Requirements Document: Water LLM – Leak Detection in Water Networks & Distribution

# 1. Document Overview

## 1.1 Purpose

This document outlines the functional and non-functional requirements for developing a Leak Detection System using Gen AI under the Water LLM initiative by TCS. The objective is to proactively identify and localize potential leaks in water distribution networks by analyzing pressure, flow, and sensor anomaly patterns using generative and predictive AI.

## 1.2 Scope

The system will ingest real-time SCADA and IoT sensor data from water distribution networks (flow rate, pressure, acoustic data), identify deviations, predict probable leak zones, and provide actionable insights. It will support leak minimization, water conservation, and operational efficiency in urban utilities.

# 2. Business Objectives

* Minimize Non-Revenue Water (NRW) due to leaks.
* Enable early detection of pipeline faults before major failures.
* Reduce manual inspection and repair time.
* Integrate with existing SCADA and GIS systems.
* Support regulatory compliance in leakage KPIs.

# 3. Actors / User Roles

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| Role | Description |
| Water Network Operator | Monitors alerts, investigates leak predictions, validates system outputs. |
| Field Technician | Executes physical leak verification and repair at predicted locations. |
| Data Engineer | Integrates sensor data, manages ingestion pipelines and model retraining. |
| AI Analyst / Engineer | Oversees model performance, fine-tuning, prompt engineering. |
| Utility Manager | Reviews reports, KPIs, and strategic recommendations from the system. |
| System Admin | Manages user access, configurations, and system uptime. |