Channel Maintenance Management Plan

Upper Mississippi River Navigation System
St. Paul District

1.0 Project Location And Description.

The St. Paul District is responsible for maintaining various navigation projects on the Upper Mississippi River (UMR) and several of its tributaries between Minneapolis, Minnesota and Guttenberg, Iowa. A table and project map located at TAB 1 - Project Information, describes the location of these projects, the boundaries and the authorized dimensions. These projects include navigation channels of varying dimensions, and harbors for both commercial and recreational craft. Maintenance involves dredging, snag removal and various structural and non-structural techniques as described further in this document. The maintenance work requirements are primarily associated with the 9-foot channel projects on the Mississippi and Minnesota Rivers.

2.0 Authorization.

The existing 9-foot navigation channel was authorized by the River and Harbor Act of 1930, which approved construction of a series of locks and dams, supplemented with channel maintenance dredging. Subsequent legislation extended the boundaries of the 9-foot navigation channel and added numerous small boat and commercial harbors to the UMR system. The ongoing program is funded through the Corps of Engineers' annual operation and maintenance appropriation.

3.0 Channel Maintenance Management Plan Objectives.

3.1 Purpose. The Channel Maintenance Management Plan (CMMP) merges previous planning efforts into a comprehensive long-term management plan for channel and harbor maintenance related activities that are associated with the described projects. It consolidates dredged material management plans (DMMP), describes the District's long term management strategy (LTMS) for placement site planning, discusses alternative channel maintenance techniques, and documents policies, procedures and past practices. It will be used as a comprehensive guide for the District's channel maintenance program and to inform other agencies and the public of practices and actions. This plan, while long term in nature, is designed to accommodate new information or changes as developments occur. Revisions will be prepared, coordinated and distributed as necessary.

3.2 Long Term Management Strategy (LTMS). It is the policy of the Corps of Engineers to develop and implement dredged material management plans (DMMP) that satisfy the long-term placement needs for Corps navigation projects. The DMMP should be for the anticipated project life or other reasonably long period of time, include all foreseeable work, address methods of reducing dredging requirements and costs, and give consideration to all management alternatives. It must be timely, technically feasible, cost-effective, and environmentally acceptable as dictated by established Federal standards, criteria and regulations.

The Corps has developed a consistent, logical procedure by which DMMP alternatives can be identified, evaluated, screened, and recommended so that the dredged material placement operations are conducted in a timely, cost-effective manner that is consistent with sound engineering practices and meets established environmental standards. The framework for DMMP development is a five-phase approach as summarized below. It serves as a guideline to the District for planning future channel maintenance actions.

Phase I - Evaluate Existing Management Options: Study boundaries are set for the geographic area and time period to be analyzed. Dredging needs are estimated in terms of volumes, frequency and dredged material characteristics. Demand for beneficial use of the dredged material is estimated. These projections result in an estimated site(s) capacity required for the time period studied.

Phase II - Formulate Alternatives: Alternatives are systematically developed for feasible management options that include structural and nonstructural techniques for reducing dredging requirements, and placement site alternatives. Data needs are identified and collected as necessary.

Phase III - Detailed Analysis of Alternatives: A detailed evaluation, screening, and selection of a preferred long-term dredged material placement site is conducted. It is a comparative assessment analysis that weighs and balances engineering, economic, and environmental factors and benefits. The purpose is to select the most practicable plan that consists of one or more alternatives, and to document that selection process. The process is explained further in section 6.1 and Appendix D - Placement Site Evaluation Procedures.

Phase IV - DMMP Implementation: Implementation of the selected plan is initiated with consideration of the administrative, procedural, management, and monitoring requirements. Environmental documentation is completed for the life of the plan; certifications, permits, easements and agreements are obtained; site preparation is accomplished as needed; and placement is initiated.

Phase V - Periodic Review and Update: The plan is periodically reevaluated based on factors such as changing regulations, economics or environmental conditions. Technological advances may also result in changes to the plan. The review process also verifies the validity of any assumptions made in the planning process. Changes in dredged material management needs can be anticipated and accommodated through this phase.

4.0 Applicable Laws And Regulations.

Various laws and regulations apply to the District's channel maintenance operations and dredged material placement practices. The more significant are summarized below.

4.1 River and Harbor Acts of 1930, 1932 and 1958. These acts are the enabling legislation for many of the navigation projects specified in TAB 1-1. They authorize the continued operation and maintenance of the projects.

4.2 National Environmental Policy Act (NEPA). NEPA requires that federal agencies evaluate the effect their actions will have on the environment, and to give appropriate consideration to environmental values in the decision making process. An Environmental Impact Statement (EIS) for operation and maintenance of the Mississippi River navigation project was placed on file in 1974. A programmatic EIS was prepared in response to the GREAT I study in 1980. Environmental assessments have been routinely prepared for specific activities not fully addressed in those documents. An EIS has been prepared to evaluate the activities described in this Channel Maintenance Management Plan.

4.3 Clean Water Act (CWA). Section 404(b) of this act requires an evaluation of the impact of depositing dredged material or effluent water in navigable waters or adjacent wetlands. Criteria for evaluating these impacts are contained in EPA regulation 40 CFR 230. Section 404(t) of the Act requires that the Corps comply with state regulatory requirements when depositing dredged material below the ordinary high water mark or discharging an effluent. State permits are not required for the actual act of dredging, or when placement is above the ordinary high water mark or when there is no effluent discharge. The District has agreements and/or understandings with the States of Minnesota, Wisconsin and Iowa concerning regulatory requirements and procedures for dredged material placement. Key components of those agreements are described in Appendix A - Interagency Coordination Procedures.

Placement of rock to protect or restore existing structures or to repair previously placed shoreline protection is not subject to state regulatory requirements. It is also the Corps' position that state permits are not required for increases in dimensions of existing structures or for new construction, however the District will apply for state permits out of comity and with the understanding that the state will grant permits in a timely fashion.

4.4 Water Resource Development Acts (WRDA). These Acts periodically passed by Congress authorize various activities and programs that may directly or indirectly apply to the channel maintenance program. Examples include using dredged material to create or enhance wetlands, adoption of the GREAT study recommendations, establishment of mitigation policy, and prescribing wetland preservation goals.

4.5 Fish and Wildlife Coordination Act. This Act requires consultation with the U.S. Fish and Wildlife Service (FWS) and state agencies on proposed actions. The Upper Mississippi River is unique in that it is the only major river system in this country that is federally designated for both commercial navigation and fish and wildlife. The navigation channel passes directly

through the Upper Mississippi River National Wildlife and Fish Refuge, which is located between Wabasha, Minnesota and Rock Island, Illinois. On the Minnesota River the navigation channel is immediately adjacent to the Minnesota Valley National Wildlife Refuge. Dredged material placement and other channel maintenance activities take place within these refuge boundaries. These activities and the associated effects on the refuges are evaluated in the accompanying EIS.

4.6 National Historic Preservation Act and EO 11593. Proposed channel maintenance activities must be reviewed and, when necessary, cultural resource surveys conducted to assure that properties of historic, archaeological, or architectural significance are not adversely affected by the proposed action. If appropriate, surveyed areas are nominated to the National Register of Historic Places.

4.7 Endangered Species Act. Proposed activities will be investigated to assure that endangered or threatened species and their habitat will not be adversely affected. Review by the FWS is required and close consultation is necessary when potential impacts exist.

4.8 Executive Order 11988. In accordance with this executive order, a floodplain impact analysis must be conducted to determine whether a proposed action would increase flood elevations.

4.9 Executive Order 11990. Dredged material placement sites are to be evaluated on the potential short and long-term impacts associated with the destruction or modification of wetlands. Construction in wetlands is to be avoided wherever there is a practicable alternative.

4.10 33 CFR 335-338 Discharge of Dredged Material Into Waters of the U.S. These rules govern the discharge of dredged material from project operation and maintenance into waters of the U.S. They provide procedures to promote consistent implementation of the environmental protection requirements of Corps operation and maintenance activities. These regulations provide procedures for compliance with state water quality certification requirements and for preparation of public notices. The procedures prescribed in these rules are reflected in the appropriate sections of the CMMP.

4.11 Engineering Regulation 1130-2-520. This Corps of Engineers regulation prescribes policies and practices relating to performance of navigation and dredging operations.

5.0 Channel Maintenance Background.

5.1 Historic Perspective. The first navigation improvements and maintenance on the UMR was legislated by Congress in 1824, when the Corps of Engineers was authorized to remove snags, shoals, and sandbars; and to close sloughs and backwaters so that flows were confined to the main channel, thus maintaining depths for navigation. The River and Harbor Act of 1878 authorized a 4.5-foot channel, to be maintained by constructing headwater reservoirs,

bank revetments, and emergent wing dams, closing dams and dikes. A 6-foot channel was authorized by the River and Harbor Act of 1907 and was primarily achieved by construction of additional wing dams and closing dams along with limited dredging. In the late 1930's, most of the 13 lock and dams in the St. Paul District were constructed and became the primary infrastructure for maintaining the 9-foot channel depth. The Upper and Lower St Anthony Falls locks were added to the system in 1963.

Even with the series of navigation dams, the wing dams, closing dams and other rock channel control structures, remain an essential component for maintaining the navigation channel. At the time the 9-foot project was legislated, it was also recognized that the navigation dams would have to be supplemented with dredging to assure that the project depth was maintained. Therefore, construction of two modern dredges was also authorized. One of these, the 20-inch pipeline cutterhead dredge WILLIAM A. THOMPSON was built and assigned to the St. Paul District.

5.2 Early Channel Maintenance Practices. Heavy dredging was initially required to establish the 9-foot channel and provide suitable channel widths on river bends. In 1937 over 4.2 million cubic yards (CY) was dredged and in 1938 nearly 5.0 million CY was dredged in the District. During the period 1938-1955 the average annual dredging requirements were 2.3 million cubic yards. This declined to 1.5 million per year during the period 1956-1972. Since 1937, the Dredge THOMPSON has been the primary piece of dredging equipment used in the District. In 1958 the THOMPSON coverage area was expanded to include the Rock Island District and in 1986 it was further expanded to include the upper portion of the St. Louis District. It has also been used for a number of temporary assignments in other Districts. In the St. Paul District, the THOMPSON has been supplemented with other government and contract hydraulic dredges and mechanical equipment. Mechanical equipment has been used where rock or other physical restrictions prevent use of hydraulic equipment; on small projects where it is more efficient; and at locations where reasonable placement conditions require barge transport.

Until 1975, the THOMPSON reach capability was limited to 1750 feet on water and under 1000 feet on land. Dredged material was placed in open water, along the shoreline, or on adjacent islands. Sites were primarily owned by the government, although some material was provided to private or public landowners within the operating limitations of the equipment. Since 1975, the Dredge THOMPSON fleet was significantly improved and expanded to meet changing placement site requirements as discussed in the following sections. Additional emphasis has also been placed on the use of mechanical equipment. Existing dredging equipment capability and its use is discussed in Section 9.0.

5.3 Environmental Concerns and Initiatives. In the late 1960's, environmental interests expressed concern that placement of dredged material was severely affecting the environment of the Upper Mississippi River. In 1969, the Upper Mississippi River Conservation Committee (UMRCC) developed a survey identifying critical areas to avoid and areas of least impact. The District agreed to follow these recommendations, if the placement was within equipment capability. In 1971, the District initiated an annual meeting to discuss dredged material placement for the upcoming navigation season. Site specific disposal review supplemented the UMRCC recommendations. In the early 1970's, the District began publishing an annual notice

of proposed channel maintenance activities and identifying potential placement sites. Notices of individual jobs were issued and on-site meetings were scheduled upon request to solicit information on proposed disposal sites of concern. In 1974, the District released an environmental impact statement for operation and maintenance of the Mississippi River 9-foot navigation project. The principal findings of the EIS were that additional equipment capability was needed to reach more selective dredged material placement sites, and further evaluation of the resource was needed to enhance system management. In response, the District effectively tripled the THOMPSON reach capability by adding a booster pump, additional pipeline and other equipment to the operation. Supplemental barges and equipment were also added to the mechanical dredging fleet to expand the range of placement sites.

In 1973, the State of Wisconsin filed a lawsuit against the Corps, on issues related to the authorized depth, the need for state permits and later on the adequacy of the EIS. The adequacy issue was not pursued after the release of the project EIS in 1974. In 1975, the State of Minnesota filed a lawsuit against the Corps, also contending that a state permit was needed for dredging operations. The District Court ruled in favor of the State of Minnesota but that ruling was overturned by the Circuit Court of Appeals and denied further review by the Supreme Court. Minnesota legislators then successfully led the way for adding the 404(t) amendment to the Clean Water Act of 1977. This amendment requires that the Corps obtain state permits. Wisconsin's lawsuit related to the need for a state permit became a moot issue at that time. In 1981 the final component of the lawsuit was settled when the court ruled that the Corps does have the authority to dredge deeper than 9 feet.

5.4 Great River Environmental Action Team Study. In 1974, under the leadership of the Corps of Engineers and Fish and Wildlife Service, an interagency team was organized to identify and assess the problems associated with multipurpose use of the river and develop recommendations for improved management of the river. This effort developed into the Great River Environmental Action Team (GREAT) study, which was formally authorized by Section 117 of the Water Resources Act of 1976. The study was subdivided into the three reaches of the St. Paul, Rock Island and St. Louis Districts. The St. Paul segment referred to as GREAT I, involved participation by the Corps, Fish and Wildlife Service, Coast Guard, Environmental Protection Agency, Soil Conservation Service, States of Minnesota, Wisconsin and Iowa, Minnesota-Wisconsin Boundary Area Commission, Upper Mississippi River Conservation Committee and Upper Mississippi River Basin Commission.

From 1974 through 1980, the GREAT team carried out an extensive program of research and pilot action projects, addressing total river resource requirements. The nine-volume report summarizing the study results included 112 specific recommendations directed at river resource agencies and organizations. Among the recommendations, was a site specific dredged material placement plan for all material expected to be dredged during the 40 year period 1986 through 2025.

Of the GREAT study recommendations, 80 were directed at the Corps of Engineers. In response to the study, the District prepared an implementation report in 1981 that analyzed the recommendations and proposed a plan of action for implementation. The North Central Division issued a public notice supporting the proposed action. The Corps concluded that the proposed action was within existing authority and the GREAT I Report and the District's Implementation

Report were forwarded through higher headquarters to Congress for information. Many of the 80 recommendations were subsequently implemented through incorporation into the operation and maintenance program for the Mississippi River project. In 1992, the District completed a GREAT I Implementation Status Report and Future Program that summarizes the District's achievements related to GREAT I recommendations and describes future actions.

6.0 Dredged Material Management.

6.1 Placement Site Planning. To start the implementation process for the GREAT I recommended dredged material placement plan, the District reviewed the GREAT sites and compared them with alternative sites to determine whether use was justified from economic, social, and environmental perspectives and to assure consistency with Federal laws and regulations. In the mid-1980's, seventeen reconnaissance reports were initially prepared for individual dredge cuts or for a group of cuts. For a number of dredging locations on the Mississippi River, and at the tributary projects and boat harbors, reports were not prepared because it was determined that no further evaluation was required at this time to initiate implementation of an acceptable long term placement plan. At some locations where plans were prepared, it has not been possible to implement the selected alternative due to various reasons. Therefore, additional planning was accomplished and three new reconnaissance reports were completed in 1995.

Placement sites selected through previous planning are listed by dredging location on the table of designated placement sites at TAB 1-3. TAB 3 also contains considerable information relating to the selected placement sites and TABs 9 through 20 have individual site information sheets and maps. The following paragraphs in this section outline the placement site planning process.

As discussed in section 3.0, the long-term management strategy serves as the general framework for dredged material placement site planning. Appendix D describes in more detail the District's evaluation process for long term site planning. In the planning process it is the Corps' policy to regulate the discharge of dredged material from its projects to assure that dredged material placement occurs in the least costly, environmentally acceptable manner, consistent with engineering requirements established for the project. The least costly alternative, consistent with sound engineering practices and selected through the 404(b)(1) guidelines will be designated the Federal standard for the proposed project. The process that has been developed is consistent with the 404(b)(1) guidelines.

The process starts with a projection of dredging volumes and beneficial use quantities to determine the area required for future placement needs. A 40 year planning period is normally used for these projections, to be consistent with the GREAT I study and to address a sufficient time period for measuring the long term impacts associated with channel maintenance at a given location. The reliability of projecting future dredging and beneficial use removal quantities is relatively low because of the many variables that influence these factors. For that reason the actual longevity of a particular placement site might vary significantly from the planning time period. This will either extend or diminish the available life of the site and determine when further long term planning is necessary.

The next step in the site selection planning is identification of reasonable alternative placement sites. The alternatives are then evaluated for economic, environmental, social and cultural resource impacts. Evaluation criteria and weighted values have been developed for each parameter and are applied to the alternatives. An evaluation matrix is used to quantify impacts and to compare the alternatives. The alternative identification, evaluation and site selection process is coordinated with the interagency River Resources Forum (RRF) and endorsement of the proposed plan is sought from that group. Section 10.0 and appendix A explains details of the coordination procedures.

The evaluation process and criteria are adjusted when it becomes evident that assumptions are no longer valid, there are changes in regulations, policy, etc., or special circumstances exist that warrant a change. Changes in the evaluation process will be coordinated with the River Resources Forum. The basic site selection process will continue to be used in the future whenever it becomes necessary due to a lack of site capacity, problems with implementation, or other factors that affect site availability.

The Channel Maintenance Management Plan (CMMP) consolidates dredged material placement site planning into a comprehensive District-wide long-term plan. The CMMP is a composite of the GREAT I study recommendations, the Corps' post-GREAT planning, and any subsequent changes or modifications that have resulted during implementation. As new dredged material management plans are developed, the selected sites will be incorporated into the CMMP.

The dredged material management plans contained in this document represent the District's best effort using information available at the time of the planning. The plans are based on a number of assumptions and variables, and therefore should not be construed to be all-inclusive. Dredging locations shift and patterns or characteristics such as quantity and frequency can change dramatically. Beneficial use demand for the dredged material is unpredictable and opportunities can develop with very short advance time. Although the District intends to closely follow the specifics contained in the CMMP, it should be recognized that there will be times when deviations are necessary or preferred to take advantage of an opportunity. In those situations, the applicable regulatory requirements will still be satisfied and the procedures described in this document will be followed.

Through an independent evaluation process as explained in section 6.5, the District is also conducting long term planning for the use of dredged material to enhance and/or maintain recreational beaches. As that process is completed, sites requiring dredged material for beach enhancement will also be added to the CMMP.

6.2 Mitigation Policy. The District understands that the site planning process may result in the selection of an alternative that includes an unavoidable impact on wetland habitat. At a national level, the Corps of Engineers does not have an established policy for mitigation of unavoidable wetland impacts resulting from operation and maintenance of existing projects. It is the District's position that authority for mitigation exists and therefore a District wide policy has been developed and is incorporated into the CMMP as Appendix B - District Mitigation Policy. The District's position is that the CMMP represents a baseline condition that has evolved from previously approved plans that were prepared prior to mitigation requirements or authority existed. The CMMP was developed without the benefit of considering mitigation requirements

in the evaluation process and therefore those requirements should not be applied at this time. Implementation was agreed to and has been initiated at nearly all of the sites in the plan. Avoid and minimize measures applied in the planning process have successfully reduced the projected wetland impacts of the CMMP to 45 percent (approximately 200 acres) of the approved dredged material placement plan contained in the GREAT I study. The total projected placement site needs of the CMMP are approximately 865 acres or 77 percent of the 1119 acres projected in the GREAT study. It is anticipated that even further reductions in projected wetland impacts will result through good management efforts during implementation. The District's policy is that compensatory mitigation is not required for impacts associated with implementation of the 1996 version of the CMMP. Proposed wetland impacts that exceed the 1996 CMMP projections will be compensated for in accordance with the established policy in Appendix B.

6.3 Site Management. Once the site selection planning has been completed, implementation and management are initiated. Site management is an important component of the CMMP and involves a number of elements, which are discussed below. Site-specific information sheets and operational maps are contained in TABs 9 through 20. The information sheets provide background information on selection of the site and various details relating to its use. The operating maps show the site boundaries and details related to material placement, removal and other management factors. As implementation progresses and more information becomes available, the site sheets and maps will be updated and upgraded to reflect the current situation and any new information or changed conditions. A five year placement site action plan (TAB 6) has been prepared to identify implementation and management measures required for individual sites. This plan will be updated annually to provide details for the upcoming year and to schedule, prioritize and budget for future required actions.

6.3.1 Real Estate. The Minnesota River, Upper St. Anthony Falls pool and the commercial and recreational boat harbors have local project sponsors that are responsible for furnishing real estate required for the ongoing maintenance of those projects. It is the District's responsibility for obtaining a real estate interest for placement sites throughout the remainder of the Mississippi River project. The District's goal is to secure a long-term interest that allows continued use of the site for the duration of the planning period. Acquisition in fee title of privately owned sites is the preferred option. Permits, easements and land use agreements are also used to acquire the right to place material on non-Federally owned sites. Unless stipulated otherwise in an agreement, dredged material placed on sites that are not Federally owned becomes the property of the landowner and is not subject to further control by the Corps.

6.3.2 Temporary Sites. A number of sites in the dredged material management plan are temporary in nature because the material is ultimately removed and transferred to a permanent site. As implementation of the existing plan progresses and long term planning continues, the need for other temporary placement sites may become evident and will be coordinated through the RRF. Temporary sites are divided into three categories as described below:

6.3.2.1 Transfer Site - A transfer site is used as an interim holding

location until the area is filled and the material can be economically removed and transferred to a designated permanent site. The capacity of the transfer site is determined by safe operating practices and the existing boundaries of the site. Site boundaries will only be expanded after coordination with the RRF.

A transfer site provides an efficient location to place the dredged material when channel maintenance dredging is conducted because placement directly at the permanent site would be too time consuming and/or costly. An example of a transfer site is the Reads Landing containment area, site 4-762.7-LWT. It is anticipated that most transfer sites will be used indefinitely, provided dredging requirements exist and a permanent site is available to periodically transfer the material to. However, changes in equipment and technology, dredging requirements, permanent sites, or other reasons may render a transfer site obsolete in the future and appropriate measures will then be taken to close the site out.

Should it be determined that a transfer site is no longer needed, the Corps will investigate and evaluate options for final disposition of the transfer site. One of the preferred options will include removal of the excess material remaining at the transfer site and restoring the area to an appropriate habitat. Investigations will include seeking a permanent location for the excess material. Other options will include reshaping of the site, capping with fine sediments and revegetating the area. Any option will include consultation with federal and state regulatory agencies to complete restoration work.

6.3.2.2 Emergency Site - An emergency site is used when an emergency or imminent closure condition exists in the channel and the necessary equipment or time is not available to place the material at a permanent or transfer site. Emergency response procedures are discussed in section 9.3 and Appendix A.

Material placed at an emergency site will be removed and transferred to a permanent site by the following spring high water or as soon as possible under time and/or equipment limitations but not to exceed two years from time of emergency placement and before the placement of any additional material, unless another mutually agreeable plan of action is reached with the appropriate regulatory agencies.

A number of sites have been designated for emergency/imminent closure purposes and are contained in the CMMP. An example of an emergency site is 7-708.7-LWE at Winters Landing. Other emergency sites that are presently not designated may be required during an emergency response. Those sites would be determined in accordance with the provisions of agreements with the state regulatory agencies as discussed in Appendix A.

At emergency sites where there is a high probability for use, advance preparation may be desirable so that adverse environmental impacts are minimized when an actual emergency channel condition develops. Advance preparation measures will be coordinated through the on-site inspection team process (OSIT).

6.3.2.3 In-water Rehandling Site - An in-water rehandling site is a temporary in-water location that is used to reach another site because of equipment reach limitations. In-water rehandling sites that are needed on a recurring basis will be designated as part of the permanent site-operating plan.

Material is temporarily stockpiled at the in-water rehandling site and then removed as

soon as possible during the final stage of the dredging event. In-water rehandling sites are selected to coincide with a portion of the dredge cut if possible. If that is not possible, rehandling areas are selected to minimize habitat disturbance and because of there reduced potential for secondary movement of the material before it can be rehandled.

6.3.3 Permanent Sites. Unless designated otherwise all actively used placement sites are considered to be permanent and the District has no plans for further removal of the material once it is placed at these locations. The District's goal is to conduct the channel maintenance program to maximize the longevity of the permanent sites. This will primarily be accomplished by efforts to minimize dredging quantities and to promote beneficial use as discussed below. Sites will be managed to achieve maximum capacity by placing material to the horizontal and vertical limits of the site as determined by the operating plan, surrounding land use, and through actual placement operations. Filling of a site will progress in a logical manner as influenced by the location of the dredge cut and site characteristics such as topography and configuration. When possible, only that portion of larger sites needed for conducting an efficient placement operation will be prepared (i.e. diked, cleared) and used at a given time. The remaining area will be left undisturbed until use of it becomes necessary. Site capacity will be monitored to determine when additional planning is necessary for selecting a future replacement site.

6.3.4 Site Preparation and Management. Most selected sites require site preparation prior to use and periodically again as placement progresses. Measures vary by individual site and method of dredging. Site preparation may include construction of containment berms, clearing of vegetation, utility relocation, installation of culverts for access, installation of effluent control structures, construction of access and material excavation.

Transfer sites requiring periodic excavation are monitored to determine when unloading will be required so that work may be scheduled and budgeted. Excavation is normally accomplished by hydraulic dredge. The dredge excavates an opening approximately 100 feet wide into the interior of the site. Material is removed from the center of the site and transported to the permanent site. Dredging depths within the sites vary from 10 feet to 30 feet or more depending on equipment capabilities and individual site constraints. A perimeter berm is left intact for future placement. Final configuration of the excavated sites will be determined on a site-specific basis. Access openings at some locations will be closed when the excavation has been completed. Access openings at other locations will be left open initially to allow for temporary use of the interior area by recreational boaters. At some stage in the filling process, it then becomes necessary to close the opening and install an effluent control structure. Disposition of a transfer site that is no longer needed is discussed in section 6.3.2.1.

Protection measures are needed at many locations to minimize erosion from wind, waves and water flow. Measures include vegetative plantings, fencing, walls and rock protection as determined by individual site requirements. Measures vary by the stage of filling at the site and the anticipated future use of the area. The District's objective is to assure that material does not erode from federally owned sites. On non-federally owned sites the landowners are responsible for protection of material placed on their property. Permanent sites that are filled to capacity will be considered for final shaping, placement of topsoil, and planting to protect the site and

improve the aesthetics.

6.3.5 Aesthetics and Social Concerns. The District is sensitive to the impacts of dredged material placement on local communities and adjacent landowners. The potential for these impacts must be carefully addressed in the planning and decision making process. Operation of a dredged material stockpile site in or near a residential area creates a number of concerns. There is noise associated with the placement of material at the site and also with the beneficial use removal operation. At some locations local zoning ordinances may affect scheduling of the operations. Trucking operations to and from the site can impact on local road maintenance and at some locations is controlled by the local municipality. Visual impacts are also a major concern for any site whether it is near a community or exposed to boaters on the river. In general, dredged material placement operations and beneficial use removal are often not compatible with surrounding land use. Measures will be taken where appropriate to ameliorate these concerns. These efforts may include fencing, plantings, and limiting hours of operation. Sites or portions of sites that are no longer used will be considered for shaping and planting to improve aesthetics.

6.3.6 Beneficial Use. A major objective of the District is to place material at locations where it can be used productively, either directly at the location where it is placed or for removal and beneficial use elsewhere. The District has provided dredged material for a variety of uses to other federal agencies, state agencies, counties, municipalities, contractors, private organizations and private landowners. Material placed at federally owned stockpile sites is made available at no cost to anyone interested in removal of it on a first come basis. However, if there are competing demands for the material and cost considerations are comparable, the District's policy is to provide the material to the governmental entity that represents the largest public constituency.

The District has had significant success in achieving beneficial use of dredged material. Records of past beneficial use are contained in TAB 2 and summarized in TAB 3-4. Dredged material has been used as landfill for residential and commercial development including airport expansion, retail stores, sanitary landfill cover, wastewater treatment plants and manufacturing facilities. It has been used to implement environmental enhancement projects such as Weaver Bottoms and Environmental Management Program (EMP) habitat rehabilitation projects like the Pool 8 islands. Recreational use of dredged material has included beach enhancement and park development such as the District's Blackhawk Park and other county and municipal parks. Sand and gravel pits have been filled with dredged material making them suitable for future development. Active uses of dredged material have been construction fill, ice control on roads, summer road maintenance, as an ingredient in molded products and as an aggregate in concrete.

The District actively promotes beneficial use at federally owned sites in a number of ways and encourages it at non-federal sites whenever possible. Notices and questionnaires are periodically distributed to potential users to make them aware of material availability and to gather information on demand and site suitability. At federally owned sites the District has established material removal guidelines (TAB 3-5) to promote fair, safe and efficient use of this resource. As placement site implementation progresses the District will explore other measures to aggressively promote active beneficial use.

The District also works closely with municipalities, developers and contractors to take advantage of new beneficial use opportunities as they surface. Because these opportunities are unpredictable, it is necessary to retain flexibility in the placement site selection and approval process. The on site inspection team process along with flexible state regulatory agreements are key elements in assuring that new beneficial use opportunities can be incorporated into the program on a timely basis. The District encourages other agencies to assist in locating new beneficial use opportunities and being responsive to taking advantage of them.

6.3.7 Floodplain Effects. Detailed hydraulic analysis of the floodplain effects of placement site development with the HEC-2 computer program has found insignificant effects on the water surface profiles. Therefore, detailed evaluation with HEC-2 of most placement sites for floodplain effects is not necessary. The following criteria have been established from review of previous studies to determine when detailed evaluation of floodplain effects using HEC-2 is not necessary. No evaluation is necessary if the placement site: a) reduces the area of the floodplain by less than 15 percent when fully developed, or b) is located immediately downstream of a major structure such as a dam or bridge, or c) is located in the outer fringe of the floodway. Each placement site will be reviewed for potential floodplain effects. HEC-2 analyses will be used for sites that do not match the criteria above and sites that may be questionable. The site information sheets in TABs 9 through 20 indicate the status of any site-specific floodplain impact analyses.

6.4 Thalweg Placement. The objective of thalweg placement is to place the material in the deeper water area of the main channel where it can be assimilated into the river's natural sediment transport system. In concept, the river downstream of the shoaled area can effectively absorb the material that is reintroduced without increasing dredging requirements at other locations and without having an adverse impact on the environment. The District has not actively pursued thalweg placement as a serious option in the long term dredged material planning process because of unknowns and concerns related to the fate of the material and the ability of the system to effectively assimilate it. As our data gathering, evaluation and monitoring capability improves, dredging equipment technology changes, and our understanding of the sediment transport processes increases, the District may investigate thalweg placement at site-specific locations. This option has the potential for increasing the longevity of placement sites or avoiding the need for developing new sites. It should not be categorically dismissed without basis.

6.5 Recreational Beach Planning. Another beneficial use of dredged material is the creation and maintenance of recreational beaches along the main channel shoreline. The sandy material placed along the shoreline provides an excellent resource for recreational boaters. The District supports its use for that purpose. The objective is to place the material at locations where it will provide recreational opportunities without creating other significant adverse impacts. To determine suitable locations, pool studies have been conducted to evaluate alternatives and select appropriate sites. Evaluation criteria include recreational demand, physical characteristics of the site and accessibility, impacts to other resources, and operational feasibility of implementation. The District has prepared recreational beach plans for a number of

pools. These plans have been reviewed by the River Resources Forum and sites have been endorsed for beach maintenance activities. TAB 3-2 lists recreational beach sites that have been endorsed. Implementation has been accomplished at a number of these locations.

Successful implementation of the recreational beach plans depends on preparing evaluations and obtaining approvals in advance. When channel maintenance dredging is required, the Corps will determine whether implementation of a RRF endorsed recreation beach maintenance site is feasible based on projected dredging quantities, available equipment, and beach requirements and physical constraints. The On-Site Inspection Team (OSIT) will be notified of the proposal and a meeting will be held if necessary. OSIT representatives will coordinate involvement of their agency's recreational planners to assure that final details are in compliance with the intended objectives. Site-specific conditions will be reviewed to determine whether conditions have changed to a degree that may render the site unacceptable.

Placement and shaping of the material will be accomplished in accordance with the endorsed site development plan. Departures from the approved site maintenance plan may be necessary in emergency dredging situations or due to actual field conditions and will be coordinated with the OSIT.

Following development of a selected beach area, the Corps and other agencies will informally monitor the beach for future action and evaluate the effectiveness of the development that has been accomplished.

6.6 Fish and Wildlife Habitat Restoration. Restoration or enhancement of fish and wildlife habitat can be accomplished under existing channel maintenance authorities if it is determined to be the base alternative to maintaining the navigation project (i.e., the most cost effective way, consistent with economic, engineering, and environmental criteria). In addition, there are special authorities under which this can occur. These authorities are Section 204 of the Water Resources Development Act (WRDA) of 1992 and Section 1135 of WRDA 1986, as amended. Section 204 authority provides for the use of dredged material for the improvement of aquatic and ecologically related habitats. Section 204 projects are cost shared on a 75 percent Federal to 25 percent non-Federal basis. Section 204 costs are limited to the incremental costs in excess of those costs necessary to implement the base alternative. For example, if it would cost $100,000 to place dredged material in an acceptable placement site and $150,000 to place the dredged material in a manner that would improve aquatic habitat, the non-Federal sponsor would be required to cost-share only the $50,000 incremental cost needed to obtain the habitat benefits. The non-Federal sponsor is responsible for providing all lands, easements, and rights-of-way, and for operation and maintenance of the habitat project.

Section 1135 authority allows for modification of Corps of Engineers water resource projects for the purpose of improving the quality of the environment. Section 1135 projects are cost shared on a 75 percent Federal to 25 percent non-Federal basis. Normally, from a non-Federal sponsor perspective, Section 204 would be the preferred authority. Section 1135 authority would only be considered when Section 204 authority could not be used (i.e., the habitat restoration activity did not involve the use of dredged material or Section 204 program funding was not available).

7.0 Channel Management.

The District approaches channel and harbor maintenance with a primary objective of minimizing or controlling dredging requirements while maintaining safe and reliable conditions within the project authorities. In addition to dredging, which is detailed in section 9.0, channel maintenance techniques include both structural and non-structural measures as discussed below. The study process and schedule for evaluating and determining significant channel modifications and actions is described in TAB 7 - Channel Management Plan. The schedule and table in this tab is updated annually. Current work-year activities can be found on the District's web page.

7.1 Channel Dimensions. Channel dimensions or dredging limits are based on a number of factors. The authorized dimensions form the baseline and are listed by project in TAB 1-1. The level and type of project use, and user feedback are important considerations in determining dredging dimensions or deciding whether to dredge. Determining dimensions for channel maintenance can be complicated, as there are a number of hydraulic and operational considerations, which must be taken into account. These are explained in TAB 4-4. The objective is to optimize a balance between dredging frequency, quantity and cost without compromising safety and reliability for the project user. Evaluation of dredging dimensions by location from both a hydraulic engineering and operational perspective is required on an ongoing basis with a view towards the long term. Dredging depth and width are discussed in greater detail below. The two are interrelated as the adjustment of one can have an effect on the other as demonstrated in a 1985 study of river tow needs for maneuvering room on the Upper Mississippi River. To avoid frequent re-dredging and ensure the least overall cost of maintaining the project, advance maintenance dredging to a specified depth and/or width is allowed.

7.1.1 Depth. Channel depths are referenced to low control pool elevation (LCP), which is the lowest water surface elevation that can be expected at a given location (within a tolerance of several tenths of a foot). All surveys and dredging depths correlate to LCP. The Mississippi River main stem and navigable tributaries are authorized to a depth of 9.0 feet. To assure that the 9.0 foot depth is available, the dredging process is generally initiated when depths less than 10.5 feet are observed encroaching into the navigable channel. This allows for the possibility of additional shoaling to occur and a reasonable lead-time to schedule and execute the dredging. Dredging is normally conducted to a depth of 11.0, 12.0 or 13.0 feet as determined by past experience and the criteria explained in TAB 4-4.

7.1.2 Width. The authorized width varies for different projects and reaches as listed in TAB 1-1. These specified widths are for straight stretches, but there is a provision in the authorizing documents for increased width on bends. Past experience, user feedback, channel alignment and flow patterns are some of the important factors in determining the appropriate dredging width. Towboat pilot recommendations for bend widths were developed during the GREAT I study and are also used as a guide. Those recommended guidelines are listed in TAB 4-3. The District will continue to work with the navigation industry on

establishing and refining site-specific guidelines for channel width.

7.1.3 Pool Operation. This document is not intended to address the procedures or effects of dam or pool operations. An explanation of operations as it relates to the channel maintenance program is important to provide an understanding of how available water depths can be affected.

The dams are designed for navigation purposes only and have no flood control benefits. When runoff and high water stages occur the dam gates are opened. All gates at each dam are fully open long before flood stages are reached, so natural open river conditions exist when flows are high. When the dams are in operation there is a slope in the water surface between two dams. As flows vary, this water surface profile will tend to pivot at the primary control point, which is located at the intersection of the project pool elevation and the ordinary high water mark. As flows increase more water is discharged causing the pool elevations immediately above the dam to decrease and the tailwater elevations downstream of the dam to increase. The decrease in water elevation on the upstream side of the dam is called the drawdown and is legally limited so that navigation and natural resources are not adversely impacted. This drawdown limit is called the secondary control elevation. Project pool elevation is maintained at the primary control point until the drawdown reaches the secondary control elevation. Control is then maintained at the dam and the water surface profile throughout the entire pool is allowed to rise until the difference between the pool and tailwater elevations is less than approximately one foot. At that time all gates are opened and open river conditions exists.

In practical terms, from a channel maintenance perspective, higher discharges and tailwater stages at a dam will result in a decrease in pool elevation or less water depth in the pool area. This condition exists, at least in some portion of the pool area, until increased flows raise water surface elevations above the project pool elevation. Contrary to the belief of some project users, higher flows do not necessarily provide an opportunity to load barges deeper.

7.2 Shoaling Patterns and Trends. The Mississippi River is a complex and dynamic system for sediment movement. Experience has shown that significant shoaling and scouring can occur rapidly in the navigation channel. As data collection and evaluation capability improve, the magnitude of these changes is becoming more quantifiable. This information is being used to develop a better understanding of sediment transport and how it relates to the channel maintenance program. This knowledge will be helpful in designing channel modification projects and evaluating, planning and scheduling dredging activities. It will also provide agencies a better understanding of the dynamics of the river system and potential effects of proposed actions, so that regulatory decisions have a more solid technical basis.

Some major factors influencing shoaling in the navigation channel are hydrologic events and related flow conditions, river geomorphology, and channel control structures. In simple terms, shoaling on the river can be separated into two basic categories, point bars and crossings.

The point bar shoal builds from the inside of the bend towards the outside. During periods of high flows the point bar and adjacent deep-water pool tends to scour and during low flow periods deposition occurs. Deposition will generally continue until a cross sectional balance has been reached and conditions stabilize. The threat of a channel closure is low, but the point bar will narrow and can make navigation difficult and increase the potential for groundings

to occur. A point bar dredge cut is characterized by a heavy face on the inside of the dredge cut tapering to a very shallow face on the outside of the cut. Dredging production and effectiveness on a point bar is generally high with both mechanical and hydraulic equipment.

The crossing situation exists between the deeper pools where the thalweg is shifting from one side of the river to the other. The crossing will aggrade during high discharge periods and scour when flows are low. Crossings are characterized by relatively long reaches with depths being fairly uniform throughout. A critical time period is when higher flows are dropping off before the river crossing has sufficient opportunity to adjust. Shoaling above the 10.5 dredging initiation depth is generally spotty over the reach. There is greater potential for channel closures to occur because of the shoaling characteristics and the minimal clearance for passing vessels. When groundings occur, efforts to free the grounded vessel will often result in significant humps being generated that will cause a channel blockage until dredging can be accomplished. The hydraulic dredge is more effective for use on crossings because the dredge face is relatively shallow over a large area.

7.3 Dredging Quantities. There are over 100 locations that have required channel maintenance dredging since 1970. The frequency and volume of dredging varies considerably by location. TAB 4-1 is a summary of dredging locations, volumes, frequency and date of last dredging. A list of all dredging events, quantities and dredging depths by location since 1970 is provided in TAB 4-2. This historic information is used as an indicator of where shoaling problems exist so that surveys and studies can be focused in areas of concern. This information also serves as a starting point in projecting future dredging quantities for placement site studies. As stated previously, a key objective of the program is to reduce dredging quantities for cost savings and to minimize placement site requirements. During the period 1975 through 1995, dredging quantities averaged approximately 700,000 cubic yards per year. This was more than a 50 percent reduction from the average annual dredging quantity of 1.5 million cubic yards during the period 1956-1974. However, dredging quantities have increased in recent years. During the period from 1991-2000, annual dredging quantities averaged 1.0 million cubic yards and during the period from 1995-2000, annual dredging quantities averaged 1.3 million cubic yards. This can be attributed in part to severe flooding on the Mississippi River in 1993 and 1997.

The heaviest dredging requirements in the District are experienced in the 20 mile reach below the mouth of the Chippewa River. This reach accounts for 45 percent of the average annual quantity in approximately 7 percent of the District's geographic area of responsibility for channel maintenance. Studies have been conducted on the feasibility of reducing Mississippi River dredging needs by performing bank protection on the Chippewa River. It has been concluded that protection of the banks would have a fairly small impact on the sediment that reached the Mississippi River. With protection of the banks, the bed erosion would increase to satisfy the transport capacity of the river. Over time, armoring of the bed by larger sediment would gradually reduce the erosion rate and limit the total degradation. After about 50 years, the sediment discharge from the Chippewa River would be reduced about 15 percent and the dredging requirement would be reduced about 84,000 cubic yards per year. An economic analysis found that bank protection was not justified by itself because of its high initial cost and the delay in time until benefits would be provided. International experts on erosion and sediment transport have reviewed this problem and the study results, and have concluded that bank

protection would probably not substantially lessen the Chippewa River's material load. The District has no plans at this time to implement a bank protection program on the Chippewa River or other tributaries as a means of reducing channel maintenance dredging requirements on the Mississippi River. The District will remain open to consider new techniques for protecting shorelines from erosion and will apply them where needed if it is determined that they are economically feasible.

7.4 Channel Monitoring. The District is strongly committed to close monitoring of channel conditions to assure that dredging is performed when needed and unnecessary dredging is avoided. Because of the river's dynamic nature and propensity for relatively rapid shoaling and scouring, monitoring through the use of timely and accurate hydrographic surveys is a key element of the channel maintenance program. Substantial savings through dredging avoidance can be realized by having the technology and capability to conduct surveys at critical times during the hydrograph period. The District has observed significant improvements in shoaled areas as flows have decreased and the channel control structures have assisted the sediment transport process. Likewise, critical or restrictive conditions can be avoided or minimized by having timely channel condition information available, so that dredging can be programmed before water levels drop and an emergency results. Providing high quality channel information to the project user has also proven to be an effective method of avoiding groundings and potentially a more significant dredging event. Information sharing with the users will become a more valuable tool in the channel maintenance program as technological advances are made. The District supports improvements that will enhance the channel maintenance mission and will continue to pursue them.

7.5 Aids to Navigation. The United States Coast Guard (USCG) is responsible for maintaining the aids to navigation (buoys, lights, daymarkers) relied upon by both commercial and recreational vessel operators. The District supports the USCG mission in any way appropriate. Hydrographic survey results are routinely furnished to the Coast Guard to provide their buoy tender current channel information. Off station buoys are reported or frequently corrected by Corps resources when Coast Guard resources are not readily available. The Corps or its dredging contractors will routinely reposition buoys after completing dredging to define the new channel alignment. In recent years the District has dedicated equipment and personnel resources to early spring buoy setting. This is a critical time when buoys are severely off station, the Coast Guard cannot mobilize its resources because of ice conditions and commercial navigation is resuming for the season. The practice of supporting the USCG with spring buoy setting has been very effective in establishing a well-marked channel early in the season and potentially avoiding economically and environmentally damaging vessel groundings. The District intends to continue this practice and also that of providing general support because of the potential benefits it provides to the channel maintenance program through grounding and dredging avoidance. The District also supports the Coast Guard in relocating permanent aids to navigation as the natural channel shifts course and these markers no longer adequately identify the navigation channel. It is not cost effective to dredge the channel to align with "obsolete" markers.

7.6 Channel Control Structures. Channel control structures are the wing dams, closing dams, trailer dams, shoreline protection and any other features constructed to maintain the channel alignment or constrict flows to improve the sediment transport efficiency through a reach of the river. Construction of these structures was the primary technique used to establish a 4.5 foot and 6.0 foot channel in the late 1800's and early 1900's. Originally built of rock and brush mats as emergent structures, they became submerged when the 9.0-foot channel was created in the late 1930's. They remain largely intact and still perform a vital role in assuring the availability of a 9.0-foot channel.

Rehabilitating, restructuring or supplementing these features is a key component of efforts to reduce dredging requirements or control where and when dredging takes place. The District approach is to identify problem reaches that may potentially be improved through structural measures. These areas are initially evaluated to determine the scope of the problem and the objective, define the study area and develop study alternatives. Field data is collected that will be used in the study process and to evaluate the potential environmental impacts. Alternatives are evaluated to determine effectiveness in satisfying the objective and to assess the potential impacts. A plan is then selected and implemented. The District values participation from other agencies and local organizations in this process to assure that a comprehensive, well balanced approach is taken. TAB 7 explains the study and coordination process in detail.

7.7 Non-Structural Techniques. Adjusting dredging dimensions, monitoring channel conditions, information sharing with users, and accurate marking of the channel are all non-structural channel maintenance techniques that have been discussed and are used to reduce dredging quantities. Another technique that is being used is sediment trap dredging. This involves advance maintenance dredging of the material somewhere between the sediment source and the navigation channel to "catch" the material before it becomes a navigational obstruction. Although the sediment trap does not necessarily reduce dredging quantities it allows more control over when and where dredging occurs. This can decrease overall dredging costs, minimize environmental impacts and reduce potentially hazardous channel situations. Sediment trap dredging has been effective at the delta of the Chippewa River in pool 4. It may be considered at other locations in the future.

7.8 Snag Removal. Snags in the river are recognized as providing valuable aquatic habitat and are only removed when there is a safety concern. Removal of trees snagged in the navigation channel is a frequent requirement on the Minnesota River and less common on the other navigation projects. Snags are removed when they become a navigation concern or if it is imminent that they will move into the navigation channel. They are normally placed on an upland site and disposed of in a manner that complies with local ordinances. Maintenance of the 3.0 and 4.0 foot channel projects is generally limited to removal of snags. Snag removal on the St. Croix River is normally limited to requests by the National Park Service because of its wild and scenic river status.

7.9 Harbor Maintenance. Maintenance of the commercial and recreational harbors is straightforward. The depth and horizontal boundaries have been established by the authorizing legislation. The dredging process is initiated when shoaling occurs within those limits, provided

funding is available. Dredging depth in harbors is generally 1.0 foot deeper than the authorized depth to avoid frequent re-dredging and ensure the least overall cost for maintaining the project. All of the harbor projects have local sponsors that are responsible for furnishing an acceptable placement site. Periodically, harbors are reviewed to determine if the economic benefits of the project exceed the cost of maintaining it. If the economics are not favorable, federal maintenance may be discontinued.

8.0 Hydrographic Surveys.

Hydrographic surveys are a very basic and integral part of the channel maintenance program. They are used to closely monitor channel conditions, gather and share channel information with project users, position navigation aids, determine dredging requirements, calculate dredging quantities, and assess scour at the dams. Field survey units are the vital onsite link in a well-managed program. Survey capability must be very flexible to respond to highly unpredictable situations such as groundings, channel closures, and pre and post dredging needs. When critical conditions exist, survey personnel must make onsite decisions on the navigability of the channel and provide guidance to project users on how to best navigate a restricted reach. The two basic categories for channel maintenance surveys, channel condition surveys and dredge cut surveys, are discussed below.

8.1 Survey Resources. The District is committed to providing the equipment and personnel resources needed for meeting the channel maintenance objectives discussed in this document. Having sufficient capability, current technology and experienced personnel are the key elements for achieving this. Equipment upgrades and improvements are continually investigated as technological advancements are made. A ten-person survey unit provides the personnel requirements for meeting the hydrographic survey and dredge inspection needs of the District. Survey operations are based at the Channels and Harbors Project Office, located at Fountain City, Wisconsin.

The District has two 26-foot, trailerable survey launches that are capable of mobilizing rapidly to remote locations. Both are equipped with channel-sweep survey systems. The channel-sweep system has retractable booms that when extended from both sides allow the vessel to survey a 25-foot wide swath. Each boom has 2 transducers and the vessel has one center-mounted transducer for a total of 5. As the vessel passes over the survey area, the transducers are collecting sonar soundings at a rate of once per second while the vessel is moving at a rate of approximately 10 feet per second. The horizontal position of the vessel is continually located through the use of a satellite based differential global positioning system (DGPS). Surveys are conducted as the vessel travels upstream and downstream completely blanketing the desired coverage area. A typical survey area may cover 60 acres and take several hours to conduct. The soundings and horizontal coordinates are recorded together in an X-Y-Z format on a computer disk using a hydrographic survey software program. Following collection of the data, the computer disk is transferred to the survey office for final processing and plotting of the soundings. The plotted information is then evaluated and programmed for its intended

purpose.

The District also operates an 18-foot trailerable small boat survey system that provides capability to mobilize rapidly to remote locations and to operate in shallower areas. It is equipped with a single transducer survey system and DGPS. Surveys are normally conducted in a cross sectional pattern perpendicular to the flow. Like the larger survey launches, data is collected on a computer disk and information plotted at the survey office.

8.2 Channel Condition Surveys. Hydrographic surveys are routinely conducted to monitor shoaling in the navigation channel or harbor. Vessels are dispatched from the Fountain City Service Base in the spring of the year, normally in mid to late March, which coincides with the opening of the navigation season in the St. Paul District. Initial surveys are conducted before the spring high water period is experienced to obtain an early indication of conditions. When high water periods exist in the spring or at other times of the year, survey operations are normally suspended because of the rapidly changing channel conditions. Reaches that have historically demonstrated heavy shoaling in the navigation channel, frequent dredging requirements or other navigation related problems will normally receive a high scheduling priority. Cursory surveys called channel runs are sometimes used to make an initial determination on whether a shoaling problem exists. The channel runs are conducted by making several broad passes through a reach. If this indicates there are no problems, the vessel can move quickly on to the next location. If there is indication of shoaling in the navigation channel a detailed channel condition survey is conducted as described above. These type of surveys form the foundation for monitoring the channel and are relied upon heavily to determine conditions throughout the navigation season. The periods immediately following high water events are the most critical time and require a concentrated survey effort to ascertain conditions quickly at many different locations.

8.3 Pre and Post Dredge Surveys. The channel condition survey is used to determine the need for dredging and is generally conducted several weeks or more before the actual dredging can be performed. To provide the most up to date information on the shoaled area, a pre-dredge survey is conducted within 7 days of the commencement of dredging. This time period may be extended if there is good reason to believe that conditions are stable and no change can be expected. The pre-dredge survey is used to make any adjustments in dredge cut alignment and to accurately calculate the quantity of material to be removed. The quantity calculations are performed using the survey software package. Within 24 hours of completion of the dredging event a post-dredge survey is conducted to assure that the desired depth and area has been satisfied and to document the dredging event. This time period may be extended if there is good reason to believe that the dredging has been performed to the specified dimensions and a quick post-dredge survey is not critical. A government dredge inspector routinely monitors the dredging process to assure that work is being performed to specifications.

9.0 Dredging.

9.1 Dredging Process. The majority of dredging takes place between 1 June and 1

November of each year. Once a dredging requirement is established as determined by a channel condition survey, a dredge cut is laid out on the survey drawing using the criteria discussed in section 7.1. The work is then scheduled to be accomplished by the appropriate dredging equipment based on the size of the dredging job, placement site location and characteristics, and equipment availability. The timing of the dredging event relates to the urgency of the situation, dredging requirements at other locations, and the work schedule of the dredging equipment. A comprehensive dredging schedule and summary is maintained for all of the pending and completed dredge events for the navigation season. It is routinely updated as new information becomes available. The priority, sequence and scheduled equipment may frequently change based on the latest overall channel condition information.

If channel conditions are not critical, the dredging work may not be accomplished for a month or more after the requirement is first identified. When the time period from the initial survey to the scheduled time of dredging is lengthy, another channel condition survey is routinely conducted to determine if there is any change. If conditions have improved, dredging may be postponed or cancelled, and monitoring will continue. Conversely, if conditions have deteriorated, dredging may be given a higher priority. As discussed in section 8.3 a pre-dredge survey is conducted immediately before the dredging event is scheduled to begin.

The general dredging schedule is updated periodically and is provided on the District's web page for viewing at any time. This keeps agencies informed of the overall dredging workload. A site-specific dredging notice is provided on the District's web page when dredging plans and details have been finalized. The OSIT is notified by electronic mail each time new dredging notices are added to the District's web page. Coordination and notification procedures are discussed in greater detail in section 10.0 and Appendix A.

Once a dredging event is scheduled, final preparations and details are initiated. Placement site requirements are reviewed to assure that arrangements are completed for real estate actions, environmental evaluations and documentation, and regulatory permits. As the dredging event approaches, a final internal review and approval process is completed, and instructions are provided to the assigned dredging unit. Global Positioning Systems (GPS) are used for dredge positioning, making it possible to immediately move into cut locations. A government dredge inspector is assigned to the dredging unit to assist and monitor operations, assure instructions are followed, and document details of the event. The inspector will also make minor field adjustments to the cut layout as necessitated by onsite conditions.

9.2 Equipment. The District uses a combination of hydraulic and mechanical equipment for channel maintenance dredging operations. Equipment is either government owned and operated or work is contracted with a private dredging company.

The hydraulic equipment best suited for the Upper Mississippi River (UMR) is the pipeline, cutterhead dredge. The material is loosened by the revolving cutterhead as the dredge sweeps over the cut area. A centrifugal pump forces the sand-water slurry through a series of floating and land based pipeline to the placement site. Using hauling winches connected to the swing anchors set out on either side, the dredge can pull back and forth across the width of the cut. The dredge pivots on one of two large cylindrical spud anchors, which are located on the stern and are used in a stepping fashion to proceed lengthwise through the cut. The sand is deposited in the placement area and the water is returned to the river either through a controlled

single point discharge or in a free flowing fashion. Placement site operations are dictated by the type of site and desired outcome. For hydraulic dredging, most sites are containment areas that have been bermed with material from the interior of the site. Bulldozers are used in the operation to concentrate the material vertically in limited areas and to maximize the sites capacity. Hydraulic equipment is specialized for dredging and normally is more cost effective and has a higher production rate than mechanical equipment. Limitations for channel maintenance dredging with hydraulic equipment are small jobs (i.e. less than 15,000 CY) with significant equipment setup time, cuts with distant placement sites (i.e. over 1.5 miles) and small placement sites that cannot tolerate the water slurry.

Mechanical dredging on the UMR consists of a barge mounted crane (dragline or clamshell bucket) or backhoe. The barge is positioned in the dredge cut with spud anchors. The excavated material is loaded on barges, which are transported to the placement site with dredge tenders (small towboats or workboats). The barges are generally deck cargo barges with side boards or coaming to contain the material. Ramps on the bow of the barges are used at the placement site to unload material with endloaders. Another crane or backhoe may also be used to unload the barge. Material is normally transported to placement sites within 4.0 miles of the dredge cut. Material has been transported up to 10 miles but efficiency declines beyond 4.0 miles. Production rates of 125-250 cubic yards per effective dredging hour are typical depending upon equipment capability. Operations are conducted on a 10 to 24 hour day basis depending on the urgency, the overall workload and other operational characteristics. Specialized barges called dumpscows are sometimes used if in-water placement or rehandling of the material is required. The dumpscow drops the material out the bottom of the barge where it can be left in place in the water or rehandled with another crane or a hydraulic dredge. Mechanical dredging is well suited for small jobs (i.e. less than 15,000 CY), cuts with distant placement sites or small, restricted placement sites. An advantage of mechanical equipment is that there is little setup time and once on site, dredging can commence immediately. It is less desirable than hydraulic dredging because of higher costs (approximately 2 to 2.5 times more expensive) and it is less productive when channel maintenance needs are urgent or extensive.

9.2.1 Government Hydraulic. The District's primary piece of dredging equipment is the cutterhead dredge WILLIAM A. THOMPSON. The THOMPSON is used regularly to service approximately 1000 miles of 9-foot channel on the Upper Mississippi and Illinois Rivers in the Corps of Engineers' St. Paul, Rock Island and St. Louis Districts. It has also been used on occasion for dredging in other Corps Districts' on the Missouri, Ohio and Lower Mississippi Rivers. A typical season has the THOMPSON operating in the St. Paul District from mid May until early August, then in Rock Island District until mid October and in St. Louis District until mid December. Normal shutdown due to winter conditions and for repair and maintenance is from mid December until early March. From early March until mid May it is generally available for dredging as needed and frequently used to respond to critical early season shoaling problems.

The THOMPSON has a 20-inch discharge pipe with a 22-inch intake pipe. The main pump is powered by an 1800 HP diesel engine. Two 850 HP generators provide onboard electrical power. It is self-propelled with two 500 HP electric motors for propulsion. Travel time between locations varies by river conditions, but generally is 2-4 miles per hour (mph)

upstream and 4-5 mph downstream. The major ancillary equipment includes a 1350 HP booster pump, a 1200 HP towboat, 3 dredge tenders (small work boats), 3 large bulldozers and a small bulldozer, a truck crane and miscellaneous support barges.

The normal traveling complement includes 4,300 feet of floating pipeline, 2,200 feet of shore pipe, and 2,300 feet of plastic pipe that can be used as either floating or shore pipe. The floating pipeline is mounted on pontoons with flange connections and full lighting. The pipeline system is designed for rapid set-up and breakdown for response to the frequent mobilization and demobilization requirements associated with river channel maintenance dredging. It is also efficient for separating the floating pipeline as necessary to pass towboats. The high speed hauling winch, cutterhead and pump design make the THOMPSON well suited to the typical shallow face, sand substrate dredging requirements typically experienced. Additional pipeline and a second booster pump are available for special projects requiring longer transport distances. Use of this equipment requires advance planning and additional cost because the equipment is mobilized from the Fountain City Service Base and must be transported independently to the dredging location. The additional equipment provides an extra 1,860 feet of steel pipe mounted on pontoons and 1,750 feet of plastic pipe. However, due to horsepower limitations, the maximum effective reach utilizing the additional equipment is 9,700 feet with a lift of 50 feet or less.

The THOMPSON operates 24 hours per day either 5 or 7 days per week depending upon workload. Subsistence and quarters are provided onboard for the dredge personnel. A crew of 49 staffs the Dredge on a 5 day/week operation and 57 employees are needed on a 7 day operation.

Effective production rates for the THOMPSON, as with any hydraulic dredge, are influenced by a number of job specific variables including pipeline length, dredging face, cut location and orientation, flow rates, sediment particle size and in place material density. Production rates between 800 and 1000 cubic yards per effective dredging hour are typical. Overall dredging time is also significantly impacted by non-effective time due to shut down for placement site work, passing vessels, set-up and breakdown, maintenance and operating repairs, and miscellaneous other reasons. An effective dredging time of 55% is considered average, which based on the above production rates equates to a daily production rate of 10,500 to 13,200 cubic yards.

The District also has a smaller cutterhead dredge, the DUBUQUE, with a 12-inch pipeline. This unit is not regularly staffed. It is used on a limited basis for dredging projects where it is well suited, or when other equipment is not available. Staff from other work units are assigned to operate it when necessary.

9.2.2 Contract Hydraulic. The District's hydraulic dredging equipment is occasionally supplemented with contract hydraulic equipment as needed. This need may result from heavy workload, unavailability of government plant, physical restrictions or specialized equipment requirements. Contract pipeline dredges used in the District range in size from 8 to 24 inch pipelines and are primarily cutterheads, although small portable auger style dredges have been used to dredge recreational boat harbors and special projects.

9.2.3 Government Mechanical. Mechanical dredging is primarily accomplished

by contract as discussed in the following section. The District has mechanical dredging equipment available for back-up response during time periods when a contract is not in effect or the overall workload and dredging time available require supplemental capability. This equipment is normally used for other channel maintenance activities and lock and dam maintenance and repair. Equipment available for dredging operations consists of two clamshell cranes (3.0 and 4.0 cubic yard buckets), dredge material barges with coaming and ramps, two dumpscows, endloaders, bulldozers and three tenders. Operations are conducted as described above in Section 9.2.

9.2.4 Contract Mechanical. The majority of the District's mechanical dredging is performed by contract. A contract is awarded for up to a three year period with each year after the first, being optional for renewal. The contract work area includes all of the channel and harbors on the District's portion of the UMR. Individual dredging locations are assigned as the requirement is established through surveys. An estimated total annual quantity is specified, with flexibility for variation due to actual dredging requirements. Payment for dredging is based on cubic yards and includes transporting the material up to 4.0 miles by barge and up to 900 feet on land. Contract provisions also allows for transport further than 4.0 miles by barge and further than 900 feet on land at additional established bid prices. An optional bid item is included in the contract for excavation of existing dredged material from island storage sites (Transfer Sites). Transportation of floating plant between dredging locations and mobilization/demobilization are also separate bid items.

9.3 Emergency Response. As a matter of national policy, the Corps of Engineers defines a navigation emergency as a situation that would result in an unacceptable hazard to life or navigation, a significant loss of property, or an immediate and unforeseen significant economic hardship if corrective action is not taken within a time period less than the normal time needed under standard procedures. Because of the ambiguity and restrictiveness of this definition, the Corps Districts are encouraged to develop local agreements with state regulatory agencies that will allow for relaxation of permit requirements and provide for a timely response when groundings and channel closures occur. The St. Paul District has reached agreements with the Minnesota, Wisconsin and Iowa regulatory agencies that include provisions for responding to these situations. Details are discussed in Appendix A. These provisions are intended to avoid or correct hazardous channel conditions with minimal impact on natural resources. When critical situations are encountered it is the District's policy to make every attempt to conduct operations in accordance with standard procedures, including placing material at the permanent selected sites. If this is not possible, designated transfer or emergency placement sites are preferred. As a last resort, non-designated sites are selected that will result in the least adverse impact under the situation that exists.

10.0 Program Coordination.

The channel maintenance program is a major activity on the Upper Mississippi River system. How it is conducted can have a significant effect on the resources of the river and many

other river related activities. These resources and activities are managed by other elements of the Corps of Engineers and by other local, state and federal agencies or organizations. There are also private individuals and groups interested or affected by the program. Close coordination of the channel maintenance program is a high priority of the District to assure that other interests are informed and have an opportunity to provide input as to how the program is executed. This document serves an important role in achieving this goal. The District employs a supervisor and two individuals in "Channel Maintenance Coordinator" positions, to plan, coordinate and manage the overall program. Management functions are centralized at the Channels and Harbors Project Office located at Fountain City, Wisconsin. There are a number of methods discussed below that the District uses to facilitate the coordination process. Appendix A provides a more detailed explanation of interagency notification and coordination procedures.

10.1 On-Site Inspection Team. The On-Site Inspection Team (OSIT) was organized during the GREAT study to provide a mechanism for timely coordination of dredging events and channel maintenance activities with field level state and federal resource managers. It also allows local communities and other organizations involvement in the program. It is valuable for providing information on proposed actions to agencies at a review level where it can be immediately evaluated for potential impacts. It allows the District the opportunity to obtain advice and recommendations from " local technical experts" as the activity is being planned. The District uses this input in formulating a final decision on a proposed action. The OSIT also facilitates the regulatory process by providing regulating agencies an early review of the action and allows the District an opportunity to obtain information related to regulatory procedures. The OSIT is used for a variety of purposes: notification for routine dredging events with designated placement sites; operational planning for placement site implementation; alternative site identification for long range dredged material placement planning; coordination and site selection for emergency and imminent closure dredging; and planning and design of channel modification work. OSIT procedures are described in Appendix A.

10.2 River Resources Forum. The River Resources Forum (RRF) is an outgrowth of the GREAT study for continuing interagency cooperation. When that study was completed in 1980, participating agencies realized that the cooperation and coordination process that was established during the GREAT study should continue. Agencies with river resource management responsibilities needed a mechanism for ongoing coordination of channel maintenance and related activities, and so they joined together to form a partnership that started out as the Channel Maintenance Forum and later became the River Resources Forum in recognition of an increased emphasis on coordination of environmental and recreational resources.

Participating federal agencies are: Corps of Engineers, Fish and Wildlife Service, Coast Guard, Environmental Protection Agency, Natural Resources Conservation Service and National Park Service. State agencies include the Department of Natural Resources' and Department of Transportations' from Minnesota, Wisconsin and Iowa and the Minnesota Pollution Control Agency. Representation is at the middle manager/policy-maker level, which has been successful in achieving results, because participants can effectively represent the interests and positions of their respective agencies.

In 1991, participating agencies entered into a formal partnership agreement that states

"We, the partners involved in management of the Mississippi River, recognize the multiple uses and benefits provided by this diverse ecosystem and are committed to work together as a trusting, cooperative team to manage the River from a resource-balanced approach in the best interest of the public." The group has a number of established goals and procedures for working together cooperatively that are described in the partnership agreement and accompanying operating procedures, which are included in Appendix A. The RRF is used to build consensus for proposed actions and to streamline administrative procedures. For the channel maintenance program it provides a mechanism by which the District can obtain the collective endorsement and support of other agencies when selecting new placement sites or implementing channel modification activities. Through effective communication and compromise, the District has been successful in obtaining RRF consensus on channel maintenance related proposals and will continue to pursue RRF support in the future.

The RRF is an advisory group that has no statutory or regulatory authority. Recommendations of the RRF are not binding upon any of the participating agencies nor does coordination of activities through the RRF eliminate the need for formal coordination and approval with the appropriate regulatory agencies. However, endorsement of a proposed action by the RRF is highly desirable and is often an important consideration element, in the agency's review and approval process. Failure to obtain RRF consensus or endorsement would result in proposed actions following normal regulatory procedures. This would require that the proponent agency would have to seek permits or agreements with the individual regulating agency.

The RRF meets three times per year, normally in April, August and December. Field trips are sometimes arranged in conjunction with the meetings so that managers have an opportunity to observe activities first hand. The RRF also has sub-groups for providing technical advice on matters related to fish and wildlife resources, navigation, recreation and public information and education. These groups are used when issues are technically complex or more involved and the RRF cannot take the time necessary to fully investigate details.

10.3 U.S. Coast Guard. In addition to the Corps' responsibility for operating and maintaining the authorized channel on the Upper Mississippi River, the U.S. Coast Guard has major responsibilities related to navigation on the project. The Coast Guard maintains the aids to navigation, licenses vessels and personnel, permits bridges, oversees spill responses and has various authorities for regulating safe transportation. Close coordination of the channel maintenance program with the Coast Guard is imperative. When critical conditions or channel closure situations exist the two agencies work cooperatively in sharing information and making decisions collaboratively so that impacts on navigation interests and the environment are minimized.

10.4 Navigation Industry. One of the principal beneficiaries and users of the Upper Mississippi River navigation projects are the commercial towing interests. Maintaining good communication with the navigation industry is a primary objective of the program. The District strongly encourages ongoing feedback from the commercial users. Information on problem reaches is particularly valuable when scheduling survey and dredging activities, to make the District aware of the situation so the appropriate response can be activated. Procedures are established for towing operators to immediately report problems and groundings to the District.

Initiatives are also taken to solicit input from towing interests. These initiatives include questionnaires, rides on vessels and various meetings with users. The River Industry Action Committee (RIAC) is an association of towboat operators, that the District frequently relies upon to coordinate activities and to seek input to decision making actions. RIAC is included in the OSIT process. This group is an especially valuable resource when critical conditions exist and decisions must be made on channel restrictions, navigability, dredging parameters and organizing the resumption of navigation following a closure event. The District participates in an annual information exchange meeting with the navigation industry. This meeting, held in March of each year, provides a forum for both the Corps of Engineers and the towing interests to exchange information and communicate concerns. The District regularly attends meetings of the Upper Mississippi River Waterways Association to stay abreast of issues and activities related to that organization. To coordinate navigation activities unique to the Minneapolis-St. Paul area, the District has been sponsoring an annual meeting with representatives of the industry in that area. Another coordination mechanism that allows for information sharing with the industry is the Navigation Work Group of the RRF. This group assembles the technical expertise of the major agencies and organizations involved in river navigation for the purpose of tackling issues that may extend beyond the capabilities or authority of an individual group.

10.5 General Public. The Upper Mississippi River projects have been authorized by Congress to provide economical transportation for the region and the country, and to provide harbors for safety and recreational opportunities. The public in general benefits by these projects and the Corps must operate and maintain them in consideration of the public's best interest. The District recognizes that navigation is only one of many uses of the river. The public relies upon the river for many other interests including recreational boating, hunting, fishing, camping, sightseeing, residential development, commercial activities and enjoyment of nature. The District strives to conduct channel maintenance activities in harmony with these other interests. Educational literature has been developed to provide information to interested groups and individuals. Presentations are frequently given to groups expressing interest in various aspects of the program.

Coordination with local interests and the general public for proposed actions or significant changes in the program is accomplished through written notifications and public information meetings. Input from individuals and organizations knowledgeable of local resources can be a valuable contribution to the planning and design of a channel maintenance action.