ENVIRONMENTAL IMPACT STATEMENT APPENDIX R: ODMDS Placement Evaluation

SAVANNAH HARBOR EXPANSION PROJECT

Chatham County, Georgia and Jasper County, South Carolina

January 2012

US Army Corps of Engineers
Savannah District
South Atlantic Division

This page intentionally blank

ODMDS Placement Evaluation

TABLE OF CONTENTS

This page intentionally blank

Savannah ODMDS Placement Evaluation

1. Introduction

This evaluation addresses transport and disposal in the Savannah Ocean Dredged Material Disposal Site (ODMDS) of new work construction in the Savannah Harbor entrance channel conducted by the Savannah Harbor Expansion Project (SHEP) from Stations +4+000 to -97+680B. New work sediments from these channel reaches would be placed into the Savannah ODMDS.

Savannah District prepared a Section 103 Evaluation for Operation and Maintenance of the Savannah Harbor from Stations 0+000 to -60+000B in December 2010 as a separate action (Savannah O&M Section 103 Evaluation). After the project completes the ongoing biological testing and evaluation of the entrance channel sediments, the District will submit a request to modify the Savannah O&M Section 103 Evaluation to include future transport and disposal in the Savannah ODMDS of entrance channel new work and O&M materials from Stations +4+000 to -97+680B.

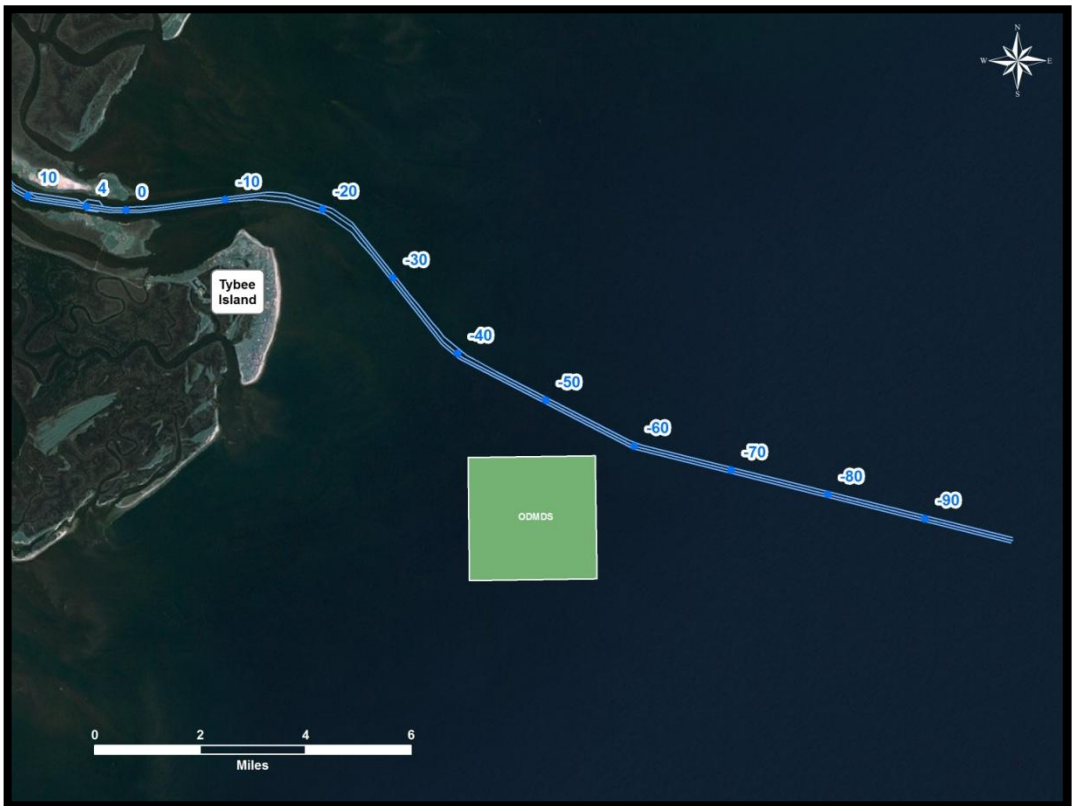
The District believes the proposed new work material meets the Exclusionary Criteria set forth in 40 CFR §227.13(b). Specifically, the material is substantially the same as the substrate at the disposal site and the dredging site is far removed from sources of pollution, so as to provide a reasonable assurance that such material has not been contaminated by pollution. Grain size and chemistry data are provided to demonstrate the similarity between the proposed dredging site and the Savannah ODMDS.

This evaluation was conducted using Appendix C of the Southeast Regional Implementation Manual (SERIM) as a guide.

2. Dredging and Disposal Project Information

a. A map showing dredging locations/boundaries and delineating dredging units. Shall include range stations to adequately delineate project limits.

The Savannah Harbor Expansion Project Bar Channel and ODMDS are shown in the following figures. The maps show the locations and boundaries of the proposed dredging.



b. Core boring logs (if available) and other historical and current sampling stations keyed to the map.

The sampling stations are described in the Sediment Quality Evaluation Savannah Harbor Expansion Project, June 2011, Appendix M of the SHEP Final EIS.

c. Volume of material to be dredged by dredging unit.

The following shows the dredging units proposed for deepening of the entrance channel during SHEP:

Dredging Unit	Placement Site	Dredge Type	Dredging Reach	Sediment Volume
1	ODMDS or Jones/Oysterbed Island CDF	Pipeline or Hopper	+4+000 to 0+000	305,674
2	ODMDS or Jones/Oysterbed Island CDF	Pipeline or Hopper	0+000 to -10+000B	917,064
3	ODMDS or Jones/Oysterbed Island CDF	Pipeline or Hopper	-10+000B to -20+000B	1,311,222
4	ODMDS	Pipeline or Hopper	-20+000B to -30+000B	1,352,115
5	ODMDS	Pipeline or Hopper	-30+000B to -40+000B	1,305,921
6	ODMDS	Pipeline or Hopper	-40+000B to -53+500B	1,632,346
7	ODMDS	Pipeline or Hopper	-53+500B to -57+000B	**391,437**
8	ODMDS	Pipeline or Hopper	-57+000B to -97+680	3,736,308
Total				10, 952,087

The following shows a comparison of proposed placement site estimated volumes:

Placement Site	Dredge Type	Volume CY
ODMDS or Jones/Oysterbed Island CDF	Pipeline or Hopper	2,533,960
ODMDS	Pipeline or Hopper	8,418,127
Total		10,952,087

d. Percentage of fine-, medium-, and coarse-grained material by dredging unit.

ew Work Sediment Grain Size (2005 Sampling). Since the dredging work proposed for placement in the Savannah ODMDS would be conducted by both hopper dredge and cutterhead dredge, some disturbance below -51 feet MLLW may occur, depending on the equipment used. Coarse-grained material dominates the new work material, as shown in the following table.

Stations	Top of Layer	Bottom of Layer	Volume (cubic yds)	% Sand	% Silt
0 to 4+000(upriver)					
		46	21,594	79.1	20.9
	46	48	101,482	76.8	23.3
	48	50	134,144	79.2	20.8
	50	51	70,048	79.2	20.8
			327,268	78.4*1	
0 to 10+000B					
		46	438,715	N/A	N/A
	46	48	346,997	88.7	11.3
	48	50	376,397	90.4	9.6
	50	51	193,670	77.9	22.1
			1,355,779	87.1*2	
10+000B to 20+000B					
		46	328,512	N/A	N/A
	46	48	473,047	N/A	N/A
	48	50	555,352	73.8	26.2
	50	51	282,823	80.5	19.5
			1,639,734	76.1*2	
20+000B to 30+000B					
		46	365,322	N/A	N/A
	46	48	529,910	77.3	22.7
	48	50	546,728	80.9	19.1
	50	51	275,477	79.8	20.2
			1,717,437	79.3*2	
30+000B to 40+000B					
		46	1,118,617	66.7	33.3
	46	48	505,693	70.9	29.1
	48	50	532,927	68.6	31.4
	50	51	267,301	70.8	29.2
			2,424,538	68.4*1	
40+000B to 53+500B					
		46	524,569	94.3	5.7
	46	48	646,976	87.3	12.8
	48	50	657,409	91.3	8.8

	50	51	327,961	57.4	42.6
			2,156,915	85.6*1	
Stations	**Top of Layer**	**Bottom of Layer**	**Volume (cubic yards)**	**% Sand**	**% Silt**
53+500B to 57+000B					
		46	88,669	94.6	5.4
	46	48	78,504	90.7	9.3
	48	50	156,310	92.4	7.7
	50	51	77,815	65.1	34.9
			401,298	87.2*1	
57+000B to 98+600B					
		46	102,927	N/A	N/A
	46	48	1,667,123	N/A	N/A
	48	50	1,258,309	N/A	N/A
	50	51	810,876	N/A	N/A
			3,839,235	N/A	

N/A data not available because project core did not encounter sediment within the subject layer or no project cores were taken
*1 Average is weighted by volumes
*2 Average is weighted by volumes but is based only on available data

The locations of the recent (2005) sampling stations are described in the Sediment Quality Evaluation Savannah Harbor Expansion Project, June 2011, Appendix M of the SHEP Final EIS.

This sampling indicates that the volume weighted average of the new work sediments is 80 percent sand. Some fines would be lost during the dredging (overflow process) and sediment placement operations (suspension in water column with down-current migration). Those two actions would effectively increase the percent sands of sediments that deposit on the floor of the ODMDS.

This can be compared to the information below that shows the composition of maintenance sediments that are presently excavated on a yearly basis and deposited in the Savannah ODMDS.

Composition of Maintenance Sediments in Entrance Channel

Stations	Percent Sand	Percent Silt
0+000 to -10+000B	86	14
-10+000B to -20+000B	81	19
-20+000B to -30+000B	79	21
-30+000B to -40+000B	77	23
-40+000B to -50+000B	74	26
-50+000B to -60+000B	93	7

This information shows that O&M sediments on the entrance channel average about 82 percent sand. On a bulk composition basis, the SHEP new sediments are not substantially different from the O&M sediments that have already been approved and are regularly deposited in the ODMDS.

e. Bathymetric information for the channel to be dredged with the project dredging depth contour highlighted.

The portion of the project proposed for hopper dredging and placement of sediment in the ODMDS is currently maintained to a depth of -46 feet MLLW. Dredging with the deeper harbor would be performed to -51 feet MLLW (with 47-foot depth alternative).

f. Design depth (including overdredge depth or advance maintenance) and width for each dredging unit or project reach.

Currently Authorized Channel

Reach	Width (Feet)	Authorized Depth (Feet MLW)	Advance Maintenance (Feet)	Allowable Overdredge (Feet)	Total Dredging Depth (Feet MLW)
+4+000 to -14+000B	500	-42	2	2	-46
-14+000B to -60+000B	600	-44	0	2	-46

Proposed Channel

Reach	Width (Feet)	Authorized Depth (Feet MLW)	Advance Maintenance (Feet)	Allowable Overdredge (Feet)	Total Dredging Depth (Feet MLW)
+4+000 to -14+000B	500	-47	2	2	-51
-14+000B to -97+680B	600	-49	0	2	-51

The proposed work from Stations -14+000B to -97+680B would be box cut 600-feet wide to a depth of approximately -51 feet MLLW.

g. Expected method(s) of dredging, transport, and disposal of material.

The dredging, transport, and disposal of project material are expected to be performed by both pipeline and hopper dredge, depending on the season.

h. Expected start, duration and end of dredging, transport, and disposal of material.

The work proposed for placement in the ODMDS is estimated to require a total of about 48 months to complete; however, the work may be performed intermittently. At present, a pipeline dredge is expected to be used for a 6-month period in 2013/2014. Hopper dredges may be used for four winter seasons as follows: December – March 2013, December – March 2014, and December – March 2015, and December – March 2016.

i. Proposed disposal location (or zone) within the ODMDS.

It is expected that deposition will take place within the northern 1/3 of the site.

j. Historical compliance with ODMDS site designation and Site Management and Monitoring Plan (SMMP) conditions.

The District is not aware of any more than minimal non-compliance issues regarding past use of the Savannah ODMDS.

Recent monitoring of the ODMDS was completed on the following dates.

Date	Survey Type
19-Jun-92	Bathymetry
13-Jun-94	Bathymetry
12-Aug-97	Bathymetry
4-Mar-98	Bathymetry
12-Aug-98	Bathymetry
14-Apr-99	Bathymetry
25-Sep-99	Bathymetry
17-Apr-00	Bathymetry
21-Dec-00	Bathymetry
20-Apr-01	Bathymetry
18-Apr-02	Bathymetry
12-Feb-03	Bathymetry
6-Jun-03	Bathymetry
20-Feb-04	Bathymetry
9-Dec-04	Bathymetry
24-Mar-05	Bathymetry
21-Oct-05	Bathymetry
1-Dec-05	Bathymetry
19-Jul-06	Side scan
9-Feb-07	Bathymetry
7-Oct-07	Bathymetry
19-Feb-08	Bathymetry
27-Mar-08	Bathymetry
8-Sep-10	Bathymetry

3. Exclusionary Criteria - 40CFR §227.13(b) [Tier I]

a. Rationale for meeting the exclusionary criteria: The material proposed for dumping is substantially the same as the substrate at the proposed disposal site and the site from which the material proposed for dumping is to be taken is far removed from known existing and historical sources of pollution so as to provide a reasonable assurance that such material has not been contaminated by such pollution.

Sediment testing indicates that the new work sediments for the entrance channel are 80 percent sand. This compares favorably to the 82 percent sand composition of the O&M sediments on the entrance channel that EPA previously approved and are deposited each year in the ODMDS.

At EPA's request, the Corps initiated biological testing of the new work entrance channel sediments. Savannah District and EPA Region 4 jointly developed a Sampling and Analysis Plan and a Quality Assurance Project Plan and the sampling and laboratory analyses have been completed. The data is undergoing analysis along with required modeling, following guidelines given in the joint EPA/USACE Southeast Regional Implementation Manual. Once Savannah District has made a determination of compliance with the Ocean Dumping Regulations, the completed MPRSA Section 103 Evaluation and Sediment Report will be forwarded to EPA Region 4 along with a request for concurrence with the Corps' determination of compliance. The District believes the proposed dredged material will meet the above exclusionary criteria § 227.13(b)(3) based, in part, on the following.

(1) Grain sizes of the dredged material (from 2d above).

As shown in 2d above, average grain size samples from cores to project depth in the proposed dredging units averages from 68 to 87 percent sand. The volume weighted average of the new work sediments is 80.3 percent sands, which is very similar to that of the O&M sediments (82 percent) which have previously been found suitable for deposition in the ODMDS.

(2) Grain sizes of the material at the disposal site

On 16 December 1998, six sediment grab samples were taken at the Savannah ODMDS at the following locations (Scott et al., 1999).

Sample #	Latitude	Longitude	State Plane E	State Plane W
DA-14	31 57.429	80 46.209	1089286	714623
DA-15	31 56.448	80 46.19	1089461	708676
DA-16	31 55.437	80 46.21	1089437	702544
DA-17	31 57.43	80 44.901	1096048	714717
DA-18	31 56.451	80 44.905	1096105	708780
DA-19	31 55.445	80 44.917	1096123	702680

The collected sediments had the following characteristics:

Sample #	% Gravel	% Sand	% Silt	% Clay	% Fines
DA-14	0.1	60.7	38.9	0.3	39.2
DA-15	0.4	97.1	0.0	2.5	2.5
DA-16	0.8	95.4	0.6	3.2	3.8
DA-17	0.0	97.2	0.0	2.8	2.8
DA-18	0.1	96.0	0.0	3.9	3.9
DA-19	0.0	97.2	0.0	2.8	2.8

Note: DA-14 is in the northwest section of the ODMDS, and is an area that is regularly used for placement of O&M sediments.

Using those samples, the surface sediments presently in the ODMDS average 90.6 percent sand. Although the surficial sediment presently in the ODMDS is not an exact match with the SHEP sediments proposed for deposition, both are predominantly sand and the 10 percent difference would be much less if measured when the sediment reaches the ODMDS floor (after the fines are lost during the dredging (overflow process) and sediment placement operations (suspension in water column with down-current migration)).

(3) Locations (keyed to map), quantities, and types of pollutants discharged upstream of the dredging area (see Section 3.1.1 of the RIM for data sources)

(a) Information on toxic releases and NPDES permit holders within the project area from the EPA Envirofacts website are listed below. These dischargers are all approximately 20.5 to 9.5 miles upstream of the uppermost extent of proposed dredging for placement in the ODMDS (Station +4+000). Because of the mixing that occurs in the river prior to reaching the proposed dredging location, the precise location of the dischargers is not relevant to this determination and therefore map locations of the dischargers is not provided. These data show that various contaminants are discharged in various amounts into the Savannah River. However, because of the high river flow volumes and mixing, these discharges would not be expected to have more than minimal impact to sediments in the area of proposed dredging.

Facility	NPDES Permit	Surface Water Discharges Reported 2008
ARIZONA CHEMICAL 1201 WEST LATHROP AVENUE SAVANNAH, GA 31415	**TRI Facility ID: 31402NNCMPWESTL**	
Acetaldehyde		2,300
Barium compounds		10,700
Catechol		4,320
Formaldehyde		200
Lead compounds		180
Manganese compounds		33,900
Polycylic aromatic compounds		13
Vanadium compounds		760
Zinc compounds		3,270

Facility	NPDES Permit	Surface Water Discharges Reported 2008
ATLANTIC WOOD INDUSTRIES INCORPORATED SUGAR REFINERY ROAD PORT WENTWORTH, GA 31407	**GA0047783**	
BASF CATALYSTS LLC - SAVANNAH OPERATIONS 1800 E PRESIDENT ST SAVANNAH, GA 31404		
Nitrate Compounds		760,000
CITGO ASPHALT REFINING CO OWNER AS OF 12/31/07 7 FOUNDATION DRIVE SAVANNAH, GA 31408	**GA0004332**	
BOD, COD, pH, suspended solids, oil & grease, ammonia nitrogen, sulfide, hexavalent chromium, chromium, phenolitic compounds		
COLONIAL OIL INDUSTRIES, INC 101 NORTH LATHROP AVENUE SAVANNAH, GA 31402	**GA0037923**	
CONOCO PHILLIPS 110 FORBES ROAD SAVANNAH, GA 31404		
Zinc compounds		503
CONSOLIDATED UTILITES, INC, 221 YORK STREET, SAVANNAH, GA 31401		
Sewerage system	GA0034819 exp 05	
EMD CHEMICALS INCORPORATED 110 EMD BOULEVARD SAVANNAH, GA 31407	**GA0034355**	
Nitrate Compounds		511,173
BOD, pH, total suspended solids, ammonia nitrogen, chromium		

Facility	NPDES Permit	Surface Water Discharges Reported 2008
FUJI VEGETABLE OIL INCORPORATED 120 BRAMPTON ROAD SAVANNAH, GA 31408	**GAU050241**	
Nickel compounds		5
Sewerage System: BOD, pH, total suspended solids, oil & grease		
GAF MATERIALS CORP 1 BRAMPTON ROAD SAVANNAH, GA 31408-2109	**GA0003841**	
Conductivity, COD, pH, total suspended solids, oil & grease		
GEORGIA-PACIFIC CHEMICALS LLC 130 CROSSGATE ROAD PORT WENTWORTH, GA 31407	**GA0047007**	
Formaldehyde		2
COD, pH, suspended solids		
HERTY FOUNDATION SAVANNAH P.O. BOX 7798 SAVANNAH, GA 31418	**GA0002402**	
BOD, pH		
GARDEN CITY WATER POLLUTION CONTROL PLANT BUD BROWN DRIVE GARDEN CITY, GA 31408	**GA0031038**	
DO, BOD, pH, total suspended solids, ammonia nitrogen, phosphorus, chlorine, fecal coliforms		
GULFSTREAM AEROSPACE CORPORATION 500 GULFSTREAM ROAD (CORPORATE HDQRS.) SAVANNAH, GA 31407	**GA0003255**	
Conductivity, pH		

Facility	NPDES Permit	Surface Water Discharges Reported 2008
IMPERIAL SUGAR COMPANY 2 BRYAN STREET PORT WENTWORTH, GA 31407	**GA0003611**	
BOD, pH		
INTERCAT-SAVANNAH, INC. 115 ELI WHITNEY BLVD SAVANNAH, GA 31408		
Vanadium Compounds		44
INTERMARINE USA 301 NORTH LATHROP AVENUE SAVANNAH, GA 31415	**Ga0003671**	
BOD, pH, suspended solids, oil & grease		
INTERNATIONAL PAPER CO - SAVANNAH COMPLEX 1201 W LATHROP AVE SAVANNAH, GA 31415		
Acetaldehyde		2,300
Barium compounds		10,700
Catechol		4,320
Formaldehyde		200
INTERNATIONAL PAPER CO - SAVANNAH COMPLEX 1201 W LATHROP AVE SAVANNAH, GA 31415 (CONT.)		
Lead compounds		180
Manganese compounds		33,900
Polycylic aromatic compounds		13
Vanadium compounds		760
Zinc compounds		3,270
KRAFT STEAM ELECTRIC GENERATING PLANT 110 CROSSGATE RD AT SAVANNAH RIVER PORT WENTWORTH, GA 31407		
Barium compounds		120
Lead compounds		3
Manganese compounds		17

Facility	NPDES Permit	Surface Water Discharges Reported 2008
NEW NGC INC D/B/A NATIONAL GYPSUM CO 2 BRAMPTON ROAD GARDEN CITY, GA 31408	**TRI Facility ID: 31418GLDBNBRAMP**	
Lead compounds		0.2
QUALA SYSTEMS INC 6061 COMMERCE COURT GARDEN CITY, GA 31408	**GAU050124**	
pH, oil & grease, cyanide, arsenic, cadmium, chromium, copper, lead, nickel, silver, zinc, mercury		
SAVANNAH – PRESIDENT STREET WPCP 1400 PRESIDENT STREET SAVANNAH, GA 31404	**GA0020427**	
Sewerage Systems		
TRONOX PIGMENTS (SAVANNAH) INC 1 KERR-MCGEE ROAD SAVANNAH, GA 31401	**GA0003646**	
Chromium compounds		200
Dioxin & like compounds		0.0203
Lead compounds		2
Manganese compounds		229,000
Vanadium compounds		600
WESTWOOD HEIGHTS & MILL CREEK, SAVANNAH, GA 31401	**GAU020234**	
Sewerage Systems		

Facility	NPDES Permit	Surface Water Discharges Reported 2008
WEYERHAEUSER NR PORT WENTWORTH 1 BONNYBRIDGE RD PORT WENTWORTH, GA 31407		
Acetaldehyde		2,737
Barium compounds		3,704
Catechol		24
Formaldehyde		1,774
Formic acid		3,682
Lead compounds		54
Manganese compounds		25,995
Methanol		7,422
Nitrate compounds		7,716
Polycyclic compounds		7

(b) The US Coast Guard records on spills in the Savannah Harbor since the last Section 103 are listed below. None of these spills would be expected to impact the sediments proposed for dredging under this evaluation.

Year	Date	Substance	Amount
2004	9-Nov-04	DIESEL	7 Gallons
	2-Jul-04	DIESEL	1.5 Gallons
	29-Jul-04	OIL LIKE	30 Gallons
	19-May-04	OIL LIKE	5 Gallons
	21-Dec-04	OIL LIKE	0.1 Gallons
	16-Nov-04	# 6 OIL	6,839 Gallons
2005	24-Mar-05	DIESEL	1 Gallon
	19-Apr-05	DIESEL	5 Gallons
	12-May-05	LUBE OIL	5 Gallons
	21-Jun-05	DIESEL	10 Gallons
	12-Aug-05	DIESEL	1 Gallon
	10-Oct-05	DIESEL	10 Gallons
2006	19-Jun-06	DIESEL	2 Gallons
	15-Jul-06	OIL LIKE	3 Gallons
	17-Jul-06	# 6 OIL	22,000 Gallons
	5-Jul-06	DIESEL	20 Gallons
	9-Aug-06	DIESEL	15 Gallons
	11-Aug-06	TALL OIL	1,209 Gallons
	28-Sep-06	DIESEL	0.3 Gallons
	25-Oct-06	DIESEL	40 Gallons
	1-Oct-06	DIESEL	2 Gallons
	7-Nov-06	OIL LIKE	1 Gallon
	13-Nov-06	DIESEL	10 Gallons
	13-Nov-06	DIESEL	710 Gallons
	14-Nov-06	DIESEL	10 Gallons
	14-Nov-06	DIESEL	10 Gallons
	13-Dec-06	OIL LIKE	1 Gallon
	12-Dec-06	OIL LIKE	2 Gallons
	24-Dec-06	HYDROGEN FLUORIDE	50 Gallons
	31-Dec-06	OIL LIKE	0.5 Gallons
2007	5-Jan-07	OIL	10 Gallons
	14-Jan-07	DIESEL	10 Gallons
	2-Mar-07	DIESEL	25 Gallons
	17-Mar-07	DIESEL	5 Gallons
	21-Mar-07	OIL-LIKE	0.5 Gallons
	30-Mar-07	OIL LIKE	0.5 Gallons
	30-Apr-07	DIESEL	5 Gallons
	14-May-07	DIESEL	5 Gallons
	16-May-07	DIESEL	25 Gallons
	26-May-07	OILY-LIKE	5 Gallons
	25-Jun-07	DIESEL	10 Gallons
	4-Jul-07	MYSTERY SHEEN	UNKNOWN
	5-Jul-07	DIESEL	30 Gallons
	12-Jul-07	OIL LIKE	25 Gallons
	16-Jul-07	HYDRAULIC FLUID	25 Gallons
	20-Jul-07	HYDRAULIC FLUID	1 Gallon
	27-Jul-07	HYDRAULIC FLUID	20 Gallons
	27-Aug-07	DIESEL	1 Gallon
	30-Aug-07	OIL	25 Gallons

Year	Date	Substance	Amount
	2-Sep-07	BUNKER OIL	1 Gallon
	4-Sep-07	LUBE OIL	25 Gallons
	6-Sep-07	BUNKER OIL	10 Gallons
	24-Sep-07	DIESEL	1 Gallon
	27-Sep-07	OIL-LIKE	1 Gallon
	26-Nov-07	HYDRAULIC OIL	3 Gallons
2008	7-Jan-08	OIL-LIKE	1 Gallon
	18-Jan-08	OIL-LIKE	5 Gallons
	20-Feb-08	DIESEL	5 Gallons
	26-Mar-08	LUBE OIL	5 Gallons
	7-Apr-08	DIESEL	10 Gallons
	28-Apr-08	DIESEL	1 Gallon
	30-Apr-08	LUBE OIL	3 Gallons
	15-May-08	DIESEL	20 Gallons
	28-May-08	OIL-LIKE	1 Gallon
	4-Jun-08	# 6 OIL	5 Gallons
	20-Jun-08	DIESEL	5 Gallons
	25-Jun-08	DIESEL	1 Gallons
	26-Jun-08	OIL-LIKE	5 Gallons
	11-Jul-08	LUBE OIL	2 Gallons
	5-Aug-08	HYDRAULIC OIL	10 Gallons
	22-Sep-08	DIESEL	1 Gallon
2009	26-Feb-09	OIL-LIKE	7 Gallons
	2-Mar-09	HYDRAULIC OIL	5 Gallons
	12-Mar-09	DIESEL	1 Gallon
	27-Mar-09	DIESEL	12 Gallons
	18-Apr-09	OIL-LIKE	1 Gallon
	10-Jun-09	# 6 OIL	5 Gallons
	3-Jul-09	SODIUM HYDROXIDE	1,200 Gallons
	17-Jul-09	DIESEL	2 Gallons
	24-Sep-09	DIESEL	25 Gallons
	26-Oct-09	LUBE OIL	0.5 Gallons
	3-Nov-09	# 6 OIL	2 Gallons
2010	21-Jan-10	DIESEL	20 Gallons
	21-Mar-10	DIESEL	7,000 Gallons
	29-Mar-10	OIL-LIKE Mixture	<1 Gallon
	17-May-10	Diesel Oil	150 Gallons
	21-Jun-10	Mystery Sheen	Unknown
	31-Aug-10	Toluene	2676 Gallons
	11-Dec-10	Hydraulic Oil	1 Gallon
	11-Apr-11	Diesel Oil	30 Gallons
	7-Jun-11	Lube Oil	3.5 Gallons
	8-Jul-11	Diesel Oil	<1 Gallon
	1-Sep-11	Gasoline	12 Gallons
	16-Sep-11	Diesel Oil	4 Gallons
	1-Oct-11	Fuel Oil	1000 Gallons
	22-Oct-11	Palm Kernel Oil	100 liters
	5-Dec-11	Mystery Sheen	Unknown
	16-Dec-11	Mystery Sheen	Unknown

(4) Results of previous testing in the area demonstrating lack of contamination

The results of new work sampling are discussed in detail in the Sediment Quality Evaluation SHEP, December 2011, Appendix M of the SHEP EIS. Organics were, for the most part, non-detect. Metal results for the bar channel samples are shown below. The only result of potential concern was cadmium found at Station -75+000B. This sample was taken near the old RACON tower site and is thought to have been influenced by contamination around the tower. Re-sampling in the vicinity of this station found no elevated cadmium. See Appendix M of the SHEP EIS for additional details.

Metal Concentrations in the Bar Channel (ATM, 1998, and Table 4 Appendix M).

Sample No.	**005NW**	**015NW**	**W01NW**	**W02NW**	**035NW**	**075NW**	**TEL****
Stations*	-5	-15	-19	-39.5	-35	-75	
Aluminum	2510	2780	11300	1200	3020	3830	
Iron	2600	2840	18100	2910	4600	3650	
Antimony	<2.7	<2.7	<3.1	<2.5	<2.7	<2.6	
Arsenic	3.3	3.4	*8.7*	3.6	6.4	12	7.2
Beryllium	<0.67	<0.68	<0.78	<0.62	<0.68	<0.64	
Cadmium	0.68	*1.5*	<0.5	<0.4	<0.4	**24.3**	**0.68**
Chromium	20.2	39.4	20	7.1	9.2	35.9	52.3
Copper	3.9	5.6	8.1	<3.1	<3.4	5.5	18.7
Lead	1.3	1.7	11.3	1.8	2.9	2.3	30.2
Manganese	25.2	13.9	436	33.6	63	38.4	
Mercury(7471)	<0.013	<0.014	0.04	<0.012	<0.014	0.04	
Nickel	6.8	8.9	5.9	1.9	3.1	9	15.9
Selenium	<1.3	<1.4	<1.6	<1.2	<1.4	<1.3	
Silver	<0.27	<0.27	<0.31	<0.25	<0.27	<0.26	0.73
Thallium(7841)	<0.27	<0.27	<0.31	<0.25	<0.27	<0.27	
Zinc	12.2	16.3	26.3	8	10.1	51.4	124

* Stations in 1000's feet above Station 0+000.

** Buchman, 1999.

2005 Sampling/Testing Sediment Cadmium Concentration (mg/kg dry wt)

STATION	AVG Cd CONC (mg/kg) to -54 ft	AVG Cd CONC (mg/kg) to -51 ft
+2+750	1.03	0.86
+0+250	1.07	1.01
-7+000	0.86	0.69
-17+000	1.89	1.73
-27+000	0.65	0.83
-34+500	0.38	0.41
-36+500	0.34	0.32
-37+500	0.84	0.82
-45+000	0.31	0.31
-50+000	0.66	0.45
-54+500	0.69	0.52
-56+500	0.48	0.39
-57+000	0.50	0.43
-63+000	0.31	

For comparison purposes, the following table shows the results of grab sample metals analyses at the Savannah ODMDS in 1998 as dry weight.

Sample #	DA-14	DA-15	DA-16	DA-17	DA-18	DA-19
Al %	0.127	<0.0903	<0.0873	0.105	0.162	<0.0777
As ug/g	3.23	3.95	1.54	4.14	2.2	0.906
Cd ug/g	<0.0329	<0.0355	<0.0343	<0.0346	0.0373	<0.0305
Cr ug/g	4.56	2.35	1.98	4.09	4.93	2.02
Cu ug/g	0.38	<0.307	0.296	0.299	0.504	0.352
Fe %	0.21	0.144	0.0895	0.168	0.195	0.0795
Pb ug/g	1.32	1.14	<0.160	0.528	0.584	0.589
Mn ug/g	41.4	28	21.8	44.3	30.3	12.8
Ni ug/g	<1.80	<1.94	<1.88	<1.89	<1.91	<1.67
Se ug/g	0.0598	<0.0343	<0.0331	<0.0334	0.291	0.0581
Ag ug/g	<0.0194	<0.0209	<0.0202	<0.0203	<0.0205	<0.0179
Sn ug/g	0.817	1.02	<0.771	<0.777	<0.785	<0.686
Zn ug/g	5.13	3.07	2.67	4.09	4.73	3.08

b. If one of the exclusionary criteria is met, items 3 through 6 below need not be addressed.

Based on the foregoing analysis, the Savannah District believes that the new work dredged material proposed for placement in the Savannah ODMDS is substantially the same as the substrate at the ODMDS. Furthermore, the new work dredged material is far removed from known existing and historical sources of pollution. Therefore, there is reasonable assurance that such material has not been contaminated by such pollution. Since Savannah District believes the proposed dredged material

meets the exclusionary criteria and in accordance with guidance in Appendix C of the Regional Implementation Manual (RIM), items 3 through 6 (Need for Testing, Water Column Determinations, Benthic Screen, Benthic Determinations) are not addressed here.

Although Savannah District has provided information indicating that the exclusionary criteria at 40 CFR § 227.13(b)(3) have been met, Savannah District is performing further detailed analyses (sampling, physical characterization, and sediment bioassays) of the new work sediments to support the determination that the exclusionary criteria have been met and the new work sediments are suitable for placement in the Savannah ODMDS. EPA Region 4 reviewed the Sediment Analysis Plan and Quality Assurance Project Plan (SAP/QAPP) prior to the work being initiated. The District will provide the test results and analysis to EPA for their approval prior to initiating dredging on the entrance channel.

8. Non-Testing Related Regulatory Issues: Subparts B, C, D and E of 40CFR§227

a. Subpart B - Environmental Impact

i. §227.4 Criteria for Evaluating Environmental Impact

The District believes the proposed work will result in: (a) No unacceptable adverse effects on human health and no significant damage to the resources of the marine environment; (b) No unacceptable adverse effect on the marine ecosystem; (c) No unacceptable adverse persistent or permanent effects due to the dumping of the particular volumes or concentrations of these materials; and (d) No unacceptable adverse effect on the ocean for other uses as a result of direct environmental impact.

ii (a). §227.5 Prohibited Materials

The proposed work is not expected to contain any prohibited materials listed at 40 CFR § 227.5. The proposed sediments are new work sediments from the open ocean and are not expected to contain such materials.

ii (b). §227.6 Constituents Prohibited as other than Trace Contaminants.

The proposed work is not expected to contain any constituents prohibited as other than trace contaminants. The proposed sediments are new work sediments from the open ocean and are not expected to contain such materials. Sediment sampling from 2005 has shown that sediments with elevated cadmium levels do not occur in the bar channel. Sampling results from 2005 indicate that average cadmium levels of 0.86 to 1.73 mg/kg should be expected in the sediments proposed for placement in the ODMDS. At 40 CFR § 227.6(f), it is stated that the prohibitions and limitations do not apply when the applicant can demonstrate that such constituents are non-toxic to marine life and non-bioaccumulative in the marine environment. These observed sediment cadmium levels are below the published Probable Effects Level (PEL) for marine sediments of 4.2 mg/kg cadmium, as published in Buchman, 1999. Furthermore, discussions and evaluations in Appendix M show there is little environmental concern for either toxicity or bioaccumulation of cadmium in sediments containing less than 4 mg/kg cadmium.

iii. §227.7 Limits established for specific wastes or waste constituents - address presence of pathogens, biological pests, non-indigenous species.

The proposed sediments are not expected to contain liquid waste constituents immiscible with or slightly soluble in seawater or radioactive materials. Because the proposed sediments are new work sediments and would be placed in an area close to the dredging site, the work should not extend the range of biological pests, viruses, pathogenic microorganisms or other agents capable of infesting, infecting or extensively and permanently altering the normal populations of organisms; the work should not degrade uninfected areas or introduce viable species not indigenous to an area. The proposed sediments are not expected to be highly acidic or alkaline and should not change the acidity or alkalinity of water at the ODMDS. The sediments are also not expected to contain significant amounts of biodegradable constituents that would depress dissolved oxygen by more than 25 percent below the normally anticipated ambient conditions in the disposal area at the time of dumping. Appendix M also discusses the low potential for effects from radioactive substances.

iv. §227.8 Limitations on the Disposal Rates of Toxic Wastes;
v. §227.9 Limitations on Quantities of Waste Materials
vi. §227.10 Hazards to Fishing, Navigation, Shorelines, or Beaches

The proposed work does not include disposal of toxic wastes, containerized wastes, or -insoluble wastes. The proposed work will not present a serious obstacle to fishing or navigation; therefore, the proposed work will not cause unacceptable interference with fishing or navigation. Proposed placement of dredged material in the Savannah ODMDS is not expected to present hazards to fishing, navigation, shorelines, or beaches.

b. Subpart C - Need for Ocean Dumping

i. For federal projects, provide authorization and reference Feasibility Study or other NEPA document providing assessment of disposal alternatives.

The proposed new work dredging, transport, and placement in the Savannah ODMDS is covered in the SHEP EIS, in which this evaluation is contained as Appendix R. The EIS contains a discussion of disposal alternatives.

(a) In accordance with at 40 CFR § 227.15
(1) No useful or feasible treatment is required for this material prior to dumping.
(2) The concept of raw materials and manufacturing or other processes resulting in the waste is not applicable to the proposed dredged material.
(3) The proposed work has been evaluated with respect to the relative environmental risks, impact and cost for ocean dumping as opposed to other potential alternatives including but not limited to: land fill, well injection, incineration, spread of material over open ground, recycling of material for reuse, and additional biological, chemical, or physical treatment of intermediate or final waste streams, and storage. None of these alternatives were determined to be feasible. Placement of a portion of the inner reaches of the proposed work in the Jones/Oysterbed dredged material containment area may be feasible and undertaken depending on conditions present at the time of construction.

(4) Irreversible or irretrievable consequences of the use of alternatives to ocean disposal have been identified for all proposed alternatives to ocean disposal.

(b) In accordance with at 40 CFR § 227.16. The District has demonstrated a need for ocean dumping by conducting a thorough evaluation of the factors listed in § 227.15 and determining that the following conditions exist where applicable:

(1) There are no practicable improvements which can be made in process technology or in overall waste treatment to reduce the adverse impacts of the waste on the total environment;

(2) There are no practicable alternative locations and methods of disposal or recycling available, including without limitation, storage until treatment facilities are completed, which have less adverse environmental impact or potential risk to other parts of the environment than ocean dumping.

ii. For non-federal projects, the alternative disposal alternatives should be summarized and assessed. The final determination is made in the USACE Statement of Findings on whether or not to grant the permit.

Not applicable.

c. Subpart D - Impact of the Proposed Dumping on Aesthetic, Recreational, and Economic Values

i. Reference appropriate section(s) of the site designation EIS/EA to address potential impacts of disposal at the site on recreational fisheries, commercial fisheries, shore recreation, and cultural resources with regard to disposal of dredged material at the site.

According to the Final EIS for Savannah, GA, Charleston, SC, and Wilmington, NC, Ocean Dredged Material Disposal Site Designation, EPA Criteria and Standards Division (WH-585), Washington, DC, page 2-7, "The existing Savannah ODMDS is seaward of valuable fishing grounds and is not adjacent to hard-bottom or artificial reef areas. Furthermore, no known cultural or economic resources occur within the vicinity of the site….Disposal has occurred at this site since 1964 and only minor, temporary increases in turbidity, smothering of benthic infauna, and sediment accumulation have been detected." Potential impacts from the proposed work are expected to be similar.

ii. Address visible characteristics.

As stated above, only minor, temporary increases in turbidity, smothering of benthic infauna, and sediment accumulation are expected from the proposed work. Because sediments proposed for placement in the Savannah ODMDS are expected to be similar to those currently at the site, overall changes in visible characteristics of the site should be minimal.

iii. Address presence of toxics and bioaccumulative chemicals (reference 6 above).

Because the proposed new work sediments and overlying maintenance materials are expected to be predominantly sands and occur along the entrance channel, the presence of toxics and bioaccumulative chemicals is not expected and would be highly unlikely. The results of chemical analysis of the new work sampling are discussed in detail in the Sediment Quality Evaluation SHEP, December 2011, Appendix M of the SHEP EIS. Organics were, for the most part, non-detect. Metal results for the bar channel samples were shown previously on pages 14 and 15. The only result of potential concern was

cadmium found at Station -75+000B. This sample was taken near the old RACON tower site and is thought to have been influenced by contamination around the tower. Resampling in the vicinity of this station found no elevated cadmium.

iv. Address pathogens (reference 7.a.iii above).

The majority of the proposed work is new work sediments with a minor O&M component. These sediments occur along the entrance channel to Savannah Harbor. Both the entrance channel and the ODMDS are in adjacent open ocean environments. If pathogens existed in the area, their occurrence is just as likely in both the dredging and placement sites. The proposed action is not expected to spread any pathogens beyond their current range.

d. Subpart E - Impact of the Proposed Dumping on other Uses of the Ocean
- reference appropriate section(s) of the site designation EIS/EA.

The site designation EIS identified no other uses of the ocean that would be impacted by the continued use of the Savannah ODMDS for dredged material placement.

i. § 227.20. Basis for determination.
   (a) Based on current state-of-the-art, the District has not identified any long-range impact the proposed work would have on other uses of the ocean.
   (b) The District has conducted an evaluation of the effect of the proposed dumping of SHEP construction materials on uses of the ocean for purposes other than material disposal. The factors considered in this evaluation are the factors listed at Subpart D. This evaluation is based on the impact of the proposed dumping on specific uses of the ocean rather than on overall esthetic, recreational and economic values.

ii. § 227.21. Uses considered in the evaluation include those listed at § 227.2.

iii. § 227.22. Assessment of impact. In conducting the assessment of impact on other uses of the ocean, the District considered both temporary and long-range effects within the state-of-the-art, but placed particular emphasis on any irreversible or irretrievable commitment of resources that would result from the proposed dumping. The District believes that temporary and long-range effects of the proposed dumping would be minimal and that no irreversible or irretrievable commitment of resources would occur.

9. MPRSA Section 103 Conditions

a. Requirements (management options) to meet the Ocean Disposal Criteria

i. Disposal zones or minimum distances from the disposal site boundaries

All placement actions will be at least 100 meters (330 feet) inside the boundary of the ODMDS.

ii. Ambient disposal conditions (e.g., current or tidal conditions)

The District believes that no disposal restriction is warranted, taking into account ambient conditions at the ODMDS.

iii. Limits on disposal vessel size or discharge rates

The District believes that no restrictions on vessel size or discharge rates are warranted. The ongoing modeling will provide additional information on this issue. The results of the modeling will be included in the Section 103 Evaluation.

b. Requirements necessary to meet site designation conditions

There are no applicable requirements in the site designation conditions.

i. Grain size limitations

There are no grain size limitations for use of the Savannah ODMDS. The proposed new work dredged material is expected to consist predominantly of sands. Savannah District will provide the results from the ongoing tests and analyses to EPA for their approval prior to initiating dredging on the entrance channel.

ii. See 40 CFR Section 228.15(h). According to 40 CFR § 228.15(h), the disposal of dredged material into the ODMDS is restricted to dredged material from the Savannah Harbor area. The proposed new work sediments would be from the Savannah Harbor Navigation Project; therefore, 40 CFR § 228.15(h) does not impose any additional conditions.

c. Requirements necessary to meet the requirements of the disposal site SMMP.

The Savannah ODMDS SMMP is currently under review. The following information reflects the District's current understanding, but is subject to change prior to finalization of the SMMP. The USACE will ensure that final conditions in the new Savannah SMMP are made a part of dredging contracts for the Savannah Harbor Expansion Project and the O&M Navigation Project.

i. Disposal zones

In the past, there have been no disposal zones for the Savannah ODMDS. However, for this deepening project, dredged sediment shall be disposed in the southern two-thirds of the site.

ii. Limits on oceanographic conditions for disposal

Disposal shall occur no less than 100 meters (330 feet) inside the site boundaries to comply with 40 CFR §227.28.

The District will prevent mounded dredged material from becoming an unacceptable navigation hazard. Dredged material shall be placed so that at no point will depths be less than -25 feet Mean Lower Low Water (MLLW) (i.e., a clearance will be maintained 25 feet above the bottom), where a depth of -30 feet MLLW is the warning threshold for monitoring and management purposes. If -30 feet is reached, then management decisions will be made on future sediment placement to avoid exceeding the -25 foot MLLW threshold.

The physical removal or leveling of material deposited above -25 feet MLLW is a management alternative should mound heights occur that are higher than those elevations. This would most likely be accomplished by physically moving the materials by bed-leveler or other mechanical means to adjacent spots within the ODMDS.

Disposal shall be limited within the disposal release zone and shall be completed (doors closed) prior to departing the ODMDS.

iii. Disposal monitoring requirements

For all disposal activities, an electronic tracking system (ETS) must be used. The ETS will provide surveillance of the transportation and disposal of dredged material. The ETS will be maintained and operated to continuously track in real-time the horizontal location and draft condition (nearest 0.5 foot) of the disposal vessel (i.e. hopper dredge or disposal scow) from the point of dredging to the disposal site, and return to the point of dredging. Data shall be collected at least every 500 feet during travel to and from the ODMDS and every minute or every 200 feet of travel, whichever is smaller, while approaching within 1,000 feet of the boundary of the ODMDS. The following information shall be electronically recorded for each disposal cycle:

a. Contractor Name
b. Load Number
c. Disposal Vessel Name and Type (e.g. scow)
d. Tow or Trawler Vessel Name (if applicable)
e. Captain of Disposal or Tow/Trawler Vessel
f. Estimated Volume of Load
g. Description of Material Disposed
h. Source of Dredged Material
i. Date, Time and Location at Initiation and Completion of Disposal Event

It is expected that disposal monitoring will be conducted using the National Dredging Quality Management (DQM) Program for Civil Works projects [see http://dqm.usace.army.mil/Specifications/Index.aspx], although other systems may be deemed acceptable upon mutual agreement between the District and EPA. Disposal monitoring and ETS data are expected to be reported to EPA Region 4 on a weekly basis using the eXtensible Markup Language (XML) specification and protocol per Section 3.5. EPA Region 4 and the USACE District shall be notified within 24 hours if disposal occurs outside of the ODMDS or specified disposal zone or if excessive leakage occurs. Excessive leakage is any change in draft exceeding 1.5 feet from the point of departure from the dredging site to the disposal site.

Post-Discharge Monitoring. The USACE will conduct a bathymetric survey within 60 days after disposal project completion. [Surveys will not be required for projects less than 50,000 cubic yards.] Surveys will conform to the minimum performance standards for Corps of Engineers Hydrographic Surveys for "Other General Surveys & Studies" as described in the USACE Engineering Manual, EM1110-2-1003, *Hydrographic Surveying*, dated January 1, 2002 [http://140.194.76.129/publications/eng-manuals/em1110-2-1003/toc.htm]. The number and length of transects required will be sufficient to encompass the ODMDS and a 500-foot wide area around the site. The survey area may be reduced on a case-by-case basis if disposal zones are specified and adhered to. The surveys will be taken along lines spaced at 500-foot intervals or less. The minimum performance standards from Table 3-1 in *Hydrographic Surveying* shall be followed. Horizontal location of the survey lines and depth sounding points will be determined by an automated positioning system using either a microwave line of site system or differential global positioning system. The vertical datum will be referenced to prescribed NOAA Mean Lower Low Water (MLLW) datum, 1983-2001 epoch, as shown on the Tidal Benchmark sheet for St. Simons Island, GA (Station ID: 8677344). MLLW is 3.23 feet below NGVD 1929. The horizontal datum will be Georgia State Plane (zone 1001 GA East, NAD 1983). Bathymetric surveys will be used to monitor the disposal mound to ensure a navigation hazard is not produced, and to assist in verification of material placement, to monitor bathymetric changes and trends, to aid in environmental effects monitoring, and to ensure that the site capacity is not exceeded, i.e., the mound does not exceed the site boundaries. Copies of these surveys shall be provided to EPA, Region 4 when completed.

The interagency team will meet to review the results of the bathymetric surveys and determine the need for additional information. This need will be based on observance of any anomalies or potential adverse impacts associated with a specific event. If the results of the bathymetric surveys do not indicate any anomalies or adverse impacts, no additional monitoring will be required for the disposal event. Reassessment of the site may be undertaken, possibly every 10 years. This reassessment may include benthic macrofaunal and sediment chemistry surveys. Additional surveys for water quality, sediment mapping, or the use of remote sensing equipment may also be required.

iv. Reporting requirements

Disposal monitoring data are expected to be provided to EPA Region 4 electronically on a weekly basis. Data shall be provided per the EPA Region 4 XML format (USEPA, Region 4, 2007) and delivered as an attachment to an email to DisposalData.R4@epa.gov. The XML format is available from EPA Region 4.

Disposal summary reports shall be provided to EPA within 90 days after project completion. These reports should include: dates of disposal; dredging project; volume disposed, number of loads completed, type of material disposed; contractor conducting the work, permit and/or contract number; identification of any misplaced material; and dates of bathymetric surveys of the ODMDS. The disposal summary reports should be accompanied by the bathymetry survey results (paper plot and X, Y, Z ASCII data file), track plots for each disposal trip, a scatter plot of all dump locations, and a summary table of the information required by Section 3.2. If all data are provided in the required XML format, track plots, scatter plots and summary tables will not be necessary.

The Corps contractor will prepare USACE daily reports of operations and a monthly report of operations for each month or partial month's work. The Corps contractor will also be required to notify USACE and EPA within 24 hours (or next business day) if a violation of the permit and/or contract conditions occur during disposal operations.

d. All conditions must be implemented through permit conditions or contract specifications for federal projects. The draft permit conditions/contract specification must be included as part of the MPRSA Ocean Disposal Evaluation Documentation. These are typically available from the SMMP.

The District plans to incorporate contract specifications that are prescribed in the final SMMP into the dredging contract(s) for the proposed work. Final contract specifications for the proposed new work will be written once final designs have been completed. Those specifications currently do not exist. The following pages are applicable portions of the contract specifications for O&M work conducted in the entrance channel in FY11 (selected portions of the dredging section and the entire DQM Section). The new work specifications are expected to be similar.

SECTION 35 20 23
DREDGING
04/06
PART 1 GENERAL
1.1 SUBMITTALS
1.1.1 National Dredging Quality Management Program
Documentation verifying the National Dredging Quality Management Program (DQM), formerly known as Silent Inspector (SI) system has been certified by the Engineer Research and Development Center (ERDC) within the last year shall be provided within the Contractor Quality Control (CQC) Plan. The DQM system shall be in operation throughout dredging and disposal operations.
1.2 WORK COVERED BY THIS CONTRACT
The Contract price includes mobilization and demobilization, dredging and disposal of materials, and disposal area operations as directed by the Contracting Officer. The work covered by this section consists of furnishing plant, labor, and materials as necessary to complete the work as indicated by the Contract and as directed by the Contracting Officer (CO).
1.3 WORK COVERED BY THIS SECTION
Operations consist of the dredging and disposal of material indicated in the specifications and drawings. Do not use drag beams, bed levelers or other such devices. Move dredge plant as necessary to facilitate proper dredge operations. Remove material above the required depth shown on the Contract Drawings and additional shoaling which may have occurred by the time of the Before Dredging Surveys within the construction limits at the unit price for Items 0002 - 0007. The Contracting Officer may waive the requirement to remove material above the required depth if the Government does not consider it a hazard to navigation. Properly dispose of dredged material properly and monitor the Ocean Dredged Material Disposal Sites (ODMDS) in accordance with this Contract.
1.3.2 Savannah Harbor
Dredging shall commence no earlier than 15 December 2011 and shall be completed by 31 March 2012. The dredging for this Contract is between Stations 0+000 and -60+000B. Channel dimensions to be provided are shown on the Contract drawings. The required depth for material removal is -44.0 ft. MLLW.
1.4 ORDER OF WORK
After the initial harbor maintenance dredging has been completed, the dredge shall proceed to the other harbor and dredge there. Simultaneous dredging in both harbors is allowed within the stated environmental windows. In each harbor, the order of work shall be as follows or as directed by the CO or the Contracting Officer's Representative (COR), based on conditions shown on the Before Dredging Survey. Dredging shall begin at the furthermost point from the ocean disposal site and progress successively toward the nearest point. The order of work for dredging shall be directed insofar as practicable to provide for efficient operation of the dredging equipment. Dredging for navigation needs shall be given priority and the Contractor will be directed to dredge in areas that are, in the opinion of the CO, more advantageous to the Government. Orders to the Contractor's representative at the site will be in writing based on acceptance sections as shown on the Contract drawings.
1.5 PLAN AND SCHEDULE OF WORK
Submit a dredging plan within 5 days after Notice to Proceed, to be approved by the CO prior to dredging. The dredging plan shall include the dredging plant the Contractor intends to use on each acceptance section and the schedule indicating starting and completion dates for dredging each section. The Contractor's dredging and disposal plan and schedule shall ensure the following:
a. Dredge size and production rates
b. Performance of work is in strict accordance with the Contract
c. Completion of the work is within the time allowed by the Contract
1.5.1 Dredging Plan
The dredging plan shall include, but is not limited to, the following:
a. A description and schedule of the operations performed in connection with the removal and transport of material. The operations shall be described in the sequence in which they are performed.
b. A description of the plant (including names of dredges) and

equipment utilized in connection with the removal and transport of material.
c. Plant to be used in each acceptance section.
1.8.2 Savannah Harbor
The Savannah ODMDS is currently authorized for disposal of dredged material. Placement is allowed only within the ODMDS. Bin loads are restricted to 12,000 cubic yards. The navigation channel is not an authorized disposal area, and the use of bed leveling or similar devices is not permitted. The maximum distance that the material is transported shall not exceed 11 miles. Bids received will be based on utilizing only the area described above.
Material shall not be placed in the ERDC nearshore disposal area.
1.8.3 Use of Other Disposal Areas
Material deposited elsewhere than in places designated or approved by the Contracting Officer will not be paid for and the Contractor may be required to remove such misplaced material and deposit it where directed by the Contracting Officer at the Contractor's expense. The use of hopper, mechanical, and/or pipeline dredges to dispose of dredged material is permitted.
1.8.4 Navigational Devices
a. To ensure that material is being deposited within the limits of the designated ocean disposal area, each vessel used for the transportation of dredged material from the work site to the ocean disposal area shall be equipped with two navigational recording devices for use during transit to and from the ocean disposal area and during dumping operations. One of these shall be either a chart or map recorder with a scaled grid that shows the beginning and ending location of each dump, either latitude/longitude or Georgia State plane coordinates. The other recording device shall be a computer to generate reports containing the information described in Paragraph Dump Logs, below. The use of a loran navigation device is not suitable for use as the primary vessel positioning system.
b. Both navigation recording devices shall be used simultaneously throughout the project. If 1 of the recording devices stops functioning, repair or replace it immediately upon return to the work site and continue to use the second device. If both recording devices stop functioning, outfit at least 1 recording device on the vessel upon return to the work site.
c. No vessel shall leave for the dump site without at least one operational navigation recording device. Under extreme emergency conditions as determined by the CO and when no recording device is operational, the vessel may be allowed to complete one loading and dump cycle. During this one loading and dump cycle, the Contractor shall manually record the vessel position at 2-minute intervals by either listing the vessel coordinates or graphically plotting the vessel position on a map. After dumping, the vessel shall not be allowed to resume dredging until both navigational recording devices are operational.
1.8.5 Dump Logs
The daily dump logs shall show the following for each dump:
a. The dump number
b. Date
c. Time dump began
d. The location in the entrance channel from which the dredged material came (give from/to dredging stations)
e. The beginning and ending coordinates for which dredging was conducted for the load
f. The beginning (hopper opened) and end (hopper closed) coordinates for each dump
g. The name of the site in which the load was placed
h. The number of cubic yards in each dump
i. Brief description of the material in each dump (e.g., clean, coarse sand; sand and shell; sand mixed with clay and shell; dark organic silt sand; debris; etc.)
At the end of the Contract, prepare a computer-generated report on a disc for the entrance channel which encompasses the required information listed above. These data shall be provided in an ASCII, delimited format, capable of being imported into a spreadsheet, such as an Excel spreadsheet.

1.8.6 Track Plot
When disposal operations are complete, provide to the COR 2 scatter plots on a disc using small dots showing where each load was deposited (beginning of each dump). One plot shall be on a scale of 1 inch equals 1500 feet (to fit an 8-1/2 x 11-inch paper), and the other plot shall be to a scale of 1 inch equals 500 feet (to fit a full-size blue line drawing). The plots shall also show the boundaries of the ODMDS. Each plot line shall indicate the load number associated with the plot. Provide this information on disc only, not hard copy.
1.8.7 Release of Load
Loads shall be released at least 110 yards inside the ODMDS boundary.
Savannah Harbor:
0002 0+000B to -30+000B* -44.0 81,000 150,000 231,000
0003 -30+000B to -40+000B* -44.0 100,000 198,000 298,000
0004 -40+000 to -60+000B* -44.0 100,000 178,000 278,000
1.11.1 Savannah Harbor
Acceptance Section Stations
1 0+000 to -10+000B
2 -10+000B to -20+000B
3 -20+000B to -30+000B
4 -30+000B to -45+000B
5 -45+000B to -60+000B
1.12 MEASUREMENT AND PAYMENT
For purposes of acceptance, dredge in accordance with the COR's written orders to the Contractor.
1.12.1 Measurement
a. Material removed and paid for under the Contract shall be measured by the cubic yard in situ by computing the volume within the required dredging prism between the bottom surfaces shown by soundings of the last survey made before dredging and the bottom surface shown by the soundings of a survey made as soon as practicable after the work has been completed, less deductions that may be required for excessive dredging, as described in Paragraph OVERDEPTH AND SIDE SLOPES, above, and misplaced material, as described in Paragraph DISPOSAL OF EXCAVATED MATERIAL, below. After dredging surveys will be made upon written request by the Contractor. The bin and scow measurement method (see Paragraph Records and Verification of Hopper Dredge Load meter System, below) will only be used to determine monthly partial payment when weather prevents the use of hydrographic surveying equipment.
b. The maps and drawings already prepared (see Contract Clause "CONTRACT DRAWINGS, MAPS, AND SPECIFICATIONS (DFARS 52.236-7001)") are believed to accurately represent conditions existing at the time surveyed, but the depths shown thereon will be verified and corrected by soundings taken within 14 days before dredging. Determination of quantities removed and the deductions made therefrom to determine quantities by place measurement to be paid for in the area specified, after having once been made, will not be reopened, except on evidence of collusion, fraud, or obvious error.
1.12.2 In-Place (Survey) Method of Measurement
1.12.3 Records and Verification of Hopper Dredge Loadmeter System
a. During the first full day of dredging, the Contractor shall furnish sufficient documentation to enable the CO to determine the quantity of material dredged. This documentation shall include the time, place dredged, and quantity of each load hauled and, for hopper dredges, the loadmeter chart. In addition, the Contractor shall demonstrate the accuracy of its bin measurement system to the COR, using displacement curves and hopper capacity tables. These documents are acceptable to the Government if prepared by the vessel's builder or a qualified engineering firm (other than the Contractor) and notarized.
b. If the Contractor cannot demonstrate the accuracy of its loadmeter to the satisfaction of the COR by completion of the first full day of dredging, the Contractor shall hire a registered marine architect or engineer to certify the accuracy of the loadmeter and ullage table and to provide the results to the COR by the completion of the first week of dredging.
1.12.4 Loadmeter Calibration
1.12.4.1 Hopper Dredges

a. The bin measure system senses changes in draft due to loading and displays the draft changes in the form of displacement changes (weight). Displacement changes are mathematically adjusted to determine the number of cubic yards of in-place density material hauled. This adjustment requires the average in-place density of the material to be dredged. For this Contract, an in-place density of 1,800 grams per liter shall be used. Hopper dredges shall be equipped with a loadmeter which displays the loading process as a function of time on a permanent record.
b. Lightship calculations shall be performed prior to commencement of dredging and subsequent calculations shall be made each time there is an appreciable change in the weight of the vessel (prior to and after taking on fuel, water, heavy equipment, etc.). The COR will be present when the lightship readings are taken and when the calculations are made. Provide a copy of the calculations to the COR immediately after lightship is determined. Daily adjustments of lightship shall be made using fuel and water soundings to determine the weight change. The change shall be documented on the Contractor's daily report and appropriate calculations shall be shown. Appreciable change in weight does not include the loading and unloading of dredge material. Draft markings (port bow, port stern, starboard bow, and starboard stern) shall be legible and adequate to perform an accurate lightship determination. Wetship calculations shall not be used as an alternate method to determine lightship.
1.12.4.2 Scows
The bin measurement for scows shall be determined by averaging a minimum of 4 draft mark readings to determine the mean depth of load, and from it, the volume of the load. The use of loadmeters on scows is optional.
as appropriate. Dredges shall also be equipped with a cellular telephone on the bridge for Corps of Engineers communication with the dredge and inspectors. Final acceptance of the plant will not be made until the radio-telephone is installed and in good working order.
2.2 DISPOSAL EQUIPMENT
The use of self-load bottom dump barges and hopper dredges to dispose of dredged material will be permitted.

SECTION 35 20 23.23
NATIONAL DREDGING QUALITY MANAGEMENT PROGRAM HOPPER DREDGE
04/2011
PART 1 GENERAL
1.1 DESCRIPTION
1.2 SUBMITTALS
1.3 PAYMENT
1.4 NATIONAL DQM PROGRAM CERTIFICATION
1.5 DREDGE PLANT INSTRUMENTATION PLAN (DPIP)
PART 2 PRODUCTS
PART 3 EXECUTION
3.1 REQUIREMENTS FOR REPORTED DATA
3.1.1 Date and Time
3.1.2 Load Number
3.1.3 Vessel Horizontal Positioning
3.1.4 Draghead Horizontal Positioning
3.1.5 Hull status
3.1.6 Dredge Course
3.1.7 Dredge Speed
3.1.8 Dredge Heading
3.1.9 Tide
3.1.10 Draft
3.1.11 Hopper Ullage
3.1.12 Hopper Volume
3.1.13 Displacement
3.1.14 Empty Displacement
3.1.15 Draghead depths
3.1.16 Slurry Densities of Dragarms
3.1.17 Slurry Velocities of Dragarms
3.1.18 Pump RPM
3.1.19 Dragarm Production Criteria
3.1.19.1 Minimum Pumping Effort
3.1.19.2 Pumping Water

SECTION 35 20 23.23
NATIONAL DREDGING QUALITY MANAGEMENT PROGRAM HOPPER DREDGE
04/2011
PART 1 GENERAL
1.1 DESCRIPTION
The work under this Contract requires use of the National Dredging Quality Management Program (DQM), formerly known as Silent Inspector (SI), to monitor the dredge's status during the Contract, and to track load number, time-position history, instrument readings, vessel state, compute tons dry solids, report data, and manage data history.
This performance-based Section identifies the minimum required output and precision and instrumentation requirements. The requirements may be satisfied using equipment and technical procedures selected by the Contractor. For purposes of this document, Contracting Officer's Representative (COR) will include the DQM Support Team personnel when on site.
1.2 SUBMITTALS
Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office responsible for review of the submittal for the Government. "SAM" Indicates the Mobile District, Operations Division; "SAS" indicates the Savannah District. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
SD-01 Preconstruction Submittals
Dredge Plant Instrumentation Plan; G, SAM
Plan Addenda And Modifications; G, SAM
Contractor Quality Control Plan; G, SAS
SD-06 Test Reports
Data Appropriately Archived e-mail; G, SAS
SD-07 Certificates
National DQM Program Certification; G, SAS
1.3 PAYMENT
No separate payment shall be made for installation, operation, and maintenance of the DQM certified system as specified herein for the duration of the dredging operations; costs in connection therewith shall be considered a subsidiary obligation of the Contractor and covered under the Contract unit prices for dredging in the bidding schedule.
SECTION 35Entrance Channel Maintenance Dredging 11B01
1.4 NATIONAL DQM PROGRAM CERTIFICATION
The Contractor is required to have a current certification from the

National DQM Program for the hopper dredge instrumentation system to be used under this Contract. Criteria for certification shall be based on the most recent specification posted on the National DQM Program website (http://dqm.usace.army.mil/Specifications/Index.aspx). Compliance with these criteria shall be verified by on-site plant inspections conducted by DQM Support Center Inspection Team personnel, and by periodic review of the transmitted data. A National DQM Program Certification is valid for one year from the date of the annual inspection. Certification is contingent upon the system's ability to continuously meet the performance requirements as outlined in Paragraphs PERFORMANCE REQUIREMENTS and CONTRACTOR QUALITY CONTROL. If issues with data quality are not corrected within 48 hours, the system certification shall be revoked and recertification may be necessary. Annual inspection shall include:

- A series of quality assurance checks as described in Paragraph COMPLIANCE INSPECTION AND QUALITY ASSURANCE CHECKS
- Verification of data acquisition and transfer (paragraph PERFORMANCE REQUIREMENTS)
- Review of the Dredge Plant Instrumentation Plan (DPIP) as described in paragraph DREDGE PLANT INSTRUMENTATION PLAN (DPIP)

Engage personnel who are familiar with the system instrumentation and who have the ability to recalibrate the sensors on site during the inspection. Provide transportation from the shore to the platforms with a DQM certified system for the COR in a timely manner. As a general rule, inspection teams will come with PPE consisting of hardhats, steel toe boots, and life jackets. If additional safety equipment is needed, such as eye protection, safety harnesses, work gloves or personal location beacons, provide these items to the team while on site.

The owner or operator of the dredge shall contact the DQM Support Center Inspection Team at dqmins@usace.army.mil on an annual basis, or at least 3 weeks prior to the proposed beginning of dredging, to schedule an inspection. This notification is meant to make the inspection team aware of a target date. At least 1 week prior to start of dredging, contact the inspection team and verbally coordinate a specific inspection date and location. Follow-up this conversation with a written e-mail confirmation. The owner-operator shall coordinate the inspection with local authorities, including but not limited to, the Contracting Officer.

Re-inspection is required for yard work which produces modification to displacement (i.e. change in dredge lines, repositioning or repainting hull marks), modification to bin volume (change in bin dimensions or addition or subtraction of structure) or changes in sensor type or location; these changes shall be reported in the sensor log section of the DPIP. A system does not have to be transmitting data between jobs, however it may not be turned off, disconnected or removed from the dredge in order to retain its certification during this period.

1.5 DREDGE PLANT INSTRUMENTATION PLAN (DPIP)

File a digital copy of the DPIP with the National DQM Support Center. Maintain a copy of the DPIP, easily accessible to Government personnel, on the dredge. This document shall describe how sensor data is collected, how quality control on the data is performed, and how sensors/data reporting equipment are calibrated and repaired if they fail, including a description of computed dredge-specific data, and how the sensor data will be transmitted to the DQM Database. Submit plan addenda and modifications to the DQM Support Center, subsequent to its original submission, prior to start of work.

The DPIP shall include the following as a minimum:

(DPIP Table Of Contents shall be in the following order)

1. Dredging Company
a. Dredge Point of Contact
b. Telephone Number
c. Email address
2. Dredge Monitoring System Provider
a. Dredge Monitoring System Point of Contact
b. Telephone Number
c. Email address
3. Dredge Name
4. Sensor data collection method
a. Any averaging

b. Route from sensor to DQM computer
5. DQM Computer Hardware & Components
a. Brand names and specifications
b. User guides and owner manuals
6. Sensor repair, replacement, installation, modification or calibration methods
7. Dimensioned Drawings of the Dredge
a. A typical plan and profile view of the dredge showing:
i. Hopper dredge cross section
ii. Locations of required sensors referenced to:
(1) Fore and aft perpendicular
(2) Hopper dredge length, depth, width, zero reference
(3) External hull draft markings (latitudinal, longitudinal, keel)
(4) Each other
iii. Overall dredge dimensions
iv. Dimensions of draghead
(1) Length
(2) Pipe inside diameter at sensor locations
(3) Offset to positioning system antenna
8. Criteria and method used to increment load number
9. Description of how the UTC date/time stamp is collected
10. Positioning system
a. Brand name and specifications
b. Dredge heading instrumentation brand name and specifications
c. Instrument used to calculate COG
d. Calculations done external to the instrumentation
e. Certificates of calibration and/or manufacturer certificates of compliance
f. Description of how dredge speed is determined
11. Tide
a. Description of how tidal information is entered into the data string.
12. Hull status
a. Instrumentation brand name and specifications
b. Certificates of calibration and/or manufacturer certificates of compliance
c. Calculations done external to the instrumentation
13. Drafts:
a. Instrumentation brand name and specifications
b. Certificates of calibration and/or manufacturer certificates of compliance
c. Calculations done external to the instrumentation
14. Displacement:
a. Method used by Contractor to calculate displacement based on fore and aft draft
b. Method used by Contractor to calculate lightship displacement
c. Hydrostatic curves
d. Tables listing (fresh and salt water) displacement as a function of draft certified by a licensed marine surveyor/ naval architect independent of the Contractor (feet and tenths of feet)
e. These methods and tables shall be an accurate reflection of the current configuration and displacement
15. Hopper Ullage:
a. Sensor brand name and specifications
b. Certificates of calibration and/or manufacturer certificates of compliance
c. Calculations done external to the instrumentation
16. Hopper Volume:
a. Method used by Contractor to calculate hopper dredge volume based on fore and aft hopper dredge ullage
b. Table listing the hopper dredge volume as a function of hopper dredge ullage, certified by a licensed marine surveyor/ naval architect independent of the Contractor (feet and tenths of feet).
c. These methods and tables shall be an accurate reflection of the current configuration and volume
17. Draghead

a. Draghead Depth
i. Sensor brand name and specifications
ii. Certificates of calibration and/or manufacturer certificates of compliance
iii. Calculations done external to the instrumentation
b. Draghead Depth Check
i. Method used
ii. If applicable sensor brand name and specifications
iii. If applicable certificates of calibration and/or manufacturer certificates of compliance
iv. If applicable, calculations done external to the instrumentation
c. Drag Head Position
i. Sensor brand name and specifications
ii. Calculations done external to the instrumentation
iii. Certificates of calibration and/or manufacturer certificates of compliance
18. Slurry Density and Velocity Sensors:
a. Sensor brand name and specifications
b. Calculations done external to the instrumentation
c. Certificates of calibration and/or manufacturer certificates of compliance
19. Pump RPM
a. Sensor brand name and specifications
b. Calculations done external to the instrumentation
c. Certificates of calibration and/or manufacturer certificates of compliance
d. Description of the pump for which the RPM is reported
20. Criteria used to determine
a. Minimum pump effort
b. Pumping water
c. Material recovery
d. Pumpout
21. Refractometer:
a. Brand
b. Resolution and accuracy
c. Method of calibration
22. Criteria used to determine open/closed status of hopper dredge
23. Documentation of:
SECTION 35 20 23.23 Page 7
Entrance Channel Maintenance Dredging 11B01
a. Test methods used by the Contractor to provide quality control of data
b. Verification that the reported values are applicable for the sensor and application
24. Remote log in information
a. Static IP address (Host)
b. Incoming and outgoing port settings (Host)
c. Username and password (Host)
25. Log of sensor performance and modifications
26. Log of Contractor data backup per Paragraph "Contractor Data Backup".
27. Quality Control Plan as per Paragraph "Contractor Quality Control":
a. Name of Quality Control Systems Manager
b. Procedures for checking collected data against know values
c. Procedures for verifying telemetry is functioning
d. Procedures for verifying DQM computer is on
e. Procedures for verifying DQMOBS is running
Changes to the computation methods shall be approved by the National DQM Program Support Center prior to their implementation.
PART 2 PRODUCTS
Not used.
PART 3 EXECUTION
3.1 REQUIREMENTS FOR REPORTED DATA
Provide, operate, and maintain the hardware and software to meet these specifications. Replace, repair, and calibrate sensors and other necessary

data acquisition equipment needed to supply the required data. Repairs shall be completed within 48 hours of sensor failure. Upon completion of a repair, replacement, installation, modification, or calibration, notify the COR, who may request re-calibration of sensors or other hardware components during the Contract as the COR deems necessary. Keep a log of sensor repair, replacement, installation, modification and calibration in the dredge's onboard copy of the DPIP. The log shall contain a three-year history of sensor maintenance to include: the time of sensor failures (and subsequent repairs), the time and results of sensor calibrations, the time of sensor replacements, and the time that backup sensor systems are initiated to provide required data. It shall also contain the name of the person responsible for the sensor work.

3.1.1 Date and Time

The date and time shall be reported to the nearest second and referenced to UTC time based on a 24 hour format; mm/dd/yyyy hh:mm:ss

3.1.2 Load Number

A load number shall document the end of a disposal event. Load numbering will begin at number 1 at the start of the Contract, and will be incremented by 1 at the completion of each disposal event or emptying of the hopper. Whenever possible, the load number shall be calculated off of the sensors aboard the dredge, and shall be a mathematically repeatable routine. Efforts shall be made to include logic that avoids false load number increments while also not allowing the routine to miss disposal events. If manual incrementing of the load number is in place, extra attention shall be paid to this value in the Contractor's quality control process (Paragraph "Contractor Quality Control").

3.1.3 Vessel Horizontal Positioning

Horizontal positioning of the antenna location shall be obtained using a Positioning System operating with a minimum accuracy level of 1 to 3 meters horizontal Circular Error Probable (CEP). Positions shall be reported as Latitude/Longitude WGS 84 in decimal degrees. West Longitude and South Latitude values are reported as negative.

3.1.4 Draghead Horizontal Positioning

Horizontal positioning of the dragheads shall be obtained using a Positioning System operating with a minimum accuracy level of 1 to 3 meters horizontal Circular Error Probable (CEP). Positions shall be reported as Latitude/Longitude WGS 84 in decimal degrees. West Longitude and South Latitude values are reported as negative.

3.1.5 Hull status

Open/closed status of the hopper dredge, corresponding to the split/non-split condition of a split hull hopper dredge shall be monitored. For dredges with hopper doors, the status of a single door that is the first opened during normal disposal operations may be monitored. An "OPEN" value shall indicate the hopper door is open, or in the case of split hull dredges, the hull is split. A "CLOSED" value indicates the hopper doors are closed, or in the case of split hull dredges, the hull is not split. For this Contract, hull status shall register closed prior to leaving the disposal area.

3.1.6 Dredge Course

Dredge course-over-ground (COG) shall be provided using industry standard equipment. Provide dredge course over ground to the nearest whole degree with values from 000 (true north) to 359 degrees referenced to a clockwise positive direction convention.

3.1.7 Dredge Speed

Dredge speed-over-ground shall be provided in knots using industry standard equipment with a minimum accuracy of 1 knot and resolution to the nearest 0.1 knot.

3.1.8 Dredge Heading

Dredge heading shall be provided using industry standard equipment. The dredge heading shall be accurate to within 5 degrees and reported to the nearest whole degree, with values from 000 (true north) to 359 degrees referenced to a clockwise positive direction convention.

3.1.9 Tide

Tide data shall be obtained using appropriate equipment to give the water level with an accuracy of +/- 0.1 feet and a resolution of 0.01 feet. Tide values above project datum described in the dredging specification shall be entered with a positive sign, those below with a negative sign.

3.1.10 Draft
Draft measurements shall be made in feet with an accuracy of +/- 0.1 foot, and reported with a resolution to the nearest 0.01 foot relative to the fore and aft draft marks. Industry standard pressure sensors, or an equivalent system, may be used. Two draft sensors, one fore and one aft, are required. At the discretion of the DQM Support Center, a system may use other means of measuring drafts if accuracies and resolution are maintained relative to the draft marks.
3.1.11 Hopper Ullage
Fore and aft hopper ullage values shall be measured to the nearest 0.01 foot with a minimum accuracy of +/- 0.1 foot relative to the hopper dredge's zero reference elevation. If only 2 sensors are used, they shall be mounted in locations as near as possible to the hopper dredge centerline, and away from discharge flume turbulence, foam, and structures that could produce sidelobe errors. If 1 sensor is offset to port or starboard, the other sensor shall be offset to the opposite side of the hopper dredge. If more than 1 fore or one aft sensor is used, they shall be placed near the corners of the hopper dredge and the average value of the fore sensors and the average value of the aft sensors shall be reported.
3.1.12 Hopper Volume
Hopper dredge volume shall be reported in cubic yards, based on the most accurate method available for the dredge. The minimum standard of accuracy for hopper dredge volume is interpolation from the certified ullage table, based on the average fore and aft ullage readings.
3.1.13 Displacement
Dredge displacement shall be reported in long tons, based on the most accurate method available for the dredge. The minimum standard of accuracy for displacement is interpolation from the displacement table, based on the average draft. For this Contract, the density of water used to calculate displacement shall be 1027 kg/cubic meter and shall be used for an additional interpolation between the fresh and salt water tables.
3.1.14 Empty Displacement
Empty displacement shall be reported in long tons, and shall be the lightship value of the dredge, or the weight of the dredge with no material in the hopper, adjusted for fuel and water consumption.
3.1.15 Draghead depths
Draghead depths shall be reported with an accuracy of +/- 0.5 feet and a resolution to the nearest 0.1 feet as measured from the surface of the water with no tidal adjustments. Minimum accuracies are conditional to relatively calm water.
3.1.16 Slurry Densities of Dragarms
A density metering device, calibrated according to the manufacturer's specifications, shall be used to record the slurry density of each dragarm to the nearest 0.0001 g/cc with an accuracy of +/- 0.001g/cc. If the manufacture does not specify a frequency of re-calibration, calibration shall be conducted prior to commencement of work.
3.1.17 Slurry Velocities of Dragarms
A flow metering device, calibrated according to the manufacturer's specifications, shall be used to record the slurry velocity of each dragarm to the nearest 0.0001 fps with an accuracy of +/- 0.001 fps. If the manufacture does not specify a frequency of re-calibration, calibration shall be conducted prior to commencement of work. The slurry velocity shall be measured in the same pipeline inside diameter as that used for the slurry density measurement.
3.1.18 Pump RPM
Pump RPM shall be measured with the highest level of accuracy that is standard on the vessel operational displays, either at the bridge, at the drag tenders controls, or in the engine room. Dredges with multiple pumps per side shall report RPM for the pump that best describes the dredging process (typically the outboard pump). If requirements of Paragraph "Dragarm Production Criteria" are determined based on pump RPM, then that value shall be reported.
3.1.19 Dragarm Production Criteria
For the purposes of DQM, a dragarm pump can only operate one of 3 ways and each shall be mutually exclusive of the other 2.
3.1.19.1 Minimum Pumping Effort
For Minimum Pumping Effort a "TRUE" value shall mean the hopper dredge

pumps are idling (assuring minimum dragarm intake velocity) or off. The logic can be triggered either with Pump revolutions per minute below a certain idle threshold or dragarm slurry velocity at or below the idle speed threshold (depending on the particular dredge plant and project). The only permissible values are "TRUE" and "FALSE". The criteria for minimum pump effort may be unique to each dredge.

3.1.19.2 Pumping Water

For Pumping Water a "TRUE" value shall indicate the dredge is not digging material but is pumping water (or very low-density material) through the dredge pump(s). For example, when the slurry density is less than 1.05 grams per cubic centimeter, the dredge is considered to be pumping water. Other parameters such as pump vacuum may be used to satisfy the pumping water requirement. These criteria may be unique to each dredge. The only permissible values are "TRUE" and "FALSE".

3.1.19.3 Material Recovery

For material recovery, a "TRUE" value shall indicate the dredge is digging material. The only permissible values are "TRUE" and "FALSE". Example: when the slurry velocity is greater than 10 feet per second and the density is greater than 1.05 grams per cubic centimeter, material recovery is "TRUE". These criteria may be unique to each dredge.

3.1.20 Pumpout

When the hopper dredge is being pumped out, a "True" value shall be reported; when it is not, a "False" value shall be reported. The only permissible values are "TRUE" and "FALSE".

3.2 NATIONAL DQM PROGRAM SYSTEM REQUIREMENTS

The Dredge shall be equipped with a DQM computer system consisting of a computer, monitor, keyboard, mouse, printer, data modem, UPS, and network hub. The computer system shall be a stand alone system, exclusive to the DQM monitoring system, and will have USACE DQM software installed on it. If a hardware problem occurs, or if a part of the system is physically damaged, repair it within 48 hours of determination of the condition.

3.2.1 Computer Requirements

Provide a dedicated on-board computer for use by the DQM system. This computer shall run the Corps' software and receive data from the Contractor's data reporting interface. This computer shall meet or exceed the following performance specifications:

CPU: Intel or AMD processor with a (non-overclocked) clock speed of at least 3 gigahertz (GHz)
Hard drive: 250 gigabytes (GB); internal
RAM: 2 gigabytes
Ethernet adapter: 10 or 100 megabit (Mbit) internal network card with an RJ-45 connector
Video adapter: Shall support resolution of 1024x768 at 16 bit color depth
Keyboard: Standard 101-key
Mouse: Standard 2-button mouse
Monitor: 17 inch viewable display; shall support 1024x768 resolution at 16 bit color depth
CD-ROM drive: 16X read speed/8X write speed
Ports: 2 free Serial ports with standard 9-pin connectors; 1 free USB port
Other hardware: Category 5 (Cat-5) cable with standard RJ-45 plugs connecting the network adapter to the network hub; 1 spare cable

Contractor shall provide a fully-licensed copy of Windows XP Professional on the computer specified above and the necessary manufacturer-provided drivers for the installed hardware.

This computer shall be located and oriented to allow data entry and data viewing, as well as to provide access to data ports for connection of external hardware. Location and orientation shall be subject to the COR's approval.

3.2.2 Software

The DQM computer's primary function is to transmit data to the DQM shore side database. No other software which conflicts with this function shall be installed on this computer. A copy of Symantec pcAnywhere™ 12.5 (Remote and Host) or newer shall be available on the dredge and installed on the DQM computer (host) and available for installation on the inspection

computer (remote). Information required to log-in on the DQM computer (host) shall be in included in the DPIP. This shall include the DQM computers (host) static IP address, data port and status port information, and associated login names and passwords. The DQM personnel will provide the DQMOBS (Dredge Quality Management Onboard Software) on the computer.

3.2.3 Network Hub

The DQM computer shall communicate via IEEE 802.3 Ethernet and the TCP/IP networking protocol. Provide a network hub to allow the temporary addition of the COR's portable computer to the computer network. The hub shall provide a minimum of four RJ-45 ports that support Category 5 (Cat-5) cable with standard RJ-45 plugs connecting the network adapter to the network hub; one spare cable shall be available on site to plug into the network hub.

3.2.4 UPS

Supply an Uninterruptible Power Supply (UPS) for the computer and networking equipment. The UPS shall provide backup power at 1kVA for a minimum of 10 minutes. The UPS shall interface to the DQM computer to communicate UPS status. Ensure that sufficient power outlets are available to run the specified equipment.

3.2.5 Printer

Supply a printer and driver software (when necessary) for use with the DQM computer. The printer shall support the Universal Serial Bus interface (cable provided by the Contractor), and shall have a minimum resolution of 300 dots per inch and have a rated print speed of 6 pages per minute (black and white) or higher and support color. Additionally, the printer shall have minimum paper capacity of 50 pages of 8.5 X 11 inch paper. Maintain a supply of printer paper and other consumables such as printer cartridges. Printer usage will not exceed 500 pages per month.

3.2.6 Internet Access

Provide an internet connection to the DQM computer with connectivity in the area where they are working. The internet shall be always available to the DQM computer with connectivity at least 12 out of 24 hours. Provide the necessary hardware and software to make this Internet connection available to the DQM on-board computer.

3.2.7 Data Routing Requirements

Onboard sensors shall continually monitor dredge conditions, operations and efficiency and route this information into the shipboard dredge-specific system computer (DSS) to assist in guiding dredge operations. Portions of this Contractor-collected information shall be routed to the DQM computer on a real-time basis for archival data storage and compilation into summary reports of dredging operations. Standard sensor data shall be sent to the DQM computer via an RS 232 19200-baud serial interface. The serial interface shall be configured as 8 bits no parity and no flow control.

3.2.8 Data Measurement Frequency

Disposal activities shall be logged with high temporal and spatial resolution. Data shall be logged as a series of events. Each set of measurements (i.e. time, position, etc.) will be considered an event. The required information in Paragraph REQUIREMENTS FOR REPORTED DATA shall be collected within one second of the reported time. A data string for an event shall be sent to the DQM computer every 10 seconds or less; but never more frequently than once per every 5 seconds.

3.2.9 Data Format

Data shall be reported as an eXtensible Markup Language (W3C standard XML 1.0) document as indicated below. Line breaks and spaces are added in the example for readability, but in the actual file, the carriage return, line feed character combination is only added to delineate records. Each data record is a single line including its data parameters with appropriate xml tags(i.e. the carriage return shall only occur after the xml tag (HOPPER DREDGE_DREDGING_DATA). Each data record is distinguishable by the beginning tag (?xml version="1.0"?) and the ending tag (HOPPER_DREDGING_DATA), with a carriage return after this tag.

{?xml version="1.0"?}
{HOPPER_DREDGING_DATA version = "2.0"}
{DREDGE_NAME} string32 {/DREDGE_NAME}
{HOPPER_DATA_RECORD}
{DATE_TIME} time date string {/DATE_TIME}
{LOAD_NUMBER} integer string {/LOAD_NUMBER}

{VESSEL_X coord_type = "LL"} floating point string {/VESSEL_X}
{VESSEL_Y coord_type = "LL"} floating point string {/VESSEL_Y}
{PORT_DRAG_X coord_type = "LL"} floating point
string{/PORT_DRAG_X}
{PORT_DRAG_Y coord_type = "LL"} floating point
string{/PORT_DRAG_Y}
{STBD_DRAG_X coord_type = "LL"} floating point
string{/STBD_DRAG_X}
{STBD_DRAG_Y coord_type = "LL"} floating point
string{/STBD_DRAG_Y}
{HULL_STATUS} OPEN/CLOSED string {/HULL_STATUS}
{VESSEL_COURSE} floating point string {VESSEL_COURSE}
{VESSEL_SPEED} floating point string {/VESSEL_SPEED}
{VESSEL_HEADING} floating point string {/VESSEL_HEADING}
{TIDE} floating point string {/TIDE}
{DRAFT_FORE} floating point string {/DRAFT_FORE}
{DRAFT_AFT} floating point string {/DRAFT_AFT}
{ULLAGE_FORE} floating point string {/ULLAGE_FORE}
{ULLAGE_AFT} floating point string {/ULLAGE_AFT}
{HOPPER_VOLUME} floating point string {/HOPPER_VOLUME}
{DISPLACEMENT} floating point string {/DISPLACEMENT}
{EMPTY_DISPLACEMENT} floating point string {/EMPTY_DISPLACEMENT}
{DRAGHEAD_DEPTH_PORT} floating point string
{/DRAGHEAD_DEPTH_PORT}
{DRAGHEAD_DEPTH_STBD} floating point string
{/DRAGHEAD_DEPTH_STBD}
{PORT_DENSITY} floating point string {/PORT_DENSITY}
{STBD_DENSITY} floating point string {/STBD_DENSITY}
{PORT_VELOCITY} floating point string {/PORT_VELOCITY}
{STBD_VELOCITY} floating point string {/STBD_VELOCITY}
{PUMP_RPM_PORT} floating point string {/PUMP_RPM_PORT}
{PUMP_RPM_STBD} floating point string {/PUMP_RPM_STBD}
{MIN_PUMP_EFFORT_PORT} true/false/unknown string
{/MIN_PUMP_EFFORT_PORT}
{MIN_PUMP_EFFORT_STBD} true/false/unknown string
{/MIN_PUMP_EFFORT_STBD}
{PUMP_WATER_PORT} true/false/unknown string {/PUMP_WATER_PORT}
{PUMP_WATER_STBD} true/false/unknown string {/PUMP_WATER_STBD}
{PUMP_MATERIAL_PORT} true/false/unknown
string{/PUMP_MATERIAL_PORT}
{PUMP_MATERIAL_STBD} true/false/unknown string
{/PUMP_MATERIAL_STBD}
{PUMP_OUT_ON} true/false/unknown string {/PUMP_OUT_ON}
{/HOPPER_DATA_RECORD}
{/HOPPER_DREDGING_DATA}
Carriage return - ASCII value 13
Line Feed - ASCII value 10
Example
{?xml version="1.0"?}
{HOPPER_DREDGING_DATA version = "2.0"}
{DREDGE_NAME}Essayons{/DREDGE_NAME}
{HOPPER_DATA_RECORD}
{DATE_TIME}04/11/2002 13:12:05{/DATE_TIME}
{LOAD_NUMBER}102{/LOAD_NUMBER}
{VESSEL_X coord_type = "LL"}-80.123333{/VESSEL_X}
{VESSEL_Y coord_type = "LL"}10.123345{/VESSEL_Y}
{PORT_DRAG_X coord_type = "LL"}-80.1233371{/PORT_DRAG_X}
{PORT_DRAG_Y coord_type = "LL"}10.12335{/PORT_DRAG_Y}
{STBD_DRAG_X coord_type = "LL"}-80.123339{/STBD_DRAG_X}
{STBD_DRAG_Y coord_type = "LL"}10.123347{/STBD_DRAG_Y}
{HULL_STATUS}CLOSED{/HULL_STATUS}
{VESSEL_COURSE}258{/VESSEL_COURSE}
{VESSEL_SPEED}3.4{/VESSEL_SPEED}
{VESSEL_HEADING}302{/VESSEL_HEADING}
{TIDE}-0.1{/TIDE}
{DRAFT_FORE}10.05{/DRAFT_FORE}
{DRAFT_AFT}15.13{/DRAFT_AFT}

{ULLAGE_FORE}10.11{/ULLAGE_FORE}
{ULLAGE_AFT}10.22{/ULLAGE_AFT}
{HOPPER_VOLUME}2555.2{/HOPPER_VOLUME}
{DISPLACEMENT}4444.1{/DISPLACEMENT}
{EMPTY_DISPLACEMENT}2345.0{/EMPTY_DISPLACEMENT}
{DRAGHEAD_DEPTH_PORT}55.10{/DRAGHEAD_DEPTH_PORT}
{DRAGHEAD_DEPTH_STBD}53.21{/DRAGHEAD_DEPTH_STBD
{PORT_DENSITY}1.02{/PORT_DENSITY}
{STBD_DENSITY}1.03{/STBD_DENSITY}
{PORT_VELOCITY}22.1{/PORT_VELOCITY}
{STBD_VELOCITY}23.3{/STBD_VELOCITY}
{MIN_PUMP_EFFORT_PORT}false{/MIN_PUMP_EFFORT_PORT}
{MIN_PUMP_EFFORT_STBD}false{/MIN_PUMP_EFFORT_STBD}
{PUMP_WATER_PORT}true{/PUMP_WATER_PORT}
{PUMP_WATER_STBD}true{/PUMP_WATER_STBD}
{PUMP_MATERIAL_PORT}false{/PUMP_MATERIAL_PORT}
{PUMP_MATERIAL_STBD}false{/PUMP_MATERIAL_STBD}
{PUMP_OUT_ON}false{/PUMP_OUT_ON}
{/HOPPER_DATA_RECORD}
{/HOPPER_DREDGING_DATA}
{cr}
{lf}
{DREDGE_NAME}Essayons{/DREDGE_NAME}
{HOPPER_DATA_RECORD}
{DATE_TIME}04/11/2002 13:12:10{/DATE_TIME}
{LOAD_NUMBER}102{/LOAD_NUMBER}
{VESSEL_X coord_type = "LL"}-80.123334{/VESSEL_X}
{VESSEL_Y coord_type = "LL"}10.123346{/VESSEL_Y}
{PORT_DRAG_X coord_type = "LL"}-80.1233372{/PORT_DRAG_X}
{PORT_DRAG_Y coord_type = "LL"}10.12336{/PORT_DRAG_Y}
{STBD_DRAG_X coord_type = "LL"}-80.123340{/STBD_DRAG_X}
{STBD_DRAG_Y coord_type = "LL"}10.123348{/STBD_DRAG_Y}
{HULL_STATUS}CLOSED{/HULL_STATUS}
{VESSEL_COURSE}259{/VESSEL_COURSE}
{VESSEL_SPEED}3.5{/VESSEL_SPEED}
{VESSEL_HEADING}300{/VESSEL_HEADING}
{TIDE}-0.1{/TIDE}
{DRAFT_FORE}10.00{/DRAFT_FORE}
{DRAFT_AFT}15.15{/DRAFT_AFT}
{ULLAGE_FORE}10.15{/ULLAGE_FORE}
{ULLAGE_AFT}10.20{/ULLAGE_AFT}
{HOPPER_VOLUME}2555.5{/HOPPER_VOLUME}
{DISPLACEMENT}4444.0{/DISPLACEMENT}
{EMPTY_DISPLACEMENT}2345.0{/EMPTY_DISPLACEMENT}
{DRAGHEAD_DEPTH_PORT}55.15{/DRAGHEAD_DEPTH_PORT}
{DRAGHEAD_DEPTH_STBD}53.19{/DRAGHEAD_DEPTH_STBD
{PORT_DENSITY}1.00{/PORT_DENSITY}
{STBD_DENSITY}1.01{/STBD_DENSITY}
{PORT_VELOCITY}22.5{/PORT_VELOCITY}
{STBD_VELOCITY}23.3{/STBD_VELOCITY}
{MIN_PUMP_EFFORT_PORT}false{/MIN_PUMP_EFFORT_PORT}
{MIN_PUMP_EFFORT_STBD}false{/MIN_PUMP_EFFORT_STBD}
{PUMP_WATER_PORT}true{/PUMP_WATER_PORT}
{PUMP_WATER_STBD}true{/PUMP_WATER_STBD}
{PUMP_MATERIAL_PORT}false{/PUMP_MATERIAL_PORT}
{PUMP_MATERIAL_STBD}false{/PUMP_MATERIAL_STBD}
{PUMP_OUT_ON}false{/PUMP_OUT_ON}
{/HOPPER_DATA_RECORD}
{/HOPPER_DREDGING_DATA}
{cr}
{lf}

3.2.10 Data Reporting

The system shall transmit correctly formatted event data XML strings to the DQM Database continuously from mobilization until the last USACE post-dredging survey has been accepted. If the internet connection is non-operable, either because of hardware failure or poor local operating conditions, the system is not in compliance with the Specifications and

manual backups shall be performed for each day the device is inoperable and submitted to the DQM center within 48 hours. Instructions on how to backup DQM data, perform DQM data transfer (Contractor), and the downloadable executable for Send Data can be found at http://dqm.usace.army.mil/Dredging_Plants/hopper.aspx. If a sensor is not functional, maintain a manually recorded disposal log, consisting of a series of events. These events are start of dredging, end of dredging, pre-disposal, and post-disposal events. Each event shall include time stamp (GMT), position (latitude and longitude WGS84), draft, ullage, volume, and displacement. Submit disposal logs on a daily basis to the COR during the time when the system is not operational.

3.2.11 Contractor Data Backup

Maintain an archive of the data collected for transmittal to the DQM computer during the dredging Contract. The COR may require, at no increase in the Contract price, the Contractor to provide a copy of these data covering specified time periods. The data shall be provided within an ascii text file (*.txt) containing the XML data strings which would have been transmitted to the DQM computer (Paragraph "Data Format"). Each data record within the text file shall be stored on a single line, including the data parameters with appropriate xml tags (i.e. the carriage return shall only occur after the xml tag (HOPPER_DREDGING_DATA). Each data record is distinguishable by the beginning tag (?xml version="1.0"?) and the ending tag (HOPPER_DREDGING_DATA) with a carriage return after this tag. As per Paragraph "Data Format", there shall be no line breaks between parameters; each record shall be a separate line. Naming convention for the files shall be (dredgename)_(StartYYYYMMddhhmmss)_(EndYYYYMMddhhmmss).txt. Data submission shall be via storage medium acceptable to the COR.

At the end of the Contact, contact the National DQM Support Center prior to discarding the data to ensure it has been appropriately archived. Record, in a separate section at the end of the dredge's on-board copy of the DPIP, the following information:

a. Person who made the call
b. The date of the call
c. The DQM representative who gave permission to discard

The same day of the phone call and prior to discarding the data, submit a "Data Appropriately Archived e-mail" to the COR with the above information, and Cc: the DQM Support Center representative providing permission; dqm-support@usace.army.mil. In addition to the above information, also include in the e-mail:

d. Project name and Contract number
e. Dredge start and end dates
f. Name of hopper dredge

3.3 PERFORMANCE REQUIREMENTS

The Contractor's DQM system shall be fully operational at the start of dredging operations and fully certified prior to moving dredge material on the Contract (see Paragraph NATIONAL DQM PROGRAM CERTIFICATION). To meet Contract requirements for operability, in addition to certification, the Contractor's system shall provide a minimum 95 percent data return and be compliant with DPIP requirements (Paragraph DREDGE PLANT INSTRUMENTATION PLAN (DPIP)) as determined by DQM support team. Data return percentage is defined as the total number of quality data strings sent by the DSS system to the DQM computer divided by the total possible number of records that could be sent by a system in good working order. Quality data strings are considered to be those providing accurate values for at least 34 of the 35 parameters reported. If repairs necessary to restore 95 percent data return are not made within 48 hours or if the Contractor fails to report required data within the specified time window for dredge measurements (see Paragraphs "Data Measurement Frequency" and "Data Reporting"), the system will be declared not fully operational, and the Contractor will be assessed liquidated damages equivalent to the additional oversight hours that would be required for Corps personnel to be on site from the first full day after the system is deemed not operational through to the time when the system is returned to fully operational status. For this purpose, the liquidated damages shall be $2413 per day, regardless of and in addition to other liquidated damages that the Government may assess against the Contractor.

3.4 COMPLIANCE INSPECTION AND QUALITY ASSURANCE CHECKS

For inspections and compliance monitoring, the COR will include, but not be

limited to, DQM support center personnel. Provide the COR transportation from the shore to platforms with a DQM certified system. Transportation to the DQM equipment shall be provided in a timely manner.
Quality assurance checks are required prior to the commencement of dredging, and at the discretion of a COR periodically throughout the duration of the Contract. Detailed instructions for performing these checks and a spreadsheet for recording the results are available at http://si.usace.army.mil/downloads.asp. Incoming data shall be periodically reviewed to assure compliance with performance requirements outlined in Paragraph PERFORMANCE REQUIREMENTS.
3.4.1 Displacement (Draft) Check
The COR will periodically verify the accuracy of the fore and aft draft sensors by comparing the vessel hull draft marks to the corresponding sensor readings indicated on the DQM screen. The vessel's hull draft reading will be viewed from a Contractor-supplied auxiliary vessel circling the dredge. The COR will review the difference between averaged drafts recorded by the instruments and those estimated from the draft marks to insure that the system is operating within the acceptable accuracy of approximately + 0.1 foot in calm seas conditions, and shall direct the Contractor to re-calibrate or repair system components as necessary. This check may be performed separately or as a part of the Water Load Test.
3.4.2 Draghead Depth Check
The COR may require periodic calibration checks of the reported draghead depth using manual means such as tape measures or sounding lines to directly measure draghead depth. Furnish a steel tape, chain, or wire with clearly visible flags/tags placed at 1 foot increments within the operational range of the dragarm. These devices shall be capable of measuring the depth below the water surface to the lowest fixed point of each draghead (often the heel) with sufficient length to measure 5 feet more than the maximum project depth. Pressure sensors may be used to verify calibration of the draghead sensors only in areas where current flow past the vessel/dragarm cannot be reduced sufficiently to allow safe handling of manual measuring devices. Pressure sensors, used for this purpose shall be vented pressure gages and shall be subjected to an annual manufacturer's calibration. Prior to the dragarm depth check, the sensor shall be checked at a known depth, and may be required to be zeroed at this point according to manufacturer's specifications. Care shall be taken not to kink the cable or restrict the vent during deployment.
The COR will review the draghead depth data to insure that the system is operating within acceptable accuracy, and may direct the Contractor to re-calibrate or repair system components as necessary. If a bubbler type system is used, weekly calibration of the draghead sensors is recommended, as they are sensitive to environmental conditions.
3.4.3 Hopper Dredge Ullage Check
The COR will periodically check the reported hopper dredge ullage using a tape measure or other distance measuring device. Furnish a clearly readable weighted tape, marked in tenths of a foot, capable of measuring throughout the full range of hopper dredge depth. The weight for this tape shall be a 6-inch diameter disk weighing between 2 and 3 pounds. The COR will review the hopper dredge ullage data to insure that the system is operating within acceptable accuracy (0.1 feet), and may direct the Contractor to re-calibrate or repair system components as necessary. This check may be performed separately or as a part of the Water Load Test.
3.4.4 Position Check
During inspection the reported position of the dredge shall be verified by comparison with readings from a handheld GPS receiver. Throughout the Contract, the COR will periodically take readings from an independent GPS to verify locations.
3.4.5 Water Load Test
Water Tests shall consist of pumping the hopper dredge out to its lowest level and then filling it to capacity with water, taking ullage and draft measurements at both levels to determine hopper dredge volume and displacement. The objective of the water test is to validate the dredge's reported displacement and hopper volumes. If the results of the water test indicate that the system is not operating within acceptable accuracy, correct the deficiencies causing the error, and repeat the water test until the results are acceptable.

Provide a handheld refractometer with automatic temperature compensation to measure the hopper dredge water specific gravity during water tests. The refractometer shall be capable of measuring the hopper dredge water specific gravity with a resolution of 0.001 and minimum accuracy of +/- 0.001. Also provide a water-sampling device to retrieve a sufficient volume of water from various depths in the hopper dredge to accurately determine specific gravity with the refractometer, and a sufficient volume of deionized water for calibration of the device.

3.5 CONTRACTOR QUALITY CONTROL

Designate a quality control systems manager (QCSM), who shall develop and maintain daily procedures to ensure quality control (QC) of the DQM system. These methods shall include a procedure by which data being collected is checked against known values, telemetry is verified to be functioning, and the DQM computer is verified to be on and the DQMOBS is running. These procedures shall be outlined in the DPIP and submitted prior to the start of the Contract. In the event a Contractor Quality Control (CQC) Report is required, daily annotations shall be made in the Daily CQC Report documenting the actions taken on each day of work including deficiencies found and corrective actions taken.

3.6 LIST OF ITEMS TO BE PROVIDED BY THE CONTRACTOR

DPIP Paragraph DREDGE PLANT INSTRUMENTATION PLAN
DQM SYSTEM
Sensor Instrumentation Paragraph REQUIREMENTS FOR REPORTED DATA
DQM Computer Paragraph NATIONAL DQM SYSTEM REQUIREMENTS
DREDGE DATA
Event documentation Paragraph "Data Reporting"
Dredge Data Backups Paragraph "Contractor Data Backups"
QA EQUIPMENT ON DREDGE
Ullage tape Paragraph "Hopper dredge Ullage Check"
Dragarm depth chain Paragraph "Draghead Depth Check"
Refractometer* Paragraph "Water Load Test"
Water sampling device Paragraph "Water Load Test"

*Measuring in grams/cubic centimeter with a resolution of 0.001 and a minimum accuracy of +/- 0.001 with calibration water

-- End of Section --

10. References

Buchman, 1999. NOAA Screening Quick Reference Tables, NOAA HAZMAT Report 99-1, Seattle WA, Buchman, M.F., Coastal Protection and Restoration Division, National Oceanic and Atmospheric Administration, 12 pages.

Scott et al., 1999. Savannah Harbor O&M Sediment Testing, Sampled December 1998. Submitted to U.S. Army Corps of Engineers, Savannah District, in Response to MIPR W33SJG83416218, by Dr. Dan Bearden and Dr. Geoff Scott, U.S. National Oceanic and Atmospheric Administration National Ocean Service, Mr. J. Edward Buxton, General Engineering Laboratories, Inc., and Dr. Walter J. Sexton, Athena Technologies, Inc., June 1, 1999.

Attachment 1

SAVANNAH HARBOR EXPANSION
ODMDS CAPACITY ANALYSIS
December 2011
Updated March 2012

Two approaches were taken to determine future capacity of the ODMDS (**Figure 1**) after placement of materials from the Savannah Harbor Expansion offshore dredging.

- The first analysis assumed that dredged material would primarily consist of sands (with no bulking factor) and that all deposited material would remain in the ODMDS area after placement.

- The alternative approach was to examine the last period of time when the ODMDS was used consistently and compare the dredged volumes removed from the channel that were placed in the ODMDS with the change in capacity of the ODMDS based on placement surveys over the same time period.

Differences in capacity were determined by using software in Bentley InRoads to determine surface areas and to make volume computations. Actual dredging volumes were obtained from dredging reports maintained in the Savannah District office.

The ODMDS boundary is shown in pink on **Figure 2**. To comply with 40 CFR §227.28 disposal shall occur no less than 330 feet (100 meters) inside the site boundaries. The ODMDS footprint (shown in yellow) for placement of material is 3,242 acres.

Figure 1: Ocean Dredged Material Disposal Site (ODMDS) Location

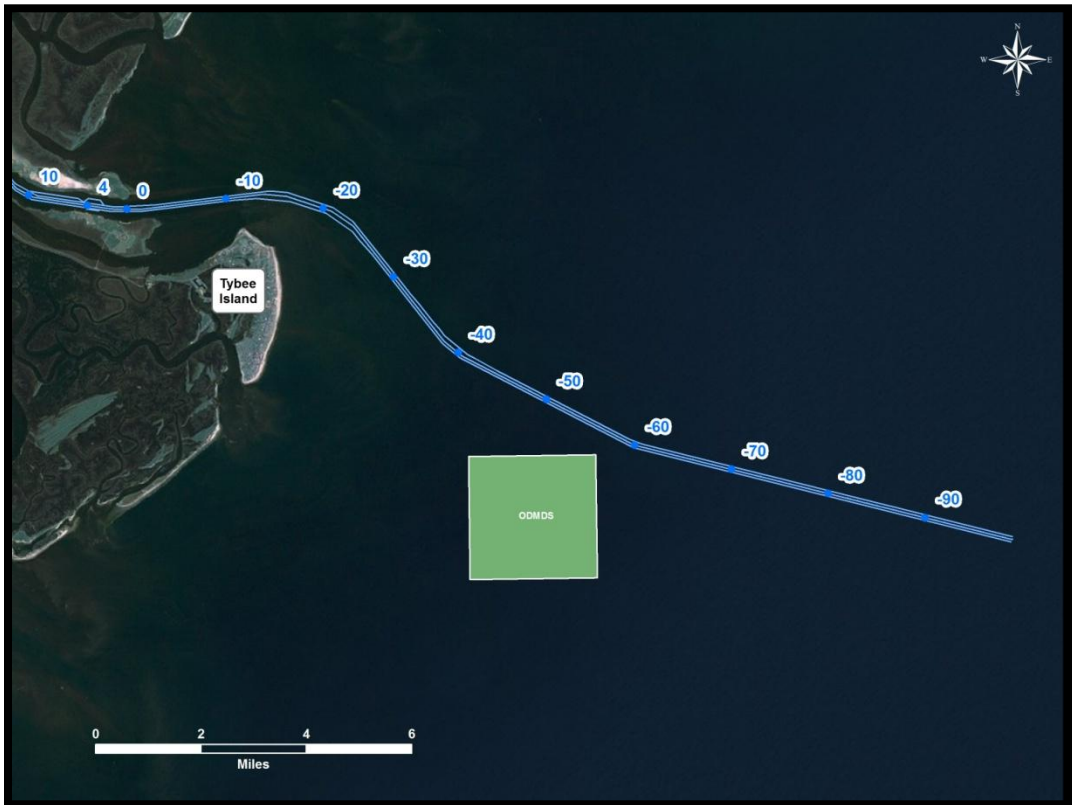


Figure 2: ODMDS Boundary and Bathymetry

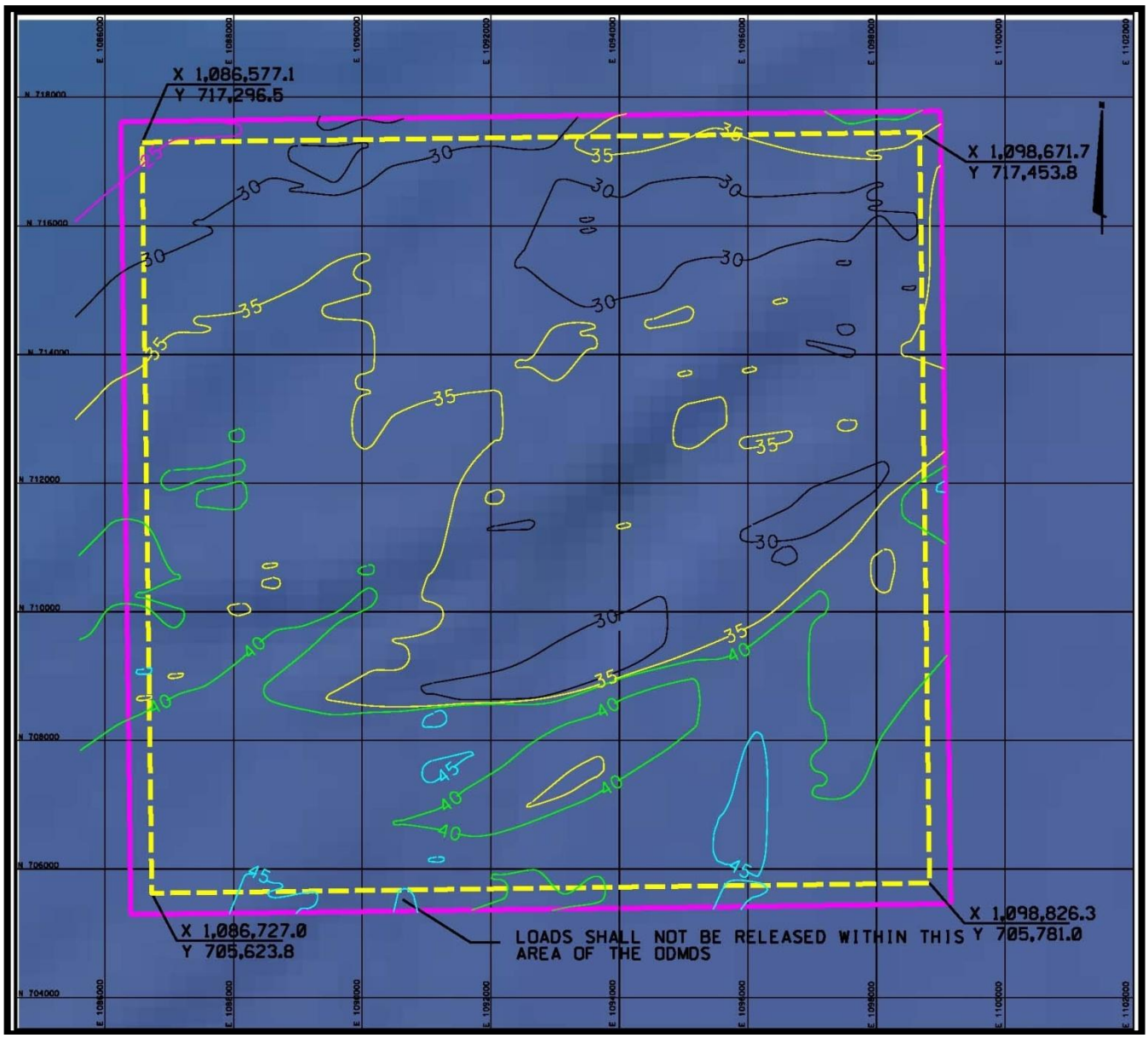


Table 1 shows the quantity of material dredged from the entrance channel from 2002 to 2007 as well as the change in capacity of the ODMDS based on placement surveys made over the same time period. Results show that roughly 93% of the material dredged from the channel remains in the ODMDS after placement, possibly because of the presence of fines in the dredged material that do not settle out or may leave the area before settling or losses during the dredging process.

Table 1: Material Dredged versus ODMDS Change in Capacity

Year	Quantity Dredged (cy)	ODMDS Capacity* (cy)	
2002	186,537	57,836,270	
2003	635,163		
2004	620,642		
2005	888,101		
2007	973,463	54,766,930	
Total Dredged	3,303,906		
Change in Capacity		3,069,340	
		percentage placed	93%

NOTE: *ODMDS capacity is determined from the surface to -25 feet MLLW

Tables 2 and **3** show results of the remaining capacity of the ODMDS for existing conditions and assuming the material placed from the Savannah Harbor Expansion is equivalent to 93% of the material dredged, based on the results from **Table 1**. Results displayed are based on the upper limit for material placement in the ODMDS as 25 feet below MLLW. The sediments would also be placed with a 100-meter (330 foot) setback from the ODMDS border.

Table 2: ODMDS Capacity (Existing Conditions)

ODMDS capacity (2012)	57,087,926 cy
Average Annual O&M Dredge Volume	1,057,721 cy
Years Remaining until Capacity is Exceeded (without deepening)	55

Table 3 on the following page shows the results for all depth alternatives. The capacity/life of the ODMDS would be reduced with a deeper project due to the greater volume of material required to be removed/placed during its initial construction and the increased maintenance since a deeper project requires a longer channel length to reach naturally-deep water in the ocean.

The average annual Operations and Maintenance (O&M) dredged material volumes were calculated based on historical dredging records. The volume of available undredged material that remains after dredging (primarily due to funding constraints) was also considered.

Given the constraints for the Savannah Harbor ODMDS of a surface area of 3,242 acres and upper height limit of 25 feet below MLLW, with materials added from the offshore channel for the 48 foot project depth, the remaining capacity for the ODMDS would last between 40 years. For the 47 foot project, capacity would last between 42 years. Without material from the Savannah Harbor Expansion Project, the capacity would last 55 years to hold annually dredged O&M material.

Table 3: ODMDS Capacity (with project)

	46 ft depth (44 ft project)	47 ft depth (45 ft project)	48 ft depth (46 ft project)	49 ft depth (47 ft project)	50 ft depth (48 ft project)
Percentage of Dredged Material on ODMDS Floor	93%	93%	93%	93%	93%
2014 Capacity (after 2 yrs of existing O&M)	54,972,484	54,972,484	54,972,484	54,972,484	54,972,484
New Work Quantity	4,326,189	6,305,655	8,410,259	10,646,413	12,950,110
2017 Capacity (after new work material)	50,949,128	49,108,225	47,150,943	45,071,320	42,928,881
Average Annual O&M Dredging Volume (after expansion)	1,066,299	1,066,587	1,066,738	1,066,778	1,067,000
O&M Dredging Volume (3 yrs during expansion)	3,198,896	3,199,761	3,200,213	3,200,333	3,201,000
2017 Capacity (after expansion new work and O&M)	47,974,155	46,132,447	44,174,745	42,095,010	39,951,951
Years Remaining until Capacity is Exceeded	48	47	45	42	40

Effects on Existing DMMP

This update was prepared to identify the expected effects of the proposed harbor deepening on the existing DMMP for the Savannah Harbor Navigation Project. If the SHEP is constructed, some events will not occur as expected, even though they have been predicted using the best practices available. Savannah District will conduct a detailed and lengthy post-construction monitoring program to identify how the estuary responds to the harbor deepening.

As part of the post-construction monitoring, the Corps will assess the maintenance patterns and identify if any changes in the shoaling patterns occurred as expected. If those patterns are sufficiently different from what is expected, the District may seek approval for changes to the advance maintenance program to allow it to maintain the harbor more efficiently.

As another part of the post-construction monitoring, the District will assess the volume of sediment storage capacity remaining in the Savannah ODMDS. If the storage capacity is substantially less than the predicted 42 years after deepening, the District would likely begin work to modify the ODMDS to restore a 50-year capacity. Modification of an ODMDS or designation of a new site is a complicated process which can take several years. The District would begin the required physical and biological studies no later than when data indicates the ODMDS will not provide the harbor's sediment disposal needs for the next 20 years.

Savannah District expects to develop a full DMMP that addresses all dredging and sediment placement issues in the harbor (to replace the DMMP developed as part of the 1996 LTMS) after data become available from a reasonable portion of the 10-year post-construction monitoring period.