

**J R ASSOCIATES**

Engineering Geophysics  
1886 Emory Street  
San Jose, CA 95126  
(408) 293-7390

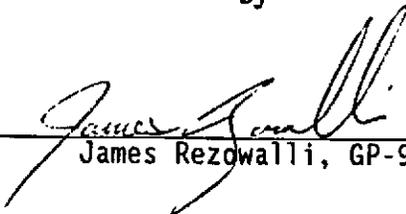
HARRISON STREET GARAGE GEOPHYSICAL INVESTIGATION  
HARRISON STREET GARAGE  
1432 HARRISON STREET  
OAKLAND, CALIFORNIA

August 27, 1990

for

SCS Engineers  
6761 Sierra Court, Suite D  
Dublin, CA 94568

by

  
James Rezwalli, GP-921

51



**TABLE OF CONTENTS**

---

LIST OF ILLUSTRATIONS . . . . . iii

I INTRODUCTION . . . . . 1

    A. Site Conditions . . . . . 1

II METHODOLOGY . . . . . 2

    A. GPR Instrumentation . . . . . 2

    B. GPR Field Procedures . . . . . 2

    C. Pipe and Cable Surveying . . . . . 3

III RESULTS . . . . . 4

    A. Car Lift Area . . . . . 4

    B. Lower Southern Garage Corner . . . . . 5

    C. Limitations . . . . . 5

    D. Conclusions . . . . . 6

IV DRAWINGS . . . . . 7

**LIST OF ILLUSTRATIONS**

---

- Drawing 1 Site Location
- Drawing 2 Example Radar Anomalies
- Drawing 3 Upper Garage Area
- Drawing 4 Lower Southern Garage Area

## I INTRODUCTION

This report presents the results of a geophysical investigation performed at the Harrison Street Garage for SCS Engineers by J R Associates. The purpose of the survey was to determine if there were geophysical indications of buried tanks at two locations in the garage. The Harrison Street Garage is located at 1432 Harrison Street in Oakland, California (Drawing 1). The field work was performed on August 16, 1990, by James Rezowalli, Principal Geophysicist, and Lanbo Liu, Geophysicist, of J R Associates.

### A. Site Conditions

The geophysical investigation took place inside the Harrison Street Garage. An area around three car lifts near the ground level Harrison Street entrance of the garage was investigated using a ground penetrating radar (GPR) and a pipe and cable locator. An area in the southern corner of the lower level of the garage adjacent to Alice Street was also investigated with the GPR and pipe and cable locator. The first purpose of the geophysical investigation was to aid in determining if there were buried hydraulic tanks associated with the car lifts near the garage entrance. The car lifts and a pneumatic line indicated that tanks may have been buried in this area. The second purpose of the GPR investigation was to aid in determining if waste oil tanks were buried in the lower southern corner of the garage. An apparent fill (or drain) pipe originating on the Alice Street sidewalk and leading into the lower garage floor along with two apparent tank vent pipes indicated that two tanks may have been buried in the lower southern corner of the garage.

## II METHODOLOGY

### A. GPR Instrumentation

A SIR 3 radar system made by Geophysical Survey Systems, Inc., was used at the site. The SIR 3 consists of a radar control unit, a graphic recorder, and a 500 MHz antenna. The GPR transmits a radio frequency electromagnetic pulse into the ground. The pulse travels through the ground at approximately 3 nanoseconds per foot. The pulse is reflected back to the surface from buried features with dielectric constants that are different than the surrounding or overlying media. GPR pulses are transmitted and the returning reflections are recorded 32 times a second as the antenna is slowly pulled across the ground. The GPR detects the returning reflections and plots them on the graphic recorder. The X axis of a GPR record is distance and the Y axis is time. Drawing 2 shows two GPR records collected at the site. The dark bands seen on the GPR records indicate the returning radar reflections. The GPR antenna must travel directly over a buried tank to detect it.

### B. GPR Field Procedures

GPR data were collected along a grid of traverse lines in the vicinity of the car lifts and in the lower southern corner of the garage. The traverse lines were spaced two feet apart. Data collection began by marking the beginning and the end of a radar traverse. A tape measure was then laid on the ground between the beginning and end marks. The antenna, connected to the control unit by a cable, was dragged along the traverse collecting radar records adjacent to the tape measure. The antenna operator manually marked the radar records every time the radar antenna traveled 5 feet. The dashed distance marks (Drawing 2) were created by pressing a momentary switch connected to the antenna. After a traverse was completed, the tape measure was moved to the next traverse line and the above process was repeated.

C. Pipe and Cable Surveying

A pipe and cable survey was performed at the site using a Radiodetection, Inc., RD 400 pipe and cable locator. Buried utilities create GPR anomalies that appear similar to the anomalies created by buried tanks. The utilities were located so their anomalies would not be associated with buried tanks. The approximate locations of most of the buried utilities found by the pipe and cable locator are noted on Drawings 3 and 4.

## III RESULTS

A. Car Lift Area

The results of the geophysical investigation around the car lifts near the ground floor entrance of the garage are illustrated in Drawing 3. The GPR and the pipe and cable locator indicated several buried pipes in this area. The most significant buried pipe appeared to connect an abandoned drain near the car lifts to two waste oil tanks buried near the southern corner of the lower level of the garage (Drawings 3 and 4). Another buried pipe, probably a pneumatic line, was traced from the garage wall to a valve adjacent to lift 1 (Drawing 3). There was also a buried line connecting lifts 1 and 2. The GPR anomaly created by the line connecting the two lifts is shown in Drawing 2. There were no other indications of buried lines leading into or away from lift 1 or lift 2. The data indicate that if a tank is buried in the vicinity of lift 1 or lift 2, it is probably located next to the hydraulic rams where surface metal interfered with the GPR. Using the pipe and cable locator, a buried line was traced from near what appeared to be a lift valve on the garage wall to lift 3. This line had been cut into the floor and patched over. There were no other indications of buried lines leading into or away from lift 3. The data indicate the hydraulic tank for lift 3 was either located above ground or is buried next to the hydraulic ram of lift 3.

There was one GPR anomaly indicative of a object buried approximately 8 feet from the car lifts (Drawing 3). This GPR anomaly is also shown in Drawing 2. Although this object could be a buried tank, there was no indications of buried lines leading to or from it, and no surface indications of a fill spout or vent lines. It is likely that this anomaly is due to an object other than a buried tank.

## B. Lower Southern Garage Corner

The results of the GPR and pipe and cable locating in the southern corner of the lower level of the garage are illustrated in Drawing 4. We were able to trace the suspected tank vent lines to two tanks buried approximately 20 feet from the corner of the garage. Large metal plates covered the fill spouts of the tanks. As mentioned above, a pipe was traced from what appeared to be an abandoned drain near lifts 1 and 2 to the two buried tanks. A pipe leading from the fill spout (or drain) in the sidewalk adjacent to the rear of the garage was also traced to these two tanks. There were no indications of other buried tanks in the area investigated.

## C. Limitations

The GPR's depth of penetration is dependent on soil conductivity. The more conductive the soil, the shallower the depth of penetration. In urban areas, particularly in the San Francisco Bay Area, soil conductivities can vary considerably over a short distance. The depth of penetration can be less than one foot in very conductive soils and greater than five feet in resistive soils. Therefore, it is possible there are materials buried at the site that were not detected by the GPR. Also the GPR cannot differentiate a buried tank from another buried object that is roughly the same shape and size.

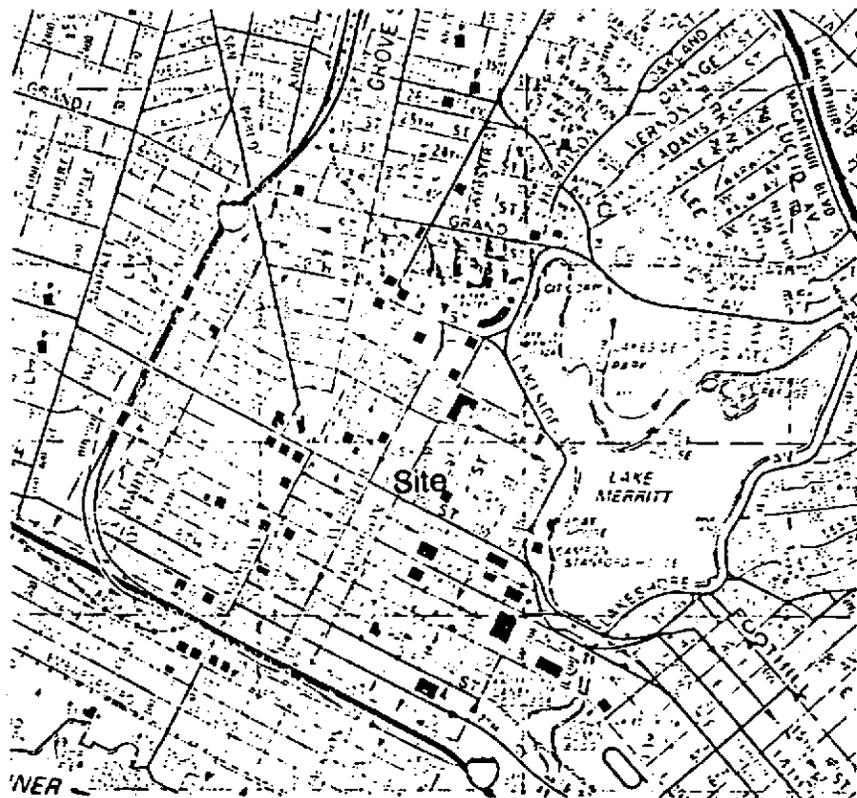
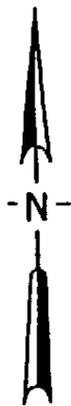
The pipe and cable survey was performed to augment the GPR data. Buried utilities can be missed if they are buried too deep, buried in groups of two or more, or if they are relatively short. Also, the RD 400 can not detect pipes that are not metal. The utility locations shown on the drawings in this report are only approximate and some utilities may have been missed.

#### D. Conclusions

Two tanks were located during the geophysical investigation at the Harrison Street Garage. These tanks were located near the southern corner of the lower level of the garage. There appeared to be a pipe connecting these two tanks to an abandoned drain in the vicinity of the car lifts located on the ground level near the garage entrance. These tanks were also connected to two vent pipes and to an opening on the sidewalk adjacent to the rear of the building.

There was one GPR anomaly indicative of a buried object near the car lifts. Although this object could be a buried tank, there were no indications of buried lines leading into or away from it, and there was no surface indications of a fill spout or vent lines. We suspect that this GPR anomaly is due to an object other than a buried tank. If there are buried tanks associated with lifts 1 and 2, they are probably located next to the hydraulic rams where surface metal interfered with the GPR data. If there is a buried tank associated with lift 3, it could have been located above ground or it could be buried next to the hydraulic ram where surface metal interfered with the GPR data. However, there were no geophysical indications of buried tanks associated with any of the three car lifts.

IV DRAWINGS



<b>Site Location- Harrison Street Garage</b> SCS Engineers Dublin, California		
SCALE: N.T.S.	Job No: 013119-90	DRAWN BY J.J.R.
DATE: August 27, 1990		REVISED
<b>J R ASSOCIATES</b> Engineering Geophysics 1886 Emory Street, San Jose, CA 95126 (408) 293-7390		
		DRAWING NUMBER <b>1</b>

Radar Anomaly

Depth = 1.3'

Time (nSec)

Radar Anomaly

Depth = 1.0'

Time (nSec)

Example Radar Anomalies- Harrison Street Garage  
SCS Engineers  
Dublin, California

SCALE: N.T.S.

DRAWN BY J.J.R.

DATE: August 27, 1990

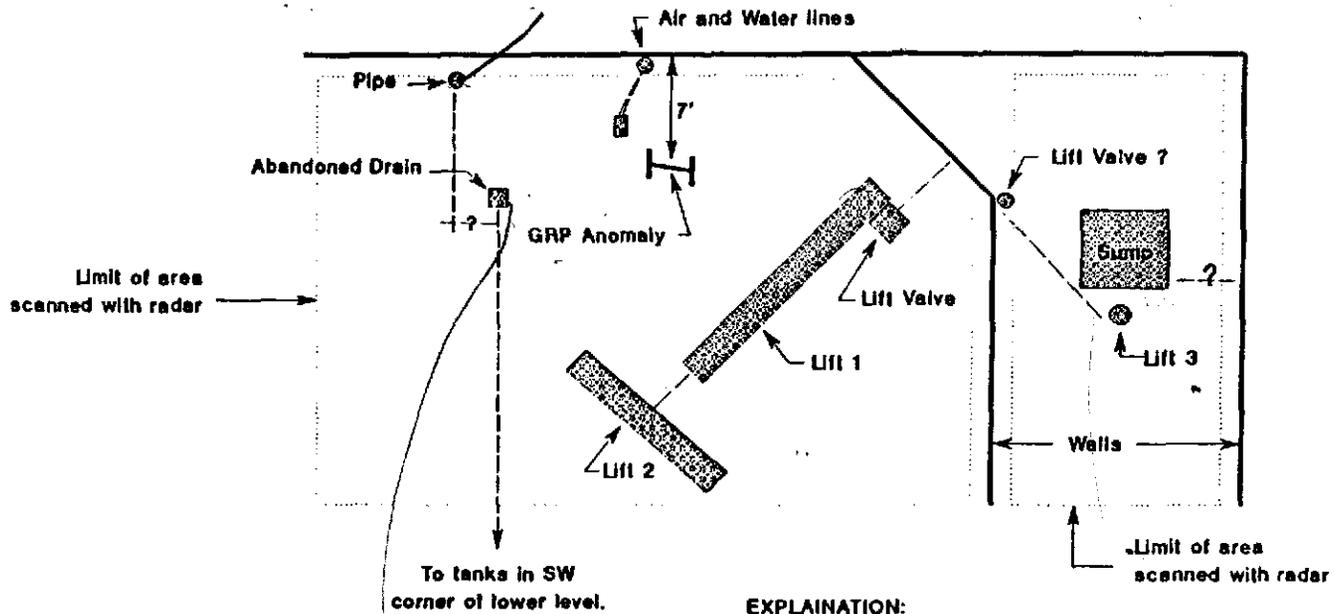
Job No: 013119-90

REVISED

**J R ASSOCIATES** Engineering Geophysics  
1886 Emory Street, San Jose, CA 95126 (408) 293-7390

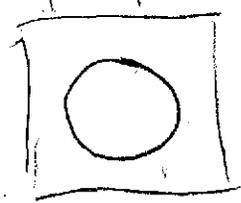
DRAWING NUMBER

2

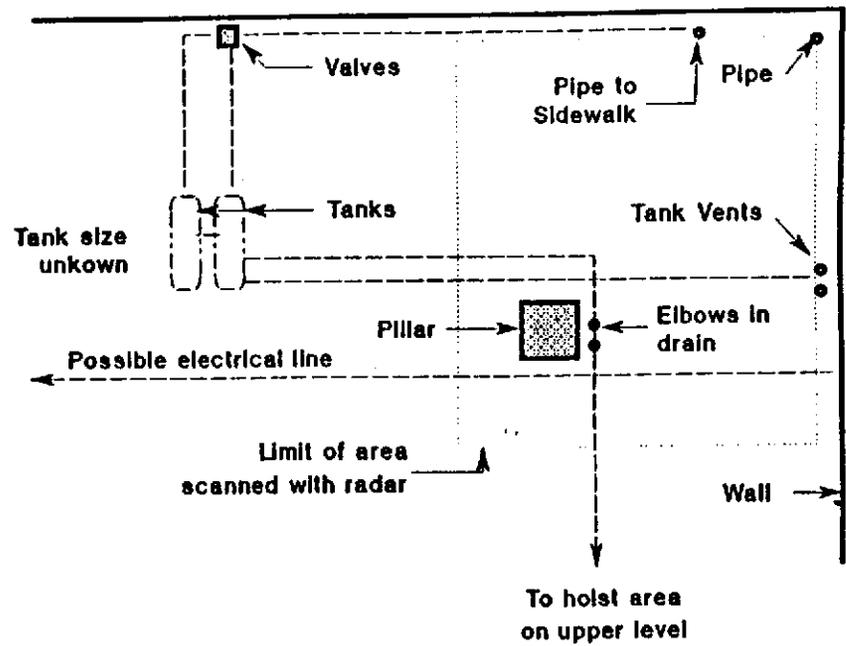


**EXPLANATION:**

- Buried Line
- ?--- Possible Buried Line



<b>Upper Garage Area- Harrison Street Garage</b> SCS Engineers Dublin, California		
SCALE: N.T.S.	Job No: 013119-90	DRAWN BY J.J.R.
DATE: August 27, 1990		REVISED
<b>J R ASSOCIATES</b> Engineering Geophysics 1886 Emory Street, San Jose, CA 95126 (408) 293-7390		
		DRAWING NUMBER <b>3</b>



**EXPLANATION:**

----- Buried Line

<p><b>Lower Southern Garage Area- Harrison Street Garage</b>          SCS Engineers          Dublin, California</p>		
<p>SCALE: N.T.S.</p>	<p>Job No: 013119-90</p>	<p>DRAWN BY J.J.R.</p>
<p>DATE: August 27, 1990</p>		<p>REVISED</p>
<p><b>J R ASSOCIATES</b> Engineering Geophysics          1886 Emory Street, San Jose, CA 95126 (408) 293-7390</p>		
		<p>DRAWING NUMBER  <b>4</b></p>