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August 17, 2010

Mr. Dean Dusette, Planner
County of Santa Barbara,
Planning and Development, Energy Division
123 E. Anapamu Street
Santa Barbara, CA 93101

Subject: Guadalupe Dunes, California

Dear Mr. Dusette,

AECOM on behalf of Shell Exploration and Production Company (Shell) is pleased to submit the attached Restoration Work Plan (Work Plan) describing the scope of work to restore areas affected by oil drilling activities conducted in the Guadalupe Dunes, Santa Barbara County, California. The restoration is being conducted to complete the terms of the March 1983 Conditional Use Permit (CUP) issued by Santa Barbara County Planning and Development, Energy Division to Husky Oil Company.

The Work Plan has been prepared by Mr. Richard Carr, III, Senior Projects Manager of C-M Environmental Group, Inc. and reviewed by Mr. Roy Hauger, Jr., Program Manager of AECOM. If you have any questions, you may contact either Mr. Carr at (775)313-6033 or Mr. Hauger at (805)388-3775 or Mr. Lynn Walker, Shell Exploration and Production Company at (832)337.2206.

Yours sincerely,

Roy Hauger, Jr., PE
Program Manager

Prepared for:
Shell Exploration &
Production Company

Prepared by:
C-M Environmental Group, Inc.
and AECOM, Environment
60150517
August 2010

Restoration Work Plan

Guadalupe Dunes
Santa Barbara County, California

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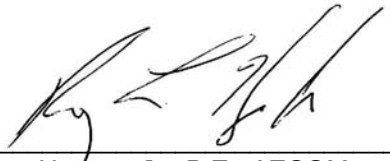
Restoration Work Plan

Guadalupe Dunes
Santa Barbara County, California

Richard Carr III, C-M Environmental Group, Inc.



Roy Hauger, Jr., P.E., AECOM

Contents

List of Appendices

List of Tables

List of Figures

1.0 Introduction

This Restoration Work Plan (Work Plan) describes the scope of work to restore areas affected by oil drilling activities conducted in the Guadalupe Dunes in Santa Barbara County, California (Site). The restoration is being conducted to complete the terms of the March 1983 Conditional Use Permit (CUP) issued by Santa Barbara County Planning and Development, Energy Division (the County) to Husky Oil Company. The restoration will remove, to the extent as outlined in this Work Plan, remaining foreign materials (gravel) in the areas where past drilling activities occurred and where lag gravels from past site restoration activities remain and will initiate re-vegetation in this area.

This Work Plan is being submitted to the County to obtain approval for Site restoration activities proposed to complete the terms of the CUP. At the conclusion of the activities proposed in this Work Plan, the County will be requested to formally release Shell from its obligations under the CUP.

1.1 Work Plan Objectives

This Work Plan describes the requirements and procedures for the removal of gravel on a portion of the Guadalupe Dunes to meet the following objectives:

- Remove foreign materials (gravel) resulting from the drilling operations, as practical, to fulfill the terms of the CUP;
- Initiate re-vegetation of a portion of the Site; and
- Comply with applicable environmental and other relevant regulations.

2.0 Background Information

2.1 Site History

In March 1983, the County issued a CUP to Husky Oil Company to drill and produce 42 oil and gas wells from two drilling islands at the Guadalupe Dunes site owned by the County. However, out of the two originally permitted islands, only Island D (Site D) was built and only five wells were drilled. This island is approximately 240 feet from the existing Gordon Sand Company (GSC) access road that is normally used by heavy equipment year round. The last producing well was abandoned in 1989 with all facilities, pipelines and power poles being abandoned by the end of 1990 in accordance with California Department of Oil and Gas and Geothermal Resources regulations. Site assessments were conducted and confirmed that no hazardous levels of any materials were present in the soils or in the groundwater. These assessments and a Remedial Action Plan (RAP) to remove crude impacted soils within the fenced area were forwarded to the County Environmental Health Department and to the Regional Water Quality Control Board (RWQCB). Upon review of these findings, these agencies deferred oversight to the County Petroleum Department, which approved the RAP in July 1992. In 1997, the remaining features were removed, including the fence surrounding the Site, small amounts of near surface crude oil/asphaltic material near the abandoned wells, and the gravel that was used to stabilize the surface of the entire Site and corridor to the GSC access road. Steel plates and gravel were also removed from sections of the GSC access road.

2.2 1997 Restoration Activities

For the 1997 gravel clean-up effort, a nominal ¼-inch screen was used, first in the Site D area, then near the junction of the Site D corridor with the GSC pit access road, and then finally at the west end of the GSC "rock spoil" area, located above the GSC sand office facilities. Sand/gravel material was picked up with a loader and screened. The fines from the screen were then spread over the immediate area of the screen with a dozer. The screened gravel oversize material was used off site, mainly on local farm roads. It was assumed going into the 1997 clean-up work that gravels would be found to a maximum depth of approximately 2 to 3 feet. During the work, gravels were found to be dispersed considerably deeper in localized areas. A restoration and revegetation project was carried out on the Site D area concurrently with the clean-up work. A final report on the restoration/revegetation monitoring was completed in December 1999.

2.3 2002 and 2003 Assessment Activities

Since 1997, lag gravels have accumulated on the sand surface due to wind erosion of the finer sands; in locations where the screened material was spread out and where +1/4-inch material was missed from the restoration effort. In 1998, plans were made for another clean-up attempt utilizing a modified beach cleaner, but the need for an assessment of the actual extent and depth of gravel dispersion over Site D and access road areas became obvious, and was requested by the County in a letter dated December 5, 2000. In 2001, preliminary sampling was done and a set of detailed aerial photos and a digital orthophoto were completed for the Guadalupe Dunes site. Between July 2002 and May 2003, a grid sampling program was carried out over the gravel-impacted areas, screening hand-auger samples to a maximum depth of 13 feet. Contour maps of gravel "pebble counts" were constructed for each of three areas impacted during the 1997 work, as well as the access road. A meeting was held with County Staff on July 11, 2003. A project plan was proposed in July 2003 based on

discussions with County Staff regarding results of this grid sampling work; however, further review resulted in a proposal by GSC to conduct a pilot screen test using a wet screen system that had not been considered in the original project plan.

2.3.1 2002 and 2003 Sampling Procedure and Data Treatment

A 1 to 2 inches deep, approximately 1 foot square sample was taken as the initial sample at each hole site on the grid. Next, the holes were sampled with a 4-inch diameter stainless steel hand auger to a maximum depth of 13 feet. Actual depth of each hole varied, depending on presence or absence of pebbles and/or hole conditions. Each auger sample down the hole was screened using 12-inch diameter, ¼-inch and +6 mesh (0.132 inches or 3.4mm) stainless steel screens. Individual pebbles in each size fraction were counted – in some cases, the pebbles were washed and photographed later (off site) for comparison. The depth of the hole was measured at several intervals. The samples were later recalculated to an average depth per sample using actual hole-depth measurements and the sample data was then divided into Intervals A through F:

- A – Top 2 inches (treated separately in calculations)
- B – Top 1 foot depth
- C – 1 t o 4 foot depth
- D – 4 to 7 foot depth
- E – 7 to 10 foot depth
- F –10 to 13 foot depth

The assumption was made that any reasonable treatment of the sands for gravel removal would likely be either surface only (top worked with a beach-cleaner, either skimming the top few inches, or to a maximum 1 foot depth), or deeper, utilizing a wheeled or track loader, which would work with approximate 3 foot depth intervals. Therefore, once actual pebble counts and average vertical thickness of each auger sample were determined, the sample data was recalculated to reflect pebbles per cubic foot within each interval down the hole. For example, Interval B was 1 foot deep, so the actual number of pebbles in the approximate first foot of auger samples (actual vertical thickness varied from 9 inches to 18 inches due to auger sampling variations) was recalculated to show the assumed number of pebbles to be expected in the cubic foot surrounding the 4-inch diameter auger hole. Likewise, the actual number of pebbles in the approximately 3-foot vertical thickness of Interval C was recalculated to show the assumed number of pebbles to be expected in the volume surrounding the 4-inch diameter auger hole per cubic foot. Intervals D through F were recalculated in a similar manner. The reasoning here is that the surface 1 square foot presently shows lag gravels due to wind erosion of sand. Once the upper 1 to 2 inches are removed, the sampling calculations gave a rough indication (and comparison) of how many pebbles to expect at surface in the same 1 square foot area for each 1 vertical foot depletion of sand by wind erosion.

The sample sites on each grid were surveyed using existing survey markers on the GSC property for elevation control. The Site locations were plotted on a digital orthophoto flown by IntraSearch, Inc. of Denver, Colorado in November, 2001. Contour maps and cross-sections were constructed, using logarithmic contour intervals for simplicity. Approximate volumes of sand to be treated within each depth interval were calculated for +¼-inch gravel and +6 mesh gravel material, respectively. Details of the grid sampling program are included in Appendix A.

2.3.2 Western Snowy Plover and California Least Tern Monitoring 2002 and 2003 Nesting Seasons

In order to carry out needed grid work during the nesting seasons of the Western Snowy Plover (Snowy Plover – a federally listed threatened species) and California Least Tern (Least Tern – a federally listed endangered species), Mr. Philip E. Persons was contracted for weekly monitoring traverses over the gravel-bearing sites during the periods June 14 – July 15, 2002, and March 17 – July 25, 2003. No Least Terns were observed on the Site in either year; during the 2003 season, the Least Terns left the Guadalupe Dunes Preserve area, presumably due to predation and harassment by Common Ravens.

One Snowy Plover nest with eggs was observed in 2002 on gravels on the level bench above the GSC facility in the northwest part of the area, but the eggs failed to hatch. Five nests were observed on gravels in this area during the 2003 season, of which two actually hatched. The fate of the chicks is unknown. Another nest was observed on gravels in the Island Site D area, north of the GSC Sand pit, and one was observed from a distance on the pit haul road in the pit area, but neither of these sets of eggs hatched.

One nest was noted during the 2001 season by an employee of the Center for Natural Lands Management in gravels on the Island Site D area near the northern part of the Site.

2.4 2007 Pilot Screen Test

In October 2005, two bulk samples of approximately 200 tons (160 cubic yards) each were extracted from the four gravel-contaminated sites (Site D, Area 2, Upper Area and Road) and stockpiled for future testing. One bulk sample (Bulk Sample “S”) was from the Site D area only; the other (Bulk Sample “C”) was a composite sampled from five samples covering all four of the impacted areas (see Figure 1 and Appendix D). After suitable testing screen equipment could be assembled, a Pilot Screen Test was carried out in February and March, 2007, using an ASTEC Mobile Screens Double Deck High Frequency Vibrating screen unit. Various wet and dry screen configurations were tested, resulting in data collection for six test runs: one wet screen run and two dry screen runs each for the two bulk sample materials, respectively. Both the wet and dry tests proved to be nearly equal in separating the gravel from sand down to the US #12 screen size, but the Pilot Screen Test results indicated that the wet screen process was three to four times more efficient in throughput, and would shorten the project life significantly. The proposed Work Plan is based on the results of this Pilot Screen Test.

2.5 Snowy Plover and Least Tern Monitoring 2004-2008 Nesting Seasons

Mr. Philip E. Persons was also contracted for weekly monitoring traverses over the project area during the period March 18, 2004 through July 22, 2004 (see Appendix B). Plovers were observed on only three of 18 surveys, and only in the Upper Area. Three nests were found, all in the Upper Area. One nest was successful, hatching two young – the other two failed due to predation of eggs, at least one by Common Raven. No California Least Terns were observed on the Site during this period.

Monitoring carried out by SRS Technologies from April 12, 2006 to September 30, 2006 indicate no Snowy Plover nesting occurred in the Site area on County land in 2006. The nearest documented nest was approximately 500 feet to the northwest of the Upper Area, on “Ten Commandments” hill.

No nests were found on the Site during the 2007 and 2008 season (only County lands were monitored). The nearest known nest occurred approximately 300 feet west of the Site D area in 2008,

though several Snowy Plover scrapes were noted on the Site D area in both years, and three and four nests were noted in the 2007 and 2008 seasons, respectively on the "Ten Commandments" hill (T. Applegate, personal communication on August 20, 2008).

2.6 Vegetation Surveys – June and July 2008, and July 2010

During the grid sampling in 2002 to 2003, vegetation on the Site D, Area 2 and Upper Area was sparse to non-existent, with a few exceptions. Vegetation along the Road edges had established on the sand/gravel mounds. By 2008, vegetation had proliferated substantially on Area 2 and the Upper Area, as well as on numerous scattered mobile sand mounds that have established across the Site D area.

A preliminary vegetation survey of the gravel-contaminated areas on County property in the project area was carried out by FLx of Santa Barbara, California on June 17, 2008. A list of plant species, including rare and commonly occurring plants observed at the Site, was compiled (see Appendix C). Five sensitive plant species were found on the Site:

> To summarize, crisp monardella (*Monardella crispa*) was observed most frequently, and was scattered to common at the four sites (Site D, Area 2, Upper Area and Road). Blochman's leafy daisy (*Erigeron blochmaniae*) and Blochman's groundsel (*Senecio blochmaniae*) also were present at all the locations, but both were rare at Site D. Suffrutescent wallflower (*Erysimum insulare* ssp*. suffrutescens*) was common along the Road, but was rare or absent elsewhere. Dunedelion (*Malacothrix incana*) was rare and found only at Site D. (page 2, FLx 2008 report, Appendix C).

It should be noted that none of these five plant species are federally listed as endangered or threatened, nor are they listed by the State of California as rare, threatened or endangered.

On July 15, 2008, a follow-up survey was carried out by FLx, accompanied by representatives of County, Shell, GSC and the Guadalupe/Nipomo Dunes Preserve management. The purpose of this second survey was to delineate gravel-contaminated areas that now host numbers of sensitive plants and vegetation. Any material that will be processed beyond these "boundaries" will necessarily disturb some or all of this vegetation, and this delineation was needed to understand the implications of attempting to remove gravel in these areas. These "boundaries" are shown as the boundaries on Figure 3. In addition, FLx flagged scattered individual sensitive plant species that now occur within the areas to be processed during operations.

On July 29 and 30, 2010, the vegetation survey was updated over the Site by FLx, accompanied again by representatives of the County, Shell and GSC. Since the first survey in 2008, the dune topography has changed considerably due to the deposition of wind-blown sand, particularly in the Upper Area (FLx, 2010, Appendix C). The list of plant species was updated, and approximate counts were made of the number of sensitive plants that will be removed in each of the four project areas as proposed in this Work Plan. Results of this 2010 survey area summarized for the five sensitive plant species in Table 1A, and the sensitive plant counts for each of the project areas is shown in Table 1B. The FLx 2010 report is included in Appendix C.

Table 1A Sensitive plant species occurrence in Gravel Removal Areas

Common Name	Scientific Name	Status	Site D	Area 2	Road	Upper Area
Crisp Monardella	*Monardella crispa*	CNPS 1B.2	C	C	C	C
Blochman's leafy daisy	*Erigeron blochmaniae*	CNPS 1B.2	R	S	C	S
Blochman's groundsel	*Senecio blochmaniae*	CNPS 4.2	S	S	S	S
Suffrutescent wallflower	*Erysimum insulare ssp. suffretescens*	CNPS 4.2	R	A-R	C	A
Dunedelion	*Malacothrix incana*	CNPS 4.3	R	A	R	A

CNPS = California Native Plant Society's Lists 1B (rare and endangered in California and elsewhere) and 4 (watch list)

.2 = fairly endangered in California; .3 = not very endangered in California

A = absent; R = rare; S = scattered; C = common

Data from FLx report, August 2010, pages 2 and A-1.

Table 2B Sensitive plant counts in Gravel Removal Areas

Common Name	Scientific Name	Number of Plants Counted Inside the Impact Area				
		Site D	Area 2		Road	Upper Area
			County Property	GSC Property		
Blochman's leafy daisy	*Erigeron blochmaniae*	2	14	10	390	23
Suffrutescent wallflower	*Erysimum insulare ssp. suffretescens*	0	0	1	569	0
Dunedelion	*Malacothrix incana*	0	0	0	1	0
Crisp Monardella	*Monardella crispa*	171	173	231	654	165
Blochman's groundsel	*Senecio blochmaniae*	11	34	79	41	61

Data from FLx report, August 2010, page 2.

2.7 Surface Assessment – March 2010

In March 2010, AECOM conducted an assessment of the extent of exposed gravel. This visual assessment included Site D, Area 2 and the Upper Area and was mapped using global positioning system (GPS) equipment. The GPS equipment collected UTM coordinates, Zone 11N, North American Datum (NAD) NAD83, meters to delineate the areas of exposed gravel. The areas of exposed gravels in 2010 are proposed to be excavated beginning at the surface and are presented on Figure 3.

3.0 Proposed Gravel Removal Activities

3.1 Scope of Work

This Work Plan proposes to remove (mine), screen and return to the Site, a maximum quantity of existing sand that is impacted with gravel from previous oil drilling operations. The objective of the restoration project is to remove gravels on the surface (lag gravels) and also gravels near the surface that have a potential to be exposed in the future. The restoration will be focused on the sand located near the surface since gravels on the surface degrade the visual esthetics of the sand dunes. This proposed quantity of sand to be mined and screened has been developed from the 2002 and 2003 assessments and updated in 2010. The proposed quantity of sand to be screened recognizes that complete removal of gravel from the sand dunes is not achievable. Gravel found at depth has a lower potential to be exposed by wind erosion. Therefore, gravel found at greater depths will be mined and screened after the near surface gravels have been removed but within the proposed quantities of sand to be restored. If quantities of near surface gravel that are mined exceed the proposed quantities, the additional sand mining activities at depth will be curtailed accordingly. In addition, restoration will be limited to mining of gravels within the top 7 feet of the surface material on County property or within the top 10 feet of the surface material on GSC property.

Past discussions with Snowy Plover monitors indicated that the surface gravels potentially provide a favorable nesting environment. Bird species monitoring is proposed for this project and is discussed in Section 3.11. Previous assessments have found that native vegetation, including a number of sensitive species, has become established on a significant portion of the gravel areas, and these species may not re-establish without the presence of surface gravels. Therefore the proposed quantity of sand to be removed and screened has been modified to exclude some areas of sensitive plant species as identified in the 2008 vegetation survey. Figure 3 presents the botanist recommended limits based upon the updated 2010 vegetation survey for Site D and a portion of the Road Area that are proposed to be implemented for the project. The botanist recommended limits from the 2008 vegetation survey for the remainder of the Road Area, Area 2 and the Upper Area will not be implemented for the project. Section 4 details the proposed revegetation plan.

The sand impacted with gravel from the oil well drilling operation is found in four areas of the Site: Site D, Area 2, the Access Road and the Upper Area. The County owns the property where these areas are located with the exception of the southern portion of Area 2, which is owned by GSC. The following sections detail the quantity of sand that is proposed to be removed and screened from each of these areas. Once the quantity of sand has been removed from each area and screened, the sand will be returned to these areas.

The following restoration activities are proposed

- Permitting,
- Layout areas for sand removal (mining),
- Set up the mobile wet screening operation,
- Preparation of areas for mining,
- Mine the sand areas containing gravels,

- Screen the sand removing the gravels,
- Dispose of the gravel off site,
- Return the sand to the mined areas,
- Conduct monitoring of bird species during sand removal and backfilling activities, and
- Implement the vegetation restoration plan.

As the areas are mined, the quantities of sand removed will be determined using GPS or other survey techniques or by estimating the screening operation throughput. Once the quantity of sand mined and screened from each area reaches the proposed quantity in the Work Plan and after restoring the near surface areas, the mining activities will proceed to the next area. Please note that additional quantities of sand that does not contain gravel may need to be removed to allow access to some areas such as Area D. This quantity of sand is not estimated at this time due to changing nature of the Guadalupe Dunes. Sand removed for access will be returned to the area where it was removed.

3.2 Clean-up Areas: SITE D AREA

Site D is considered the highest priority of the areas to be screened, since it is located in the dunes proper, is within the "normal" nesting areas of the Snowy Plover, is not within the active sand mining operations, and is most affected by wind erosion. In addition, the well head exclusion zone is located in Site D.

The grid sampling results indicate that most of the remaining gravel lies within the area mapped visually, and is concentrated at depths mainly in the vicinity of the old wellhead site. The sampling also indicates that a layer of gravel occurs from 1 to 10 feet deep beneath an advancing dune in the northwest portion of the grid area, as well as beneath about 4 to 5 feet of clean sand at the base of the old entrance road.

The excavated depths originally proposed in 2003 would remove some of the dune layer where it is thin, but would leave the gravel layer that is currently buried beneath 10 feet of advancing dune (Figure 3). Likewise, the 2003 proposed cleanup would leave material buried deep at the entrance road to Site D, but would remove the piles currently visible at the GSC pit access road. Figure 3 shows the currently proposed excavation depths, using the botanist's sensitive plant delineation lines as approximate boundaries, and leaving gravel material in place that is buried too deeply under the advancing dune in the northwest corner area. Note that as of 2010, this dune had advanced more than 80 feet since the 2003 sampling was completed. Please note that additional material will need to be moved to gain access to the Site and to accommodate the process plant setup. Due to the changing nature of the dunes the quantity of material that will need to be excavated to gain access is not presented here. Table 2 summarizes the volumes of material estimated to be processed.

Table 3 Estimated Volumes of Sand with Gravel to be Mined Site D (all County Property)

Site D Area (Cubic Yards)	
Surface to 1 foot depth	5,925
Estimated Additional Volume to be Excavated and Screened	
1 to 4 foot depth	15,660
4 to 7 foot depth	6,515
Max. Estimated Total	**28,100**

3.3 Clean-up Areas: AREA 2

The Area 2 grid covers an area of screened material (from the 1997 cleanup effort) south of Site D and extends west along the GSC pit access road into the pit itself. Aerial photos from 1977 through 1989 indicate the access road into the GSC pit turned south at the entrance to Site D; the pit itself was extended gradually from east to west within the GSC property during those years. However, the 1992 aerial photo shows that the access road has been changed by cutting through the gravel/sand piles at the Site D entrance and running the road straight southwest from there into the western part of the pit, leaving an "island" mound between the old and new pit roads. It is likely that gravel was first dragged into the pit area during this change in the pit access by GSC personnel sometime between the 1989 and 1992 aerial photo flights. The situation was complicated further by the screening work done in 1997, when the "island" was used as a screen site and the screened material was pushed south and west into the old eastern part of the pit area, as seen in the 2001 aerial photos (and visible today). In addition, gravel has been dragged and scattered further due to regular road cleaning during normal sand operations. In 2003, the "island" was about 7 feet above the then-current pit access road grade.

During grid sampling, gravel was found at surface and within the top 1 foot extending from the screened pile area west into the pit. In each successive depth interval below the 1 foot level, however, the extent of gravel contamination diminishes significantly; gravel was found below the 7 foot level only in the vicinity of the screened pile at the east end of the grid.

Figure 3 shows the proposed excavated depths for Area 2. The "island" mound area will be excavated to a varying depth of approximately 7 to 10 feet, depending on the amount of gravel encountered and the surface height of the piles. The deepest excavation will be in the center of the "island" mound area, which is about 7 feet above the adjacent pit access road. An area partly surrounding the "island" mound and extending down toward the current pit will be excavated to a depth of approximately 4 feet. Vegetation will be avoided if at all possible along the south side of the grid area. The estimated volumes of material to be treated are shown in Table 3.

A number of sensitive plants currently exist on the "island" mound that were present only in small isolated gravel mounds in 2003. This proposal will remove all of these plants on the "island", since to leave them undisturbed would create a gravel-contaminated "island" within the active areas of the GSC pit, and would result in further scattering of gravel over time. Once the gravel is removed and replaced with clean sand, it is anticipated that the plants will re-establish themselves in locations not actively being mined in this area.

Table 3 Estimated Volumes of Sand with Gravel to be Mined Area 2 (County and Private Property)

Area 2 (Cubic Yards)			
	Area 2 (County)	Area 2 (GSC)	Total
Surface to 1 foot depth	1,580	4,650	6,230
Estimated Additional Volume to be Excavated and Screened			
1 to 4 foot depth	3,520	10,200	13,720
4 to 7 foot depth	2,900	4,100	7,000
7 to 10 foot depth	2,900	4,100	7,000
Max. Estimated Total	**10,900**	**23,050**	**33,950**

3.4 Clean-up Areas: ROAD (Road)

Sampling along the access road indicates the center part of the road contains gravel mainly at the surface, but the piles on either side are quite variable, with only a few pebbles showing up in the piles at depth. An exception to this is the upper part of the Road area that is visible from the beach access road, where material was apparently pushed out to the north of the road. It should be noted here that the gravel estimates for the access road are very approximate, based on relatively few sampling sites. The data from these samples were extrapolated over a large area to estimate volumes and percentages. The sampling was planned to test some of the more obvious “worst-case” visible gravel piles and road sites.

The current proposed excavation depths are shown in Figure 3. The botanist’s sensitive plant delineation lines will be implemented for the north side of the Road at the extreme west end, however this limit will not be implemented for the remainder of the Road. Once the gravel is removed and replaced with clean sands, it is anticipated that the plants will re-establish themselves in this area. The road base will be processed to a maximum depth of 1 foot; care will be taken to preserve an existing clay-based roadbed used by GSC for pit access. Piles containing gravel along the road edges will be removed and screened. The piles along the edges of the upper part of the road will be excavated to a depth of approximately 7 feet, depending on their location and the sampling results. An attempt will be made to remove and screen all material pushed off the road area to the north that is now visible from the beach access road. Table 4 shows an estimate of the volume of material to be processed along the Road.

Table 4 Estimated Volumes of Sand with Gravel to be Mined Access Road (All County Property)

Road (Cubic Yards)	
	Road Proposal
Surface to 1 foot depth	4,300
Estimated Additional Volume to be Excavated and Screened	
1 to 4 foot depth	5,000
4 to 7 foot depth	1,160
Max. Estimated Total	**10,460**

3.5 Clean-up Areas: UPPER AREA

The grid covers the area just west of (and up the hill from) the GSC process plant, and includes the area historically used by GSC as a "rock spoil" area (southeast of the access road) and the access road itself. An encroaching dune from the north is periodically cleaned out by GSC along the access road; this is also used as a sand stockpile area for loading the process plant feed hopper at the northeast end of the grid. At the southwest end of the grid, the encroaching dune has covered the access road at the highest point on the road. By 2003, the rock spoils bench had been colonized by significant numbers of scattered plants, including dune mint and lupine. Currently, a number of sand dune mounds (some as high as 10 feet) have developed on the original flat gravel-bearing surface that now host thick vegetation clusters, including some sensitive plant species.

Aerial photographs from 1977 and 1981 (pre-dating the Site D construction) show that this rock spoil area was mostly in place by the time the gravel access road was built in 1985, though the 1985 aerial photo seems to indicate that more material was pushed out over a portion of this area during this period of time. The configuration of the Site in the 1992 aerial photos is essentially the same as today, except that the southwest end of the grid area was used for screening during the 1997 cleanup attempt, and the screened material was pushed south over clean sands. Numerous piles of contaminated sand material (rock spoil) are now located on the eastern half of the grid area; some of these clearly contain material from the Thriftway site at the end of the beach access road (Main Street). These piles are not seen on the 1992 aerial photos. These rock spoil areas are outside of the scope of this project.

Significant gravel occurs at surface over most of the grid area and at depth mainly along the south edge of the rock spoil area. Given the buildup history of this area as indicated by the aerial photos, however, it seems unlikely that the deeper gravel material could have resulted from the Husky access road work. Examination of the pebbles found in the lower intervals is inconclusive, though there are scattered debris (plastic, wood fragments, metal) in the deeper holes along the south part of the grid that were not seen elsewhere on the Site.

The current proposed excavation depths for the Upper Area are shown in Figure 3. The proposed work was restricted to the immediate vicinity of the screen pile visible from the 1997 cleanup work, as well as the main roadway area immediately adjacent to the rock spoils bench. The botanist's sensitive plant delineation lines as shown will not be implemented for the Upper Area; many of the plants originally delineated by these lines have been covered by wind-blown sand since 2008. Once the

gravel is removed and replaced with clean sand, it is anticipated that the plants will re-establish themselves in locations not actively mined in this area.

The proposed area includes the screen pile from the 1997 cleanup attempt (C4 Bulk Sample site). Fine gravel material from the vicinity of this screen pile has been progressively blowing southeast across the uncontaminated dune surface below. This proposal would necessarily remove a number of sensitive plants, but would provide a wider buffer zone of clean sands between the roadway and the remaining gravels, and would reduce further gravel contamination of the dune areas to the southeast. Table 5 shows the estimated volumes of material to be treated in the Upper Area.

Table 5 Estimated Volumes of Sand with Gravel to be Mined Upper Area (All County Property)

Upper Area (Cubic Yards)	
	Upper Area Proposed
Surface to 1 foot depth	4,730
Estimated Additional Volume to be Excavated and Screened	
1 to 4 foot depth	7,420
Estimated Total	**12,150**

Table 6 summarizes the estimated volumes of material to be mined for all of the cleanup areas.

Table 6 Estimated Volumes of Sand with Gravel to be Mined (All Areas)

All Areas – Cubic Yards						
	Site D	Area 2 (County)	Area 2 (Gordon Sand)	Road	Upper Area	Total
Surface						
Surface to 1 foot depth	5,925	1,580	4,650	4,280	4,730	21,160
Estimated Additional Volumes to be Excavated and Screened						
1 to 4 foot depth	15,655	3,520	10,200	5,000	7,420	41,800
4 to 7 foot depth	6,520	2,900	4,100	1,160	0	14,660
7 to10 foot depth		2,900	4,100	0	0	7,000
Max. Estimated Total	**28,100**	**10,900**	**23,050**	**10,440**	**12,150**	**84,620**

3.6 Permitting

Necessary permits and/or approvals will be obtained prior to the commencement of excavation. Permits are anticipated to include:

- Authority to Construct and Permit to Operate for the Sand & Gravel Operations Screening equipment from the Santa Barbara County Air Pollution Control District

- National Pollutant Discharge Elimination System General Permit for Storm Water Discharges associated with Construction and Land Disturbance Activities from the State of California RWQCB, Central Coast Region
- Grading permit from the County Building and Safety
- "No Take" concurrence letter from the United States Fish and Wildlife Service after consultation regarding the project

The County's approval of this Work Plan will also be obtained prior to the commencement of restoration activities.

3.7 Layout of the Areas to be Mined

The limits of excavations will be delineated before commencement of removal activities. The areas to be excavated will be called the "excavation areas" and will be marked with stakes, and/or high-visibility paint or ribbon, whichever is appropriate.

At this time no clearance of utilities and other underground obstacles is planned to be performed prior to excavation because the oil well drilling equipment and support facilities have been removed and the area has previously been excavated. An area around the existing oil well heads is proposed to be excluded from excavation activities so that the well heads are not disturbed during the project. The well heads will be located prior to excavation using either a magnetic survey or other appropriate methods.

3.8 Site Preparation

Except as noted below, existing vegetation located within the boundaries of the proposed excavations will be removed, and transported to a marshalling area, either the GSC facility or a location in the Upper Area. This vegetation will be shredded or broken down as needed, in the marshalling areas, and transported to a green waste facility.

Wherever possible, dune "topsoil" – clean sand along with existing native vegetation – that overlies gravel-bearing sands will be excavated prior to mining activities and stockpiled until project completion. Potential areas for dune topsoil on the Site D area are shown on Figure 3.

3.9 Security Measures

The Site is located in a portion of the County park that is not readily accessible to the public. Portions of the park have signs posted that warn the public to stay out of nesting areas. To further ensure trespassers or unauthorized personnel are not entering work areas, security measures may include, but are not limited to:

- Posting notices directing visitors to the GSC facility entrance.
- Maintaining a visitor's log at the GSC facility. Visitors must have prior approval from the Site manager to enter the Site. Visitors shall not be permitted to enter the Site without first receiving site orientation, and as applicable, specific health and safety training. Before leaving the Site, personnel must sign out in the visitor's log.
- Installing appropriate barriers, as necessary, prior to beginning the excavation process to restrict access to sensitive areas such as exclusion zones. These barriers will typically

consist of materials such as orange, plastic temporary construction fencing (approximately 4-feet high) held in place with metal or wood stakes at approximately 10-foot intervals.

- Providing adequate site security, as necessary, to ensure unauthorized personnel have no access to work areas.
- Maintaining a safe and secure work area, including areas where equipment is stored or placed, at the close of each workday, as necessary.
- If necessary, upgrading entrance gates or adding additional lighting at night.

Persons requesting access will be required to demonstrate a valid purpose for access.

3.10 Basic Plant Setup and Screening Operations

The basic process plant will be a mobile wet screen operation, utilizing a Fold-N-Go or similar vibrating double deck screen with a high-frequency vibrating screen as the second deck. The operation requires an approximate 150 foot by 150 foot plant footprint that will be moved up to twice (3 setup locations) during the project life. It is anticipated that the process plant may be located at the south end of Area D or the east end of Area 2 and set up again in the Upper Area. A 35 foot by 100 foot "dune pond" will be constructed in the GSC pit area for reclaiming and recycling process water. The restoration work would progress from the outermost areas (northwest) of Site D and move toward the GSC access road, then to Area 2 and the Road, and finally to the Upper Area closest to the GSC facility.

The Pilot Screen Test indicated that the gravel larger than the #12 screen size would be removed from the impacted sand using the wet process.

3.10.1 Mining

"Mining" of the gravel/sand areas would be carried out in a manner similar to a small-scale strip-mine operation: gravel-contaminated material would be removed from one strip to the process plant, screened, and the resulting clean sand "product" would be backfilled into the previous strip in a continuous cycle as the cleanup progressed. Throughput (based on the Pilot Screen Test results) is expected to be about 130 tons per hour; the project is expected to take approximately 5 to 7 months to complete. See Appendix D for project flow sheets and details on the Work Plan operations.

3.10.2 Disposition of Gravel

The gravel that is screened from the sand will be collected in open top bins. Once a bin is filled, the gravel will be transported off site to a nearby (on the order of less than one mile) privately owned ranch and used for road base or other beneficial uses. Based on the production rate achieved during the Pilot Test, approximately two 20-cubic yard roll off bins may be filled and transported off site on a daily basis.

3.10.3 Sand Backfill Operations

Once the sand has been screened, the sand will be returned to the mined areas and will be backfilled into the excavation. The final grade of the excavated areas will be approximately equal to the pre-excavation grade. There will not be any compaction or finish grading of the backfilled areas as the prevailing wind process of sand movement will be used to allow the area to match surrounding natural conditions.

Dune topsoil collected during Site preparation will be replaced as described in the revegetation plan (Section 4). Any temporary fencing will be removed.

3.11 Snowy Plover and Least Tern Monitoring Prior to and During Sand Removal and Backfilling Operations

Similar to past assessments, Snowy Plover and Least Tern monitoring will be conducted prior to and during activities conducted in the sand dunes that have a potential to disrupt these species: either mining of the sand with gravel or backfilling with the screened sand. For the fall/winter flocking season (October 1 to March 15), weekly traverses will be conducted for the first month in active portions of Site D or Area 2. Monthly traverses will be conducted for the remainder of the fall/winter flocking season if disruptive activities are conducted in these areas. For the first half of the nesting season (March 15 to July 15) daily traverses will be conducted for the first month in active areas where disruptive activities are occurring. Weekly traverses will be conducted for the remainder of the first half of the nesting season if disruptive activities are conducted in these areas. For the second half of the nesting season (July 15 to October 1) weekly traverses will be conducted for the first month in active areas with disruptive activities. Bi-weekly traverses will be conducted for the remainder of the second half of the nesting season if disruptive activities are conducted in these areas. The results of these observations will be recorded. Work activities may be modified as needed to lessen the impacts of the project on these species.

3.11.1 Other Monitoring

Biological monitoring will be conducted as may be required for the “dune pond”. Appropriate wildlife protective measures may be implemented to address the observations of the monitoring and to comply with State of California or United States guidelines.

3.12 Confirmation Activities & Reporting

During the gravel removal activities, the daily quantity of sand processed will be determined and recorded. This information will be included in the report of completed activities.

4.0 Proposed Revegetation Plan

The stabilized dunes of the Guadalupe Project area have been revegetating naturally since the gravel sampling was completed in 2003. Revegetation efforts for the proposed Work Plan will concentrate on assisting natural revegetation only to the extent of re-seeding locally where possible in those areas where significant numbers of specific sensitive plants were removed, and on the control of non-native weeds. It is recognized that shifting dunes in Site D will make it difficult to predict where plants will establish successfully.

4.1 Re-seeding Plan

1. Following the recommendations of the botanists (FLx), dune topsoil with existing native vegetation will be salvaged wherever possible and stockpiled until project completion. It is assumed that the vegetated (gravel-free) sand mounds currently present on the surface of Site D and the Upper Area contain a significant seedbank of the sensitive and other native plant species. The dune topsoil, along with the incorporated native vegetation and seeds, will be replaced as scattered mounds on the Site D area in particular, and other areas as deemed feasible.

2. Sensitive plant species seed will be collected locally where possible, and will be collected and seeded at times and locations deemed appropriate by botanists familiar with the Guadalupe Dunes ecology.

3. Only species of sensitive plants that have been removed will be re-seeded into any given area in the season following completion of backfilling.

4. As the species to be re-seeded are plants native to the Guadalupe Dunes area, no irrigation will be used in the re-seeding program.

4.2 Follow-up Monitoring of Revegetation

1. Monitoring will focus on preventing the establishment of weedy species, but will also track the number of seeded plants that are surviving.

2. Monitoring will continue for a total of four years after completion of gravel clean-up; semi-annually for two years, then on an annual basis for two years.

3. Weed control will focus on the reduction and/or eradication of non-native species in the areas upwind adjacent to the project area, as well as complete removal of all non-native weeds from all areas disturbed by gravel removal during clean-up operations. This will take place concurrently with project activities and will be monitored on the same schedule as the project seeded areas. Hand-removal of weeds is preferred; herbicide usage will be considered in consultation with botanists familiar with the local ecology, and only in conjunction with County approval.

Figures

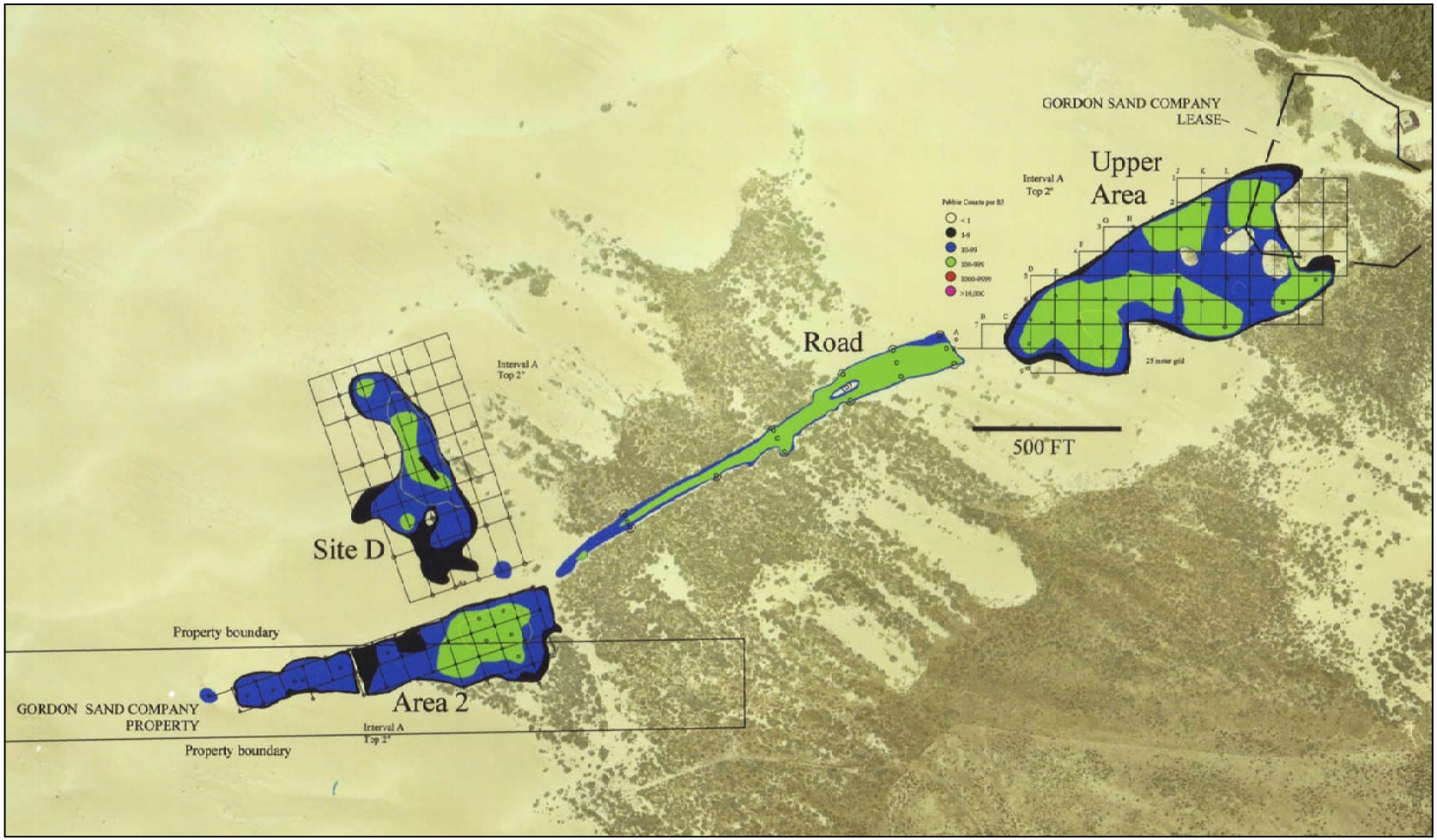


Figure 1. Map showing the locations of the 2002-2003 sampling grids. Filled contours represent the sampling results for the top 2 inches depicted in number of pebbles counted per cubic foot.

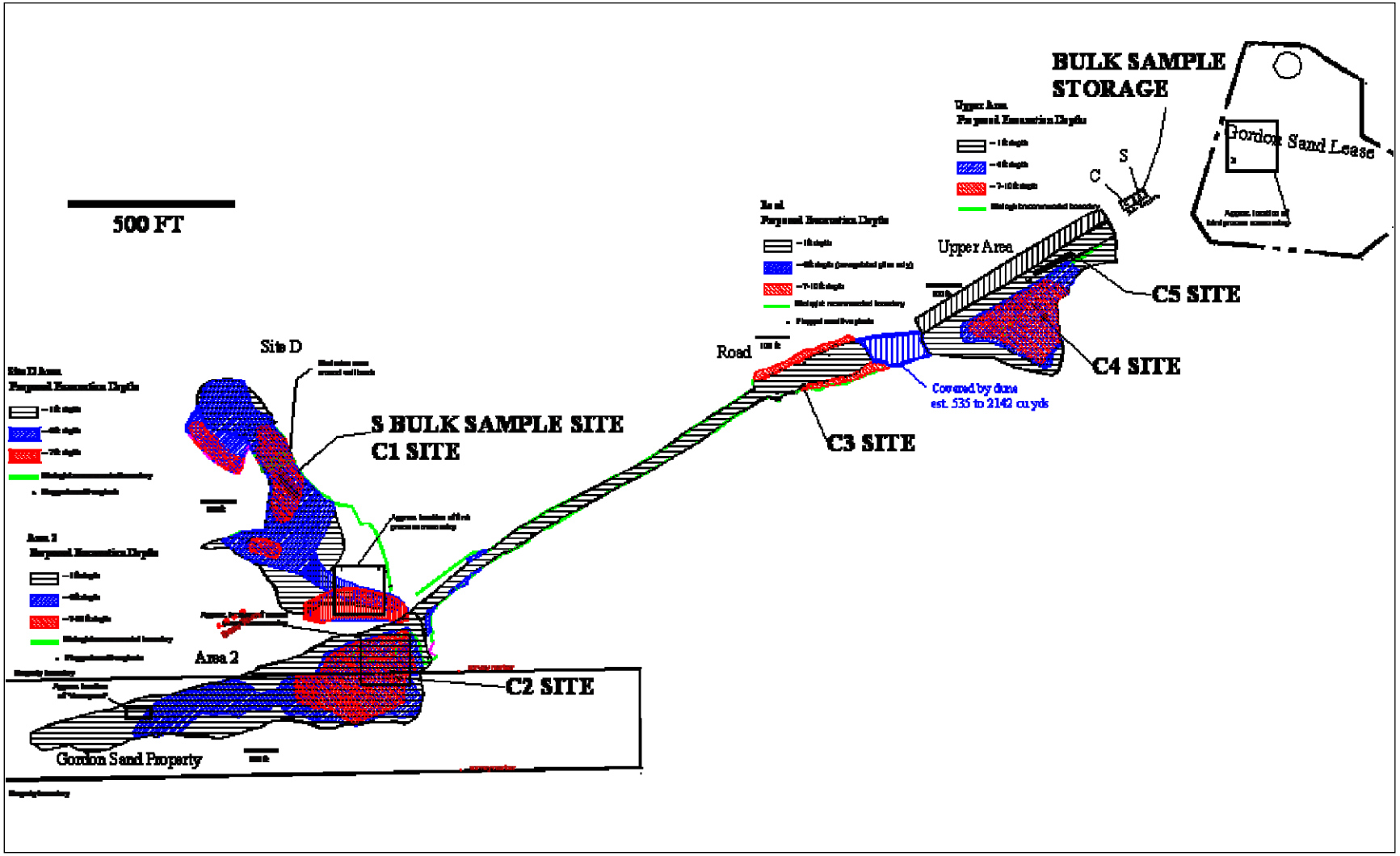
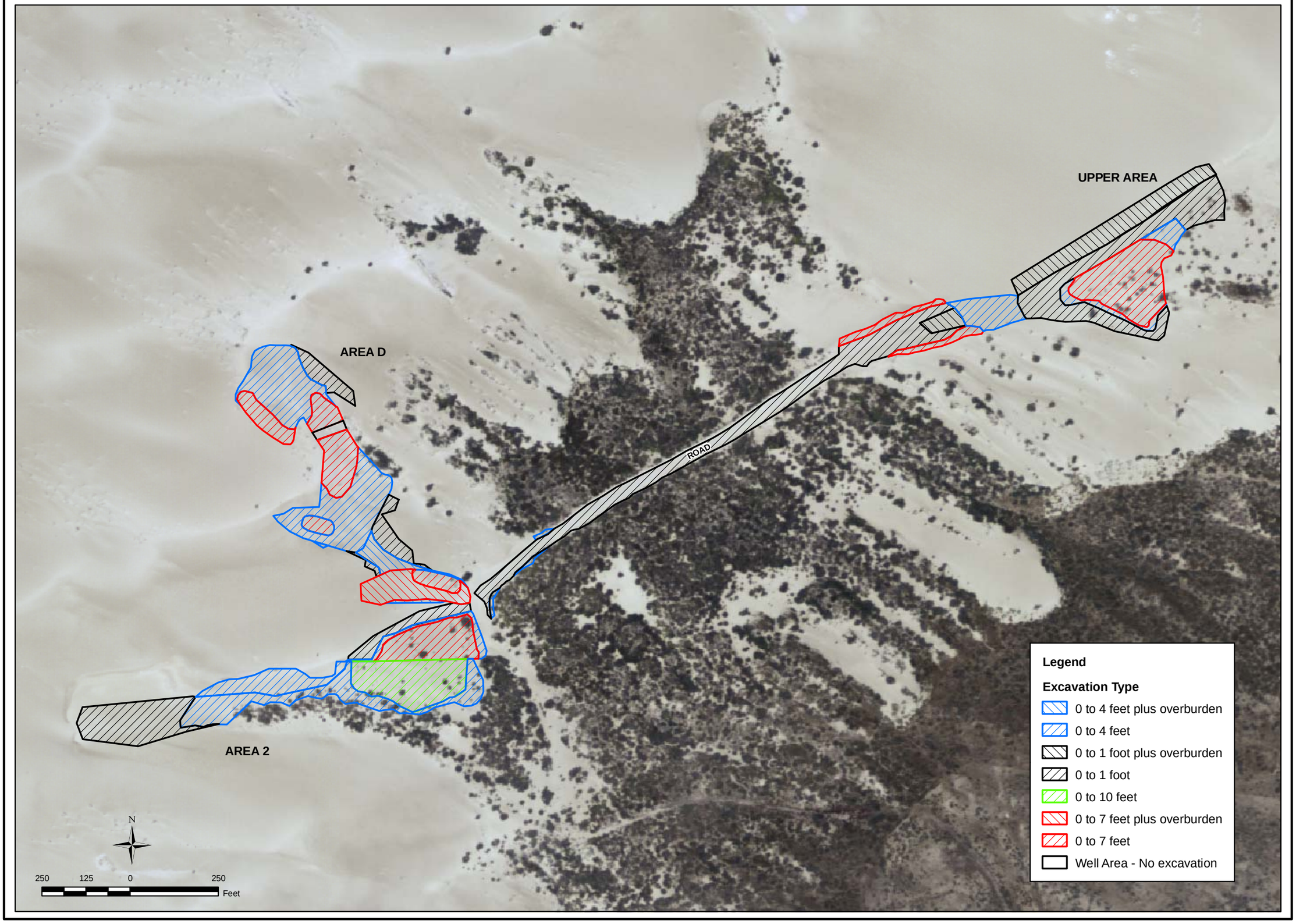


Figure 2. Guadalupe Dunes project area with bulk sample sites shown.



REVISIONS:			
NO:	DESCRIPTION:	DATE:	BY:

DESIGNED BY:	DRAWN BY:	CHECKED BY:	APPROVED BY:
X	X	X	X

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Figure 3 Excavation Plan

Guadalupe Dunes Restoration
Shell E & P
Santa Barbara County, California

SCALE:	DATE:	PROJECT NUMBER:
AS SHOWN	06/30/2010	X

FIGURE NUMBER:

3

SHEET NUMBER:

X

Appendix A

2002 and 2003 Summary of Sampling

Appendix A

GUADALUPE DUNES PROJECT

Summary of Sampling – 2002-2003

Sampling Procedure and Data Treatment

A 1-2" deep, approximately one foot square sample was taken as the initial sample at each hole site on the grid. Next, the holes were sampled with a 4-inch stainless steel hand auger to a maximum depth of 13 feet. Actual depth of each hole varied, depending on presence or absence of pebbles and/or hole conditions. Each auger sample down the hole was screened using 12-inch diameter ¼" and 6 mesh (3.4mm) stainless steel screens. Individual pebbles in each size fraction were counted – in some cases, the pebbles were washed and photographed later (off-site) for comparison. The depth of the hole was measured at several intervals down the hole. The samples were later recalculated to an average depth per sample using actual hole depth measurements and the sample data was then divided into Intervals A through F:

A – Top 2" (treated separately in calculations)
B – Top 1 foot depth
C – 1-4 ft depth
D – 4-7 ft depth
E – 7-10 ft depth
F - >10 ft depth, to maximum of 13 ft depth

The assumption was made that any reasonable treatment of the sands for gravel removal would likely be either surface only (top worked with a beach-cleaner, either skimming the top few inches, or to a maximum one foot depth), or deeper, utilizing a wheeled or track loader, which would work with approximate 3 foot depth intervals. Therefore, once actual pebble counts and average vertical thickness of each auger sample were determined, the sample data was recalculated to reflect pebbles per cubic foot within each Interval down the hole. For example, Interval B is one foot deep, so the actual number of pebbles in the approximate first foot of auger samples (actual vertical thickness varied from 9" to 18" due to auger sampling variations) was recalculated to show the assumed number of pebbles to be expected in the cubic foot surrounding the 4" diameter auger hole. Likewise, the actual number of pebbles in the approximately 3 foot vertical thickness of Interval C was recalculated to show the assumed number of pebbles to be expected in the volume surrounding the 4" diameter auger hole – per cubic foot. Intervals D through F were recalculated in a similar manner. The reasoning here is that the surface one square foot presently shows lag gravels due to wind erosion of sand. Once the upper 1-2" is removed, the sampling calculations give a rough indication (and comparison) of how many pebbles to expect at surface in the same one square foot area for each one vertical foot depletion of sand by wind erosion.

The sample sites on each grid were surveyed using existing survey markers on the Gordon Sand Company property for elevation control. The site locations were plotted on a digital orthophoto quad flown by IntraSearch, Inc. of Denver, CO in November, 2001. Contour maps and cross-sections were constructed, using logarithmic contour intervals for simplicity. Approximate volumes of sand to be treated within each depth Interval were calculated for +¼" gravel and +6 mesh gravel material, respectively, based on treating areas with 1-9 or more pebbles per cubic foot, or 10-99 or more pebbles per cubic foot, respectively. Tables 1 and 2 summarize these data for all the sampled areas.

Table 1.

GUADALUPE DUNES PROJECT
VOLUME CALCULATIONS
+1/4" material treated

Scenario 1: All material with 1-9 or more pebbles per cubic foot that are +1/4" in size moved and screened.
Top 2" treated separately by beach-cleaner.

[All values in cubic yards]

		Volume added by Interval					Total volume treated to Interval Depth				
Level	Depth Treated	Site D	Area 2	Upper Area	Road	**Total**	Site D	Area 2	Upper Area	Road	**Total**
A	2"	715	1,088	2,072	647	**4,522**	715	1,088	2,072	647	**4,522**
B	1 ft	2,152	6,292	11,714	3,893	**24,051**	2,152	6,292	11,714	3,893	**24,051**
C	4 ft	13,687	16,883	34,181	3,019	**67,770**	15,839	23,175	45,895	6,912	**91,821**
D	7 ft	12,826	14,186	28,079	2,197	**57,288**	28,665	37,361	73,974	9,109	**149,109**
E	10 ft	18,438	7,511	28,390	957	**55,296**	47,103	44,872	102,364	10,066	**204,405**
F	10-13 ft	2,671	7,664	16,102	694	**27,131**	49,774	52,536	118,466	10,760	**231,536**
TOTAL (excluding A)		**49,774**	**52,536**	**118,466**	**10,760**	**231,536**	**49,774**	**52,536**	**118,466**	**10,760**	**231,536**

Scenario 2: All material with 10-99 or more pebbles per cubic foot that are +1/4" in size moved and screened.
Top 2" treated separately by beach-cleaner.

[All values in cubic yards]

		Volume added by Interval					Total volume treated to Interval Depth				
Level	Depth Treated	Site D	Area 2	Upper Area	Road	**Total**	Site D	Area 2	Upper Area	Road	**Total**
A	2"	487	475	1,684	647	**3,293**	487	475	1,684	647	**3,293**
B	1 ft	2,152	6,292	11,609	3,893	**23,946**	2,152	6,292	11,609	3,893	**23,946**
C	4 ft	8,219	10,697	29,038	2,021	**49,975**	10,371	16,989	40,647	5,914	**73,921**
D	7 ft	9,049	8,933	17,744	804	**36,530**	19,420	25,922	58,391	6,718	**110,451**
E	10 ft	9,240	4,677	8,578	886	**23,381**	28,660	30,599	66,969	7,604	**133,832**
F	10-13 ft	2,541	3,704	2,758	692	**9,695**	31,201	34,303	69,727	8,296	**143,527**
TOTAL (excluding A)		**31,201**	**34,303**	**69,727**	**8,296**	**143,527**	**31,201**	**34,303**	**69,727**	**8,296**	**143,527**

Table 2.

GUADALUPE DUNES PROJECT
VOLUME CALCULATIONS
+6 mesh material treated

Scenario 1: All material with 1-9 or more pebbles per cubic foot that are +6 mesh in size moved and screened.
Top 2" treated separately by beach-cleaner.

[All values in cubic yards]

		Volume added by Interval					Total volume treated to Interval Depth				
Level	Depth Treated	Site D	Area 2	Upper Area	Road	**Total**	Site D	Area 2	Upper Area	Road	**Total**
A	2"	931	1,240	2,318	646	**5,135**	931	1,240	2,318	646	**5,135**
B	1 ft	4,022	7,142	12,156	3,889	**27,209**	4,022	7,142	12,156	3,889	**27,209**
C	4 ft	12,236	22,142	34,460	11,696	**80,534**	16,258	29,284	46,616	15,585	**107,743**
D	7 ft	18,879	15,234	39,000	7,749	**80,862**	35,137	44,518	85,616	23,334	**188,605**
E	10 ft	23,652	12,917	29,010	1,894	**67,473**	58,789	57,435	114,626	25,228	**256,078**
F	10-13 ft	3,919	7,950	19,899	771	**32,539**	62,708	65,385	134,525	25,999	**288,617**
TOTAL (excluding A)		**62,708**	**65,385**	**134,525**	**25,999**	**288,617**	**62,708**	**65,385**	**134,525**	**25,999**	**288,617**

Scenario 2: All material with 10-99 or more pebbles per cubic foot that are +6 mesh in size moved and screened.
Top 2" treated separately by beach-cleaner.

[All values in cubic yards]

		Volume added by Interval					Total volume treated to Interval Depth				
Level	Depth Treated	Site D	Area 2	Upper Area	Road	**Total**	Site D	Area 2	Upper Area	Road	**Total**
A	2"	652	1,009	2,098	646	**4,405**	652	1,009	2,098	646	**4,405**
B	1 ft	4,022	7,142	12,156	3,889	**27,209**	4,022	7,142	12,156	3,889	**27,209**
C	4 ft	12,236	21,751	30,556	5,828	**70,371**	16,258	28,893	42,712	9,717	**97,580**
D	7 ft	11,779	13,594	30,322	1,683	**57,378**	28,037	42,487	73,034	11,400	**154,958**
E	10 ft	17,875	9,518	22,276	741	**50,410**	45,912	52,005	95,310	12,141	**205,368**
F	10-13 ft	2,653	6,972	11,152	931	**21,708**	48,565	58,977	106,462	13,072	**227,076**
TOTAL (excluding A)		**48,565**	**58,977**	**106,462**	**13,072**	**227,076**	**48,565**	**58,977**	**106,462**	**13,072**	**227,076**

Grids

Site D Grid (Island Site "D")

Prior to grid construction, a field map was made of the site, delineating: 1) visible surface gravel areas, 2) areas where gravels appeared to be covered by an advancing dune, and 3) finer-grained screened pile areas left from the 1997 cleanup effort. In July, 2002, a grid was laid out with points on an approximate 25 meter spacing, to adequately cover the mapped gravel areas. Thirty-six sites were sampled with a hand auger using the method outlined above. Sample hole depths ranged from 4 feet 10 inches to 13 feet 9 inches, with an average depth of all 36 holes of 10 feet 6 inches.

Results indicate that the surface mapping was quite accurate, including those areas that appeared to be covered by the advancing dune. Only one area with significant gravel occurs at extreme depth (> 10 ft) in the vicinity of the old well head site.

Estimated volumes containing gravel range from 31,000 cubic yards to 63,000 cubic yards, depending on the lower cut-off used for the size fraction and pebble counts (see Tables 1 and 2, Site D columns).

Area 2 Grid (Gordon Sand property and pit area)

The Area 2 grid was sampled in December, 2002. The grid covers an area of screened material (from the 1997 cleanup effort) south of Site D and extends west along the Gordon Sand Company pit access road into the pit itself. Fifty-seven sites were sampled with a hand auger using the method outlined above. Sample hole depths ranged from 2 feet 8 inches to 13 feet 9 inches, with an average depth of all 57 holes of 10 feet 5 inches.

Airphotos from 1977 through 1989 indicate the access road into the Gordon Sand Company pit turned south at the entrance to the Island Site D; the pit itself was extended gradually from east to west within the Gordon Sand property during those years. However, the 1992 airphoto shows that the access road has been changed by cutting through the gravel/sand piles at the Island Site D entrance and running the road straight SW from there into the western part of the pit. It is likely that gravel was first dragged into the pit area during this change in the pit access by Gordon Sand personnel sometime between the 1989 and 1992 airphoto flights. The situation was complicated further by the screening work done in 1997, when the screened material was pushed south and west into the old eastern part of the pit area, as seen in the 2001 airphotos (and visible today).

Significant (10-99+ pebbles) gravel was found at surface and within the top one foot extending from the screened pile area west into the pit. In each successive depth Interval below the one foot level, however, the extent of gravel contamination diminishes significantly; gravel was found below the 7 foot level only in the vicinity of the screened pile at the east end of the grid.

Estimated volumes containing gravel range from 34,000 cubic yards to 65,000 cubic yards, depending on the lower cut-off used for the size fraction and pebble counts (see Tables 1 and 2, Area 2 columns).

Upper Area Grid (Rock Spoil area)

The Upper Area grid was sampled in February, 2003. The grid covers the area just west of (and up the hill from) the Gordon Sand Company process plant, and includes the area historically used by Gordon Sand as a “rock spoil” area (southeast of the access road) and the access road itself. An encroaching dune from the north is periodically cleaned out by Gordon Sand along the access road; this is also used as a sand stockpile area for loading the process plant feed hopper at the northeast end of the grid. At the southwest end of the grid, the encroaching dune has covered the access road at the highest point on the road.

Aerial photographs from 1977 and 1981 (pre-dating the Husky Island Site D construction) show that this "rock spoil" area was mostly in place by the time the gravel access road was built in 1985, though the 1985 airphoto seems to indicate that more material was pushed out over a portion of this area during the construction. The configuration of the site in the 1992 airphotos is essentially the same as today, except that the SW end of the grid area was used for screening during the 1997 cleanup attempt, and the screened material was pushed south over clean sands. Numerous piles of "contaminated" sand material ("rock spoil") are now located on the eastern half of the grid area; some of these clearly contain material from the Thriftway site at the end of the beach access road (Main Street). These piles are not seen on the 1992 airphotos. Gordon Sand personnel have mentioned that they add to these periodically.

Significant (10-99+ pebbles) gravel occurs at surface over most of the grid area and at depth mainly along the south edge of the "rock spoil" area. Given the buildup history of this area as indicated by the airphotos, however, it seems unlikely that the deeper gravel material could have resulted from the Husky access road work. Examination of the pebbles found in the lower intervals is inconclusive, though there are scattered debris (plastic, wood fragments, metal) in the deeper holes along the south part of the grid that were not seen elsewhere on the site.

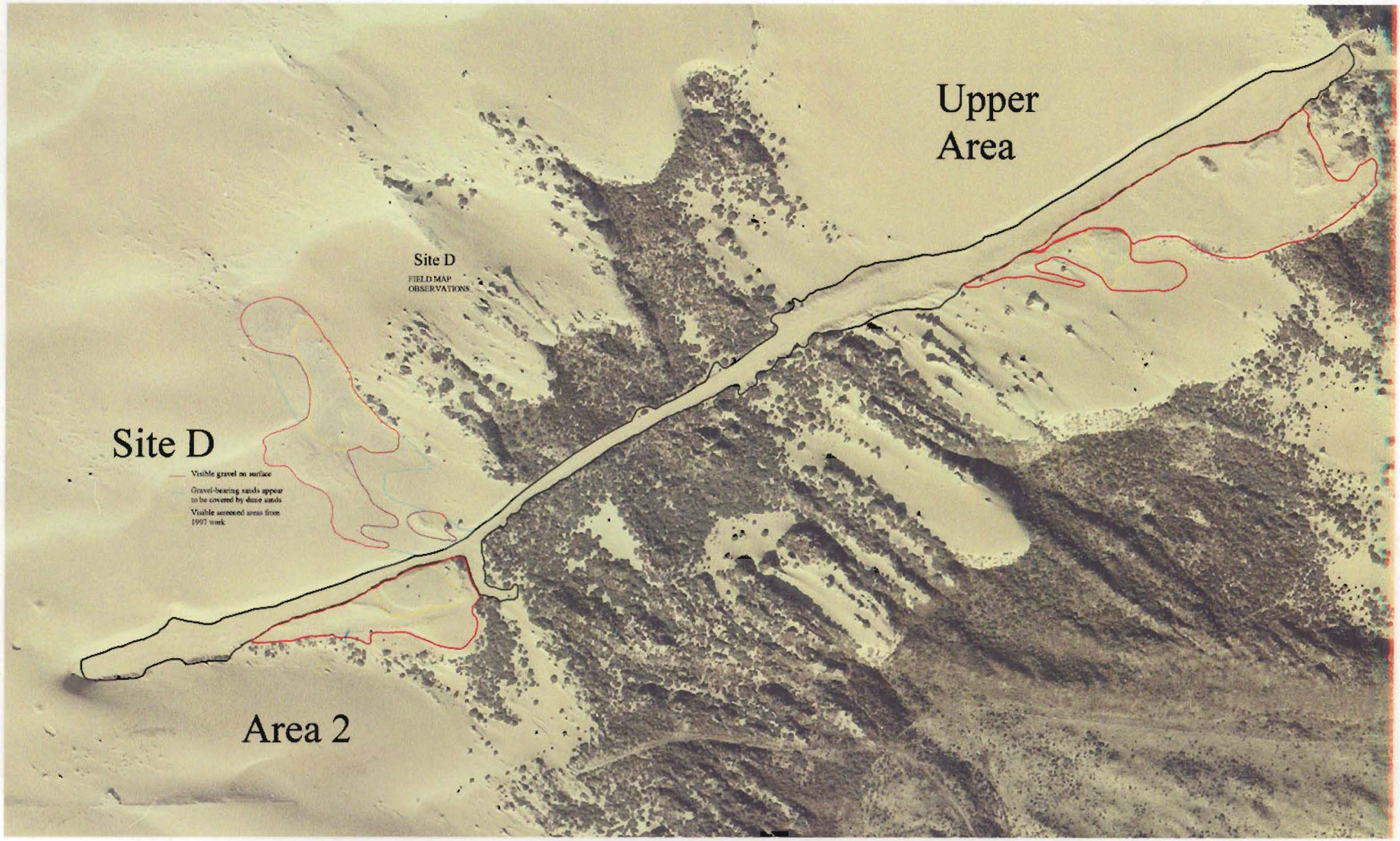
Taking the Upper Area grid as a whole, estimated volumes containing gravel range from 69,000 cubic yards to 135,000 cubic yards, depending on the lower cut-off used for the size fraction and pebble counts (see Tables 1 and 2, Upper Area columns).

Road (access road area)

The access Road area between the Upper Area and Area 2 was sampled in May, 2003. A series of short three-hole lines were sampled at approximately equal intervals perpendicular to the road axis. (One line was omitted, with only one sample taken – R-16 – due to time constraints). The outer holes on each line sampled the piles at the road edge. The volume estimates for the Road area are very approximate, as they are based mainly on only 16 samples over a distance of 1,300 feet.

As expected, the center part of the Road contains significant gravel mainly at the surface, but the piles on either side are quite variable, with only a few pebbles showing up in the piles at depth. An exception to this is the upper part of the Road area, where material was apparently pushed out to the north of the road.

A rough estimate of total volume of material containing gravel ranges from 8,000 cubic yards to 26,000 cubic yards, depending on the lower cut-off used for the size fraction and pebble counts (see Tables 1 and 2, Road columns).


Upper
Area
Site D
FIELD MAP
OBSERVATIONS
Site D
Visible gravel on surface
Gravel-bearing sands appear
to be covered by dune sands
Visible screened areas from
1997 work
Area 2

GUADALUPE DUNES PROJECT
VOLUME CALCULATIONS
+1/4" material treated

Scenario 1: All material with 1-9 or more pebbles per cubic foot that are +1/4" in size moved and screened.
Top 2" treated separately by beach-cleaner.

[All values in cubic yards]

		Volume added by Interval					Total volume treated to Interval Depth				
Level	Depth Treated	Site D	Area 2	Upper Area	Road	**Total**	Site D	Area 2	Upper Area	Road	**Total**
A	2"	715	1,088	2,072	647	**4,522**	715	1,088	2,072	647	**4,522**
B	1 ft	2,152	6,292	11,714	3,893	**24,051**	2,152	6,292	11,714	3,893	**24,051**
C	4 ft	13,687	16,863	34,181	3,019	**67,770**	15,839	23,175	45,895	6,912	**91,821**
D	7 ft	12,826	14,186	28,079	2,197	**57,288**	28,665	37,361	73,974	9,109	**149,109**
E	10 ft	18,438	7,511	28,390	957	**55,296**	47,103	44,872	102,364	10,066	**204,405**
F	10-13 ft	2,671	7,684	16,102	694	**27,131**	49,774	52,536	118,468	10,780	**231,536**
TOTAL (excluding A)		**49,774**	**52,536**	**118,466**	**10,760**	**231,536**	**49,774**	**52,536**	**118,466**	**10,760**	**231,536**

Scenario 2: All material with 10-99 or more pebbles per cubic foot that are +1/4" in size moved and screened.
Top 2" treated separately by beach-cleaner

[All values in cubic yards]

		Volume added by Interval					Total volume treated to Interval Depth				
Level	Depth Treated	Site D	Area 2	Upper Area	Road	**Total**	Site D	Area 2	Upper Area	Road	Total
A	2"	487	475	1,684	647	**3,293**	487	475	1,684	647	**3,293**
B	1 ft	2,152	6,292	11,609	3,893	**23,946**	2,152	6,292	11,609	3,893	**23,946**
C	4 ft	8,219	10,697	29,038	2,021	**49,975**	10,371	16,989	40,647	5,914	**73,921**
D	7 ft	9,049	8,933	17,744	804	**36,530**	19,420	25,922	58,391	6,718	**110,451**
E	10 ft	9,240	4,877	8,578	886	**23,381**	28,660	30,599	68,969	7,804	**133,832**
F	10-13 ft	2,541	3,704	2,758	692	**9,695**	31,201	34,303	69,727	8,296	**143,527**
TOTAL (excluding A)		**31,201**	**34,303**	**69,727**	**8,296**	**143,527**	**31,201**	**34,303**	**69,727**	**8,296**	**143,527**

GUADALUPE DUNES PROJECT
VOLUME CALCULATIONS
+6 mesh material treated

Scenario 1: All material with 1-9 or more pebbles per cubic foot that are +6 mesh in size moved and screened.
Top 2" treated separately by beach-cleaner

[All values in cubic yards]

		Volume added by Interval					Total volume treated to Interval Depth				
Level	Depth Treated	Site D	Area 2	Upper Area	Road	**Total**	Site D	Area 2	Upper Area	Road	**Total**
A	2"	931	1,240	2,318	646	**5,135**	931	1,240	2,318	646	**5,135**
B	1 ft	4,022	7,142	12,156	3,889	**27,209**	4,022	7,142	12,156	3,889	**27,209**
C	4 ft	12,236	22,142	34,460	11,696	**80,534**	16,258	29,284	46,616	15,585	**107,743**
D	7 ft	18,879	15,234	39,000	7,749	**80,862**	35,137	44,518	85,616	23,334	**188,605**
E	10 ft	23,652	12,917	29,010	1,694	**67,473**	58,789	57,435	114,626	25,228	**256,078**
F	10-13 ft	3,919	7,950	19,899	771	**32,539**	62,708	65,385	134,525	25,999	**288,617**
TOTAL (excluding A)		**62,708**	**65,385**	**134,525**	**25,999**	**288,617**	**62,706**	**65,385**	**134,525**	**25,999**	**288,617**

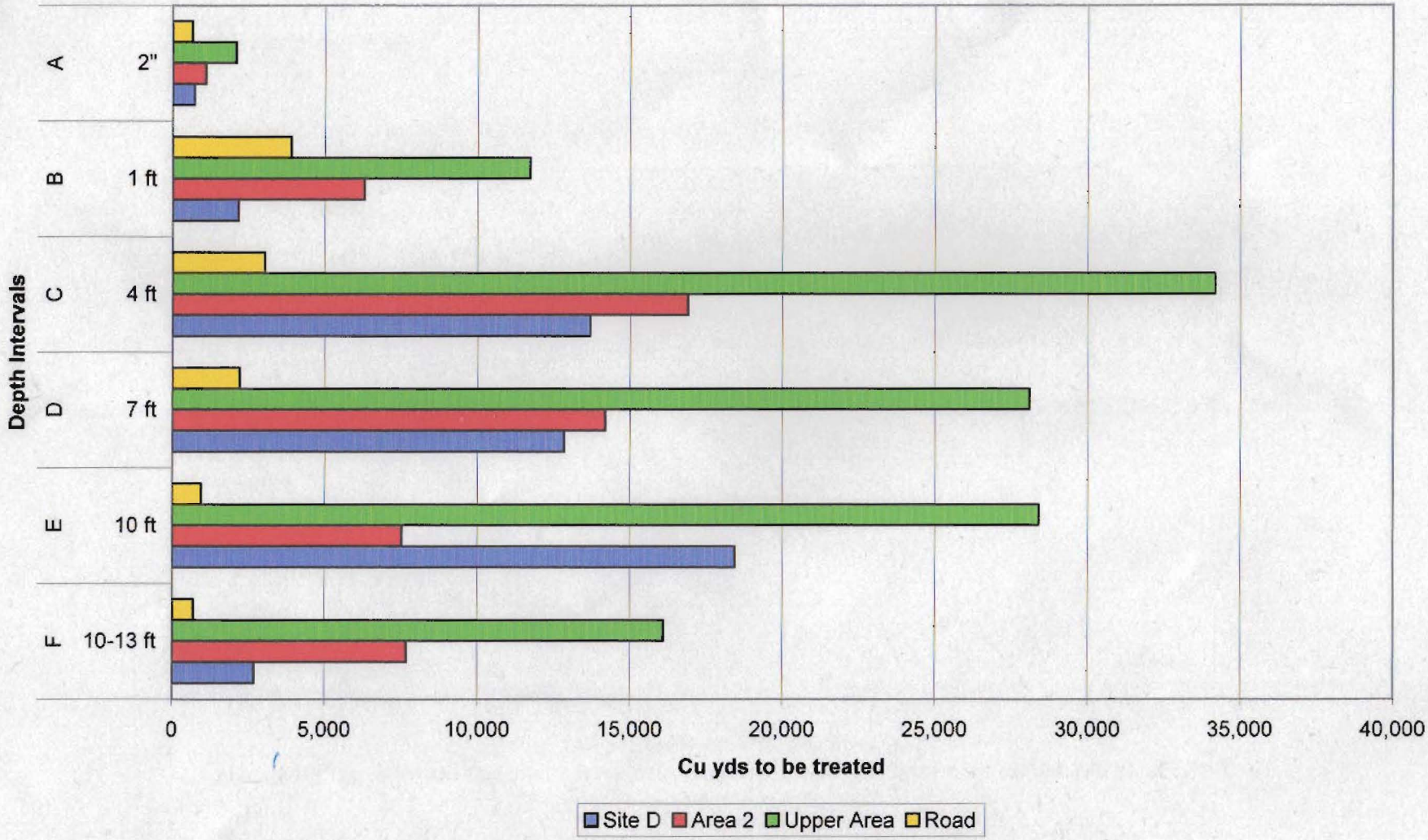
Scenario 2: All material with 10-99 or more pebbles per cubic foot that are +6 mesh in size moved and screened.
Top 2" treated separately by beach-cleaner.

[All values in cubic yards]

		Volume added by Interval					Total volume treated to Interval Depth				
Level	Depth Treated	Site D	Area 2	Upper Area	Road	**Total**	Site D	Area 2	Upper Area	Road	**Total**
A	2"	652	1,009	2,098	646	**4,405**	652	1,009	2,098	646	**4,405**
B	1 ft	4,022	7,142	12,156	3,889	**27,209**	4,022	7,142	12,156	3,889	**27,209**
C	4 ft	12,238	21,751	30,556	5,828	**70,371**	16,258	28,893	42,712	9 717	**97,580**
D	7 ft	11,779	13,594	30,322	1,883	**57,378**	28,037	42,487	73,034	11,400	**154,958**
E	10 ft	17,875	9,518	22,276	741	**50,410**	45,912	52,005	95 310	12,141	**205,368**
F	10-13 ft	2,653	6,972	11,152	931	**21,708**	48,565	58,977	106,462	13,072	**227,076**
TOTAL (excluding A)		**48,565**	**58,977**	**106,462**	**13,072**	**227,076**	**48,565**	**58,977**	**106,462**	13,072	**227,076**

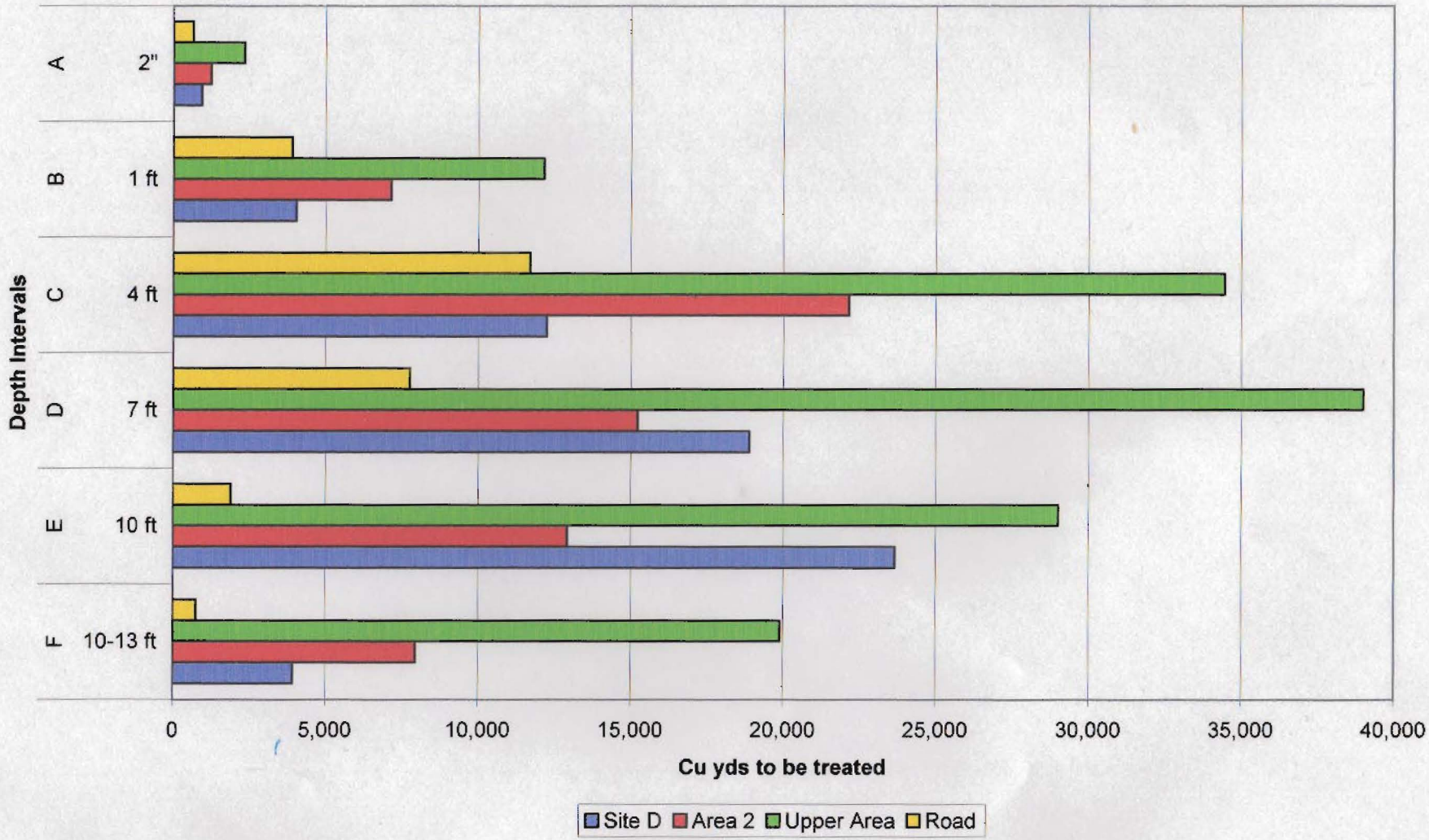
Guadalupe Dunes Project

Scenario 1. All material with 1-9 pebbles/ft3 that are +1/4" in size moved and screened.
Top 2" treated separately by beach-cleaner.



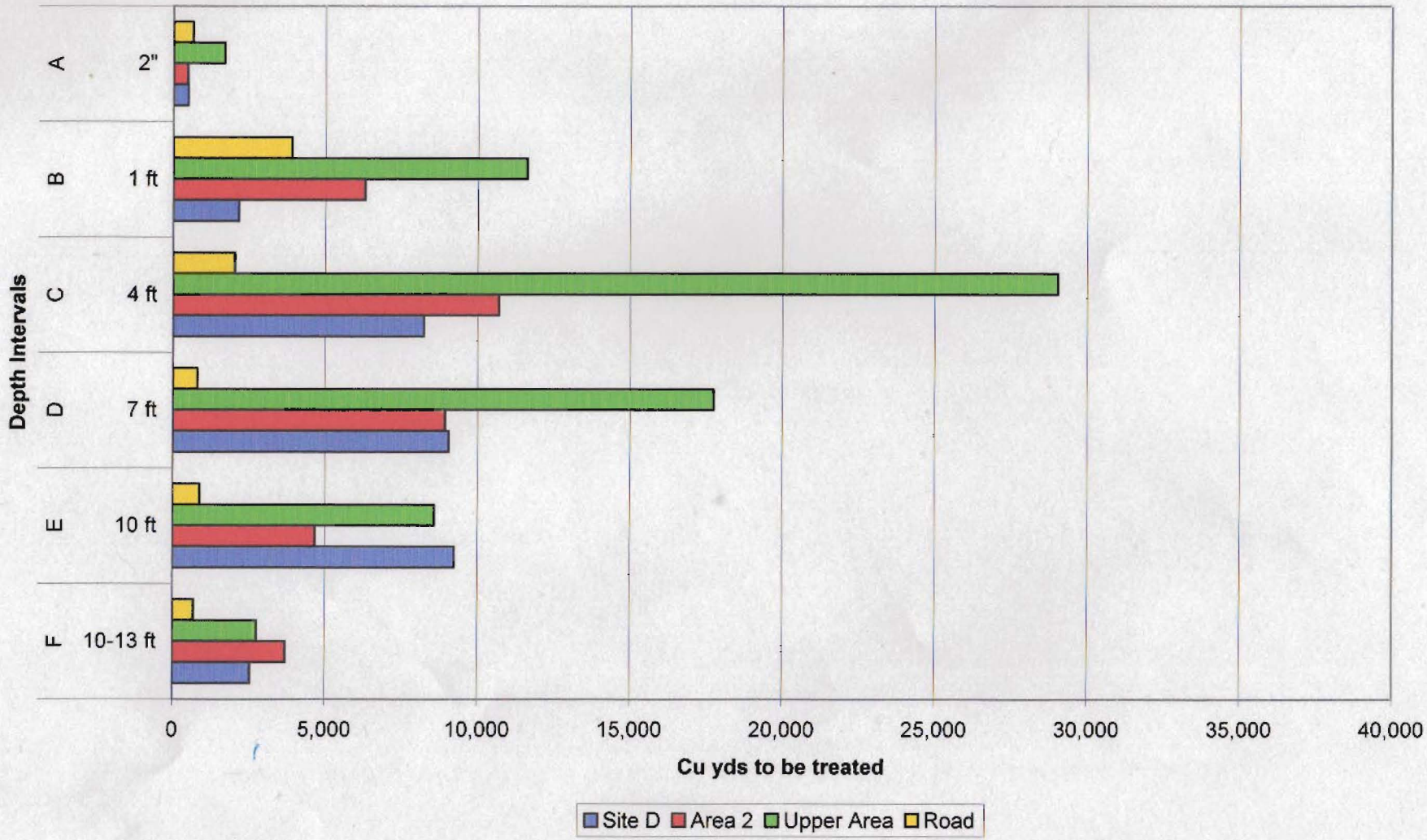
Guadalupe Dunes Project

Scenario 1. All material with 1-9 or more pebbles/ft3 that are +6mesh in size moved and screened.
Top 2" treated separately by beach-cleaner.



Guadalupe Dunes Project

Scenario 2. All material with 10-99 or more pebbles/ft3 that are +1/4" in size moved and screened.
Top 2" treated separately by beach-cleaner.



Average Pebble Cts per hole, by Interval
Using only holes with pebbles (no blank holes)
+1/4"

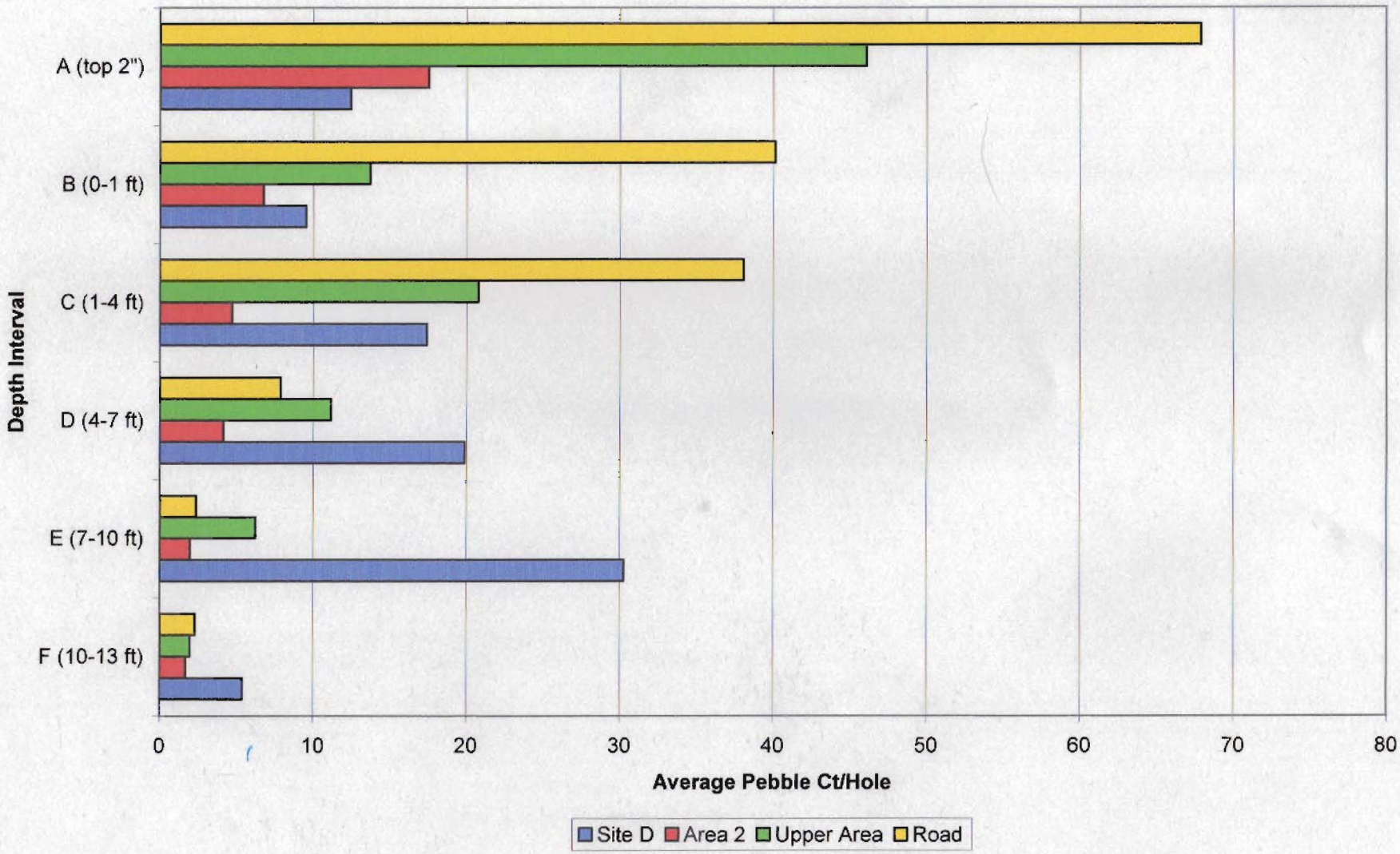
Site	D	A2	UA	Road
A	12	18	46	68
B	10	7	14	40
C	17	5	21	38
D	20	4	11	8
E	30	2	6	2
F	5	2	2	2

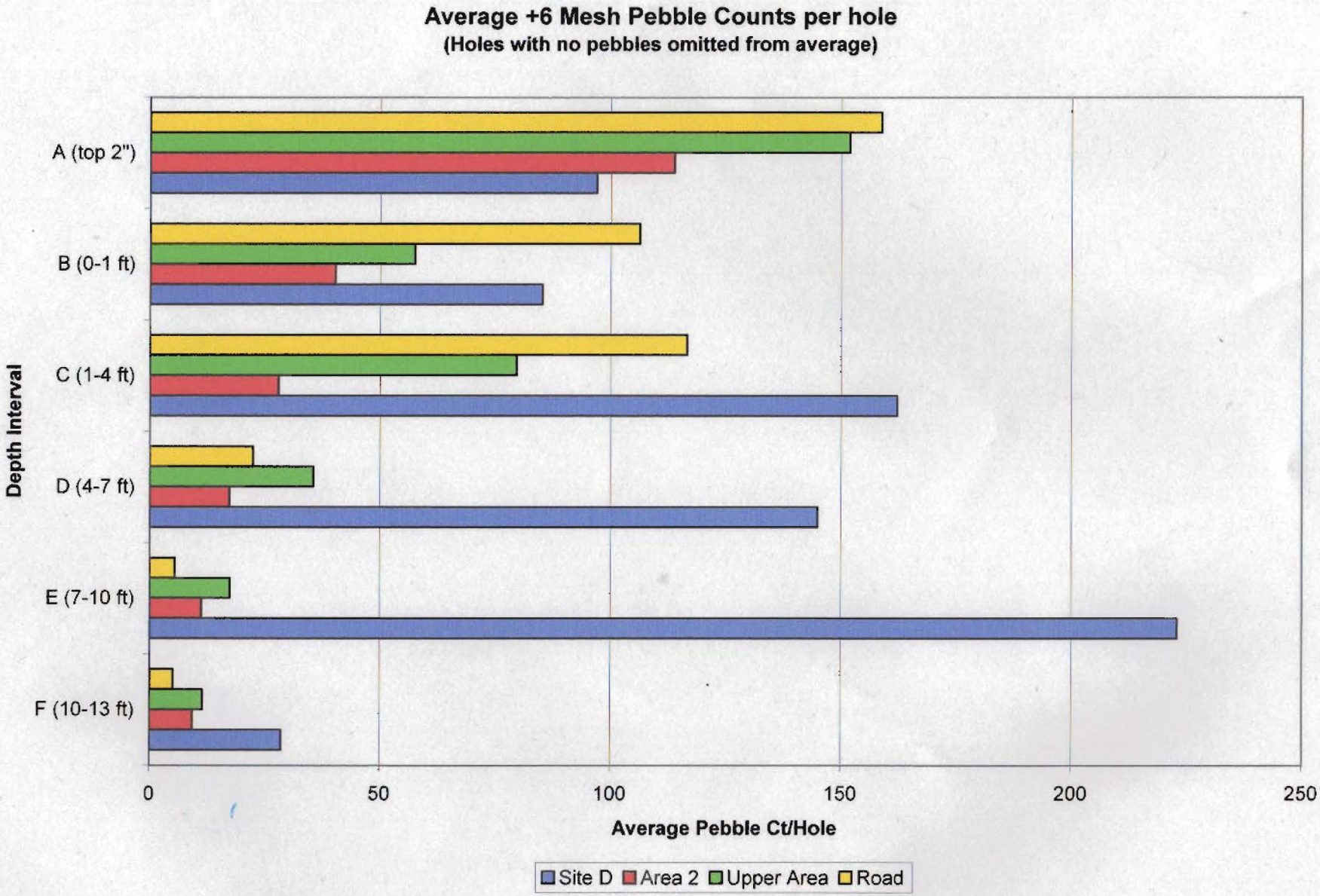
Using only holes with pebbles (no blank holes)
+6mesh

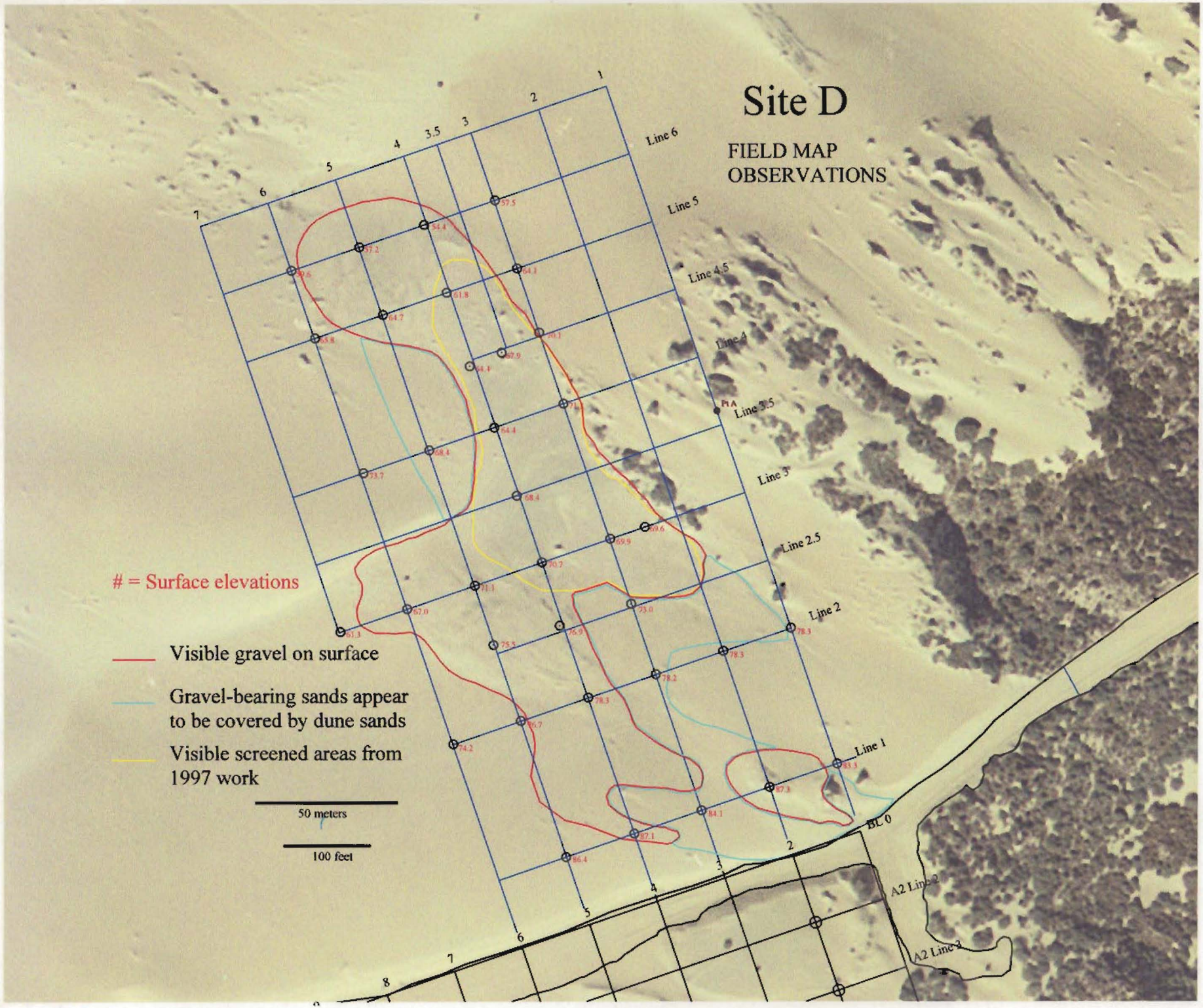
Site:	D	A2	UA	Road
A	97	114	152	159
B	85	40	57	106
C	162	28	80	117
D	145	17	35	22
E	223	11	17	6
F	29	9	12	5

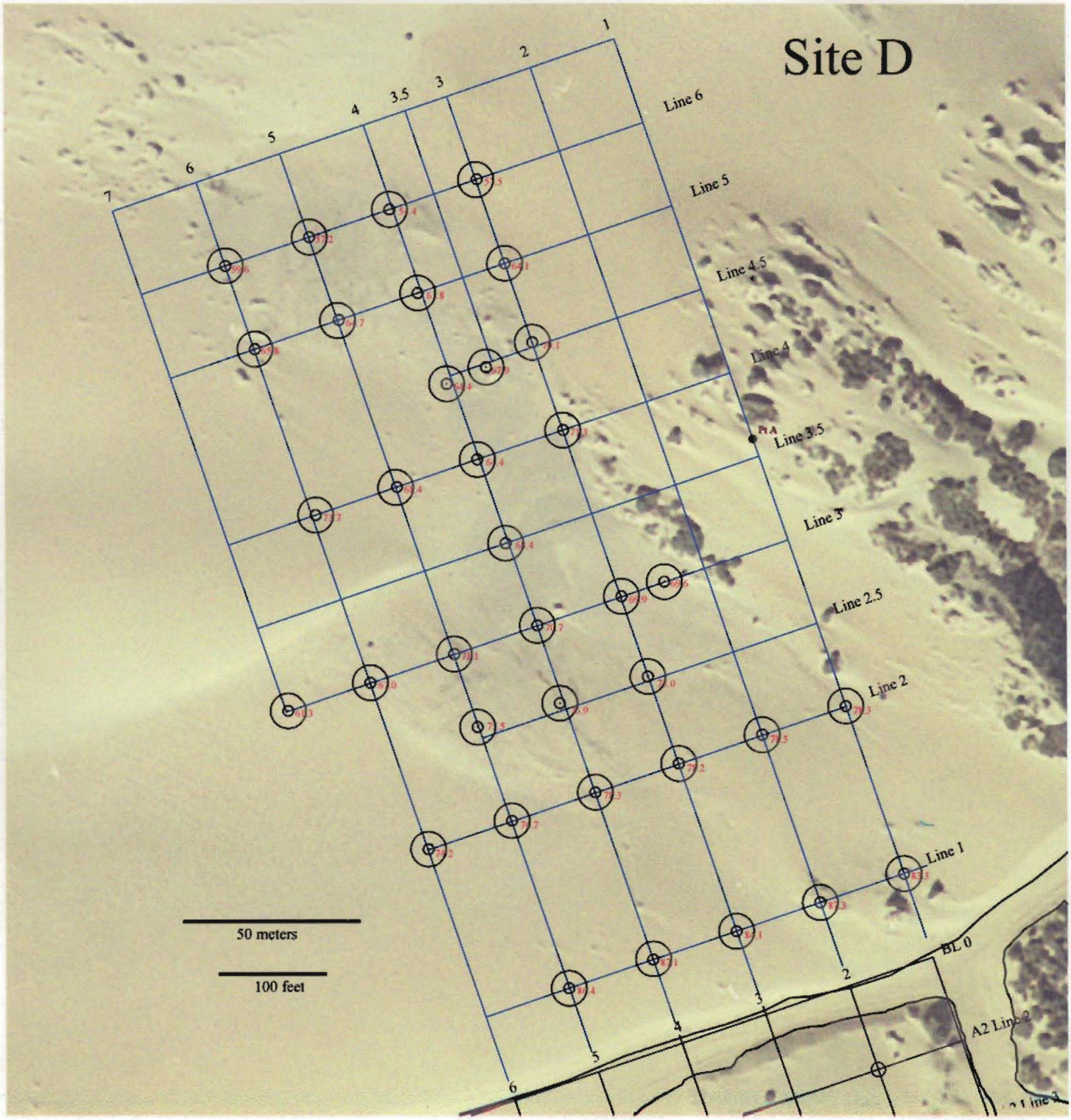
Average +1/4" Pebble Counts per hole

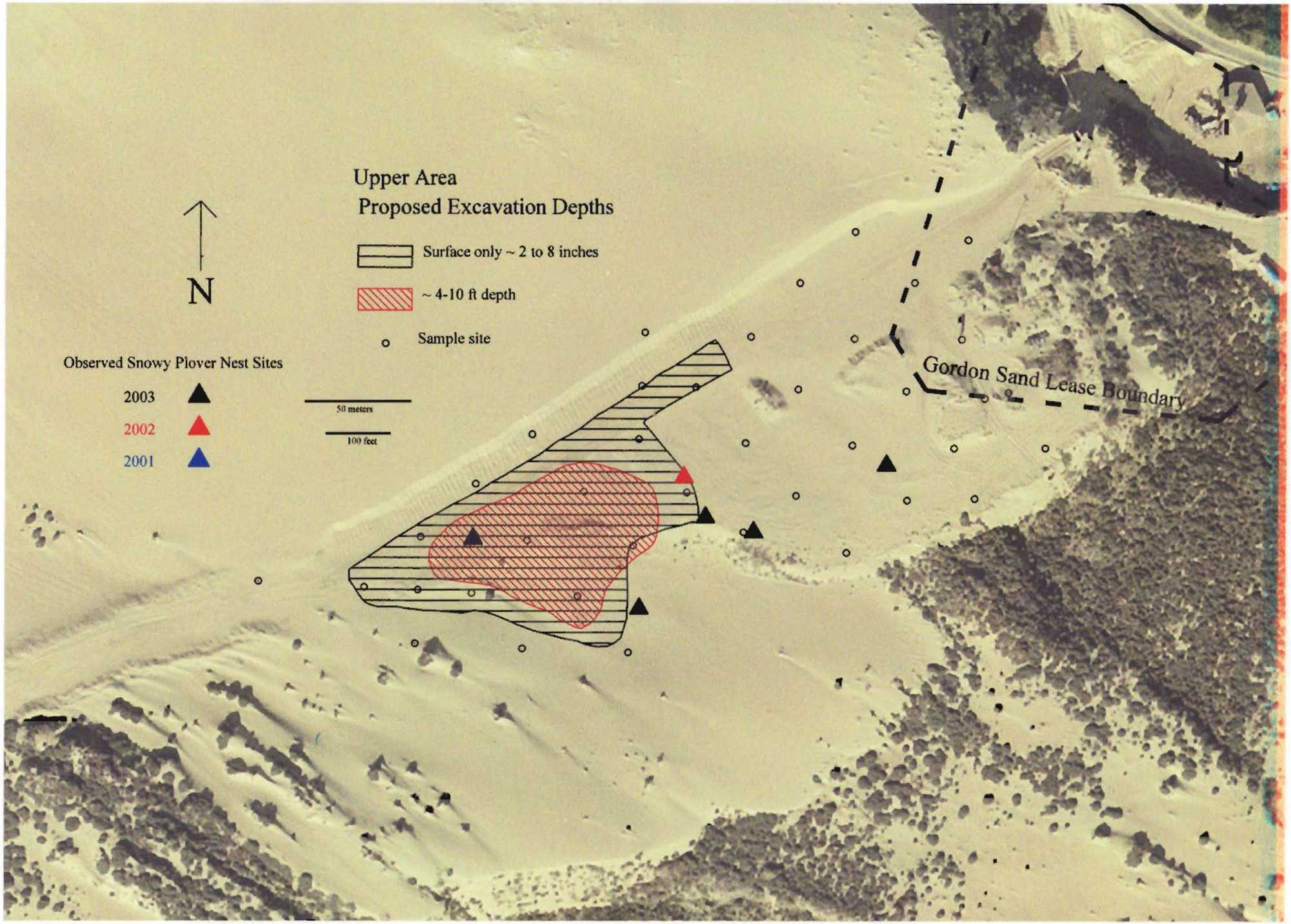
(Holes with no pebbles omitted from average)

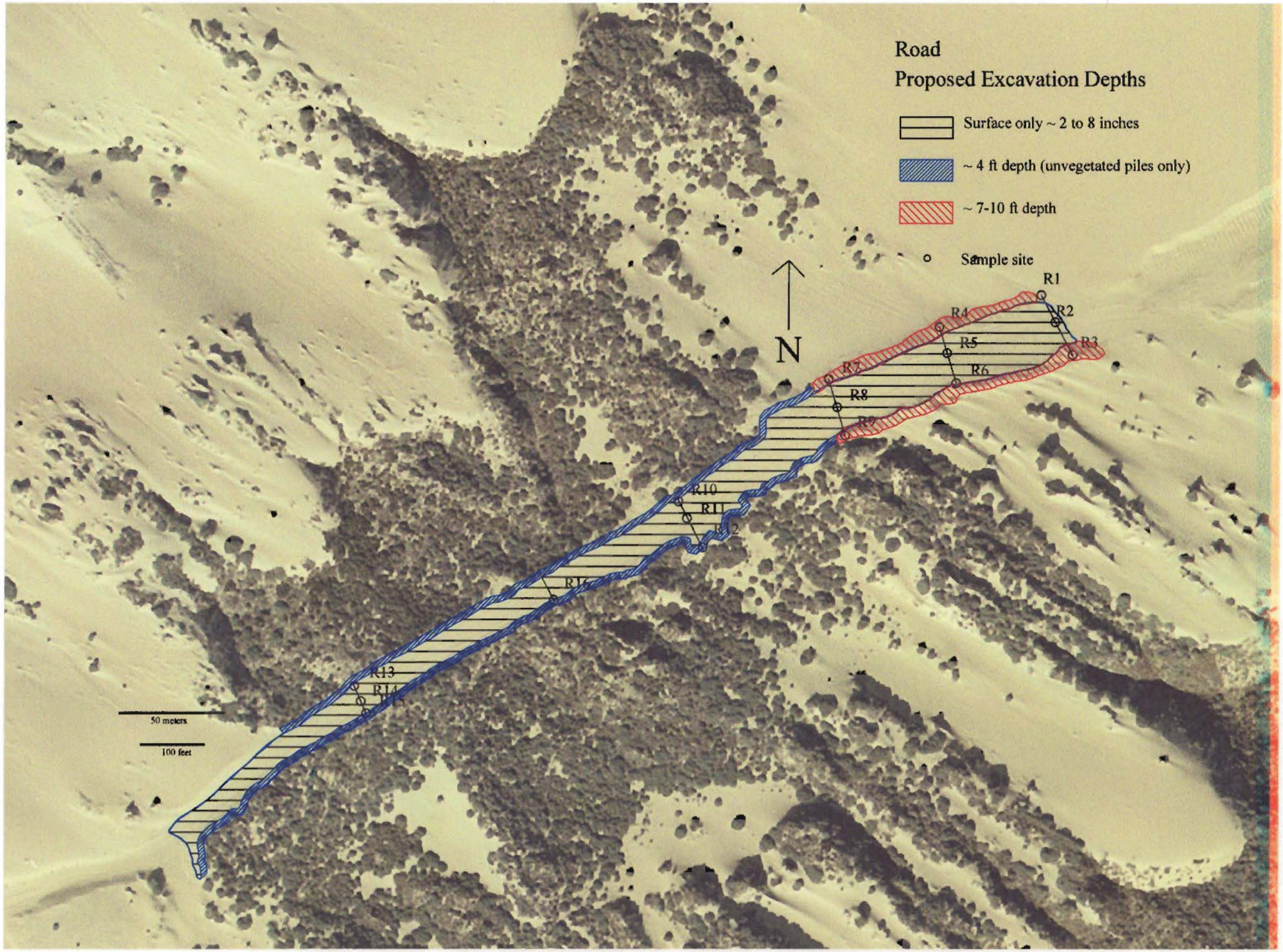


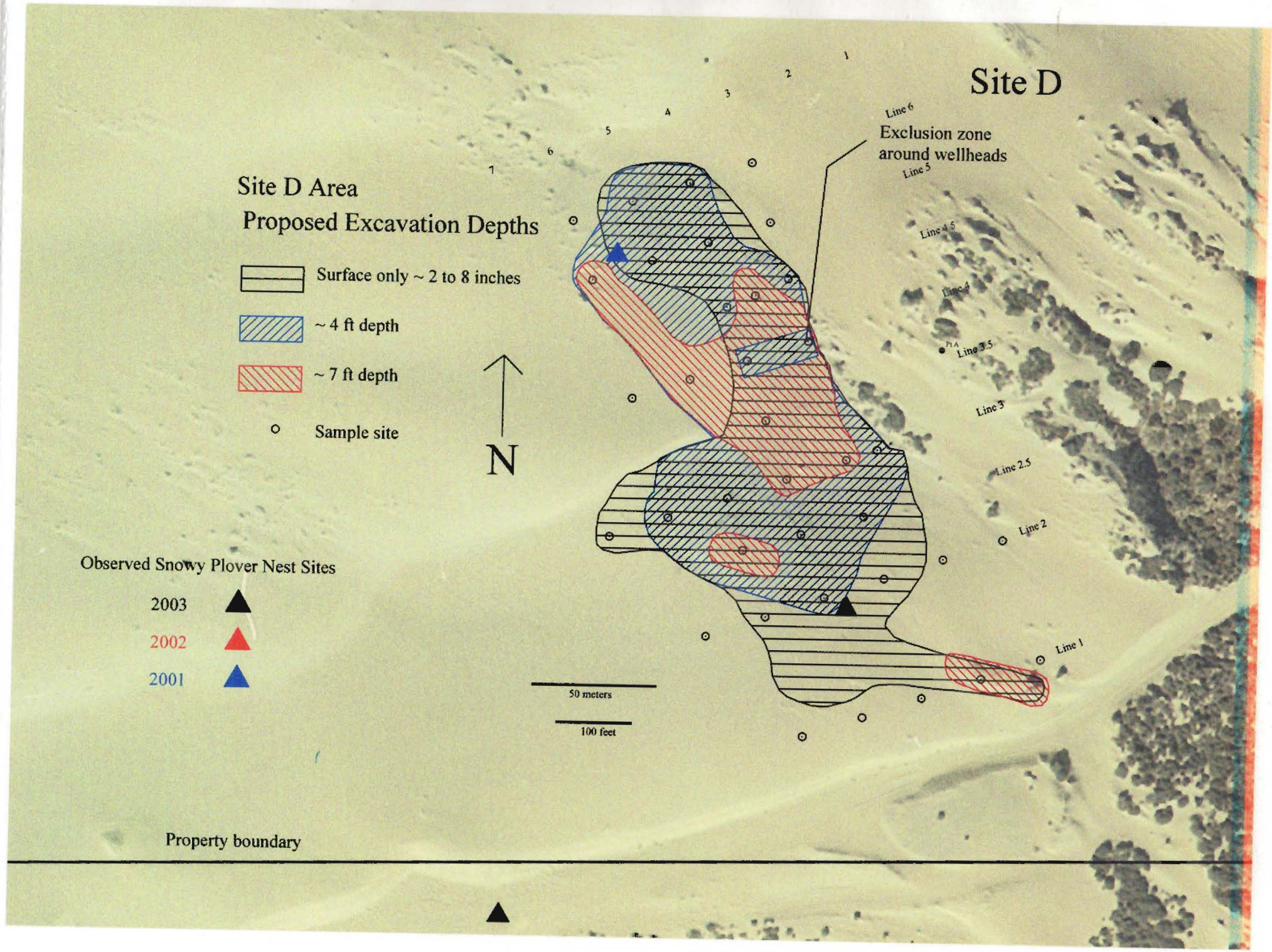

Average +6 Mesh Pebble Counts per hole
(Holes with no pebbles omitted from average)
Depth Interval
A (top 2")
B (0-1 ft)
C (1-4 ft)
D (4-7 ft)
E (7-10 ft)
F (10-13 ft)
0
50
100
150
200
250
Average Pebble Ct/Hole
Site D
Area 2
Upper Area
Road

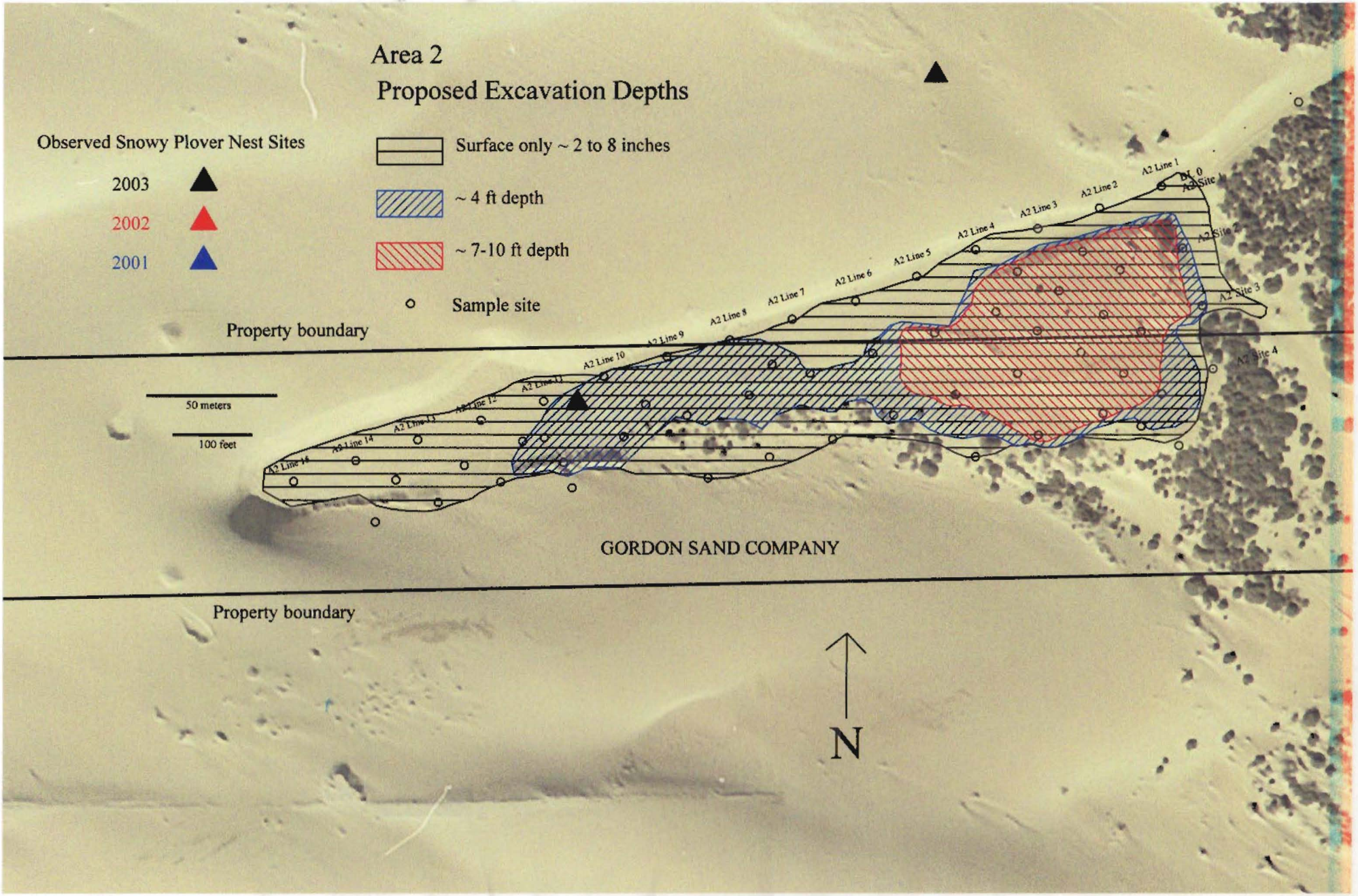

Site D
FIELD MAP
OBSERVATIONS
Line 6
Line 5
Line 4.5
Line 4
Line 3.5
Line 3
Line 2.5
Line 2
Line 1
BL 0
A2 Line 2
A2 Line 3
= Surface elevations
Visible gravel on surface
Gravel-bearing sands appear to be covered by dune sands
Visible screened areas from 1997 work
50 meters
100 feet


Site D
1
2
3.5
3
4
5
6
7
Line 6
Line 5
Line 4.5
Line 4
Line 3.5
Line 3
Line 2.5
Line 2
Line 1
50 meters
100 feet
BL 0
A2 Line 2


Upper Area
Proposed Excavation Depths
Surface only ~ 2 to 8 inches
~ 4-10 ft depth
Sample site
N
Observed Snowy Plover Nest Sites
2003
2002
2001
50 meters
100 feet
Gordon Sand Lease Boundary


Road
Proposed Excavation Depths
Surface only ~ 2 to 8 inches
~ 4 ft depth (unvegetated piles only)
~ 7-10 ft depth
Sample site
N
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
50 meters
100 feet


Site D
Site D Area
Proposed Excavation Depths
Surface only ~ 2 to 8 inches
~ 4 ft depth
~ 7 ft depth
Sample site
N
Exclusion zone
around wellheads
Line 6
Line 5
Line 4.5
Line 4
Line 3.5
Line 3
Line 2.5
Line 2
Line 1
Observed Snowy Plover Nest Sites
2003
2002
2001
50 meters
100 feet
Property boundary


Area 2
Proposed Excavation Depths
Observed Snowy Plover Nest Sites
2003
2002
2001
Surface only ~ 2 to 8 inches
~ 4 ft depth
~ 7-10 ft depth
Sample site
Property boundary
50 meters
100 feet
A2 Line 1
A2 Line 2
A2 Line 3
A2 Line 4
A2 Line 5
A2 Line 6
A2 Line 7
A2 Line 8
A2 Line 9
A2 Line 10
A2 Line 11
A2 Line 12
A2 Line 13
A2 Line 14
A2 Line 15
A2 Site 1
A2 Site 2
A2 Site 3
A2 Site 4
GORDON SAND COMPANY
Property boundary
N

12” diameter sieves: ¼” (left), 0.132”/6 mesh (right)

Approximate square foot for surface sample (~2” depth)

SAMPLE TECHNIQUE

Collecting surface sample.

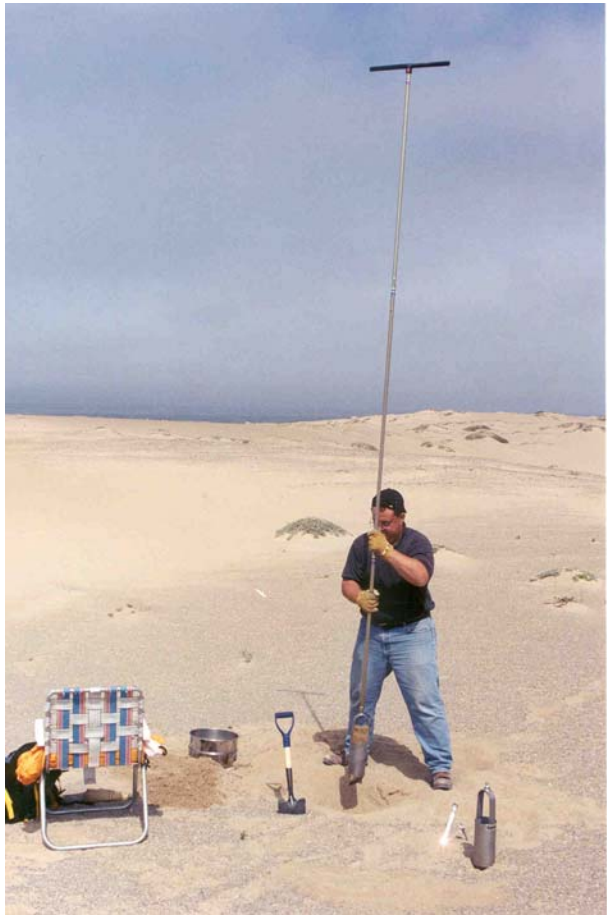
Preparing for auger samples after surface sample collected.

Collecting top auger sample of this hole.

Screening auger samples and counting pebbles.

SAMPLE TECHNIQUE

Measuring hole depth during sampling.



Full extent of auger (13 ft).

Appendix B

Surveys of the Western Snowy Plover and California Least Tern

Appendix B

SURVEYS OF
THE WESTERN SNOWY PLOVER
AND
THE CALIFORNIA LEAST TERN
AT
SHELL EXPLORATION AND PRODUCTION COMPANY
GUADALUPE DUNES PROJECT SITE
SANTA BARBARA COUNTY, CALIFORNIA
18 MARCH – 22 JULY 2004

Submitted To

Richard S. (Dick) Carr, III
Consultant
Minerals, Exploration and Mine Closure
1019 Gordon Avenue
Reno, NV 89509

Submitted By

Philip E. Persons
3899 Jalama Road
Lompoc, CA 93436

15 September 2004

Introduction

This report summarizes the results of surveys conducted between 18 March and 22 July 2004 to assess the presence and breeding activity of the Western Snowy Plover (*Charadrius alexandrinus nivosus*) and the California Least Tern (*Sterna antillarum browni*) at Shell Western Exploration and Production Company's Guadalupe Dunes project site at Rancho Guadalupe Dunes County Park, Santa Barbara County, California. Surveys were conducted under federal Threatened and Endangered Species Permit No. TE837310-4 issued to the writer by the U. S. Fish and Wildlife Service. This work was performed under contract to Richard S. (Dick) Carr III, Consultant.

Plovers and terns are ground-nesting species that inhabit coastal beaches and dunes. Both species are protected under federal and state law. The Pacific coast population of the plover is listed as Threatened and the tern is listed as Endangered under the federal Endangered Species Act. Under the California Endangered Species Act, the tern is listed as Endangered and the plover is listed as a Species of Special Concern. Activities that may affect these species or their habitat may require prior consultation with the U.S. Fish and Wildlife Service and the California Department of Fish and Game.

Survey Site and Methods

The survey site includes portions of Rancho Guadalupe Dunes County Park (Park) and private lands owned by Gordon Sand Company (Gordon). The Park is managed by The Center for Natural Lands Management (CNLM) under a lease agreement with the County of Santa Barbara Parks Department. Gordon's mine and processing sites are partly on Park lands and partly on private lands.

Survey areas include Upper Area, Area 2, and Site D, outlined in red on the photomap, the dunes adjacent to these areas, and Gordon's mining sites and haul road, outlined in black on the photomap (Figure 1).

Surveys consisted of searching for evidence of plover and tern foraging or nesting activity by walking slowly along a crudely rectangular grid of transects approximately 15 to 25 feet apart, pausing frequently to scan with binoculars for plovers. Numbers of plovers were recorded, and nests were described, mapped, and documented with photographs. Surveys were conducted approximately once per week for a total of 18 surveys.

Results

Western Snowy Plover

Plovers were observed on only 3 of 18 surveys, and only in the Upper Area. Plovers frequently go unobserved at active nesting sites because pairs are often absent during courtship and egg-laying stages; incomplete clutches are incubated only intermittently;

incubating females depart furtively from nests at the approach of potential predators and humans; and males, which incubate at night, are usually absent during daylight hours. Precocial hatchling plovers typically are led by their parents away from the nest site within hours after hatching.

Three nests were found, all in the Upper Area (Table 1; Figures 1 - 4). One nest was successful, hatching two young. Two nests failed to due to predation of eggs, one by Common Raven (*Corvus corax*) and one by an unknown predator. Analysis of nest duration suggests that one to two pairs of plovers nested in the Upper Area.

Table 1. Western Snowy Plover nests at Shell Exploration and Production Company's Guadalupe Dunes project site in 2003.

Area	Nest No.	Date Found	Dates Active	Eggs	Fate
Upper Area	UA-1	4/28	4/25 – 5/10	3	Failed, unknown predator
Upper Area	UA-2	5/21	5/18 – 5/24	2	Failed, Common Raven
Upper Area	UA-3	6/11	6/01 – 7/02	3	Hatched 2 young

Annual observations of found nests and successful nests are compiled in Table 2. These data should be interpreted cautiously because infrequent surveys, typically once per week, may have failed to discover nests before they were destroyed .

Table 2. Annual number of Western Snowy Plover nests found and number of successful nests (in parentheses) at Shell Exploration and Production Company's Guadalupe Dunes project site in 2001 through 2004.

	Year			
Area	2001[a]	2002 [b]	2003	2004
Upper Area	n.s.	1(0)	5 (2)	3 (1)
Area 2	n.s.	0	0	0
Site D	5 (2)	0	1(0)	0

Notes
(a) Surveyed by CNLM
(b) Partial season survey, 14 June – 15 July
n.s. Not surveyed

California Least Tern

Terns were not observed on the survey site in 2004. A small number of terns arrived at Rancho Guadalupe Dunes County Park in mid-June, a late date, and established a breeding colony in the foredunes just inland of the beach.

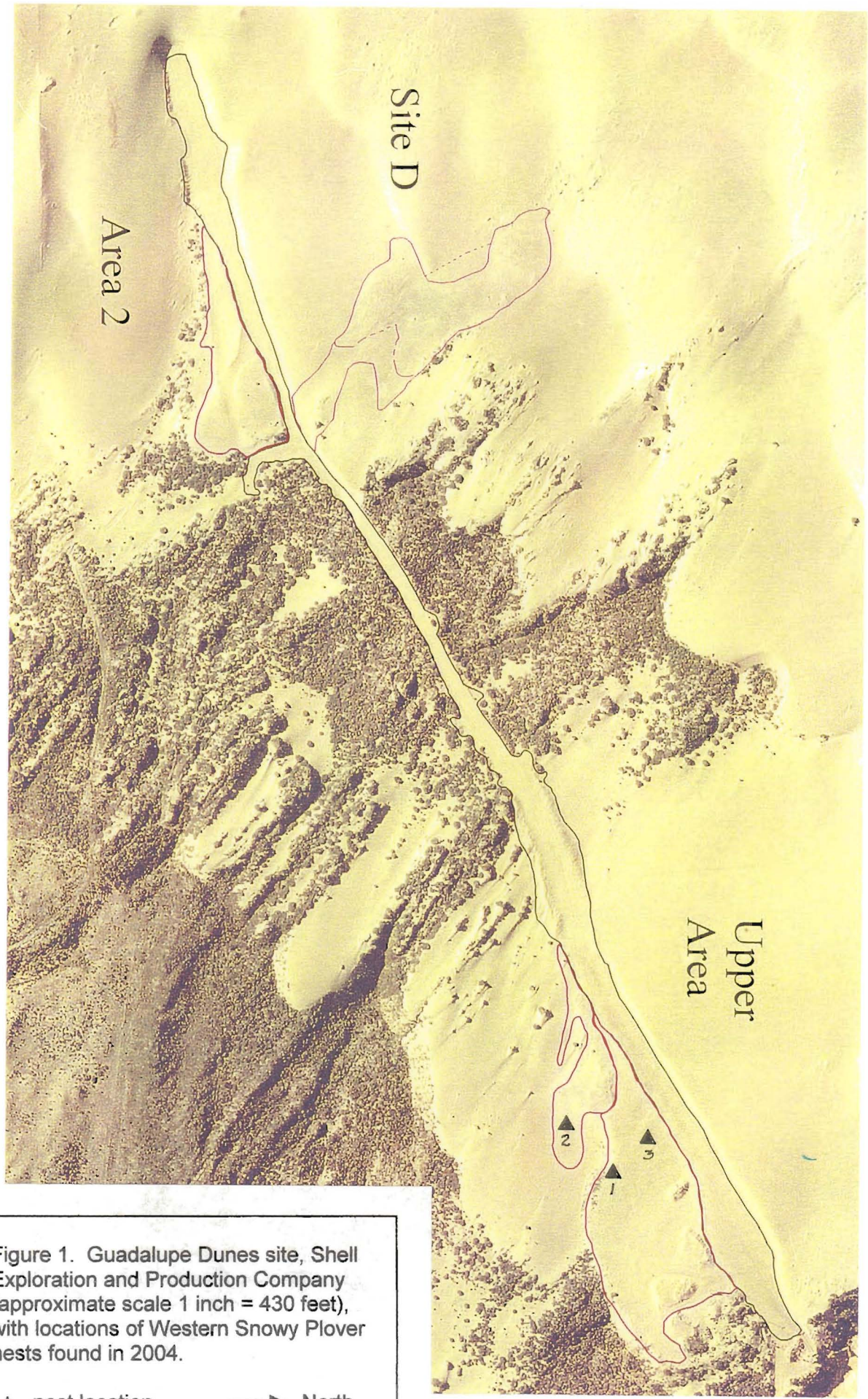


Figure 1. Guadalupe Dunes site, Shell Exploration and Production Company (approximate scale 1 inch = 430 feet), with locations of Western Snowy Plover nests found in 2004.

▲ nest location ⟶ North

Figure 2. Snowy Plover nest UA-1. Above, nest with two eggs at base of crisp dune mint (Monardella crispa). For scale, notebook measures 4 by 6 inches. Below, view northeasterly from nest site toward waste piles and power poles in northeast portion of Upper Area.

Figure 3. Snowy Plover nest UA-2. Above, nest with two eggs at base of crisp dune mint (Monardella crispa). For scale, notebook measures 4 by 6 inches. Below, view northeasterly from nest site over south bank of Upper Area toward waste piles and power poles in northeast portion of Upper Area.

Figure 4. Snowy Plover nest UA-3. Above, nest with two eggs at base of crisp dune mint (Monardella crispa). For scale, notebook measures 4 by 6 inches. Below, view easterly from nest site toward waste piles and power poles in northeast portion of Upper Area.

Appendix C

Vegetation Survey

Appendix C

VEGETATION SURVEY

SRMP GUADALUPE DUNES SITE
SANTA BARBARA COUNTY, CALIFORNIA

Submitted to:

C-M ENVIRONMENTAL GROUP, INC.
62 Beaver Run Road
Pinedale, WY 82941
ATTN: Richard Carr III

Submitted by:

Anuja Parikh, Ph.D.
Nathan Gale, Ph.D.
FL*x*
1215 Bajada
Santa Barbara, CA 93109
Tel/FAX: 805-564-1352

June 2008

1. INTRODUCTION

This report documents the results of a preliminary vegetation survey conducted in June 2008 at the Shell Rocky Mountain Production (SRMP) Guadalupe Dunes site, Santa Barbara County, California. The property is located west of the City of Guadalupe at the end of West Main Street, and lies south of the Santa Maria River. The site is about 1.5 km east of the Pacific Ocean. Access to the site is from the Gordon Sand Company property lease to the northeast. The proposed project involves the removal of gravel remaining in the dunes from previous oil extraction facilities.

2. METHODS

FL*x* personnel conducted the rare plant survey on June 17, 2008, accompanied by representatives from Shell, Santa Barbara County, and Gordon Sand Company. A wildlife biologist/monitor also was present during the field survey to ensure that no impacts occurred to sensitive bird species known to occur in the dunes.

The general survey area consists of four parts, designated from east to west as "Upper Area," "Road," "Area 2," and "Site D." The field survey of all four sites was conducted on foot, and the area covered by walking transects when appropriate. During the field visit, vegetation types and plant species associations were noted and their dominant species were recorded. A list of plant species, including rare and commonly occurring plants observed at the site, was compiled (Appendix). Plant community descriptions in this report follow Holland (1986) where applicable; species nomenclature follows Hickman (1993) and Smith (1998).

3. SITE DESCRIPTION AND VEGETATION

The survey area lies in the Guadalupe-Nipomo Dunes complex, and occupies relatively flat terrain on the sand dune ecosystem south of the Santa Maria River. The site previously has been disturbed by oil extraction activities, which no longer occur. Much of the sandy dune system is bare, either due to being part of a natural active dune system, or due to previous disturbance.

Plant species belonging mainly to the coastal dune scrub plant community now are recolonizing parts of each of the four sites. The vegetation is composed primarily of native plants. The cover of non-native species was relatively low in comparison; in particular, the cover of the invasive species iceplant (*Carpobrotus edulis*), narrow-leaved iceplant (*Conicosia pugioniformis*), and veldt grass (*Ehrharta calycina*), was low. Native dominants at the site include dune lupine (*Lupinus chamissonis*), seaside woolly sunflower (*Eriophyllum staechadifolium*), beach evening-primrose (*Camissonia cheiranthifolia* ssp. *cheiranthifolia*), beach-bur (*Ambrosia chamissonis*), and yarrow (*Achillea millefolium*). The non-native species sea rocket (*Cakile maritima*) also was observed at all four sites.

4. RARE PLANT SPECIES

The vegetation survey at the SRMP Guadalupe Dunes site was carried out in June to accommodate the blooming periods of various rare plant species found in the region or known to occur in sand dune ecosystems on the central coast of California.

Five rare plant species were found in the general survey area and are listed below.

Scientific Name	Common Name	Family	Status* Federal/State/CNPS
Erigeron blochmaniae	Blochman's leafy daisy	Asteraceae	-/-/1B.2
Erysimum insulare ssp. *suffrutescens*	Suffrutescent wallflower	Brassicaceae	-/-/4.2
Malacothrix incana	Dunedelion	Asteraceae	-/-/4.3
Monardella crispa	Crisp monardella	Lamiaceae	-/-/1B.2
Senecio blochmaniae	Blochman's groundsel	Asteraceae	-/-/4.2

* - = No listing
1B = California Native Plant Society (CNPS) List 1B, plants rare, threatened, or endangered in California and elsewhere
4 = CNPS List 4, plants of limited distribution, a watch list
0.2 = fairly endangered in California
0.3 = not very endangered in California

The occurrences of these rare plant species in the four different survey sites are documented in the plant species list (Appendix). To summarize, crisp monardella (*Monardella crispa*) was observed most frequently, and was scattered to common at the four sites. Blochman's leafy daisy (*Erigeron blochmaniae*) and Blochman's groundsel (*Senecio blochmaniae*) also were present at all the sites, but both were rare at Site D. Suffrutescent wallflower (*Erysimum insulare* ssp. *suffrutescens*) was common along the Road, but was rare or absent elsewhere. Dunedelion (*Malacothrix incana*) was rare and found only at Site D.

5. REFERENCES

Hickman, J.C. (Editor). 1993. The Jepson Manual, Higher Plants of California. University of California Press, Berkeley, California.

Holland, R.F. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. Unpublished Report. State of California, The Resources Agency, Department of Fish and Game, Natural Heritage Division, Sacramento, California.

Smith, C.F. 1998. A Flora of the Santa Barbara Region, California. Second Edition. Santa Barbara Botanic Garden and Capra Press, Santa Barbara, California.

APPENDIX

PLANT SPECIES LIST
SRMP GUADALUPE DUNES SITE
SANTA BARBARA COUNTY, CALIFORNIA

PLANT SPECIES LIST
SRMP GUADALUPE DUNES SITE, SANTA BARBARA COUNTY, CALIFORNIA

Scientific Name	Common Name	Origin	Plant Form	Occurrence			
				Upper Area	Road	Area 2	Site D
Abronia latifolia	Yellow sand verbena	N	PH	✓	✓		✓
Achillea millefolium	Yarrow	N	PH	✓	✓	✓	✓
Ambrosia chamissonis	Beach-bur	N	PH	✓	✓	✓	✓
Amsinckia menziesii var. *intermedia*	Rancher's fireweed	N	AH	✓			
Baccharis pilularis	Coyote bush	N	PS	✓			
Bromus diandrus	Ripgut grass	Nn	AG	✓			
Bromus madritensis ssp. *rubens*	Red brome	Nn	AG	✓	✓		
Cakile maritima	Sea rocket	Nn	AH	✓	✓	✓	✓
Camissonia cheiranthifolia ssp. *cheiranthifolia*	Beach evening-primrose	N	PH	✓	✓	✓	✓
Carpobrotus edulis	Iceplant	NnI	PSs		✓	✓	✓
Castilleja affinis ssp. *affinis*	Indian paintbrush	N	PH		✓		
Cirsium occidentale var. *occidentale*	Cobweb thistle	N	PH		✓		
Conicosia pugioniformis	Narrow-leaved iceplant	NnI	PSs	✓	✓		
Conyza canadensis	Horseweed	N	AH	✓			
Cryptantha clevelandii	Cleveland's cryptantha	N	AH	✓			
Cryptantha ?leiocarpa	Cryptantha	N	AH	✓			
Dudleya lanceolata	Dudleya	N	PH		✓		
Ehrharta calycina	Veldt grass	NnI	PG	✓	✓		✓
Equisetum laevigatum	Smooth scouring rush	N	PH	✓			
Ericameria ericoides	Mock heather	N	PS	✓	✓	✓	
Erigeron blochmaniae ■	Blochman's leafy daisy	N	PSs	S	C	S	R
Eriophyllum staechadifolium	Seaside woolly sunflower	N	PSs	✓	✓	✓	✓
Erodium cicutarium	Red-stemmed filaree	Nn	AH	✓			
Erysimum insulare ssp. *suffrutescens* ■	Suffrutescent wallflower	N	PSs	R	C		
Gnaphalium bicolor	Bicolored everlasting	N	PH		✓		
Gnaphalium stramineum	Annual everlasting	N	AH			✓	
Heterotheca grandiflora	Telegraph weed	N	AH, PH	✓			
Hirschfeldia incana	Perennial mustard	Nn	PH	✓			
Lessingia filaginifolia var. *filaginifolia*	California-aster	N	PSs		✓		
Lotus scoparius var. *scoparius*	Deerweed	N	PSs		✓		
Lupinus chamissonis	Dune lupine	N	PS	✓	✓	✓	✓
Malacothrix incana ■	Dunedelion	N	PH				R
Melilotus indica	Sourclover	Nn	AH	✓	✓		
Monardella crispa ■	Crisp monardella	N	PH	C	S	S	S
Phacelia ramosissima var. *austrolittoralis*	Shrubby phacelia	N	PH	✓		✓	
Senecio blochmaniae ■	Blochman's groundsel	N	PSs	S	S	S	R
Sonchus asper ssp. *asper*	Prickly sow thistle	Nn	AH	✓	✓		
Vulpia myuros var. *hirsuta*	Rattail fescue	Nn	AG	✓	✓		

PLANT SPECIES LIST
SRMP GUADALUPE DUNES SITE, SANTA BARBARA COUNTY, CALIFORNIA

NOTES

▪	Sensitive plant species (refer to text for status).
Origin	N = Native; Nn = Non-native (excluding invasive species); NnI = Non-native invasive.
Plant Form	Life cycle: A = Annual; P = Perennial (including biennial); U = Unknown. Growth habit: H = Herb; G = Grass; Ss = Subshrub; S = Shrub.
Occurrence	C = Common; S = Scattered; R = Rare.

RARE PLANT SURVEYS

SRMP GUADALUPE DUNES SITE
SANTA BARBARA COUNTY, CALIFORNIA

Submitted to:

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August 2010

1. INTRODUCTION

This report documents the results of rare plant surveys conducted in July 2010 at the Shell Rocky Mountain Production (SRMP) Guadalupe Dunes site, Santa Barbara County, California. A preliminary vegetation and rare plant survey at the property had been conducted in June 2008, and documented in a previous report. Five rare plant species were observed at the site. The purpose of the 2010 surveys was to compile counts of these species within proposed impact areas of the project.

The SRMP Guadalupe Dunes property is located west of the City of Guadalupe at the end of West Main Street, and lies south of the Santa Maria River. The site is about 1.5 km east of the Pacific Ocean. Access to the site is from the Gordon Sand Company property lease to the northeast. The proposed project involves the removal of gravel remaining in the dunes from previous oil extraction facilities.

2. METHODS

FL*x* personnel conducted the rare plant surveys on July 29 and 30, 2010, accompanied by representatives from Shell, Santa Barbara County, and Gordon Sand Company. A wildlife biologist/monitor also was present during the field surveys to ensure that no impacts occurred to sensitive bird species known to occur in the dunes.

The general survey area consists of four parts, designated from east to west as "Upper Area," "Road," "Area 2 (Santa Barbara County property and Gordon Sand property)," and "Site D." The field survey of all four sites was conducted on foot, and the area covered by walking transects when appropriate. Counts of each rare plant species were prepared by impact area for each portion of the SRMP property. Concurrently, a list of plant species, including rare and commonly occurring plants observed at the site, was compiled (Appendix).

Plant community descriptions in this report follow Holland (1986) where applicable; species nomenclature follows Hickman (1993) and Smith (1998).

3. SITE DESCRIPTION AND VEGETATION

The survey area lies in the Guadalupe-Nipomo Dunes complex, and occupies relatively flat terrain on the sand dune ecosystem south of the Santa Maria River. The site previously has been disturbed by oil extraction activities, which no longer occur. Much of the sandy dune system is bare, either due to being part of a natural active dune system, or due to previous disturbance. Since the first survey in 2008, the dune topography has changed considerably due to the deposition of wind-blown sand, particularly in the Upper Area.

Plant species belonging mainly to the coastal dune scrub plant community are recolonizing parts of each of the four sites. The vegetation is composed primarily of native plants. Dominants at the site include dune lupine (*Lupinus chamissonis*), seaside woolly sunflower (*Eriophyllum staechadifolium*), beach-bur (*Ambrosia chamissonis*), beach evening-primrose (*Camissonia cheiranthifolia* ssp. *cheiranthifolia*), yarrow (*Achillea millefolium*), and shrubby phacelia (*Phacelia ramosissima* var. *austrolittoralis*). The cover of non-native species was relatively low in comparison; in particular, the cover of the invasive species iceplant

(*Carpobrotus edulis*), narrow-leaved iceplant (*Conicosia pugioniformis*), and veldt grass (*Ehrharta calycina*), was low. The non-native species sea rocket (*Cakile maritima*) also was observed at most of the sites.

4. RARE PLANT SPECIES

The rare plant surveys at the SRMP Guadalupe Dunes site were carried out in July to accommodate the blooming periods of various rare plant species found in the region or known to occur in sand dune ecosystems on the central coast of California.

Five rare plant species were found in the general survey area and are listed below.

Scientific Name	Common Name	Family	Status* Federal/State/CNPS
Erigeron blochmaniae	Blochman's leafy daisy	Asteraceae	-/-/1B.2
Erysimum insulare ssp. *suffrutescens*	Suffrutescent wallflower	Brassicaceae	-/-/4.2
Malacothrix incana	Dunedelion	Asteraceae	-/-/4.3
Monardella crispa	Crisp monardella	Lamiaceae	-/-/1B.2
Senecio blochmaniae	Blochman's groundsel	Asteraceae	-/-/4.2

* - = No listing
1B = California Native Plant Society (CNPS) List 1B, plants rare, threatened, or endangered in California and elsewhere
4 = CNPS List 4, plants of limited distribution, a watch list
0.2 = fairly endangered in California
0.3 = not very endangered in California

The occurrences of these rare plant species in the four different survey sites are documented in the plant species list (Appendix). To summarize, crisp monardella (*Monardella crispa*) was observed most frequently, and was relatively common at the four sites. Blochman's leafy daisy (*Erigeron blochmaniae*) was scattered to common in the survey area, and was rare at Site D. Blochman's groundsel (*Senecio blochmaniae*) was scattered at all the sites. Suffrutescent wallflower (*Erysimum insulare* ssp. *suffrutescens*) was common along the Road, but was rare or absent elsewhere. Dunedelion (*Malacothrix incana*) was rare and found only along the Road and at Site D.

The table below summarizes the counts of the individual species within the impact areas at the four sites on the SRMP Guadalupe Dunes property.

Scientific Name	Common Name	Number of Plants Counted Inside the Impact Area				
		Upper Area	Road	Area 2		Site D
				SB County property	Gordon Sand property	
Erigeron blochmaniae	Blochman's leafy daisy	23	390	14	10	2
Erysimum insulare ssp. *suffrutescens*	Suffrutescent wallflower	0	569	0	1	0
Malacothrix incana	Dunedelion	0	1	0	0	0
Monardella crispa	Crisp monardella	165	654	173	231	171
Senecio blochmaniae	Blochman's groundsel	61	41	34	79	11

5. RECOMMENDATIONS

We recommend that wherever possible during implementation of project activities, dune topsoil with existing native vegetation (but without gravel material) should be salvaged and stockpiled. It is likely that this soil contains a valuable seed bank of native and rare plants. The soil stockpiles could be stored in areas relatively protected from the wind, and/or covered with soil stabilizing material such as jute netting. Following completion of the removal of gravel, the salvaged topsoil should be redeposited in the project area. The methods and locations for redistribution of this soil can be developed in the future based upon final post-project topographic contours. It may be preferable to replace the soil in shallow mounds or ridges to mimic natural dune topography, rather than distributing it in a uniform layer over the sites.

Seeds of native plants, particularly the rare plant species impacted during the project, also should be collected locally on the site before and during project activities, and within the appropriate collecting periods for the various plant species. Specifically, the following rare species may be collected, since they will be impacted directly: crisp monardella (*Monardella crispa*), Blochman's leafy daisy (*Erigeron blochmaniae*), Blochman's groundsel (*Senecio blochmaniae*), and suffrutescent wallflower (*Erysimum insulare* ssp. *suffrutescens*). Other native species that also may be collected include beach-bur (*Ambrosia chamissonis*), beach evening-primrose (*Camissonia cheiranthifolia* ssp. *cheiranthifolia*), seaside woolly sunflower (*Eriophyllum staechadifolium*), shrubby phacelia (*Phacelia ramosissima* var. *austrolittoralis*), and yarrow (*Achillea millefolium*). Specific seed mix proportions and the identification of seeding locations can be defined later, based upon the availability of seed from various species, and final post-project topography.

6. REFERENCES

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APPENDIX

PLANT SPECIES LIST, 2010 SURVEYS
SRMP GUADALUPE DUNES SITE
SANTA BARBARA COUNTY, CALIFORNIA

PLANT SPECIES LIST, 2010 SURVEYS
SRMP GUADALUPE DUNES SITE, SANTA BARBARA COUNTY, CALIFORNIA

Scientific Name	Common Name	Origin	Plant Form	Occurrence				
				Upper Area	Road	Area 2		Site D
						SB	GS	
Abronia latifolia	Yellow sand verbena	N	PH		✓		✓	✓
Achillea millefolium	Yarrow	N	PH	✓	✓	✓	✓	✓
Ambrosia chamissonis	Beach-bur	N	PH	✓	✓	✓	✓	✓
Artemisia californica	California sagebrush	N	S		✓			
Baccharis pilularis	Coyote bush	N	PS		✓			
Bromus diandrus	Ripgut grass	Nn	AG		✓			
Bromus madritensis ssp. *rubens*	Red brome	Nn	AG	✓	✓	✓		
Cakile maritima	Sea rocket	Nn	AH		✓	✓	✓	✓
Camissonia cheiranthifolia ssp. *cheiranthifolia*	Beach evening-primrose	N	PH		✓	✓	✓	✓
Carpobrotus edulis	Iceplant	NnI	PSs		✓	✓	✓	✓
Castilleja affinis ssp. *affinis*	Indian paintbrush	N	PH		✓			
Centaurea melitensis	Tocalote	Nn	AH		✓			
Cirsium occidentale var. *occidentale*	Cobweb thistle	N	PH		✓			
Conicosia pugioniformis	Narrow-leaved iceplant	NnI	PSs		✓			
Croton californicus	California croton	N	PH		✓			
Cryptantha leiocarpa	Cryptantha	N	AH		✓			
Dudleya lanceolata	Dudleya	N	PH		✓			
Ehrharta calycina	Veldt grass	NnI	PG		✓			
Ericameria ericoides	Mock heather	N	PS		✓	✓	✓	
Erigeron blochmaniae ■	Blochman's leafy daisy	N	PSs	S	C	S	S	R
Eriophyllum staechadifolium	Seaside woolly sunflower	N	PSs	✓	✓	✓	✓	✓
Erysimum insulare ssp. *suffrutescens* ■	Suffrutescent wallflower	N	PSs		C		R	R
Gnaphalium bicolor	Bicolored everlasting	N	PH	✓	✓			
Gnaphalium stramineum	Annual everlasting	N	AH			✓		
Lessingia filaginifolia var. *filaginifolia*	California-aster	N	PSs		✓			
Lupinus chamissonis	Dune lupine	N	PS	✓	✓	✓	✓	✓
Malacothrix incana ■	Dunedelion	N	PH		R			R
Melilotus indica	Sourclover	Nn	AH		✓			
Monardella crispa ■	Crisp monardella	N	PH	C	C	C	C	C
Phacelia ramosissima var. *austrolittoralis*	Shrubby phacelia	N	PH	✓	✓	✓	✓	
Senecio blochmaniae ■	Blochman's groundsel	N	PSs	S	S	S	S	S
Sonchus oleraceus	Common sow thistle	Nn	AH		✓			
Vulpia myuros var. *hirsuta*	Rattail fescue	Nn	AG			✓		

PLANT SPECIES LIST, 2010 SURVEYS
SRMP GUADALUPE DUNES SITE, SANTA BARBARA COUNTY, CALIFORNIA

NOTES

▪ Sensitive plant species (refer to text for status).

Origin N = Native; Nn = Non-native (excluding invasive species); NnI = Non-native invasive.

Plant Form Life cycle: A = Annual; P = Perennial (including biennial); U = Unknown.
Growth habit: H = Herb; G = Grass; Ss = Subshrub; S = Shrub.

Occurrence **Area 2:**
SB = Santa Barbara County property; **GS** = Gordon Sand (private) property.

C = Common; S = Scattered; R = Rare.

Appendix D

Guadalupe Dunes Pilot Screen Test

Appendix D

GUADALUPE DUNES PILOT SCREEN TEST

A Pilot Project to test both dry and wet screen methods for cleanup of gravel-contaminated dune sands was carried out on the former Shell/Husky Guadalupe Dunes site in Guadalupe, California. The pilot project was designed to help determine:

1. "Cut point" and "efficiency factor" (Reclamation specification)
2. Projected rate of production (tons per hour)
3. Conditional acceptance of the reclamation process (proposed flow sheet)
4. Side effects of the finer foreign aggregate and silt retentions (quantitative)
5. Other physical factors which may not have been identified or addressed
6. Cost effectiveness of the methods tested

Additionally, this "pilot" project would yield "typical production" of reclaimed sand which should accurately reflect the reclaimed sand characteristics obtainable in a full scale operation.

Bulk Sample Extraction

On October 12 and 13, 2005, two bulk samples were extracted from the gravel-contaminated sites using a CAT 966-F loader. The samples were approximately 200 tons (160 cu yds) each, and were labeled as Bulk Sample "S" and Bulk Sample "C". Bulk Sample "S" was taken from the Site D Dunes area only; Bulk Sample "C" was a composite from five individual sites, including Site D (see attached map):

- C1 = Site D Dunes area (old Husky drill pad location); this is also the "S1-S5" sample location.
- C2 = Area 2 - previous screen location for 1997 cleanup attempt, on Gordon Sand property at pit entrance.
- C3 = Pile along road, near Ten Commandments hill.
- C4 = Upper Area – previous screen location for 1997 cleanup attempt.
- C5 = Upper Area – roadway.

The sample method consisted of 40 bucket loads for each sample, taken in the following sequence (each bucket load recorded as shown):

- 1S1 – from Site D Dunes area along a flagged location for a sample cut; this location was selected to sample across the main gravel contaminated area as indicated by the 2002-03 sampling.
- 1S2 – same location as above
- 1S3 – same location as above
- 1S4 – same location as above
- 1S5 – same location as above
- 1C1 – same location as above
- 1C2 – from C2 location
- 1C3 – from C3 location

- 1C4 – from C4 location
- 1C5 – from C5 location
- [Repeat the sequence for 2S1-2S5, 2C1-2C5, then 3S1-3S5, 3C1-3C5, etc. through 8 cycles (8C5 is last bucket load taken)]

The "S" and "C" bucket loads were deposited on the "S" and "C" bulk sample piles, respectively. The bulk sample piles were then covered with plastic and staked down, awaiting the screen testing. All five sample site locations were mapped with a Trimble Geo-XT GPS unit.

Bulk Sample Screen Test – February/March, 2007

A series of dry and wet screen test runs was carried out using an ASTEC Mobile Screens 2618VM Double Deck High Frequency Vibrating screen unit between February 20 and March 14, 2007. This double screen deck has three screen panels on the first (top) deck and two on the second (lower) deck. Various screen configurations were tested on both decks. Runs #1 through #12 were used to tune and test the screen setup with various gravel-contaminated materials from available waste piles, prior to testing the Bulk Samples. Six test runs were used to collect data for the Pilot Test: #13, 14, 18, 19, 23 and 24. The purpose of the Pilot Test was to determine the feasibility of dry or wet screening the gravel-contaminated dune sands, and the most efficient, if any, method to use for a final cleanup attempt.

Dry Screen Tests

The flow sheet for the dry screen tests is shown in attached figure. Feed material enters the feed hopper, drops through a gate onto the first conveyor, where it is taken to the power screen (PS II). The PS II screen scalps off the grossly oversize material before it reaches the upper screen deck and damages the screens. The material then loads onto the second conveyor, which deposits it onto the first (top) screen deck. Oversize from this deck are collected (for the test) as "1st Overs" (1+). Undersize material falls through the upper screens onto the second deck. Oversize from this deck are collected as "2nd Overs (2+) and undersize material falls through the screens onto the stacker conveyor, which stacks the product "2nd Unders" (2-) in a cone pile. All sample collection bags were weighed and the volume of the product cone calculated by measuring the cone height and angle of repose for each dry test run. The 2nd Overs (2+) and 2nd Unders (2-) bags were sampled directly for sieve testing. The PS II oversize (PS II+) and 1st Overs (1+) material was too coarse to sample directly, so these bags were later coned and quartered to reduce sample size to approximately 50 lbs, then scalped using a vibrating separator with US#8 mesh and 7/16" screens; the –US#8 mesh material from this was sampled for sieve testing. The object of the dry screen test sampling was to help determine the efficiency of the dry screen method with the various screen configurations tested. In actual operations, the 2nd Overs (2+) material and much of the 1st Overs (1+) material would need to be recycled through the system again, since undersize material makes up too high a proportion of these discharge points.

Samples taken during the Dry Tests include:

- Feed Sample
- PS II Overs (PS II+)
- 1st Overs (1+)
- 2nd Overs (2+)
- 2nd Unders (2-)

Wet Screen Tests

The flow sheet for the wet screen tests is shown in Figure 3. With the exception of the water sprays, the wet screen configuration is identical to the dry tests up to the point of the discharge of the 2nd Unders (2-) material. In the wet configuration, this material along with the process water is transported directly to the Eagle dehydrator, where most of it is dehydrated and discharged as "Eagle Unders". The Eagle Overs, containing fine sand, silt and clay are then pumped into the mid-section of the 6-W Separator (Hydrocyclone) which creates an internal vortex resulting in two discharges: the top discharge is dirty water, clays and silts, and the bottom discharge is a 50% slurry of fine sand and dirty water. This recovers about 99% of the fine sand from the Eagle Overs. The Hydrocylone Unders are dropped back into the Eagle "above the tub" to be dehydrated down to 90% solids. The Hydrocyclone Overs are returned to the Second Chamber of the Slurry Tank to both supplement the Slurry Pump as needed and to discharge into the Pond for settlement of the clays. During actual operations, the Settlement Pond would be replaced by a Mud Tank (4-W) which would recirculate the dirty water from the Hydrocyclone resulting in:

a) Some accumulation of mud (silt and clay) in the Mud Tank, which will need to be cleaned out periodically – the Wet Test sampling is designed to estimate the anticipated volume of this material;
b) Some retention of silt and clay in the Reclaimed Dune Sand. Gordon Sand Company tests over the years indicate that there is about 2.0% clay on the native dune sand and that about 50% of this (1% of total) can be washed off in a normal wash process. The rest substantially stays on the final product.

Screen Deck Setups

Two pairs (S and C material) of dry screen tests were run. Runs 13 and 14 used #12 and 10mm screen configurations. Runs 23 and 24 used a screen and deck setup recommended by the ASTEC representatives, who were visiting the site during the first dry screen runs.

One wet screen test pair was run: Runs 18 and 19 used the same screen and deck setup as the first dry screen runs (13 and 14), but with 20 psi water spray nozzles (455 gpm total) installed above the screen decks, as well as the added dehydrator and slurry setup described above. The various test run configurations are listed below:

- Run #13 – dry screen test
  - "S" bulk sample material
  - Top (1st) deck:
    - first panel - #12 screen
    - second panel – 10mm screen

        - third panel - 10mm screen
    - Lower (2nd) deck:
        - first panel - #12 screen
        - second panel - #12 screen
    - Screen deck tilt angle = 35°
    - Length of test = 33.68 minutes
    - Feed material = 56,728 lbs

- Run #14 – dry screen test
    - "C" bulk sample material
    - Top (1st) deck:
        - first panel - #12 screen
        - second panel – 10mm screen
        - third panel - 10mm screen
    - Lower (2nd) deck:
        - first panel - #12 screen
        - second panel - #12 screen
    - Screen deck tilt angle = 35°
    - Length of test = 11.8 minutes
    - Feed material = 18,200 lbs

- Run #18 – wet screen test
    - "C" bulk sample material
    - Top (1st) deck:
        - first panel - #12 screen
        - second panel – 10mm screen
        - third panel - 10mm screen
    - Lower (2nd) deck:
        - first panel - #12 screen
        - second panel - #12 screen
    - Screen deck tilt angle = 35°
    - Length of test = 15.6 minutes
    - Feed material = 99,000 lbs

- Run #19 – wet screen test
    - "S" bulk sample material
    - Top (1st) deck:
        - first panel - #12 screen
        - second panel – 10mm screen
        - third panel - 10mm screen
    - Lower (2nd) deck:
        - first panel - #12 screen
        - second panel - #12 screen
    - Screen deck tilt angle = 35°
    - Length of test = 15.03 minutes
    - Feed material = 108,000 lbs

- Run #23 – dry screen test
    - "S" bulk sample material
    - Top (1st) deck:

        - first panel - #10x2" slotted screen
        - second panel – 3/16"x1/2" slotted screen
        - third panel - 3/16"x1/2" slotted screen
    - Lower (2nd) deck:
        - first panel - #12x2" slotted screen trilock
        - second panel - #12x2" slotted screen trilock
    - Screen deck tilt angle = 40.5°
    - Length of test = 12.71 minutes
    - Feed material = 36,840 lbs

- Run #24 – dry screen test
    - "C" bulk sample material
    - Top (1st) deck:
        - first panel - #10x2" slotted screen
        - second panel – 3/16"x1/2" slotted screen
        - third panel - 3/16"x1/2" slotted screen
    - Lower (2nd) deck:
        - first panel - #12x2" slotted screen trilock
        - second panel - #12x2" slotted screen trilock
    - Screen deck tilt angle = 40.5°
    - Length of test = 11.5 minutes
    - Feed material = 30,560 lbs

Sample Processing

All samples were processed at the Gordon Sand Company Guadalupe facility. Samples collected and processed during the Pilot Tests include:

- Feed Sample – sampled from bulk sample pile
    - dry sieve tests
- PS II Overs (PS II+)
    - Cone and quarter to ~50 lb sample
    - Scalp sample with vibrating separator
        - +US#8 mesh material weighed
        - –US#8 mesh material weighed and split down to ~100 gm sample
            - dry sieve tests
- 1st Overs (1+)
    - Cone and quarter to ~50 lb sample
    - Scalp sample with vibrating separator
        - +US#8 mesh material weighed
        - –US#8 mesh material weighed and split down to ~100 gm sample
            - dry sieve tests
- 2nd Overs (2+)
    - Dry runs #13, 14, 23, 24 – sampled directly from bags
        - dry sieve tests
    - Wet runs #18 and 19
        - Cone and quarter to ~50 lb sample

        - Scalp sample with vibrating separator
            - +US#8 mesh material weighed
            - –US#8 mesh material weighed and split down to ~100 gm sample
                - dry sieve tests

- Eagle Unders – sampled directly from discharge cone
    - dry sieve tests
- Hydrocyclone Unders – sampled water in 5L bottles???
    - dry sieve tests
- Eagle Overs – sampled water in 5L bottles from Eagle CEC washer tub surface
    - Solids allowed to settle in graduated cylinder to obtain clay/sand proportions and total amounts
    - Wet sieve tests of solids
- Slurry Overs – sampled water in 5L bottles (x2) from Second Chamber of Slurry Tank
    - Solids allowed to settle in graduated cylinder to obtain clay/sand proportions and total amounts
    - Wet sieve tests of solids

Demonstration Boxes – June, 2007

Six bulk bags of product material from the best dry and wet test runs were retained for construction of a "Demo Box" to observe the wind effects over time on the screened material. Four Demo Boxes were constructed on the dunes, near the Site D Dunes location, north of the Gordon Sand Company pit. The boxes are made of 2" x 8" boards, 8ft square, open at the bottom and top. The top edge of the boxes protruded about 1-2 inches above the surrounding sand surface when constructed. The product sand material inside the boxes were compacted, leveled to the top edge of the 2x8's and lightly raked. The boxes were oriented to avoid contamination between boxes, based on the predominant wind direction. From west to east, the boxes are: Run #24, #19, #23, #18.

Photos of the Demo Box construction on June 19, 2007 and of the results as of December 12, 2007 are shown in attached figures.

GUADALUPE PILOT TEST SUMMARY

	Run 13	Run 14	Run 18	Run 19	Run 23	Run 24
Test Date	2/24/2007	2/24/2007	3/10/2007	3/10/2007	3/14/2007	3/14/2007
Test Type (Dry or Wet)	Dry	Dry	Wet	Wet	Dry	Dry
Sample Type	S	C	C	S	S	C
Total Feed lbs	56714	18212	99000	107994	36847	30548
Test Duration (minutes)	33.68	11.8	15.6	15.03	12.71	11.5
Feed Tons per Hour	**50.5**	**46.3**	**190**	**216**	**87.0**	**79.7**
PS II Power Screen						
lbs Total	97	202	1368	2634	100	197
% of Total Feed	0.17%	1.11%	1.38%	2.44%	0.27%	0.64%
lbs +US#12 mesh	14.2	74.9	242.7	69.7	6.4	66.1
% of Total Feed	0.03%	0.41%	0.25%	0.06%	0.02%	0.22%
PS II Power Screen Efficiency	14.6%	37.1%	17.7%	2.6%	6.4%	33.6%
Top Screen Deck						
Panel 1	#12	#12	#12	#12	#10x2"	#10x2"
Panel 2	10mm	10mm	10mm	10mm	3/16"x1/2"	3/16"x1/2"
Panel 3	10mm	10mm	10mm	10mm	3/16"x1/2"	3/16"x1/2"
1st Overs						
lbs Total	383	1945	379	257	239	258
% of Total Feed	0.68%	10.7%	0.38%	0.24%	0.65%	0.84%
lbs +US#12 mesh	322.6	235.6	327.5	256.7	194.7	90.3
% of Total Feed	0.57%	1.29%	0.33%	0.24%	0.53%	0.30%
1st Screen Deck Efficiency	84.2%	12.1%	86.4%	99.9%	81.5%	35.0%
Bottom Screen Deck						
Panel 1	#12	#12	#12	#12	#12x2"	#12x2"
Panel 2	#12	#12	#12	#12	#12x2"	#12x2"
2nd Overs						
lbs Total	2654	4265	368	422	5448	6333
% of Total Feed	4.7%	23.4%	0.4%	0.4%	14.8%	20.7%
lbs +US#12 mesh	61.1	42.9	364.2	413.2	149.3	513.4
% of Total Feed	0.11%	0.24%	0.37%	0.38%	0.41%	1.68%
2nd Screen Deck Efficiency	2.3%	1.0%	99.0%	97.9%	2.7%	8.1%
2nd Unders/Eagle Unders						
lbs Total	53580	11800	96900	104680	31060	23760
% of Total Feed	94.5%	64.8%	97.9%	96.9%	84.3%	77.8%
lbs +US#12 mesh*	0	0	55.3	153.8	9.9	6.7
% of Total Feed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Preliminary Test Efficiency	**95.1%**	**66.1%**	**98.8%**	**97.6%**	**85.1%**	**79.5%**
% +US#12 mesh gravel of Total Feed	0.70%	1.94%	1.00%	0.83%	0.98%	2.21%

Clay Content Estimate at Discharge Points						
Calc. lbs Total in 2nd Unders/ Eagle Unders (="pan" in sieve tests)	107	30	124	131	63	45
% of Total Feed	0.19%	0.16%	0.13%	0.12%	0.17%	0.15%
Calc. lbs Total in Slurry Overs*			571	447		
% of Total Feed			0.58%	0.41%		
Total Calc. Clay Discharge - % of Total Feed	0.19%	0.16%	0.70%	0.53%	0.17%	0.15%

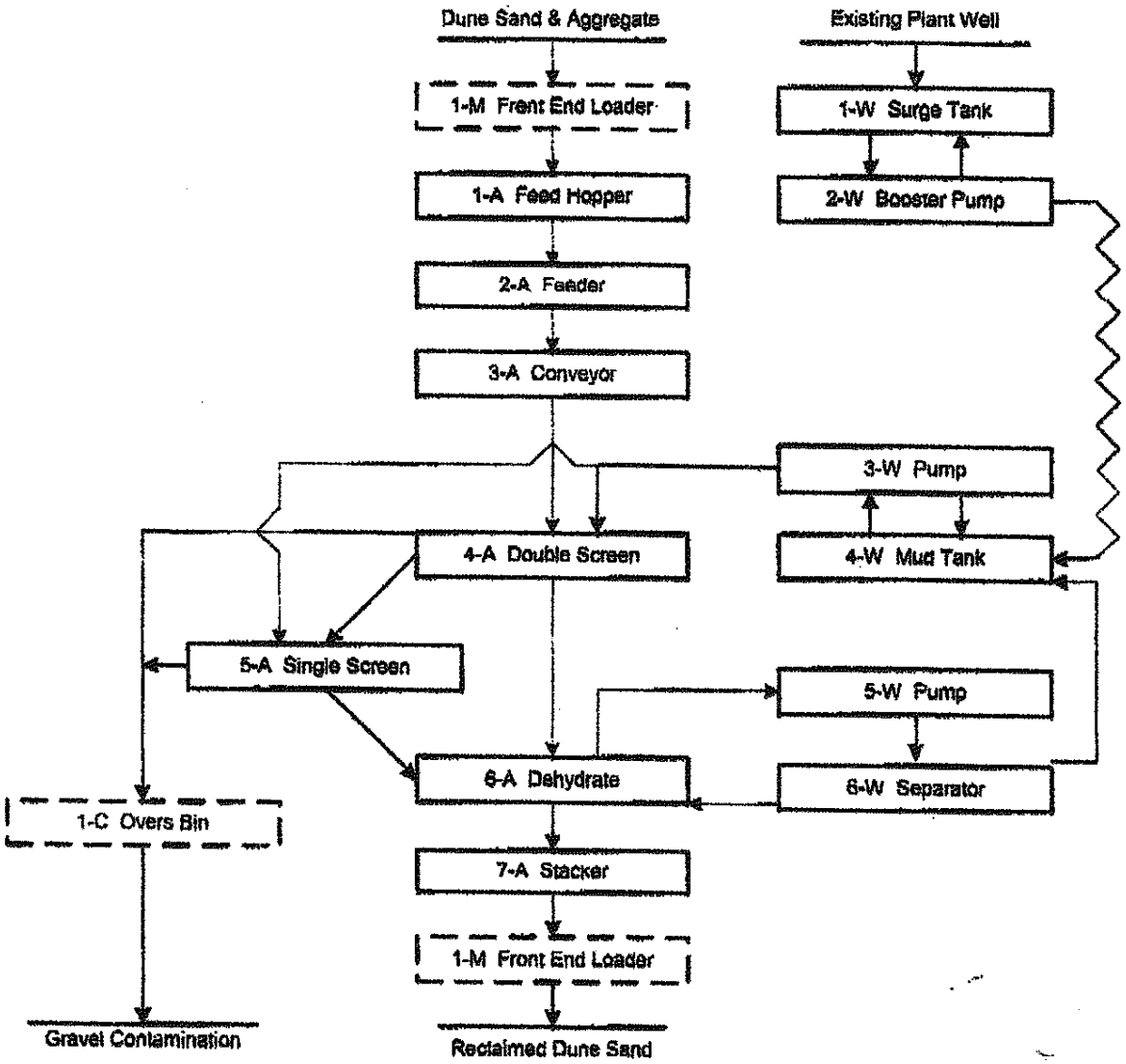
* average of multiple samples

GORDON SAND COMPANY

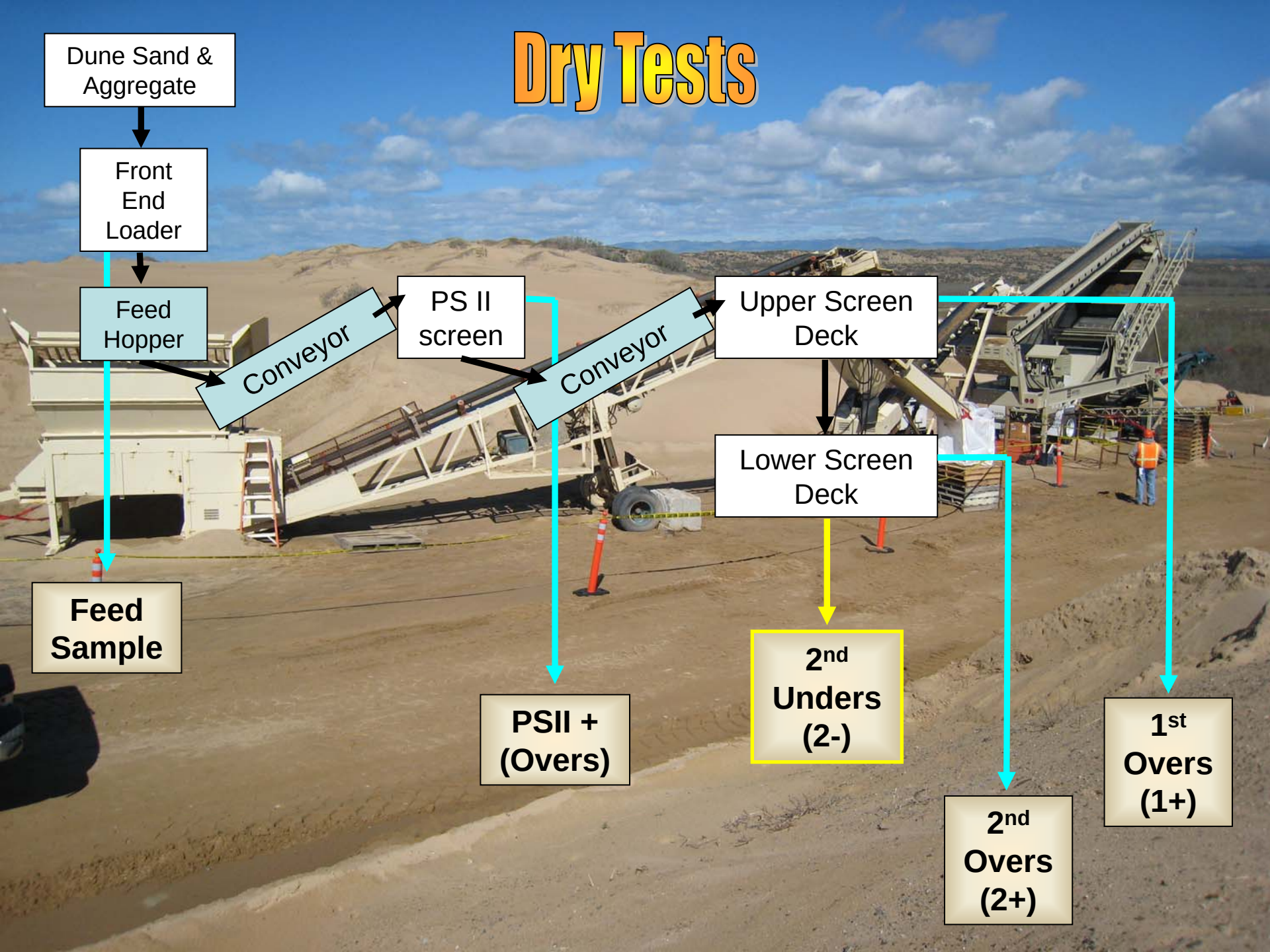
Guadalupe Dunes

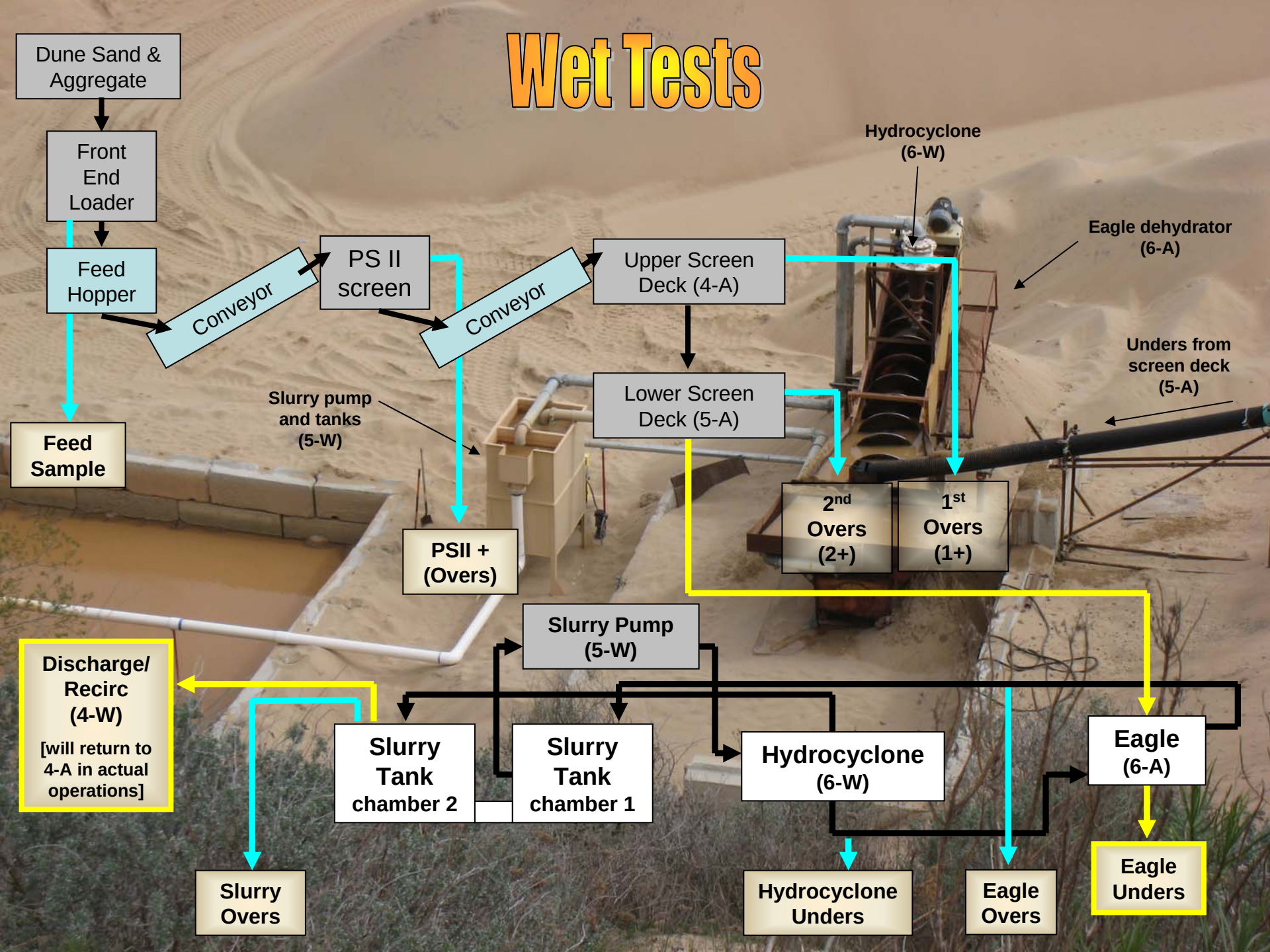
Reclamation Flow Sheet

June 18, 2004



By


Dry Tests
Dune Sand & Aggregate
Front End Loader
Feed Hopper
Conveyor
PS II screen
Conveyor
Upper Screen Deck
Lower Screen Deck
Feed Sample
PSII + (Overs)
2nd Unders (2-)
2nd Overs (2+)
1st Overs (1+)


Wet Tests
Dune Sand & Aggregate
Front End Loader
Feed Hopper
Conveyor
PS II screen
Conveyor
Upper Screen Deck (4-A)
Lower Screen Deck (5-A)
Hydrocyclone (6-W)
Eagle dehydrator (6-A)
Unders from screen deck (5-A)
Slurry pump and tanks (5-W)
Feed Sample
PSII + (Overs)
2nd Overs (2+)
1st Overs (1+)
Slurry Pump (5-W)
Discharge/ Recirc (4-W)
[will return to 4-A in actual operations]
Slurry Tank chamber 2
Slurry Tank chamber 1
Hydrocyclone (6-W)
Eagle (6-A)
Slurry Overs
Hydrocyclone Unders
Eagle Overs
Eagle Unders


ASTEC
MOBILE SCREENS
1st overs (1+)
2nd overs (2+)
2nd unders (2-)
Run #24


Uncovering bulk samples

Dry Tests

Feb/Mar 2008


Power screen (PS II)

2nd unders discharge to Eagle dehydrator

Wet Tests

March 10, 2008

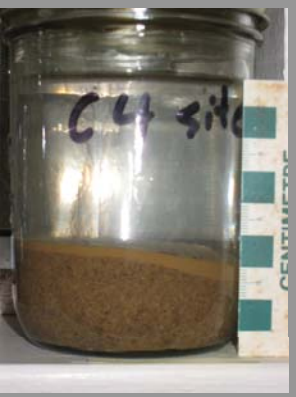
(photos are of equipment, not the tests)

“S” bulk sample
(=C1 site)

“C” bulk sample

“C2” site

“C3” site



“C4” site

“C5” site
(road)

“Blank”
(uncontaminated
dune sand)

Relative Clay Contents

Cone and quarter
sample size reduction

Reduced sample size - ~50lbs each

Sample Processing

Scalping: +US#8 and –US#8 mesh

Wet sieve setup for clay/fines

Bulk Sample Extraction
Site D - Dunes area

Oct 13-14, 2005

C2 sample site

C3 sample site

C4 sample site

C5 sample site (roadway)

Bulk Sample Extraction
C2-C5 sample sites

Oct 13-14, 2005

Bulk sample storage (S sample pile)

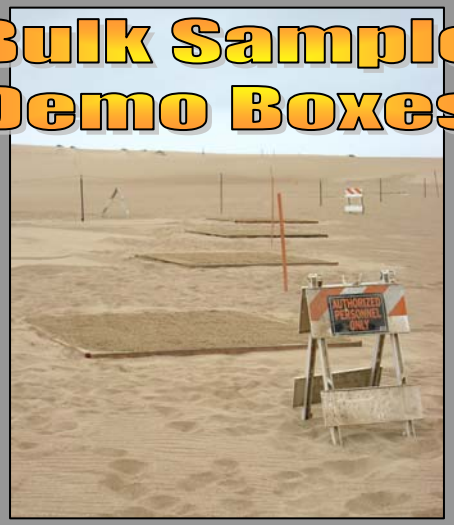
June 19, 2007

June 19, 2007

June 19, 2007

June 19, 2007

Bulk Sample Demo Boxes



June 19, 2007

December 12, 2007

December 12, 2007