100 Pine Street, 10th Floor
San Francisco, CA 94111
(415) 434-9400 • FAX (415) 434-1365

GEOMATRIX

13 June 1995
Project 1736.14

Mr. Rahn Verhaeghe
Alameda Real Estate Investments
1150 Marina Village Parkway, Suite 100
Alameda, California 94501

Subject: Work Plan for Groundwater Sampling
Lots 1 and 5 (Northwest Area)
Alameda Marina Village
Alameda, California

Dear Mr. Verhaeghe:

As requested by Alameda Marina Village Associates (AMVA), Geomatrix Consultants, Inc. (Geomatrix) has prepared this work plan to perform groundwater sampling of selected wells at Lots 1 and 5 (formerly called the "Northwest Area") of Alameda Marina Village in Alameda, California (Figure 1). This work plan responds to a letter issued 6 April 1995 from Alameda County Health Care Services Agency (ACHCSA) to AMVA requesting additional soil and groundwater investigations at the site.

OBJECTIVES

The objective of this groundwater sampling event is to provide current data on: (1) the possible presence of free-phase petroleum hydrocarbons in wells at the site; (2) the distribution of possible dissolved petroleum hydrocarbons in groundwater at the site; and (3) the magnitude and direction of the hydraulic gradient at the site. These data will be presented to the ACHCSA and used to develop an appropriate management strategy for the site. It is our understanding that AMVA intends to develop the property as paved parking lots, including a public rest room in the northeast corner of the Lot 1.

BACKGROUND

The site currently consists of undeveloped areas and paved parking lots. The site is bounded to the east by Oakland Inner Harbor and boat docks, to the west by Marina Village Parkway, to the south by four former shipways that currently are developed as office space, and to the north by an adjacent property owned by Barnhill Construction Company (Figure 2). A sheet pile wall extends from the shipways westward and northward along the boat docks as shown on Figure 2. The direction of the hydraulic gradient at the

site generally appears to be toward Oakland Inner Harbor, and may be influenced by the presence of the sheet pile wall.

Previous investigations performed by Levine*Fricke (1988, 1989) and Geomatrix (1992) indicate the presence of petroleum hydrocarbons in the subsurface at the site and surrounding areas. Medium and high boiling petroleum hydrocarbons (crude oil, waste oil, diesel oil and fuel) have been detected in shallow fill soil at concentrations greater than 500 parts per million (ppm) beneath approximately 2.5 acres of the site. Separate-phase high boiling petroleum hydrocarbons, characterized as degraded crude oil, have been observed over approximately 1.3 acres adjacent to the northwest property boundary. The vertical extent of petroleum hydrocarbons in soil has been limited by the occurrence of estuarine clay sediments, locally referred to as San Francisco Bay Mud. The Bay Mud occurs at shallow depths (less than 15 feet) below the ground surface at the site. The source of petroleum hydrocarbons in soil at the site likely was a combination of shipbuilding activities at and in the vicinity of the site that date back to the first half of this century, and from historical off-site sources to the northwest of Marina Village. Priority pollutant metals have been detected only at relatively low concentrations (i.e., within expected naturally occurring concentrations). Polychlorinated biphenyls (PCBs) and priority pollutant volatile organic compounds (VOCs) have not been detected in the soil at the site, with the exception of relatively low concentrations of toluene (up to 0.7 ppm).

Since 1987, ten shallow groundwater monitoring wells have been installed at and adjacent to Lots 1 and 5 (Figure 2). In groundwater from wells located at the site perimeter (wells WC-3, LF-6, LF-7, LF-11, LF-12, LF-13 and GMW-2) concentrations of medium and high boiling petroleum hydrocarbons have been either in the range of several milligrams per liter (mg/l) or have not been detected. Separate-phase product or petroleum sheen have been observed in two of the wells, LF-8 and LF-9, located near the northwest property boundary. A sheen has also been observed in groundwater from well LF-10, which is located approximately upgradient from Lot 5. Dissolved petroleum hydrocarbon constituents benzene, toluene, ethylbenzene, and xylenes (BTEX) have not been detected in groundwater at the site.

TECHNICAL APPROACH

Based on previously collected data (Investigation of Northwest Area, Levine*Fricke 1988; and Continued Soil and Groundwater Investigation of Parcel 5, Levine*Fricke, 1989) the extent of petroleum hydrocarbons in soil at the site has been characterized, and therefore additional soil quality data will not be collected as part of this field program. Our approach

will be to better define the distribution and extent of dissolved petroleum hydrocarbons, if any, in groundwater at the site and assess their potential for migration and impact to the Harbor. The presence of separate-phase petroleum hydrocarbons in groundwater will be assessed; however non-dissolved materials are not generally mobile in groundwater at natural hydraulic gradients.

In order to obtain analytical results representative of dissolved-phase water quality, and to avoid non-dissolved petroleum hydrocarbons being incorporated into the samples as an artifact of sampling methods, no groundwater samples will be collected for analysis from wells where separate-phase petroleum hydrocarbons are measured or observed. Non-dissolved constituents may be incorporated into water samples if the sampling device passes through a sheen on the top of the water column during sampling, or if the non-dissolved constituents are sorbed onto solid particles suspended in the water column inside the well (turbidity). Suspended solids are likely to contain sorbed petroleum constituents if the well is screened across soil affected by residual separate-phase petroleum hydrocarbons, as is the case at some of the wells at this site. Analysis of groundwater samples affected in this manner do not provide an accurate assessment of dissolved-phase petroleum hydrocarbons in groundwater. For this reason, samples will be filtered in the field to remove solid particles, and duplicate samples will be collected and analyzed without filtering for comparison. In addition, to mitigate the effects of positive interference on the Total Petroleum Hydrocarbon (TPH) analytical results from natural soluble byproducts of intrinsic bioremediation, a silica gel cleanup will be performed prior to analysis to remove soluble polar biogenic materials (non-petroleum hydrocarbons).

With the exception of LF-9, monitoring wells inspected by Geomatrix personnel on 25 May 1995 appeared in good condition, and will be used to assess the presence of separate-phase and dissolved petroleum hydrocarbons in the groundwater and the direction of the groundwater gradient. Well LF-9 was not accessible due to the presence of a soil stockpile. Well locations are shown on Figure 2. Floating and heavier-than-water separate-phase petroleum thicknesses and groundwater elevations will be measured in each well. Since site wells have not been accessed for 6 years, they will be redeveloped prior to sampling. Wells will not be redeveloped and sampled if separate-phase petroleum hydrocarbons are present. Based on historical data and well accessibility, we anticipate wells LF-6, LF-7, LF-10, LF-11, LF-12 LF-13, WC-3, and GMW-2 will be redeveloped and sampled. Well LF-8 likely will not be redeveloped and sampled due to the presence of separate-phase petroleum hydrocarbons.

FIELD PROGRAM

The field program will be conducted in accordance with Geomatrix protocols (attached). The monitoring wells will be surveyed for vertical control by a licensed surveyor using an established benchmark and datum. Prior to redevelopment and sampling, the presence of free-phase (floating or heavier-than water) petroleum hydrocarbons will be measured using a Flexidip oil-water interface probe. If free-phase petroleum hydrocarbons are not detected in the well, the water level will be measured using a steel tape, and the well will be redeveloped by a combination of bailing, surging and pumping. Redevelopment will continue until the water quality parameters of temperature, pH, and specific conductance have stabilized and the produced water is sufficiently clear.

At least one day after redevelopment, the wells will be tested again for the presence of free-phase petroleum using the Flexidip probe. Water levels will be measured and a groundwater sample collected for chemical analysis from wells where no free-phase petroleum was measured. The wells will be purged using a bailer and/or bladder pump until a minimum of four casing volumes or one pore volume of water have been removed, and water quality parameters have stabilized. Groundwater samples will be collected using a clean Teflon bailer or disposable polyethylene bailer and submitted to a state-certified analytical laboratory for chemical analysis for total extractable hydrocarbons as diesel and motor oil by EPA Method 8015. Samples will be collected in duplicate, and one set will be filtered in the field using a 0.45 micron filter. A silica gel cleanup will be performed on all samples prior to analysis. For quality control purposes, one field blank and one blind field duplicate sample also will be collected and submitted to the laboratory for analysis.

Purge water produced during redevelopment and sampling will be contained in 55-gallon drums and temporarily stored on site pending analysis.

DATA ANALYSIS AND REPORTING

After completion of the field program and receipt of the analytical results, Geomatrix will evaluate the data and prepare a report. The report will describe the work performed and the results, and will include recommendations for a site management program. We will schedule a meeting with the ACHCSA to discuss the results and our recommendations.

Please contact Ms. Yvonne Pierce or either of the undersigned if you have any questions or require additional information.

Sincerely,

GEOMATRIX CONSULTANTS, INC.

Elizabeth Nixon, P.E.
Senior Engineer

Tom Graf, P.E.
Vice President

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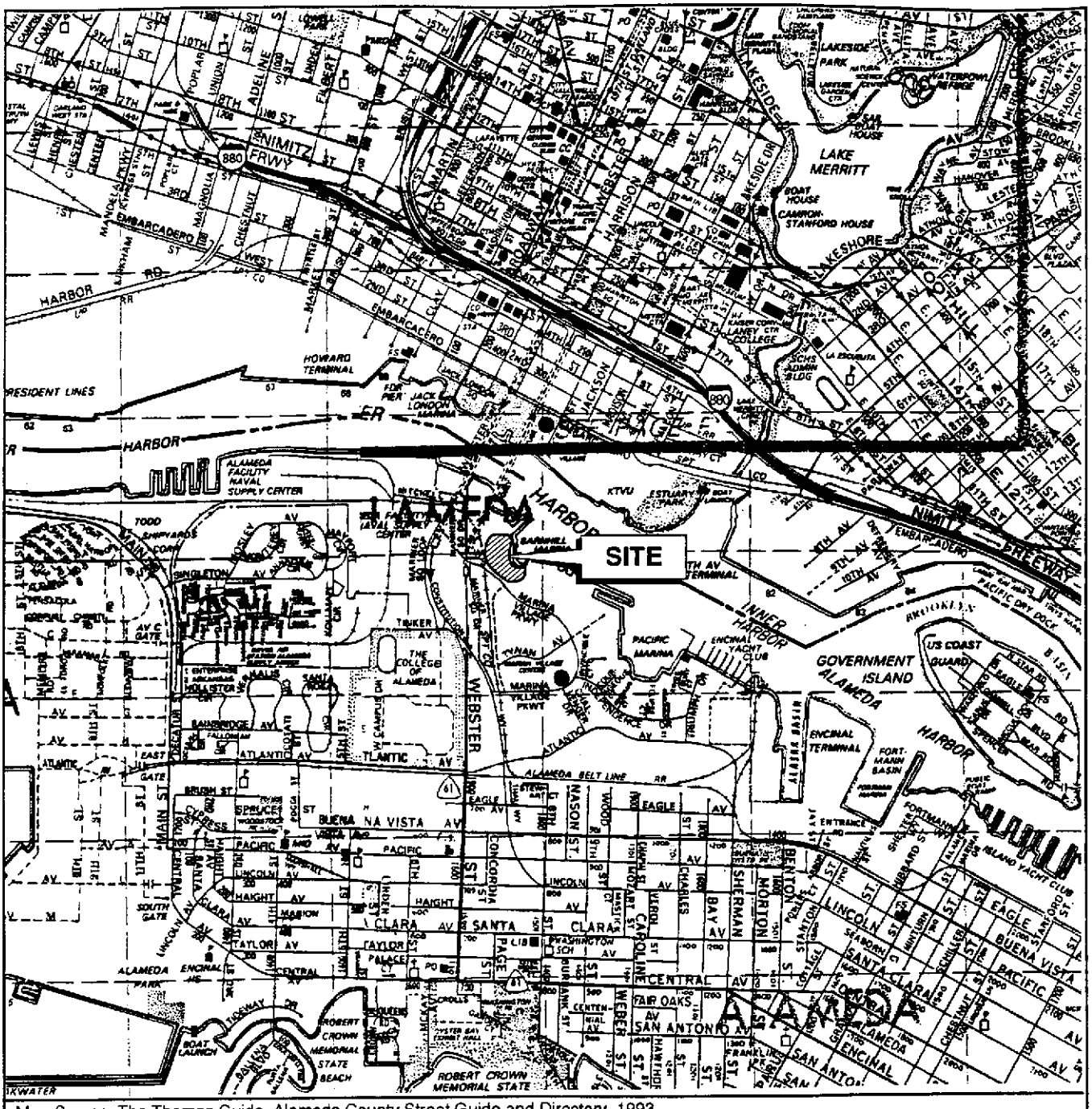
Attachments: Figure 1
Figure 2

cc: Ms. Juliet Shin, ACHCSA



Map Source: The Thomas Guide, Alameda County Street Guide and Directory, 1993

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SITE LOCATION MAP
Marina Village
Alameda, California

Figure
1

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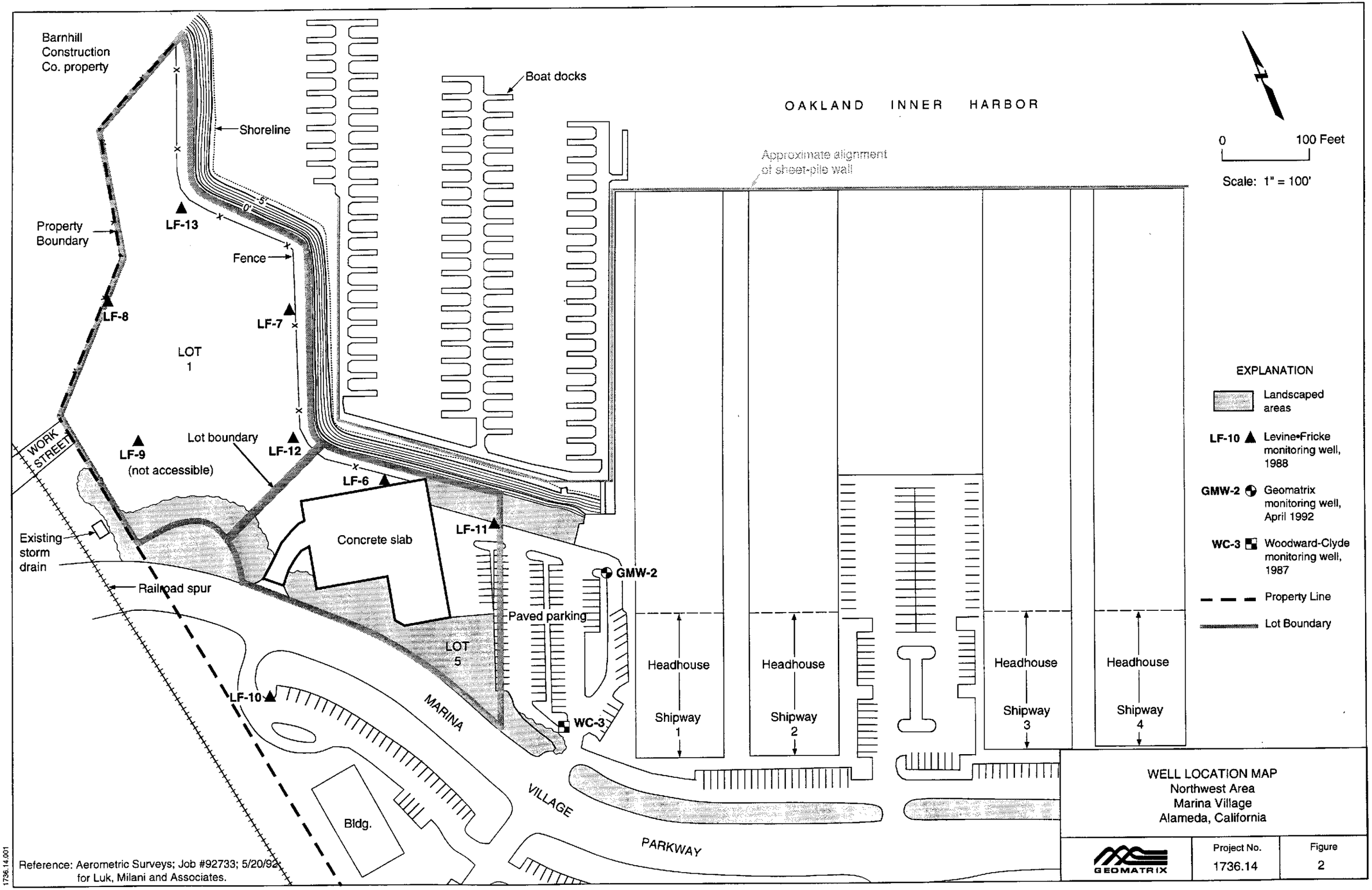

Reference: Aerometric Surveys; Job #92733; 5/20/92; for Luk, Milani and Associates.

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WELL LOCATION MAP
Northwest Area
Marina Village
Alameda, California

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