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**GEOPHYSICAL SUBSURFACE INVESTIGATION**  
for  
**STU DEPPER**  
at  
**3820 Manilla, Oakland, California**

**Subject**

Geophysical subsurface investigation for underground storage tanks (UST).

**Site Location and Description**

On November 4, 1999, Subtronic conducted a subsurface geophysical survey over the sidewalk in front of 3820 Manilla street, in Oakland, California. The suspect area is approximately 135 feet long by 12 feet wide. The survey was negatively influenced by a parked truck approximately 50 feet north of the southwest corner of the building at 3820 Manilla.

**Geophysical Equipment**

The specialized equipment used at the site includes an RD 400, TW-6 M-Scope, a magnetic locator (the Schonstedt GA-72CV) and ground penetrating radar (GPR).

*Magnetic Locator*

The Schonstedt Instrument Company GA-72CV is a hand-held magnetic locator designed to detect magnetic objects made of iron and steel buried up to a depth of eight feet below the surface.

Primary applications of the magnetic locator are locating UST's, buried drums and underground pipes.

*Radiodetection RD 400 Cable and Pipe Tracer*

The RD 400 cable locator is a hand-held instrument used to detect buried utilities. The primary application of the RD 400 is to pinpoint the path of electric lines and other power conductors such as CATV and telephone cables. Pipes made of steel or copper and pipes with tracer wire are also easily traced.

*TW-6 M-Scope*

The Fisher TW-6 M-Scope is a split box inductive locator and metal detector mounted on a four foot rod. The split box locator can detect metal lines "inductively".

The M-Scope is also used to detect buried metallic objects such as manhole covers, underground storage tanks, etc...

#### **Ground Penetrating Radar (GPR)**

A ground penetrating radar system graphically records subsurface structures. Both geological and manmade structures are recorded by the introduction of a pulse of electromagnetic energy into the ground. Reflected pulses received by the antenna are then processed for measurable contrast in electrical properties. The result is a visual pseudo-cross-sectional profile.

Primary applications of the GPR are detecting UST's, buried drums, previously excavated areas, i.e., UST excavations, and detecting metallic and non-metallic utilities.

The GPR depth penetration is severely limited by clay-rich soil. Radar waves penetrate deeper in sandy and gravelly soils. GPR penetration is limited at many sites in the "Bay Area" due to the clay type soil. However if the UST is backfilled with p-gravel the GPR will provide a nice image of the UST.

#### **Survey Methodology**

Exposed piping or risers found on the site were energized, traced out and the surface location was spray painted on the ground. The site was then scanned with both the M-Scope and the magnetic locator for piping and possible buried UST's along traverses spaced approximately five feet apart. GPR scans were collected along profiles spaced ten feet apart to detect either USTs or UST excavations.

#### **Results of the Subsurface Investigation**

The metal detecting instruments (magnetic locator and TW-6 M-SCOPE) did not detect any UST type anomalies. Note that the geophysical data was survey was biased due to the metal windows, the metal roll up doors along the west wall of the building and a parked car approximately 50 feet north of the southwest corner of the building. An area showing a depression or a possible excavation was interpreted from the GPR scans (see site sketch for location). This excavation may or may not be associated with a UST excavation.

A drain cap located 40 feet north of the southwest corner of the building was inspected. This drain is probably part of a floor drain system. No smell of hydrocarbons was detected on the probe inserted into the drain.

Subtronic did not detect a underground storage tank type anomaly in the area investigated.


#### **Limitations**

The subsurface geology, object size and composition, burial depth, and surface interference are all major factors as to whether the object will be detected by surface geophysical methods. These are all factors beyond Subtronic's control. The results

of geophysical surveys may not represent unique solutions. Apparently similar anomalies may be created by different subsurface phenomena.

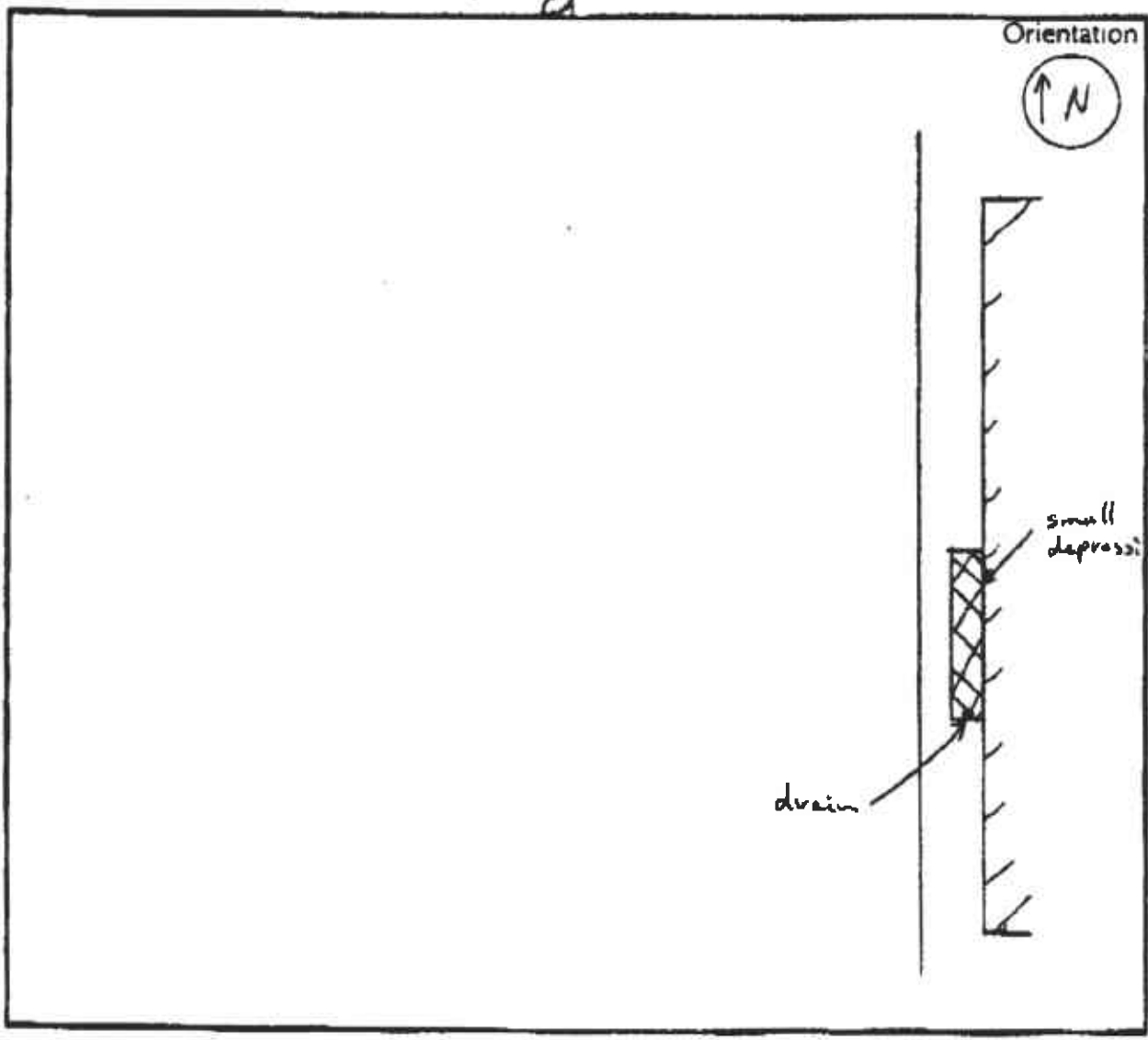
The magnetic influence from buildings, metal fences, and vehicles diminish the area that can be scanned for underground storage tanks.

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# SUBTRONIC UTILITY SURVEY

Client: Stu Depper Date: 11/8/99  
Project: Sidewalk in front of Subtronic Job No: \_\_\_\_\_  
Borehole/Site I.D. 38 200 Mainville, Oakland CA Client Job Ref: \_\_\_\_\_



Utility drawings used: \_\_\_\_\_

Utilities which were not located and why? \_\_\_\_\_

Notes: \_\_\_\_\_

Client's Signature \_\_\_\_\_ Print Name \_\_\_\_\_  
Surveyor Piero Amund Copy given/faxed to Client on? \_\_\_\_\_