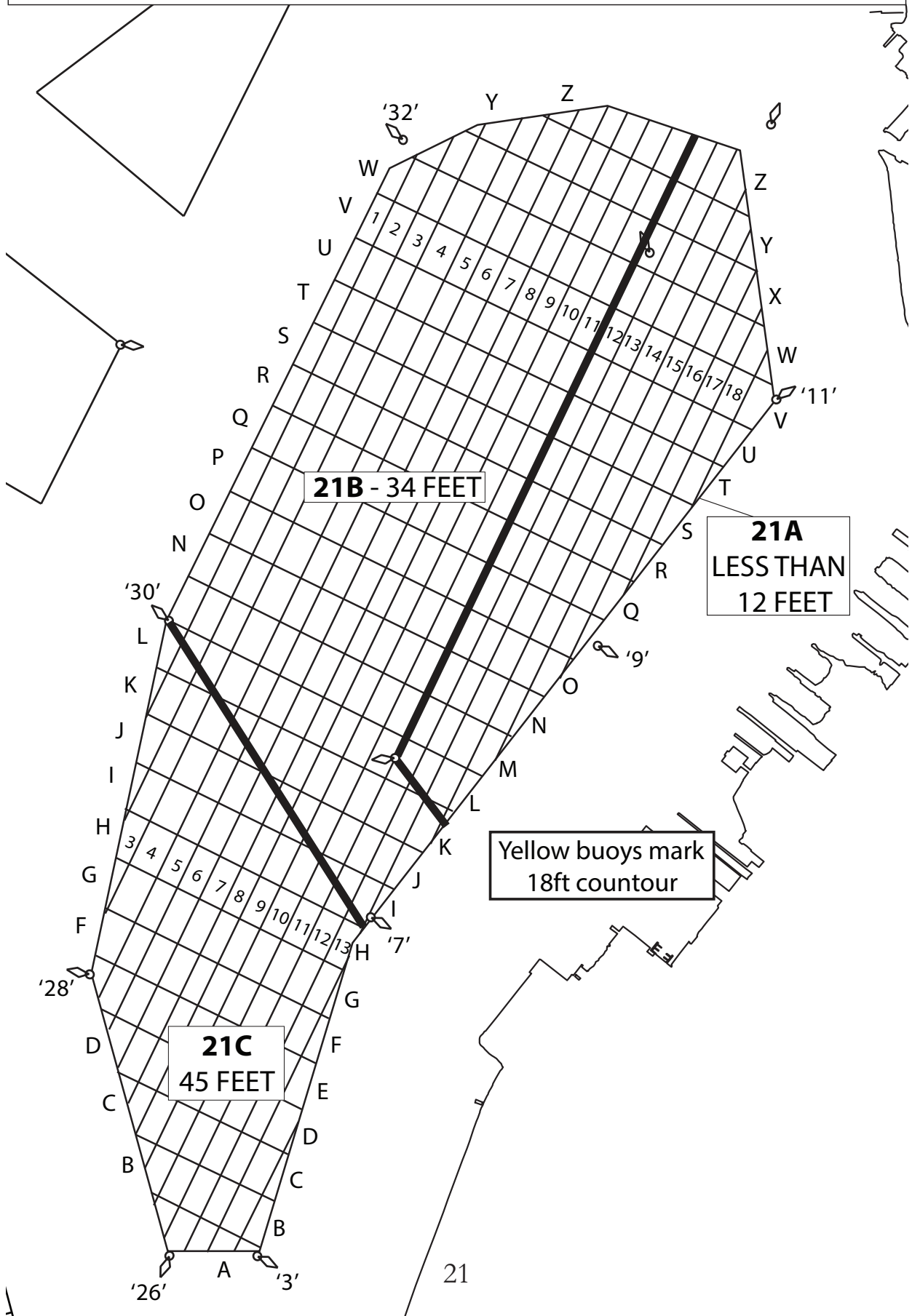
STAPLETON ANCHORAGE

NOT FOR NAVIGATIONAL USE - PLEASE REFERENCE NOAA CHART 12334



BAY RIDGE FLATS ANCHORAGE

NOT FOR NAVIGATIONAL USE - PLEASE REFERENCE NOAA CHART 12334

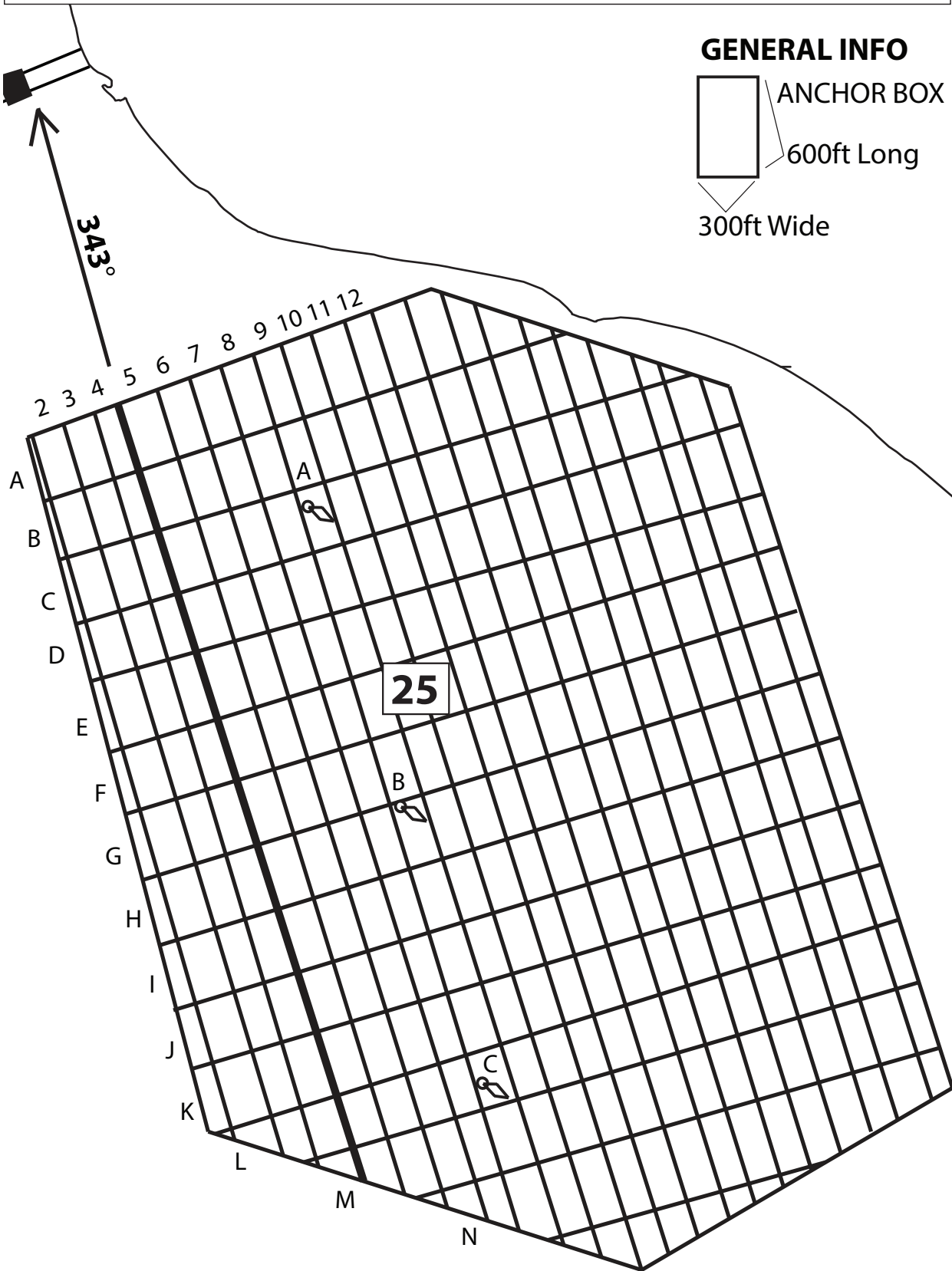
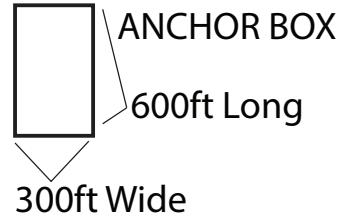


GRAVESEND BAY ANCHORAGE

NOT FOR NAVIGATIONAL USE - PLEASE REFERENCE NOAA CHART 12402



GENERAL INFO



Anchorage

Number	Locations
19	Hudson River Naval Anchorage
20 - A	Liberty
20 - B	North Side Bayonne Naval Terminal
21 - B	Red Hook Flats
23	Staten Island
24	Quarantine
25	Gravesend Bay (Eastern Part)
27	Sandy Hook
44	Perth Amboy
49 - C	Gravesend Bay (Western Part)
49 - G	Leonardo

Anchorage Regulations

WHEN ANCHORED IN FEDERAL ANCHORAGE 20-A THROUGH 20-G, 21-A, 21-B, 21-C, 23-A AND 23-B, 24 OR 25 MUST COMPLY WITH THE FOLLOWING REQUIREMENTS:

- MAINTAIN A BRIDGE WATCH.
- GUARD AND ANSWER CHANNEL 16 FM AND MAINTAIN AN ACCURATE POSITION PLOT.
- NOTIFY THE COAST GUARD ON CHANNEL 12 WHEN COMMENCING AND COMPLETING THE TRANSFERRING OF PETROLEUM PRODUCTS.
- NOTIFY THE COAST GUARD ON CHANNEL 12 WHEN ANCHORED AND WHEN LEAVING THE ANCHORAGE.

UPPERBAY - WEST PART

NOT FOR NAVIGATIONAL USE - PLEASE REFERENCE NOAA CHART 12334



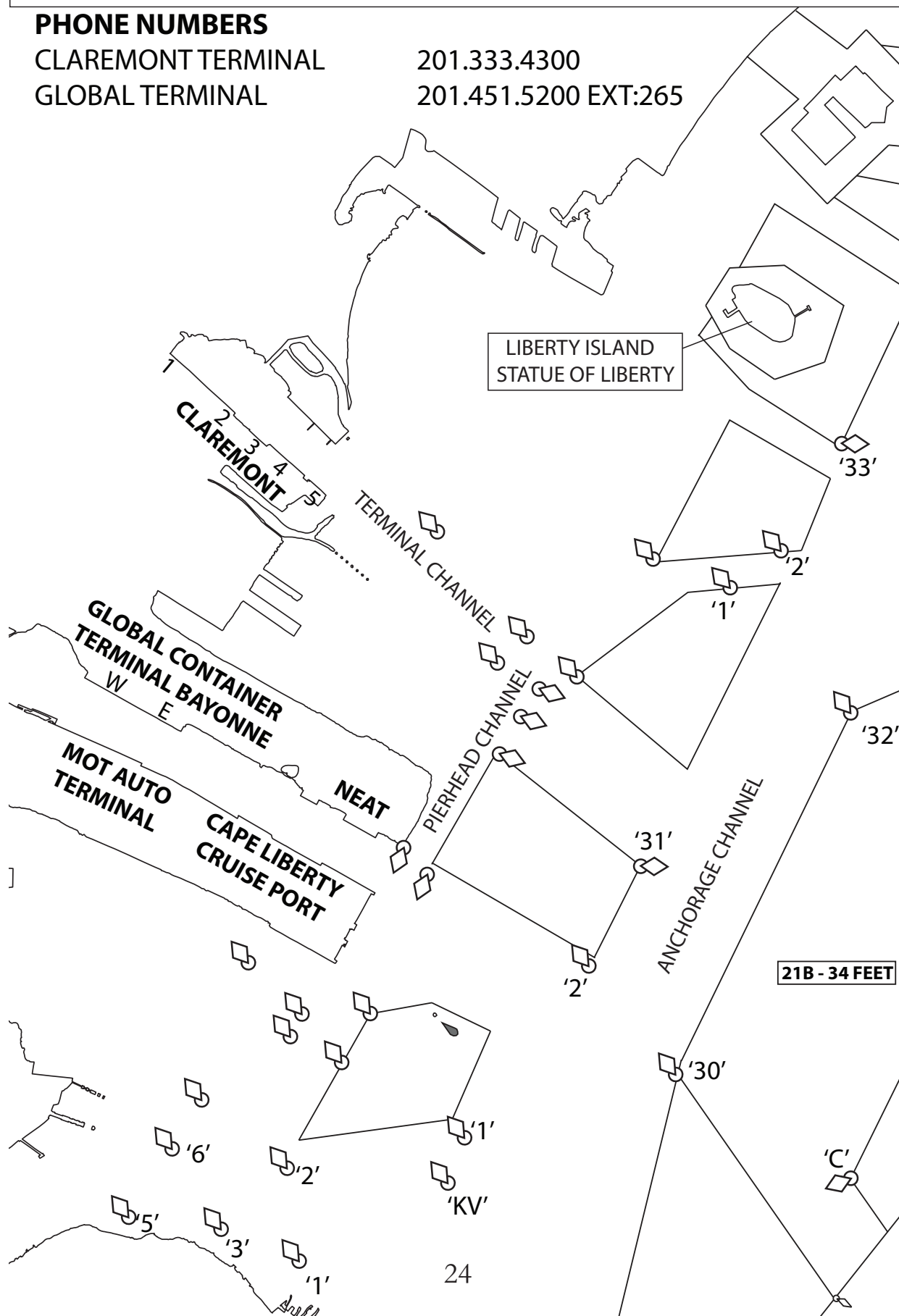
PHONE NUMBERS

CLAREMONT TERMINAL

201.333.4300

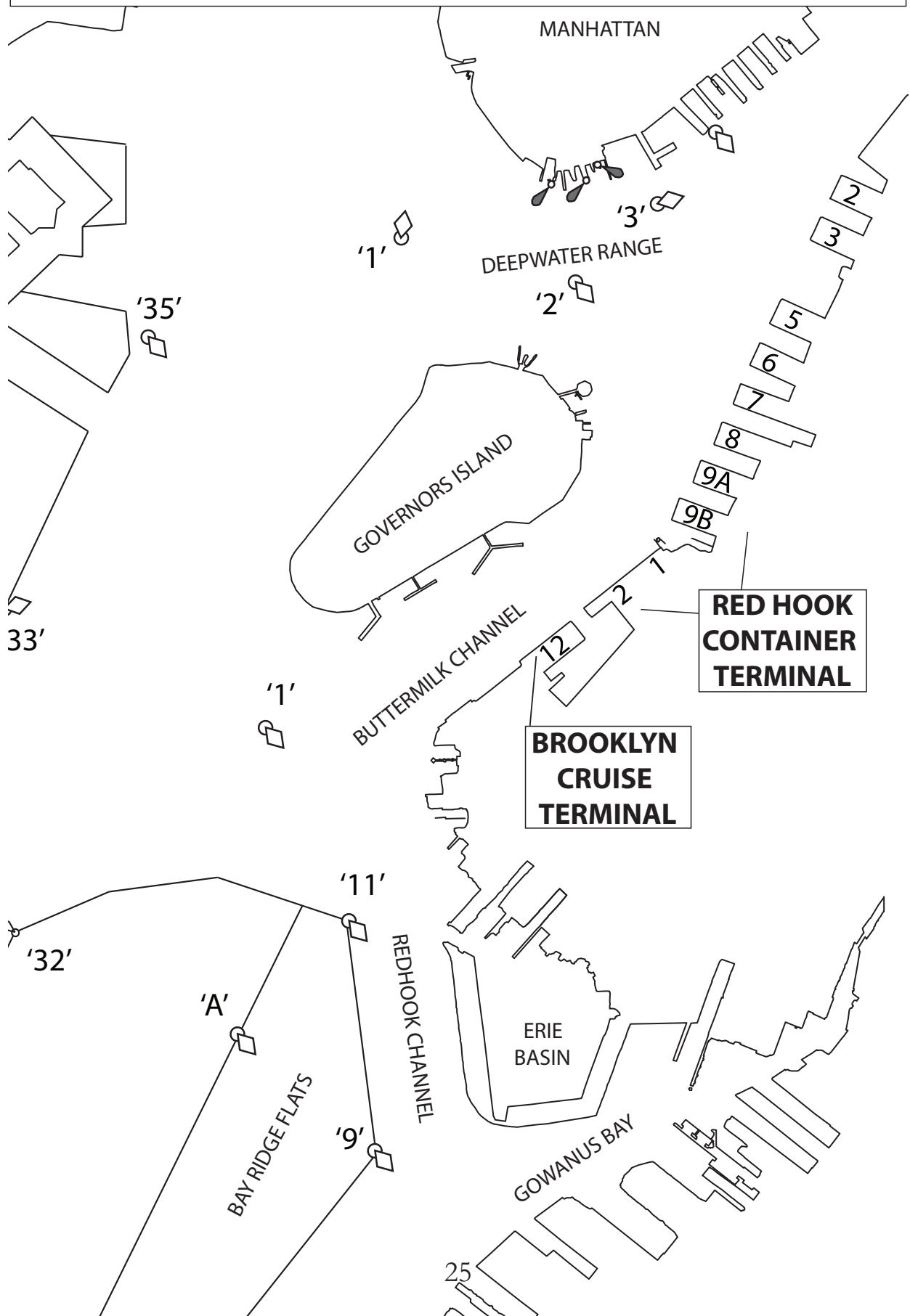
GLOBAL TERMINAL

201.451.5200 EXT:265



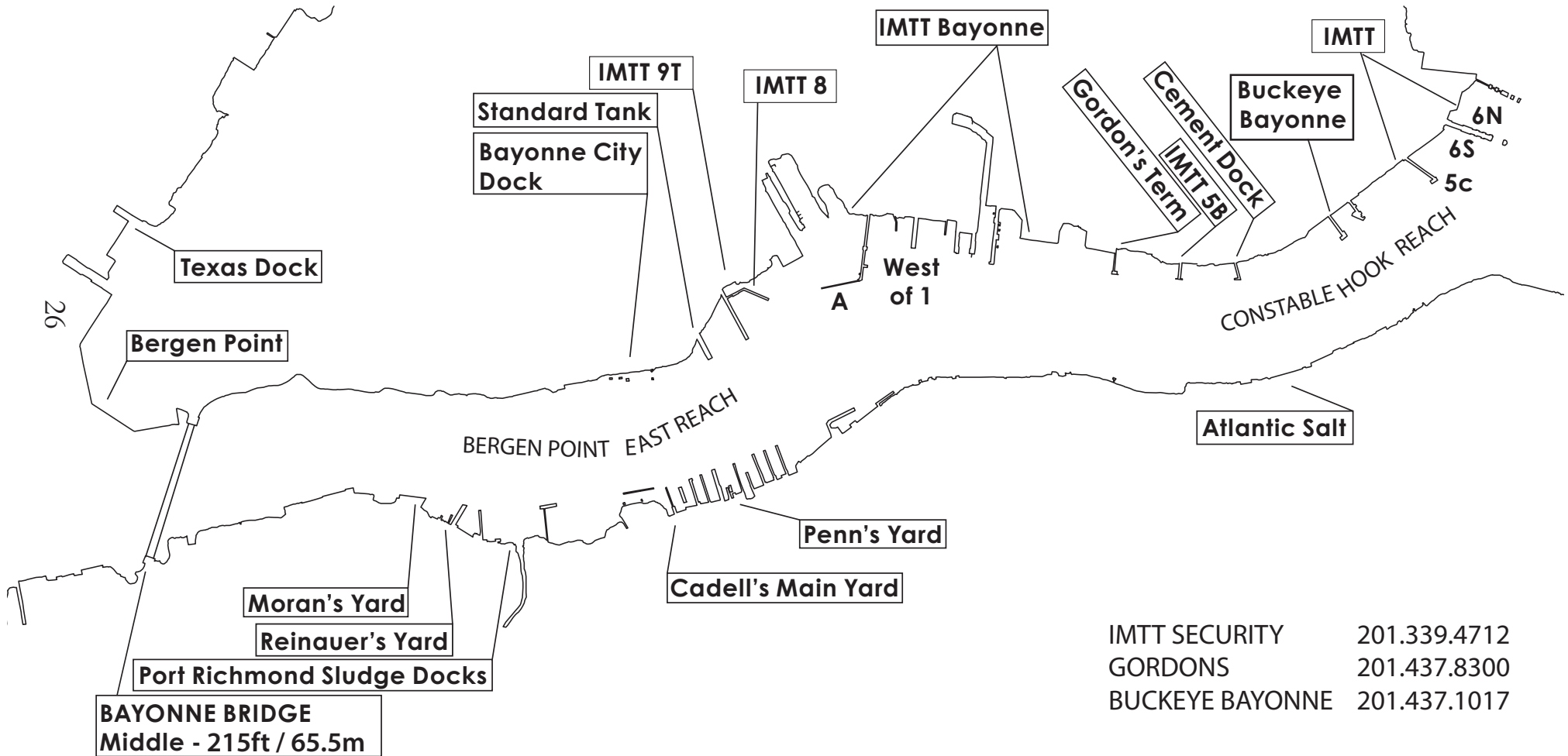
UPPERBAY - EAST PART

NOT FOR NAVIGATIONAL USE - PLEASE REFERENCE NOAA CHART 12334



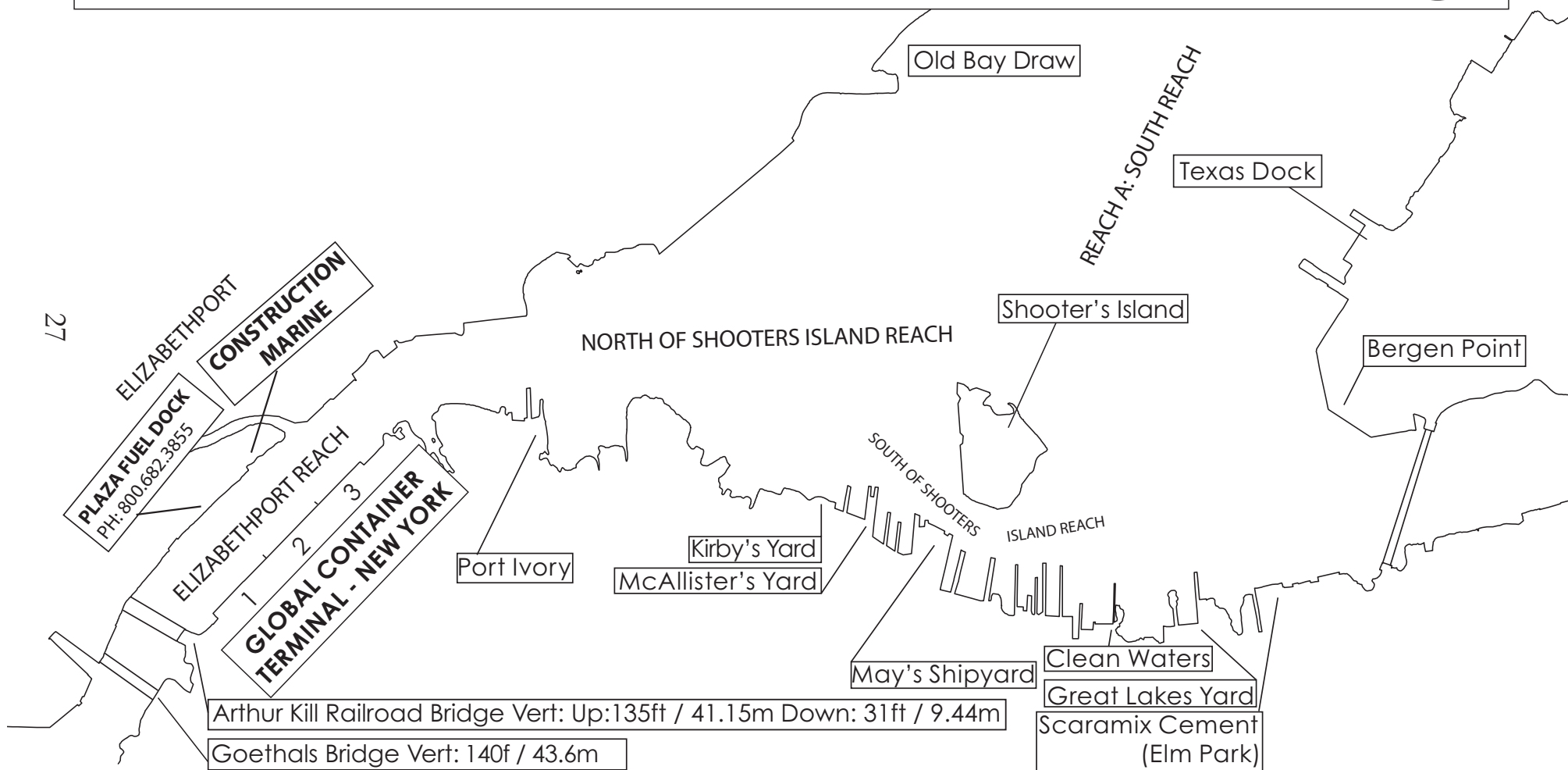
KILL VAN KULL

NOT FOR NAVIGATIONAL USE - PLEASE REFERENCE NOAA CHART 12333



NORTHERN PART OF ARTHUR KILL

NOT FOR NAVIGATIONAL USE - PLEASE REFERENCE NOAA CHART 12333

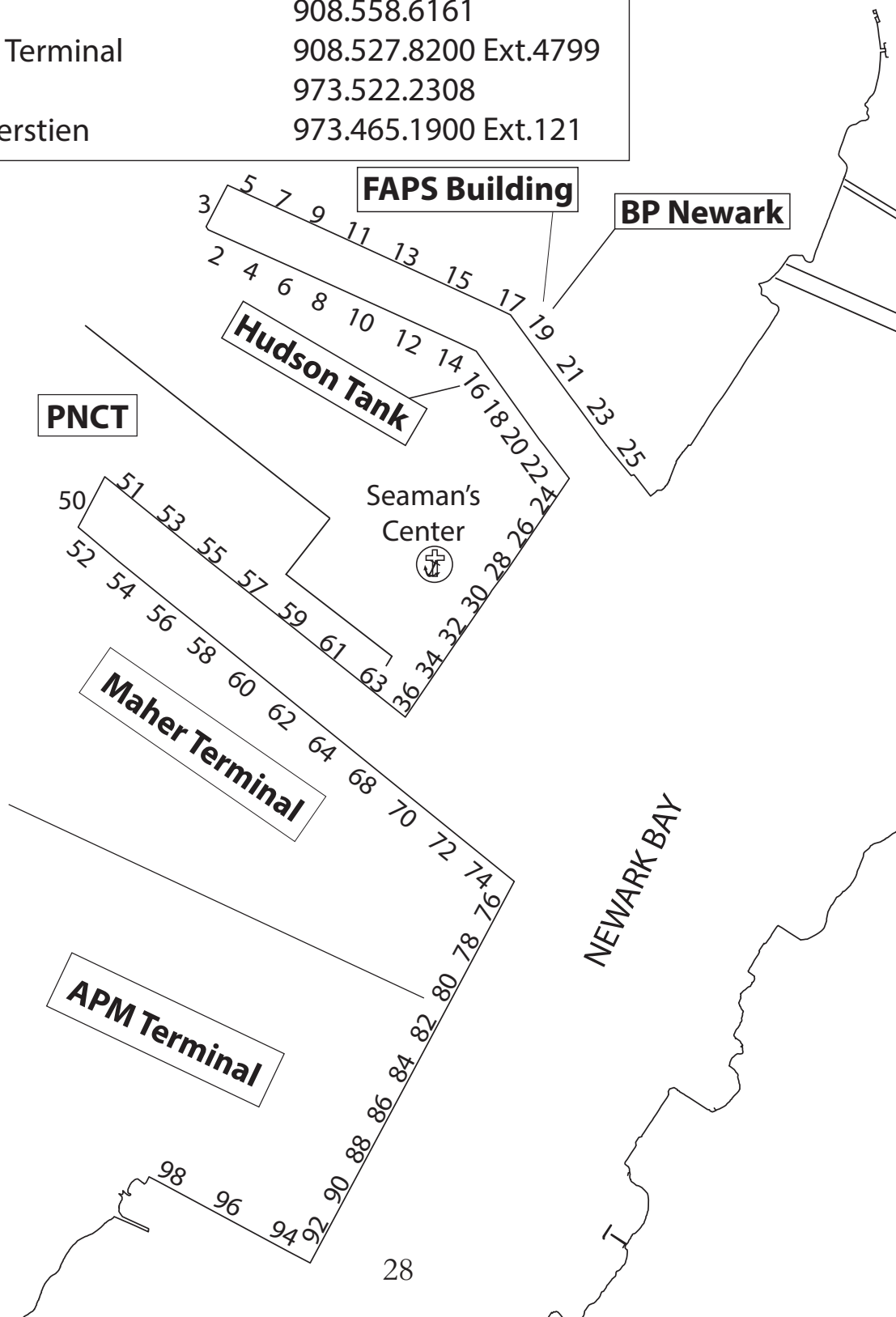


NEWARK BAY

NOT FOR NAVIGATIONAL USE - PLEASE REFERENCE NOAA CHART 12333

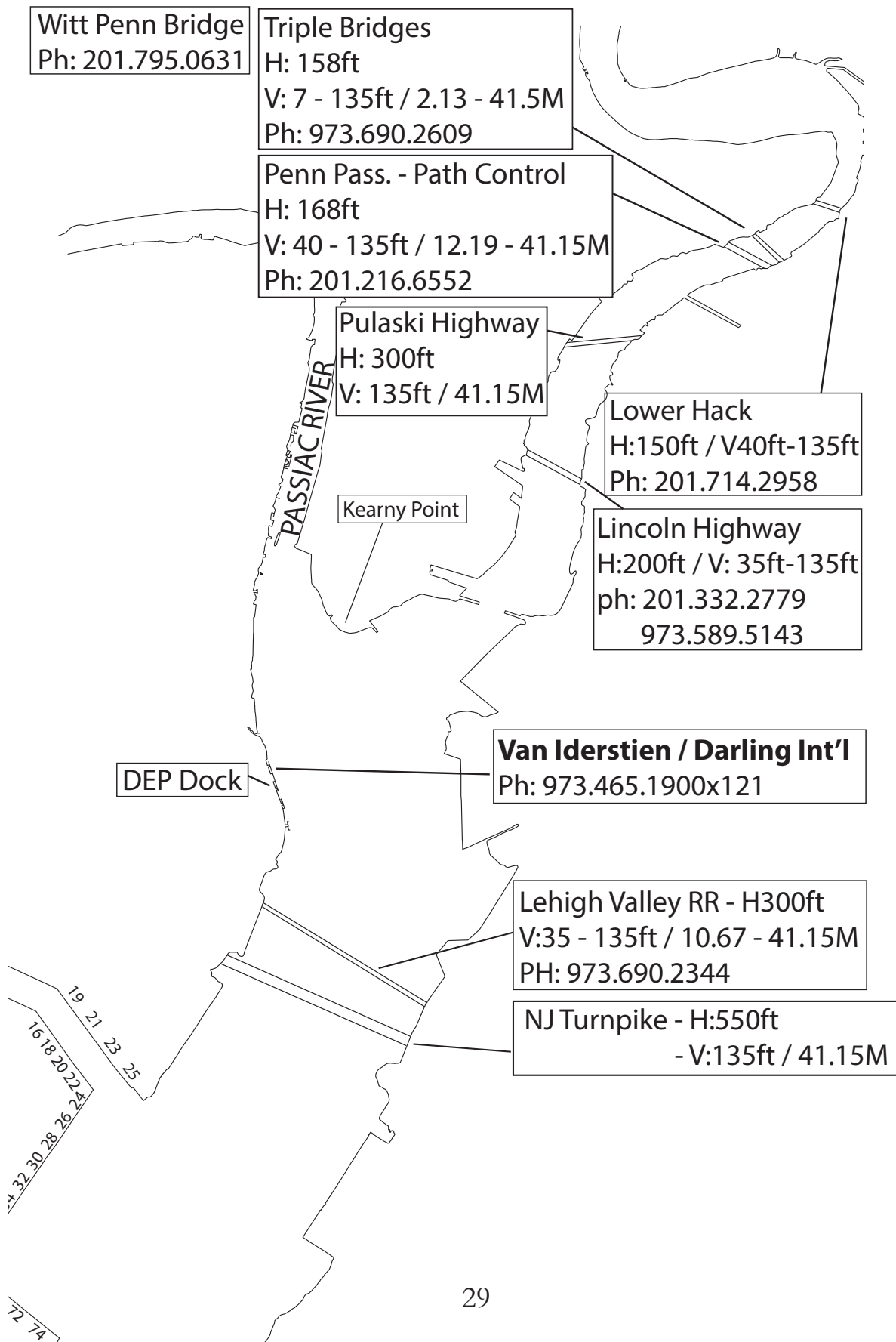


Hudson Tank	201.803.1166
APM Terminal S/L Bus	908.558.6138
APM Terminal S/L Security	908.558.6163
	908.558.6161
Maher Terminal	908.527.8200 Ext.4799
PNCT	973.522.2308
Van Iderstien	973.465.1900 Ext.121



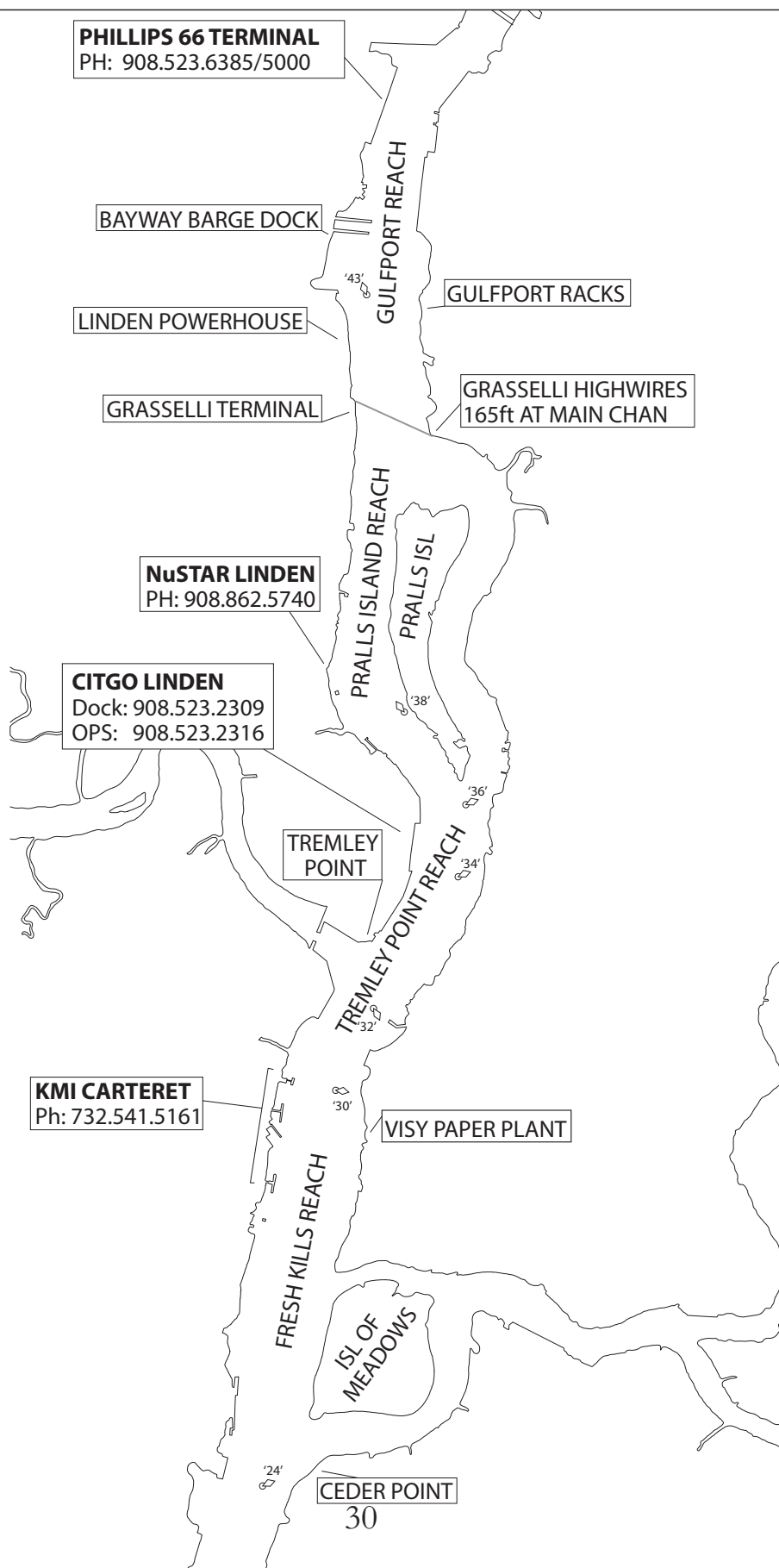
PASSAIC & HACKENSACK RIVERS

NOT FOR NAVIGATIONAL USE - PLEASE REFERENCE NOAA CHART 12337



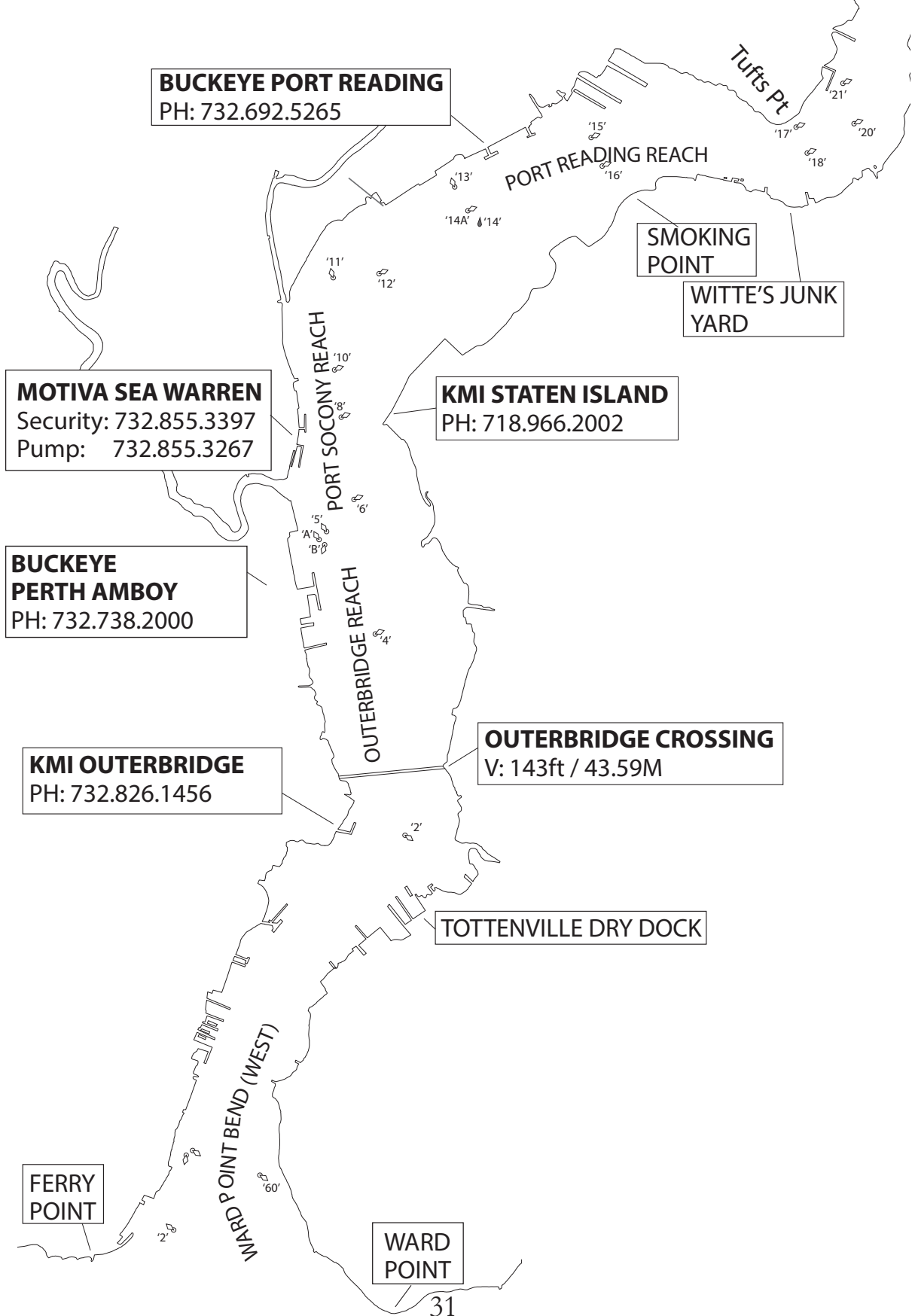
ARTHUR KILL NORTH

NOT FOR NAVIGATIONAL USE - PLEASE REFERENCE NOAA CHART 12333



ARTHUR KILL SOUTH

NOT FOR NAVIGATIONAL USE - PLEASE REFERENCE NOAA CHART 12331



NORTH RIVER

NOT FOR NAVIGATIONAL USE - PLEASE REFERENCE NOAA CHART 12335



LINCOLN HARBOR YACHT CLUB

VHF CH 74 & 9 - PH: 201.309.5100

Weehawken Cove

Castle Point

Lackawanna Canal

NEWPORT MARINA

VHF CH 16

PH: 201.626.5550

Morris Canal Basin

LIBERTY LANDING MARINA

VHF CH 72

PH: 201.985.8000

NORTH COVE MARINA

VHF CH 69 - PH: 212.786.1200

SOUTH COVE MARINA

64

62 - **CHELSEA PIERS**

61 - **SURFSIDE 3 /**

60 - **MARINE MAX**

59 - **VHF CH 68**

54 - **PH 800.650.7873**

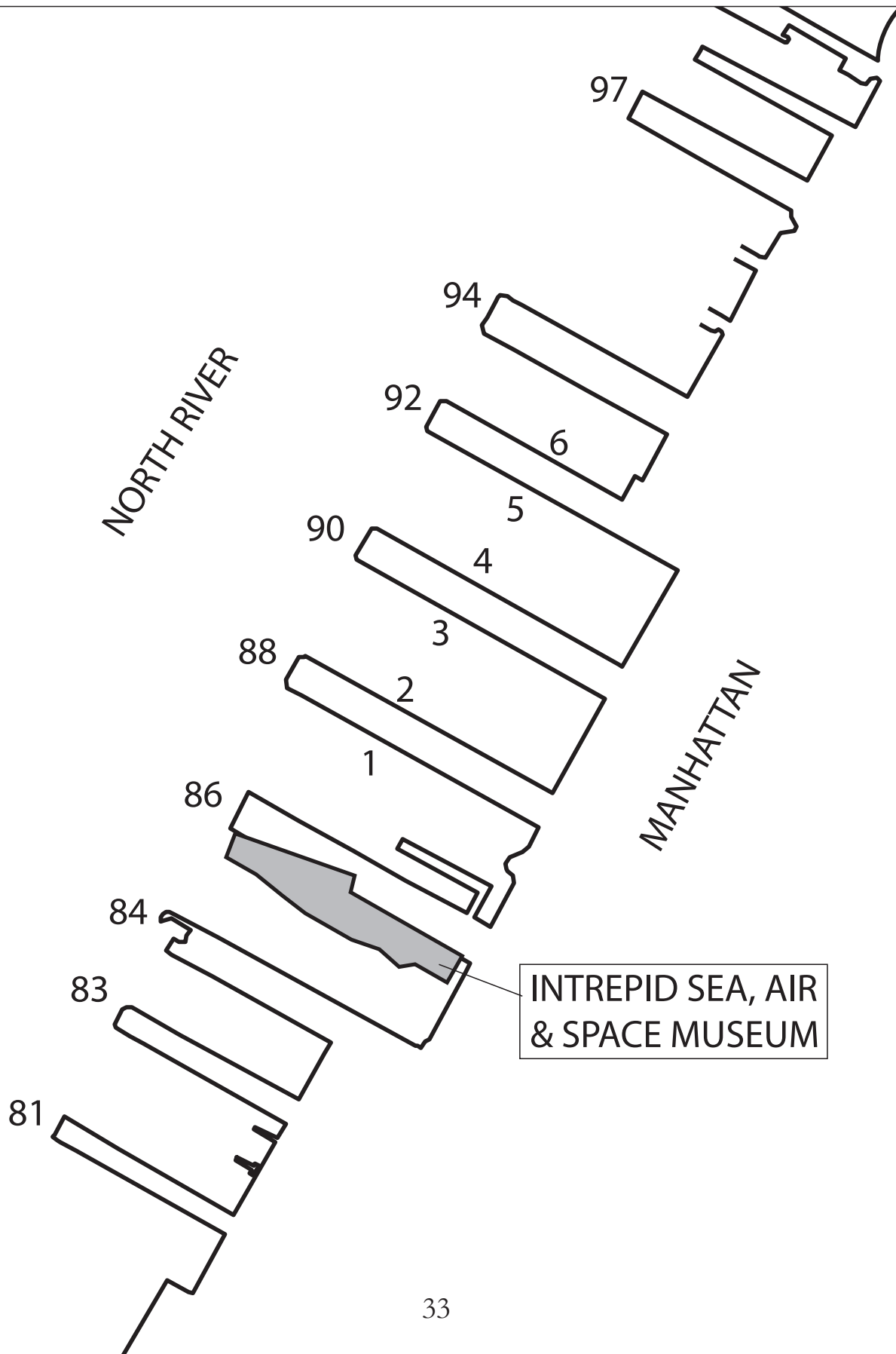
53

45

40

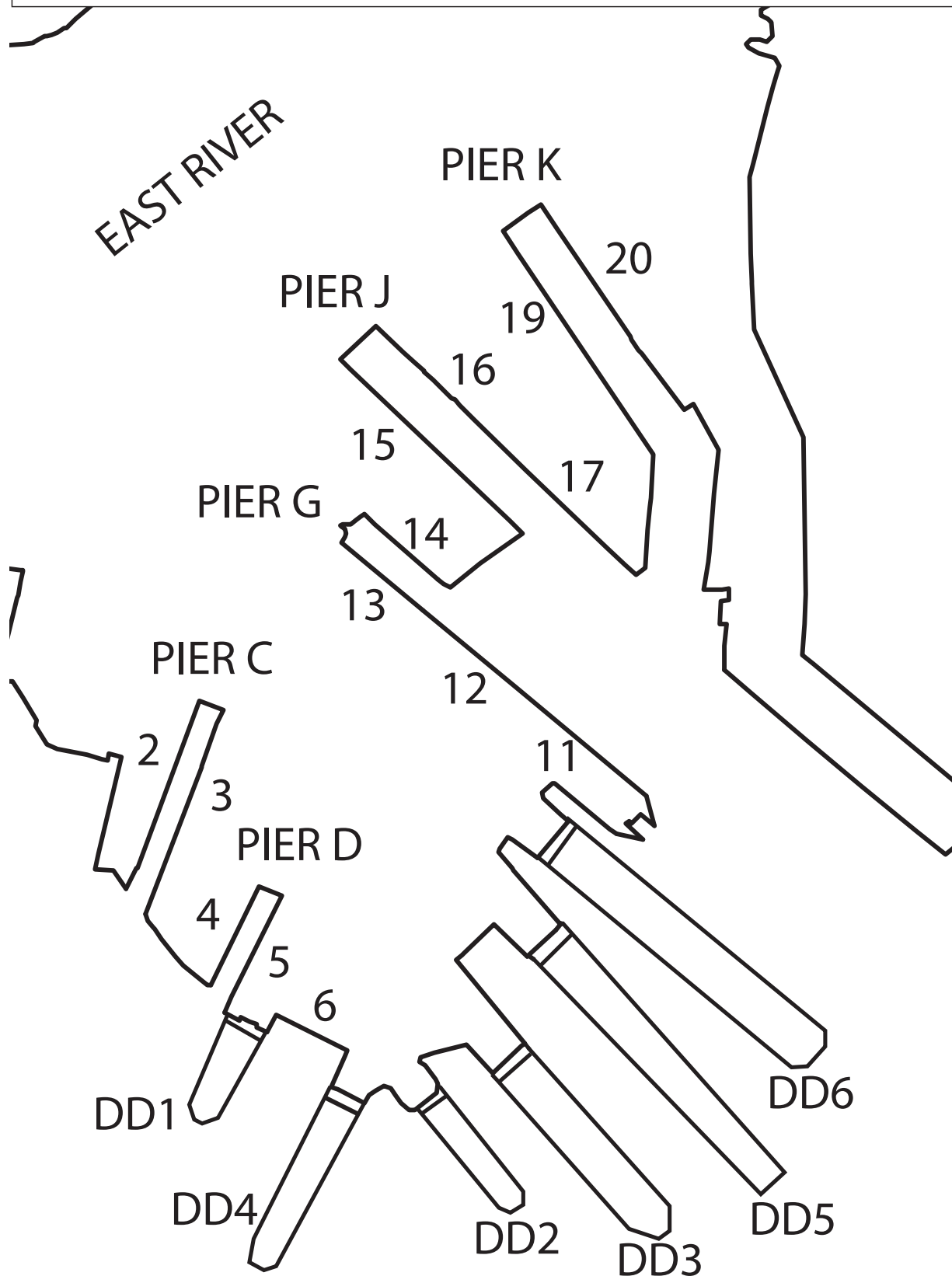
N. RIV. - PASSENGER TERMINAL

NOT FOR NAVIGATIONAL USE - PLEASE REFERENCE NOAA CHART 12335



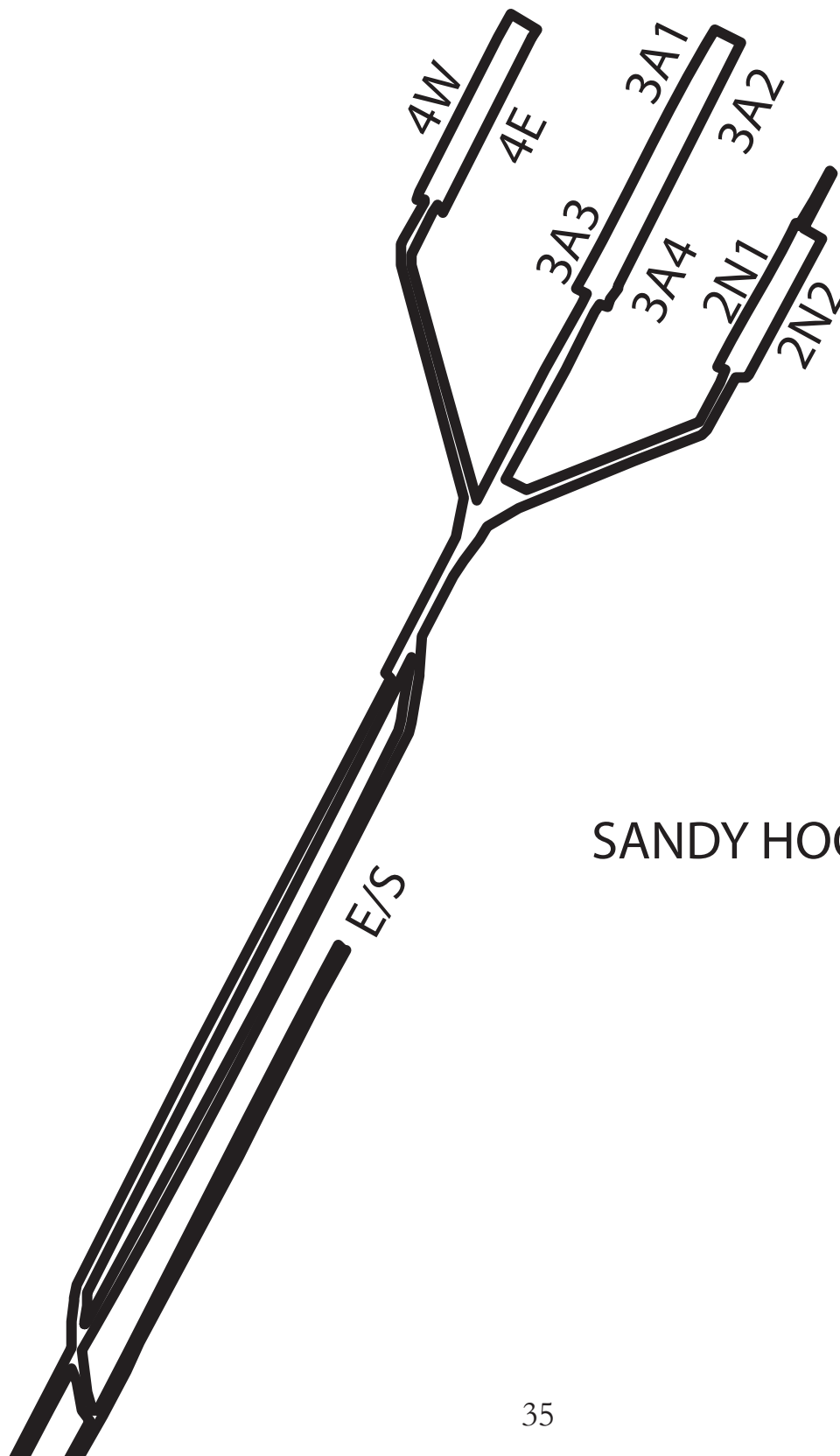
OLD BROOKLYN NAVY YARD

NOT FOR NAVIGATIONAL USE - PLEASE REFERENCE NOAA CHART 12335



LEONARDO, EARLE, NJ

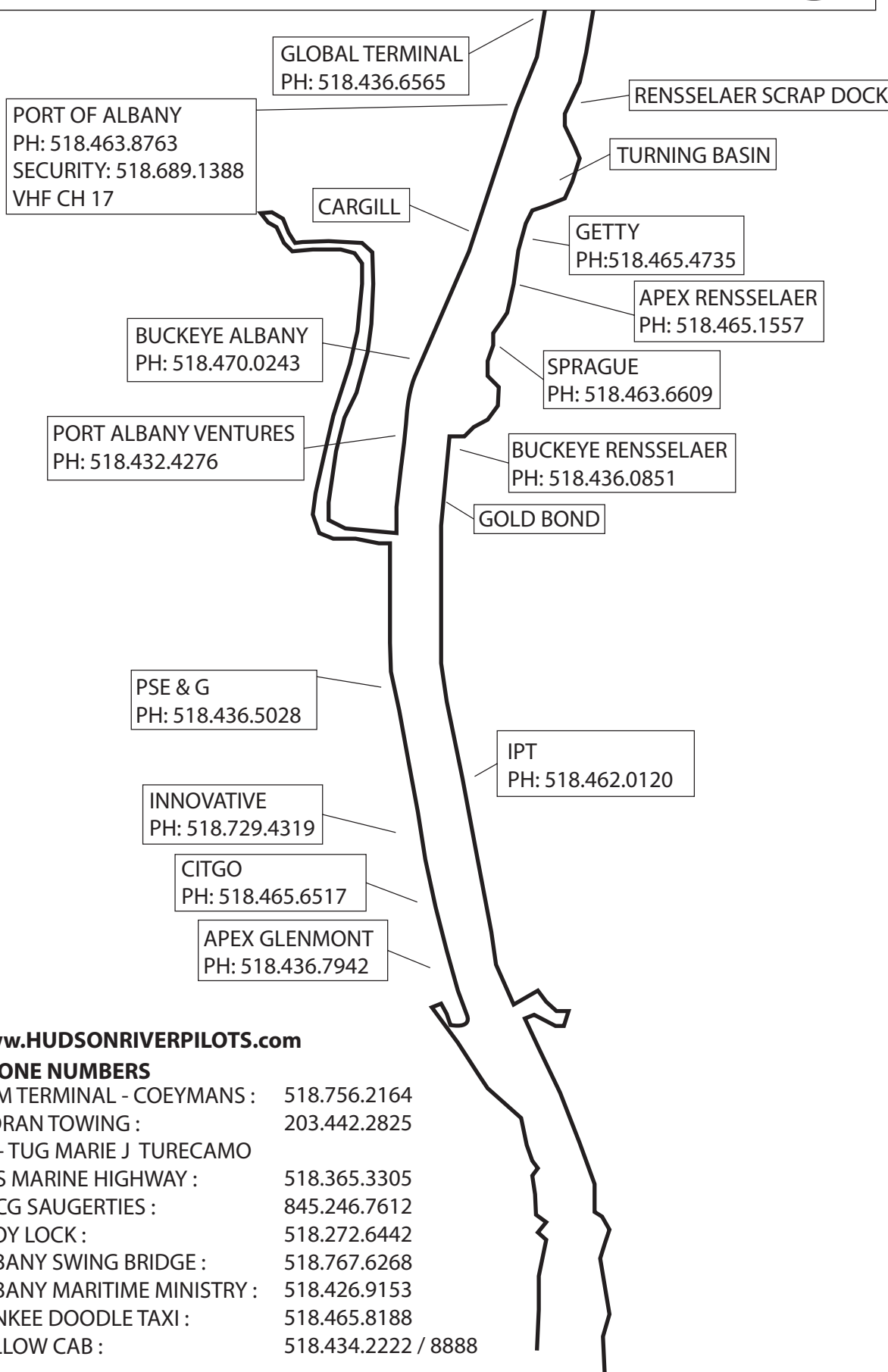
NOT FOR NAVIGATIONAL USE - PLEASE REFERENCE NOAA CHART 12



SANDY HOOK BAY

ALBANY

NOT FOR NAVIGATIONAL USE - PLEASE REFERENCE NOAA CHART 12348



www.HUDSONRIVERPILOTS.com

PHONE NUMBERS

P&M TERMINAL - COEYMANS : 518.756.2164
MORAN TOWING : 203.442.2825
- TUG MARIE J TURECAMO
NYS MARINE HIGHWAY : 518.365.3305
USCG SAUGERTIES : 845.246.7612
TROY LOCK : 518.272.6442
ALBANY SWING BRIDGE : 518.767.6268
ALBANY MARITIME MINISTRY : 518.426.9153
YANKEE DOODLE TAXI : 518.465.8188
YELLOW CAB : 518.434.2222 / 8888

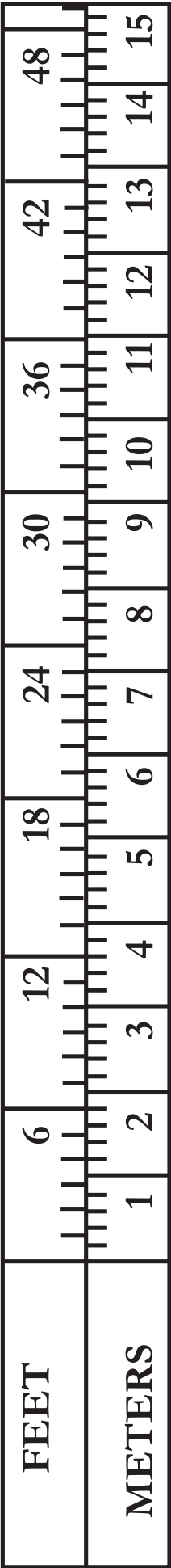
Common Conversion Factors and Metric Tables

Barrels (fuel oil).....	42.	Gallons (fuel oil)	
British Gallon	1.20094	U.S. Gallons	
Cable	600.0	Feet	
Centimeters	00.3937	Inches	
Cubic Feet	1728.0	Cubic Inches	
Cubic Feet (fresh water)	62.5	Pounds Fresh Water	
Cubic Feet (sea water)	64.0	Pounds Sea Water	
Feet	0.3048	Meters	
Gallons	3.78533	Liters	
Gallons of Water	8.33	Pounds of Water	
Inches	2.54	Centimeters	
Kilograms	35.274	Ounces	
Kilograms (KG)	2.20462	Pounds	
1000 KG (1 metric ton)	0.98421	Long Tons	
IGlometers	3281.0	Feet	
Knots	1.152	Miles Per Hour	
Liters	0.2642	Gallons	
Meters	3.281	Feet	
Meters	1.0936	Yards	
Miles	1.609	Kilometers	
Miles (land)	5280	Feet	
Miles (nautical)	6080	Feet	
Tons (long) 2,240 lbs.	1.016047	Metric Tons	
Tons (short) 2,000 lbs	0.90718486	Metric Tons	
Tons (long) Fresh Water	35.84	Cubic Feet Fresh Water	
Tons (long) Sea Water	35	Cubic Feet Sea Water	
Yards	0.9144	Meters	
Fahrenheit = 915 Centigrade + 32°			
Centigrade = (Fahrenheit - 32°) x 5/9			

To find diameter of a circle, multiply circumference by .31831.
To find circumference of a circle, multiply diameter by 3.1416.
To find area of a circle, multiply square of diameter by .7854.
To find surface of a ball, multiply square of diameter by 3.1416.
To find cubic inches of a ball, multiply cube of diameter by .5236.
Doubling the diameter of a pipe increases its capacity four times.
Double riveting is from 16 to 20 percent stronger than single.

METRIC CAPACITIES		METRIC LENGTHS	
1 Milliliter	= 0.001 Liters	1 Millimeter	= 0.001 Meters
1 Centiliter	= 0.01 Liters	1 Centimeter	= 0.01 Meters
1 Deciliter	= 0.1 Liters	1 Decimeter	= 0.1 Meters
1 Dekaliter	= 10 Liters	1 Dekameter	= 10 Meters
1 Hectoliter	= 100 Liters	1 Hectometer	= 100 Meters
1 Kiloliter	= 1000 Liters	1 Kilometer	= 1000 Meters

BOW THRUSTER CONVERSION
KW. X 1.361 = Horsepower



PRECAUTIONARY STATEMENT

The tide figures used herein are based upon the National Oceanic and Atmospheric Administration tables, and we believe them to be accurate. They cannot, however, be guaranteed because tides tend to vary with the weather conditions.

Other information herein is based upon sources deemed to be reliable and is believed to be correct but it is likewise not guaranteed.

Effective October 28, 1991, the National Ocean Service (NOS) Tidal current charts - New York Harbor will be officially withdrawn from distribution. A recent evaluation shows that tidal currents determined from the New York Harbor charts, last revised in 1976, are not as accurate as those determined from more recent information published in the NOS Tidal Current Tables - Atlantic Coast of North America including Greenland. NOS plans no further revisions of the tidal current chart series.

PRECAUTIONARY NOTE - TIDAL CURRENT PREDICTIONS FOR NEW YORK HARBOR

Tidal currents at The Narrows, and at Hell Gate have been reported to deviate significantly from official predictions published by the National Ocean Service (NOS). Tidal currents in Arthur Kill and Kill Van Kull have also been reported to deviate significantly from prediction computed from table 2 values in the NOS Tidal Current Tables - Atlantic Coast of North America. Such reports cannot, at this time, be either confirmed or dismissed. Until NOS conducts a Quality Assurance Study for these locations, mariners should exercise caution and discretion in the use of published tidal current predictions for these locations.

Enter the table with the duration of rise or fall which most nearly agrees with the actual value and on that horizontal line find the time from the nearest high or low water which agrees most nearly with the corresponding actual difference. The correction sought is in the column directly below, on the line with the range of tide.

HEIGHT OF TIDE AT ANY TIME															
Duration				Time from the nearest high water or low water											
h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
5 30	0 11	0 22	0 33	0 44	0 55	1 06	1 17	1 28	1 39	1 50	2 01	2 12	2 23	2 34	2 45
6 00	0 12	0 24	0 36	0 48	1 00	1 12	1 24	1 36	1 48	2 00	2 12	2 24	2 36	2 48	3 00
6 20	0 13	0 25	0 38	0 51	1 03	1 16	1 29	1 41	1 54	2 07	2 19	2 32	2 45	2 57	3 10
6 30	0 13	0 26	0 39	0 52	1 05	1 18	1 31	1 44	1 57	2 10	2 23	2 36	2 49	3 02	3 15
6 40	0 13	0 27	0 40	0 53	1 07	1 20	1 33	1 47	2 00	2 13	2 27	2 40	2 53	3 07	3 20
7 00	0 14	0 28	0 42	0 56	1 10	1 24	1 38	1 52	2 06	2 20	2 34	2 48	3 02	3 16	3 30
Duration				Correction to height											
Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.
2.5	0.0	0.0	0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.6	0.7	0.9	1.0	1.1	1.2
3.0	0.0	0.0	0.1	0.1	0.2	0.3	0.4	0.5	0.6	0.8	0.9	1.0	1.2	1.3	1.5
3.5	0.0	0.0	0.1	0.2	0.2	0.3	0.4	0.6	0.7	0.9	1.0	1.2	1.4	1.6	1.8
4.0	0.0	0.0	0.1	0.2	0.3	0.4	0.5	0.7	0.8	1.0	1.2	1.4	1.6	1.8	2.0
4.5	0.0	0.0	0.1	0.2	0.3	0.4	0.6	0.7	0.9	1.1	1.3	1.6	1.8	2.0	2.2
5.0	0.0	0.1	0.1	0.2	0.3	0.5	0.6	0.8	1.0	1.2	1.5	1.7	2.0	2.2	2.5
5.5	0.0	0.1	0.1	0.2	0.4	0.5	0.7	0.9	1.1	1.4	1.6	1.9	2.2	2.5	2.8
6.0	0.0	0.1	0.1	0.3	0.4	0.6	0.8	1.0	1.2	1.5	1.8	2.1	2.4	2.7	3.0
6.5	0.0	0.1	0.2	0.3	0.4	0.6	0.8	1.1	1.3	1.6	1.9	2.2	2.6	2.9	3.2
7.0	0.0	0.1	0.2	0.3	0.5	0.7	0.9	1.2	1.4	1.8	2.1	2.4	2.8	3.1	3.5
7.5	0.0	0.1	0.2	0.3	0.5	0.7	1.0	1.2	1.5	1.9	2.2	2.6	3.0	3.4	3.8
8.0	0.0	0.1	0.2	0.3	0.5	0.8	1.0	1.3	1.6	2.0	2.4	2.8	3.2	3.6	4.0
8.5	0.0	0.1	0.2	0.4	0.6	0.8	1.1	1.4	1.8	2.1	2.5	2.9	3.4	3.8	4.2
9.0	0.0	0.1	0.2	0.4	0.6	0.9	1.2	1.5	1.9	2.2	2.7	3.1	3.6	4.0	4.5

VELOCITY OF CURRENT AT ANY TIME

Places except Hell Gate, Cape Cod Canal, C & D Canal. Interval between slack and maximum current															
hrs. mins.		1 20	1 40	2 00	2 20	2 40	3 00	3 20	3 40	4 00	4 20	4 40	5 00	5 20	5 40
Interval bet. slack & desired time	0 20	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	0 40	0.7	0.6	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2
	1 00	0.9	0.8	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3
	1 20	1.0	1.0	0.9	0.8	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.4
	1 40	....	1.0	1.0	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.4
	2 00	....	....	1.0	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.5
	2 20	....	....	....	1.0	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.6	0.6
	2 40	....	....	....	....	1.0	1.0	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.7
	3 00	....	....	....	....	....	1.0	1.0	1.0	0.9	0.9	0.8	0.8	0.8	0.7
	3 20	....	....	....	....	....	....	1.0	1.0	1.0	0.9	0.9	0.9	0.8	0.8
	3 40	....	....	....	....	....	....	....	1.0	1.0	1.0	0.9	0.9	0.9	0.9
	4 00	....	....	....	....	....	....	....	....	1.0	1.0	1.0	1.0	0.9	0.9
	4 20	....	....	....	....	....	....	....	....	....	1.0	1.0	1.0	1.0	0.9
	4 40	....	....	....	....	....	....	....	....	....	....	1.0	1.0	1.0	1.0

Hell Gate, Cape Cod Canal, C & D Canal. Interval between slack and maximum current															
hrs. mins.		1 20	1 40	2 00	2 20	2 40	3 00	3 20	3 40	4 00	4 20	4 40	5 00	5 20	5 40
Interval bet. slack & desired time	0 20	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2
	0 40	0.8	0.7	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3
	1 00	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.4
	1 20	1.0	1.0	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.5	0.5	0.5	0.5
	1 40	....	1.0	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.6
	2 00	....	....	1.0	1.0	0.9	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.7	0.6
	2 20	....	....	....	1.0	1.0	1.0	0.9	0.9	0.8	0.8	0.8	0.7	0.7	0.7
	2 40	....	....	....	....	1.0	1.0	1.0	0.9	0.9	0.9	0.8	0.8	0.8	0.7
	3 00	....	....	....	....	....	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.8	0.8
	3 20	....	....	....	....	....	....	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.8
	3 40	....	....	....	....	....	....	....	1.0	1.0	1.0	1.0	0.9	0.9	0.9
	4 00	....	....	....	....	....	....	....	....	1.0	1.0	1.0	1.0	0.9	0.9
	4 20	....	....	....	....	....	....	....	....	....	1.0	1.0	1.0	1.0	0.9
	4 40	....	....	....	....	....	....	....	....	....	....	1.0	1.0	1.0	1.0

1. Enter from the top of the proper table with the time interval between slack and maximum current encompassing the time for which the velocity is desired.
2. Enter from the side of the proper table with the interval between slack and the desired time.
3. Multiply factor corresponding to above intervals, by maximum current from daily predictions.

Tidal Differences & Other Constants on New York, NY

PLACE	POSITION		DIFFERENCES			
	LAT.	LONG.	TIME		HEIGHT	
			High water	Low water	High water	Low water
NEW YORK	• ' N.	• ' W.	h. m.	h. m.	feet	feet
Time meridian, 75• W.						
East River						
Hell Gate, Ward's Island	40 47	73 55	+ 2 59	+ 3 45	+ 1.4	0.0
Hell Gate, Hallets Point	40 47	73 56	+ 2 04	+ 2 07	+ 0.5	0.0
Horns Hook, E. 90th Street	40 47	73 56	+ 1 52	+ 1 34	+ 0.1	0.0
Roosevelt Island, north end	40 46	73 56	+ 1 49	+ 1 28	+ 0.2	0.0
37th Avenue, Long Island City	40 46	73 57	+ 1 34	+ 1 13	- 0.1	0.0
East 41st Street, New York City	40 45	73 58	+ 1 07	+ 0 48	- 0.3	0.0
Hunters Point, Newtown Creek	40 44	73 57	+ 1 22	+ 0 56	- 0.5	0.0
English Kills Ent., Newtown Creek	40 43	73 55	+ 1 34	+ 1 07	- 0.4	0.0
East 27th Street, Bellevue Hospital	40 44	73 58	+ 1 12	+ 1 06	- 0.4	0.0
East 19th Street, New York City	40 44	73 58	+ 1 06	+ 1 01	- 0.5	0.0
North 3rd Street, Brooklyn	40 43	73 58	+ 0 59	+ 0 45	- 0.5	0.0
Williamsburg Bridge	40 43	73 58	+ 0 56	+ 0 41	- 0.5	0.0
Wallabout Bay	40 42	73 58	+ 0 32	+ 0 22	- 0.3	0.0
Brooklyn Bridge	40 42	74 00	+ 0 17	+ 0 10	- 0.3	0.0
NEW YORK and NEW JERSEY						
New York Harbor						
Bay Ridge	40 38	74 02	- 0 20	- 0 21	0.0	0.0
St. George, Staten Island	40 39	74 04	- 0 17	- 0 15	- 0.1	0.0
Bayonne, New Jersey	40 41	74 06	- 0 15	- 0 05	- 0.1	0.0
Gowanus Bay	40 40	74 01	- 0 15	- 0 12	- 0.2	0.0
Governors Island	40 42	74 01	- 0 07	- 0 03	- 0.2	0.0
NEW YORK (The Battery)	40 42	74 01	Daily Predictions			
Hudson River*						
Jersey City Con. Rail. RR. Ferry, N.J.	40 43	74 02	+ 0 11	+ 0 10	- 0.2	0.0
New York, Desbrosses Street	40 43	74 01	+ 0 14	+ 0 13	- 0.2	0.0
New York, Chelsea Docks	40 45	74 01	+ 0 21	+ 0 19	- 0.3	0.0
Hoboken, Castle Point, N.J.	40 45	74 01	+ 0 21	+ 0 19	- 0.3	0.0
Weehawken, Days Point, N.J.	40 46	74 01	+ 0 28	+ 0 26	- 0.4	0.0
New York, Union Stock Yards	40 47	74 00	+ 0 31	+ 0 29	- 0.4	0.0
New York, 130th Street	40 49	73 58	+ 0 41	+ 0 38	- 0.6	0.0
George Washington Bridge	40 51	73 57	+ 0 50	+ 0 46	- 0.7	0.0

* Values for the Hudson River above the George Washington Bridge are based upon averages for the six months May to October period, when the fresh-water discharge is a minimum.

Tidal Differences & Other Constants on New York, NY

PLACE	POSITION		DIFFERENCES			
	LAT.	LONG.	TIME		HEIGHT	
			High water	Low water	High water	Low water
NEW YORK	• ' N.	• ' W.	h. m.	h. m.	feet	feet
Time meridian, 75° W.						
Hudson River, continued						
Spuyten Duyvil West of RR Bridge .	40 53	73 56	+ 1 02	+ 0 56	- 0.8	0.0
Riverdale	40 54	73 55	+ 0 49	+ 0 49	- 0.7	0.0
Yonkers	40 56	73 54	+ 1 13	+ 1 13	- 0.9	0.0
Dobbs Ferry	41 01	73 53	+ 1 33	+ 1 43	- 1.2	0.0
Tarrytown	41 05	73 52	+ 1 49	+ 1 57	- 1.4	0.0
Ossining	41 10	73 52	+ 1 57	+ 2 17	- 1.5	0.0
Haverstraw	41 12	73 58	+ 2 03	+ 2 28	- 1.7	0.0
Peekskill	41 17	73 56	+ 2 28	+ 3 03	- 1.4	+ 0.3
West Point	41 24	73 57	+ 3 20	+ 3 40	- 1.6	+ 0.3
Newburgh	41 30	74 00	+ 3 46	+ 4 03	- 1.6	+ 0.2
New Hamburg	41 35	73 57	+ 4 04	+ 4 28	- 1.6	+ 0.1
Poughkeepsie	41 42	73 57	+ 4 34	+ 4 46	- 1.4	+ 0.1
Hyde Park	41 47	73 57	+ 5 00	+ 5 12	- 1.4	0.0
Kingston Point	41 56	73 58	+ 5 20	+ 5 34	- 1.0	- 0.1
Tivoli	42 04	73 56	+ 5 50	+ 6 04	- 0.9	- 0.2
Catskill	42 13	73 51	+ 6 41	+ 6 58	- 0.8	- 0.3
Hudson	42 15	73 48	+ 6 58	+ 7 12	- 1.0	- 0.4
Albany	42 39	73 45	DAILY PREDICTIONS			
The Kills and Newark Bay						
Kill Van Kull						
Constable Hook	40 39	74 05	- 0 30	- 0 18	- 0.1	0.0
New Brighton	40 39	74 05	- 0 08	- 0 15	- 0.1	0.0
Port Richmond	40 38	74 08	+ 0 01	+ 0 08	- 0.1	0.0
Bergen Point	40 39	74 08	+ 0 07	+ 0 06	0.0	0.0
Shooters Island	40 39	74 10	+ 0 10	+ 0 21	0.0	0.0
Port Elizabeth	40 40	74 08	- 0 02	+ 0 15	+ 0.5	0.0
Port Newark Terminal	40 41	74 08	+ 0 03	+ 0 21	+ 0.5	0.0
Point No Point	40 44	74 07	0 00	+ 0 22	+ 0.7	0.0
Newark, Passaic River	40 44	74 10	+ 0 26	+ 0 55	+ 0.5	0.0
Belleville	40 47	74 09	+ 0 04	+ 0 43	+ 0.9	0.0
Passaic, Gregory Ave. Bridge	40 51	74 07	+ 0 53	+ 2 00	+ 0.5	0.0
Hackensack River						
Kearney Point	40 44	74 06	+ 0 13	+ 0 36	+ 0.4	0.0
Secaucus	40 48	74 04	+ 1 17	+ 1 12	+ 0.5	0.0
Uttle Ferry	40 51	74 02	+ 1 26	+ 1 17	+ 0.7	0.0
Hackensack	40 53	74 02	+ 1 37	+ 2 01	+ 0.7	0.0

Tidal Differences & Other Constants on New York, NY

PLACE	POSITION		DIFFERENCES			
	LAT.	LONG.	TIME		HEIGHT	
			High water	Low water	High water	Low water
NEW YORK	• ' N.	• ' W.	h. m.	h. m.	feet	feet
Time meridian, 75° W.						
The Kills and Newark Bay						
Arthur Kill						
Elizabethport	40 39	74 11	+ 0 24	+ 0 41	+ 0.2	0.0
Chelsea	40 36	74 12	+ 0 23	+ 0 37	+ 0.3	0.0
Carteret	40 35	74 13	+ 0 22	+ 0 27	+ 0.6	0.0
Rossville	40 33	74 13	+ 0 16	+ 0 27	+ 0.6	0.0
Tottenville	40 31	74 15	+ 0 02	+ 0 15	+ 0.6	0.0
Perth Amboy	40 30	74 16	+ 0 12	+ 0 21	+ 0.5	0.0
Lower New York Bay,						
Raritan Bay, etc.						
New Dorp Beach	40 34	74 06	- 0 05	+ 0 15	+ 0.2	0.0
Great Kills Harbor	30 33	74 08	+ 0 06	+ 0 21	0.0	0.0
Princess Bay	30 31	74 12	0 00	+ 0 06	+ 0.2	0.0
Raritan River						
South Amboy	40 29	74 17	+ 0 04	+ 0 06	+ 0.3	0.0
Washington Canal	40 28	74 22	+ 0 33	+ 0 52	+ 0.9	0.0
South River Highway Bridge	40 27	74 22	+ 0 54	+ 1 04	+ 0.8	0.0
New Brunswick	40 29	72 26	+ 0 45	+ 1 28	+ 1.1	0.0
Keyport	40 26	74 12	+ 0 07	+ 0 21	+ 0.3	0.0
Keansburg	40 27	74 09	- 0 04	+ 0 01	+ 0.2	0.0
Port Monmouth	40 26	74 05	- 0 03	0 00	+ 0.1	0.0
Atlantic Highlands	40 25	74 02	- 0 02	+ 0 02	0.0	0.0
SANDY HOOK	40 28	74 01	DAILY PREDICTIONS			

New Jersey Outer Coast & Long Island Sound

Abseson Channel	Sandy Hook	+ 0 11	- 0 09	*0.84	3.9	4.7
Cape May Harbor	Sandy Hook	- 0 03	- 0 14	*0.94	4.4	5.3
Coney Island	Sandy Hook	- 0 04	- 0 17	*1.01	4.7	5.7
Norton P1. J. Bay	Sandy Hook	+ 0 38	+ 0 45	*1.16	5.4	6.5
Rockaway Inlet.	Sandy Hook	- 0 01	- 0 04	*1.07	5.0	6.0
Beach Chan. Bdge.	Sandy Hook	+ 0 37	+ 0 24	*1.09	5.1	6.2
E. Rkaway Inlet.	Sandy Hook	- 0 07	- 0 14	*0.88	4.1	5.0
Fire Is. Inlet.	Sandy Hook	- 0 39	- 0 27	*0.56	2.6	3.1

Current Differences and Constants

Reference Station - The Narrows

PLACE	TIME DIFFERENCES				AVG. SP. / DIR.		
	Min.	Max.	Min.	Max.	Max.	Max.	
	Before	Flood	Before	Ebb	Flood	Ebb	
	Flood		Ebb				
	h.m.	h.m.	h.m.	h.m.	kts.	deg.	kts.
New York Lower Bay and Raritan Bay & River							
Ambrose Entrance	- 0 57	- 1 10	- 0 25	- 0 07	1.6	303	1.7
Coney Is. Channel	- 1 21	- 0 44	- 0 24	- 0 48	1.1	293	1.2
The Narrows	DAILY PREDICTIONS						
off Sandy Hook Pt	- 1 51	- 1 55	- 1 30	- 1 50	2.0	235	1.6
S W Spit	- 1 45	- 2 00	- 1 50	- 1 42	0.6	263	0.6
Channel Seguine Pt.	- 2 02	- 2 50	- 0 48	- 2 08	0.7	281	0.3
Channel Seguine Pt. 34 . . .	- 3 38	- 2 51	- 0 13	- 2 24	0.5	285	0.2
P. Amboy R.R. Br.	- 2 12	- 2 25	- 1 15	- 2 01	0.9	326	0.7
Upper Bay & Hudson River							
Bay Ridge Channel 15' . . .	- 0 58	- 1 26	+ 0 04	- 1 17	1.0	032	0.7
Bay Ridge Channel 36' . .	- 1 35	- 2 36	- 0 50	- 0 09	0.6	037	0.4
Red Hook Channel	- 1 03	- 0 44	- 0 08	- 0 30	1.0	353	0.7
E. of Robbins Reef	+ 0 16	+ 0 16	+ 0 02	+ 0 24	1.3	016	1.6
I mi. W of Red Hook	+ 0 41	+ 1 06	+ 0 47	+ 0 52	1.3	024	2.3
E. of Liberry	+ 0 57	+ 0 58	+ 0 56	+ 0 59	1.4	031	1.9
NW of Battery	+ 0 49	+ 1 12	+ 1 22	+ 2 18	1.4	009	1.4
Grant's Tomb 16'	+ 1 10	+ 0 46	+ 1 42	+ 2 06	1.6	024	1.9
Grant's Tomb 18'	+ 1 04	+ 1 18	+ 1 58	+ 1 27	1.8	025	1.8
G. Washington Br	+ 1 41	+ 1 55	+ 1 50	+ 2 08	1.6	020	2.2
Riverdale	+ 2 11	+ 2 07	+ 2 02	+ 2 32	1.4	015	2.0
Haverstraw	+ 2 55	+ 3 08	+ 3 13	+ 3 26	0.8	355	1.3
Peekskill	+ 3 10	+ 3 24	+ 3 33	+ 3 42	0.8	000	1.2
West Point	+ 3 32	+ 3 47	+ 3 51	+ 4 04	1.0	010	1.1
Newburgh	+ 3 50	+ 4 06	+ 4 03	+ 4 21	0.9	005	1.1
Poughkeepsie	+ 4 26	+ 4 37	+ 4 21	+ 4 49	1.1	005	1.2
Kingston	+ 5 09	+ 5 09	+ 4 54	+ 5 19	1.3	005	1.6
Hudson	+ 6 23	+ 6 45	+ 6 20	+ 6 15	1.6	030	2.0
Albany	+ 8 29	+ 7 32	+ 6 46	+ 7 47	0.3	020	0.8
Troy							0.7

Current Differences and Constants

Reference Station - The Narrows

PLACE	TIME DIFFERENCES				AVG. SP. / DIR.		
	Min.	Max.	Min.	Max.	Max.	Max.	
	Before	Flood	Before	Ebb	Flood	Ebb	
	Flood		Ebb				
	h.m.	h.m.	h.m.	h.m.	kts.	deg.	kts.
Kill Van Kull & Arthur Kill							
W. New Brighton 15'	- 1 44	- 2 08	- 1 24	- 1 43	1.3	262	1.9
W. New Brighton 12'	- 2 00	- 2 19	- 1 38	- 1 14	1.3	259	1.4
Elizabeth port.	+ 0 05	- 0 09	+ 0 32	+ 0 04	1.4	090	1.1
Carteret	- 0 18	- 0 54	+ 0 31	+ 0 29	0.9	015	0.8
Tufts Point	- 0 48	- 0 44	- 0 24	- 1 00	1.2	109	1.2
Tottenville 15'	- 1 14	- 1 25	- 0 33	- 1 23	1.0	023	1.1
Tottenville 32'	- 1 33	- 1 05	- 0 48	- 1 03	0.6	026	0.5
Newark Bay, Hackensack & Passaic Rivers							
South Reach	- 0 56	- 1 45	- 0 51	- 1 06	0.7	031	0.7
Lincoln Hway. H. River	- 0 06	+ 0 12	+ 0 47	- 0 14	0.9	017	0.8
Lincoln Hway. P. River.	- 0 31	- 0 19	- 0 12	- 0 20	0.6	009	0.5
East River Reference Station Hell Gate							
Buttermilk Channel	- 0 12	- 0 18	- 0 06	+ 0 18	1.8	050	2.4
(See Caution Note)							
Brooklyn Bridge	- 0 18	+ 0 08	- 0 04	- 0 07	2.9	046	3.5
Corlears Hook	- 0 05	+ 0 12	- 0 01	+ 0 10	2.7	020	2.9
Off Pier 67, 19th St.	- 0 08	+ 0 08	- 0 08	+ 0 07	1.8	355	1.9
Hell Gate	DAILY PREDICTIONS						
Port Morris	- 0 17	+ 0 04	- 0 06	- 0 12	1.5	054	1.2
Hunts Point SW of	+ 0 01	- 0 10	+ 0 01	- 0 05	1.7	108	1.3
Old Ferry Point	- 0 34	- 0 46	- 0 10	- 1 27	1.7	076	1.0

Caution: During the first 2 hours of flood in channel north of Governors Island, the current in the Hudson River is still ebbing, while during the first 1.5 hours of ebb in this channel the current in the Hudson is still flooding.

Changes of Meters into Feet and Inches

METERS	FEET	METERS	FEET	METERS	FEET	METERS	FEET
3.0	09 10	7.5	24 07	12.0	39 04	16.5	54 02
3.1	10 02	7.6	24 11	12.1	39 08	16.6	54 06
3.2	10 06	7.7	25 03	12.2	40 00	16.7	54 09
3.3	10 10	7.8	25 07	12.3	40 04	16.8	55 01
3.4	11 02	7.9	25 11	12.4	40 08	16.9	55 05
3.5	11 06			12.5	41 00		
3.6	11 10	8.0	26 03	12.6	41 04	17.0	55 09
3.7	12 02	8.1	26 07	12.7	41 08	17.1	56 01
3.8	12 06	8.2	26 11	12.8	42 00	17.2	56 05
3.9	12 09	8.3	27 03	12.9	42 04	17.3	56 09
		8.4	27 06			17.4	57 01
4.0	13 01	8.5	27 10	13.0	42 08	17.5	57 05
4.1	13 05	8.6	28 02	13.1	43 00	17.6	57 09
4.2	13 09	8.7	28 06	13.2	43 04	17.7	58 01
4.3	14 01	8.8	28 10	13.3	43 08	17.8	58 05
4.4	14 05	8.9	29 02	13.4	44 00	17.9	58 09
4.5	14 09			13.5	44 03		
4.6	15 01	9.0	29 06	13.6	44 07	18.0	59 01
4.7	15 05	9.1	29 10	13.7	44 11	18.1	59 05
4.8	15 09	9.2	30 02	13.8	45 03	18.2	59 09
4.9	16 01	9.3	30 06	13.9	45 07	18.3	60 00
		9.4	30 10			18.4	60 04
5.0	16 05	9.5	31 02	14.0	45 11	18.5	60 08
5.1	16 09	9.6	31 06	14.1	46 03	18.6	61 00
5.2	17 01	9.7	31 10	14.2	46 07	18.7	61 04
5.3	17 04	9.8	32 02	14.3	46 11	18.8	61 08
5.4	17 08	9.9	32 06	14.4	47 03	18.9	62 00
5.5	18 00			14.5	47 07		
5.6	18 04	10.0	32 10	14.6	47 11	19.0	62 04
5.7	18 08	10.1	33 02	14.7	48 03	19.1	62 08
5.8	19 00	10.2	33 06	14.8	48 07	19.2	63 00
5.9	19 04	10.3	33 09	14.9	48 11	19.3	63 04
		10.4	34 01			19.4	63 08
6.0	19 08	10.5	34 05	15.0	49 03	19.5	64 00
6.1	20 00	10.6	34 09	15.1	49 06	19.6	64 04
6.2	20 04	10.7	35 01	15.2	49 10	19.7	64 08
6.3	20 08	10.8	35 05	15.3	50 02	19.8	65 00
6.4	21 00	10.9	35 09	15.4	50 06	19.9	65 03
6.5	21 04			15.5	50 10		
6.6	21 08	11.0	36 01	15.6	51 02	20.0	65 07
6.7	22 00	11.1	36 05	15.7	51 06	20.1	65 11
6.8	22 04	11.2	36 09	15.8	51 10	20.2	66 03
6.9	22 08	11.3	37 01	15.9	52 02	20.3	66 07
		11.4	37 05			20.4	66 11
7.0	22 11	11.5	37 09	16.0	52 06	20.5	67 03
7.1	23 03	11.6	38 01	16.1	52 10	20.6	67 07
7.2	23 07	11.7	38 05	16.2	53 02	20.7	67 11
7.3	23 11	11.8	38 09	16.3	53 06	20.8	68 03
7.4	24 03	11.9	39 00	16.4	53 10	20.9	68 07

Conversion Table - 1 m = 3.281 feet

Meters to Feet and Inches (Approximate Values)

m	Ft	In	m	Ft	In	m	Ft	In
1	3	03	150	492	01	300	984	03
5	16	05	155	508	06	305	1000	08
10	32	10	160	524	11	310	1017	01
15	49	03	165	541	04	315	1033	06
20	65	07	170	557	09	320	1049	10
25	82	00	175	574	02	325	1066	03
30	98	05	180	590	07	330	1082	08
35	114	10	185	606	11	335	1099	01
40	131	03	190	623	04	340	1115	06
45	147	08	195	639	09	345	1131	11
50	164	00	200	656	02	350	1148	03
55	180	05	205	672	07	355	1164	08
60	196	10	210	689	00	360	1181	01
65	213	03	215	705	05	365	1197	06
70	229	08	220	721	09	370	1213	11
75	246	00	225	738	02	375	1230	04
80	262	06	230	754	07	380	1246	09
85	278	10	235	771	00	385	1263	01
90	295	03	240	787	05	390	1279	06
95	311	08	245	803	10	395	1295	11
100	328	01	250	820	02	400	1312	04
105	344	06	255	836	07	405	1328	09
110	360	11	260	853	00	410	1345	02
115	377	04	265	869	05	415	1361	07
120	393	08	270	885	10	420	1377	11
125	410	01	275	902	03	425	1394	04
130	426	06	280	918	08	430	1410	09
135	442	11	285	935	00	440	1443	07
140	459	04	290	951	05	450	1476	04
145	475	09	295	967	10			

2020

January

Su	Mo	Tu	We	Th	Fr	Sa
			01	02	03	04
05	06	07	08	09	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

July

Su	Mo	Tu	We	Th	Fr	Sa
			01	02	03	04
05	06	07	08	09	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

February

Su	Mo	Tu	We	Th	Fr	Sa
						01
02	03	04	05	06	07	08
09	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

August

Su	Mo	Tu	We	Th	Fr	Sa
						01
02	03	04	05	06	07	08
09	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

March

Su	Mo	Tu	We	Th	Fr	Sa
01	02	03	04	05	06	07
08	09	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

September

Su	Mo	Tu	We	Th	Fr	Sa
		01	02	03	04	05
06	07	08	09	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

April

Su	Mo	Tu	We	Th	Fr	Sa
			01	02	03	04
05	06	07	08	09	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

October

Su	Mo	Tu	We	Th	Fr	Sa
				01	02	03
04	05	06	07	08	09	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

May

Su	Mo	Tu	We	Th	Fr	Sa
					01	02
03	04	05	06	07	08	09
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

November

Su	Mo	Tu	We	Th	Fr	Sa
01	02	03	04	05	06	07
08	09	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

June

Su	Mo	Tu	We	Th	Fr	Sa
	01	02	03	04	05	06
07	08	09	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

December

Su	Mo	Tu	We	Th	Fr	Sa
		01	02	03	04	05
06	07	08	09	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

2021

January

Su	Mo	Tu	We	Th	Fr	Sa
					01	02
03	04	05	06	07	08	09
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

July

Su	Mo	Tu	We	Th	Fr	Sa
				01	02	03
04	05	06	07	08	09	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

February

Su	Mo	Tu	We	Th	Fr	Sa
	01	02	03	04	05	06
07	08	09	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28						

August

Su	Mo	Tu	We	Th	Fr	Sa
01	02	03	04	05	06	07
08	09	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

March

Su	Mo	Tu	We	Th	Fr	Sa
	01	02	03	04	05	06
07	08	09	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

September

Su	Mo	Tu	We	Th	Fr	Sa
			01	02	03	04
05	06	07	08	09	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

April

Su	Mo	Tu	We	Th	Fr	Sa
				01	02	03
04	05	06	07	08	09	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

October

Su	Mo	Tu	We	Th	Fr	Sa
					01	02
03	04	05	06	07	08	09
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

May

Su	Mo	Tu	We	Th	Fr	Sa
						01
02	03	04	05	06	07	08
09	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

November

Su	Mo	Tu	We	Th	Fr	Sa
	01	02	03	04	05	06
07	08	09	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

June

Su	Mo	Tu	We	Th	Fr	Sa
		01	02	03	04	05
06	07	08	09	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

December

Su	Mo	Tu	We	Th	Fr	Sa
			01	02	03	04
05	06	07	08	09	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

Sunrise and Sunset Predictions for 2020

Day	JAN.		FEB.		MAR.		APR.		MAY		JUN.		Day
	Rise h m	Set h m	Rise h m	Set h m	Rise h m	Set h m	Rise h m	Set h m	Rise h m	Set h m	Rise h m	Set h m	
01	7:20	16:39	7:06	17:13	6:29	17:48	6:39	19:21	5:54	19:53	5:27	20:21	01
02	7:20	16:40	7:05	17:14	6:28	17:49	6:37	19:22	5:53	19:54	5:27	20:22	02
03	7:20	16:41	7:04	17:16	6:26	17:50	6:36	19:23	5:52	19:55	5:26	20:23	03
04	7:20	16:42	7:03	17:17	6:24	17:51	6:34	19:24	5:50	19:56	5:26	20:23	04
05	7:20	16:43	7:02	17:18	6:23	17:52	6:32	19:26	5:49	19:57	5:26	20:24	05
06	7:20	16:44	7:01	17:19	6:21	17:54	6:31	19:27	5:48	19:58	5:25	20:25	06
07	7:20	16:44	7:00	17:21	6:20	17:55	6:29	19:28	5:47	19:59	5:25	20:25	07
08	7:20	16:45	6:59	17:22	*7:18	18:56	6:27	19:29	5:46	20:00	5:25	20:26	08
09	7:20	16:46	6:58	17:23	7:17	18:57	6:26	19:30	5:45	20:01	5:25	20:26	09
10	7:20	16:48	6:57	17:24	7:15	18:58	6:24	19:31	5:44	20:02	5:25	20:27	10
11	7:19	16:49	6:56	17:25	7:13	18:59	6:23	19:32	5:42	20:03	5:24	20:27	11
12	7:19	16:50	6:54	17:27	7:12	19:00	6:21	19:33	5:41	20:04	5:24	20:28	12
13	7:19	16:51	6:53	17:28	7:10	19:01	6:20	19:34	5:40	20:05	5:24	20:28	13
14	7:18	16:52	6:52	17:29	7:08	19:02	6:18	19:35	5:39	20:06	5:24	20:29	14
15	7:18	16:53	6:51	17:30	7:07	19:03	6:17	19:36	5:39	20:07	5:24	20:29	15
16	7:18	16:54	6:49	17:32	7:05	19:04	6:15	19:37	5:38	20:08	5:24	20:29	16
17	7:17	16:55	6:48	17:33	7:04	19:05	6:13	19:38	5:37	20:09	5:24	20:30	17
18	7:17	16:56	6:47	17:34	7:02	19:07	6:12	19:39	5:36	20:10	5:25	20:30	18
19	7:16	16:57	6:45	17:35	7:00	19:08	6:11	19:40	5:35	20:11	5:25	20:30	19
20	7:16	16:59	6:44	17:36	6:59	19:09	6:09	19:41	5:34	20:11	5:25	20:31	20
21	7:15	17:00	6:42	17:37	6:57	19:10	6:08	19:42	5:33	20:12	5:25	20:31	21
22	7:14	17:01	6:41	17:39	6:55	19:11	6:06	19:43	5:33	20:13	5:25	20:31	22
23	7:14	17:02	6:40	17:40	6:54	19:12	6:05	19:44	5:32	20:14	5:26	20:31	23
24	7:13	17:03	6:38	17:41	6:52	19:13	6:03	19:45	5:31	20:15	5:26	20:31	24
25	7:12	17:05	6:37	17:42	6:50	19:14	6:02	19:46	5:31	20:16	5:26	20:31	25
26	7:12	17:06	6:35	17:43	6:49	19:15	6:01	19:48	5:30	20:17	5:27	20:31	26
27	7:11	17:07	6:34	17:44	6:47	19:16	5:59	19:49	5:29	20:18	5:27	20:31	27
28	7:10	17:08	6:32	17:46	6:45	19:17	5:58	19:50	5:29	20:18	5:28	20:31	28
29	7:09	17:09	6:31	17:47	6:44	19:18	5:57	19:51	5:28	20:19	5:28	20:31	29
30	7:08	17:11			6:42	19:19	5:55	19:52	5:28	20:20	5:28	20:31	30
31	7:07	17:12			6:40	19:20			5:27	20:21			31

Sunrise and Sunset Predictions for 2020

	JUL.		AUG.		SEP.		OCT.		NOV.		DEC.		
Day	Rise h m	Set h m	Rise h m	Set h m	Rise h m	Set h m	Rise h m	Set h m	Rise h m	Set h m	Rise h m	Set h m	Day
01	5:29	20:31	5:53	20:11	6:24	19:27	6:53	18:37	*6:27	16:52	7:01	16:29	01
02	5:29	20:31	5:54	20:10	6:25	19:26	6:54	18:36	6:28	16:51	7:02	16:29	02
03	5:30	20:31	5:55	20:08	6:25	19:24	6:55	18:34	6:29	16:49	7:03	16:29	03
04	5:31	20:30	5:56	20:07	6:26	19:22	6:56	18:32	6:30	16:48	7:04	16:29	04
05	5:31	20:30	5:57	20:06	6:27	19:21	6:57	18:31	6:32	16:47	7:05	16:29	05
06	5:32	20:30	5:58	20:05	6:28	19:19	6:58	18:29	6:33	16:46	7:06	16:28	06
07	5:32	20:29	5:59	20:04	6:29	19:17	6:59	18:27	6:34	16:45	7:07	16:28	07
08	5:33	20:29	6:00	20:02	6:30	19:16	7:00	18:26	6:35	16:44	7:08	16:28	08
09	5:34	20:29	6:01	20:01	6:31	19:14	7:01	18:24	6:36	16:43	7:09	16:29	09
10	5:34	20:28	6:02	20:00	6:32	19:12	7:02	18:23	6:38	16:42	7:09	16:29	10
11	5:35	20:28	6:03	19:59	6:33	19:11	7:03	18:21	6:39	16:41	7:10	16:29	11
12	5:36	20:27	6:04	19:57	6:34	19:09	7:04	18:20	6:40	16:40	7:11	16:29	12
13	5:37	20:27	6:05	19:56	6:35	19:07	7:06	18:18	6:41	16:39	7:12	16:29	13
14	5:37	20:26	6:06	19:55	6:36	19:06	7:07	18:16	6:42	16:38	7:12	16:29	14
15	5:38	20:26	6:07	19:53	6:37	19:04	7:08	18:15	6:43	16:38	7:13	16:30	15
16	5:39	20:25	6:08	19:52	6:38	19:02	7:09	18:13	6:45	16:37	7:14	16:30	16
17	5:40	20:24	6:09	19:50	6:39	19:01	7:10	18:12	6:46	16:36	7:14	16:30	17
18	5:41	20:24	6:10	19:49	6:40	18:59	7:11	18:10	6:47	16:35	7:15	16:31	18
19	5:41	20:23	6:11	19:47	6:41	18:57	7:12	18:09	6:48	16:35	7:16	16:31	19
20	5:42	20:22	6:12	19:46	6:42	18:56	7:13	18:08	6:49	16:34	7:16	16:32	20
21	5:43	20:21	6:13	19:44	6:43	18:54	7:14	18:06	6:50	16:33	7:17	16:32	21
22	5:44	20:20	6:14	19:43	6:44	18:52	7:15	18:05	6:51	16:33	7:17	16:33	22
23	5:45	20:20	6:15	19:41	6:45	18:51	7:17	18:03	6:53	16:32	7:18	16:33	23
24	5:46	20:19	6:16	19:40	6:46	18:49	7:18	18:02	6:54	16:32	7:18	16:34	24
25	5:47	20:18	6:17	19:38	6:47	18:47	7:19	18:01	6:55	16:31	7:18	16:34	25
26	5:48	20:17	6:18	19:37	6:48	18:46	7:20	17:59	6:56	16:31	7:19	16:35	26
27	5:49	20:16	6:19	19:35	6:49	18:44	7:21	17:58	6:57	16:30	7:19	16:36	27
28	5:50	20:15	6:20	19:34	6:50	18:42	7:22	17:57	6:58	16:30	7:19	16:37	28
29	5:50	20:14	6:21	19:32	6:51	18:41	7:23	17:55	6:59	16:30	7:20	16:37	29
30	5:51	20:13	6:22	19:31	6:52	18:39	7:25	17:54	7:00	16:29	7:20	16:38	30
31	5:52	20:12	6:23	19:29			7:26	17:53			7:20	16:39	31