2.0 ALTERNATIVES

Chapter 2:

This chapter describes how potential alternative ocean disposal site locations were screened, some alternatives were eliminated from further consideration, and an appropriate range of final alternatives was developed. This chapter then described the final alternatives in detail.

Section 2.1 describes the ocean disposal site designation process. This process begins with USEPA's ocean disposal site selection criteria. A constraints analysis ("Zone of Siting Feasibility Study") used USEPA selection criteria and best available information on the marine environment around Guam to identify areas that were potentially suitable for an ODMDS site. Those areas that did not meet the criteria were dismissed from further impact analysis in this EIS (Section 2.2). This process identified two areas (the Northwest Study Area and the North Study Area) that met the criteria. Field studies within the two zones were conducted to identify the best ODMDS site within each zone. These locations became the "action" alternatives carried forward for detailed evaluation in this EIS. Sections 2.4 and 2.5 describe the two "action" alternatives in detail and Section 2.6 describes the No Action Alternative, which is the *status quo* for Guam and would not designate any ODMDS. Section 2.7 summarizes the degree to which the two action alternatives comply with the USEPA ocean disposal site selection criteria. Section 2.8 is a statement of the Preferred Alternative, and Section 2.9 shows a comparison of impacts between the two action alternatives.

2.1 ODMDS DESIGNATION PROCESS

Ocean Disposal is regulated under Title I of the Marine Protection, Research, and Sanctuaries Act (MPRSA) (33 USC 1401 *et seq*). USEPA has the responsibility for designating an acceptable location for the ODMDS (MPRSA Section 102).

In summary, the steps required to designate an ODMDS are:

1. Demonstrate a need for an ODMDS.
2. Conduct a constraints analysis (Zone of Siting Feasibility [ZSF] study), based on existing information to identify areas with the least conflicting uses and the least potential for any environmental impacts.
3. Evaluate the identified zones in detail, to determine the most suitable location within each zone for a candidate ODMDS.
4. Evaluate the specific candidate site in each zone using the USEPA general and specific criteria (40 CFR Part 228) (Table 2-1) and document the findings in the EIS.
5. Identify the preferred alternative (e.g., the site that best meets the criteria) and proceed with rulemaking published in the FR to formally designate the ODMDS.

Table 2-1. Five General and Eleven Specific ODMDS Selection Criteria

General Site Selection Criteria (40 CFR 228.5)	
1	The disposal of materials into the ocean will be permitted only at sites or in areas selected to minimize the interference of disposal activities with other activities in the marine environment particularly avoiding areas of existing fisheries or shellfisheries and regions of heavy commercial or recreational navigation.
2	Locations and boundaries of disposal sites will be so chosen that temporary perturbances in water quality or other environmental conditions during initial mixing caused by disposal operations anywhere within the site can be expected to be reduced to normal ambient seawater levels or to undetectable contaminant concentrations or effects before reaching any beach shoreline marine sanctuary or known geographically limited fishery or shellfishery.
3	If at any time during or after disposal site evaluation studies it is determined that existing disposal sites presently approved on an interim basis for ocean dumping do not meet the criteria for site selection set forth in Sections 228.5 through 228.6 the use of such sites will be terminated as soon as suitable alternate disposal sites can be designated.
4	The sizes of the ocean disposal sites will be limited in order to localize for identification and control any immediate adverse impacts and permit the implementation of effective monitoring and surveillance programs to prevent adverse long-range impacts. The size configuration and location of any disposal site will be determined as a part of the disposal site evaluation or designation study.
5	USEPA will wherever feasible designate ocean dumping sites beyond the edge of the continental shelf and other such sites that have been historically used.
Specific Site Selection Criteria (40 CFR 228.6(a))	
1	Geographical position, depth of water, bottom topography, and distance from the coast.
2	Location in relation to breeding, spawning, nursery, feeding, or passage areas of living resources in adult or juvenile phases.
3	Location in relation to beaches and other amenity areas.
4	Types and quantities of wastes proposed to be disposed of, and proposed methods of release, including methods of packaging the waste, if any.
5	Feasibility of surveillance and monitoring.
6	Dispersal, horizontal transport, and vertical mixing characteristics of the area, including prevailing current direction and velocity, if any.
7	Existence and effects of current and previous discharges and dumping in the area (including cumulative effects).
8	Interference with shipping, fishing, recreation, mineral extraction, desalination, fish and shellfish culture, areas of special scientific importance, and other legitimate uses of the ocean.
9	Existing water quality and ecology of the site as determined by available data or by trend assessment or baseline surveys.
10	Potentiality for the development or recruitment of nuisance species in the disposal site.
11	Existence at, or in close proximity to, the site of any significant natural or cultural features of historical importance.

2.2 ALTERNATIVE DEVELOPMENT

Alternatives were eliminated from detailed impact analysis in this EIS if they did not meet specified USEPA siting criteria. The ZSF study for a Guam ODMDS, prepared by Weston and Belt Collins in September 2006, was a rigorous assessment used to identify any and all reasonable alternatives for potential ODMDS siting and the information is summarized in this EIS section. Based on the ZSF study, two zones in the Philippine Sea met the siting criteria. Based on their location relative to Apra Harbor, the zones are described as North and Northwest zones. Within these two zones, field analysis was conducted to identify the most suitable ODMDS within each of the two zones. It is these two specific sites within the two zones that are carried forward in the impact analysis as the North and Northwest Alternative ODMDS.

2.2.1 Zone of Siting Feasibility Methods

A schematic representation of the ZSF process is shown on Figure 2-1. The initial assumption of the ZSF is that most of the Guam dredging would occur in Apra Harbor; therefore, the most economic regional location, with respect to travel distance from the dredged site to ODMDS, would be west of Guam. The ZSF methodology uses best available information to screen for areas acceptable for an ODMDS by using Geographic Information Systems (GIS) to graphically represent the following siting constraints:

- Regulated navigation lanes
- Military operating areas and safety zones / danger areas
- GOVGUAM jurisdictional boundaries
- Marine protected areas
- Parks
- Ocean outfalls from wastewater treatment plants
- Oil and mineral extraction installations (not applicable to Guam)
- Continental Shelf considerations (not applicable to Guam)
- Important fishing areas including Fish Aggregation Devices (FADS)
- Important visual resources

ODMDS designation should avoid these constrained areas. The description of these resources is provided in detail in Chapter 3. Finally, the location must be within the economic feasibility distance that is described in Section 2.2.2.

These evaluation factors were considered and it was determined that most were applicable to Guam. Active shipping lanes eliminated areas west of Guam. Military operating zones were eliminated west, southwest and south of Guam. Areas containing FADS or shallow bathymetric features capable of supporting coral habitat, pelagic and bottomfish fisheries, and recreational fishing were eliminated north, west, and southwest of Guam. Marine protected areas, ecological reserve areas, and park areas were eliminated south, west and northeast of Guam. Important visual areas were eliminated northwest of Guam. After eliminating these areas, the economic feasibility distance was applied as described in Section 2.2.2 below.

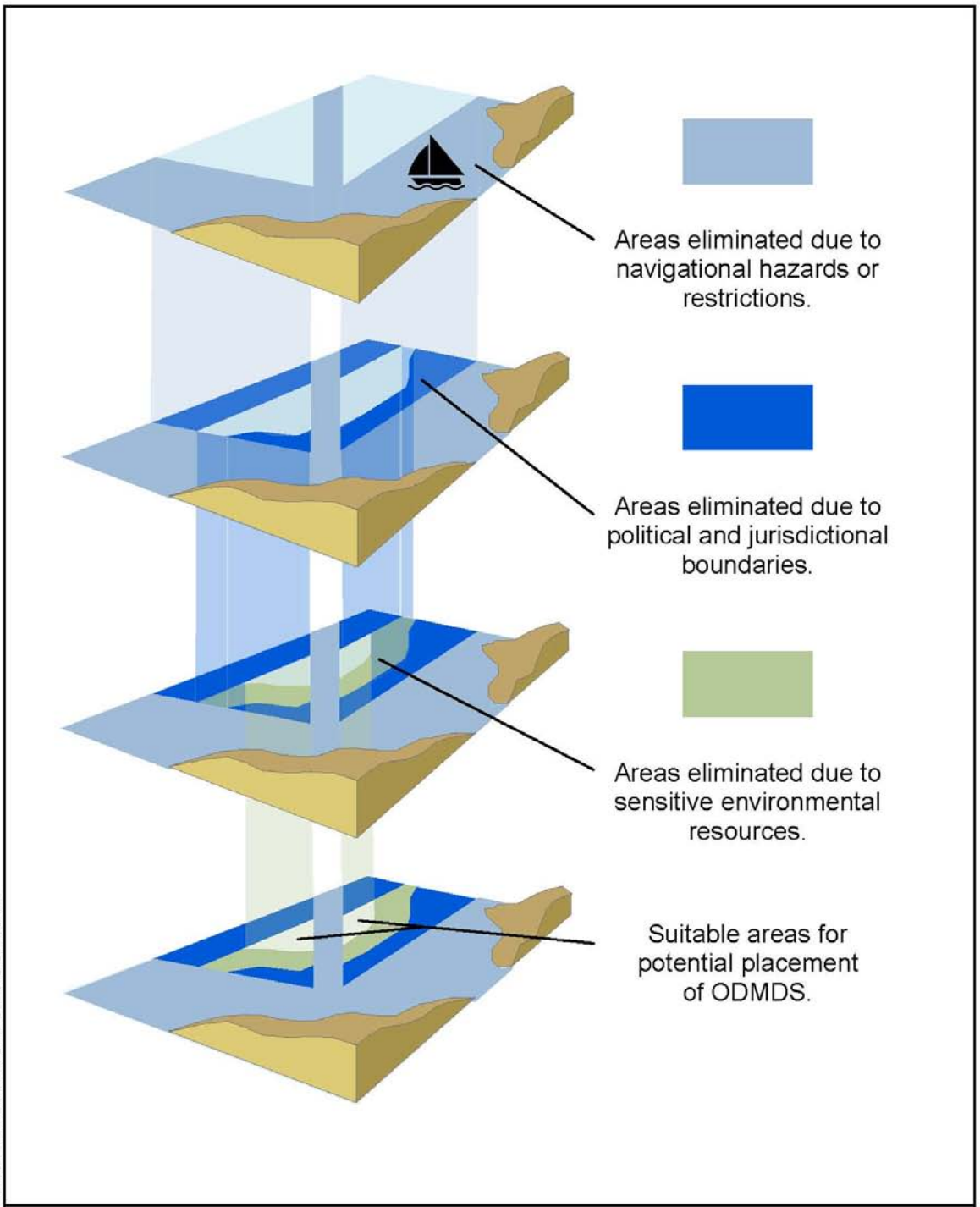

Figure 2-1
Schematic Representation
Zone of Siting Feasibility Process

2.2.2 Economic Feasibility Distance

The extent of the ZSF should be equal to the transport distance that is economically feasible for both construction and maintenance dredging projects. For Guam, the ZSF would be an area inside an arc originating from the entrance of Apra Harbor (where most dredging would occur) and radiating offshore to the economic transport distance. The economic transport distance is dependent on a number of factors, including the kind of project (maintenance versus new construction), the type and size of dredging equipment used, production rate of the dredge equipment and acceptable production downtime (Weston Solutions and Belt Collins 2006). Mechanical dredging is the method historically utilized by the Navy and others on Guam for both maintenance and construction dredging, and it was assumed in the ZSF that this would continue to be the method of choice. Although mechanical dredging was assumed in the ZSF, other dredging methods such as hydraulic dredging may be used in Apra Harbor in the future.

In a typical mechanical dredging operation, a large clamshell-shaped bucket is affixed to the moveable arm of the dredge equipment, which is secured to a barge and transported to the dredge site by tugs. The dredging process consists of lowering the bucket to the seafloor, closing the bucket to grab the bottom sediment, raising it back to the water surface, and depositing the dredged material into a scow (Figure 2-2). When full, the scow is towed by a tug to the ODMDS where it is released from the scow. It is most efficient to have two scows so that one can be loaded while the other is transiting to and from the ODMDS.

The size of the dredge bucket and scows, and number of scows available factor into the maximum transport distance. The most efficient mechanical dredging operations use at least two scows so that the dredge can continue to work filling one scow while the other is being towed to and from the ODMDS. The ZSF analysis indicated that for the clamshell dredging options using two scows, the economically feasible transit distance for maintenance projects is up to 18 nm (33 km) from the entrance to Apra Harbor.

Figure 2-2
Dredging Equipment

2.2.3 Zone of Siting Feasibility (ZSF) Conclusions

Figure 2-3 shows the composite of all constraints identified in the ZSF. The results suggest there are two zones located offshore of Guam that are unconstrained and may be suitable for placement of an ODMDS. The first zone, the Northwest Study Area, begins approximately 8.9 nm (16.4 km) northwest of the entrance to Outer Apra Harbor with an area of approximately 59 square miles (mi^2) (152 km^2). The second zone, the North Study Area, begins approximately 12.4 nm (23 km) north of the entrance to Outer Apra Harbor with an area of approximately 22 mi^2 (58 km^2).

There is a third zone, located southwest of the entrance to Outer Apra Harbor, that appears to be free of constraints and to meet the ZSF requirements. However, the travel route to this southwest zone must circumvent the firing danger zone and submarine operating area. The scow and barge would be required to transit 10 nm (18 km) due west from Apra Harbor then 5.5 nm (10 km) south to reach the boundary of the southwest zone. The 15.5 nm (28.7 km) minimum transit distance to the edge of the zone is already close to the economic transport distance of 18 nm (33 km). Also, the potential to transit into a restricted area is much greater than for the other alternatives. Therefore, this zone has been excluded from further consideration for placement of an ODMDS.

2.2.4 Identification of a Specific ODMDS Alternative Within Each ZSF Study Area

Following the ZSF study, additional field research and analyses were conducted to identify the least constrained areas within each of the two study areas. Studies were conducted to determine physical, biological, and socioeconomic site constraints and are detailed in Chapter 3, Affected Environment. The study findings suggest that the two study areas could be described as pristine and are not readily distinguishable from each other based on water quality and sediment quality. The physical characteristics within the study areas were the basis of selecting a preferred site. Favorable sites had relatively flat, featureless sea floor to avoid potentially unique features or potentially more valuable aquatic habitats (e.g., seamounts). Unfavorable areas appeared unique or potentially valuable based on the field study results. Among those areas that meet these environmental and physical criteria, the alternative site within each of the two study areas was the one that was closest to Apra Harbor.

For each alternative site, the discharge zone on the surface would be round, with a radius of 1,640 feet (ft) (500 m) at the center of the site. The overall boundary of the disposal site is the outer extent of the area on the bottom of the ocean where maximum deposition of 0.4 in (1 centimeter [cm]) is predicted to occur if 1,000,000 cy (760,555 cubic meters [m^3]) of dredged material were disposed in one year. This area is defined as a circle approximately 3.1 nm (5.0 km) in diameter when modeled to a depth of 6,560 ft (2,000 m). At a deposit thickness of 3.9 in (10 cm), the area modeled would be a circle approximately 1.2 nm (1.9 km) in diameter; therefore, there is a buffer for deposition of approximately two-and-one-half times the area (3.1 nm/1.2 nm). This volume (1,000,000 cy in one year, or approximately 333 disposal events of 3,000 cy of dredged material each) represents the worst reasonable case scenario and is therefore used for planning and impact evaluation purposes; it is expected that such a large quantity would only rarely, if ever, be disposed at the Guam ODMDS in any one year.

This process resulted in the two ODMDS alternatives carried forward through the EIS analysis. These two alternatives are referred to as the Northwest Alternative ODMDS and the North Alternative ODMDS. These alternative ODMDSs, along with the No Action Alternative, are discussed in detail in Sections 2.4, 2.5 and 2.6.

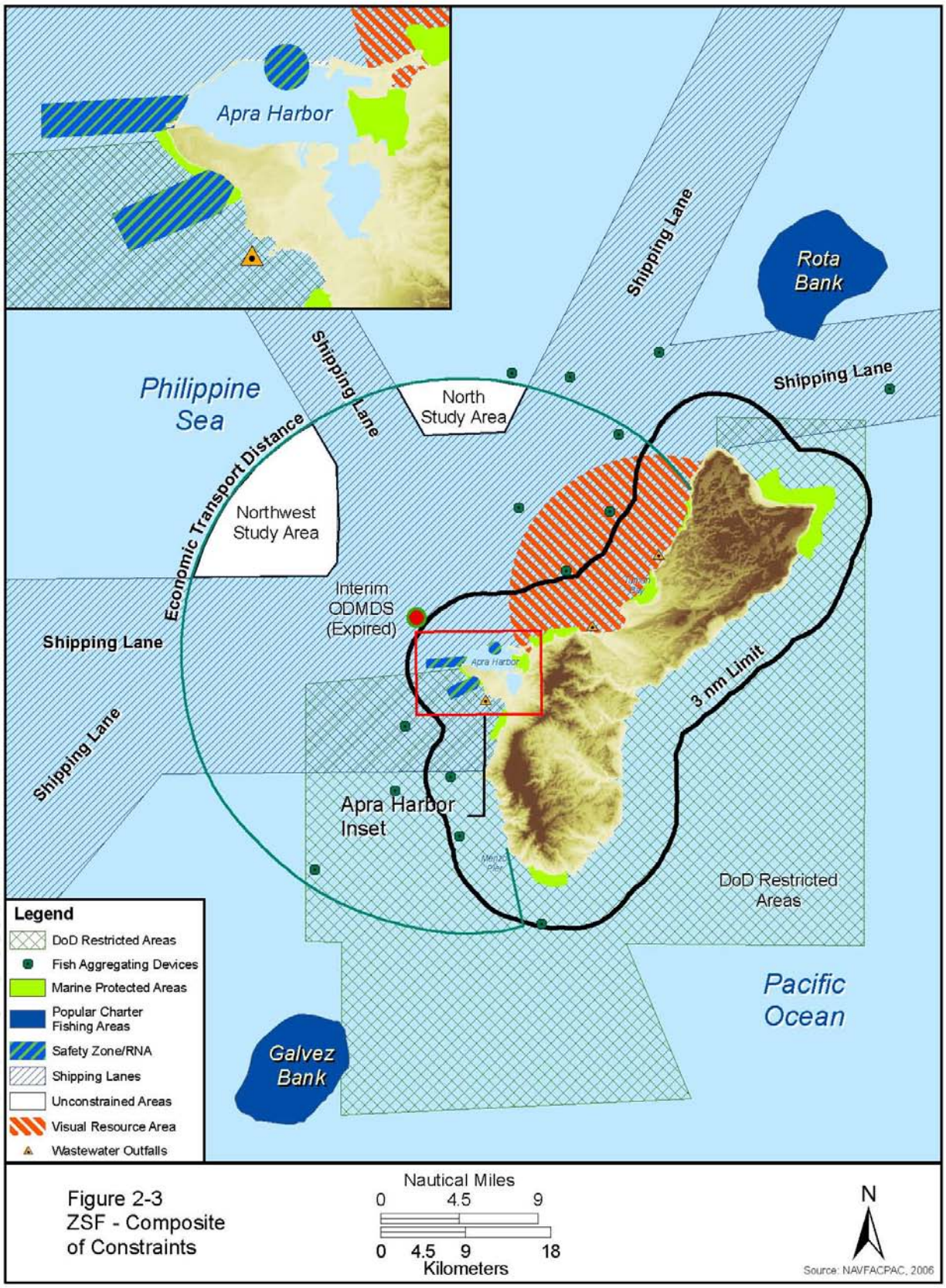

Figure 2-3
ZSF - Composite of Constraints