

N61331.AR.001731
NSA PANAMA CITY
5090.3a

GROUND PENETRATING RADAR SURVEY NSA PANAMA CITY FL
2/1/2001
FLORIDA SPILL RESPONSE CORPORATION

Ground Penetrating Radar Survey
at the
Department of the Navy
Coastal Systems Station
Panama City, Florida

Prepared By:

Florida Spill Response Corporation
P.O. Box 1847
Cocoa, Florida 32923

February 2001

Introduction

On February 13, 14 and 15, 2001, Florida Spill Response Corporation conducted a Ground Penetrating Radar (GPR) survey for the Department of the Navy at the Coastal Systems Station, Panama City, Florida. The GPR survey was conducted to augment the existing knowledge of the underground gasoline and diesel fueling system at the facility.

GPR Equipment

The survey area was scanned with a SIR-2 digital control unit and a 400 MHz antenna. Subsurface reflections were recorded on the field computer hard drive of the SIR-2. Any anomalous readings that represent underground utilities in the areas surveyed were plotted on the site maps.

Transect Locations

GPR transects were conducted in areas of the facility where information was required on the underground gasoline and diesel system. GPR transects were generally conducted perpendicular to the expected utility direction. The optimum GPR data is obtained when transects are conducted over the utility line in a perpendicular direction.

Results

Continuous GPR data were received from depths of up to approximately nine feet. The sandy soils in the survey area allowed good penetration of the subsurface. Numerous GPR anomalies representing underground utilities were delineated by GPR. These anomalies are mapped on the enclosed site maps (Figures 1 to 7). An example of GPR data is included in the report.

Solid lines on the site maps represent underground utilities that were very clear in the GPR data and could be traced for some distance.

Some underground utilities were not easily traced since the GPR data were not well defined. This could be due to a pipe with a small diameter at a deep depth or the pipe may have been coated which produces a less clear GPR signal. Dashed lines on the site maps designate these utilities.

The approximate diameter and depth of each utility line are marked on the site maps. These are approximations only.

Limitations

It should be noted that ground penetrating radar can generally detect pipes an inch for every foot of depth. A one inch pipe can be detected at one foot; a two inch pipe can be detected at two feet. However, a one inch diameter pipe may not be detected at two feet, for example.

Ground penetrating radar detects round steel pipes best. However, if the pipes are coated or have considerable rust, detection may be more difficult.

As with any remote sensing tools, the results of the GPR survey are, in part, interpretive. This survey was conducted using instrumentation considered in good working order and the interpretation provided uses our best judgments. However, as with other remote sensing tools, we cannot guarantee the accuracy of this survey, nor can we accept responsibility for actions taken as a result of this survey.

General Description

The reference point utilized to establish the GPR Station Marks was the southeastern corner of the paved parking area southwest of buildings 370 and 393. A grid was established in 10 foot increments to define a location of each underground anomaly detected by the GPR.

The starting point of the survey was to establish the locations of the 6 inch line and the double 3 inch lines from the area east of the paved parking where the previous fuel storage tank 11 and fuel pump house 8 had been located. The 6 inch line was surveyed to building 431. Figures 1, 2 and 7 indicate the results.

The next step was to survey the area west of fuel pump house 8 to building 102. Figure 3 indicates the results.

Next, the double 3 inch lines were surveyed from the south end of the paved parking area to building 431. The left diagram of figure 5 indicates the results.

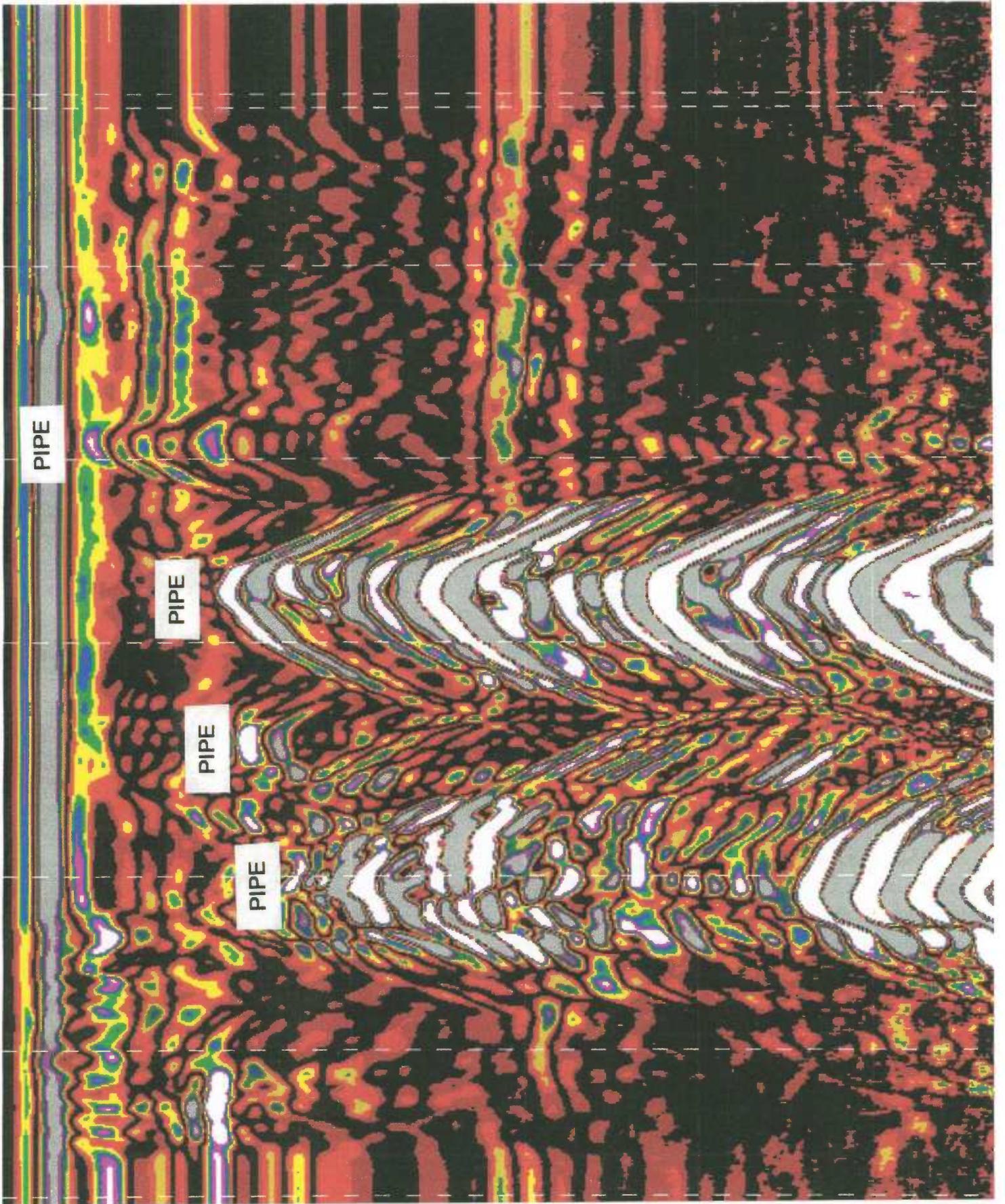
Following the survey for the double 3 inch lines, the area west of the 3 inch lines was surveyed to locate the interconnecting 3 inch line to the Alligator Bayou dock. The results are indicated on figure 4.

The next survey was to try to locate the 2 inch line from the double 3 inch line intersection to building 431. Figure 5 indicates the results.

A survey of Solomons Drive in front of building 431 was made to locate the double 3 inch lines to the south dock on Alligator Bayou as well as to locate the 2 inch line from the double 3 inch line to building 9. Figure 6 indicates the results.

Each figure is provided with a description of the survey and an explanation of the findings. A composite of the figure diagrams is also provided as an overview.

The conclusion section summarizes the work.



PIPE

PIPE

PIPE

PIPE

Figure 1.

In order to establish a reference point for the GPR survey, the southeastern corner of the paved parking area southwest of buildings 370 and 393 was chosen as a central location. This point seems to be a consistent reference to existing drawings.

The top of figure 1 diagrams the east side of the parking area and from the southeastern corner of the parking area GPR station marks were placed on 10 foot intervals. These intervals established data points to reference pipe locations.

The GPR antenna was then traversed across the station marks from west (lower side of diagram) to east (upper side of diagram). Crossing underground pipes perpendicularly allows for the best radar reflection and therefore the best delineation of the pipe location.

Typically, pipe sizes are identified to be within a range i.e., 8-12" would mean a pipe 8 to 12 inches in diameter, so that interpretation is based on accurate data, previous history, and the experience of the individual analyzing the data. Burial depth is based on the reflection, with a smooth pipe providing the best reflection, but depth could also be misread by other pipes crossing over the location.

As shown in the diagram, the two 3 inch pipes as seen in the storm drain are identified to the north of the storm drain but then were not visible. It may be possible that the two pipes shown as 4-6" are actually the 3" pipes. There was not any clear reflection of the two pipes in any part of the parking area except as mentioned. This could be a result of the pipes being coated with coal tar and providing no clear reflection or that the pipes are buried deeper than the radar would reflect. It is remotely possible that the 8-12" shown is actually the double 3" pipe, but we believe it is a separate pipe run. A previous Geophysical Investigation provided to us by Coastal Systems Station does not delineate the 3" lines except at the storm drain and towards building 51 slab. We believe, based on Figure 8-3 supplied to us, that the 8-12" pipe we found is in the same approximate location as the double 3" pipes shown in Figure 8-3.

The other pipes shown are likely to be other buried utilities.

The bottom of figure 1 shows the reflection (6-12") of the 6" pipe west of building 91 south to the north side of the street adjacent to building 431. This is in agreement with the previous Geophysical Investigation and Navfac Drawing No. 5165439 SITE DEMOLITION PLAN for the construction of building 431.

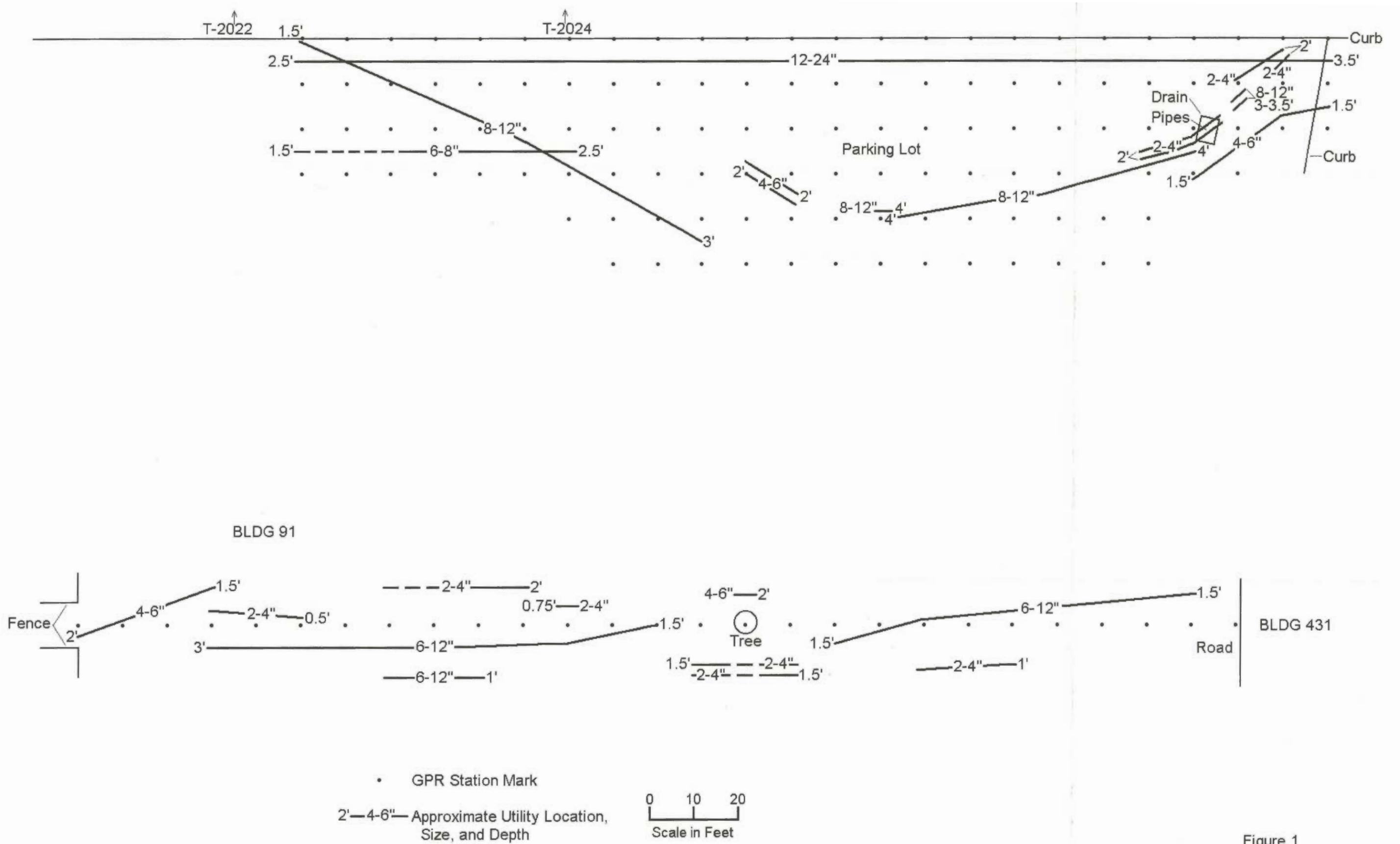


Figure 1

Figure 2.

This diagram depicts the GPR station marks for the area east of the paved parking area. This grid was established to locate the 6" pipe, the double 3" pipes, determine piping at the old pump house 8 area and locate the 3" pipe going to the west dock on Alligator Bayou. The grid pattern was surveyed west to east to accommodate expected pipe directions.

The 4-6" pipe shown just west of the building marked "trailer" is the correct size and generally appears to be in the correct direction to be considered the 6" pipe that previously connected to fuel storage tank 11. The composite of the diagrams seems to confirm that as well.

The double 3" pipes are not readily visible nor does there appear to be any piping in place from the old pump house 8.

The street immediately to the north of the paved parking area was also surveyed without a grid to locate the 3" pipe going to the west dock on Alligator Bayou from the pump house area, but because there was no indication of a pipe present crossing the street (other than larger utility pipes in the street), a formal grid was not laid out.

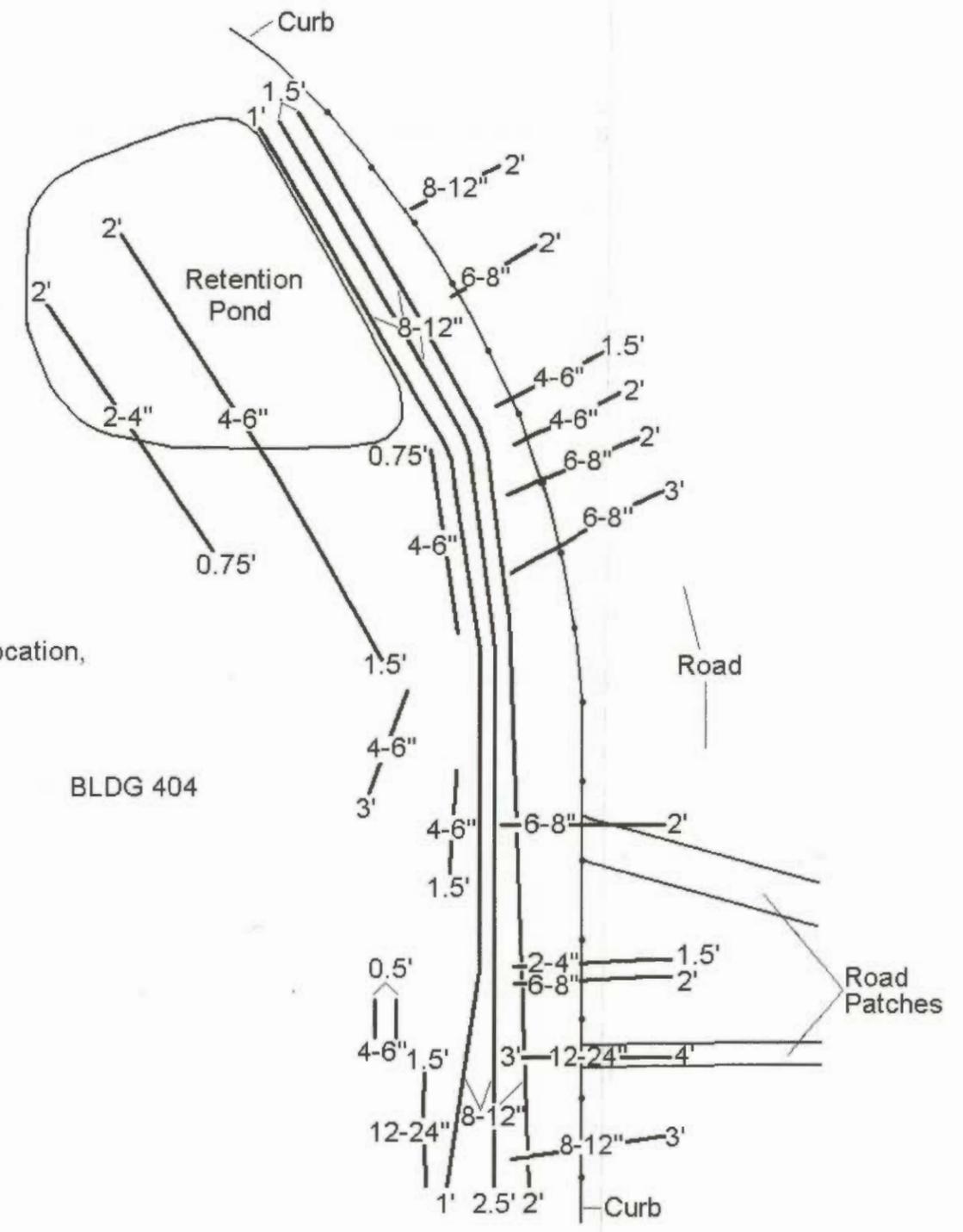
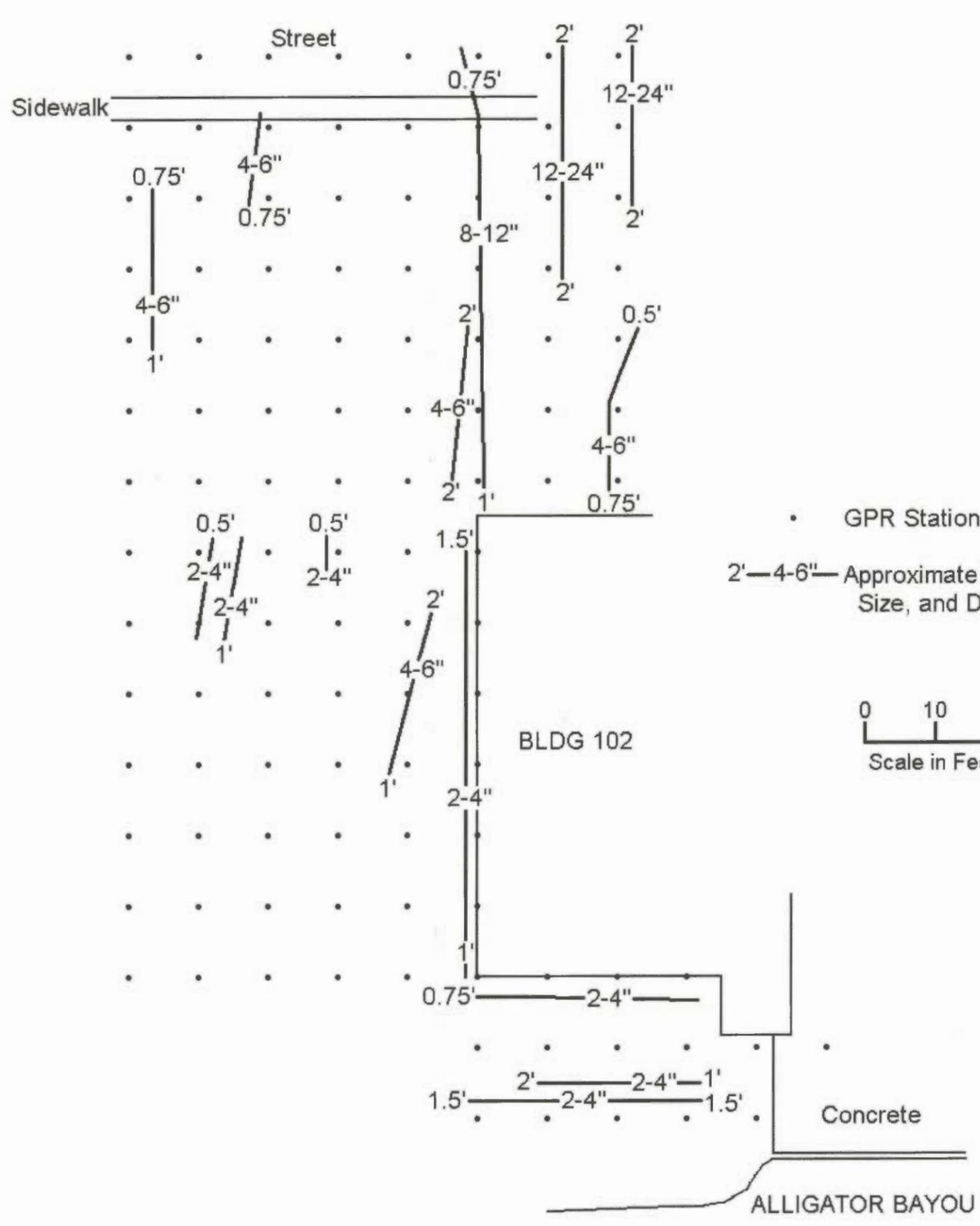
Figure 3.

The right diagram depicts the survey on the north side of the street adjacent to the west end of the large paved parking area.

The only consistent reflections for pipe were for larger pipes which are believed to be water or sanitary related due to their size.

There are pipes indicated on both the right and left diagrams consistent with the size of the 3" pipe and those are shown as 2-4" pipe. One is located in the retention area west of building 400 and again crossing the road east of building 102. There are also 2-4" pipes shown north of building 102 and also to the west of building 102. There is not any continuity to those pipes for any consistent length. At the depth indicated on the diagrams for those pipes found there should have been clearer reflections over a greater distance.

The manways and double covers were opened along the length of the utility trench from building 104 south on the west dock on Alligator Bayou to the existing above ground fuel tank. There was no 3" pipe in the utility trench as indicated on P.W. Drawing No. M-298A.



• GPR Station Mark
 2'—4-6"—Approximate Utility Location, Size, and Depth
 0 10 20
 Scale in Feet

BLDG 102

Figure 3

Figure 4.

This area was surveyed to locate the 3" pipe connected to the double 3" pipe and its run to the dock at Alligator Bayou. The 2" pipe connection and run were considered as part of this area.

The pipe range of 2-4" would indicate the presence of 3" pipe. Two small sections of pipe that size were found as shown on the right and approximate center of the diagram. These locations are not consistent with the previous Geophysical Investigation and Figure 8-3.

Data is not provided beyond structure 333 (Boom Containment Wash Area) due to unusable reflective images. This is likely due to corrosion of piping, presence of salt and/or presence of other utilities contributing to poor reflections.

The 2-4" pipe found would not be the 2" pipe to building 94 due to its location.

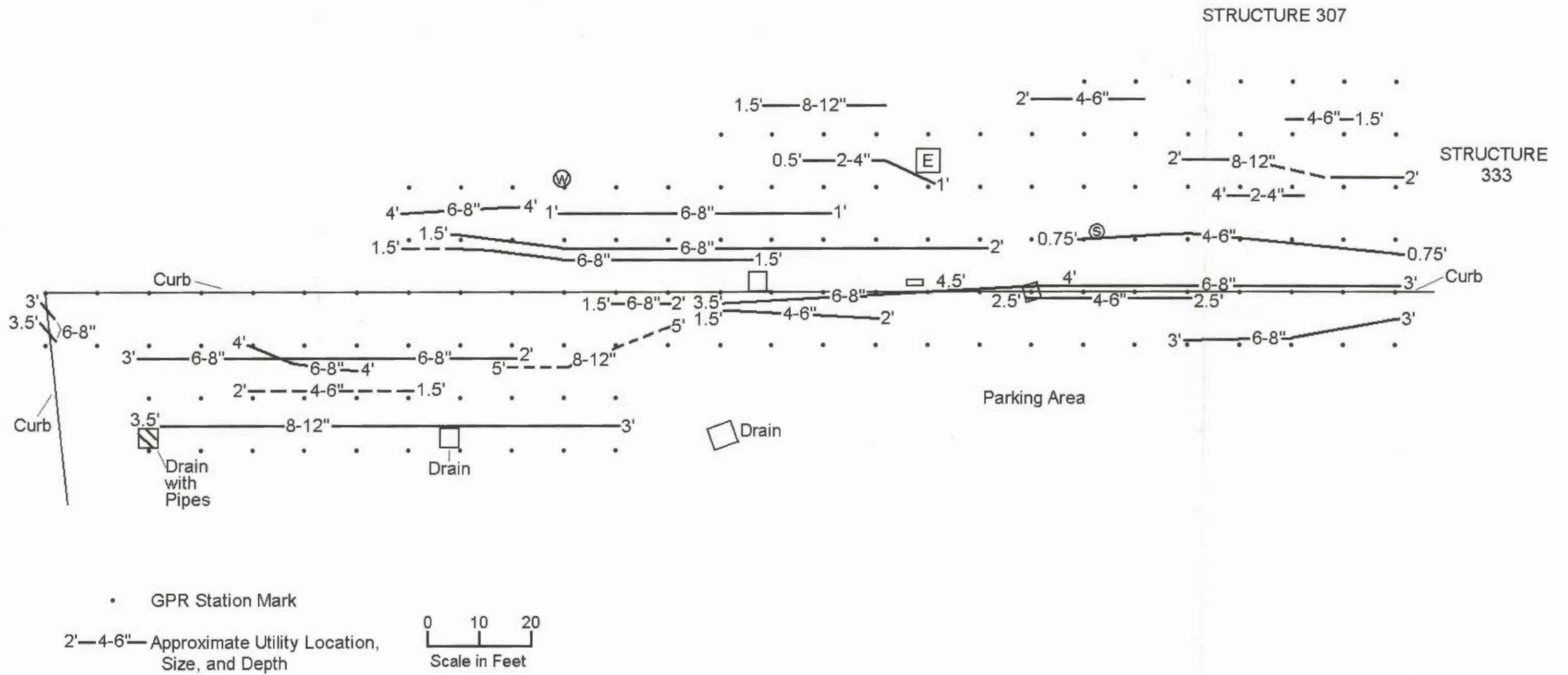
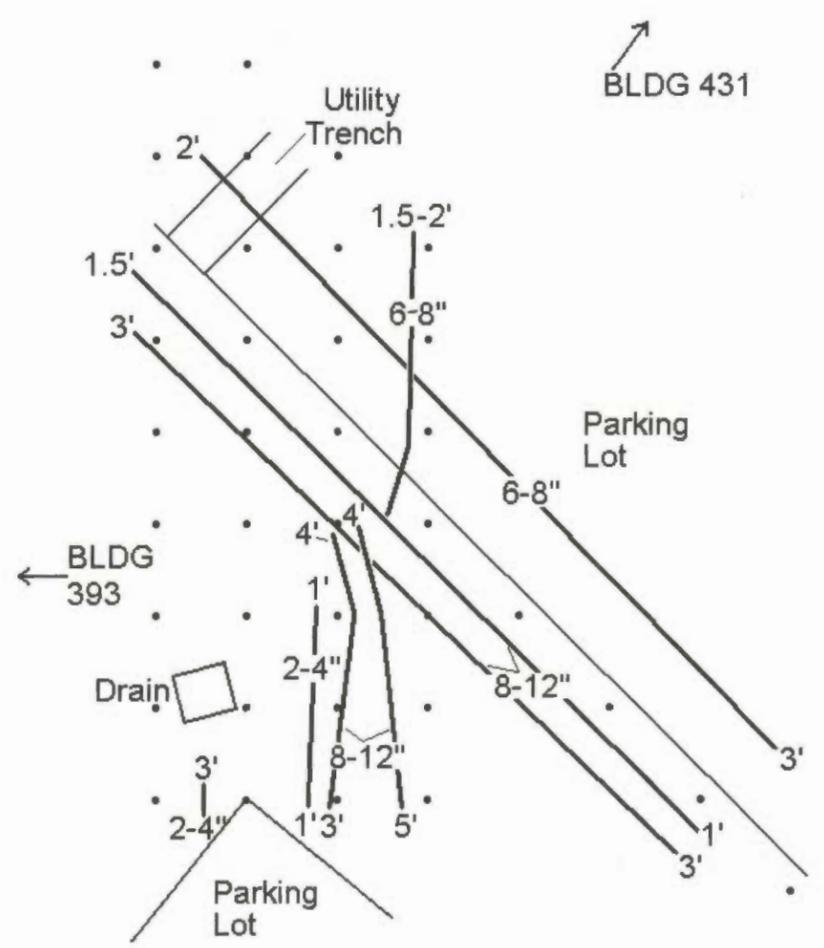


Figure 4

Figure 5.

The area south of the paved parking reference point was surveyed to locate the connection of the 2" pipe to the 3" double pipe run and to locate the run of the 2" pipe to the north side of building 94 and south along building 431.

No 2" pipe was located. This does not mean that it is not present, but that the pipe may be buried deeper than the radar could reflect (rough rule is 1" per foot of depth-2" deeper than 2 feet may not be visible). The pipe could also be below existing utilities which are shown.



• GPR Station Mark

2'—4-6" — Approximate Utility Location, Size, and Depth

0 10 20
Scale in Feet

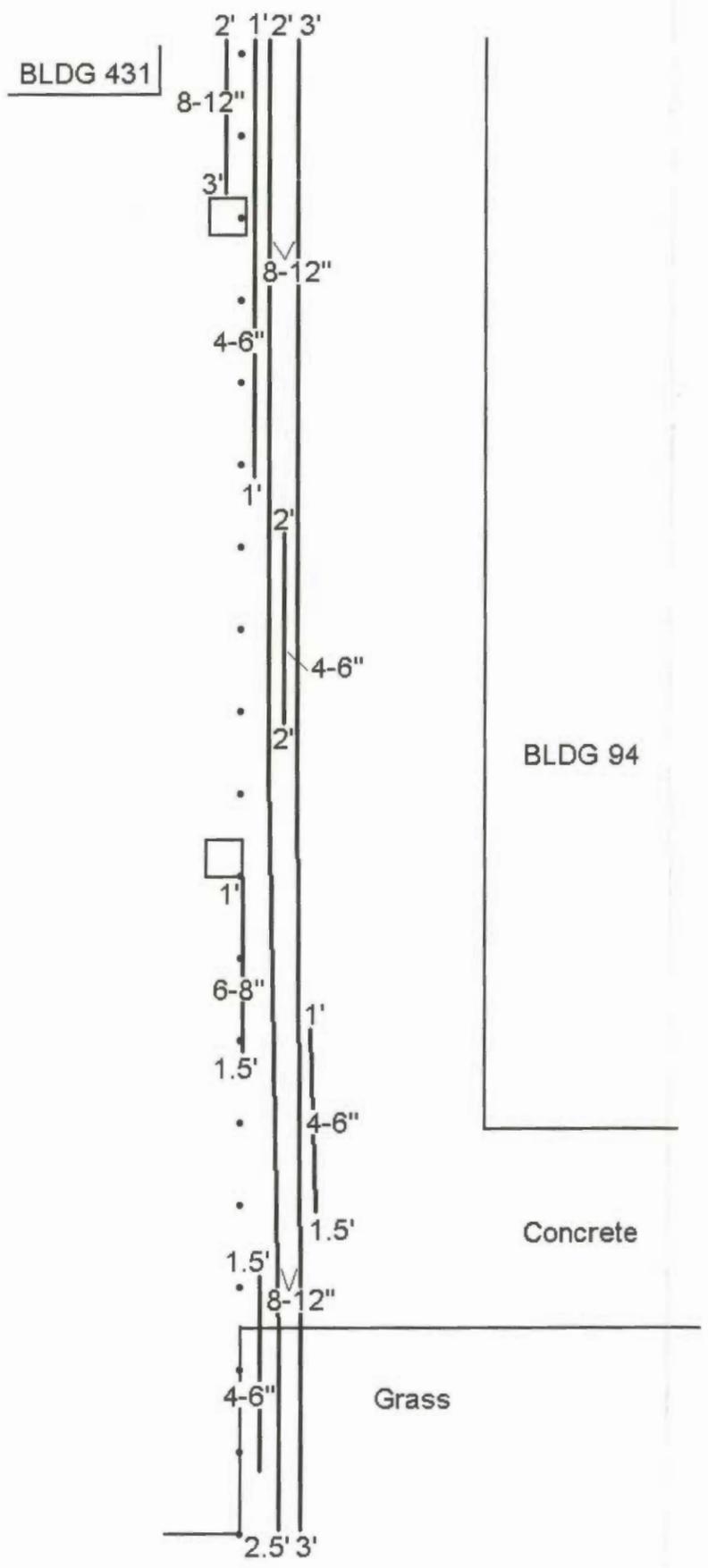


Figure 5

Figure 6.

The data on this figure is as a result of a survey of Solomons Drive on the east side of building 431.

The survey was made to locate the double 3" pipe re-emerging from under building 431 and turning south to the dock on Alligator Bayou. The survey was also trying to establish a 2" pipe leading from the 3" pipes to building 9.

The 3" pipe should be represented by 4-6" range in reflection.

There were several indications of pipe in the correct range. These are shown on Figure 6. There are also a number of larger pipes indicated as well. It is possible that the double 3" pipes are under or above other lines. There is no indication of the smaller 2" pipe running to building 9.

The data shown on the right side of Figure 6 is the southernmost extent of useable data. Beyond the last data shown the radar reflection was massed meaning that there was possibly salt crystals in the area causing a diffusion of the reflectance. This may be due to saltwater intrusion from the bayou area.

Notes

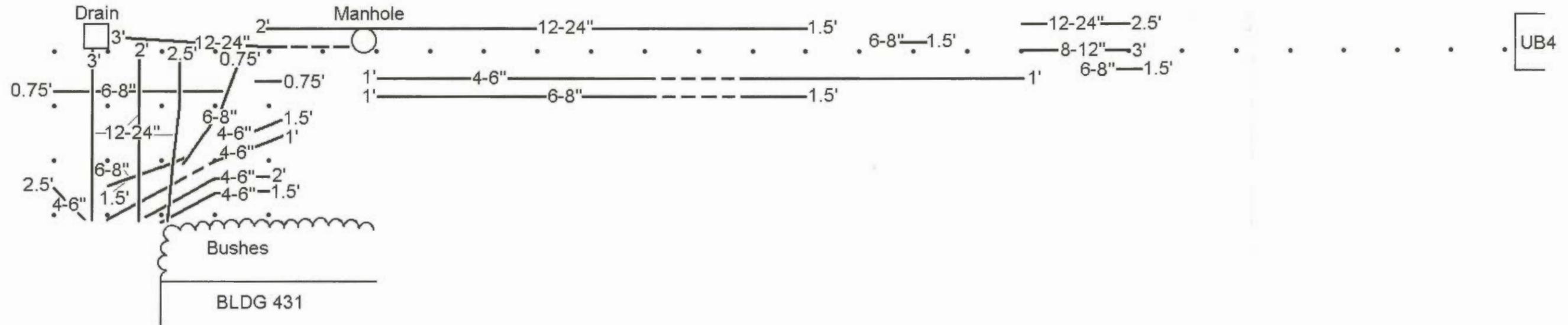
There is not a figure showing data from the west, south, and east sides of building 9. However, a pattern was followed on the west side of the building that only indicated pipes in the 6-8" range. Nothing smaller was noted which means it is buried deeper than 2 feet or it is masked by other pipes (not likely because of the direction of the pattern).

A number of radar passes were made to the east of building 9 as well as in front of building 2 and building 410. No 2" pipe was located meaning that it was buried too deep or it has been removed. There were utility lines crossing the street from the area east of building 9 and south of building 2, but were in the 4" range.

Radar passes made to the south of building 9 were also inconclusive.

A formal grid would have been surveyed if the initial passes had indicated any 2" pipe, but that was not the case.

BLDG 9



• GPR Station Mark

2'—4-6" Approximate Utility Location,
Size, and Depth

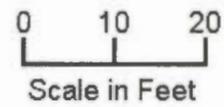


Figure 6

Figure 7.

This data was accumulated to connect the 6" pipe shown in figures 1 and 2 (the fence around the area in question had been locked previously).

The pipe shown in the 4-6" range is believed to be the 6" pipe from building 431 to the area where fuel storage tank 11 was previously located.

A number of unplotted passes were made. They were east and west along the south fence line adjacent to building 393 both inside and outside of the fence. Additional passes were made to the north of building 370 inside the fence line to the building.

These passes were made to try to find any sections of pipe equal to the 6" that was being located. There is a gap of 70 feet where no pipe reflection was found in the general line of the 6" pipe. There is no explanation for the gap unless the pipe itself is not there which may or may not be the case.

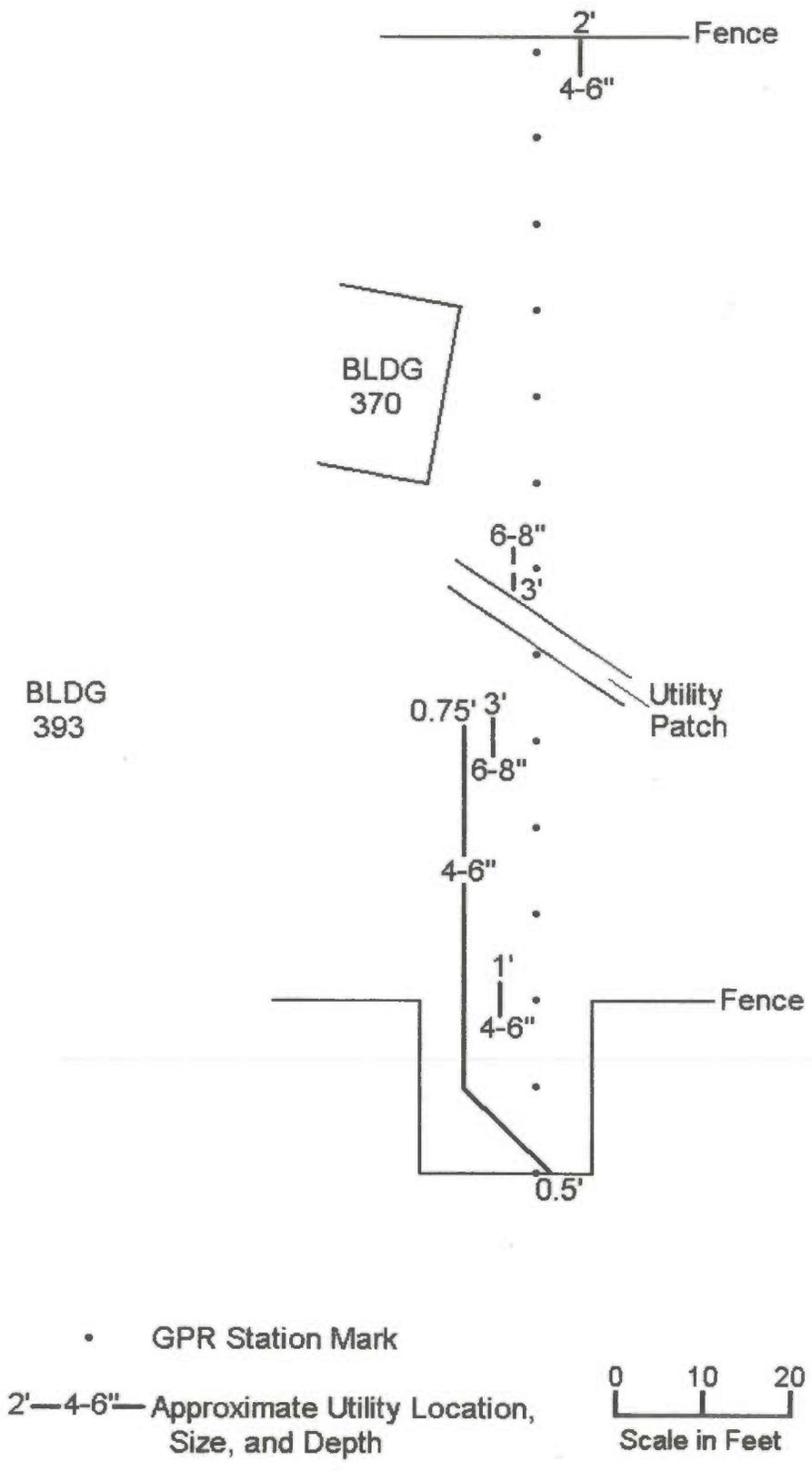


Figure 7

Conclusions

Based on the GPR data in this report, a work plan may be established to clean and abandon old fuel lines. The original consideration was to machine excavate in some specific areas to open pipe ends to clean and close pipes. Due to the number of utilities in the areas of the old pipes it will be necessary to hand excavate to the pipes. There also will be some hand digging required to confirm pipe locations due to difficulties in providing exact data by GPR due to site conditions.

The 6" pipe cleaning will require a hand excavation in the area west of building 3. Hand excavation is recommended due to other utilities in the general area. All data indicates the south end of the 6" pipe to terminate at that point. The most logical excavation for the north end of the 6" pipe is in the field just north of building 370 at the pipe end marked 4-6", depth 2 feet shown in Figure 2. After both pipe ends are exposed, continuity between ends can be established. If there is no continuity, then the pipe shown to the east marked 6-8" can be excavated. Due to the difficulty of a good locate in the area just east of building 370, any problems with establishing continuity of the 6" pipe would likely be remedied in that area where a clear reflection could not be established as shown in Figure 7.

The cleaning of the double 3" pipes will be more difficult due to the inconsistency of data, not only from the GPR findings, but past Geophysical Investigations and the lack of good historical data on pipe runs.

Per NAVFAC DRAWING No. 5165439 SITE DEMOLITION PLAN for the construction of building 431 as well as other data, the southern end of the double 3" pipes just north of building 431 should be located close to the point shown on the drawing. Due to other utilities, it will be necessary to hand excavate that location to find the piping. The more difficult task will be to identify the excavation areas for the intersection of the 2" to the 3" and the 3" to the 3" due to the fact there were no clear reflections of the piping or intersections. The previous data provided in the Geophysical Investigation and accompanying figures do not provide additional useful information for pipe locations.

The first excavation should be in the area east of the paved parking area to locate an end of the double 3" pipes. This location will be guided by the GPR data showing 4-6" range pipe sizes shown at the top of Figure 1 and some line-of-sight. These ends will allow for a starting point that is also out of normal traffic. It will be necessary to hand excavate a trench to the southeast of the storm drain where the double 3" pipes are visible by line-of-sight towards building 431 to locate the 2" to 3" intersection and the 3" to 3" intersection. It may be necessary to also

trench to the northwest of the storm drain to accommodate the 3" to 3" intersection. Once those locations are found, it will be possible to separate pipes at intersections and also to establish continuity between those areas and the ends of the double 3" piping in the area east of the paved parking. Provided continuity is available, then the area north of building 431 can be excavated and the double 3" pipes can be cleaned.

Hand excavation will also be necessary to identify the route of the 2" pipe headed west of the double 3" pipes towards building 94 as well as the turn of the pipe to the south and along the west side of building 431. The same will be true for the route of the 3" pipe going west to the dock on Alligator Bayou. The excavations will determine whether the pipes exist and, if they do, allow for cleaning and closure.

The 3" pipe from the old pump house area to building 102 will also require hand excavation to determine the pipe's existence. The excavating will take into consideration the GPR data as well as old design data. If the pipe exists and two ends can be determined, then it can be cleaned and closed.

The 2" pipe around building 9 and east will require hand excavation to confirm its existence. Again, this work will be based on logical consideration of pipe direction.

The most difficult area to excavate to determine piping will be in the street east of building 431. This street to the south dock also provides access to building 431 and other activities. The demolition plan for the site of building 431 indicates that the double 3" pipe was removed to approximately 20 feet from the west of the center of the street and that it continues to the dock area. Due to larger utilities in the street, concrete in the dock area, high traffic in this area and the need for fire and other emergency access, it would be better to leave this piping in place.

The GPR data provided in this report augments existing data relative to the old underground gasoline and diesel fuel system no longer in service. It establishes reference points to be used in locating, cleaning and capping the old pipe system.

