3.0 ALTERNATIVES ANALYSIS

3.1 Introduction

The goal when evaluating locations for an aquatic disposal site is to identify which of several potential alternative sites can best meet the need for long-term disposal activities with the fewest or least detrimental impact(s) to natural resources and human activities. The primary authorities that define the standards by which potential sites will be evaluated are the federal CWA section 404(b)(1) guidelines and the state MEPA Scope. CZM's rationale for this analysis approach is described in detail below. The disposal site screening process is designed to assess the alternatives through the sequential application of environmental, social and economic criteria defined by the CWA and MEPA. The process of identifying a preferred site is therefore iterative, and the information needed to make determinations about the potential suitability of a given area becomes increasingly detailed as the best candidate sites are identified through the process. Accordingly, the remainder of this alternatives analysis is organized to assess the following elements critical to the site selection process:

Section 3.2: No Action Alternative

Section 3.3: Disposal Site Screening Process

Section 3.4: Treatment Technology Alternatives

Section 3.5: Upland/Reuse Alternatives

Section 3.6: Aquatic Disposal Alternative: Unconfined Open Water Disposal

Section 3.7: Summary

CZM's approach to the analysis of the BBDS as a dredged material disposal alternative has been directed by two authorities: the state level and the federal level. At the state level, the MEPA Scope issued for this Draft EIR directs CZM to "evaluate the potential environmental benefits/drawbacks of opening an historic disposal site versus identifying a new site." The Scope then establishes the framework of studies required to evaluate the suitability of "the site."

At the federal level, the USACE is the lead federal agency in permitting the use of disposal sites in state waters in conjunction with the USEPA, NMFS, and the USFWS. The NAE has formally concurred that it is appropriate to investigate the "continued use of areas in and adjacent to the [BBDS] as an open water disposal alternative…" (USACE-NAE, May 2, 2003). To confirm that BBDS can be classified under the CWA regulations as the LEDPA, the NAE requires that CZM "document the environmental impacts (e.g., to salt marshes, shellfish or eelgrass beds)" of the following alternatives: 1) upland sites; 2) the existing MBDS, CCDS and Site W; 3) historic sites in Buzzards Bay; and 4) BBDS proposed candidate sites 1 and 2.

3.2 No Action Alternative

Consideration of the No Action alternative for the BBDS DMMP is required under the MEPA Regulations at 301 CMR 11.07(6)(f). The No Action alternative is used to provide a future baseline against which the impact of the preferred alternative(s) is (are) measured, compared and contrasted. It is representative of future conditions in the harbors and channels of the Buzzards Bay region, without the changes or activities that would result from the implementation of the preferred alternative(s) for disposal of CDM.

The No Action alternative assumes that dredging activities involving the removal of sediments that are suitable for unconfined open water disposal would not occur. It is estimated that approximately 2,110,720 cy of sediment to be dredged from Buzzards Bay region harbors and channels over the next 20 years is suitable for unconfined open water disposal. Therefore, under the No Action alternative, this 2,110,720 cy of sediment would not be dredged.

Existing sedimentation rates would continue unabated and the navigation channels would slowly fill in. The dredging projects and activities which have been identified to continue economic growth in the harbors and channels of the Buzzards Bay region will not occur.

Specifically, for the BBDS DMMP, no aquatic or upland disposal sites for CDM would be developed, and possible future environmental impacts which would result from their development and use would be avoided. If an aquatic disposal site is not designated, temporary environmental impacts to aquatic organisms and/or physical alterations to subtidal habitats (as discussed in later sections) would not occur. Furthermore, if an upland disposal site is not developed, environmental concerns associated with oxidation/acidification, dust and odor nuisances and leaching of salts would not result.

3.3 Disposal Site Screening Process

The disposal site screening process in Phases I and II of the DMMP (Maguire 1997b, 1998d) was designed to assess all possible alternatives through the sequential application of environmental, social and economic screening criteria. This process, which was used successfully for site screening in the New Bedford/Fairhaven Harbor DEIR (Maguire 2002c, 2003), is illustrated in Figure 3-1. This proven approach, therefore, was applied herein for the purpose of determining the preferred alternative site(s) that can best meet the need identified in Section 2.0.

A universe of potential disposal sites was developed during Phases I and II of the DMMP, including historic dredged material disposal sites. Many of these sites were evaluated in a tiered process for the recent New Bedford/Fairhaven Harbor EIR, and the results are applicable to this BBDS DEIR as well.

The outcome of this multi-step screening process was the identification of a range of practicable and reasonable disposal site alternatives for CDM generated within the Buzzards Bay region. These sites, determined through the evaluation process described below, are presented in this section of the DEIR. A variety of standard dredged material management methods, including treatment technology, upland disposal/reuse, and aquatic disposal, were all considered in this BBDS DEIR.

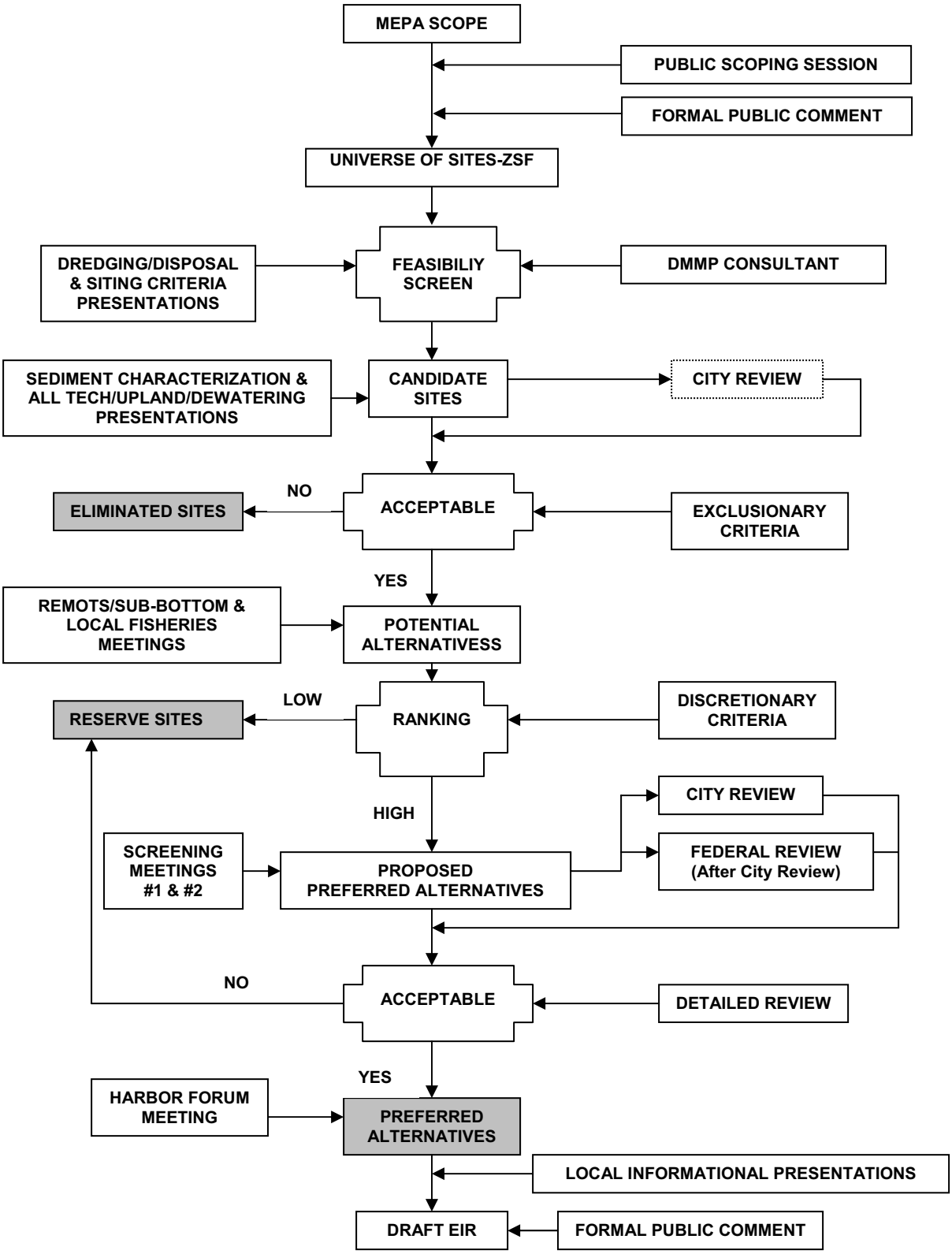


Figure 3-1. DMMP preferred alternative screening process proven in the New Bedford/ Fairhaven Harbor EIR and applied to this BBDS DEIR.

The upland/reuse path for CDM placement covers dewatering, potential application of treatment technology and ultimately reuse or disposal in a state certified landfill. The aquatic path includes placement of CDM in a confined disposal facility (CDF) for land creation or for use in capping unacceptably-contaminated dredged material (UDM), tidal habitat creation (mudflat or marsh), or unconfined open-water disposal. Individual dredging projects in the Buzzards Bay region will require testing to determine whether the sediment to be dredged can be categorized as CDM, and, if not, what treatment(s) might be required prior to placement. The screening criteria were applied in sequential phases to each of the two major disposal site option groups (i.e., upland and aquatic). Sediment classified as CDM, either *in-situ* or post-treatment, may be considered for upland disposal/reuse.

3.4 Treatment Technologies Alternatives

3.4.1 Dewatering

Dewatering is an important intermediate step in the management of dredged material destined for upland/reuse placement. After dewatering, certain CDM from Buzzards Bay projects may require additional treatment before upland/reuse placement. Specific sediment treatment technologies evaluated previously in the New Bedford/Fairhaven Harbor DEIR (Maguire 2002c) are re-evaluated below.

There is currently one dredged material dewatering and treatment facilty in the earliest stage of operation located on the New Bedford Harbor waterfront (USEPA 2004). This system was installed to manage PCB laden UDM from the New Bedford Harbor basin and a section of the Acushnet River contiguous to the Harbor. Coarse dredged materials such as sand and gravel are extracted from the UDM composite at the desanding station and the contaminated finer sediment is dewatered and treated then trucked out of state to a certified landfill (USEPA 2004). This process is effective for certain UDM classified as actionable under the Record of Decision (ROD) for the New Bedford Harbor Superfund cleanup. It is very unlikely that processing CDM from Buzzards Bay regional dredging projects in this system would be practical currently or within the context of the planning horizon covered in theis DEIR. Specific sediment treatment technologies evaluated previously in the recent New Bedford/Fairhaven Harbor EIR (Maguire 2002c, 2003) are re-evaluated below for CDM.

3.4.2 Treatment Technologies

Five treatment technology classes, including incineration, soil washing, solid-phase bioremediation, solidification/stabilization, and vitrification, may be necessary to manage CDM for upland/reuse in certified landfills**.** Treated CDM must have a beneficial end use (reuse) such as landfill grading or capping for approval to be granted. Also, the product and the treatment process must be demonstrated to have no adverse effect on the environment. Because dredged sediments often contain a mixture of different grain sizes, the ability of a treatment technology to handle widely-varying sediment types is very important. There are technologies that will treat specific sediment types in a relatively inexpensive manner, but some technologies that treat a full range of grain sizes may be more expensive.

The average cost for all of the technologies considered applicable to dredged material generated in the Buzzards Bay region is estimated to be $154 per cy (Table 3-1). The costs in Table 3-1

are strictly for comparative use and should be considered estimates only. For comparison, the average cost of disposing sediments at the Central Long Island Sound open-water disposal site in Connecticut is estimated to be $12.85 per cy for a smaller, 26,000 cy project and $16.54 per cy for a larger (e.g., 100,000 cy) project (USEPA, 2003).

Table 3-1. Cost and production rates of various dredged material treatment technologies.

Technology	Treatment Rate (tons/hr)	Average Cost (per cubic yard)	# Technologies per Category
Incineration	10	$243	8
Soil Washing	32	$89	19
Solid-Phase	62	$62	51
Bioremediation	ND	$48	2
Landfarming Composting	40	$73	7
Solidification	40	$99	1
Vitrification	3	$462	17

ND = Not enough data
Sources: Environment Canada 1996 and USEPA 1996

Even though vendors surveyed in the DMMP treatment technologies analysis reported implementations of their technology, the ability of a treatment system to handle widely varying sediment types remains a challenging issue. The availability of space, utilities, time, and other logistics represent additional site-specific factors that are not addressed in this report but which would contribute to making various treatment technologies more expensive and/or less practical as disposal alternatives. Table 3-2 summarizes the major advantages and disadvantages of each technology with respect to the various screening factors. Alternative treatment technologies, unto themselves, do not appear to offer any practicable solution to the management of the estimated 2.1 million cy of CDM to be generated in the Buzzards Bay over the next 20 years. This is due to several factors, most notably cost. The costs for some technologies, such as solidification and landfarming, do not overcome the fact that there needs to be a permanent receiving site for the treated sediment. Currently, the supply of upland fill material exceeds the demand for construction fill, and at a much lower price (approximately $20 per cy) than that of even the lowest-priced treatment technology. The rationale for characterizing each of the various alternative treatment technologies as impractical is summarized in Table 3-3.

For this reason, the DEIR carries forward all alternative treatment technologies as "potential future alternatives." This flexible approach will provide a baseline from which proponents of alternative treatment technologies can develop and present specific, detailed proposals, and will allow the State to focus its reviews on potentially practicable proposals. This approach is based on that used for the Boston Harbor dredging project EIR/EIS. The DMMP will reevaluate, on a five-year cycle, the feasibility of alternative treatment technologies for CDM in the Buzzards Bay region and other harbors throughout the Commonwealth.

Table 3-2. Summary of treatment technology characteristics.

Technology	Major Advantages	Major Disadvantages
Incineration	High treatment efficiency	Permittability, air emissions, cost
Soil Washing	Relatively low cost, low technology	Not appropriate for silts and clays
Solid-Phase Bioremediation Landfarming Composting In-Vessel Bioremediation	Relatively low cost, low technology	Slow process, large land area requirement , cost
Solidification/Stabilization	By-product can be used as structural fill, relatively moderate cost, proven track-record for large volumes	Infective for some organics
Vitrification	High treatment efficiency	Requires low moisture content, cost, permittability, air emissions

Table 3-3. Rationale for characterizing various alternative treatment technologies as impracticable.

Technology	Rationale
Incineration	Sidestream wastes High costs Permitting difficulties
Soil Washing	Marginally effective for clay and silt sediments Dewatering after treatment required High cost
Solid-Phase Bioremediation	Not suited for cold climates, sidestream wastes, land intensive, long duration
Landfarming	Land intensive, sidestream wastes, high cost
Composting	sidestream wastes, high costs
Solidification/Stabilization	Final product volume significantly larger than original dredged material, market demand, high costs.
Vitrification	Sidestream wastes, long processing time, extremely high cost

3.5 Upland/Reuse Alternatives

The purpose of the upland/reuse disposal site screening process under the DMMP is to identify preferred alternative sites where disposal of dredged material might be both feasible and least damaging to the environment. This screening was accomplished for the New Bedford/Fairhaven Harbor EIR by employing the generic, tiered screening process depicted in Figure 3-1. Because New Bedford/Fairhaven Harbor is the most logical port for handling the transport and off-loading of CDM from Buzzards Bay projects, specific upland/reuse disposal sites identified in the New Bedford/Fairhaven EIR are re-evaluated here. The DMMP screening follows the guidelines of 40 CFR Part 230, established under Section 404(b)(1) of the CWA and complying with 310 CMR 16.00 (Site Suitability Regulations) for dredged material classified as solid waste by DEP (MDPW, 1990).

3.5.1 Zone of Siting Feasibility (ZSF)

New Bedford/Fairhaven Harbor is the most rational industrial location in Buzzards Bay to dewater clean dredged material (Maguire, 2002c). A Zone of Siting Feasibility (ZSF) within a 50-mile radius of New Bedford/Fairhaven Harbor (representing a reasonable truck travel

distance) was delineated for the purpose of selecting potential terrestrial disposal sites (Figure 3-2). This upland ZSF included a universe of 1,123 candidate sites throughout southeastern Massachusetts, Rhode Island, and eastern Connecticut.

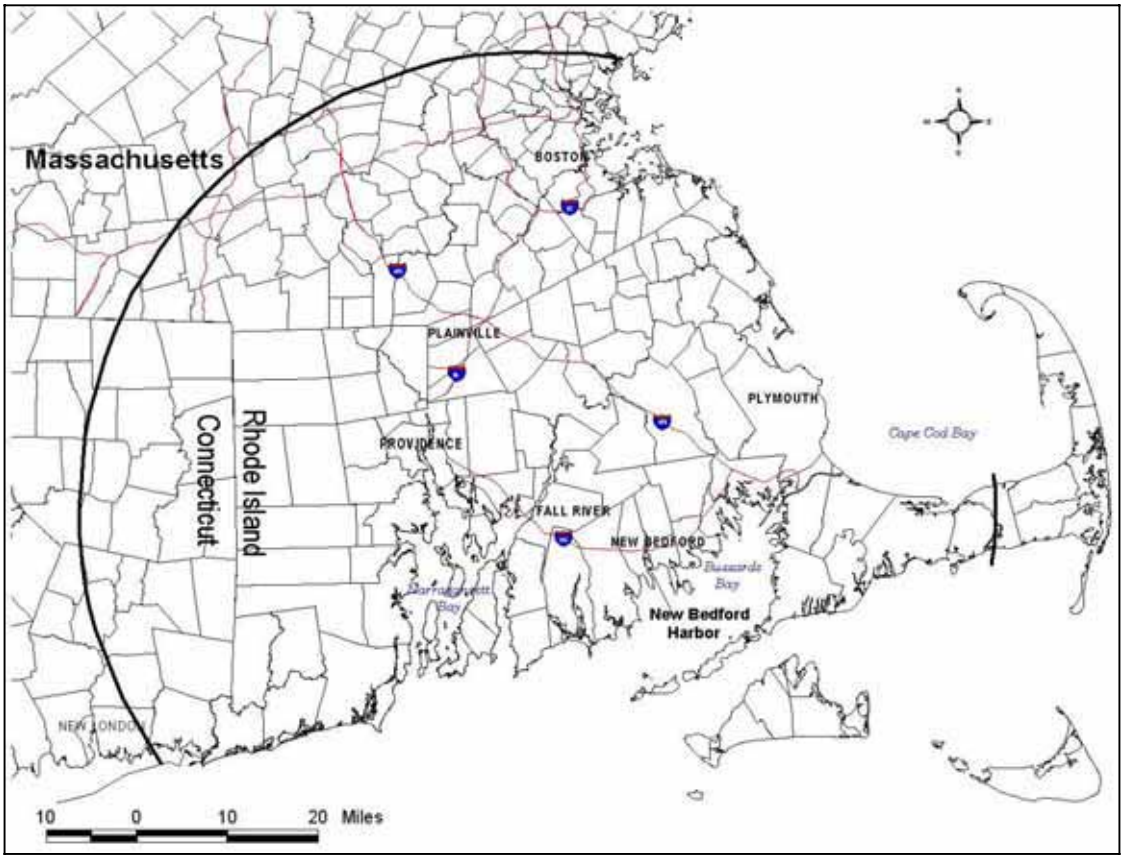


Figure 3-2. ZSF (50-mile radius) delineated for the New Bedford/Fairhaven EIR and applied to the BBDS DEIR.

3.5.2 Exclusionary Screening Criteria

The candidate sites were screened initially using a set of exclusionary criteria that were based on existing federal and state regulations governing upland disposal. For example, close proximity to a drinking water supply is an exclusionary criterion which precludes an area from use as a landfill or upland disposal site. After applying the exclusionary criteria, over 1,000 of the candidate sites were eliminated, leaving eight potential alternative sites to be considered within the 50-mile ZSF (Table 3-4). These were carried forward as preferred alternative upland/reuse sites in the subsequent discretionary analysis.

Table 3-4. Summary of screening results for the upland/reuse sites in the ZSF for New Bedford/Fairhaven Harbor applied to BBDS.

Total sites in ZSF subjected to analysis	1,123 sites
Sites eliminated in exclusionary screening outside of ZSF	1,115 candidate sites
Sites eliminated in discretionary screening	8 potential alternative sites
Sites carried forward in DEIR	0 preferred alternative sites

3.5.3 Discretionary Criteria

Table 3-5 presents a summary of the general characteristics of each of the eight upland sites that remained after the initial exclusionary screening. These eight alternative sites were then evaluated and compared using a set of secondary or discretionary criteria regarding the feasibility and potential impacts of an upland/reuse disposal site. In addition, DEP policies and regulations related to waste disposal were applied to the set of potential alternatives to determine the relative feasibility of each site for accepting dredged material.

Table 3-5. Characteristics of the eight alternative upland disposal sites.

Site ID	Site Name	City	Present Site Usage	Distance from NB (mi)	Capacity (cy)	Cost ($ per cy)
FRV-02	BFI Fall River Landfill	Fall River	active landfill	11	160, 000	$ 62
EBR-02	Northern Disposal BFI Landfill	E. Bridgewater	inactive landfill	30	711,100	$137
WEY-13	Bates Quarry	Weymouth	active quarry	37	189,600	$169
DAR-06	Cecil Smith	Dartmouth	inactive landfill	5	102,700	$200
MAT-01	Mattapoisett Landfill	Mattapoisett	inactive landfill	8	38,500	$214
PLA-02	Plainville Landfill	Plainville	inactive lined landfill	24	172,800	$217
PLY-11/12	MHD ROW Parcel	Plymouth	undeveloped woods	25	124,400	$238
BRK-02	Brockton Landfill	Brockton	unlined inactive landfill	30	42,500	$333

With respect to CDM originating from CAD cell construction in the state-designated area of Popes Island North in New Bedford/Fairhaven Harbor, it was suggested that CZM consider utilizing an active quarry in Acushnet MA as a potential upland disposal option (personal communication with the Coalition for Buzzards Bay). The Tilcon Capaldi Stone Crushing Quarry and Asphalt Making Plant is an active commercial enterprise. DEP Southeast Regional Office (SERO) had no record of any potential landfill application from either the previous or current owners of this enterprise (personal communication with DEP). Since this quarry is operational and there are no pending landfill applications, it does not qualify as an alternative disposal site for dredged material at the present time.

In general, there are several environmental, logistical, and cost constraints that make upland disposal an infeasible alternative:

1. There are no practical dewatering sites currently available for the temporary stockpiling and dewatering of CDM. A dewatering site is a mandatory element of the upland disposal process.

2. The lowest estimated cost for upland disposal is $62 per cy (Maguire, 2002c). This is considerably more costly than either open-water disposal or CAD. In addition, the $62 per cy cost would be for limited volumes of upland disposal.

3. Massachusetts DEP regulations and policies for handling of dredged material, as well as for landfill siting, engineering, and operations, are very restrictive. The process of obtaining a permit to site a new landfill is a significant and challenging undertaking, and even if a site were to become permitted, it would require five to seven years to achieve all the necessary approvals. While a large-scale facility established on such a schedule could potentially accommodate the out-year dredging projects, it would not accommodate the immediate (zero to five years) dredging need.

3.5.4 Summary

This DEIR takes into consideration the upland/reuse alternatives that were evaluated recently in the New Bedford/Fairhaven EIR (Maguire 2002c, 2003) for CDM generated from Buzzards Bay regional harbor and channel improvement projects. Although there is a lack of current market demand for dredged material, the potential remains that dredged material treatment technology will advance toward practicability and that additional landfill sites will become certified within the ZSF. Given the relatively high costs and other practical constraints that exist at present, no upland/reuse alternatives are carried forward in this DEIR. Consideration of the upland/reuse disposal option for dredged material will continue to be required on each proposed dredging project and therefore may emerge as the least environmentally damaging, practicable alternative in the future.

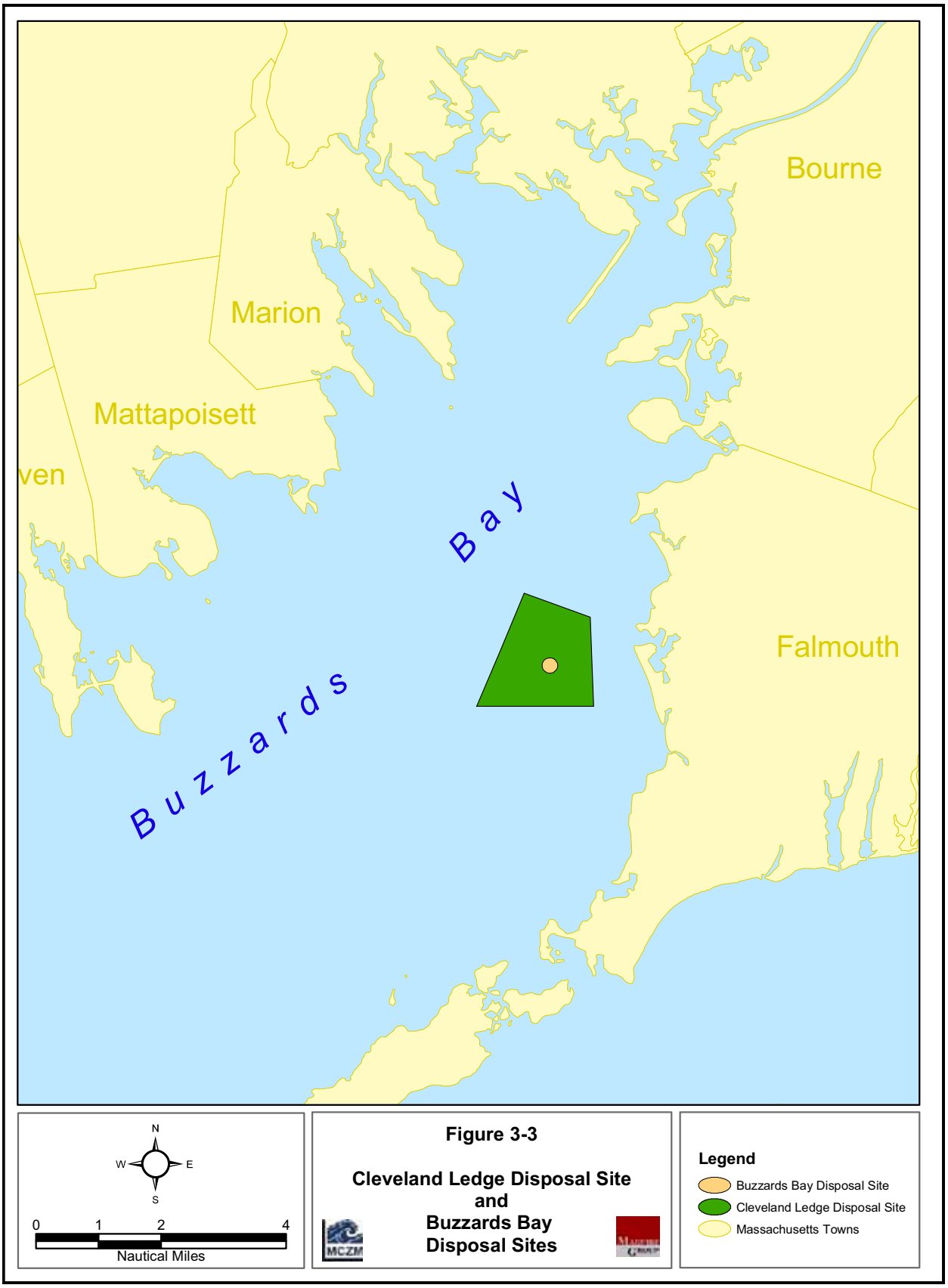
3.6 Aquatic Disposal Alternative Screening: Unconfined Open Water Disposal

This section describes existing aquatic disposal sites in Massachusetts and Cape Cod Bays, the Commonwealth's rationale for evaluating the suitability of the historic BBDS for designation, the MEPA requirement that this EIR "evaluate the potential environmental benefits/drawbacks of opening an historic site versus identifying a new site," and the process by which the preferred alternatives were identified. In response to direction from the USACE, this section documents the environmental impacts, feasibility, costs and benefits of existing open water sites (the no action alternative); use of historical sites in Buzzards Bay; and use of proposed candidate sites 1 and 2.

3.6.1 Background

The area within and surrounding the historical BBDS has been subject to disposal activity for most of the twentieth century (NAE records; see Appendix B). As previously indicated, the historical BBDS is a discrete area within the larger historic disposal grounds of CLDS (Figure 3-3). Since 1980, open-water disposal for private and municipal projects of the Buzzards Bay region harbors and channels has occurred exclusively at the BBDS (Figure 3-4).

Based on their review of two field studies of BBDS conditions (see below), and subject to project-specific evaluation of sediment quality and practicable non-aquatic alternatives, the NAE has considered the BBDS to be the least environmentally damaging, practicable alternative under the CWA regulations for the permitted projects listed in Table 3-6. In the early 1990s, the Commonwealth initiated a site designation study to address dredging needs in Cape Cod Bay that ultimately resulted in the designation of the CCDS. At the same time, the Commonwealth determined that continued use of the BBDS should not be permitted until a similar analysis was completed.


Bourne
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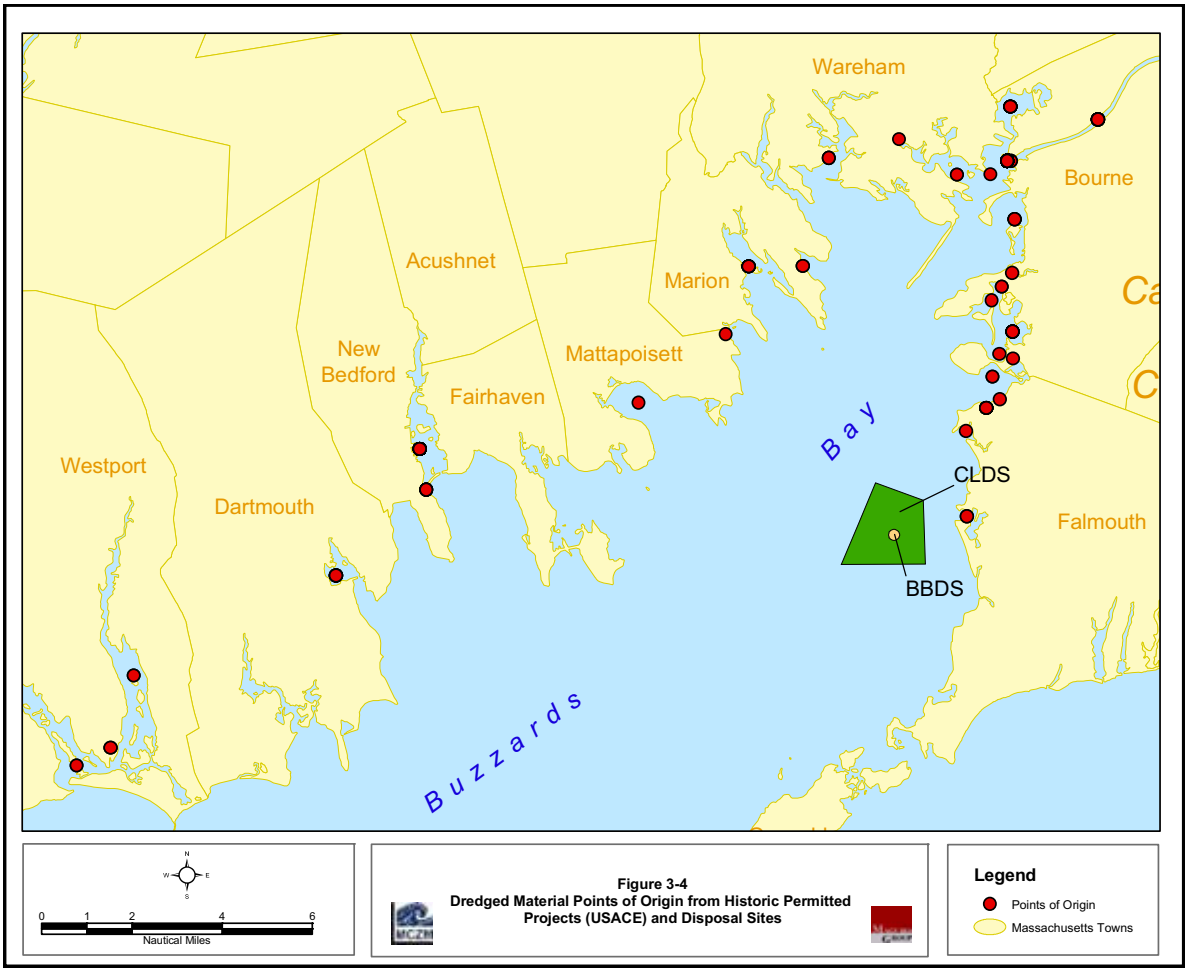
Nautical Miles
MCZM
Figure 3-3
Cleveland Ledge Disposal Site
and
Buzzards Bay
Disposal Sites
Legend
Buzzards Bay Disposal Site
Cleveland Ledge Disposal Site
Massachusetts Towns


Wareham
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Acushnet
Marion
New Bedford
Mattapoisett
Fairhaven
Westport
Dartmouth
Falmouth
Bay
CLDS
BBDS
Buzzards
0 1 2 4 6
Nautical Miles
Figure 3-4
Dredged Material Points of Origin from Historic Permitted Projects (USACE) and Disposal Sites
Legend
Points of Origin
Massachusetts Towns

Table 3-6. BBDS disposal history (projects permitted by USACE for disposal at BBDS).

Year	Volume (m^3)	Source of Material
1980	28,403	Unknown
1981	0	
1982	0	
1983	7,687	Buttermilk Bay
1984	302	Current River, Squeteague Harbor
1985	54,745	Mass Maritime Academy
1986	1,682	Unknown
1987	0	
1988	0	
1989	612	Steamship Authority
1990	0	

Source: USACE Disposal Area Monitoring System (DAMOS) records

CZM and state agency staff reviewed the two existing site studies and additional investigations of the Buzzards Bay environment (see below) and held several discussions with the NAE to assess the current condition of the BBDS and whether there is any evidence of impacts associated with its prior use. Based on that review and analysis, EOEA determined that the existing information supported a presumption that the BBDS site and/or the vicinity of the larger historic disposal area in which it is located are suitable to consider for designation (EOEA Dredging/Disposal Workgroup, February 8, 1995). On receipt of public and agency comment, MEPA directed that the state site designation process proceed as an EIR.

Therefore, the approach taken by this DEIR, as directed by MEPA and the federal agencies, is to perform a detailed analysis of the existing BBDS and the surrounding area that has historically been used for dredged material disposal, and to use that information as the basis for determining: 1) whether the general area is suitable for designation as a dredged material disposal site; and, if so, 2) where within the area a disposal site would be most appropriate. Information on existing and historic sites, as well as on specific areas that were considered early on as potential locations for new sites, is presented in general terms to characterize the attributes of the range of aquatic alternatives. Site-specific fieldwork was not conducted at these sites/areas, and they were not subjected to detailed analysis. These alternative sites will be investigated in greater detail if the BBDS and surrounding area are determined to be unsuitable for designation.

The screening of aquatic sites in this section is therefore organized to: 1) describe the existing designated open-water sites and assess the feasibility of using one of them; 2) identify potential locations for a new site; 3) identify historic sites and compare the benefits and detriments of designating one of them; and 4) identify alternatives for detailed investigation. The following sub-sections characterize the range of sites and recommend two specific sub-areas for consideration as the preferred alternatives.

3.6.2 Description of Existing Sites in Massachusetts Bay and Cape Cod Bay

The two existing, designated, open-water disposal sites in Massachusetts are the MBDS and the CCDS (Figure 3-5). Use of these existing sites for disposal of dredged material from the Buzzards Bay region represents a "no-action alternative" within the scope of this EIR.

Figure 3-5

Existing Designated Disposal Sites

The MBDS is an USEPA-designated disposal site located 12 nautical miles (nm) southwest of Gales Point and 29 miles east-northeast of Marblehead; it is a circular area having a diameter of 4,046 yards and centered at coordinates 42°25'06" N, 70°35'00" W. The site lies seaward of the baseline of the territorial sea and was designated by the USEPA under the Marine Protection Research and Sanctuaries Act (MPRSA). Site use is restricted to materials determined through physical, chemical and biological testing to be suitable for unconfined open-water disposal.

The CCDS is a state-designated disposal site located 18.7 nm northwest of Wellfleet; the site is a 1 square nm area centered at 45°53' 59.7"N, 70 12' 45.4" W. The site lies within state waters and was designated in 1990 by the Secretary of Environmental Affairs under the same MEPA EIR process as this DEIR. Like the MBDS, site use is restricted to materials determined through physical, chemical and biological testing to be suitable for unconfined open-water disposal. The CCDS is located in critical habitat for the Northern Right Whale, and site use is prohibited for the period during which the whale is most commonly present in Cape Cod Bay waters. Additional special provisions are used to minimize potential conflict between disposal activities and animals such as Right Whales, other marine mammals, and turtles.

3.6.3 Description of an Existing Site in Rhode Island Sound

The Site W is an USEPA-designated disposal site located seaward of the state territorial water jurisdictions of both Massachusetts and Rhode Island. Site W is a 1 square nm area centered 6.5 nm east of Block Island at 41°13'51"N and 71°22'49"W with a maximum water depth of 130 feet (Figure 3-5). This open-water site was called Site 69B and it was used for disposal of dredged material from the Providence Harbor maintenance dredging project. Site W was formally designated in January 2005 to meet the long-term dredged material disposal needs of the Rhode Island region (USEPA 2004). Such federal designation allows open-water disposal of dredged material originating throughout the region, including Buzzards Bay in southeastern Massachusetts. Endangered species occasionally visit the site but do not rely on it for critical habitat. Those species that transit through the site are not expected to be adversely effected by disposal activities.

3.6.4 Potential Locations for New Disposal Sites in Buzzards Bay

As a baseline component of the statewide DMMP, CZM investigated potential aquatic disposal alternatives for the port of New Bedford and Fairhaven DMMP, Phase 1, Volume I (Maguire 1997b). The purpose of the Phase I siting analysis was to identify all potential disposal or reuse alternatives for material classified unsuitable for unconfined open-water disposal. Aquatic alternatives comprised a subset of this analysis, and while the purpose of this EIR is to assess alternative disposal sites for material classified suitable for unconfined open-water disposal, the siting methodology is similar.

The screening described below was based in part on existing resource information and generalized marine resource maps developed through discussion with the Massachusetts Division of Marine Fisheries (DMF) staff. The first step applied physical criteria to identify potential disposal sites. The physical characteristics used were capacity, location, confinement potential, media quality, drift patterns, accessibility, use and ownership characteristics, and proximity to water supply sources. This step resulted in the identification of a number of candidate sites

physically capable of serving as aquatic or near-shore sites for dredged material disposal (Figure 3-6).

In the second step, additional information was compiled from an inventory of existing literature to characterize the general environmental conditions at each of the sites. Site-specific information, where available, included average water depth, site area, habitat areas, shellfish areas, finfish areas, and general comments. This information is summarized as follows:

Bents Ledge – The Bents Ledge site has an average water depth of 24 feet and a surface area of 237 acres. The natural resources inventory indicates that Bents Ledge supports large spring catches of tautog and winter flounder (Maguire 1997a). Based on the Division of Marine Fisheries field sampling, the site contains abundant tautog, scup, squid, butterfish, and summer flounder. Windowpane flounder were also found in large quantities at this site. Bents Ledge contains commercial quantities of quahogs and was in 1997 being reclassified from a "prohibited area" to a "conditionally approved area" for commercial harvest of shellfish including quahogs and conch. The site does not contain endangered species, rare wildlife, or eelgrass. Recreational fishing occurs in the vicinity of the site.

Great Ledge – The Great Ledge site has an average water depth of 30 feet and a surface area of 20 acres. Great ledge is an "approved shellfish area" and was in 1997 being fished by five commercial dredge boats. Shellfish are relayed from Silver Shell Beach to this location. Great Ledge is important for both recreational fishing and lobstering. The site does not contain endangered species, rare wildlife, or eelgrass. Recreational fishing occurs in the vicinity of the site.

Mosher Ledge – The Mosher Ledge site has an average water depth of 35 feet and a surface area of 260 acres. The natural resources inventory indicates that the Bents Ledge, Mosher Ledge, and West Island Ledge sites all have identified shellfishing or finfishing areas within or near the proposed site (i.e., within 0.5 mile). According to the Division of Marine Fisheries, these sites contain abundant tautog, scup, squid, butterfish, and summer flounder. Mosher's Ledge is also a commercial shellfish area, a recreational fin fishing, and a commercial lobster fishing area. The site does not contain endangered species, rare wildlife, or eelgrass.

Deep Bay West – The Deep Bay West site has an average water depth of 53 feet and a surface area of 570 acres. Deep Bay West is an approved shellfish area; the site contains quahogs. The natural resources inventory noted lobsters were found at this site in abundance during the spring. The Phase 1 analysis indicated a lack of reliable data on habitat conditions at this site.

Deep Bay East – The Deep Bay East site has an average water depth of 46 feet and a surface area of 842 acres. The Phase I analysis indicated a lack of reliable data on habitat conditions at this site.

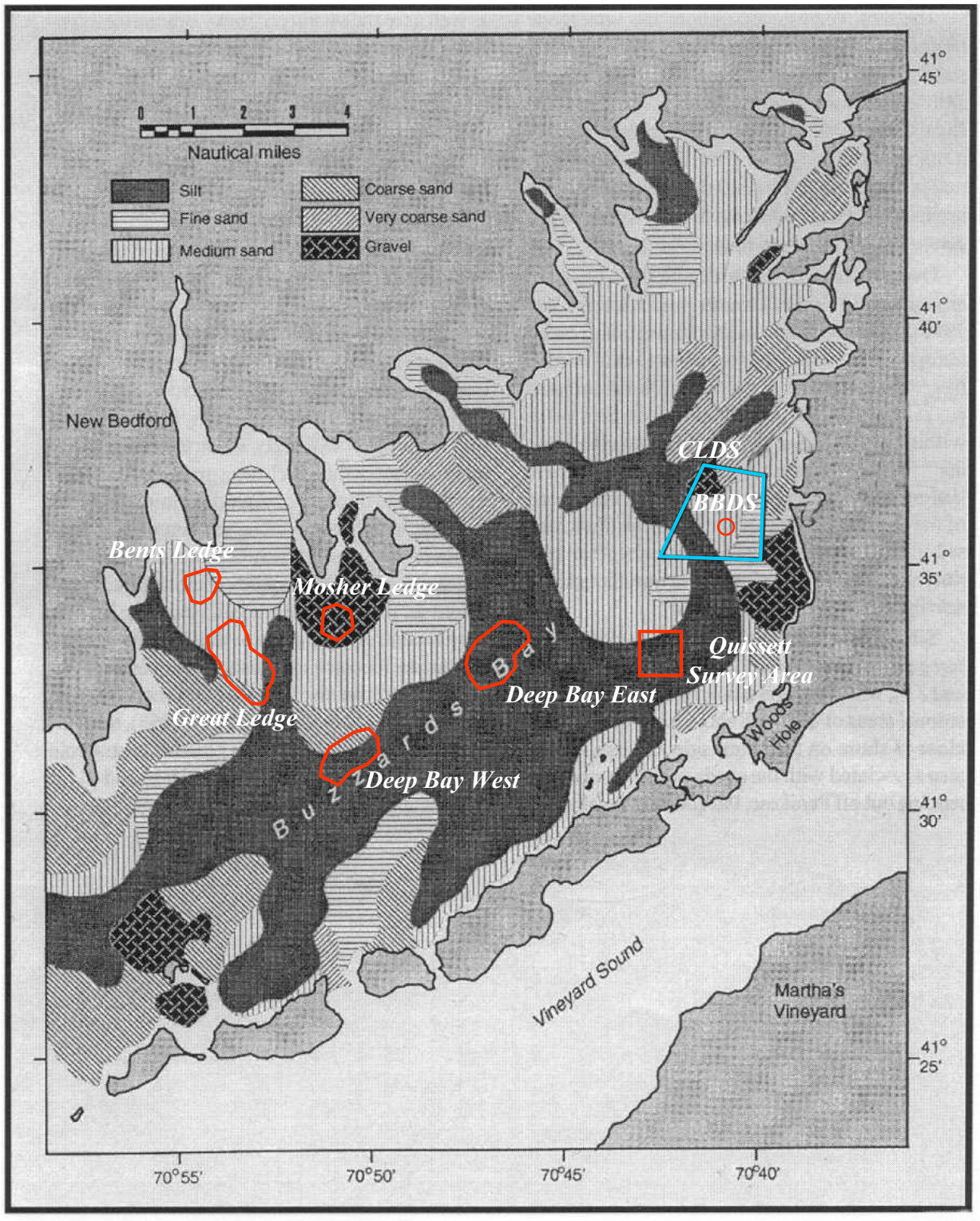


Figure 3-6. Map showing the general distribution of different types of sediments in Buzzards Bay (from Moore 1963) and the locations of several potential aquatic disposal sites evaluated in this EIR.

An additional potential location for a new site emerged from an initial physical characterization of the CLDS (Maguire 1998d). Field work was conducted subsequently to characterize three specific areas, including those areas that have become, for this DEIR, candidate sites 1 and 2, as well as the so-called Quisett Survey Area located to the south of the CLDS (Figure 3-6):

> Quissett Survey Area – This is a 1,500 meter square area located approximately six kilometers west of Falmouth (Figure 3-6). The seafloor is generally flat, with a gentle slope from the northwest to the southeast. Water depths range from 12.8 meters in the shallowest area to 14.4 meters in the northwest quadrant. At the time of the survey in 1998, side-scan sonar images were used to characterize the site as having uniformly fine-grained sediment with numerous lobster burrows. Sand waves were also present across the seafloor at the site, indicating the presence of bottom currents with enough strength to influence the physical structure of the sediment surface.

Information on the use of each site by recreational and commercial fishermen is summarized in Table 3-7 and supported by information presented graphically (Figures 3-7 through 3-12) from a competing fishing site use assessment conducted for this DEIR (Maguire 2002b; see also Appendix N).

Table 3-7. Summary of competing fishing site uses in Buzzards Bay.

	General (Figure 3-7)	Recreational Anglers (Figure 3-8)	Recreational Charter Boats (Figure 3-9)	Recreational Bait & Tackle Shops (Figure 3-10)	Commercial Fishermen (Figure 3-11)	Harbormasters (Figure 3-12)
Bents Ledge	Moderate	Mid-Season Scup	Mid-Season Scup	Scup	Unknown	Some Lobster
Great Ledge	Moderate-Low	Mid-Season Scup	Mid-Season Scup	Scup	Unknown	Lobster – Conch Pots
Mosher Ledge	Moderate	Mid-Season Scup	Mid-Season Scup	Scup	Unknown	Lobster – Scup
Deep Bay East	Low	Conch Pots	Sea Bass Pots	Fish Pots	Potential Conch Pots	Conch Pots
Deep Bay West	Low Unproductive	Conch Pots	Some Scup, Sea Bass, Potentially Unproductive Sections	Fish Pots	Generally Unproductive	Conch Pots
Quissett Site	Moderate Unproductive	Generally Unproductive	Some Scup (Spring) Some Mud (poor fishing)	Scup	Lobster	Conch Pots

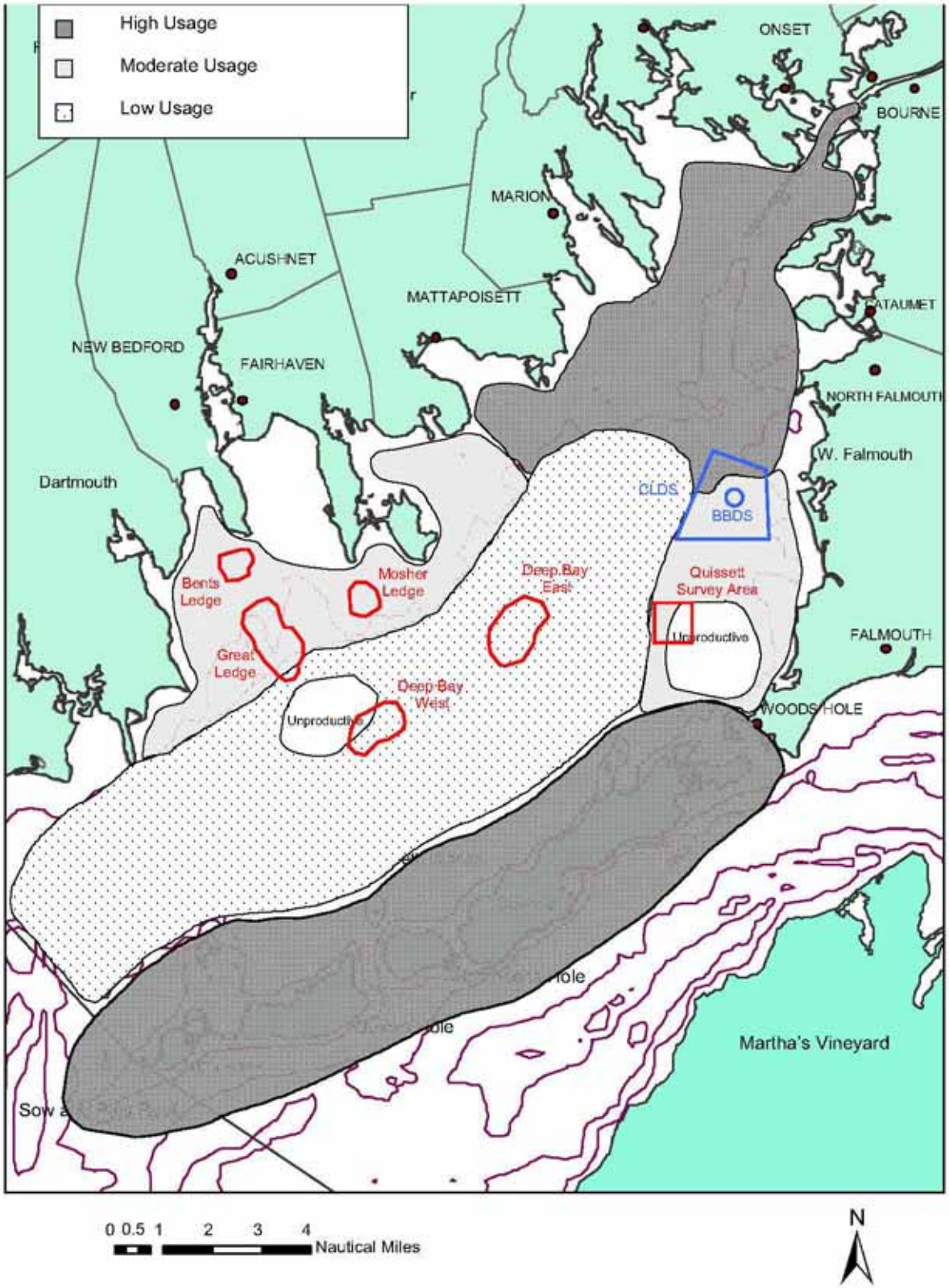


Figure 3-7. Generalized competing site fishing uses for new disposal sites in Buzzards Bay.

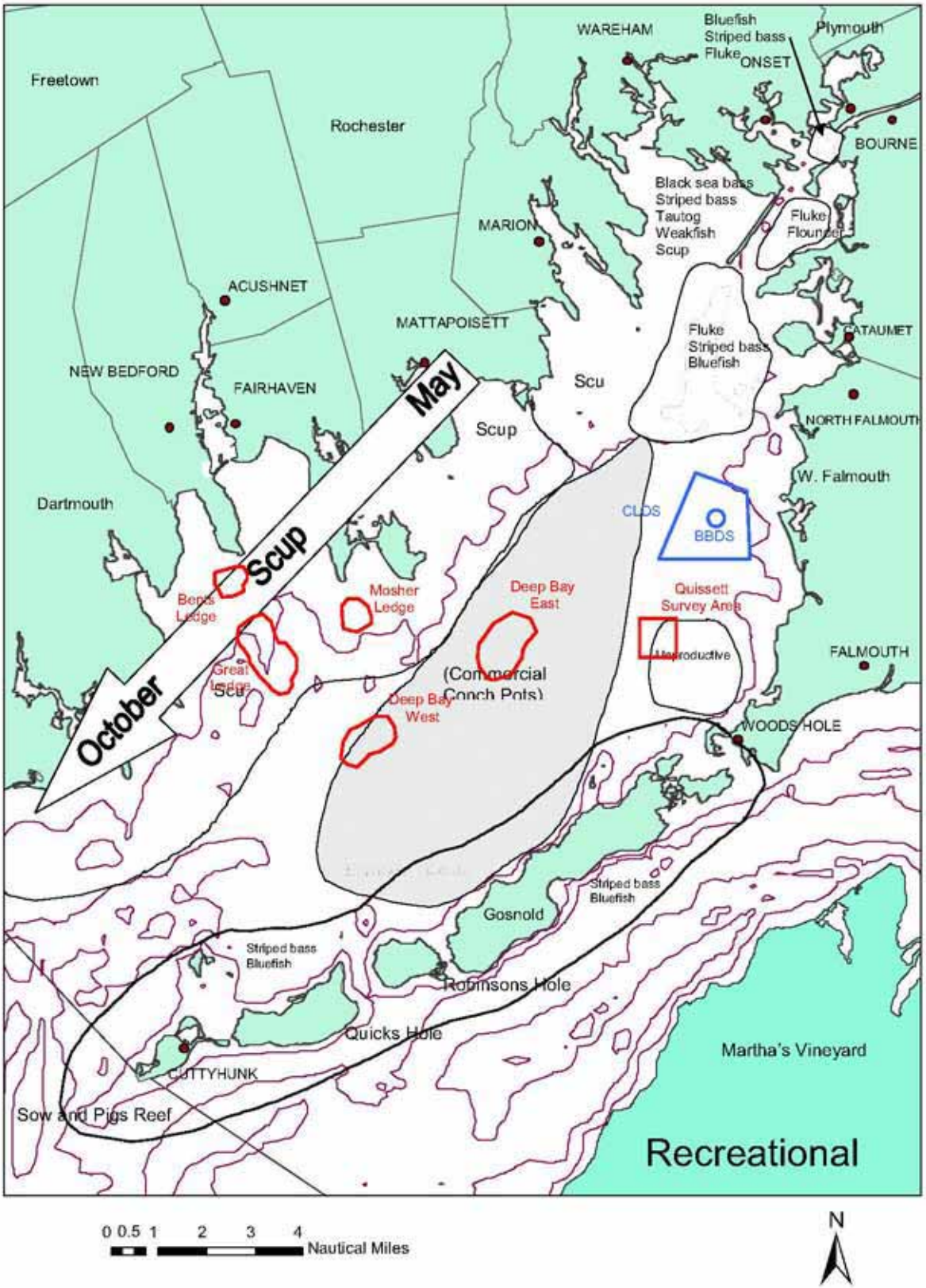


Figure 3-8. Generalized competing site recreational fishing uses for new disposal sites in Buzzards Bay.

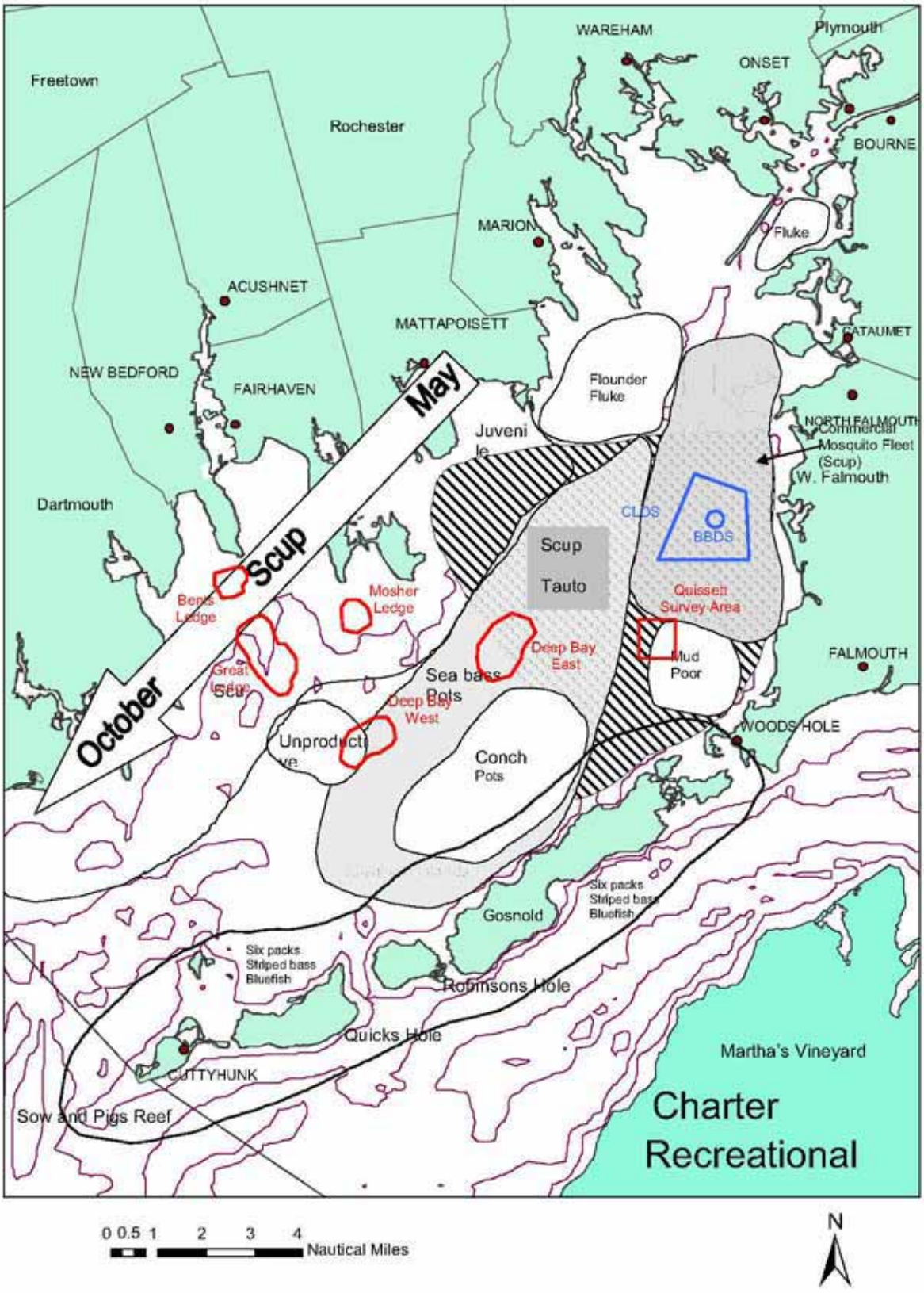


Figure 3-9. Generalized competing site recreational charter uses for new disposal sites in Buzzards Bay.

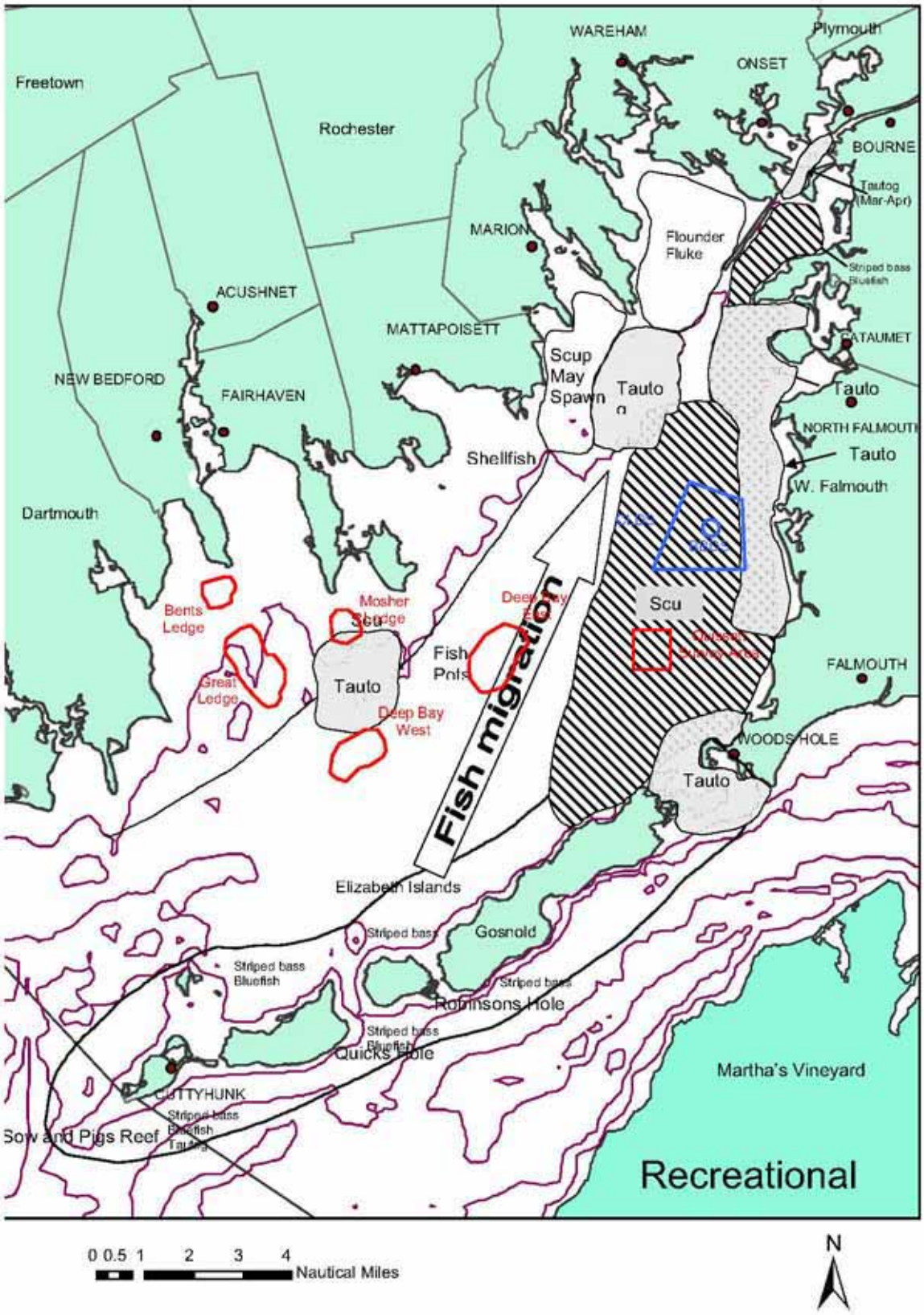


Figure 3-10. Generalized competing uses as described by bait and tackle shops for new disposal sites in Buzzards Bay.

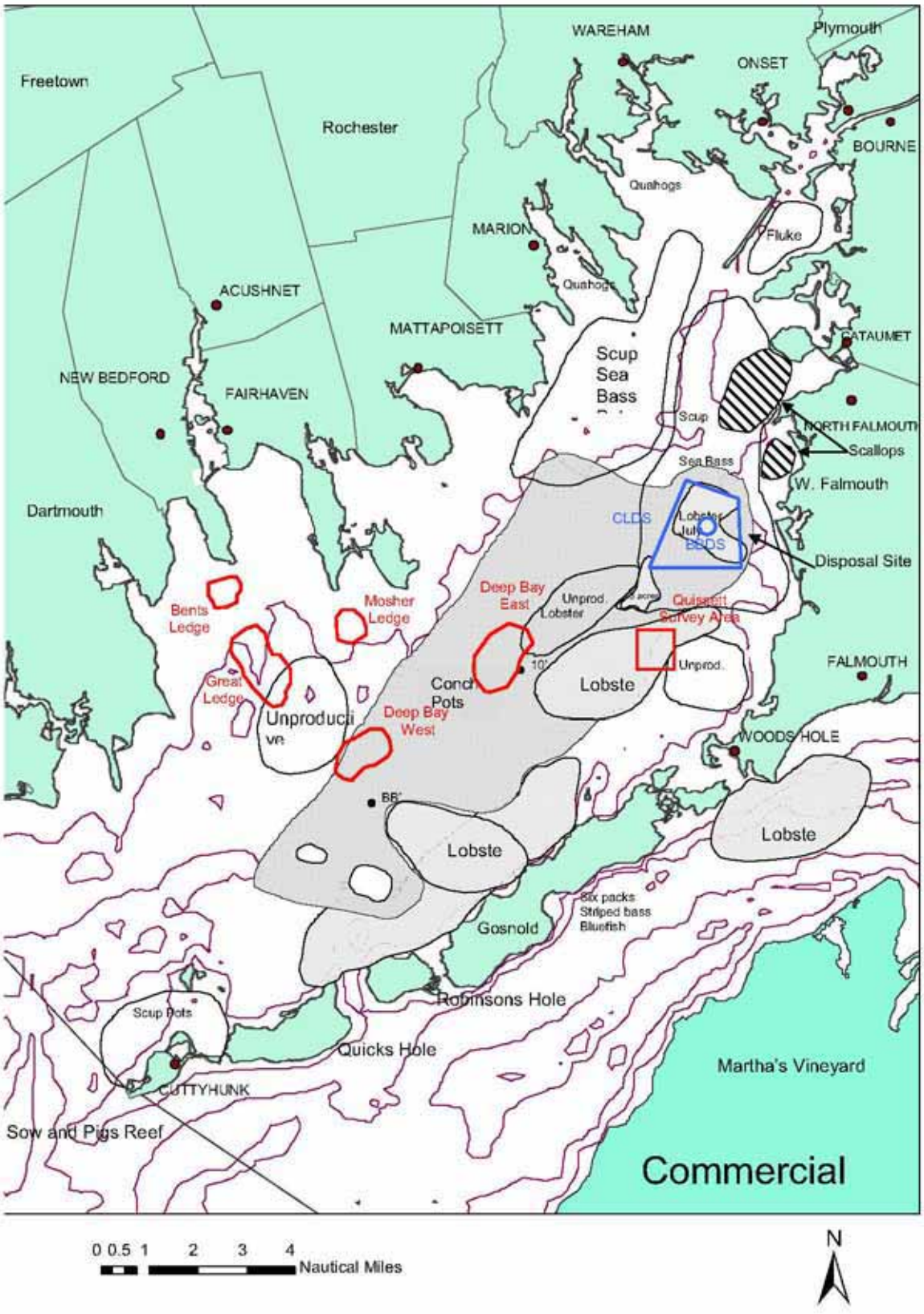


Figure 3-11. Generalized competing site commercial uses for new disposal sites in Buzzards Bay.

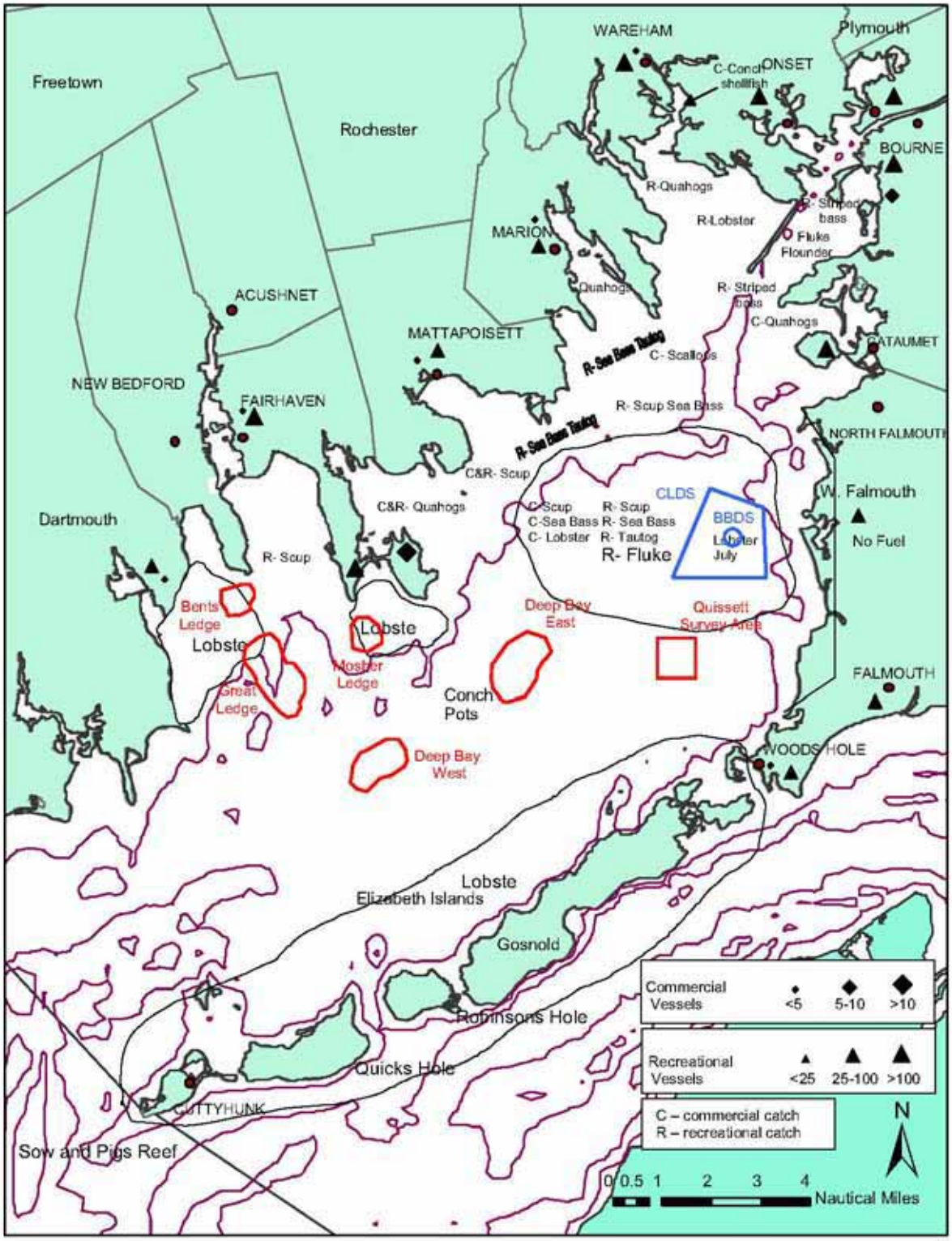


Figure 3-12. Generalized completing uses as described by harbormasters for new disposal sites in Buzzards Bay.

Figure 3-13 shows the locations of historical disposal sites and the new sites discussed above in relation to the main shipping channels and anchorage areas in Buzzards Bay. A largely protected coastal passage leading to and from the Cape Cod Canal, Buzzards Bay is quite important for commercial shipping. Traditionally, ship traffic has followed a course through the central part of the bay, generally in accordance with navigational aids. Deeper-draft commercial vessels sometimes favor an area of deeper water located east of the Buzzards Bay "BB" fairway marker (personal communication, Captain Brown, 2004).

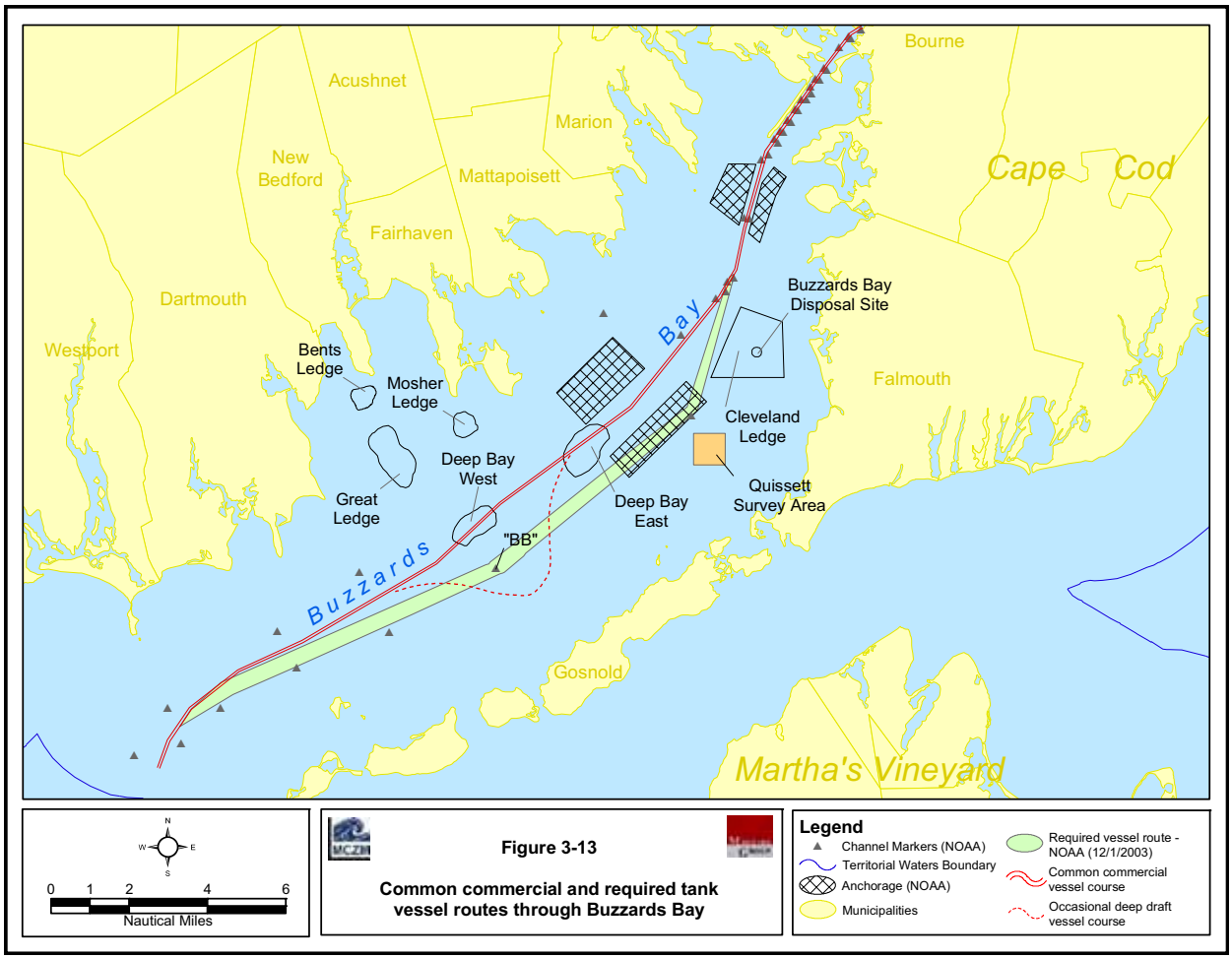
Major oil spill accidents involving towed barges have occurred in Buzzards Bay. Most recently, in April 2003, the Bouchard Barge #120 was holed on a ledge near the mouth of the Bay and released oil through the hole as the tow proceeded to the head of the bay. At the Coast Guard's request, NOAA published a set of coordinates in December 2003 that identified the route through Buzzards Bay which tank vessels are requested to follow for safety reasons (Figure 3-13).

The Coast Guard has not yet initiated the rulemaking process needed to formally designate the route. Non-tank ship commercial shipping traffic may continue to follow the slightly shorter traditional course depicted in Figure 3-13, which crosses over the potential new disposal sites Deep Bay East and Deep Bay West.

Constraints to the siting of the potential new sites discussed above include depositional character, capacity competition from use of resources, and navigational issues. Only Deep Bay West and Deep Bay East show moderate acceptability for potential dredged material disposal sites of the six new sites under consideration. Deep Bay East and West sites fail the screening for the presence of significant fisheries resources and navigational conflict. Constraints to the siting of the potential new disposal sites, such as depositional character, capacity, resources and navigational issues, are summarized in Table 3-8. A number of historic dredged material disposal sites have benefited past local dredging projects for Buzzards Bay. The following sub-section includes a discussion of historic disposal sites in the Bay that may have potential for the state designation needs presented in this DEIR.

Table 3-8. Summary of Environmental Conditions at the New Disposal Sites Under Consideration.

	Use	Depositional Site	Adequate Capacity Potential	Resources and/or Navigational Constraints
Bents Ledge	New	Medium, Fine sand	Yes	Fisheries and water depth
Great Ledge	New	Primarily medium sand	Yes	Fisheries - Scup
Mosher Ledge	New	No - Gravel bottom	No	Fisheries - Lobster
Deep Bay West	New	Silt, Some coarse sand	Yes	Fisheries – Commercial conch Ship channel
Deep Bay East	New	Yes – Silt	Yes	Fisheries - Commercial conch Ship channel
Quissett	New	Yes – Silt	Yes	Lobster burrows


Bourne
Acushnet
Marion
New Bedford
Mattapoisett
Cape Cod
Fairhaven
Dartmouth
Westport
Buzzards Bay Disposal Site
Buzzards Bay
Bents Ledge
Mosher Ledge
Falmouth
Cleveland Ledge
Deep Bay West
Great Ledge
Quissett Survey Area
Deep Bay East
"BB"
Buzzards
Gosnold
Martha's Vineyard
N
W
E
S
0 1 2 4 6
Nautical Miles
Figure 3-13
Common commercial and required tank vessel routes through Buzzards Bay
Legend
Channel Markers (NOAA)
Territorial Waters Boundary
Anchorage (NOAA)
Municipalities
Required vessel route - NOAA (12/1/2003)
Common commercial vessel course
Occasional deep draft vessel course

3.6.5 Benefits of Designating an Historic Site

The two primary benefits of reopening an historic dredged material disposal site include the likelihood of creating fewer environmental impacts than if an entirely new site were designated and the ability to use pre-existing data about the site's characteristics and past disposal impacts to inform designation and/or management decisions. Avoiding new impacts where reasonable alternatives exist is a basic principle of environmental management and regulation (see below). Therefore, if sufficient data exist to demonstrate that use of an historic site has not resulted in significant adverse impacts, it is appropriate to consider that site as an acceptable alternative unless contemporary analysis determines otherwise. This approach mirrors federal site designation methodology. A secondary benefit of using an historic site is the potential, depending on quality of material previously placed at the site, to achieve remediation benefits by covering ecologically incompatible historic dredged sediments with new clean material.

State and federal regulations described below embody the presumption that continued or resumed use of an historic site constitutes an alternative with fewer impacts than disposal at a new site on undisturbed seafloor habitat.

- Federal and state regulation, policy and practice require that projects be designed to avoid, minimize, and mitigate for impacts to the environment (e.g., CWA regulations at 40 CFR 230.10(d); MEPA regulations at 301 CMR 11.01(1); Wetlands Protection Regulations at 310 CMR 10.00 (performance standards under coastal resource areas)). The use of an historic, previously disturbed site rather than a new area of seafloor that has never been subject to disturbance constitutes, by definition, avoidance and minimization of impact to the environment. As one example, the CWA regulations specifically list, as an action to minimize adverse effects, "selecting a disposal site that has been previously used for dredged material discharge" (40 CFR 230.70(c)).

The USEPA is required by regulation to apply the avoidance/minimization principle to their disposal site designation studies. The Ocean Dumping Act regulations at 40 CFR 228.5(e) states:

> *USEPA will, wherever feasible, designate ocean dumping sites beyond the edge of the continental shelf and other such sites that have been historically used.*

- USEPA characterizes that regulation in policy as: "Pursuant to 40 CFR 228.5(e), USEPA is required to, whenever feasible, designate sites that have been historically used." (Draft Environmental Impact Statement: Evaluation of the Continued Use of the Massachusetts Bay Disposal Site, USEPA, 1989, p.12) This DEIS states:

  > *The purpose of this DEIS is to evaluate the effects of continued use of the MBDS and to clarify the site's status over an extended period….If it is determined that continued use of the MBDS is not feasible, USEPA will perform additional studies so that an alternative site can be identified….Only if this study shows that the existing site is not suitable for continued use will other sites in the area be investigated for potential designation.*

- The NAE, in providing guidance from the federal agencies under the CWA to this EIR, states that "the USACE continues to view the existing [BBDS] as an appropriate open-water disposal option for suitable material, but concurs that re-examining the disposal needs and potential site alternatives is a reasonable long-term objective" (USACE-NAE, May 2, 2003). The formal statement of project purpose, which represents the consensus position of the federal agencies and guides federal agency review of this EIR under the CWA, reads:

  > *To allow continued use of areas in and adjacent to the historic Cleveland Ledge Disposal Site as an open-water disposal alternative for dredged material from the Buzzards Bay region that is classified as suitable for unconfined ocean disposal.*

This DEIR has assimilated the foregoing direction and guidance and evaluates existing, operational disposal sites in CCDS and MBDS, Site W in the Rhode Island region, potential new disposal sites, and known historic disposal sites in Buzzards Bay, including two newly delineated areas within and adjacent to the historic CLDS. In the following section, the location and basic characteristics of known historic sites are catalogued, the level of existing data for each site is reviewed, and the general environmental impacts from use of each site are assessed.

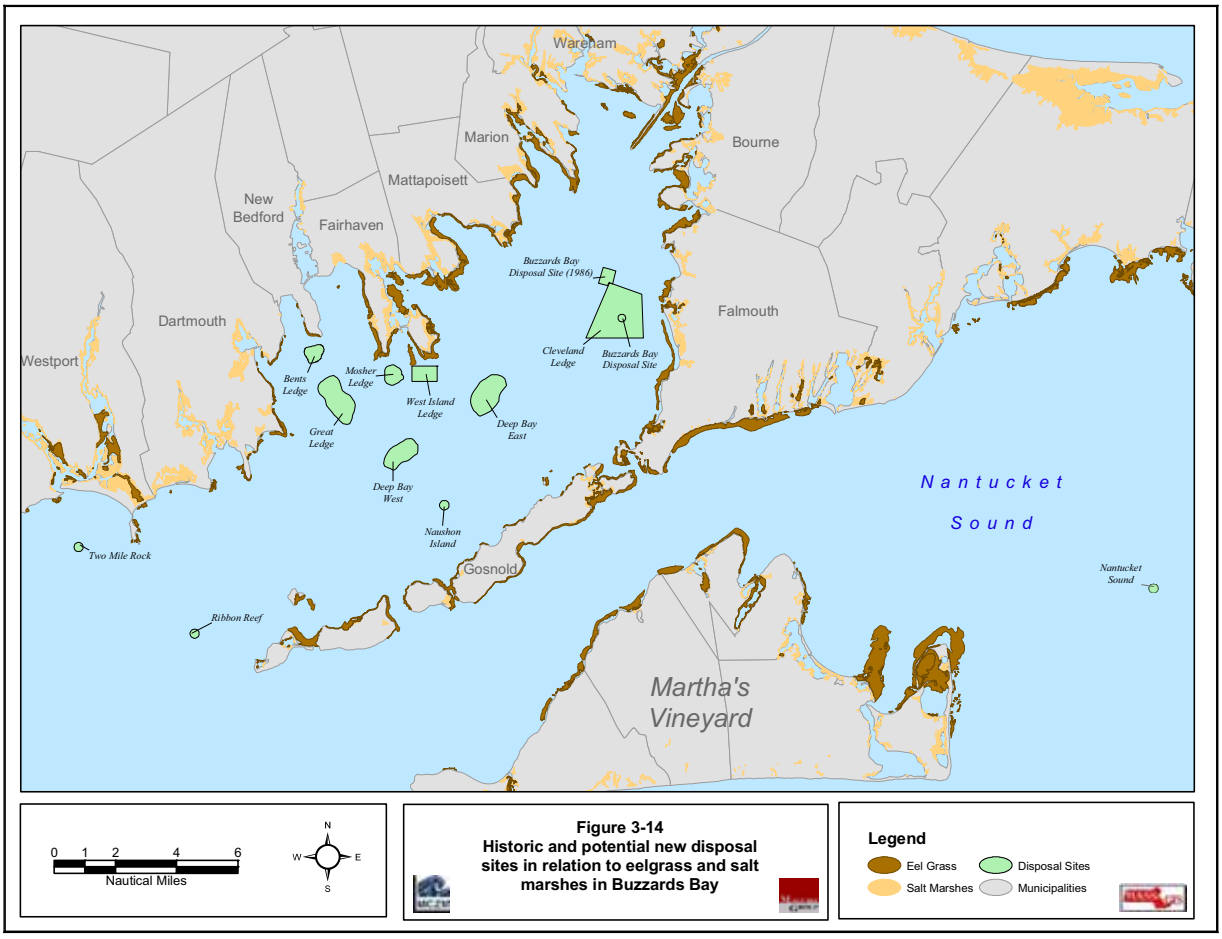
3.6.6 Historic Disposal Sites in Buzzards Bay

Historic disposal sites in Buzzards Bay were identified from a statewide inventory prepared by NAE in 1995 for the Massachusetts Navigation and Dredging Management Study (USACE-NAE 1995; Table 3-9). Maps showing the locations of salt marshes and eelgrass beds, as well as fish and shellfish resources, in relation to these historic sites and the proposed new sites identified in Buzzards Bay, and its immediate approach at the mouth of the bay, are presented in Figures 3-14 and 3-15, respectively. The following discussion is based on those sites identified in Buzzards Bay and westward into Nantucket Sound as summarized in Table 3-10.

Table 3-9. Historic Disposal Sites in Buzzards Bay Inventoried for the Massachusetts Navigation and Dredging Management Study (USACE-NAE 1995).

Site	Depth (feet)	Size	Use	Material	Comments
Gosnold	30	na	USACE	sand	Used by USACE hopper dredge
BBDS	32-41	500 yd diameter	Municipal/private	various	
CLDS	20-41	8.3 km^2	all	various	Main historic disposal site
Nantucket Island	48	na	na	na	
Naushon Island	na	na	na	na	
Ribbon Reef	na	1 nm diameter	na	na	
Two Mile Rock	42	2,000 ft^2	na	na	
West Island Ledge (aka Fairhaven)	20	344 acres	na	na	

Source: USACE NAE records


Wareham
Marion
Bourne
Mattapoisett
New Bedford
Fairhaven
Buzzards Bay Disposal Site (1986)
Falmouth
Dartmouth
Westport
Cleveland Ledge
Buzzards Bay Disposal Site
Bents Ledge
Mosher Ledge
West Island Ledge
Great Ledge
Deep Bay East
Deep Bay West
Naushon Island
Nantucket Sound
Two Mile Rock
Gosnold
Ribbon Reef
Martha's Vineyard
0 1 2 4 6
Nautical Miles
N
W
E
S
Figure 3-14
Historic and potential new disposal sites in relation to eelgrass and salt marshes in Buzzards Bay
Legend
Eel Grass
Disposal Sites
Salt Marshes
Municipalities

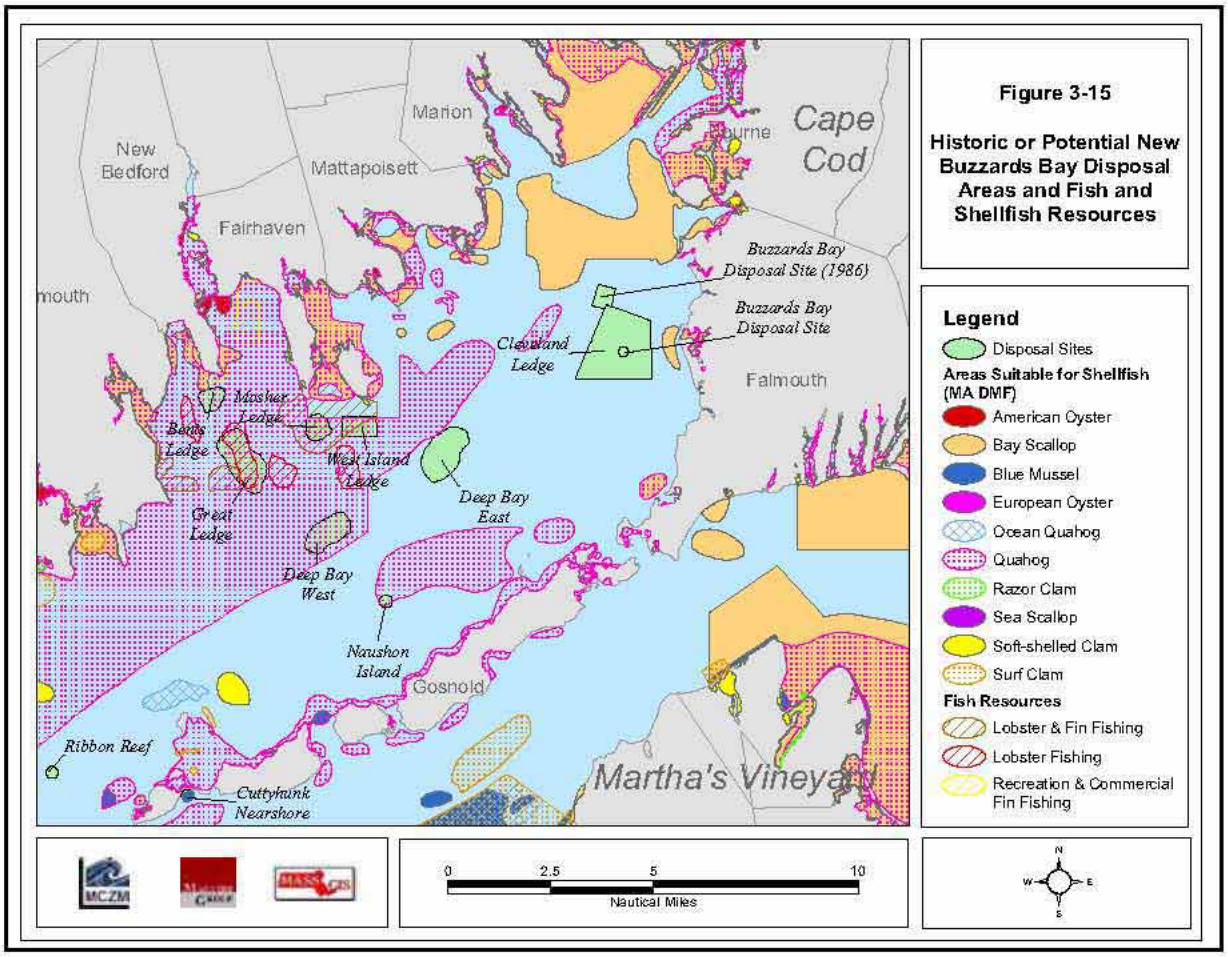


Figure 3-15
Historic or Potential New Buzzards Bay Disposal Areas and Fish and Shellfish Resources
Legend
Disposal Sites
Areas Suitable for Shellfish (MA DMF)
American Oyster
Bay Scallop
Blue Mussel
European Oyster
Ocean Quahog
Quahog
Razor Clam
Sea Scallop
Soft-shelled Clam
Surf Clam
Fish Resources
Lobster & Fin Fishing
Lobster Fishing
Recreation & Commercial Fin Fishing
Marion
New Bedford
Mattapoisett
Fairhaven
Cape Cod
Falmouth
Gosnold
Martha's Vineyard
Buzzards Bay Disposal Site (1986)
Buzzards Bay Disposal Site
Cleveland Ledge
Musher Ledge
Bella Ledge
West Island Ledge
Deep Bay East
Great Ledge
Deep Bay West
Naushon Island
Ribbon Reef
Cuttyhunk Nearshore
MCZM
0 2.5 5 10
Nautical Miles
N
W
E
S

Table 3-10. Summary of Historic Disposal Sites in Buzzards Bay and Vicinity.

Historic Site	Former Use	Inside Territorial Sea Baseline	Depositional Site	Adequate Capacity Potential	Resources and/or Constraints
Nantucket	Historical	No	Presumed No	Yes	Presumed shallow water, sandy
Two-Mile Rock	Historical	No	Unknown but exposed to fetch	Yes	Unknown
Ribbon Reef	Historical	No	Unknown but exposed to fetch	Yes	Unknown
Cuttyhunk Nearshore	Active	Yes	No	No	Shallow water sand environment
West Island Ledge	Historical	Yes	No	No	Unknown
Naushon	Historical	Yes	Unknown, silt bottom	Yes	Quahog habitat
CLDS	Historical	Yes	Areas of sediment reworking	Yes	No
BBDS	Most Recent	Yes	Areas of sediment reworking	No	No
Site W	Active, Currently exclusive to single project	No	Yes	Yes	Temporary, subject to federal designation

West Island Ledge – Also known as the Fairhaven site, the 344-acre West Island Ledge site is located outside New Bedford/Fairhaven harbor and was used for disposal of improvement and maintenance dredged material from the harbor. The NAE, through its Disposal Area Monitoring System (DAMOS) program, is currently evaluating the West Island Ledge site to determine whether placement of clean material would provide benefits. Preliminary review of field sampling results does not indicate a chemically or biologically degraded environment; additional chemical analysis of the sediment is currently underway (Dr. Tom Fredette, USACE-NAE, personal communication, 2004). A review conducted under the CZM DMMP determined that this site was unsuitable as a potential placement location for dredged material from New Bedford Harbor (Maguire 2000b). This determination was made based on the predominance of rock ledges and coarse-grained sediment and the site's close proximity to shore, with relatively shallow water depths of six to nine meters (20 to 30 feet), leading to the conclusions that it has significant erosion potential and marginal capacity (Maguire 2000b).

CLDS – CLDS is a large area identified on NOAA navigation charts as an historic dumping ground. NAE records indicate that the site was used extensively for material dredged from the Canal (USACE-NAE 1995). The 2,051-acre CLDS area includes the smaller BBDS, described below. The substrate of the CLDS consists of variable topography and a somewhat chaotic mix of fine-grained and coarse-grained sediments, from silt to gravel, that reflects the historical use of the site for disposal of dredged material (Moore 1963; Menzie et al. 1982; Germano et al. 1989; Maguire 1997a). A disposal mound identified in previous surveys as the "dump top" is also evident in one portion of the CLDS (Germano et al. 1989; Maguire 1998b).

BBDS – BBDS is a 40-acre circular area having a diameter of 500 yards, located within the historic CLDS and used since at least 1980. The NAE has evaluated the environmental impacts of historic use of the BBDS during field surveys conducted in 1981 and 1990 (Menzie, et al. 1982; Germano et al. 1989; SAIC 1991 and 1996). These surveys provide information on topography, physical and chemical characteristics of the sediments, and the biological communities occurring both within the disposal site and in nearby reference areas. The earliest survey was a demonstration project performed in December 1981 to show how two remote mapping tools can be used to provide synoptic images of both large- and small-scale features of the seafloor. Side-scan sonar data were collected to identify the large-scale features, and sediment profile imaging (SPI) was used to measure the small-scale physical and biological features. The second survey was performed for the DAMOS program in March 1990 to provide information on the effects of past disposal operations at the BBDS and to establish baseline conditions for future monitoring. Field data collection included a precision bathymetric survey, sediment profile imaging, and sediment sampling for benthic, chemical, and physical analyses.

Although the site has not been the subject of any previous, formal designation studies, the NAE considers it to be an acceptable site for consideration as a disposal alternative on a case-by-case basis with respect to federal permits. Compliance with National Environmental Policy Act (NEPA) and the CWA is accomplished with preparation of an Environmental Assessment and a determination of compliance with the 404(b)(1) guidelines for each permitted disposal at the site. Due to the lack of a comprehensive evaluation of environmental impacts, the Commonwealth of Massachusetts has not permitted any disposal at the site since 1989.

BBDS - East of Cleveland Ledge Light – This box-shaped polygon site was permitted for temporary use outside the historic CLDS. A public notice from the NAE indicated the use of a disposal site located directly off the East Cleveland Ledge Light for the purposes of the Canal maintenance. This site was used in the past and as recently as 2002 by the NAE for the Canal dredged material. For the most recent canal project in the fall of 2002, the NAE used areas of this site to dispose of 228,000 cy (Dr. Tom Fredette, USACE-NAE, personal communication, 2004). The 2002 project disposal scow logs revealed shallower depths of 15 to 26 feet at a discrete disposal location within the site. The most current NOAA chart of Buzzards Bay (Chart #13230) shows soundings of between 26 and 33 feet from surveys conducted as late as 1994 for the same area within the site. This difference in depth range indicates that the disposal capacity for this area of the site is increasingly more limited.

Nantucket Sound – No data regarding past usage exists for the Nantucket Sound site, which is located in federal waters and is subject to designation under Section 103 of the MPRSA. The site is presumed to be characterized by sandy sediments and dynamic bottom currents. It is also located a considerable distance from much of Buzzards Bay.

Two Mile Rock and Ribbon Reef – These sites are in federal waters and are subject to designation under Section 103 of the MPRSA. Both sites are in an area with considerable exposure to open-ocean swells and elevated bottom currents. Also, they are not centrally

located. Ribbon Reef is described as a 668-acre circular area having a diameter of 1 nm. Two Mile Rock is described as a 2,000 square foot area in 42 feet of water.

Site W This open-water disposal site is centered 6.5 nm east of Block Island; it is a 1-nm square located seaward of the state territorial waters jurisdictions of Massachusetts and Rhode Island (Figure 3-5). Site W was recently designated for unconfined disposal material. This site has water depths ranging from 116 to 132 feet, with approximately 15 million cy of capacity beyond the Providence River and Harbor Navigation Project (PRHNP) deposits. Water quality impacts from disposal events appear to be limited outside the site, under even worst-case conditions (USEPA 2004).

Naushon Island – The Naushon Island site is located in central Buzzards Bay, north of Naushon Island. There is little available information regarding the history of this site, particularly with respect to the source(s) and volume of dredged material placed there. This site is located almost entirely within quahog habitat (Figure 3-15), making it considerably less desirable as a primary candidate for future use.

Cuttyhunk Nearshore – The Cuttyhunk Nearshore disposal site is located near the passage between Cuttyhunk and Nashawena Islands. This shallow-water site is permitted only for clean sand material dredged from the entrance channel. The site is not suitable for the disposal of fine-grained (i.e., muddy) material or major volumes of sand.

3.6.7 Discussion

The existing open-water disposal sites in Massachusetts (CCDS and MBDS) and the Rhode Island Region (Site W) are generally not economically feasible alternatives because of their distance from potential dredging sites in Buzzards Bay. Transit distances and associated costs from potential dredging sites in Buzzards Bay to the CCDS range from approximately 23 nm and $20 per cy for Buttermilk Bay in the north, to 45 nm and $25 per cy for Cuttyhunk Harbor in the south, with an average distance of 34 nm and an average cost of $22 per cy (Table 3-11). The MBDS is located even further north than the CCDS, with significantly greater transit distances from the Buzzards Bay area, on the order of 40 to75 nm at $25 to $51 per cy. Site W is more distant than Central Buzzards Bay. As Table 3-11 illustrates, disposal at a centrally located site in Buzzards Bay would average $17 per cy.

Table 3-11. Estimated costs for use of MBDS, CCDS, and Central Buzzards Bay Site.

Potential Dredging Sites in Buzzards Bay	Potential Dredged Material Disposal Sites for Buzzards Bay Region Projects							
	CCDS		MBDS		Central Buzzards Bay		Site W, RIR	
	Distance	*Cost*	*Distance*	*Cost*	*Distance*	*Cost*	*Distance*	*Cost*
Buttermilk Bay	23 nm	$20	40 nm	$25	13 nm	$15	47.8 nm	$25
Mattapoisett Harbor	34 nm	$22	64 nm	$51	6.5 nm	$17	39 nm	$25
West Falmouth	40 nm	$25	70 nm	$51	6.5 nm	$17	39 nm	$25
Cuttyhunk Harbor	45 nm	$25	75 nm	$51	15.2 nm	$19	21.7 nm	$20

Notes: Distances and costs are estimated. Costs are based on estimated prices per cubic yard for dredging, transport and open-water disposal (obtained from national dredging companies).
Sources: 1) Rhode Island Region Long-Term Dredged Material Site Evaluation Project Task 13 Zone of Siting Feasibility
2) DEIS for the Designation of Dredged Material Disposal Sites in Central and Western Long Island

Beyond the temporary air-quality impacts of tug and barge transport across the Bay, there would be no environmental impact to Buzzards Bay resources from the continued use of the existing open water sites in Cape Cod and Massachusetts Bays.

The practical effects of the relative costs to Buzzards Bay projects of using either the MBDS or CCDS are reflected in the conditions reported by local waterways officials, who report that it is currently prohibitively expensive to dredge sediments that cannot be used for beach nourishment or other local beneficial use alternatives. Therefore, while these sites remain available for projects that choose to use them, they have not been carried forward as practicable alternatives for Buzzards Bay long-term dredged material disposal needs.

Of the potential locations for new sites in Buzzards Bay, only the Deep Bay East and West sites appear to pass an initial screening for the presence of significant fisheries resources or other constraints, although the commonly used commercial shipping course passes over both sites. While there is only limited existing information available to characterize the sites, new site locations are presumed by regulatory policy to be a less preferred alternative than existing or historical sites. Therefore, these sites have not been carried forward for additional analysis and review as preferred alternatives.

The CLDS and BBDS are the two historical sites that passed the initial screening. The BBDS benefits from the existence of site- and function-specific data in support of a documented history of site use; a threshold analysis of those data support additional study of the site and the surrounding CLDS.

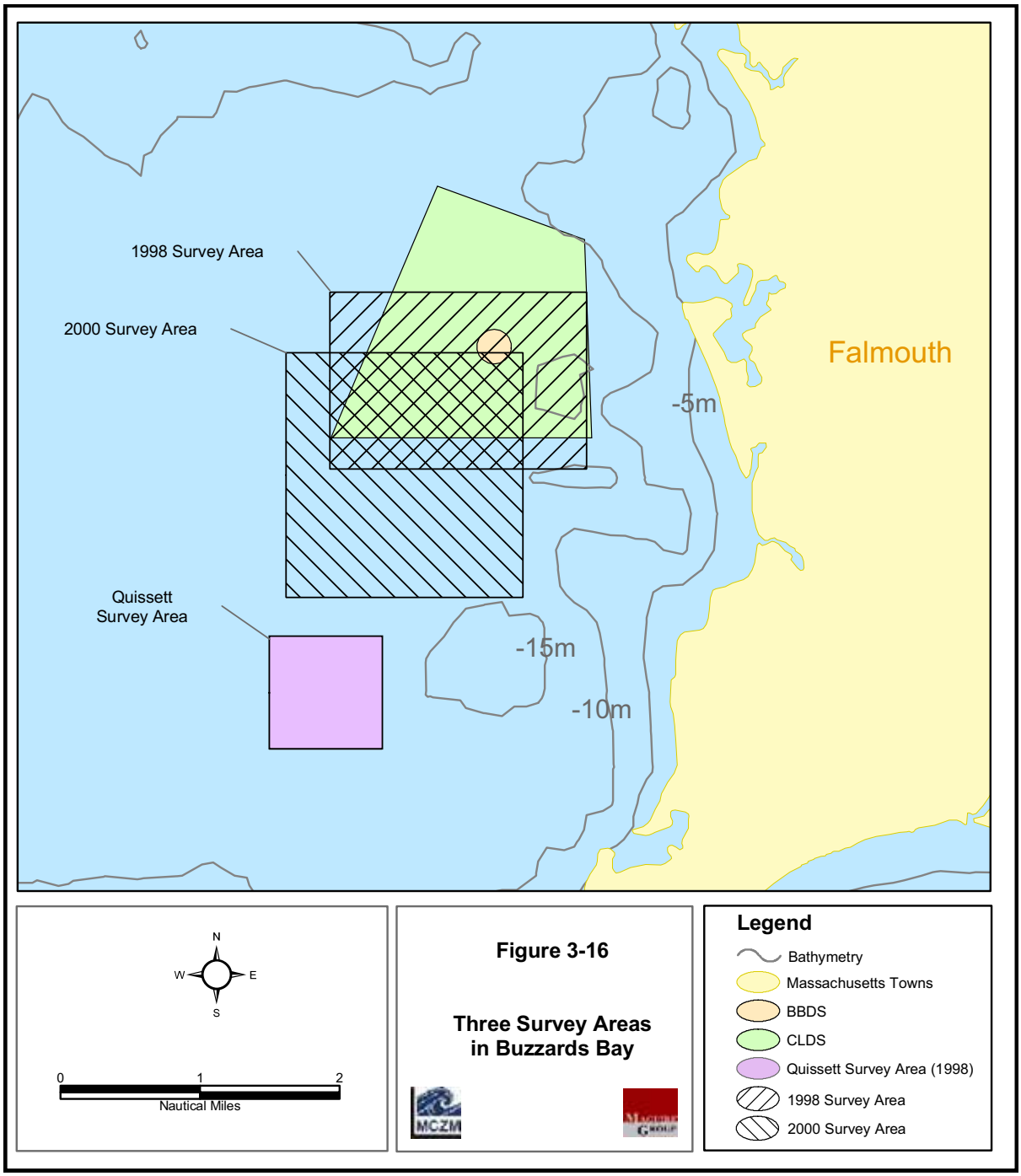
The area within and adjacent to the CLDS and BBDS therefore is carried forward as a proposed alternative site for further, more-detailed screening.

3.6.8 Delineation of Proposed Sites

In response to the MEPA Scope, issued to the DEM based on their proposed designation of the historic BBDS, an investigation of existing conditions (Appendix C) and a physical characterization of the site and surrounding area was completed in 1998 (Maguire, 1998b – See Appendix D). The survey area was delineated based on the following major site-selection requirements:

- Limit the potential for sediment resuspension and movement out of the designated area;
- Minimize the impact to the resident benthic community;
- Minimize the impact to recreational and commercial fisheries; and
- Provide sufficient water depths to maintain existing navigation

Based both on concerns that the historic BBDS (a circular area limited to 500 yards in diameter) was too small to contain material placed at the site, and on the MEPA requirement to assess alternatives, existing information was reviewed to determine potential survey locations. Three areas were selected for detailed bathymetric surveys in 1998 and 2000 (Figure 3-16).



An expanded survey of the Cleveland Ledge area was conducted in 1998 based on previous site use and an interest in characterizing deeper areas within the CLDS and vicinity. The dimensions of the surveyed area, 2,300 meters north-south by 3,400 meters east to west, established a rectangular area that included the BBDS but not the northern section of the CLDS, due to the observed presence of areas of seafloor erosion (Figure 3-16). The surveyed area extended slightly beyond the limits of the CLDS to the south to investigate deeper depths. Because of the importance of water depth in determining the near-bottom energy regime and thus the

containment potential of an area, a site located in slightly deeper water outside the CLDS was also surveyed in 1998. Named the Quissett Site, this 1,500 meter square area is located in roughly 14 meters of water in an area classified as dominated by fine-grained sediment. The area has not previously received dredged material, so it provided important ambient information to compare and contrast with data collected at the CLDS. Bathymetry and side-scan sonar surveys were conducted over both areas to obtain contemporary data, develop an accurate illustration of the seafloor topography, and determine physical sediment characteristics.

The 1998 survey report concluded that the location of the originally proposed BBDS had several drawbacks, including the existence of mainly sandy sediments, the proximity to a sand "wave field" and an area characterized by an historic coarsening of the tops of dredged material mounds. All of these characteristics suggest the potential for erosion and transport of fine-grained dredged material placed on the bottom (Maguire 1998b). The 1998 survey identified three general areas potentially suitable for additional investigation based on water depth alone, including a couple of seafloor depressions named (for the purposes of this DEIR) the Eastern Basin and the Southern Basin located within or near the former CLDS, as well as the Quissett Site.

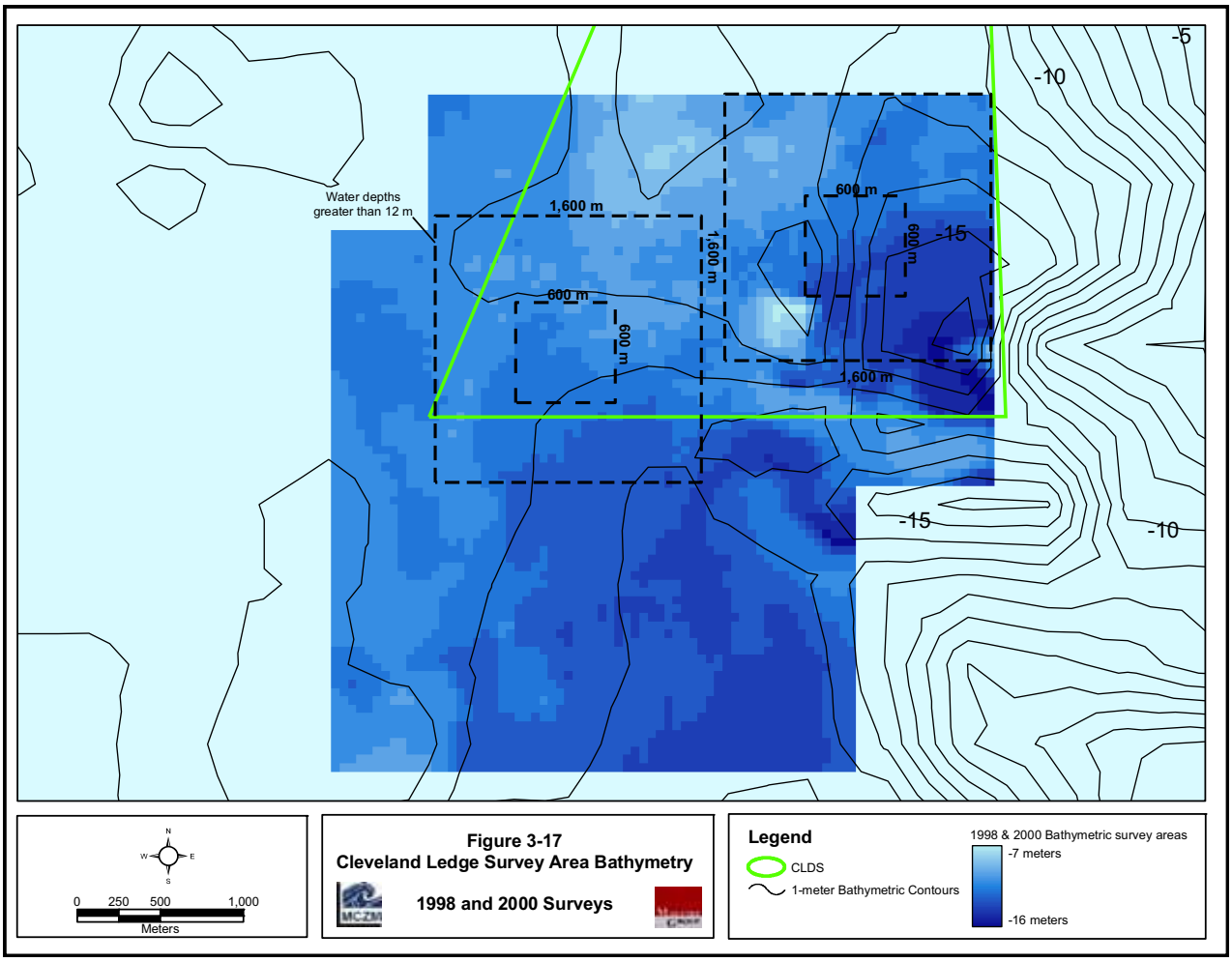
The Quissett Site is located approximately 6 kilometers west of Falmouth. The seafloor is generally flat, with a gentle slope from the northwest to the southeast. Water depths range from 12.8 meters in the shallowest area in the northwest quadrant to 14.4 meters in the southeast quadrant. The Quissett Site was removed from further consideration based on the absence of prior historic impact from disposal and the observation of sand waves, indicative of the possible presence of bottom currents strong enough to reshape the sediment surface. Features believed to be lobster burrows were observed in side-scan sonar images of the Quissett Site; these provide further support for its rejection as a candidate site (Maguire 1998b). Therefore, only the Eastern Basin and Southern Basin areas were carried forward for further consideration in siting a new dredged material disposal site in the vicinity of the historic BBDS and CLDS (Figure 3-17). Proposed alternative disposal sites 1 and 2 were established in these two areas and are evaluated in the following sections.

3.6.9 Proposed Alternative Site 2

3.6.9.1 Physical and Chemical Characteristics

Bathymetry

Proposed alternative site 2 was established as a 1,000 meters by 1,700 meters rectangle located over the Eastern Basin (Figure 3-18). The proposed alternative site 2 polygon excludes the historical circular BBDS and a shoal feature (Gifford's Ledge) to the east. Proposed alternative site 2 is located over a relatively deep trough in the southeast corner of the historic CLDS (called herein the Eastern Basin), with maximum depths within the trough of up to 16 meters. The trough feature extends further east than the survey area, and may in part be the result of scour around the south side of Gifford Ledge. A more-detailed evaluation of the bathymetry of alternative site 2 is presented in Section 4.1.


-5
-10
-15
-15
-10
Water depths
greater than 12 m
1,600 m
600 m
600 m
600 m
600 m
1,600 m
1,600 m
600 m
N
W
E
S
0 250 500 1,000
Meters
Figure 3-17
Cleveland Ledge Survey Area Bathymetry
1998 and 2000 Surveys
Legend
CLDS
1-meter Bathymetric Contours
1998 & 2000 Bathymetric survey areas
-7 meters
-16 meters

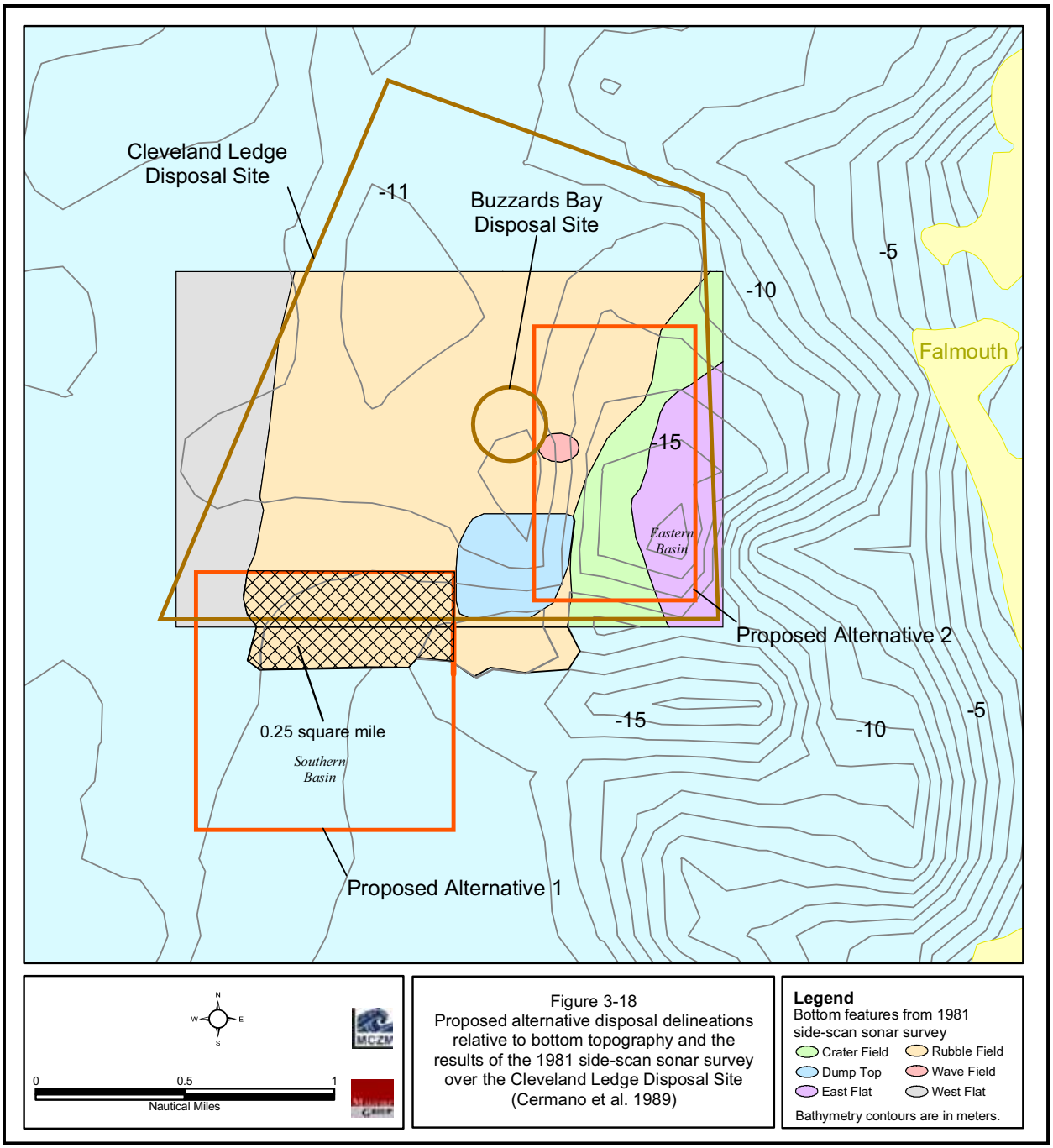


Figure 3-18
Proposed alternative disposal delineations relative to bottom topography and the results of the 1981 side-scan sonar survey over the Cleveland Ledge Disposal Site (Cermano et al. 1989)

Sediment

Physical Character: Areas of fine, medium, and coarse sand characterize proposed alternative site 2. An historic study indicated that the coarse sand and gravel deposits located primarily within the shallower nearshore areas of Buzzards Bay were primarily due to scouring by waves and tidal currents (Moore 1963). Based on a 1981 survey, most of the western side of proposed alternative site 2 consisted of a "crater field" resulting from deposition of coarser dredged material on finer-grained substrate (Figure 3-18; Germano et al. 1989). A 1998 survey

conducted for this DEIR identified these features primarily in the northern part of the basin in proposed alternative site 2 (Maguire 1998b). The eastern side of proposed alternative site 2 contains a flat area interpreted as consisting of ambient, fine-grained sediments in the bottom of the "Eastern Basin" trough around Gifford Ledge. For proposed alternative site 2, the 2002 side-scan showed an area of soft mud bottom in the central area of the site just north of Gifford ledge.

Grain size results for proposed alternative site 2 were also consistent with historical surveys, and indicated a predominance of sandier sediments with a minor component of silt and clay. Sand was the dominant grain size fraction in the shallower, northern portion of the site and along Gifford Ledge (66% to 85% sand). Silt-clay was the dominant grain size fraction closer to the trough. Metals concentrations at proposed alternative site 2 were slightly lower than the average concentrations at the Southern Basin. Section 4-2 provides a more-detailed description of the characteristics of surface sediments within proposed alternative site 2 sediment.

Chemical Character: Variations in metal concentrations primarily reflected variations in grain size. Proposed alternative site 2 had low concentrations of PAHs, with maximum concentrations less than the maximum values detected at one station in the Southern Basin. No pesticides were detected above the method detection limits for the sediment samples collected at proposed alternative site 2. PCB congeners were only detected at one sampling station at proposed alternative site 2. Only trace amounts of four PCB congeners (PCBs 8, 66, 101 and 153) were detected at another sampling station in proposed alternative site 2. Surficial bottom sediments at proposed alternative site 2 were generally free of chemical contamination and therefore highly unlikely to be causing any adverse effects to resident biota (Maguire 2001c). The total organic content and low chemical contaminant concentrations observed in the surficial sediment samples at the candidate sites were similar to unpolluted areas of Buzzards Bay. A more-detailed evaluation of sediment chemistry at proposed alternative site 2 is provided in Section 4.2.

Water

Quality: Because Buzzards Bay is relatively shallow, tidal currents and wind waves are effective at producing a well-mixed water column. Therefore, water column stratification is generally not a widespread or persistent condition in this estuary. Camisa and Wilbur (2002) found no evidence of stratification within the water column above proposed alternative site 2 during 20 sampling events conducted over a thirteen consecutive month sampling period (March 2001 to March 2002).

With the exception of copper, concentrations of metals, pesticide and PCB analytes in the water column were considerably below the corresponding USEPA water quality criteria over the proposed alternative site 2. A more in-depth evaluation of water quality at proposed alternative site 2 is provided in Section 4.4.3.

Waves: The eastern portion of Buzzards Bay is relatively well-protected from the effects of large, long-period, open-ocean waves (i.e., swells). As open ocean swells enter the mouth of Buzzards Bay from the southwesterly direction, they are refracted and slowed along the east and west shorelines as they progress toward the area of BBDS. An analysis of hydrodynamics conducted for this DEIR using available information showed that even under extreme conditions of waves and bottom currents, there would be no erosion of dredged material placed on the

bottom at proposed alternative site 2 (Maguire 2004b). Section 4.3 provides a more-detailed description of wave conditions at site 2.

Currents: Currents within Buzzards Bay are dominated by the semi-diurnal M_2 tides, with amplitudes of tidal currents decreasing from a maximum of 1 to 1.2 knots near the mouth to 0.2 to 0.3 knots at the head (Signell 1987). An analysis of data generated from a USGS current meter deployed just below the head of the bay approximately six kilometers north of proposed alternative site 2 showed an average tidal current of 0.64 knots. Preliminary modeling indicated an average tidal current speed of 0.138 knots at proposed alternative site 2.

A field survey to measure tidal currents throughout the water column at proposed alternative site 2 was conducted on November 11 and 12, 2003. Bottom currents in the area were found to be relatively low, with a mean speed of 0.086 knots and a maximum speed of 0.131 knots during the survey period. Bottom currents were generally aligned northeast/southwest, parallel to the axis of Buzzards Bay. Currents were relatively uniform throughout the water column at this location, and there was little spatial variation in currents within the area defined by the two proposed disposal sites. A review of historical recorded winds and currents supported the finding of a very limited potential for significant sediment erosion and transport by bottom currents and/or during extreme storm events (e.g., Hurricane Bob in 1991) at proposed alternative site 2 (Maguire 2004a). Section 4.3 provides a detailed description of site 2 currents.

3.6.9.2 Biological Characteristics

Benthos

The community of benthic macroinvertebrates inhabiting surface sediments at proposed alternative site 2 was dominated by opportunistic, "Stage I" polychaetes (e.g., *Mediomastus ambiseta*, *Prionospio perkinsii, Caraziella hobsonae*) known to have high population turnover rates and therefore wide spatial and temporal variance. This community generally was similar in composition to those found in two nearby reference areas. Section 5.1 presents a detailed analysis of the benthos found at site 2.

Commercial /Recreational Fish and Shellfish Resources

Many of the fish in Buzzards Bay are migratory, moving along the southeastern New England coast and into the bay in spring and summer. These populations are dynamic and will continue to change spatially and temporally in response to a variety of biotic and abiotic environmental factors. A trawl study conducted for this DEIR over a 13-month period found that little skate, long-finned squid, scup, summer flounder and tautog were among the most abundant fish species found at alternative site 2 at various times of the year (Camissa and Wilbur 2002). Economically important gastropod and bivalve mollusks collected in grab sampling and trawl surveys were found to have a very limited presence at alternative site 2. A more-detailed analysis of fish and shellfish resources at this site is provided in Section5.2.

Commercial/Recreational Fishing

In Buzzards Bay, commercial fishers seek bottom areas having significant structural complexity because they represent preferred habitat for many types of fish and shellfish. Commercial potters largely pursue scup and black sea bass in the vicinity of alternative sites 1 and 2 (Maguire 2002b). As discussed above, the bottom habitat of proposed alternative site 2 exhibits more structural diversity than site 1 due to its steeper slope, mosaic of sediment types, proximity to structure (e.g., Gifford Ledge), and the fact that it lies closer to nearby eelgrass habitat. Section 6.1 gives a more-detailed description of commercial and recreational fishing at site 2.

Based on interviews with commercial and recreational lobsterman, the shallower, structure-filled areas of the old Cleveland Ledge Disposal Site represent good lobster habitat (Maguire 2002b). The structure-filled Eastern Basin area of proposed alternative site 2 may also render it a preferred area for recreational anglers, as described fully in Section 6.3.

Submerged Aquatic Vegetation

Water depths throughout proposed alternative site 2 are too deep to support eelgrass beds, and recent surveys show no eelgrass beds associated with the shallow areas of Gifford Ledge (Howes and Goehringer 1996; Schwartz 2000). Section 5.6 provides a detailed description of submerged aquatic vegetation at site 2.

Rare and Endangered Species

Personnel of the DEP Endangered Species Review Program were contacted with regard to rare and endangered species for this DEIR. Their review of files revealed no known rare plants or animals or exemplary natural communities within the project area, including proposed alternative site 2 in the Eastern Basin (DEP 2002). No federally listed or proposed threatened or endangered species under the jurisdiction of the USFWS are known to occur in the project area (USFWS 2002). A more-detailed assessment is provided in Section 5.4.

Based on the above characteristics, alternative site 2 (hereafter called candidate site 2) located within the Eastern Basin was carried forward for additional evaluation as a potential disposal site in this DEIR.

3.6.10 Proposed Alternative Site 1

3.6.10.1 Physical and Chemical Characteristics

Bathymetry

Bathymetry in the 1,600 meters by 1,600 meters (approximately one square mile) area constituting proposed alternative site 1 slopes gently downward from northwest to southeast, with depths of 11 meters (36 feet) in the northwest corner increasing to 14 meters (46 feet) in the southeast corner. Because it is located within the Southern Basin, almost all of the area within proposed alternative site 1 has water depths of greater than 10 meters (33 feet), with the majority of the site having a depth between 13 meters and 14 meters (43 and 46 feet; Maguire 2001a). A detailed description of site 1 bathymetry is provided in Section 4.1.

Sediments

Physical Character: Previous studies demonstrate that fine-grained sediments tend to accumulate in the deeper basins and troughs that generally represent lower-energy, depositional environments within Buzzards Bay (Moore 1963; Howes and Goehringer 1996). Images of the bottom obtained in 2002 using side-scan sonar confirm that the deeper areas within proposed alternative sites 1 and 2 are characterized by fine-grained (i.e., muddy) sediments (Maguire 2002d). The historic map of surface sediment textural distributions prepared by Moore (1963) shows medium to fine sands throughout most of the CLDS (including the historic BBDS), with a band of finer-grained silts in the southwest corner of the site in the vicinity of proposed alternative site 1 (Figure 3-6). Section 4.2 provides a detailed description of surface sediment characteristics at site 1.

Chemical Character: Results for grain size analyses of samples collected in November 2000 were consistent with the historical surveys, indicating a predominance of silt and clay throughout the broad topographic depression in proposed alternative site 1 (58% to 93% silt and clay), with a component of fine sand and a minor fraction of gravel (0% to 3.5%; Maguire 2001b). Total organic carbon (TOC) concentrations ranged from 0.5% (at the sandier Station B6) to 2.3%, which is typical for Buzzards Bay sediments removed from anthropogenic inputs of organic matter. Concentrations of metals, PAH compounds, pesticides, and PCB congeners were either very low or not detected in surface sediments within site 1**.** These results suggest that past disposal activities in and around proposed alternative site 1 have not resulted in any differences in sediment chemistry compared to ambient Buzzards Bay sediments in nearby areas unaffected by past disposal. Section 4.2 provides a more-detailed description of sediment chemistry at alternative site 1.

Water

Quality: Similar to candidate site 2, Camisa and Wilbur (2002) found no evidence of stratification within the water column above proposed alternative site 1 during 20 sampling events conducted over a thirteen consecutive month sampling period (March 2001 to March 2002). A detailed description of water quality at site 1 is provided in Section 4.4.

With the exception of copper, concentrations of metals, pesticides and PCBs in the water column over alternative site 1 were considerably below USEPA water quality criteria. Section 4.4.3 provides for a more detailed description of water quality at this site.

Waves: An analysis of hydrodynamics conducted for this DEIR using available information showed that even under extreme conditions of waves and bottom currents, there would be negligible erosion of dredged material placed on the bottom at proposed alternative site 1 (Maguire 2004b). Section 4.3 provides a more-detailed description of wave conditions at site 1.

Currents: Currents within Buzzards Bay are dominated by the semi-diurnal M_2 tides, with amplitudes of tidal currents decreasing from a maximum of 1 to 1.2 knots near the mouth to 0.2 to 0.3 knots at the head (Signell, 1987). An analysis of data generated from a USGS current meter deployed just below the head of the bay approximately six kilometers north of

proposed alternative site 1 showed an average tidal current of 0.64 knots. Preliminary modeling indicated an average tidal current speed of 0.138 knots at proposed alternative site 1.

A field survey to measure tidal currents throughout the water column at proposed alternative site 1 was conducted on November 11 and 12, 2003. Bottom currents in the area were found to be relatively low, with a mean speed of 0.086 knots and a maximum speed of 0.131 knots during the survey period. Bottom currents were generally aligned northeast/southwest, parallel to the axis of Buzzards Bay. Currents were relatively uniform throughout the water column at this location, and there was little spatial variation in currents within the area defined by proposed alternative site 1. A review of historical recorded winds and currents supported the finding of a very limited potential for significant sediment erosion and transport by bottom currents and/or during extreme storm events (e.g., Hurricane Bob in 1991) at this site (Maguire 2004a). Section 4.3 provides a detailed description of site 1 currents.

3.6.10.2 Biological Characteristics

Benthos

While the overall type and character of benthic habitats at proposed alternative sites 1 and 2 are similar, minor differences in habitat characteristics suggest that the large, muddy topographic depression that dominates most of site 1 provides *slightly* more stable and/or optimum conditions for the establishment of an advanced (i.e., Stage III) benthic community (Maguire 2001c and d). Section 5.1 provides a detailed description of the benthic infaunal communities found at site 1.

Commercial /Recreational Fish and Shellfish Resources

The marine fish and shellfish of Buzzards Bay are part of the faunal communities that comprise the Atlantic temperate biogeographical region. This region is characterized by moderate temperatures and longer summer warming, and therefore a wider annual temperature range than waters north of Cape Cod (the boreal region). Many northern species of fish reach the southern limit of their range at Cape Cod, while many southern species reach their northern range limit. The trawl study conducted for this DEIR over a 13-month period found that little skate, long-finned squid, scup, summer flounder and tautog were among the most abundant fish species found at alternative site 1 at various times of the year (Camissa and Wilbur 2002). Only one lobster was sampled at the site during this 13-month trawl study, and economically important gastropod and bivalve mollusks were found to have a very limited presence (Camisa and Wilbur 2002). A detailed description of fish resources at site 1 is provided in Section 5.2.

Commercial/Recreational Fishing

Deeper, muddy areas like most of proposed alternative site 1 generally are considered unproductive with respect to commercial and recreational fisheries. The northwestern portion of Buzzards Bay, including the BBDS, is fished in summer with pots for scup and black sea bass (Maguire 2002b). The deeper, muddy areas of this region appear to be of relatively low value as lobster habitat. Section 6.1 provides a detailed description of commercial and recreational fishing and Section 6.3 provides a detailed description of lobstering at proposed alternative site 1.

Submerged Aquatic Vegetation

As confirmed by recent studies conducted for this DEIR, water depths throughout proposed alternative site 1 are too deep to support eelgrass beds or other types of submerged aquatic vegetation (SAV), as discussed further in Section 5.6.

Rare and Endangered Species

DEP Endangered Species Review Program personnel were contacted with regard to rare and endangered species. Their review of files revealed no known rare plants or animals or exemplary natural communities within or surrounding proposed alternative site 1 (DEP 2002). No federally listed or proposed threatened or endangered species under the jurisdiction of the USFWS are known to occur in the project area (USFWS 2002). Section 5.4 provides additional detail regarding the occurrence of rare and endangered species at site 1.

3.6.10.3 Selection of Preferred Alternative

A supplementary bathymetric survey was conducted in 2000 to evaluate an area that included the southwest quadrant of the former CLDS and a larger area extending southward beyond the limits of the CLDS, towards deeper water shown in Figure 3-16 (Maguire 2001a, Appendix E).

This survey confirmed that water depths in excess of 12 meters continue to the south of the former CLDS and showed that most of this area to the south represents a relatively broad, gradually sloping topographic depression referred to herein as the "Southern Basin" (Figures 3-18 and 3-19). Three-dimensional renderings of the bathymetric data suggest that this topographic depression may be protected from the effect of storm waves and higher energy bottom currents by shallower areas immediately to the west, north and east (Maguire 2001a).

Proposed alternative site 1 (hereinafter called candidate site 1) comprises a one-square mile area, roughly one-quarter of which is located within the former CLDS and three-quarters of which extend south into the Southern Basin, outside the former CLDS boundary (Figures 3-18 and 3-19). In theory, approximately three-quarters of candidate site 1 has not experienced dredged material disposal in the past, but old dredged material deposits have been observed extending southward beyond the CLDS into approximately the northern third of candidate site 1 that lies within the boundary of the former CLDS (see Figure 3-18). While consideration of the expanded area comprising candidate site 1 constitutes evaluation of a partially new site, the potentially superior containment characteristics of the site and its overlap with and immediate proximity to the historic CLDS argue for its consideration as an alternative (Maguire 2001a). Potential configurations of this site and a comparison of the benefits and impacts of using a hybrid historic/new site are discussed in the Site Management and Monitoring Plan (SMMP) presented in Section 11.0.

Based on the results summarized above, candidate site 1 and alternative site 2 (hereinafter refered to as candidate site 2) were both carried forward as preferred alternative sites and were each subjected to the detailed analyses presented in subsequent sections of this DEIR.

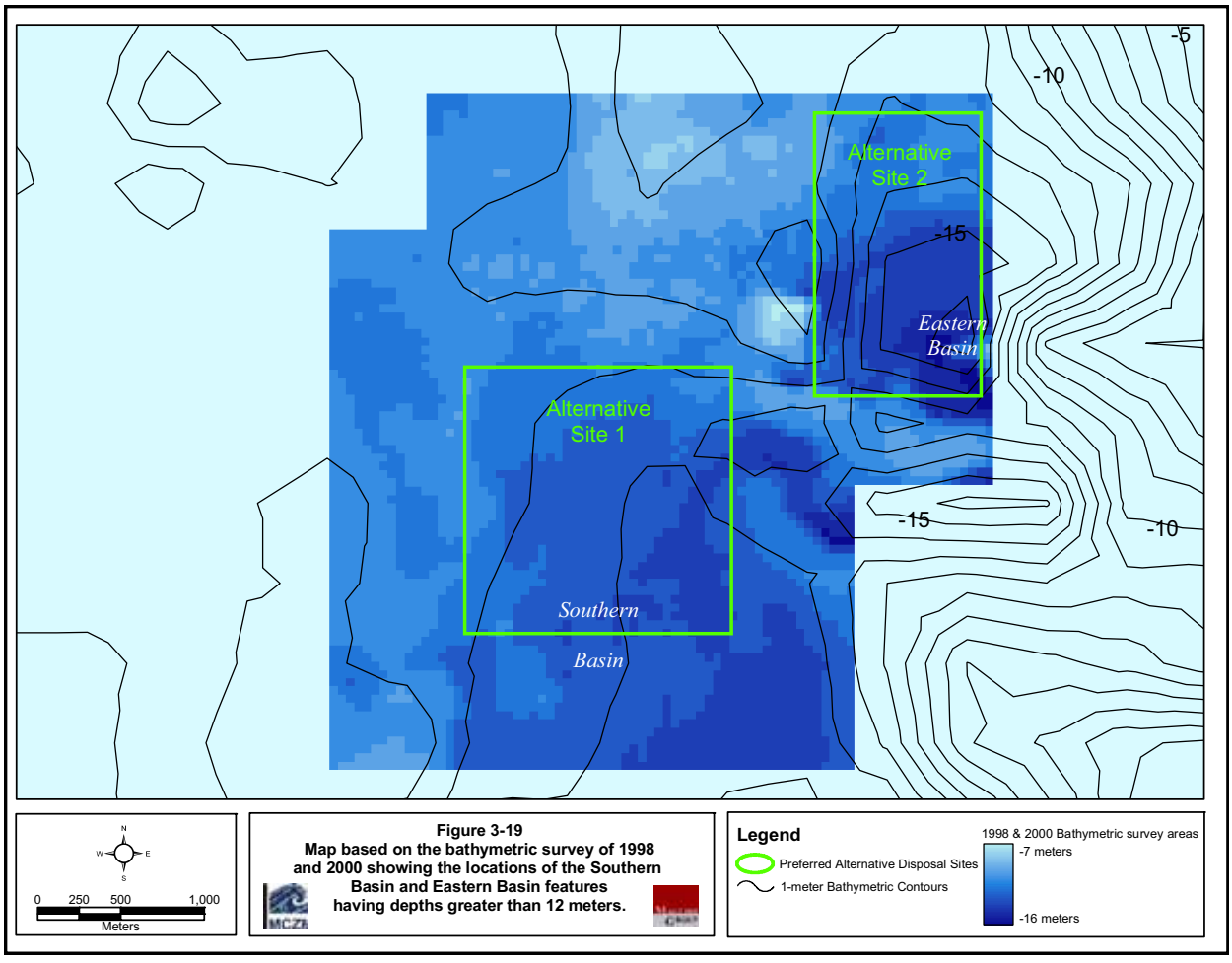


Figure 3-19
Map based on the bathymetric survey of 1998 and 2000 showing the locations of the Southern Basin and Eastern Basin features having depths greater than 12 meters.

3.6.11 Evaluation Factors for candidate sites

In the following sections of this document, candidate sites 1 and 2 are evaluated using the factors described below to determine on a comparative basis the suitability of each for continued dredged material disposal. Detailed information on the existing characteristics of candidate sites 1 and 2 pertaining to these evaluation factors is provided in Sections 4.0, 5.0, and 6.0; the evaluation of impacts to each site from continued dredged material disposal activities is presented in Section 7.0, and summarized in Section 8.0.

Site Evaluation Factors:

(a) Bathymetry, site accessibility, and site capacity (suitable water depths and capacity to accommodate projected volumes of dredged material over the 20-year DMMP time-frame);

(b) Sediment grain size and chemistry (grain size and sediment chemistry that are comparable to the range of dredged material likely to be placed at the site);

(c) Bottom currents and sediment resuspension potential (hydrodynamic conditions can indicate a lower-energy, depositional environment that will provide long-term stability of the substrate);

(d) Water column chemistry (information on water column stratification is to be factored into modeling efforts to assess potential water column impacts and the extent of suspended sediment plumes created during disposal operations);

(e) Impacts on the benthic community;

(f) Potential impacts on fishery resources, including spawning and nursery habitat, as well as adult populations and habitat areas, and EFH considerations;

(g) Potential impacts on commercial and recreational harvest of finfish, shellfish and lobster;

(h) Potential impacts on wetlands or submerged aquatic vegetation;

(i) Potential impacts on wildlife (including avifauna);

(j) Potential impacts on rare or endangered species;

(k) Potential impacts on historical and archaeological resources;

(l) Potential impacts on navigation and shipping;

(m) Potential impacts on land use and special area designations (e.g., Areas of Critical Environmental Concern (ACECs), marine sanctuaries and refuges, etc.);

(n) Potential impacts on air quality and noise;

3.7 Summary

Upland/reuse disposal alternatives for CDM originating from Buzzards Bay regional projects have been screened in this DEIR. New Bedford/Fairhaven Harbor is the only industrial waterfront centrally located for Buzzards Bay regional dredging projects. None of the eight potential upland disposal sites would be considered preferred alternatives for disposal of UDM from New Bedford/Fairhaven Harbor. Additionally, all of the property owners were contacted, and none expressed an interest in accommodating the DMMP UDM material of New Bedford/Fairhaven Harbor. In this DEIR, CDM from potential Buzzards Bay region harbor and channel dredging projects in the Buzzards Bay region has been similarly considered for upland disposal. There are several environmental, logistical, and cost constraints that make upland disposal an infeasible alternative. Among them are:

1. There is no practical dewatering site available for the temporary stockpiling and dewatering of UDM or CDM. A dewatering site is a mandatory element of the upland disposal process.

2. The lowest cost for upland disposal is $62 per cy. This is more costly than traditional open-water disposal or CAD disposal. In addition, the $62 per cy cost would be for limited volumes of upland disposal.

3 DEP regulations and policies for handling of dredged material on land, as well as for landfill siting, engineering, and operations, are very restrictive. The likelihood of obtaining a permit for a new landfill is low, and even if a site were to become permitted, it would take five to seven years to achieve all the necessary approvals. While a large-scale facility established on that schedule could potentially accommodate out-year dredging projects, the five to seven year permitting schedule does not accommodate the immediate (zero to five years) dredging need.

Aquatic disposal alternatives for CDM from Buzzards Bay regional dredging projects have also been screened for this DEIR. The screening of potential aquatic sites included: 1) assessing the feasibility of using one of the two existing open-water sites in Massachusetts and one in Rhode Island, 2) screening of potential locations for a new site, 3) identifying historic sites and comparing the benefits and drawbacks of designating one of them, and 4) identifying two preferred alternative sites as candidates for more detailed investigation.