APPENDIX A – Solution Architecture

1. The Utility Asset Management Program

In 2013, the IST division proposed a long-term vision for the WWD to develop a set of foundational technologies to deliver integrated business solutions to support the Water Services, Wastewater Services and Engineering Divisions. The goal of this strategic vision is to make improvement to the operations of many of the business operational and planning units identified within the WWD. Part of the vision is to establish an architecture framework of technology solutions and business processes that improves the overall delivery and quality of information used by utility asset managers, planners and operators. A conceptual view of the vision is shown in Figure 1.
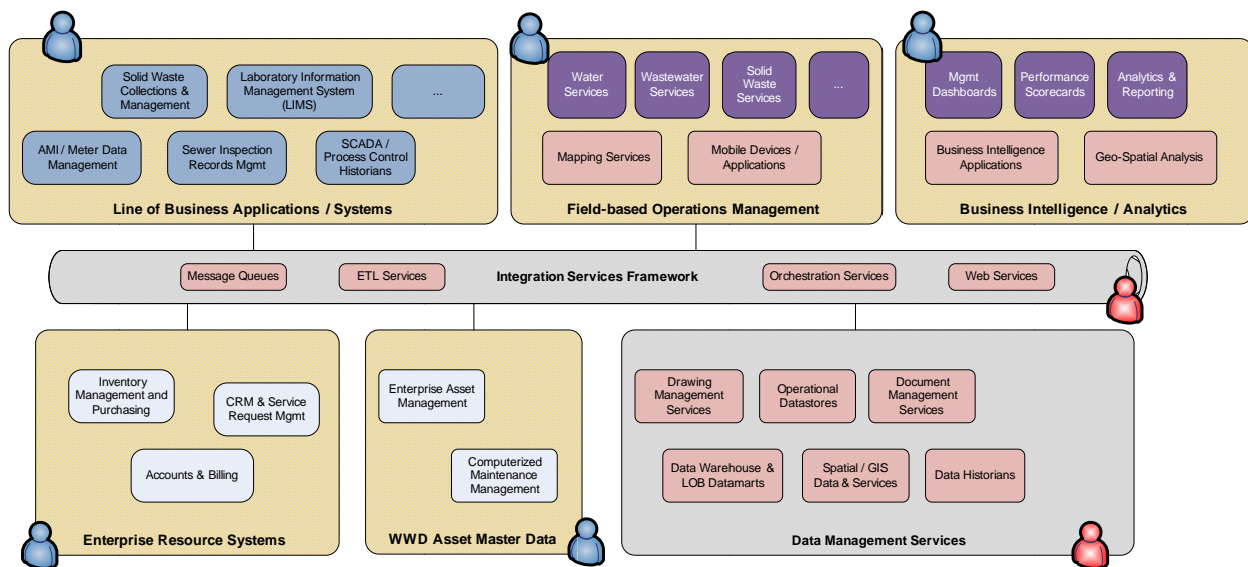

Figure 1 - WWD Conceptual Systems Architecture

Key to this architecture is the logical separation of several core areas of the enterprise, including:

- Operations Management Framework – a collection of technologies and processes designed to deliver asset and maintenance management capabilities to operational business units. The WWD currently utilizes a single platform for managing both above ground, plant-based asset department operational assets.

- WWD Asset Master Data – The WWD maintains several sources of record representing department assets, collectively referred to as asset master data. In some cases, this data is retained within specific applications designed with asset management and/or computerized maintenance management capabilities.

- Integration Services Framework – a standard platform of services that facilitate and manage the integration of data and information across systems within the WWD enterprise and with other corporate systems.

- Business Intelligence and Analytics Framework – a standardized platform of data, processes and end-user tools to support exploratory analysis of commonly accessed datasets (assets, work-orders, expenditures, incidents, etc). Operational and Management Dashboards for display of key performance indicators (KPIs). Working in combination with Data Management Services, this platform leverages a central, consolidated repository of data collected from disparate department business systems.

- Data Management Services – Many of the operational systems within the WWD / COW enterprises contain their own databases. This component represents the logical collection of technology, policies, practices and procedures to properly manage and govern the data lifecycle needs of the department.

- Line of Business Applications – Various specialized applications exist within the department, to support specific business areas and/or technologies. Many of these systems collect, share or consume information from other systems and databases within the enterprise.

- Enterprise Resource Systems – Consists of several enterprise legacy systems used throughout the WWD and/or corporate standard systems used throughout all City of Winnipeg department. This includes the corporate 311 call centre system (Lagan 311), corporate enterprise resource management system (Peoplesoft) and the department accounts and billing system Oracle Customer Care & Billing (CCB).

Overall, the culmination of these architectural components is intended to provide the following benefits for the Divisions within the WWD:

    (a)   Improved confidence in information and decision making supports;

    (b)   Improved organizational productivity and efficiency;

    (c)   Reduced relative disruptions of service to its customers;

    (d)   Improved justification for work prioritization and spending; and

    (e)   Information shared among collaborative business units.

2. Operations Management Solution - Conceptual Architecture

One key component of the architecture discussed in the UAM Program is a new Operations Management solution or "*OMS*". Conceptually, the OMS is a framework of one or more COTS-based software and hardware solutions, designed to support the central management of day-to-day corrective and preventative maintenance work / activities of linear-based assets. Information gathered within this system will eventually support long-term asset management and planning functions within the WWD.   The scope of the OMS is intended to deliver support for "industry vertical" function points (shown in purple) for both water and wastewater underground asset and operations management domains. In the future, other department business units may potentially utilize the capabilities of the OMS platform to manage operational activities in their business domains, such as Solid Waste cart/bin maintenance.

At a glance, the delivery of a solution for Operations Management is envisioned to provide a core set of capabilities summarized in the following table.

Deliverable	Features / Capabilities
COTS-based solution for Operations Management of Underground assets	• Single point of management for key asset information and operational insight (underground assets) • Integrated work-order management system for planning and tracking corrective and preventative maintenance work • Functions accessible from mobile computing devices to support operational crews in the field. • Source of record for all asset maintenance history and incidents

| Mobile network devices to field crews	• Real-time access (in-field) to asset information, location and updating of operational status • Real-time access (in-field) to access and update work-order informtion and asset related information
Unified system for all operational staff – crews, work planners and management	• Real-time updates on work order status to back-office support staff and management. • Electronic dispatching of work-orders to field-crews • Real-time view of current and planned work locations
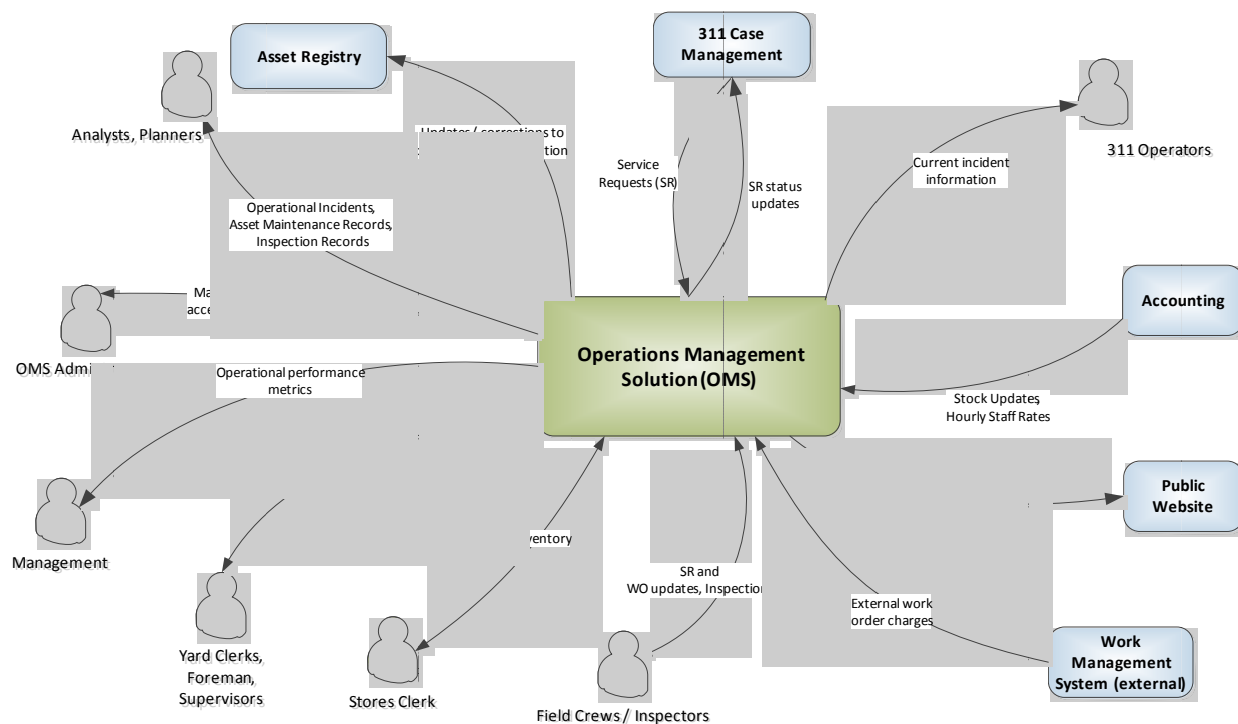
Figure 2 - System Context for Operations Management

To address the aforementioned capabilities, the OMS will need to interoperate with several corporate and departmental legacy systems as shown in the System Context diagram in Figure 2. The System Context diagram represents a high-level overview of all key interactions between the main OMS system (depicted in the centre) and all related systems and/or users. These systems are summarized below:

(a) **Asset Registry** – The City's corporate standard for desktop GIS tooling and spatial data management is Intergraph GeoMedia and Oracle Database 11g. This technology platform is the basis for creating and maintaining all underground, linear-based Water and Wastewater network infrastructure assets; herein referred to as the "Asset Registry". The Engineering, Water Services and Wastewater Services divisions of the WWD all employ the corporate desktop GIS for a variety of spatial analysis, data management and planning functions. The OMS will be used to access asset location and attribute information (stored in the Asset Registry), as well as be used to correct missing and/or out-of-date in the Asset Registry. The interface between the OMS and the Asset Registry will also facilitate access to asset maintenance history records for spatial analysis and planning.

(b) **Case Management** – The city's corporate Contact and Case Management system is Lagan 311. This system is the central point for managing all inquiries to Winnipeg 311. The system supports a variety of engagement channels to obtain information and access City services, including phone, online web self-service and mobile devices. Inquiries requiring attention from WWD, will initiate a service request (SR) to the OMS, which will manage the request and any associated work from beginning to end internally. Status updates to Service Requests are communicated back to the Case Management system as they change within the OMS.

(c) **Accounting System** – The city's corporate Accounting and Purchasing system is Oracle Peoplesoft. The interface between Peoplesoft and the OMS facilitates the sharing of information related to Work Orders Costs (Staff Hourly Reates) and Inventory Management (Purchase Requisitions).

(d) **Public Website** – The city's public website includes a Water Main Activity webpage which lists Water Main locations which are experiencing service disruptions (Off or Reduced Flow) to customers. Information captured and managed within the OMS should provide automated updates to the city's Water Main Activity webpage.

(e) **Work Management System (External)** – From time to time, services are provided to Water Services Branch from external organizations. The costs associated with this work needs to be assigned to specific work orders within the OMS, for complete cost tracking. An example of one such relationship is the Public Works (PW) department of COW performing "road cuts" for excavations required by Water Services. The work and all related costs for road cuts is managed within Public Works' own Work Management System. In order for Water Services to comprehend the complete cost of work and repairs on their assets, the costs associated with work "outsourced" to Public Works needs to be sent to the OMS and assigned to the appropriate work order.

(f) **OMS Administrator** – This is a new role that will be leveraged to support the ongoing configuration and maintenance of the OMS system, once in place.

(g) **Management** – The manager acts as the liaison with other department management, media, councillors, etc. Management requires visibility into issues in order to answer to the public. Responsible for the overall operations of the Water Services Division.

(h) **Yard Clerks, Foremen, Supervisors** – Responsible for the day to day operations of Water Services, including managing the work of the field crews, communicating and escalating issues, prioritization of work, resource management, etc.

(i) **Field Crews, Inspectors** – Responsible for field work such as excavations, repairs, inspections, etc. These are the individuals who are responsible for executing the work tasks assigned to them.

(j) **311 Operators** – The primary system 311 Operators is the Case Management system. In order to provide up-to-date information to inquiries to the 311 Phone channel, 311 Operators periodically need to consult the OMS to obtain information about current WWD activities and emergent situations that may be affecting customer services.