SOUTH EAST SCANNING

WHITEPAPER

Understanding Utility Locating and Reporting

A practical guide to AS 5488 and Quality Levels for project managers, engineers, and site teams.

Prepared by South-East Scanning Pty Ltd

INTRODUCTION

Why This Guide Exists

Underground services are among the most common causes of unexpected cost, delay, and safety incident on a construction site. Yet the information a project relies on, the plans, the records, and the marks sprayed on the ground, varies enormously in how far it can be trusted.

A line on a drawing can mean a service was physically dug up and measured, or it can mean someone drew it from a record that was never surveyed. Both look the same on paper. The difference decides whether it is safe to put a machine in the ground.

This guide explains how that reliability is classified under AS 5488, what each level of confidence means for your decisions, and how to read and commission a utility locating deliverable so the risk is understood before anyone breaks ground. It is written for the people who order and act on utility information, rather than for locators themselves.

What AS 5488 actually is

AS 5488, Classification of Subsurface Utility Information, is the Australian Standard that classifies how reliable underground utility information is. It does not locate anything, and it cannot make a service more accurate. What it provides is a common language, a set of Quality Levels, so that everyone from the designer to the excavator understands how much confidence sits behind a given line.

First published as AS 5488-2013 and revised in 2019, the standard now sits in two parts. Part 1 covers subsurface utility information, the Quality Levels this guide focuses on. Part 2 covers subsurface utility engineering, the framework for managing that information through design and delivery.

The idea in one line

AS 5488 measures **confidence, not correctness**. A service shown at the highest Quality Level has been physically verified. A service shown at the lowest has been drawn from a record that may be incomplete, superseded, or simply wrong. Both can appear on the same plan, which is exactly why the level matters.

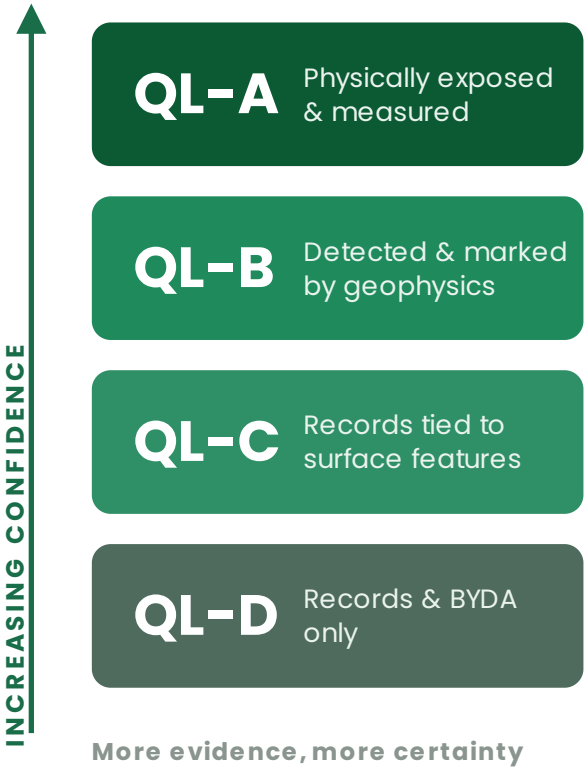
What the standard does not do

- It does not prescribe how a utility must be located; the method is left to the locator.
- It does not guarantee that a service exists exactly where it is shown.
- It does not remove the need for physical verification before high-risk excavation.

THE FRAMEWORK

The Four Quality Levels

AS 5488 defines four Quality Levels of confidence, ranked from **QL-D**, the lowest, to **QL-A**, the highest. Each level reflects how the information was obtained, and therefore how far you can rely on it when planning or excavating.



Each step up the ladder adds a layer of evidence. Records tell you a service may exist. Surface features tell you roughly where. Geophysical detection gives a measured position on the surface. Physical exposure confirms exactly where it is, how deep, how big, and what it is made of.

Confidence and effort rise together. QL-D is a desktop exercise; QL-A requires careful digging. Neither is automatically the right answer. The skill lies in matching the level to the consequence of being wrong.

Read every plan as mixed

A real utility plan is rarely a single Quality Level. One drawing routinely carries a potholed water main at QL-A, a traced cable at QL-B, an inferred drain at QL-C, and a gas main known only from records at QL-D. A good deliverable labels each, so you can see where confidence is high and where it is not.

The following pages set out each level in turn: how it is achieved, what you can and cannot rely on, and a worked example drawn from typical site conditions.

THE LEVELS IN DETAIL

The Lower Levels: QL-D and QL-C

The two lower levels are built from information rather than field measurement. They are valuable for planning and desktop work, but neither is a basis for putting a machine in the ground.

QL-D
RECORDS

Existing records only

Information taken entirely from existing records: utility plans, as-built drawings, and Before You Dig Australia (BYDA) responses. It is the starting point for almost every project.

ACHIEVED BY Desktop review of asset-owner records and BYDA plans. No field work is involved.

YOU CAN RELY ON A general indication that a service may be present in an area, enough for early planning and design.

TREAT WITH CARE Records are frequently incomplete, superseded, or drawn without survey accuracy. QL-D alone is not a basis for any excavation decision.

EXAMPLE

A BYDA plan shows a gas main along the northern verge. On site, the main is found two metres inside the boundary. The record was right that gas was present, and wrong about where.

QL-C
CORRELATED

Records correlated with surface features

Records reconciled with visible surface features, such as pits, valves, marker posts, and service boxes, to infer the likely alignment of a service between known points.

ACHIEVED BY A site walkover that ties record information to what can be seen and measured above ground.

YOU CAN RELY ON A more credible alignment than records alone, anchored to real surface evidence at each end.

TREAT WITH CARE The path between features is still inferred, depth remains unknown, and any service with no surface expression will be missed.

EXAMPLE

Two stormwater pits sit thirty metres apart. The pipe between them is drawn as a straight run at QL-C. In reality it bends around an obstruction, which only excavation would reveal.

THE LEVELS IN DETAIL

The Higher Levels: QL-B and QL-A

The two higher levels involve field measurement. QL-B fixes a service on the surface; QL-A confirms it in the ground. The step between them is the difference between a strong estimate and a certainty.

QL-B

DETECTED

Detected and marked by geophysics

The horizontal position of a service detected and marked on the surface using geophysical methods, principally electromagnetic locating and ground penetrating radar.

ACHIEVED BY

Field detection with equipment such as the Radiodetection RD8100 and IDS C-Thrue, by direct connection to an accessible point or by tracing an induced signal.

YOU CAN RELY ON

A measured horizontal position for detectable services, marked on the ground and captured on plan. Confidence is substantially higher than QL-C.

TREAT WITH CARE

Depth is an estimate, not a measurement. Non-conductive pipes and deep or congested services may be weak or undetectable, and a stated tolerance applies.

EXAMPLE

A power cable is traced and marked along a driveway at QL-B. The horizontal line is reliable; the depth note is indicative only, and a nearby poly water service does not respond at all.

QL-A

VERIFIED

Physically exposed and measured

The highest level of confidence, achieved by physically exposing the service so its exact position, depth, size, and material can be measured directly.

ACHIEVED BY

Careful excavation, typically non-destructive potholing or vacuum (hydro) excavation at the point of interest.

YOU CAN RELY ON

Verified horizontal position, depth, diameter, and material at the exposed point. This is the only level suited to high-consequence excavation.

TREAT WITH CARE

QL-A applies only at the point exposed. The service reverts to a lower level between potholes.

EXAMPLE

Before boring beneath a road, the crossing of a water main is exposed by vacuum excavation and confirmed at 300mmØ, I.L 1150mm. The bore is set clear of it with confidence.

WORKED EXAMPLE

One Site, Four Levels

A single plan usually carries several Quality Levels at once. The cross-section below shows four services on one verge, each held at a different level of confidence. **Refer to Figure 1.**

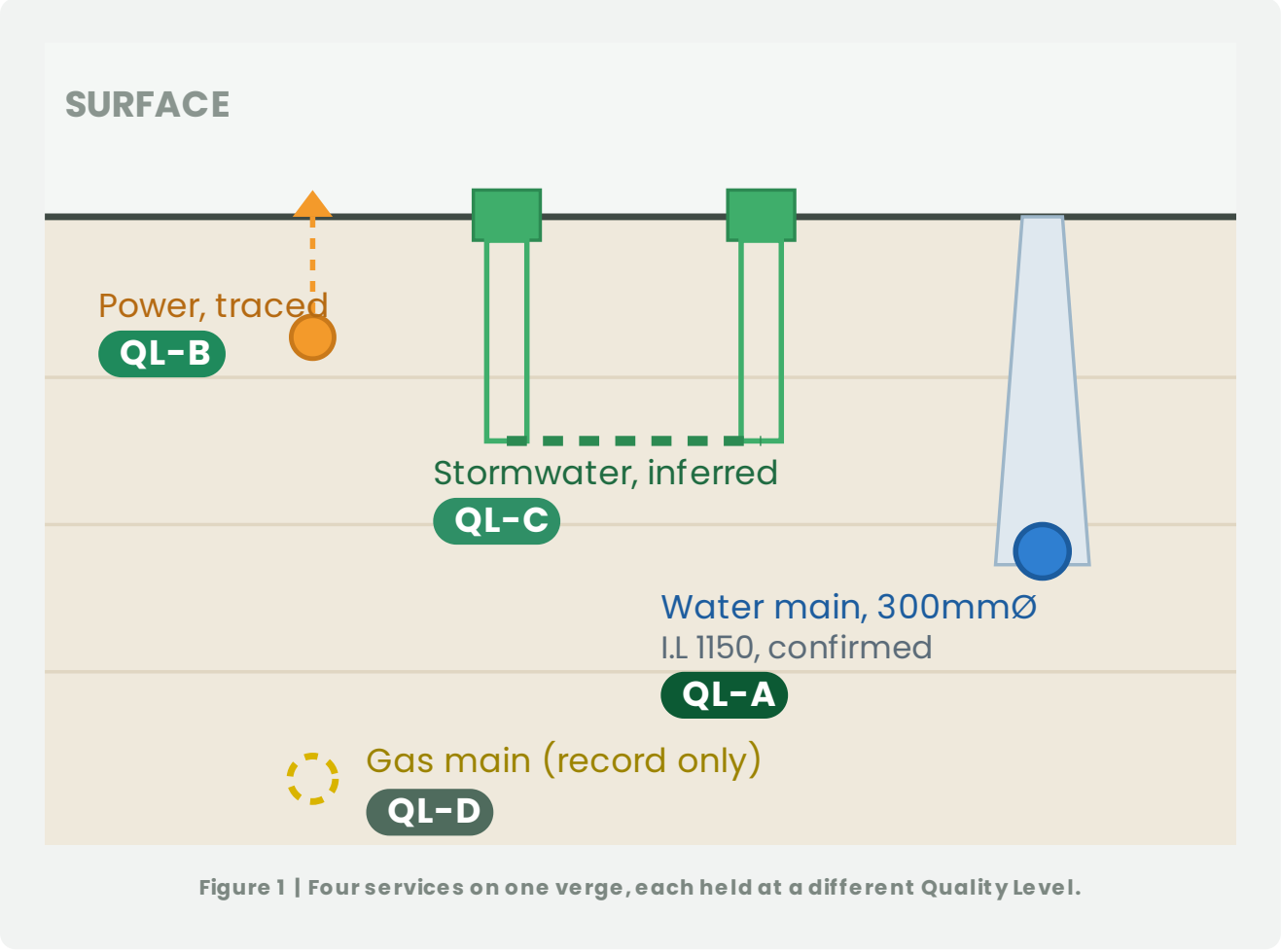


Figure 1 | Four services on one verge, each held at a different Quality Level.

How the levels combine on a real job

On this verge, the water main was potholed at the proposed bore crossing, so it is held at **QL-A**: position, depth, diameter, and material are all confirmed at that point. The power cable was traced and marked from an accessible pit, giving a reliable surface line at **QL-B**, with depth noted only as an estimate.

The stormwater pipe was drawn between two visible pits at **QL-C**, a sensible inference but not a measured path. The gas main appears only because a BYDA record places it there; with no field confirmation it stays at **QL-D**, and its true position is genuinely unknown.

The lesson for the reader is simple. Do not treat a plan as uniform. Check the level attached to each service, and, where it matters, to each segment. Confidence is something you read off the drawing, not something you assume from the fact that a line has been drawn at all.

BEHIND THE LEVELS

The Methods That Set the Level

A Quality Level is not chosen; it is earned by the method used. The stronger the evidence a technique produces, the higher the level it can support. Most site work combines several methods.

Electromagnetic locating (EM)

Traces conductive services, such as power, metallic water, and copper comms, by applying or inducing a signal and following it on the surface. The workhorse of QL-B, but it needs a conductor or an accessible connection point.

Ground penetrating radar (GPR)

Detects buried features from reflected radar, including non-conductive pipes that EM cannot see. Complements EM well, but attenuates in wet, clay-rich, or heavily reinforced ground.

Sonde and traceable rodding

Pushes a small transmitter or traceable rod through a non-conductive pipe or drain so it can be tracked from the surface. Requires internal access to the line.

Potholing and vacuum excavation

Physically exposes the service to confirm it directly. The only route to QL-A, and the only way to measure depth, size, and material with certainty. Point-specific, slower, and higher cost.

Method	Typical level	Principal limitation
Records & BYDA review	**QL-D**	Only as reliable as the source records
Surface feature correlation	**QL-C**	The path between features is inferred
Electromagnetic locating	**QL-B**	Needs a conductor or tracer; depth estimated
Ground penetrating radar	**QL-B**	Attenuates in wet, clay, or congested ground
Sonde / traceable rodding	**QL-B**	Requires internal access to the pipe
Potholing / vacuum excavation	**QL-A**	Point-specific, slower, higher cost

READING THE DELIVERABLE

Colours, Codes, and Line Types

A utility plan communicates through a consistent visual language. Three conventions do most of the work: the colour of a service, the code that names it, and the line type that shows how it was found.

Service colours

AS 5488 sets out a suggested colour convention used both for marks sprayed on the ground and for lines on the plan. The Australian convention differs from the American one in an important way: **electricity is orange, and red is reserved for fire services**.

- **Electricity** Orange
- **Potable water** Blue
- **Stormwater / drainage** Green
- **Communications** White (black on light plans)
- **Cadastral / boundary** Grey
- **Gas** Yellow
- **Sewer / wastewater** Cream
- **Recycled water** Purple
- **Fire services** Red
- **Unknown** Pink

Shades may vary between providers, and contrast sometimes forces a substitution, such as white paint for comms on a dark surface. What matters is that the plan carries a legend and that colour use stays consistent across every mark, sketch, and drawing for the site.

Asset codes

The standard also defines a set of short alphanumeric codes, around 150 of them, that label each service type on a drawing. Codes keep a plan readable in black and white and remove ambiguity where colours are hard to tell apart. They sit alongside the colour, not instead of it.

Line types

Line style carries meaning too. A **solid line** generally shows a service that was detected and marked in the field. A **dashed line** shows an alignment that was inferred or taken from a record. Reading line type alongside the Quality Level tells you how the line came to be on the page.

READING THE DELIVERABLE

Notation and Annotation

Beyond colours and codes, a plan carries short annotations that record what was measured and, just as importantly, where a measurement stops. The common terms are worth knowing.

`100mmØ` Diameter of a pipe or conduit; the Ø symbol denotes diameter.

`Depth` Depth to the top of a service; at QL-B this is an estimate.

`QL-A…D` The Quality Level attached to a run or segment.

`I.L 700mm` Invert level, the depth to the inside base of a pipe.

`EOT` End of trace, the point beyond which a signal could not be followed.

`— / — —` Solid for located, dashed for inferred or record.

Note on EOT

An **`EOT`** mark does not mean the service ends. It means the trace ended. The line may well continue underground; it simply could not be confirmed past that point. Treat everything beyond an EOT as unlocated.

How we annotate

Our plan annotations state the finding, then use a semicolon to introduce any caveat, naming the methods that could not confirm it. For example: *100mmØ PVC stormwater, I.L 700mm; alignment beyond pit inferred, not traced.* The reader sees both what was found and the limit of that finding in a single line. The worked plan overleaf shows the full set of conventions together.

READING THE DELIVERABLE

A Worked Annotation

The plan below brings the conventions together on a small site. Colour identifies the service, a code and note record what was measured, an `EOT` marks where a trace stopped, and every run carries its Quality Level. **Refer to Figure 2.**

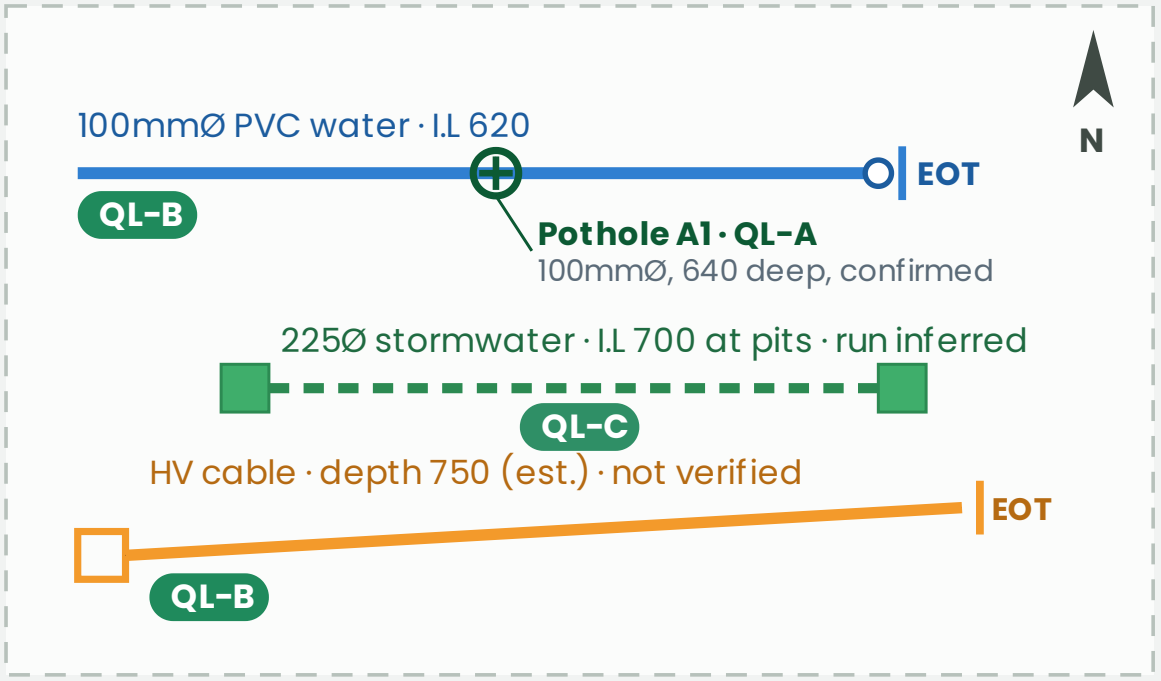


Figure 2 | A plan snippet showing colour, code, notation, EOT, and Quality Level together.

Reading the plan, the water main is a solid blue line: detected and marked at **QL-B**, with an `EOT` where the trace could no longer be followed past the valve. At Pothole A1 the main was exposed and confirmed, so that one point is **QL-A**.

The stormwater line is dashed and green, drawn between two visible pits at **QL-C**: invert levels were read at the pits, but the run between them is inferred. The power cable is solid orange at **QL-B**, its depth noted only as an estimate, and it too carries an `EOT`.

Every run states what was found and, in the note after each semicolon, the limit of that finding. Nothing on the plan asks the reader to guess how far to trust it.

EXPECTATIONS

Limitations and Realistic Expectations

Utility locating is a risk-reduction process, not a guarantee. Understanding where it is weakest is what lets a project use it safely. A few recurring limits are worth keeping in mind on every job.

Locating reduces risk. It does not remove it.

The best outcomes come from combining methods, from good records, and from verifying anything whose strike would be serious. No responsible locate can promise that every service on a site has been found.

Detection is not identification

A signal or a radar response shows that something is present. Confirming what it is, and how big, needs supporting evidence or exposure.

Depth is approximate

Positions from surface geophysics estimate depth from signal, which shifts with soil and congestion. Only QL-A confirms depth.

Not everything responds

Non-conductive poly water and gas, fibre without a tracer, and deep or congested services can be weak or wholly undetectable.

"Not located" is not "not there"

An absence of signal means nothing was detected, not that the ground is clear. Unrecorded and abandoned services exist on many sites.

Marks carry a tolerance

A surface mark is the centre of a tolerance zone, not a hairline. Hand-dig or use non-destructive methods within that zone.

Some areas cannot be reached

Access, surfaces, and structures create zones where no data can be collected. These are gaps, not confirmation of a clear path.

COMMISSIONING WORK

Specifying a Locate, and Digging Safely

A locate delivers most value when it is scoped around risk. The question is not simply "locate the services", but "to what level of confidence, and where does that confidence need to be highest".

Before the work

- Share drawings, BYDA plans, and known site constraints up front.
- State the objective clearly: a clash check reads differently to a dig approval.
- Nominate the Quality Level you need, and where. QL-A at the crossings that matter, a lower level elsewhere.

Match confidence to consequence

Decide where a record or a surface trace is enough, and where the cost of a strike justifies physical verification. A comms conduit in soft ground and a charged high-voltage cable beneath a proposed bore are not the same decision, and should not be given the same level of confidence.

The FIVE P's of safe digging

Whatever the Quality Level, excavation near services follows a simple, ordered discipline.

01	02	03	04	05
PLAN	**PREPARE**	**POTHOLE**	**PROTECT**	**PROCEED**
Lodge a BYDA enquiry and review every available record.	Have services located and marked to a level suited to the work.	Expose critical services to confirm position and depth (QL-A).	Support, barricade, and clearly mark exposed services.	Dig carefully, hand-dig within tolerance zones, and stop if the unexpected appears.

The single most useful habit

Ask, for every excavation, "what is the consequence if this is wrong". Where the answer is serious, lift the service to QL-A before you dig. Where it is minor, a documented lower level is a reasonable, deliberate risk. The point is that the choice is made on purpose, not by accident.

IN PRACTICE

Common Questions

What is the difference between a BYDA enquiry and a utility locate?

A Before You Dig Australia enquiry returns the asset owners' own records, which sit at QL-D. A locate is field work that lifts confidence to QL-C, QL-B, or, with potholing, QL-A. The two are complementary: records tell us where to look, and the locate tells us what is actually there.

Can you find plastic (poly or PE) water and gas pipes?

Not always. Non-conductive pipes give no electromagnetic signal, and in poor ground they can be invisible to radar as well. A tracer wire, an accessible fitting to connect to, or physical verification may be needed. Where a poly service is suspected but cannot be confirmed, we say so on the plan.

Why is the depth on my plan only an estimate?

Surface geophysics infers depth from the returned signal, which varies with soil type, moisture, and congestion. That makes QL-B depth an estimate by nature. The only way to confirm depth is to expose the service, which is QL-A.

What does EOT mean?

End of trace: the point where the signal could no longer be followed. The service itself may continue underground. EOT marks the limit of what could be confirmed, not the end of the asset, so everything beyond it should be treated as unlocated.

Do I need potholing on every job?

No. Pothole where a strike would be serious, or where design clearances are tight. Elsewhere a lower Quality Level can be an acceptable, documented risk. The aim is to spend verification effort where the consequence justifies it.

Does a located mark mean it is safe to dig on the line?

No. Every mark carries a tolerance and represents the centre of a zone, not a hairline. Hand-dig or use non-destructive methods within the tolerance zone, and treat all marks as a guide rather than a guarantee.

Can you guarantee every service has been found?

No responsible locator can. Locating substantially reduces risk; it does not eliminate it. Unrecorded, abandoned, or undetectable services can exist on any site, which is why verification matters wherever the stakes are high.

PUTTING IT TO WORK

Using the Results Well

Good utility information only pays off in the decisions it informs. Three habits carry most of the benefit through design, delivery, and the moment before excavation.

In design

Read each service at its Quality Level. Design clearances against confirmed information, and flag where low-confidence services sit inside the works for later verification.

During works

Keep the plan live. As services are exposed or added, record the new evidence and update the level. A locate is a snapshot, and sites change.

Before excavation

For any high-consequence dig, verify by potholing to QL-A. Treat records and traces as a guide to where to expose, not as approval to excavate.

Read a plan as a map of confidence

AS 5488 exists so that confidence can be stated plainly rather than assumed. Act freely where confidence is high, verify where it is low, and never let a line on a drawing stand in for a hole in the ground when the cost of being wrong is serious. Used this way, utility information becomes a genuine tool for managing risk, cost, and safety across the whole life of a project.

SOUTH EAST SCANNING

GET IN TOUCH

Let's talk about your site

We can undertake utility location, ground penetrating radar, concrete scanning, and structural diagnostics across South-East Queensland, with reporting classified to AS 5488. Send through your drawings and scope, and we can advise the Quality Level each part of the job calls for.

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ACCREDITATION

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