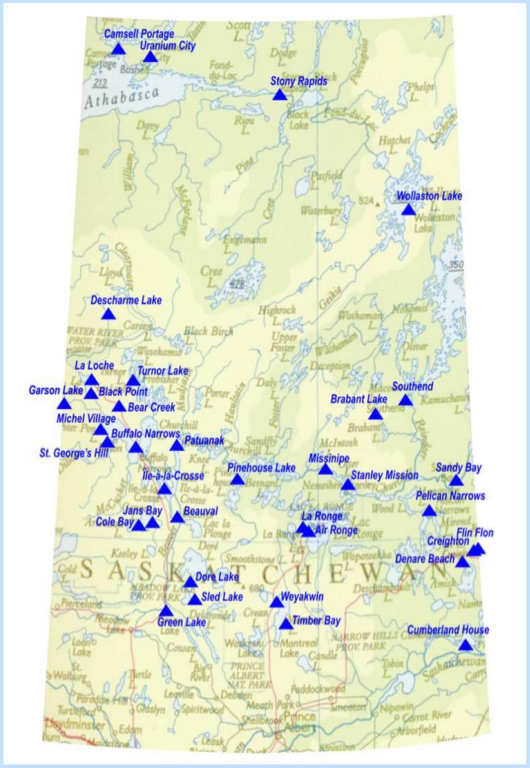
Report

Saskatchewan Ministry of Municipal Affairs

Asset Management Implementation Pilot and Development Project Summary and Strategy

September 2010



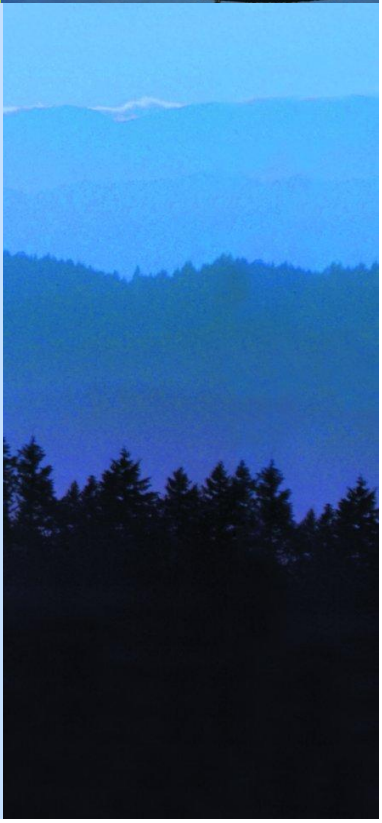


Table of Contents

REPORT

1 Introduction

This document has been produced to provide insight into both the development of an Asset Management (AM) pilot and a Northern Municipal Asset Viewer (NMAV) developed under the auspices of the *Ministry of Municipal Affairs, PS 3150 Compliance and Waterworks Systems Assessment, MAIS Implementation Pilot, MAIS Development for Northern Saskatchewan* project conducted by Associated Engineering, ATAP Infrastructure Management Ltd., Vemax Management Incorporated and TCA Consulting Ltd.

This report also provides insight into the key aspects of the project including, but not limited to, the following as required by the supplied Request for Proposal document and feedback gained through stakeholder meetings:

- Asset Management local sustainability issues and municipal staff "buy in";
- Technology challenges including the sustainability, augmentation and quality control of spatial information;
- Hardware, logistics, software and internet connectivity issues and business logistics for the storage, version control and transfer of information;
- Overview of acceptance of asset management theory by municipal staff; and
- Additional training required and alternate methods of internal and external service delivery.

In addition, this document is intended to provide a preliminary go forward strategy for the sustainability of the supplied project deliverables in the context of the individual and collective goals of the project partners, the Saskatchewan Ministry of Municipal Affairs (SMMA), Northern Municipal Trust Account (NMTA), SaskWater and the 36 communities within the project scope.

The following report sections are intended to provide a summary level overview of the project and the challenges facing the project partners going forward in the deployment of the project results on a municipal, regional and/or provincial basis.

2 Project Overview and Background

Associated Engineering (AE), as prime consultant, was retained in July of 2009 to provide consulting services and a suitable data set for the provision of PSAB Section 3150 compliant Registers, Waterworks System Assessments and developing an Asset Management System for 36 communities in Northern Saskatchewan.

It is understood that the Asset Management initiative is a cooperative effort for the standardization of municipal asset information by the following agencies and partners:

- SMMA
- Saskatchewan Urban Municipalities Association (SUMA)
- Saskatchewan Association of Rural Municipalities (SARM)

- Urban Municipal Administrators Association of Saskatchewan (UMAAS)
- Cities of Regina, Saskatoon, Prince Albert and Estevan

The focus of this report is the Asset Management component of the project which is understood to be a pilot for the implementation of a Municipal Asset Information System which will allow, in advanced form, for the analysis of aggregated asset inventory performance and financial information from Saskatchewan municipalities at a provincial level.

The process that was followed for provision of all of the required deliverables allowed the project team and stakeholders a unique insight into the infrastructure portfolio within the project area while outlining the challenges and possible constraints in deploying this type of project on a larger scale or provincial basis. It should be noted that the community demographic of the project area may be unique from a number of perspectives, however it is assumed that the challenges faced in creating the various project outputs are or could be assumed to be shared with the majority of Saskatchewan municipalities with the possible exception of the large urban centres.

All of the prescribed deliverables resulting from this project are consistent with the recommendations of the previously produced MAIS Feasibility Report produced by others in March 2009. The report indicated the need for a uniform and comparative framework and schema for the collection, storage and analysis of inventory, performance and financial information for municipal assets. The output of this framework and set of business processes is intended to provide a normalized and comparative data set for the determination of infrastructure needs and funding requirements on a provincial basis.

The aforementioned report recommended a pilot project for the implementation of a Municipal Asset Information System in order to verify and quantify the effort required to implement a central knowledge-based system for community infrastructure. The other critical element of the pilot is to demonstrate the value of infrastructure information on an aggregated basis for the Northern Municipal Trust Account, SaskWater and the Provincial Government.

Furthermore, this report also discusses the sustainability of the existing project deliverables in both the short and long term and the resource requirements for the further development of the NMAV into a more mature evidenced-based Asset Management decision making system.

The system and aggregated data, “NMAV”, can be characterized as the starting point for preliminary investment decisions and basic asset management, based on the application of classical lifecycle analyses on the project dataset. It is reasonable to assume that the sustainability and furthermore the extension of the project deliverables into an advanced-needs or condition-based data set is of key concern to the stakeholders. The project team has offered a number of recommendations for both the maintenance of the existing data set as well as its extension into an advanced investment planning tool and asset management system.

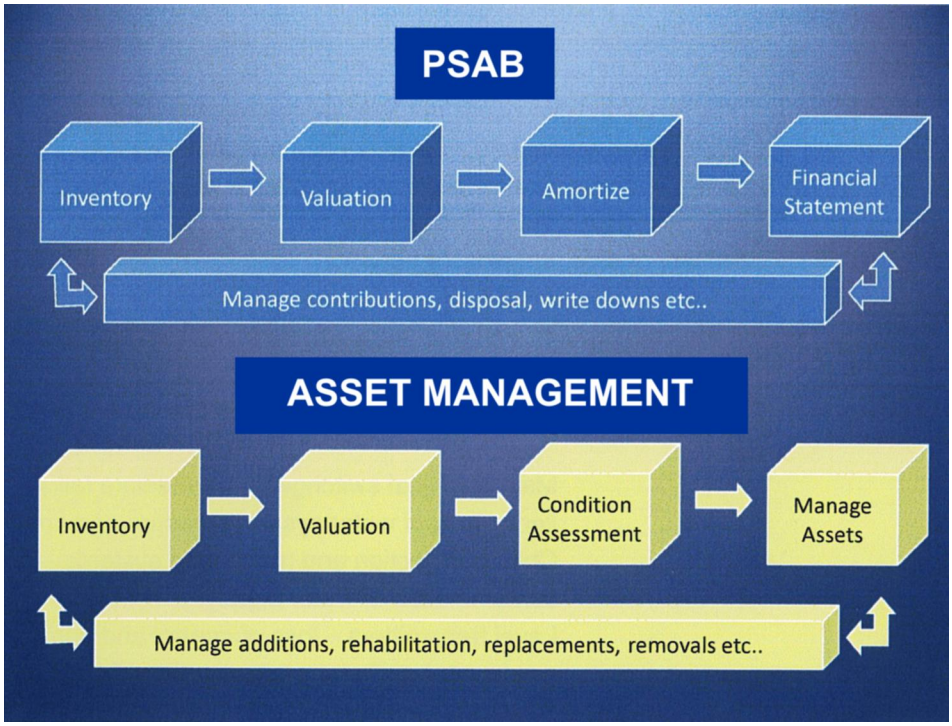
Where applicable, the AE project team has integrated feedback from the workshops provided to the Saskatchewan Urban Municipalities Association, under the auspices of another project conducted in 2008-2009, to augment the feedback received during training sessions and field visits with the member communities.

The following sections outline the project methodology/work plan at a summary level and the recommendations from an asset management capacity building and sustainability perspective going forward in the deployment of the process and deliverables to a wider and more comprehensive data set. In addition, the fundamental differences between a classical lifecycle approach to Asset Management (PSAB) versus Asset Management Best Practices is explored.

3 Asset Management vs. PSAB

This project represents the largest combined initiative in Canada to date to fulfill the requirements of PS 3150 reporting and the provision of a WEB/GIS enabled Asset Management System. It is critical going forward that project stakeholders recognize the functional value of the two distinct components and their respective strengths and weaknesses.

The workflow, synergies and differences in the creation and maintenance of the two components are shown in the following figure.



The two processes are clearly similar in the initial stages where both require a defensible inventory and the application of valuations to the said inventory. Subsequent to this point in the workflow, the processes diverge into their respective functional areas of amortization and condition respectively. The distinct differences in these processes as they relate to their intended use are further explored in the following sections.

3.1 Inventory

This project as delivered recognized the value of producing both deliverables from a common data source in the interest of economy and the sustainability of the resulting data set going forward for both uses. The granularity of the inventory required to support both processes is however distinctly different.

3.1.1 PSAB vs. AM Inventory Requirements

A comparative and audit quality financial statement can be produced at a highly aggregated inventory level and still fulfill PS 3150 requirements. A valid example is the inventory and valuation of a facility or treatment works which can be described in the context of a single asset with valuations applied to “systems”, HVAC, electrical structural etc., on a percentage of overall facility value or on a significant asset, from a TCA threshold value perspective basis. The resulting data set or TCA register will provide the suitable valuations, amortizations etc., but will not allow for the management of the constituent assets based on their individual condition or criticality.

This resulting listing does not indicate the relative importance of individual assets in the delivery of a prescribed level of service primarily because the aggregation or dismissal of assets in inventory based on cost thresholds assumes that all other assets for all intensive purposes do not exist. The value of any asset is not indicative of its value or criticality in the delivery of safe and reliable service.

In the context of this project many assets fell below the prescribed threshold value of $5000 but remain critical to the ongoing operation of the facility or process. The following items and their consequence of failure are described to provide evidence of this concept:

- Main electrical switchgear – immediate failure of process and all connected items, loss of water system pressure and fire flow etc...
- Chlorine injection and monitoring systems – loss of disinfection, contamination of water supply.
- Level transmitters – loss of control and pump operation resulting in wastewater spill and contamination of surrounding lands.

Throughout this project the value of the required underlying inventory was examined from the gross requirements of PSAB in conjunction with the level of inventory required to

"manage" assets from a risk and consequence of failure perspective. The distinction of value from a monetary versus end-use customer perspective needs to be stressed in any future inventory augmentation efforts in this regard.

3.1.2 Asset Performance

Another significant difference in these two business processes and their deliverables is the assessment of asset performance over time. PSAB essentially assumes the following if employed as an infrastructure investment planning tool:

1. All assets should be replaced on a "fix as it fails" or useful-life-plus-one day basis;
2. Assets deteriorate in a linear fashion with age; and
3. Similar assets have similar useful lives irrespective of method of construction, operating load or environment.

The above illustrates that the presentation of a classical operate-to-failure regime is not realistic in the operating environment of municipal infrastructure or any other asset class primarily because age is not the prime indicator of asset performance. An extreme example of this concept of the gap between age-versus-asset value from an ability-to-provide value to the end use customer is the "cloaca maxima" collection system located in Rome, This water/wastewater collection system was constructed in 600 BC and continues to provide continuous service to the residents of Rome. Interestingly no significant improvements, "betterments" to this series of structures occurred until 300 years after its original construction date.

The management of assets based purely on amortized value does not provide any insight into the actual performance and condition of significant assets. Predicted "useful lives" employed in the PSAB process are for all intensive purposes gross estimates in that insufficient empirical evidence exists, i.e. pvc watermain introduced in the last 30 years, to support the meaningful estimation of future infrastructure needs. Some may argue that PSAB does allow for the quantification of infrastructure rehabilitation benefit via the application of "betterments" to the PSAB statement and the associated extension or re-justification of useful life. This benefit as expressed in the financial statement is not stated in enough granularity to estimate the actual benefit: to end-use customers, the level of service, functional redundancy, operational costs etc.

PSAB does not account for the predictive analysis of premature asset failure and its root causes however it does monitor the financial impact of the replacement of an asset prior to the end of its useful life.

Asset Management Best Practices are predicated upon the measurement of actual performance via the ongoing examination and monitoring of asset failures, condition and functional redundancy etc. against a prescribed level of service. Levels of service, in the

broadest sense, can be largely characterized in the context of two book ends corresponding to “fix as it fails” or reactive management techniques or “managed risk or optimized infrastructure planning” or proactive asset management that takes into account all factors to arrive at the least cost, highest value and risk-adverse approach to infrastructure investment planning.

3.1.3 PS 3150 Planning Risks

As alluded to the in the preceding section PSAB does offer a coarse window on future funding requirements based on estimated lifespans for which insufficient objective evidence exists. This lack of “evidence” presents significant risks in that these estimates are not truly indicative of future performance or lifespan. Of significance is that PSAB does not address the operational redundancy, backups, or the functional redundancy, capacity, of assets.

An asset’s structural integrity, remaining life, amortized value and condition may be optimum; however development, population growth or other factors external to the asset may render it functionally redundant for the service level it is expected to provide.

The single largest argument against age or expected useful life based infrastructure planning is the increasing prevalence, “evidence”, of premature, asset age < remaining life, asset failure with one of the more prominent examples being the recent catastrophic bridge failure in Laval which resulted in the death of five people. The bridge in question had a 75 year “design life” however failed at 35 years old, less than 50% of the predicted life. The root cause of this failure is that the loads put upon the bridge vastly exceeded that which it was designed for from both volume and individual vehicle weights which could not have been reasonably predicted at the time of design.

This example illustrates the need for continued monitoring of condition over time to more accurately predict and presumably prevent asset failure in view of many variables and unknowns.

3.1.4 Asset Useful Life

For the purposes of this project, asset useful lives were determined on an asset class-by-class basis taking into account previously published values from Manitoba, Alberta, British Columbia and the United States (GASB – Governmental Accounting Standards Board - Statement No. 34). These values were examined in detail by a group of senior engineers at AE to determine what if any changes were required to reflect the durability of assets in the unique climate of northern Saskatchewan. Useful lives for all asset classes employed for the purposes of PSAB are shown in **Appendix “A”.**

It is important to note that the useful life employed for the purposes of PSAB should be considered as an expected or approximate design life. Service life in the context of Asset

Management takes into account the operating environment, applied load, past failures, climate, condition along with a number of other factors to better determine an actual predicted life. The inventory supplied for the purposes of this project currently constitutes a snapshot of asset performance given that the project team cannot reasonably assess deterioration without knowledge of the condition of the asset and failure rates over time.

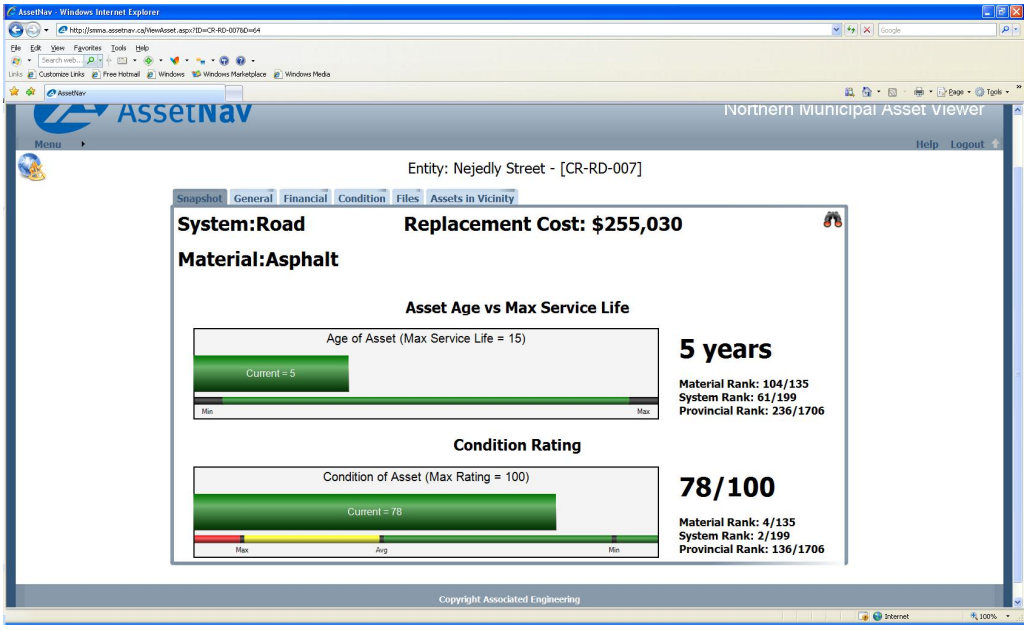
Additional information on this aspect of the project is available via published best practices by Infraguide, British PAS 55 and other asset management advocacy groups. This subject is clearly explained in the following presentation available from the Ontario Public Works Association at http://www.opwa.ca/lib/db2file.asp?fileid=16524 . This presentation published in February of 2007 by Terry Corrigan, then principle of the Public Sector Accounting Group of the Canadian Institute of Chartered Accountants, provides clear insight into the risks associated with employing useful life in the context of PSAB for infrastructure replacement planning and financing.

The following section outlines the condition assessment protocols for the purposes of this project in view of the above.

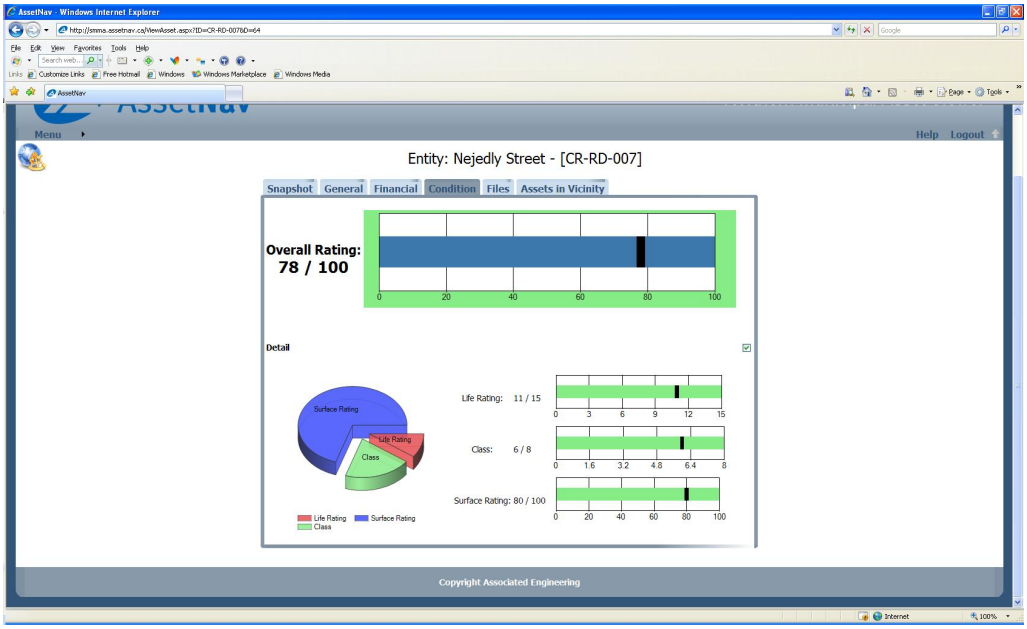
3.1.5 Asset Condition

The assessment of a number of items within the supplied inventory produced for the purposes of this project is considered to be a value-added item produced by the project team as part of the inspection, as the originally supplied terms of reference did not require the addition of condition metrics to inventory but rather the assessment and delineation of quantity of inventory of different types.

Again, as a value-added deliverable, the project team and inspection staff attempted to provide an assessment of individual assets where visual inspection was feasible on a pre-defined scale. The visual inspection value was then integrated into an “overall rating” taking into account the individual class, importance or criticality and remaining life (useful life minus age), to provide the prospective users of the NMAV application the ability to examine the asset in question relative to all other assets in the same class. An example for a community road is shown in the following screenshots from the application.



This graphic indicates in the first bar the relative age of the chosen section of road relative to those of the same material, class and provincially. A more detailed view of the asset is shown in the following graphic.

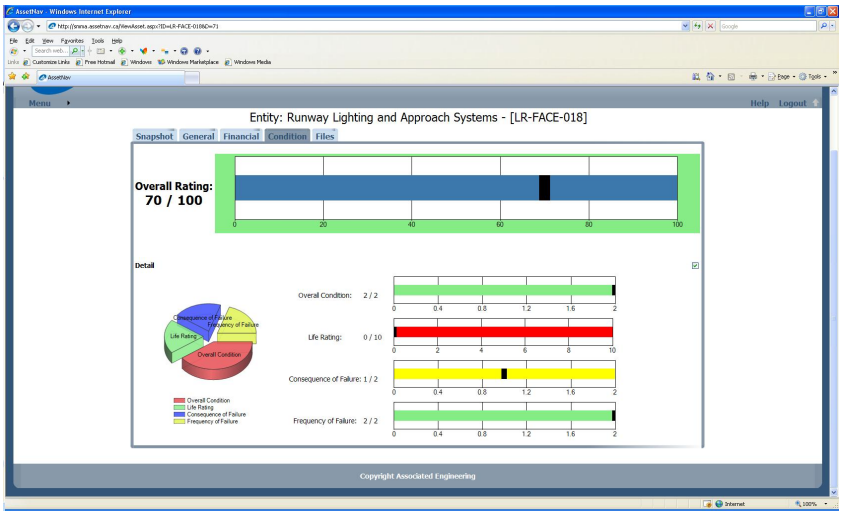


This pie chart illustrates the individual weights given to remaining life, surface rating and road class respectively. All values for all asset classes have been normalized to multiples of 5, 10 or 100 in the interest of simplicity. Individual inspection scales for each asset class for which condition statements have been provided, namely facility equipment, facilities,

and road are indicated in the sample inspection sheets provided in **Appendix "B".** In regards to facility or process equipment each item was inspected in conjunction with community staff in view of the following:

1. Overall visual condition
2. Remaining Life
3. Consequence of Failure
4. Frequency of Past Failure

These metrics were then normalized to predefined scales, weighted and inserted into the NMAV application as evidenced by the following screenshot. Again the NMAV application allows for the grouping of assets on a provincial or community basis.



In addition, AE will deploy an inspection look up or hyperlink within the NMAV application upon project completion which will outline inspection form templates, rating scales and weightings for each class of asset. Individual weightings for each metric were derived in consultation with AE's asset management group and can be altered upon request.

No condition information was available for the remaining asset classes. A go forward strategy for these asset classes is included in the latter stages of this report.

3.1.6 Comparative Condition Standards

In the event that this project is expanded to accommodate inventory and key performance indicators on a provincial basis, serious consideration needs to be given to the condition metrics defined as provincial standards.

In this project, simplistic condition ratings were employed in the interest of sustainability, more specifically the ability of line department staff to continue the process without the need for specialized training.

In contrast, most urban centres, due to the complexity and size of their systems, require more granular and sophisticated systems to monitor the rate of deterioration in their asset complements. Some examples include

- Water Research Council, 4th edition, PACP rating standards for wastewater collection systems
- National inspection standards for facilities
- Provincial Road and Bridge rating standards

These inspection standards offer a greater level of description as to both the condition of the asset under examination, but more importantly provide valuable information to employ in the determination of required rehabilitation and/or replacement. These systems will have to be accommodated in any future provincial assessments in the event that urban areas are included in any province-wide project. AE respectfully recommends that two tiers of asset condition metrics be applied to ensure that the comparison of asset condition is performed with like systems and metrics. All condition metrics, at any level, should be complete with quantifiable statements for rehabilitation and/or replacement, temporal priority and applicable costs in order to drive funding and capital investment planning from a tangible perspective.

As alluded to earlier in this document, a functional needs determination outlining community and provincial strategic and tactical goals is recommended to ensure that the agreed upon standards for asset condition and performance measurement achieve the desired outcomes.

The project team can provide a more detailed explanation of the various strengths and weaknesses of both processes to interested stakeholders in a workshop environment if required as part of a separate but complimentary project.

4 Pilot Project Methodology and Work Plan

In consideration of the proposed functional uses for the Asset Management (AM) component of this project, the AE team followed a task-based and iterative work plan that focused on meeting a number of tangible functional successes as the project progressed. Full stakeholder involvement was stressed during the project progress to ensure that deliverables were consistent with the functional requirements and ultimate goals of the MAIS Committee and was applicable to a wide ranging, provincial and community demographic.

A brief description of the key tasks involved in the delivery of the project follows. A more comprehensive listing of the supplied work plan is available in the previously supplied proposal.

4.1 Stakeholder Workshop / Functional Use Assessment

In order to better define the actual-versus-perceived scope of the data collection and assessment effort and to develop a common understanding within the project stakeholder group of the anticipated outcomes, project approach and proposed level of community development in the delivery of the Asset Management component of the project, a two-day workshop was conducted with the MAIS Committee in Saskatoon September 15-16, 2009.

The workshop focused on the proposed high-level, provincial, and low-level, community uses of the MBS in the context of classical, industry-standard asset management best practices. The group present at the meeting was reasonably diverse in terms of population demographic, management level and their level of understanding of asset management theory and practices, and provided the opportunity to solicit truly relevant and meaningful feedback for the production of a “go forward” strategy.

Feedback was solicited via an interactive session at the workshop where each participant group was requested to produce three (3) key objectives or project outcomes which when achieved would be indicative of project success. In addition, participants were also asked to produce three (3) key objectives which were not included in the project scope as specified that were considered to be of real functional value. Interestingly, the results of this exercise, given the diverse group demographic, were not dissimilar indicating that the project as originally conceived could meet and, in fact, exceed most of these goals.

Minutes of the meeting and presentation materials were distributed to committee members subsequent to the meeting to solicit additional feedback on the project approach and to solidify the project team’s understanding of the project outcomes.

4.2 Review of Background Information

Functional needs expressed during the interactive session were aggregated with those specified within the request for proposal document. They were integrated into a project execution plan which specified both the key project objectives and any secondary objectives for consideration during the data collection period. Synergies were developed, where applicable and practicable, between the objectives to ensure that the data collection and aggregation process recognized efficiencies where possible.

Objectives were then examined in the context of the information that would be required to support their fulfillment during the project period or in subsequent efforts in this regard.

A comprehensive analysis of information from Provincial, SaskWater and NMTA resources was conducted to determine the quantity and quality of information that was readily available to support the stated functional uses. The information sources examined included data from, but were not limited to, the following providers and authors:

1. SaskWater available record drawings
2. Information Services Corporation
3. Saskatchewan Ministry of Municipal Affairs
4. Northern Municipal Trust Account
5. Saskatchewan Highways
6. Saskatchewan Assessment Management Agency
7. Federal Resources

Each of the information sources were examined in relation to the following:

1. Author and contributing agency
2. Currency
3. Update frequency
4. Accuracy and precision

Information from the various agencies was submitted to the project team via portable hard drive media and was loaded to the project file resource section shared by both the AE Saskatoon and AE St. Catharines project technical staff for use and reference in the field inspection and Geographic Information System (GIS) creation phases of the project respectively. All relevant hard-copy engineering drawing information was scanned by the project team and indexed by the community of interest and engineering discipline area in a four-week period commencing July 28, 2009. Suitable metadata was created for each of the data sets to ensure effective tracking of the source, author and currency of the submitted information.

Live or dynamic information sources available from Saskatchewan Geospatial Imagery Collaborative (SGIC) were connected to the GeoAssets data resource and tested for throughput and connectivity. Information sources from SGIC considered relevant for this project are as follows:

1. Multiple Digital Ortho Imagery (4)
2. Municipal boundaries and locations
3. Parks

The project team assumes that these information resources are the exclusive responsibility, from a maintenance and update perspective, of the owner.

4.3 Data Model / Schema Definition

A suitable data model was created to house the infrastructure attribute and geometric information for each of the communities specified. Standardized domain (lookup) values were created, where applicable, to ensure consistency of the information being input by the contributors to the project data. Provisions were made within the data model for the attachment of scanned reference information during the inventory build.

Core attribute values describing each asset class were reviewed at the workshop by participants and no significant alterations were made.

A shared Microsoft Access database was created to house the information resulting from the field and from research of existing engineering drawing information. This resource allowed for the sharing of information between field and technical staff as the asset registry was developed.

4.4 Data Collection Templates

Standardized Excel-based data collection templates consistent with the structure of the asset registry were developed to allow for the review of drawing-sourced information on site, water, sewer etc. and for the collection of data relating to the facility and fleet asset portfolios in each community at the time of the field inspection. Inspection staff were equipped with comprehensive infrastructure inventories for the subject communities prior to their arrival in each community.

This information resource being made available to field staff prior to their site visits significantly reduced the time involved in staff orientation with each system being inspected.

Copies of the data inspection forms, along with a data dictionary, are provided in **Appendix "B".**

4.5 Pilot Community

In order to better align the anticipated project deliverables with stakeholder expectations, the project team conducted a comprehensive asset inventory of a pilot community, Weyakwin, on August 5, 2009. The results from the pilot community were presented to the stakeholder group workshop conducted on September 16, 2009. All feedback was received and integrated into the project execution strategy for the remaining 35 communities.

4.6 Asset Registry Build and Field Data Collection

The data collection effort for the remaining 35 communities consisted of two distinct and complimentary phases given that the asset registry build for linear underground infrastructure could not reasonably be performed by field inspection staff.

4.6.1 Linear / Underground Asset Definition

Under this task each community's existing linear asset inventory register and coordinate registry (GIS) was created via the use of both community and SaskWater general arrangement and plan and profile engineering drawings. Each system was geometrically defined using the aforementioned information in conjunction with provincially sourced digital ortho imagery, single line road network and parcel mapping to achieve a suitably accurate spatial representation of each network in reference to available landmarks.

Resulting data sets provided the basis for "Gap Analysis" reports which were submitted to field inspection staff prior to their arrival in each community for augmentation via field identification and/or community staff interviews. Information retrieved during field visits was then committed to the shared project database for further review and quality control.

4.6.2 Facility / Fleet / Equipment Asset Definition

The definition of assets in this class involved the review of available drawings and equipment listings at SaskWater and NMTA respectively prior to the field inspection visits. Existing equipment inventories were augmented and verified as necessary via visual inspection. Facility asset inventories were conducted employing solely visual inspection methods with data captured within the supplied facility inspection template. Careful consideration was given toward the examination of critical components of each facility irrespective of the prescribed $5000 Capital Asset Threshold employed in each community.

Community land assets were inventoried via the use of provincial parcel mapping and assessment information and transferred into the project database.

Completed data collection templates were reviewed and then uploaded to the project database for a subsequent gap analysis.

Field inventory data capture and verification occurred over a fourteen-week period from mid-August to late November 2009. All of the completed inventory information underwent a final review by field inspectors, AE and ATAP staff who were familiar with the community systems by virtue of previous and/or ongoing support projects in the subject communities. Completed inventories were then transferred and committed to the final SQL Server project database for publication within the AssetNav application for community and stakeholder review and use.

4.7 Valuation

In order to fulfil the requirements of PS 3150, "historical value", and the requirements with respect to future Infrastructure Asset Management Planning, "replacement value", the project team undertook a significant amount of research to determine the valuation for all assets in inventory.

PS 3150 requires the determination of the initial cost of acquisition or historical cost for reporting purposes. In the vast majority of cases the stakeholder communities lacked the original cost of acquisition for assets which they owned given the age of the assets involved. In order to determine historical cost for the asset complement the project team derived modern equivalent replacement costs for the asset inventory where no original acquisition cost was available. These replacement costs were then deflated to the original "in service" date to determine the historical cost. A portion of the assets did have suitable reference material available for the determination of current replacement cost or assessed value based on provincial assessment data and insurance documentation for facility assets.

The valuation for all other asset replacement costs for the purposes of the project was based on the following sources:

- Community construction tender information;
- AE in house construction tender information;
- Saskwater in house construction tender information; and
- Research in conjunction with the vendor/supplier community.

The project team paid significant regard to the community location in deriving replacement values as their remoteness has a significant impact upon both the materials and labour costs for infrastructure replacement in comparison with urban centres. All valuations were vetted by Professional Engineers at AE with considerable experience in the construction and replacement of infrastructure in northern Saskatchewan.

In general, costs were applied on a linear and nodal basis. Linear infrastructure, roads, water, sewer etc. were assessed in relation to its length, dimensions and class and variable rates applied to derive a section-by-section basis. This was accomplished by applying a cost-per-unit length by diameter for all underground infrastructure, water sewer etc., while above-ground linear assets, road, sidewalk etc. was assessed via the application of a standard replacement value by square metre by component. All other assets were valued singularly based on available supporting information.

Additional detail in regards to the determination and application of replacement and historical values and deflation indices used for the supplied inventory is available in the report provided for the PSAB portion of this project entitled *"Saskatchewan Ministry of Municipal Affairs PS 3150 Pilot and Development Project Summary and Strategy, September 2010"* provided under separate cover.

4.8 Deliverable Component Integration

The project team employed a central information resource, SQL Server-based Asset Registry, for the three major deliverable components. These are understood to be:

1. Waterworks System Assessments
2. PSAB TCA Registers
3. Asset Management System

These requirements, although distinctly different in focus and business need, all require a common core set of asset inventory and performance information to support their delivery. The AE project team, throughout the project delivery phase, has attempted to integrate these components into the asset register to avoid duplication within the digital deliverables provided with the concept being one central and minable information resource to support all of the core elements of the three functional needs and business processes.

Please note that WSA-specific information, in regards to items such as water quality results, public health risk assessments past and present, and hydraulic performance, have not been included with the supplied asset register as they were not considered to be critical to the other two functional uses and an inter-community standard reporting or capture method for much of this information was not well defined at the time of capture.

4.9 Application Development

GeoAssets Ltd. AssetNav product and its core engine were employed for the visualization of the data resulting from this project. Visualization of information was deployed at two distinct levels, namely:

1. Provincial, NMTA and SaskWater view of aggregated community information area wide; and
2. Community specific views for display at the individual community level.

The AssetNav core engine was modified to permit access to these two user levels as well as the addition of core reporting requirements as specified by the request for proposal document. In addition, user tools allowing for the segregation of data by community type, population and community name were provided in the upper-tier views.

4.10 Community Application Delivery and Training

A series of interactive training workshops were held to provide insight into the use and maintenance of information for Asset Management and PS 3150 reporting purposes from March 15-18 in four locations: Buffalo Narrows, Prince Albert, La Ronge and Creighton.

These training sessions illustrated the use of the PS 3150 register previously submitted to the communities between January 30 and February 17, 2010 and the use of the community view of the AssetNav product in accessing and retrieving infrastructure inventory and performance information. Feedback from these sessions was captured by training staff and necessary adjustments to the AssetNav product and community centric asset information were made.

Edits and alterations to the supplied inventory resulting from the review of submitted WSA draft reports have also been integrated into the supplied Asset Register(s).

4.11 Provincial Application Delivery and Training

Training for the AssetNav product for the upper-tier view was provided on Tuesday, June 22, 2010 to representatives of SMMA and SaskWater. This final training session was preceded by a two-week period of AssetNav refinement to meet the requirements as set out in the supplied request for proposal document and to respond to items received as a result of feedback from SMMA and SaskWater staff.

4.12 Integration of Feedback

The project team has endeavoured to integrate the feedback gained throughout the project into the final deliverables submitted. Remaining requested functional enhancements have been categorized into the following priority classifications:

1. System hang ups and/or errors encountered during operation not due to client end or connectivity issues – addressed immediately via GeoAssets support system;
2. Minor alterations to function or aesthetic issues – addressed in the short term at no cost where practicable; and
3. Major alterations to function and/or aesthetics – addressed on a fee-for-service basis at a flat rate of $85 per hour; alternatively, included in subsequent releases based on user base demand for enhancement on a case-by-case basis.

GeoAssets Ltd., in an effort to continuously develop and enhance the end customer experience, has developed a web resource for submission of requested enhancements and error fixes. In the interest of confidentiality, access to this resource will be provided to lower- and upper-tier users of the AssetNav application via a link on the application interface. This customer service initiative will be launched on the site(s) upon project completion.

The preceding sections are intended to be a general guide as to the methodology employed for the creation of the NMAV outside of the considerable amount of correspondence in this regard. This background is provided for context in view of the observations and recommended strategies presented in the following sections.

5 Project Challenges

The delivery of this project presented significant challenges to the project team from conceptual through data collection and deliverable phases. In essence, this project and its delivery mechanism, could be characterized as a top-down or basic asset management approach given the limited resources provided at the community level for completion of deliverables.

This project involved the inventory of approximately 27,000 community assets valued at approximately $600M in 2010 dollars. It represents the largest project of this type completed in relation to the geographical disparity and number of individual communities included in the project scope. In addition, the project deliverables illustrate the disparity between the community population demographics, technical sophistication and available resources to sustain the resulting data set.

Notwithstanding the above, the resulting data set and application constitute a sustainable corporate or community memory of physical assets at the community and aggregate or NMTA level that will and can exist irrespective of changes to staff complements at either level.

The following sections outline the challenges in producing the project deliverables as expressed by project team members throughout the project delivery phases. Not all observations noted apply to all communities within the project area, however all of the challenges noted are relevant from the perspective of a go forward strategy.

5.1 Jurisdictional

This project involved a number of stakeholders, all who possessed significant pieces of information considered to be critical to the creation of the required deliverables. The retention of the project team as a third party provider allowed for the review, aggregation and inclusion of this data irrespective of owner or author.

This distributed information source arrangement makes the path to accountability and access to information problematic going forward. If either the top-down or bottom-up, community-based approach is to be employed going forward, a single agency or champion needs to take accountability for the production of the requisite asset inventories in order to retain value in the information and for production of annual PS 3150 statements. In addition, each agency appears to have somewhat individual goals for the information in each of their business areas. The data to support these goals are not mutually exclusive given the obvious synergies resulting from the deliverables of this project.

At present, this management role is not clearly defined irrespective of the approach taken, and access to information at these agencies for communities is not clear.

5.2 Technical Support Roles

During the project, it became readily apparent that widely varying degrees of technical sophistication and availability of staff resources existed within the communities in the project area. These individual capacities ranged from those communities, approximately 70% by number, that by virtue of a lack of local technical expertise and a shortage of staff resources are largely reliant and

dependent upon the municipal advisory services provided by the SMMA for the inventory tracking and management of their assets, the “top-down approach”.

The remaining communities appear to be somewhat self sufficient in the delivery and management of their municipal assets and services and would appear to be capable of maintaining their information resources with little or no technical assistance provided that a clear and auditable process is put in place and regular training and reinforcement of concepts is provided.

In either case, the delivery of a clear and consistent asset inventory on an annual basis and enforcement of data collection, assessment and valuation may become problematic if the two delivery mechanisms and logistics are not clearly defined at the outset. In addition, the overall changes to the inventory will require a formal audit process on an annual or preferably more frequent basis to ensure that the currency and accuracy of the resulting data set(s) are maintained.

5.3 Community Record Keeping

In several of the communities visited by field inspection staff, it was noted that effective record keeping was either not a priority for the community or that the administration staff lacked sufficient resources for effective records management. This was illustrated by the inordinate effort required by field staff in the inspection of infrastructure for which no records existed.

The lack of easily accessible infrastructure information, prior to this project, in these communities is troubling in that many of the communities are in the process of losing whatever “community infrastructure memory” that they previously possessed via the retirement or loss of legacy of experienced operations staff and administrators.

The above demonstrates that there is clearly a role for an effectively managed infrastructure information resource for a portion of the communities.

5.4 Shared Community Infrastructure

In many cases, a number of communities shared critical and core infrastructure delivery systems. Prior to this project, the ownership and, therefore, the responsibility for this infrastructure was somewhat nebulous. The project team, through extensive research, managed in all cases to determine the rightful owner and operator of these systems to the extent of the information available. Careful regard should be paid going forward that custodians of newly constructed systems are made aware explicitly of their individual responsibilities in this regard. Again a central and definitive infrastructure information resource would assist in the clear delineation of ownership, rehabilitation and maintenance responsibilities. This is made more relevant as the use of shared infrastructure delivery systems may become more prevalent in this area than in the remainder of the province.

5.5 Access for Inspection

Access to many communities is impeded by their geographical location and, furthermore, by seasonal transportation limitations. These limitations may impact the sustainability of the inventory given that, in many cases, these communities lack the necessary staff and technical resources to become self sufficient from both a PSAB and Asset Management perspective. Consideration should be given to blending the inventory management, audit process, with scheduled visits to these communities by skilled staff rendering other operations or engineering services in the interest of economy. These visits should be coordinated and scheduled with required reporting and audit intervals for both PSAB and Asset Management.

5.6 Staff Transience and Retirement

It is understood that many of the communities visited are experiencing a loss of their intellectual property or community memory through staff retirements or loss of staff to other communities, as the lack of qualified administrators and or operators becomes more prevalent. This intellectual property goes well beyond the loss of local infrastructure inventory information and includes knowledge of system performance, chronically failing assets, community or seasonally specific system operations requirements and infrastructure needs. Consideration needs to be given to garner as much of this information in a central sustainable information resource prior to its loss.

5.7 Vendor Dependent Community Infrastructure Knowledge

Many communities in the project area have opted to retain a single service provider for the provision of engineering services and advice. In many cases, this results in the service provider retaining the majority of the information, community infrastructure memory, pertaining to the infrastructure systems in the community. These service providers presumably provide a valuable service through effective decision making and records management, however also function as an information island from a community and provincial infrastructure performance analysis perspective.

Careful consideration should be given to the liberation or democratization of these information sources through the use of standard contract deliverable requirements in regards to the submission of information to the community and/or the Province. Ideally, this process should be centralized and auditable to ensure submitted information meets the standards specified and is being submitted in a readily useable form.

5.8 Temporal

The project stakeholders and individual communities are now in receipt of an information-rich basic asset inventory management system. Information submitted under the auspices of this project is current as of the last date of inspection in each community and is considered to be indicative of the inventory at the time of inspection.

The value of the collected information for decision making and other purposes will diminish over time if appropriate steps are not taken and formal business processes are not instituted to keep the information current and indicative of the infrastructure portfolio in each community. The project fee or investment in this basic asset management endeavour, approximately $1.1M, represents approximately 1.8% of the aggregate value of the infrastructure inventoried, ~ $600M.

Asset inventory management was presumably not a priority in the majority of the communities until the advent of PS 3150 reporting requirements. The project team's considerable national experience indicates that the path to effective and auditable asset inventory management is often paved with the best intentions, however is often forgotten, albeit unintentionally, in the face of other more pressing business needs. This is clearly both an education and resource issue going forward for most of the project communities.

Experience has shown that the path to effective basic and advanced management plans requires the systematic evaluation and re-evaluation of infrastructure systems as part of an overall needs-based management regime over time as systems, needs and asset investment changes.

The project deliverables, in their present form, offer a great deal of insight into both community specific and aggregate infrastructure portfolios. This insight will only exist from a value perspective if a systematic and auditable process is put in place to maintain the information resource and to further develop it into a more advanced decision making and infrastructure tool.

It is understood that the rate of growth and rate of infrastructure system change in each of these communities can be classified as low in relation to many Saskatchewan communities. This change, however, if not managed in the near term, will impact the viability and further development of the existing information resource, basic to advanced asset management system and to the feasibility and level of effort in the production of future PSAB TCA registers.

These challenges outlined above are not insurmountable in the project team's opinion, but will require concerted effort in the short term to prevent depletion of value in the project data delivered.

5.9 Information Technology and GeoSpatial Needs

As alluded to in Section 5.1, this project and its sustainability are indeed impacted by the somewhat distributed nature of the communities, contributing information and stakeholder groups.

Information technology capacity at the community level, in the majority of cases, proved to be adequate for the maintenance and inquiry of the information source, AssetNav. The majority of communities were in receipt of the Microsoft Office software necessary to operate and manipulate the submitted TCA registers and AssetNav web-based asset management system, however project stakeholders should give serious consideration to the standardization of Office software in use at the community level. This standardization could conceivably be achieved through the bulk purchase

and deployment of software on a bi-annual or more frequent basis and would avoid frustration at the user and application service provider level with older or incompatible versions of Excel and Internet Explorer. GeoAssets Ltd., at the project team's request, has installed an Internet Explorer browser version detector that runs upon log in. It would, if applicable, inform the prospective user that their version is out of date and provide explicit instructions on the source and installation of a newer browser version.

5.9.1 IT Hardware and Software

Clearly, the majority of communities lack the necessary IT infrastructure to deploy a workstation/server-based client asset management application. The need for aggregation of the data at the various levels combined with the possible issues regarding version control, installation of updates and deployment of application enhancements dictates the need for a web-based, centrally-deployed software as a service solution. Careful regard needs to be paid going forward to the deployment of upgrades in functionality to avoid the need for specialized browser-specific settings or the requirement for "plug ins" as their configuration would be problematic in the project area and more so from a provincial perspective.

5.9.2 Interaction with External Software

It is apparent, through interaction with various communities both within and outside of the project area, that a number of municipalities are employing proprietary financial software as a vehicle for producing PSAB reports and financial statements. This approach is contrary to the advice to municipalities rendered by SUMA via their educational sessions as to the use of the free TCA register.

The project team did endeavour to investigate the possibility of an application interface with the Munisoft TCA fixed asset module, apparently the most prevalent third party software in use in this regard, however the vendor appeared to be reluctant to provide any application program interface or additional information on this subject.

5.9.3 Internet Connectivity

The project team as part of the overall deployment process attempted to conduct an internet speed and connectivity test by advising community administration staff to test their internet upload and download speeds via a third party internet throughput site. To date, five communities have submitted results as indicated in the following table.

Community Name	Login Sent:	Download Spd	Upload Spd	Quality %	RTT(W)	Max Delay
Buffalo Narrows	6-Apr-10	1.46 Mbps	110 kbps	93	73 ms	353 ms
Cumberland House	6-Apr-10	1.46 Mbps	72.1 kbps			
Dore Lake	6-Apr-10	1.48 Mbps	110 kbps	99	103 ms	31 ms
Green Lake	6-Apr-10	1.48 Mbps	111 kbps			
Michel Village	6-Apr-10	Dial up -very, very slow , Shaw test was too slow to complete				
Timber Bay	6-Apr-10	Dial up slow				

The limited data shown in the table was augmented via information sourced via www.sasktel.ca that indicated that the majority of communities had access to appropriate internet service. In some cases this service was via dial up, however the current thin client deployment of AssetNav appears to function adequately within this environment. It is understood that the stakeholder group is currently working to provide improved services in these areas where possible.

5.9.4 GeoSpatial

The geospatial information employed for this project consists of three classes of information pertaining to the functional need of the information or product. These are understood to be:

1. Infrastructure coordinate and geometry information – asset inventories and mapping
2. Background imagery and topography – reference layers
3. Cadastral – road, land boundaries, ownership and value

As alluded to in previous sections, it is critical that these components remain in place for the functional uses specified, however in differing capacities. Reference layers are considered to be dynamic and to be indicative of the implicit data at the time of inquiry, however the integration of alterations to infrastructure mapping and cadastral, land/road inventory files will require intervention by qualified staff at an upper-tier level given their impact over time on both the PSAB and asset management goals of the stakeholder group.

A portion of the GeoSpatial files submitted from outside agencies did not share a common projection and datum. A combination of North American Datum NAD 27 and NAD 83 files was submitted in the initial stages of the project. It is understood that this discrepancy is likely due to the original date of acquisition of the data sets, however consideration should be given to the presentation of this data in a common datum.

It is unreasonable to assume that any of the communities possess either the technical resources and/or software at present to integrate geometric, GIS, changes to their inventory records as a result of asset or land acquisition or disposals. A clear business process is now required to harmonize these data sets as time progresses.

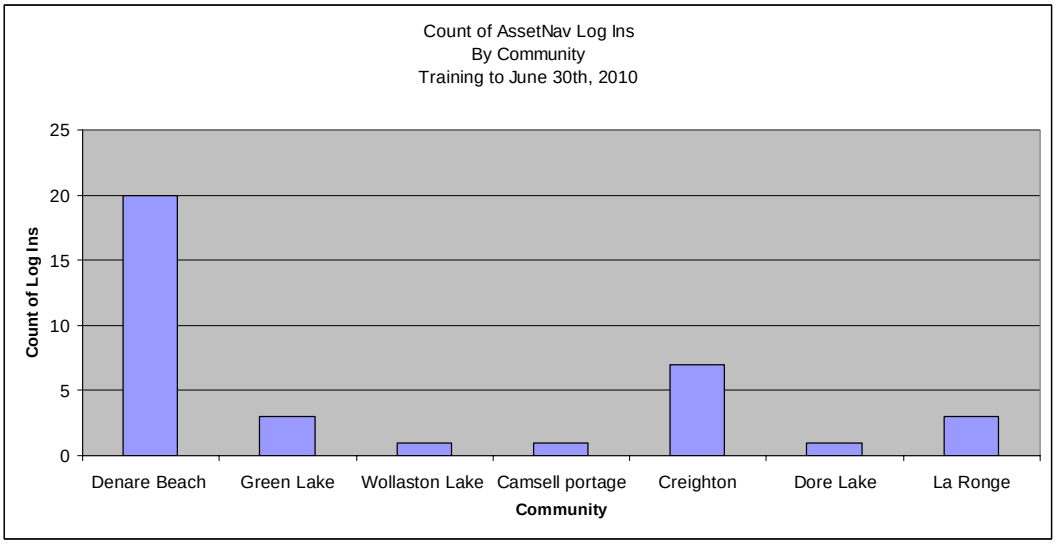
This challenge and possible solutions are further explored with others in Section 5 of this report.

5.9.5 Asset Management Building Capacity

In the interest of clarity, the communities' collective knowledge of basic and asset management theory, best practices and application is currently limited to information gained through their own practical experience and to research and limited training provided by the project team through this project and through the previous SUMA PSAB and Asset Management training conducted in 2008 through 2009.

Interest in the application of asset management techniques, as a vehicle to effective evidenced-based infrastructure planning strategies, was noted during these training sessions; however the limited exposure to these techniques provided by both initiatives currently limits the level of understanding of the process at the community level.

The project area is unique in its population, demographic and infrastructure needs planning and, as such, requires further, systematic and continued training in those communities that realize the benefits that it can provide. The following graphic indicates, albeit indirectly, the current level of interest or community engagement with respect to access to infrastructure information.



The graphic indicates the number of times in total that the AssetNav interface was accessed by the group of 36 communities for whom a log in was provided. The period shown is from the date of training in the individual communities to June 30, 2010.

Those communities not listed have not accessed the system in that period. Clearly, reinforcement of the use of the application and additional training is required in its

relevance to infrastructure management in these communities. Examples of the practical application of the data for prioritization need to be provided.

In those communities with limited resources, it is foreseen that a top-down and/or assisted business process will be required. Given that it will likely be a challenge as noted for these communities to sustain their inventory and financial statements, the application of advanced asset management techniques in these communities is not considered to be realistic in the foreseeable future. The project team has provided guidance in this regard in the following sections.

The challenges indicated in the preceding sections, although significant, are not seen as insurmountable in both the short and long term by the AE project delivery team. The primary requirements moving forward are the sustainability of the resource already created in combination with the creation of a documented and auditable business process complete with target milestones irrespective of the delivery mechanism of the plan, be it internally or externally driven.

In response to the requests at the last stakeholder meeting, realistic and tangible solutions to the challenges presented are provided without prejudice in the following section.

6 Sustainability Recommendations and Go Forward Strategy

In order to better define the options going forward for the project deliverables and their sustainability, the project team has provided their understanding of the core components of Asset Management theory for context. In the interest of clarity all sections that discuss sustainability of the project data are accompanied by bullet point recommendations for the project stakeholders' consideration.

6.1 Basic versus Advanced Asset Management

The approach used allowed for the creation of a detailed asset inventory to which key performance indicators (KPI), condition and capital and operating investment information can be added. This format will allow for the aggregation of the inventory information and limited available infrastructure condition information at the levels prescribed in the request for proposal document. The data provided is therefore characterized as a basic asset management data set, data model and application that describe the inventory in a comprehensive yet somewhat limited or basic capacity.

The project team through the development of the NMAV endeavoured to provide value-added information with respect to condition wherever possible, however information regarding condition was lacking in many of the communities in terms of quantity and comparative quality. The addition of this information, primarily in the area of facility equipment via visual inspection, should not be considered as an advanced asset management data set for use in risk analysis and complex strategic decision making.

In order to develop a common understanding of the asset management process, the following information is provided for discussion purposes.

The provision of municipal services such as safe and reliable drinking water requires competencies to design, operate and maintain assets in line with the strategic objectives of the organization.

Asset management aligns the organisational strategy and the level of service with capital investment planning for asset creation, maintenance and financial planning. It requires the optimisation of total cost of ownership and operation with the objective of delivering service levels to meet customer expectation at defined levels of risk.

A physical asset-centric definition of asset management that was developed by the British Standard Institute is defined as "***systematic and co-ordinated activities and practices through which an organisation optimally manages its physical assets, and their associated performance, risks and expenditures over their lifecycle for the purpose of achieving its organizational strategic plan****".* This definition is offered primarily to illustrate that the asset management process involves a multi-faceted approach to the management of physical assets that requires information from many sources.

Furthermore, the management of assets requires **evidence-based decisions** on the correct course of action to take in time and by reference to cost and risk, and builds on strategic planning and organisational development. Monitoring, evaluation and optimisation in asset management are supported by formal systematic processes. Tools and processes at strategic, policy and tactical level form an integrated framework to proactively and consistently identify risk, assess risks and select appropriate controls. This places risk identification, assessment and control (together, risk management) at the centre of asset management, and the availability and quality of asset data at the centre of asset decision making.

The preceding illustrates that the process of advanced asset management is dependent upon the realization of comparative key performance indicators and upon a solid, reliable and continuous business process.

Progressive organisations that "do" asset management often have processes in place to introduce, implement and operate an asset management system. This system is based on business processes that primarily result in some form of an asset management decision. For water supply and wastewater collection assets, the asset management decision process usually involves a periodic (public health and environmental) risk assessment to determine operational and maintenance requirements and the design of new physical assets. This decision process includes:

- Setting operational level of service objectives for assets;
- Managing data from asset performance and statistical reliability data;
- Deriving acceptability criteria for risk and reliability that define 'system safety';
- Assessing risk and prioritising assets from catchment to tap;

- Specifying water safety criteria based on public health risk assessment;
- Presenting engineering specification, e.g. technical reliability, materials;
- Designing specification for data flow, monitoring and control for human-machine interfaces and machine-machine interfaces;
- Designing standard operational processes and procedures;
- Designing incident detection, response and tracking procedures; and
- Defining normal and abnormal operating procedures;.

The assessment concludes with a recommendation how and when to:

- Operate the existing physical asset better to control risk;
- Design new assets to eliminate, reduce or isolate the risk; and
- Maintain the existing assets to upkeep the ability to eliminate reduce and/or isolate public health risks.

These decisions are usually made dependent on the whole life cost of assets and their tangible benefits such as level of service or serviceability, operational reliability and other benefits defined by the strategic objectives of the client organization.

The above illustrates that the asset management process for the purposes of this project includes the functional aspects of the three core components of the project, namely:

1. Asset Inventory and condition;
2. PS 3150 – Valuation, investment planning; and
3. WSA – System performance assessment, operational and water quality objectives and risk.

Clearly, going forward, these components should be delivered in a standard and, furthermore, comparative manner to make the best use of the information for investment planning at the community and provincial levels outside of the mandatory reporting requirements currently in place. Again, this process is defined as a continuous effort that allows for monitoring asset condition, capital and operating investments, levels of service and mitigation of risk over time. The following sections outline specific recommendations to further the NMAV product into a more mature and transparent investment decision making system and set of business processes.

6.2 Sustainability of Existing Dataset

Due consideration needs to be given to the sustainability of the existing 27,000 asset database prior to any further development of the NMAV. It is unclear at this point, as alluded to in previous sections, if the necessary staffing and technical resources are available to support the information in its current form, and to develop it into an advanced asset management system.

The project team respectfully requests that project stakeholders duly consider a phased-in transition of the maintenance of the data resource from the AE project team until such time that verifiable and auditable business processes can be put in place to ensure data quality at all levels, and a clear go-forward strategy is defined for the development of an advanced asset management system.

The tracking of asset removal, replacement and rehabilitation (betterment) could be reasonably achieved at a relatively low cost via the integration of these requirements with other work activities at the community sites. Release of editing capabilities to the member communities without further education on the impacts of these changes could lead to pollution of the database and diminishment of its relative value over time. The selection of either a third-party (external), or internal business centric unit to provide this service will ensure consistency and accountability going forward. The project team assumes that two levels of service will be offered corresponding to the individual community's resource availability and technical sophistication.

This transition period would also offer an opportunity to augment the community understanding of the asset management process through the delivery of a systematic and iterative training program. In addition, the required 2010 PSAB statements due in January 2011 could be delivered in a turn-key manner for any or all of the project communities in conjunction with training in this regard.

The project team recommends an external and accountable data maintenance service delivery mechanism in the short term with a transition to a central and accountable service delivery mechanism in the long term. This will allow for requisite business processes, standards and training to occur in the intervening period and will ensure the continued value and development of the Asset Management information resource.

6.2.1 Recommendations:

- Phased-in transition of data upkeep and augmentation from the AE project team;
- Delivery of additional training programs during transition period (possibly in conjunction with January 2011 PS 3150 statements)
- Asset tracking should be integrated with other work activities at community sites in the interest of economy;
- Consideration of third-party (external) or internal business centric unit to provide data upkeep on a continuous basis to ensure the ongoing validity of data;
- Two levels of service should be applied in regards to data upkeep and augmentation (facilitated or turn key) depending on each community's resource availability and technical sophistication and expertise; and
- External, independent and accountable data maintenance service delivery mechanism in the short term with a transition to a central and accountable service delivery mechanism in the long term.

6.3 Integration of Deliverables Going Forward

Clearly, the project deliverables, although being driven by different requirements, all depend upon a clear, consistent and auditable record of the infrastructure inventory in each community. Conversely, these project components, if integrated in digital and comparative form and added to the Asset Management framework, would add significant value to the database as a resource. The following table illustrates the value of these contributing sources in the delivery of an advanced asset management process.

Accounting Practice	Asset Management Phase	Asset Management Practice
Asset Accounts	**Inventory**	Asset Register
Contribution Disposal Write-down Amortization	**Assessment**	WSA Condition, Reliability, Risk Level of service – serviceability (Downtime, availability, etc)
Historical Cost Net Book Value Disposal Value	**Valuation**	Whole life cost (CapEx, OpEx) including consequential cost and risk pricing (contingencies)
Asset sweating vs. Conservative asset replacement and renewal	**Scenario Modeling**	Technical options development Asset sweating vs. renewal
Repeating of financial situation Scope to improve financial and physical assets	**Decision Making**	Options selection (Investment and Capital Maintenance) Operational optimization Maintenance planning & scheduling

Going forward, the reporting requirements, essentially fixed for PSAB and WSA, and delivery mechanisms for these components should be examined in reference to their comparative decision making value and to the development of sustainable intelligent deliverables for both. In essence, this would allow for the integration of the data resulting from these exercises within the NMAV product to provide a greater depth of information upon which to formulate decision making.

Integration of standard templates for the delivery of these projects in the future will allow for effective decision making for water and wastewater assets. This will allow key performance indicators, regulatory requirements, and risk and investment planning metrics to be viewed in unison to make more defensible decisions. Outside of water and wastewater asset classes, standardized and comparative templates will be required for all other asset classes.

6.3.1 Recommendations:

- The fixed reporting requirements and delivery mechanisms for PSAB and WSA should be examined in reference to:
  - comparative decision making value;
  - development of sustainable intelligent deliverables; and
  - integration of the PSAB/WSA data within the NMAV product .
- Integration of standard templates allowing:
  - key performance indicators;
  - regulatory requirements; and
  - risk and investment planning metrics

  (to be viewed in unison to make more defensible decisions).
- Outside of water and wastewater classes, standardized and comparative templates will be required for all other asset classes.

6.4 Standardized Data Submission and Reporting

The changes to infrastructure in many of these communities and throughout Saskatchewan are, for the most part, delivered via Consulting Engineering or external providers. Consideration needs to be given in the short term to the development of standard database and GIS templates and technical specifications for the provision of deliverables in a form that is easily integrated into the NMAV. This is considered to be in addition to the conventional engineering drawing submission deliverables.

Standardized templates for the submission of inventory and condition or inspection information will ensure consistency and comparative value at the service provider level and will facilitate the growth and development of the NMAV without putting undue strain on the stakeholders' currently limited staff resources. It is understood that inventory templates are a required deliverable for this project; however the advanced template and standardized information submission specifications are considered to be above and beyond the scope of this project.

These templates would provide standard scales for condition and inspection reporting, asset class specifications i.e. road class in addition to those provided for inventory management along with detailed information submission requirements and technical specifications for all service providers. It is understood that the development of these requirements would be performed in conjunction with project stakeholders, community representatives, Consulting Engineers of Saskatchewan and

infrastructure advocacy groups. In most cases, these standards exist, however they are currently not being applied uniformly.

To truly provide an effective and evidence based decision making system, comparative and therefore standardized approaches need to be adopted by external service providers.

As the NMAV database has provided standards for infrastructure inventory assessment at the community and provincial level, communities and project stakeholders now need further standardization from external service providers to ensure the accurate assessment of need at a strategic level.

6.4.1 Recommendations:

- Advanced template and standardized information submission of inventory and condition or inspection information;
- Further standardization from external service providers to ensure the accurate assessment of need at a strategic level; and
- Buy in from CES/Academia on a Provincial strategy to ensure the comparative value of data form this and other locales.

6.5 Data Additions

The issue of the addition of data to the asset inventory database remains somewhat unresolved to this point as the clear focus of the project has been the creation of a current, consistent and accurate set of attribute and GIS data for the infrastructure in the communities.

Three types of data exist in the system:

1. Non PSAB/financial asset attribute information;
2. PSAB financial data; and
3. Geometry or GIS files.

The AssetNav product is currently able to allow for editing of data freely, when appropriate permissions are granted within the application. Currently, the system also allows for the export of information (tabular and coordinate information).

Prior to implementing any type of bulkload or import facility, clarity needs to be provided as to the following:

1. Accountability for changes and alterations (community, NMTA and/or SaskWater roles);
2. Consideration of the impacts to PSAB statements made by contributors of data in the event that the TCA registers are not employed as a separate submission source as recommended by the project team in the short term; and

3. Quality control on the addition and disposal of assets from a GIS perspective. The existing data set is free of topological errors and will presumably remain so with appropriate administrative control.

The project team will solicit input on these items at the next available opportunity with the stakeholder committee. The preferred method of editing would be on an annual basis with the contributor exporting the asset listing in its entirety, applying the necessary changes/additions and committing them to the application. This would provide a verifiable and intermediate audit trail of the changes that were applied. These changes should likely coincide with field audit activities and the requirements with respect to PSAB submission.

6.5.1 Recommendations:

- The preferred method of editing would be on an annual basis with the contributor exporting the asset listing in its entirety, applying the necessary changes/additions and committing them to the application.
- These changes should likely coincide with field audit activities and the requirements with respect to PSAB submission.

6.6 Asset Tagging and Identification

This project involved the unique identification of over 27,000 distinct assets including but not limited to land, right of ways, water, sewer, wastewater and other infrastructure. The majority of these assets can now be referenced singularly within the AssetNav interface via the use of the GIS component of the NMAV as these assets are identified via their unique identifier in the interface. The remaining significant assets to which no referencing system exists consist primarily of facility and equipment. The identification of these assets is problematic from a mapping or tagging perspective given the environment in which they exist.

It is understood that, moving forward, the capture of operational and capital costs, regulatory limit exceedances and equipment failure will be required at the asset level to provide for an evidenced based asset management regime. This is in contrast to the capture of these metrics at an activity or production metric perspective i.e. rehabilitation costs for wastewater pumps, cost per square meter of road. These broad based metrics do provide value from a budgeting perspective, however they do not address issues such as chronic or systemic asset failure, individual assets that consume inordinate resources for repair and/or have inordinate risks or operational costs associated with them.

In addition, the ongoing PSAB reporting requirements will essentially mandate that these pieces of equipment be tracked at the significant asset level, > $5000, for the determination of disposal, acquisition and betterment activities at the community level.

The deployment of asset inventory audit staff will be resource intensive if the clear delineation of assets is not apparent through a physical tag or Radio Frequency Identification (RFID) or other suitable technology. RFID presents a higher capital cost initially but lower costs overall from an audit perspective in that equipment inventory checks can be applied against the existing inventory records and an audit performed in minutes via a handheld device versus the hours that an item-by-item verification would take. In addition, this method will ensure that committed funds can be tracked from grant award to changes in the physical inventory. This technology can also allow for the tracking of asset movement in and out of facility sites.

Consideration should be given to the most efficient equipment inventory tracking and audit method by the committee in the short term to ensure that the existing inventory is maintained in the most practical and cost effective method possible.

6.6.1 Recommendation:

- A physical tag or Radio Frequency Identification, (RFID), or other suitable technology to greatly facilitate the cost effective use of asset inventory audit staff.

6.7 Training for a Common Understanding

It is unreasonable to assume that understanding of Asset Management theory and practices will achieve a critical mass at the community level without the delivery of additional, systematic and iterative training sessions. These sessions ideally should focus on providing value at the community level with *their* community information resource. This effort should be augmented with case studies from Saskatchewan municipalities that have derived tangible benefits from the application of asset management strategies for a variety of infrastructure types. It should also highlight the value of the information required for PS 3150 and its relevance for infrastructure planning.

Various deployment and delivery methods are available for the delivery of an iterative education program in a cost effective manner given the geographic diversity of the project community locations. Failure to provide this continued training will result in the loss of the critical mass of understanding that has been achieved through this project. This training should focus on the functional use of the information in the context of community infrastructure planning.

It is critical that the delivery mechanism for continued training take into account the needs at political, administrative and line department levels as the continued success of this initiative is largely dependent upon support at all of these levels.

6.7.1 Recommendations:

- Training sessions focusing on:
  - The value of PS 3150;
  - Presentation of Saskatchewan case studies where tangible benefits were realised; and

    - Functional use of information in community infrastructure planning.
- Partnering with a suitable academic institution that exists outside of project delivery partners and stakeholders.

Consideration should be given to partnering with a suitable academic institution to provide a central centre of excellence in this regard that exists outside of project delivery partners and stakeholders. The involvement of academia would ensure that resources provided are state of the art, current and relevant to the infrastructure demographic in Saskatchewan.

6.8 Business Process and Workflow Definition

Going forward the sustainability of the NMAV will be impacted if suitable business processes for the update and refinement of information are not clearly defined. In addition to defining stakeholder, service provider and community goals and expectations, this business process should define clear accountability in regards to the update and augmentation of the Asset Management resource.

This multi-faceted plan should address the required update of the information resource in addition to a critical path complete with milestones and key dates for the iterative development of advanced asset management. This plan will require the determination of resources at each level as well as the provision of measures of success for each milestone.

This business process and workflow definition will provide an auditable record of both the sustainability of NMAV and provide a clear path to a mature or advanced framework.

6.8.1 Recommendations:

- Clear business process that defines:
    - Stakeholders
    - Service providers
    - Community goals/expectations
    - Resources available at each level
    - Accountability for update & augmentation
    - Plan for sustainability of MAIS Basic
    - Key dates/milestones for MAIS Advanced

6.9 Data Update Frequency Considerations

Concerns with respect to the currency of information and its use for various business needs have been voiced by a number of project stakeholders. The creation of the NMAV database constitutes a giant leap forward in reference to the community's and furthermore the stakeholder's understanding of constituent assets within each community and aggregate forms.

The project team respectfully recommends an initial annual update and data audit exercise that coincides with the PSAB reporting requirements. This will provide a clear target for the communities

without burdening them with a resource-intensive or more frequent reporting interval. More frequent data updates in resource-rich communities can be considered, however the annual update would seem an achievable and reasonable target in the short term.

6.9.1 Recommendations:

- An initial annual update and data audit exercise that coincides with PSAB reporting; and
- More frequent data updates in resource rich communities could be considered.

6.10 Policy Development

It may be unreasonable to assume in the short term that education alone will provide the necessary impetus to the upkeep of information at a community level. Due consideration should be given to the development of Provincial Policy and/or Regulations for the annual reporting of asset management specific versus financial reporting, PSAB, to ensure that the process is sustainable.

Presumably, the project stakeholders intend to employ the information for determining need at community, regional and provincial levels and, furthermore, to optimize their community-based investment planning by determining the optimal time of intervention or rehabilitation in order to defer costlier wholesale asset replacement or capital expenditures.

Practical national and Saskatchewan specific examples of policy in this regard include, but are not limited to, the following:

1. Saskatchewan Waterworks System Assessment – 5 year reporting frequency;
2. Saskatchewan Municipalities/Cities Act Requirements for Financial Reporting (PSAB) – annual;
3. Ontario Bridge Inspection – 2 year reporting frequency;
4. Saskatchewan Municipal Water Quality Monitoring Guidelines – daily to bi-annual; and
5. Ontario Municipal Performance Measures – annual.

Interestingly, the majority of these standards relate to asset performance and/or outputs and not to the asset inventory portfolio itself.

It is interesting to note that considerable economies and benefit could be recognized at the community and other government levels in the performance of subsequent Waterworks System Assessments, utility master planning, hydraulic modeling, development impact assessments, studies etc. if an accurate asset inventory, in a suitable format, could be made available to Consulting Engineering service providers in lieu of resource intensive re-inspection of the asset portfolio.

To accomplish this goal in the short term, a policy framework should be considered, punitive or remunerative in nature, that provides additional incentive to individual communities for submission of required information to support this strategic objective. A point of reference for policy that is geared toward financial sustainability and the holistic management of infrastructure is Bill 13, The Sustainable Water and Waste Water Systems Improvement and Maintenance Act, which has received its first reading and has been carried in the Legislative Assembly of Ontario. This act not only provides for the full cost accounting of these systems but also speaks to security of supply, levels of service, asset renewal, expansion due to growth and overall economic efficiency. This legislation allows for the "regulator" to assume operation of systems that do not comply with the specified requirements. This legislation is considered to be consistent with the requirements of the Post Walkerton O'Connor inquiry that highlighted the need for, among other things, increased vigilance in the management of water systems to prevent future risk to the end-use customer.

6.10.1 Recommendations:

- Development of Provincial Policy and or Regulations for the annual reporting of asset management specific versus financial reporting, PSAB, to ensure that the process is sustainable.

  Examples of policy:
  - Saskatchewan Waterworks System Assessment – 5 year reporting frequency;
  - Saskatchewan Municipalities/Cities Act Requirements for Financial Reporting (PSAB) – annual;
  - Ontario Bridge Inspection – 2 year reporting frequency;
  - Saskatchewan Municipal Water Quality Monitoring Guidelines – daily to bi-annual; and
  - Ontario Municipal Performance Measures – Annual.

6.11 Level of Service and Key Performance Indicator Determination

Prior to the further development of the NMAV, the determination of condition rating, key performance indicators and initial targets for achievable levels of service need to be established.

This process, likely in a collaborative workshop format, should occur in the short term to ensure that key strategic objectives are closely matched to the information proposed for collection toward a more advanced product. This functional use assessment will provide a clear roadmap as to the type, quality, sustainability, deployment feasibility and availability of asset performance data at the community level. **This process should also examine the practical use of the information by staff at the community level in the context of infrastructure planning and not purely from an inspections services perspective.**

6.11.1 Recommendations:

- Prior to Further Development of an Advance Asset Management System, a Functional Use Assessment should be undertaken to determine:
  - Condition rating;
  - Key performance indicators;
  - Initial targets of achievable levels of service; and
  - Practical use of information by staff in the communities.
- THEN DEFINE STRUCTURE.

6.12 Failure, Condition, Risk and Financial Monitoring

Moving forward the development of asset needs cannot be reasonably achieved without the ongoing capture of asset failure, condition and costs over time. The project deliverables in this context represent a snapshot of both the inventory and its condition state at the time of inspection. To truly derive tangible benefit from the project results, from an effective infrastructure management perspective, the aforementioned metrics should be monitored over time to determine their rate of deterioration, relative operational and capital costs and risk.

The process of effective, optimized asset management is characterized as a cyclical and continuous process by which asset operators and maintainers gain better insight over their asset portfolio via the continuous re-evaluation of these systems. Reasonable predictions as to future needs cannot be achieved until the behaviour of the asset portfolios in each of the communities can be better characterized over time.

6.12.1 Recommendation:

- Metrics on STANDARD AND COMPARATIVE asset failure, condition and costs over time should be monitored and analyzed to determine the rate of asset deterioration, relative operational and capital costs and risk to provide a baseline for reasonable predictions on future need.

6.13 Support Resource Requirements

In addition to the provision of systematic, iterative and ongoing training, the project team foresees the need for a centralized support system going forward. This resource would provide the following services:

1. Telephone and email support line;
2. Web site and supporting materials, best practices, case studies etc.;
3. Ongoing education services, accounting fundamentals, asset management theory and practice; and
4. General technical assistance.

In the interest of economy and recognizing the obvious synergies between asset management and financial reporting, this support system should assist with both the PSAB and asset management support roles and should likely be administered via a nongovernmental organization preferably with support from academia. This business unit could operate at arms length from the project stakeholders and government agencies and could provide a continuous support system in addition to the periodic training alluded to in previous sections.

Feedback from this organization would be invaluable in the monitoring and support of the uptake of asset management and PSAB initiatives and would provide a central one-stop resource for all municipalities. This business unit could conceivably be comprised or or executed by staff from Saskatchewan Urban Municipalities Association, Saskatchewan Association of Rural Municipalities, Urban and Rural Administration advocacy groups, and be funded via a suitable provincial agency.

Continued reinforcement of this initiative, in addition to periodic training, will be required to ensure that the long term goals of the project stakeholders are met. The project team believes that it is unrealistic to assume that the status quo in terms of support will either sustain or aid in the development of asset management in Saskatchewan communities. In addition the uniform delivery of advice for both business needs will promote uniformity in approach and support materials and will highlight the value of each exercise.

6.13.1 Recommendations:

- Centralized support system for Asset Management and PSAB needs consisting of:
  - Telephone and email support line;
  - Web site and supporting materials, best practices, case studies etc.;
  - Ongoing education services, accounting fundamentals, asset management theory and practice; and
  - General technical assistance.

Ideally, this one-stop support system could be administered via an arm's-length, nongovernmental organization, preferably with support from academia. This organization could be comprised or executed by staff from:

- Saskatchewan Urban Municipalities Association (SUMA);
- Saskatchewan Association of Rural Municipalities (SARM); and
- Urban and rural administration advocacy groups.

This organization could be funded by a suitable provincial agency.

6.14 Asset Sustainability

It is the project team's collective experience that prior to the asset management process, most municipalities and/or operating authorities assume that they are providing an insufficient level of funding for asset sustainability, however the perceived gap is somewhat nebulous and not quantified.

The basic asset management process and lifecycle assessment presents a factual statement, albeit at a summary level, of the real financial needs, "gap", of community infrastructure versus actual funding. Project stakeholders and provincial agencies should be equipped to address the anticipated recognition at the community levels of their respective funding gaps. The aforementioned will provide the impetus to move into advanced needs-based management and away from classical lifecycle or basic asset management planning.

6.15 Moving Forward

It is imperative going forward in the short term that project stakeholders institute the following:

- Documented standards for incoming information with respect to the acquisition, disposal and rehabilitation of assets;
- Documented standards for the measurement of asset condition, failure and performance for subsequent assessments;
- Auditable work and information workflows between the communities, NMTA, Saskwater and the steward of the project data;
- Engagement of communities in the pilot area and beyond and demonstrate the end use value of the information resulting from the project in infrastructure planning and financing; and
- Consideration of policy for the statement of infrastructure performance in addition to inventory on a community basis.

In the interim, the NMTA, the communities and SaskWater will be required on a frequent and more importantly a systematic basis to communicate on the improvements made to local infrastructure.

6.16 Delivery Models

The project team, in response to a request by the project stakeholders, offers the following discussion on potential delivery models for the update, maintenance and further development of the project database in addition to the delivery of PSAB reports for all 36 communities.

6.16.1 Provincial / Regional Approach

Under this option all necessary information updates, maintenance and condition inspections would be administered by a single source at the Provincial or Regional,

NMTA/SaskWater, administrative level. It is assumed for the purposes of discussion that this option would require the addition of several qualified staff positions in the areas of:

1. Municipal Infrastructure Asset Management
2. Engineering
3. Information Technology, Database Management and Geomatics
4. Administration and Program Management
5. Accounting / Municipal Finance
6. Training

It is reasonable to assume that some of the skill sets listed do in fact exist in some capacity within the project stakeholder organizations however it is assumed that these skill sets would be required within one cohesive management group to realize success in the short term. It is also assumed that employees of the stakeholder organizations are already fully committed in the delivery of core business functions.

To that end, the assumption of the maintenance, refinement and augmentation of the project database and application will likely require an expansion of staffing in all or one of the stakeholder organizations and management of these staff from a central and accountable management structure. It is unreasonable to assume that this augmentation of staff could reasonably be achieved in time to collect the required data necessary to complete the communities' 2010 PSAB statements.

It should be noted that the maintenance of the project information for the purposes of an auditable asset inventory and associated PSAB reporting should be considered as a part time activity that does not necessarily require the full time resources of the proposed staffing group but will require a group with diverse skill sets on a periodic basis. In the interest of economy and relationship building with the subject communities, this maintenance should be performed in unison with other on site works or advisory services.

The aforementioned likely makes the augmentation of staff within the stakeholder organizations or the creation of an Asset Management business unit economically unfeasible in the short term in any of the organizations. The intermittent nature of the inventory audit and inspection work combined with the high demand annual requirements for PSAB reporting does not at present lend itself to a full time workforce. The requirement for and feasibility of a business centric unit may change with the introduction of a Provincial initiative in this regard in the long term.

6.16.2 Third Party Provider

Given the intermittent nature of the work involved in maintaining the project inventory and asset performance indicators and the annual end of year high demand requirements for the production of PSAB report materials, a third party provider of these services should be

considered. In the short term, a third party service provider will provide a number of advantages:

- A singular, independent and objective point of accountability for maintenance and expansion of the project deliverables;
- Contractually enforced accountability for delivery of results on a predefined schedule;
- Fixed and quantifiable annual costs for updates and enhancements
- Access to experts in each of the fields of practice on demand without the fixed cost of an internal Asset Management business centric group in advance of demand;
- Available resources upon request as demand fluctuates and project requirements are altered;
- The preferable optics of having an independent body that operates outside of each of the stakeholder organizations with no perceived or actual biases;
- An independent body that can provide training and community in the context of asset management best practices from previous assignments both within and outside of the Province of Saskatchewan; and
- The ability to provide resource efficient inventory audit and refinement services in conjunction with other services required by the community from external service providers.

Irrespective of the delivery model chosen, it is recommended that a suitable management structure be formed from representatives of the stakeholder organizations to ensure that:

1. The strategic and tactical goals of each of the stakeholders are met and continue to be met throughout the process;
2. The intellectual property or “lessons learned” during the assignment are clearly communicated to the stakeholders and remain their property;
3. The free and unfettered flow of information required for the upkeep of the NMAV data holdings continues; and
4. Project progress and financial management are maintained.

It is unclear at this point as to the likelihood of a proposed expansion of the concepts as applied in this proposal to a wider or provincial audience. The project team respectfully recommends in the interim that the most cost effective, resource efficient and logistically feasible service delivery option for the preservation of the project results is via an external service provider with a view to a transition to a business centric unit comprised of project stakeholders in the long term.

7 Summary and Conclusion

The deliverables for this project represent a first in Canada as the successful implementation of a top-down approach to a defensible asset management strategy. These deliverables will only provide value going forward in this regard if they are maintained and augmented to the point of fulfilling the strategic goals at community, regional and provincial levels.

The project team, in this report, has attempted to provide clear insight into the process followed and its outcomes, and to present a strategy for the fulfillment of these objectives. The transition to a community, NMTA or externally-based initiative needs to be examined carefully from a resource, technical capacity and audit perspective to ensure that the cumulative knowledge gained through the information resulting from the project is both maintained and made best use of for the benefit of stakeholders, communities and their constituents.

8 Acknowledgements

The project team would like to acknowledge the following individuals for their valuable insight, contribution of information and their guidance during this most challenging project.

Project Steering Committee:

Glen Gillis	Manager, Northern Engineering, SaskWater / Project Manager
Randy Braaten	Director, MA Northern Municipal Services Branch
Tony Bunz	Former Manager, Financial Services, MA Northern Municipal Services Branch
John Edwards	Executive Director, MA Policy Development Branch
Ryan Cossitt	Manager, Policy and Research , MA Policy Development Branch
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Northern Municipal Trust Account Management Board:

Gordon Stomp	Chairman / Mayor - Northern Village of Air Ronge
Doug Gailey	Vice Chairman / Administrator - Northern Village of La Loche
Jim Bogard	Administrator of the NMTA Board
Terri Daniels	Member / Chairman – Northern Settlement of Wollaston Lake
Bev Wheeler	Member / Administrator – Northern Village of Denare Beach
Bobby Woods	Member / Mayor – Northern Village of Buffalo Narrows
Eugenie LaFleur	Member / Administrator - Northern Hamlet of Dore Lake
Jackie Kennedy	Member / Alderman – Northern Village of Green Lake
Brian Chaboyer	Member / Alderman – Northern Village of Cumberland House
Thomas Sierzycki	Member / Mayor - Town of La Ronge

MAIS Committee:

Phyllis Dunphy	Representative / City of Prince Albert (Cities Representative)
Sandy Bailey	Representative / City of Regina – Manager, Water & Sewer Engineering
Shannon Underwood	Representative / City of Saskatoon - City Clerks Office
Shelley Funk	Representative / Urban Municipal Administrators Assoc. of Sask. V.P.
Tim Leson	Representative / City of Estevan – Treasurer

Other:

Kevin Cudmore	Project Manager, Northern Engineering - SaskWater
Bob Hyggen	Program Coordination Assistant, Northern Engineering - SaskWater

Appendix A - Useful Life Matrix, November 2, 2009

Appendix A - Useful Life Matrix, November 2, 2009

Asset Class	Northern Sask. SMMA Project (Years)
Land	
Land	Not amortized
Land Improvements	
Athletic Field	15
Outdoor Courts (e.g. basketball, tennis)	20
Golf Course-All Related Infrastructure	45
Lighting-Outdoor (not street lights)	10
Parks (Paved trails and related structures are amortized separately)	na
Running Track	15
Landscaping	25
Sprinkler System-Outdoor	25
Fountains	15
Buildings	
Permanent Buildings-Brick, Stone or Cement (all buildings made of brick, stone or cement)	50
Permanent Buildings-Log, Frame and Other (wood or metal frame)	30
Buildings-No Foundation (e.g. some greenhouses)	20
Temporary/Portable Structures	10
Operational Lease (Annual cost is shown as a current year expense)	na
Capital Lease	na
Leasehold Improvements	na
Building components	
Building Fixtures - aggregate approach (HVAC, carpets, elevators, plumbing, lighting, wiring …)	20
Excavation	50
Foundation	50
Frame	50
Floor structure	50
Floor covering	15

Asset Class	Northern Sask. SMMA Project (Years)
Carpeting	5
Computer flooring	10
Exterior walls	50
Roof cover	20
Interior construction	10
Interior renovation	10
Ceiling finish	10
Plumbing	20
HVAC	20
Electrical	20
Fire system	20
Elevators	20
Other structures	
Arena and Stadiums	50
Bleachers-Wooden, Aluminum and Other (excluding stadium bleachers)	15
Fences, gates	15
Parking Structures-Concrete (parkades, not open parking lots)	50
Retaining Walls	20
Boat ramp - wood	10
Boat ramp - concrete, asphalt	15
Boat ramp - metal	n/a
Piers, Seawalls, Bulkheads	25
Swimming Pools-Outdoor	25
Dams-Earthen	40
Dams-Concrete	n/a
Manmade Lakes/Waterways/canals	60
Other specialty structures (use engineering advice on the useful life)	n/a
Roads (includes gutters and railway crossings)	
Dirt	20
Gravel	20
Asphalt Rural Local	15
Asphalt Rural Collector	15
Asphalt Rural Arterial	15
Asphalt Urban Local	15

Asset Class	Northern Sask. SMMA Project (Years)
Asphalt Urban Collector	15
Asphalt Urban Arterial	15
Concrete Rural Local	n/a
Concrete Rural Collector	n/a
Concrete Rural Arterial	n/a
Concrete Urban Local	n/a
Concrete Urban Collector	n/a
Concrete Urban Arterial	n/a
Road components	
Road Surface - Asphalt	15
Road Surface - concrete	n/a
Road Grade (formation works, drainage works, culverts < 2 metres, initial application of gravel on gravel roads)	40
Other built surface areas	
Airport runways	20
Open Parking Lot - Asphalt	15
Open Parking Lot - Brick or Stone	30
Open Parking Lot - Concrete	n/a
Open Parking Lot - Gravel	15
Alleys-Asphalt	20
Alleys-Brick or Stone	n/a
Alleys-Concrete	n/a
Alley-Dirt	10
Alleys-Gravel	15
Sidewalks - Asphalt	25
Sidewalks - Concrete	25
Sidewalks - Brick or Stone	20
Path or trail - Composite rubber	10
Path or trail - Dirt	10
Path or trail - Gravel	15
Path or trail - Asphalt	20
Path or trail - Brick or Stone	20
Path or trail - Chip Trail	10

Asset Class	Northern Sask. SMMA Project (Years)
Path or trail - Concrete	25
Road Furniture	
Traffic Signs	15
Traffic Lights	20
Traffic Lights - mast arm	20
Traffic Lights - hung wire	15
Street Lights	20
Street Lights - concrete	n/a
Street Lights - metal	20
Street Lights - wood	15
Noise Reduction Berm (plastic, metal, not earthen)	n/a
Parking Meters	n/a
Bridges, Tunnels	
Tunnel	n/a
Bridge	n/a
Bridges > 2 meters – Treated Timber / Wood	60
Bridges > 2 meters - Precast concrete	60
Bridges > 2 meters - Concrete Pre Stressed	60
Bridges > 2 meters - Steel w/o trusses	60
Bridges > 2 meters - Steel with trusses	60
Pedestrian bridge - steel	n/a
Pedestrian bridge - concrete	n/a
Pedestrian bridge - wood	n/a
Culverts > 2 meters: - Plastic	30
Culverts > 2 meters: - Steel/ Corrugated Steel	60
Culverts > 2 meters: - Precast Concrete	40
Culverts > 2 meters: - Concrete Pre Stress	45
Culverts > 2 meters: - Cast Iron	n/a
Culverts > 2 meters – Treated Timber / Wood	30
Water Supply Infrastructure	
Above ground and in-ground reservoirs-Concrete	45
Reservoirs - other (includes lined earth, wood stave and steel reservoirs)	45

Asset Class	Northern Sask. SMMA Project (Years)
Water Towers and Tanks (steel)	50
Wells (including well casing)	40
Wells-Screen for wells	25
Water Treatment Infrastructure	
Treatment Plant - Aggregated Approach	25
Chlorinating Systems	25
UV Disinfection Systems	25
Ozonation Disinfection	20
Aerator (including tank, compressor hose, etc. but not the blower)	15
Blower (component of an aerator)	10
Clarifier	20
Filters-Sand	25
Filters-Membrane (ceramic and polyurethane)	15
Flocculator	20
SCADA Software	5
Screens-Bar and Rotary	15
Screens-Stainless Steel	15
Thickener	20
Water Distribution Infrastructure	
Water distribution - Aggregated Approach	50
Fire Hydrants-Steel and Ductile Iron	50
Fittings for Pipes-Ceramic, Concrete, Plastic and Steel	40
Generator	20
Meters	20
Pipes-Brick	na
Pipes-Cast Iron (British Standard)	50
Pipes-Cast Iron (Other Classes)	50
Pipes-Concrete (reinforced and non-reinforced concrete and asbestos cement)	50
Pipes-Copper	50
Pipes-Ductile Iron	40
Pipes-Galvanized Steel	50
Pipes-PVC	60

Asset Class	Northern Sask. SMMA Project (Years)
Pipes-Steel	50
Pipes-Vitrified Clay	40
Pipes - HDPE	60
Pumps (wells, booster, other)	20
Valves	40
Sewage Collection System	
Collection System - Aggregated Approach	50
Fittings for pipes-Ceramic, Concrete, Plastic and Steel	40
Manholes	40
Meters-Including Flow Meters	10
Pipes-Brick	na
Pipes-Cast Iron (British Standard)	30
Pipes-Cast Iron (Other Classes)	30
Pipes-Concrete (reinforced and non-reinforced concrete and asbestos cement)	40
Pipes-Copper	na
Pipes-Ductile Iron	25
Pipes-Galvanized Steel	40
Pipes-PVC	50
Pipes-Steel	40
Pipes-Vitrified Clay	40
Pipes –HDPE (forcemain)	60
Pumps	15
Septic Systems-on site	20
Valves-Water Control (ceramic, concrete, plastic, steel and others)	25
Valves-Chamber	40
Wet Well	50
Sewage Treatment Infrastructure	
Filtration Treatment System - Aggregated Approach	25
Aerators	20
Blowers	10
Concentrators	20
Digesters	20

Asset Class	Northern Sask. SMMA Project (Years)
Heat Exchangers	15
Lagoons	50
Screens (bar and rotary and stainless steel)	10
Effluent Discharge Infrastructure	
Discharge System - Aggregated Approach	25
Pumps (including booster pumps)	15
Tanks-Wastewater Storage (includes CSO tanks)	30
Drainage Infrastructure	
Culverts-Concrete	40
Culverts- Steel / Corrugated Steel	30
Culverts-Treated Timber	30
Culverts- Plastic	30
Storm Drain-Cast Iron	25
Storm Drain-Concrete	30
Storm Drain-Ditch and/or Trench	60
Storm Drain-Metal Corrugated	30
Storm Drain-Plastic	25
Vehicles	
Light Duty	10
Medium Duty	10
Heavy Duty	20
Transit Buses	20
Fire Trucks	25
Communication	
Radio	10
Telephone System	10
Tools Shop & Garage Equipment	15
Scales	15
Bins	15
Meters	
Electrical	20
Cumulative	20
Interval	20

Asset Class	Northern Sask. SMMA Project (Years)
Gas	20
Water	40
Parking Meters & Splitters	20
Office Furniture & Equipment	
Furniture	20
Office Equipment	10
Audiovisual	10
Photocopiers	5
Computer Systems	
Hardware	5
Software	10
Miscellaneous	
Food Services	10
Fire Equipment	12
Police Special Equipment	10
Aircraft	Variable
Boats	25
Fitness & Wellness	10
Control Systems	5
Communication Links	20
SCADA System	10
Fuelling Stations	15
Laboratory	10

Appendix B - Inspection Forms and Data Dictionary

SMMA Facility Asset Inspections

AEID		**Inspected By**	
Facility ID		**Assessment Date**	
Community Name			

GENERAL ASSET INFORMATION

Asset Description			
Asset Class		**Material**	
Building			
	Floor	**Room**	

Status ☐ Operating ☐ Not Operating ☐ Spare

CONDITION	**1**	**2**	**3**
Overall Condition	Good	Fair - Repair Required	Replace
Repair Priority	Immediate	1 to 5 Years	5 to 10 Years
Freq. Of Failure	Rare	Possible	Imminent
Conseq. Of Failure	Insignificant	Significant	Catastrophic

Health_Safey Violation	☐ **Health Violation Description:**	
Code Violation	☐ **Code Violation Description**	

COSTING

Asset Valuation Cost	$	**Year of Valuation**	
Repair Cost	$	**Install Date (Year)**	
		Useful Life (Lifespan)	

MEDIA

Photographs	

MISC.

Make		**Manufacturer**	
Model		**Serial Number**	
Comments			

SMMA Bridge Inspections

AEID		Community Name	
Bridge File No.		Assessment Date	

BRIDGE INFORMATION

Full Road Name		Year of Construction Deck	
Crossing Name		Year of Construction Super/Sub	
Crossing Type	Water ☐ Land ☐ Other ☐		
Total Spans		Length (m)	
Total Lanes		Deck Width (m)	
Overall Condition		Posted Loading	
Design Loading			

	Wood	Steel	Concrete
Deck Material	☐	☐	☐
Super-Structure Material	☐	☐	☐
Substructure Material	☐	☐	☐

COSTING

Asset Valuation Cost	$	Useful Life (Lifespan)	
Year Of Valuation			

MEDIA

Photographs	
Most Recent Inspection Report	

Information Source	
Comments	

Road Inspection Form

ROAD SURFACE

AEID 1 — **National Road Class** 0

(Road Surface ID)

Community Name — **Prov. Road Class**

Full Legal Road Name — ** See Bottom of Page for Road Classes*

From: — **To:**

Road Surface Characteristics

Length (m): 0 — **Surface Material**

Width (m): 0 — **Date of Construction**

Lanes 0 — **Curb**

(Both Sides, One Side, None)

Sidewalk — **Curb Type**

(Both Sides, One Side, None) *(Header Curb, Gutter, Sidewalk, Curb and Gutter, Median)*

Ownership

Maintenance Responsibility

Information Source

Road Surface Valuation

Asset Valuation Cost $ $0.00 — **Useful Life (years)** 0

Year of Valuation — **Surface Condition**

(1-100)

ROAD BASE

AEID 1 — **Road Surface ID** 1

(Road Base ID)

Road Base Characteristics

Length (m) — **Base Material**

Width (m) — **Date of Construction**

Road Base Valuation

Asset Valuation Cost $ $0.00 — **Useful Life (years)** 0

Inspected By:

National Road Classes

Freeway, Expressway/Highway, Arterial, Collectors, Local/Street, Local/Strata, Local/Unknown, Alleyway/lane, Ramp, Resource/Recreation, Rapid Transit, Service Lane, Winter Road

Prov. Road Classes

Class 1 - Link All Cities to Major Cities, Link all regional service centres with pop >3000 with nearest community with greater services, link regional hospitals to base hospitals.

Class 2 - Link the USA national Highway system to Class 1, Link Alberta Class 1, Link Manitoba Provincial Expressway and Primary arterial Highways to class 1.

Class 3 - Link Manitoba secondary arterial highways to class 2 or higher, link service centres of population >1000 to each other, link communities/reserves with pop >500 to service areas, link care homes and health centres to hospitals, link prov/regional parks.

Class 4 - Link international border crossings to a class 3 or higher, like communities/reserves >500 pop to each other, provide inter-municipality road network, link communities with >100 to service areas, links large industrial sites to higher classes.

Class 5 - Link communites with <=100 to class 4 or highier class, Provide inter-municipal road networks, link medium industrial sites to 4 or higher, provide access to intensive livestock/poultry that require daily accesss, link prov/reg parks and rec sites to 4.

Class 6 - Provide access to a small agricultural or industrial site, provide access to parks or rec sites that provide seasonal services, provide access to individual occupied residense, school bus route.

Class 7 - Provide acces to the land.

DATA DICTIONARY

Facilities

Facility ID – The name of facility where the asset is located
Assessment Date – Date of Facility inspection
Asset Description – Gives a detailed description about the asset at hand
Asset Class – Gives the general function of the asset (See Below)

BA = Building Architectural
BEM = Building Electrical Mechanical
BS = Building Structural
PE = Process Electrical
PI = Process Instrumentation
PPE = Process Piping & Equipment
SW = Site Works
HV = HVAC
IRE = Indoor Recreational Equipment
ORE = Outdoor Recreational Equipment
OE = Office Equipment
FR = Furniture
FC = Fencing
LT = Lighting
PP = Paved Parking
FL = Fleet/Vehicle
FE = Fire Equipment
Other

Material – Material type of the asset (if applicable)

(1) Roof Material - Asphalt Shingles
- Asphalt Membrane
- Slate Roofing
- Metal
- Tar & Gravel
- Wood

(2) Foundation Material - Concrete Blocks
- Concrete
- Brick
- Stone

(3) Building Siding Material - Metal Siding

- Brick
- Wood
- Vinyl Siding
- Fibre Cement Siding
- Concrete Block

(4) Fencing Material - Chain Link
- Wood
- Metal

Building – Location of asset by Facility name
Floor – Location of asset by floor (Basement, Ground, Second Floor, Third Floor, etc)
Room – Location of asset by room name or number
Status – Indication of assets status of being operational, non-operational or spare
Overall Condition – A number valve ranking the general condition of the asset (See Below)

1 = Good – no repair or replacement required
2 = Fair –repairs required
3 = Replacement needed

Repair Priority – A number valve ranking the importance of asset repair by time

1 = Immediate to 1 year
2 = 1 to 5 years
3 = 5 to 10 years

Frequency of Failure – A number valve ranking the reliability of an asset

1 – Rare = May occur in exceptional circumstances and has not occurred in the past. It is new (within warranty period)
2 – Possible = Has occurred or may occur once or more per year. It is approaching the end of its life cycle
3 – Imminent = One or more occurrences on a monthly or more frequent basis. It has exceeded its life cycle

Consequence of Failure - A number valve ranking the ramification of an asset failing

1 – Insignificant = No injuries or illness; no environmental impact; population is unaffected; minor investment required (current O & M budget); no loss of Region's reputation
2 – Significant = Minor injuries or illness; easily reversible environmental impact; small population affected for short period or time; unplanned investment would be required to repair/replace ($25,000 - $100,000); non-compliance, some potential loss of Region's reputation - easily regained
3 – Catastrophic = Death or serious injury; severe and irreversible contamination; large population affected for extended period or time; significant unplanned investment would be required to repair/replace (greater then $250,000); significant loss of Region's reputation

Code Violation – Indication that a code violation is present (check box)
Code Violation Description – If code violation is present a detailed description is given
Health and Safety Violation - Indication that a health and safety code violation is present (check box)
Health and Safety Violation Description – If health and safety code violation is present a detailed description is given
Asset Valuation Cost – The present day or valuated cost of an asset (ie. Current day replacement, insurance valuation, or original construction cost).
Year of Valuation – The date when an asset was valuated (ie. If it was valuated in 2005 for insurance, it would be 2005)
Repair Cost – The cost to repair a damaged asset
Useful Life – Approximate life expectancy of an asset – from beginning of life to failure.
Install Date – The installation date of an asset
Photograph – Link to a photographic record of an asset
Make – Make of the asset
Model – Gives the asset model number or code
Manufacturer – Gives the name of the asset's manufacturer
Serial Number - Asset/product number given by the manufacturing company
Drawing – Link to the structural/mechanical/layout PDF drawing of pump station
Comments – General notes about the asset and recommendations
Manual Link – Link to operations manual file.
Information Source – Source of valuation cost.
InformationSourceFile – Link to file of source of the valuation cost (PDF of bill, etc).
Public Works – True = Public Works Facility. False = Non-Public Works Facility.

Sewer

AEID – Unique ID assigned to asset.
Community Name – Community in which the asset is located.
Length – Length of pipe segment.
Slope – Slope of pipe segment.
Diameter Width – Diameter of pipe segment.
Diameter Height - Diameter of pipe segment.
Type – Type of Asset (Elbow/Tee, Manhole, Sewer, Force Main)
Material - Material type of the asset
Asset Valuation Cost - The present day or valuated cost of an asset (ie. Current day replacement or original construction cost).
Year of Valuation - The date when an asset was valuated (ie. If cost is from the original construction cost and was constructed in 2005, the Year of Valuation would be 2005)
Install Date – Year asset was installed.
Useful Life - Approximate life expectancy of an asset – from beginning of life to failure.
Ownership – Owner of Asset
Maintenance Responsibility – Who is responsible for maintenance of asset (if different than Owner).

Information Source – Source of Valuation Cost.
CCTV Reference – Link to CCTV data where available.
East/West/North/South Invert – Invert measurements.

Water

AEID – Unique ID assigned to asset.
Community Name – Community in which the asset is located.
Length – Length of pipe segment
Diameter – Diameter of pipe segment.
Type – Type of Asset (Elbow/Tee, Hydrant, Valve, Watermain)
Material – Material type of the asset
Asset Valuation Cost - The present day or valuated cost of an asset (ie. Current day replacement or original construction cost).
Year of Valuation - The date when an asset was valuated (ie. If cost is from the original construction cost and was constructed in 2005, the Year of Valuation would be 2005)
Install Date – Year asset was installed.
Status – Operating, Abandoned, Not Operating.
Useful Life – Approximate life expectancy of an asset – from beginning of life to failure.
Ownership – Owner of Asset
Maintenance Responsibility– Who is responsible for maintenance of asset (if different than Owner).
Fireflow – True: Used for fireflow (feeds hydrants). False: Not used for fireflow.
Breaks – number of breaks on pipe segment since installation.
InformationSource – Information source of Valuation Cost.

Road Surface

AEID – Unique ID assigned to asset.
Community Name – Community in which the asset is located.
Class – Freeway, Expressway/Highway, Arterial, Collectors, Local/Street, Local/Strata, Local/Unknown, Alleyway/lane, Ramp, Resource/Recreation, Rapid Transit, Service Lane, Winter Road
Provincial Road Class – Class 1 – Link all cities to major cities, link all regional service centres with pop >3000 with nearest community with greater services, link regional hospitals to base hospitals.

- Class 2 – Link the USA national Highway system to Class 1, link Alberta Class 1, link Manitoba Provincial Expressway and Primary arterial Highways to Class 1.
- Class 3 – Link Manitoba secondary arterial highways to Class 2 or higher, link service centres of population >1000 to each other, link communities/reserves with pop >500 to service areas, link care homes and health centres to hospitals, link provincial/regional parks.

- Class 4 – Link international border crossings to a class 3 or higher, link communities/reserves >500 pop to each other, provide inter-municipality road network, link communities with >100 to service areas, links large industrial sites to higher classes.
- Class 5 – Link communities with <=100 to class 4 or higher class, provide inter-municipal road networks, link medium industrial sites to 4 or higher, provide access to intensive livestock/poultry that require daily access, link provincial/reg park and recreation sites to 4.
- Class 6 – Provide access to a small agricultural or industrial site, provide access to park or recreation sites that provide seasonal services, provide access to individual occupied residence, school bus route.
- Class 7 – Provide access to the land.

From/To: Intersecting Roads.
Length – Length of road segment.
Width – Width of road segment.
Lanes – Number of traffic lanes.
Surface Material – Material type of the asset (gravel, dirt, asphalt, etc)
Install Date – Date road surface was installed.
Asset Valuation Cost - The present day or valuated cost of an asset (ie. Current day replacement or original construction cost).
Year of Valuation - The date when an asset was valuated (ie. If cost is from the original construction cost and was constructed in 2005, the Year of Valuation would be 2005)
Useful Life – Approximate life expectancy of an asset – from beginning of life to failure.
Ownership – Owner of Asset
Maintenance Responsibility– Who is responsible for maintenance of asset (if different than Owner).
Full Legal Road Name – Road Name.
Condition – Rating from 1-100.
Sidewalk – Both sides, One Side, None.
CurbGutter – Header Curb, Gutter, Sidewalk, Curb and Gutter, Median.
InformationSource – Information Source of Valuation Cost.
Status – Operating/Abandoned.

Road Base

AEID – Unique ID assigned to asset.
Community Name – Community in which the asset is located.
Length – Length of road segment.
Width – Width of road segment.
Material – Material type of the asset
Install Date – Date road surface was installed.
Asset Valuation Cost - The present day or valuated cost of an asset (ie. Current day replacement or original construction cost).

Year of Valuation - The date when an asset was valuated (ie. If cost is from the original construction cost and was constructed in 2005, the Year of Valuation would be 2005)
Useful Life – Approximate life expectancy of an asset – from beginning of life to failure.
Surface Rd ID – ID of the associated Road Surface.

Fleet

AEID – Unique ID assigned to asset.
Community Name – Community in which the asset is located.
Make – Vehicle make.
Model – Vehicle Model Number/Name.
Year – Year car was made.
Insured Value – Value the vehicle is currently insured for.
In Service Year – Year the vehicle was put in service in the community.
Information Source – Information source of valuation.

Land

AEID – Unique ID assigned to asset.
Community Name – Community in which the asset is located.
Class – Zoning Class.
Value – Appraised land value.
Year of Valuation – The date when an asset was valuated.
InformationSource – Source of information.