



**RPM Aerial
Services**



USING DRONES TO ENHANCE WATER LEAK DETECTION

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ABOUT RPM





WATER LEAKS =



- Increased treatment/distribution costs
- Repair & replacement costs
- Infrastructure/road damage costs
- Reduced water pressure/service disruptions/safety issues
- Environmental and contamination risks
- Development challenges
 - New water vs leak prevention



DETECTION CHALLENGES

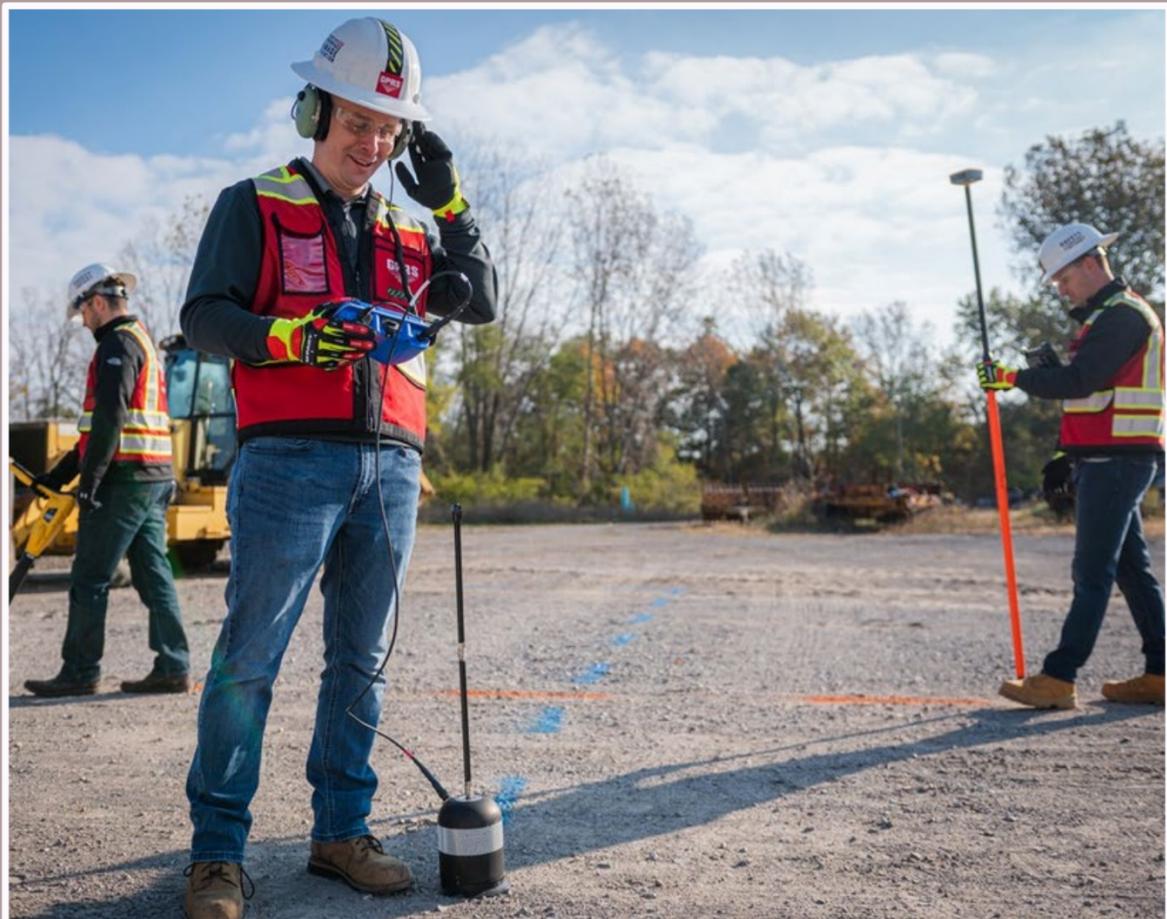
Budgets



Monitoring



Staffing





CURRENT PRACTICES

Geophones



Pros

Affordable (\$5000 - \$8000)

Accurate in ideal conditions

Quick and easy deployment

Cons

Manual and time intensive

Physical infrastructure issues

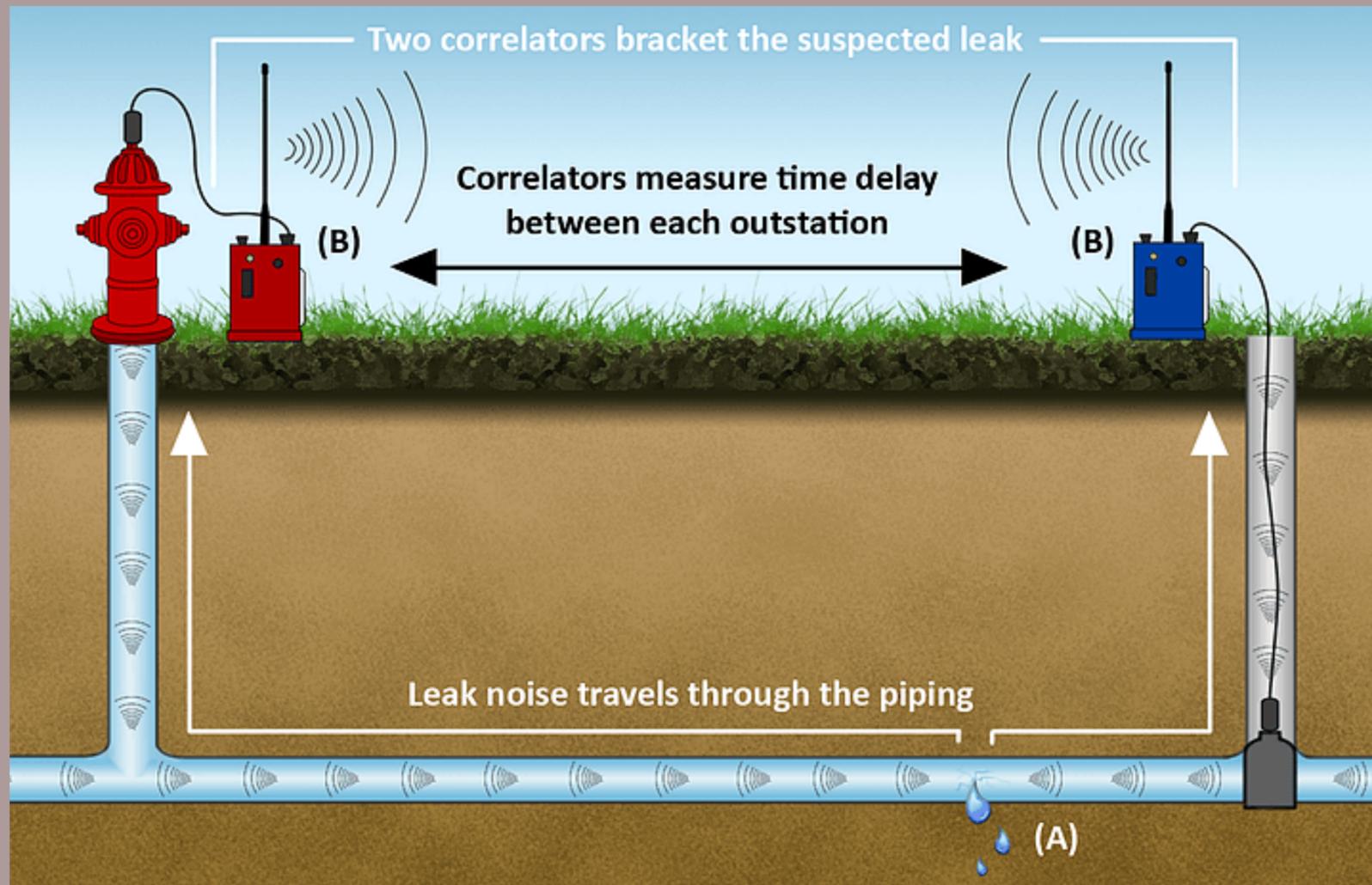
- PVC/HDPE pipes are not friendly
- Limited valves/hydrants reduce effectiveness

Geographic and weather challenges



CURRENT PRACTICES

Correlators



Pros

- Increased accuracy
- Non-invasive detection
- Labor efficiency
- Better for noisy environments

Cons

- Expensive
- Requires Trained Operators
- Not Ideal for Short Pipe Sections

Challenges with

- plastic pipes
- pipes with multiple leaks, excessive corrosion



INFRARED DRONE DETECTION





HOW IT WORKS

- Infrared cameras convert detected heat radiation into a thermal image
- Leaks release water into the environment, altering the surrounding area's temperature
- The infrared camera captures temperature differences, displayed as color variations in the thermal image





RADIOMETRIC VS RELATIVE INFRARED CAMERAS

Radiometric Infrared Cameras

- Measure and assign actual temperature values to each pixel.
- Provide quantitative thermal data for precise analysis

Relative Infrared Cameras

- Display thermal variations but do not provide exact temperature readings
- More affordable, good for basic thermal imaging tasks
- **Insufficient for water leak detection**





EQUIPMENT



- **DJI M300**
 - \$10,000 - \$14,000
- **H20T Camera (IR + RGB)**
 - \$14,000
- **Batteries & Charger (3 sets)**
 - \$8000
- **DJI M30**
 - \$10,000 - \$12,000
 - Camera included (IR + RGB)
- **Batteries & Charger (3 sets)**
 - \$5000
- Don't forget in\$urance...



TRAINING

- Requires Advanced Pilot Certification
- 3 day course
- Approx. \$1200 per person
 - Recommended that 2 get trained





PRE-FLIGHT PLANNING

Site Assessment

- Identify suspect areas (if any)
- Review municipal maps/GIS data for water lines and underground utilities
- Segment town for survey



Regulatory Compliance

- Secure municipal permissions and NAV CANADA approvals
- Verify compliance with Transport Canada drone regulations





FLIGHT EXECUTION

Flight Parameters

- Survey after influences of the sun and adverse weather are eliminated
- Determine operating areas throughout town
 - <2km from pilot
 - Don't exceed visual line of sight
 - Or “fly while driving”





FLIGHT EXECUTION

Flight Parameters

- Maintain an altitude of 50 –100m AGL for optimal thermal imaging and coverage.
- If planning a grid, ensure sufficient overlap (10 -20%) between images for complete coverage
- When taking images ensure camera is pointing perpendicular to the ground





Data Collection



- Take independent temperature reading to validate water line temperature
- Perform quality check on RPAS camera to ensure accuracy of temperature readings
- Ensure the chosen RPAS is capable of geotagging images
- Do a separate logging with a Garmin etc. for area validation
- Capture thermal and visual images
- Verify evidence of leaks



POST-FLIGHT ANALYSIS

Data Processing

- Use thermal image analysis software to detect temperature anomalies indicating leaks
- Cross-reference with GIS water system data and surrounding topography to confirm possible leak locations

Report Generation

- Create a detailed report with IR images, potential leak locations, and severity assessment
- Recommend areas for further ground inspection



BENEFITS

- **Efficient:** Drones can survey vast areas much faster than traditional ground inspections
- **Cost-Effective** : Reduces the need for extensive physical inspections, saving on labor and repair costs
- **Versatile:** Good for finding leaks in difficult conditions
 - Inaccessible pipes with few valves (ex. main line from reservoir)
 - Smaller systems with few valves for microphone point of contacts
- **Non-Invasive:** Detects without disturbing terrain or infrastructure



CHALLENGES

Environmental

- Temperature differences can cause false positives in thermal imaging
- Time of year - spring and fall are most effective for detecting temperature differences
- Strong winds limit use of RPAS
- Asphalt, concrete, and rocky or boggy ground can mask leaks
- More effective for leaks closer to the surface
 - Leak must be breaking the surface or saturating the ground



CHALLENGES

Materials

- Drone surveys may be less effective on insulated or heavily buried pipes

Regulatory & Operational Constraints

- NAV CANADA-controlled airspace requires flight approvals
- Potential privacy/public relations issues



CHALLENGES

Equipment

- Initial set -up can challenge budgets
 - Funding opportunities?
 - *Municipal Asset Management Program*

Training/Certification

- Specialised skills *and experience* required for drone piloting, thermal imaging and data analysis
- Staff to take on the work



In spite of challenges, finding leaks faster saves money, conserves water, and improves public safety and environmental stewardship

Acting before small leaks compound to become big problems is crucial



OUT OF REACH?



ADVANTAGES OF CONTRACTING

Cost-effective: No investment in equipment, software, or staff training

Expertise & Accuracy: Service providers are skilled in drone piloting, thermal imaging, leak detection and data analysis and management

Regulatory Compliance: Licensed operators understand airspace regulations and optimize flight planning

Scalability: Services can be customized for small or large municipalities

CONTACT



- Pilot training
- Leak detection services
- Data analysis and management
- Preventive maintenance/municipal leak programs

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