US Army Corps of Engineers
New England District

Boston Harbor, Massachusetts

Deep Draft Navigation Improvement Feasibility Report and Supplemental Environmental Impact Statement

Technical Working Group
Project Update – 3 December 2012

USACE New England District
in Partnership with Massport

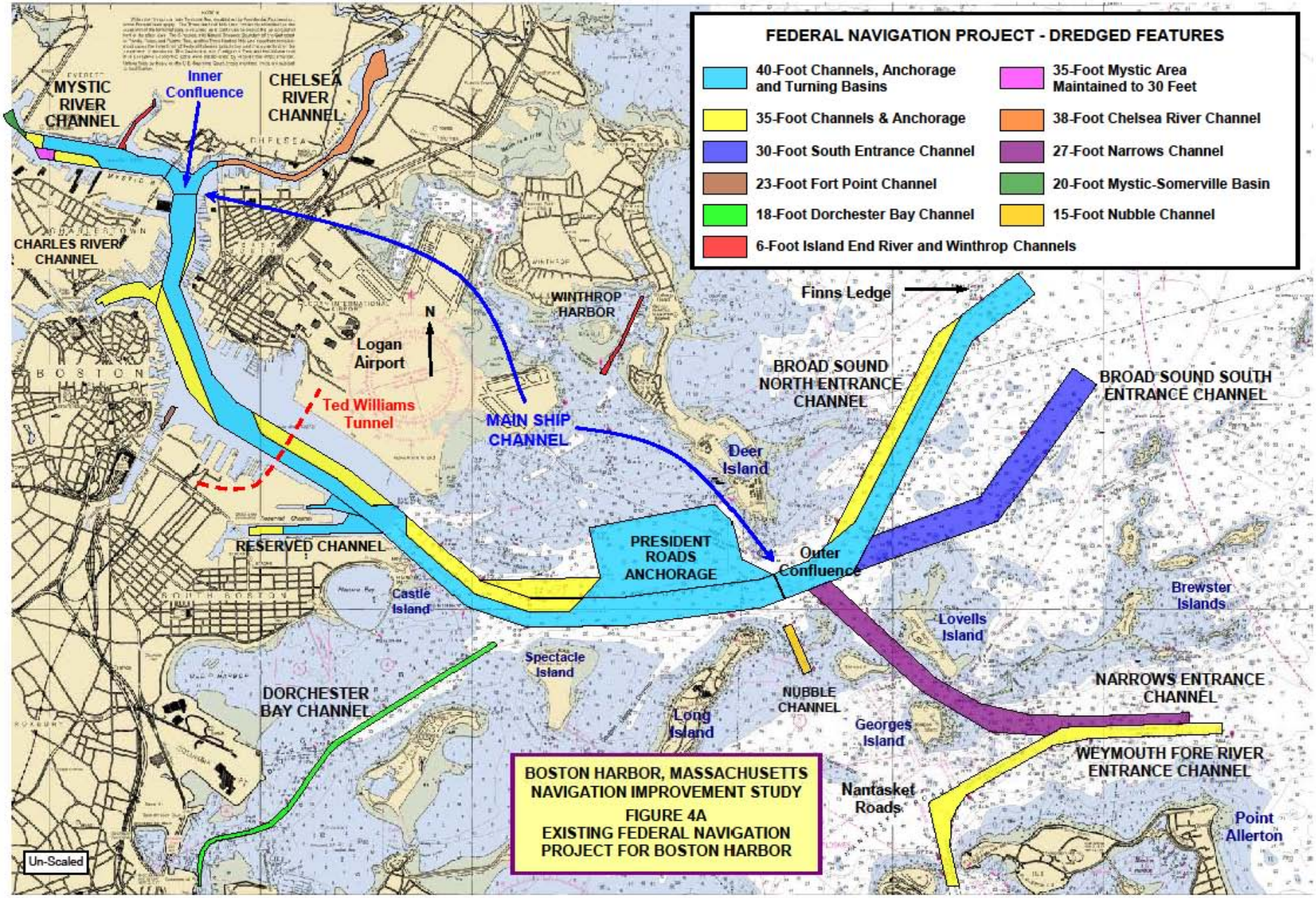
Mark L. Habel, USACE

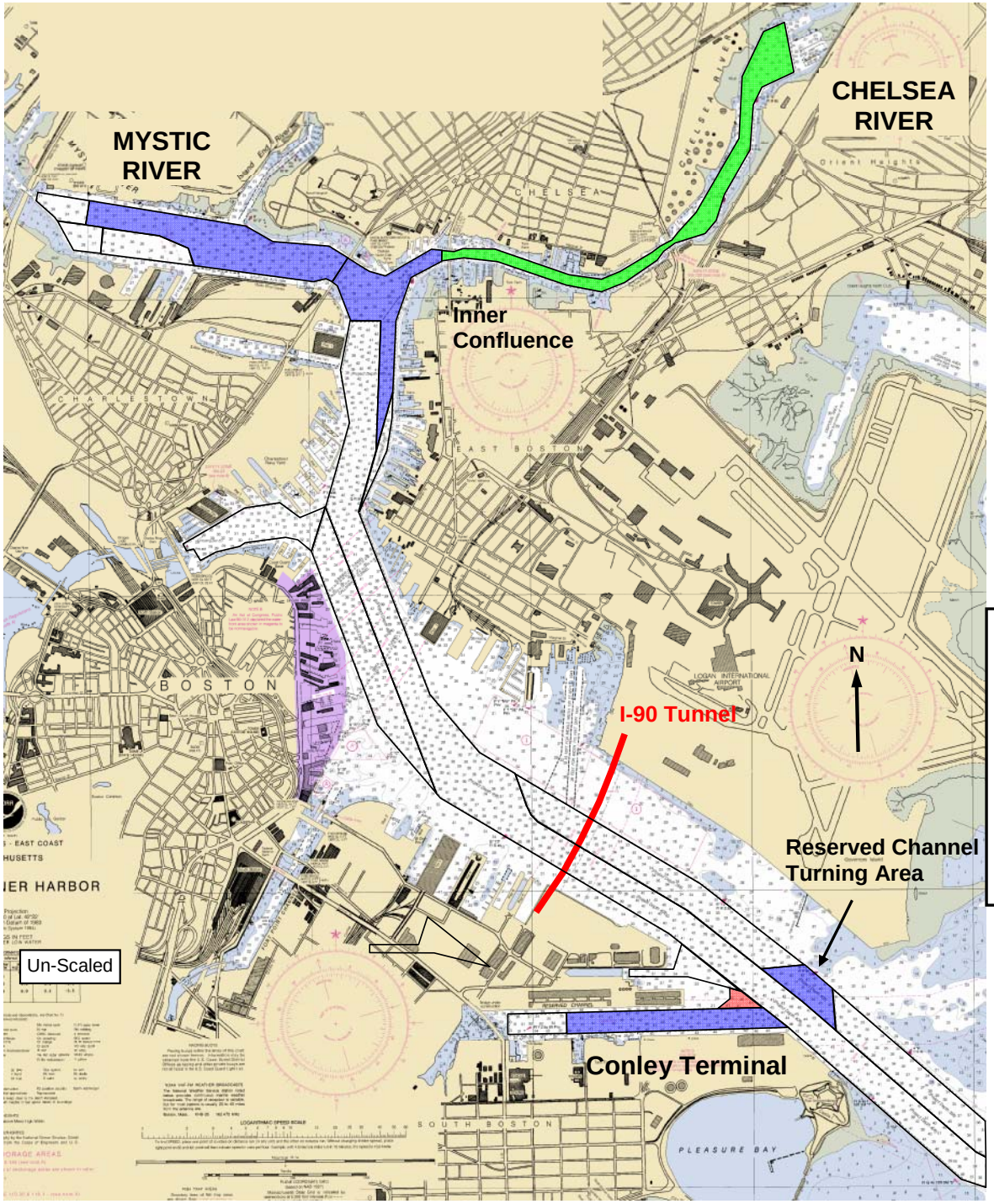
massport

Today's Task – Re-Engage TWG

Under the Base Economic Case – 3 Carrier Services Use Larger Ships and PONYNJ Landings of New England Cargo Shifts to Boston Harbor

- Review of Navigation Improvement and Maintenance Activities of 1998-2012
- Update on Corps Activities Since 2008 Draft Report
- Present Final Recommendation for Improvements
  - Design, Quantities, Costs, Timeline
- Review Plans and Opportunities for Disposal
- Review Design Phase Activities


FEDERAL NAVIGATION PROJECT - DREDGED FEATURES
40-Foot Channels, Anchorage and Turning Basins
35-Foot Mystic Area Maintained to 30 Feet
35-Foot Channels & Anchorage
38-Foot Chelsea River Channel
30-Foot South Entrance Channel
27-Foot Narrows Channel
23-Foot Fort Point Channel
20-Foot Mystic-Somerville Basin
18-Foot Dorchester Bay Channel
15-Foot Nubble Channel
6-Foot Island End River and Winthrop Channels
MYSTIC RIVER CHANNEL
Inner Confluence
CHELSEA RIVER CHANNEL
CHARLES RIVER CHANNEL
WINTHROP HARBOR
Finns Ledge
N
Logan Airport
BOSTON
Ted Williams Tunnel
MAIN SHIP CHANNEL
BROAD SOUND NORTH ENTRANCE CHANNEL
BROAD SOUND SOUTH ENTRANCE CHANNEL
Deer Island
RESERVED CHANNEL
PRESIDENT ROADS ANCHORAGE
Outer Confluence
Castle Island
Brewster Islands
Lovells Island
Spectacle Island
NARROWS ENTRANCE CHANNEL
DORCHESTER BAY CHANNEL
NUBBLE CHANNEL
Long Island
Georges Island
WEYMOUTH FORE RIVER ENTRANCE CHANNEL
Nantasket Roads
Point Allerton
Un-Scaled
BOSTON HARBOR, MASSACHUSETTS NAVIGATION IMPROVEMENT STUDY
FIGURE 4A
EXISTING FEDERAL NAVIGATION PROJECT FOR BOSTON HARBOR



BOSTON HARBOR, MASSACHUSETTS

NAVIGATION IMPROVEMENT STUDY

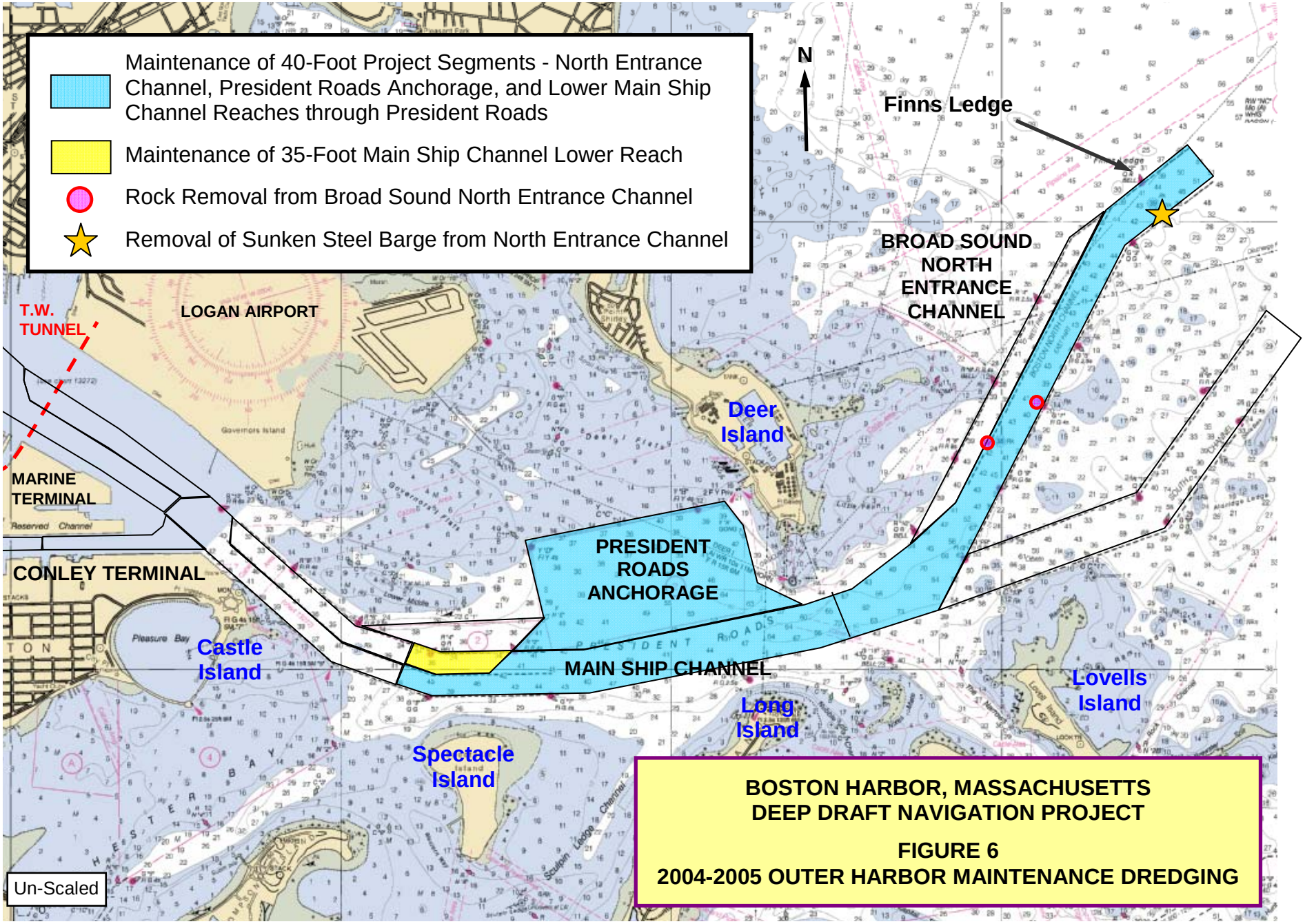
FIGURE 5

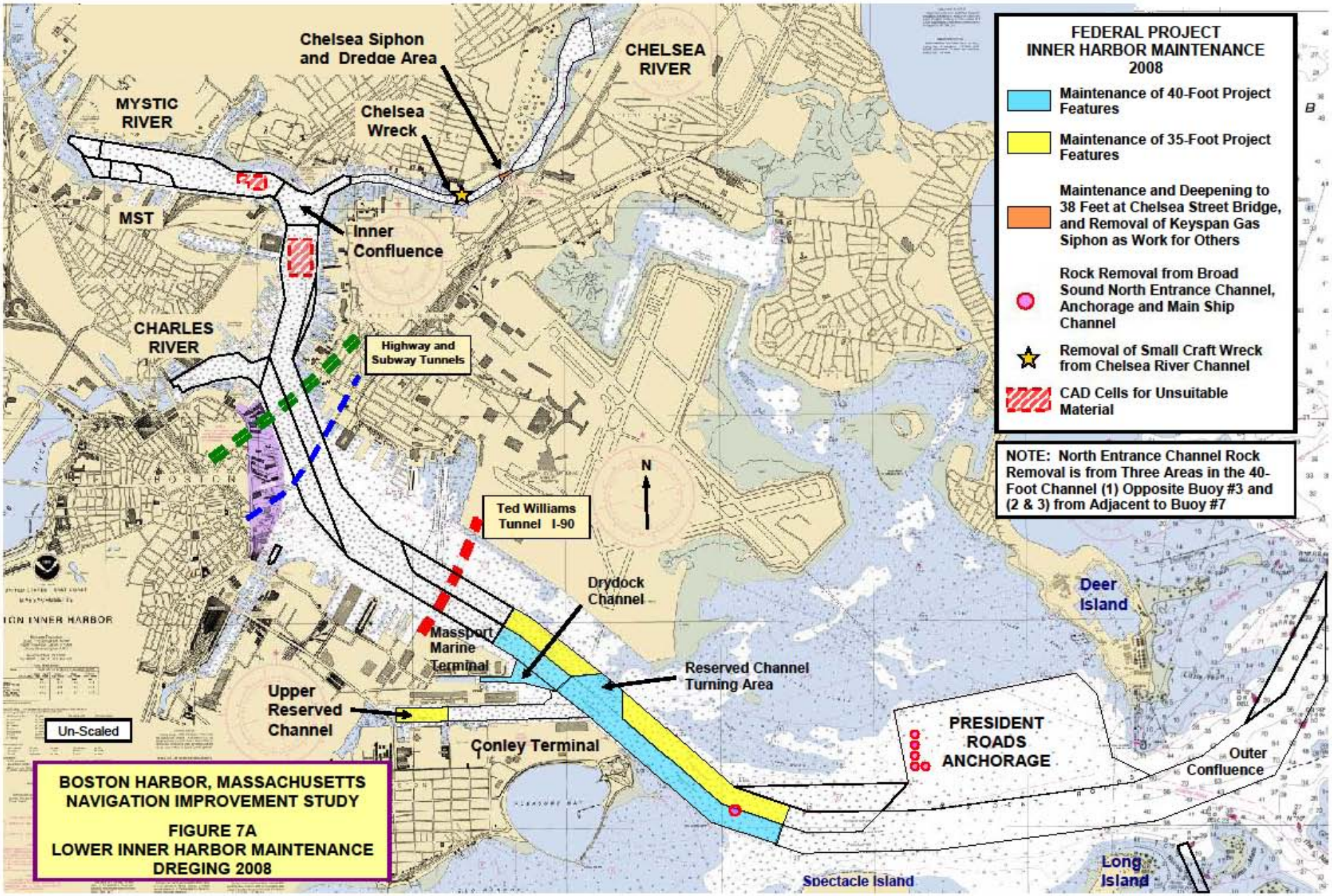
MAINTENANCE AND IMPROVEMENT DREDGING OF MAIN TRIBUTARIES

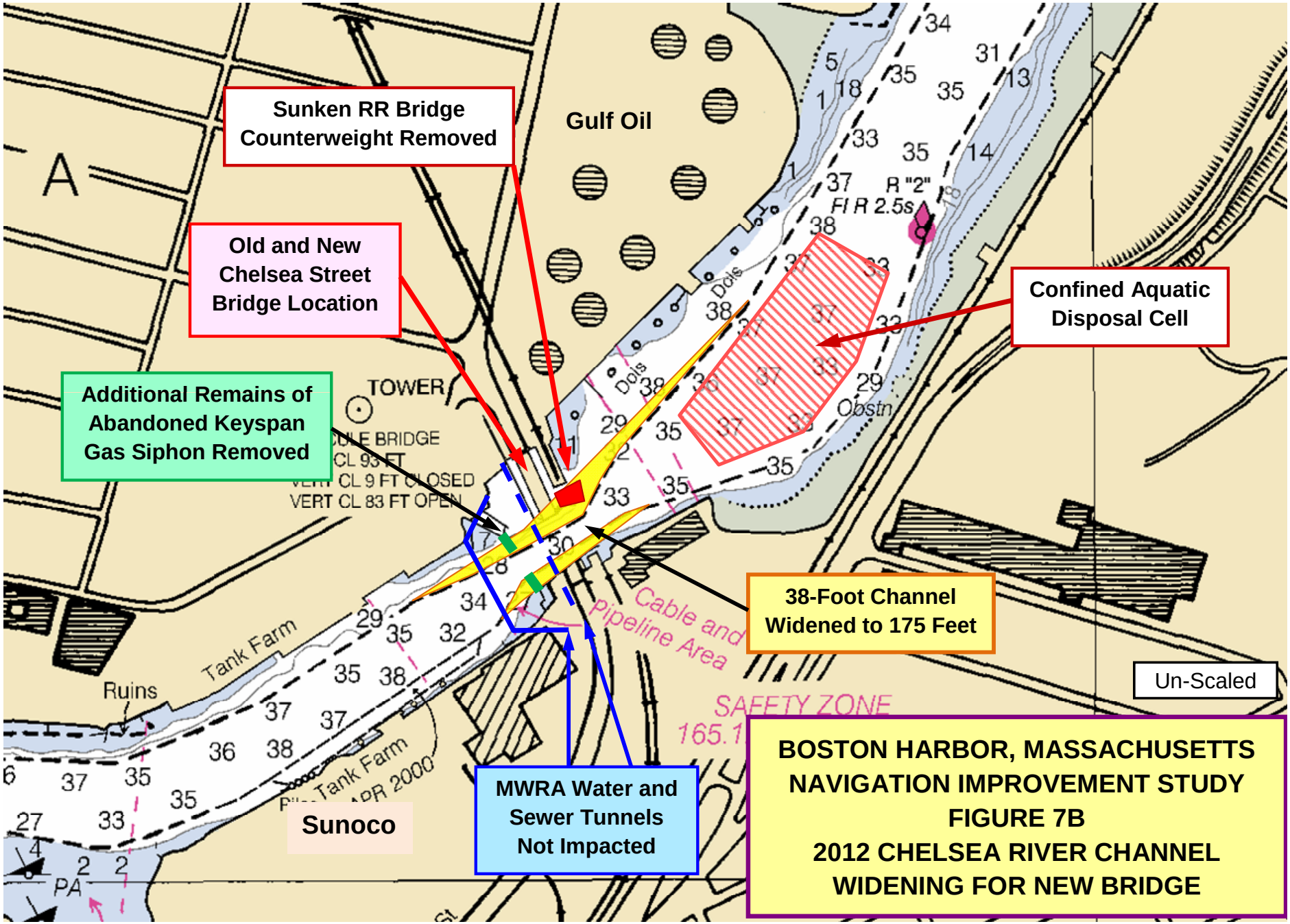
1998-2001

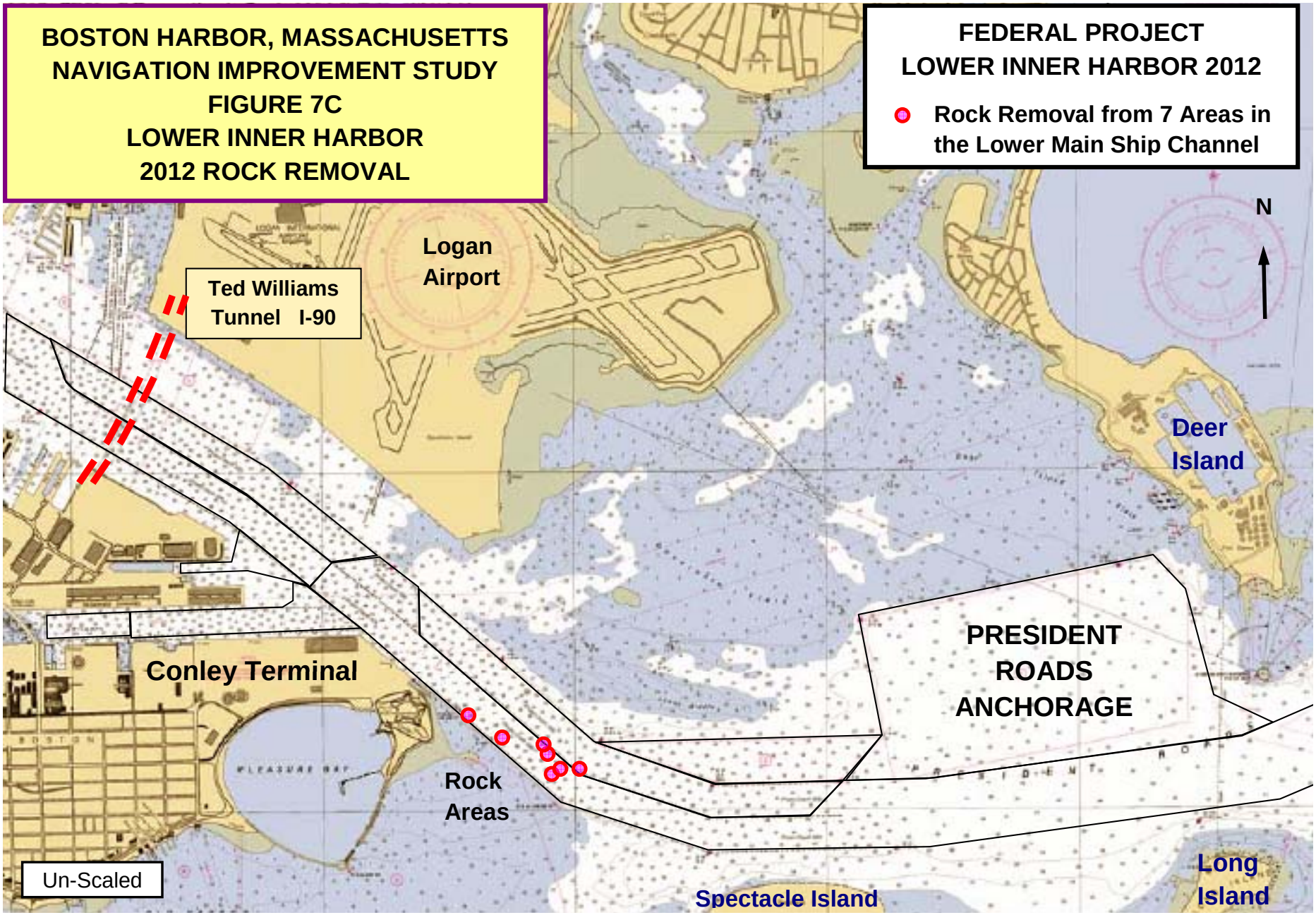
1990 AUTHORIZED IMPROVEMENT PROJECT

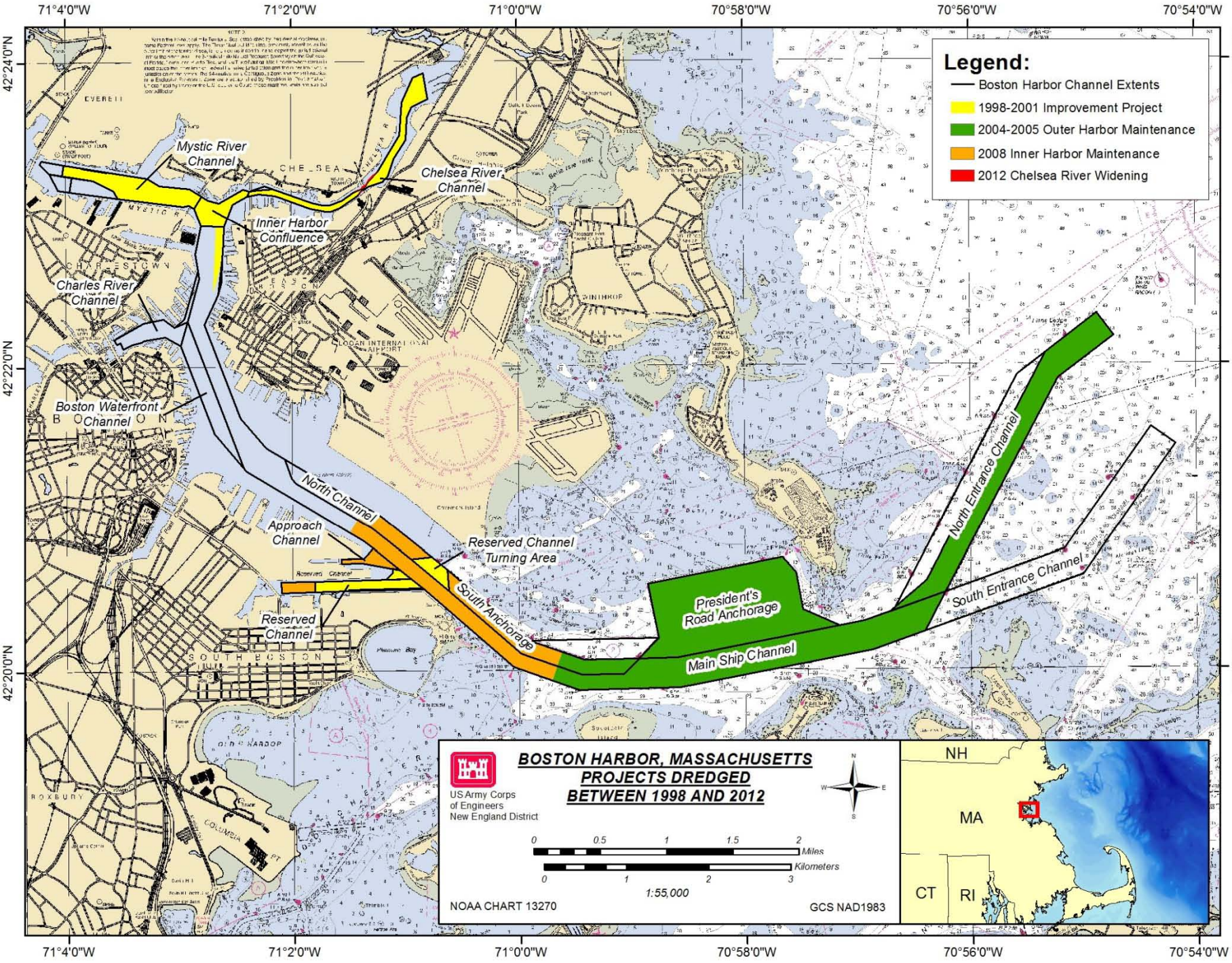
- 35-Foot Areas Deepened to 40 Feet
- 35-Foot Areas Deepened to 38 Feet
- Previously Undredged Area where Project was Widened at 40 Feet


Maintenance of 40-Foot Project Segments - North Entrance Channel, President Roads Anchorage, and Lower Main Ship Channel Reaches through President Roads
Maintenance of 35-Foot Main Ship Channel Lower Reach
Rock Removal from Broad Sound North Entrance Channel
Removal of Sunken Steel Barge from North Entrance Channel
N
Finns Ledge
BROAD SOUND NORTH ENTRANCE CHANNEL
T.W. TUNNEL
LOGAN AIRPORT
Deer Island
MARINE TERMINAL
CONLEY TERMINAL
PRESIDENT ROADS ANCHORAGE
Castle Island
MAIN SHIP CHANNEL
Long Island
Lovells Island
Spectacle Island
Un-Scaled
BOSTON HARBOR, MASSACHUSETTS
DEEP DRAFT NAVIGATION PROJECT
FIGURE 6
2004-2005 OUTER HARBOR MAINTENANCE DREDGING


Chelsea Siphon and Dredge Area
CHELSEA RIVER
MYSTIC RIVER
Chelsea Wreck
MST
Inner Confluence
CHARLES RIVER
Highway and Subway Tunnels
Ted Williams Tunnel I-90
N
Drydock Channel
Deer Island
Massport Marine Terminal
Reserved Channel Turning Area
Upper Reserved Channel
Conley Terminal
PRESIDENT ROADS ANCHORAGE
Outer Confluence
Spectacle Island
Long Island
FEDERAL PROJECT
INNER HARBOR MAINTENANCE
2008
Maintenance of 40-Foot Project Features
Maintenance of 35-Foot Project Features
Maintenance and Deepening to 38 Feet at Chelsea Street Bridge, and Removal of Keyspan Gas Siphon as Work for Others
Rock Removal from Broad Sound North Entrance Channel, Anchorage and Main Ship Channel
Removal of Small Craft Wreck from Chelsea River Channel
CAD Cells for Unsuitable Material
NOTE: North Entrance Channel Rock Removal is from Three Areas in the 40-Foot Channel (1) Opposite Buoy #3 and (2 & 3) from Adjacent to Buoy #7
Un-Scaled
BOSTON HARBOR, MASSACHUSETTS
NAVIGATION IMPROVEMENT STUDY
FIGURE 7A
LOWER INNER HARBOR MAINTENANCE
DREGING 2008


Sunken RR Bridge Counterweight Removed
Gulf Oil
Old and New Chelsea Street Bridge Location
Confined Aquatic Disposal Cell
Additional Remains of Abandoned Keyspan Gas Siphon Removed
TOWER
VERT CL 83 FT OPEN
38-Foot Channel Widened to 175 Feet
Cable and pipeline Area
SAFETY ZONE
Un-Scaled
Tank Farm
Ruins
Sunoco
MWRA Water and Sewer Tunnels Not Impacted
BOSTON HARBOR, MASSACHUSETTS
NAVIGATION IMPROVEMENT STUDY
FIGURE 7B
2012 CHELSEA RIVER CHANNEL
WIDENING FOR NEW BRIDGE


BOSTON HARBOR, MASSACHUSETTS
NAVIGATION IMPROVEMENT STUDY
FIGURE 7C
LOWER INNER HARBOR
2012 ROCK REMOVAL
FEDERAL PROJECT
LOWER INNER HARBOR 2012
Rock Removal from 7 Areas in the Lower Main Ship Channel
N
Logan Airport
Ted Williams Tunnel I-90
Deer Island
PRESIDENT ROADS ANCHORAGE
Conley Terminal
Rock Areas
Un-Scaled
Spectacle Island
Long Island


71°4'0"W
71°2'0"W
71°0'0"W
70°58'0"W
70°56'0"W
70°54'0"W
42°24'0"N
42°22'0"N
42°20'0"N
Legend:
Boston Harbor Channel Extents
1998-2001 Improvement Project
2004-2005 Outer Harbor Maintenance
2008 Inner Harbor Maintenance
2012 Chelsea River Widening
Mystic River Channel
Chelsea River Channel
Inner Harbor Confluence
Charles River Channel
Boston Waterfront Channel
North Channel
Approach Channel
Reserved Channel Turning Area
Reserved Channel
South Anchorage
President's Road Anchorage
Main Ship Channel
North Entrance Channel
South Entrance Channel
BOSTON
CHELSEA
EVERETT
CHARLESTOWN
WINTHROP
SOUTH BOSTON
ROXBURY
BOSTON HARBOR, MASSACHUSETTS
PROJECTS DREDGED
BETWEEN 1998 AND 2012
US Army Corps of Engineers
New England District
0 0.5 1 1.5 2 Miles
0 1 2 3 Kilometers
1:55,000
NOAA CHART 13270
GCS NAD1983
NH
MA
CT
RI

Why Improve Boston Harbor?

- New Panama Canal to come Online in Late 2014 – 55 Foot Depth - Will Allow 50-Foot Drafts – Now Allows 39-Foot Vessels. Beam from 106 Now to 120
- Other Ports on Route Deepening – NYNJ to be at 50 Feet in 2015 and 55-Foot Study Authorized. Norfolk, Baltimore already at 50. Miami Authorized to 50. Savannah to 47. Charleston and Port Everglades at 45 and Studying Deeper. Most EU Ports at 56 Feet and Suez Canal now at 78 Feet (2011)
- Carriers Increasing Vessel Sizes in Trans-Oceanic Routes to Save Costs
- Road Traffic Congestion Worsens and with it Highway Maintenance and Air Quality Issues
- Global Trade Volumes Projected to Increase

What Has Happened Since 2008?

- Civil Works Review Board met in August and September 2008 to Consider Boston Harbor
- Board requested additional Economic Studies of Depth Optimization
- Study Scope Approved 2009 and Studies Completed 2010
- Additional Analysis was Requested by Corps Headquarters
- Final Economic Reports Submitted in May 2012
- Final Design Depth of 47 Feet for Inner Main Channels Improvement to Conley Terminal Selected in September 2012
- Final Entrance Channel Depth of 51 Feet Selected November 2012.

Economic Reanalysis Framework Issues

Three Parts to Framework Reanalysis

(1) Landside Analysis – Where are the containers going and why. How many more might come to Boston by water?

(2) Waterside Analysis – What means used to ship to Boston – larger ships, small ships, barges?

(3) Loading Factors – How will new Boston ships load? Tidal advantage. 1st-in last-out.

Landside Analysis (Task #1)

- Analysis of Current Shipping Conditions
  - Determine Current Origin & Destinations of boxes
  - Use PIERS data for Boston and PONYNJ
  - Conduct Sample of Shippers (200 shippers account for 80% of shipments)
  - Interview Carriers using Boston and PONYNJ
  - Develop Economic Model to explain current proportions of Boston cargo shipped through PONYNJ and project potential change in boxes that can go to Boston directly.

Waterside Analysis (Task #2)

Determine Means Available to Transport Boxes Shifted from PONYNJ to POB

- What Carriers?
  - Existing Carriers Calling on POB?
  - Carriers Calling PONYNJ and Currently Not POB?
  - Why Carriers are Calling on PONYNJ and not POB.
- What Vessels & Routes?
- Trucking Firms Canvassed for Distance Costs and Volumes
- Carrier Interviews Conducted to Collect Needed Information
  - Both Carriers Currently Serving POB Interviewed
  - Seven Carriers that Call PONYNJ & Not POB Interviewed.

Vessel Loading & Sailing Drafts (Task #3)

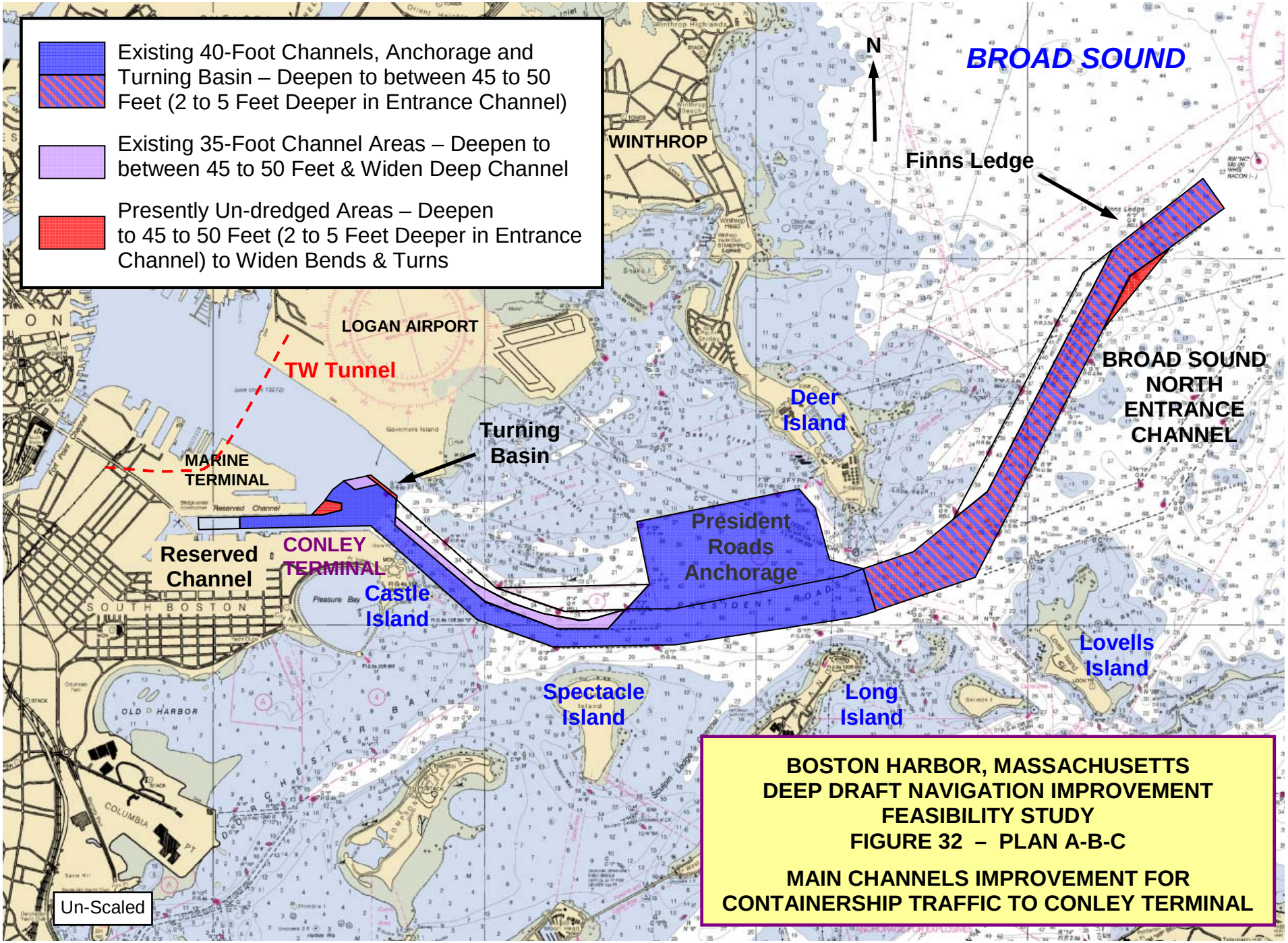
- **Determine Existing Vessel Distribution and Current Operating Practices on Vessel Loading and Sailing Drafts**.
  - Boston First in/Last Out for North America
  - Boston Has Greater Tidal Advantage Than Most East Coast Ports (9.5 Feet versus 5.5 at NYNJ and 4-5 Feet Elsewhere along US East Coast)
  - High Export Percentage Relative to Other East Coast Ports Encourages Greater Loading.
  - Outbound Boston Cargo much Heavier than Inbound
- **Determine Future Vessel Loading and Sailing Drafts**
  - Drafts and Loading were Determined on Current Industry Practices and Weight of Cargo
  - Boston Harbor Pilots and Carriers Consulted on Underkeel Clearance Requirements and Movement Restrictions

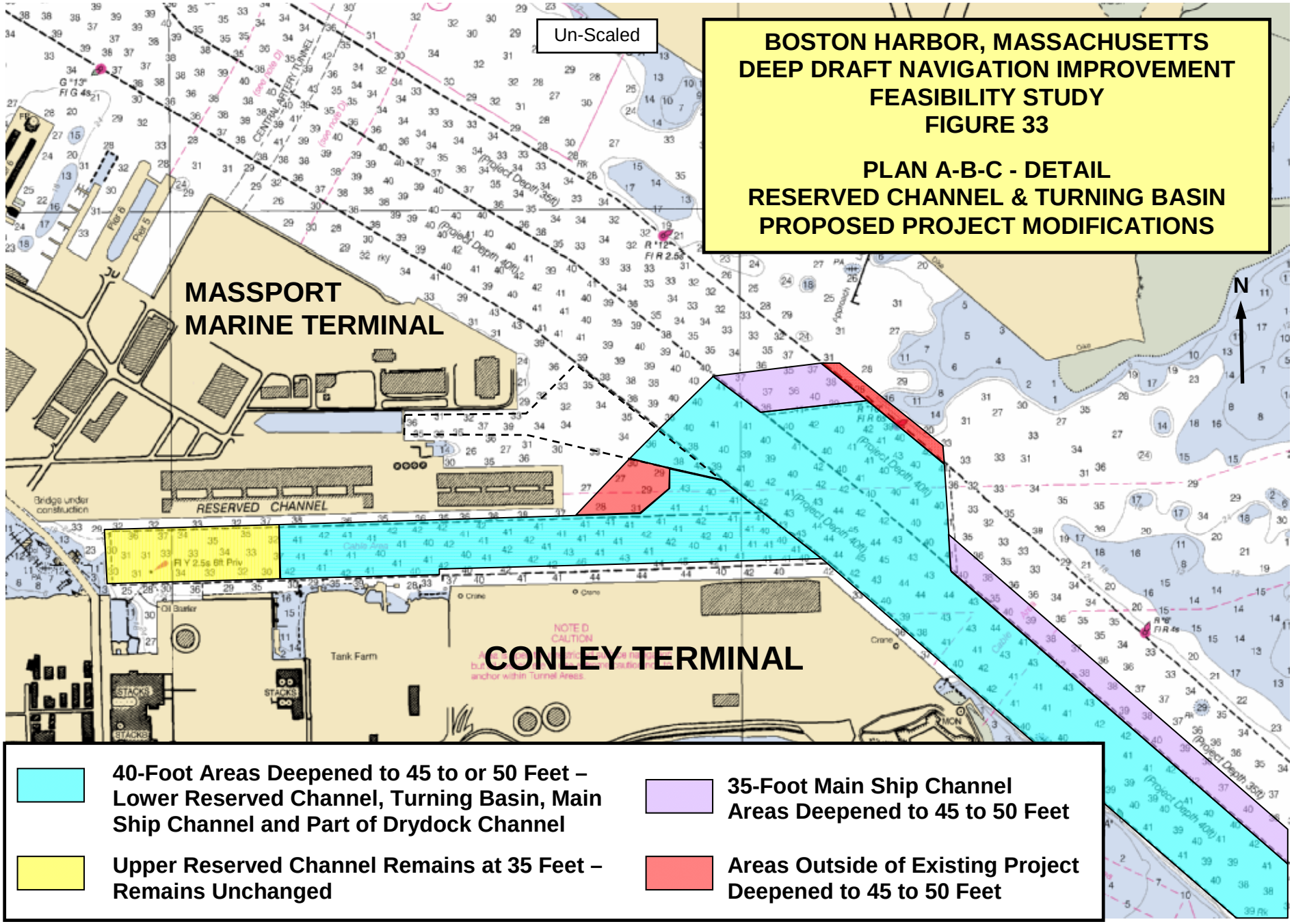
Recommendation – 4 Improvements

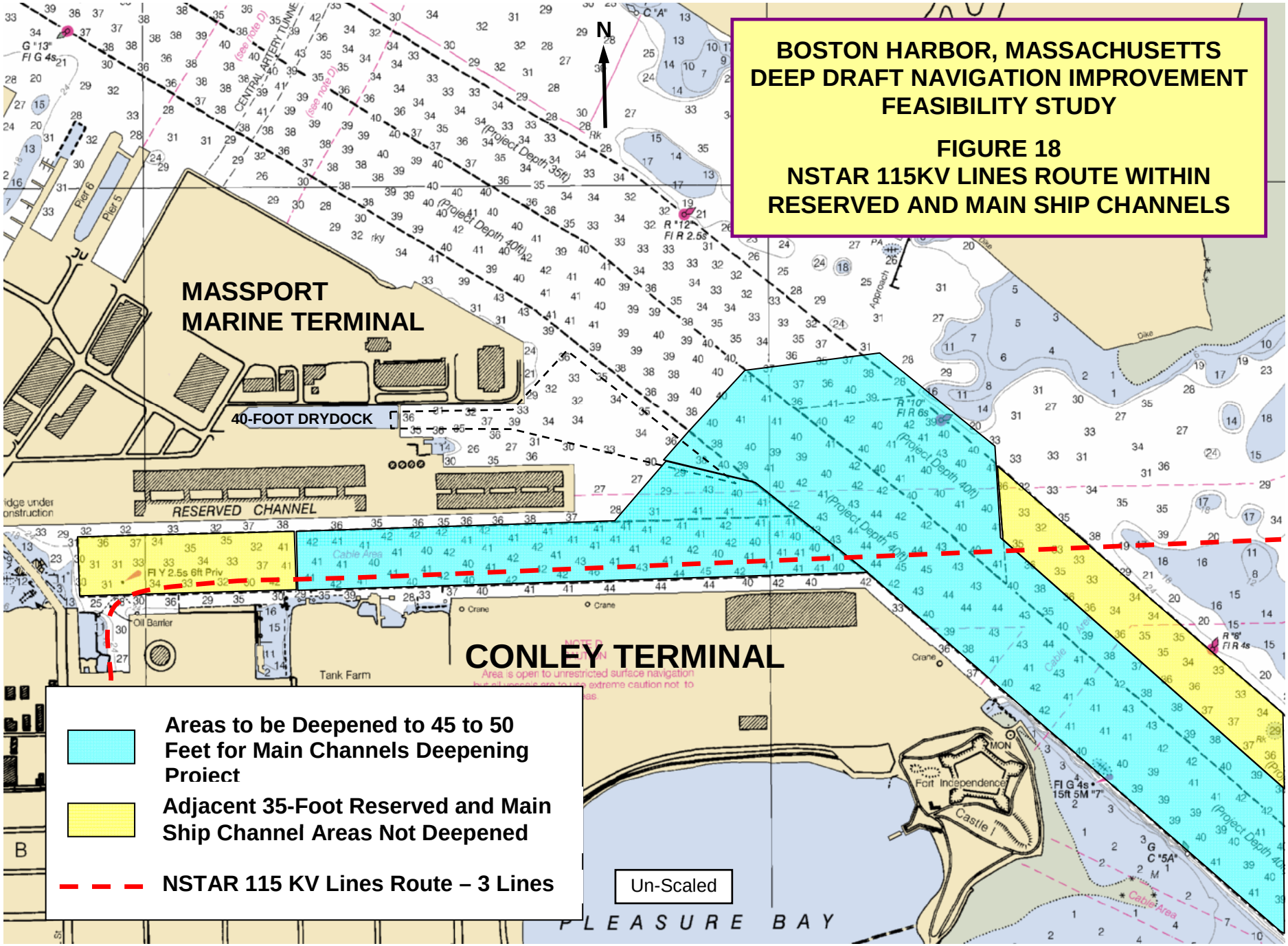
- **Main Channels Improvement:** For Containership Access to Conley Terminal
- **Main Ship Channel Deepening Extension:** For Large Dry Bulk Carrier Access to Massport Marine Terminal
- **Mystic River Channel:** Deepen for Smaller Dry Bulk Carrier Access to Massport's Medford Street Terminal
- **Chelsea River Channel:** Deepen Channel for Liquid Petroleum Carriers
- **Base Plan for Disposal - All Disposal at the Massachusetts Bay Disposal Site**

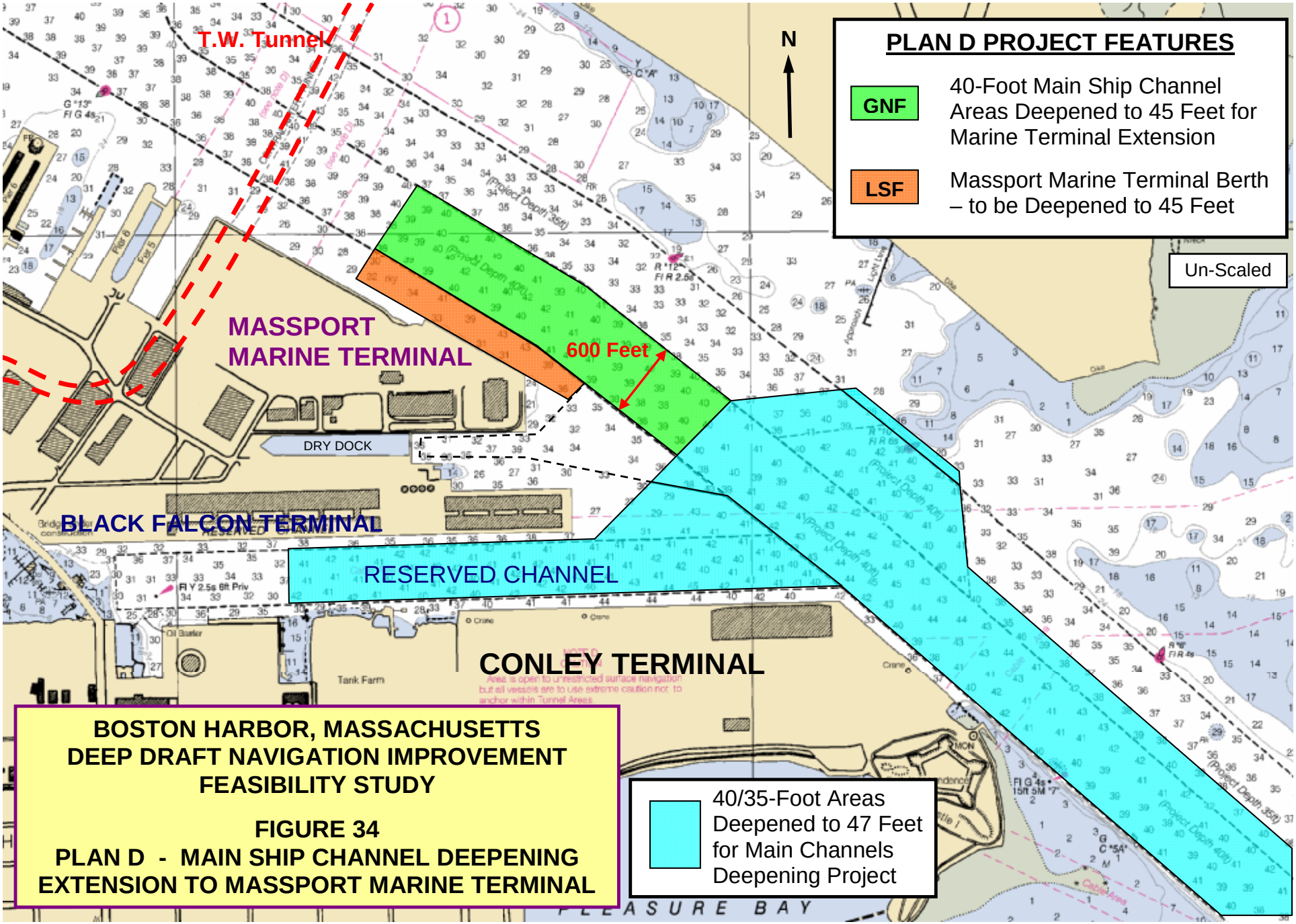
Main Channels Improvement
Deepening for Containership Access

- **Project Features**
  1. North Entrance Channel to 51 feet, widened at Finns Ledge Bend
  2. Main Ship Channel from Outer Confluence to Reserved Channel to 47 feet, widened to 900 feet below Castle Island and 800 feet above. Widened further in the bends.
  3. President Roads Anchorage Area to 47 feet
  4. Lower Reserved Channel along Conley Terminal to 47 feet
  5. Reserved Channel Turning Area widened to 1600 feet and deepened to 47 feet
  6. Conley Berths deepened to at Least 50 Feet
- Examined incremental depths of 42 to 50 feet MLLW – Optimized at 48 feet but no significant benefits increase above 47 feet
- Entrance Channel four feet deeper than inner channels for increased sea states and vessel motion
- Conley Terminal Berths will be deepened to 3 feet deeper than the channel by Massport for tidal navigation
- Benefits from shifting truck transport to containership transport


Existing 40-Foot Channels, Anchorage and Turning Basin – Deepen to between 45 to 50 Feet (2 to 5 Feet Deeper in Entrance Channel)
Existing 35-Foot Channel Areas – Deepen to between 45 to 50 Feet & Widen Deep Channel
Presently Un-dredged Areas – Deepen to 45 to 50 Feet (2 to 5 Feet Deeper in Entrance Channel) to Widen Bends & Turns
N
BROAD SOUND
WINTHROP
Finns Ledge
LOGAN AIRPORT
TW Tunnel
MARINE TERMINAL
Turning Basin
Deer Island
BROAD SOUND NORTH ENTRANCE CHANNEL
Reserved Channel
CONLEY TERMINAL
Castle Island
President Roads Anchorage
SOUTH BOSTON
Lovells Island
Spectacle Island
Long Island
OLD HARBOR
COLUMBIA PT
Un-Scaled
BOSTON HARBOR, MASSACHUSETTS
DEEP DRAFT NAVIGATION IMPROVEMENT
FEASIBILITY STUDY
FIGURE 32 – PLAN A-B-C
MAIN CHANNELS IMPROVEMENT FOR
CONTAINERSHIP TRAFFIC TO CONLEY TERMINAL

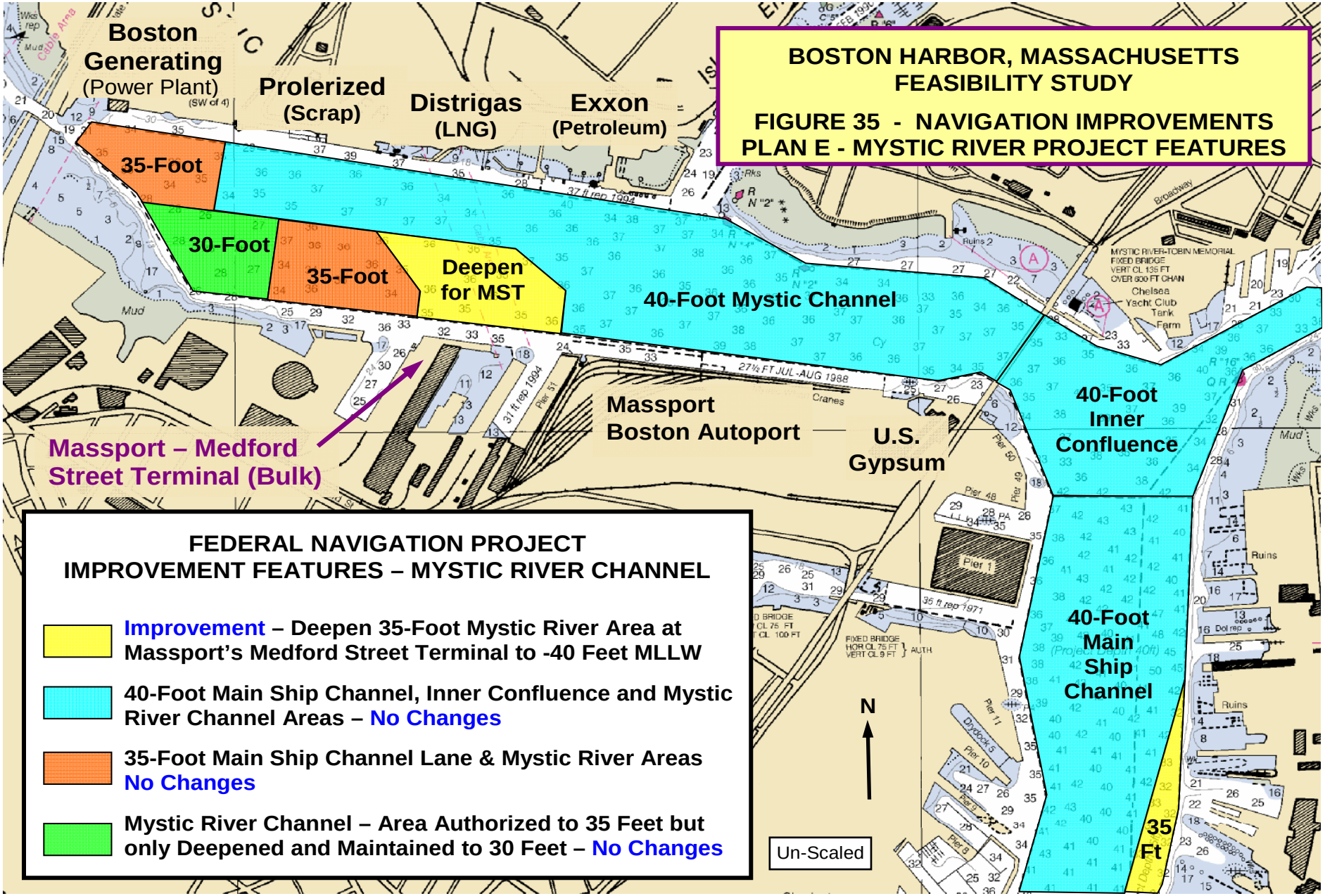

Un-Scaled
BOSTON HARBOR, MASSACHUSETTS
DEEP DRAFT NAVIGATION IMPROVEMENT
FEASIBILITY STUDY
FIGURE 33
PLAN A-B-C - DETAIL
RESERVED CHANNEL & TURNING BASIN
PROPOSED PROJECT MODIFICATIONS
MASSPORT
MARINE TERMINAL
CONLEY TERMINAL
RESERVED CHANNEL
Bridge under constitution
Tank Farm
Oil Barrier
N
40-Foot Areas Deepened to 45 to or 50 Feet – Lower Reserved Channel, Turning Basin, Main Ship Channel and Part of Drydock Channel
35-Foot Main Ship Channel Areas Deepened to 45 to 50 Feet
Upper Reserved Channel Remains at 35 Feet – Remains Unchanged
Areas Outside of Existing Project Deepened to 45 to 50 Feet

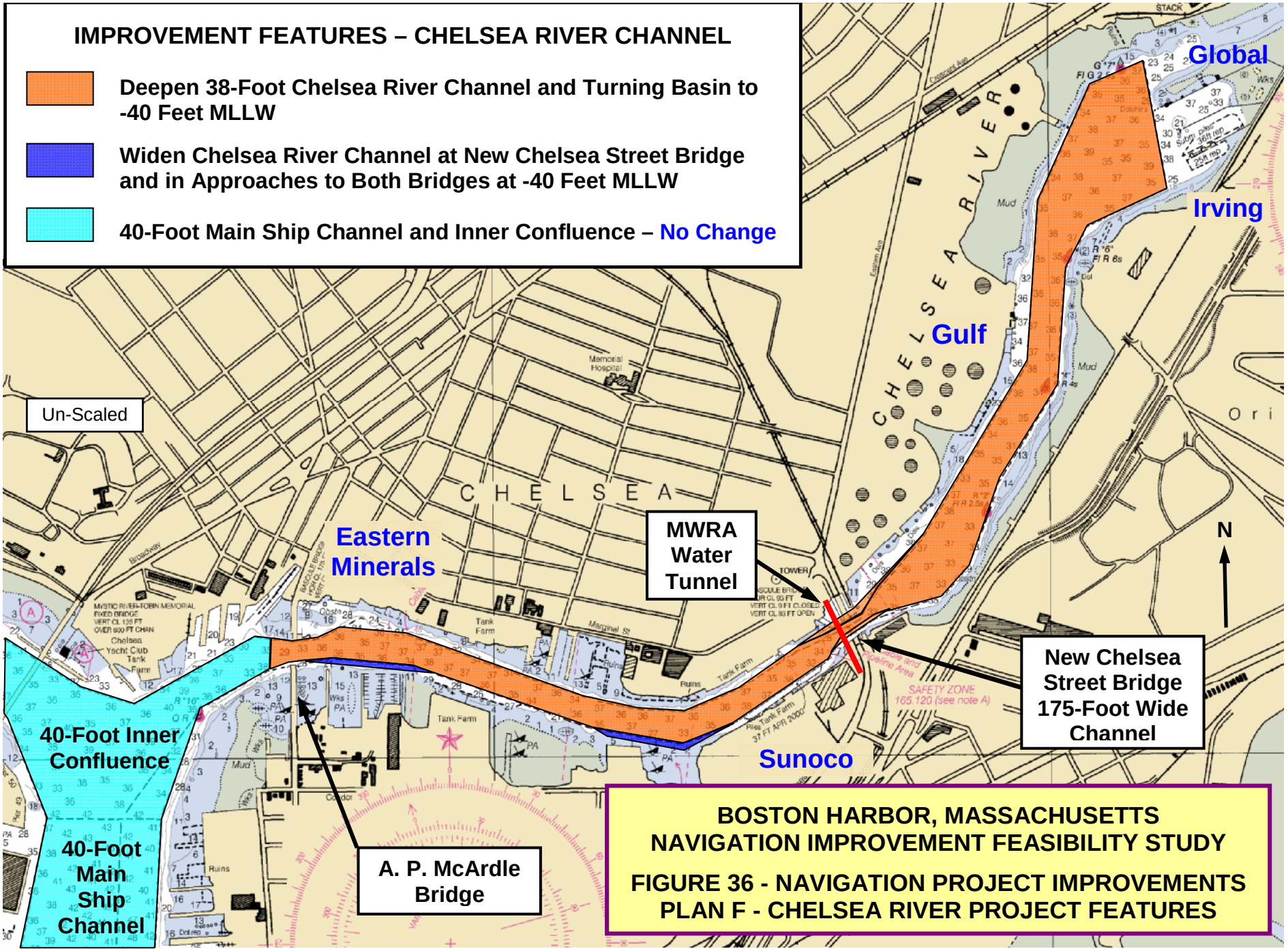

BOSTON HARBOR, MASSACHUSETTS
DEEP DRAFT NAVIGATION IMPROVEMENT
FEASIBILITY STUDY
FIGURE 18
NSTAR 115KV LINES ROUTE WITHIN
RESERVED AND MAIN SHIP CHANNELS
MASSPORT
MARINE TERMINAL
40-FOOT DRYDOCK
RESERVED CHANNEL
CONLEY TERMINAL
Tank Farm
Oil Barrier
Pier 6
Pier 5
Fort Independence
Castle I
PLEASURE BAY
(Project Depth 40ft)
(Project Depth 35ft)
Areas to be Deepened to 45 to 50 Feet for Main Channels Deepening Project
Adjacent 35-Foot Reserved and Main Ship Channel Areas Not Deepened
NSTAR 115 KV Lines Route – 3 Lines
Un-Scaled

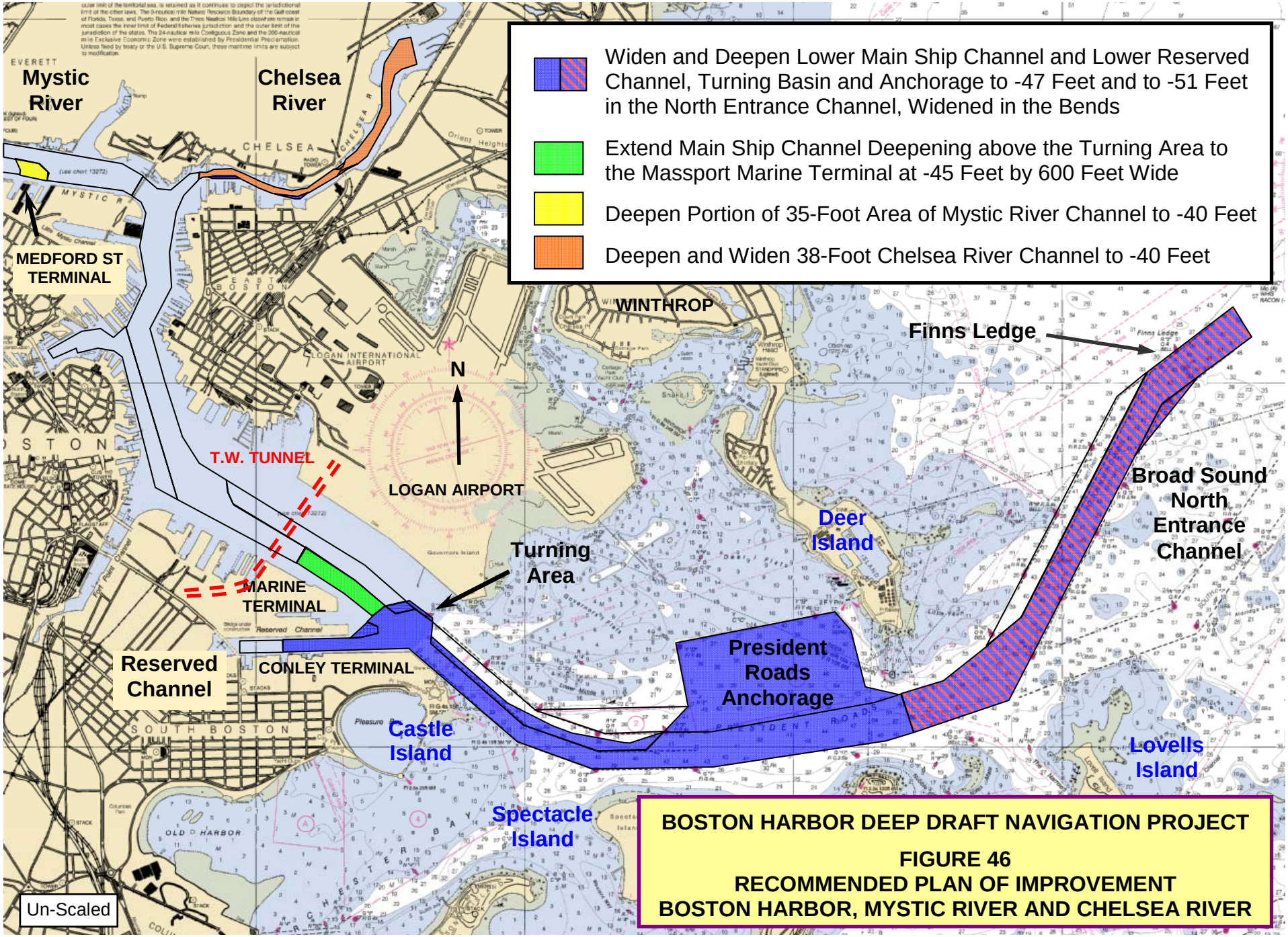


BOSTON HARBOR, MASSACHUSETTS
DEEP DRAFT NAVIGATION IMPROVEMENT
FEASIBILITY STUDY

FIGURE 34
PLAN D - MAIN SHIP CHANNEL DEEPENING
EXTENSION TO MASSPORT MARINE TERMINAL


BOSTON HARBOR, MASSACHUSETTS
FEASIBILITY STUDY
FIGURE 35 - NAVIGATION IMPROVEMENTS
PLAN E - MYSTIC RIVER PROJECT FEATURES
Boston Generating
(Power Plant)
Prolerized
(Scrap)
Distrigas
(LNG)
Exxon
(Petroleum)
35-Foot
30-Foot
35-Foot
Deepen for MST
40-Foot Mystic Channel
Massport – Medford Street Terminal (Bulk)
Massport Boston Autoport
U.S. Gypsum
40-Foot Inner Confluence
40-Foot Main Ship Channel
35 Ft
Un-Scaled
N
FEDERAL NAVIGATION PROJECT
IMPROVEMENT FEATURES – MYSTIC RIVER CHANNEL
Improvement – Deepen 35-Foot Mystic River Area at Massport's Medford Street Terminal to -40 Feet MLLW
40-Foot Main Ship Channel, Inner Confluence and Mystic River Channel Areas – No Changes
35-Foot Main Ship Channel Lane & Mystic River Areas No Changes
Mystic River Channel – Area Authorized to 35 Feet but only Deepened and Maintained to 30 Feet – No Changes


IMPROVEMENT FEATURES – CHELSEA RIVER CHANNEL
Deepen 38-Foot Chelsea River Channel and Turning Basin to -40 Feet MLLW
Widen Chelsea River Channel at New Chelsea Street Bridge and in Approaches to Both Bridges at -40 Feet MLLW
40-Foot Main Ship Channel and Inner Confluence – No Change
Un-Scaled
Global
Irving
Gulf
CHELSEA RIVER
CHELSEA
Eastern Minerals
MWRA Water Tunnel
New Chelsea Street Bridge 175-Foot Wide Channel
Sunoco
40-Foot Inner Confluence
40-Foot Main Ship Channel
A. P. McArdle Bridge
N
BOSTON HARBOR, MASSACHUSETTS
NAVIGATION IMPROVEMENT FEASIBILITY STUDY
FIGURE 36 - NAVIGATION PROJECT IMPROVEMENTS
PLAN F - CHELSEA RIVER PROJECT FEATURES


Widen and Deepen Lower Main Ship Channel and Lower Reserved Channel, Turning Basin and Anchorage to -47 Feet and to -51 Feet in the North Entrance Channel, Widened in the Bends
Extend Main Ship Channel Deepening above the Turning Area to the Massport Marine Terminal at -45 Feet by 600 Feet Wide
Deepen Portion of 35-Foot Area of Mystic River Channel to -40 Feet
Deepen and Widen 38-Foot Chelsea River Channel to -40 Feet
Mystic River
Chelsea River
MEDFORD ST TERMINAL
WINTHROP
Finns Ledge
N
LOGAN INTERNATIONAL AIRPORT
T.W. TUNNEL
LOGAN AIRPORT
Broad Sound North Entrance Channel
Deer Island
Turning Area
MARINE TERMINAL
Reserved Channel
CONLEY TERMINAL
President Roads Anchorage
Castle Island
Lovells Island
Spectacle Island
Un-Scaled
BOSTON HARBOR DEEP DRAFT NAVIGATION PROJECT
FIGURE 46
RECOMMENDED PLAN OF IMPROVEMENT
BOSTON HARBOR, MYSTIC RIVER AND CHELSEA RIVER

BOSTON HARBOR IMPROVEMENT PROJECT
DREDGING QUANTITY ESTIMATES (1000s of CY)

	CY Ordinary Material	CY Rock	Total CY
Main Channels Improvement to 47 Feet for Conley Terminal (Entrance Channel to 51 Feet)	10,221	900	11,121
Extend Deepening of MSC to Marine Terminal at 45 Feet	246	78	41
Deepen Portion of 35-Foot Mystic Channel to 40 Feet	67	0	9
Deepen 38-Foot Chelsea River Channel to 40 Feet	342	1	78
TOTAL PROJECT (12/2012)	10,876	979	11,855

TABLE 32

BOSTON HARBOR DEEP DRAFT IMPROVEMENT PROJECT – DREDGING QUANTITIES (CUBIC YARDS)

Detailed Plans	Ordinary Material			Ledge Blasting and Removal				Total Quantity - All Material		
	Cut to Design Depth	2-Foot Pay Overdepth Allowance	Total Ordinary Material	Cut to Design Depth	2-Foot Additional Required	2-Foot Pay Overdepth	Total All Rock Removal	All Required Material	All Overdepth	Total All Material
Plan ABC Includes Deepening of the Broad Sound North Entrance Channel to 51 Feet, and Deepening the President Roads Anchorage, Widened Lower Main Ship Channel, Lower Reserved Channel & Expanded Reserved Channel Turning Area to 47 Feet										
47/51-Foot Depth	7,093,800	3,127,100	10,220,900	409,300	271,600	218,800	899,800	7,774,700	3,345,900	11,120,700
PLAN D - MAIN SHIP CHANNEL DEEPENING EXTENSION TO MASSPORT MARINE TERMINAL AT 600-FOOT WIDTH										
45-Foot Depth	151,800	94,500	246,300	12,600	29,500	36,300	78,400	193,900	130,800	324,700
PLAN E - MYSTIC RIVER CHANNEL DEEPENING PLANS FOR MASSPORT MEDFORD STREET TERMINAL ACCESS										
40-Foot Depth	38,500	28,600	67,100	0	0	0	0	38,500	28,600	67,100
PLAN F - CHELSEA RIVER CHANNEL DEEPENING PLANS										
40-Foot Depth	80,200	262,400	342,600	0	50	490	540	80,200	262,900	343,100
TOTAL OF ALL RECOMMENDED IMPROVEMENT INCREMENTS - PLANS ABC, D, E & F										
ABC-D-E-F	7,364,300	3,512,600	10,876,900	421,900	301,150	255,590	978,740	8,087,300	3,768,200	11,855,600

TABLE 51
RECOMMENDED PLANS OF IMPROVEMENT
MAIN CHANNELS DEEPENING TO CONLEY TERMINAL
WITH MAIN SHIP CHANNEL EXTENSION TO MMT, MYSTIC RIVER CHANNEL DEEPENING TO MST, AND CHELSEA RIVER CHANNEL DEEPENING

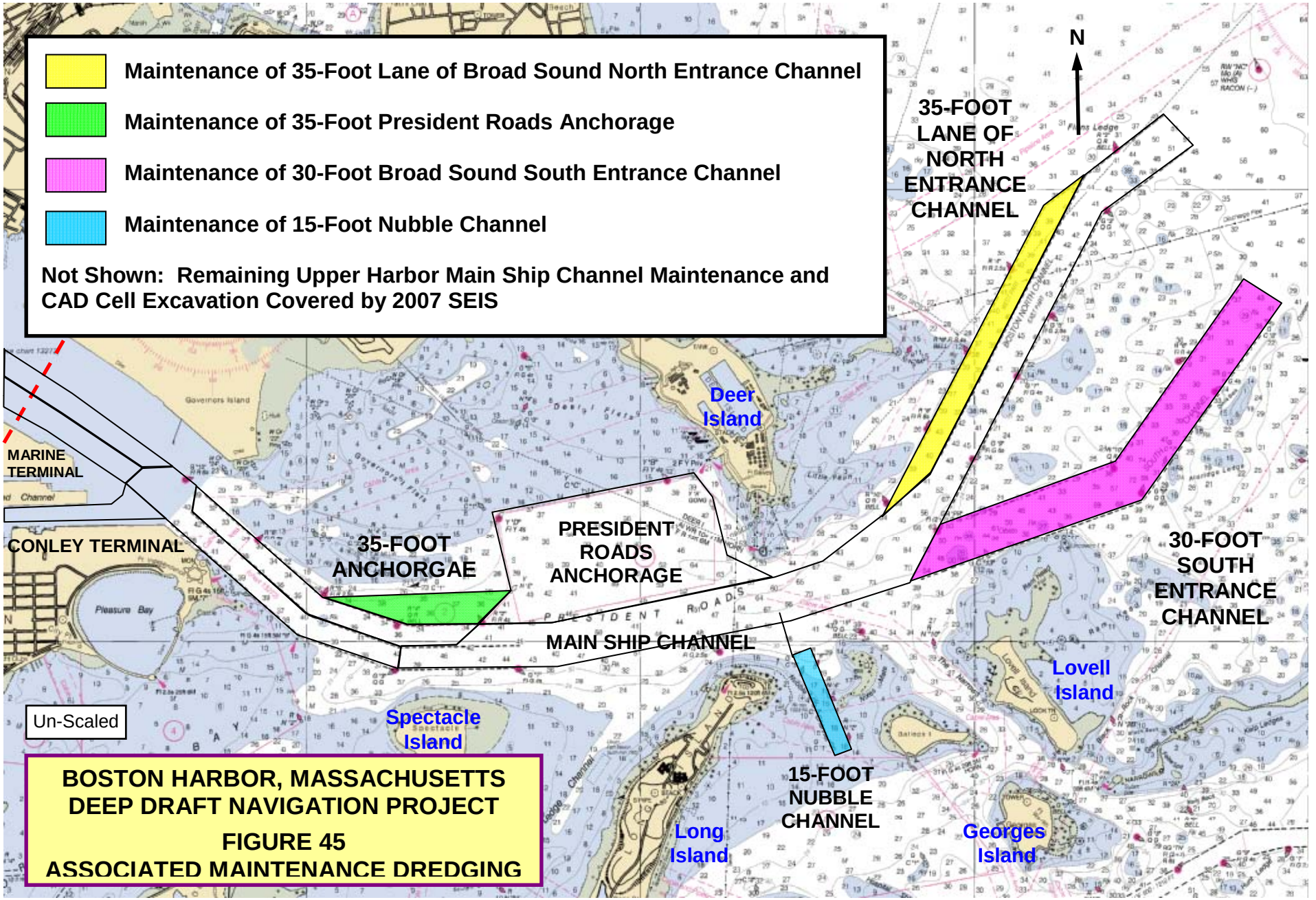
RECOMMENDED PLANS OF IMPROVEMENT BY PROJECT SEGMENT		PLAN ABC MAIN CHANNELS 47/51 FEET	PLAN D MSC TO MMT 45 FEET	PLAN E MYSTIC RIVER 40 FEET	PLAN F CHELSEA RIVER 40 FEET	TOTAL COMBINED 4 PLANS ABC-47/51 + D, E & F
	Components of Recommended Plan					
FIRST COST - JULY 2011 ESTIMATE						
	General Navigation Features - Construction	$252,130,000	$15,431,000	$1,902,000	$9,943,000	$279,406,000
	GNF - PED Costs	$5,373,000	$367,000	$170,000	$394,000	$6,304,000
	GNF - Construction Management Costs	$8,593,000	$843,000	$269,000	$960,000	$10,665,000
	Total GNF - July 2011 Estimate	$266,096,000	$16,641,000	$2,341,000	$11,297,000	$296,375,000
	Real Estate (LERRDs)	$125,000	$15,000	$4,000	$18,000	$162,000
	Aids to Navigation	$192,000	$24,000	$0	$48,000	$264,000
	Utility Relocations	$0	$0	$0	$15,000,000	$15,000,000
	Local Service Facilities (Berths)	$446,000	$1,344,000	$0	$1,493,000	$3,283,000
	Total First Cost - July 2011 Estimate	$266,859,000	$18,024,000	$2,345,000	$27,856,000	$315,084,000
PROJECT FIRST COST - CONSTANT DOLLAR BASIS - 2013 BUDGET YEAR						
	Total GNF First Cost - PY2013 Basis	$275,837,000	$17,231,000	$2,419,000	$11,687,000	$306,974,000
	Local Service Facilities (Berths)	$462,000	$1,394,000	$0	$1,548,000	$3,404,000
	Total Project First Cost - PY2013 Basis	$276,428,000	$18,666,000	$2,423,000	$28,304,000	$325,821,000
FULLY FUNDED PROJECT COST						
	Total GNF Fully Funded Cost - Escalated	$285,795,000	$18,303,000	$2,471,000	$11,919,000	$318,488,000
	Local Service Facilities (Berths)	$476,000	$1,475,000	$0	$1,573,000	$3,524,000
	Escalated/Fully Funded Project Cost	$286,812,000	$19,821,000	$2,475,000	$28,562,000	$337,470,000

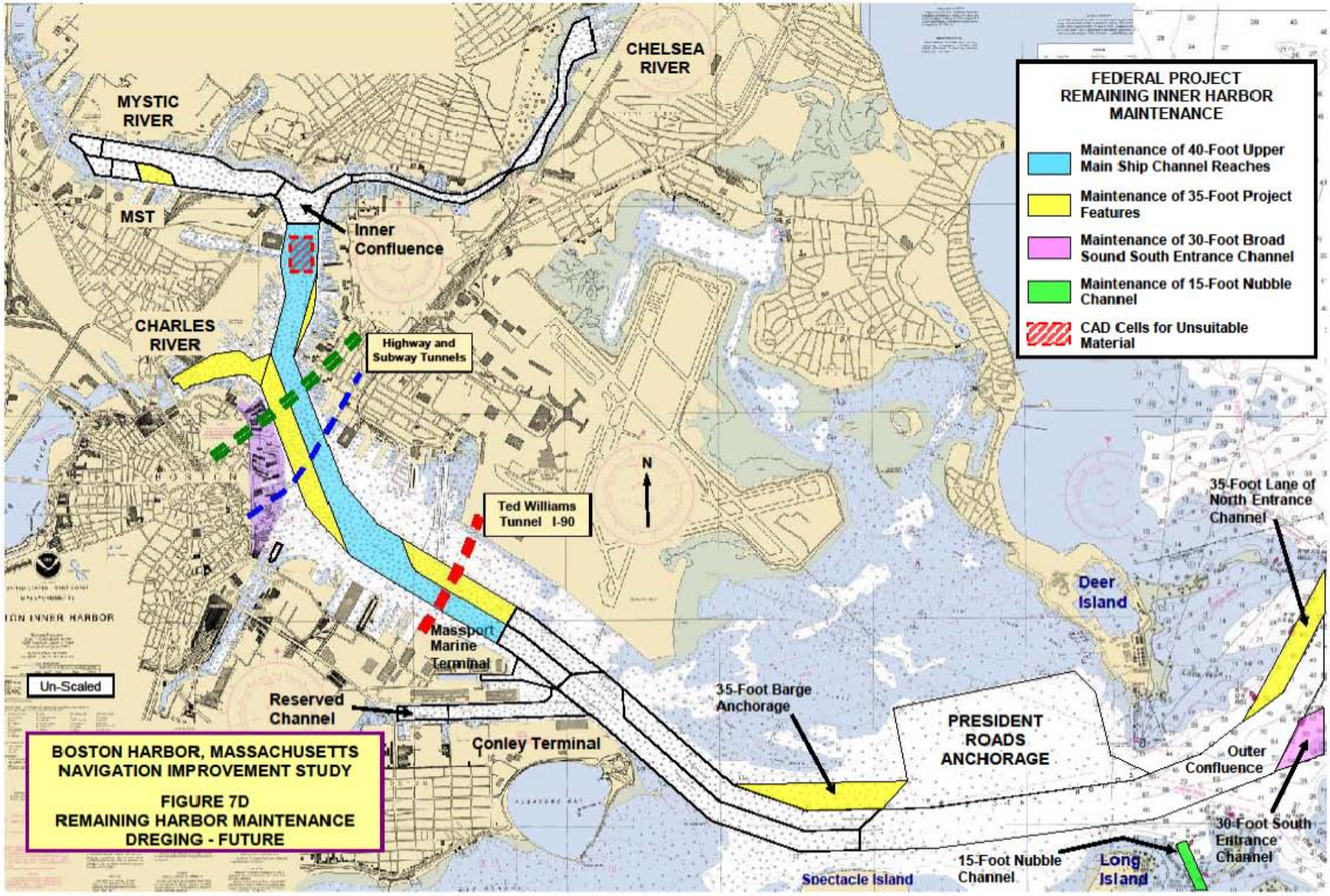
TABLE ES-1

BOSTON HARBOR NAVIGATION IMPROVEMENT STUDY

SUMMARY OF RECOMMENDED PLAN COSTS AND BENEFIT/COST ANALYSIS

July 2011 Price Levels with April 2012 Contingency Risk Analysis FY 2012 Interest Rates	Main Channels Improvements	Main Ship Channel Extension to Marine Terminal	Mystic River Channel Deepening	Chelsea River Channel Deepening	Total All Recommended Improvements
	PLAN ABC	PLAN D	PLAN E	PLAN F	COMBINED
GNF Construction	47/51 Feet	45 Feet	40 Feet	40 Feet	
Total First Cost - July 2011 Price	$266,413,000	$16,680,000	$2,345,000	$11,363,000	$296,801,000
Investment Cost (+IDC)	$280,619,000	$16,758,000	$2,345,000	$11,434,000	$311,156,000
Local Service Facilities Cost	$446,000	$1,344,000	$0	$1,493,000	$3,283,000
Total Annual Costs (Fed & Non-Fed)	$12,770,000	$829,000	$116,000	$718,000	$14,433,000
Total Annual Benefits	$102,555,000	$1,161,000	$221,000	$1,936,000	$105,873,000
Benefit/Cost Ratio	8.03	1.40	1.91	2.70	7.34
Net Annual Benefits	$89,785,000	$332,000	$105,000	$1,218,000	$91,440,000


Maintenance of 35-Foot Lane of Broad Sound North Entrance Channel
Maintenance of 35-Foot President Roads Anchorage
Maintenance of 30-Foot Broad Sound South Entrance Channel
Maintenance of 15-Foot Nubble Channel
Not Shown: Remaining Upper Harbor Main Ship Channel Maintenance and CAD Cell Excavation Covered by 2007 SEIS
N
35-FOOT LANE OF NORTH ENTRANCE CHANNEL
Deer Island
MARINE TERMINAL
CONLEY TERMINAL
35-FOOT ANCHORGAE
PRESIDENT ROADS ANCHORAGE
30-FOOT SOUTH ENTRANCE CHANNEL
MAIN SHIP CHANNEL
Lovell Island
Un-Scaled
Spectacle Island
15-FOOT NUBBLE CHANNEL
Long Island
Georges Island
BOSTON HARBOR, MASSACHUSETTS
DEEP DRAFT NAVIGATION PROJECT
FIGURE 45
ASSOCIATED MAINTENANCE DREDGING


CHELSEA RIVER
MYSTIC RIVER
MST
Inner Confluence
CHARLES RIVER
Highway and Subway Tunnels
Ted Williams Tunnel I-90
N
Massport Marine Terminal
Reserved Channel
Conley Terminal
Un-Scaled
35-Foot Barge Anchorage
PRESIDENT ROADS ANCHORAGE
Deer Island
35-Foot Lane of North Entrance Channel
Outer Confluence
30-Foot South Entrance Channel
15-Foot Nubble Channel
Spectacle Island
Long Island
FEDERAL PROJECT
REMAINING INNER HARBOR
MAINTENANCE
Maintenance of 40-Foot Upper Main Ship Channel Reaches
Maintenance of 35-Foot Project Features
Maintenance of 30-Foot Broad Sound South Entrance Channel
Maintenance of 15-Foot Nubble Channel
CAD Cells for Unsuitable Material
BOSTON HARBOR, MASSACHUSETTS
NAVIGATION IMPROVEMENT STUDY
FIGURE 7D
REMAINING HARBOR MAINTENANCE
DREGING - FUTURE

DREDGING QUANTITY ESTIMATES (1000s of CY)
For Associated Maintenance Dredging

	CY Cut to Design Depth	Over Depth	Total CY
Broad Sound South Channel	53	86	139
Broad Sound North Channel 35-Foot Lane	246	78	56
Nubble Channel	1	1	2
35-Foot Barge Anchorage	2	65	67
Chelsea River Remaining O&M	126	88	214
Total Associated Maintenance	215	263	478
Upper Main Ship Channel and Mystic River O&M Remaining from Work Covered in 2007 SEIS	589	415	994
Upper Main Ship Channel CAD Cell from Work Covered in 2007 SEIS	1,176	0	1,176

All Dredged Materials from Boston Harbor Would be Beneficially Used

All Materials Suitable for Unconfined Ocean Disposal at Mass Bay Disposal Site by US EPA and Corps

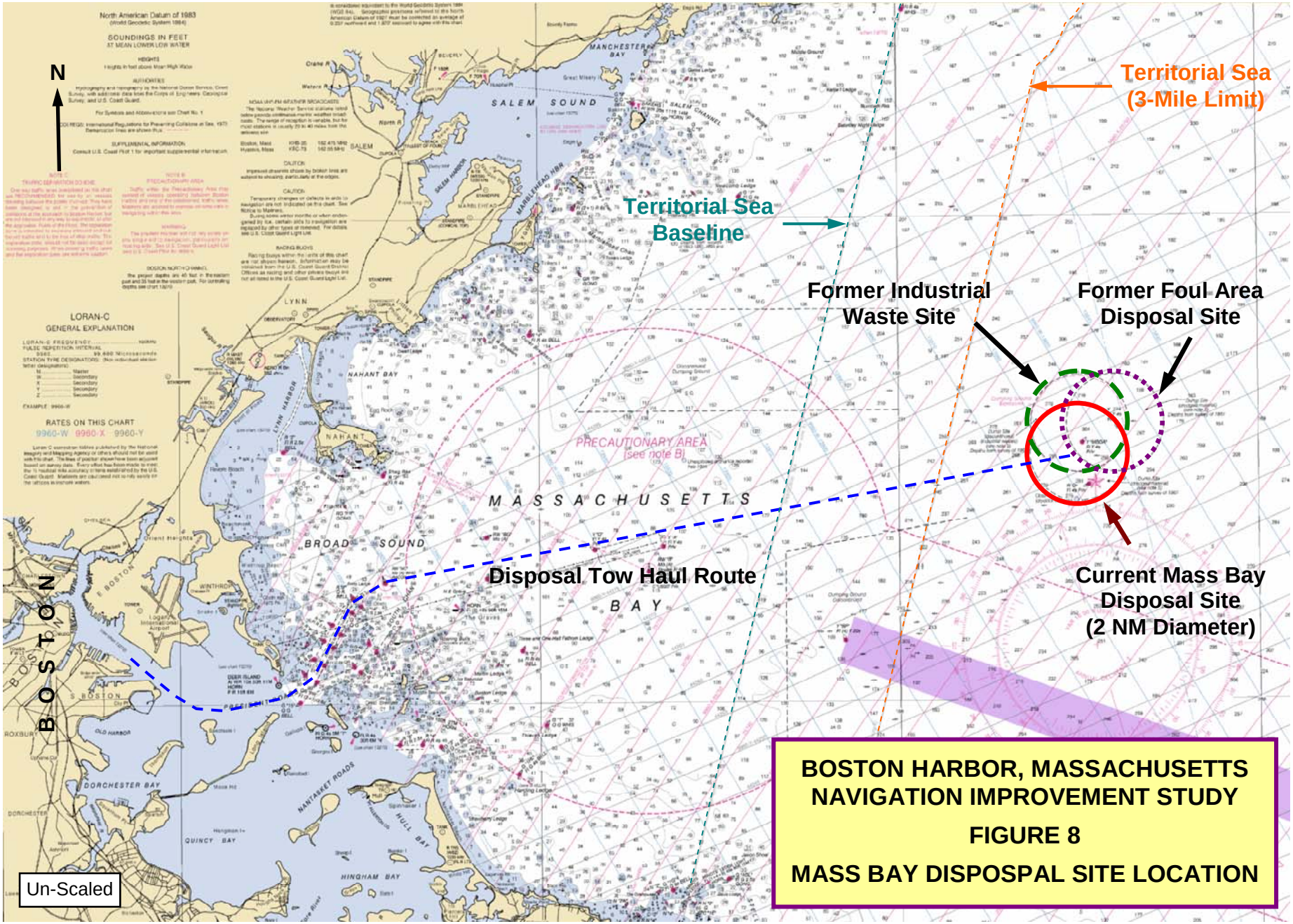
- 300-Foot Deep Basin Site has Indefinite Capacity

Beneficial Use Potential for Clay and Unconsolidated Material

- One-Time Opportunity for Using Dredged Material as Clean Cap Material for Old Industrial Waste Site
- US EPA Monitored Former Ocean Waste Site Contains Barrel Fields of Chemical and Radiological Waste from 1930s to 1970s. EPA has asked Corps to cap the site.

Beneficial Use Potential for Rock and Till

- Rock Reef and Hard Bottom Habitat in Mass Bay
- State may Process Ashore for Use in Shore Protection Work



BOSTON HARBOR, MASSACHUSETTS NAVIGATION IMPROVEMENT STUDY

FIGURE 8

MASS BAY DISPOSPAL SITE LOCATION

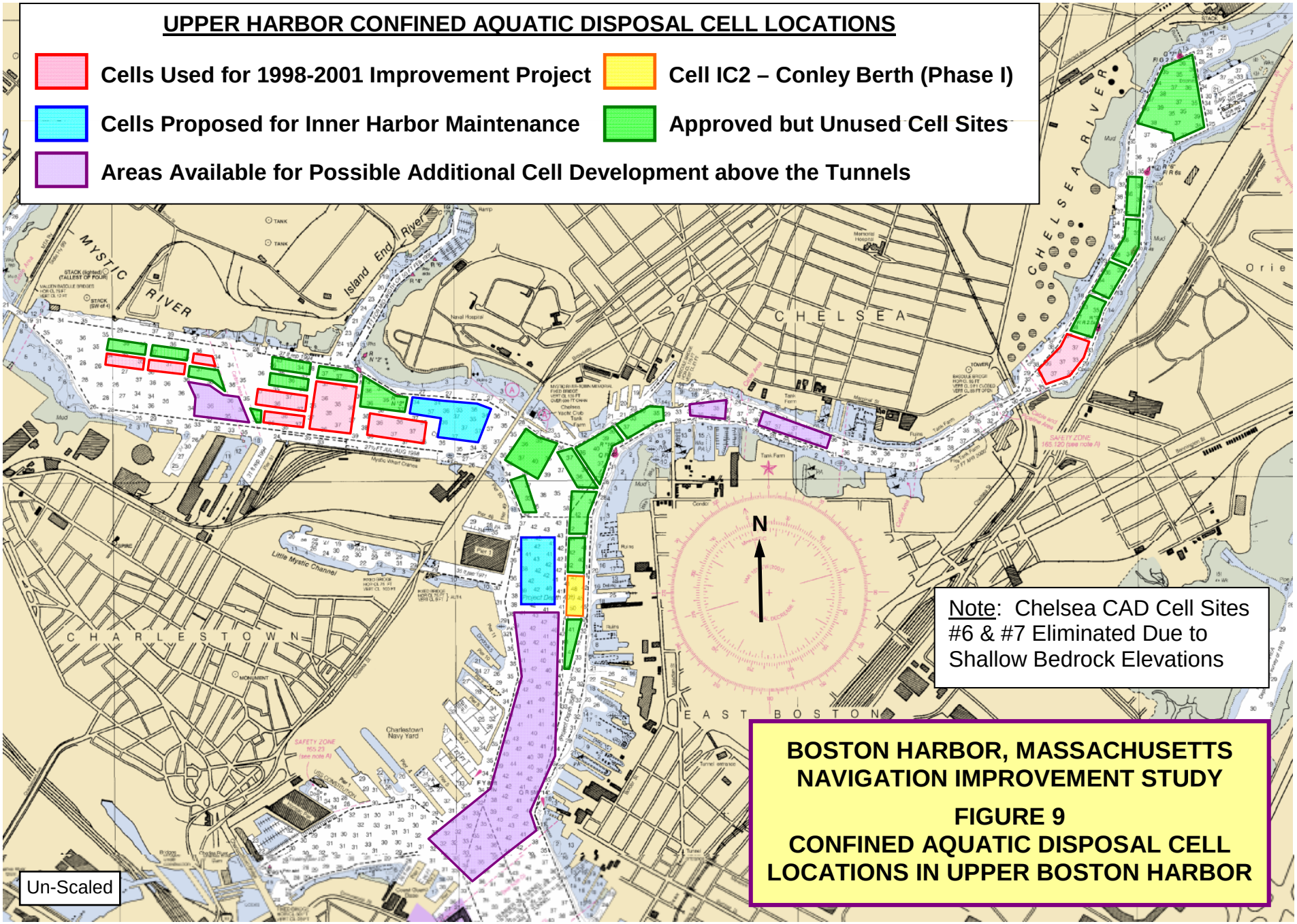
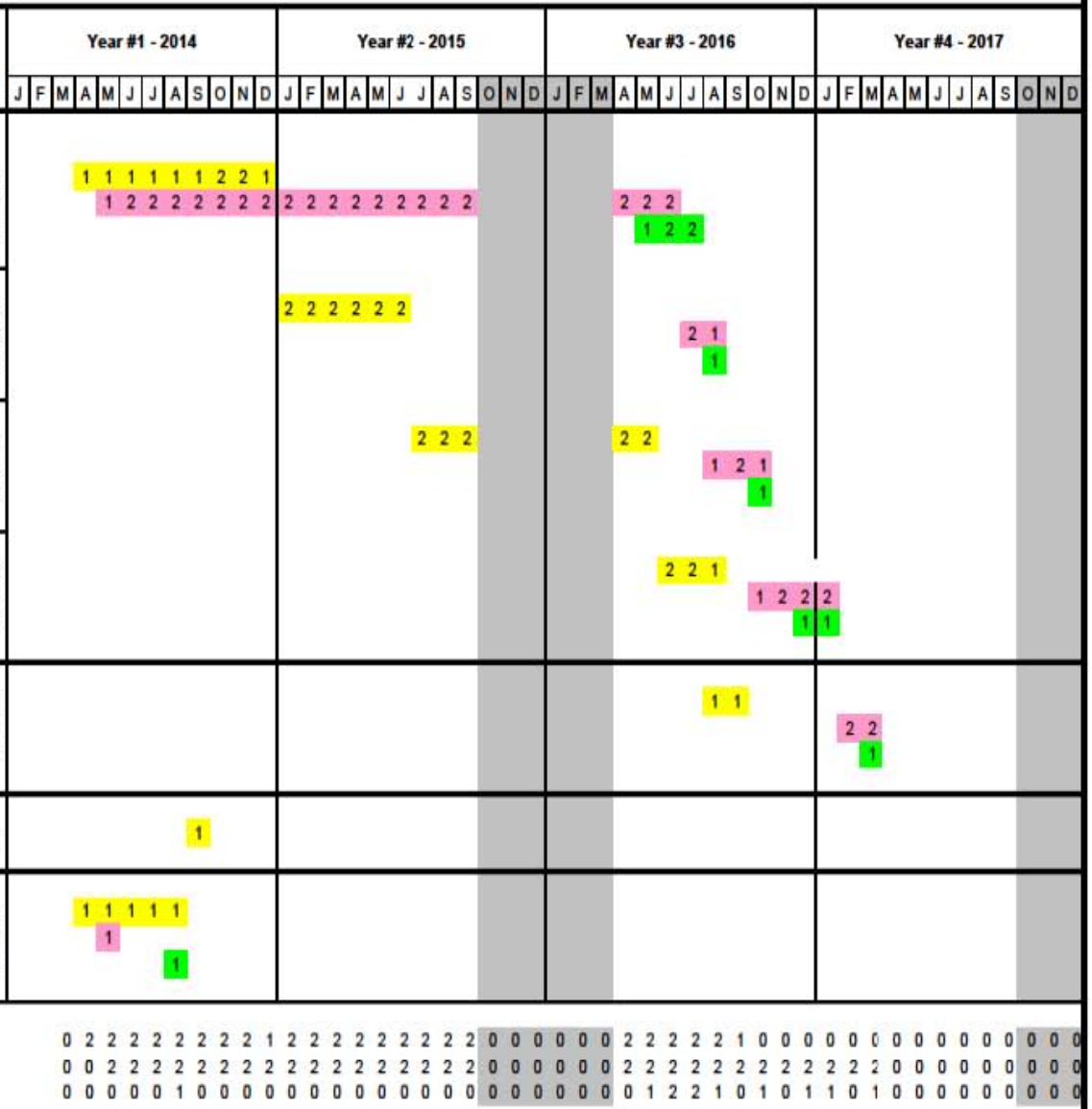

UPPER HARBOR CONFINED AQUATIC DISPOSAL CELL LOCATIONS
Cells Used for 1998-2001 Improvement Project
Cell IC2 – Conley Berth (Phase I)
Cells Proposed for Inner Harbor Maintenance
Approved but Unused Cell Sites
Areas Available for Possible Additional Cell Development above the Tunnels
MYSTIC RIVER
Island End River
CHELSEA
CHELSEA RIVER
CHARLESTOWN
EAST BOSTON
Little Mystic Channel
Charlestown Navy Yard
N
Note: Chelsea CAD Cell Sites #6 & #7 Eliminated Due to Shallow Bedrock Elevations
BOSTON HARBOR, MASSACHUSETTS
NAVIGATION IMPROVEMENT STUDY
FIGURE 9
CONFINED AQUATIC DISPOSAL CELL LOCATIONS IN UPPER BOSTON HARBOR
Un-Scaled

TABLE D2-30B - CONSTRUCTION SCHEDULE

BOSTON HARBOR, MASSACHUSETTS - DEEP DRAFT NAVIGATION IMPROVEMENT PROJECT - RECOMMENDED PLANS OF IMPROVEMENT WITH 47/51-FOOT MAIN CHANNELS PLAN

Schedule assuming air quality shutdown from months 19 to 24, and assuming separate rock removal plant(s)
Schedule also assumes Chelsea and Mystic Rivers will be done in Year #1

CURRENT FEASIBILITY ESTIMATE	Total Duration Months	Excavation Time (Months)	Hauling Time (Months)
PLAN A3 - MAIN CHANNELS IMPROVEMENT - 47/51 FEET	34		
Broad Sound North Entrance Channel - 51 Feet	17		
Dredging and Disposal - Ordinary Material		5.36 MO	5.19 MO
Drill and Blast Ledge			16.20 MO
Rock Removal and Disposal		2.41 MO	2.59 MO
President Roads Anchorage - 47 Feet	10		
Dredging and Disposal - Ordinary Material		6.10 MO	6.37 MO
Drill and Blast Ledge			1.50 MO
Rock Removal and Disposal		0.37 MO	0.44 MO
Main Ship Channel - Roads to Reserved Channel - 47 Feet	12		
Dredging and Disposal - Ordinary Material		5.92 MO	5.10 MO
Drill and Blast Ledge			2.00 MO
Rock Removal and Disposal		0.50 MO	0.41 MO
Lower Reserved Channel and Turning Area - 47 Feet	6		
Dredging and Disposal - Ordinary Material		2.32 MO	2.18 MO
Drill and Blast Ledge			3.27 MO
Rock Removal and Disposal		0.61 MO	0.77 MO
PLAN D - MAIN SHIP CHANNEL EXTENSION TO MMT - 45 Feet	4		
Dredging and Disposal - Ordinary Material		1.38 MO	1.23 MO
Drill and Blast Ledge			1.97 MO
Rock Removal and Disposal		0.46 MO	0.46 MO
PLAN E - MYSTIC RIVER CHANNEL AT MST - 40 Feet	1		
Dredging and Disposal - Ordinary Material		0.41 MO	0.47 MO
PLAN F - CHELSEA RIVER CHANNEL - 40 Feet	5		
Dredging and Disposal - Ordinary Material (1 Plant Only)		4.38 MO	3.40 MO
Drill and Blast Ledge (1 Plant Only)			0.11 MO
Rock Removal and Disposal (1 Plant Only)		0.02 MO	0.02 MO
TOTAL - COMBINED PLANS A2-D-E-F	34		
Dredging and Disposal - Ordinary Material (1 Plant Only)			
Drill and Blast Ledge (1 Plant Only)			
Rock Removal and Disposal (1 Plant Only)			



Container Truck Haul Mileage Saved

Under the Base Economic Case – 3 Carrier Services Use Larger Ships and PONYNJ Landings of New England Cargo Shifts to Boston Harbor

- 218,800 TEUs annually shift to ships
- 125,000 Trucks reduce their haul distance
- 148.5 miles saved per trip
- 18.5 million truck miles annually
- About 3 million gallons diesel fuel saved annually
- Road air emissions reduced
- Traffic safety and congestion improved.

Next Steps in Process

- Re-coordination with State and Federal Agencies - Ongoing
- Agency Technical Review of Revised Report & SEIS – January 2013.
- Revised Report Submitted to Corps HQ – February 2013
- Civil Works Review Board Reconsideration – March 2013
- Draft Chief of Engineers Report with Final Report & FSEIS Released for State (Governor) and Agency (Federal Cabinet Level) Review and Notice in Federal Register – April 2013
- Chief's Report Submitted to Assistant Secretary of the Army and OMB – Summer 2013
- Record of Decision Published – Late Summer 2013
- Reports Submitted to Congress for Action – Fall 2013
- Design Phase Efforts Commence – Summer 2013
- Construction Requires Authorization of Project by Congress thru Water Resources Development Act

Critical Design Phase Activities

Continue Technical Working Group Involvement During Design Phase

Execute Design Phase Cost-Sharing Agreement with Massport

Dredged Material Characterization

- Subsurface Explorations to Define Nature and Amount of Rock and Other Hard Material and Identify Potential Removal Methods
- Refine Dredging Quantities and Durations
- Confirm Suitability of Associated Maintenance Area Sediments

Develop Dredge and Rock Removal Sequencing Plans

- Time of Year Sensitivities of Fisheries Resources and Listed Species
- Timeline of Other Harbor Activities and Traffic Management Strategy

Identify Potential Beneficial Uses of the Rock and Gauge Financial Interest

- Identify Costs of Rehandling Rock for Various Uses Proposed by Others

Identify Alternative Air Quality Mitigation Measures if Necessary

- EPA Revised Attainment for Boston Area?

NStar-MWRA Power Cable Elevation Resolved for Reserved/MS Channels

Critical Design Phase Activities

Remaining Cultural Resource Investigations

- Cultural Resource Surveys in Chelsea River Widening Areas
- Cultural Resource Investigations at Proposed Rock Reef Creation Sites
- Cultural Resource Investigations for Shipwrecks at IWS if to be Capped

Update Project Cost and Cost-Sharing

Congress Includes Project in Water Resources Development Act

Identify Non-Federal Funding Sources

Execute Project Cooperation Agreement with Massport