

# LASER SURVEYS LIMITED

UNDERGROUND SERVICES DIVISION

## **Laser Surveys Limited**

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## **Underground Services Survey Using Radiodetection & Ground Radar**

At

\*\*\*\*\*

Job No \*\*\*\*\*

Date: \*\*\*\* 201\*

## INTRODUCTION

### 1.1 GENERAL.

Laser Surveys Ltd were employed \*\*\*\*\* to try to identify the main utility services within and around the site as shown on supplied *PDF* '\*\*\*\*\*' received on 00<sup>rd</sup> \*\*\*\*\* 2013. *This was a marked-up aerial image, with the area revised from previous similar mark-ups.* This was achieved by a non intrusive 2D below ground services survey by the combination of radiodetection and Ground Penetrating Radar (GPR) methods. All underground service information was superimposed onto an original topographic survey produced by \*\*\*\*\*8, Job. No. \*\*\*\* dated \*\*\*\*, supplied to us by \*\*\*\*\*.

Laser Surveys Ltd were not issued with the existing statutory authority mains services layout.

### 1.2 SERVICE CONSTRAINTS

Please note that it is illegal to lift telecommunications and fibre optic covers in public areas. Broken or damaged manholes were not to be lifted by Laser Surveys Limited. We do not "break out" manhole covers. It is not possible to trace plastic pipes by radiodetection eg. Gas/water or fibre optic cables or drainage pipes of less than 100mm in diameter. The electronic detection of pipework applied to live metallic pipes/cables or ones that we could physically induce a signal into. All tracing is subject to retrieval of clear signals and areas where interference was found these are marked on our drawing as 'mixed signals'.

Two areas on site were not accessible at time of survey – *one being a construction site (at the North-west extent of the survey area) and another being the residences with individual gardens at the North-east extent. No access had been arranged to this area. It could be possible that some services in and around the construction site were not 'live' or de-commissioned, and that there are services running through the garden areas into the main site area that have not been detected. We have assumed the route of several services through the construction area.*

*The topographic survey issued to us was out-of-date in areas where significant changes had occurred, namely around the construction area itself. A part topographical survey was undertaken in this area, to locate & position newly-installed services infrastructure and major landscaping detail to give context to these items. A new (full) topographical survey should be undertaken to this area to give a true reflection of site layout once the construction works have been completed.*

### 2.0 DESCRIPTION OF THE SITE.

The site was located around the grounds of \*\*\*\*\* as shown in Appendix A (*PDF – extents of survey as defined by \*\*\*\*\**). \*\*\*\*\* forms the Eastern Boundary, and \*\*\*\*\* Road the South boundary. \*\*\*\*\* Road bisects the site

*approximately 75% to the North. To the south of \*\*\*\* Road, the western boundary is primarily Construction Site, whereas a cul-de-sac Garage access road forms the Western Boundary to the North. The Northern Boundary is coincident with the Northern extent of the individual fenced gardens (no's 90-104). There are 3 blocks of 6-storey residential buildings on site, surrounded by mostly soft landscaping, trees & parking areas intersected by feeder roads. There are 8 no. 2-storey dwellings with private garden areas to the north of \*\*\*\* Road.*

### 3. SITE WORK

#### 3.1 GENERAL

All site work was carried out using radiodetection equipment and GPR equipment by experienced personnel who are also qualified in Confined Spaces Entry & Monitoring Signing, Lighting & Guarding (Chapter 8). Radiodetection site work was carried out on site *00<sup>nd</sup> to 00<sup>th</sup> \*\*\*\* 2013 and the GPR 00<sup>th</sup> & 00<sup>th</sup> \*\*\*\* 2013*

Equipment used:

Radiodetection	- RD4000 manufactured by Radiodetection Ltd
GPR	- RAMAC – X3M manufactured by MALA GEOSCIENCE

#### 3.2 GROUND PENETRATING RADAR

The site was walked over as a series of lines in a grid pattern at approximately *5 metre* intervals or closer where appropriate. Where services were known to exist ie from results of the radiodetection survey, the GPRE would cross the longitudinal axis at 90 degrees. Where services were unknown then the survey was carried out in two perpendicular directions ie. In a grid formation.

The relationship of these 'grids' were then related to the original topographic survey by identifying and relating to common features.

All information is automatically data logged on site for later interpretation in the office. Laser Surveys Ltd has learnt from experience that on site identification does not produce the best results. Laser Surveys Ltd carry out all identification with the use of filtering software from the comfort of the office. Determined services are drawn onto the topographic survey within AutoCAD in their appropriate layer.

On this site, a mixture of post-processed and 'live' scanned Radar was undertaken, to compliment the radiodetection survey. Grids were established in areas where it was assumed that most of the services would exist (within carriageways & adjacent to residential blocks) and 'live' scanning was undertaken in the areas where less services were anticipated.

#### 3.3 RADIODETECTION

The site is first scanned for passive signals. These signals are called “passive” because they already exist on buried cables and pipes and are there for us to detect. There are two types of passive signal either a power signal (50Hz or 60 Hz) emitted by power cables or radio signal emitted by telephone cables.

Secondly an “active” signal can be applied by a transmitter to a pipe or cable via a fire hydrant, stopcock, gas valve, etc. and then this unique signal is traced above ground using a receiver.

Thirdly a transmitting sonde (a sausage shaped transmitter) attached to a flex-rod (a plastic glass fibre rod coiled on a rotating steel caged spool) is introduced into the drainage at an inspection pit and manually pushed down the pipe. Its progress is monitored and positioned above-ground using a RD 4000 Locator. It cannot be assumed that the sonde is lying centrally in the pipe.

The ground is then marked up with coloured paint to differentiate between services at about 5-10m centres or at changes in direction.

The route is then surveyed-in using a total station with automatic data capture. On return to the office it is processed and superimposed into the AutoCAD DWG topographic survey. Each service is given its unique name with the utility provider within its own AutoCAD layer.

### 3.4 STATUTORY SERVICES SEARCH

Not Supplied/Requested.

## 4. INTERPRETATION

### 4.1 GENERAL COMMENTS

All work is carried out to the RICS Specification.

It is important you read their preamble, which is printed below, that highlights the possible incompleteness of electronic tracing.

***Electronic Tracing:*** This is a more reliable method of locating buried services. On heavily built-up sites 85% completeness is probably all that can be expected. Plan accuracies of the order  $\pm 150\text{mm}$  may be achieved but this figure will depend on the depth of the service below ground level. Where similar services run in close proximity, separation may be impossible. Successful tracing of non-metallic pipes may be limited (due to technology available at the time of publication of this specification).

*Electronic tracing is relatively expensive. In the case of development sites it is more economical to indicate those areas where excavation will take place and concentrate there.*

### 4.2 GROUND PROBING RADAR

GPR does **NOT** trace services, but indicates the presence of voids, disturbed ground, trenches, pipes and cables under the surface.

GPR is an echo sounding method where a transmitter/receiver is passed over the ground under investigation. It is effective at mapping metallic and non-metallic services. It is of limited use in conductive ground (e.g. wet clay) or through reinforced concrete. NB: GPR does not identify a particular service, only the likely location of a pipe or cable, and is best used in conjunction with Radiodetection where possible.

The effectiveness of GPR is reduced on slopes of greater than 1:3 and in woodland areas where the signal is degenerated by tree roots. Also ground obstructions also affect the results e.g. Presence of litter, spoil heaps, brambles or other vegetation.

Depth results using GPR are typically accurate to within  $\pm 10\%$  with a horizontal accuracy of  $\pm 150\text{mm}$

#### 4.3 RADIODETECTION.

There are a number of circumstances, as listed below, which can occur that will degrade the information surveyed by radiodetection.

- a. Fractured service
- b. Service comes into close contact with other services or rebar
- c. Electrical field from other services degrades signal.
- d. Trace limited to 100m from transonde
- e. Sound signal corrupted by ground density e.g. re-enforced concrete
- f. Sound signal corrupted by traffic and construction plant
- g. Plastic repair incorporated into metal pipe terminates the signal.
- h. Ground density corrupts signal
- i. No trace wire incorporated into plastic pipe
- j. No trace wire in plastic pipe exposed at stop cock.
- k. High voltage cable can be 'balanced' and will not have a field that can be traced. It can not be traced unless direct access is available in order that we can clamp onto it to induce a signal.

For radiodetection we hope to achieve an accuracy of  $\pm 10\%$  of depth.

E.g. Service 2m deep = positional accuracy  $\pm 200\text{mm}$ / depth accuracy  $\pm 200\text{mm}$

For drainage it cannot be assumed that the sonde is lying centrally in the pipe, but a position and depth accuracy of  $\pm 10\%$  of depth plus twice diameter of pipe can be expected.

#### 4.4 SUMMARY OF FINDINGS

The following services were found by Laser Surveys Ltd on this site and are shown on the drawing with different line styles and colours. They are also represented as individual AutoCAD layers describing what they are and who provides the service as far as we could determine.

#### Telecommunications

British Telecom

Colt

Energis (now part of Cable & Wireless)

Fibre Optics (Unknown)

Mercury

#### Electricity

We cannot differentiate between the High & Low Voltage, although those routes serving Lighting columns are usually LV. There are numerous Electricity feeds crossing the site, two of which cross into the construction site area. There are two (roughly) parallel lines running adjacent to the private gardens at the Northern end of the site, but no spurs into those areas have been detected. We were unable to confirm who provides the service.

#### Street Lighting & TCSU (Traffic Control Signal Unit) cables.

These were traced by inducing a signal into the cable as the street lamps were not on at the time of survey. We suspect that all are live.

#### Drainage.

All combined and storm drainage was traced by radiodetection. The results are shown on our drawing. This method of survey will only provide the sewer route, and will NOT identify node points (remote gulley connections etc.). If node points are required a CCTV camera unit with sonde enables a visual location.

*Three outfalls into \*\*\*\*\* Road were located (2 into Manhole chambers and one into a 'blind' node. These Manholes were not lifted as they were outside the survey area, and were traffic sensitive.*

*One outfall into \*\*\*\*\* was located; this was 'blind' also (not served by a manhole chamber) and assumed into the main carrier sewer although this will require Utilities searches/plans to confirm.*

*The Drainage run in \*\*\*\* Road was confirmed as far as the manhole near to the junction with \*\*\*\*\*; although this manhole was traffic sensitive also and was therefore not raised.*

*The drainage around the Southern end and Western side of 35-62 \*\*\*\*\* Road was surcharged (flooded) and will require jetting to determine the cause/clear the standing water. This has left several Gullies and Rodding Eyes unable to be traced.*

*Drainage serving 1-34 \*\*\*\*\* Road terminates in \*\*\*\*\* Road – outfalling into two manhole chambers serving the east and West sides of that block. Both drain runs terminate in UTF points (unable to trace further) at their upstream end. This is adjacent to the construction site; it is possible that they have been capped and*

are redundant above these points, or have debris from the construction site within. There are two manhole covers North of the North-East corner of the block that have either been removed or buried since the original survey was undertaken.

Drainage serving Bennett House outfalls to a node in \*\*\*\*\* Road, after the drains from the west & east side of the building converge at a manhole at the South-west corner of the building. There are several Rodding Eyes & Gullies serving the building that we could not trace, but assume join into the main carrier drain flanking each side of the building.

Drainage from the Private gardens at the North end of the site appears to drain from the western side of the buildings into the drainage run in \*\*\*\*\* Road, but no other drainage was located.

The above comments are annotated on our drawing supplied at the appropriate locations.

### Water.

The only Water pipes we could trace were in the southern pavement to \*\*\*\* Road, and the feed to \*\* \*\*\*\*\* Road. Others are assumed plastic. GPR did not locate these, probably due to their small size, relative depth and location relative to adjacent services. Valves which we could not trace are labeled 'UTT'. There is a possible water Scar between a valve and building face on \*\*\*\*\*.

### Unknown Services

We found some service with radiodetection and/or GPR which we can not confirm what they are or who are responsible for them. These are identified on our drawing and in a separate AutoCAD layer.

We have identified several surface scars that point to a service being present. We have assumed the type of service in some cases, based on adjacent infrastructure etc, others are labeled accordingly ('unknown'). We recommend that further investigation is carried out by digging trial pits unless further information is available from site building maintenance records.

### Gas.

We could only locate a limited section of Gas pipe in the survey area, Running along the Eastern side of both \*\*\*\*\* Road blocks and terminating in \*\*\*\*\* Road. No side-spurs to this were located into the respective buildings; we assume those spurs to be plastic and of small diameter. However, Gas Valves and Risers have been shown on the drawing.

There is a possible short section of gas scar on the east side of \*\*\*\*\* also.

### Cable Television

The CATV serving \*\*\*\*\* has been located, and it's route out to \*\*\*\*\* Avenue has been located. This includes a spur into \*\*\*\*\* Road. No CATV to numbers \*-\*\* has been determined. Routes from individual CATV covers of \*\*\*\*

*have been traced to the main feed, which has been traced out to the \*\*\*\* Avenue pavement.*

#### Telecommunications

As it is illegal to lift BT covers, the amount of coverage we have gained is limited; *however, we have obtained several routes, both overhead and underground.*

#### Other Services

*There is a series of empty ducts served by CATV covers running along the West side of 1-34 \*\*\*\*\* Road.*

### 5. SUMMARY & CONCLUSIONS

All services that could find have been shown on our drawing. However, although every reasonable effort has been made to trace underground services, no guarantee can be given that all have been found. Due to their non-conductivity or size it may not have been possible to trace certain types of pipes. All underground services should be read in conjunction with the latest statutory authorities available at time of any groundworks.

The results of GPR survey should be treated with caution as there is no guarantee that any service shown actually exists, only a possibility that something can be seen on the scan records.

We recommend that Service Trial holes should be hand dug prior to any excavation and that normal Health & Safety Guidelines are followed when excavating near to underground services.

Our survey is presented in 2D AutoCAD – our findings are superimposed onto the existing topographical data named at the top of this report. Our subsequent digital drawing has been supplied to the client ('\*\*\*\*\*-R0.dwg') with all of our findings in their own layers, named with a 'LASER-...' prefix.