PipeMedic Final Summary

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The PipeMedic project will develop and test an intelligent autonomous robotic system that inspects and performs maintenance on underground water pipes. The system will allow operators to remain on the surface while a remote unit is sent down through existing manholes and valve openings, eliminating the need for costly and potentially dangerous manual entry into pipes to inspect them. The PipeMedic will use sonar, laser, and optical sensors to provide a detailed internal inspection of the pipe's surface for signs of leaks, cracks, corrosion, blockages, thinning of the pipe wall, and other defects. In some cases, it will also be able to perform light cleaning or maintenance to remove small amounts of debris.

This document outlines the background, goals, scope, stakeholders, limitations, and assumptions for the PipeMedic project. Currently available pipe inspection systems can be slow, expensive, time-consuming, and even hazardous, relying on manual inspection by trained professionals. The ultimate goal of the PipeMedic system is to allow users to more quickly arrive at a diagnosis and to complete repairs more safely and accurately. Maintenance crews, robot operators, supervisors, and PipeMedic engineers, as well as municipal water utility and public works department personnel, city residents, and environmental regulatory staff are stakeholders affected by the completed system.

This document describes the requirements for a system for pipe inspection and damage monitoring. The requirements have been organized and presented in the following way: section 1 describes the requirements for the system use cases and required behaviour; section 2 describes the use cases for the system and their required functionality; section 3 describes the data, performance, and dependability requirements for the system. Section 4 describes the

requirements for the system to handle data, and Section 5 describes the requirements for system performance and dependability.

The scope document addresses additional requirements for the scope of work, including: maintainability, security, usability, look and feel, operational needs, cultural considerations, legal requirements, etc. The tooling should be easily updateable, supportable, and easily trainable for end-users. The tooling should be maintainable over time. The inspection tooling and software require multiple security features such as role-based access, restricted robot control, protected inspection data, activity logging, secure downloading of updates, etc. The PipeMedic product must be safe to deploy into the pipe and retrieve from the pipe.

The latter part of the book addresses new challenges for pavement management systems, deals with the tasks that are associated with the migration to new systems, describes the risks and costs related to the use of a pavement management system some of which are already apparent and others which are purely speculative, provides some future oriented ideas, outlines some personal views concerning the development of the pavement management systems and provides a glossary, references and an index for this book. Migration to a new pavement management system should be carried out in an organised, step-by-step manner. First, road management engineers and their support staff need to be provided with adequate training, and this should be undertaken before the system is put into operation. Among the risks are the risk and costs of communication failure between components of the pavement management system; the risk and costs of false detection of defects, such as mis-classification and under-estimation of the severity of distress; the risk of premature breakage of hardware. PipeMedic is designed to make the job of contractors/plumbers safer, faster, and more accurate, while providing valuable information to municipalities for long-term planning of their infrastructure.