MCR Dredged Material Disposal Site
Annual Use Plan for 2003

1. Background

The mouth of the Columbia River (MCR) is the ocean gateway for maritime navigation to/from the Columbia – Snake River navigation system. The U. S. Army Corps of Engineers is responsible for the operation and maintenance (O&M) of the federal deep-draft navigation channel at the Mouth of the Columbia River (MCR). The MCR channel is 2640 ft wide and nominally 55 ft deep (below MLLW). Each year, the Portland District dredges 3-5 million cubic yards (MCY) of sand at MCR to maintain the 5-mile long deep draft navigation channel. The dredged material is fine-medium sand (0.17-0.27 mm) and fine-grained material content is less than 4%.

Maintenance of the MCR project includes disposal of dredged material. The dredged sand is placed at ocean dredged material disposal sites (ODMDS) or at sites permitted through Section 404 of the Clean Water Act (404 site). MCR open water dredged material disposal sites available for 2003 are shown in figure 1. Management of an open water disposal site is predicated on the need to efficiently utilize the site's capacity while minimizing impacts to navigation and offsite environment, and meet statutory requirements. The capacity of a dredged material disposal site is the volume (or height and area) of dredged material that can accumulate within a site's boundaries without unacceptable adverse impacts to navigation or the environment. The potential effect of dredged material accumulation upon waves (mound-induced wave shoaling) is an important consideration at MCR [USACE 2003 a & b]. In consideration of stakeholders concerns, USACE and EPA have assigned a target capacity for each disposal site to be used during the 2003 dredging season. General utilization procedures and governing constraints for each disposal site are described in Appendix A.

Due to the exposed ocean conditions at MCR, only ocean-going hopper dredges can perform dredging and disposal at MCR; dredging is limited to summer when wave conditions are favorable for working on the bar. Two hopper dredges are used to perform maintenance dredging at MCR: A government operated dredge and a contractor operated dredge, each with different capacities and operating characteristics. Refer to Appendix A for a general description of hopper dredge operations. For 2003, the contract dredge (*Sugar Island*) will begin dredging at MCR on approximately 25 June and the government dredge (*Essayons)* will begin MCR dredging on approximately 21 July. The principal disposal site to be used by the contract dredge will be the Shallow Water Site (Site E). The government dredge will use the Shallow Water Site, North Jetty site, and possibly the Deep Water Site. The total O&M dredging requirement for MCR in 2003 is estimated to be 4 MCY.

2. Objective

The objective of this *Annual Use Plan* for 2003 is to: A) Provide a decision framework that allows MCR dredging operations managers to manage open water disposal sites on a day to day basis , and B) Define a strategy to collect information (via monitoring or assessment of operational data) on a frequent basis, so that potential problems can be identified and corrective action can be undertaken. The amount of dredged material that can be placed in an open water disposal site is limited by the site's capacity to disperse or accumulate the material without adversely affecting the environment or navigation. The principal site management constraint for MCR is to avoid modification of a disposal site's bathymetry (via dredged material mounding) that could potentially result in excessive wave amplification, due to wave shoaling over mounded dredged material.

As proposed, this *Annual Use Plan* is in place for the 2003 dredging season only. Elements of this annual use plan can be changed during the dredging season in accordance with adaptive site management. A final site management and monitoring plan for MCR dredged material disposal sites will be developed during EPA's final site designation process [EPA 2003].

The 2003 *annual use plan* describes how each available MCR dredged material disposal site will be used and monitored. Two methods will be employed to monitor the placement of dredged material within each disposal site used during 2003 and prevent mounding beyond the management target. The first monitoring method focuses on tracking the placement of dredged material within each disposal site on a daily basis, by plotting the location of each load placed. Frequent plotting of disposal locations will provide a continuous knowledge base of how placed dredged material is likely being deposited within a given site. The second monitoring method involves conducting frequent bathymetry surveys at active MCR disposal sites, during the dredging season. Comparison of surveys to a site's baseline condition will quantify deposition of dredged material placed within a given site. Timely use of this information can prevent excedance of target levels with regard to dredged material accumulation.

The 2003 *annual use plan* is based on adaptive management. This means that MCR disposal sites will be proactively managed: As sites are used, they are monitored to verify that the sites are being managed according to 2003 capacity targets. If a given disposal site is at or near its target capacity, then site management changes accordingly. The *annual use plan* implements various recommendations made by a "*Federal Review Team"* [USACE 2001] which was convened in September 2001 for the purpose of reviewing management practices at MCR dredged material disposal sites.

3. Site Management Criteria

Geometrically, the target capacity for a given disposal site is defined by the target height and area over which dredged material can accumulate (collectively referred to as a "target accumulation"), with respect to a baseline condition. Use of an active disposal area will be discontinued upon reaching the specified target accumulation. The target

accumulation is based on the need to manage dredged material accumulation such that mounded dredged material does not excessively amplify waves, due to shoaling and refraction. The target accumulation can be different for each disposal site.

Values for managing the accumulation of dredged material were obtained using the RCPWAVE model [Ebersole 1986] as discussed in USACE [1999 and 2002]. RCPWAVE is a computer program that simulates the behavior of waves as they interact with variable bathymetry (or in this case, underwater mounds). It must be noted that results obtained using RCPWAVE can be 10-50% higher than the actual case: The RCPWAVE program overestimates how waves interact with variable bathymetry (the model is conservative). The target mound heights given in table 1 are conservative and should provide a safe operational limit.

Table 1 presents the target mound heights applicable for MCR disposal sites and Appendix A discusses site specific details concerning target mound heights, site utilization, and present disposal site capacity. Because of the need to assign capacity and concern for navigation safety, thresholds for increasing the level of monitoring intensity and management responses have been identified. The "target mound height" values shown in table 1 are intended to be used only as an ODMDS management guide (a screening tool to identify site management thresholds for concern). It is important to note that the values shown in Table 1 apply to a mound feature that occupies an area of 2,000 x 2,000 ft. For smaller mound features that are equal to or marginally exceed the "target mound height" values, there may be little or no wave amplification [USACE 2002]. **The target mound height** corresponding to the **"present"** site condition (April 2003) is the parameter that applies to the utilization of sites during 2003. Note that the bathymetry at several disposal sites has changed since the establishment of the sites' baseline condition. For example, the eastern area of the SW Site is now deeper than is was in 1997 (baseline condition) while the western area of the site has less depth than in 1997 (see figure 7b). The "present" target mound heights shown in table 1 account for the change in site bathymetry that have occurred since the baseline condition.

Concern should arise only if the level of accumulation significantly exceeds the target height and/or the area of accumulation exceeding the target value becomes greater than 2,000 x 2,000 ft. Examination of wave amplification potential will be conducted only if dredged material accumulates to levels that far exceed the "target mound height" and/or covers an area larger that 2,000 x 2,000 feet. Should this occur, the STWAVE model [Smith 2001] will be used to assess whether the area of accumulation may potentially affect waves in or near the disposal site in question. Although RCPWAVE is considered an appropriate model for establishing conservative target mound heights, STWAVE is more accurate and considered to be more suitable for predicting actual conditions.

Table 1. Target height of dredged material mounds, based on the RCPWAVE model. Values to be used for screen level assessment of disposal site capacity. Sites NOT in BOLD are not expected to be used in 2003

Disposal Site	Target Mound Height with respect to Baseline	**Present**	Usable Disposal Site Area(acre)	Present Site Capacity Volume (CY)
SW Site – East	5	**9**	190	**2.6 M**
SW Site – West	5	**4**	290	**1.5 M**
NJ Site*	8	**3**	110	**500 K**
DW Site	40	**40**	207	**7.5 M +**
Site F(102)^	15	**4**	72	350 K
Site A(102)^	10	**3**	51	200 K

SW Site = Shallow Water Site (Site E)
* = The NJ is not subject to the same target mound geometry criteria as unprotected sites. For 2003, Capacity of Site NJ has been set at 340 kcy to minimize potential transport to areas near the MCR channel.
^ = Due to the nature of the existing bathymetry at this site, it is prudent not to utilize this site unless no other sites are available. If site A were used, placement would be would limited to the northeastern third of the site.

4. Decision Framework for Site Threshold Management

Based on the above site management criteria, there are 6 action levels that will be used for managing disposal site capacity at MCR. The objective of the Annual Use Plan is to prevent any action level above "Level 4".

Level 1. **Normal Capacity Level** = Dredged material accumulation is not close to the accumulation target. ACTION: Proceed as planned.
Level 2. **Limited Capacity Level** = Dredged material accumulates to within 1-2 ft of the allowable target. ACTION: Minimize placement in affected location.
Level 3. **Threshold Capacity Level** = Dredged material accumulates to (or marginally exceeds) the target mound height within localized extent (less than 500 x 500 ft). ACTION: Avoid placement in the affected location of accumulation. Continue to use adjacent areas within site appropriately.
Level 4. **Limited Management Level** = Dredged material exceeds target mound height by 1-2 ft within an area greater than 500 x 500 ft. ACTION: Avoid placement in the affected location of accumulation and in adjacent areas. Continue to use areas not affected; adopt early exit strategy for site.
Level 5. **Moderate Management Level** = Dredged material exceeds target mound height by more than 2 ft within an area greater than 1,000 x 1,000 ft. ACTION: Stop using site, until natural erosion has restored sufficient site capacity.
Level 6. **General Management Level** = Dredged material exceeds target mound height by more than 2 ft within an area greater than 2,000 x 2,000 ft. ACTION: Stop using site. Assess potential wave impacts using STWAVE and determine appropriate action based on results.

5. Strategy

The goal of managing MCR disposal sites is to fully utilize each available site, while limiting the average vertical accumulation of placed dredged material so as to minimize the potential for adversely affecting wave conditions at or near the site. To successfully manage each site throughout the dredging season, the capacity of each site must be frequently assessed.

As a general rule, capacity assessment for an *active* disposal site (one that is being used) will occur based upon the frequency at which a given site's bathymetry is surveyed. The frequency of conducting surveys will be directly related to the rate at which dredged material is placed within a given site. In this regard, the frequency for assessing active disposal sites will be based on the rate of volume of dredged material placed within the site. The Portland District (OP-NW and EC-R) will, on a daily basis, collect operational dredging/disposal data at MCR (specifically, dump coordinates). The data will be transferred to EC-HY/HR for compilation and plotting. Figure 2 shows the flow diagram describing the procedure of processing monitoring data and using the processed data to manage disposal site capacity. If dredged material disposal (shown by daily tracking of dump locations) is occurring in manner that is not desirable for proper site management, improvements to the disposal plan will be initiated within 1-2 days.

A weekly coordination briefing will be conducted between different Portland District offices on Tuesdays. On a weekly basis, Portland District (OP-NW) and EPA (Region 10) will prepare a report that summarizes the volume of dredged material placed and relate this data to the changes in capacity for active MCR disposal sites and, make recommendations for utilizing each site for the next week. Active dredged material disposal sites will be assessed according to the management thresholds listed in Section 4 "Decision Framework for Site Threshold Management". A draft of the weekly summary report will be furnished to EPA prior to public dissemination. The weekly summary report will be furnished via email, typically by the Friday of that week, to the members of the MCR Update Distribution List maintained by the MCR Channel O&M project manager (OP-NW).

Use of an active disposal site may be temporarily discontinued based on management indicators which could have the potential for exceeding the target accumulation within the site, the status or location of the dredges and hydrosurvey vessels, priority use of sites, or other site use constraints. Weekly recommendations may address revision of monitoring needs (i.e. site bathymetry surveys) or the collection of additional operational data to be used for the purpose of improving the assessment of disposal site capacity. Data required to monitor the weekly progress of site utilization includes: bathymetry surveys; analysis of surveys (plotting, differencing, or other processing); tracking of disposal locations within each site; and other pertinent information provided by the dredge operators. See figure 2 for the flow diagram describing the work elements for monitoring and managing disposal site capacity.

Within the collective constraints of available MCR disposal sites, preference will be given to using the Shallow Water (SW) Site and the North Jetty (NJ) site. It is intended

for the contract dredge to be place 1.5 – 2.0 million cubic yards in the SW site. The government dredge is expected to place 2.0-2.5 million cy in the SW Site and NJ Site, collectively. Should either the SW Site or the NJ site not be sufficient to meet the requirements for dredged material disposal, the Deep Water (DW) Site would be used (refer to Section 7, fourth paragraph). Ocean dredged material disposal sites A and F (based on 102 boundary) have restricted capacity and would only be used if all other disposal options were not sufficient to meet the needs at MCR (refer to appendix A, second section). Use of Site A or F would require a priori coordination with EPA-Region 10.

It is noted that the SW Site will require focused attention during dredged material placement and monitoring to ensure that the site is fully utilized without exceeding the site's management target. The SW Site will be managed such that the site may be under-utilized, rather than attempting to achieve full utilization of the site at the risk of exceeding the site's capacity constraints. Figures 3a-b shows the flow diagram describing the procedure for assessing site capacity and directing the government and contractor dredges to specific MCR disposal sites.

6. Survey Frequency for Monitoring Dredged Material Accumulation

Minimum site monitoring requirements are a pre- and post -disposal bathymetry survey for each active MCR disposal site and a 2 x 2 mile area on Peacock Spit. Refer to figure 4 for survey coverage at MCR. The SW Site and the NJ Site will be surveyed at least once a month during the 2003 MCR dredging season. If the DW Site is used during 2003, the site would be surveyed at the end of the dredging/disposal season. For active disposal sites, the survey frequency may differ from the minimum requirements, as specified below.

For all sites that are actually being used, an alternative Frequency for Site Monitoring (FSM) will be based on: The volumetric rate ($\forall$) at which dredged material is begin placed, the area (A) over which the dredged material is being placed, and the vertical target (H) for dredged material accumulation. It is noted that as a given site is "filled" with dredged material, H will change (become less with time). The FSM may need to increase as a site is being filled. FSM will be re-assessed each time an active site is surveyed. An entire disposal area need not be surveyed during each survey; only the parts of the site receiving dredged material and adjacent areas (within 1,000 ft of disposal activity). If the FSM becomes too frequent, then the disposal area may be considered "filled" and not used until sufficient dredged material dispersion occurs (as determined by site monitoring).

Equation 1 was used to estimate survey frequency for each site. Note that FSM (equation 1) assumes: The survey will be conducted at the midpoint of a site's total remaining capacity; dredged material is continuously placed at the site; and 20% of the site's area is not used. Table 2 specifies the initial FSM for each site based on initial conditions for 2003 and other parameters as shown. Note that the FSMs in table 2 will require revision

as the capacity (allowable accumulation height) of each site is reduced by dredged material disposal.

Frequency of Site Monitoring (FSM)
= (Target Height/2) x (Site Area*0.8/∀olume placed per day) [Equation 1]

Example: Initial FSM for the Western half of the SW site (Site E) for govt. dredge is:
= (4/2) x (290*43560*0.8 /50,000*27) = 15 days.
…this is halfway thru the total time expected to fill the site.

Table 2. Values used to estimate Initial Frequency of Site Monitoring (FSM) for 2002.

Disposal Site	Target Mound **H**eight (H,ft)*	**A**rea (A, acres)*	Volume of DM Placed (∀,CY/day)♣ *Government*		*Contractor*	FSM** (days)
SW Site – East	9	190	55,000	or	35,000	20 or 32
SW Site – West	4	290	50,000	or	30,000	15 or 25
Overall SW	6	480	52,000	or	32,000	35 or 57
NJ Site	3	92	60,000	or	40,000	3 or 5
DW Site	40	207	30,000	or	18,000	178 or 296
Site F (102)	4	72	40,000	or	25,000	5 or 8
Site A (102)	3	51	45,000	or	27,000	2 or 3

* = Based on present values and will change as a site is filled; may be redefined based on subsequent site surveys. Sites NOT in BOLD are not expected to be used in 2003.
**= time interval between FIRST successive surveys, assuming site in continuously used AND that dredged material is placed evenly throughout available disposal area. Frequency for Site Monitoring
♣= values based on recent average production rates – values will be changed if 2003 production rates are higher

As a given disposal site is "used", the interval between successive surveys will become smaller. Table 3 shows an estimated schedule for surveying MCR disposal sites during 2003, assuming that disposal occurs continuously in the site and that dredged material is placed uniformly within the available area. The values shown in () are the revised FSMs, following the initial value. An example of how to read table 3 is given for the SW Site – Eastern half, and assumes that dredged material is continuously and evenly placed from day 1using a government hopper dredge:

1) 20 days after commencement of the disposal operation, the site would be surveyed and remaining capacity assessed.
2) After 10 additional days, the site would be re-surveyed and re-assessed. The total time for disposal would be 30 days.
3) After 5 additional days, the site would be re-surveyed and re-assessed. The total time for disposal would be 35 days.
4) After 3 additional days, the site would be re-surveyed and re-assessed. The total time for disposal would be 38 days.
5) After 1 additional day, the site would filled. The total time for disposal would be 39 days.

Table 3. Estimated successive frequency of site monitoring.

Disposal Site	Initial FSM	2nd FSM	3rd FSM	4th FSM	5th FSM	
	days, starting from when site is first used in 2002 (days from previous FSM)					
SW Site – East	20	30 (10)	35 (5)	38 (3)	39 (1)	Filled –2.6MCY
SW Site – West	15	22 (7)	26 (4)	28 (2)	29 (1)	Filled-1.5MCY
Overall SW	35	53 (18)	62 (9)	66 (4)	68 (2)	Filled-4.1MCY
NJ Site	3	5 (2)	6 (1)			Filled--340KCY
DW Site	178	Survey DWS at Beginning and End of Dredging Season**				
Site F(102)	5	8 (3)	10 (2)	11 (1)		Filled—500KCY
Site A(102)	2	3 (1)				Filled—340KCY

Values indicate cumulative time for which site has been used during 2003.
Values in () indicate successive FSM; or the time that the site can be used been used between successive surveys. When the FSM becomes less than 3 days, use of the site by be temporarily halted while site capacity is evaluated.
** Post-Survey of DWS occurs only if the site has been used in 2003.

7. Utilization of Active Disposal Sites during Monitoring and Other Conditions

Under the present contracting agreement, the contract dredge will place dredged material within the SW Site. The government dredge will be using the SW Site, NJ Site, and if necessary the DW Site. Sites A and F are not expected to be used in 2003.

Under certain conditions active disposal sites may be left alone and others will be used. For example, the government dredge has no on-dredge survey capability. This means that when the SW Site or the NJ Site (used by the government dredge) is being surveyed to assess remaining site capacity, the government dredge may use another disposal site until the site's remaining capacity has been assessed. This will typically take 1-2.5 days. During each site assessment period, the government dredge may use the NJ site (if available) or possibly the DW Site.

USACE will also monitor the contractor disposal area according to the FSM. However, the contractor will not need to depart the active site during USACE surveys and site capacity assessment, UNLESS the management threshold is above Level #3 ("threshold capacity level" or higher). In which case, the contractor may leave the active site and use another while USACE determines available capacity (2-2.5 day activity).

During periods of rough bar conditions; the SW Site or the NJ Site may not be available for use; in which case the DW Site may be used. At times during the 2003 dredging season, both contract and government dredges may relocate to other work areas.

8. Optimization of Site Capacity

The SW Site has become the principal disposal site for MCR project maintenance dredged material. Since 1997, 72% of all MCR dredged material (sand) has been placed in the SW Site . Continued use of the SW Site as a primary disposal site is of strategic importance to the MCR federal project and environment [USACE 2003]. Full utilization of SW Site capacity can be achieved by promoting even deposition of dredged material throughout the entire SW Site boundary. This means that the dredged material would be placed though out the entire site, both in space and time, using a regimented procedure to produce a uniform continuous layer on the seabed, avoiding the formation of any localized mounding.

To promote even and controlled deposition of dredged material within the SW Site and NJ Site, the sites were partitioned into a system of cells (about 500 x 500 ft). Initial dump assignments are made for each cell within a given site based on the target mound heights (elevations) for dredged material accumulation. The cell assignments (dumps per cell) will be periodically refined as a given site is "filled". As areas of a site become filled; filled cells are either minimally used or are restricted from use. To facilitate coordination of site assessment, the same placement grid will be used by the contractor and government dredges. Figures 5 and 6 show initial cell assignments for the SW Site and NJ Site and constitute the initial disposal plan for each site for 2003.

During 2003, placement of dredged material within either the SW Site or NJ Site will be conducted according to the following specification. The SW Site sand NJ Site shall be filled uniformly with no more than one load difference between any two cells: All cells must be filled with one load before placing a second load in any cell; all cells designated for two loads must be filled before placing a third load in any cell, etc. When recording the placement location, material shall be credited to the cell in which the disposal operation is started regardless of the number of cells disposed in. Each load shall be distributed across no less than 2 cells.

If the DW Site is used during 2003, dredged material is to be placed in a confined manner within the available placement area (point dumping). The intent is to minimize the areal dispersal of dredged material placed within the DW Site (opposite of the SW and NJ Sites). The vertical limit for total dredged material accumulation (on the seabed) with the DW site is 40 ft.

9. Data Reporting Requirements

Field Data to be Provided to NWP: Field offices and Portland District will conducted an internal briefing every Tuesday. Contract and government hopper dredge disposal coordinates will be provided to NWP-OP-NW and EC-HY/HR digitally every day while the dredges are working at MCR. Other data may be transferred to OP-NW and EC-HY/HR, as adaptive site management requirements dictate. EC-HY will plot dump coordinates to verify that the active disposal sites are being used as intended. Results will

be provided to EC-HR, EC-R, and OP-NW weekly; unless deviations are observed, in which case results will be provided to subject offices immediately. OP-NW should provide hydrographic survey information to EC-HY in a timely format. EC will compile survey information and disseminate according to the flow diagram in figure 2.

Updates from NWP to Public: The Portland District (MCR project manager) will send out email updates to collaborating agencies and interested stakeholders every Friday. Other data may be sent, as adaptive site management requirements dictate.

APPENDIX A

The Hopper Dredge

A hydraulic hopper dredge is a self-propelled seagoing ship with sections of its hull compartmented into one ore more hoppers. It is normally configured with two drag arms, one on each side of the dredge. During dredging, bottom sediment is sucked into the drag arm by hydraulic pumps and deposited into the dredge's hoppers. The dredged material enters the hoppers in slurry form and settles to the bottom as excess water flows over the top of the hoppers. Once the hoppers are full, the drag arms are lifted, and the dredge transits to the disposal area where the dredged material is usually dumped thru doors located on the bottom of the ship (hoppers). In some cases, the hopper dredge can use its pump to discharge the dredged material directly overboard or thru a pipeline to a disposal site not reachable by the hopper dredge (ie. beach, upland, or nearshore locations). The operating parameters for several dredges that have been used at MCR are shown below.

Table A-1. Operating parameters for hopper dredges commonly used at MCR

DREDGE	OVERALL DIMENSIONS length (ft)	beam (ft)	draft(ft) loaded/empty	CAPACITY load-average (cy)	VESSEL type	TIME TO PLACE open water dump (minutes, per load)	pump-out (minutes, per load)
Newport*(Cntr)*	300	55	20/10	3,000	split-hull	4 to 8	N/A
Sugar Island*(Cntr)*	281	52	19/8	2,300	split-hull	4 to 8	80 to 100
Padre Island*(Cntr)*	281	52	19/8	2,700	split-hull	4 to 8	N/A
Essayons*(Gvt)*	350	68	27/15	5,400	bottom doors	6 to 15	120 to 140*
Stuyvesant*(Cntr)*	372	72	29/17	6,800	bottom doors	6 to 15	130 to 160

*** will have pump-out capability in 2004**
During 2003, the *Essayons* and *Sugar Island* will be used to maintain the MCR bar

Hopper dredges are used mainly for dredging in wave exposed or high current areas where traffic and operating conditions preclude the use of more stationary dredges and their attendant pipeline or dump scows. Hopper dredges are effective working offshore and in entrances where sea and weather conditions preclude the use of extensive dredge pipe. Most hopper dredges are capable of operating in ocean swell 10 ft high and they are important for accessing disposal sites many miles from the dredging location. The government hopper dredge (*Essayons*) utilizes a series of "doors" located on the hull bottom to release each load of dredged material. The bottom doors are sequentially opened during disposal until the entire load of dredged material is released form the vessel, resulting in a gradual release of dredged material from the vessel. Contractor hopper dredges typically employ a split-hull design. A split-hull hopper dredge releases its load of dredged material by opening (splitting) the entire hull of the vessel. The split-hull method of disposal is more rapid (efficient) than bottom-door hopper dredges. While the use of split-hull hopper dredges reduces the time required for material disposal, split-

hull dredges reduce the horizontal dispersal of dumped dredged material on the seabed while increasing the vertical extent of accumulation per dump.

MCR Disposal Site Utilization Procedures and Governing Constraints

Information used to formulate the use strategy for individual MCR disposal sites was obtained from the annual report "*Utilization of MCR Ocean Dredged Material Disposal Site during 2002 and Recommendations for 2003"* [USACE 2003]. All water depths are specified with respect to MLLW.

Shallow Water Site (Site E): As of 29 April, the *total* target capacity within the Shallow Water Site (Site E) was about 4.9 MCY (this assumes that dredged material accumulates to the target level, described in Table 1, accounting for dredged material side slope only). The site's present *effective* target capacity is 4.1 MCY; this is the volume that can be realistically placed within the site (accounting for "edge" effects along the site's boundary). Refer to figures 5, 7, and 8 for SW Site constraints. The western half of the site is typically less dispersive than the eastern half of the site and may be unavailable for dredged material disposal after 15 August. Figure 7a shows the *target contour elevations* for SW Site: These contours account for a 5-ft accumulation added onto the site's baseline bathymetry. Figure 8 shows the *contour heights* at which dredged material can accumulate within the site, without exceeding the site's management target (with respect to May 1997), based on the 29 April 2003 survey. As of 29 April, the average height of accumulation at the target contour elevations for the eastern and western areas of SW Site is 9 ft and 4 ft respectively. Due to the goal of not exceeding the management target for dredged material accumulation within SW Site (with respect to the baseline condition- May 1997), dredged material should be placed such that it accumulates uniformly throughout the site, both in space and time. This means that an entire site should be utilized, to the maximum extent practicable. Note that the MCR entrance channel buoy #7 will be relocated (moved out of SW Site) by 25 June 2003 , as shown in figure 7.

NJ Site: The average water depth within the NJ Site is about 45 ft. The present target capacity of the NJ site (for the 2003 dredging season) is 340 KCY, assuming that 70% of the NJ site is permitted to accumulate dredged material to a height of 8 ft (with respect to the site's baseline 1999 condition). Refer to figures 9 and 10. Due to the relatively shallow water depths thru the NJ Site, care should be taken to place dredged material such that it accumulates evenly within the site and the entire site should be utilized, to the maximum extent practicable. It may be advantageous to first use the eastern half of the NJ site, then fill in the western half; so as not get "blocked" from using the eastern half of the site--- should accumulation within the western part of the site restrict dredged access due to keel clearance.

Deep Water Site: The DW Site (MRPSA section 103 boundary) occupies an area of 7,000 x 7,000 ft and lies 6 miles offshore from MCR in a water depth of 225 ft. The DW Site has not been used for dredged material disposal, prior to 2003. The capacity for dredged material disposal within the DW Site (103 boundary) is about 13 million cy . Use of the DW Site is expected to occur ONLY when the other disposal sites have been

used to the maximum extent practicable or when inclement weather conditions eliminate the safe use of the other disposal sites. Placement of dredge material would occur within a smaller 3,000 X 3000 foot (207 acres) "drop zone" area so that material does not leave the larger 7000 X 7000 foot site boundaries as sand is dispersed from the dredge through the water column. Refer to figure 11. If the DW Site is used during 2003, dredged material should be placed in a confined manner within the available placement area (point dumping). The intent is to minimize the areal dispersal of dredged material placed with the DW Site (opposite of the SW and NJ Sites). The vertical limit for dredged material accumulation (on the seabed) with the DW site is 40 ft.

Site F: The MPRSA Section 103 part of ODMDS F (as expanded to 10,000 x 10,000 ft in 1993) expired in Fall 2002. For 2003 and beyond, only the original EPA-designated area of ODMDS F (1,800 x 1,800 ft as designated in 1986) is available for use. The average water depth within Site F (102) is about 120 ft. The total remaining target capacity of Site F is 350,000 cy. Refer to figure 12 and 13 for Site F layout. Based on the small area (and capacity) that is currently available for use within Site F, EPA considers this site full. Use of Site F is considered less desirable than the other sites NJ Site, SW Site, or DW Site. If Site F were used in 2003, dredged material should be placed uniformly within the site. Dredged material accumulation during 2003 should not exceed a height of 4 ft (or 15 ft, relative to the 1981 baseline condition) within site F.

Site A: The MPRSA Section 103 part of ODMDS A (as expanded to 6,000 x 4,000 ft in 1993) expired in Fall 2002. For 2003 and beyond, only the original EPA-designated area of ODMDS A (5,000 x 2,000 ft as designated in 1986) will available for use. Site A is located in average water depth of 60 ft. The total remaining target capacity of Site A is 200,000 cy. Refer to figure 14 and 15 for Site A layout. Based on the small area (and capacity) that is currently available for use within Site A, EPA considers this site full. Use of Site A is considered less desirable than the other sites NJ Site, SW Site, or DW Site. If Site A were used in 2003, dredged material should be placed such that is accumulates uniformly within the northern half of the site. Dredged material accumulation during 2003 should not exceed a height of 3 ft (or 5 ft, relative to the 1981 baseline condition) within the part of site A used during 2003.

References

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USACE (2002). "Utilization of existing MCR ODMDSs during 2001 and Recommendations for 2002". Portland District – US Army Corps of Engineers.

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USACE (2003b). "Mouth of the Columbia River Shallow Water Ocean Dredged Material Disposal Site Supplemental Evaluation of Optimized Site Utilization and Assessment of Potential Wave-Related Impacts". Portland District – US Army Corps of Engineers.

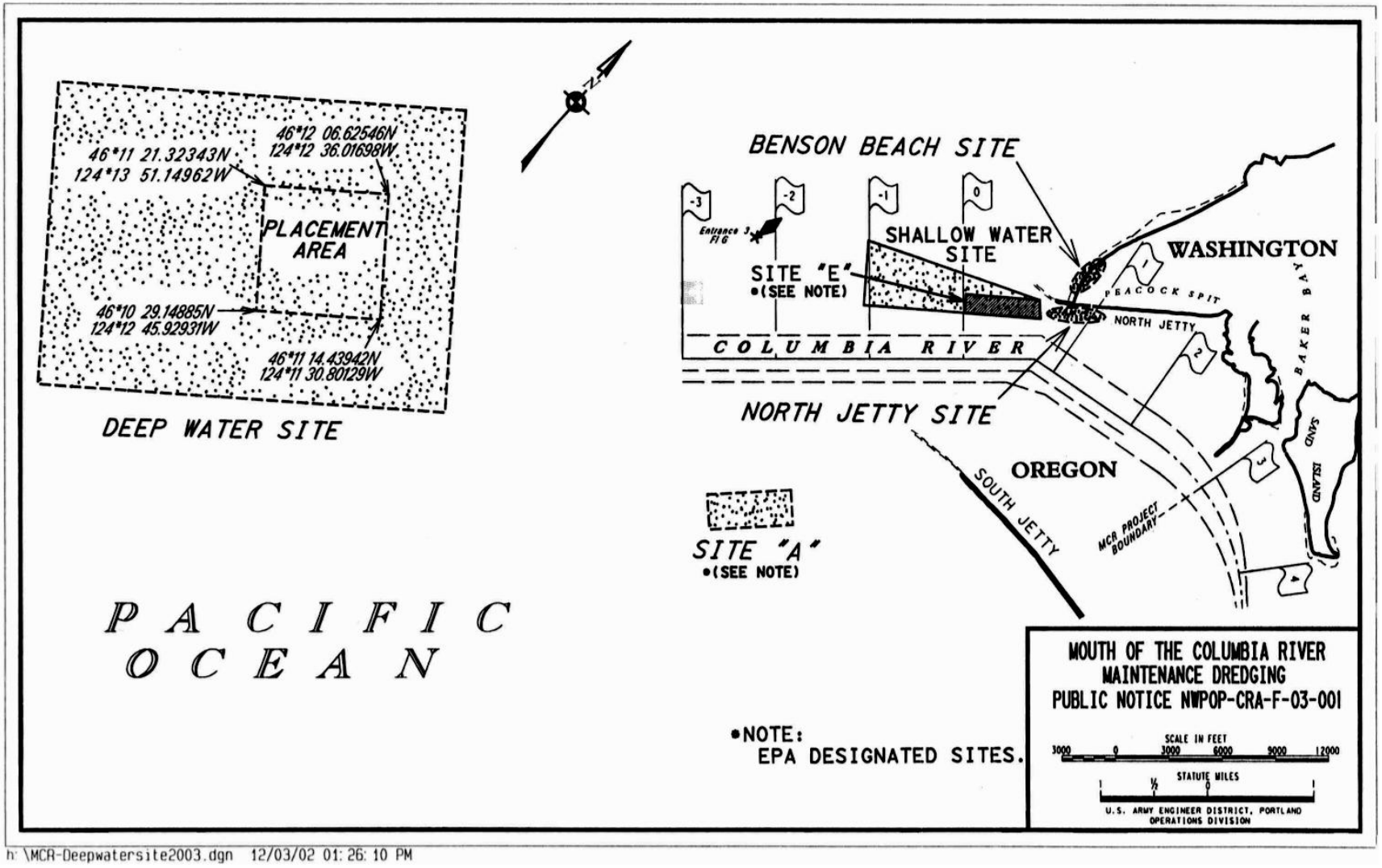

46°12 06.62546N
124°12 36.01698W
46°11 21.32343N
124°13 51.14962W
PLACEMENT AREA
46°10 29.14885N
124°12 45.92931W
46°11 14.43942N
124°11 30.80129W
DEEP WATER SITE
BENSON BEACH SITE
SHALLOW WATER SITE
SITE "E"
•(SEE NOTE)
Entrance 3 FIG
-3
-2
-1
0
WASHINGTON
PEACOCK SPIT
NORTH JETTY
COLUMBIA RIVER
BAKER BAY
SAND ISLAND
NORTH JETTY SITE
OREGON
SOUTH JETTY
MCR PROJECT BOUNDARY
SITE "A"
•(SEE NOTE)
PACIFIC OCEAN
•NOTE:
EPA DESIGNATED SITES.
MOUTH OF THE COLUMBIA RIVER
MAINTENANCE DREDGING
PUBLIC NOTICE NWPOP-CRA-F-03-001
SCALE IN FEET
3000 0 3000 6000 9000 12000
STATUTE MILES
1/2 0 1
U.S. ARMY ENGINEER DISTRICT, PORTLAND
OPERATIONS DIVISION
h:\MCR-Deepwatersite2003.dgn 12/03/02 01:26:10 PM

Figure 1

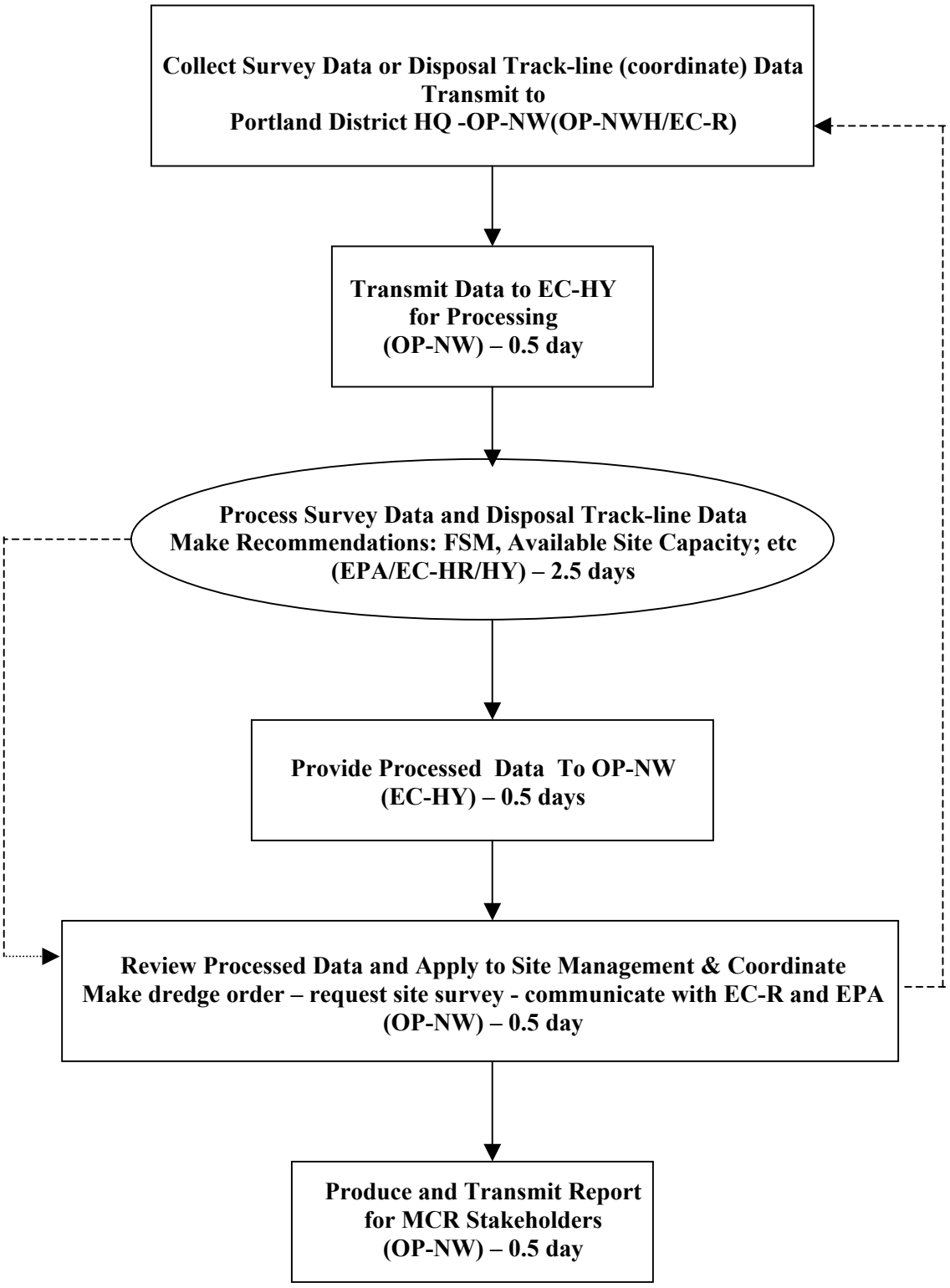


Figure 2. Flow diagram describing the procedure of processing monitoring data and using the processed data to manage disposal site capacity. Offices shown in () are assigned responsibility for task; expected duration of task is specified. FSM = frequency for Site Monitoring.

Government Dredge

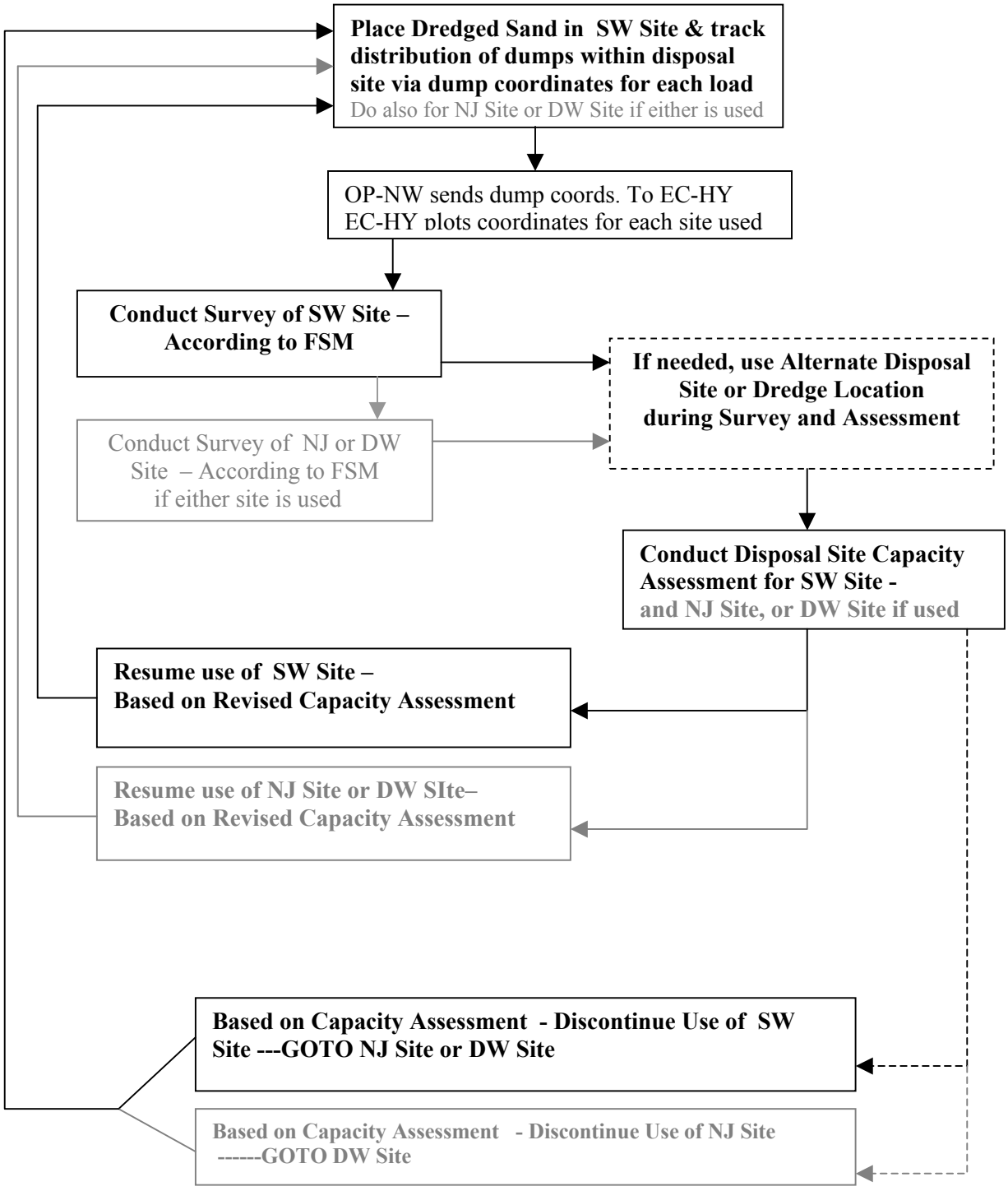


Figure 3a. Flow Diagram describing Action events for government dredge Essayons during dredging-disposal at MCR for 2003.

Contract Dredge

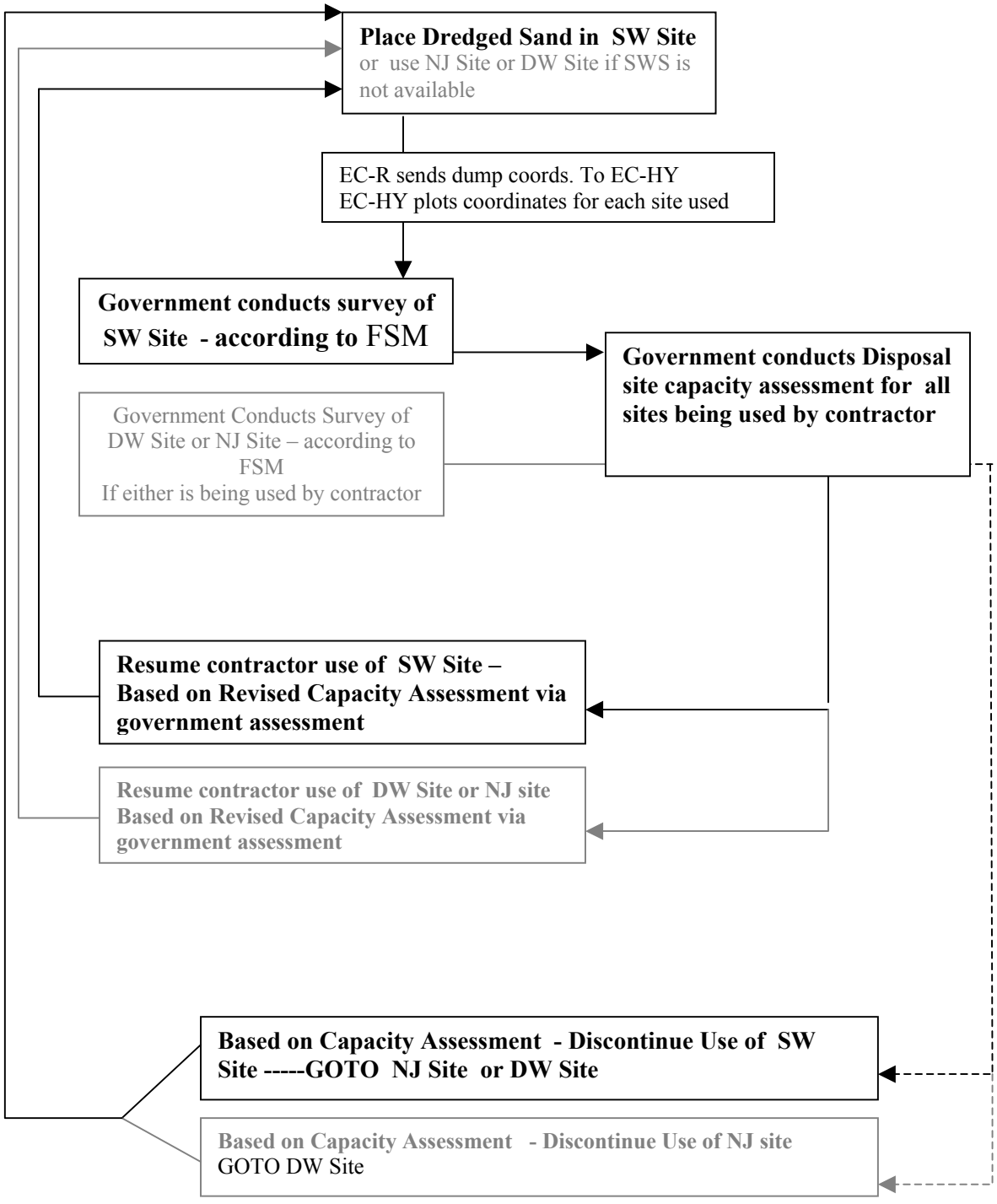
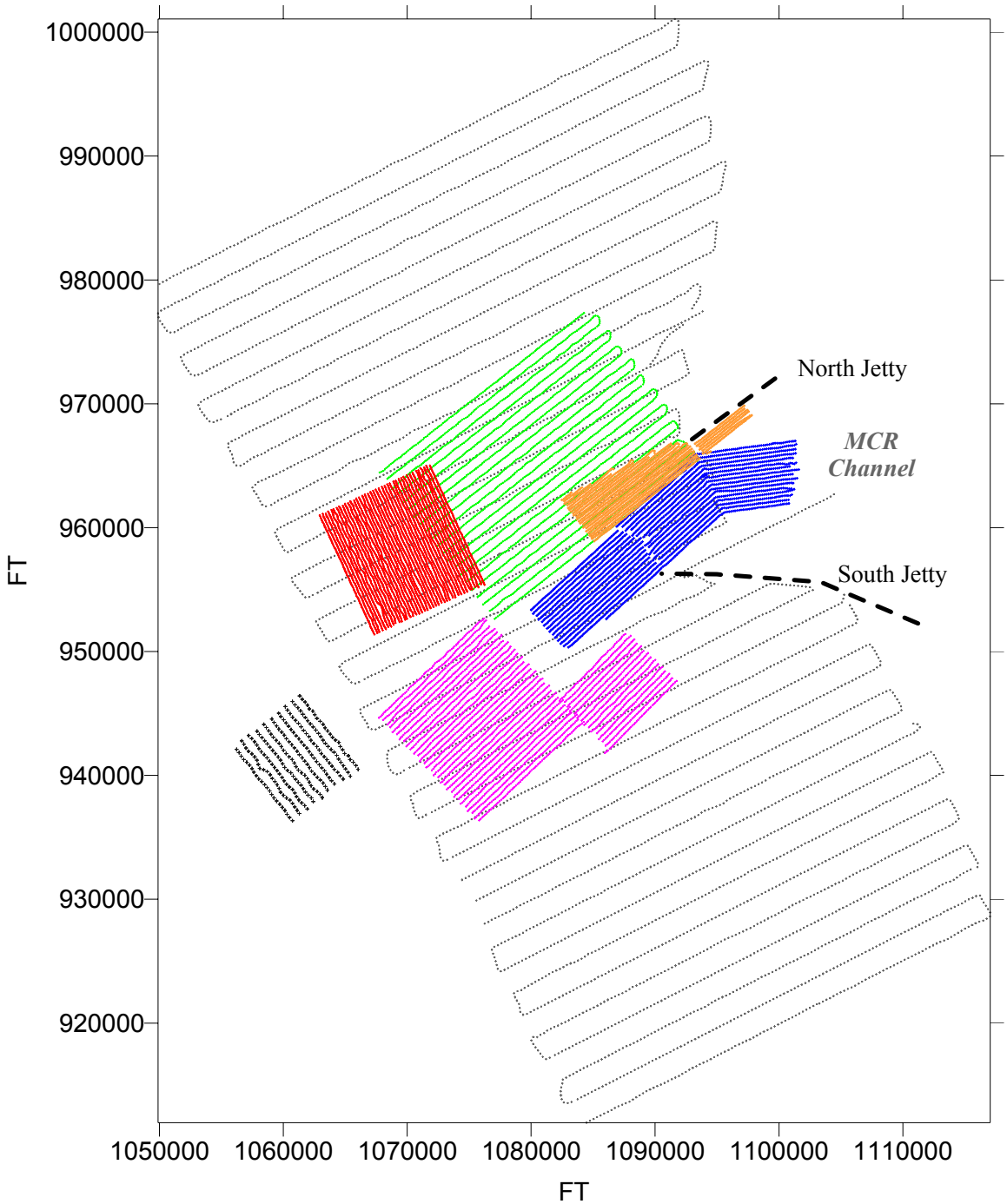


Figure 3b. Flow Diagram describing Action events for contract dredge during dredging-disposal at MCR for 2003.

MCR SURVEY DATA - COVERAGE



Grey = Approach Survey

Red = Site B

Green = Peacock Spit , 2 x 2 mile

Blue = MCR Channel

Lavender = Site F and Site A

Orange = Site E and NJ Site

Black = 103 Part of DW Site

Figure 4

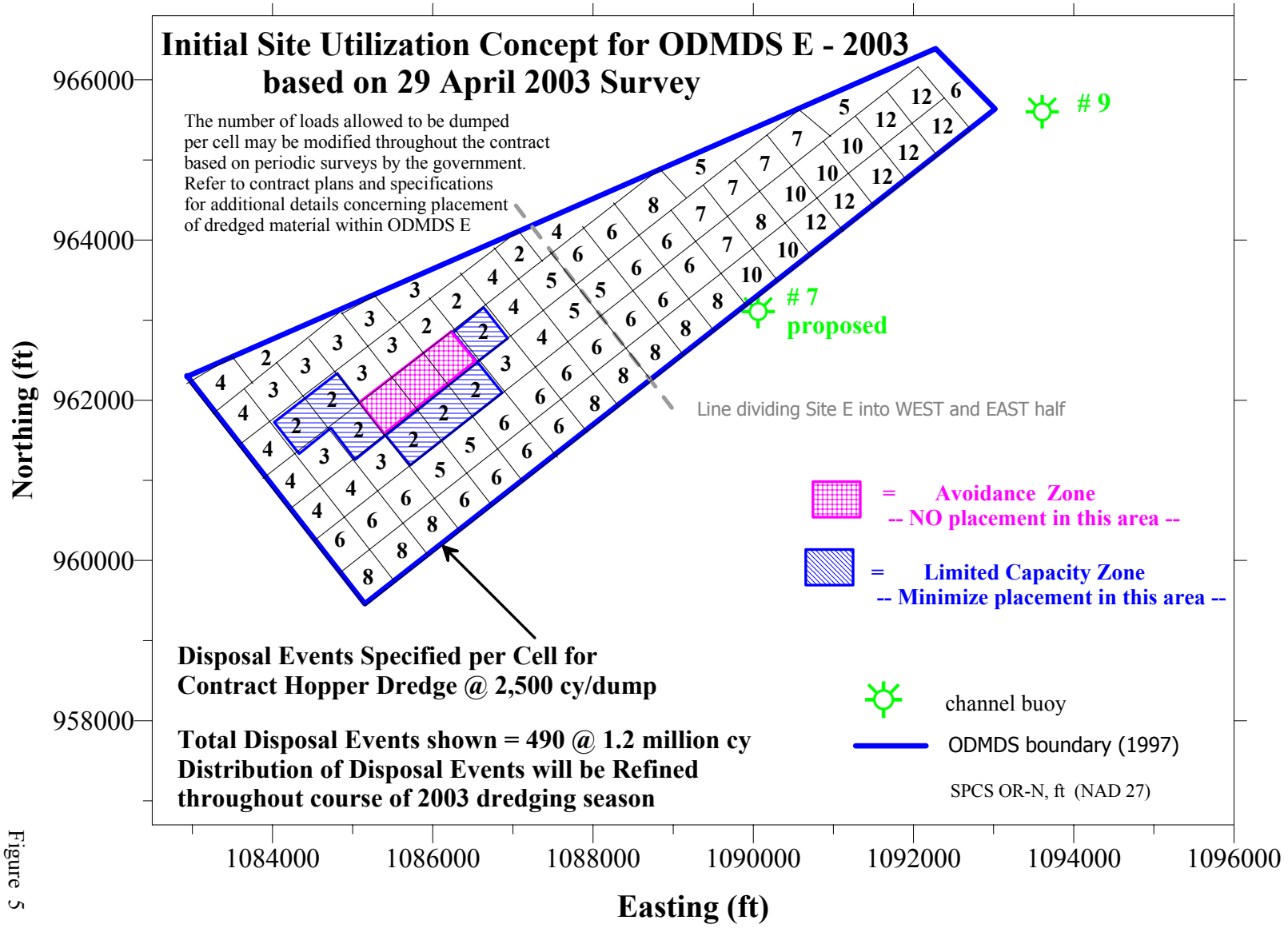

Initial Site Utilization Concept for ODMDS E - 2003
based on 29 April 2003 Survey
The number of loads allowed to be dumped per cell may be modified throughout the contract based on periodic surveys by the government. Refer to contract plans and specifications for additional details concerning placement of dredged material within ODMDS E
9
7
proposed
Line dividing Site E into WEST and EAST half
= Avoidance Zone
-- NO placement in this area --
= Limited Capacity Zone
-- Minimize placement in this area --
Disposal Events Specified per Cell for
Contract Hopper Dredge @ 2,500 cy/dump
Total Disposal Events shown = 490 @ 1.2 million cy
Distribution of Disposal Events will be Refined
throughout course of 2003 dredging season
channel buoy
ODMDS boundary (1997)
SPCS OR-N, ft (NAD 27)
Northing (ft)
966000
964000
962000
960000
958000
1084000
1086000
1088000
1090000
1092000
1094000
1096000
Easting (ft)

Figure 5

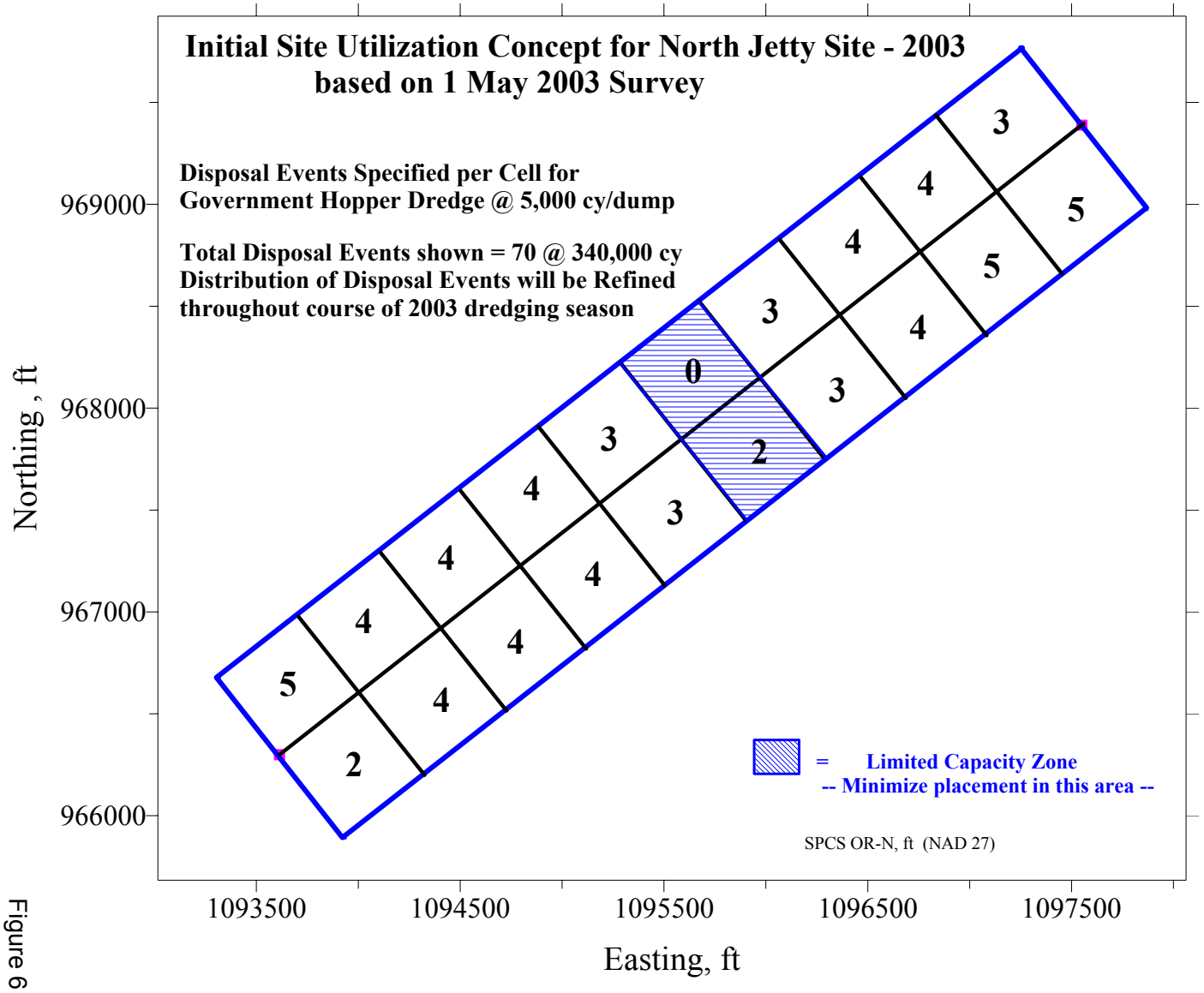

Initial Site Utilization Concept for North Jetty Site - 2003
based on 1 May 2003 Survey
Disposal Events Specified per Cell for
Government Hopper Dredge @ 5,000 cy/dump
Total Disposal Events shown = 70 @ 340,000 cy
Distribution of Disposal Events will be Refined
throughout course of 2003 dredging season
= Limited Capacity Zone
-- Minimize placement in this area --
SPCS OR-N, ft (NAD 27)
Northing , ft
969000
968000
967000
966000
1093500
1094500
1095500
1096500
1097500
Easting, ft

Figure 6

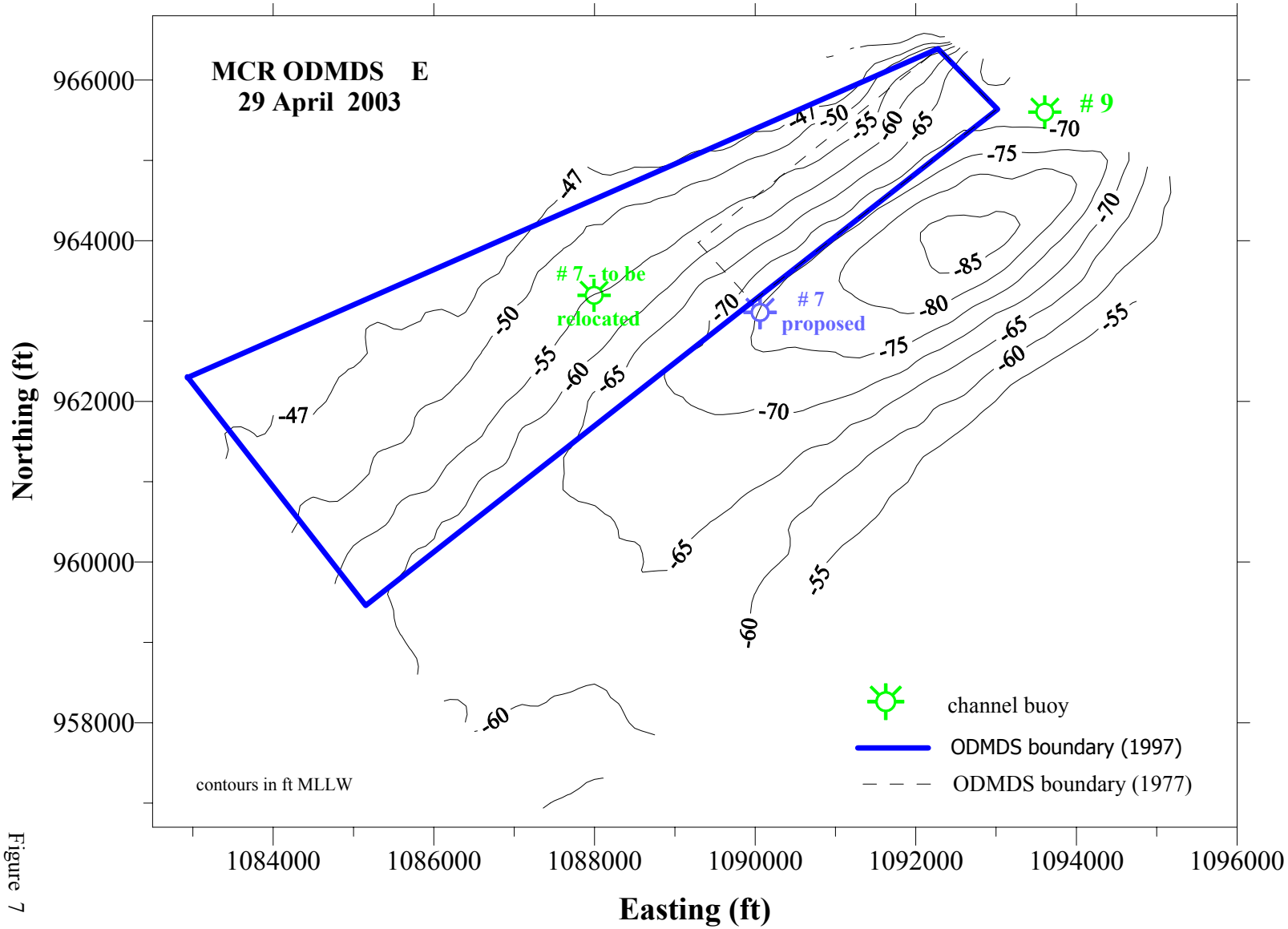

MCR ODMDS E
29 April 2003
9
7 - to be relocated
7 proposed
channel buoy
ODMDS boundary (1997)
ODMDS boundary (1977)
contours in ft MLLW
Northing (ft)
Easting (ft)
966000
964000
962000
960000
958000
1084000
1086000
1088000
1090000
1092000
1094000
1096000

Figure 7

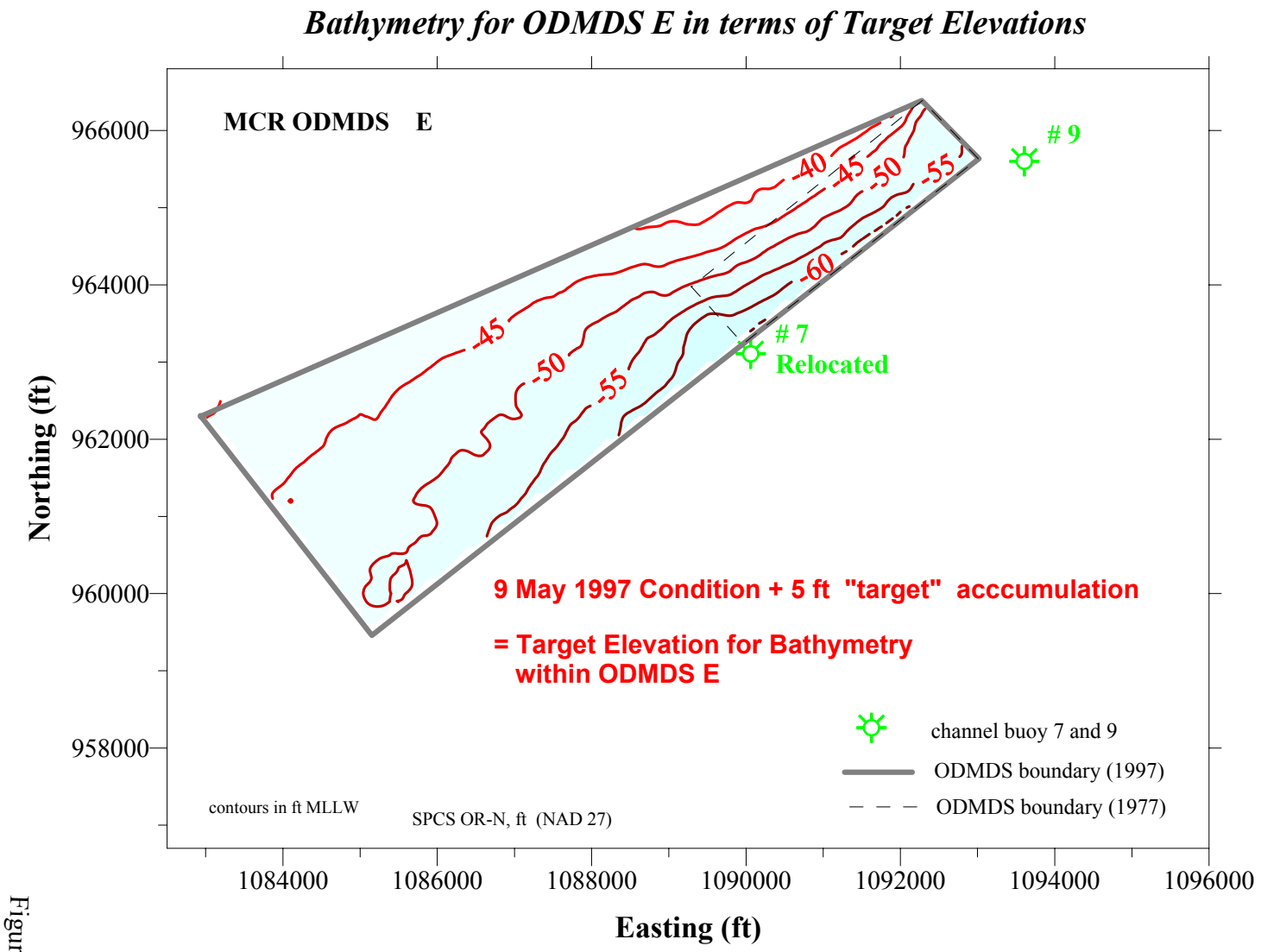

Bathymetry for ODMDS E in terms of Target Elevations
MCR ODMDS E
9
7
Relocated
-40
-45
-50
-55
-60
-45
-50
-55
9 May 1997 Condition + 5 ft "target" acccumulation
= Target Elevation for Bathymetry
within ODMDS E
channel buoy 7 and 9
ODMDS boundary (1997)
ODMDS boundary (1977)
contours in ft MLLW
SPCS OR-N, ft (NAD 27)
Northing (ft)
966000
964000
962000
960000
958000
1084000
1086000
1088000
1090000
1092000
1094000
1096000
Easting (ft)

Figure 7a

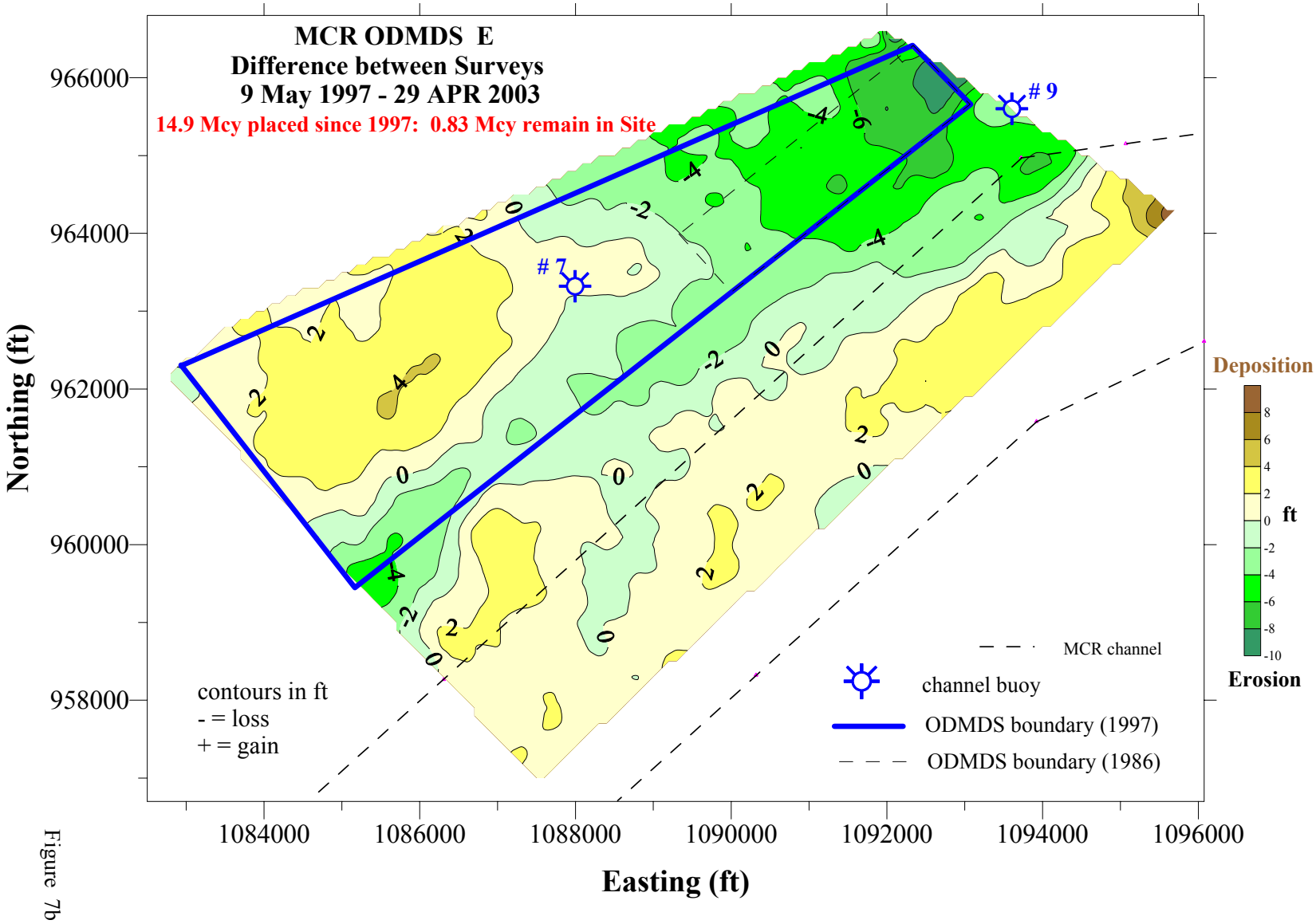

MCR ODMDS E
Difference between Surveys
9 May 1997 - 29 APR 2003
14.9 Mcy placed since 1997: 0.83 Mcy remain in Site
9
7
Northing (ft)
966000
964000
962000
960000
958000
1084000
1086000
1088000
1090000
1092000
1094000
1096000
Easting (ft)
contours in ft
- = loss
+ = gain
MCR channel
channel buoy
ODMDS boundary (1997)
ODMDS boundary (1986)
Deposition
8
6
4
2
0
-2
-4
-6
-8
-10
ft
Erosion

Figure 7b

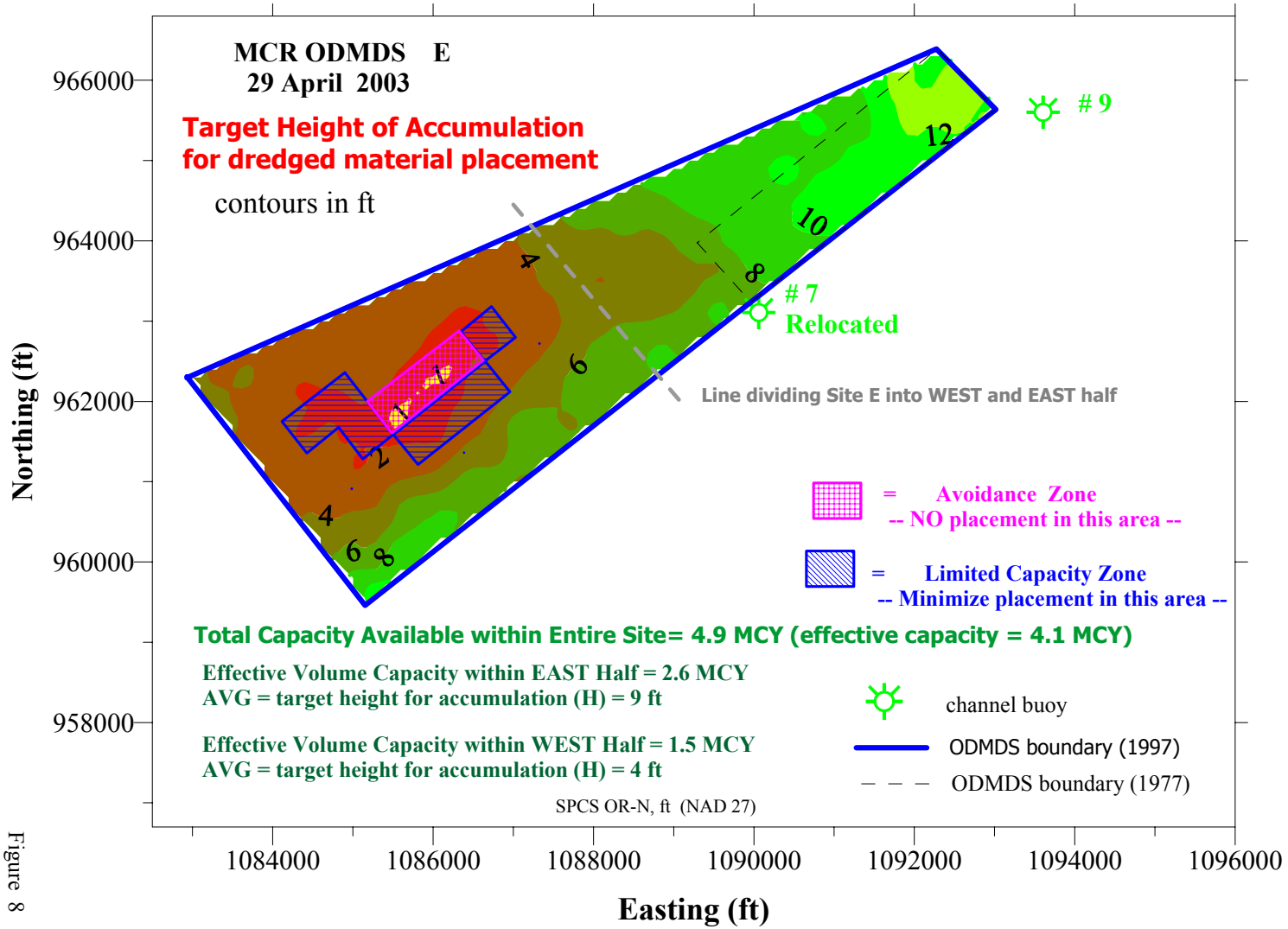

MCR ODMDS E
29 April 2003
Target Height of Accumulation
for dredged material placement
contours in ft
9
7
Relocated
Line dividing Site E into WEST and EAST half
= Avoidance Zone
-- NO placement in this area --
= Limited Capacity Zone
-- Minimize placement in this area --
Total Capacity Available within Entire Site= 4.9 MCY (effective capacity = 4.1 MCY)
Effective Volume Capacity within EAST Half = 2.6 MCY
AVG = target height for accumulation (H) = 9 ft
Effective Volume Capacity within WEST Half = 1.5 MCY
AVG = target height for accumulation (H) = 4 ft
SPCS OR-N, ft (NAD 27)
channel buoy
ODMDS boundary (1997)
ODMDS boundary (1977)
Northing (ft)
966000
964000
962000
960000
958000
1084000
1086000
1088000
1090000
1092000
1094000
1096000
Easting (ft)

Figure 8

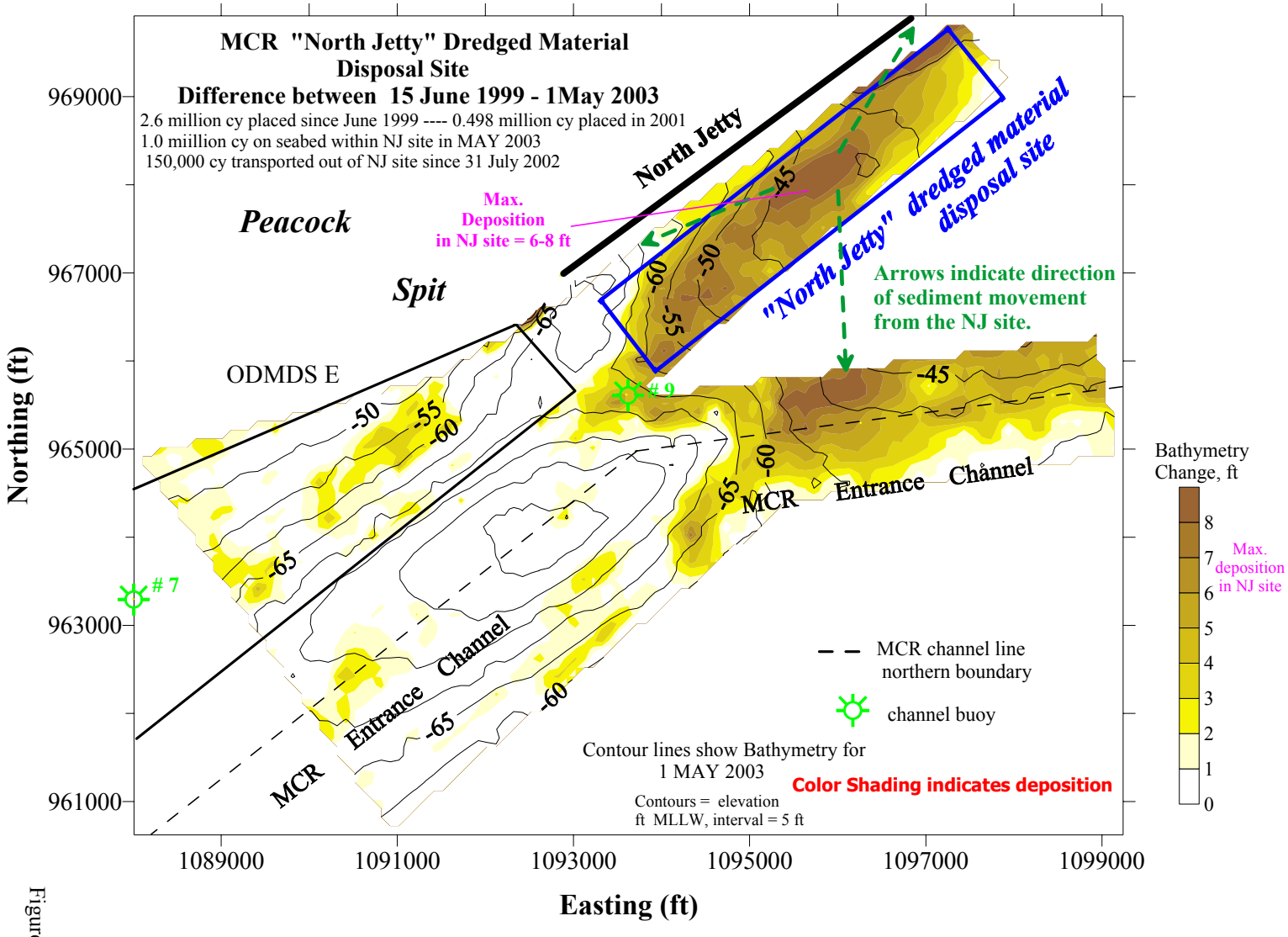

MCR "North Jetty" Dredged Material Disposal Site
Difference between 15 June 1999 - 1May 2003
2.6 million cy placed since June 1999 ---- 0.498 million cy placed in 2001
1.0 miillion cy on seabed within NJ site in MAY 2003
150,000 cy transported out of NJ site since 31 July 2002
Peacock Spit
North Jetty
Max. Deposition in NJ site = 6-8 ft
"North Jetty" dredged material disposal site
Arrows indicate direction of sediment movement from the NJ site.
ODMDS E
9
7
MCR Entrance Channel
MCR channel line northern boundary
channel buoy
Contour lines show Bathymetry for 1 MAY 2003
Contours = elevation ft MLLW, interval = 5 ft
Color Shading indicates deposition
Bathymetry Change, ft
Max. deposition in NJ site
Northing (ft)
Easting (ft)
969000
967000
965000
963000
961000
1089000
1091000
1093000
1095000
1097000
1099000

Figure 9

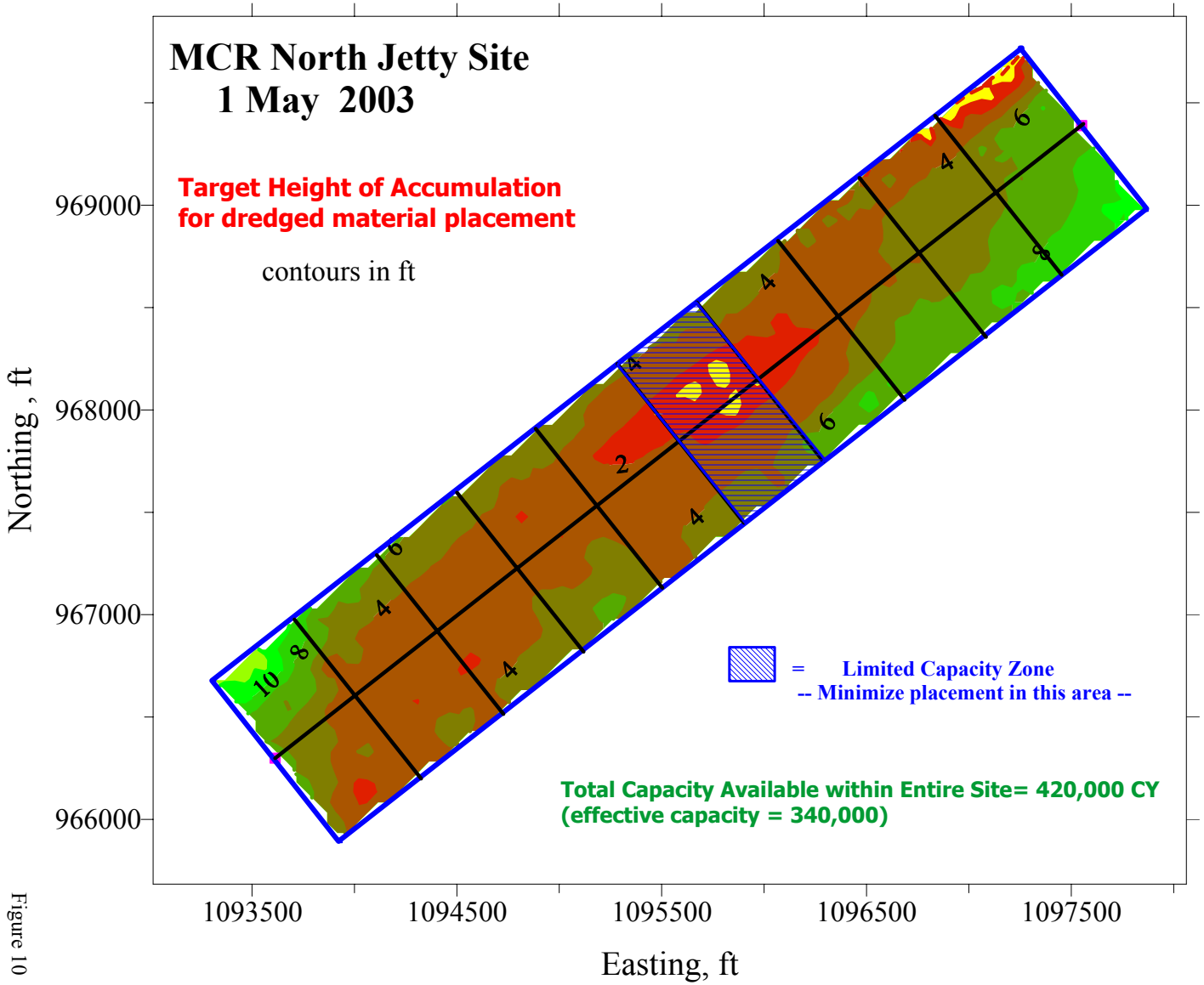

MCR North Jetty Site
1 May 2003
Target Height of Accumulation
for dredged material placement
contours in ft
= Limited Capacity Zone
-- Minimize placement in this area --
Total Capacity Available within Entire Site= 420,000 CY
(effective capacity = 340,000)
Northing , ft
969000
968000
967000
966000
Easting, ft
1093500
1094500
1095500
1096500
1097500

Figure 10

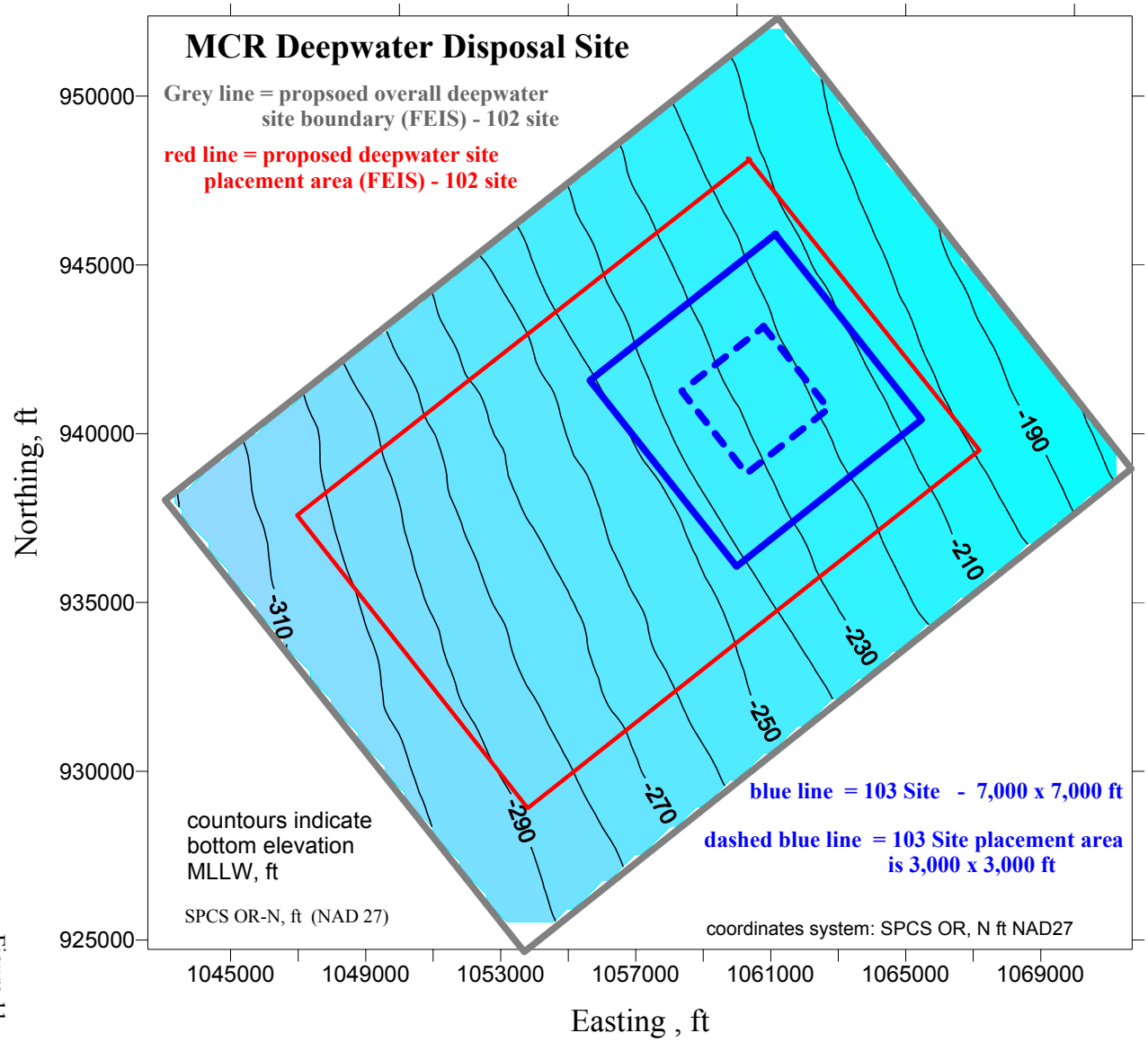

MCR Deepwater Disposal Site
Grey line = propsoed overall deepwater site boundary (FEIS) - 102 site
red line = proposed deepwater site placement area (FEIS) - 102 site
blue line = 103 Site - 7,000 x 7,000 ft
dashed blue line = 103 Site placement area is 3,000 x 3,000 ft
countours indicate bottom elevation MLLW, ft
SPCS OR-N, ft (NAD 27)
coordinates system: SPCS OR, N ft NAD27
-190
-210
-230
-250
-270
-290
-310
950000
945000
940000
935000
930000
925000
1045000
1049000
1053000
1057000
1061000
1065000
1069000
Northing, ft
Easting , ft

Figure 11

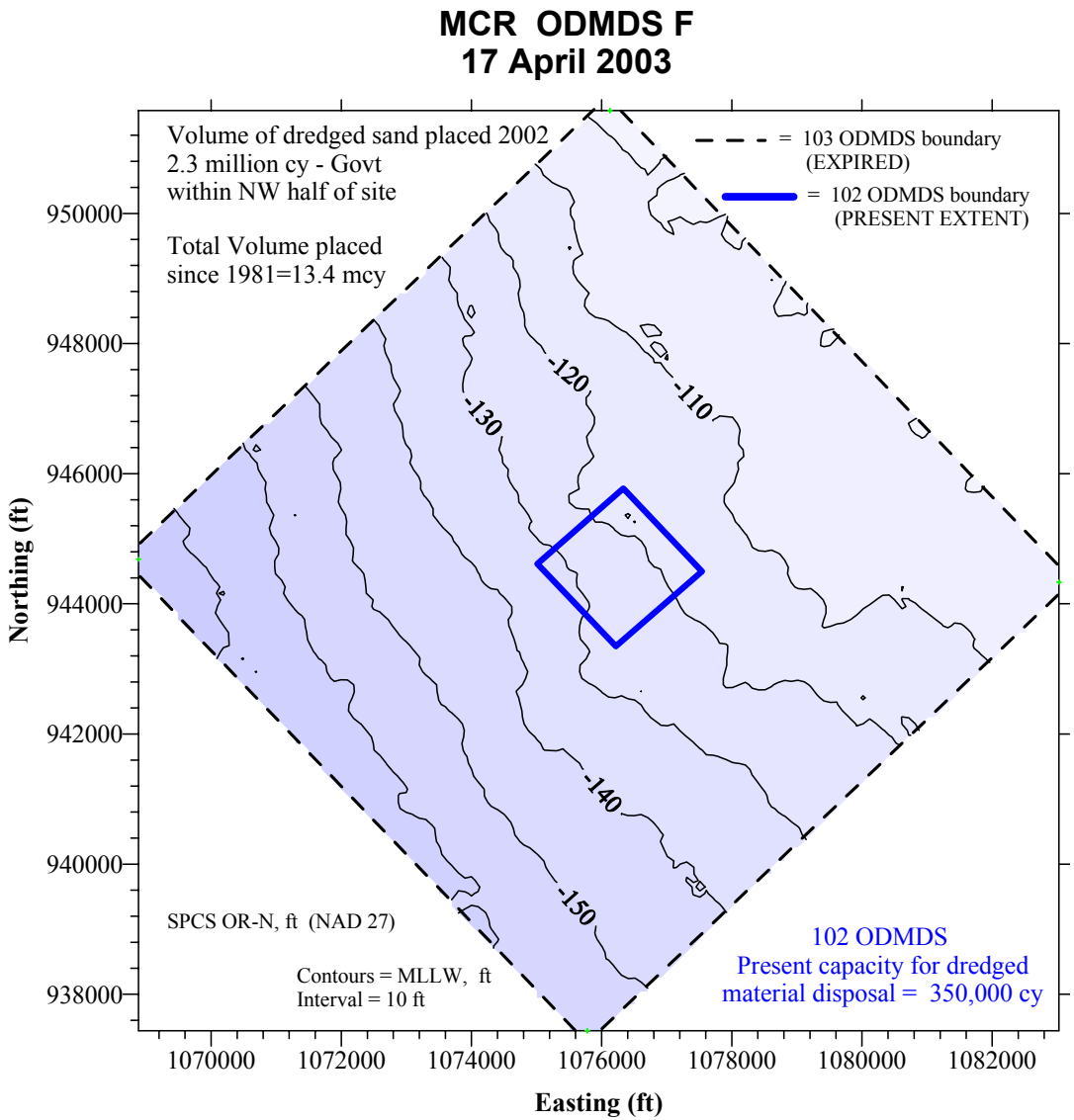

MCR ODMDS F
17 April 2003
Volume of dredged sand placed 2002
2.3 million cy - Govt
within NW half of site
Total Volume placed
since 1981=13.4 mcy
= 103 ODMDS boundary
(EXPIRED)
= 102 ODMDS boundary
(PRESENT EXTENT)
-110
-120
-130
-140
-150
950000
948000
946000
944000
942000
940000
938000
Northing (ft)
1070000
1072000
1074000
1076000
1078000
1080000
1082000
Easting (ft)
SPCS OR-N, ft (NAD 27)
Contours = MLLW, ft
Interval = 10 ft
102 ODMDS
Present capacity for dredged
material disposal = 350,000 cy

Figure 12

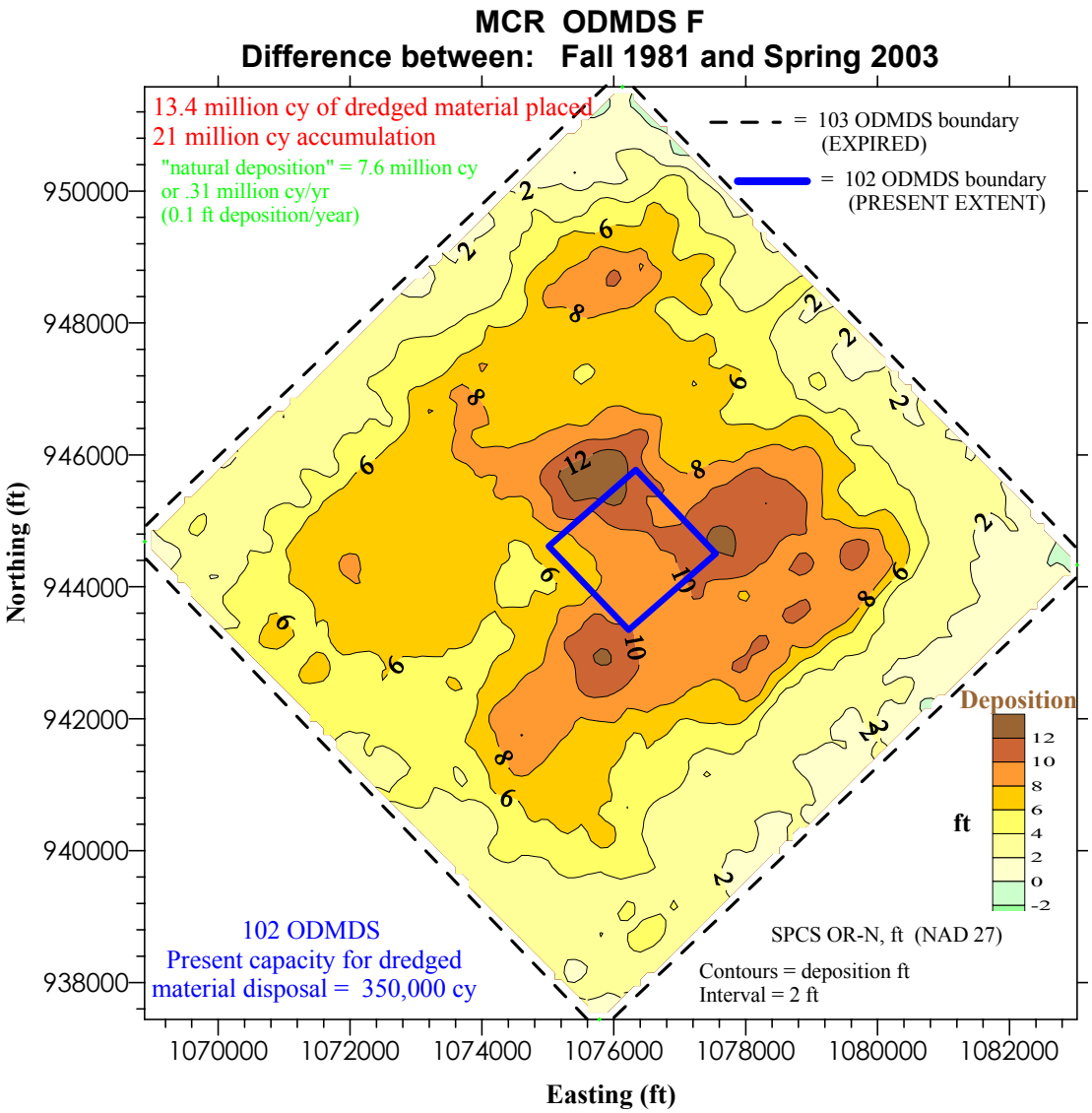

MCR ODMDS F
Difference between: Fall 1981 and Spring 2003
13.4 million cy of dredged material placed
21 million cy accumulation
"natural deposition" = 7.6 million cy
or .31 million cy/yr
(0.1 ft deposition/year)
= 103 ODMDS boundary
(EXPIRED)
= 102 ODMDS boundary
(PRESENT EXTENT)
Northing (ft)
950000
948000
946000
944000
942000
940000
938000
Easting (ft)
1070000
1072000
1074000
1076000
1078000
1080000
1082000
Deposition
ft
12
10
8
6
4
2
0
-2
102 ODMDS
Present capacity for dredged
material disposal = 350,000 cy
SPCS OR-N, ft (NAD 27)
Contours = deposition ft
Interval = 2 ft

Figure 13

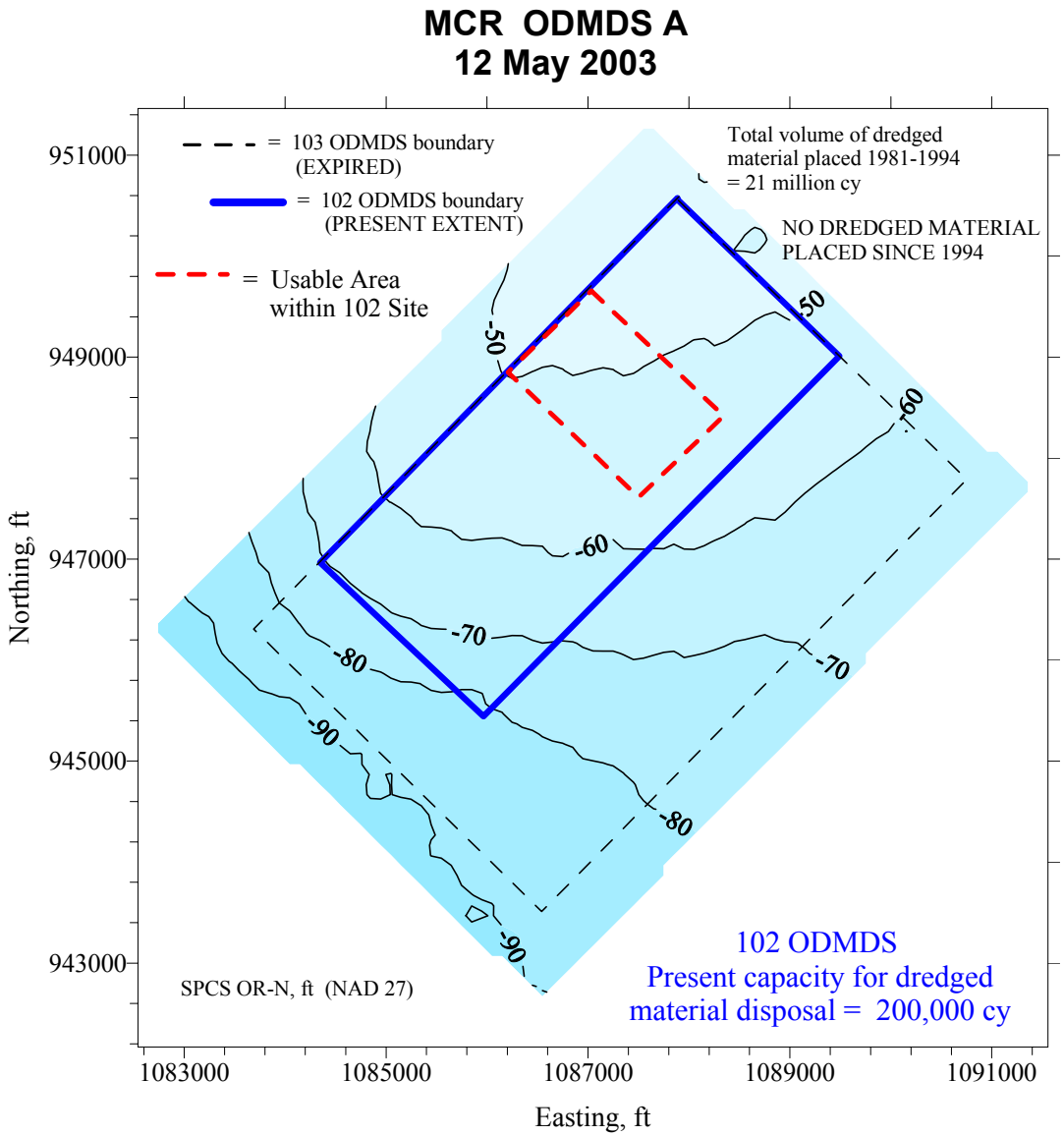

MCR ODMDS A
12 May 2003
= 103 ODMDS boundary (EXPIRED)
= 102 ODMDS boundary (PRESENT EXTENT)
= Usable Area within 102 Site
Total volume of dredged material placed 1981-1994 = 21 million cy
NO DREDGED MATERIAL PLACED SINCE 1994
-50
-60
-70
-80
-90
951000
949000
947000
945000
943000
Northing, ft
1083000
1085000
1087000
1089000
1091000
Easting, ft
SPCS OR-N, ft (NAD 27)
102 ODMDS
Present capacity for dredged material disposal = 200,000 cy

Figure 14

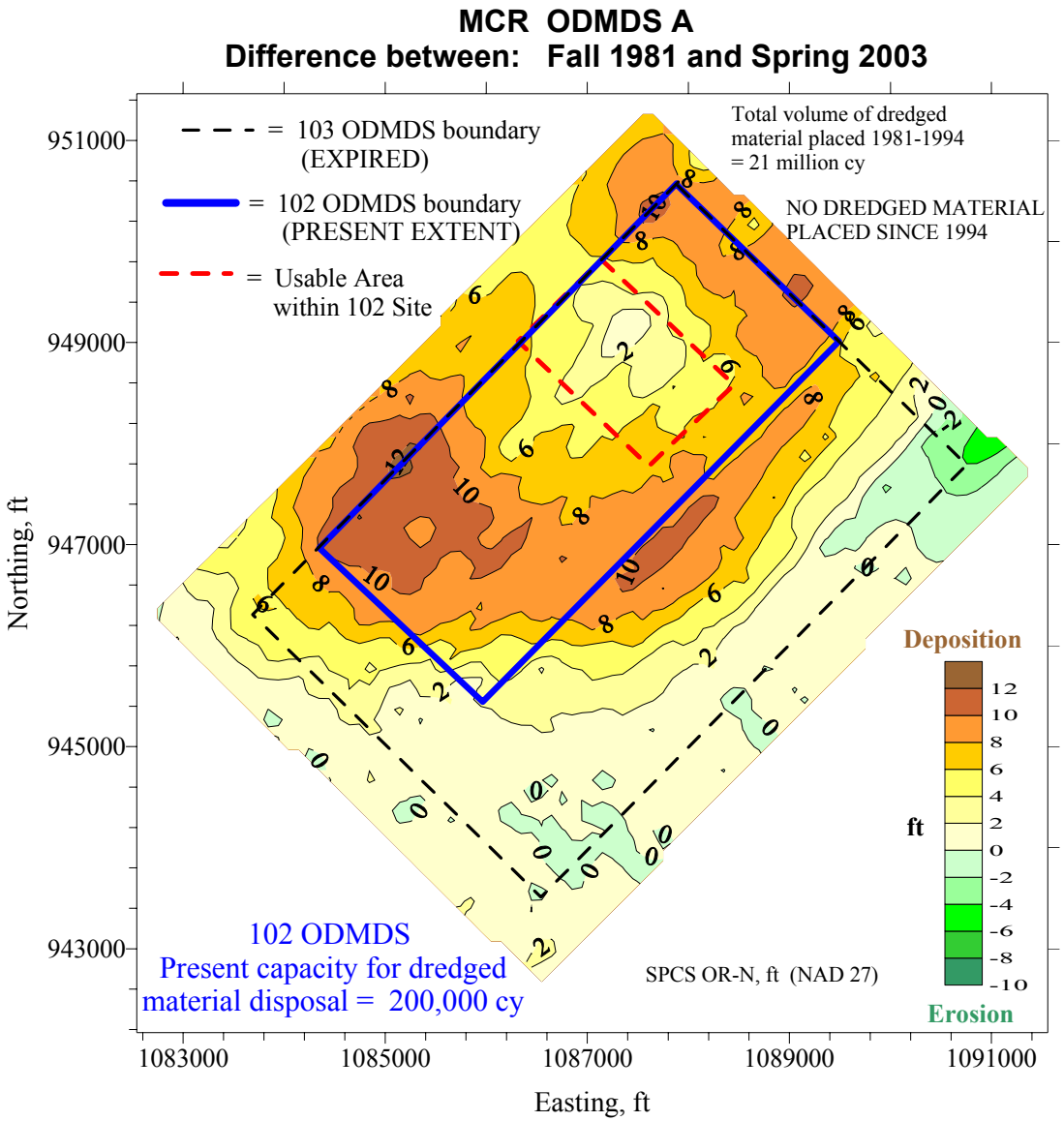

MCR ODMDS A
Difference between: Fall 1981 and Spring 2003
= 103 ODMDS boundary (EXPIRED)
= 102 ODMDS boundary (PRESENT EXTENT)
= Usable Area within 102 Site
Total volume of dredged material placed 1981-1994 = 21 million cy
NO DREDGED MATERIAL PLACED SINCE 1994
102 ODMDS
Present capacity for dredged material disposal = 200,000 cy
SPCS OR-N, ft (NAD 27)
Deposition
ft
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
Erosion
Northing, ft
951000
949000
947000
945000
943000
1083000
1085000
1087000
1089000
1091000
Easting, ft

Figure 15