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INTERNATIONAL TECHNOLOGY CORPORATION

August 1993

Site Walk Report

Site 11 - Hillside East of Dry Dock 1
Long Beach Naval Shipyard
Long Beach, California

Contract No. N47408-92-D-3056
Delivery Order No. 0007

Prepared for:
Naval Construction Battalion Center
Naval Facilities Engineering Command
NAVFAC Contracts Office, Code 27233, Building 90
Port Hueneme, California 93043-5000

Prepared by:
IT Corporation
2790 Mosside Boulevard
Monroeville, Pennsylvania 15146-2792

RESPONSIVE TO THE NEEDS OF ENVIRONMENTAL MANAGEMENT

INTERNATIONAL TECHNOLOGY CORPORATION

12 August 1993

305924-ITNHO-002

Ms. Lolita Batis
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NAVFACCO, Building 90
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Contract: N47408-92-D-3056-0005
Paints and Solvents
Site 11 - Hillside East of Drydock 1
Long Beach Naval Shipyard
Long Beach, California

Subject: Delivery of - CDRL A0001, Site Walk Trip Report

Dear Ms. Batis:

IT Corporation is pleased to submit the enclosed deliverable report for the Long Beach Shipyard Site Walk Trip Report. This is CDRL Deliverable Number A0001 - Trip Report. The Trip Report includes a video tape and an evaluation of alternatives and recommendations. This effort was performed in accordance with the Request for Issuance of a Modification to Delivery Order Number 0007 (305924-ITNHO-001).

Should you have questions, please contact the undersigned at (412) 372-7701.

Sincerely,

James Franklin FOR

Earl R. Seeber, Jr.
Chief, Contract Administrator

ERS/JJF:eab
Enclosure: Deliverable

cc: J. Jeffrey, NEESA Code 112E4
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Contract File

SD/08-93/WP:neesa/30592419.L1

SITE WALK REPORT
SITE 11 - HILLSIDE EAST OF DRYDOCK 1
LONG BEACH NAVAL SHIPYARD
LONG BEACH, CALIFORNIA

Contract No. N47408-92-D-3052
Delivery Order 0007

Prepared For

NAVAL CONSTRUCTION BATTALION CENTER
Naval Facilities Engineering Command
Contracts Office, Code 27238, Building 90
Port Hueneme, California 93043-5000

Prepared By

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August 1993

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1.0 Introduction

In response to Delivery Order 007 under Contract N47408-92-D-3056, IT Corporation (IT) performed a site visit of Site 11 - Hillside East of Drydock 1 at Long Beach Naval Shipyard, California. The site visit was performed on 23 July 1993, and consisted of a visual inspection of the site and documentation which included photographs and a video recording (VHS format) of Site 11. During the site visit, the scope of work and removal action alternatives were discussed with the Navy and California Environmental Protection Agency (Cal-EPA).

This site walk report documents the visit and provides related information regarding the scope of work and the draft specifications.

The project will include the following tasks:

- Task 1: Site walk will include a trip report which provides detailed findings of the site visit and technical comments for the removal action, and an evaluation of removal action alternatives

- Task 2: Site Management Plan will address site-specific health and safety, construction quality control, project implementation, scheduling, and meetings.

The site report is organized as follows:

- Section 2.0 presents the site description and background information
- Section 3.0 presents the description of site photographs
- Section 4.0 presents an evaluation of removal action alternatives which includes the following:

  - Alternative 1 - Shotcrete cap
  - Alternative 2 - Geosynthetic and cover soil cap
  - Alternative 3 - Topsoil and replant bare areas only
  - Alternative 4 - Topsoil and plant entire site

- Section 5.0 presents the conclusions and recommendations
- Section 6.0 presents the references used in this report
- Appendix A presents the site photographs
- Appendix B includes a video tape of Site 11.

2.0 Background

The site description, source of contamination, and previous control efforts are described in the following sections.

2.1 Site Description

Site 11 is an embankment slope located in the eastern portion of the Naval Shipyard. Directly east of the site are Building 300 (engineering management building) and Parking Lots A and F. Parking Lots H and G are directly west (Figure 1). An asphalt roadway bisects the site. Vegetation (ice plant) covers part of Site 11, but in many areas soils and deposited sandblast grit are exposed. Dead vegetation was observed in some areas. Plastic sheeting has been placed in areas where sandblast grit is exposed. The slope has a surface relief of about 20 feet. Oil wells are located east of the site adjacent to a proposed parking lot. The southern edge is approximately 150 feet from the West Basin of Long Beach Harbor. Access to Site 11 is limited by the security provided for the Naval Shipyard. No additional security specific to Site 11 exists.

2.2 Waste/Source Information

Waste/source information is based on the Preliminary Assessment Report (PAR) of Site 11 prepared by Jacobs Engineering Group, Inc. (Jacobs, 1993). Around 1975, spent sandblast abrasives were used as fill to extend the natural hillside east of Drydock 1 where Site 11 exists. No records were found to document the quantity of spent sandblast grit ultimately disposed at Site 11. Based on the topography and reasoned assumptions, an estimated 6,400 cubic yards sandblast abrasives were used as fill (Jacobs, 1993). Jacobs calculated that the used sandblast grit contains approximately 46,000 pounds of cuprous oxide. During the Initial Assessment Study (IAS) inspection (Jacobs, 1993), the black sandblast material was found near the surface of the hillside cover and just east of Building 174. The hillside has been covered with a matting and top soil, and planted with ice plant for vegetative cover.

The Naval Shipyard Public Works Department has composited a sample from 14 locations in Site 11. Analytical results indicate that the copper concentration exceeded the soluble threshold limit concentration (STLC) and the total threshold limit concentration (TTLC), whereas lead exceeded only TTLC.

2.3 Previous Erosion Control Improvements

to whom?

In 1977, Long Beach Naval Shipyard awarded a contract to accomplish the following scope of work at Site 11:

- Construct asphalt Parking Lot G
- Remove sandblasting material, debris, plants, bushes, and grade the slope
- Place 6 inches of compacted top soil on slope
- Revegetate entire slope with ice plant
- Install new sprinkler system on top of slope north from Building 174 to the street. A new three-station-type automatic controller for the sprinkler system has been installed in Building 302.

The construction plans describing the above scope of work reviewed by IT refer to that section of Site 11 from Building 174 north to the street. No mention is made of those sections of the site north of the street toward Building 300 or to the approximately level section south of Building 174. A sprinkler system was observed installed on the top of slope north of the street, but no system was observed in place for the section south of Building 174 which was covered by plastic sheeting.

Based on inspections by Long Beach Naval Shipyard personnel, the sprinkler system is presently not operational. The dead vegetation on the slope is due to a lack of water rather than incompatibility of the top soil and vegetation. The vegetation was observed thriving during the rainy season.

3.0 Photographs

Photographs were taken during the site walk visit conducted on 23 July 1993. One roll of 24 color prints was exposed, of which 10 were selected that best represented Site 11. The photographs are presented in Appendix A and described below approximately in the order in which they were taken. Location and view directions are shown in Figure 1.

Photograph 1 shows the angle of slope (1½ horizontal [H]:1 vertical [V]) with the drainage ditch at the base of the slope. The white patches along the ditch are precipitated salts.

Photograph 2 was taken approximately 20 feet north of Photograph 1 and shows the face of the slope. The dead or dying vegetation is composed mostly of grasses and the dark green vegetation is mainly ice plant. The sprinkler irrigation system is believed to be nonfunctioning at the present time. The cause of the salt precipitation in the area surrounding the drainage ditch has not been determined. Possible causes are as follows:

- Drainage from the slope has leached out salts contained in the hydraulic fill.
- This area is below sea level due to subsidence, and perimeter wells are pumped to keep out seawater. At the time the photographs were taken, some of the wells were not pumping because maintenance was being performed. The lack of pumping may allow the intrusion of seawater in this area. Evaporation would then leave the salts precipitated on the surface.

Photograph 3 was taken approximately 20 feet north of Photograph 2 and shows the same mixture of brown and green vegetation. Plastic sheeting was placed over completely bare areas to prevent contaminants from becoming airborne.

Photograph 4 was taken at the intersection of the slope with the ramp road leading to Parking Lots A and F and which divides Site 11 into two parts. Slope grade along the road is similar to the main slope of 1½H:1V and shows signs of water erosion (possibly run-off) from parking lot F.

Photograph 5 shows the slope with a grade of 1½H:1V north of the ramp road looking toward Building 300. This section of the slope is greener due to more coverage by ice plant.

Trees at the top of the slope as well as the 6-inch airline at the base of the slope adjacent to the fences will be protected during remediation work.

Photograph 6 shows the northern boundary for Site 11. The vegetation is mostly brown with little ice plant. As previously discussed, the ice plant may be impacted due to insufficient watering.

Photograph 7 shows the area east of Building 174 and shows a gentle slope to the west. The plastic sheeting was placed over the entire area to minimize airborne contamination. The area is bounded by a fence on three sides.

Photograph 8 is a view of the southern portion of parking lot F east of the area shown in Photograph 7. Although the area shown is outside Site 11, the operating oil wells and associated piping will be protected during remediation work.

Photograph 9 shows a detail of the western boundary of the area covered in Photograph 7. Metal sheeting was positioned along the lower portion of the fence line to prevent the movement of airborne contamination to the adjacent parking lot.

Photograph 10 shows the southern portion of Site 11 extending past the fence line to the harbor. This triangular portion of the site is located in a high security area needing a special access pass.

4.0 Evaluation of Alternatives

The removal action alternatives and the criteria for selection are presented in the following sections.

4.1 Evaluation Criteria

Removal action alternatives were selected based on technologies that would protect human health and the environment. The criteria used to evaluate the alternatives included direct contact, inhalation, groundwater ingestion, surface water, groundwater, and air. Objectives for protecting human health and the environment were discussed during the site walk and include the following:

Human Health

- Direct contact: Removal action must prevent direct contact with the sandblast grit.
- Inhalation: Removal action must prevent inhalation hazards due to wind-blown dispersion of the sandblast grit.
- Groundwater ingestion: Based on statements by the Department of Toxic Substances Control (DTSC), groundwater protection is not an objective of the removal action. The groundwater is nonpotable and will be evaluated during the remedial investigation/feasibility study (RI/FS).

Environment

- Surface water: Removal action must prevent direct run-off of sandblast into the surface water collection system.
- Groundwater: Not an objective of the removal action. Groundwater impacts will be evaluated during the RI/FS.
- Air: Removal action must prevent dispersion of sandblast grit.
- Surface Soil: Removal action must contain sandblast grit and prevent erosion of the cover system.

An RI/FS will be performed under a separate contract at Site 11 to assess the extent of sandblast grit and to select a remedial design. The RI/FS process will take approximately 5 years to complete. The removal action feasibility study was performed in three phases: the development of alternatives, the screening of alternatives, and the detailed analysis of alternatives. Alternatives were selected based on the following technologies:

- Containment Technologies: Options include Alternative 1 - A shotcrete cap and Alternative 2 - A synthetic liner with topsoil cap.
- Erosion Controls: Options include Alternative 3 - Topsoil and revegetate bare areas and Alternative 4 - Topsoil and revegetate the entire area.

The removal action alternatives are evaluated with respect to six criteria and are shown in Table 1. These criteria are (1) overall protection of human health and the environment; (2) long-term effectiveness and permanence; (3) reduction of toxicity, mobility, or volume through treatment; (4) short-term effectiveness; (5) implementability; and (6) costs.

The analysis of each alternative with respect to overall protection of human health and the environment evaluates how the alternative reduces the risk from potential exposure pathways through treatment, engineering, or institution controls. This evaluation also examines whether alternatives pose unacceptable short-term or cross-media impacts. Groundwater protection is not an objective of the removal action. As previously discussed, an RI/FS will be performed to characterize the hydrogeology and to determine the groundwater impacts.

Long-term effectiveness and permanence are based on a 5-year period. The alternatives are evaluated with respect to the magnitude of residual risk and the adequacy and reliability of control used to prevent impacts to human health and the environment.

The reduction of toxicity, mobility, or volume through treatment evaluates the alternatives for the reduction of health hazards, movement of contaminants, and the quantity of contaminants through treatment. This criteria does not apply to the removal action because treatment will not be performed.

Short-term effectiveness addresses the period of time to complete the removal action and adverse effects to human health and the environment that may be caused during the construction and implementation of the remedy.

The analysis of implementability evaluates the technical and administrative feasibility of implementing the alternatives as well as the availability of materials and services required to implement the option and the ability to coordinate local, State, and Federal regulatory requirements.

The evaluation of cost compares the estimated capital, operation, and maintenance costs. The cost estimates are presented in Table 2 and represent an order-of-magnitude estimate. The intent of the estimate is a cost comparison between alternatives. The costs are based on a conceptual design and may require more components to perform. The removal action design will be presented in the Site Management Plan.

4.2 Containment

Detailed descriptions of containment alternatives and their evaluation criteria are presented in the following sections.

4.2.1 Alternative 1 - Shotcrete Cap

The shotcrete cap would be installed in accordance with the specifications. Site preparation activities would include removing the existing fence for construction access and installing a temporary construction access fence. The existing vegetation would be removed and the slope graded (estimated 8 inches cut/fill) to provide an even base for the shotcrete. The water supply line will be capped and the sprinkler heads removed. It is estimated that approximately 8 inches of soil would require regrading. A geotextile layer would be placed over the soil base. The shotcrete will be placed by a specialty subcontractor in accordance with the specifications. If the RI/FS specifies removal of the sandblast grit, demolition and removal of the concrete will be required.

4.2.2 Alternative 2 - Geosynthetics and A Soil Cover Cap

This alternative consists of grading the slopes and placing a geosynthetic barrier layer. A soil cover will be placed on top of the barrier layer for protection. Vegetation and permanent irrigation system are required to minimize erosion of the cover soil.

Geosynthetic barrier covers usually consist of a 20-mil minimum thickness (40-mil if high-density polyethylene [HDPE]) overlain by a drainage layer. A typical drainage layer material using steep sideslopes is an HDPE-expanded grid called a geonet. The geonet requires a geotextile separation layer between the soil and the geonet to minimize the infiltration of soil fines into the drainage layer. For slope stability, the design also requires an additional geotextile between the geomembrane barrier layer and the geonet. A soil cover will be required to protect against damage from operations and maintenance (O&M) activities at the shipyard. Soil covers tend to slip on geosynthetics, so the soil may have to be reinforced with a geogrid.

The cover soil thickness is a total of 18 inches, of which the upper 6 inches is a topsoil material. Vegetation is required to limit erosion of the cover soil. Direct seeding or vegetative propagation are the two methods of establishing plant growth.

Vegetation requires a permanent irrigation system to establish and maintain growth. A manually operated system is not a reliable system. An automatic irrigation sprinkler system combined with regularly scheduled maintenance is the best feasible system for maintaining the cover growth.

4.2.3 Criteria Assessment - Alternatives 1 and 2

These alternatives are positive structural barriers to humans. However, since there is no bottom liner system, migration of contaminants can still occur with high groundwater levels. The cap will minimize percolation and subsequent leaching of contamination into the groundwater and soil.

Because the contaminated soil remains on site, there is no reduction in toxicity, mobility, or volume of the contaminated soil. The 6,400 cubic yards of contaminated sandblast grit (Jacobs, 1993) will remain on site.

Although the geosynthetic cap usually requires a specialty contractor, both cap construction techniques have been used at many sites throughout the world. These alternatives are very difficult compared to the other alternatives which simply require vegetation. The main problem is the cut and fill operations required to trim the site to an even grade. This work

requires at least Level C (respirators) working conditions and dust suppressants to minimize wind-blown dispersion.

The estimate present worth cost of these alternatives ranges from $390,000 to $650,000. O&M costs for the shotcrete cap would be minimal. O&M cost for the geosynthetic liner would be similar to Alternative 4.

4.3 Erosion Control

Detailed descriptions of erosion control alternatives and their evaluation criteria are presented in the following sections.

4.3.1 Alternative 3 - Topsoil and Revegetate Bare Areas

During the site walk on 23 July 1993, large areas of the slopes were bare or were covered with dead vegetation. An irrigation system runs along the top of the slope. Long Beach Naval Shipyard personnel indicate that the sprinkler system is not operational.

This alternative assumes that reestablishment of vegetation growth in the bare areas is possible. Soil samples should be collected from the soil to verify that the soil is capable of supporting plant growth.

If this is a viable solution, then the bare areas require topsoil, erosion control blankets, and vegetation. The topsoil is required to propagate growth and the erosion control blankets are designed to hold the topsoil in place.

4.3.2 Alternative 4 - Topsoil and Revegetate Entire Area

This alternative is for removal of all the existing vegetation, placing new plants, and installing a new irrigation system.

The large ice plant at the site may not be the most suitable slope cover. For example, the "red apple" ice plant is a desirable cover because of its smaller size. When the large ice plant dies, large clumps of soil or contaminated sandblast grit could be pulled away in its rootball. The mass of the "red apple" ice plant is much smaller and tends not to pull as much soil away from the slopes.

Other types of vegetation groundcovers may also be suitable. Erosion control blankets would also be installed.

4.3.3 Criteria Assessment - Alternatives 3 and 4

Both alternatives 3 and 4 provide good human health and environment protection only if the vegetation cover is well established and maintained. If the vegetation is not maintained, erosion will scour the topsoil and possibly expose the contaminated sandblast grit. Particles can then become airborne.

The long-term effectiveness (understood to be 5 years) is suitable for erosion control only. Rainwater and irrigation water will percolate into the groundwater. However, the irrigation system can be adjusted so that optimum moisture to support vegetation can be maintained without excess moisture to cause percolation or run-off. The reliability of the alternatives is only as good as the ability of the slope to maintain a vegetation cover. If water is not supplied by a permanent irrigation system, the plants will die, the soil will be eroded, and the contaminated soil will be exposed.

The short-term effectiveness is good: topsoil and vegetation can be applied quickly, at the start of the wet season. Growth should propagate quickly with minimal disturbance of the sandblast grit. There is no reduction of toxicity, mobility, or volume with either of these alternatives.

These alternatives are the easiest and quickest to implement. Monthly maintenance of the irrigation system will consist mainly of sprinkler head adjustment and replacement and trimming vegetation. The plant cover can be adjusted easily if more action is required.

Present worth costs vary from $220,000 for Alternative 3 to $295,000 for Alternative 4.

5.0 Conclusions and Recommendations

The four alternatives described in this report were selected as the best options for the interim removal action for protecting human health and the environment. The RI/FS to be performed at Site 11 will obtain the necessary information to complete a permanent remedial design.

Based on the information currently available, including input from the site walk discussions, IT suggests that Alternative 3 would be the most cost-effective and least disruptive to the environment. However, it must be emphasized that this alternative does not provide total containment of the contaminants of concern.

The possibility still exists for small quantities of these contaminants to work their way to the surface even if optimum vegetative cover is maintained. Because such concentrations should be below action levels, no threat to human health and the environment should occur.

6.0 References

Department of the Navy, Naval Facilities Engineering Command, Naval Shipyard, Long Beach, California, "Pavement Repair and Groundwater Improvement" Drawing Nos.:

12457, 1 of 5, Paving and Slope Protection
12458, 2 of 5, Grading and Paving, Drydock 1 Area
12459, 3 of 5, Fencing and Spot Paving Drydock 1 Area
12460, 4 of 5, Striping and Traffic Control Drydock 1 Area
12461, 5 of 5, Sprinkling System, Drydock 1 Area.

Department of the Navy, Naval Facilities Engineering Command, Naval Shipyard, Long Beach, California, Drawing No. 10070, Elevation Study Benchmark Record.

Department of the Navy, Naval Facilities Engineering Command, Naval Shipyard, Long Beach, California, "Subsurface Utilities" Drawing Nos.:

21,363 Zone 5, Plat 2
21,364 Zone 5, Plat 3
21,367 Zone 5, Plat 6
21,368 Zone 5, Plat 7
21,370 Zone 6, Plat 1
21,373 Zone 6, Plat 4
21,374 Zone 6, Plat 5
21,377 Zone 6, Plat 8.

Jacobs Engineering Group, Inc., 1993, "Preliminary Assessment of Site 11 - Hillside East of Drydock No. 1."

TABLES

Table 1

Individual Evaluation of Final Alternatives
Case Study[a]

(Sheet 1 of 5)

Criteria	Alternative 1 Cap: Shotcrete	Alternative 2 Cap: Geosynthetics, Cover Soil, and Vegetation	Alternative 3 Topsoil and Revegetate Bare Areas	Alternative 4 Topsoil and Revegetate Entire Area
1) Overall Protectiveness				
Human Health Protection				
• Direct contact	Reduces direct contact risk and soil ingestion.	Geosynthetic cover would prevent direct contract in the event of loss of vegetative cover.	Good protection if vegetation is irrigated regularly using an automatic irrigation system. System will fail if water is turned off for long periods.	See Alternative 3.
• Inhalation	Reduces inhalation risk and contains soil particles.	Geosynthetic cover would prevent erosion and airborne dispersal of contaminants in the event of loss of vegetative cover.	Airborne contamination may occur from erosion in the areas where vegetative cover was not maintained.	See Alternative 3.
• Groundwater ingestion - Groundwater beneath the site has been designated for nonbeneficial use by RWQCB. However, marine aquatic toxicity criteria would apply.	Institutional controls provide protection against risk from groundwater ingestion.	See Alternative 1.	See Alternative 1.	See Alternative 1.
Environmental Protection	Further contamination is curtailed by use of cap.	Geosynthetic cover would prevent dispersal of contaminants to the environment if vegetative cover is lost.	Contaminated soils can be exposed if erosion goes unchecked.	See Alternative 3.
• Surface water	Best control of run-on and runoff.	Require concrete or asphalt swales for run-off control. Collect runoff in existing asphalt swales.	See Alternative 2.	See Alternative 2.
• Groundwater	Minimizes infiltration to groundwater.	See Alternative 1.	Requires irrigation system to be set to provide optimum moisture to vegetation while preventing percolation of contaminants into groundwater.	See Alternative 3.

Table 1

Individual Evaluation of Final Alternatives
Case Study[a]

(Sheet 2 of 5)

Criteria	Alternative 1 Cap: Shotcrete	Alternative 2 Cap: Geosynthetics, Cover Soil, and Vegetation	Alternative 3 Topsoil and Revegetate Bare Areas	Alternative 4 Topsoil and Revegetate Entire Area
• Air	Airborne particles contained.	See Alternative 1.	Particles can become airborne if erosion goes unchecked and exposes contaminated soils.	See Alternative 3.
• Surface soil	Surface soils contained.	See Alternative 1.	Contaminated soils can be exposed if erosion goes unchecked.	See Alternative 3.
2) Long-Term Effectiveness and Permanence (5 Years)				
Magnitude of Residual Risk				
• Direct contact/soil ingestion and inhalation	Risk minimized as long as cap is maintained. Because source is only contained, inherent hazard of waste remains.	See Alternative 1.	Risk lowered if vegetation is maintained.	See Alternative 3.
• Groundwater - Movement of contaminants of concern into the groundwater over the interim action time span of 5 years is not a concern of the DTSC (as expressed during the site walk).	Risk reduced by minimizing percolation.	See Alternative 1.	Rainwater will continue to permeate the contaminated soil.	See Alternative 3.
Adequacy and Reliability of Controls	Shotcrete cap controls contaminated soil. Reliability of cap is high with minimum maintenance.	Soil cover and geosynthetic contains contaminated soil. Reliability of barrier component is good: geomembrane can be punctured by sharp instruments but the 18-inch soil cover should provide adequate protection.	No structural containment system installed. Migration of contaminated soil minimized only by the integrity of the vegetation and soil cover. If irrigation system is not maintained or turned off during water shortages, vegetation will die and soil cover will erode exposing the contaminated soil.	See Alternative 3.

Table 1

Individual Evaluation of Final Alternatives
Case Study[a]

(Sheet 3 of 5)

Criteria	Alternative 1 Cap: Shotcrete	Alternative 2 Cap: Geosynthetics, Cover Soil, and Vegetation	Alternative 3 Topsoil and Revegetate Bare Areas	Alternative 4 Topsoil and Revegetate Entire Area
Adequacy and Reliability of Controls (Continued)		Requires liner stability analysis. Soil cover may slide off geosynthetics during heavy rainfall events.	Migration of contaminated soil minimized only by the integrity of the vegetation and soil cover. If irrigation system is not maintained or turned off during water shortages, vegetation will die and soil cover will erode exposing the contaminated soil.	
Need for 5-Year Review	Yes	Yes	Yes	Yes
3) Reduction of Toxicity, Mobility, or Volume through Treatment				
Treatment Process Used	None.	None.	None.	None.
Amount Destroyed or Treated	None.	None.	None.	None.
Reduction of Toxicity, Mobility, or Volume	None.	None.	None.	None.
Irreversible Treatment	None.	None.	None.	None.
Type and Quantity of Residuals Remaining After Treatment	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Statutory Preference for Treatment	Does not satisfy.	Does not satisfy.	Does not satisfy.	Does not satisfy.
4) Short-Term Effectiveness				
Community Protection	Temporary increase in dust production through cap installation. Contaminated soils remain undisturbed.	See Alternative 1.	Minimal disturbance and limited to bare areas only.	Temporary disturbances during vegetation removal.

Table 1

Individual Evaluation of Final Alternatives
Case Study[a]

(Sheet 4 of 5)

Criteria	Alternative 1 Cap: Shotcrete	Alternative 2 Cap: Geosynthetics, Cover Soil, and Vegetation	Alternative 3 Topsoil and Revegetate Bare Areas	Alternative 4 Topsoil and Revegetate Entire Area
Worker Protection	Protection required against dermal contact and inhalation of contaminated dust during cap construction.	See Alternative 1.	Protection required against dermal contact and inhalation of dust during removal of vegetation and topsoil.	See Alternative 3.
Environmental Impacts	Contains potential for airborne contaminants.	See Alternative 1.	Sandblasting grit may become airborne if existing topsoil cover on bare areas is less than 4 inches.	See Alternative 3.
Time Until Action is Complete	Cap installed in 12 weeks.	Cap installed in 12 weeks.	Revegetate bare areas and repair existing irrigation system in 6 weeks.	Remove vegetation, place topsoil, and install new irrigation system in 8 weeks.
5) Implementability				
Ability to Construct and Operate	Difficult to construct. Would require materials handling of about 4,000 yd^3 of soil and placing 1,000 yd^3 of concrete. Minimal maintenance (if any) required.	Difficult to construct. Requires excavation and removal of over 2,000 yd^3 of soil and a retaining wall at the toe of the slope. Requires automatic sprinkler system (irrigation) to maintain vegetation cover. Requires monthly maintenance. During heavy rainfall, over 3,000 yd^3 of cover soil could slide off geosynthetics placed on steep slopes.	Very simple to construct and operate. Requires automatic sprinkler system (irrigation) to maintain vegetation cover. Requires monthly maintenance. Contaminants in sandblast grit may be toxic to vegetation. Requires review of analytical data to determine if existing surface soils can support plant growth. Contaminant levels may be too high and all surface soils may require removal and disposal. Requires repair work after very heavy rainfall events.	Very simple to construct and operate. Requires automatic sprinkler system (irrigation) to maintain vegetation cover. Requires monthly maintenance. Contaminants in sandblast grit may be toxic to vegetation. Requires repair work after very heavy rainfall events.

Table 1

Individual Evaluation of Final Alternatives
Case Study[a]

(Sheet 5 of 5)

Criteria	Alternative 1 Cap: Shotcrete	Alternative 2 Cap: Geosynthetics, Cover Soil, and Vegetation	Alternative 3 Topsoil and Revegetate Bare Areas	Alternative 4 Topsoil and Revegetate Entire Area
Ease of Doing More Action if Needed	Very difficult to remove concrete. Cap materials require possible decontamination before removal from site or disposal as a waste.	Moderate, geosynthetics protect cover soils above from contamination. Geosynthetics require decontamination before removal from site or disposal as a hazardous waste.	Very easy: remove vegetation and topsoil. Vegetation roots may require decontamination before removal from site or disposal as a hazardous waste.	See Alternative 3.
Ability to Monitor Effectiveness	Visual inspection (quarterly) for wide cracks.	Visual inspection after heavy storm events for erosion of cover soils or puncture of geosynthetics.	Monthly visual inspection for establishment of growth and inspection after heavy storm events.	See Alternative 3.
Ability to Obtain Approvals and Coordinate with Other Agencies	No approval necessary.	See Alternative 1.	See Alternative 1.	See Alternative 1.
Availability of Services and Capacities	No services or capacities required.	Requires electricity and water to operate irrigation system.	See Alternative 2.	See Alternative 2.
Availability of Equipment, Specialists, and Materials	No special equipment, material, or specialists required. Cap materials available within 20 miles.	Specialty trade: Geosynthetic liner contractor required to furnish, and install liner materials.	No special equipment material or specialists required.	See Alternative 3.
Availability of Technologies	Cap technology readily available.	See Alternative 1.	Readily available.	See Alternative 3.
6) Cost				
Capital Cost	See Table 2.	See Table 2.	See Table 2.	See Table 2.

Notes: [a] Table format for detailed analysis of alternatives for feasibility studies under CERCLA.

TABLE 2
COST ESTIMATE
SITE 11 - HILLSIDE EAST OF DRY DOCK 1
LONG BEACH NAVAL SHIPYARD

Description	Quantity	Unit	Amount
Alternative 1 - Shotcrete Cap			
Division 1 - General Requirements			
Mobilize and establish on site	1	LS	$0
Division 2 - Sitework			
Remove existing fence for construction access	1,600	FT	$5,065
Install temporary fence	1,600	FT	$7,615
Construct new 6' high security fence at completion of work	1,600	FT	$27,309
Remove 5' high x 35' concrete wingwall near Building 174	175	FT2	$954
Protect existing oil lines and other utilities	1	LS	$0
Remove and cap irrigation system(1" to 3" PVC)	1,800	FT	$2,593
Remove thin plastic sheeting	25,000	FT2	$1,054
Clear and grub slopes	82,000	FT2	$35,234
Cut , fill and grade slopes for shotcrete (assume 8'' deep)	2,035	YD3	$20,519
Place thin plastic cover on graded area	82,000	FT2	$5,094
Support 6 " dia. air line above grade	700	FT	$0
Division 3 - Concrete			
Install 4 " thick shotcrete	1,002	YD3	$172,806
Install welded wire fabric reinforcement	82,000	FT2	$0
Subtotal			$278,243
Contingency (40%)			$111,297
Total - Alternative 1			$389,540
Alternative 2 - Geosynthetic & cover soil cap			
Division 1 - General Requirements			
Mobilize and establish on site	1	LS	$0
Division 2 - Sitework			
Remove existing fence	1,600	FT	$5,065
Install temporary fence	1,600	FT	$7,615
Construct new 6' high security fence at completion of work	1,600	FT	$27,309
Protect existing oil lines and other utilities	1	LS	$0
Protect trees	3	Each	$0
Remove and cap irrigation system	1,800	FT	$2,593
Remove thin plastic sheeting	25,000	FT2	$1,054
Clear and grub slopes	82,000	FT2	$35,234
Cut , fill and grade slopes for geosynthetics (assume 8" deep)	2,035	YD3	$20,519
Support 6 " dia. air line above grade	700	FT	$0
Install 18" cover soil over geosynthetics	4,556	YD3	$55,858
Install new irrigation system	1,800	FT	$32,500
Import and place 6" topsoil over cover soil	1,519	YD3	$36,051
Install erosion control blankets	82,000	FT2	$39,360
Plant vegetation cover	82,000	FT2	$30,725
Establish vegetation growth	3	Months	$10,000
Division 13 - Special Construction			
Install geomembrane liner	82,000	FT2	$40,756
Construct anchor trench at top of steep slopes	1,260	FT	$893
Install geogrid on steep slopes	61,000	FT2	$12,376
Install geocomposite drainage net	82,000	FT2	$40,756
Install 3' high concrete block retaining wall at toe of slope	1,600	FT	$49,800
Install toe drain	1,600	FT	$15,659
Connect toe drain to outlet	1	LS	$0
Subtotal			$464,123
Contingency (40%)			$185,649
Total - Alternative 2			$649,772

TABLE 2
COST ESTIMATE
SITE 11 - HILLSIDE EAST OF DRY DOCK 1
LONG BEACH NAVAL SHIPYARD

Description	Quantity	Unit	Amount
Alternative 3 - Topsoil and replant bare areas only			
Division 1 - General Requirements			
Mobilize and establish on site	1	LS	$0
Division 2 - Sitework			
Remove existing fence (for construction access)	1,600	FT	$5,065
Install temporary fence	1,600	FT	$7,615
Construct new 6' high security fence at completion of work	1,600	FT	$27,309
Protect trees	3	Each	$0
Test and repair irrigation system	1,800	FT	$1,737
Support 6 " dia. air line above grade	700	FT	$0
Remove thin plastic sheeting	25,000	FT2	$1,054
Clear and grub slopes	54,000	FT2	$21,907
Cut , fill and grade slopes (assumed 6'' deep)	1,000	YD3	$12,000
Import and place 6" topsoil on bare areas	1,000	YD3	$24,444
Install erosion control blankets to bare areas	54,000	FT2	$25,920
Plant vegetation cover in bare areas	54,000	FT2	$20,438
Establish vegetation growth	3	Months	$10,000
Subtotal			$157,489
Contingency (40%)			$62,996
Total - Alternative 3			$220,485
Alternative 4 - Topsoil and plant entire site			
Division 1 - General Requirements			
Mobilize and establish on site	1	LS	$0
Division 2 - Sitework			
Remove existing fence (for construction access)	1,600	FT	$5,065
Install temporary fence	1,600	FT	$7,615
Construct new 6' high security fence at completion of work	1,600	FT	$27,309
Protect existing oil lines and other utilities	1	LS	$0
Protect trees	3	Each	$0
Test and repair irrigation system	1,800	FT	$1,737
Support 6 " dia. air line above grade	700	FT	$0
Remove thin plastic sheeting	25,000	FT2	$1,054
Clear and grub slopes	82,000	FT2	$35,234
Cut , fill and grade slopes (assumed 6'' deep)	1,519	YD3	$16,851
Import and place 6" topsoil	1,519	YD3	$36,050
Install erosion control blankets	82,000	FT2	$39,360
Plant vegetation cover	82,000	FT2	$30,725
Establish vegetation growth	3	Months	$10,000
Subtotal			$211,000
Contingency (40%)			$84,400
Total - Alternative 4			$295,400

LIMITATIONS OF ESTIMATE

1. This is an order-of -magnitude estimate. The intent of this estimate is a cost comparison between alternatives.
2. Quantities are based upon visual observations from a single job walk on 23 July 1993 and by scaling undated utility maps supplied by the Navy.
3. A current topographic survey is not available. Drainage flow direction in flat areas is unknown. Additional drainage structures such as swales, catch basins, and downdrains may be required.
4. Topsoil requires sampling and analysis to verify vegetation compatibility.
5. Costs are based upon alternative "ideas" only: the concept design of the selected alternative may require more components to perform properly and may cost more.

FIGURES

DRAWN BY	BJW 8-4-93	CHECKED BY / APPROVED BY	8-11-93 / 8-11-93	DRAWING NUMBER	305824-A1C

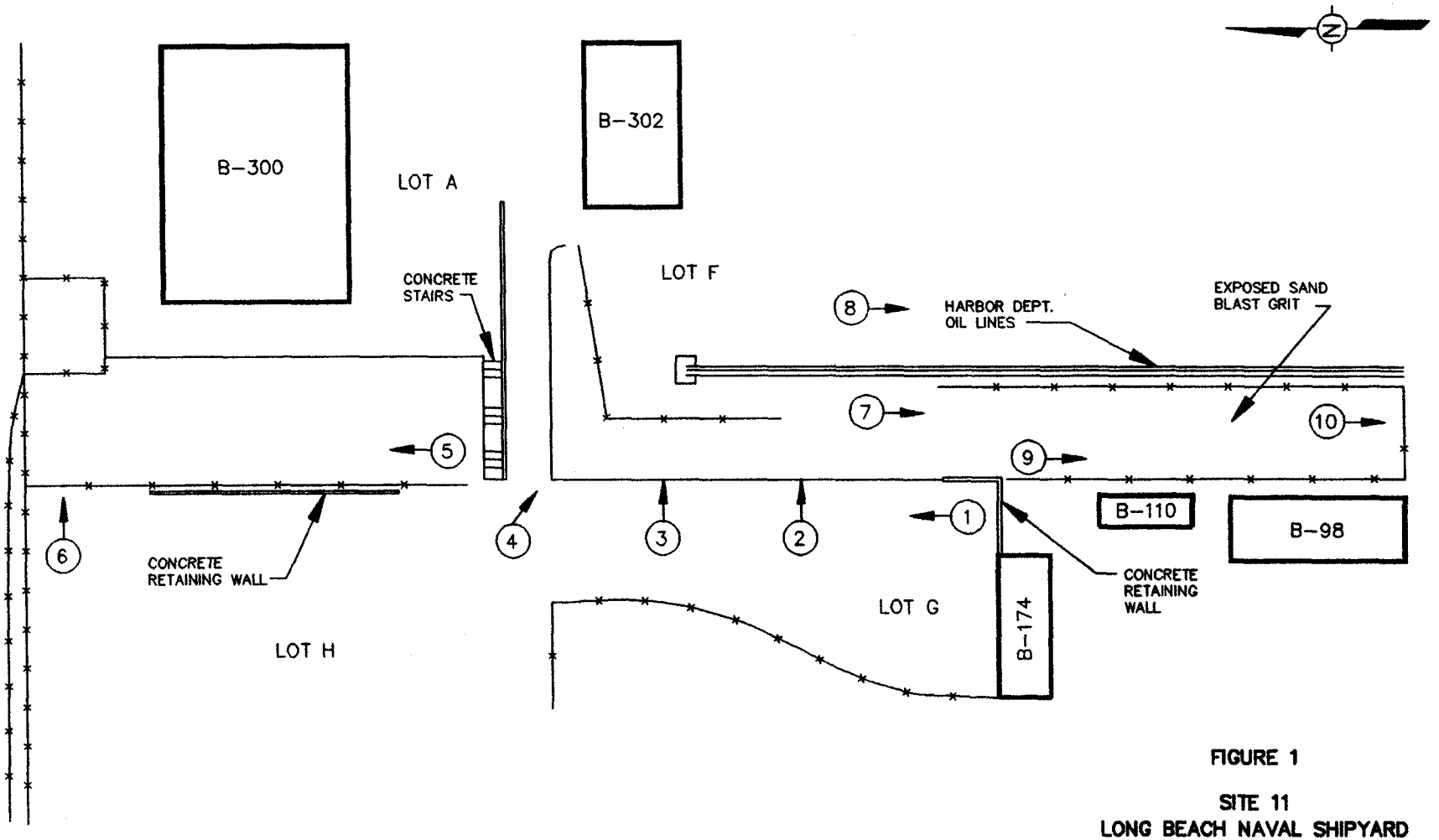


FIGURE 1

SITE 11
LONG BEACH NAVAL SHIPYARD
LONG BEACH, CALIFORNIA

PREPARED FOR

NAVAL CONSTRUCTION BATTALION CENTER
NAVAL FACILITIES ENGINEERING COMMAND
FORT HUENEME, CALIFORNIA
CONTRACT N47408-92-D-3045

LEGEND:

(1) PHOTOGRAPH NO. & DIRECTION

REFERENCE:

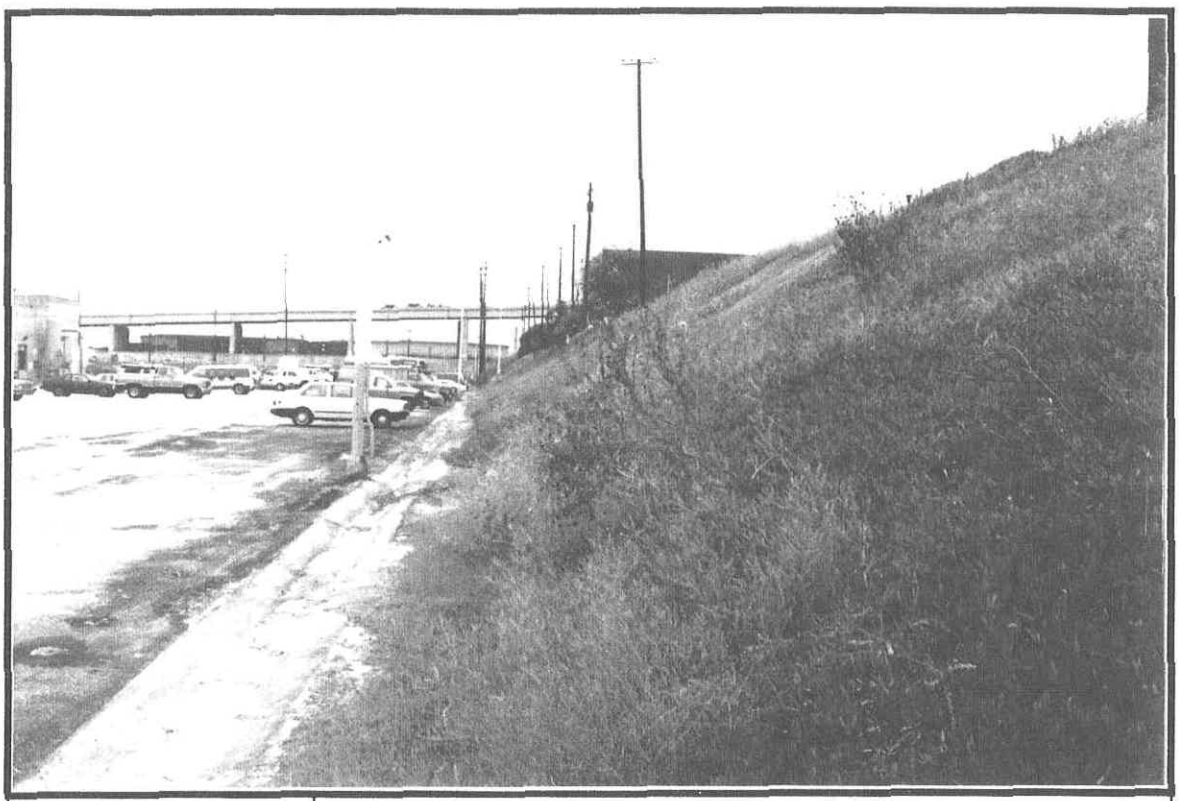
SITE MAP FROM STATEMENT OF WORK, NEESA 1993, "DELIVERY ORDER NO. 7" JUNE 30

NOT TO SCALE

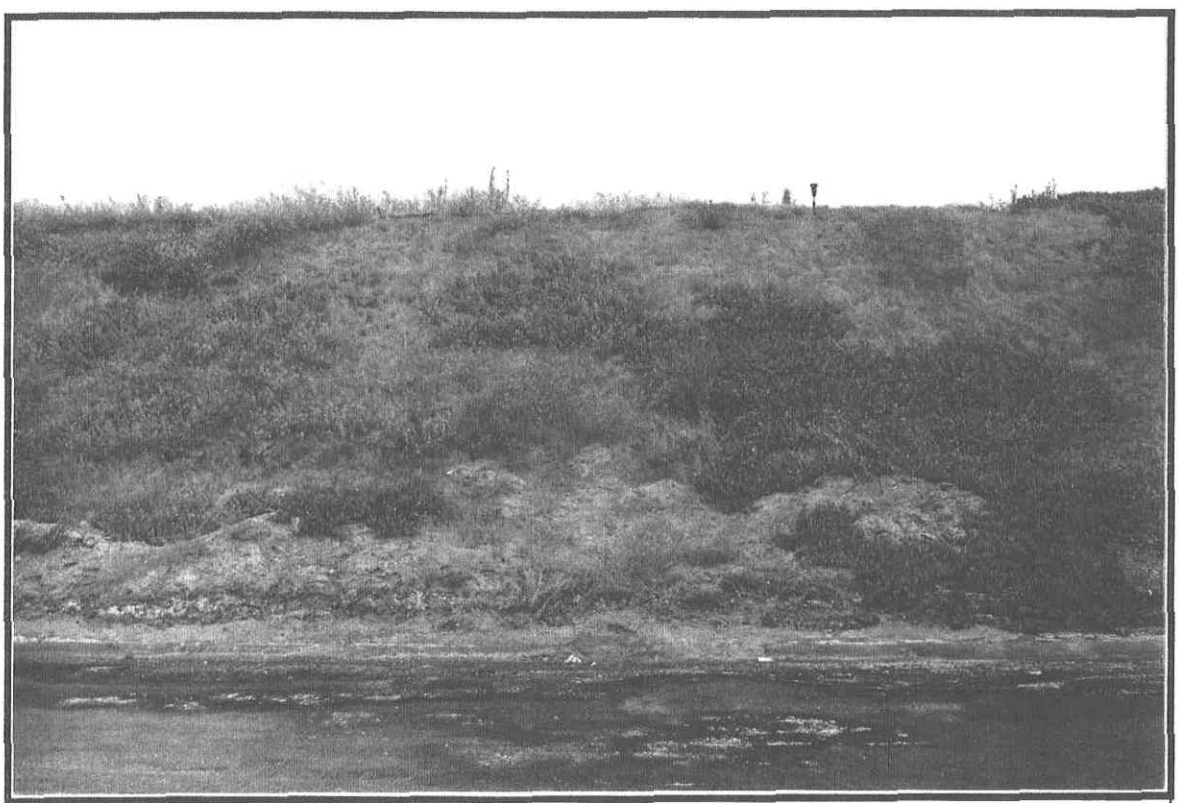
INTERNATIONAL TECHNOLOGY CORPORATION

APPENDIX A

SITE PHOTOGRAPHS



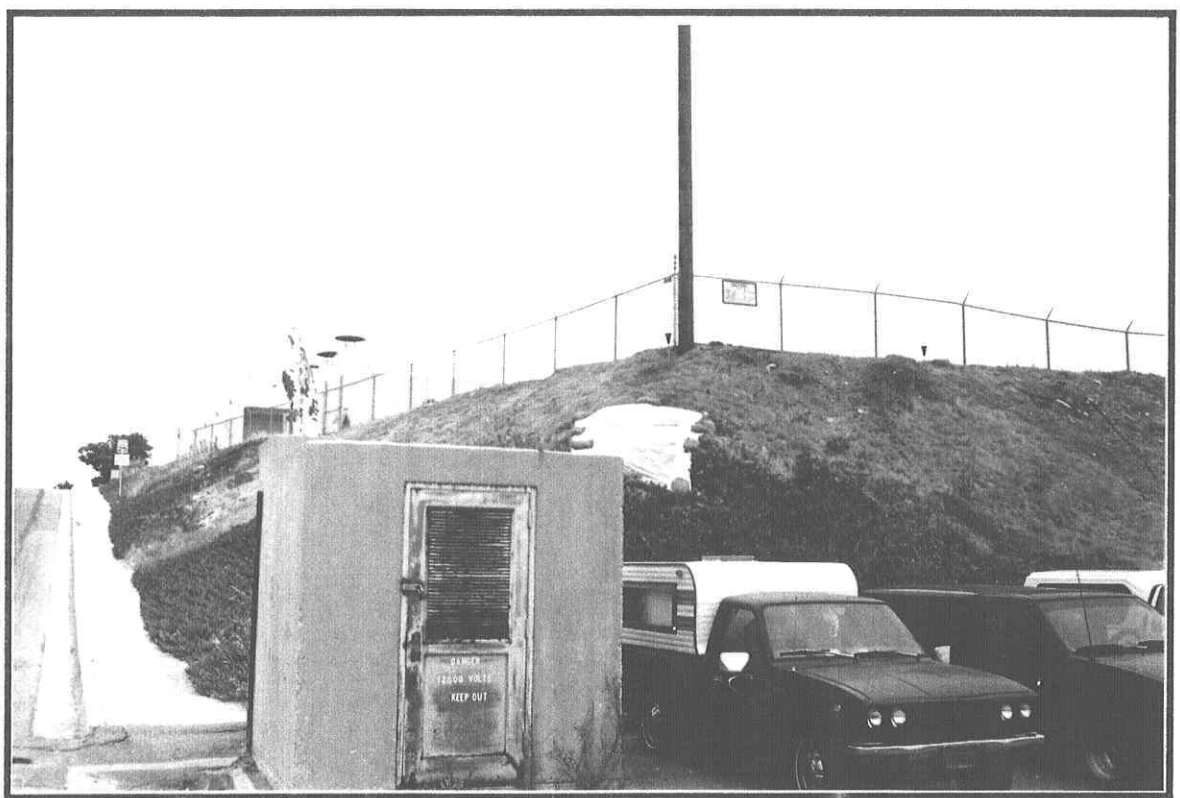
PHOTOGRAPH NO. 1	Looking north along slope from B-174



PHOTOGRAPH NO. 2	View east shows partial vegetation and salt precipitation at toe of slope

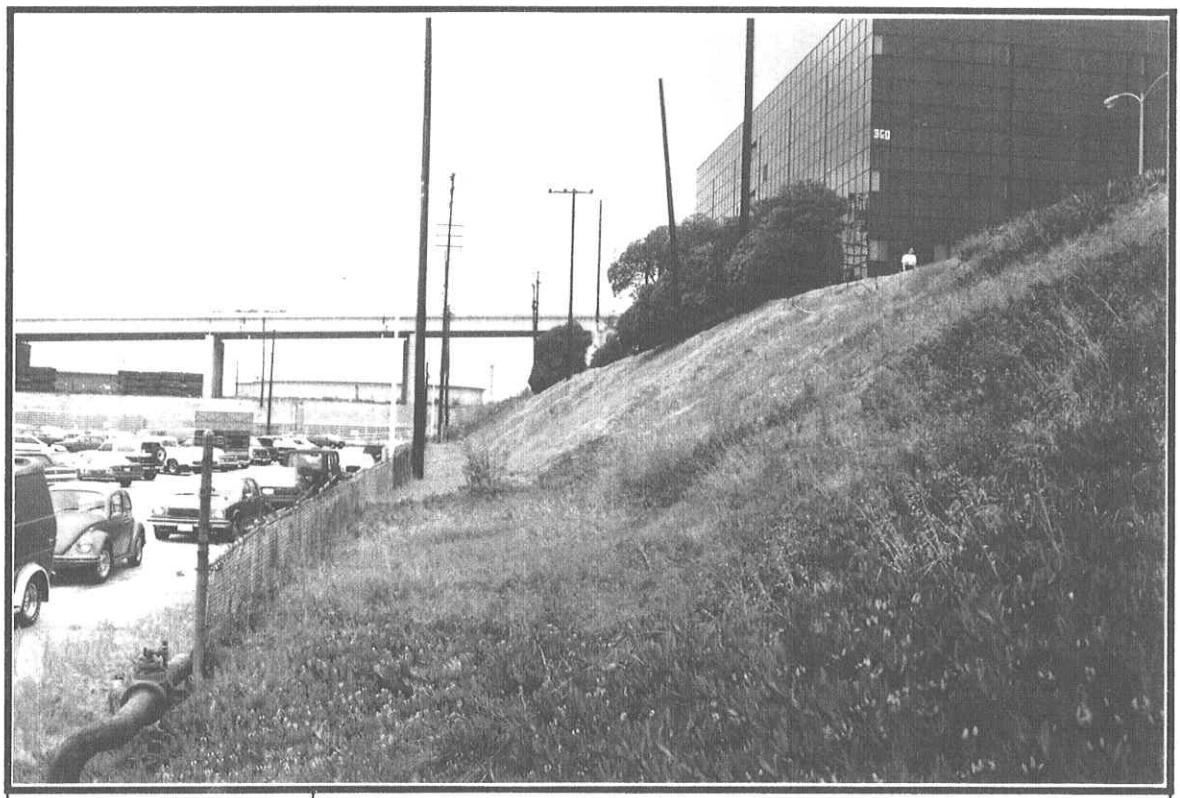
Note: Photographs taken on 23 July 1993.

PHOTOGRAPH NO. 3	View east with plastic sheet over bare soil

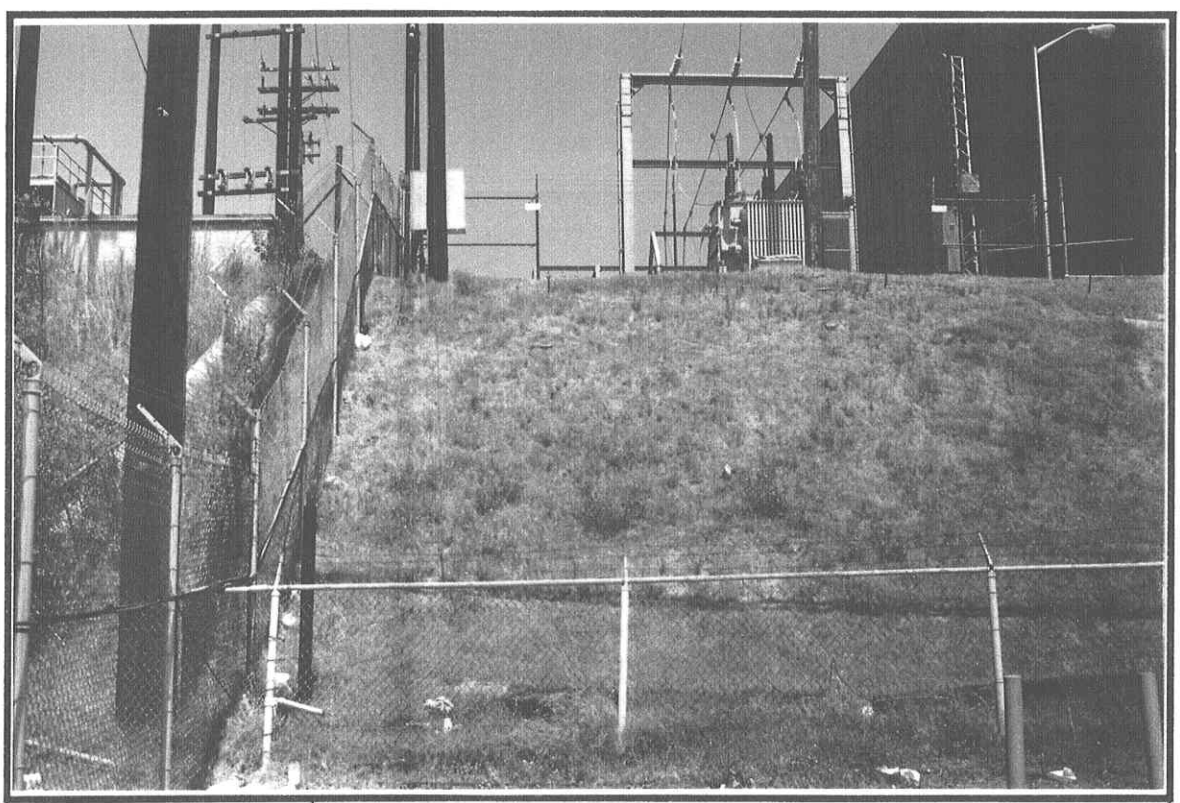


PHOTOGRAPH NO. 4	Looking southeast at slope corner bordering ramp road

Note: Photographs taken on 23 July 1993.

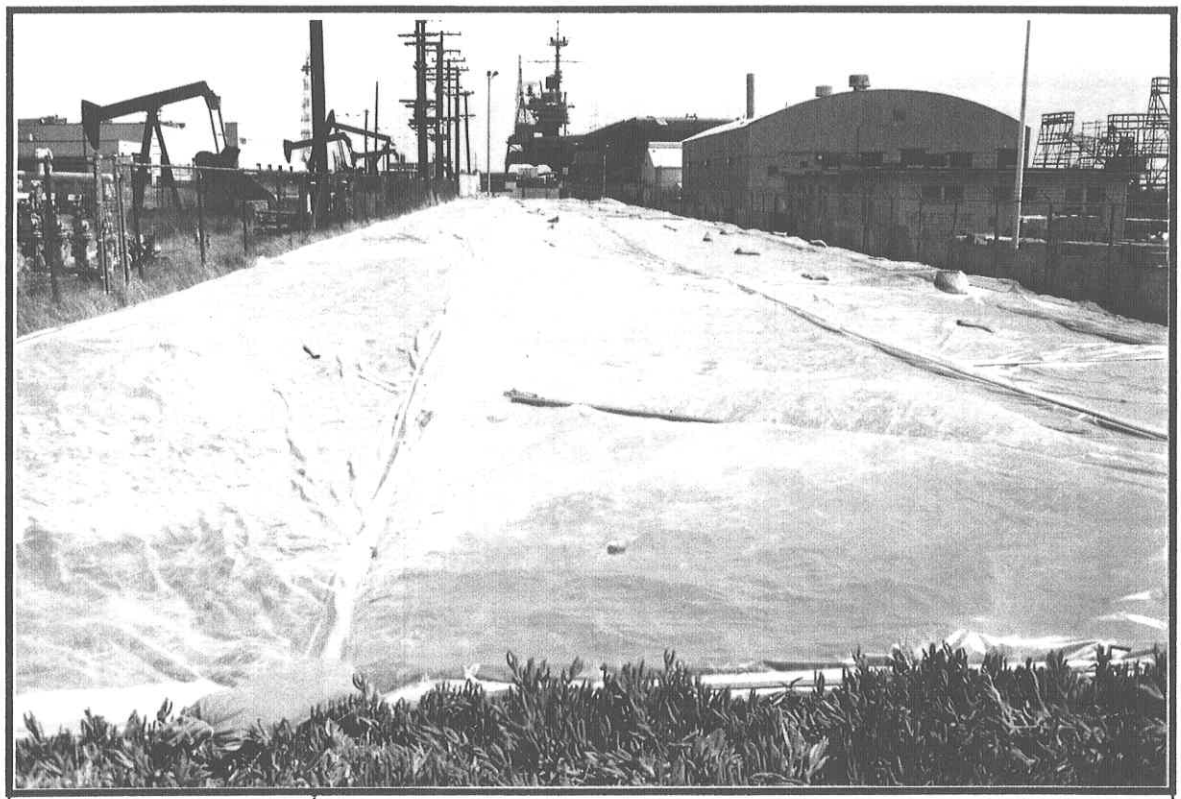


PHOTOGRAPH NO. 5	View of slope north of ramp road toward B-300

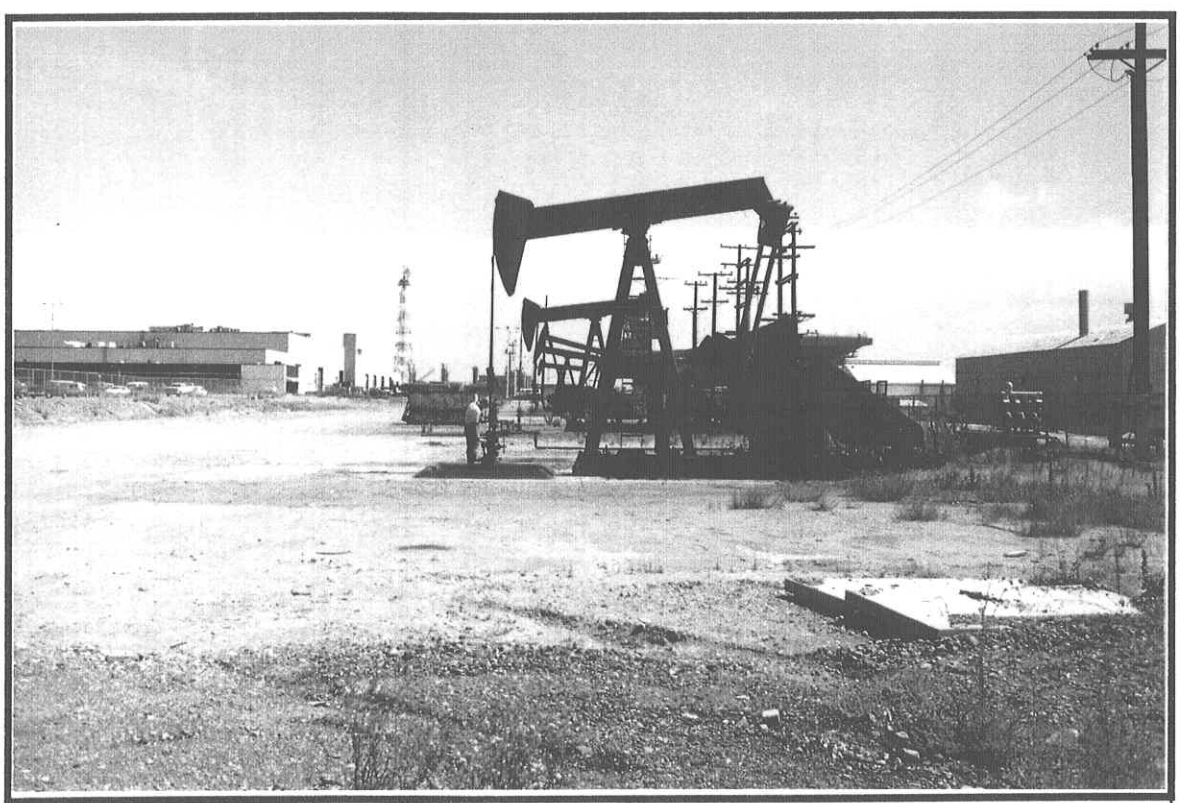


PHOTOGRAPH NO. 6	View east at north site boundary

Note: Photographs taken on 23 July 1993.

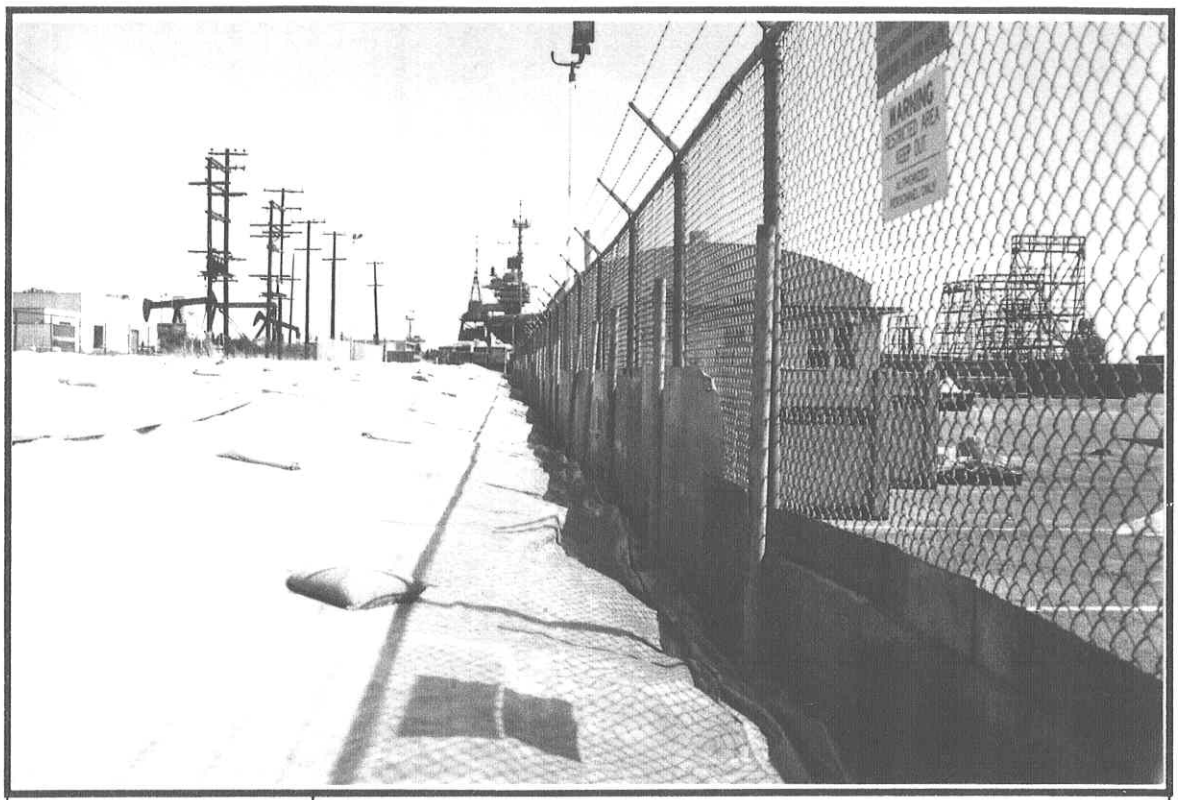


PHOTOGRAPH NO. 7	Looking south from B-174 over gentle slope towad south end boundary



PHOTOGRAPH NO. 8	View south at parking lot FX

Note: Photographs taken on 23 July 1993.



PHOTOGRAPH NO. 9	View south along west side boundary fence

PHOTOGRAPH NO. 10	South boundary of site

Note: Photographs taken on 23 July 1993.

APPENDIX B

VIDEO TAPE OF SITE 11

APPENDIX B SITE VIDEO

IS CONTAINED ON VIDEO TAPE

TO VIEW THE TAPE, CONTACT:

DIANE C. SILVA
RECORDS MANAGEMENT SPECIALIST
SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
1220 PACIFIC HIGHWAY
SAN DIEGO, CA 92132

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