Utilization of MCR Ocean Dredged Material Disposal Sites During 1998 and Recommendations for 1999

Purpose and Summary

Approximately 4.4 million cy/yr of sand is dredged at the Mouth of the Columbia River (MCR) entrance channel [based on 10 year average from 1988-1998]. Figure 1 shows MCR and vicinity. The dredged sand is placed at designated ocean dredged material disposal sites (ODMDS). During fiscal year 1998, 4.27 million cy of sand was dredged at MCR and placed in ODMDS E and F. ODMDS E is located 1/4 mile seaward of the MCR north jetty, in water depth of 50-65 ft , and is considered to be within the active littoral zone of MCR. ODMDS F is located about 4 miles offshore from the north jetty in water depth of 100-170 ft and is considered to be seaward of the active littoral zone at MCR. Approximately 3.45 million cy of dredged sand was placed at ODMDS E and 825,000 cy was placed at ODMDS F.

Whenever an ODMDS is used for dredged material disposal, the bathymetry of the site is monitored to determine the extent of dredged material accumulation on the seabed. This report specifically describes observed bathymetric change at MCR (ODMDS) E during 1998, based on the comparison of several hydrographic surveys. This report also presents recommendations for ODMDS E utilization during 1999. Page 4 of this report summarizes bathymetric surveys and related computations made at ODMDS E during 1998. Supporting information and details are presented on page 5-11.

Figure 2 shows the bathymetry at ODMDS E as of 19 May 1998, prior to 1998 dredged material disposal. This survey documents the 1998 pre-disposal condition of ODMDS E. During 13 June - 30 August 1998, approximately 3.5 million cubic yards (cy) of sand was placed within ODMDS E. A government-operated hopper dredge placed 1.95 million cy of dredged material within the western half of ODMDS. A contractor-operated hopper dredged placed 1.5 million cy of dredged material in the eastern half of ODMDS E. Figure 3 documents the bottom accumulation of dredged material that occurred within ODMDS E during 19 May 1998 - 16 Sept 1998. To maintain safe distance between the two hopper dredges and avoid overlapping usage of ODMDS E, the middle part of the site was not used. Figure 4 shows the distribution of dredged material disposal events within ODMDS E, during 1998 (note the area of no disposal located midway between the eastern and western parts of the site).

Monitoring results indicate that only 35% (or 1.2 million cy) of all dredged material placed at ODMDS E during 1998 was observed to have accumulated on the seabed of the site. This result indicates that during the 1998 dredging-disposal season, the wave/current environment at ODMDS E had dispersed 65% of all dredged material placed at this site. The eastern and western areas of ODMDS E exhibited similar dispersion rates. The placed dredged material that has been dispersed out of ODMDS E

does not appear to be accumulating (to a detectable height, ±1) either within the MCR navigation channel or on Peacock Spit.

To avert excessive mounding of placed dredged material within ODMDS E, dredged material was distributed uniformly throughout the site using a series of grid-cells to control the release point for each disposal event: The goal was to prevent mound-induced wave amplification at or near ODMDS E by limiting the vertical accumulation of placed dredged material to 4-6 ft , with respect to the baseline bathymetry of ODMDS E [USACE 1998b]. Figure 5 shows the distribution of grid-cells used to guide the placement of dredged material within ODMDS E during 1998.

The baseline bathymetry for ODMDS E is based on the site survey of 9 May 1997 (figure 6). Based on the difference between the site's baseline survey and the 1998 post-disposal survey (conducted on 16 September 1998), approximately 70% of the bathymetry at ODMDS E experienced net deposition (presumably due to dredged material accumulation) during the 1998 dredging-disposal season. Figure 7 shows the difference between the ODMDS E baseline survey and the 16 September 1998 survey. The average height of observed dredged material accumulation at ODMDS E was about 3 ft. The maximum observed height of dredged material accumulation at ODMDS E, with respect to the site's baseline bathymetry (9 May 1997), was 6 ft. Less than 2% of the ODMDS E bathymetry had accumulated sediment greater than 5 ft high, with respect to the baseline condition. Although the maximum height of accumulation exceeded the vertical limit by 1-2 ft, the area of vertical exceedance was small enough as to not affect incident waves.

Recommendations

Between 19 May -16 September 1998, approximately 1.2 million cy of dredged material had accumulated on the seabed within ODMDS E. As of 16 September 1998, the total remaining capacity of ODMDS E was estimated to be 1.5 million cy [refer to page 11]. Assuming that no additional sediment has accumulated within or eroded from the site since September 1998, the minimum capacity of the site available for 1999 dredging disposal is estimated to be 1.5 million cy. This represents an extremely conservative (low) estimate for available disposal capacity at ODMDS E in 1999.

Based on ODMSD E monitoring during 1997-1998, it is expected that all dredged material residing within ODMDS E during September 1998 will be dispersed out of the site by June 1999. It is therefore recommended that ODMDS E be used to it's full potential capacity (3.5 million cy) for dredged material disposal during 1999. This recommendation will be verified, before commencement of the 1999 dredging-disposal season, when ODMDS E is surveyed in May or June 1999. The 1999 pre-disposal survey will be compared to the 9 May 1997 baseline condition of ODMDS E (figure 6) to verify available disposal site capacity.

It is recommended that the areal coverage of the 1999 pre-disposal survey should, at a minimum, be similar to the extent covered by the 11 Aug 1998 survey. If possible, the

1999 pre-disposal survey should cover a similar extent as did the 16 September 1998 survey. Figure 8 shows the areal coverage of surveys conducted at MCR ODMDS E during 11 August and 16 September 1998.

To avert vertical accumulation of dredged material exceeding 5 ft, it is recommended that the same method of uniform distribution employed at ODMDS E in 1998 again used in 1999 (figure 5). However, the middle part of ODMDS E should be used more extensively than what occurred in 1998 (i.e. dredged material should be placed uniformly throughout the entire site). Coordinates indicating the beginning and ending point for each disposal event should be recorded in electronic (ASCII, space or comma delimited) format along with the duration for each disposal event . File format for the recorded ASCII disposal data should be: X1, Y1, X2, Y2, dump duration in minutes). The electronic files should be sent to OP-NW (c/o Eric Braun).

Finally, ODMDS E should be surveyed at least once every 4 weeks while dredged material is being placed at the site (the areal coverage of these "check" surveys should be similar to that of the 11 Aug 1998 survey). A post-disposal survey should be obtained at ODMDS E after all dredged material has been placed within the site, to document total dredged material accumulation. It is recommended that the areal coverage of the 1999 post-disposal survey should be similar to extent covered the 16 September 1998 survey (figure 8).

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Summary Information

Overall period of monitoring for 1998 = 19 May – 16 September 1998
Open water disposal site = ODMDS E and F
Dredging Vessels used = multiple bottom-door hopper dredge ***Essayons*** and split-hull dredge ***Newport***
Sediment dredged = fine-medium sand (average grain-size = 0.22 mm)

Surveys conducted in 1998: 19 May 1998 (Site E, 200 ft spacing) , 9 July 1998 (Peacock Spit - 2x2 miles, 750 ft spacing), 26 July 1998 (Site E, 200 ft spacing), 11 Aug 1998 (Site E, 200 ft spacing), 26 Sept 1998 (Site E, 200 ft spacing and Peacock Spit - 2x2 miles, 750 ft spacing) 23 June 1998 (Site F, 400 ft spacing)
"Monitoring Baseline condition" for ODMDS E is documented by the survey of May 1997
"Monitoring Baseline condition" for Peacock Spit is documented by the survey of 9 July 1998

Volume of Dredged Material Placed at ODMDS E

Volume of dredged material placed in **western half** of ODMDS E, by ***Essayons***, during 13 June – 23 July = 1.95 million cy (381 dumps)

Volume of dredged material placed in **eastern half** of ODMDS E, by ***Newport***, during 11 July – 30 August = 1.50 million cy (534 dumps)

Total volume of dredged material placed within **entire** ODMDS E during 13 June – 30 August = 3.45 million cy

NOTE: MCR Dredged material placed at **ODMDS F** during 1998 = 825,450 cy (820,700 by *Essayons* and 4,750 by *Newport*)

Volume of Material Observed to be on Seabed at ODMDS E

Accumulation on seabed within **western half** of ODMDS E for:
19 May – 16 September 1998 = 700,000 cy (1.9 million cy actually placed)
Maximum height of dredged material accumulation = 6 ft, 37% of all material placed retained on seabed

Accumulation on seabed within **eastern half** of ODMDS E for:
19 May – 16 September 1998 = 500,000 cy (1.5 million cy actually placed)
Maximum height of dredged material accumulation = 8 ft, 33% of all material placed retained on seabed

Accumulation on seabed within **entire** ODMDS E for:
19 May – 16 September 1998 = 1.2 million cy (3.45 million cy actually placed)
35% of all material placed retained on seabed or 65% dispersed during the 1998 disposal season

Supporting Information

Based on recommendations made in USACE [1998a], the bathymetric survey obtained during 9 May 1997 (figure 6) defines the "project baseline" condition for ODMDS E. The "baseline" condition survey documents the condition of ODMDS E before placement of any dredged material occurred in 1997. Subsequent ODMDS E surveys are compared to the "baseline" condition to monitor accumulation of dredged material placed within the site.

ODMDS E Disposal Capacity Estimate: 1997

The total volume of dredged material placed within ODMDS E during calendar year (CY) 1997 was 905,000 cy. Based on a ODMDS E post-disposal survey (Oct 1997), the accumulation of dredged material within ODMDS E immediately after cessation of disposal operations in 1997 was estimated to be about 55% of the volume placed. This means that about 45% of the dredged material placed at ODMDS E during 1997 was immediately dispersed to areas either beyond the survey boundaries or accumulated to a thickness less than the vertical detection threshold of the survey. It was assumed that, in general, 60% of the material placed at ODMDS E will accumulate on the seabed in terms of a distinguishable mound feature, immediately following disposal [USACE 1998a].

The above finding was used to estimate the dynamic capacity of ODMDS E: 40% of all dredged material placed at ODMDS E during a given dredging-disposal season would be dispersed before the ensuing fall-winter. Since, the static capacity of ODMDS E was calculated to be 2.1 million cy, the total annual capacity (static capacity + dynamic capacity) of the site was estimated to be 3.5 million cy. The site capacity calculation is described below:

Total potential volume of dredged material that can be placed at ODMDS E per disposal season
= static site capacity + dynamic site capacity

Total potential static capacity for ODMDS E = 2.1 million cy
Dynamic capacity for ODMDS E = 40% of the total placed per season

Calculate total potential placement capacity by: Total = Static + Dynamic
Dynamic = 40% of the total

Total Capacity = Static Capacity + 0.4 *Total Capacity
0.6 *Total Capacity = Static Capacity
Total Capacity = Static Capacity/0.6
= 2,100,000 cy / 0.6
= 3.5 million cy

Dynamic Site Capacity = 0.4 * Total Placement Capacity
= 0.4 * 3.5 million
= 1.4 million cy/season

Prelude to 1998 Dredged-Disposal Operations at ODMDS E

On 19 May 1998, a bathymtric survey of ODMDS E was performed to determine the status of the site with respect to dredged material placed during 1997. Comparison of the Oct 1997 and May 1998 surveys indicated that all dredged material placed within ODMDS E during 1997 had been dispersed (beyond the site and survey boundaries). Therefore, the total disposal capacity for ODMDS E (3.5 million cy) was available for use was 1998. A similar analysis will be performed in May or June of 1999, to verify the available capacity of ODMDS for the 1999 dredging-disposal season.

At the beginning of the 1998 dredging season (May 1998), the total volume of dredged material that could potentially be placed within ODMDS E during 1998 was estimated to be 3.5 million cy. It was estimated that approximately 1.5 million cy could be placed within the eastern half, and 2 million in the western half of the site. These estimates are based on the combined static and dynamic capacity of ODMSD E [USACE 1998a]. The above capacity estimate assumes that the only sediment that is deposited on the bathymetry of ODMDS E during the dredging-disposal season is that which is placed by the hopper dredges: It is assumed that no sediment "naturally" shoals within ODMDS E during the dredging disposal period, typically June-September. The volume of dredged material actually placed in ODMDS E during 1998 was 3.45 million cy.

To avert potential "overloading" of ODMDS E during the 1998 dredging-disposal season, the bathymetry within and outside of ODMDS E was monitored throughout the period of disposal (13 June-30 August). The term "overloading" applies to ***potential*** accumulation of dredged material within ODMDS E, which would exceed a height threshold of 4-6 ft with respect to the site's baseline bathymetric condition. The baseline condition for ODMDS E is defined by the 9 May 1997 survey (figure 6). Assignment of a threshold height for the accumulation of dredged material at ODMDS E is based on the desire to minimize potential mound-induced wave amplification: Potential wave amplification due to dredged material mounding would not exceed 10% as compared to the baseline condition of the site and surrounding area. The threshold height criteria was developed based on a previous report [USACE 1998a and 1998b]. The static capacity of ODMDS E (2.1 million cy) is defined by the 4 to 6-foot accumulation threshold.

Dredging and Disposal for 13 June 1998 – 30 August 1998

During this time period, dredging at MCR was performed by the government dredge ***Essayons*** and the contractor dredge ***Newport***. Sediment dredged by the ***Essayons*** was placed within the western half of ODMDS E, westward of entrance buoy #7. Sediment dredged by the ***Newport*** was placed within eastern half of ODMDS E. To avoid concentrating the accumulation of placed dredged material on the seabed (creating high

relief mounds), the ***Essayons*** and ***Newport*** were directed to place dredged material uniformly within ODMDS E, using a series of grid-cells (figure 5). Disposal of dredged material within the western half of ODMDS E begin along the northern boundary of the site and proceeded toward the southern boundary. During the period of 13 June – 9 July, the total volume of sediment dredged from the MCR navigation channel and placed within the western half of ODMDS E was 1.4 million cy. Between 9 July and 23 July an additional 900,000 cy was dredged at MCR, 500,000 cy of which was placed within the western half of ODMDS E by the ***Essayons*** and 400,000 cy was placed in the eastern half of ODMDS E by the ***Newport***. Between 13 June – 23 July, the total volume of sediment dredged at MCR and placed within the ODMDS E was 2.3 million cy.

The accumulation (on the seabed) of dredged material placed in the western half of ODMDS E during 13 June – 9 July 1998 was determined by differencing of bathymetry surveys for 19 May-9 July 1998 (figure 9). Between 19 May and 9 July 1998, accumulation of placed dredged material had resulted in depositional feature that was nominally 6 ft high and was observed to be confined within the western half of ODMDS E. The maximum height for the depositional feature was 8 ft and limited to a very small part of the disposal area. The volume of the depositional feature due to accumulation on the seabed within the western half of ODMDS E, during 19 May – 9 July 1998, was calculated to be 740,000 cy. The volume of dredged material placed within the western half of ODMDS E during 13 June – 9 July was about 1.4 million cy.

Based on the 9 July 1998 survey, the overall shape of the depositional feature as indicated by the 0-value contour mimicked the outline of the site's northern and western boundaries. Within the western half of ODMDS E, along the southeastern boundary of the site, there was a 700-foot margin where very little deposition had occurred as of 9 July.

Based on an average water depth of 55 ft, the limiting height for dredged material accumulation within the western half of ODMDS E was determined to be 5 ft. As of 9 July, the observed depositional feature (as described above) exceeded the limiting mound height by 1 ft (3 ft maximum over a very small area). To avoid additional accumulation on the newly formed 6-foot depositional feature, the ***Essayons*** was directed on 13 July to confine dredged material disposal to the southern-most 700-foot area along the site's southern boundary. This location was where minimal dredged material accumulation had occurred before 9 July (as noted above).

By 23 July, the total volume of dredged material placed within the western half of ODMDS E during the 1998 dredging season was about 1.9 million cy. The placement of 500,000 cy of dredged material within the western half of ODMDS E, between 13 July and 23 July, resulted in an increase in the areal extent of the subject depositional feature toward the southern boundary of the ODMDS. This was anticipated, due to the dredge ***Essayons*** using only the southern quarter of the ODMDS E for dredged material disposal during 13-23 July.

With respect to the 19 May 1998 pre-disposal bathymetry, the subject depositional feature was still nominally 6 ft high, based on the 26 July survey. As of 26 July the overall shape of the depositional feature, as indicated by the 0-value contour, was observed to be mostly confined within the western boundaries of ODMDS E and the maximum height for the depositional feature was between 8-10 ft and limited to a small part of the disposal area (figure 10). The western flank of the subject depositional feature appeared to be migrating westward at the expense of the eastern flank, which appeared to be eroding from the southeast.

The accumulation (on the seabed) of dredged material placed in the eastern half of ODMDS E during 11 July – 23 July was determined by differencing of bathymetry surveys for 19 May-26 July 1998. The result is shown in figure 10. Seabed accumulation of dredged material placed in the eastern half of ODMDS E had resulted in several depositional features that were nominally 2 ft high and were confined within the eastern half of ODMDS E, with respect to the May 1998 pre-disposal bathymetry. The volume of dredged material placed within the eastern half of ODMDS E during 11 July – 23 July was about 400,000 cy.

Comments Regarding Survey Comparison

Four surveys were used for assessing bathyemtry change at MCR ODMDS E, as reported above. The surveys for 9 May 1997, 19 May 1998 and, and 26 July 1998 were obtained using a transect distance (the distance between survey lines) of 250 ft. The 9 July 1998 survey was obtained using a transect distance of 750 ft.

When comparing two surveys of a highly variable bathymetry area, based on survey differencing, accurate (quantitative) assessments of seabed relief and surface volume change can be made when each survey was collected using similar transect geoemetry. When the transect distance between two surveys of a highly variable bathymetry area is large (greater than a factor of 3), survey difference results for seabed relief and volume change can be used for qualitative purposes, but the reliability of such results may not be sufficient for accurate assessments.

Because the 9 May 1997, 19 May 1998, and 26 July 1998 surveys were collected using similar 250-foot transect geometry, it was assumed that accurate comparisons were obtained when using these surveys to calculate seabed change and bottom volume accumulation for ODMDS E. Seabed change calculations based on comparing the 9 July 1998 survey (obtained using a 750-foot transect geometry) to any of the other 250-foot transect surveys are assumed to be qualitatively correct, but will not be as accurate as when comparing two 250-foot transect surveys. For this reason, the ODMDS E bathymetry change (accumulation volume) results based on the 19 May 1998 – 26 July 1998 survey comparison are assumed to be more accurate than the 19 May 1998 – 9 July survey comparison.

Improvements for ODMDS Utilization – Avoidance of Localized Mounding

The areal extent of dredged material accumulations indicates that during 13 June–26 July:

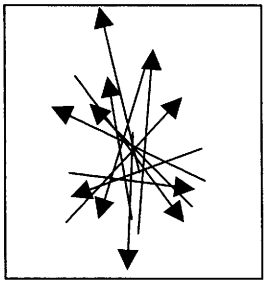
- **No dredged material was placed beyond the ODMDS E boundaries**
- **The western half of ODMDS E was utilized to its full areal extent**
- **The western half of the site was being "filled" in a methodical north to south manner.**
- **Dredged material placed in ODMDS E appears to be moving westward.**

Based on the 9 July and 26 July surveys, the vertical extent of dredged material accumulation indicates that uniformly distributing the starting point of each dump does not guarantee uniform dredged material deposition. Two operational requirements should be met in order to facilitate uniform deposition of placed dredged material: A) The starting point for each dump should be distributed throughout the assigned disposal area, and B) Overlap of the disposal lanes (for each dump) should be kept to a minimum. Minimum disposal lane overlap can be achieved if the heading of the dredge during disposal is consistently aligned in one direction, to avoid repeated crossing of previous disposal lanes. The importance of point (B) is illustrated below. In scenario 1(typical of disposal operations at ODMDS E before 13 July), the release point (tail of arrow) for 11 dumps is uniformly distributed throughout the "box" while the vessel heading for each dump is different (random). Scenario (1) results in multiple dump lane crossings in the center of the "box", leading to more accumulation of placed dredged material in the center than along the edges of the placement area. In scenario 2, the release point for each dump is uniformly distributed **and** the vessel heading is consistently aligned in one direction. Scenario (2) results in minimal dump lane crossings in the "box", promoting uniform deposition of placed dredged material throughout the placement area.

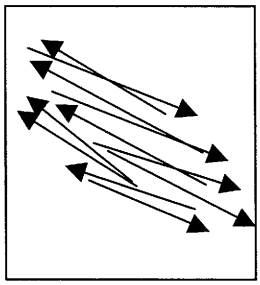
Scenario (2) assumes that the starting positions for each dump do not fall on a previous dump lane, otherwise multiple lane crossings may result with concentrated deposition on the bottom. For conditions that require long cycle times for the release of dredged material the disposal vessel (equal to long disposal lanes if the vessel is underway), there may be a high occurrence of dump lane crossing as described above. Average disposal-cycle time for the hopper dredge ***Essayons*** is 8-12 minutes. If the Essayons is moving at 3 ft/sec during disposal, the lane for each dump would be about 1,800 ft long. For a disposal area that is 5,000 ft in length, there is a high likelihood that numerous dump lanes would be superimposed or cross each other using scenario (1) or (2).

Scenario (3) avoids the vessel heading consideration, by requiring that each dump (or a finite number of dumps) be completely contained within a specific "cell": In essence, limiting the length of each dump lane. This method of disposal control limits the number of dumps per area within a given ODMDS, promoting uniform deposition of placed dredged material on the seabed, regardless of vessel heading. Depending on the cell size, scenario 3 can be operationally more challenging to achieve than scenarios 1 or 2: It is difficult to maintain station within a small area on the open coast while the dredge is moving to provide safe steerage.

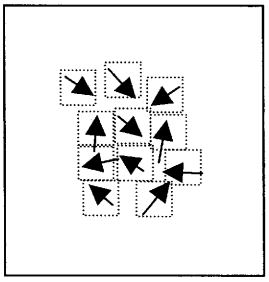
To improve uniform deposition of placed dredged material at ODMDS E, it is recommended that the disposal plan consider either scenarios (2) or (3) as much as operationally practicable.



Scenario 1. Uniform placement, with random vessel heading. High potential for overlapping disposal lanes.



Scenario 2. Uniform placement, with uniform vessel heading Reduced potential for overlapping disposal lanes.



Scenario 3. Uniform placement, with random (or uniform) vessel heading, and dumping ***within*** assign "cells". Minimal potential for overlapping disposal lanes.

To provide a reliable method of tracking the location of each disposal event and prevent excessive overlap of dump lanes at sensitive disposal areas, it is recommended that the operating dredge digitally record each/every disposal location in terms of X,Y coordinates (for both the beginning and ending point of each dump) and the duration of each dump event (minutes). This information should be supplied to the Portland District in a stand-alone ASCII data file during each month of dredging.

Total Bathymetric Change at ODMDS E due to 1998 Dredged Material Disposal

The 1998 post-disposal condition for ODMDS E is documented by the 16 September 1998 survey (figure 3). At the conclusion of dredged material disposal operations for 1998, several locations within ODMDS E had accumulated dredged material to heights greater than 5 ft (with respect to the 9 May 1997 baseline condition, figure 7). However, the highpoints of the observed accumulation (exceeding the 5-ft criteria) were localized

and accounted for less than 2% of the total ODMDS E area. Although the maximum height of accumulation exceeded the vertical limit by 1-2 ft, the area of vertical exceedance was small enough as to not affect incident waves. [i.e. The areal size of the accumulation highpoints were about 300 ft long, which is smaller than 1 wavelength. Incident waves don't "feel" limited seabed variations smaller than 1 wavelength].

Recent monitoring results, based on the latest available survey (26 September 1998), indicate that only 35% (1.2 million cy) of all dredged material placed at ODMDS E during 1998 was residing on the seabed within (or adjacent to) the site at the time of the 26 September survey. This observation infers that 65% of the 3.45 million cy placed at ODMDS E during June-August 1998, was either transported beyond the site boundaries, or has been dispersed to such a degree that the dredged material can not be detected. During 1998, the observed rate of dispersal at ODMDS E was 55% higher than observed in 1997. Even though the observed dispersion rate at ODMDS E for 1998 was substantially higher than the value (40%) used to estimate the site's dynamic capacity, it is recommended that the 40% dispersion rate continued to be used for estimating future dynamic capacity of ODMDS E.

Available Capacity for 1999 Dredged Material Disposal at ODMDS E

Between 19 May -16 September 1998, approximately 1.2 million cy of dredged material had accumulated on the seabed within ODMDS E. The total potential static capacity of ODMDS E has been estimated to be 2.1 million cy [USACE 1998b]. As of 16 September 1998, the static capacity remaining within ODMDS E was calculated to be 900,000 cy:

Static capacity remaining within ODMDS E, as of 16 Sept 1998
= total potential static capacity – volume of dredged material on seabed as of 16 Sept 1998
= 2.1 million cy – 1.2 million cy = 900,000 cy

Since the dynamic capacity of ODMDS E is estimated to be 40% of the total dredged material volume placed at the site, the total placement capacity for ODMDS E as of 16 September 1998 was estimated by:

Total Placement Capacity as of 16 Sept 1998 = static capacity + dynamic capacity
= static capacity + 0.4* total capacity
= static capacity/0.6
= 900,000/0.6 = 1.5 million cy

The total capacity of ODMDS E as of 16 September 1998 was estimated to be 1.5 million cy (static capacity, 900,000 cy + dynamic capacity, 600,000 cy). Assuming that no sediment has shoaled within or has been eroded at the site since September 1998, the minimum capacity of the site available for 1999 dredging disposal is estimated to be 1.5 million cy. This represents an extremely conservative (low) estimate for available disposal capacity at ODMDS E in 1999.

Based on ODMSD E monitoring during 1997-1998, it is expected that all dredged material placed within ODMDS E during 1998 will be dispersed out of the site by June 1999. It is likely that ODMDS E could be used to it's full potential capacity (3.5 million

cy) for dredged material disposal during 1999. This assumption will be verified, before commencement of the 1999 dredging-disposal season, when ODMDS E is surveyed in May or June 1999. The 1999 pre-disposal survey will be compared to the 9 May 1997 baseline condition of ODMDS E (figure 6) to verify available disposal site capacity.

References:

USACE (1998a). "Analysis of MCR ODMDS Utilization for 1997 and Proposed Options for ODMDS Use in 1998 - for ODMDSs A, B, E and F. With Addendum". Portland District – US Army Corps of Engineers.

USACE (1998b). "Observed Bathymetric Change at MCR ODMDS E during 1997-98 and Available Disposal Capacity for 1998". Portland District – US Army Corps of Engineers.