Harbor Safety Committee

of the San Francisco Bay Region

Mandated by the California Oil Spill Prevention and Response Act of 1990

Harbor Safety Committee of the San Francisco Bay Region
Thursday, June 12, 2008
7th Floor Conference Room, Port of Oakland, Oakland, California

Rich Smith, Vice-Chair of the Harbor Safety Committee of the San Francisco Bay Region (HSC), Westar Marine Services; called the meeting to order at 1000. **Alan Steinbrugge**, Marine Exchange of the San Francisco Bay Region (Marine Exchange), confirmed a quorum of the HSC.

The following committee members (M) and alternates (A) were in attendance: **Capt. Esam Amso** (A), Valero Marketing and Supply Company; **Capt. Marc Bayer** (M), Tesoro Refining & Marketing Company; **John Berge** (M), Pacific Merchant Shipping Association, (PMSA; **Ted Blanckenburg** (A), AMNAV Maritime Services; **Margot Brown** (M), National Boating Federation; **Len Cardoza** (M), Port of Oakland; **Warner Chabot** (M), Ocean Conservancy; **Capt. John Cronin**, Matson Navigation Company; **John Davey** (A); Port of San Francisco; **Capt. Paul Gugg** (M), United States Coast Guard (USCG); **Capt. Fred Henning** (M), Baydelta Maritime; **Capt. Bruce Horton** (M), San Francisco Bar Pilots (Bar Pilots); **Robert J. Lawrence** (M), U.S. Army Corps of Engineers (COE); **Pat Murphy** (M), Blue & Gold Fleet; **Gerry Wheaton** (M), National Oceanic and Atmospheric Administration (NOAA); **Richard Nagasaki** (M), Chevron Shipping Company; **William Nickson** (A), Transmarine Navigation Corporation; **Sara Randall** (M); Institute For Fisheries Resources; **Linda Scourtis** (A, Bay Area Conservation and Development Commission (BCDC); **Marina V. Secchitano** (M), Inland Boatmen's Union; **Tom Wilson** (M), Port of Richmond.

Also present and reporting to the HSC were Rick Chapman, (COE); **Bob Chedsey**, California State Lands Commission (State Lands); **Capt. Lynn Korwatch**, Marine Exchange; **Lt. Cmdr. Kevin Mohr**, USCG; **Capt. Gary Toledo**, California Office of Spill Prevention and Response, (OSPR).

The meetings are always open to the public.

Approval of the Minutes

There were no corrections to the minutes of the meeting of May 8, 2008. A motion was made, and seconded to accept the minutes. It passed without discussion or dissent.

Comments by the Chair – Smith

- **Smith** was chairing the meeting to do a loss in **Joan Lundstrom's** family.

Coast Guard Report – Capt. Gugg

- There will be visiting delegations from a number of countries this summer, including Chile, Costa Rica, and Ecuador.

Wilson said that notification of municipal authorities should be part of the discussion of lessons learned from the response to the shore-side toluene leak in Richmond. Wilson said that the City of Richmond was notified very late on the incident. He said that notification to local authorities should be included in future drills and exercises. He asked **Capt. Gugg** to pass along his concerns to the Environmental Protection Agency.

Lt. Cmdr Mohr read from a report attached to these minutes.

Davey asked **Lt. Cmdr. Mohr** to correct his report since neither the *Maersk Bering* nor the *YM Prosperity* had called at the Port of San Francisco.

Capt. Horton asked if the Coast Guard could report on two draw-bridge incidents that he had hear of. **Dave Sulouff**, Chief of Bridge Section for USCG Eleventh District, said that there had been two recent incidents. One had occurred at the Rio Vista drawbridge and the other was at the Benicia-Martinez Railroad Drawbridge. **Sulouff** could not comment in detail, since both incidents were still under investigation. Sulouff said that Union Pacific had signed a letter of intent to install a Physical Oceanographic Real Time System (PORTS) wind sensor on the bridge. He said that it could be installed as early as the end of May.

Capt. Horton thanked the Coast Guard for their assistance with the *Cielo Di Parigi*. On her arrival on May 1 she was found to have mechanical problems. The agent wanted the vessel to go to the dock but the Coast Guard directed her to Anchorage 9, where she was still undergoing repairs at the time of the HSC meeting.

Clearinghouse Report – Steinbrugge

Steinbrugge read from a report that is attached to these minutes.

OSPR Report – Capt. Toledo

- There was nothing to report.

NOAA Report – Wheaton

- He had received several requests for the definition of the term "sustained winds." He said that it is a measure of wind velocity taken for two minutes before the start of the hour.

US Army Corp of Engineers (COE) Report – Lawrence

Lawrence read from a report that is attached to these minutes.

Amso asked which type of dredge would be used for the Pinole Shoals project. **Lawrence** said that the contract had not been let, so he couldn't say.

Someone from the public asked about the status of sunken tugs in the Bay Area**. Lt. Cmdr. Mohr** said that they hadn't heard anything lately. **Lawrence** said that COE was trying to raise funds to have them removed. After further discussion, **Smith** asked for a status report to be given at the July meeting of the HSC.

State Lands Commission Report – Chedsey

Chedsey read from a report that is attached to these minutes.

Tug Escort Work Group – Capt. Henning

- They met with representatives from the Bar Pilots and tug companies on June 19 to discuss best practices.
- Assembly Bill 2032 had been amended so that it no longer changed regulation for which vessels should have escort tugs.

Navigation Work Group – Capt. Horton

- Their next meeting will be devoted to discussing the State Board of Pilot Commissioner's report on the *COSCO Busan* allision. They have been waiting for this report in order to begin their discussion on navigation technology in response to the Governor's directive.
- The removal of underwater rocks near the edge of existing channels could allow for the creation of two deep water lanes in the area, where currently there is only one. This should be considered in light of the large number of deeper draft vessels coming after the Oakland channel is lowered to fifty feet. After further discussion, **Smith** asked the Navigation work group to pursue the issue.

Briefing on Dredge Clearance Survey – Chapman

- The PowerPoint presentation given was subsequently emailed to members of the HSC, and is available for download at http://www.sfmx.org/support/hsc/ppt/EC-1130-2-xxxx_12Jun08_SPN-Briefing-to-HSC.pps. The Engineering Circular discussed was a draft of how to set internal COE policy for describing to the public the uncertainty of measurements and the rounding of measurements in sounding. If the Engineering Circular became policy, the COE would only report to the public rounded measurements, and not the data behind the measurements. NOAA would still get the data, and they could share it with anyone according to whatever their policies are. **Chapman** said that there was still time for public comment on the draft.

After much discussion of the technical details included in the presentation, it was the consensus of those present that it was not a good idea for the COE to keep the underlying data from their reports to the public.

Smith asked **Capt. Bayer** to work with the Navigation Work Group to draft a letter of comment from the HSC.

During the above discussion, **Cardoza** reported on the briefing he had received from the Office of Management and Budget (OMB) on the status of the Harbor Maintenance Trust Fund:

- **Cardoza** had traveled to Washington, D.C., with representatives of the California Marine Affairs and Navigation Conference and the American Association of Port Authorities, to discuss the issue with the California legislative delegation and representatives from the Executive branch.

- **Cardoza** said that they had been told by the spokesperson from OMB that there was no money in the trust fund, despite the perception of many in industry that there was upwards of four billion dollars in the fund. **Capt. Pete Bonebakker** asked where the money had gone. **Cardoza** said that the spokesperson had discussed the Yucca Mountain nuclear dump in Nevada, and that he didn't understand what the spokesperson had to say, other than that there was no money in the trust..

- **T**he delegation that met with California legislators worked to make sure that California receives it's fair share of the trust fund on a higher annual basis than has been the case in the past. States like Washington and Oregon are currently seeing a great return than California.

Ferry Operations Work Group –- Davey

- **Davey** briefly summarized the memoranda from the work group on speed recommendations for ferries that was attached to the minutes of the last meeting. The preliminary conclusion of the work group was that: "sufficient regulations and guidelines exist regarding speed limitations for ferry vessels transiting the San Francisco Bay region during periods of reduced visibility. At the next meeting of the work group they would turn their recommendations into something that could be voted on.

Capt. Korwatch said that in a recent meeting at the Coast Guard Vessel Traffic Service, the idea of managing ferry runs like numbered airline trips had been raised. **Murphy** said that suggestion had come up in past discussions, and the work group has been thinking about it. **Davey** said there was a lot for the work group to think about, including excursion boats.

Prevention Though People Work Group – Brown

- The group is doing out reach to recreational boaters to inform them about the new ferry routes and maneuvering zones on the navigation charts.
- **Ariel Armbruster**, of the Center for Collaborative Policy at California State University Sacramento, has developed an interest in the activities of the HSC as a result of her work on the Bay Waterways Trail. She is going over all of the material the group has created, and would like to meet with the HSC at some point in the future.

Plan Work Group – Scourtis

- There was nothing to report.

PORTS Work Group – Capt. Bayer

- He had met with **Col. Craig Kiley**, of the COE, after the last meeting of the HSC, and Kiley had assured him that the agenda of the HSC would be presented to the next colonel to take over the local office.

PORTS Report – Steinbrugge

- The new wind sensor for the Benicia-Martinez railroad drawbridge is in the works. It could be reporting day by the July meeting of the HSC.

Public Comment

Wheaton said that the issue of heavy weather is under discussion at other HSC meetings he attends in California. It was his impression that it would be helpful if the Coast Guard could provide more guidelines on what they are interested in. **Wilson** said that the Coast Guard had been working with State Lands, ports, and crane operators to get a sense of how operations are conducted locally during times of heavy weather. **Wheaton** said that it might be helpful if the Bay Region HSC shared their efforts with the other HSC's, because they don't seem to understand what the Coast Guard was looking for.

Capt. Gugg said that the goal was for the Coast Guard to have knowledge of what the plans and policies are, and to have them in one place where they could be referred to as need be. He said that there would be an agenda review. **Smith** asked all of the work groups to take a look at the issue. Lt. Cmdr. Mohr said that in the long run, all of the procedures could be collected under best practices in the *Harbor Safety Plan.*

Old Business

There was no old business.

New Business

Capt. Korwatch announced events of interest to the community that were scheduled to take place before the next meeting of the HSC.

Chabot said that he had received a press release from the Office of the Governor of California about oil spill response. He requested that the issue be on the agenda at the next meeting of the HSC. That press release is attached to these minutes.

Next Meeting

Steinbrugge said that the next meeting would convene at 1000, July 10, 2008, at the Port of Richmond's Harbor Master's Office.

Adjournment

A motion to adjourn was made and seconded. It passed without discussion or dissent. **Lundstrom** adjourned the meeting adjourned at 1141.

Respectfully submitted,

Lynn Korwatch

Captain Lynn Korwatch
Executive Secretary

USCG SECTOR SAN FRANCISCO

PREVENTION / RESPONSE - SAN FRANCISCO HARBOR SAFETY STATISTICS

May-08

PORT SAFETY CATEGORIES

	TOTAL
Total Port Safety (PS) Cases opened for the period:	**16**
1. Total Number of Port State Control Detentions for period:	**3**
SOLAS (3), MARPOL (0), ISM (0), ISPS (0	
2. Total Number of COTP Orders for the period:	**2**
Navigation Safety (0), Port Safety & Security (1), ANOA (1)	
3. Marine Casualties (reportable CG 2692) within SF Bay: Allison (2), Collision (0), Fire (0),	**4**
Grounding (0), Sinking (0), Steering (0), Propulsion (1), Personnel (1), Other (0)	
4. Total Number of (routine) Navigation Safety related issues / Letters of Deviation	**6**
Radar (4), Steering (0), Gyro (0), Echo sounder (0), AIS (2), AIS-835 (0	
5. Reported or Verified "Rule 9" or other Navigational Rule Violations within SF Bay	**0**
6. Significant Waterway events or Navigation related cases for the period:	**1**
7. Maritime Safety Information Bulletins (MSIBs): MSIB 06-05	**0**

MARINE POLLUTION RESPONSE

	TOTAL
Total Oil/Hazmat Pollution Incidents within San Francisco Bay for Period	**43**
*** Source Identification (Discharges and potential Discharges):**	
TOTAL VESSELS	**17**
Commercial Vessels	**4**
Public Vessels (Military)	**0**
Commercial Fishing Vessels	**1**
Recreational Vessels	**12**
TOTAL FACILITIES	**15**
Regulated Waterfront Facilities	**3**
Other Land Sources	**12**
UNKNOWN/UNCONFIRMED	**11**
***Spill Information**	
Pollution Cases Requiring Clean-up	**7**
Federally Funded Cases	**1**
Oil Discharge and Hazardous Materials Release Volumes by Spill Size Category:	
1. Spills < 10 gallons	**28**
2. Spills 10 - 100 gallons	**4**
3. Spills 100 - 1000 gallons	
4. Spills > 1000 gallons	**1**
5. Spills - Unknown	**10**
Total Oil Discharge and/or Hazardous Material release volumes:	**3407**
1. Estimated spill amount from Commercial Vessels:	**6**
2. Estimated spill amount from Public Vessels:	**0**
3. Estimated spill amount from Commercial Fishing Vessels:	**0**
4. Estimated spill amount from Recreational Vessels:	**56**
5. Estimated spill amount from Regulated Waterfront Facilities:	**5**
6. Estimated spill amount from Other Land Sources:	**3340**
7. Estimated spill amount from Unknown sources:	**0**
Penalty Action:	
Civil Penalty Cases for Period	**1**
Notice of Violations (TKs)	**0**
Letters of Warning	**4**

** SIGNIFICANT PORT SAFETY & SECURITY (PSS) CASES **

* A. MARINE CASUALTIES - PROPULSION / STEERING

Marine Casualty - Loss of Propulsion, M/V MORNING CHARM (22 May): While approaching the pier at Benicia Port Terminal vessel experienced a loss of propulsion under tug assist. Vessel was able to moor safely and a COTP order was issued directing the vessel to remain at the pier until the vessel's classification society surveyed the main propulsion plant. The cause of the loss of propulsion was attributed to a deficient air starting system. On 2 Jun all deficiencies were fixed and verified and the vessel was allowed to depart port. There were no injuries, damage, or pollution reported

* B. MARINE CASUALTIES - VESSEL SAFETY CONDITIONS

Marine Casualty - Allision, M/V CALIFORNIA DAWN (5 May): While conducting a navigation familiarization class, vessel allided with the sea wall at the Berkeley Marina. Vessel was making its approach to the marina when the master became distracted by the students onboard, resulting in the vessel striking the sea wall with the vessel's bow. As a result of the allision, the vessel sustained damage to the bow estimated at $3K. There were no injuries or pollution, and neither drugs nor alcohol were a factor in the

Marine Casualty - Allision, Tug INDEPENDENCE (14 May): Vessel was enroute from New York Slough back to the Benicia Industrial Dock when it allided with a pier at the Avon Tesoro Refinery in Martinez, CA. A one-inch gasoline pipeline was damaged and 5 gallons of gasoline was discharged into the Carquinez Straits. The pier sustained damage in excess of $100K. No damage occurred to the vessel. No injuries were reported. The causal factors leading up to the allision were poor decision making by the crew, violating company policy, alcohol consumption, and fatigue. A civil penalty against the master pends

Marine Casualty - Crewmember Injury, M/V DAWN PRINCESS (27 May): While moored at Pier 35 in the Port of San Francisco, a 71-year-old passenger on board lost his balance and fell as he was going through a doorway to exit onto the starboard weather deck. As a result of the fall, the passenger suffered a fractured right hip. The passenger received initial assistance from the ship's medical staff and was later disembarked and transported to a local hospital for further treatment. The cause was attributed to a loss of situational awareness by the passenger. Neither drugs nor alcohol were a factor in the incident.

* C. COAST GUARD - GENERAL SAFETY/SECURITY CASES

General Safety - SOLAS Detention, M/V MEDI TRADER (12 May): During a Port State Control examination in Pittsburg, CA, vessel was detained for numerous deficiencies including failing two seperate fire drills and an inoperable starboard lifeboat gravity davit system. On 13 May CG inspectors were able to revisit the vessel and observed a vast improvement in the crews fire fighting procedures. On 15 May the vessel's classification society provided CG inspectors with a report clearing the remaining deficiencies. The detention was lifted, and the vessel was allowed to depart port.

General Safety - SOLAS Detention, M/V SUPERTRAMP (13 May): During a Port State Control examination at the Port of Stockton, CG inspectors witnessed numerous deficiencies including improperly mounted quick-release lifebuoys on the bridge, rotted lifebuoys throughout the vessel, and broken lines on the embarcation ladder. On 16 May the vessel's classification society provided CG inspectors with a report stating that all repairs were made. The detention was lifted, and the vessel was allowed to

Navigation Safety, M/V YM PROSPERITY (23 May): Vessel failed to comply with the 24-hour Advance Notice of Arrival requirement for vessels entering San Francisco Bay. A COTP order was issued delaying the vessel entry into the port until the 24-hour Advance Notice of Arrival requirement was met. The vessel complied with the movement restrictions and on 24 May the

General Safety - SOLAS Detention, M/V RIO GOLD (27 May): During a Port State Control examination at the Port of Oakland, CG inspectors witnessed numerous deficiencies including ballast water leaking into the engine room, holes in the forepeak tank and chain locker, and possible use of an illegal pipe bypassing the oily water seperator. Deficiencies were addressed by the vessel's classification society, flag state, and a complete ISM audit was conducted. On 9 Jun the vessel's classification society provided CG inspectors with a report allowing the remaining deficiencies to be cleared. The detention was lifted and the vessel was allowed to depart port, however the CG is still pursuing criminal penalties for the alleged use of an illegal pipe to bypass the oily water

* D. COAST GUARD - NAVIGATIONAL SAFETY

Navigation Safety - M/V HYUNDAI CONFIDENCE (6 May): Vessel reported an inoperable 10 cm, s-band radar and was issued an inbound LOD while transiting to the Port of Oakland. On 7 May, the repairs were made and the vessel was allowed to depart

Navigation Safety - T/V MARITIME GISELA (17 May): Vessel reported an inoperable AIS and was issued an inbound LOD while transiting to the Port of San Francisco. On 19 May, the repairs were made and the vessel was allowed to depart

Navigation Safety - M/V HYUNDAI FREEDOM (20 May): Vessel reported an inoperable 10 cm, s-band radar and was issued an inbound LOD while transiting to the Port of Oakland. On 21 May, the repairs were made and the vessel was allowed to depart

Navigation Safety - M/V MAERSK BERING (24 May): Vessel reported an inoperable 10 cm, s-band radar and was issued an inbound LOD while transiting into San Francisco Bay. On 28 Apr, the repairs were made and the vessel was allowed to depart

Navigation Safety - M/V CAPE AVILA (27 May): While departing from the Port of Oakland the vessel reported and inoperable AIS. The vessel was issued an outbound LOD to make repairs at its next scheduled port. Vessel safely departed on 27 May

Navigation Safety - T/V CAPTAIN H.A. DOWNING (29 May): While in the Port of San Francisco, the vessel reported an inoperable 10 cm, s-band radar and an inoperable 3 cm, x-band radar. The vessel also reported that their second 3 cm, x-band radar was working. The vessel was issued an LOD allowing them to shift locations within San Francisco Bay. On 30 May, the repairs were made and the vessel was allowed to depart

SIGNIFICANT INCIDENT MANAGEMENT DIVISION (IMD) CASES:

Medium Release - REACTION PRODUCTS Toluene Release (05 May): 3,300 gallons of toluene was released from a storage tank into the environment at the Reaction Products facility in Richmond, CA . The CERCLA fund was opened and a unified command of USCG, CAL Fish and Game and East Bay Regional Parks oversaw cleanup of the site, with EPA assistance. A total of 845 gallons were recovered. The spill took place when an unknown party had stolen a brass valve fitting from the tank.

SIGNIFICANT PORT SAFETY INFORMATION or EXERCISES

None.

DEPARTMENT OF THE ARMY
SAN FRANCISCO DISTRICT, U.S. ARMY CORPS OF ENGINEERS
1455 MARKET STREET
SAN FRANCISCO, CALIFORNIA 94103-1398

REPLY TO
ATTENTION OF

May 22, 2008

Executive Office

SUBJECT: Your letter dated April 25, 2008, concerning my May 8, 2008, briefing to the Harbor Safety Committee (HSC)

Ms. Joan Lundstrom, Chair
Harbor Safety Committee of the San Francisco Bay Region
Fort Mason Center, Building B, Suite 325
San Francisco, California 94123-1380

Dear Ms. Lundstrom:

It was a pleasure to finally meet you and the members of the HSC. I am sending this letter to repeat a few key points from my briefing and to ask that you include the District on the agenda for the next HSC meeting. We wish to present a briefing on the Draft Engineering Circular (EC) Assessment and Reporting of Acoustic Clearance Surveys in Deep-Draft Navigation Projects.

Concerning the issue of timely reporting of survey depths to the maritime community, I described the delays in 2007 and the improvements in our survey posting times to date in 2008, with most surveys being posted within 12 working days after survey completion (in accordance with our SOP) and only 5 surveys being posted more than 18 working days after survey completion. I expect further improvements this summer when we upgrade to RTK GPS (Real Time Kinematic Global Positioning System) for position and elevation control and to a more advanced inertial motion unit (IMU) for vessel motion filtering. To emphasize the importance of timely posting of surveys, any navigation channel surveys not posted within 12 working days will be elevated to the attention of the District Commander.

Although we are discussing navigation channel surveys, it must be emphasized that our Condition Surveys are performed to manage the development of construction projects and the Before-Dredge and After-Dredge surveys are used to compute dredged material volumes. These surveys are "Not for Navigation" and, even though we will strive to post them within 12 working days after survey completion, prompt posting of surveys cannot undermine our construction management responsibilities.

The District's mission and funding are not aligned with the HSC vision of more frequent Corps surveying of several SF Bay channels. For other outside agencies, such as FEMA and the EPA, I mentioned that MOUs were negotiated for these agencies to pay for USACE positions which would allow USACE participation in otherwise unfunded efforts. This is something the HSC might wish to pursue with my successor.

As this was my only meeting with the HSC during my tenure, I will recommend that my successor attend at least one HSC meeting quarterly.

Sincerely,

Craig W. Kiley

Craig W. Kiley
Lieutenant Colonel, U.S. Army
Commanding

Harbor
Safety
Committee

of the San Francisco Bay Region

Mandated by the California Oil Spill Prevention and Response Act of 1990

May 22, 2008

Mr. Dan Donohue
Chief, Emissions Assessment Branch
California Air Resources Board
P.O. Box 2815
Sacramento, CA 95812

Subject: Vessel Speed Restrictions in San Francisco Bay

Dear Mr. Donohue:

On behalf of the Harbor Safety Committee of the San Francisco Bay Region, I would like to take this opportunity to provide the California Air Resources Board a copy of a recently completed report on the subject of speed of large vessels transiting the Bay region during periods of reduced visibility. I offer this information in light of the investigation by the Board of the impacts of vessel speed on air quality.

The attached report was prepared in response to a directive by the Governor to the state Office of Spill Prevention and Response (OSPR) to review causes of the Cosco Busan incident and to develop recommendations to prevent such an incident from occurring again. OSPR tasked the Harbor Safety Committee of the San Francisco Bay Region (HSC) to “analyze the navigational safety-related issues of the Governor’s directive and make appropriate recommendations regarding the prevention aspects of the incident.”

State law established the 21-member HSC in 1991 to make recommendations to prevent vessel accidents in the Bay, which might lead to an oil spill. The Committee consists of representatives of four Port Authorities; Bar Pilots, tanker, cargo, tug and barge and oil terminal operators; labor; recreational boaters; commercial fishing; a nonprofit environmental organization; BCDC, NOAA, the U.S. Army Corps of Engineers and the Coast Guard Captain of the Port. Our monthly meetings, publicly noticed, are well attended by the maritime community.

Since the Cosco Busan incident, the HSC, per direction of the OSPR Administrator, has focused on the implications of the incident to recommend prevention measures as part of a “lessons learned” process. One of the topics considered by the HSC is the issue of speed restrictions for large vessels transiting San Francisco Bay.

The HSC Navigation Work Group reviewed regulations currently in place for Central San Francisco Bay. Included are Regulated Navigational Areas (RNAs) adopted in 1995 to improve navigation safety by organizing traffic flow patterns; reducing meeting, crossing, and overtaking situations in constricted channels; and by limiting vessel speeds.

I also would refer you to the *San Francisco, San Pablo and Suisun Bays Harbor Safety Plan* (Chapter VII, Vessel Speed and Traffic Patterns) for background on the development of the speed restrictions. For example, industry related that lower speeds, such as a 12-knot limit, would unnecessarily restrict the maneuverability of some ships in swift currents. Also, certain ships can operate in ranges of full ahead and half ahead only, which may not coincide with an established upper speed limit. The Harbor Safety Plan can be found at the San Francisco Marine Exchange website, www.sfmx.org/support/hsc/introhscplan.htm.

The Navigation Work Group met several times with staff members of the Air Resources Board in 2005-6 to discuss safety ramifications of the use of low sulfur fuel oil for shipboard auxiliary engines, and would be pleased to discuss with your staff safety considerations related to vessel speed restrictions.

If you would like to arrange such a meeting, or if you have any questions, please don't hesitate to contact me at (415) 461-4566.

Sincerely,

Joan Lundstrom, Chair
Harbor Safety Committee
San Francisco Bay Region

encl: Report to OSPR Administrator on speed restrictions for large vessels
in transiting San Francisco Bay in reduced visibility, dated May 19, 2008.

cc: Peggy Taricco, Manager, Technical Analysis Section, California Air Resources Board
Paul Milkney, Technical Analysis, California Air Resources Board
Harbor Safety Committee
Captain Paul Gugg, U.S. Coast Guard Captain of the Port
Bud Leland, Deputy Administrator OSPR

OSPR
Office of Spill Prevention and Response

San Francisco Bay Region
Tank Vessel Escort Clearing House
c/o Marine Exchange of the San Francisco Bay Region
Fort Mason Center, Building B, Suite 325
San Francisco, California 94123-1308

San Francisco Clearinghouse Report

June 8, 2008

- In May the clearinghouse did not contact OSPR about possible escort violations.
- In May the clearinghouse did not receive any notifications of vessels arriving at the Pilot Station without escort paperwork.
- The Clearinghouse has contacted OSPR 1 time so far in 2008 about possible escort violations. The Clearinghouse called 9 times in 2007, 9 times in 2006; 16 times in 2005; 24 times in 2004; twice in 2003; twice in 2002; 6 times in 2001; 5 times in 2000.
- In May there were 118 tank vessels arrivals; 3 LPG's, 5 Chemical Tankers, 12 Chemical/Oil Carriers, 34 Crude Oil Tankers, 25 Product Tankers, plus 39 tugs with barges.
- In May there were 346 total arrivals.

San Francisco Bay Clearinghouse Report For May 2008

San Francisco Bay Region Totals

			2007	
Tanker arrivals to San Francisco Bay	79		72	*(before 2008 barge arrivals were not totaled)*
Barge arrivals to San Francisco Bay	39			
Total Tanker and Barge Arrivals	118			
Tank ship movements & escorted barge movements	333		393	
Tank ship movements	232	69.67%	232	
Escorted tank ship movements	101	30.33%	103	
Unescorted tank ship movements	131	39.34%	129	
Tank barge movements	101	30.33%	161	
Escorted tank barge movements	40	12.01%	80	
Unescorted tank barge movements	61	18.32%	81	

Percentages above are percent of total tank ship movements & escorted barge movements for each item.

Escorts reported to OSPR	0		0	

Movements by Zone	Zone 1	%	Zone 2	%	Zone 4	%	Zone 6	%	Total	%
Total movements	173		305		0		141		619	
Unescorted movements	94	54.34%	175	57.38%	0	0.00%	87	61.70%	356	57.51%
Tank ships	88	50.87%	128	41.97%	0	0.00%	57	40.43%	273	44.10%
Tank barges	6	3.47%	47	15.41%	0	0.00%	30	21.28%	83	13.41%
Escorted movements	79	45.66%	130	42.62%	0	0.00%	54	38.30%	263	42.49%
Tank ships	68	39.31%	98	32.13%	0	0.00%	29	20.57%	195	31.50%
Tank barges	11	6.36%	32	10.49%	0	0.00%	25	17.73%	68	10.99%

Notes:
1. Information is only noted for zones where escorts are required.
2. All percentages are percent of total movements for the zone.
3. Every movement is counted in each zone transited during the movement.
4. Total movements is the total of all unescorted movements and all escorted movements.

San Francisco Bay Clearinghouse Report For 2008

San Francisco Bay Region Totals

	2008	%	2007	
Tanker arrivals to San Francisco Bay	362		785	*(before 2008 barge arrivals were not totaled)*
Barge arrivals to San Francisco Bay				
Total Tanker and Barge Arrivals	362			
Tank ship movements & escorted barge movements	1,944		3,907	
Tank ship movements	1,137	58.49%	2,241	
Escorted tank ship movements	541	27.83%	1,121	
Unescorted tank ship movements	596	30.66%	1,120	
Tank barge movements	807	41.51%	1,666	
Escorted tank barge movements	370	19.03%	869	
Unescorted tank barge movements	437	22.48%	797	

Percentages above are percent of total tank ship movements & escorted barge movements for each item.

Escorts reported to OSPR	1		9

Movements by Zone	Zone 1	%	Zone 2	%	Zone 4	%	Zone 6	%	Total	%
Total movements	1,082		1,813		0		892		3,787	
Unescorted movements	542	50.09%	959	52.90%	0	0.00%	458	51.35%	1,959	51.73%
Tank ships	382	35.30%	591	32.60%	0	0.00%	233	26.12%	1,206	31.85%
Tank barges	160	14.79%	368	20.30%	0	0.00%	225	25.22%	753	19.88%
Escorted movements	540	49.91%	854	47.10%	0	0.00%	434	48.65%	1,828	48.27%
Tank ships	337	31.15%	526	29.01%	0	0.00%	210	23.54%	1,073	28.33%
Tank barges	203	18.76%	328	18.09%	0	0.00%	224	25.11%	755	19.94%

Notes:
1. Information is only noted for zones where escorts are required.
2. All percentages are percent of total movements for the zone.
3. Every movement is counted in each zone transited during the movement.
4. Total movements is the total of all unescorted movements and all escorted movements.

Harbor Safety Committee
Of the San Francisco Bay Region

Report of the
U.S. Army Corps of Engineers, San Francisco District
June 12, 2008

1. CORPS 2008 O&M DREDGING PROGRAM

The following is this years O & M dredging program for San Francisco Bay.

a. **Main Ship Channel –** Dredging is underway. There are about 9,000 yards of material remaining. This will be dredged as the dredge alternates between the Main Ship Channel and Richmond Harbor. Surveys will be done after the dredging is completed and posted as soon as is possible.

b. **Richmond Outer Harbor (and Richmond Long Wharf) –** Hopper dredging began on June 9 and will continue for 2-3 weeks.

c. **Richmond Inner Harbor –** The Corps hopes to dredge the few high spots with the same hopper dredge as is dredging the Outer Harbor, following the dredging of the Outer Harbor. However, the Corps still needs to obtain some environmental approvals.

d. **Oakland O & M Dredging –** The Outer Harbor is planned to be dredged in August, with the material going to the Hamilton restoration site. Inner Harbor maintenance dredging will be done along with the deepening of that area (which is on-going).

e. **Suisun Bay Channel –** Suisun Bay Channel and New York Slough will be dredged starting in September this year.

f. **Pinole Shoal** - Pinole Shoal will be dredged under the same contract as Suisun. This dredging will begin this fall. It is not known at this time if that dredging will be before or after the Suisun dredging.

g. **Redwood City/San Bruno Shoal –** Money is being reprogrammed for this project. Once the money has been reprogrammed, the project will be re-solicited. Dredging will begin after a contract is signed, hopefully early this fall.

2. DEBRIS REMOVAL The Raccoon is now back in operation. Debris totals for May 2008 was 18 tons; 10 tons collected by the Raccoon and 8 tons collected by the Grizzly.

[redacted]

3. UNDERWAY OR UPCOMING HARBOR IMPROVEMENTS

f. Oakland 50-ft Deepening Project - Deepening of Oakland's Outer Harbor began on March 16, 2007. Completion targeted for September 2008, for the entire Outer Harbor. The rock pile. The project team has no yet decided what to do with it. It is right now not scheduled to be removed until that part of the Harbor is deepened in October of next year. The rock is presumed to be 6' and less, and is not considered to be a navigational hazard. The rock does show up in the Alameda side of the channel on recent surveys. No change.

4. EMERGENCY (URGENT & COMPELLING) DREDGING

There has been no emergency dredging in FY 2008.

5. OTHER WORK

a. **San Francisco Bay to Stockton** The project team conducted two very successful public scoping meetings - on March 26 and April 2, co-hosted by local sponsors Port of Stockton and Contra Costa County Water Agency. Key attendees were: regulatory and resource agencies, EBMUD, DOT, CALTRANS, League of Women Voters, reclamation districts, oil companies, and local landowners. The team continues to receive written comments for the EIS/R. This project is moving forward. No change.

b. Sacramento River Deep Water Ship Channel Deepening Additional Federal money was received in May. The money will be used for more testing and disposal site evaluation. The proposed design depth is -35 feet mean lower low water, plus overdepth.

6. HYDROGRAPHIC SURVEY UPDATE

Address of Corps' web site for completed hydrographic surveys. New surveys.

http://www.spn.usace.army.mil/hydrosurvey/

Main Ship Channel – Survey was completed in March 2008 and has been posted.
Pinole Shoals –Surveys completed in March and April 2008 have been posted.
Suisun Bay Channel, Bullshead Channel – Surveys dated May 2008 have been posted.
Suisun Bay Channel, NY Slough – Surveys dated April 2008 have been posted.
Redwood City – Surveys completed in February 2008 have been posted.
San Bruno Shoal – Surveys completed in February and March 2008 have been posted.
Oakland Inner, Outer Harbors and Outer Harbor Approach – Surveys dated 11-12, 14, 17-18 May 2008 have been posted.
Southampton Shoal and Richmond Long Wharf – Surveys completed in February 1-2, 2008 have been posted.
Richmond Inner Harbor: Surveys completed in April 2008 have been posted.
North Ship Channel: Surveys completed 12-13 and 20-21 March 2008 have been posted.

FIRST DRAFT: 01 FEBRUARY 08
THIS DRAFT DOCUMENT PROPOSES CHANGES TO CURRENT CORPS PRACTICES AND STANDARDS BASED ON S&M-COP/DCA AND NAD/MUG CONFERENCES.
AN INDEPENDENT TECHNICAL REVIEW BY ERDC (CHL/TEC), NOAA, CORPS FOA, AND THE DCA IS RECOMMENDED. SOME OF THE MORE SIGNIFICANT ITEMS REQUIRING REVIEW & RECOMMENDED CHANGES ARE HIGHLIGHTED WITH COMMENTS.

DEPARTMENT OF THE ARMY EC 1130-2-XXXX
US Army Corps of Engineers
CECW-CO **Washington, DC 20314-1000**

Circular
No. 1130-2-XXXX 1 July 2008

Expires: 30 June 2010

Project Operations

ASSESSMENT AND REPORTING OF ACOUSTIC CLEARANCE SURVEYS IN DEEP-DRAFT NAVIGATION PROJECTS

1. Purpose. This circular establishes new Corps of Engineers policies and reporting procedures for the probabilistic uncertainty analysis of depths derived from acoustic surveys in deep-draft navigation projects. Its primary purpose is to formally document agreements with the dredging industry to standardize clearance evaluation tolerances and methods, and to provide consistent and equitable payment procedures for contracted construction based on unit price/in-place measurement surveys. This circular provides new channel depth clearance reporting criteria that contain risk-based statistical probabilities and uncertainties that are consistent and compatible with DOD, federal, and international standards for assessing depth measurement uncertainties in navigation projects. In addition, and most critically, it implements a standardized Corps policy for consistently communicating channel clearance risk and reliability to the public. This circular also provides updated policy and technical guidance to cover the expanding use of high-density, multibeam acoustic survey systems and real-time-kinematic (RTK) technology for the direct measurement of water surface elevations relative to the GPS-based National Spatial Reference System (NSRS) ellipsoid. This circular updates, supplements, and supersedes portions of ER 1130-2-520 and EM 1110-2-1003.

2. Applicability. This circular applies to all USACE commands having responsibility for the planning, engineering, design, construction, operation, and maintenance of deep-draft navigation projects. This circular does not apply to inland or intracoastal waterways, or coastal shallow-draft projects less than 15 feet in depth. This circular applies to government, Architect-Engineer, and contracted construction forces performing clearance surveys and shall be included by reference in all dredging contracts. Procedural and technical guidance in this circular is mandatory.

3. References.

a. ER 1130-2-520, Navigation and Dredging Operations and Maintenance Policies.
b. EM 1110-2-1003, Hydrographic Surveying.
c. EM 1110-2-1613, Hydraulic Design of Deep-Draft Navigation Projects.
d. EM 1110-2-1619, Risk-Based Analysis for Flood Damage Reduction Studies.
e. EP 1130-2-520, Navigation and Dredging Operations and Maintenance Guidance and Procedures.
f. EC 1110-2-6065, Comprehensive Evaluation of Project Datums: Guidance for a Comprehensive Evaluation of Vertical Datums on Flood Control, Shore Protection, Hurricane Protection, and Navigation Projects.

g. FAR 52.236-16, "Quantity Surveys," Federal Acquisition Regulation, April 1984.
h. FGDC-STD-007.3-1998, "Geospatial Positioning Accuracy Standards, PART 3: National Standard for Spatial Data Accuracy," Federal Geographic Data Committee (FGDC), 1998.
i. IHO 1998, "International Hydrographic Survey Standards," Special Publication S-44, International Hydrographic Organization, Monaco, 14th Edition, April 1998.
j. IHO 2005, "Manual on Hydrography," Publication M-13, International Hydrographic Organization, Monaco, 1st Edition, May 2005.
k. NIST 1994, "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results," NIST Technical Note 1297, National Institute of Standards and Technology, 1994.
l. NAVOCEANO/Hare 2001, "Error Budget Analysis for US Naval Oceanographic Office (NAVOCEANO) Hydrographic Survey Systems: Final Report for Task 2, FY 01," Hare, R., University of Southern Mississippi, Hydrographic Science Research Center, September 2001.

4. Distribution. This circular is approved for public release; distribution is unlimited.

5. Expiration and Rescission. This circular shall expire on the above date or when applicable policy portions are incorporated into ER 1130-2-520 and technical guidance from Appendix A is incorporated into EM 1110-2-1003, whichever is later.

6. Policy. It is the policy of the Corps of Engineers that:

a. Survey tolerance. Dredged channel depths, and related channel clearances, shall be assessed, evaluated, and reported at tolerances commensurate with the estimated uncertainties of the survey measurements, fully considering all global and local random/systematic variables involved in arriving at the total propagated error (TPE) in acoustically measured elevations or depths. All dredging contract specifications shall clearly indicate the survey tolerance that will be used in clearance and acceptance assessment.

b. Reported depth data. Depth or channel clearance plan drawings or reports provided to outside users, project sponsors, pilots, and other interests, shall be rounded to a representative significant figure level and contain clearly noted statistical confidence estimates of the data reliability based on the estimated survey tolerance applicable to the project. An uncertainty or risk-based assessment of a navigation project's expected performance is comparable to reliability assessments developed for flood control projects—see EM 1110-2-1619.

c. Development of contract specifications. Contract specifications for in-place measurement and payment surveys shall be structured to fit specific project conditions based on the estimated uncertainty tolerances in the acoustic measurement process. During the preconstruction engineering and design (PED) phase, these survey uncertainty/tolerance estimates shall be developed and documented by an engineer or surveyor assigned to the project delivery team (PDT) who is fully knowledgeable of the propagated errors inherent in the acoustic measurement system, tidal hydrodynamic model, horizontal positioning system, water column velocity and density variations, and subsurface conditions existing at the project site. This individual shall also be included on pre-construction meetings and subsequent meetings involving contract clearance or payment disputes. A PED specification development checklist for contract measurement and payment is attached at Appendix B.

d. Survey tolerance overdepth grade—new work deepening projects. In new deepening work involving hard bottom material (rock, hard clays, or highly consolidated/cemented materials), an additional "survey tolerance overdepth grade" template shall be specified below the required grade to assure that all material is removed from the required prism (Project Depth). This overdepth grade shall be based on the computed/propagated measurement uncertainty at the project site. Full-coverage multibeam or multi-transducer sweep systems are required on deepening projects involving hard bottom materials.

e. Survey tolerance on maintenance dredging projects In maintenance dredging of soft, non-consolidated material, a survey uncertainty tolerance window shall be developed about the required prism, within which dredged clearance will be deemed acceptable. This survey tolerance window shall be based on the computed/propagated measurement uncertainty at the project site. Depending on material or shoaling irregularities, either single-beam or multibeam survey systems may be specified on maintenance dredging projects.

f. Standardized quantity computation procedures. Estimated construction quantities and contract payment quantity computation methods shall be standardized using the Contour Dredging surface-to surface modeling procedures developed by the North Atlantic Division, as described in this circular.

g. Contract specification reference. This circular, and its subsequent derivative regulation, shall be incorporated by reference in all contract specifications involving in-place dredging measurement and payment. The policies and related technical guidance in this circular, and referenced engineering manuals, applies equally to government or contractor performed surveys (FAR 52.236-16).

h. Existing technical guidance. Survey procedures shall follow the technical guidance and calibration standards in EM 1110-2-1003, which supplements this circular. This circular updates and supersedes portions of the guidance in ER 1130-2-520, EM 1110-2-1003, and EP 1130-2-520, and supplements EM 1110-2-1613.

7. Survey Tolerances on Dredging Measurement and Payment Projects. The design or required dredging template shall be modified to account for a survey tolerance or confidence allowance. The survey tolerance is defined as the estimated repeatability or reproducibility of the statistical average of multiple acoustic measurements made over a finite area or cell, and at a specific project site using the same or different measurement systems. It is roughly equivalent to a statistical "confidence level" of the mean deviation when multiple depths with large uncertainties (TPE) are averaged within a finite sample (cell) area. The survey tolerance is dependent on (1) a statistical analysis of the total propagated error (TPE) of individual depth measurements made by the acoustic measurement system along with estimated hydrodynamic, meteorological, and environmental conditions occurring at a specific project site, and (2) the typical number of depths averaged or evaluated in a particular region or cell. Given the statistical complexity involved in determining (1) and (2)—see NAVOCEANO/Hare 2001 and IHO 2005—practical engineering judgment necessitates that an estimated "average survey tolerance" be assigned to a specific condition survey or dredge measurement and payment survey of a navigation project.

a. Required survey tolerance and allowable overdepth allowance. An estimated survey tolerance shall be determined for each specific navigation project and/or dredging contract and shall be specified in the contract. The allowable overdepth allowance shall not be reduced to compensate for the estimated survey tolerance. Technical guidance for estimating the survey tolerance for a project is at Appendix A.

b. Survey tolerance grades in new work deepening projects. A dredging grade below the required depth prism shall be specified based on the estimated survey tolerance, as shown in Figure 1 below. The overdepth allowance is measured relative to the survey tolerance grade. Payment for quantity of material removed will be measured relative to the required depth prism along with contract specified allowances down to the overdepth prism. Material falling between the required depth and survey tolerance overdepth grade need not be removed. Estimated quantities in the contract shall be based on the survey tolerance overdepth and allowable overdepth grades.

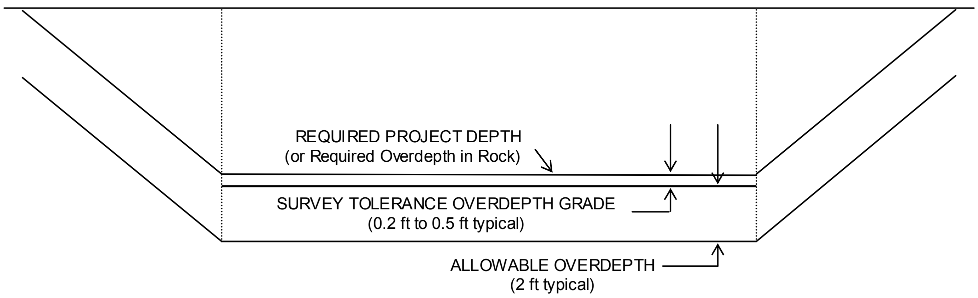

Figure 1. Survey tolerance overdepth grade in hard bottom projects (rock, dense clay, or manmade materials)

c. Survey tolerances in maintenance dredging projects. A survey uncertainty tolerance about the required prism shall be specified, as shown in Figure 2 below. The overdepth allowance is measured relative to the required depth grade. Payment for quantity of material removed will be relative to the required depth prism along with contract specified allowances down to the overdepth prism. Material falling within the survey uncertainty tolerance window need not be removed. Estimated quantities in the contract shall be based on the required depth and allowable overdepth grades.

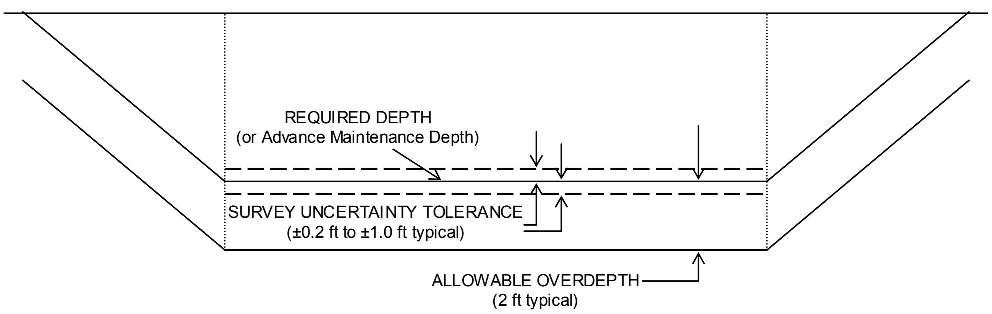

Figure 2. Survey uncertainty tolerances in soft bottom maintenance dredging projects

d. Minimum survey tolerance. The minimum survey tolerance on deep-draft navigation projects shall not be less than ±0.2 ft. This minimum tolerance would be applicable only on projects where the water surface elevation can be accurately modeled relative to the reference gage (e.g., visual proximity to a tidal gage or RTK surface elevation measurement), water column velocities are consistent throughout the project, and no unconsolidated sediments or acoustic reflectivity issues are present.

e. Tolerances on Project Condition and other surveys. The above survey tolerance criteria are applicable to all surveys performed over a navigation project, regardless of the intended engineering, operations, or maintenance purpose (e.g., feasibility studies, reconnaissance surveys, project condition surveys, contract plans and specifications (bid) surveys).

8. USACE Standards and Specifications for Acoustic Surveys. The following standards apply to all surveys of deep-draft navigation projects. They shall be included in all contract measurement and payment specifications, either directly or by reference.

a Cell size. The grid cell size used for assessing depth clearances shall be exactly 3 ft x 3 ft in hard material and 5 ft x 5 ft in soft material. The cell size on single-beam or multi-transducer systems shall be a linear/rectangular cell of estimated footprint width by velocity (ft/sec) x 1-sec length.

Comment [WAB1]: WAB: These arbitrary cell size standards were developed in 2004 by agreement of the North Atlantic Division & Corps Multibeam Users Group and incorporated in EM 1110-2-1003. A single-beam standard is proposed.

b. Representative depth selection procedure. Representative depths collected on single-beam, multi-transducer, or multibeam acoustic surveys, and used for clearance assessment and/or dredged quantity take-offs, shall be computed based on the average of all edited depths collected in a defined cell. Alternatively, the median depth in a cell sample may be selected as the representative depth.

c. Acoustic frequency standard. The standard acoustic frequency shall be 200 kHz (± 10%). This frequency best represents a consistent and recognized standard for the acoustic return from rock and semi-consolidated soft sediment materials found on most projects. Deviations from this standard (e.g., use of lower frequencies in unconsolidated or unconfined sediments) shall be clearly defined in the contract specifications. Single-beam system transducers shall have narrow beam widths not exceeding 6° (-3dB) and shall be internally calibrated such that the recorded depth represents a fixed 60% (±10%) of the maximum return echo voltage available for a saturated echo—see Appendix A and IHO 2005.

Comment [WAB2]: Verify this standard is technically correct and applicable to all single-beam systems (Ross, Odom, Innerspace, Knuedson)

d. Bar-Plate calibration. The "bar-check" remains the standard calibration method for all acoustic systems. Irrespective of known uncertainties in the bar-check calibration process itself, it remains the USACE "gold standard" by which channel clearance and payment is ultimately established. Single-beam, multi-transducer, and multibeam depth sensors shall be calibrated by plate bars placed as close as possible to the project depth such that the signal threshold processing of the acoustic return from the calibration plate best matches (or correlates with) the acoustic return from the channel bottom without subsequent adjustment for gain, sensitivity, or intensity variations.

e. Vessel motion filtering. Vessel motion (roll, pitch, yaw, and heave) relative to the water surface shall be minimized using GPS carrier phase and/or inertial motion unit (IMU) filtering techniques.

f. Performance Tests. Performance tests shall be performed on dredging measurement and payment surveys. Performance tests are indirect methods of verifying the stability, repeatability, and reproducibility of a particular survey system—see EM 1110-2-1003. Multibeam system array confidence shall be tested and evaluated against reference surfaces that are derived from narrow-beam, motion-stabilized, single-beam systems—reference the technical guidance in EM 1110-2-1003.

g. Frequency of calibration and performance testing. There is no definitive standard for the periodic calibration of acoustic survey systems—engineering judgment is required based on the documented past performance of the survey system, the required project tolerance, potential contract clearance disputes, etc. On critical clearance surveys over hard materials, frequent (i.e., daily) calibration and performance testing would be warranted.

9. Channel Clearance and Acceptance Procedures. Government channel clearance surveys shall be expeditiously performed and processed, such that a preliminary evaluation of acceptable or unacceptable clearance can be made within 24 hours after completion of the survey. In new work or deepening projects in hard material, authoritative government and contractor representatives shall be present during clearance surveys so that potential strikes or shoals above grade can be immediately assessed and/or resurveyed for either confirmation or acceptable clearance, fully considering the survey tolerances in the preceding paragraph. In such cases, near-real-time data processing shall be performed at the site so that additional verification surveys can be immediately performed over questionable areas.

a. Strike verification (new work or rock). When multiple adjacent/contiguous cells on a single acoustic multibeam survey sweep over an area contain averaged depths above the required grade shown in Figure 1, then a confirmed strike above the required grade may be inferred and additional dredging clearance may be indicated. When an isolated cell indicates an averaged depth above the required grade, further confirmation shall be made to verify the strike by making at least two (2) additional “dead slow” separate survey passes [sweeps] over the suspected strike area in order to accumulate a statistically significant number of depths from which to evaluate the confidence of the average representative depth.

b. Shoal verification (maintenance dredging/soft bottom material). When multiple adjacent/contiguous cells on a single acoustic survey (single-beam or multibeam) over an area contain averaged depths outside (i.e., above) the survey tolerance limit shown in Figure 2, then a confirmed shoal above grade may be inferred and additional dredging clearance may be indicated. When an isolated cell indicates an average depth above grade, further confirmation shall be made to verify the shoal by making at least two (2) additional “dead slow” separate survey passes over the suspected shoal area in order to accumulate a statistically significant number of depths from which to evaluate the confidence of the average representative depth.

c. Minimum number of depths in a cell for assessing clearance. A minimum of 10 depths shall be required to be considered statistically significant to fall within the resolution confidence (or survey tolerance) of the averaged representative depth in the cell—i.e., when the confidence of the mean of the depths in a cell approaches the estimated survey tolerance.

Comment [WAB3]: Need to come up with reasonable and statistically significant number of depths per cell—without getting bogged down in statistical sampling noise, t-distributions, etc. One simple standard needed. Not easy, many variables. "Previous "3-depths hit" rule is obviously too low ... 30 is probably too high. "10" may or may not be the right number.

d. Evaluation of individual recorded depths. In no case shall shoal or strike detection and/or channel clearance assessment be based on a single recorded depth measurement; in particular, the "minimum" or "shoal-biased" depth in an area or cell shall never be used (see EM 1110-2-1003). Clearance depths shall be assessed considering the TPE and confidence tolerance of all the measurements in a cluster or cell.

e. Combined Uncertainty and Bathymetry Estimator (CUBE). Statistical hypothesis testing algorithms such as CUBE (Calder and Mayer 2003, NOAA 2005) have been developed to search for and assist in evaluating the potential existence of strikes or shoals above grade. CUBE is especially useful in locating multiple depth clusters in a defined region (node or cell) that may indicate isolated strikes above grade but are masked by an average or median depth. CUBE also develops a most probable representative depth (or multiple hypothetical strike depths) at each nodal location, along with an estimate of its statistical uncertainty. If such algorithms are used in lieu of the above averaged cell depth assessment procedures, then the contract specifications shall fully describe the detection and rejection procedures applicable to dredge measurement. CUBE is recommended as a detection tool on critical projects involving rock near the project grade.

Comment [WAB4]: WAB ... what exactly is it? average, median, mode, ?

Comment [s5]: WAB: may need some caveat in that CUBE was developed for nautical charting applications ... not dredge clearance assessment. A "DREDGECUBE" development is recommended for future work.

f. Dispute resolution procedures. In the event that repeatable (and unaccountable) biases exist between government and contractor surveys that exceed the allowable survey tolerances specified in the contract, and both survey systems are functionally equivalent and procedurally performed in technical compliance with this circular and EM 1110-2-1003, then the government survey shall be presumed as the payment/clearance standard.

10. Policy on the Use of Multibeam Survey Systems on Maintenance Dredging Projects. Full bottom acoustic coverage (i.e., multibeam or multi-transducer sweeps) is only required on surveys involving newly authorized navigation projects containing hard bottom material, such as rock, compacted clays, or other highly compacted material. Full-bottom acoustic coverage may be specified on maintenance dredging of existing navigation projects where low under-keel clearances are anticipated over potentially hazardous bottom conditions, hazardous cargo is transported, or where bottom sediment could adversely impact naval vessels transiting a project. Other special maintenance dredging cases may include highly varying topography, historical small isolated shoaling areas falling between the nominal section stationing interval, suspected debris, or in environmentally sensitive areas.

a. Contract specifications. Dredging contract specifications shall clearly indicate the specific survey requirement for full-bottom acoustic sweep coverage for assessing clearance and measuring payment on maintenance dredging projects in soft materials.

b Justification. Justification for use of full-bottom acoustic coverage on maintenance dredging projects shall be documented in the project file.

11. Policy on Determining Payment Grades in Suspended Sediments or Unconsolidated Materials. Detailed contract payment procedures shall be developed during the PED phase and shall be included in the contract specifications when known issues with unconsolidated or suspended sediments exist at a project. At minimum, the contract specifications shall include the acoustic frequency and/or alternative mechanical or density measurement method. Reference the technical guidance in Chapter 11 (Depth Measurement over Irregular or Unconsolidated Bottoms) of EM 1110-2-1003.

Comment [s6]: WAB: *... too tough to develop any firm policy on this topic ... no one has in the last 40 years ... perhaps CHL/Tim Welp has written up more definitive technical guidance on this topic based on his recent research?]*

12. Reporting Channel Condition and Clearance Grade Tolerances—Significant Figures. Depths shown on final as-built drawings, channel condition reports, and other related documents furnished to federal agencies, pilots, project sponsors, and other interests, shall be rounded to the significant figures based on the computed survey tolerances, as indicated in Table 1 below. Depths shall be rounded using standard engineering rounding convention.

Comment [WAB7]: WAB: The NOAA "7/10" rounding convention is not recommended since this arbitrary method has no statistical basis for biasing the data, inconsistent with CUBE, etc.

Table 1. Required Rounding Criteria for Depths and Channel Clearances Furnished to the Public

Estimated Survey Tolerance	Round Depths to Nearest	Examples
±0.2 ft to ±0.5 ft	half (0.5) foot	39.7 rounds to 39.5 39.8 rounds to 40.0 40.2 rounds to 40.0 40.3 rounds to 40.5
Greater than ±0.5 ft	Even foot	39.4 rounds to 39 39.5 rounds to 40 40.5 rounds to 40 40.6 rounds to 41

a. Internal database resolution. Acoustically measured depths, and internal corrections thereto, shall be edited, corrected, and processed in the internal database maintaining a 0.1 ft resolution. Thus, the above table does not apply to working survey datasets or drawings involving contracted construction measurement and payment. These interim construction documents/databases will retain the nearest 0.1-foot resolution and will not be released to the public.

b. Contract plans. Dredging contract plans and estimated dredging overdepth contour limits shall be based on the plotted channel shoaling conditions represented by the rounded depths in Table 1. Actual estimated quantities shown in the contract plans (and Contour Dredging limits) shall be based on the dense dataset maintained at the 0.1-foot level.

13. Required Accuracy Statement on Published Plans, Studies, and Channel Condition Reports. All released plans, reports, studies, databases, and related documents containing channel depth or clearance data shall contain a statement (note) attesting to the estimated accuracy (confidence) of the geospatial data. Since hydrographic survey data are rarely, if ever, tested against a higher accuracy source, this statement shall indicate that the accuracy is estimated. This statement should also indicate that the depth or clearance confidence estimate is relative to a local reference benchmark/gage and not all global variables and biases have been accounted for in the confidence estimate. Federal requirements for this statement are contained in FGDC-STD-007.3-1998, along with sample formats. Additional details are at Appendix A.

14. Selection of Controlling Depths for Channel Condition Reports. The controlling depth selected to represent an entire channel reach/quarter shall be determined by searching for the shoalest average/median/node representative depth that occurs in all the cells or digital terrain model covering that defined reach. In no case shall the raw "minimum" depth of all observed depths be used. Reported controlling depths shall be rounded to their significant uncertainty level in accordance with paragraph 11 above and a confidence statement shall be included on all channel condition reports (ENG FORM 4020-R/4021-R) issued to other federal agencies and the public.

15. Requirements for Carrier-Phase GPS Water Surface Elevation Measurement. RTK position and elevation control shall be specified on all projects involving critical underkeel clearances (e.g., new work deepening in rock). On maintenance dredging projects, when systematic biases due to tidal phase latencies (or river flowline slope) between the reference gage and project site approach or exceed 0.5 ft, water surface elevations shall be measured using RTK methods. Either single base or virtual networked RTK solutions may be used. In project areas beyond the range of standard or networked GPS baseline solutions and/or telecommunication operability, the contract specifications shall detail the method for measuring and compensating for tidal phase latencies.

a. Tidal datum updates. Tidal datums on Corps coastal navigation projects shall be referenced to tidal gages, tidal benchmarks, and the latest tidal epochs established by the US Department of Commerce (NOAA). Reference the guidance in EC 1110-2-6065.

b. Reference benchmarks. Contract specifications shall clearly describe the permanent benchmarks (PBM) from which the defining project grade is referenced. The NOAA NSRS and/or tide station identifier for this PBM shall be clearly indicated in the contract specifications.

16. Corps-wide Standard for Dredging Payment Quantity Computations. All USACE dredged payment determination within the channel prism and side slopes shall be delineated and computed using "Contour Dredging" procedures and surface-to-surface payment modeling methods developed and implemented by the North Atlantic Division (Philadelphia District). This standard employs three-dimensional (3D) digital terrain models and triangulated irregular network (TIN) methods to link and difference all representative depths of triangulated cell elements between the actual dredged surface (Post-Dredge survey) and the original Pre-Dredge surface, or between the Pre-Bid survey and the Required and Overdepth prisms for estimated contract quantities. This standard represents the most accurate, equitable, and consistent contract payment method. These standardized payment methods shall apply to either single-beam cross-section coverage or full coverage multibeam surveys and shall be used on new work or maintenance dredging. Technical details on this standard are at Appendix A.

17. Response Times for Dissemination of Survey Data. On contracted construction surveys, data shall be provided to the construction contractor within the time frames indicated in Table 2 below.

Recommended response guidance for mobilizing survey forces to the project site, and alternate options, are outlined in EP 1130-2-520, and should be reiterated in the contract specifications.

Table 2. Required Response Times for Disseminating Survey Data on Contracted Construction

Comment [WAB8]: WAB: Need field/DCA review consensus on these time standards

	Delivery after Completion of Survey		
Survey	Raw, unedited unprocessed dataset	Preliminary edited and processed dataset (field processed)	Final reviewed dataset, plots, and/or pay quantities
Before (Pre) Dredge (Pay)	24 hours	48 hours	30 days
Intermediate Progress Payment Surveys (contractor performed)	n/a	n/a	per contract specs (30 days typical)
Acceptance Section Clearance	real-time assessment on board survey vessel	< 24 hours	N/A
Final Post-Dredge As-Built (Pay)	24 hours	48 hours	30 days

18. PDT Design Checklist for Measurement and Payment Clause in Dredging Contracts. Appendix B contains a design checklist that shall be used in developing the survey specifications in dredging contracts.

19. Proponency and Waivers. Technical development of this circular was coordinated by the Engineer Research and Development Center (ERDC), Topographic Engineering Center. The circular was reviewed by both USACE field activities and representatives in the dredging industry. The HQUSACE proponent for this circular is the Operations and Regulatory Community of Practice, Directorate of Civil Works. Comments, recommended changes, or waivers to this circular should be forwarded through MSC to HQUSACE (ATTN: CECW-CO).

FOR THE COMMANDER:

~~YVONNE J. PRETTYMAN-BECK~~
~~Chief of Staff~~ DCW/O&R COP ?

2 Appendices
1. Appendix A: Supplemental Technical Guidance for Estimating Acoustic Survey Measurement Tolerances
2. Appendix B: Project Delivery Team Design Checklist for Dredge Measurement & Payment Contract Clauses

APPENDIX A
Supplemental Technical Guidance for Estimating Acoustic Survey Measurement Tolerances

The following technical guidance supplements the policy in this circular. It contains updated technical information and references that is not found in current USACE guidance publications. Applicable portions of this guidance will be incorporated into the next update of EM 1110-2-1003 or other guidance documents.

Comment [WAB9]: WAB: This appendix is a rough draft--requires thorough technical review and considerable editing.

A-1. Background and Discussion

The increasing use of multibeam survey systems on dredging measurement and payment surveys over the past five years has resulted in a need to evaluate the quality and confidence of data being obtained and reported, in particular, during construction clearance assessment. Previous technical guidance for clearance assessment in EM 1110-2-1003 is largely based on single beam technology. The evolving multibeam measurements require a more probabilistic approach that considers the inherent uncertainties in the data along with risk and reliability reporting issues. This reliability analysis applies to single-beam surveys as well. Calder and Hare 2003 point out the added complexity of analyzing and processing multibeam data:

> "While our ability to gather bigger and denser data sets has increased dramatically, our ability to process and make sense of these data sets has not. Unlike single beam sonar data sets, the complex geometry and sensor integration associated with multibeam sonars leads to demanding processing requirements."

Other federal and international hydrographic survey agencies (e.g., USNAVOCEANO and NOAA) are developing standards and procedures that deal with the uncertainties of echo-sounding data. This is illustrated by the following excerpt from NOAA's contract specifications (NOS 2007):

> "The Navigation Surface requires that each sounding have a horizontal and vertical uncertainty. To do this effectively, an error model is needed for all systems supplying measurements to compute the sounding; including not only the multibeam echo-sounder, but the GPS sensors, the heave, pitch, and roll sensors, the sound speed measuring devices, tide gauges, draft measurements, dynamic draft, or anything else that contributes to the calculation of a sounding. Once this comprehensive error model is assembled, then all the inherent errors in each measurement can be propagated from the measurement platform to each individual sounding. Only when each sounding has an associated Total Propagated Error (TPE), can we combine the soundings into a Navigation Surface with each node having a depth and uncertainty attribute."

Current USACE regulations and design guidance documents are largely silent on the magnitude of acoustic survey uncertainties. Much of this guidance was developed based on the accuracies associated with older lead line or topographic survey techniques in shallow draft projects. Neither ER 1110-2-1414 nor EM 1110-2-1613 prescribes an allowance for acoustic survey uncertainty or TPE in developing the underkeel clearance allowance for a deep-draft navigation channel—see Figure A-1 below. The gross underkeel clearance allowances developed during the planning phase—typically 1 to 3 feet below the design vessel—are not considered as a "tolerance" when dredging to a required depth prism, nor is this underkeel clearance allowance rigidly maintained by transiting vessels that load close to the authorized depth rather than the design channel depth. In effect, the reported controlling depths from Corps project condition or dredge clearance surveys are assumed as absolute with no tolerance or confidence attribution.

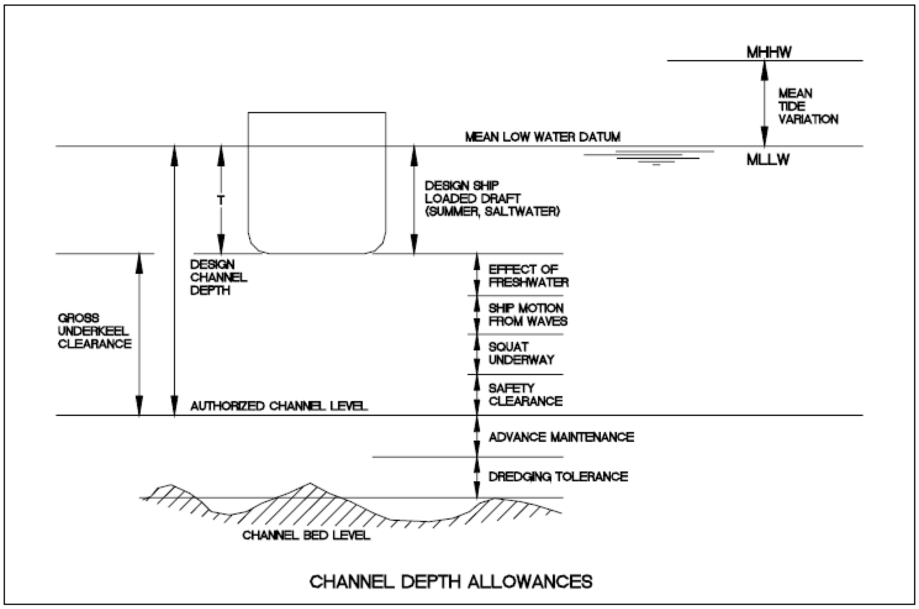

Figure A-1. Channel design depth allowances in deep-draft navigation projects
(From Figure 6-17 EM 1110-2-1613, Hydraulic Design of Deep-Draft Navigation Projects)

ER 1130-2-520 does provide discretion to the Contracting Officer to release the contractor from removing material above the required prism if "...deviations from the maintained dimensions can be attributed to the *inaccuracies* in the surveying measurement process, material characteristics, extreme weather conditions, or when the government is at fault." EP 1130-2-520 states that:

> "...Sweep surveys shall be performed as necessary to locate underwater obstructions within the navigation channel limits or when dredging is performed in hard material (e.g., dense clays, rock, or manmade materials). Equipment capable of detecting obstructions will be used to ensure that the project is clear for navigation. Mechanical sweeps may be used for all bottom conditions and shall consist of a drag capable of being moved for complete coverage of the dredged area. Acoustic sweep systems (multiple transducers on booms or interferometric, multi-beam swath/sweep transducer systems) may be used when appropriately designed to provide *accurate* and full coverage of bottom conditions."

Survey "*inaccuracies*" is not defined in either of the above documents. The following excerpts from ERDC/TN EEDP-04-37 2007 and USACE 2006 illustrates that uncertainties in the survey measurement process are essential in defining and designing various project grades:

> **a. Authorized Dimensions.** The authorized dimensions are the depth and width of the channel authorized by Congress to be constructed and maintained by the USACE. These authorized channel dimensions are generally based on maximizing net transportation savings considering the characteristics of vessels using the channel and include consideration of safety, physical conditions, and vessel operating characteristics. For entrance channels from the ocean into harbors, the authorized dimensions often include an additional allowance of safety for wave action for that portion of the channel crossing the ocean bar. For example, a 45-foot entrance channel may have an authorized 47-foot depth over the ocean bar.

b. Advance Maintenance. Advance maintenance is dredging to a specified depth and/or width beyond the authorized channel dimensions in critical and fast shoaling areas to avoid frequent re-dredging and ensure the reliability and least overall cost of operating and maintaining the project authorized dimensions. For maintenance dredging of existing projects, Major Subordinate Commanders (MSC) (Division Commanders) are authorized to approve advance maintenance based on written justification. For new navigation projects, advance maintenance is approved as part of the feasibility report review and approval process based on justification provided in the feasibility report.

c. Paid Allowable Overdepth. Paid allowable overdepth dredging (depth and/or width) is a construction design method for dredging that occurs outside the required authorized dimensions and advance maintenance (as applicable) prism to compensate for physical conditions and inaccuracies in the dredging process and allow for efficient dredging practices. The term “allowable” must be understood in the contracting context of what dredging quantities are eligible for payment, rather than in the regulatory context of what dredging quantities are reflected in environmental compliance documents and permits. Environmental documentation must reflect the total quantities likely to be dredged including authorized dimensions, advance maintenance, allowable overdepth, and non-pay dredging. The paid allowable overdepth should reflect a process that seeks to balance consideration of cost, minimizing environmental impact and dredging capability considering physical conditions, equipment, and material to be excavated. ER 1130-2-520 provides that District Commanders may authorize dredging of a maximum of two feet of allowable overdepth in coastal regions and in inland navigation channels. Paid allowable overdepth in excess of those allowances or the use of zero paid allowable overdepth requires the prior approval of the MSC Commander. The USACE recognizes that there may be circumstances where there is a need for increased excavation accuracy in the dredging process, for example in environmental dredging of contaminated material, which dictate trading potential increased costs for a reduction in paid allowable overdepth, i.e., reducing the quantity of material required for special handling/placement or treatment.

d. **Non-pay Dredging.** Non-pay dredging, also known as non-paid overdepth, is dredging outside the paid allowable overdepth that may and does occur due to such factors as unanticipated variation in substrate, incidental removal of submerged obstructions, or wind or wave conditions that reduce the operators’ ability to control the excavation head. In environmental documentation, non-pay dredging is normally recognized as a contingency allowance on dredging quantities, and may and does occur in varying magnitude and locations during construction and maintenance of a project.

e. **Characterization Depth.** Regulatory compliance necessitates that material to be dredged be characterized and evaluated with regard to its suitability for the proposed placement of the material. Characterization and evaluation of dredged material must consider the entire dredging prism, including paid allowable overdepth and non-pay dredging.

f. Required Project Grade. This is the depth specified by the Corps for each dredging contract. Often it is the federally authorized depth, but in some cases can be less or more (for example when advance maintenance has been authorized). The dredging contractor (or the Corps when a government owned dredge is used), is required to have all of the channel sections defined in the contact at this depth.

Physical Environment Impacts on Hydrographic Surveying and Dredging Accuracy. Because hydrographic surveying is used to measure the depth to the bottom before and after dredging, the accuracy of the hydrographic survey is a critical component in determining characterization depth. In the relative calm of sheltered harbors, bays, and estuaries, typical hydrographic survey accuracies of +/- 0.5 ft are achievable for a majority of the soundings at a 95-percent statistical confidence level. As exposure to the elements increases, so can the motion of the hydrographic survey vessel, reducing the accuracy of the individual soundings. Additionally, the water surface’s relationship to the dredge datum must be established and measured during times of surveying and dredging (USACE 2002). This is typically achieved by using a tide gage or Real Time Kinematic (RTK) methodology. Either selection requires accurate modeling to avoid height/time tide errors. For example, if the tide gage is a long distance from the dredging area, the water surface at the dredging site can be a different elevation from the tide gage, further reducing accuracy of the hydrographic survey. The dredge often relies on the same methodology for determining the depth of the excavation head, therefore reductions in accuracy that impact the hydrographic surveying will also impact dredging accuracy. Increased wave heights also impact the dredge, reducing accuracy as the increased hull motion is transmitted to the excavation head. Hopper dredges, which are designed to work in the open ocean, have heave compensators to reduce wave impacts, but accuracy is reduced as wave heights increase.

This leaves an assumed “accuracy” of these various grades, depths, and overdepths based on the display resolution of the depth data—in effect, this is often interpreted as an absolute depth measurement certainty at the ±0.05 foot level given the 0.1 ft plotted resolution (even 0.01 ft plotted depth resolution in some instances) typically portrayed on plans, documents, maps, or charts furnished to dredge contractors, port authorities, bar pilots, and other federal agencies. In reality, the absolute depth accuracy is typically closer to ±0.50 foot to ±1.0 foot (at the 95% confidence level). In addition, biased outlier data (i.e., "noise") is often misinterpreted to represent strikes above grade and requiring additional dredging, resulting in contract disputes and claims.

To rectify the above problems, an allowable depth confidence estimate or "survey tolerance" must be developed and applied during construction that includes estimates for the overall depth measurement model, which is made up of (1) functional or deterministic properties and (2) stochastic (nondeterministic) or probabilistic properties of the observational variables (Mikhail 1976 and Papoulis 1965). Statistical uncertainties in the depth measurement process that must be reviewed and evaluated during the PED phase shall include local system variables, (positional uncertainties, acoustic calibration precisions, vessel motion correction, acoustic depth resolution, sound velocity and outer beam refraction, etc.) and other systematic biases (tidal phase variations, draft variations, etc.) that may be present in the depth error budget—often referred to as "total propagated error" or TPE. The basic concepts behind the depth error budget or TPE are covered in Chapter 4 of EM 1110-2-1003 (single beam systems) and NAVOCEANO/Hare 2001 (multibeam and LIDAR survey systems).

A-2. Depth Measurement Uncertainty

No measured depth is without error. Unlike visual topographic survey measurements, acoustic depths are indirectly measured using various forms of time difference (amplitude detection) or phase difference (interferometric) measurements. These measurement methods contain varying magnitudes of signal/noise that must be resolved into a "best estimate" of the depth. This "best estimate" of a single resolved depth can have uncertainties ranging from ±0.2 ft to more than a foot in deep-draft navigation projects. The resolved depth typically represents the acoustic return over a relatively large area (footprint) on the bottom—the acoustic footprint often being larger than the grid cell size being assessed for clearance. The horizontal position of the depth's footprint on the bottom will also have uncertainties ranging from 2 to 10 feet. In addition, numerous corrections must be applied to the resolved depth to account for often significant variables in the measurement system or water column, each of which contains uncertainties, both random and systematic. The total propagated magnitude of all these errors is termed uncertainty—or "total propagated error."

a. Root Mean Square Error. The uncertainty of an individual depth measurement (or all the depths collected over an entire survey of a project) is usually represented by some statistical uncertainty measure, such as its estimated standard deviation. This uncertainty measure is obtained by combining the individual uncertainties arising from Type A (random) errors and/or a Type B (systematic) errors—see NIST 1994. This combined uncertainty of random and systematic variables may be estimated by traditional error propagation methods—from the "mean square error" (MSE), or its square root, the "root mean square" (RMS) error (Mikhail 1976). Thus estimates of systematic errors (i.e., biases) that commonly occur in a hydrographic depth measurement (e.g., water surface error, draft error, etc.) are practically treated as random in arriving at the MSE/RMS statistic for uncertainty.

b. Averaged Depth Accuracy Measures. The uncertainty of the resultant average of a series of depth measurements over a fixed area is usually represented by the estimated standard deviation of the resultant mean—i.e., the "standard deviation of the mean" or "confidence level." This statistical estimate of dispersion is applicable when multiple depths are grouped in a defined bin, cell, or DTM node, as is done on dredge clearance assessment surveys. The multiple depth measurements in a defined cell area may have been obtained from a single pass by a multibeam system or accumulated from different multibeam passes on different days—see example at Figure A-2. In this example, the 95% standard deviation of the 59 depths in the cell sample is ±0.8 ft. The 95% confidence of the representative 42.2 ft average depth may be estimated based on the standard deviation of the mean. Estimates of the uncertainty of the mean or average depth in the cell relates to the "survey tolerance" used in evaluating clearance.

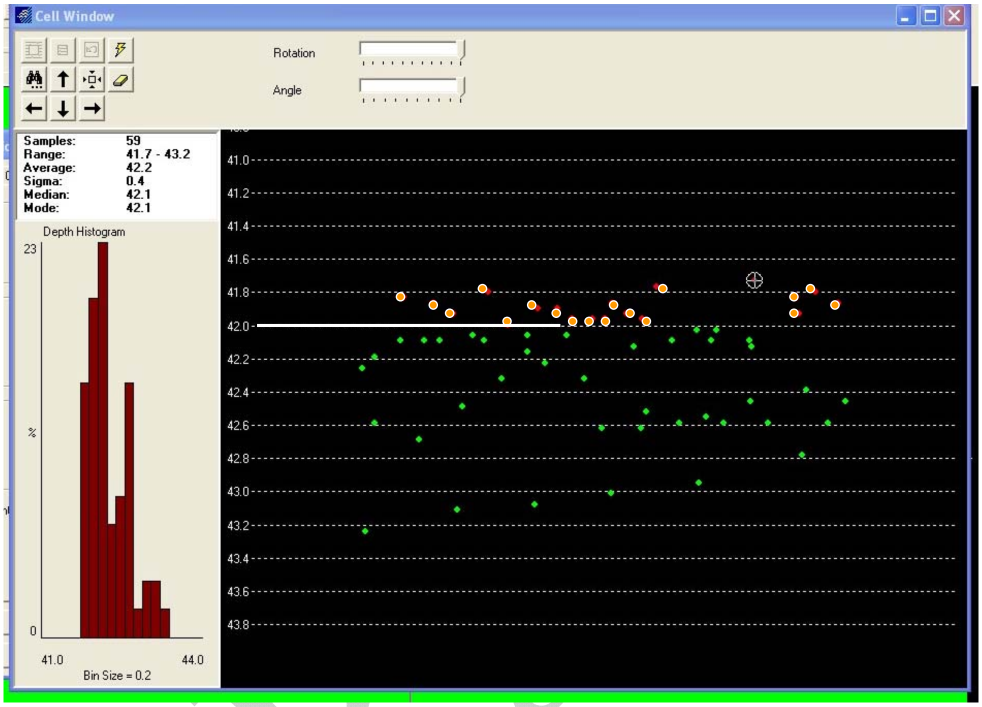

Figure A-2. Typical dispersion of 59 individual multibeam depths observed in a 3 ft x3 ft cell—multiple passes over a suspected strike in a rock-cut turning basin. Depths above the required 42-ft grade are highlighted. Miami Harbor—Jacksonville District (2006)

The scattered dispersion of depths in Figure A-2 clearly illustrates why a statistical evaluation is necessary to evaluate dredged clearance, and none of the individual depths can be selected to represent the cell.

A-3. Accuracy (or Uncertainty) of an Individual Depth Measurement (Total Propagated Error)

Accuracy refers to the degree of closeness of an estimate to its true value. Because "accuracy" is a qualitative concept, one should not use it quantitatively, that is, associate numbers with it; numbers should be associated with measures of uncertainty instead (NIST 1994). All depth measurements contain uncertainties—the "true depth" at a point (or within a cell) on the bottom can never be absolutely known or quantified, as shown in Figure A-2. An individual depth measurement can only be numerically specified with its statistical uncertainty, along with an estimate of its propagated deviation—e.g., 39.3 ft ±0.8 ft (95%). The uncertainty of individual depth measurements collected over a project (i.e., the "universe") can be roughly equated to "total propagated error," factoring in all random and systematic errors that make up the total error budget of the observation—see NAVOCEANO/Hare 2001.

A-4. Precision or Repeatability of a Depth Measurement Cell Samples

Precision is defined as the closeness of observations to their mean, and is directly related to the dispersion of a distribution (Mikhail 1976). Precision is the "repeatability" or closeness of agreement between the results of successive measurements carried out under the same conditions of measurement. These conditions include: the same measurement procedure, the same observer, the same measuring instrument used under the same conditions, the same location, and repetition over a short period of time. For dredging measurement and payment surveys of a specific navigation project, these conditions of measured repeatability would include: using the same vessel, survey system, calibration procedures, tide/water level measurement methods, and performed over a short environmental time interval. Repeatability may be expressed quantitatively in terms of the dispersion characteristics of the results—e.g., the "standard error of the mean" (NIST 1994). When multiple depths are observed over the same area (e.g., a cell), the repeatability of these depth observations may be statistically estimated by computing the standard deviation of their meaned value, considering the estimated uncertainty of each individual depth. This is often expressed as a "confidence."

A-5. Reproducibility of Depth Measurements in a Cell Sample

Reproducibility is defined the closeness of the agreement between the results of measurements carried out under changed conditions of measurement (NIST 1994). For hydrographic surveys, changed conditions would involve depth measurements made over the same area (or cell) by different vessels, different measurement systems, different environmental conditions, different calibration methods, different acoustic frequencies, different tidal conditions, different times (e.g., days apart), etc. A measure of reproducibility is observed when two vessels survey the same area, a common occurrence on dredging contracts when the government and dredging contractor's survey vessels survey the same acceptance section. Both vessels have differing TPE estimates and differing precisions or repeatability over a given area or cell. Reproducibility may also be seen when the same vessel repeats a survey under differencing tidal and wind conditions and RTK is not used to compensate for these biases. Reproducibility is typically evidenced as a "bias" in the average depth over a given point/cell. All things being equal, the magnitude of any "reproducibility" biases should be within the allowable "survey tolerance" window.

A-6. Survey Tolerance or Confidence

"Survey Tolerance" is roughly defined as an approximation of the estimated reproducibility and repeatability of depth measurements in a sample. It is the ability to repeat or reproduce depth measurements over a given point, or actually the ability to repeat the average (or mean/median) of multiple sampled depths measured over a given area, such as a defined cell. The tolerance is determined given the estimated error budget (TPE) of the individual depths in the entire survey coupled with the deviation or dispersion of the depths within the specified area or cell. It may also be estimated based on the deviation of the meaned depths collected in that cell—i.e., their repeatability. It is analogous to a statistical confidence level, represented by the expected value of the confidence (i.e., tolerance) of the mean depth in a cell sample containing multiple depths.

a. Confidence level of a sample. For example, if 10 depths are collected within a 5 ft x 5 ft cell, and the standard deviation or estimated uncertainty (TPE) of all depths in the survey project (universe) is ±1.0 ft, then the estimated precision (or confidence) of the average of the 10 depths in the defined area may be roughly estimated from:

$$\sigma_x \approx \sigma / \sqrt{n} \quad = \quad \pm 1.0 / \sqrt{10} \quad = \quad \pm 0.3 \text{ ft}$$

where:

σ_x - standard deviation of the mean (approximate confidence)

σ - estimated uncertainty of the individual depths (TPE)
n - number of depths in cell sample

Depending on the number of depths in a cell, the confidence of the mean will be less than the estimated TPE of the individual depths. This is why repeated surveys (performed over different days, tide phases, or even with different vessels) over a suspected shoal or strike will generally “repeat” or "reproduce" each other to the 0.2 to 0.5 foot level when the average representative depth is evaluated, even though the dispersion (TPE) of the individual depths in the cell may be ±2.0 ft. As the number of depths in a cell increases, the more confidence in the mean is obtained. Although in theory the confidence level of the average depth in each cell should be evaluated (computed), such a procedure is currently not a practical engineering option—an estimated confidence (survey tolerance) based on an average measurement repeatability needs to be established for a given survey and project site.

b. Cell size. These is no statistical validation for the standard USACE 3x3 ft or 5x5 ft cell sizes, relative to the echo sounder footprint size, horizontal positioning accuracy, and numerous other factors entering into the TPE estimate. These standard cell sizes represent practical engineering practice so that consistent clearance and pay computation practices can be performed Corps-wide. In the future, more statistically relevant procedures may be developed to replace rigid cell definitions—e.g., a CUBE specifically tailored to dredge clearance assessment.

c. Number of sample depths in a sample The more depths that can be collected in a 3x3 ft or 5x5 ft cell, the more reliable is the precision/confidence statistic computed based on the average cell depth. In critical channels (rock or hard clay) the vessel speed should be set at dead slow over suspected strikes above grade, and multiple passes made over the strike using different aspects of the multibeam array. In this manner, 20 to over 100 depths may be collected within a 3x3 ft cell—over 30 typically being considered statistically significant, although lesser numbers will still have validity for strike assessment. In large samples, the average representative depth in the cell will have maximum validity for clearance assessment, or hypothesis testing if multiple depth levels appear—i.e., the "Combined Uncertainty and Bathymetry Estimator—CUBE," Calder and Mayer 2003. For practical engineering use, a fixed standard for the minimum number of depths in a cell is specified.

d. Average or median representative depth. When large samples are available in a defined cell, the difference between the statistical mean (average) depth and the median depth will be insignificant, and is not likely to bias over an entire project area. Thus, either value may be selected as the representative (and reported) depth for the cell. When an even number of depths result in the cell, the representative median depths must be computed as the average of the two depths closer to the median. Given the typical echo-sounder footprint size coupled with the horizontal positioning uncertainties, in small USACE cell sizes (3x3 ft or 5x5 ft) the horizontal location of the actual median depth should be ignored—use the cell center (centroid) at the location for the represented depth.

A-7. Computation of Survey Tolerance

Determining the uncertainty or TPE of individual depth measurements collected over a project survey is complex, and includes numerous variables based on the measurement system and environmental conditions (NAVOCEANO/Hare 2001). Likewise, determining the survey tolerance is also complex in that the precision of a group of depths measured over a given cell may be spatially variable, depending on the number of depths collected or the number of separate survey passes over the cell, the size of the defined cell relative to the acoustic footprint size, horizontal location errors, beam angle, among other factors.

a. It is impractical at present to apply TPE computations and estimated confidence precisions to individual cells when assessing clearances on dredging surveys—a practical engineering assessment must be derived. Thus, a constant "survey tolerance" (i.e., confidence) must be estimated for a specific navigation project, and that tolerance used for the entire survey or dredging contract. The survey tolerance may be estimated from past results, such as from deviations and biases in past Performance Tests. It may also be determined using generic ranges in typical project conditions. Options for estimating the survey tolerance are outlined in the following sections.

b. Since the most critical (and usually by far the largest) variable in the estimated survey tolerance is the water surface elevation uncertainty, the impact of river gradients and tidal phase lags must be realistically factored into its determination.

c. In cases of extremely soft or suspended sediment bottoms, errors in acoustic reflectivity (or impedance changes) from different density grades may exceed all other propagated errors. In such cases, the use of a Survey Tolerance is problematic and alternative payment methods need to be considered—see EM 1110-2-1003 (Chapter 21--Depth Measurement Over Irregular or Unconsolidated Bottoms).
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A-8. Determination of Total Propagated Error

The Total Propagated Error of the individual depth measurements in a project dataset can be estimated using the general guidance in Chapter 4 of EM 1110-2-1003 ("Survey Accuracy Estimates for Dredging and Navigation Projects"). The estimated (albeit simplified) propagated error budget for a single beam survey is shown in Table 4-1 of that chapter, reproduced below. The high depth uncertainties resultant in that table are largely due to the large magnitude of the "tide/stage correction accuracy" and lack of heave compensation (platform stability error)—this table was developed prior to refined GPS-aided inertial measurement unit (IMU) technology. The error budgets in this table are still relevant when tidal/stage measurements are observed from extrapolated or interpolated gage readings or when GPS/IMU alignment stabilization/heave systems are not used. (Keep in mind that the Total Propagated Error is not the same statistic as Survey Tolerance—the TPE is a statistic that is used in computing the estimated Survey Tolerance, which is an estimate of precision, not TPE).

Table A-1. (EM 1110-2-1003, Table 4-1). Quantitative estimate of acoustic depth measurement accuracy in different project conditions

Single-beam 200 kHz echo sounder in soft, flat bottom
USCG DGPS vessel positioning accurate to ± 2 m RMS
All values in ± feet

Error Budget Source	Inland Navigation Min river slope Staff gage < 0.5 mile 12-ft project <26-ft boat No H-P-R	Turning basin 2 ft tide range Gage < 1 mile 26-ft project <26-ft boat No H-P-R	Coastal entrance 4-ft tide range Gage < 2 mile 43-ft project <26-ft boat No H-P-R	Coastal offshore 8-ft tide range Gage > 5 mile 43-ft project 65-ft boat H-P-R corrn
Measurement system accuracy	0.05	0.05	0.1	0.2
Velocity calibration accuracy	0.05	0.1	0.1	0.15
Sounder resolution	0.1	0.1	0.1	0.1
Draft/index accuracy	0.05	0.1	0.1	0.1
Tide/stage correction accuracy	0.1	0.15	0.25	0.5
Platform stability error	0.05	0.2	0.3	0.25
Vessel velocity error	0.05	0.1	0.1	0.15
Bottom reflectivity/sensitivity	0.05	0.1	0.1	0.2
RMS (95%)	**± 0.37 ft**	**± 0.66 ft**	**± 0.90 ft**	**± 1.32 ft**
Allowed per Table 3-1	**± 0.5 ft**	**±1.0 ft**	**± 1.0 ft**	**± 2.0 ft**

A-9. Total Propagated Error Calculator

An estimate of the Total Propagated Error may also be computed using algorithms developed by Rob Hare of the Canadian Hydrographic Service (CHS)—see NAVOCEANO/Hare 2001. A TPE computation calculator, based on Rob Hare's algorithms, is openly available at www.hypack.com. A screen capture of this TPE calculator is shown in Figure A-3 below. This TPE calculator provides user input of the estimated accuracies of over 50 parameters making up the total depth error budget. It is applicable to either multibeam or single-beam systems. This calculator compares the resultant TPE with both Corps and International Hydrographic Organization (IHO 1998) accuracy standards. In addition, positional errors and target detection resolutions are estimated, as shown in Figure A-3. (Note that the TPE Calculator in Figure A-3 is still undergoing development and has not been fully tested for USACE dredging applications).

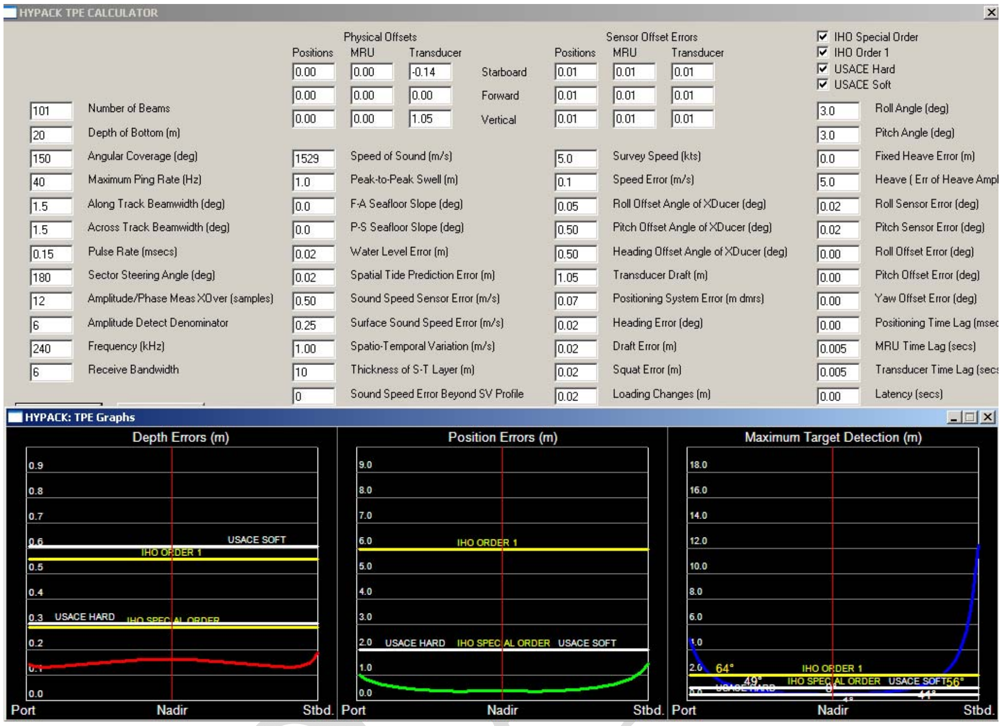

Figure A-3. HYPACK Total Propagated Error calculator for depth, position, and object detection. Values shown are for example only—users must insert estimated uncertainties for each parameter specific to their survey systems, procedures, and project. (HYPACK, Inc. and Rob Hare, CHS)

Alternative Total Propagated Error algorithms are also referenced in international hydrographic survey standards (IHO 2005).

A-10. Estimating Survey Tolerance from Past Performance Test Results

Repeated Performance Tests —i.e., evaluating the repeatability comparisons between multiple internal or external measurements made over the same region (cell or node)—may be used to estimate the Survey Tolerance. Performance Tests do not measure TPE. As detailed in Chapter 11 of EM 1110-2-1003, mandatory Performance Tests are not truly independent tests from a statistical standpoint—both the Reference Surface and the Tested Surface contain uncertainties (i.e., TPE). When the same vessel compares itself on repeated single-beam or multibeam passes over the same test area, the results provide a statistical indicator of "repeatability" and can be used to estimate the Survey Tolerance. When Performance Tests are conducted by different vessels over the same area, as shown in Figure A-4 below, then the results tend to indicate a measure of "reproducibility" and can be used in estimating Survey Tolerances. Repeated and varied Performance Tests by a survey vessel/system may trend, over time, toward a consistent estimate of Survey Tolerance that may be used for that vessel.

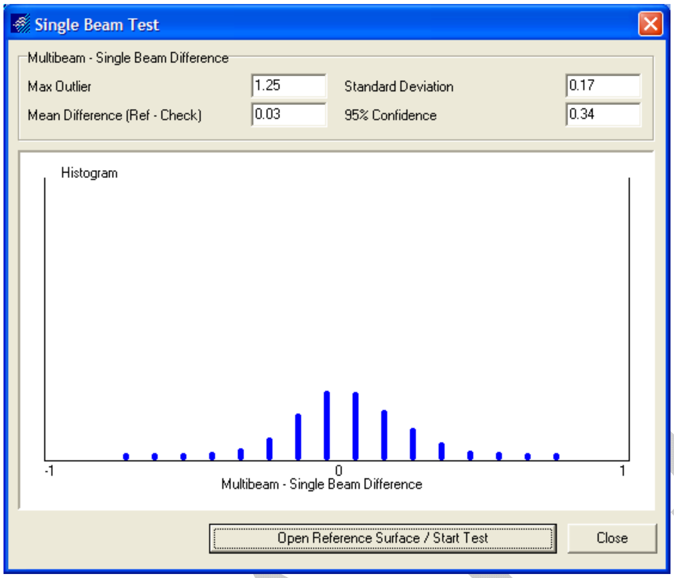

Figure A-4. Comparison of a multibeam system (S/V Shuman) against single-beam reference surface from a different vessel (S/V Cherneski)—Philadelphia District. The multibeam was 0.03 ft deeper with a 95% standard deviation of ±0.34 ft as compared to the assumed absolute single-beam reference

A-11. Approximate Method for Determining Survey Tolerance

The following table provides general estimates of survey tolerance ranges under nominal deep-draft project conditions, accounting for various measurement conditions largely dependent on the water surface measurement correction. These ranges may be used to roughly estimate the tolerance for a specific project.

Table A-2. Estimated Allowances for Survey Tolerances on Clearance and Acceptance Surveys

Allowable Tolerance not less than	Water Surface Elevation Measurement Procedure	Tidal regime hydrodynamically modeled
Hard Bottom Materials		
±0.20 foot	Determined from carrier phase GPS (RTK)	Yes
±0.25 foot	Determined from carrier phase GPS (RTK)	No
±0.20 foot	Estimated from gage less than 1 mile from project site	Yes
±0.25 foot to ±0.50 foot	Estimated from gage 1 to 5 miles from project site	No
±0.50 foot to ±1.0 foot	Estimated from gage greater than 5 miles from project site	No
±0.50 foot to ±2.0 foot	Estimated from gage greater than 10 miles from project site	No
Soft Bottom Materials (Maintenance Dredging)		
±0.25 foot	Determined from carrier phase GPS (RTK)	Yes
±0.25 foot to ±1.0 foot	Estimated from gage 1 to 10 miles from project site	No
±0.50 foot to ±2.0 foot	Highly variable acoustic reflectivity due to suspended sediment, fluff, dense bottom vegetation, etc.	Yes

Selection of tolerances (including any interpolations between tolerance ranges) shall be made during the PED phase and shall be documented in the design file in case of subsequent disputes during construction

Given the main variable in the above table is dependent on the gage location relative to the project site (non-RTK measurement) the magnitude of this error needs to be estimated, as shown in the following section.

A-12. Water Surface Correction Uncertainty due to Unmodeled Tidal Phase Lags

Aside from vessel motion corrections (roll, pitch, yaw, heave), the largest portion of the depth error budget (TPE) is attributable to unmodeled tidal phase lags—i.e., surface slope gradients between the reference gage and the project site. This error is significant is tidal estuaries, rivers, or when inshore gage readings are extrapolated out into a coastal entrance channel—see EM 1110-2-1003 and EM 1110-2-1100. This phase error is often a primary cause for disputes over dredged clearances. If the lag or latency on a flood or ebb tide is known (or estimated from NOAA tidal predictions), then the resultant slope difference can be estimated. This estimate does not account for environmental or meteorological effects (e.g., wind or current set up) which may be even more significant than the tidal latency. Figure A-5 below provides a rough estimate of the error uncertainty given an estimated tidal phase lag (in hours) and a given mean tidal range. This graph is based on a 50% probable difference—the likelihood that a pre-dredge and post-dredge survey are performed at differing tidal phases. This graph clearly indicates that the error due to unmodeled tide phase can be large as the mean tide range increases. It is also difficult to estimate the tidal wave phase lag time differences in a given project. Slope differences of a half-foot or more can occur over relatively short distances (less than one-half mile) during ebb or flood tides when gage readings are extrapolated to the project area. Carrier phase RTK methods are the only effective way to minimize or eliminate these tidal phase errors, and minimize the resultant Survey Tolerance value.

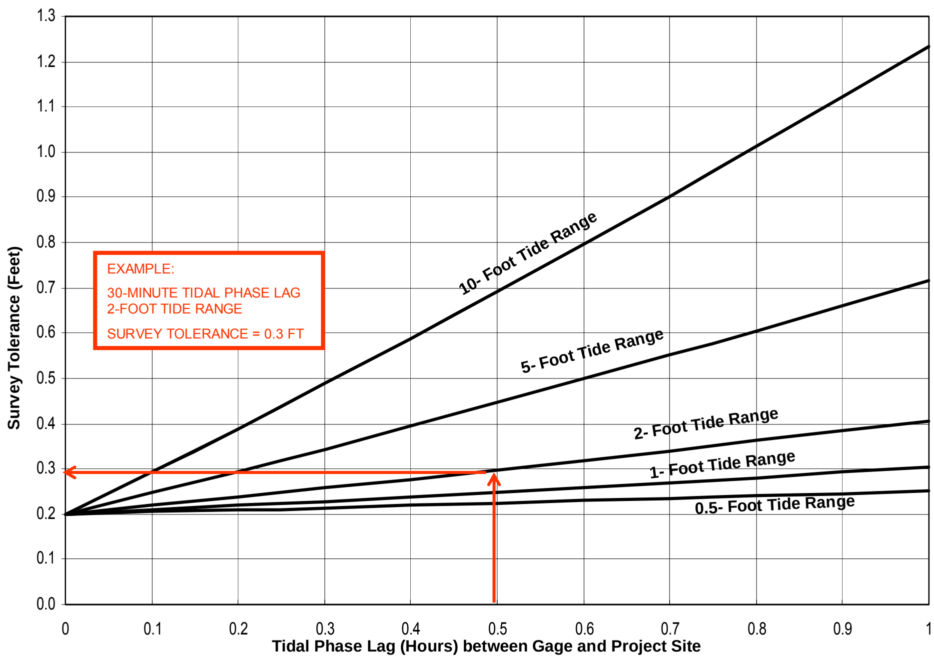

Figure A-5. Approximate Survey Depth Uncertainty in Unmodeled Tidal Waters (non-GPS Surface Elevation)

The resultant tidal uncertainty derived from this graph must be statistically propagated with all other measurement system uncertainties in the survey to obtain a TPE—i.e., Table A-1.

If RTK-derived water surface elevations are measured, coupled with GPS-aided IMU systems to correct vessel motions (e.g., POS/MV), then the survey tolerance may be simply approximated using the following formula:

Survey Tolerance (feet) $= 0.2 + 0.01 \cdot d$ ***[not sure this spatial decorrelation multiplier is good ... needs checking]***

where d = distance from GPS/RTK base station in miles

A-13. Global Variables

Global variables include biases in tidal models, tidal epoch latencies, reference datum biases, tidal benchmark settlement, sea level rise, acoustic bottom reflectivity, reference datum adjustments, geoid readjustments, and other largely indeterminate factors. They are generally not included in the TPE of a depth measurement or in the Survey Tolerance used in dredge clearance assessment. This is because these biases are present in all repeated surveys over the project, assuming the same vertical reference tidal benchmark is used on a given project. They do, however, enter into the estimated uncertainty of a reported channel clearance to the public and cost estimates for dredging.

a. For example, sea level rise occurring between tidal epoch updates could be as much as 0.2 ft. Thus, the MLLW datum at the reference benchmark would have a constant bias of 0.2 ft and the reported channel clearance constantly off by that same amount. This equates to overdredging the project by a constant 0.2 ft, which may have significant budget impacts.

b. The use of outdated or undefined local reference datums will also cause systematic biases in the maintained or reported project depth—see IPET 2006. Datum biases of upwards of 2 ft have been known to occur, resulting in incorrectly reported or interpreted clearance depths—see IPET 2006 and EC 1110-2-6065.

c. Tidal benchmark elevations used to reference measurement, payment, and clearance surveys at a project are also subject to uncertainties. The stability of the benchmark could be subject to regional settlement or uplift. The MLLW datum has an uncertainty dependent on the length of the time the gage was in place, the distance from a primary gage, and other factors. The uncertainty of the computed MLLW datum at a gage site can range from ±0.1 ft to as much as ±0.25 ft—see NOS 2001 and NOS 2003. It is also assumed that a primary reference benchmark is used to control all surveys performed at a given project site. If different benchmarks are used, and any inconsistencies between these benchmarks exist (height or MLLW datum), then these errors would be propagated into the TPE or Survey Tolerance estimates. An example would be uncertainties in a tidal zoning model.

d. Tidal datum variations over a project may be subject to uncertainties if not minimized by some form of hydrodynamic modeling, such as TCARI or VDatum methods—see Brennan 2005 and Meyers 2005.

e. Geoid undulations occurring over a project must be modeled if RTK methods are used to measure the water surface elevation—refer to Meyer 2006 and EC 1110-2-6065. Geoid model uncertainties in coastal areas are typically at the 1 to 3 cm range, with predicted uncertainties slightly larger (5 cm) in offshore entrance channels. There are no practical methods of refining the model in offshore models; however, since these errors are systematic to all users of the same model, survey repeatability (or more importantly, reproducibility) is not impacted.

f. Summary. The accumulation of these global uncertainties can range from 0.1 to 0.5 ft. The addition of these global uncertainties to the local survey tolerance uncertainties can propagate to an overall uncertainty in the reported project clearance. For example, a project with an estimated local survey confidence of ±0.25 ft relative to a fixed benchmark/gage and an estimated global uncertainty of ±0.25 ft would have an overall uncertainty of nearly ±0.4 ft. Given these uncertainties, reporting project clearances to an implied 0.1 ft confidence level is problematic.

A-14. Theoretical Required "Hits" to Confirm Strike Detection

Figure A-6 below depicts an approximation on the number of "hits" required to statistically confirm a strike or shoal above a required grade. These plots for an assumed depth TPE of ±1.0 ft are computed based on a t-distribution sampling statistic. They indicate decreasing detection probabilities as the relative height of the strike above grade decreases. There is no relationship between this plot and "survey tolerance" or the size of the object—this plot simply shows that a statistically significant number of confirmed "hits" are required to obtain confidence in the detection of small objects or shoals.

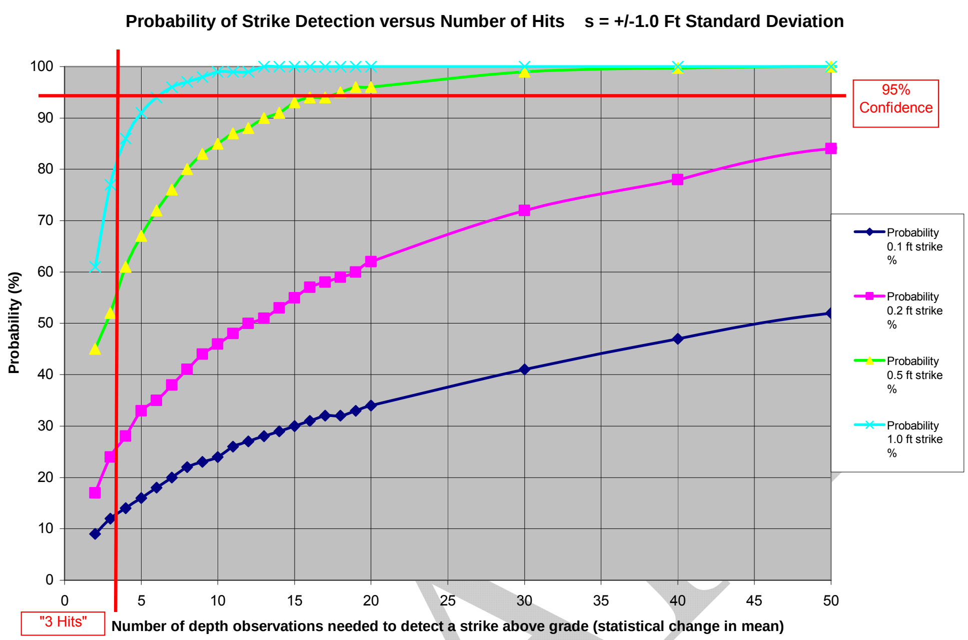

Figure A-6. Strike detection probabilities for varying clearance levels

A-15. Single Beam Receiver Sensitivity Effects on Survey Tolerances

The proper setting of the receiver's gain or sensitivity control must be maintained when conducting single beam hydrographic surveys. Up to a 0.3 ft error can be induced with too low of a setting. The leading edge of the return echo must be a nearly vertical straight line in order to obtain the correct sounding.

a. Most survey sounders take a point for the sounding depth that is at 60% of the maximum return echo voltage available for a saturated echo. If the return echo is nearly vertical, there will be no time or depth delay from the point where the received echo starts to return from the bottom and the point where if reaches the 60% of maximum which is the digitized depth point on the echo. If the receiver gain setting is too low, the received echo will have a more rounded shape. If the gain is quite low, the slope of the echo can induce a significant difference in time between when the echo is first being received to when the 60% point is reached, resulting in a depth error showing a deeper depth than the true bottom.

b. The correct gain setting is reached when the top most color of the echo trace on the sounders display is at its maximum, typically red. It should stay at this color without breaking up or changing to the next color in the palette—approximately one third of the total echo trace. If a bottom tracking line is displayed, the line should be fairly stable without jumping up and down while on a flat bottom. This can also be an indicator of a weak echo as the slope of curve is changing as the weak echo fades, causing the 60% point and resulting depth indication to move around.

c. Caution must also be used in not setting the gain too high, as this results in false soundings from fish targets, vegetation, suspended sediments, and noise in the water column, which can reach a 60% level and become erroneous depths—i.e., shallower than the grade.

A-16. Accuracy/Uncertainty Statement for Channel Condition or Dredging As-Built Surveys

Federal guidelines prescribe mandates for including accuracy or uncertainty statements for all developed and disseminated geospatial data (FGDC-STD-007.3-1998). Such statements provide users with a confidence and reliability in the data—including any implied risks associated with its use. Data accuracy and reliability statements are currently rarely provided for USACE hydrographic survey data, leaving the user to assume accuracy based on the displayed depth resolution—typically 0.1 ft. The need for providing specific uncertainty estimates in survey data is best captured in the following excerpt from Deick 2007.

Comment [WAB10]: WAB: Confirm reference ... obtained indirectly from David Wells correspondence.

> " ... procedures and models [should] be developed for providing decision makers [e.g., construction QC/QA reps] with a clear, unambiguous statement of the . . . uncertainty of their [depth] data. No manager [e.g., construction QC/QA reps] should ever be without a statement of [depth] measurement uncertainty attendant to each piece of data on which decisions are based. No experimenter [e.g., surveyor] should permit management [e.g., construction QC/QA reps] to consider [depth] measurement data without also considering its measurement uncertainty. The manager has responsibility for requiring [depth] measurement uncertainty statements. The experimenter [e.g., surveyor] has the responsibility for never reporting . . . [depth] results without also reporting their measurement uncertainty." (page 36, "Measurement Uncertainty: Methods and Applications")

a. As stated earlier, the overall global uncertainty of a channel clearance is difficult to quantify. Since most navigation projects are referenced to a single gage or tidal benchmark, the "local relative accuracy" of that benchmark is assumed absolute; thus, the only uncertainties are attributed to the TPE of the survey itself. Factoring in the global (or "network") uncertainties of that reference gage/benchmarks (MLLW datum, settlement, sea level rise) accumulates additional uncertainty onto the survey TPE.

b. Since hydrographic survey data is not tested against a higher reference source, FGDC guidance in FGDC-STD-007.3-1998 specifies that accuracies shall be reported "*... at the 95% confidence level for data produced according to procedures that have been demonstrated to produce data with particular horizontal and vertical accuracy values ... Compiled to meet ____ (meters, feet) horizontal accuracy at 95% confidence level [and] ____ (meters, feet) vertical accuracy at 95% confidence level*."

c. A sample USACE accuracy statement included on plan drawings or channel condition reports is shown below. Accuracies are defined as "relative"—not global or "network" in a geodetic control sense. The estimated "survey tolerance" is inserted into the vertical confidence—typically ranging between ±0.2 and ±1 ft for most projects. The specified horizontal accuracy is estimated based on the positioning system—typically ranging between ±1 ft and ±10 ft for most DGPS, RTK, or total station positioning systems.

> Depths shown on this [plan][report] have an estimated vertical accuracy of ±[____] ft at the 95% confidence level and an estimated horizontal accuracy of ±[____] ft at the 95% confidence level. These estimated accuracies are defined relative to local NSRS geodetic control at the project site. The depths shown are representative of observations collected over a defined area and have been rounded to the nearest [_____] ft to reflect their confidence uncertainty levels.

d. Additional background information related to GIS users of undefined geospatial data is at ASPRS 2005.

A-17. Significant Figures: Rounding Depths to their Uncertainty Levels

USACE hydrographic surveyors have recognized for decades the impropriety of displaying echo sounding depths to the 0.1 ft in deep water channels. This recognition is based on their first-hand intuitive knowledge of the inaccuracies inherent in depth measurements collected on a dynamic platform in deep open water—a sophisticated TPE depth uncertainty calculator is not required. This practice of displaying depths to the nearest 0.1 ft (with an implied accuracy of 0.05 ft) when the uncertainty may actually be at the ± 1 ft level or more, conflicts with nearly all the guidance in civil engineering and surveying texts, as is evident in the excerpts below. Therefore, depths shown on plans or reports must be rounded to a level that is consistent to their relative confidence.

> "... significant figures refers to those digits in a number which have meaning; that is, those digits the value of which are known ... Confusion in the matter of computations involving measured quantities arises from the failure of the novice to distinguish between exact numbers and numbers which carry with them the inevitable errors of measured quantities. Obviously then, the number of digits that will have meaning and that may be used to indicate the [measured] length of a line [a depth] is strictly limited by the precision with which the measurement has been made ... it cannot be said offhand how many significant figures there are in any measured quantity [depth] until the character and magnitude of the errors have been examined." "*Surveying Theory & Practice*," Davis, Foote & Kelly (5th Ed)

> "Any properly recorded measurement can be presumed to have a maximum uncertainty of plus or minus half of its last digit ... Field measurements are given to some specific number of significant figures, thus dictating the number of significant figures in answers derived by computing using them. In an intermediate calculation, it is common practice to carry at least one more digit than required and than round off the answer to the correct number of significant figures." "*Elementary Surveying*," Wolf & Brinker, 9th Ed.

A-18. USACE Standard Volume Computation Methods

Currently there are numerous dredged quantity computation methods, options, and reporting variations unique to Corps Districts and even separate Area Offices. These variations involve nuances (and unnecessary complexities) in overdepth allowances, dredging limits, side slope allowances, box cuts, and reporting formats—see Chapter 15 of EM 1110-2-1003. These individualized payment methods have necessitated duplicative procurement of dedicated software and training by the Corps and dredging industry personnel. The following standards simplify the process of determining in-place quantities, and most importantly, provide for a more consistent, equitable, and accurate contract payment. The Contour Dredging standard payment method is illustrated in the typical cross-section at Figure A-7.

a. Dredge Payment Computation Standards. Dredging limits shown in contract plans, estimated quantities, and dredge payment shall be determined using the "Contour Dredging" method. Estimated quantities shall be determined by differencing the 3D/TIN (surface-to-surface digital terrain model) cells containing representative depths (average or median) between the Pre-Dredge and After-Dredge surveys, factoring in limits in the modeled Required and Overdepth prisms. In Contour Dredging, all material removed above the Required Depth prism (including the side slopes) is paid for and overdepth quantities are paid only where material delineated on the Pre-Dredge survey exists above the Required Depth prism, including the side slopes. (Note that in new work the Required Depth Grade is modified to the Survey Tolerance Overdepth Grade).

b. Side Slope Dredging Payment Restriction Options. Payment for dredging side slopes (and including overdepth payment in the side slopes) may optionally be restricted to a defined extension distance outside the channel toes, as specified in the contract. Side slope restrictions, if any, shall be developed specific to each project. If no side slope restrictions are specified, then full payment for Required Depth and Overdepth is assumed. Side slope payment optionally may be restricted to the existence of material at the toe of the slope.

c. Box Cut Allowance Payment Options. Box cut payment allowances below the overdepth payment prism are optional, and typically are used in new deepening work. Box cut payment allowances apply only outside the channel toes, and shall be determined by extending the Allowable Overdepth prism outside the toes by the defined side slope dredging restriction distance specified in the contract. Payment will be made for all material removed within the extended Overdepth prism out to the defined extension limit. (No allowance shall be computed or made for material dredged outside the extended box prism—i.e., a "sloughing" allowance).

d. Estimated Quantities and Dredging Limits in Contract Plans. Estimated quantities of Required Depth and Overdepth quantities for each Acceptance Section shown in the contract plans shall be computed based on the 3D/TIN digital terrain model of the Project Condition or P&S Survey referenced in the contract. Quantities shall be estimated based on the spatial differences between the Pre-Bid survey and the 3D models of the Required and Overdepth templates.

e. Restricted Dredging Limits. General dredging limits or restrictions may be specified in contract plans as required to delineate environmental or structural restrictions. However, within these limits, the above "Contour Dredging" payment methods shall apply.

f. Quantity Tolerances. Software used in performing quantity computations should yield volumes within a 1% tolerance level. This tolerance allows for variations in developing TIN models from digital terrain matrix models, especially when developed from sparse single-beam cross-sections in irregular channels or basins.

g. Average-End-Area Quantity Computations. Approximate "Average-End-Area" volume computation methods shall not be used for estimating dredge quantities. This method may be used for computing quantities placed in upland (beach) or underwater disposal sites.

b. Quantity computation software. 3D/TIN surface-to-surface volume routines in any existing CADD package may be used for determining payment quantities, provided they (1) report accumulated 3D/TIN volumes by incremental channel station, and (2) compute box cut allowances consistent with the above parameters. Technical guidance on Contour Dredging and 3D/TIN computation procedures may be obtained by contacting the Operations Division of the Philadelphia District (CENAP-OP-TS).

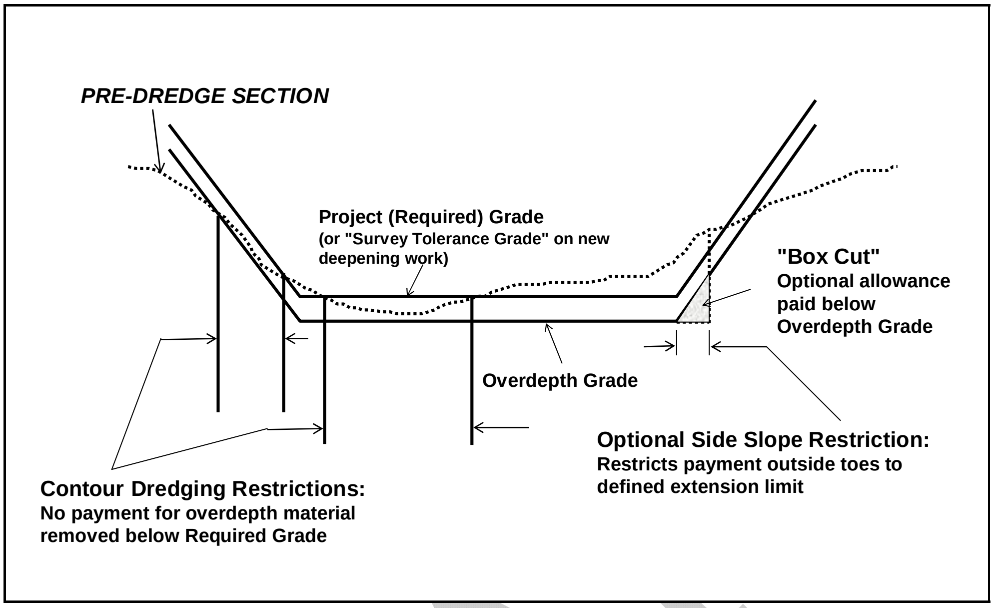

Figure A-7. Standard USACE payment grades and optional allowances

A-19. Technical References (Appendix A)

EM 1110-2-1100, "Coastal Engineering Manual—Coastal Hydrodynamics (Part II)."
Chapter 5, “Water Levels and Long Waves”
Chapter 8, “Hydrodynamic Analysis and Design Conditions”

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Meyer 2006, "What Does Height Really Mean," Meyer, Roman, Zilkoski; University of Connecticut
Part I: Introduction
Part II: Physics and Gravity
Part III: Height Systems
Part IV: GPS Orthometric Heighting

Papoulis1965, "Probability, Random Variables, and Stochastic Processes," A. Papoulis, Polytechnic Institute of Brooklyn, McGraw-Hill, 1965.

APPENDIX B
Project Delivery Team Design Checklist for Dredge Measurement & Payment Contract Clauses

The following checklist outlining contract "Measurement and Payment" specifications shall be utilized during the PED phase by a member of the PDT that is familiar with the project and the likely survey system that will be deployed during construction. All of the following items in the table below shall be clearly and separately addressed in the contract plans and/or specifications.

Comment [WAB11]: WAB: This is very rough. Design checklist recommended by DCA/Holliday

Table B-1. Checklist for Development of Measurement and Payment Clause in Dredging Contracts

Survey Specification	Required or Detailed Standard
Dredging Limits	Delineate Acceptance Section limits with overdepth payment restrictions based on the below grade contours
Plans & Specs (P&S)/Bid Survey	Specify file location (Web access) for dense bid survey from which estimated quantities were derived Verify P&S survey reference datums are noted on plans Verify tidal model is noted on plans by source and date Verify tidal reference gage PBM is noted on plans Verify plans note that that contours and depths shown on plans are based on rounded depths and estimated quantities are based on original detailed survey dataset
Side Slope Payment	Reference Appendix A (paragraph A-18)
Extension outside channel toes	Specify limiting distance, if any, in feet payment will be made outside toes
Box Cut allowance	Specify if a box cut allowance will be made to the above extension limit
Survey Tolerance Allowance	
New Work	Specify tolerance below Required Depth in feet
Maintenance	Specify tolerance about Required Depth in ± feet
Survey Procedures and Calibrations	Reference technical guidance in EM 1110-2-1003
Acoustic Frequency	Reference Paragraph 8 200 kHz (±10%) (Specify alternate frequency in unconfined sediments, if applicable)
Acoustic Survey System	Specify single-beam or multibeam per criteria in Paragraph 10
Density of Survey Coverage	
Single-beam	Specify cross-sectional spacing in feet (NTE 200 ft) (Note planned coverage methods in irregular basins)
Multibeam/Multi-transducer	Specify percentage of bottom coverage and overlap coverage
Horizontal Reference	
Datum	NAD83, SPCS & local chainage-offset
Positioning system	Specify system to be deployed: DGPS, RTK, tag line, topo, etc.
Reference PBMs	Specify/list/reference control data sheets for PBMs

Table B-1. (Concluded) Checklist for Development of Measurement and Payment Clause in Dredging Contracts

Survey Specification	Required or Detailed Standard
Vertical Reference	
Orthometric Datum	NAD83 (NAVD88)
Low Water Datum	Specify
Tidal Epoch	Specify model/year
Geoid Model/Ellipsoid Reference (Optional)	Specify (applicable to RTK surveys only)
Reference PBMs/gage	NSRS PIN or Station ID
Tidal Range Model	Specify along with source and date of model
Tidal or River Gradient Model	Provide file detailing tidal phase corrections or river slope gradient interpolations, as applicable
Water Surface Correction Procedure	Gage interpolation, extrapolation, or RTK (detail site calibration procedures & reference PBMs)
Vessel motion corrections:	
Heave filtering	Specify method/system
Roll-pitch-yaw-latency correction	Specify method/system
QA Performance Testing	Describe QA requirements, location, frequency, etc.
Data Editing & Processing	
Outlier Rejection Limit	3σ
Bin/Cell Size	3 ft x 3 ft (New Work) or 5 ft x 5 ft (Maintenance) – reference Paragraph 8 for single-beam
Representative Depth/ per Cell	Reference Paragraph 9 above--Average or Median
Volume Computations for Payment	Reference Paragraph A-19--3D TIN Surface-to-Surface
Software	Specify by manufacturer/provider
Survey Request Notifications	Specify advance notification in days for a pre-dredge or after-dredge clearance—or reference EP 1130-2-520
Data Processing Time Standards	Reference Paragraph 17
Dredge Clearance Assessment	Reference Paragraph 9
Unconsolidated sediments (fluff)	Specify alternate and specific measurement & payment method
CUBE Assessment	Indicate if CUBE will be used along with evaluation parameters

Contract specifications shall not contain general options for duplicate systems, methods, or control unless the rationale or conditions for having the options is clearly spelled out.

CALIFORNIA STATE LANDS COMMISSION

HARBOR SAFETY COMMITTEE MONTHLY REPORT - MAY COMPARISON

VESSEL TRANSFERS

	Total Transfers	Total Vessel Monitors	Total Transfer Percentage
MAY 1 - 31, 2007	279	132	47.31
MAY 1 - 31, 2008	277	143	51.26

CRUDE OIL / PRODUCT TOTALS

	Crude Oil (D)	Crude Oil (L)	Overall Product (D)	Overall Product (L)	GRAND TOTAL
MAY 1 - 31, 2007	15,192,000	685,000	20,960,639	13,110,795	34,071,434
MAY 1 - 31, 2008	15,387,000	0	22,533,350	12,028,695	34,562,045

OIL SPILL TOTAL

	Terminal	Vessel	Facility	Total		Gallons Spilled
					T	Cutter Stock / 1 gal
MAY 1 - 31, 2007	2	0	0	2	T	Fuel Oil / 42 gals
MAY 1 - 31, 2008	0	2	0	2	V	Other / 1 gal
					V	Gasoline / 5 gals

*** Disclaimer:

Please understand that the data is provided to the California State Lands Commission from a variety of sources; the Commission cannot guarantee the validity of the data provided to it.

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CSLC NCFO

FERRY OPERATIONS WORK GROUP

To: Harbor Safety Committee
From: John Davey, Work Group Chair
Re: Work group activities related to safe ferry transit
Date: June 4, 2008

Background

Navigating the San Francisco Bay Region during periods of reduced visibility requires mariners to exercise additional caution and vigilance. The safe speed of ferry operations in reduced visibility is based on a number of factors as described in the Rules of the Road (COLREGS). Passenger ferries are highly maneuverable with short stopping distances and have a shallow draft which enables operation outside of shipping channels. A safe speed for a ferry vessel can be quite different from a deep draft ship or tug and barge along the same route. In addition to Rules of the Road and USCG regulatory requirements, each Ferry operator has developed specific safety procedures.

Ferry Operations Work Group

The Bay Area's three commute ferry companies/agencies agreed to work with the Harbor Safety Committee, Coast Guard Vessel Traffic Service (VTS), the Water Transit Authority and stakeholder parties to develop a protocol safe for ferry navigation in the San Francisco and San Pablo Bays.

The Ferry Operations Work Group conducted a two-year process to develop an approach and maneuvering scheme in the vicinity of the congested San Francisco Ferry Building, as well as a routing protocol in the Central Bay to decrease the risk of collision for commute ferries. The Work Group agreed to protocols and referred them to the Harbor Safety Committee, which adopted the Work Group findings and recommendations in May 2008.

Ferry Traffic Routing Protocol

The Ferry Traffic Routing Protocol consists of planned routes and communications procedures for improving ferry navigation safety. When ferries follow routes, the Closest Point of Approach (CPAs) with other ferries are greatest at points where speeds are typically greatest. The adopted routes cross at predetermined locations at nearly right angles, enabling ferries to predict crossing situations and plan ahead.

Within an approximately ½-mile zone around the San Francisco Ferry Building, the protocol calls for port-to-port meeting and heightened radio communications. For inbound Ferry Building ferries, the protocol requires planning far enough in advance to avoid getting within approximately ½ nautical mile from the Ferry Building if another ferry is still at the inbounder's dock.

This reduces crowding around the Ferry Building. With ferry routes charted on nautical charts, other types of vessels can more easily predict the locations of ferries and steer clear. The Ferry Traffic Routing Protocol supports aggressive use of electronic nautical charts (ENCs) with intergraded Automatic Identification System (AIS). When all ferries consistently update their AIS data and follow routes, the protocol will ultimately lead to reduced VTS-ferry communications.

More recently, S.F. Bay Area ferry operators have participated in the Ferry Operations Work Group to develop common best maritime practices for operation in inclement weather.

San Francisco Bay Area Ferry Operation in Inclement Weather

Microclimates

As described in the Harbor Safety Plan, localized microclimates can alter visibility along an entire route or a portion of a route. During summer, channel fog is prevalent in the central San Francisco Bay with outer areas clear. In winter months Tule fog can be wide spread, dense in the morning with clearing later in the day.

Safety Practices

The Master of a ferry is the person in charge of the vessel, responsible for the safety of the passengers and crew at all times, and has the authority to decide if it is safe to get underway or to proceed.

In reduced visibility and inclement weather conditions, the following practices are followed:

- A go or no-go decision to get underway is made by the vessel Master or the company Operation Manager, based on conditions along the entire route, using all available information including the experience of the master and operations manager.
- Look-outs: the vessel Master assigns crewmembers for look-out duty based on the existing or anticipated conditions; the applicable regulations are found in the Navigation Rules and Regulations, Rule 5 Look-out (text attached).
- Safe speed: the vessel is required to proceed at a speed appropriate to the prevailing circumstances and conditions, which include; state of visibility and the manageability of the vessel with special reference to stopping distance and turning ability; applicable regulations Navigation Rules and Regulations, Rule 6 Safe Speed (text attached).
- Equipment: each Ferry is required to have at minimum one radar; commuter ferry vessels generally have two operational radars onboard; the vessel Master is required to have a radar observer license endorsement. Global Positioning Satellite, Automatic Identification System and Electronic Charting navigation systems are also installed and used to assist navigation.

In conditions of high wind and waves:

- Go/no-go decision is made by the vessel Master or the company Operation Manager, based on conditions along the entire route, using all available information including the experience of the master and operations manager.
- Passenger safety: Captain can maneuver the vessel to minimize wave effects. Crew duties include rough weather announcements and passenger safety management.

High Speed Ferry Operations (over 30 Knots)

U.S. Coast Guard Navigation and Vessel Inspection Circulars (NAVIC) 5-01 and 5-01 Change 1 provide specific guidance for high speed passenger vessels and include approved vessel operation manuals, training programs and risk assessment tools (matrix).

- Vessel equipment: operators have exceeded minimum requirements for navigation electronics including dual radar, Global Position Satellite and electronic charting with Automatic Identification System overlay.
- Manning/Training: Vessels traveling at high speed are required to have a minimum of two qualified watch-standers during normal operations. Vessel operators have developed approved training programs for high speed navigation in compliance with NAVIC 5-01 and 5-01 Change 1.

U.S. Coast Guard Authority to Regulate Vessel Speed

The Federal Ports and Waterways Safety Act of 1972 (33USC1223) grants authority to the Coast Guard to further regulate vessel speed, and specifically states:

> [The Coast Guard] may control vessel traffic in areas subject to the jurisdiction of the United States which the Secretary [of the Department of Homeland Security] determines to be hazardous, or under conditions of reduced visibility, adverse weather, vessel congestion, or other hazardous circumstances by a number of means, including establishing vessel traffic routing schemes and by establishing vessel size, speed, draft limitations and vessel operating conditions.

Under 33 Code of Federal Regulations (CFR) 161.11, the Coast Guard may, through the Vessel Traffic System (VTS), issue measures or directions to enhance navigation and vessel safety and to protect the marine environment, including establishing vessel traffic routing schemes.

International Regulations for Prevention of Collisions at Sea (COLREGS)

Maritime practices accepted worldwide are codified under the International Regulations for Prevention of Collisions at Sea (COLREGS), which address safe transit speed, risk of collision, and conduct of vessels in restricted visibility.

Rule 6 states, in part, that, “Every vessel shall at all times proceed at a safe speed so that the vessel can take proper and effective action to avoid collision and be stopped within distance appropriate to the prevailing circumstances and conditions.” Rule 6 continues, stating that factors to be taken into account in determining a safe speed include, but are not limited to, the state of visibility and the manageability of the vessel with special reference to stopping distance and turning ability in the prevailing conditions.

Rule 7 addresses risk of collision, and states, in part, that, “Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt such risk shall be deemed to exist.”

Rule 19, Conduct of Vessels in Restricted Visibility, states, in part, that, “Every vessel shall proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted visibility [and] every vessel shall have due regard to the prevailing circumstances and conditions of restricted visibility when complying with the Rules....”

Preliminary Conclusion

In reviewing the regulations in place in San Francisco Bay, the Work Group agreed that sufficient regulations and guidelines exist regarding speed limitations for ferry vessels transiting the San Francisco Bay region during periods of reduced visibility.

Investigations into Causes of and Response to Cosco Busan Oil Spill

June 12, 2008 Update

Linda Scourtis, BCDC

State Government Inquiries

<u>State Board of Pilot Commissioners</u>

1. Through the Incident Review Committee (IRC), the Board investigates actions on the part of the pilot that may have contributed to the incident. The board will work with the HSC work group as it also considers lessons learned from the incident.

Update: Hearing before administrative law judge is scheduled to begin September 2, 2008. The pilot's license will remain suspended until an outcome is determined.

Executive Director: Capt. Pat Moloney, 415.397-2253

2. Established a standing Navigation Technology Committee. The purpose is "to investigate the different types of navigation systems generally found on ships calling on the San Francisco Bay Area and the sufficiency of pilot training in the use of such systems; to evaluate lap top computers, GPS units and other portable electronic chart systems that can be brought aboard ships by pilots to assist in navigation…The committee shall establish a dialogue with the Harbor Safety Committee and its cognizant subcommittees in the exchange of relevant information."

Capt. Bruce Horton will serve as liaison to the BOPC for interim reports.

Update: Preliminary report June 2008.

<u>Governor's Investigation into causes of and response to the oil spill</u>

The Governor has directed OSPR, in coordination with the Governor's Office of Emergency Services and the Department of Fish and Game, to review procedures and identify areas for improvement including prevention, preparation, response, notification, and cleanup; assess natural resource damage and the associated economic impact to fishermen, small businesses and state and local economies; assess environmental damage to water and beaches; identify the best ways to return the environment to its natural state.

Update: SF Harbor Safety Committee forwarded findings of PORTS work group to OSPR Feb 1, 2008.

HSC reports containing Tug Escorts, Prevention through People and Navigation Work Group recommendations submitted to OSPR March 19 and 20, 2008.

Ferry Operations Work Group recommendations on ferry routing in the Central Bay forwarded to OSPR May 21, as were recommendations by the Navigation Work Group on speed and crew staffing.

<u>California State Legislature</u>

State Assembly special hearing on spill response held in Emeryville November 15, 2007. State Senate Joint Informational Hearing of Natural Resources and Governmental Organization subcommittees held a special hearing November 30, 2007, on the state response to the spill.

The following bills related to navigational issues that may be of interest to the Harbor Safety Committee have been introduced in the State Legislature in response to the Cosco Busan spill:

SB 1217, Yee, would add Section 1157.5 to the Harbors and Navigation Code, to require the Board of Pilot Commissioners to submit an annual report to the Legislature, beginning February 2010, that provides information on each pilot and trainee, vessel movements, investigations of reported incidents, and the financial status of the Board of Pilot Commissioners. Sponsored by the SF Bar Pilots Association and supported by PMSA. Amended May 6, 2008, to include stronger language regarding incident reports and additional fiscal reporting requirements tied to the passage of SB 1627.

SB 1627, Wiggins, would place the Board of Pilot Commissioners under the direct oversight of the Business, Transportation and Housing Agency, as opposed to its current independent status. The Department of Finance is required to complete Finance and Performance Audits of the Board by the end of 2009, with BT&H comments on any recommendations included in the audits due within six months of completion. The bill also clarifies that all additional state administrative costs will be borne by the Board Operations special fund and creates new special funds for pilot and trainee training. Sponsored by PMSA and supported by the SF Bar Pilots Association, Save the Bay, the Ocean Conservancy and the California Trade Coalition.

AB 2032, **Hancock**, would amend Section 4670.40 of the Government Code to increase the Oil Spill Prevention and Administration Fee (OSPAF) maximum from $0.05 to $0.08 per barrel, and amend Section 46012 of the Revenue and Taxation Code to adjust annually for inflation the Oil Spill Response Trust Fund.

Passed Assembly May 28, 3008; to Senate.

AB 2441, **Lieber**, would amend Section 8670.17.2 of the Government Code (OSPRA) to require the OSPR Administrator to adopt regulations governing tug escorts for vessels carrying hazardous materials in bulk cargo quantities entering, leaving or navigating state harbors.

The HSC Tug Escorts Work Group is working with Baykeeper to refine the list of hazardous cargoes to those that call SF Bay in large quantities.

Other Organizations

San Francisco Bar Pilots

The San Francisco Bar Pilots internal review of its policies and procedures as well as of the Harbor Safety Committee Safety Plan will produce recommendations to improve shipping safety. The pilots will work with the HSC work group to inform our efforts.

Update: The HSC included in its March 19, 2008, report to OSPR, "Guidelines for Navigating in Reduced Visibility" developed primarily by the Bar Pilots and Coast Guard. The Guidelines apply to specific "Critical Maneuvering Areas" in the Bay.

Capt Pete McIssac: 415.362-5436

Federal Government Inquires

National Transportation Safety Board (NTSB)

Will consider equipment and navigation systems as well as human error in looking into the cause of the accident: the performance of the master, pilot and crew, as well as the operation and maintenance of equipment and navigation systems. A second focus of the NTSB investigation is on the response to the spill.

Public hearing held April 2008. Investigation complete; in analysis phase. Report expected Fall 2008.

U.S. Coast Guard: Incident Specific Preparedness Review (ISPR)

Will evaluate the effectiveness of the Coast Guard's oil spill response and communications efforts, as well as the overall preparedness system. The following are the investigating agencies: San Francisco, OSPR, Pacific States-British Columbia Oil Spill Task Force, Baykeeper, PMSA, NOAA and the USCG. *Chair: Rear Admiral Carlton Moore, Ret.*

Update: An initial report was released January 28, 2008, which concentrated on the first two weeks of response to the spill (http://uscg.mil/foia/CoscoBuscan/CoscoBusanISPRFinal.pdf.). The final report will expand on some Phase I focus issues and add some that extend beyond the first two weeks of the incident.

Final report released May 16, 2008, available at http://www.uscg.mil/FOIA/CoscoBuscan/part2.pdf

Congressional Inquiry

Special Senate briefing with the USCG spill response was held in Washington, D.C., November 14, 2007. Special hearing on the Coast Guard spill response held by the House Subcommittee on Coast Guard and Maritime Transportation in San Francisco November 19, 2007. The congressional panel focused on a number of issues, including what caused the ship to hit the bridge, whether there were adequate communications and equipment on board, and why there were delays in reporting the spill and its severity.

Further inquiry into preparation for and response to the spill was conducted by Department of Homeland Security Inspector General. The report of the IG's review of the U.S. Coast Guard's response to the allision, dated April 9, 2008: http://www.dhs.gov/xoig/assets/mgmtrpts/OIG_08-38_Apr08.pdf.

Federal legislation to upgrade VTS technology, require pilots to carry their own navigational laptop computers while piloting a vessel, and to raise liability limits for cargo ship owners to cover cleanup costs and damages proposed in the Senate late 2007.

> **S. 2430, Boxer/Feinstein ("**Maritime Emergency Prevention Act of 2007"), would authorize the VTS to command the pilot of a vessel to modify the speed or direction of a vessel in an emergency or hazardous conditions as determined by the VTS director. Also would require a federally licensed pilot to carry and use a laptop computer equipped with a navigation system where determined by the pilotage authority that a computer is practical and necessary.
>
> *The HSC voted on March 13, 2008, to accept the Prevention through People Work Group's recommendation that no additional authority be proposed for the Coast Guard to regulate shipping and control vessel movements, recognizing that the best skills for maneuvering a vessel originate from onboard the vessel itself, and not from the Vessel Traffic Service. Transmitted to OSPR March 20.*

The HSC stated in comment letters dated April 17, 2008, to Senators Boxer and Feinstein, that no additional Coast Guard VTS authority is needed.

Additionally, the HSC Navigation Work Group will review a Board of Pilot Commissioners study, due in June, of navigation systems and make a recommendation to the HSC.

2699, Lautenberg/Boxer/Cantwell ("Oil Spill Prevention Act of 2008"), would require new vessels (contracted for construction after the date of enactment of the Act or delivered after August 1, 2010), with an aggregate capacity of 600 cubic meters or more of fuel oil to have double hulls, oil fuel being defined as "oil used as fuel in connection with the propulsion and auxiliary machinery of the vessel in which such oil is carried."

S. 2841, **Feinstein** ("Marine Emergency Protocol and Hull Requirement Act of 2008"), would amend the Oil Pollution Act of 1990 to require new cargo ships over 5,000 gross tons to have a double hull protecting their fuel tanks by 2010, and existing ships to be retrofitted by 2024. The bill also would direct the Coast Guard to assume direct authority of all vessels during adverse conditions, or "enhanced danger" situations, such as an act of war or terrorism, low visibility, or after a large oil spill or hazardous materials discharge.

H.R. 5428, Tauscher/Woolsey/Filner ("Vessel Navigation and Safety Improvement Act"), would direct the Coast Guard to issue regulations requiring pilots of vessels 300 gross tons or greater to carry and utilize a portable electronic device that is equipped for navigational purposes and capable of connection to AIS, and require pilot training on such devices.

As stated above, the HSC Navigation Work Group will work with the Pilot Commissioners on this issue. No recommendation to date.

Office of the Governor ARNOLD SCHWARZENEGGER THE PEOPLE'S GOVERNOR

06/11/2008 GAAS:324:08 FOR IMMEDIATE RELEASE

Gov. Schwarzenegger Joins with Legislators to Strengthen and Streamline the State's Oil Spill Prevention and Response

Governor Arnold Schwarzenegger today met with a bipartisan group of legislators, including Senator Joe Simitian (D-Palo Alto), Senator Abel Maldonado (R-Santa Maria), Assemblymember Pedro Nava (D-Santa Barbara), Assemblymember Lois Wolk (D-Davis), Assemblymember Sam Blakeslee (R-San Luis Obispo) and Assemblymember Cameron Smyth (R-Santa Clarita) to highlight legislative and administrative solutions to strengthen and streamline California's oil spill prevention and response.

"We must do everything we can to protect and preserve California's natural resources for future generations," Governor Schwarzenegger said. "There is so much at stake-our waterways and our wildlife, our ecosystem and our economy-and today's actions will successfully enhance our oil spill prevention and response efforts. Last November, I said we would take action, and these bipartisan solutions are the tools we need to prevent another devastating oil spill of the magnitude we saw last fall."

Following the November 2007 spill of 58,000 gallons of fuel oil into San Francisco Bay, the Governor took immediate action on response and clean-up. He also committed to taking steps to prevent that kind of spill from happening again. Today, with a bipartisan group of legislators, the Governor is making good on his commitment by coming out in support of three pieces of legislation and a series of administrative changes that will improve marine oil spill prevention and response, enhance the state's oiled wildlife search and rescue collection efforts, step up enforcement and fines for polluters and for the first time focus on inland oil spill prevention and response similar to what already takes place in our coastal waters.

The Governor's Administration has taken the following steps to improve oil spill response times and environmental protections:

- The Office of Spill Prevention and Response (OSPR) is speeding up the response times to oil spills in high-traffic ports. Oil spill response organizations will have to comply with regulatory changes to speed up response in the San Francisco Bay and the Los Angeles/Long Beach ports and be able to demonstrate their ability to meet the new standard. These changes are expected to be in place within the next six months.
- The Governor's Office of Emergency Services (OES) is improving accuracy of information and more quickly notifying local governments and neighboring counties. OES has changed its protocols for notifying local governments that are potentially impacted by an oil spill, and OSPR is working with OES to ensure the State Warning Center always has the most up-to-date and accurate information.
- The Administration is developing new guidelines to enhance recovery and rehabilitation of wildlife affected by an oil spill. Through a coordinated effort with the Oiled Wildlife Care Network, OSPR has developed recovery and training classes for volunteers, as well as established two new positions focused on wildlife recovery and rehabilitation.
- The Governor's Budget proposal includes funding for a 24-hour monitoring program in the San Francisco Bay. The Physical Oceanographic Real-Time System in the Bay is a 24 hour-a-day program

that measures the currents, depth, salinity and wind in San Francisco and Suisun Bays every six minutes.

In addition to these Administrative actions, the three pieces of legislation the Governor is supporting are Assemblymember Nava's AB 1960, Assemblymember Wolk's AB 2911 and Senator Simitian's SB 1739.

Assemblymember Nava's AB 1960 will be amended to enact a comprehensive Inland Oil Spill Prevention Program by requiring effective maintenance standards and oversight of inland oil-producing facilities. It ensures that the Department of Conservation's Division of Oil, Gas and Geothermal Resources effectively oversees the inspection, testing, maintenance and operations of oil production facilities. The bill will be amended to enhance the state's oversight of inland oil production facilities, including the ability to shut down high frequency oil spillers, in order to better prevent expensive and environmentally damaging oil spills.

Assemblymember Wolk's AB 2911 will be amended to statutorily enact a comprehensive Inland Oil Spill Response and Clean-up program within OSPR, similar to what currently exists in law for marine oil spills, and strengthen enforcement penalties for inland and marine oil spills. The bill will also enhance the state's efforts to conduct search, rescue and treatment of oiled wildlife following an oil spill.

Senator Simitian's SB 1739 will ensure first-responders are adequately trained and prepared to take action on marine oil spills by ensuring that routine, thorough emergency drills and practices are taking place. The bill also makes it mandatory that oil spill response organizations actually demonstrate, through inspections and announced or unannounced drills, that they can deploy the response resources outlined in their contingency plans.

San Francisco Chronicle

June 12, 2008

Governor backs 3 bills on oil spill response

John Wildermuth, Chronicle Staff Writer

Government response to oil spills like the one that polluted San Francisco Bay last fall would get a boost under a group of measures backed Wednesday by Gov. Arnold Schwarzenegger.

He met with lawmakers to endorse bills to improve emergency response guidelines as a result of the Cosco Busan spill in November and to unveil the action his administration is taking on the subject.

"We must do everything we can to protect and preserve California's natural resources for future generations," he said at the Sacramento meeting. "There is so much at stake ... and today's actions will successfully enhance our oil spill prevention and response efforts."

The meeting came as a welcome surprise to state Sen. Joe Simitian, D-Palo Alto, whose bill to require more training and drills for the groups that respond to oil spills is now before the Assembly.

"It's nice to get a signal early on, since the governor typically holds off (support) until a bill is on his desk," Simitian said. "There was a lot of frustration after the Cosco Busan spill. We had a good law on the books that was adequately funded, but when the emergency happened, it failed."

The South Korea-bound container ship banged into one of the towers of the Bay Bridge during a heavy fog, spilling an estimated 53,000 gallons of fuel oil into the bay. Cleanup efforts were slow to start, allowing the oil to spread across the bay and up and down the coast. More than 2,500 birds died as a result of the spill, with cleanup costs swelling to $100 million or more.

"This bipartisan package of legislation deals with the governor's promise to deal with the oil spill problems and crack down on those responsible," said Lisa Page, a spokeswoman for Schwarzenegger.

But Assemblywoman Loni Hancock, D-Berkeley, isn't convinced that Schwarzenegger is going far enough to improve the state's response to future oil spills.

"This is a start, but unfortunately it's only window dressing," she said. "We need to do much more to actually solve the problems we're facing."

Schwarzenegger did not voice support for bills by Hancock and a number of other Bay Area legislators that would take more direct - and more costly - action to prepare for spills.

A measure by Assemblyman Mark Leno, D-San Francisco, would tighten oil-spill-response standards and establish a $5 million annual technology development grant. Two Hancock bills would require a new program for training local volunteers, grants to local governments for cleanup equipment and $19 million a year more for the state Oil Spill Prevention and Administrative Fund, the money coming from increased fees on crude oil and petroleum products that pass through the state's ports, terminals and pipelines.

Besides Simitian's bill, the governor endorsed legislation by Assemblyman Pedro Nava, D-Santa Barbara, that will require tougher oversight of inland oil-producing facilities, and another by Assemblywoman Lois Wolk, D-Davis, that will add to penalties for inland and marine oil spills.

Sen. Abel Maldonado, R-Santa Maria (Santa Barbara County), Assemblyman Sam Blakeslee, R-San Luis Obispo, and Assemblyman Cameron Smyth, R-Santa Clarita (Los Angeles County), also joined the governor at the event.

It's important to look at the Cosco Busan spill to see what didn't work and prepare the state and its emergency responders for the inevitable next time, Simitian said.

"We can't afford to use an emergency as the next opportunity to practice," he said. "We need to ensure that when the next one happens, we're ready."

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http://sfgate.com/cgi-bin/article.cgi?f=/c/a/2008/06/12/BA5M117KGF.DTL

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