DREDGING IN A CHANGING SCIENTIFIC AND REGULATORY ENVIRONMENT

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16. Abstract

Dredging activities associated with commercial navigation have been the subject of substantial public policy conflict. At both the national and local levels, substantial concern has been expressed over the environmental consequences of the disposal of dredged materials, and significant discord has arisen between those who favor navigational dredging to satisfy the operational needs of modern shipping in the name of economic development and those concerned with the environmental consequences of dredging and the disposal of dredged materials. Sharp clashes have ensued regarding dredging projects, leading to delays and higher costs.

This study examines the changing regulatory and scientific framework for dredging, growing public concern with the disposal of dredged materials, and the changing process of determining what constitutes "contaminated sediments." Further, it examines efforts to forge a meaningful consensus on how to proceed, given seemingly conflicting economic and environmental needs. Changing public perceptions of the environment and subsequent legislation have forced consideration of environmental and ecological impacts of navigational dredging to a much greater degree than was the case in the past. A variety of measures and recommendations are made to address the economic development/environmental protection breach such as through the use of National Dredging Teams and local and regional analogs, clarification of agency duties and responsibilities, and pre-application procedures.

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Dredging Navigational Channels in a Changing Scientific and Regulatory Environment

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I
INTRODUCTION

Since the 1960s, public policy issues associated with dredging navigational channels have come to be extremely controversial and their resolution has required enormous expenditure of time and effort. As will be seen in the body of this article, contemporary maritime transportation systems have operational requirements not only for dredging that maintains shipping channels and port areas but also for dredging that deepens and widens them. Yet, as the needs of the maritime industry for dredging have changed, public attitudes, understanding, and expectations with respect to environmental protection have changed as well. The latter changes are reflected in legislative actions taken by Congress and are reviewed below.

At both the national and local levels, substantial concern has been expressed over the environmental consequences of the disposal of dredged materials, and conflict has arisen between those who favor navigational dredging in the name of economic development and those concerned with the disposal of dredged materials because of their environmental consequences. A wide mix of interested groups, the courts, a variety of executive branch agencies, and even the office of the President of the United States have been involved in the public policy decisions relating to dredging. Sharp clashes have ensued regarding dredging projects, leading to substantial delays and higher costs.

What, exactly, is the problem? Explanations run the gambit from inadequate science, to bureaucratic turf, to inadequate efforts to assess benefits

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and costs of navigational projects, to lack of funding, to fundamental flaws in the regulatory pocess. While each may play a significant role in the matter, the purpose of this article is to examine the changing regulatory framework for dredging, the disposal of dredged materials, and the process of determining what constitutes "contaminated sediments."

Consideration of legal and regulatory change reveals at least two broad problem areas. The first is that of regulatory uncertainty, which appears to reflect society's mixed feelings toward dredging activities. Under what circumstances and with what conditions should navigational projects necessitating the disposal of dredged material be authorized? How does society understand and value the commerce-versus-environment balance? The second problem area is one of scientific uncertainty relating to assessments of dredged material contamination. How is contamination to be measured and at what levels of contamination is it safe to dispose of dredged materials in marine waters? The regulatory and scientific elements are inextricably interrelated, and both are explored in detail in the body of this article.

For the development of transportation systems to be effective, it must follow from the integration of transportation needs with other requirements of society, such as conservation of the environment. The reality is that the public desires both environmental protection and effective transportation networks; the problem is in successfully balancing the two. Dredging initiatives encounter opposition with increasing frequency because of the perceived inability of project promoters and regulators to adequately incorporate environmental considerations into their proposals and decisions. Most particularly, contemporary maritime transportation and environmental interests clash with respect to the disposal of dredged materials. Accordingly, it is appropriate to consider carefully the policy framework in which decisions are made and to examine how environmental and scientific information is utilized in the decision process.

Part of the inability to reach effective policy decisions in a reasonable time frame is related to the decision process itself. Dredging is subject to various federal laws that are interpreted by a large Washington bureaucracy as well as in regional and state offices. As will be seen below, among the key federal statutes are the Rivers and Harbors Act, the Clean Water Act, the Marine Protection Research and Sanctuaries Act, and various Water Resources Development Acts. Associated laws include the National Environmental Policy Act, the Coastal Zone Management Act, and the Sustainable Fisheries Act.

The controversy over dredge material disposal has become a significant impediment to the maintenance and development of navigational channels. It impacts the entire transportation network, because ports are the key points of intermodal transfer between marine and land-based transportation. Moreover,

dredging impacts other coastal uses and, consequently, is an issue of substantial importance to a wide variety of policy makers at the federal, state, and local levels, as well as a diverse group of nongovernmental stakeholders.

II
MARITIME TRANSPORTATION AND THE NEED FOR DREDGING

Historically, transportation by vessels operating on rivers and oceans has been essential to the expansion of both the national and international trade of the United States. Rivers, canals, and oceans provide the "road" over which ever increasing amounts of cargo are transported, and they tie together the disparate elements of the world's economy. Before the advent of railroads and modern highways, ships provided the only practical way to move large amounts of cargo from location to location; now, in the modern world, carriage by ship or barge remains the most economical way to move goods, particularly those dealt in high volume and at low unit value, such as mineral ores and food grains. World-wide, it is estimated that by weight, some ninety percent[1] of all international trade of goods moves by ship, an astounding figure, especially given the tremendous expansion in world trade in past decades.

As seen in Table 1, and reflected in the value of its imports and exports, the United States has experienced an explosion in the growth of its involvement in international trade as trade barriers have been reduced. Also noted in Table 1 is the growing significance of the international trade in goods for the economy

Table 1. U.S. International Trade in Goods (Billions of Dollars)

Year	Export Value	Import Value	Total Value of Trade	U.S. GDP	Total value of International Trade as Per Cent of U.S. GDP
1960	19.7	14.8	34.5		
1965	26.6	21.5	48.1		
1970	42.5	39.9	82.4	1,039.7	7.93%
1975	107.1	98.2	205.3	1,635.2	12.56%
1980	224.3	249.8	474.1	2,795.6	16.96%
1985	215.9	338.1	554.0	4,213.0	13.15%
1990	389.3	498.3	887.6	5,803.2	15.3%
1995	575.2	749.4	1,324.6	7,400.5	17.90%
2000	772.2	1,224.4	1,996.6	9,962.7	20.00%

Source: Calculated from data from U.S. Department of Commerce, International Trade Administration, "U.S. Aggregate Foreign Trade Data" online <www.ita.doc.gov/td/industry/otea/usfth/tabcon.html>.

[1]Co-Chairs Report from the Global Conference on Oceans and Coasts at Rio+10 at 8, held at UNESCO, Paris, December 3-7, 2001. Available at <ioc.unesco.org/icam/rio+10_outputs.htm>.

of the United States; by the year 2000, the total value of imports and exports was equivalent to twenty per cent of the total Gross Domestic Product (GDP).

Of course, American involvement in international trade is predicated on the ability of the maritime transportation system to move goods into and out of the country. Statistics provided by the Department of Transportation (DOT) to Congress in September 1999 summarize and indicate the extent and importance of the maritime transportation network of the United States.[2] According to DOT, some ninety-five per cent of all U.S. imports and exports pass through U.S. ports.[3] The U.S. maritime transportation system is characterized by more than 1,000 harbor channels, 25,000 miles of inland, intracoastal, and coastal waterways serving over 300 U.S. ports, with more than 3,700 terminals. And, in an age of intermodal transportation networks, it is significant to note that these ports, in turn, connect to 152,000 miles of rail, 460,000 miles of pipelines, and 45,000 miles of interstate highways.[4]

According to DOT, U.S. port facilities annually service the movement of more than 2 billion tons of domestic and international cargo, 3.3 billion barrels of oil, 134 million ferry passengers, and over 5 million cruise ship passengers. The DOT estimates that waterborne cargo contributes more than $742 billion to the U.S. gross domestic product and provides employment for more than 13 million people. It has been estimated that by 2020 American overseas trade will more than double, further increasing dependence on the maritime transportation system.[5]

But port facilities and maritime transportation are also important from another perspective, that of national security. They enable the supply of United States military forces deployed abroad. For example, DOT points out that ninety per cent of all supplies used in Operation Desert Storm were shipped from U.S. ports.[6]

According to DOT, water transportation is environmentally sound, since ships and barges, when compared to other means of transportation, have the smallest number of accidental spills or collisions.[7] Further, water transportation is more fuel efficient per ton of cargo moved than other modes of transportation.[8] But these assessments focus only on the actual operation of trans-

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[2]Department of Transportation, An Assessment of the U.S. Marine Transportation System: A Report to Congress (1999), available on line at <www.dot.gov/mts/report>.

[3]This figure excludes imports and exports to and from Canada and Mexico.

[4]Assessment of the U.S. Marine Transportation System, supra note 2, at 1-2.

[5]Id. at 3.

[6]Id.

[7]Id. at 3-4.

[8]The Army Corps of Engineers reports, for example, that trucks can move a ton of cargo 59 miles, railroads 202 miles, and inland barges 514 miles per gallon of fuel. Transportation Mode Comparison-Energy-Environment-Efficiency, available online at <www.mvr.usace.army.mil/navdata/tr-comp.htm>.

portation systems and do not consider, for example, potential environmental problems associated with dredging, an activity essential for contemporary maritime transportation.

While the movement of goods in trade is shaped fundamentally by factors of supply and demand, it is also affected by the ability to transport goods from where they are found or manufactured to where they are desired, as well as the ability to do so in a dependable and efficient manner and on cost-competitive terms.[9] Containerization[10] and the use of ever larger ships, tankers and bulk ships as well as container ships, represent responses by the shipping industry to these transportation influences.

Simply put, larger ships benefit from economies of scale, so that a larger container vessel has lower costs per container and a larger tanker lower costs per unit of crude oil or other cargo.[11] DOT has noted the trend toward the use of mega-container ships, that is ships designed to carry over 4,500 boxes measured in terms of twenty foot equivalent units (TEUs).[12] The *Regina Maersk*, the first 6,000+ TEU containership, was delivered in early 1996,

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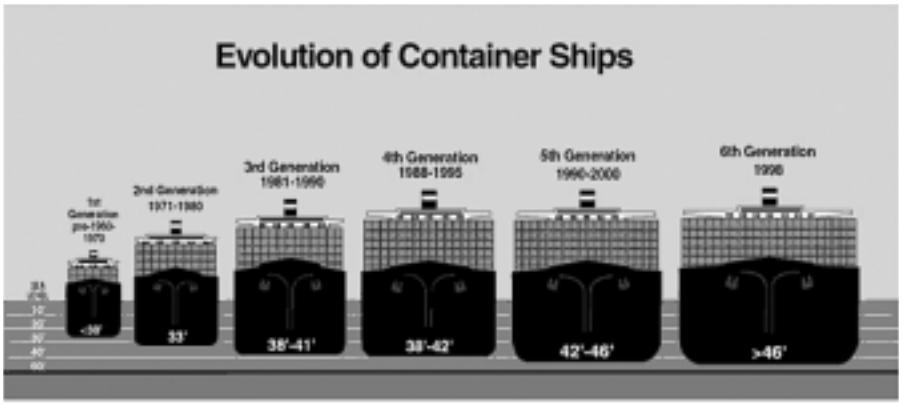
[9]In this regard, see the December 3, 1993 letter to President Clinton from the American Association of Port Authorities and thirty other groups concerned with maritime transportation noting that many U.S. export commodities "face tough competition around the world, [and] even marginal transportation cost increases affect their marketability and, consequently, the nation's balance of trade." The letter continues, "It is clear that dredging, whether to maintain existing depths or to deepen channels to meet the demands of the next generation of ocean carriers, is as essential to our nation's commerce as maintaining and improving our highways and railroads." Text reproduced in House Comm. on Merchant Marine and Fisheries, Subcomm. on Oceanography, 103d Cong., The Federal Dredge Permitting Process and its Effect on Ports of the Gulf Coast Region 83-85 (Comm. Print 1994).

[10]On the advent and development of containerization in world shipping see Gerhardt Muller, Intermodal Freight Transportation 25-28 (4th ed. 1999). See also U.S. Department of Transportation, Office of Intermodalism, The Impacts of Changes in Ship Design on Transportation Infrastructure and Operations (February 1998) available online at <ntl.bts.gov/ruraltransport/subjects/display.cfm?sub=Aa7&cat=17>. This study cites estimates that by 2010, some 90% of all liner cargoes will be containerized. Id. at 1.

[11]"Clearly, the primary factor influencing the movement toward larger ships is that they offer lower transportation costs." National Research Council, Marine Board, Dredging Coastal Ports 31 (1985). Using larger ships means that that fewer are required and their construction costs are lower per TEU capacity than those of smaller ships. Office of Intermodalism, supra at 3. A study done for the Texas Department of Transportation does note the phenomenon of "diseconomies of scale" beyond some points, and cites the example of the growth of oil tankers in the period of the 1950s-1970s. Robert Harrison, Miguel A. Figliozzi, & C. Michael Walton, Mega-Containerships and Mega-Containerports in the Gulf of Mexico: A Literature Review and Annotated Bibliography 13 (2d rev. 2000) (Research Rep. No. 1833-1), online at <www.utexas.edu/research/ctr/pdf_reports/1833-1.pdf>.

[12]U.S. Department of Transportation, An Assessment of the U.S. Marine Transportation System: A Report to Congress 27 (1999), notes that in 1999, 40 % of the containerships on order were in the mega-containership category. According to the U.S. Maritime Administration, as of July 2000, of the total 339 containerships on order world-wide, 148 had over 4,000 TEU capacity and another 111 had capacities between 2,000 and 4,000 TEUs, accounting, respectively, for some 43.7% and 32.7% of all containerships on order. Department of Transportation, Maritime Administration, Maritime Statistics, available online at <www.marad.dot.gov/Marad_statistics/index.html>.

Figure 1.



source: U.S. Army Corps of Engineers

and in the period of 1997-1999 some thirty five new vessels were ordered with a TEU capacity ranging from 4,500 to 9,000 TEUs.[13] Ships on order now include what will be the two largest containerships in the world, with a capacity of 9,800 TEUs (for the China Shipping Group to be operated between Hong Kong and Los Angeles).[14] Industry sources suggest that in the near future ships with up to 12,000 TEU capacity will enter into service,[15] and DOT expects that, by 2010, almost one third of all general cargo tonnage will be transported on ships with more than 4,000 TEUs.[16]

But if larger vessels offer cost efficiencies for ship operators, they present new problems for port managers. As ships have become larger, they have acquired deeper drafts, demanding deeper water to accommodate their hulls. At the start of the twentieth century, navigational channels of thirty 30 feet in depth were sufficient to allow safe movement of almost all ships,[17] but this is no longer the case. Since the introduction of container carrying ships in the 1950s, six generations of such ships have evolved, with successively deeper drafts (Figure 1).[18] It is believed that the drafts of the mega-containerships

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[13]U.S. Department of Transportation, Maritime Administration, A Report to Congress on the Status of the Public Ports of the United States, 1996-1997 at 49, available online at <www.marad.dot.gov/publications/public_portshtm.htm> .

[14]Economist Intelligence Unit, China Shipping Group to Order World's Largest Container Ships, online at <www.chinaonline.com/issues/econ_n...rchive/secure/2001/January/C01010552.asp>.

[15]Baltic World Ports, Heavyweight Boxing, online at <www.thebaltic.com/supplements/World%20Ports/heavy.htm>.

[16]Office of Intermodalism, supra note 10, at 2.

[17]Sen. Comm. on Env't and Public Works, 99th Cong., Water Resources Development Act of 1985 at 8 (1985), S. Rep. No. 99-128, reprinted in 1985 U.S.C.C.A.N. 6639 (1985).

[18]See U.S. Army Corps of Engineers, Oakland Inner and Outer Harbors, Report on the Feasibility Study for Deep Draft Improvements Ch. 3 (1998 updated 2000), online at <www.50ftdredge.com/FS>.

Table 2. Water Depth for Selected U.S. Container Ports

Port	Channel Depth	Berth Depth	Container Port Ranking
Boston	40	45	23
New York/NewJersey	40	35-45	3
Philadelphia	40	40	21
Baltimore	50	36-42	13
Hampton Roads	50	36-45	7
Wilmington (NC)	40	40	22
Charleston	42	40	4
Savannah	42	42	11
Jacksonville	38	38	16
Everglades	47	37-44	12
Miami	42	42	8
Gulfport	36	36	18
New Orleans	36 & 45	35	14
Houston	40	38-40	9
Honolulu	45	40	26
Long Beach	76	35-50	1
Los Angeles	45	45	2
Oakland	42	35-42	6
Portland (OR)	40	40	15
Tacoma	40-50	40-50	10
Seattle	75	40-50	5

Source: U.S. Department of Transportation, Maritime Administration, A Report to Congress on the Status of the Public Ports of the United States, 1996-1997, online at <www.marad.dot.gov/publications/public_portshtm.htm> p. 50.

that will be coming online will not be greater than 14.5 meters, a figure that does not exceed the draft of the largest containerships now in service.[19] Mega-containership operations require a water depth of at least fifty feet in ship channels, turning basins, and ship berths.[20] According to the Maritime Administration, in 1997 only four of the ten major U.S. container ports that collectively loaded and unloaded almost eighty per cent of container traffic had channel and berthing areas deep enough in draft for fully laden mega-containerships.[21] (Table 2).

[19]Heavyweight Boxing, supra note 15. Harrison, Figliozzi and Walton maintain that most of the mega-containerships currently in operation and many that will be deployed in the future have a fully loaded draft of 46 feet. Designs for future ships as large as 15,000 TEUs will maintain a 46 foot draft as their capacity will result from an increase in length and width. Mega-Containerships, supra note 11, at 36.

[20]Id. at 45-47.

[21]U.S. Department of Transportation, Maritime Administration, A Report to Congress on the Status of the Public Ports of the United States, 1996-1997, online at <www.marad.dot.gov/publications/public-portshtml.htm>. It is interesting to note that channel depth alone does not necessarily correlate with cargo volume. Note that Boston and New York, with similar channel depths, are ranked 23 and 3 in container movements. Port locations in relation to transportation networks and population centers must also be understood.

It is not ship draft alone that must be considered in navigational dredging. Other factors, such as increased beam and windage, create maneuverability problems in narrow channels.[22]

A particular port's lack of the clearances needed by these larger, deeper draft vessels undercuts its potential for commercial success. To maximize their attraction for very large containerships, ports must be able to offer easy entrance and departure, the capacity to entertain such vessels even with full loads (high load factors), efficient loading and unloading, and ready access to other forms of transportation as part of the desired seamless network of intermodal carriage. For ship operators, fast turnaround time is essential, as any time lost at ports lessens the time that ships can move cargoes and generate revenues, frustrates the expectations of shippers regarding delivery, and generally raises questions about the reliability of service.

In this market, ports with channels or berthing facilities that do not provide needed clearance for these newer and larger vessels may be avoided altogether. Otherwise, they may be left to served only by smaller ships or those that are not fully loaded. In the port of Oakland, for example, deep draft vessels have had to key their arrival times to tidal schedules, and delays in unloading might then cost an additional 10.5-14 hours of waiting for the next high tide.[23] Such scenarios have serious implications for the port, for businesses dependent on maritime transportation, and, ultimately, for the consumer.

The needs of ports to accommodate larger vessels with deeper drafts, taken together with the natural process of sedimentation, create demands for the dredging of shipping lanes. As noted by a former DOT official, for ports "the competition to capture markets by having the deep channels required for mega-ships translates simply and inescapably into millions of tons of dredged materials."[24] The Environmental Protection Agency (EPA) estimates that the Corps of Engineers annually dredges and disposes of some 300 million cubic yards of material from navigation maintenance and improvement projects. To this figure must be added some 100 million cubic yards of material dredged by port authorities, terminal owners, marinas, and private individuals.[25]

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[22]On these problems, see William O. Gray et al., Channel Design and Vessel Maneuverability-Next Steps, online at <www.usna.edu/NAOE/channel/final.pdf>, and Jennifer K. Waters, Robert H. Mayer & David L. Kriebel, Shipping Trends Analysis (2000).

[23]Oakland Inner and Outer Harbors, supra note 18, at § 3.3.2.

[24]Stephen D. Van Beek, Keynote Address: The Maritime Transportation System, in Interagency Committee on Waterways Management, 1999 Marine Transp. Sys. Research and Dev. Coordination Conf. 7.

[25]U.S. Environmental Protection Agency, The Dredging Process in the United States: An Action Plan for Improvement," online at <www.epa.gov/OWOW/oceans/ndt/s2.html>.

In connection with maritime transportation, dredging is needed in three types of situations: to maintain present widths and depths by counteracting the natural redistribution of coastal sediments, to widen and deepen existing channels for access by new, larger vessels, and to create new port facilities where they have not existed before.

III
ENVIRONMENTAL ISSUES

Whatever the motivation, dredging is recognized as having the potential for significant environmental impacts. There are environmental effects of the dredging itself, that is, the picking up of sediments, and of the later disposal of those sediments. With respect to the dredging itself, a study done by the National Research Council has noted some general environmental perturbations that may occur, including:

- disruption of bottom living communities
- suspension of particulates in the water column
- modification of local circulation and sediment transport patterns
- increased salinity by channel deepening, salt water encroachment.[26]

Likewise, the disposal of dredged materials may also have important environmental implications such as

- burying bottom living communities,
- increasing water turbidity,
- modifying local circulation

Where the dredged materials are contaminated, there is also the risk of introducing toxic materials into marine food chains, posing human health hazards and damaging the potential for commercial and recreational fishing.

Indeed, a survey of the dredging policies of coastal states conducted by the National Oceanic and Atmospheric Administration (NOAA) found that the dredging issues most often raised were those of dredge material disposal and beneficial use. And these concerns were projected to grow in importance as the pressure to deepen navigation channels increases.[27]

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[26]National Research Council, Marine Board, Dredging Coastal Ports 124-128 (1985).

[27]Jennifer L. Lukens, 1 National Coastal Program Dredging Policies: An Analysis of State, Territory, & Commonwealth Policies Relating to Dredging & Dredged Material Management 15 (2000) (OCRM/CPD Coastal Mgmt. Program Policy Series, Tech. Doc. 00-02). According to the EPA, "virtually all ocean dumping occurring today is dredged material, sediments removed from the bottom of waterbodies in order to maintain navigation channels and berthing areas." Office of Water, Ocean Dumping Program Update, EPA 842-F-96-002 (1996) online at <www.epa.gov/owow/OCPD/oceans/update2.html>.

Environmental change occurs both at the site of the dredging and where dredged materials are placed, as biological systems respond to a changed environment. Understanding the nature of these changes depends on basic research concerning relevant processes as well as on monitoring of ongoing dredging activities. Physical and chemical changes precede biological alterations. The latter receive most attention in management.

Physical changes include those to water flow, bottom morphology and sediment characteristics, turbidity, and light penetration.[28] Removal of sediments from the bottom results in the inevitable loss of sediments into the water and, in some settings, a plume of material extends 500 meters or more beyond where the dredge is working.[29] Within 300 meters of the dredge, suspended sediment concentrations can be up to 400 times background levels, while at distances greater than 300 meters, the concentration could be five times normal background. The sediments suspended by the dredge block light penetration and settle in areas remote from the dredging operations. Inevitably, channel deepening alters the flow of water and the bottom conditions under which sedimentation takes place.

At the disposal location, many of these processes repeat themselves. Release of the dredged material as a slurry from a pipe, or as bulk material from a barge or ship, results in substantial deposition of material directly to the bottom and the creation of a plume of finer sediments that moves some distance from the deposit site. On the basis of the literature, Kennish finds that typically less than five per cent of the volume of sediment discharged from a vessel disperses away from the disposal site.[30] In the plume, light penetration will be limited. Dumping also changes bottom morphology, producing elevation changes that can reach two meters or more.

Hydrology and bottom morphology have been used to select sites for specific physical characteristics at open water disposal sites. Retentive sites intended for contaminated sediments ought to have low energy environments that result in little transport.[31] In cases where erosion is possible, caps of clean sediments 0.5 meters or more in thickness can be applied. However, as Kennish notes, storms or other processes may move the sediments, and, even when they stay in place, a cap may not succeed as an impenetrable barrier. Conversely, dispersive sites are apt when there is a specific intent of subsequent sediment transport.[32]

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[28]Michael J. Kennish, Ecology of Estuaries: Anthropogenic Effects 357-397 (1991); Michael J. Kennish, Practical Handbook of Estuarine and Marine Pollution 447-477 (1997); and C.M.G. Vivian and L.A. Murray, Pollution, Solids in Encyclopedia of Ocean Sciences 2236-2241 (J.H. Steele, S.A. Thorpe, & K.K. Turekian, eds. 2001).

[29]Id. at 2236-2241.

[30]Practical Handbook, supra note 28, at 452.

[31]Ecology of Estuaries, supra note 28, at 367-368.

[32]Id. at 367.

Chemical analyses of sediments, adjacent waters, and suspended particles provide one means of identifying potential impacts. Naturally occurring or anthropogenically enhanced levels of metals, hydrocarbons, synthetic organics, or nutrients among other materials may come into contact with organisms at greater frequency due to the dredging or disposal operations. In chemical terms, contamination may be considered as the occurrence of a material in the sediments or water at levels above what would be encountered normally.[33] Contaminated sediments consist of chemicals that sorb to fine grained particles and include trace metals, hydrophobic organics, and aromatic hydrocarbons among others.[34] As will be discussed below, these sediments are considered toxic when they affect living organisms.

Dredging and disposal can release contaminants into the water column.[35] Hence, chemical characterization of dredged material is important in management and may be accomplished in several ways. A bulk chemical analysis identifies contaminants present in the sediment, and leaching can provide information on the chemical state of materials associated with sediments. The elutriate tests assess the amount released to the aqueous phase. Considerable analytical effort is devoted to sediment sorption and exchange capacities as well as the partitioning of contaminants between solid and liquid phases to better determine the fate of the contaminants as dredging and disposal takes place. Even nutrients can be released and ambient levels can be increased 50 to 100 times, which raises the potential for eutrophication.[36]

Ultimately, dredging and disposal result in biological impacts due to changes in physical and chemical properties of the water column and sediments. Organisms encounter these changed properties. Organisms directly in the path of the dredging equipment are unlikely to survive and as a result the abundance, taxa, and biomass of species in the benthos[37] decline immediately following dredging. Recovery through ecological succession follows for periods ranging from months to up to a decade, depending on bottom

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[33]R.B. Clark, Marine Pollution 7 (1989).

[34]National Research Council, Contaminated Sediments in Ports and Waterways: Cleanup Strategies and Technologies 23-24 (1997).

[35]Ecology of Estuaries, supra note 28, at 378-380.

[36]Id. at 380. "Eutrophication is a condition in an aquatic ecosystem where high nutrient concentrations stimulate blooms of algae (e.g., phytoplankton) . . . . [Waters in a eutrophic state are] extremely rich in nutrients, with high biological productivity. Some species may be choked out." U.S. Environmental Protection Agency, Mid-Atlantic Integrated Assessment, Issues: Eutrophication, available at <http://www.epa.gov/maia/html/eutroph.html>.

[37]The benthos is the community of organisms that live in or on the bottom. Benthic animals include clams, amphipods, polychaetes, and isopods. These macroinvertebrates are used as biological indicators because they are reliable and sensitive indicators of habitat quality in aquatic environments. Chesapeake Bay Info. Mgmt. Sys., The Chesapeake Bay Program: Benthos, available at <http://www.chesapeakebay.net/benthos.htm>.

conditions and the organisms in question.[38] Estuarine environments with fine mobile deposits experience frequent disturbance and rapid recolonization, with reported recovery rates of six to eight months.[39] In contrast, sands and gravels require two years or more. Complex slow-growing systems, like reefs, require five to ten years for recovery.

Habitat alterations in addition to the direct removal of sediments and organisms include the impacts of the turbidity plumes, both in the water column and on the bottom as settling takes place. Thus, even at a distance from the dredging or disposal operation, the plume affects water quality and ultimately settles on bottom organisms. Loss of light penetration affects seagrasses that depend on photosynthesis. Organism life cycle may be disrupted in a variety of ways. For example, the settling of sediments on winter flounder eggs may affect their viability. This is all in addition to direct burial of the existing benthos at the disposal site itself.

The interaction of contaminants with living organisms may result in mortality, behavioral change, bioaccumulation, and biomagnification, among other alterations. It is important for the analysis of environmental change that these processes be understood. Because multiple contaminants are invariably present and may be located in the water column, suspended particles, pore waters, and sediments, establishing cause and effect is problematic at best. Benthic communities have the greatest risk, but organisms in the water column can also be affected.

IV
DREDGING POLICY FRAMEWORK

A. Introduction

By their very nature, ports are located where land and water meet, and are often situated in the midst of environmentally sensitive areas such as wetlands and estuaries, areas of great importance to wildlife and fisheries, as well as to recreational and other human activities. Clearly, the coastal water environment merits environmental protection. At the same time**,** the costs of dredging operations can be substantial and, further, may rapidly and significantly increase as a consequence of requirements for environmental protection and mitigation. While the need for some dredging and dredge material

[38]R.C. Newell, L.J. Seiderer & D.R. Hitchcock, The Impact of Dredging Works in Coastal Waters: A review of the Sensitivity to Disturbance and Subsequent Recovery of Biological Resources on the Sea Bed," 36 Oceanography and Marine Biology: an Annual Review 127, 138-140 (1998).

[39]Id. at 161-165.

disposal may be understood, there is also a need to safeguard the ocean environment. In this context, dredging, and more particularly dredge disposal, has become a major source of conflict among coastal/ocean users, environmental groups, local communities, and those associated with the maritime industries. Major questions include how:

- statutory and regulatory provisions should address problems of conflict of use and environmental impacts;
- the costs of dredging should be shared;
- science should be incorporated into decision making; and
- public participation should be structured and made effective.

While there are a number of federal, state, and even local laws and permit processes in place, their administration has been marked by delay and uncertainty. Difficulties associated with the issues noted above have created a time consuming and costly nightmare for ports seeking to undertake dredging activities, without necessarily leading to results pleasing to those with concerns over the impacts of dredging projects on the environment or other ocean/coastal uses.

Over time, the context in which dredging decisions are made has been altered as increased capabilities in assessing changes in, and impacts of, toxins in dredged materials have been developed, as greater understanding of the workings of natural ecosystems has emerged, and as the comprehension of the consequences of change in ecosystem variables for both the health of the ecosystem and the potential for human use has continued to increase.[40] Not surprisingly, these developments and the growing interest in environmental and quality of life issues have been reflected in the changed political milieu, legislation, rules, and procedures that collectively provide the public policy framework in which dredging decisions are made.

Clearly, there has been a change in the perceptual framework in which dredging decisions are made to the effect that environmental protection has been given enhanced consideration. There is also evident a widening circle of individuals and groups who see themselves as stakeholders. Not surprisingly, they may seek to influence decisions about dredge disposal to suit their own values or purposes. Yet, from the perspective of contemporary

[40]See, e.g., Wayne Munns, Jr., et al., Toxicity Testing, Risk Assessment, and Options for Dredged Material Management, 44 Marine Pollution Bull. 294 (2002); Kay T. Ho, et al., An Overview of Toxicant Identification in Sediments and Dredged Materials, 44 Marine Pollution Bull. 286 (2002); and Peter M. Chapman, et al., Issues in Sediment Toxicity and Ecological Risk Assessment, 44 Marine Pollution Bull. 271 (2002).

maritime transportation systems, the need for dredging remains a matter of substantial importance.[41]

B. Six Relevant Statutes

The American experience under the Articles of Confederation was marked by severe regional trade rivalries and discriminatory measures by one state against another. It is not surprising then, that the framers of the new constitution included a provision that gave to the Congress of the United States control over interstate and foreign trade.[42]

Because of the role ports play as an essential element of the basic infrastructure needed to service trade and, thus, to expand the national economy and tie the country together, influential figures such as Hamilton and Jay championed public expenditures for the improvement of ports and waterways as well as other transportation facilities.[43] Historically, pressure from farmers on Congress for waterway improvements was to be especially strong, given their concern for getting their produce to markets. But waterways and port facilities would also serve industrial interests, making it possible to link resources, factories, and markets. And the American experience in two world wars made clear the national security benefits of water borne transportation facilities.[44] Concern with preventing regional favoritism, however, resulted in the adoption of a constitutional provision that continues to have ramifications for contemporary U.S. port policy, making more difficult the development of a rational federal port policy. Article I, section 9 stipulates that:

> No Preference shall be given by any Regulation of Commerce or Revenue to the Ports of one State over those of another; nor shall Vessels bound to, or from, one State, be obliged to enter, clear or pay Duties in another.

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[41]James Capo, President of the New York Shipping Association has testified that dredging "is a fundamental requirement for preserving America's place in the global economy." H. Comm. on Merchant Marine and Fisheries, Subcomm. on Merchant Marine, 103d Cong., Dredging and its Impact 32 (Comm. Rep. 1989). According to John Loftus, Seaport Director, Toledo-Lucas County Port Authority, for Great Lakes ports, dredging "is not just a matter of competitiveness, it is a matter of survival." Id. at 66. For consideration of the actual constraints of a failure to dredge on the movement of container vessels into and out of the port of Oakland, see the testimony of Gene Pentimonti, Vice President, American President Lines, Id. at 27-29.

[42]"The Congress shall have the power to . . . regulate Commerce with foreign Nations, and among the several States . . . ." U.S. Const., art I, § 8, cl. 3.

[43]William J. Hull & Robert W. Hull, The Origin and Development of the Waterways Policy of the United States 9-12 (1967). For an examination of the constitutional basis of federal support for navigational dredging, see Alan L. Blume, A Proposal for Funding Port Dredging to Improve the Efficiency of the Nation's Marine Transportation System, 33 J. Mar. Law & Com. 40 (2002).

[44]Hull & Hull, supra at 33-39.

However, the Port Preference Clause has not barred Congress from authorizing specific navigational projects, including dredging, that incidentally benefit a particular port or group of ports while exercising its power to regulate interstate commerce.[45]

Authority to undertake navigation projects on behalf of the United States was granted to the Corps of Engineers in 1824,[46] and in 1899 Congress, in the Rivers and Harbors Act, made it unlawful to undertake any modifications of navigable water channels unless authorized by the Secretary of War on the recommendation of the Corps of Engineers.[47] With the passage of this legislation, the Corps, already recognized as having *operational* responsibility for dredging and public works, was now also given *regulatory* authority over dredging and filling of navigable waters.[48] This latter, congressionally granted authority was to be exercised for many years in an atmosphere in which the view prevailing was that natural resources and the environment existed for the purpose of human exploitation. Economic development was the basic, unmitigated theme in the nineteenth and much of the twentieth centuries, and port and waterway development and their consequent dredging were but manifestations of that concern. The close relationship between the Corps and congressional interests pursuing projects (some would say "pork") for their districts led some observers to see the Corps as the "construction and engineering arm of the U.S. Congress."[49]

But, as noted in a self-written history of the Corps Engineers, with the 1960s, an increasingly urbanized and educated society gave more attention to recreation, environmental protection, and water quality relative to irrigation, navigation, or flood control, traditional concerns of the Corps.[50] These new concerns led to rising opposition to water projects and to the adoption of a variety of legislative acts that would affect the port and navigational channel dredging process. This legislation includes, but is not limited to the:

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[45]For an examination of the relationship of the commerce and port preference clauses of the Constitution and the relevant case law of the U.S. Supreme Court, see Blume, supra note 43, at 47-61. Blume concludes that "Proving action by Congress violates the port preference [provision] requires showing that the preference created was not merely incidental to the legitimate exercise of the commerce power, and that its effect was discrimination against all of the ports of one state in favor of all of the ports of another." He further notes that "The port preference clause has never been used by the judiciary to hold an act of Congress unconstitutional." Id at 54.

[46]General Survey Act of 1824.

[47]Rivers and Harbors Act of 1899, P.L. 55-525; 30 Stat. 1151.

[48]NRC, New Directions for Water Resources Planning for the U.S. Army Corps of Engineers 11 (1999), online at <www.nap.edu/openbook/0309060974/html>.

[49]Id. at 15-16.

[50]Martin Reuss & Charles Hendricks, U.S. Army Corps of Engineers: Brief History Ch. 9 at 5-6, online at <www.hq.usace.army.mil/history/brief.htm>.

- Fish and Wildlife Coordination Act (1958)
- National Environmental Policy Act (1969)
- Marine Research, Protection and Sanctuaries Act (1972)
- Federal Water Pollution Control Act (1972)
- Coastal Zone Management Act (1972)
- Sustainable Fisheries Act (1996)

1. The Fish and Wildlife Coordination Act of 1958[51]

The purpose of this legislation is to provide for the effective integration of fish and wildlife concerns with Federal water-resource developments. Dredging activities can adversely affect wetlands, the spawning and nursery areas of fish, and those where waterfowl nest and feed. While acknowledging the economic importance of water projects, this act directs that wildlife conservation "receive equal consideration and be coordinated with other features of water-resource development programs" through effective planning and coordination.[52] In particular, the act mandates that whenever channel deepening or diversion is proposed or authorized by any part of the United States government, for any purpose including navigation, the proposing or licensing agency is first to consult with the Department of the Interior's Fish and Wildlife Service (FWS) and with the relevant state agency with wildlife responsibilities.[53] Subsequently, and in the wake of reorganization, this requirement was amended to include consultation with the National Marine Fisheries Service (NMFS).

These agencies, in turn, were to consider possible damage to wildlife resources resulting from projects and to determine means to minimize such damage. While the comments of FWS and NMFS are advisory in nature, the legislation specifically indicates that the views of these agencies are to be given "full consideration" before project decisions are made and, further, that project plans "shall include such justifiable means and measures for wildlife purposes as the reporting agency finds should be adopted to obtain maximum overall project benefits."[54] Moreover, the reports and recommendations of the FWS, NMFS, and state agencies are to be made "an integral part" of any report made to Congress by any federal agency responsible for engineering surveys or construction.[55]

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[51]Pub. L. No. 85-624, 72 Stat. 563 (1958) (codified as amended at 16 U.S.C. 661-666c (1988 & Supp. V 1993)).

[52]Fish and Wildlife Coordination Act, P.L. No. 85-624 (1958), § 2.

[53]Id. § 2(a).

[54]Id. § 2(a)(b).

[55]Id. § 2(b).

2. The National Environmental Policy Act (NEPA) of 1969[56]

This legislation, concerned with minimizing the harmful effects of human activities on the natural environment, has had profound effect on the operation of departments and agencies throughout the federal government. The act directs that, to the "fullest extent possible", policies, regulations and the public laws of the United States "shall be interpreted and administered in accordance with the policies set forth in this Act."[57] NEPA is best known for the establishment of a requirement for a detailed environmental impact statement (EIS) "in every recommendation or report on proposals for legislation and other major Federal actions significant affecting the quality of the human environment . . . . "[58] Among other things, the EIS is to consider environmental impacts and adverse effects of proposed actions as well as alternatives to the proposed action. The act establishes requirements for federal inter-agency consultations, allows for comments by state and local agencies and directs that the EIS "shall accompany the proposal through the existing agency review processes."[59] Of specific significance to the Corps of Engineers in the process of its evaluation of proposed dredging operations is the provision that federal agencies are to develop methods and procedures to insure that "presently unquantifiable environmental amenities and values may be given appropriate considerations in decisionmaking along with economic and technical considerations."[60]

3. The Marine Protection Research, and Sanctuaries Act (MPRSA) of 1972[61]

Adoption of the MPRSA was triggered by a 1970 message to Congress by President Nixon and a subsequent report by the Council of Environment Quality in the same year. In his statement to Congress, which reflected a new perspective on ocean dumping, the president observed that:

> We are only beginning to find out the ecological effects of ocean dumping and current disposal technology is not adequate to handle wastes of the volume now being produced. Comprehensive new approaches are necessary if we are to manage this problem expeditiously and wisely.[62]

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[56]Pub. L. No. 91-190, 83 Stat. 852 (1970) (current version at 42 U.S.C. 4321-4332(2)(c) (1988 & Supp. V 1993)).

[57]National Environmental Policy Act, P.L. 91-190 (January 1, 1970), § 102.

[58]Id.

[59]Id. § 102(A).

[60]Id. § 102(B).

[61]Pub. L. 92-532, 86 Stat. 1061 (current version at 16) U.S.C. §§ 1431-1447f.

[62]The text of President Nixon's Message on Waste Disposal to Congress, April 15, 1970, is reproduced in Council on Environmental Quality, Ocean Dumping: A National Policy (1970) at 43-44.

In his message, the President called for a comprehensive study on ocean dumping and the Council on Environmental Quality delivered that report in October 1970. That report noted that, by weight, some eighty per cent of all ocean dumping involved dredged material (then still termed "dredge spoils") and estimated that one third of that material was polluted.[63] Further noted was the lack of a legislative basis for regulation of dredge disposal beyond the territorial sea and that whatever authority did exist failed to provide a role for agencies concerned with environmental protection.[64] In its recommendations, the CEQ called for the newly established EPA to be given regulatory authority over ocean dumping and to be empowered to issue required permits for transportation and dumping of all materials into oceans and estuaries.[65] This recommendation was endorsed by President Nixon.[66]

The dominant role proposed for the EPA in ocean dumping, however, was strongly opposed by port and ship operator interests, who feared excessive delays in navigational projects.[67] The American Association of Port Authorities opposed any transfer of authority from the Corps of Engineers to the EPA, asserting that dredging activities should be seen as engineering or planning matters.[68] The American Institute of Merchant Shipping, a trade group of more than thirty U.S. ship-operating companies indicated that it was "unalterably opposed" to any transfer of dredge permit authority from the Secretary of the Army and the Corps to EPA. Necessary dredging, it was said, would not be undertaken because EPA would not impartially and equitably evaluate all of the factors associated with waterway improvement. Environmental considerations, it was asserted, would outweigh all others and EPA would require dredged material to be transported for disposal far at

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[63]Id. at 3.

[64]The CEQ report notes "In general, the Corps has no power other than in internal navigable waters and in the territorial sea." and "Despite jurisdictional limitations, the Corps has occasionally concurred in ocean dumping outside the territorial seas when its direction was requested. For example, dumping areas have been established off Boston Harbor by the Corps, but with full recognition that authority was lacking…Often when the Corps receives a request to dump in areas beyond the territorial sea, it simply issues a letter of no objection." Id. at 30-31.

[65]Id. at v-vi, 31-33. The EPA was established by President Nixon under Reorganization Plan No. 3 of 1970 (July 9, 1970) online at <www.epa.gov/history/org/origins/reorg.htm>.

[66]See President of the United States, Special Message of the President to Congress Proposing the 1971 Environmental Program, February 8, 1971, online at <www.nixonfoundation.org/Research_Center/PublicPapers.cfm>. In this statement the President called for legislation that "will require a permit from the Administrator of the Environmental Protection Agency for any materials to be dumped into the oceans, estuaries, or Great Lakes and that will authorize the Administrator to ban dumping of wastes which are dangerous to the marine ecosystem."

[67]H. Comm. on Merchant Marine and Fisheries, Subcomm. on Fisheries and Wildlife Conservation and Subcomm. on Oceanography, 92nd Cong., Ocean Dumping of Waste Material, 339, 471-473 (Comm. Rep. 1971).

[68]Id. at 335-345 and Sen. Comm. on Commerce, Subcomm. on Oceans and Atmosphere, 92nd Cong., Ocean Waste Disposal 292-299 (1971).

sea—or to inland locations—substantially increasing costs and thus undercutting economic justification.[69] Interestingly, an official of the Council of Environmental Quality turned this argument around, suggesting that EPA leadership was needed because then the Corps of Engineers, the polluting agent (or potentially polluting agent) would no longer be regulating itself, and the regulatory and developmental authorities would thus be separated, negating a conflict of interest.[70]

No doubt, the fears of the maritime industry were fed by the views of the EPA Administrator, William Ruckelshaus, who held that in administering its responsibilities under the proposed legislation, the EPA would be guided by "the ultimate objective of terminating all ocean dumping which is damaging to the marine environment."[71] According to Ruckelshaus:

> We would adopt a precautionary, preventive approach, aimed at terminating all dumping not clearly demonstrated to be safe. Ocean dumping of materials clearly identified as harmful would be stopped as soon as possible. Where existing information on the effects of ocean dumping of particular materials is inconclusive, yet the best indications are that such materials may create adverse conditions when dumped, the dumping of these materials would be phased out.[72]

Members of Congress were clearly wary of the implications of such views, and the House Merchant Marine and Fisheries Committee maintained that, until there were economically feasible alternatives for dredge material disposal, it would not allow arbitrary or unreasonable restrictions to be imposed on dredging activities essential for the maintenance of interstate and foreign trade.[73] Though the Nixon Administration favored legislation providing for EPA leadership on dredge disposal,[74] Congress decided other-

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[69]Ocean Dumping of Waste Material, supra note 67, at 357-366. In other testimony, the spokesman for the American Institute of Shipping observed that the Corps of Engineers has been concerned with keeping cost of waterway improvement and maintenance projects at a minimum, thus helping to achieve a favorable benefit-cost ratio so as to establish the economic justification of improvement projects. "We could not be sure that the Administrator of the EPA would give appropriate consideration to project cost factors in the event the authority to issue dumping permits is transferred from the Secretary of the Army and Chief of Engineers to the EPA Administrator." Ocean Waste Disposal, supra at 256.

[70]See the testimony of Gordon MacDonald, Member, Council on Environmental Quality, Id. at 144-156. MacDonald agreed with the characterization of Senator Hollings that not separating the regulatory and promotional aspects of dredging was tantamount to "putting the fox in the chicken coop."

[71]Ocean Dumping of Waste Material, supra note 67, at 392.

[72]Id. at 395.

[73]H. Comm. on Merchant Marine and Fisheries, 92nd Cong., Marine Protection, Research, and Sanctuaries Act of 1971 at 20, H. Rep. No. 92-361 (1971). Note in this regard the letter from EPA Administrator Ruckelshaus to House Speaker Carl Albert, which states that: "In most cases, feasible and economic land-based disposal methods are available for wastes currently being dumped in the ocean. In many cases, alternatives to ocean dumping can be applied positively for purposes such as land reclamation and recycling to recover valuable waste components." Id. at 30-31.

[74]H.R. 4723.

wise, leaving the Corps of Engineers with permit authority while making the Corps apply criteria established by EPA.[75]

As finally approved by Congress and signed into law, the MPRSA provides for the regulation of ocean dumping, research on ocean dumping, and the establishment of the marine sanctuaries program.[76] The premise of the legislation as it relates to dredge material disposal is in the finding that "Unregulated dumping of material into ocean waters endangers human health, welfare, and amenities, and the marine environment, ecological systems, and economic potentialities." The MPRSA clearly makes it the policy of the United States to "regulate the dumping of all types of materials into ocean waters and to prevent or strictly limit the dumping into ocean waters of any material which would adversely affect human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities."[77]

In accordance with Title I of this Act, the Secretary of the Army, after public notice and hearings, is authorized to issue permits for the transportation of dredged materials to be dumped in ocean waters if the Secretary determines that dumping "will not unreasonably degrade or endanger human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities."[78] In making his judgments, the Secretary is not only to consider the need for such dumping and alternative methods of dredge material disposal, but also to apply criteria developed by the EPA Administrator for assessing the effects of dumping. These criteria include considerations of the impact of dumping on marine organisms and ecosystems, the effect of dumping on alternate uses of dump sites, and the potential for designating dump sites in areas beyond the edge of continental shelves.[79]

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[75]According to the Report of the House Merchant Marine and Fisheries Committee, the new bill, H.R. 9727, is "an improved version of the Administration bill, H.R. 4723." H. Rep., supra note 73, at 10-11. See H. Conf. Rep, 92nd Cong., Marine Protection, Research, and Sanctuaries Act of 1972, H. Rep. No. 92-1546 (1972). In approving the MPRSA, the Conference Committee stated that "It is expected that permit applications will be processed promptly and that there will be a minimum delay in agency review of these applications before a final decision has been made . . . to the greatest extent practicable, the permit review process will be consolidated to allow review and decision on all aspects of the proposed permit operations known at the time application is made by the proposed permittee. The permit review process was not designed, and is not intended to be used, as a bottleneck to prevent otherwise meritorious activities from being carried out." Id. at 16.

[76]P.L. 92-532 (1972). These subjects were addressed, respectively, in Titles I, II, and III of this Act. Title I has come to be known as the Ocean Dumping Act.

[77]Id. § 2.

[78]Id. § 103(a).

[79]Id. §§ 102(a), 103(a & b). Ocean dumping regulations promulgated pursuant to these statutory requirements are found in 40 C.F.R. 227. In spite of these requirements, it has been maintained by a former executive director of the Coast Alliance, an environmental group, that a "pro-dumping outlook has become institutionalized at the EPA and Army Corps of Engineers" and that non-dumping options were not seriously considered until the 1990s. Beth A. Millemann, Muddy Waters: The Toxic Wasteland Below America's Oceans, Coasts, Rivers and Lakes 30 (1999).

Prior to issuing permits, the Secretary of the Army is to notify the EPA Administrator, who, if he or she believes that the Secretary did not comply with EPA developed criteria can prevent the issuance of the needed permit by the Corps of Engineers.[80] In situations in which there does not appear to be an economically feasible method to dispose of dredge materials other than through dumping that is not compliant with the EPA criteria, the Secretary may request a waiver from the EPA Administrator. The waiver is to be granted within thirty days unless the Administrator determines that the dumping will cause "an unacceptably adverse impact on municipal water supplies, shell-fish beds, wildlife, fisheries (including spawning and breeding areas), or recreational areas . . . ."[81]

The EPA is also to be involved in site selection for dredge material disposal. While the Secretary of the Army may determine appropriate locations for dumping dredged material, he is "to the extent feasible" to utilize sites recommended by the EPA Administrator. Further, if the Secretary wants to utilize EPA designated "critical areas" as dump sites, he must obtain an EPA waiver.[82]

The MPRSA marked a major change in the regulation of dredging activities, a clear move away from the simple public-works approach to dredging that was implicit in the 1899 Rivers and Harbors Act. The MPRSA forces broader consideration of the effects of dredging activities, establishes a major role for the Environmental Protection Agency in dredge disposal, and specifically provides for public notice and hearings prior to permitting, making the regulatory process for such activities more open and complex than before.

4. The Federal Water Pollution Control Act of 1972[83]

This act, known generally as the Clean Water Act, is the principal legislation governing coastal water quality. Among other things, it establishes requirements for the disposal of dredged materials in the navigable waters of the United States. Under the terms of this act, the Secretary of the Army and the Corps of Engineers may issue permits for disposal at specified sites only after adequate public notice and opportunity for public comment.[84] Disposal sites are to be designated by the Secretary of the Army on the basis of criteria established by the Environmental Protection Administration.[85]

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[80]P.L. 92-532, section 103(c).

[81]Id. § 103(d).

[82]Id. §§ 102(c), 103(b, c, & d).

[83]Pub. L. No. 92-500, 86 Stat. 896 (1972) (codified as amended at 33 U.S.C. 1251-1376 (1988 & Supp. V 1993)).

[84]Id. § 404(a).

[85]Id. § 404(b).

The EPA, after public notice and hearings and consultations with the Secretary, can exercise, in effect, a dredging veto. If the EPA determines that dredge disposal in a particular area "will have unacceptable adverse effect on municipal water supplies, shellfish beds and fishery areas (including spawning and breeding areas), wildlife, or recreational areas," the agency can prohibit the designation of that area as a lawful dump site.[86]

5. The Coastal Zone Management Act (CZMA) of 1972[87]

The CZMA represents a significant departure from earlier legislation in its treatment of the coastal environment. Unlike previous legislative acts that were sectoral in nature, the CZMA takes a systemic approach, encouraging states to develop and implement comprehensive management programs "to achieve wise use of the land and water resources of the coastal zone giving full consideration to ecological, cultural, historic, and esthetic values as well as to needs for economic development."[88] As envisaged in the CZMA, the coastal zone encompasses coastal waters and adjacent shore lands, including salt marshes and wetlands, and extends three miles out to sea.[89] The CZMA does not require states to take any particular action but, rather, provides inducements in the form of federal funding, both for state efforts to develop coastal zone management plans and for their implementation, once they have been approved by the Secretary of Commerce.[90] This approval leads to a duty of consistency for federal agencies, which is most pertinent to decisions on dredging proposals.

To earn Federal approval of state coastal zone management plans, states must satisfy the conditions provided in the CZMA. States are to define permissible land and water uses within the coastal zone having a direct and significant impact on coastal waters, undertake an inventory of, and establish a designating process for, areas of particular concern, and develop as guidelines on the priority of uses in particular areas.[91] Before approving a state plan, the Secretary of Commerce must have allowed for the "full participa-

[86]Id. § 404(c).

[87]Pub. L. No. 92-582, 86 Stat 1280 (codified as amended at 16 U.S.C. §§ 1451, 1465.

[88]Id § 303.

[89]Id. § 304(a). The CZMA of 1972 refers to the seaward limit of the coastal zone as extending to the "outer limit of the United States territorial sea," which in 1972 was three nautical miles. To clarify the situation with the extension of the U.S. territorial sea to 12 miles in 1988, the CZMA when reauthorized in 1990 changed the wording of the definition of the coastal zone to indicate that the coastal zone extends only to the three-mile limit, with certain historic exceptions. P.L. 101-508, §6204, 104 Stat. 1388-302. See 16 U.S.C. § 1453 (1).

[90]CZMA §§ 305, 306 & 307.

[91]Id. § 305(b).

tion" of relevant federal agencies, state and local governments, regional organizations, port authorities, and other interested parties.[92]

Once the Secretary approves a state coastal zone management plan, federal consistency requirements take effect. Every federal agency conducting activities or undertaking any development project, including those involving dredging, affecting a state's coastal zone must act in a manner that is "to the maximum extent practicable, consistent with approved state management programs,"[93] and a federal consistency determination is to be made.[94] Further, the Act obliges applicants for federal licenses or permits to conduct activities that affect water or land uses in the coastal zone, such as dredging,[95] to provide to federal authorities state certification that proposed activity will be consistent with the approved state coastal management program. In the absence of such state certification and unless the state fails to act so that concurrence may be conclusively presumed, no federal license or permit is to be granted. The license or permit applicant, however, may appeal to the Secretary of Commerce, who may override a state inconsistency finding if he believes that the proposed activity is indeed consistent with the CZMA's objectives, or is otherwise needed for reasons of national security.[96]

Twenty-six of the thirty-four federally approved state coastal management programs have established processes (through the device of a memorandum of understanding) for periodic permit review that include meetings or other opportunities for comment. These are intended to ensure adequate coordination between the federal government and those of the states and consistency from state to state regarding dredging activities. Thirteen management programs have established joint permit application processes, and a number of states encourage or require pre-application consultations to ease the permit process.[97]

6. The Sustainable Fisheries Act of 1996[98]

This act, which reauthorizes and amends the Fisheries Conservation and Management Act, is significant for dredging because of its provisions for essential fisheries habitat. According to this act, "One of the greatest long-

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[92]Id. § 306(c)(1) and 307(b).

[93]Id. § 307(c)(1)(2). For an example of how consistency requirements may be used by coastal states to modify dredging projects of the U.S. Army Corps of Engineers, see Shamus Malone, Pennsylvania's Use of Interstate Consistency to Condition a Federal Dredging Activity in Conneaut Harbor, Ohio, 12 Biennial Coastal Zone Conf. (2001).

[94]Lukens, supra note 27, at 7.

[95]Id.

[96]CZMA, § 307(c)(3).

[97]Lukens, supra note 27, at. 7-8.

[98]P.L. 104-297, 110 Stat. 3559 (1996).

term threats to the viability of commercial and recreational fisheries is the continuing loss of marine, estuarine, and other aquatic habitats."[99] Essential fish habitat is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity"[100] and the Sustainable Fisheries Act requires federal agencies to consult with the Secretary of Commerce with respect to any action or proposed action authorized, funded, or undertaken that "may adversely affect" any identified essential fish habitat.[101]

The Sustainable Fisheries Act also specifically empowers the Regional Fisheries Councils (established under the original Fisheries and Conservation Management Act[102]) to comment and to make recommendations to the Secretary of Commerce and to any federal agency regarding any activity of any federal or state agency that the Regional Council believes may affect fishery habitat.[103] If the Commerce Secretary is informed by a Regional Fisheries Council or a federal or state agency of an action proposed or taken by a federal agency that would adversely affect any essential fish habitat, he is to recommend to that agency measures that could be taken to protect that habitat.[104] The Secretary's suggestions are not binding on other agencies, but if an agency's actions are inconsistent with the Secretary's recommendations, that agency must "explain its reasons for not following the recommendations."[105]

All of these laws have served to ensure consideration of a variety of issues associated with dredge material disposal and to assure a higher level of environmental protection. They introduce new substantive standards and considerations and they require new consultations: among units of the federal government, between federal and state governments, and with the interested public. Given growing recognition of the potential negative consequences of dredge material disposal, it appears appropriate that it be subject to adequately informed governmental oversight.

As noted by the General Accounting Office (GAO), however, it is very difficult to assess the impact of recommendations made to the Corps of Engineers by other federal agencies such as the EPA, FWS, and NMFS.[106] Based on its study of cases concerning wetlands, the GAO estimated that the

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[99]Id. § 101.

[100]Id. § 102(10).

[101]Id. § 110(b).

[102]Pub.L. No. 94-265, 90 Stat. 331 (1976).

[103]16 U.S.C. § 1855(b)(3).

[104]Id.

[105]Id.

[106]General Accounting Office, Wetlands: The Corps of Engineers' Administration of the Section 404 Program, GAO/RCED-88-110 (1988).

Corps issued permits over denial recommendations of other agencies in some thirty-seven per cent of the 111 cases (out of 1,419 applications) where denials had been requested. The GAO also found that the resource agencies lacked the capability to follow up on whether their recommendations were incorporated in permit requirements, and that such agencies rarely appealed decisions by district field offices of the Corps of Engineers.[107]

The resource agencies may suggest not only the denial of a permit, but also the modification of its conditions so as to reduce environmental impacts; such modifications may have significant effects on project costs.[108] The GAO did find that Corps districts generally accepted such suggestions when they were within the areas of expertise of the resource agencies (e.g., FWS recommendations concerned with habitat protection).[109] As for the EPA's "veto," it was employed only five times from 1972 to 1988,[110] but it may otherwise have been useful in the negotiation of permit requirements, as may have been the bleak prospect of a dispute between one of the resource agencies and the Corps.[111]

The resulting permitting process for dredging projects has been described by the Director of the Port of Houston as "working through the jungle of laws, rules, regulations, and agencies. The experience is one of redundant review and delay."[112] Why is this so? Problems with respect to dredging may be better understood if the policy process is viewed more broadly. (Figure 2) In that process, broad objectives, such as achieving higher levels of economic development and increasing participation in international trade, translate into the need for specific actions to encourage or enable activities such as port development or dredging. Congress, influenced by interest groups, constituencies, and executive agencies, adopts statutes that establish objectives and programs embodying general (and often vague, ambiguous or even conflicting) standards. The indefinite nature of these standards stems in part from political factors, such as the need to win support for, or to neutralize opposition to, the legislation. As well, Congress must balance different and conflicting public goals, such as economic development and environmental protection.

With the passage of legislation, the executive departments, which possess much more substantive expertise than does Congress, take responsibility for

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[107]Id. at 37, 41, 44, 48-50.

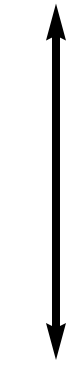
[108]By the late 1970s, the GAO, citing Corps of Engineers data, reported that addressing environmental considerations could increase dredging costs by 200 to 1000%. General Accounting Office, American Seaports-Changes Affecting Operations and Development, CED-80-8 at 14 (1979).

[109]Wetlands, supra note 106, at 46-47.

[110]Id. at 51.

[111]This point is stressed in a commentary to the GAO by the Department of Defense. See the letter of Robert W. Page, Assistant Secretary of the Army (Civil Works) to the GAO, Id. at 89.

Figure 2. The Policy Process



Element	Reflected in:
General policy decisions, setting broad objectives	Findings, objectives in laws passed by congress, as in MPRSA, Clean Water Act
Laws creating programs, general standards to promote broad objectives	Statutory language of public laws
Rules and regulations based on authority delegated to executive agencies through law	Rules and regulations adopted by administrative agencies, COE, EPA
Guidance documents for "end users," detailing procedures	"Green Book" and the Inland Testing Manual

carrying out the law, filling in the details and attempting to reconcile the inconsistencies. From an administrative rule making process emerge regulations and guidance documents that provide the particulars to those who are affected by the enabling legislation. In the case of dredging, the rules and guidance documents indicate, for example, how the necessary permits are to be obtained and what specific standards and expectations must be met.

But aside from the administrative decisions and actions that must be taken under the laws reviewed above, note must also be taken of the potential for involvement of the court system and citizen law suits in which citizen groups, independent of governmental agencies, take legal action against those believed to be in violation of laws and regulations that seek to protect the environment.[113] Lawsuits may be seen narrowly as a means of asserting and clarifying legal rights and obligations. Yet in the public policy arena they can play an important additional role: as a tool to increase transaction costs and, thereby, force the defendant party to make significant concessions as a price for avoiding protracted and costly litigation. The dredging policy framework, involving the interplay of multiple laws and agencies and the need to apply and meet a variety of general standards and procedures, provides numerous opportunities for the use of law suits to delay or put a halt to dredging activ-

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[112]H. Thomas Kornegay, Regulated's Perspective-Port of Houston Authority, in Bureau of Trade Statistics, Environmental Regulatory Process: Does it Work?: Dredging U.S. Ports 17, 20 (1994), available online at <nts.bts.gov/DOCS/DUP.html>.

[113]See Matthew D. Zinn, Policing Environmental Regulatory Enforcement: Cooperation, Capture and Citizen Suits," 21 Stan. Envtl. L. J. 81 (2002), and Ross Macfarlane & Lori Terry, Citizen Suits: Impacts on Permitting and Agency Enforcement, 11 Nat. Resources & Env't 20 (1997); Adam Babich, Citizen Suits: The Teeth in Public Participation, 25 Envtl. L. Rep. 10141-10151 (1995).

ities.[114] Kagan has detailed the phenomenon of "adversarial legalism" and the use of citizen suits to wring concessions from the port of Oakland in its long effort to deepen its navigational channels during the 1980s and 1990s.[115]

C. Who Pays for Dredging?

Cost is a major factor in all port and navigation dredging decisions. Questions for those fashioning public policy therefore include: how will costs of dredging be met and who will provide the extra funding for dredging and disposal that are environmentally sound? These two questions prompt a third: who benefits from dredging? Is it the ports themselves, the vessel operators, shippers, or the general public? Ports have long maintained that vessel operators have not fairly shared in the costs of port infrastructure investment despite the fact that they derive clear benefit from such investment. In fact, vessel operators, to their own advantage, have played one port against another.[116] The allocation of the costs of dredging activities has been an ongoing concern, and the continuing controversy contributes to the problems of American ports.[117]

Until 1986 the federal government paid the full costs of dredging necessary for the construction, maintenance, or deepening of navigational channels leading into ports; the costs of dredging berthing areas for ships, on the other hand, were left to the ports.[118] The Water Resources Development Act (WRDA) of 1986,[119] however, introduced cost sharing for construction projects, with local sponsors paying for between ten and fifty per cent, based on the depth of navigation channels. As channels were dredged deeper, the local

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[114]For a veritable handbook of ways environmental interests may challenge agency actions (or inactions) see Millemann, supra note 79.

[115]Robert A. Kagan, The Dredging Dilemma: Economic Development and Environmental Protection in Oakland Harbor, 19 Coastal Mgmt. 313 (1991); Dredging Oakland Harbor: Implications for Ocean Governance, 23 Ocean & Coastal Mgmt. 49 (1994); and Preface: Adversarial Legalism: Tamed or Still Wild?, 2 N.Y.U. J. Legis.& Pub. Pol'y 217 (1998/1999).

[116]Changes in Ship Design, supra note 10, at 21-22.

[117]A task force appointed during the second Clinton Adminstration by the Secretary of Transportation to study the marine transportation system (with membership from federal agencies, private sector organizations, and other stakeholders) reported that it was not possible to achieve a consensus on how to fund that system due to the different concerns and approaches of its members. Assessment, supra note 2, at 77-78. On funding problems associated with navigational dredging see Blume, supra note 43.

[118]Planning and Management Consultants, Ltd., The National Dredging Needs Study of Ports and Harbors-Implications to Cost-Sharing of Federal Deep Draft Navigation Projects Due to Changes in the Maritime Industry, submitted to U.S. Army Corps of Engineers at iv, 2 (2000).

[119]Pub. L. 99-662, 100 Stat. 4082 (1986).

share of cost increased.[120] The cost of maintenance dredging was left completely to the federal government except where the channel's depth exceeded forty-five feet; in such a case the local sponsor was responsible for half of the cost of dredging in excess of forty-five feet.[121]

This cost sharing, requiring contributions from non-federal interests, was seen as helping to ensure that only the most cost-effective projects moved forward and only after less expensive options were fully considered.[122] In its support for such an approach, the Congressional Budget Office, for example, asserted a view shared by the Reagan Administration that, in a situation in which the federal government assumed all costs, there was no disincentive to projects of questionable merit.[123] Costs to local governments and users would encourage more careful consideration of projects and, thus, more cost-efficient investment. Local government willingness to pay, it was said, would aid Congress in making better project investment decisions[124] and would also encourage local sponsors to keep costs down.[125]

Dredging is expensive, and debate continues about who should pay for it. In WRDA 1986, Congress recognized the difficulties that ports may face and authorized the non-federal contributor to institute harbor dues or fees on the basis of tonnage of cargo loaded or unloaded in that port and paid by the cargo owner. This Harbor Maintenance Tax could be imposed when the navigation project was completed, but the amounts collected could not exceed those necessary to fund the non-federal share of construction, operation, and maintenance costs of navigation project such as dredging.[126] The tax could be charged on cargo passing through the port, whether imported or export-

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[120]See 33 U.S.C. § 2211. According to this section, non-federal interests, during the construction period are to pay the following costs associated with general navigation features: 10% of construction costs of project portion with depth of less than 20 feet, 25% of costs for the portion deeper than 20 feet but no more than 45 feet, and 50% of costs for the portion deeper than 45 feet. Non-federal interests are also to pay 10% of the general navigation features cost over a period not to exceed 30 years.

[121]P.L. 99-662, § 101(b).

[122]Sen. Rep. No. 99-126, supra note 17, at 8-9.

[123]Congressional Budget Office, Efficient Investments in Water Resources: Issues and Options xv (1983). On the views of the Reagan Administration, see the testimony of Robert Dawson, Acting Assistant Secretary of the Army for Civil Works who held that cost sharing would help to promote sound investment decisions since local willingness to pay a substantial amount of the cost would attest to the project's economic feasibility. H. Comm. on Merchant Marine and Fisheries, 99th Cong., Port Development 28-29 (Comm. Rep. 1985).

[124]Congressional Budget Office, Efficient Investments in Water Resources 41, 44. A preliminary assessment of the effects of WRDA's cost sharing requirements has concluded that those requirements "had a significant negative effect on legislators' demands for local water projects." Alison F. DelRossi & Robert Inman, Changing the Price of Pork: The Impact of Local Cost Sharing on Legislators' Demands for Distributive Public Goods, 71 J. Pub. Economics 247, 250 (1999).

[125]National Research Council, New Directions in Water Resources Planning for the U.S. Army Corps of Engineers 1 (1999), Online through <www.nap.edu>.

[126]P.L. 99-662, § 208(a)(1).

ed, and would be equivalent to four cents per hundred dollars of value.[127] The legislation sought to align dredging costs with its benefits, providing that such harbor dues could not be levied on a vessel that could have used the waterway prior to the dredging and, with regard to widening or creating or enlarging turning basins, could be levied only those vessels of a size used to justify the project may be charged.[128]

But the attempt to fund navigational improvements by what might be seen as a user fee was soon challenged for constitutionality. The congressional view was that the Harbor Maintenance Tax was validated by the Constitution's Commerce Clause.[129] By a unanimous decision in 1998, however, the U.S. Supreme Court found the Harbor Maintenance Tax unconstitutional insofar as it was applied to exports because of the constitutional restriction that "No tax or Duty shall be laid on Articles exported from any State."[130] In the view of the Court, this clause does not forbid a "user fee" so long as that charge does not have the character of a "generally applicable tax and is, instead, a charge designed as compensation for government-supplied service."[131] In this instance, however, the Court found that the Harbor Maintenance Tax as imposed on the basis of cargo value (ad valorem) did not constitute "a fair approximation of services, facilities, or benefits furnished to the exporters" and, consequently, could not qualify as a user fee.[132]

Having reached this conclusion, the Court went on to make it clear that, while the Harbor Maintenance Tax as adopted by Congress violated the Constitution's Export Clause, that does not mean that exporters could not be subject to any user fee for the purpose of defraying harbor development and maintenance costs. Indeed, in its decision, the Court appeared to invite Congress to adopt an alternative scheme that would more directly relate fees to the use of port services by exporters.[133]

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[127]P.L. 99-662. Title XIV of this Act, referred to as the Harbor Maintenance Revenue Act of 1986, provides the details of how and against whom charges are levied. Id. § 1402. Collected revenues are to be placed in a Harbor Maintenance Trust Fund and are to be used in accordance with provisions in WRDA. Id. § 1403.

[128]Id. § 208(a)(3). According to a Senate report, the purpose of the fees is not to raise revenue but rather "to repay costs related directly to the servicing of commerce. These fees and taxes offset services rendered to vessels. The provision of a new, deeper channel is as much a service rendered to the shipper as pilotage, dockage, or wharfing." S. Rep. No. 99-126, supra note 17, at 7.

[129]P.L. 99-662 § 208(a) specifically refers to clause 3 of section 8 of Article I of the U.S. Constitution, which provides that Congress shall have the power "To regulate Commerce with foreign Nations, and among the several States . . . "

[130]United States v. United States Shoe Corp., 523 U.S. 360, 1998 AMC 1403 (1998). See U.S. Constitution, art. I, § 9, cl. 5.

[131]523 U.S. at 363, 1998 AMC at 1403.

[132]In this decision, the Court observed that the Harbor Maintenance Tax "is determined entirely on an ad valorem basis. The value of export cargo, however, does not correlate reliably with the federal harbor services used or usable by the exporter." Id. at 369, 1998 AMC at 1408.

[133]See id.

The decision of the Supreme Court in *United States Shoe Corp.* led to the suspension of fee collection against exporters, and caused the Clinton Administration and Congress to seek funding mechanisms that would accord with the Supreme Court's decision. The following year, legislation was introduced calling for the establishment of a Harbor Services Fund and for charges in aid of that fund structured to link them with port services to commercial vessels, thus, qualifying them as permissible user fees.[134] These fees would be deposited in the Harbor Services Fund, and the monies would be utilized to pay for eligible harbor development, operation and maintenance of commercial navigation of U.S. ports, and maintaining dredging capability.[135] In this way, what was proposed in the Harbor Maintenance Revenue Act of 1986, to shift the cost of dredging from the taxpayer to the immediate consumer of dredging's benefits, would have been accomplished had the proposal for a Harbor Services Fund been adopted by Congress.

An important factor that contributes to the cost of dredging is the matter of the appropriate disposal of dredged materials. Whether contaminated or not, disposal of dredged materials in a way that is at least environmentally sound and even beneficial usually adds to the cost of dredging operations. WRDA 1992 addressed this matter by authorizing the federal government to provide seventy-five per cent of the incremental cost of beneficial disposal if "the environmental, economic, and social benefits of the project, both monetary and nonmonetary, justify the cost thereof."[136] Unfortunately, the authorization for such expenditure was limited to $15 million annually.[137]

WRDA 1996 amended WRDA 1992 in an apparent effort to encourage beneficial use of dredged materials. It provided that, for a navigation project involving dredged material disposal, the Secretary of the Army, with the consent of the non-federal interest, may select a means of disposal other than the least expensive if he determines that the additional costs of such disposal are reasonable relative to the environmental benefits, including benefits derived from the creation of wetlands or from efforts to control shoreline erosion.[138] The federal share of incremental disposal costs remained at the seventy-per cent level.

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[134]H.R. 1947 introduced May 26, 1999. (106th Cong., 1st session).

[135]H.R. 1947 § 3(b). According to section 2 of the bill, the aggregate amount of fees imposed under this legislation is to be "sufficient to pay the projected total expenditures of the Department of the Army, subject to appropriations, for harbor development, operation, and maintenance for a fiscal year. If amounts appropriated in any fiscal year are less than the amount collected in fees for the prior fiscal year, then the rate of the fee for each vessel category shall be reduced in the year of the appropriation so as to result in collections not exceeding the total amount appropriated from the Harbor Services Fund for that fiscal year." Note that expenditures from the Harbor Services Fund are subject to congressional appropriations and, thus, are not automatically available for use.

[136]P.L. 102-580 § 204, 106 Stat. 4797 (1992). See U.S.C. § 2326.

[137]Id. § 204(e).

Approaching differently the matter of costs and cost recovery for dredge material disposal, WRDA 2000 provides an option for the Secretary of the Army to establish a program for the direct marketing of dredge material to both government agencies and private parties, with resulting revenues going to the U.S. Treasury. This program, however, is to be created only if the Secretary determines that it is "in the interest of the United States and is economically justified, equitable, and environmentally acceptable."[139]

D. Regulatory Approaches to Assessment of Contaminated Sediments

An important aspect of the dredging problem is the concern that dredged materials may be contaminated with substances dangerous to the health of the environment and humanity. This section examines how federal guidance documents have been structured to respond to law and regulation while protecting the environment.

Ultimately the administrative process must convert legislative intent to regulatory practice, specific guidance, and individual technical decisions. The involvement of two agencies with different traditions and interests further complicates this process because environmental protection and transportation development intersect at each of the successive steps from fashioning regulations to applying technical decisions. In addition, two principal laws both govern aquatic disposal, depending mostly on the distance from shore for the planned activity. The definition and management of contaminated sediments is embedded in this process and constitute the central issues that all urban port dredging activities must face.

Ambiguities in law, in agency responsibility, and in criteria and standards can result in a complex and time-consuming process. Indeed, uncertainties may be exploited by opposing interests. To clarify the current status of the criteria, both the regulatory framework and the original guidance manual are described below.

The potential impacts to humans and biota from contaminated sediments are considered significant.[140] They are "hazards" in the sense that there is a possibility of damage from them, and they may be "risks" if, through testing, the probability of damage may be assigned.[141] For toxicologists, sediments are toxic when adverse responses result from specific tests.[142] Hence toxicity is a biological response that is measured directly. Recently the EPA

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[138]P.L. 104-303 § 207, 110 Stat. 3658 (1996).

[139]P.L. 106-541 § 215, 114 Stat. 2572 (2000).

[140]National Research Council, Contaminated Marine Sediments: Assessment and Remediation (1989).

[141]Peter M. Chapman, K.T. Ho, W.R. Munns, K. Solomon, & M.P. Weinstein, Issues in Sediment Toxicity and Ecological Risk Assessment, 44 Marine Pollution Bull. 271, 272 (2002).

Table 3. Laws, Regulations. and Guidance Documents

Law	Key Regulations	Guidance
MPRSA		
Section 102	**40 CFR 220-229**	**"Green Book" (1991)** • Most responsive to prohibited contaminants (227.6) and placement of dredged materials (227.13)
Clean Water Act		
Section 404	**40 CFR 230-232**	**Inland Testing Manual (1998)** • Most responsive to site selection (230) and definitions (232)

estimated that ten per cent by volume of the sediment that underlies the nation's waters is sufficiently contaminated to pose a risk.[143] Those risks are directly to fish, and indirectly to humans and wildlife that eat the fish. The EPA also estimated that annually 3-12 million cubic yards of the approximately 300 million cubic yards of dredged sediments are also contaminated to a level requiring special handling.[144]

Key regulations under the Marine Protection Research and Sanctuaries Act[145] and the Clean Water Act[146] trigger guidance documents that specify the means to make individual technical decisions. The "Green Book" covers evaluation of material proposed for ocean disposal under the MPRSA.[147] It focuses on contaminant evaluation as indicated in sections of the regulations that address prohibited contaminants[148] and placement of dredged materials.[149]

The Inland Testing Manual (ITM) provides guidance for implementation of section 404 of the Clean Water Act for the disposal of dredged material into waters of the United States.[150] These waters include the territorial sea and waters landward of the baseline of the territorial sea. The ITM focuses on impacts that are related to contaminants associated with dredged materi-

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[142]Id.

[143]Environmental Protection Agency, Office of Water, EPA's Contaminated Sediment Management Strategy, EPA-823-R-98-001 (1998) <www.epa.gov/ost/cs/strategy.pdf>. See the foreword of this document.

[144]This amounts to 1% to 4% of the annually dredged material.

[145]40 C.F.R. §§ 220-229.

[146]Id. at §§ 230-232.

[147]Environmental Protection Agency, Office of Water, Evaluation of Dredged Material Proposed for Ocean Disposal-Testing Manual (Hereafter Green Book) (Report Number EPA-503/B-91/001) (February 1991) <www.epa.gov/OWOW/oceans/gbook>.

[148]40 C.F.R. § 227.6.

[149]Id., § 227.13.

[150]Environmental Protection Agency and the Army Corps of Engineers, Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S.—Testing Manual (Inland Testing Manual), EPA-823-B-98-004 (1998).

al discharges. Site selection[151] and program definitions[152] factor predominantly in these determinations. The relationship among these laws, regulations, and guidance documents are shown in Table 3.

V
TESTING FOR SEDIMENT CONTAMINATION

A. The Sediment Quality Triad

This triad, developed by Long and Chapman,[153] is a framework for collecting sediment chemistry, toxicity, and benthic impact with the purpose of using these measurements to assess relative sediment quality.[154] The triad relates benthic ecosystem degradation to chemical contamination. First, by measuring levels of chemical contamination, a measure of potential biological impact is developed. This information is provisional as some observe that toxicity cannot be defined solely on the basis of chemistry.[155] (Hence, the need for other parts of the triad.) Ideally, multiple sediment quality guidelines are a convenient measure to compare against. Second, laboratory activities, such as toxicity testing and/or bioaccumulation of contaminants, provide additional, more specific insights. For toxicity testing, multiple endpoints are desirable (mortality, growth, reproduction). Evaluation of the significance of multiple toxicity tests requires application of best professional judgment. Finally, observation of resident communities may be used to assess a variety of effects. Data on number of species and abundances can portray the effects of contaminants when compared with cleaner reference sites.

Both the first and third elements of this triad require comparison to reference conditions. In general, reference sediments ought to have natural geochemical features similar to the sediment being tested.[156] However, selection of a reference site goes "beyond science" to incorporate societal considerations and policy decisions.[157] In urban areas, identification of reference sites is particularly difficult because of the potential of the contaminants to

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[151]40 C.F.R. § 230.

[152]Id., § 232.

[153]Edward R. Long & P.M. Chapman, A Sediment Quality Triad: Measures of Sediment Contamination, Toxicity, and Infaunal Community Composition in Puget Sound, 16 Marine Pollution Bull. 405 (1985).

[154]Peter M. Chapman et al., Viewpoint: General Guidelines for Using the Sediment Quality Triad, 34 Marine Pollution Bull. 368 (1997).

[155]Issues in Sediment Toxicity, supra note 141, at 274-276,

[156]Viewpoint, supra note 154.

spread. Selection of a reference site within this zone of influence affects the level of environmental quality ultimately achieved.

This triad has been used to assess sediment quality in U.S. estuaries where 26% or more of the sediment samples had chemical concentrations with the potential to cause toxic effects.[158] In this same assessment, about 7.5% of surficial area studied showed acute toxicity in amphipod bioassays. This, in combination with other measures, showed that slightly degraded conditions are widespread.

B. Regulatory Determination of Contamination in Sediments

The tiered approach to testing and evaluation "is designed to aid in generating necessary toxicity and bioaccumulation information, but not more information than is necessary."[159] This approach is described in detail in the Dredged Material Testing Manual or "Green Book"[160] and in a slightly different context in the "Inland Testing Manual" (ITM) published more recently.[161]

The approach consists of four tiers that are generally considered to assemble relevant information at increasing complexity and cost. The goal is to suspend analysis when the information is sufficient to determine how the material in question conforms to the criteria in the governing regulations.[162]

Direct determinations depend upon toxicity testing utilizing "appropriate" organisms. In 1991, approved benthic impact tests relied on twenty-five species of which five were recommended.[163] At present, amphipods are commonly used, but the appropriateness of individual species varies, and sensitivity differences have been documented not only among but within species.

Tier I involves compiling available information and may require a chemical analysis of the sediments.[164] In general, the analyst seeks to determine if the material is far removed from pollution sources, beach sand, or similar to material at the disposal site. In addition, disposal without exceeding the limiting permissible concentration (LPC) is required. For the liquid phase, the LPC is that amount of a contaminant which, after the initial mixing, does not

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[157]Id. at 369.

[158]Edward R. Long, Degraded Sediment Quality in U.S. Estuaries: A Review of Magnitude and Ecological Implications, 10 Ecological Applications 338, 339-344 (2000).

[159]Green Book, supra note 147, at 3-4.

[160]Id.

[161]Testing Manual, supra note 150. The synopsis here is developed from the 1991 version of the Green Book.

[162]I.e., with 40 C.F.R. §§ 226.13 and 227.6

[163]Green Book, supra note 147. See Table 11-2 at 11-11.

[164]Id. at 4-1 to 4-7.

exceed appropriate water quality criteria (WQC) or 0.01 of the acutely toxic concentration for the contaminants in question.[165] For the solid or particulate phase, the LPC is the amount that does not cause unreasonable toxicity or bioaccumulation.

If compliance with WQC remains uncertain after tier I analysis, then tier II procedures commence, utilizing contaminant concentrations in the sediment and numerical models for initial mixing evaluations.[166] The goal is to predict release of contaminants into the water column and compare levels with marine WQC to determine compliance or lack thereof. If the proposed disposal operation will exceed WQC according to the model, an elutriate test is then conducted. It directly measures the concentration of contaminates in water that has been in contact with the sediments proposed for dredging. Elutriate data are used to modify the modeling approach. If specific contaminants of interest do not have WQC limits, then water column impact is evaluated by toxicity testing.

As originally proposed, Tier II testing of benthic impact focuses on the calculation of a theoretical bioaccumulation potential (TBP) of selected organic compounds (such as PCBs, hydrocarbon pesticides, many PAHs, dioxins, etc.), which is estimated from associations of the contaminant with sediment organic carbon and animal lipid content. If the TBP for dredged sediments exceeds that for reference sediments (or other contaminants not covered by it are found to be involved), then bioaccumulation testing in subsequent tiers is required. The bioaccumulation potential of the proposed dredged material is compared with reference sediments. The EPA and ACE Green Book defines the latter as substantially free of contaminants, and as similar as practicable to grain size of dredged material and disposal site sediments, subject to additional somewhat flexible conditions.[167]

In urban estuaries, reference sediments with differing levels of contaminants may be adopted, reflecting varying political or management objectives.[168] Indeed, the selection of a reference site is an exercise subjective in nature. It is combined with setting as a maximum a twenty per cent reduction in amphipod survival when comparing test and reference sediments. This norm is socially constructed through judgments of how contaminated the reference sediments are and what level of mortality is acceptable. Furthermore, even though statistically significant differences in survival do not equate with ecological significance, they are widely used in management.

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[165]Id. at 1-6.

[166]Id at Appx. B.

[167]Id. at 1-6.

[168]Issues in Sediment Toxicity, supra note 141, at 273-274.

In reality, sediments from urban harbors almost invariably require Tier III bioaccumulation testing. Such testing compares the bioavailability of contaminants with FDA action levels, where available. Tissues of organisms are analyzed for metals and/or organics after exposure of ten or, more commonly, twenty-eight days. When these exposures result in levels above the FDA's standards, then the sample exceeds the LPC. If the FDA's levels are not exceeded, but the reference sediment values are, then case-specific evaluation is dictated.[169]

The complexity and costs of tests in tier IV compound yet again. Tier VI testing consists of water column and benthic bioassays interpreted with respect to case-specific criteria. Steady state bioaccumulation is determined and compared with the FDA levels, contaminant by contaminant. Samples that fall below the FDA levels meet the LPC requirement. However, if tissue levels that do not exceed FDA standards are nevertheless higher than reference sediments, an additional comparison is made with organisms living around but not in the disposal site. If dredged material organisms do not exceed body burdens[170] of field organisms, then the LPC is met. If that is not the case, additional case-specific reasoning is employed.

VI
DISCUSSION

A. Regulatory Complexity and Evolution

Why have dredging activities become so controversial and what factors have contributed to the perceived gridlock with respect to dredging decisions? Figure 3 depicts a variety of changes, occurring over time, that individually and cumulatively have contributed to the complications of dredging decisions. Underlying this problem are these basic and inter-related factors, independent of particular decisions, that have developed over time and that impact decision making relating to dredging.

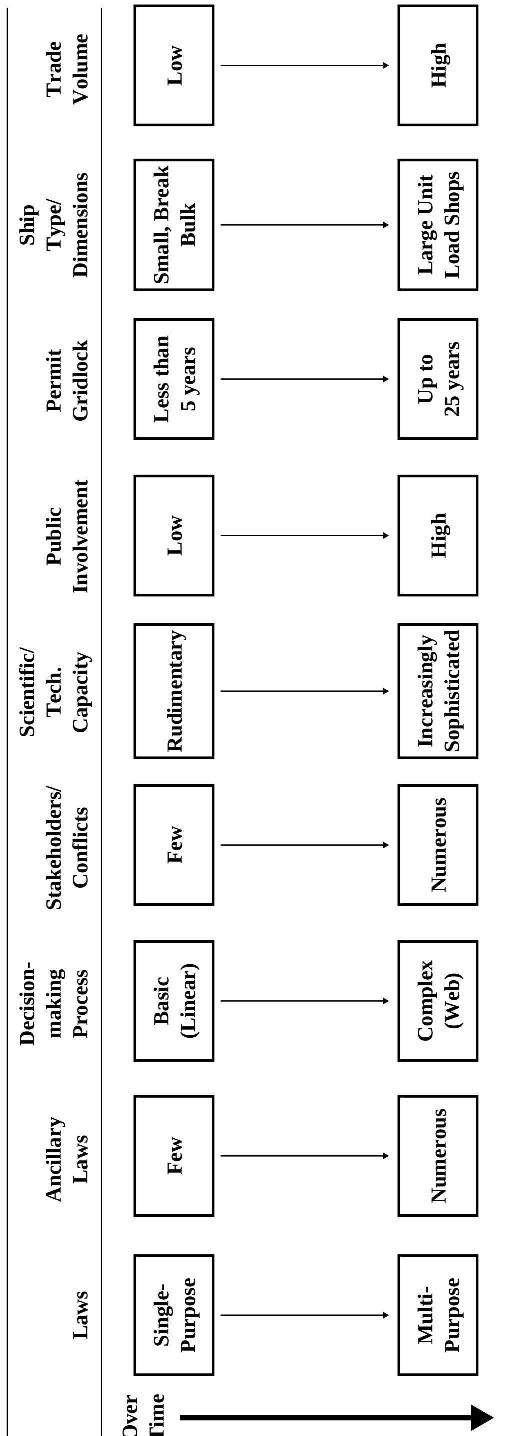
1. Transportation needs are more complex than in the past and these needs have significant implications for ports

Ports, as parts of contemporary, integrated, multi-modal, transportation networks require infra-structure modifications as well as simple maintenance, and individual ports must be responsive to the demands of the marketplace if they are to continue to operate successfully. In particular, ports need to provide the services required by the vessels that would call at their

[169]Green Book, supra note 147, at 3-12. See 40 C.F.R. § 227.13(c)(3).

[170]Levels of contaminants measured in the body.

Figure 3. Dredging Issue Evolution



facilities. Ports are absolutely essential to the contemporary transportation network, the totality of which makes possible dependable delivery, allowing for cost- and time-efficient just-in-time production,[171] in an increasingly competitive world marketplace.

2. There is growing awareness of the externalities of modern transportation in general and of dredging in particular

Basically, two types of difficulties can be noted: conflicts of use and the threat of environmental damage resulting from dredging and dredge disposal. Other users of coastal and ocean areas, such as fishermen, may feel threatened by dredging. And with advances in the scientific ability to detect toxic substances in dredged material and to understand their impacts on the natural environment, public opposition to dredge disposal has increased.

3. Given the growing awareness of dredging's externalities, it is not surprising that there is an increasing number of parties, both inside and outside of government, who regard themselves as stakeholders in decisions about dredging

These parties believe that they have legitimate interests, however defined, and thus should be entitled to participate in decision making relevant to dredging. Whatever normative judgments about their role might be made, the involvement of a larger number of players certainly increases the complexity of that process. Legislation and rulemaking relevant to dredging supports and reflects this widening of participation, and provides for input not only from the public at large, but also from federal agencies other than the Corps of Engineers, such as the Environmental Protection Agency, and from state governments.[172] It appears that there is a growing belief that decisions with respect to dredging should not be left to those with a narrow sectoral view and those with direct economic interests in proceeding.

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[171]In regard to just-in-time production, Michael Huerta, Associate Deputy Secretary, Director, Office of Intermodalism, U.S. Department of Transportation testified in 1994 that "Many factories operate with as little as 15 minutes of stock on hand so that the plant is being served by a constant stream of transportation vehicles . . . One maritime liner carrier conducts 35-day Pacific round trips with only 19 hours of slack time built into them. When a maritime carrier has to interface with a 15-minute window, there is no room for port inefficiencies. Twenty years ago, a ship could wait for a tide and a truck could deliver goods tomorrow. Today, such delays shut down assembly lines." Dredging and its Impact, supra note 41, at 11.

[172]See Anthony Downs, Inside Bureaucracy (1967), in which he describes the increased crowding of "policy space." While in his classic study Downs focuses on the application of this concept to the various subdivisions of the federal government relative to a particular policy area, the concept of "policy space" can be used, as well, to apply to all of those actors, governmental and non-governmental, that seek to shape policy outcomes.

4. Dredging policy and decisions have come to be made in a multi-use, rather than a single use, context, requiring a balance of different values and objectives

Such a context takes into account the externalities associated with dredging and their impact on other concerns. It is interesting to note that, at a general level, there is substantial agreement that dredging of port facilities and navigational channels is a legitimate and necessary activity, but one that must be balanced with consideration for the natural environment. The Director of the Port Department of the Port Authority of New York and New Jersey observes that:

> our responsibility is not only to develop, maintain, and promote the maritime commerce of the entire harbor in the interest of the New York/New Jersey region, but also to do so in a way that is environmentally responsible.[173]

The Environmental Protection Agency, in its work with the Corps of Engineers, recognizes the need to achieve the objectives of ensuring that dredged material disposal is environmentally acceptable while making the dredge material program more consistent and predictable for the regulated community and the public.[174] While it sees itself primarily as the "steward for living marine resources and their habitats," the National Marine Fisheries Service asserts that it "recognizes the importance of functioning, well-maintained, modern ports both for national economic security as well as for the benefit of the fishing industry itself."[175] And, though concerned with environmental and human health problems, the environmental community, it is said, "recognizes the nation's economic need to keep American ports competitive in the world market by maintaining navigation channels."[176]

It appears then that there is a general consensus that some dredging activities will be found necessary, but that they will be subject to environmental constraints. However, significant controversy persists as to the precise balance to be struck. This persistent controversy is reflected in the policy and decision making framework for dredging and contributes to the ongoing delays associated with port dredging projects.

5. Today there are more sophisticated information and communication networks and organized groups with capability to inform (or misinform) people as to the impact of policies and decisions

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[173]Lillian C. Liburdi, "Regulated's Perspective-The Port of New York & New Jersey," in Environmental Regulatory Process, supra note 112, at 9.

[174]David G. Davis, Regulator's Perspective-Environmental Protection Agency, in Environmental Regulatory Process, supra note 112, at 30.

[175]Nancy M. Foster, Regulator's Perspective-National Marine Fisheries Service, in Environmental Regulatory Process, supra note 112, at 33.

[176]Sally Ann Lentz in Environmental Regulatory Process, supra note 112, at 37.

The American Association of Port Authorities (AAPA) and others favoring dredging have maintained that port projects have been tarred unfairly with the negative label of "pork barrel" politics.[177] The AAPA and particular ports find that they have to make the case repeatedly that dredging is a required and legitimate activity.

Contemporary communication networks have served to strengthen the campaign against dredging, making it possible for opponents to share information quickly, economically, and widely via the internet.[178] Questions may be raised, calls issued for more careful consideration, and those opposed to dredging activities mobilized. This is important because of a fundamental reality: in the process of government deciding, it is typically easier to prevent action than to force it. To move something forward requires overcoming a series of potential obstacles, whereas opposition forces may triumph with a single victory or cause significant and meaningful delay in a variety of venues.

The problems posed by dredging suggest difficulties in three closely interrelated areas: policy, process, and cost distribution. Here, policy refers to the broad guidelines developed through governmental institutions to further waterway development so as to enable efficient port services. Given the growing importance of international trade to the American economy, the role of maritime transportation in carrying that trade, and the changing characteristics of merchant vessels, it is not surprising that port development, in general, and dredging, in particular, have found themselves on the public policy agenda.[179]

B. Regional Plans and National Teams

In recognition of the many problems associated with dredging, Secretary of Transportation Federico Peña, in October 1993, established an Interagency Working Group on the Dredging Process to suggest improvements in the review process for dredging activities so as to promote greater certainty and predictability. A year later, after consulting with stakeholders, the group issued its report.[180]

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[177]See, e.g., American Association of Port Authorities, "The Realities of Delay," in Port Development, supra note 124, at 250-257, and the testimony of Robert Dawson, Acting Assistant Secretary of the Army for Civil Works, House Committee on Public Works and Transportation, Subcommittee on Water Resources, 99th Cong., The Administration's Proposed Water Resources and Inland Waterways Legislation, 19-24 (1985).

[178]On the use of the internet by advocacy groups see Joseph Zelwietro, "The Politicization of Environmental Organizations through the Internet," 14 The Information Society 45 (1997).

[179]On the setting of the public policy agenda, see generally John W. Kingdon, Agendas, Alternatives, and Public Policies (2d ed. 1995).

Table 4. Findings Identified by the Interagency Working Group on the Dredging Process

- A network of ports and harbors is essential to the United States' economy, affecting its competitiveness in world trade and national security. Port facilities serve as a key link in the intermodal transportation chain and can realize their full potential as magnets for shipping and commerce only if dredging occurs in a timely and cost-effective manner.
- The nation's coastal, ocean, and freshwater resources are critical assets which must be protected, conserved, and restored. These resources are equally important to the United States by providing numerous economic and environmental benefits.
- Consistent and integrated application of existing environmental statutes can protect the environment and can allow for sustainable economic growth.
- Close coordination and planning at all governmental levels, and with all aspects of the private sector, are essential to developing and maintaining the nation's ports and harbors in a manner that will increase economic growth and protect, conserve, and restore coastal resources.
- Planning for the development and maintenance of the nation's ports and harbors should occur in the context of broad transportation and environmental planning efforts such as the National Transportation System and the ecosystem/watershed management approach.

Source: Interagency Working Group on the Dredging Process, **The Dredging Process in the United States: An Action Plan for Improvement**, A Report to the Secretary of Transportation (December 1994) online <www.epa.gov/owow/oceans/ndt/report.html>. Section 4.0, "National Dredging Policy."

In its introduction, the report immediately gets to the basic difficulty: ports are essential to the economy and the defense of the United States, but at the same time they are located in or near some of the most environmentally sensitive areas, including wetlands and estuaries that are ecologically significant and generate economic, recreational, and aesthetic values. Acknowledging that dredging and dredge material disposal threaten the environment, the quandary is how to address the needs of port maintenance and development while protecting coastal resources and the marine environment. The report suggests that the two concerns are not mutually exclusive and that an early and effective planning process could address the need for both port development and environmental protection.[181]

To this end, the Inter-Agency Group unanimously called for the development of a unified national dredging policy and called upon the Clinton Administration to adopt the Findings and Principles reproduced in Tables 4 and 5 as a statement of national dredging policy. Those findings and principles indicate explicit recognition and understanding of the need to balance the traditional sectoral interest of ports in dredging with wider concerns of natural resource and environmental protection and the need to evaluate dredging activities in a watershed and ecosystem framework rather than in terms of port needs alone.

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[180]Interagency Working Group on the Dredging Process, The Dredging Process in the United States: An Action Plan for Improvement, A Report to the Secretary of Transportation (1994) online at <www.epa.gov/owow/oceans/ndt/report.html>.

[181]Id. § 1.0.

Table 5. Principles Identified by the Interagency Working Group on the Dredging Process

- The regulatory process must be timely, efficient, and predictable, to the maximum extent practicable.
- Advanced dredged material management planning must be conducted on a port or regional scale by a partnership that includes the Federal government, the port authorities, state and local governments, natural resource agencies, public interest groups, the maritime industry, and private citizens. To be effective, this planning must be done prior to individual Federal or non-Federal dredging project proponents seeking individual project approval.
- Dredged material managers must become more involved in watershed planning to emphasize the importance of point and non-point source pollution controls to reduce harbor sediment contamination.
- Dredged material is a resource, and environmentally-sound beneficial use of dredged material for such projects as wetland creation, beach nourishment, and development projects must be encouraged.

Source: Interagency Working Group on the Dredging Process, **The Dredging Process in the United States: An Action Plan for Improvement**, A Report to the Secretary of Transportation (December 1994) online <www.epa.gov/owow/oceans/ndt/report.html>. Section 4.0, "National Dredging Policy."

To advance this national dredging policy, the Interagency Group adopted the eighteen recommendations reproduced in Table 6. The recommendations address four perceived dredging problem areas: planning mechanisms, the project review process, scientific understanding of dredging activities, and funding.

With respect to planning, the Interagency Group noted that federal and state agencies often contribute to decision-making delays by not coordinating or communicating their concerns soon enough in the permitting process. Likewise, other interested parties are seen as not participating constructively in the early part of the review process and this, too, contributes to delay. The Interagency Group found also that insufficient attention was paid to disposal sites and alternatives, including beneficial use. Perhaps the most notable matter raised in the planning context is the need to link port planning and dredging requirements to wider watershed management.[182] Such a perspective recognizes and highlights the need to address upstream point source and non-point source pollution that affects the quality and character of the sediments that ports seek to dredge and deposit elsewhere. An integrated watershed approach, by lessening the polluted character of dredge materials, could enable more options in disposal and lessen opposition to necessary dredge operations.

Recommendations 1-8 (Table 6) address these matters. Those recommendations call for the development of regional dredged material management plans and for study of federal, state, and local partnerships for the purpose of advancing the management of dredged materials. Early public and stake-

[182]Id. § 5.1.

Table 6. Recommendations Made by the Interagency Working Group on the Dredging Process

1. Create and/or augment regional/local dredged material planning groups to aid in the development of regional dredged material management plans.
2. Identify the characteristics of successful Federal/state/local partnerships for se in developing dredged material management planning efforts.
3. Develop public outreach and education programs to facilitate stakeholder involvement.
4. Provide guidance to relevant Agency field offices, state and local agencies, and the general public on opportunities for beneficial use of dredged material
5. Update guidance on disposal site monitoring requirements and procedures.
6. Ensre that dredged material management planners work with pollution control agencies to identify point and nonpoint sources of sediments and sediment pollution, and to implement watershed planning.
7. Review the Federal Economic and Environmental Principles and Guidelines for Water and Related Land Resource Implementation Studies (P&G) to determine whether changes are needed to better integrate the economic and environmental objectives of National Economic Development (NED) and Environmental Quality (EQ).
8. Revise the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) to ensure that the planning process outlined in the legislation provides for linkages with plans which address dredging issues.
9. Establish a National Dredging Issues Team and Regional Dredging Issues Teams.
10. Schedule pre-application meetings among the Corps, the applicant, the EPA, other interested Federal agencies and relevant state agencies for dredging projects that are potentially controversial or that may involve significant environmental issues.
11. Develop and distribute a permit application checklist which identifies the information required from the applicant.
12. Develop or revise the procedures for coordinating inter-agency review at the regional level to define the process by which various Federal parties coordinate on dredging projects.
13. Establish a national MOA [memorandum of agreement] to clarify roles and coordination mechanisms between the EPA and the Corps.
14. Clarify and improve the guidance used to evaluate bioaccumulation of contaminants from dredged materials.
15. Identify the practical barriers to managing contaminated sediments and ways to overcome the barriers.
16. Identify means to reduce the volume of material which must be dredged.
17. Revise WRDA to establish consistent Federal-local sponsor cost sharing, across all dredged material disposal methods.
18. Study the feasibility of a fee for open-water disposal for non-Federal dredging projects.

holder involvement is favored, as is multi-jurisdictional coordination; in particular, those concerned with dredged material management are called upon to work with pollution control agencies to identify the sources of sediment pollution and to implement watershed planning so as to reduce contamination of sediments to be dredged.

As to the project review process, the Interagency Group was of the view that, for many projects, the permitting process is too long, unpredictable, and inefficient for resolving conflicts. Recommendations 9-13 (Table 6) respond to these problems with regional dredging issue teams, pre-application meetings that involve the applicant and government agencies and allow potential problems to be identified earlier, and a checklist of for permit applicants. On the government side, the Interagency Group recommended development of procedures for coordination of the regional, inter-agency review process and clarification of the respective roles of the EPA and the Corps of Engineers.

Scientific aspects of the problem are addressed in recommendations 14-16, which call for identification and treatment of the practical obstacles to the management of sediments and efforts to lessen the volume of dredged materials. The need to clarify and improve the process of evaluating bioaccumulation of contaminants in sediments was recognized. And, finally, recommendations 17-18 concerned the issue of funding for dredging operations, calling for a consistent pattern of cost-sharing between the federal government and the local sponsor and for an examination of a payment system for open water disposal.

On June 22, 1995, President Clinton endorsed the suggested national dredging policy and ordered federal agencies to implement the eighteen recommendations.[183] To assist with the implementation of the policy and recommendations, a National Dredging Team (NDT) was established in July 1995. Under the terms of the NDT Charter, as revised and adopted in July 2003,[184] the NDT is composed of representatives from the:

- Environmental Protection Agency, co-chair of the group;
- Army Corps of Engineers, co-chair of group;
- Maritime Administration (Department of Transportation);
- National Marine Fisheries Service (NOAA, Department of Commerce);
- Office of Ocean and Coastal Resource Management (NOAA, Department of Commerce);

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[183]National Dredging Team, Dredged Material Management: Action Agenda for the Next Decade, Workshop Sponsored by the National Dredging Team, January 23-25, 2001, Jacksonville, Florida.

[184]The full text of the July 9, 2003 National Dredging Team Charter may be found online at <www.epa.gov/owow/oceans/ndt/2003_charter.pdf>.

- U.S. Coast Guard (Department of Homeland Security); and
- Fish and Wildlife Service (Department of the Interior).

Other federal agencies have also participated, including the Navy (Department of Defense) and the U.S. Geological Survey (Department of the Interior).[185] The composition of this group clearly indicates that a number of departments and agencies now view themselves as stakeholders in dredging, in contrast with the views of earlier eras. Broader agency participation is a logical consequence of the NDT vision statement that dredging of harbors and channels is to be "conducted in a timely and cost efficient manner while meeting environmental protection/restoration/enhancement goals."[186]

The NDT is to act as a forum for the identification and resolution of dredging issues, as an agent for implementation of the recommendations of the Inter Agency Report, and as a hub for communications with Regional Dredging Teams (RDTs) and other stakeholders. The NDT consists of both a Steering Committee and an Operating Management Committee. Members of the Steering Committee are to be senior executives appointed by the department or agency head, with authority to make binding policy decisions and commitments on their behalf. The Operating Management Committee is made up of agency managers, decision makers, and technical experts and is to keep the Steering Committee adequately informed.[187]

The NDT approach also involves Local Planning Groups (LPGs), co-chaired by the Corps of Engineers and port authorities and/or states. Such bodies are being set up in a variety of ports on an estuarine basis for the purpose of producing dredged material management plans. The RDTs and LPGs are to provide regional and local mechanisms for conflict resolution, interagency coordination, and stakeholder input. Efforts are to be made to resolve problems at the lowest level.[188]

For its part, the Bush Administration is concerned with what it sees as an overly complex and dilatory decisional process and, in September 2002, issued an executive order that establishes a new Transportation Infrastructure Streamlining Task Force.[189] The purpose of the Task Force is to "enhance environmental stewardship and streamline the environmental review and development of transportation infrastructure projects." As of October 2003, the Task Force has not yet addressed dredging matters, but,

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[185]National Dredging Team, supra note 183.

[186]NDT Charter, supra note 184.

[187]Id.

[188]EPA, Office of Water, "Procedures to Elevate Issues from Regional Dredging Teams and Local Planning Groups to the National Dredging Team," Guidance by the National Dredging Team (February 19, 1999). Online at <www.epa.gov/owow/oceans/dmmp/elevate.html>.

once more, it is clear that choices will have to be made regarding the appropriate balance between environmental and project values.[190] It is to be expected that different administrations will give different weights to those values.[191]

VII
CONCLUSIONS

Ninety-five percent of the imports and exports of the United States pass through ports and their competition creates pressures for the use of economies of scale, larger ships and, consequently, deeper channels. This race to deepen has already produced channels dredged to a depth of fifty feet, which would naturally be no more than a third of that depth. Both deepening old channels and dredging new both, however, entail the movement of large amounts of material, some of which is contaminated. Some dredging is absolutely necessary if cargoes are to continue movement in and out of ports. Banning all dredging for navigational purposes is therefore not an option, but, given contemporary environmental concerns, unlimited dredging and dredge disposal is also out of the question.

As a consequence of dredging, physical, chemical, and biological changes take place at the location both where the material is removed and where it is deposited, most often in marine waters. A plume of sediment spreads from the activity, affects light penetration, and settles on benthic organisms up to hundreds of meters away. Bottom morphology and water flow are changed. Approximately four percent of the sediments dredged nationally are contaminated with various chemicals that may be released to the water column or come into direct contact with organisms during the process. For example, in the vicinity of dredging operations, nutrients may be 50 to 100 times higher than normal. The biological consequences include shading of plants and

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[189]"Environmental Stewardship and Transportation Infrastructure Project Reviews," E.O. 13274, September 18, 2002, 67 Fed. Reg. 59449 (September 23, 2002). The Designated Task Force, is chaired by the Secretary of Transportation with members coming from the Council of Environmental Quality, the Department of Agriculture, the Department of Commerce, the Department of the Interior, the Department of Defense, the Environmental Protection Agency, and the Advisory Council on Historic Preservation. Among other things, the Task Force is to monitor and assist agencies in expediting review of transportation infrastructure projects and to "identify and promote policies that can effectively streamline the process required to provide approvals for transportation infrastructure projects, in compliance with applicable law, while maintaining safety, public health, and environmental protection.

[190]The agenda and meeting minutes of the Transportation Infrastructure Streamlining Task Force may be found online at <www.fhwa.dot.gov/stewardshipeo/taskforce.htm>.

[191]On the a different approaches to consideration of environmental and development conflicts by the Clinton and Bush Administrations, compare E.O. 13148, Greening the Government through Leadership in Environmental Management, April 21, 2000, 65 Fed. Reg. 24593 (April 26, 2000) with E.O. 13274.

elimination or burial of benthic organisms in the direct path of the operations. Recovery can take from six months to ten years. At a distance, settling of sediments may affect viability of benthic organisms. Most importantly the chemicals affect the survival, behavior, composition of exposed individual organisms, impacting populations and ecosystems.

While ports are referred to in the Constitution and navigation projects and legislation supporting navigation projects trace back as early as 1824, the number of considerations influencing dredging decisions has increased of late, as environmental systems and their dynamics have come to be better understood. Significant new provisions relating to environmental impacts were incorporated in the 1972 versions of the Clean Water Act and the Marine Protection Research and Sanctuaries Act. Implementation through joint action of the Army Corps of Engineers and the Environmental Protection Agency ensures that the interests of both commerce and environment are brought to bear on each decision; as a consequence, substantial delays in dredging projects have become routine. Other federal legislation requires protection of fish and wildlife, identification of the impacts of significant federal action, consistency of federal action with state plans, and protection against the loss of fish habitat, among other factors. The Water Resources Development Act requires local contribution toward certain costs associated with dredging deep channels. Each of the laws reviewed in this study places constraints on the dredging process, rendering the process for project decision making more complex and time consuming.

Many of the environmental arguments revolve around contaminated sediments and their treatment. The problem has been approached scientifically, with bulk chemistry employed to determine the presence and amounts of toxins, toxicity testing or bioaccumulation in laboratory tests to consider impacts on individual organisms, and community assessments of impacts in the natural environment. The regulatory framework for these tests consists of four tiers of analysis focused on benthic and water column impacts and incorporating dozens of decision points. Thus, the complexity of the decision process reflects not only the diversity of interested parties but also both the complex nature of the scientific problem. In addition, some aspects nominally scientific, like selecting reference sediments and determining what survival declines exclude ocean disposal, remain contentious because they require professional judgment subject to dispute.

The varied, and at times conflicting, interests and demands associated with dredging lead to public body decision making that is complex, prolonged, unpredictable and potentially arbitrary. A potential solution lies in the use of National Dredging Teams and their local or regional analogs. At the regional level, pre-application procedures, check lists for applicants, and clarification of agency duties can all improve decision making. From the

larger perspective of regulatory process, while this team approach may ameliorate some difficulties, it cannot ensure completely effective and efficient decisions about dredging as long as societal values and agency responsibilities remain imperfectly defined and inadequately ordered.