



# LONG TERM MANAGEMENT STRATEGY

DRAFT April 7, 2014 DRAFT

## LTMS Update

### **Programmatic ESA Consultation with NOAA: Proposed Windows Modifications and Additional Measures for Salmonids and Green Sturgeon**

The LTMS Program is an interagency federal-state 50-year plan that covers all dredging and aquatic disposal activities in the San Francisco Bay region. In October, 1998, the San Francisco District US Army Corps of Engineers (USACE), Region 9 of the US Environmental Protection Agency (EPA), the San Francisco Bay Conservation and Development Commission (BCDC), the State Water Resources Control Board (SWRCB), and the San Francisco Bay Regional Water Quality Control Board (Water Board) published the *Long-Term Management Strategy (LTMS) for Placement of Dredged Material in the San Francisco Bay Region, Final Policy Environmental Impact Statement/Programmatic Environmental Impact Report* (EIS/EIR) for the LTMS Program ([LTMS 1998](#)).

On September 18, 1998, prior to publishing the Final EIS/EIR, EPA and USACE (the co-lead federal agencies) completed a programmatic Endangered Species Act (ESA) consultation with NOAA-Fisheries Service (NOAA). The LTMS Program has been operating under that 1998 consultation ever since ([NMFS, 1998](#)). However, in late 2004, we re-initiated formal programmatic consultation to include analysis of possible effects of the LTMS Program on the southern distinct population segment of North American green sturgeon, and newly-designated anadromous salmonid critical habitat. This document has been prepared in support of finalizing the re-initiated programmatic consultation with NOAA.

## **INTRODUCTION: HISTORICAL CONTEXT OF THE LTMS PROGRAM**

The San Francisco Bay/Delta estuary is one of the critical maritime thoroughfares in the nation, supporting international trade, commercial and recreational fishing, and recreation. For over a century navigational channels through the estuary have been created, deepened, and maintained by dredging (the removal of sediments from the bottom) to enable ships to navigate safely into and out of ports, harbors, and marinas without running aground. Today's large commercial ships require deeper channels than ever before, and prospects are for even larger ships in the future. Dredging the region's channels, ports and associated docking, berthing and other facilities will continue to be necessary to maintain adequate depths for vessels to maneuver.

The San Francisco Bay/Delta system is also the largest and most significant estuary along the entire west coast of North and South America. Over 40 percent of the land area of the state of California — with 60 percent of the state's runoff — drains into the estuary where it mixes with the saline waters of the Pacific Ocean. Estuarine conditions support the most productive kinds of ecosystems in the world, but due to human activity they have been among the most degraded environmental systems.

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The San Francisco Bay/Delta exemplifies this trend. The past century and a half of intensive human settlement and development in the Bay Area has severely stressed the estuary, and brought fundamental changes to the ecosystem. Chief among the causes of significant adverse impacts are extensive habitat loss from diking and filling of baylands and wetlands to create farming and industrial land (over 90 percent of the area's historic salt and brackish marshes have been destroyed); huge diversions of fresh water from the estuary to Central Valley farms and to cities as far away as southern California (up to 75 percent of the flow of the Sacramento River is diverted before it reaches the estuary); and pollution from nonpoint and point-source discharges.

Compared to these large-scale perturbations, changes associated with dredging and dredged material disposal are much less significant. However, even minor additional impacts to an already stressed ecosystem can be cause for concern, and dredging and disposal are activities that are often very visible to the public.

Throughout the 1980s and early 1990s, the public expressed concerns about the potential for both direct and cumulative effects of dredging and disposal activities on the already stressed resources of the estuary, and demanded assurances that these activities be properly managed with the health of the overall estuary in mind. In 1990, the state and federal regulatory agencies with primary authority to review and permit dredging and disposal activities in the San Francisco Bay region cooperatively initiated an integrated planning process for dredged material management. The resulting effort — the Long Term Management Strategy (LTMS) for Placement of Dredged Material in the San Francisco Bay Region — was organized to address dredging-related issues in detail and to develop a comprehensive dredged material management plan.

In the same general timeframe, other efforts to restore and improve environmental quality of the estuary as a whole were also accelerating. EPA established the San Francisco Estuary Project (SFEP) in 1987 as a broad-based and cooperative program that brought together over 100 representatives from private and public interests in the region. The goals of the SFEP were to:

- Develop a comprehensive understanding of environmental and public health values attributable to the Bay and Delta and how they interact with social and economic factors;
- Achieve effective, united, and ongoing management of the Bay and Delta;
- Develop a Comprehensive Conservation and Management Plan (CCMP) to restore and maintain the chemical, physical and biological integrity of the Bay and Delta, including restoration and maintenance of: water quality; a balanced indigenous population of shellfish, fish, and wildlife; recreation activities in the Bay and Delta; and ensure that the beneficial uses of the Bay and Delta are protected; and
- Recommend priority corrective actions and compliance schedules addressing point and nonpoint sources of pollution.

The SFEP's CCMP (SFEP 1993, [revised 2007](#)) identified five key challenges facing the estuary, and made recommendations for addressing each:

- Decline of biological resources (especially wetlands and related habitats);
- Increased pollution;
- Freshwater diversions and altered flow regime;
- Intensified land use and population; and
- [Dredging and waterway modification.](#)

The interagency LTMS program, which had begun its planning studies at the time, effectively became the arm of the SFEP (and the CCMP) charged with developing and implementing actions to address dredging and waterway modification issues for the region.

The overall goals of the LTMS Program are to:

- Maintain in an economically and environmentally sound manner those channels necessary for navigation in San Francisco Bay and Estuary and eliminate unnecessary dredging activities in the Bay and Estuary;
- Conduct dredged material disposal in the most environmentally sound manner;
- Maximize the use of dredged material as a resource; and
- Maintain the cooperative permitting framework for dredging and disposal applications.

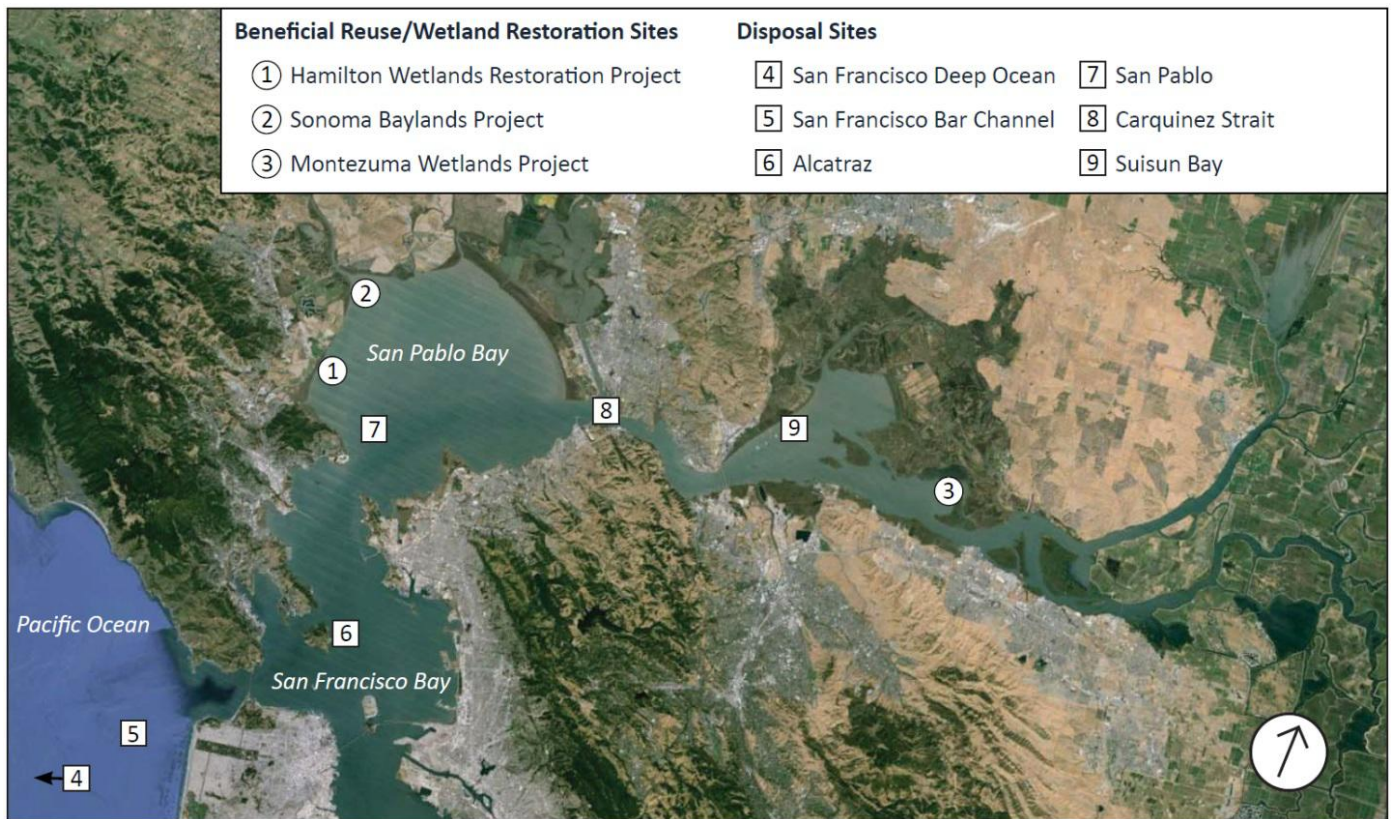
To implement these goals, the LTMS agencies have: instituted an aggressive reduction of in-Bay disposal volumes; worked to establish new beneficial reuse options, including habitat creation benefitting sensitive and listed species; encouraged beneficial reuse where practicable; worked with projects to avoid or minimize impacts by dredging during “Environmental Work Windows” as much as possible; continuously improved dredged material testing practices to ensure that contaminant-related impacts to the aquatic environment are minimized; and done this while substantially streamlining the permitting process for the dredging community.

The discussions below describe the LTMS Program, and summarize how its implementation to date has minimized impacts to listed and sensitive species managed by NOAA-Fisheries Service. In particular, we emphasize changes and improvements that have been incorporated into the LTMS Program since the original programmatic consultation with NOAA was completed in 1998. We also briefly address some possible future actions under the Program.

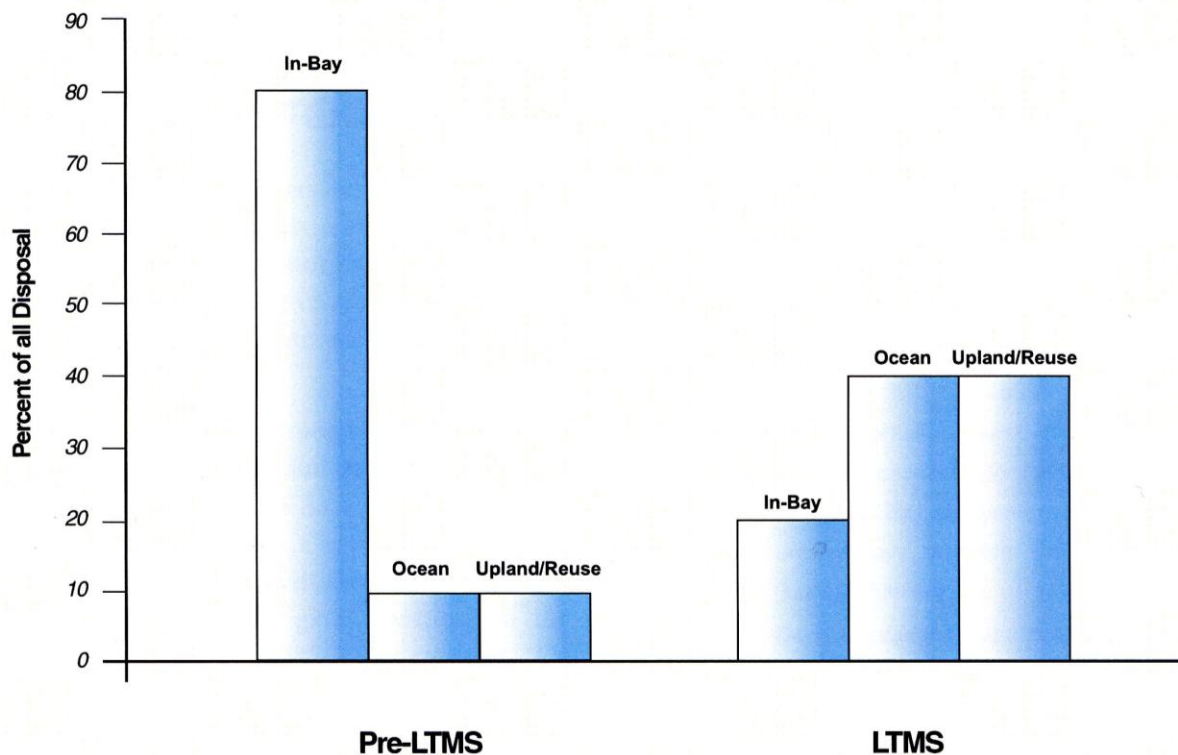
## **DEVELOPMENT OF THE LTMS MANAGEMENT PLAN**

Beginning in the early 1970s, the majority of dredged material in the San Francisco Bay region was disposed at four designated sites within the greater San Francisco Bay: Suisun Bay (“SF-16”), Carquinez Strait (“SF-9”), San Pablo Bay (“SF-10”), and Alcatraz (“SF-11”) (Figure 1).

Pre-LTMS, a long term average of approximately six million cubic yards of dredging occurred in the Bay Area each year. However, the LTMS agencies used the 1990s when the planning studies were taking place, and during which disposal of less than 3 million cy per year took place, as the baseline period for developing a management plan. During this period an intensive (8-year, \$16 million) Federal-State planning effort took place, which culminated in the *LTMS Final Policy EIS/Programmatic EIR* in 1998 ([LTMS 1998](#)). The “environmentally preferred alternative” in the EIS/EIR became the selected plan. Its key objectives were to reverse the historic practice of dumping 80 percent or more of all dredged material back into San Francisco Bay, and to increase the recycling of dredged material as a useful resource (“beneficial reuse”). Specifically, the plan aims for: a minimum of 40 percent of all dredged material to be beneficially reused (e.g., for enhancing or creating new aquatic habitat, maintaining levees, etc.); up to 40 percent of material to be discharged offshore at the EPA-designated San Francisco Deep Ocean Disposal Site (SF-DODS) when beneficial reuse is not feasible; and no more than 20 percent of dredged material to continue to be disposed in-Bay (some called this the “40-40-20 Plan”) (Figure 2). Formal implementation of the selected LTMS plan began in 2001 with adoption of the LTMS Management Plan ([LTMS 2001](#)), and codification of key aspects of it into state regulations.



**Figure 1.** Dredged material disposal sites, and existing major beneficial reuse sites, in the LTMS Planning Area.



**Figure 2.** The pre-LTMS situation compared to the LTMS goals (from LTMS, 2001). The vast majority of all dredged material was dumped in the Bay before the LTMS Program began.



## EXISTING MANAGEMENT PLAN IMPLEMENTATION MEASURES

The Management Plan provides implementation guidance related to all of the LTMS goals. However, the following discussions focus on implementation measures that relate to minimizing impacts on sensitive species managed by NOAA under the ESA, including:

- Transition to reduced in-Bay disposal;
- Encouraging use of alternatives to in-Bay disposal, where practicable;
  - Ocean Disposal
  - Beneficial reuse to expand and improve habitat;
- Improving sediment testing guidelines to ensure environmentally sound disposal; and
- Environmental Work Windows, and improving project planning and compliance.

### **Transition to Reduced in-Bay Disposal**

The “40-40-20 Plan” described above could not be implemented over night. The main hurdle to reducing in-Bay disposal and increasing beneficial reuse was the lack of available multi-user beneficial reuse or upland placement sites. EPA had designated the San Francisco Deep Ocean Disposal Site (SF-DODS) in late 1994 as a less damaging alternative to in-Bay disposal while additional beneficial reuse capacity was being developed ([EPA, 1994](#)). However, only certain (larger) projects could utilize SF-DODS practicably and safely.

At the time the Management Plan was published, several major beneficial reuse sites were in the planning stages - including the Hamilton Wetlands Restoration Project, the Montezuma Wetlands Project, and the Mare Island Disposal Ponds Project<sup>1</sup> – but actual reuse site capacity was extremely limited. So the LTMS Management Plan instituted a 12 year Transition Period during which in-Bay disposal would be gradually but systematically reduced. The intent was to provide time for beneficial reuse sites to be developed and for dredgers to plan ahead for the logistic and potential economic changes that would attend changing over to a new way of managing their dredged material.

The LTMS agencies agreed that instead of immediately assigning project-specific volume limits to individual dredgers based on their past dredging history, during the Transition Period dredgers would be allowed to make collective progress toward the LTMS goals on a voluntary basis. However, the public was concerned that the program should have “teeth” in the event that consistent reduction of in-Bay disposal did not come about voluntarily. Accordingly, the Transition Period started by immediately reducing the previous maximum allowable in-Bay disposal volume by over 50 percent, to 2.8 million cy per year<sup>2</sup>. Thereafter, a further reduction of 378,500 cy would automatically occur every three years. By “stepping down” in this manner, the final in-Bay disposal volume limit of 1.25 million cy per year<sup>3</sup> would be reached on January 1, 2013, at the end of the 12 year Transition Period (Figure 3).

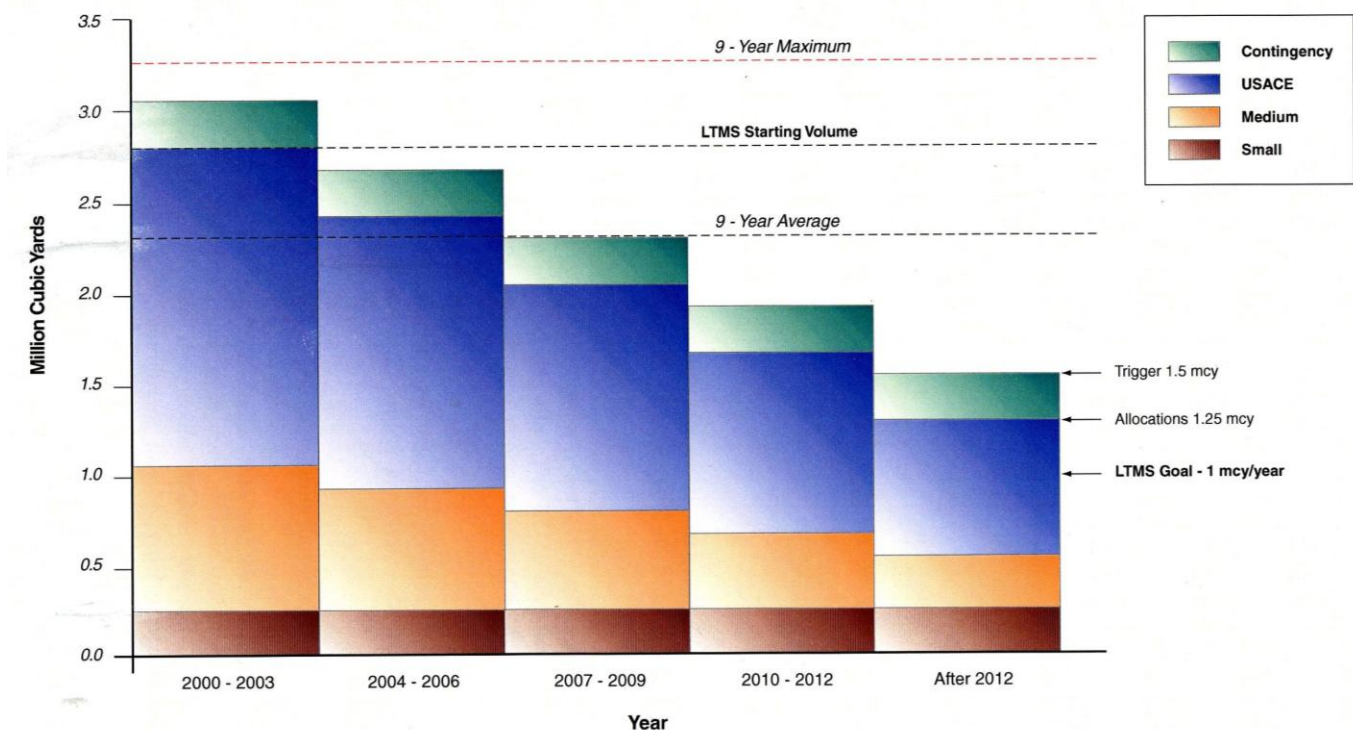
The Management Plan also includes a provision that, should the actual average disposal volume during any three-year period exceed the maximum allowed, project-specific regulatory limits (allocations) are initiated. These allocations would automatically occur unless the BCDC

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1 The proposal to reopen the Mare Island disposal ponds was ultimately withdrawn by the proponent.

2 Annual limits at the in-Bay disposal sites otherwise added up to over 6 million cy per year.

3 This final *limit* is slightly higher than the in-Bay disposal *goal* of 1 million cy per year, to allow for flexibility in managing individual permits. Not including a 250,000 cy contingency volume.



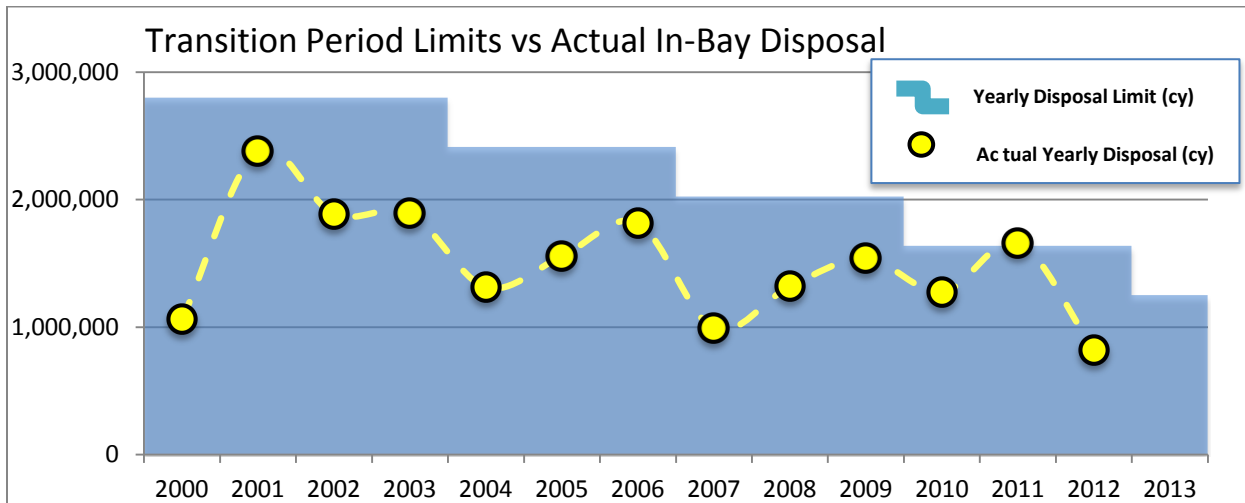
**Figure 3.** The LTMS Transition Period, showing how the annual in-Bay disposal volume limit automatically decreased every three years by 387,500 cy (from LTMS, 2001)

Commissioners actively vote to *not* invoke them. Thus, the LTMS Management Plan provides an assurance that the in-Bay disposal reduction objectives can be met even if dredgers' voluntary measures prove to be inadequate.

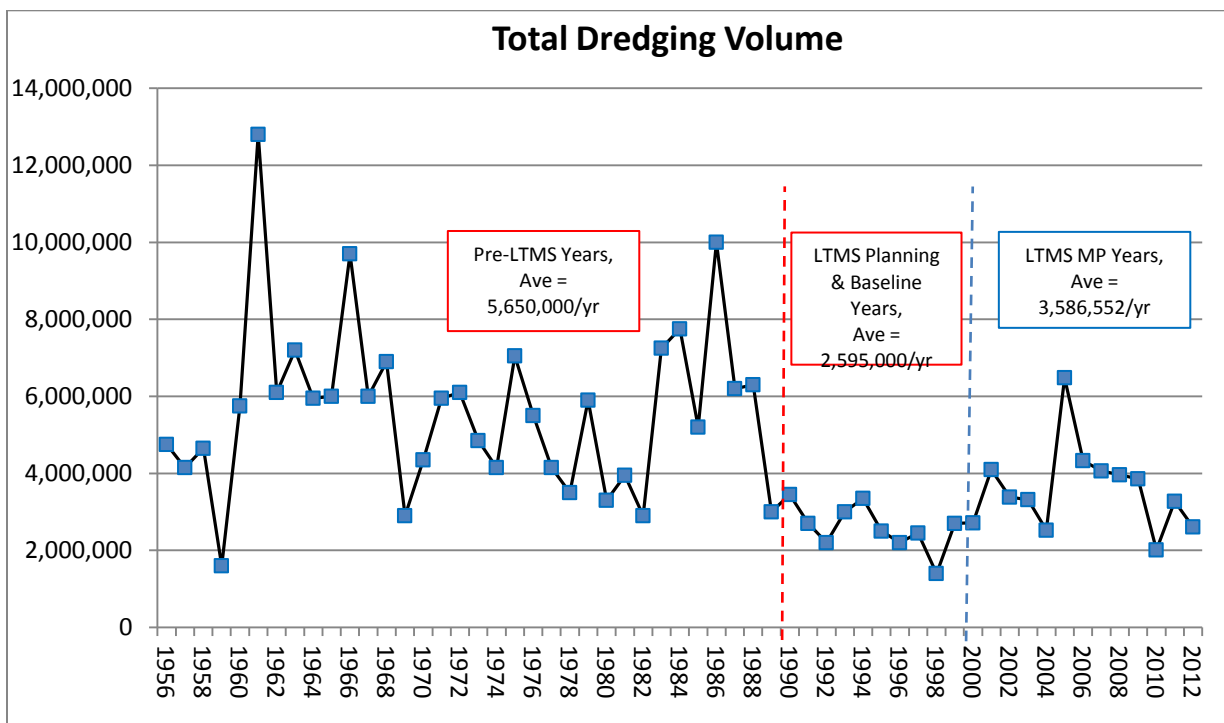
It is important to note that although the Transition Period only places interim limits on collective in-Bay disposal volume while allowing voluntary efforts to increase ocean disposal and beneficial reuse, the LTMS agencies continue to screen individual dredging projects regarding alternatives. Projects that either have traditionally used upland or reuse sites, or that clearly could utilize the SF-DODS, etc., are expected to continue doing so at a rate commensurate with the stage of the Transition Period at any time.

### *Success to Date at Meeting the in-Bay Disposal Limits*

The 12 year Transition Period ended on December 31, 2012. During this time, a total of approximately 46.6 mcy was dredged from the Bay from 11 USACE navigation channels and nearly 100 other ports, marinas, and homeowners' associations. Of this total, approximately 19.5 mcy of sediment was placed at in-Bay sites (41.8 percent of the total volume dredged), averaging 1.5 mcy per year. The 3-year average in-Bay disposal volume limits were never exceeded (Figure 4), and so the Management Plan provision to invoke individual allocations was never triggered. In fact, even the annual disposal limit was exceeded in only one year – 2011 – and then only very slightly (1,662,191 cy actual vs the 1,637,500 cy limit, or a 1.5 percent exceedence). This is despite the fact that the overall amount of dredging that occurred between 2000 and 2012 was substantially higher than during the 1990-1999 LTMS baseline planning period (Figure 5).



**Figure 4.** Actual in-Bay disposal volumes for 2000-2012, compared to the Transition Period limits (not including the allowable 250,000 cy contingency). In-Bay disposal was below the annual Transition Period limit each year except 2011, and the 3-year averages were below the Transition Period limits during every 3-year period. Individual dredger allocations were never triggered (from [LTMS, 2013](#)).



**Figure 5.** Annual total dredging volumes for 1956-2012. The long-term average dredging volume prior to the initiation of LTMS planning had been nearly 6 million cy per year. However, the LTMS agencies used the average volume from the 1990s (2.6 million cy per year) for developing the Management Plan, including the in-Bay Transition Period disposal limits and the 3-year average allocation trigger volumes. Since the Management Plan was adopted in 2001, average total dredging has been greater than during the LTMS planning years, averaging approximately 3.6 million cy per year (from [LTMS, 2013](#)).

Of course, reducing in-Bay disposal, especially with increased overall dredging, only occurred because alternative placement sites were both available, and practicable for at least some dredging projects to use. More recently, the pace of creating new beneficial reuse site capacity has not been as fast as hoped when the Management Plan was written. Similarly, the economics and/or logistics of reuse have become more difficult for many projects, rather than less so as hoped. Ocean disposal remains available as well, but its practicability remains limited to a subset of Bay Area projects. Thus, while technically substantial capacity currently remains available for alternatives, substantial further reductions to in-Bay disposal may be difficult in the near term.

### **Encouraging Use of Alternatives to in-Bay Disposal**

Reduction of in-Bay disposal is one of the principal goals of the LTMS program. As noted above, the in-Bay disposal volume reduction targets were successfully met for each three-year period of the 12-year transition, despite overall dredging volumes being greater than during the baseline planning period for the LTMS program.

#### ***Ocean Disposal***

Disposal of suitable material (i.e., material that is not harmful to the environment) at SF-DODS was considered in the LTMS EIS/EIR to be environmentally superior to disposal of the same material at the traditional unconfined disposal sites within the more sensitive San Francisco Bay and Estuary. Since 2000, approximately 7.6 mcy of dredged material that was not practicable to beneficially reuse at the time was diverted from in-Bay placement to SF-DODS, representing 16.2 percent of the material dredged during the 12-year transition. Extensive monitoring of SF-DODS has confirmed that no significant adverse impacts to ocean resources occurred as a result of this placement ([Germano and Assoc., 2008](#)).

#### ***Beneficial Reuse***

Another principal objective of the LTMS program is the beneficial reuse of as much dredged material as feasible, with a long-term target of at least 40 percent. The dredged material volume beneficially reused during the first 12 years also totaled just over 19.8 mcy, or 42.5 percent of the total volume dredged. Thus the long-term target for reuse has successfully been met overall, so far. However, most of the reused material came from USACE channel deepening projects as opposed to maintenance dredging projects<sup>4</sup>, and no further federal deepening projects are currently being constructed. Similarly, most of the reused material was placed at just a few large restoration sites: the Hamilton Wetland Restoration Project (HWRP), the Montezuma Wetland Restoration Project (MWRP), and the Middle Harbor Enhancement Area Project (MHEA). The HWRP and MHEA are now completed and no longer accepting additional dredged material, while planning for a major expansion of the Hamilton Project at the adjacent Bel Marin Keys property is not moving forward at this time, due to concerns about costs of hydraulic offloading and potential impacts to sensitive fish species if a more cost-effective “aquatic transfer facility” were used instead. Nevertheless, the MWRP remains open and several smaller reuse sites are available or in the process of becoming available. Overall, substantial capacity for beneficial reuse still existed at the close of the 12-year transition. But it is unclear whether the pace of reuse that the region has been able to support to date can be maintained with current practices and funding levels.

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4 It is generally easier for a capital improvement project such as channel deepening to cover any additional costs for reuse, as compared to a maintenance dredging project.



## **Improving Sediment Testing Guidelines**

Prior to the LTMS program, there was considerable public distrust that the Bay was being adequately protected from the aquatic disposal of contaminated sediments. Only limited sediment testing was done under the “Public Notice 87-1” guidance, and sediments that by today’s standards are considered toxic were being permitted for disposal at the in-Bay sites. Early on in the LTMS planning process, the agencies established a pilot Dredged Material Management Office (DMMO) to begin to streamline and coordinate the sediment testing and permitting process. But the most significant change to the testing program came about as the LTMS EIS/EIR was being finalized and the Management Plan was being developed. At this time, the USEPA and USACE issued updated national sediment testing guidance for inland waters, including coastal estuaries, in the form of the 1998 Inland Testing Manual (ITM) ([EPA and USACE, 1998b](#)). The ITM was based on the comprehensive, tiered sediment testing framework already established for offshore waters in the 1991 national Ocean Testing Manual (OTM) ([EPA and USACE, 1991](#)). The LTMS agencies adopted these national testing manuals and replaced the antiquated pre-LTMS sediment testing program, in the process increasing chemical and biological testing, and developing disposal site reference databases for SF-DODS and the Alcatraz disposal site.

### ***Sediment Testing Under the Management Plan***

Once the ITM was published nationally, the DMMO developed updated local guidance on different aspects of sediment testing (e.g., regarding Implementation of the ITM for the Bay Region, Tier One Exclusions from Testing, Sampling and Analysis Plan preparation, and beneficial reuse). Greater environmental protection was also achieved by reviewing test results for in-Bay, ocean disposal, and beneficial reuse of sediment in a systematic way; establishing that the program is a net “remover” of contaminated sediments through upland and ocean disposal (an exception that likely would not exist in the absence of the LTMS program); clarifying that California’s Sediment Quality Objectives (SQOs) do not use test methods that are relevant to dredged material management, and so do not directly apply to dredged material discharges; and developing a post-oil spill rapid assessment method to confirm whether dredging projects may proceed following a spill. Overall, these actions improved testing quality and predictability, increased environmental protectiveness, and enhanced public trust. The program made these improvements while at the same time reducing costs, because as testing track records became established the DMMO was able to allow many projects to reduce their testing frequency (through “Tier I” testing exemptions). But further improvements were to come.

### ***EFH Programmatic Consultation Brings Further Testing Improvements***

In late 1997, NOAA published regulations requiring consultation for projects or programs that may adversely affect Essential Fish Habitat (EFH)<sup>5</sup>. Although the LTMS EIS/EIR was published in 1998, no EFH consultation was conducted at that time. Consequently, in 2004 the LTMS agencies and NOAA began preparing a programmatic EFH consultation. The programmatic EFH agreement was completed in 2011 ([EPA and USACE, 2011](#)) and updated in 2012 ([EPA and USACE, 2012](#)). The EFH agreement includes a number of Conservation Measures that enhance the environmental protectiveness of the LTMS program. Conservation Measures 7 and 8, in particular, further improve the sediment testing program for projects proposing in-Bay disposal. Specifically, these

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5 50 CFR Part 600 regulations, published on December 19, 1997, require EFH consultations pursuant to the Magnuson-Stevens Fishery Conservation and Management Act.

Conservation Measures make more systematic and predictable the requirements for bioaccumulation testing, and “residual” (post-dredge sediment surface) sampling and characterization. These Conservation Measures also for the first time tie the sediment testing program to San Francisco Bay’s existing TMDLs for mercury and PCBs, as well as to the established Regional Monitoring Program for the Bay (see: [SFEI dredger web page](#)). This ensures that dredging and disposal will be managed in a manner that directly complements other key pollution-reduction programs for the Bay

### ***Ongoing Improvements and Emerging Testing Issues***

The LTMS agencies consider DMMO and its sediment testing requirements to be ongoing programs that will continue to adapt as scientific understanding improves, testing methods advance, and resources permit. The agencies intend to publish a significant update to the local sediment testing guidance over the next year, in part to reflect many of the testing program improvements that have already occurred. But ongoing research, new TMDLs, or new national sediment testing guidelines could also come about and result in changes such as:

- More routine evaluation for “emerging” contaminant classes such as pyrethroids, PBDEs, or dioxins/furans;
- Different testing thresholds for contaminants routinely monitored today, such as PAHs and other bioaccumulative compounds;
- Different bioassays (such as chronic toxicity) or different test species; and
- New sediment reference sites for the Bay.

### **Environmental Work Windows**

Environmental Work Windows (Windows) were established through formal programmatic ESA consultations with the resource agencies on the LTMS EIS/EIR. These programmatic Windows are based on presence/absence information for various sensitive species, and establish times and locations wherein dredging and disposal activities may take place without further (formal or informal) consultation. Although minor corrections and updates to the Windows have been instituted over time, by and large they remain similar to when they were originally instituted.

While Environmental Windows for the Bay Area are effective at avoiding impacts to sensitive species, they nevertheless present a complicated array of restrictions that have presented a challenge to project proponents during project planning. The LTMS agencies have therefore taken both a short- and a long-term approach to managing Windows to minimize impacts to resources while working to ease effects on dredge project planning.

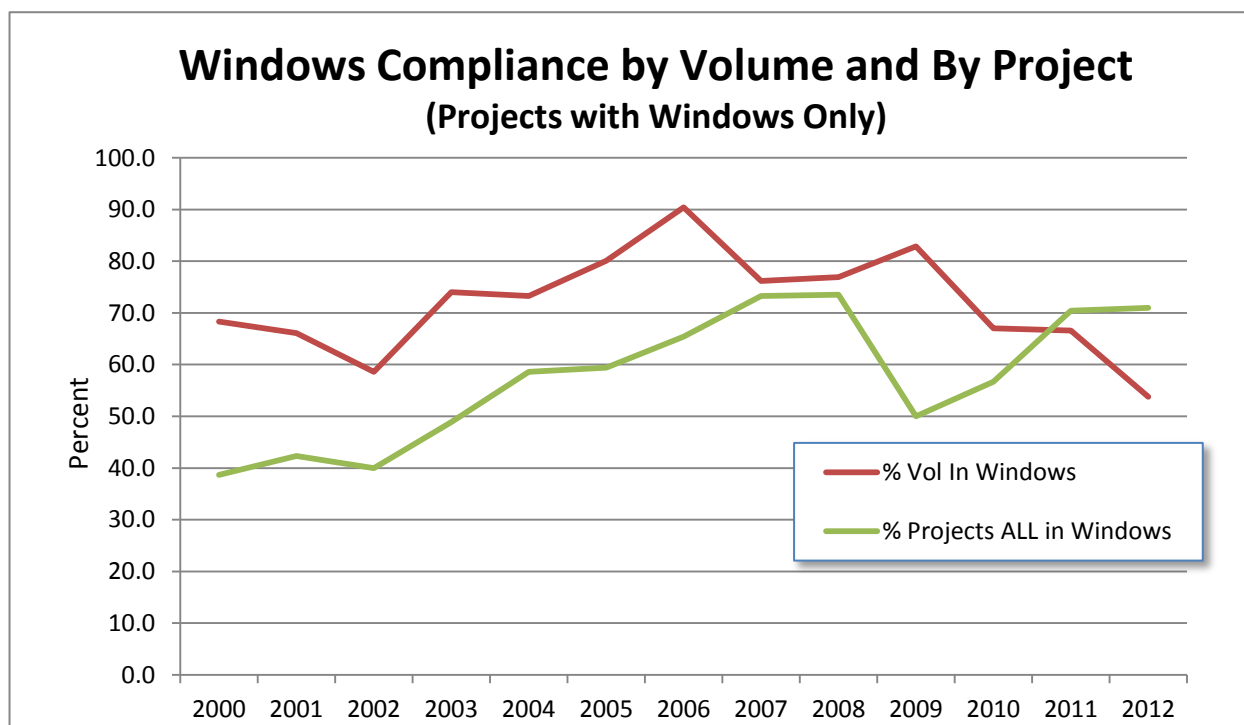
### ***Short Term: Improving Planning to Maximize Windows Compliance***

Every year the LTMS agencies hold coordination meetings at least quarterly with dredgers who, for a variety of project-specific reasons, are concerned that they may not be able to complete their dredging within the time frame allotted by the Window(s) relevant to their project. These Project Coordination Meetings are over and above the regular (twice monthly) DMMO project review meetings. Participation at these meetings by NOAA and the other resource agencies is crucial for solving evolving problems early, and is greatly appreciated by the LTMS agencies and dredgers alike.

Project Coordination Meetings have been instrumental in helping dredging projects avoid impacts by staying within their Windows as much as possible, and by identifying the best ways to minimize impacts when they cannot. Of course, in addition to avoiding impacts, working within Windows reduces the need

for agency staff to conduct project-specific consultations, which speeds the overall permitting process for the dredger. Indeed, soon after the Management Plan was issued, overall compliance with the Work Windows improved rapidly, peaking in 2006 when 90% of all material was dredged inside the relevant programmatic Windows<sup>6</sup>.

However, from 2009 through 2012 overall Windows compliance diminished significantly, from just over 80% to just over 50% of the volume of material dredged (Figure 6). This drop was attributable almost entirely to USACE maintenance dredging projects. It is true that USACE remains the largest dredger in the Bay area, accounting for an average of over 54% of all dredging under the Management Plan. But due to a number of difficulties, recently USACE projects have been disproportionately and increasingly accounting for the dredging that has occurred outside Windows. Since 2009, 72-90% of all the non-Windows-compliant dredging has been due to USACE projects (Figure 7).

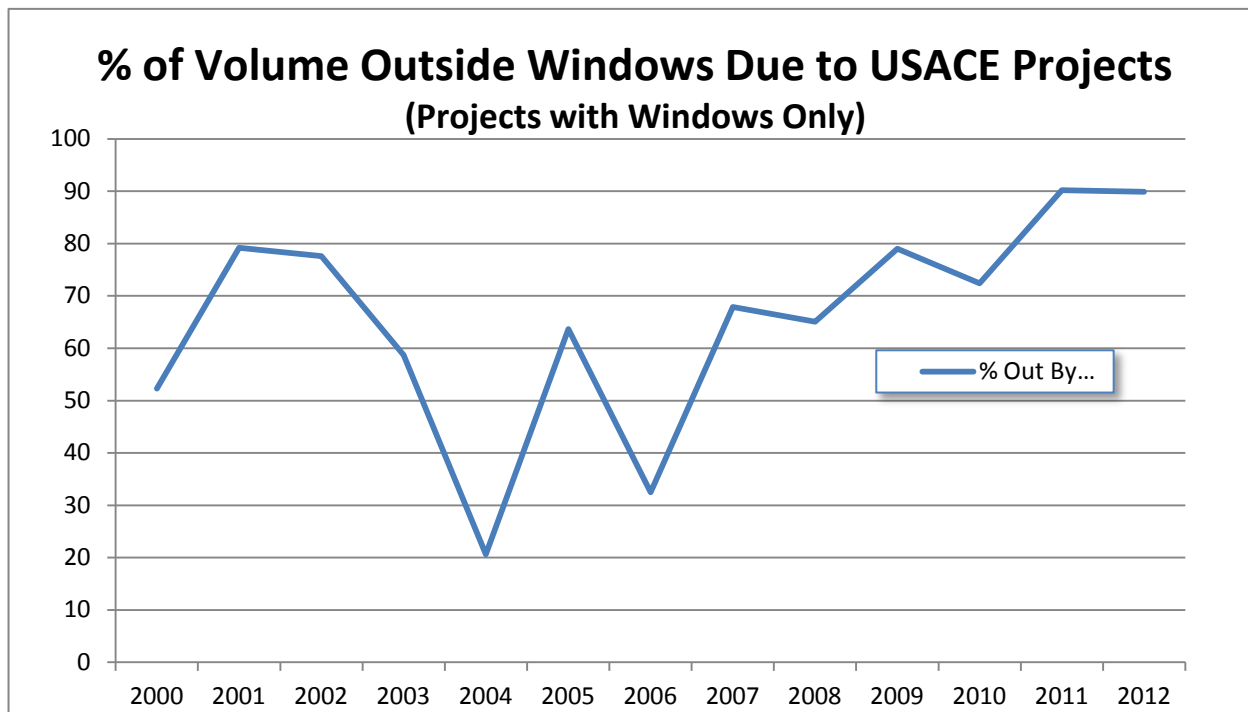


**Figure 6.** Percent of Bay Area dredging occurring within the relevant programmatic Work Windows under the LTMS Management Plan (from LTMS, 2013). Project coordination efforts resulted in increasing compliance for several years. But since 2009 an increasing proportion of dredging has again been occurring outside the Windows.

### *Long Term: LTMS-Supported Science Studies*

Even though the LTMS agencies have focused on project planning and coordination in order to help dredgers maximize their ability to comply with the existing Windows, the Windows themselves remain complicated to manage. The agencies have received numerous concerns from dredging project proponents that the Windows, in aggregate, have resulted in reduced competition among

6 Projects with individual consultations are not included in this analysis.



**Figure 7.** Percent of the dredging that has occurred OUTSIDE programmatic Work Windows, that is attributable to USACE maintenance dredging projects (from LTMS, 2013). Various issues have affected Windows compliance for USACE maintenance dredging in recent years.

dredging contractors, reduced dredging equipment availability, and increased costs. Consequently, the LTMS program also funded a number of studies, intended to help address the basis of some of the existing Windows with an eye toward whether they could be modified to allow dredging for longer periods in some locations.

Initially, efforts were made to examine technological advances or operational changes that might reduce impacts sufficiently that the Work Windows could be programmatically extended in some areas. This effort produced a set of best management practices (BMPs) for medium to large dredging contractors, but largely did not identify improvements that would ease dredging and disposal restrictions.

More extensive efforts in both time and funding focused on increasing scientific knowledge regarding either species' presence and behavior, or impacts to them from dredging. The LTMS Environmental Work Window Science Framework was developed, with input from NOAA and the other resource agencies, which identified agency concerns and potential studies that may be able to address those concerns. The LTMS program went on to undertake a number of identified studies, including both literature reviews and laboratory and field studies (see list below). For example, a study of the effects of increased turbidity on herring eggs and larvae confirmed that impacts do occur, primarily to egg adhesion and development. Salmon tracking studies identified residence times and migration pathways out of the Bay. The science work group also hosted a number of symposia to facilitate collaborative communication among stakeholders and scientists.



The LTMS program was well funded for several years, largely due to stakeholder efforts to secure funding to USACE from Congress. However, since 2011-12, funding has been nearly eliminated; therefore, any further potential science studies have been put on hold.

### **Completed LTMS Studies and Literature Reviews**

1. Framework for Assessing Dredging Effects
2. Spatial Characterization of Suspended Sediment Plumes at Oakland Outer Harbor
3. Assessment of Resuspension by Vessel Traffic at Redwood City Harbor
4. Characterization of Plumes Associated with Knockdowns at Richmond Long Wharf
5. Bibliography of Herring Literature
6. Herring Literature Review
7. State of Knowledge of Dredging Impacts on Herring
8. Herring Study I - Impacts on Larvae
9. Herring Study II - Impacts on Juveniles
10. Least Tern Literature Review
11. Tools for Assessing Fish Behavior Literature Review
12. Effects of Water Quality Impacts Literature Review

### **Draft LTMS Studies and Literature Reviews**

1. Juvenile Salmonid Outmigration: Interim Draft Report 2008 – 2009
2. Juvenile Salmonid Outmigration & Green Sturgeon: Distribution Draft Annual Report 2009
3. Juvenile Salmonid Outmigration & Green Sturgeon: Distribution Draft Annual Report 2010
4. Juvenile Salmonid Outmigration & Green Sturgeon: Distribution Draft Annual Report 2011
5. Framework Update
6. Effects of Resuspended Sediments Literature Review
7. Fish Behavior During Dredging - Literature Review
8. Longfin Smelt Literature Review
9. Fish Behavior During Dredging

(The completed literature reviews and studies, as well as some drafts, can be found on the LTMS website at: [http://www.spn.usace.army.mil/lrms/lrms\\_studies\\_symposia.html](http://www.spn.usace.army.mil/lrms/lrms_studies_symposia.html).)

### **ONGOING PRACTICES AND PROPOSED ADDITIONAL AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES**

Based on the LTMS 12-year program review and continued coordination with NMFS on this updated consultation for salmon, steelhead and green sturgeon, the LTMS agencies are proposing some modifications to the existing fish Windows, as described below. We are also proposing some additional avoidance, minimization, and mitigation measures which are also listed below. The additional measures have been developed by USACE and the Water Board in close coordination with the California Department of Fish and Wildlife (CDFW) to evaluate potential impacts to fish species that may be affected, particularly via entrainment by USACE hopper dredge operations in the Bay. Although these measures were developed primarily for species not managed by NMFS and therefore not the subject of this consultation, we include them here as program measures because we believe they serve to further reduce the potential for impacts to salmonids and sturgeon as well.

### **Proposed Modifications to Salmonid Windows, for All Dredgers**

Note that these proposed modifications are independent of Windows or measures that may apply to other species not managed by NMFS. No additional Windows are proposed for green sturgeon.

1. For NMFS-listed salmon, steelhead and sturgeon in San Francisco Bay (inside the Golden Gate), San Pablo Bay, and Suisun Bay, the Work Window is June 1 through November 30.
2. In particular, no dredging (mechanical or hydraulic) will be permitted from December 1 through May 31 in Larkspur/Corte Madera Creek, Napa River Channel/Mare Island Strait (including Vallejo), Petaluma River, and Novato Creek without individual consultation.
3. For all other locations, a proponent may plan a project that performs work outside the Work Window (e.g., from December 1 through May 31) if the project mitigates for potential impacts by placing the dredged sediment at a beneficial reuse site that NMFS agrees will provide aquatic habitat benefits, such as tidal wetlands restoration. (For the purposes of this consultation only the portion of the material that is dredged between December 1 and May 31 is required to be placed at the beneficial reuse site.) If a project is unable to place all of the material dredged outside the Work Window at a beneficial reuse site (e.g., due to equipment constraints or site availability), the project proponent will be required to provide an equivalent volume of material, deemed suitable for the purpose by DMMO, to a similar beneficial reuse site from a dredging project conducted inside the Work Window (June 1 to November 30). The placement of a like volume of dredged material at a beneficial reuse site must occur within 12 months of the end of the previous Work Window (i.e. November 30<sup>th</sup>).
4. For projects with unplanned and unavoidable needs to complete a portion of their dredging outside of the Work Window (e.g. due to weather delays, mechanical breakdown), DMMO may approve up to a cumulative total of 50,000 cubic yards per year of dredging outside the Work Window without further coordination with NMFS and without the need for further mitigation. For the purposes of this consultation these small volumes may continue to be placed at the site(s) otherwise approved for the project(s) during the Work Window.

### **General Practices, and Proposed Additional Avoidance, Minimization, and Mitigation Measures for USACE Dredging**

The following general practices are currently implemented by USACE during dredging and placement to avoid and minimize impacts to both listed and non-listed fish species, and will continue to be implemented:

1. Dredging at each project location would continue to be limited to the approved depth, with no more than 2 feet of over-depth allowance;
2. Knockdowns to reduce dredging and disposal volume or to extend the time needed between full dredging episodes may be proposed as appropriate in any location except the San Francisco Main Ship Channel;
3. No overflow or decant water would be allowed to be discharged from any barge, with the exception of spillage incidental to clamshell dredge operations;

4. Return water overflow from hopper-type suction dredges would continue to be limited to no longer than 15 minutes at the dredge site during any one excavation action (cut). Overflow would be unrestricted when dredging material is greater than 90 percent sand;
5. Dredging and disposal activities would continue to be limited to the Work Windows set out by the CDFW, the National Marine Fisheries Service, and the United States Fish and Wildlife Service in their Biological Opinions on the LTMS, unless through an additional consultation process, the appropriate agencies provide written authorization to work outside these Windows;
6. The Corps would immediately stop/repair and clean up any fuel or hazardous waste leaks or spills on the Project site from Project activities at the time of occurrence. Corps shall properly contain and dispose of any unused or leftover hazardous products off site;
7. During dredging and disposal activities, notes to mariners and navigational warning markers would continue to be used as needed to prevent navigational hazards for recreational boaters.

In addition, the following measures determined through coordination with the CDFW will be implemented to protect longfin smelt and delta smelt (these measures generally benefit other fish species as well):

8. Dredging may proceed anywhere when water temperature exceeds 22.0 degrees Celsius;
9. No dredging would occur in water ranging from 0 to 5 parts per thousand salinity between December 1 and June 30;
10. To the extent feasible, USACE will dredge later (October-November) during the June to November environmental Work Window in San Francisco Bay to reduce entrainment risk;
11. The USACE would implement a worker education program for smelt, and other listed terrestrial and aquatic species;
12. Draghead pumps would only be turned on when the dragheads are on the seafloor or within 3 feet of the seafloor when priming pumps.
13. USACE will coordinate with the dragtender to monitor the dragheads so that they maintain positive contact with the seafloor during suction dredging; and
14. To the extent feasible, the draghead water intake ports will be kept closed during dredging.
15. In 2011 and 2012, USACE purchased a total of 1.4 acres of credit at the Liberty Island Conservation Bank as compensatory mitigation for potential residual impacts to fish including delta and longfin smelt. At this time, USACE is coordinating an agreement with CDFW that will identify additional compensatory mitigation sufficient to address, in advance, potential ongoing impacts to these species for the next 10 years.

## CONCLUSIONS

The end of the 12-year Transition Period occurred in 2013. To date the LTMS has made significant progress in achieving its key goals to reduce in-Bay disposal volumes and increase beneficial reuse while reducing and minimizing impacts to sensitive species. For example:

- The initial LTMS implementation immediately reduced maximum in-Bay disposal by over 50 percent (to 2.8 million cy, from a pre-LTMS limit of 6.7 to 7.7 million cy).

- In-Bay disposal has consistently remained within the transition period volume limits; total in-Bay disposal since 2000 was 19.5 million cy or ~42% of all area dredging, compared to ~80% pre-LTMS.
- The “voluntary” transition period was a success, and individual allocations to dredgers were never triggered.
- The designated deep-ocean disposal site, SF-DODS, has received a total of about 18 mcy of dredged material that pre-LTMS would have been mostly discharged in-Bay; less than 8 mcy of this total was disposed since 2000, or ~16% of the total volume dredged in the Bay area during the transition.
- Extensive monitoring at SF-DODS has confirmed that no significant impacts to ocean resources (including EFH) have occurred.
- Approximately 20 mcy of dredged material has gone to beneficial reuse since 2000, or over 42% of the total volume dredged; pre-LTMS, much of this would likely have been disposed in-Bay.
- Reused sediment has mostly come from USACE deepening projects, with a relatively small proportion coming from maintenance dredging projects (including USACE and non-USACE).
- Since 2000, reused dredged material has helped create or restore over 2,000 acres of intertidal and aquatic habitat; this habitat directly benefits a range of threatened and endangered fish and wildlife species.
- Through DMMO, the LTMS agencies have published improved, comprehensive testing guidelines for dredged material to ensure that significant contaminant-related impacts do not occur during dredging or disposal operations.
- Programmatic EFH consultation further improved the sediment testing program, and tied it for the first time to existing Bay TMDLs (for mercury and PCBs) and Bay-wide monitoring (RMP).
- Environmental Work Windows established under the LTMS program help to protect sensitive species by encouraging work during times that the species are less likely to be impacted.
- Through DMMO, the LTMS agencies meet regularly with project proponents to actively help minimize adverse impacts to fish by maximizing Windows compliance; and compliance by private dredging proponents has increased substantially.
- In recent years USACE maintenance dredging projects have increasingly had difficulty complying with the programmatic Windows, and have accounted for the majority of dredging outside Windows.
- The LTMS program has funded numerous science studies to help inform potential modification of certain Windows, and some modifications to the salmonid Work Windows are now proposed.
- Further avoidance, minimization, and mitigation measures are proposed to be incorporated into the LTMS program via this programmatic consultation with NMFS. This includes mitigation by USACE that, while not targeted at NMFS-listed species, will nevertheless provide some additional benefit to them.

As this list shows, during its first 12 years the LTMS Program has already materially benefited fishery habitat in the San Francisco Bay area. Since the LTMS program began: in-Bay disposal has been successfully and substantially reduced; beneficial reuse has increased and has significantly benefitted fishery habitat; dredged material that could not be reused has been diverted to the deep ocean disposal site, further reducing in-Bay disposal without any significant impacts to ocean resources; and significantly improved sediment testing has benefitted Bay habitat quality for fish and wildlife. Although reuse has recently become more costly and difficult to coordinate, substantial capacity for reuse remains available today. These successes and benefits will only be further enhanced through modification of the Work Windows, and implementation of the additional avoidance, minimization, and mitigation measures proposed by the LTMS agencies.



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