PQWT TECHNICAL FIELD GUIDE

Indoor, Outdoor & Fire Pipeline Leak Detection

Detailed Standard Operating Procedure for acoustic survey, pinpointing, verification and field reporting

Document	Revision	Applies to
English field edition	2026-08	Residential supply, buried distribution and fire-protection water piping

SAFETY & SCOPE NOTICE

This guide is training and field-reference material. It does not replace local codes, project specifications, approved method statements or the manual for the exact instrument and piping system. Pressure testing, fire-system isolation, tracer gas use, confined-space access, drilling and excavation must be authorized and performed by qualified personnel.

Technical support and current documents

Website: https://pqwtofficial.com
Email: lsmachine@gmail.com
WhatsApp: Chris +86 136 0173 7840

SECTION 1

Purpose, Scope & Core Workflow

A disciplined leak survey moves from confirmation to verification. Do not excavate based on a single sound reading.

Stage	Objective	Typical evidence	Decision gate
1. Confirm	Establish that unexplained loss is real.	Meter movement, pressure decay, tank-level change, pump cycling.	Rule out legitimate use, valve leakage and gauge error.
2. Route	Map the pipe and access points.	Drawings, tracer/locator, valves, hydrants, fixtures and visible route clues.	Mark route and hazards before acoustic work.
3. Survey	Narrow the suspected section.	Repeatable sound-energy trend and comparable spectra along the route.	Identify a stable anomaly, not a single loud point.
4. Pinpoint	Reduce the excavation area.	Dense measurement grid, fixed settings, repeatable peak and consistent audio character.	Confirm from two directions or two methods where practical.
5. Verify	Reduce false excavation risk.	Second pass, pressure-on/off comparison, auxiliary method or inspection hole.	Record basis for excavation or further testing.

Recommended roles

- Survey lead: owns the method statement, safety controls, instrument settings and final interpretation.
- Operator: maintains consistent sensor contact, point spacing, listening time and data labels.
- Site representative: confirms pipe operation, authorizes isolation and identifies protected services.
- Safety observer or traffic controller: used when access, traffic, excavation or fire-system impairment requires it.

STOP-WORK CONDITIONS

Stop when the pipe route, pressure limit, electrical risk, traffic control, confined-space condition or excavation clearance is uncertain. Protect people and the live system before protecting the schedule.

SECTION 2

Site Information & Preparation

Better input data produces a smaller search area and a more defensible conclusion.

Information group	Record before testing
Pipe	Material, nominal diameter, approximate depth, age, joint type, length, branches, valves and known repairs.
Operation	Normal pressure and flow, pump schedule, reservoir/tank behavior, pressure zones and expected demand.
Leak symptoms	First observed time, estimated loss, wet areas, pressure drop, noise, settlement or unexplained pump cycling.
Drawings	As-built plan, valve map, fire-system drawing, utility records and known deviations.
Environment	Surface type, soil, traffic, nearby machinery, electrical interference, rain, drainage and safe access windows.
Instruments	Detector model, sensor type, headphones, route locator, pressure gauge, logger/correlator, tracer-gas kit and calibration status.

Pre-test checklist

- Confirm the exact test section and identify all outlets, bypasses, drains, tanks, pumps and automatic make-up devices.
- Check instrument battery, cables, sensor faces, headphones and time/date settings. Perform a known-signal functional check.
- Agree a point-numbering system and mark the pipe route on a map or mobile field plan.
- Choose a quieter survey window where possible. Record weather, traffic and operating changes.
- For manholes or chambers, assess traffic, fall, oxygen, toxic-gas and electrical hazards before opening or entry.

PRESSURE TESTING

Hydrostatic testing is generally preferred. Never exceed the permitted pressure of the pipe, valves, fittings, equipment or complete system. Any reference value such as 0.6–0.8 MPa or a fixed hold time is only a historical starting reference, not a universal acceptance criterion. Use the approved project procedure and applicable code.

SECTION 3

Indoor Residential Supply Pipes

Use controlled isolation and consistent acoustic settings to separate a real leak from appliance, drain and mechanical noise.

3.1 Confirm unexplained loss

- Close all faucets and water-consuming appliances. Observe the meter or system pressure long enough to establish a stable trend.
- Isolate branches and end devices where possible, including hot-water units, toilets, irrigation and automatic fill valves.
- Test cold and hot-water branches separately. Account for thermal expansion, trapped air and pressure-regulating devices.
- If using a manual hydraulic pump, connect at an approved point away from known wet areas and raise pressure slowly under the approved test plan.

3.2 Establish the pipe route

- Use drawings, fixture positions and valve locations first. Confirm uncertain routes with an appropriate locator.
- Infrared imaging may help identify temperature anomalies, but it does not prove a pressurized-water leak on its own.
- Mark route changes, tees, wall penetrations, floor transitions and repaired areas as higher-priority listening points.

3.3 Survey and pinpoint

Pass	Method
General survey	Move along the marked route using regular spacing. Keep gain and filter settings consistent. Compare both spectrum and headphone audio.
Anomaly check	Repeat the suspect point and adjacent control points. A useful anomaly should be repeatable and show a local trend.
Dense grid	Reduce point spacing around the anomaly; approximately 10 cm may be useful indoors when surface access allows.
Pressure comparison	Listen with the line pressurized and, when safe and authorized, after pressure is removed. A true pressurized leak normally changes with operating condition.

3.4 Starting settings and adjustment

- Quiet environment: start with moderate gain and a stable baseline; avoid amplifying floor handling noise.
- Noisy environment: reduce sensitivity to irrelevant high-frequency noise, then increase gain in small steps.
- Broad search: higher gain can reveal weak zones; for pinpointing, tighten spacing and freeze settings for fair point-to-point comparison.
- Legacy L-series reference: low around 200 Hz and high around 1700–2000 Hz can be an initial window only. Adapt to pipe material, depth, surface and detector model.

SECTION 4

Outdoor Buried Water Distribution

Outdoor surveys require route control, repeatable point spacing and deliberate management of traffic and ground-coupling noise.

4.1 Field assessment

- Confirm pipe material, diameter, depth, pressure, approximate length, branch points, valves, hydrants and the estimated loss.
- If the route is uncertain, use a suitable utility locator, non-metallic-pipe method or ground-penetrating radar where justified.
- Inspect valve boxes, manholes and hydrants for unexplained flow, standing water, wet soil, cracking, settlement or abnormal vegetation.
- Prioritize joints, tees, reducers, valves, hydrants, wall/manhole crossings and sections exposed to settlement or heavy loads.

4.2 Acoustic survey

- Start with approximately 1–2 m point spacing where conditions allow; tighten the grid around a stable anomaly.
- Maintain firm, repeatable sensor contact and listen for roughly 8–10 seconds per point before recording the result.
- Work during quieter periods when practical. Use traffic control, permission and an observer where required.
- Compare adjacent points using the same gain, filter and frequency window. Note passing vehicles, pumps, rain and nearby machinery.

Signal / condition	Interpretation guidance
Sharp hiss or jet-like high-frequency content	May indicate turbulent escape close to the sensor, but confirm repeatability and local trend.
Low-frequency hum	May be leak energy, pump/motor vibration or flow noise. Compare pressure-on/off and nearby control points.
Metal pipe	Sound can travel farther; the loudest point may be displaced from the physical leak.
PE or other non-metallic pipe	Sound may be weaker and lower-frequency. Use tighter spacing and consider correlation or tracer gas.
Deep, wet or loose ground	Ground attenuation and poor coupling can weaken the signal; use additional methods before excavation.

SECTION 5

Fire-Protection Water Piping

Any impairment to a fire-protection system must be coordinated, documented and restored under the site's approved fire-safety procedure.

5.1 Confirm continuous loss

- Look for repeated jockey-pump or fire-pump cycling, unexpected independent meter movement, falling tank level, pressure instability or continuous drainage at alarm assemblies.
- Confirm that tests, maintenance, legitimate demand and automatic devices are not causing the observed loss.

5.2 Hydrostatic test and sectional isolation

- Obtain authorization and coordinate any shutdown, notification, fire watch and restoration requirement.
- Define and isolate the test section, fill it, vent trapped air and raise pressure slowly to the approved value.
- Record pressure, temperature, time and gauge identification. Inspect accessible valves, flanges, joints, hydrants and alarm valves.
- Use sectional isolation to reduce the search area. Do not assume a universal 0.6–0.8 MPa pressure, 10/30-minute hold or 0.05 MPa drop limit; follow the approved design and governing code.

5.3 Route confirmation and acoustic pinpointing

- Confirm the buried route and inspect the ground around hydrants, valve boxes, wall entries and known joints.
- Survey the isolated section with regular point spacing; densify around a repeatable local peak.
- Verify from both directions or with a second method. If acoustics are poor, use correlation or an approved tracer-gas procedure.
- After repair, retest and formally document restoration of the fire-protection system.

FIRE-SYSTEM IMPAIRMENT

Never leave a fire system isolated or partially restored without the site's designated authority confirming the final status. Record valve positions, alarms, pumps, notifications and return-to-service checks.

SECTION 6

Verification Before Excavation

A defensible excavation decision uses repeatability, operating-condition changes and an independent check wherever cost or consequence is high.

Verification action	Why it matters
Repeat two passes	Confirms that the peak is stable rather than random handling or environmental noise.
Use adjacent control points	Shows whether the suspect location is a local maximum within a broader trend.
Pressure-on / pressure-off comparison	Helps separate pressurized-leak energy from pumps, drains, traffic and mechanical vibration.
Change operator or sensor direction	Reduces confirmation bias and checks contact consistency.
Apply an independent method	Correlation, tracer gas, logging, inspection hole or imaging can reduce false excavation risk.
Locate all utilities	Prevents injury and damage during drilling or excavation.

Minimum evidence package

- Marked route map with point numbers, spacing and suspected section.
- Instrument model, sensor, gain, filters, frequency window and operating mode.
- Audio/spectrum observations and environmental notes for the suspect point and control points.
- Pressure, flow, meter or pump behavior before and during the survey.
- Verification method, result and excavation clearance reference.

DO NOT RELY ON A SINGLE SCREENSHOT

A graph or spectrum is supporting evidence, not a standalone diagnosis. Combine instrument readings with pipe route, operating conditions, repeatable audio character, control points and field verification.

SECTION 7

Field Record Template

Use one record per survey area. Attach photographs, route sketches and instrument screenshots with matching point numbers.

Project / client		Date / time	
Site / survey area		Weather / noise	
Pipe material		Diameter / depth	
Pressure / flow		Test section length	
Detector model		Sensor / mode	
Gain / filters		Frequency window	
Point spacing		Listening time	
Suspected point(s)		Control point(s)	
Verification method		Result	
Utilities cleared by		Excavation decision	

Point log

Point	Distance / location	Audio character	Level / spectrum	Environment / note

SECTION 8

Troubleshooting & Method Selection

When the signal is weak or contradictory, improve the survey design before increasing gain.

Problem	Check first	Next action
Everything sounds loud	Gain too high, poor sensor contact, traffic or building vibration.	Lower gain, stabilize contact, repeat during a quieter window and use control points.
No useful sound	Line pressure, route accuracy, sensor suitability and pipe material.	Tighten spacing; test an access point; consider correlation, logging or tracer gas.
Peak moves between passes	Operating changes, surface coupling, vehicles, pumps and operator handling.	Freeze settings, repeat from both directions and record external noise events.
Metal pipe carries sound far	Peak may be displaced from the leak.	Use valves/fittings as access points, correlate or triangulate with dense ground listening.
PE / plastic pipe	Lower acoustic transmission and shallow broad peaks.	Use shorter spacing, lower-frequency emphasis and an appropriate auxiliary method.
Fire network remains uncertain	Valve isolation, alarm valves, hydrants and pump behavior.	Coordinate sectional testing and use correlation/tracer gas under approved procedures.

Auxiliary methods

- Correlation and multi-sensor logging: useful when access points and pipe data are available.
- Tracer gas: helpful for small leaks, low-pressure sections and non-metallic pipe; use only approved gas, ventilation and safety procedures.
- Pressure zoning / district metering: narrows large distribution systems before pinpointing.
- Ground-penetrating radar or thermal imaging: can support route or moisture-anomaly assessment but should not be treated as sole proof of leakage.

SECTION 9

Terminology, Units & Support

Use consistent names in records so a second operator can reproduce the survey.

Term	Recommended English usage
General Survey	Broad route survey used to identify a suspected section.
Pinpointing / Positioning	Dense local survey used to reduce the excavation area.
Spectrum Analysis	Comparison of signal energy across frequency bands.
Filter Analysis	Controlled use of frequency filters to improve signal discrimination.
Outside network	Buried outdoor or regional water-distribution network; not the internet.
Pressure conversion	1 kgf/cm² is approximately 0.098 MPa.

Final field checklist

- Leak confirmed and legitimate demand excluded.
- Route and hazards marked; all utilities cleared for intrusive work.
- Instrument functional check passed; settings recorded.
- Suspected point is repeatable and supported by adjacent control points.
- Independent verification completed where consequence or excavation cost is high.
- Repair, retest and return-to-service records completed.

NEED MODEL-SPECIFIC HELP?

Send the pipe material, diameter, burial depth, operating pressure, route length, surface condition and suspected leak rate. PQWT support can recommend a suitable detector and a practical field plan. Email: lsmachine@gmail.com | WhatsApp: Chris +86 136 0173 7840

Document control

English field edition · Revision 2026-08 · Prepared from the Chinese indoor, outdoor and fire-pipeline leak-detection workflow supplied by the client. Always use the latest approved site procedure and device manual.