Development of a Rural Municipal Road Conditions Assessment Method and Associated Quality Assurance Process

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ABSTRACT

This paper discusses the issues confronted during a multi-year project involving the development of a conditions assessment method and a quality assurance process for surfaced rural roads in Parkland County, Alberta, Canada.

The objectives of this innovative project included; developing a surfaced roads conditions assessment method and procedures for collecting the condition data, and creating business processes for ensuring that quality assurance and consistency is maintained into the future. The project commenced in 2006, was successfully completed in 2010 and fully implemented in 2011.

The project utilized custom road network and project level Pavement Management System and Maintenance Management System software.

The paper discusses the major technical and organizational issues that were experienced and addressed including:

- Developing accurate methods for measuring and collecting data on the surface roads,
- Piloting the data collection process and refining the process,
- How treatment triggers (distresses, severities and extents) for the surfaced road network were identified
- How a Condition State Map that drives all physical surface work was developed,
- Identifying methods to quality assure the data as part of the collection process.

This paper focuses on the critical success factors and the lessons learnt throughout the five year project. How condition data is collected and used is explained in sufficient detail to enable similar rural municipal governments to assess its relevance and consider the opportunity of implementing similar processes in their own operating environment.

The paper also details the innovative quality assurance and business processes developed to ensure the data collected is reliable and consistent over time.

INTRODUCTION

Parkland County is a rural municipality located in Alberta, Canada, immediately west of the City of Edmonton. The County surrounds the City of Spruce Grove and the Town of Stony Plain, but is a separate municipality, Figure 1.

With a population of over 30,000, Parkland County maintains 2060 km of roads, covers 242,595 hectares, has 365 country residential rural subdivisions, 12 hamlets and employs 209 (FTE) employees. Residents enjoy a mix of agricultural, professional and industrial employment opportunities for Parkland County contains excellent farm land and two of Alberta's largest coal fired power generating stations.

Sharing boundaries with the City of Edmonton, the County has immediate access to all of the amenities provided by the City and is only minutes from major amenities such as the Edmonton International Airport, West Edmonton Mall, and Edmonton's downtown core.

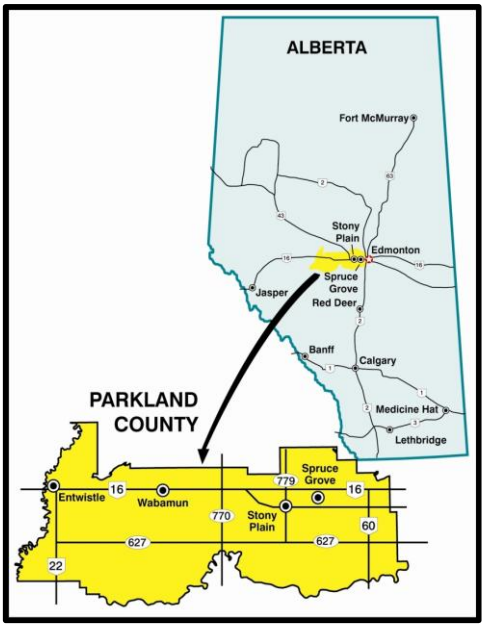

Figure 1 – Location of Parkland County.

Recently, Parkland County has been experiencing growth due to residential and commercial development. This growth has put additional demands on the grid road network that the County manages on behalf of the community.

The Engineering and Public Works Departments work together to develop and maintain the public roadways within Parkland County. Engineering such as road design, reconstruction, and upgrading as well as maintenance such as road gravelling, surface repair, pothole repair, dust control and snow removal are some of the major activities conducted by the departments.

THE START OF ASSET MANAGEMENT IN PARKLAND COUNTY

In 2006 the County engaged VEMAX Management Inc. to assist the County in developing a Road Network Asset Management Plan that included a condition rating method that would enable the County to quantify major work needed on their surfaced road network. As the County had never measured condition of their surfaced road network the County had to first identify what distresses would drive the treatments that were to be used for maintaining and improving the network.

From the start of the project the County had a clear idea as to why they wanted to develop a road condition assessment method as the foundation for the Road Network Asset Management Plan.

The initial goal was to put in front of Council a long term Plan for the road network. It was explained to Council that the purpose of the Plan was to provide a:

- *Better Management of the Road Network* through optimizing decision making, improving current practices, addressing service standards, applying the right practices in the right places and applying practices in a cost effective manner.
- *Better Risk Awareness* by prioritizing programs accordingly and allocating resources effectively, identifying current performance and future liability and reducing Council's exposure to liability related incidents.
- *Better Understanding of Sustainability* by introducing life cycle planning, performing economic evaluations to determine whether to replace or upgrade, determining when the right time is to replace or upgrade and to set minimum target levels of service for Council's road assets.
- *Better Customer Confidence* through demonstrating the road network is managed to the best of Council's ability and by demonstrating the road network is being managed well and equitably for both present and future generations with budget constraints.
- *Continuous Process Improvement* by implementing systems that identify the strengths and weaknesses of the existing asset management program and through continually evaluating the effectiveness of treatments being applied to the road network.

The two slides of Figure 2 were used in the first Council briefing, held in 2006, on this major initiative for Parkland County.

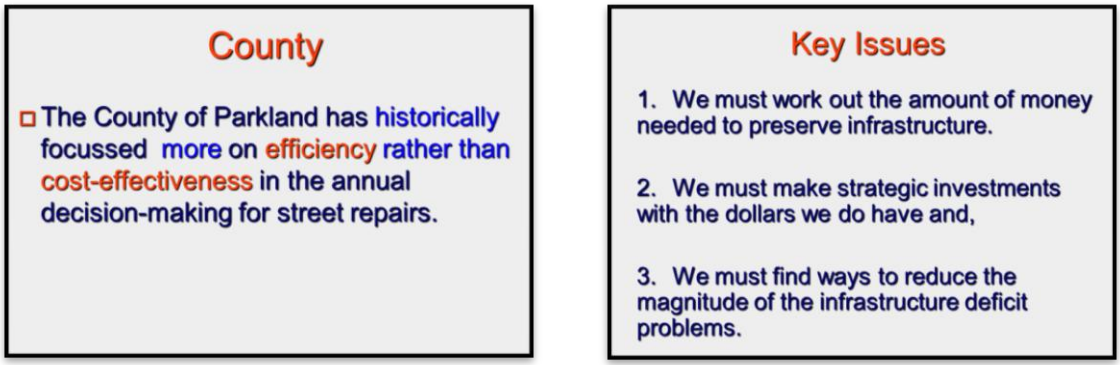

Figure 2 – Two presentation slides from the 2006 Asset Management briefing that was made to Parkland County Council.

The key points that Council understood were that Parkland County needs to:

- Demonstrate that they are using existing funding on the right maintenance activities and that the activities are cost effective,
- Know what level of service they are providing.
- Be able to measure the performance of the road network and know the outcome of their capital and maintenance efforts.

In 2006, Parkland County Council understood the need for developing a Road Network Asset Management plan and fully supported the initiative.

BACKGROUND - PARKLAND COUNTY'S SURFACED ROAD NETWORK

Roads that are within Parkland County and fall under the County's jurisdiction include; grid roads (range roads, township roads and forced roads), named roads (example: Burtonsville Road), highway service roads, and subdivision or hamlet roads. These roads are included in the County's Road Network Asset Management Plan. Roads that are within Parkland County but do not fall under the County's jurisdiction include; provincial highways, summer village roads and roads within the Town of Stony Plain or the City of Spruce Grove. These roads are not included in the Road Network Asset Management Plan.

In 2008, the total length of Parkland County's surfaced road network was 782 kilometres. This network was divided into 611 segments. A segment is a relatively homogenous part of the road network and is typically 1.6 km (1 mile) in length or shorter. The surfaced roads are divided into the following functional road classifications: Arterial; Major Collector; Minor Collector; Local; Subdivision and Hamlet Roads, Figure 3.

Figure 3 – Distribution of ALL of Parkland County's surfaced roads by, road classification.

To date Parkland County has only analyzed surfaced grid roads and therefore this paper only addresses the grid road network. With the subdivision and hamlet roads removed, 424 segments with a total length of 560 kilometres remain, Figure 4.

Figure 4 – Distribution of Parkland County's surfaced GRID roads only, by road classification.

INVENTORYING AND SEGMENTING THE ROAD NETWORK

In order to be able to assess the condition of the surfaced grid road network, the County needed to develop an inventory of its road network. At this stage in the project the County chose to inventory the entire road network and separate out the surfaced grid roads at the analysis stage. The roads in the network were first divided into permanent unique identifiers, called Road Identifiers. Since the County has roads made of varying surfaces (surfaced, gravel and undeveloped) as well as roads of varying widths, lengths and in different locations, the Road Identifier system incorporated using a control section number for identifying the location and length of the road plus a segment number for differentiating between surface types, road widths, or other significant differences.

Creating the Control Sections

Control sections were developed as permanent identifiers for sections of roads. Typically, control sections are 1.6 km in length on grid roads (range roads or township roads). In subdivisions, hamlets or on service roads the control section will vary from the 1.6 km length. Specific rules were developed to name control sections so each one was unique.

Creating the Segments

To differentiate between surface types, varying road widths, or other significant variances, a segment number was added to the end of the control section number. The primary purpose of segmenting is to determine if treatment or maintenance repair costs are consistent throughout the segment. Then major work can be planned in advance and budgets can be set with some degree of accuracy. Segmenting is vital to the integrity of condition based budget planning.

Segment numbers in the 100 series are used for surfaced roads, numbers in the 200 series are used for gravel roads and in the 900 series are used for undeveloped roads. The “00” ending indicates there is only one segment for the corresponding control section, or there are no variances in surface, width or other parameters for the total length of the control section. Once variances occur in a control section the “_01”, “_02”, “_03” and so on, endings are then used to indicate the sequential order each segment occurs along the from - to (start - end) direction of the control section.

Creating the Road Identifiers

The combination of the control section number and segment number yields a unique identifier for individual sections of County roads. The following are samples of some Road Identifiers in the County – See Figure 5:

- **271 535 540 200** - This is the Road Identifier for the section of road on Range Road 271 from Township Road 535 to Township Road 540. The segment number 200 identifies it as a gravel surface for the entire length 1.6 km of the control section.

- **534 272 271 101** - This is the Road Identifier for the section of road on Township Road 534 from Range Road 272 to Range Road 271. The segment number 101 identifies it as a surfaced road for the first 800 m of the control section length.
- **534 272 271 202** - This is the Road Identifier for the section of road on Township Road 534 from Range Road 272 to Range Road 271. The segment number 202 identifies it as a gravel road for the second 800 m of the control section length.

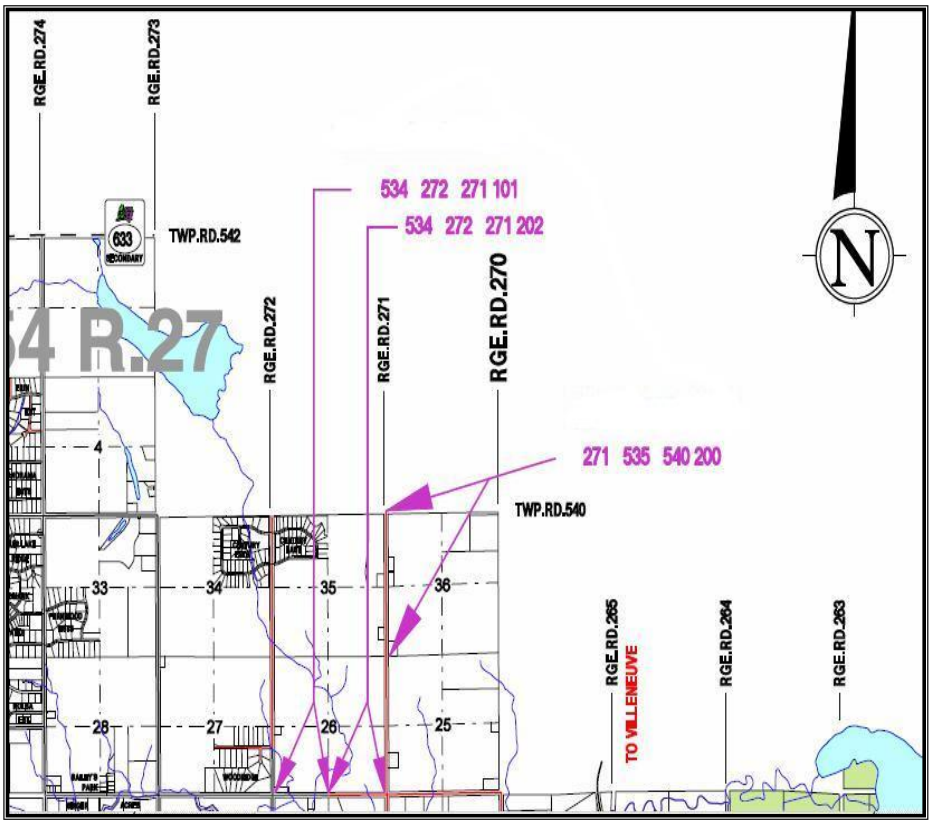

Figure 5 – Road Identifier naming convention examples.

In subdivisions, the Road Identifier number is the subdivision name, plus the "100" or "200" surface, gravel identifier:

- Yellowhead Estates 100 – Has surfaced roads throughout and the road width is uniform.
- Woodridge Estates 200 – Has gravel roads throughout and the road width is uniform.

Using customizable Pavement Management System software, a data input form was designed to enter every Road Identifier, along with attribute data into a Sequel database. Now that the County had completed the segmenting, naming and inventorying of its road network, it was now ready to proceed to begin the surface condition rating each Road Identifier.

MEASURING SURFACE CONDITION

Background

Parkland County determined which distresses were going to be measured during the condition rating process. To collect the condition ratings, a rating team of students is hired in July and August. The rating is conducted at this time because the road conditions have stabilized and a majority of the planned preservation work would be completed.

The rating process involves both driving the full length of the segment to observe, identify specific and measure large-scale distresses that will be rated over the entire segment, as well as walking a portion of the road to observe and measure specific road distresses.

The driving portion of the rating procedure is called the "In Vehicle" rating, Figure 6. During the In Vehicle rating, the following distresses are observed:

- The General Surface Condition (new, good, fair, poor).
- Patch Frequency (none, small less that 30% of area, isolated large less than 30% of area, extensive).
- Patch Condition (zero patches, new patches, good, fair, poor).
- Any hazardous surfacing failures are also recorded during the in vehicle rating.

To observe these distresses, the rater first drives the full length of the segment at the posted speed limit to determine the General Surface Condition of the road. The rater then drives the full length of the road segment a second time at a speed of 10 to 15 km/hr and observes the Patch Frequency and Patch Condition distresses.

The walking portion of the rating procedure is called the "Exit Vehicle" rating, Figure 7. During the Exit Vehicle rating, the following distresses are physically measured; Alligator Cracking, Block Cracking, Ravelling or loss of surface material and Rutting.

For the Exit Vehicle rating, the rater chooses a 50 m long section of road, called the gauging area, to physically measure the distresses. The 50 m section of road is chosen so that it is a representative sample that reflects the general surface condition of the entire road segment.

Figure 6 – "In Vehicle" surface rating inspection.

Figure 7 – "Exit Vehicle" surface rating inspection.

All data collected during the In Vehicle and Exit Vehicle rating process is recorded in the field on the County's Surface Condition Rating (SCR) Form, Figure 8. At the end of the day, the raters return to the office and transfers the data into the County's Asset Management Surface Condition Rating Database, Figure 9.

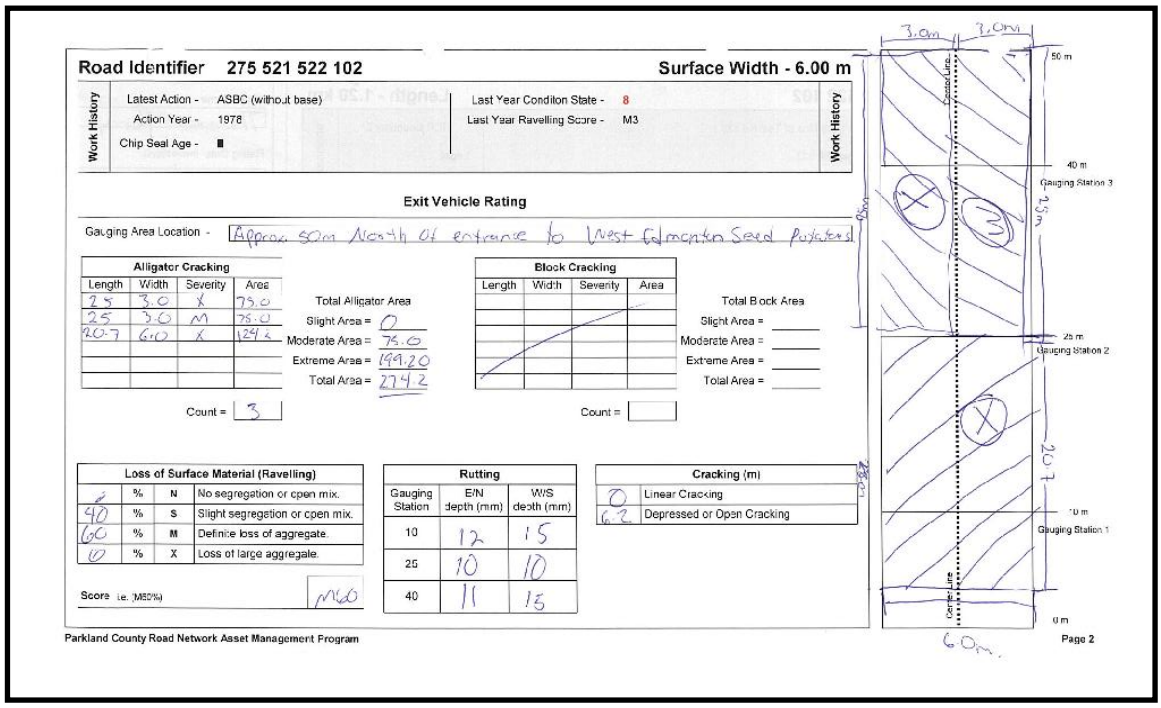

Figure 8 – Surface Condition Rating (SCR) Form that is used to record data in the field.

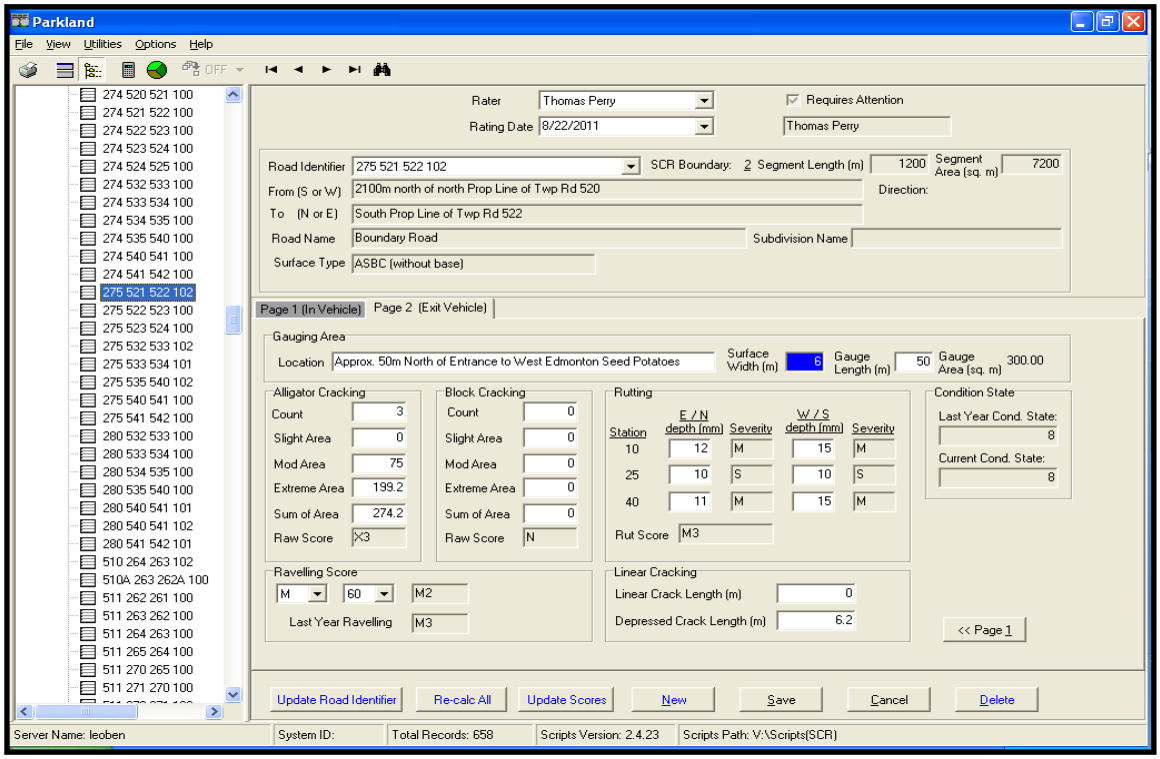

Figure 9 – SCR Pavement Management System database data entry screen.

MEASURING AND SCORING DISTRESSES

During the Exit Vehicle rating, raters use the following guidelines to record both the severity and extent of the distress being measured on the Surface Condition Rating Form:

Patch Frequency

Patching, Figure 10, is rated as a distress because patches are placed on the road to correct a surface failure such as cracking or potholes. Raters measure the amount of patching that is present on the entire segment. The patch frequency is them given a rating score of 0, 1, 2 or 3 as outlined in the Table 1 below:

Score	Range
0 – none	0
1 – small patches accumulated	0 to 30%
2 – isolated large individual patches	0 to 30%
3 – extensive	> = 30%

Table 1 – Patch Frequency score ranges.

Figure 10 – Typical skin patch in Parkland County.

Patch Condition

The Patch Condition rating indicates the general condition of the patches that are on the entire segment of road, Table 2. The predominant Patch Condition is recorded by the rater on the Surface Condition Rating (SCR) form.

Rating	Description
Zero Patches	No patches exist in segment area.
New Patches	Patches are new with no distresses.
Good	Patch is smooth with few distresses.
Fair	Patch is slightly rough to rough, cracking and or ravelling is starting.
Poor	Patches are uncomfortable to drive, are cracked and / or have potholes.

Table 2 – Patch Condition descriptions.

Alligator Cracking

Alligator Cracking is formed when a high density of linear cracks become interconnected to form polygons that are less than 150 mm by 150 mm across. Figures 11 and 12 show samples of alligator cracking.

The appearance of these interconnecting cracks is similar to an alligator's skin. Raters measure the area of Alligator Cracking that exists in the gauging area and assigns a severity to the Alligator Cracking as defined in Table 3.

None (N)	No cracks exist.
Slight (S)	Fine hairline cracks running parallel to each other with only a few interconnecting cracks.
Moderate (M)	Light cracks that form into a pattern or network of cracks that may be lightly spalled.
Extreme (X)	Cracking has progressed so pieces are well defined and spalled at the edges. The pieces may rock under traffic or be missing.

Table 3 – Alligator Cracking Severity Rating.

The presence of Alligator Cracking indicates the subgrade of the road is failing.

Figure 11 – Extreme Alligator Cracking.

Figure 12 – Moderate Alligator Cracking.

Block Cracking

Block Cracking, Figure 13, is formed when linear cracks are joined to form blocks that are less than 2 m by 2 m and greater than 150 mm by 150 mm square. Block Cracking is recorded when 3 or more blocks are interconnecting within the gauging area.

Block Cracking that exists in the gauging area is assigned a severity as defined in Table 4.

None (N)	No cracks exist.
Slight (S)	Fine hairline cracks – blocks are tightly interlocked with no displacement
Moderate (M)	Well-defined cracks – blocks interlocked with little or no displacement.
Extreme (X)	Large cracks – loss of interlock between blocks with vertical displacement.

Table 4 – Block Cracking Severity Rating.

Figure 13 – Block Cracking.

Ravelling (Loss of Surface Material)

Loss of Surface Material or Ravelling is created through the progressive loss of surface materials, aggregate particles and bitumen binder, from the surface downward, leaving a rough surface which is then vulnerable to deterioration due to weather.

The rater assigns a Ravelling Severity Score of None, Slight, Moderate or Extreme (N,S,M,X) based on the amount of binder that has been lost, or how much of the surface aggregate is exposed, Figure 14.

A percentage of area each Ravelling Surface Score that exists in the gauging is also recorded by the raters. This percentage is the extent measure for this distress.

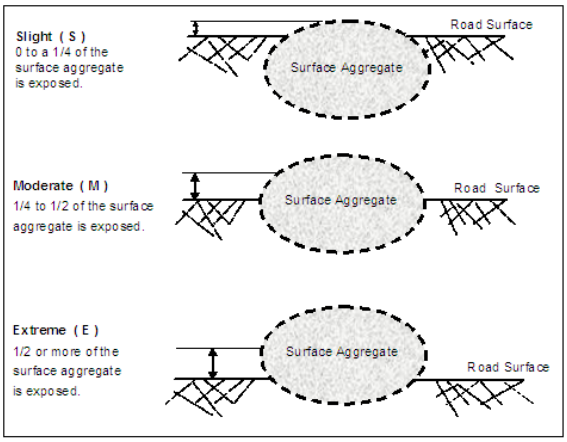

Figure 14 – Ravelling surface score.

Rutting

Rutting is a longitudinal surface depression which develops in the wheel paths from repeated loading. Rutting may occur in either lane or wheel path.

Raters measure rutting in millimetres by placing a straight edge perpendicular to the rut and measuring the deepest depression of the rut, Figure 15. Six rut measurements (three in each lane direction) are taken and recorded for the gauging area being rated.

A Rutting Severity Score is assigned to each rut based on the depth of the rut as outlined in Table 5 below:

(N) None	0
(S) Slight	<10 mm
(M) Moderate	10 to <25 mm
(X) Extreme	Greater than 25 mm

Table 5 – Block Cracking Severity Rating.

Figure 15 – Measuring Rutting on a Parkland County Road.

DEVELOPING THE CONDITION STATE MAP FOR PARKLAND COUNTY'S ROAD NETWORK

To create the Condition State Map for Parkland County, specific tolerances are used to convert the rater's ratings for the distress severities and extents for the three predominant distresses, into either a "Good = 1" or "Poor= 2" Strategic Score. It was found that very little Block Cracking and minimal or localize Rutting exists on the County's surfaced road network. These two distresses do not drive the County's treatment program, so they were not converted to Strategic Scores or used for the Condition State Map.

For the ravelling and cracking distresses, specific tolerances based on what extent or percentage of area a distress needs to be present before a treatment is applied was calculated. Extents of 0, 1, 2 and 3 are calculated as shown in Tables 6 and 7.

Extent	Lower Limit	Upper Limit
0	0 %	<=1%
1	>1 %	<=10 %
2	>10 %	<=20 %
3	>20 %	

Table 6 – Ravelling area converted to Extent Score.

Extent	Lower Limit	Upper Limit
0	0 %	<=1%
1	>1 %	<=5 %
2	>5 %	<=10 %
3	>10 %	

Table 7 – Cracking area converted to Extent Score.

The rating Severities are then combined with the Extent Scores extent scores, as shown in Table 8, to determine the Strategic Score for each of the three measured distresses. For the patching distress, both Patch Frequency and Patch Condition are combined to create the patching "Good = 1" or "Poor= 2" Strategic Score.

Ravelling Strategic Score (1 = Good, 2 = Poor)

Ravelling Severity	Severity + Extent	Strategic Level
None	N1	1
Slight	S1,S2, S3	1
Moderate	M1	1
Extreme	X1	1
Moderate	M2,M3	2
Extreme	X2,X3	2

Cracking Strategic Score (1 = Good, 2 = Poor)

Crack Severity	Severity + Extent	Strategic Level
None	N1	1
Slight	S1,S2,S3	1
Moderate	M1	1
Extreme	X1	1
Moderate	M2,M3	2
Extreme	X2,X3	2

Patching Strategic Score (1 = Good, 2 = Poor)

Crack Severity	Severity + Extent	Strategic Level
None	no patches	1
Small patches < 30 % of segment area	new, good, fair	1
Large patches < 30% of segment area	new, good	1
Small patches < 30 % of segment area	poor	2
Large patches < 30% of segment area	fair, poor	2
Extensive patching > 30% of segment area	new,good,fair,poor	2

Table 8 – Calculating the Strategic Scores for Ravelling, Cracking and Patching.

Through combining the possible combinations of "Good" and "Poor" Strategic Scores, for each of the three distresses in a matrix, eight separate Condition States for Parkland County's surfaced road network are created. The optimal treatment which is the most cost effective for each of these Condition States was also defined. Through using these Condition States, optimal treatments can then be assigned to each Road Identifier that was rated by the road raters. Parkland County's Condition State Map is shown below in Figure 16.

Condition State Map					
	(1 = Good, 2 = Poor)				
Condition State	**Ravelling**	**Cracking**	**Patching**	**Treatment**	**Cost**
1	1	1	1	Routine	Low
2	1	1	2	Overlay	High
3	1	2	1	Patch	Medium
4	1	2	2	Patch / Overlay	High
5	2	1	1	Chip Seal	Medium
6	2	1	2	Overlay	High
7	2	2	1	Overlay	High
8	2	2	2	Overlay	High

Figure 16 – Parkland County's Condition State Map.

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QUALITY ASSURANCE

The task of segmenting the County's road network took several years. In 2006 the initial segmenting was conducted using a desktop method where the segments were created from reviewing a County map. Once this task was completed, the County began its condition rating process where road raters physically assessed each road segment.

The first tasks the County undertook was to create the Road Identifier segmenting system, develop the surface condition road rating process and through using custom Pavement Management System software, create the data input forms and Sequel database that would be used for retaining and analysing he collected data. Throughout 2006 the County used a "pilot project" approach to develop and test the proposed processes. A small portion of the road network was segmented, condition rated and the data collected was entered into the database. Through the fall of 2006 and spring of 2007 some refinements were made to the segmenting and condition rating processes. In 2007 the complete road network was segmented and all surfaced roads were condition rated. At this time road lengths were measured with vehicle odometers.

Through 2007 and 2008 road raters continued to find sections of roads that were not identified in the desktop segmenting exercise. At this time, the County's Public Works Department also began tracking its road maintenance work against Road Identifiers by using Maintenance Management System software. The Public Works Department found additional Road Identifiers that were missed during the desktop exercise. By the end of 2008 the County had confidence that 95%+ of its road network was properly identified and segmented and was being condition rated.

In 2008 and 2009 through two separate County initiatives, final quality assurance checking of the segmenting of the County's road network was conducted. In 2008, as a part of the Finance Department's Tangible Capital Assets Project, finance staff compared the known Road Identifiers to County maps to verify that all road allowances and roads were accounted for. Staff also checked road lengths using a County digital map. To check lengths, the staff used a measuring tool that was part of the software. This method of checking lengths was not extremely accurate, however it was able to reveal where significant measuring errors or data entry errors had been made.

Finally, in 2009, the Planning Department began developing a Geographic Information System (GIS) which was to include County roads. The department created a County GIS map from a province wide map base and overlaid the map onto air photos. They then took the Asset Management Road Identifier database and linked each known Road Identifier to the new GIS map. This process revealed additional roads that were on air photos but had not previously been identified through the desk top exercise or field visits. Road Identifier lengths were again verified, this time by using GIS coordinates. At the end of 2009 the County was confident that they now had very close to 100% of the road network properly identified, segmented and recorded in the database.

It was decided since 2008 most of the surfaced road network was segmented and condition ratings had been obtained for the roads, that 2008 would be the base year to be compared to. At the end of the 2010 rating season, the County now had three years of condition data that could be used to assess the performance of the surfaced road network. A multi-year data view was developed, Figure 17, with which one could quickly view a Road Identifier's condition state over the years.

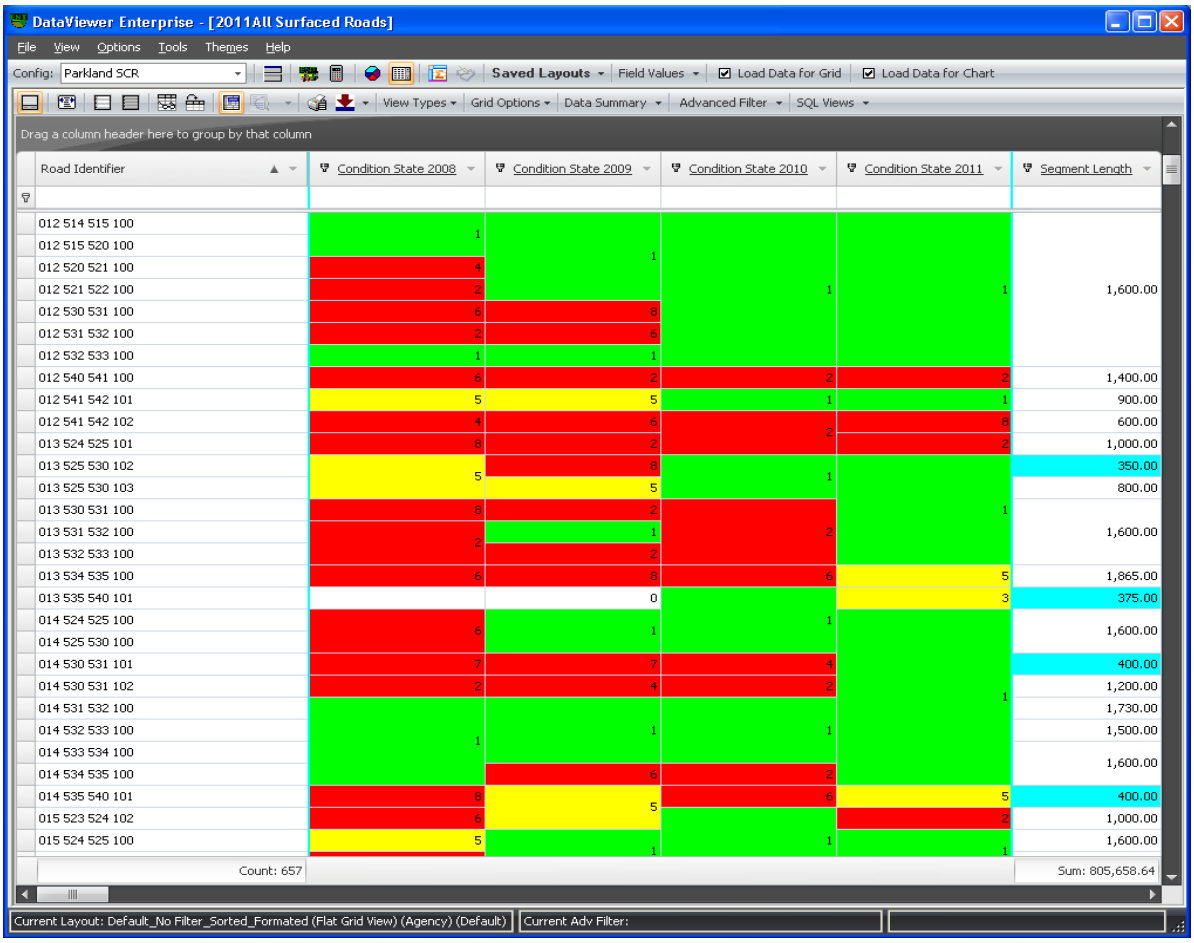

Figure 17 – Multi-year data view used to compare each Road Identifier's performance from year to year.

The questions "How can we be certain the resulting data is accurate?" and "Do we know why a Condition State 8 has moved to a Condition State 1 – what caused this improvement, capital work, maintenance work or a rating data collection error?" arose. Since capital work as well as maintenance work was also being tracked against Road Identifiers, the software and data views were further customized to provide a work history quality assurance feature.

In Figure 18, it is shown Road Identifier 534 014 013 100 was a Condition State of 8 in 2010 and improved to a Condition State of 1 in 2011. Through expanding the Capital Work History Grid in the database, one can see that in 2011 this road was part of the capital program where it was ACP surfaced and widened from 6.5 m to 10.4 m which therefore confirms the reason for the Condition State 1 status of this Road Identifier in 2011.

It should be noted here that although an overlay is the preferred treatment for a Condition State 6, an ACP widening capital project also achieves the same goal.

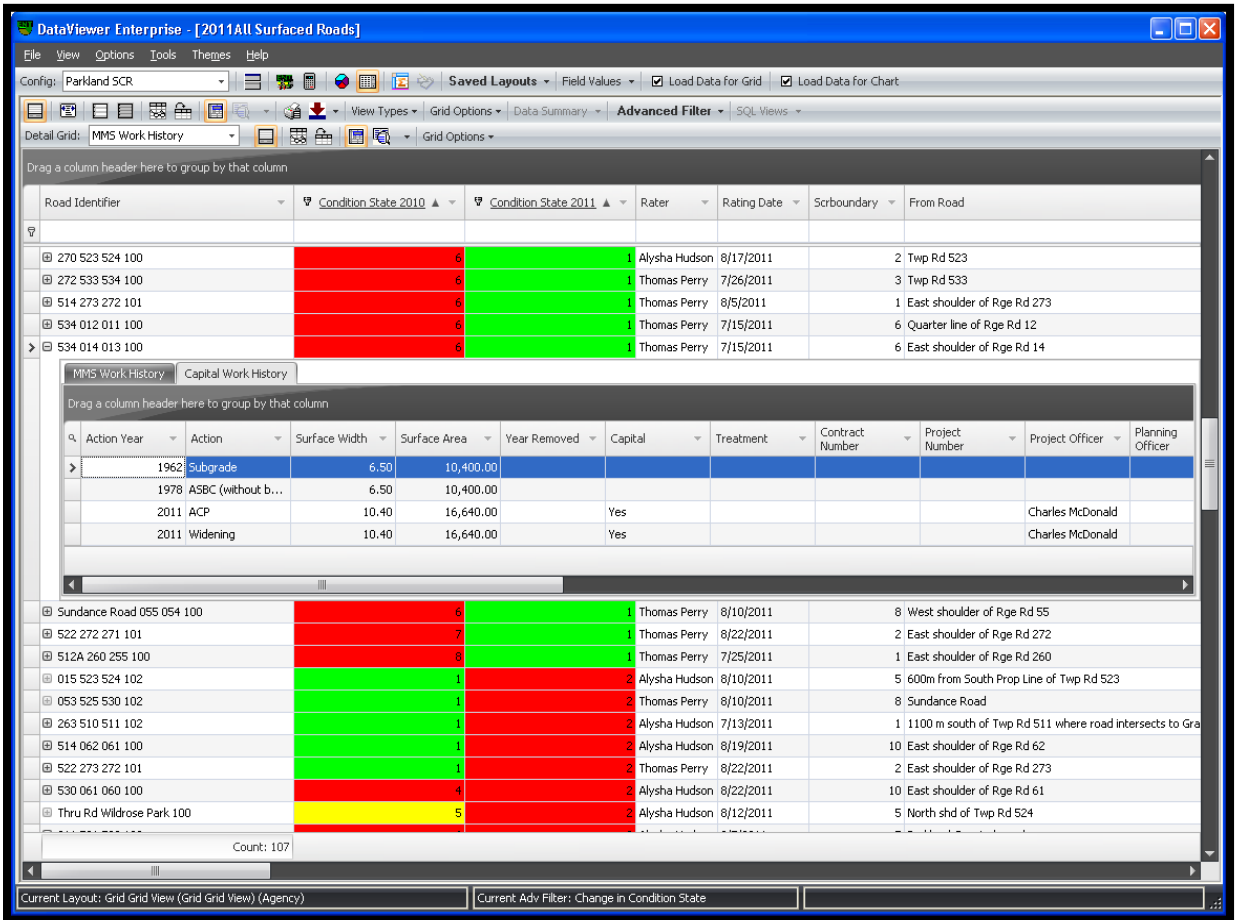

Figure 18 – Multi-year data view with the Capital Work History Grid displayed. Confirms why 534 014 013 100 became a Condition State 1 in 2011 from Condition State 6.

Similarly, Figure 19 shows that Road Identifier 531A 264 263 100 was a Condition State of 3 in 2010 and improved to a Condition State of 1 in 2011. Through expanding the Maintenance Work History grid in the database, it is shown that in 2011 this road was both pot hole and skin patched through Public Works' MMS (Maintenance) work program. Thus confirming the reason why this Road Identifier moved to a Condition State 1 in 2011. Per the Condition State Map, patching is the preferred treatment that should be applied to Condition State 3 roads.

Note the spray patching that shows as well in the 2011 MMS history is not considered a treatment that can change a condition state and hence is shown solely for information purposes

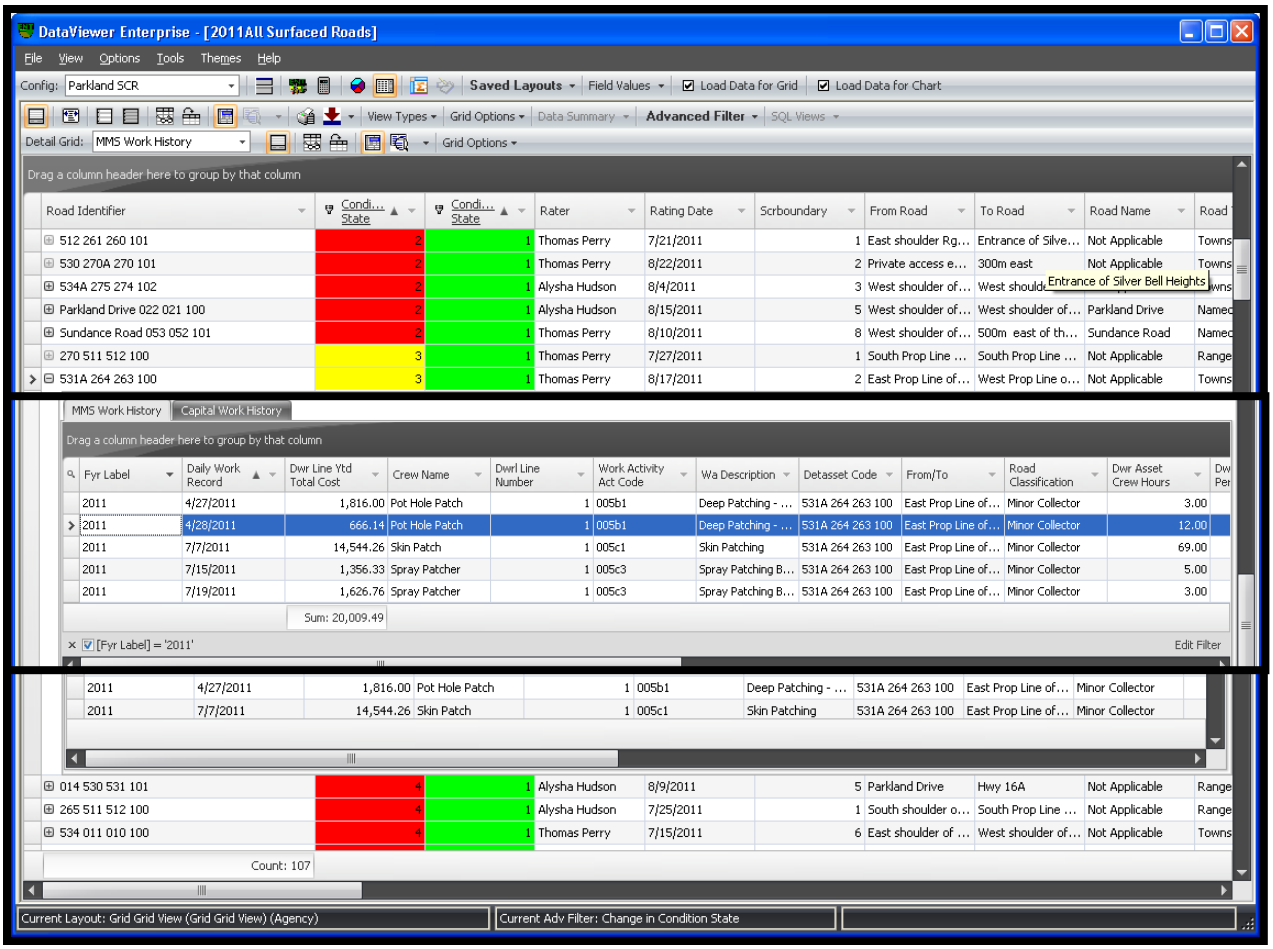

Figure 19 – Multi-year data view with the Maintenance Work History Grid displayed. Confirms why 531A 264 263 100 became a Condition State 1 in 2011 from Condition State 3.

With the data quality assured, Parkland County is able to confidently now also use the data for; analyzing the condition of the surfaced road network, planning the annual capital work program, ensuring the correct maintenance treatments are applied to the correct distress, evaluating the effectiveness and life of treatments track costs and amount of work applied to each Road Identifier as well as to each Condition State.

An example of how comparing the condition states of the surfaced road networks between 2008 and 2010 is shown in Figure 20. In Figure 20, it is shown that over these years, the condition of the County's surfaced road network has improved. The capital and maintenance programs applied over these years has reduced the amount of Condition State 5, 6 and 8 roads and increased the amount of Condition State 1 roads.

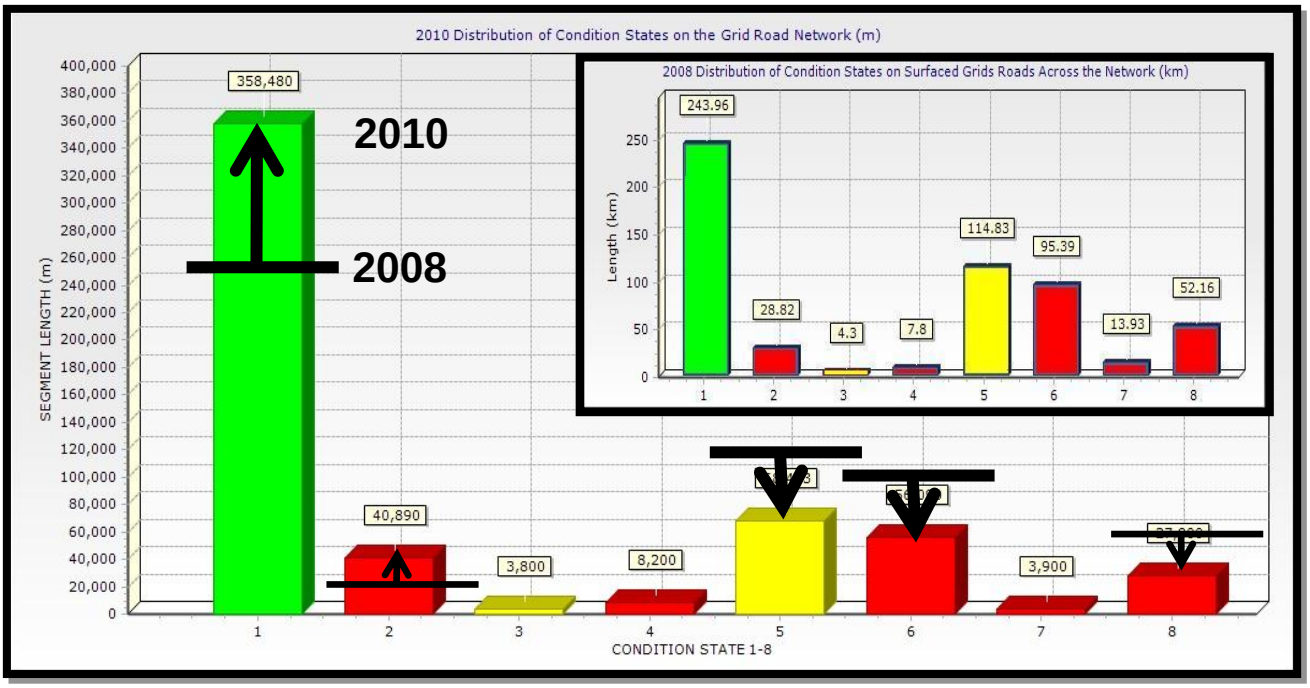

Figure 20 – Comparing Total Lengths vs. Condition State of Parkland County's surfaced roads between 2010 and 2008.

LESSONS LEARNT

Lesson Learnt: Gaining Council support.
Through the support of Parkland County's Council, the project was able to receive funding and staff resources that were required to permit the project to proceed.

Lesson Learnt: Develop unique identifiers and attributes in a manner that they can be separated easily in a database query.
Since Parkland County maintains road network in which the road classifications, surface types, widths, lengths and applied treatments vary significantly, it was important to develop a unique identifier of Road Identifier naming system that could be easily used to separate different groups or classes of roads. In conjunction with the Road Identifier naming system, the County was cognisant to ensure the varying attribute data such as surface type, width, length, treatments, were included as fields that are tracked against each Road Identifier. In doing so, there are unlimited ways in which the data can be examined, grouped or queried.

Lesson Learnt: Ensure the base data that all information would be connected to, which in this case was the segmented Road Identifiers, is as accurate as possible before moving forward.
Over the four years of work, Parkland County learnt that in order to be confident at the evaluation and analysis stage of the project, they had to ensure the data was of a high quality. The County found through performing the desktop segmenting exercise that was later proofed in the field, they obtained a 95%+ accurate record of their road network. It was not until a "fresh set of eyes" from

the Finance Department's Tangible Capital Assets and from Planning Department's GIS projects viewed and proofed the Road Identifier database that near 100% accuracy was obtained. Through completing these quality assurance checks early on in the program, the County benefitted because efforts could then be focused on collecting and analysing the condition rating data as opposed to correcting data.

Lesson Learnt: At the start of the data collection project, try to predict all the factors that impact road condition and performance and begin collecting these all from the start of the project.
After three years of condition data collection, and having assigned Condition States to each Road Identifier, the County was able to compare each road's performance from year to year. It became evident that it was important to be able to justify why Condition States change. Since Parkland County was also tracking capital and maintenance work history against each Road Identifier, they were able to further develop the database viewing software to show the work history grid of each Road Identifier.

Lesson Learnt: Not all data initially collected may occur or drive a treatment.
The paper discussed how the patching, ravelling, alligator cracking, block cracking and rutting distresses were all condition rated and how it was found that block cracking and rutting occur very infrequently on the County's surfaced road network. Regardless, the County will continue to condition rate block cracking and rutting to see if they begin to appear as the network ages. If they do, we will have the historical data available and will be able to predict the behaviour of these distresses.

NEXT STEPS – FUTURE DEVELOPMENT

As indicated at the start of this paper, even though Parkland County began segmenting roads in 2006 and 2007 and has been collecting surface condition data and tracking both capital and maintenance work against all surfaced roads since 2007, the project and paper only examined and evaluated the surfaced grid roads from 2008 and on. Recall 2008 was determined to be the year in which he County was confident that they had accurately segmented and recorded 95%+ of its entire road network.

With the completion of the quality assurance process in 2010, the County is confident that the rating and Condition State Mapping is working accurately. Therefore, it is now the County's intent to conduct a similar evaluation of the Subdivision Roads. Since the same data has been collected for the Subdivision Roads since 2008, the 2008 year will also be used as the base year for the Subdivision Road evaluation.

To date, cold mix, ASBC and ACP surfaces are being condition rated by using the same method and distress triggers. Parkland County does not presently use significantly different treatments on these different surfaces. The database fields were designed so that it is straightforward to group or separate Road Identifiers based on attributes such as surface type. Now that Parkland County is comfortable with the data collection, rating and evaluating process, the County plans to further refine the process by considering and evaluating the different surfaces as individual sub-networks that perform differently and that may lead to exploring the application of differing treatments on the different surfaces.