MAINTAINING THE NATION'S WATERWAYS

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The requirement to dredge navigable waterways to maintain channel depths for shipping has become a problem of great national significance. The ability of the U.S. Army Corps of Engineers to dredge is declining. Unless ways can be found to continue the maintenance of waterways in the face of environmental, legal, and technical constraints, an economic situation that would adversely affect the entire economy will be precipitated. The purpose of this paper is to familiarize the reader with the Army's role in maintaining waterways, the problems it faces, and its efforts toward solving the problems.

•THE REQUIREMENT to dredge the navigable waterways of the United States to maintain channel depths for shipping has become a problem of great national significance. The ability of the U.S. Army Corps of Engineers to dredge is declining. Vital harbors, ports, and inland waterways throughout the nation are adversely affected. In some cases, they face being shut down. Unless the Corps of Engineers can find ways to continue to maintain waterways in the face of environmental, legal, and technical constraints, an economic situation that would adversely affect the economy of the entire country could be precipitated.

BACKGROUND

Waterway System

Since 1824 congressionally directed navigation maintenance responsibilities have constantly increased; today they include 22,000 miles (35 400 km) of inland waterways, 3,000 miles (4800 km) of intracoastal channels, 107 commercial port facilities, and 400 small boat harbors.

Domestic waterborne commerce, including inland barge and Great Lakes traffic, moves almost 16 percent of the nation's ton-miles (metric-ton-kilometers) of intercity cargo.

Inland waterway barge traffic has increased over the past 2 decades at a compound rate of slightly more than 5 percent/year. The amount of tonnage that can be moved in a single tow has increased from 5,000 to 50,000 tons (4500 to 45 000 metric tons)/tow.

Waterway commerce presently totals 1.7 billion tons (0.9 billion metric tons)/year, which is more than 350 billion ton-miles (196 billion metric ton-km), or about 7 tons (6.3 metric tons) per capita. This cargo is carried at an average cost of 3 mills/ton-mile (5 mills/metric ton-km). Energy-producing commodities, predominantly petroleum and coal, make up slightly more than 50 percent of U.S. waterborne freight. The rate of energy use in the United States has outstripped the rate of population growth, gross national product, and most other indicators. Water carriers consume less energy than other carriers do; water carriers use less than 500 Btu/ton-mile (950 kJ/metric-ton-km).

Continued economic and population growth requires continued expansion of ports and associated facilities. In the 27-year period ending in 1972, individual ports in the United States, Puerto Rico, and Canada invested almost $4 billion in marine terminal facilities. The projected annual rate of investment for these purposes for 1973

to 1977 is $341 million. The development of service facilities for offshore oil terminals may add another $500 million to this investment.

The economic effect of a port on the local area and state in which it is located is tremendous. At the Port of New Orleans, for example, the chain of economic events that starts when cargo lands results in the employment of 37,000 people, $7 million in taxes for the city, $19 million in taxes for the state, $256 million in port-related income, for a total economic effect on Louisiana of $1.8 billion a year. The health of the U.S. economy clearly depends on its ability to keep waterways, ports, and harbors open to navigation.

Harbors and channels are subject to natural deposits of material that cause them to shoal and lose depth. To maintain navigation, the Corps of Engineers either has to limit vessel draft or remove the material. Annually, the volume of material removed from U.S. waterways is approximately 300 million yd^3 (228 million m^3). We could give Delaware a new 1-yd-deep (0.9-m-deep) surface in 20 years.

Operation and maintenance costs for navigation in fiscal year 1974 were $270 million. The sum of $155 million (57.5 percent of the costs) was spent for maintenance dredging on federal project channels.

Disposal Locations

Obviously, the material that the Corps of Engineers removes to maintain navigation has to be put somewhere. There are 4 locations where it can be placed:

1. Off channel,
2. Ocean or open water,
3. Diked areas, or
4. Upland.

Off-channel disposal is an inexpensive method that has been used for many years. Materials dredged from the channel are redeposited in open water or on islands adjacent to the channel.

Ocean or open-water disposal of dredged material also has been used for many years. Material contained in hopper dredges is transported to an open-water area and discharged. Approximately 250 million yd^3 (190 million m^3) of dredged material is deposited annually in open water, which represents 70 percent of the annual dredge product.

There are 2 types of diked disposal: (a) diked areas on shore that prevent runoff into the water or (b) diked areas built adjacent to the shore or in the water. The Corps of Engineers normally builds diked disposal areas by diking adjacent to the shoreline. This contains the dredged material and minimizes turbidity in the discharge area.

Upland disposal is controlled almost completely by the availability of areas on which to place the material. Even a small volume of material requires a relatively large disposal area. For example, a small effort such as the river channel at West Haven, Connecticut, involved only 81,000 yd^3 (61 560 m^3), but it required more than 20 acres (8 hm^2). In high-density population areas, a lot that size within economic reach is difficult to find.

Plant Capability

Although nearly 67 percent of Corps dredging is done under contract with private companies, the Corps maintains its own moderate fleet of specialized hydraulic and mechanical dredges, such as pipeline, hopper, dipper, and bucket dredges. All types of Corps plant are available in the private sector except for the hopper dredge.

The plant used most often in major channel work is the pipeline dredge. This dredge sucks the material from the bottom and pumps it through a pipeline to the disposal site. The length of the discharge line varies widely with the size and capacity of the plant.

Approximately 90 percent of this type of dredging is done by contract.

The sea-going hopper dredge, which was developed by the Corps, is a self-contained ship that pumps dredged material into internal hopper bins through suction lines. The dredge then sails into open sea, or other deep water areas, and discharges its cargo. These dredges also can pump the material from the hopper bins to a shore location if one is available.

The mechanical plants—bucket and dipper dredges—are much like land-based shovels and scoops. They are used in confined areas where larger equipment cannot operate and on special tasks that hydraulic equipment cannot handle.

LEGISLATION

Some of the major laws that affect the maintenance effort subject all Corps dredging to public scrutiny. Three will be discussed in detail:

1. Section 404 of the Federal Water Pollution Control Act of 1972 (FWPCA),
2. Section 103 of the Ocean Dumping Act of 1972, and
3. National Environmental Policy Act of 1969 (NEPA).

NEPA requires an environmental impact statement when a major federal action significantly affects the quality of the human environment. On the date of enactment, the Corps had more than 1,200 navigation maintenance projects alone, many of which are of great scope and environmental complexity. The Corps had to consider impact statements on them all.

The Federal Water Pollution Control Act and the Ocean Dumping Act contain sections pertaining to the disposal of dredged material. The first law applies to inland waters, and the second law applies to ocean waters. Although both designate the Corps as the agency responsible for authorizing such discharges, each act gives the Environmental Protection Agency (EPA) a substantial review responsibility for the disposal of dredged material.

Under Section 404 of FWPCA, the Corps does not issue permits to itself, but rather controls its own disposal operations by applying to itself by regulation the same criteria and procedures that are applied to permit applicants. FWPCA requires public notice and involvement. It requires the Corps and EPA to develop disposal guidelines.

If the Corps feels that the public interest demands navigation maintenance, it may request a waiver from EPA and dispose of the normal criteria. The ultimate decision, however, rests with the Environmental Protection Agency.

The requirements of Section 103 of the Ocean Dumping Act are similar to those contained in Section 404 of FWPCA. If no economically feasible method or site is available for disposal other than one that conflicts with EPA criteria or restrictions, the Corps must request a waiver. The waiver request must identify critical need, impact on commerce if dredging is not accomplished, and explain why alternate sites or methods are not feasible. The ultimate decision in these cases also rests with EPA.

BASIC PROBLEM

The basic problem of maintaining and operating U.S. waterways springs from the interrelationship of 3 factors: placement of dredged material, plant capability, and legal constraints.

Placement of Dredged Material

All of the 300 million yd^3 (228 million m^3) dredged annually has to be placed somewhere, and that somewhere is almost always unacceptable to someone. Off-channel discharge, common to inland waterways, is cost effective. It can result in the extension of wetland

areas, the creation of active biotic communities, and the development of attractive recreational sand spits and beaches. But off-channel discharge increases water turbidity at the discharge point, temporarily disrupts the biotic community, and tends to cause shoaling, which can interfere with lateral drainage and natural flows. The Corps knows about the changes in affected biotic communities, but the state of technology does not permit the quantitative evaluation of these changes with any degree of accuracy.

Ocean and other open-water disposal appears to be an environmentally acceptable method of disposal. It avoids disruption of all the natural values in the coastal zone and wetlands. The disruptive influence it has in the discharge area is so small compared with the vast and dynamic influence of the surrounding waters that the net effect should be minimal. However, some of the dredged materials are polluted, and some marine scientists contend that the long-term cumulative effects of ocean disposal could have serious adverse consequences. Again, simply not enough is known about the effects of open-water disposal to determine the degree of risk involved.

Dredged material could be disposed of in very deep water at great distances from the shore, but the costs of long-haul disposal increase drastically with distance.

Diked disposal areas offer major advantages. They can be used as land fills, and, if the elevation of the final lift is carefully controlled, they can be used as wetland areas. Diked disposal areas usually lie along a shoreline or are superimposed on natural wetlands, and they are usually controversial. In addition, they are expensive. For example, the diked disposal program in the Great Lakes will cost an estimated $240 million over the next 10 years. That would pay for open-water disposal in the Great Lakes for the next 25 years.

Upland disposal is an alternative often suggested by those who find disposal in open water or on wetlands unacceptable. Unfortunately, upland disposal also has disadvantages. In addition to its high costs, all upland disposal results in some change in land configuration, some disruption of the predisposal biotic community, and some opposition from landowners, communities, developers, conservationists, and others.

There is no comfortable solution to the disposal problem.

In the upper Mississippi River, where off-channel disposal is used extensively, the disposal problem is in sharp focus. Navigation has extended both the water surface and the surrounding wetlands, and locks and dams have created a highly attractive biological setting. By direction of the U.S. Congress, the Corps of Engineers has maintained navigability of the upper Mississippi River since 1922. But maintenance dredging in the channel, along the natural accretions, has created a series of small islands that act to reduce water surface, narrow existing wetlands, and, in some cases, cause shoaling. This has caused back-channel drainage problems. As a result, Corps disposal techniques have come under sharp criticism.

In San Francisco Bay, constraints against traditional open-water disposal seriously affect maintenance efforts. This was caused when the state adopted suggested EPA guidelines for pollution. These guidelines, for example, provide that dredged material containing levels of heavy metals exceeding those recommended should not be placed in open water. However, the natural state of San Francisco Bay exceeds EPA guidelines for heavy metals. In other words, what is picked up cannot be put back. Added costs associated with the constraints would result in a drastic increase of the unit dredge costs in Oakland Harbor and Mare Island Straits.

Jacksonville Harbor is a place where upland disposal is essential from an economic viewpoint. The harbor and river areas are too shallow to accept dredged material, and the ocean is too far away. In the harbor area itself, disposal sites are available, but, almost without exception, they have been contested. Many Corps proposals are reasonably sound environmentally. They provide beach nourishment; they also provide recreational areas.

Occasionally the Corps has found itself doing such a good job of material placement that disposal sites become preempted. For example, at Cabin John Creek, on the C&O Canal, the Corps used approximately a third of its disposal capacity in 1969. When it returned to use the site again, the pond that had been created in the upper basin had become a popular fishing place that was abundant with wildlife. It is now a valuable natural resource. So it is environmentally unacceptable for the Corps to use its own approved disposal site.

Plant Capability

Corps plant is old; it has been in operation for an average of 35 years. It is expensive to maintain and operate. Contractor plant is in much the same condition. To make matters even more serious, no new plant is coming on line.

Government appropriations committees have for the past 2 years imposed a moratorium on any additions, modifications, or replacement of Corps dredge plant pending a report from the Corps on proportionate plant requirements in the federal and private sectors. Under the moratorium, the Corps of Engineers cannot improve its plant. In the private sector, because the future is uncertain, most commercial dredging firms are unwilling to make any major investments in new dredging equipment.

As a result, the Corps is hard pressed to maintain its channels. In the spring of 1974, for example, as little as 34 ft (10 m) was in the 40-ft (12-m) entrance channel to the Port of New Orleans. This required ships to sail without a full load and resulted in the detaining of $500 million in world commerce imports and exports. To meet this crisis, Corps and contractor plant had to be shifted from the East Coast and the Gulf Coast areas. Now there is a backlog in ports in those areas.

Costs of operating Corps plant are steadily increasing. Even though annual dollar allocations are going up, funds available for expenditure in terms of constant dollars have experienced a net decrease.

In addition to the inefficiencies of aging plant and the higher costs of labor and materials, the Corps also faces the increased costs associated with more expensive disposal methods while using a plant that is not well adapted to those methods.

Legal Constraints

The Corps of Engineers is now publishing regulations that will bring them into full compliance with the administrative requirements of FWPCA and the Ocean Dumping Act. Nevertheless, the Corps of Engineers still faces problems on 2 matters. First, an overwhelming number of impact statements have to be prepared. Second, greater effort and time are now needed to prepare technical and legally sufficient impact statements that will satisfy other federal agencies and private organizations.

When NEPA became law, the Corps of Engineers had several thousand projects and activities across the nation in a variety of stages between planning and operations that were immediately subject to that law. To date, the Corps has written more than 1,500 environmental impact statements. By the end of this year, impact statements are scheduled to be on file to cover all new ongoing construction work. A substantial backlog on certain dredging projects in operation before NEPA still exists. There are environmental assessments for these projects but either no environmental impact statement or no negative determination has yet been filled. Three hundred and six dredging projects are included in the budgeted effort for fiscal year 1975. Of these, 95 dredging projects may have to proceed without either an environmental impact statement or a negative determination. The situation is extremely serious because of the public notice requirements of the applicable laws. When the Corps of Engineers issues public notice of dredging activities not covered by an environmental impact statement or a negative determination, it invites court action by those opposed to the projects.

Other government agencies sometimes add to the burden. The Corps of Engineers faces an apparently insatiable demand for more detailed analyses of additional alternatives covering both specific and cumulative impacts on any proposed work.

Justification does exist for these requirements, but neither the Corps of Engineers nor anyone else now has the kind of information to satisfy such requirements. And, if Corps environmental impact statements are challenged, comments, particularly those from other federal agencies, weaken the legal position of the Corps.

OVERVIEW

I have discussed the U.S. waterway system and demonstrated that navigation must be maintained. I have defined the disposal placement problem and have identified the techniques available to handle dredged material. I have explained that, with old equipment, the Corps has limited ability to do the work that must be done. And I also have delineated the difficult legal constraints within which the Corps of Engineers must work.

Much is being done to solve the problems and much remains to be done by other agencies.

WHAT IS BEING DONE

On dredged material and its placement, the Corps of Engineers is continuing and intensifying a 2-pronged attack initiated several years ago. First, the Corps is looking for new disposal concepts and techniques that will convert dredged material from a vexing problem into a valuable resource. Corps environmental and recreational staffs are working with engineers to develop beneficial ways to use dredged materials. In some areas, new wetlands, water-based recreational areas, nourished beaches, and wildlife habitats have been created, and highly attractive islands have been extended. As other agencies and groups become convinced that dredged material can serve useful environmental purposes, the Corps will have far greater success. Second, the Corps embarked last year on a 5-year, $30 million research program that is being managed at the Waterways Experiment Station in Vicksburg, Mississippi, by the finest staff of experts the Corps can find in government, education, science, and industry. Out of all this, the Corps should learn where dredged material is harmful and where it is not. The Corps should learn what additional costs are justified in the interests of environmental protection. And it should learn enough to answer the kinds of questions to make environmental impact statements technically sufficient to satisfy other agencies and groups.

Since last year, the Corps of Engineers has had under way a comprehensive study of the national dredge plant requirement and the capacity of both federal and private equipment to meet this requirement. The study will be completed in 1975. A determination of the total plant required in both the federal and private sectors should be found. Hopefully, the moratorium on federal plant improvement then will be lifted. When this study is completed, both government and private industry should be able to modernize the national dredge fleet and improve operations.

The Corps of Engineers over the next decade should see an increase in plant capacity and operating efficiency that will allow far greater flexibility in scheduling dredging operations in the interests of environmental quality.

On the time needed to comply with legal requirements and still maintain navigability the Corps of Engineers has taken the position that NEPA was not intended to halt all ongoing major federal actions that might significantly affect the quality of the human environment. But, in its latest regulation, the Corps of Engineers delineated a phased preparation of environmental statements for maintenance and operation projects including those authorized or constructed before 1970. The Corps has gone further in regulations covering its own dredging by providing that no maintenance dredging will take place after January 1, 1976, unless full compliance with the intent of NEPA in the preparation of environmental impact statements has been met. In the interim, the Corps of Engineers will follow a phased approach to preparing necessary statements.

The Corps of Engineers feels that its approach is reasonable, that it will enhance the environment, and that it will cause minimum environmental degradation. But legal actions challenging either the phased approach or the sufficiency of any proposed environmental impact statement probably will not be forestalled. The Corps hopes to minimize these challenges by placing the more controversial navigational maintenance projects high on the list of priorities for the preparation of environmental impact statements. In addition, the Corps will ask other federal agencies, especially the Bureau of Fish and Wildlife Service, to help set these priorities.

WHAT OTHER AGENCIES CAN DO

No new dredging equipment is coming on line that will permit a change in dredging methods. And there is a legal problem that will be uncomfortable for the next few months. The Corps of Engineers needs the help of other federal agencies, the water resource community, and the general public. Federal agencies must be informed on the importance to the national economy of maintaining navigation. An attitude that no dredging should be permitted is simply wrong. Dredging is necessary to maintain navigation. It must be understood that the Corps has very real plant and cost constraints. The Corps of Engineers recognizes that agencies with responsibility for conservation of natural resources cannot and should not relax the standards that they seek to achieve. Nevertheless, the sentiment that the Corps must do something different, but what it does and how much it costs is the problem of the Corps, is not constructive. The Corps of Engineers also needs the active support of the water resource community to help reach the general public to develop a better understanding of the need for dredging and the steps that are being taken to minimize environmental impacts while definitive answers to questions of concern to everyone are sought. The Corps needs continued cooperation from those with whom it works and reasoned judgment from others as it processes environmental impact statements on maintenance dredging projects. The current laws designed to protect the environment are good laws. Representatives of the Secretary of the Army and the Chief of Engineers have publicly pronounced this belief. But, if the Corps cannot continue to maintain U.S. waterways, then the resulting economic disruptions may generate major pressures for legislative relief. The Corps of Engineers seeks balanced actions that consider all sides and reflect decisions that are of the greatest benefit to the most people.