Township of Strong

Road Needs Study

Prepared by:

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Date: February 17, 2009

AECOM

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February 17, 2009 Project Number: 108774 (TSH 3619679)

David Pringle, Roads Superintendent
Township of Strong
1713 Hwy #11,
P. O. Box 1120, Sundridge, On POA 1Z0

Dear Mr Pringle;

Re: Township of Strong
2008 Municipal Road Inventory Condition Assessment

AECOM is pleased to submit this report with respect to the results of the 2008 Township of Strong Road Needs Study.

The road appraisals in this study were completed using WorkTech's Asset Foundation software and following the methodology of the Inventory Manual, 1991.

With this report, all road related data has been updated to present day values and the content of the report reflects road system conditions as of the time of the field data collection, in the spring of 2008 for the road system. Also included in this study is tabular information reflecting the valuation and accumulated depreciation for the municipal road assets in accordance with the PSAB requirements.

We trust that this report will be beneficial to the Township in developing their asset management plans and wish to express appreciation for the opportunity for AECOM to participate in the work.

Sincerely,
AECOM Canada Ltd.

David Anderson, CET
Project Manager, Asset Management
Dave.anderson@aecom.com

DA:daEncl.
cc:

Revision Log

Revision #	Revised By	Date	Issue / Revision Description
1	DA	November 2008	
2	DA	November 2008	I Roger Comments added
3	DA	January 2009	Client Comments

Signature Page

Report Prepared By:	Report Reviewed By:
David Anderson	
David Anderson, CET Project Manager, Asset Management Township of Strong, 2008 Road Needs Study	Ian Roger, P.Eng Program Manager, Asset Management Township of Strong, 2008 Road Needs Study

Executive Summary

The 2008 Township of Strong Roads Needs Study summarizes roads system surveys conducted during 2008 by identifying road section condition by their time of need and rehabilitation strategy. All of the roads under the Municipality's jurisdiction were included in this survey. Gravel roads were evaluated during mid April in order that spring break-up conditions were observed. Gravel roads are best reviewed during the spring break-up in order that a more accurate assessment of their condition can be determined, however, the performance of each gravel road section can be inconsistent from spring to spring.

The report also includes tabular information reflecting the valuation and accumulated depreciation for the municipal road assets in accordance with the Public Sector Accounting Board (PSAB) requirements, a review of the public works buildings and an equipment replacement schedule

The purpose of a Road Needs Study is to provide an overview of the overall condition of the road system. The study provides a rating of the general condition of the road system, by road section, including such factors as structural adequacy, drainage, and surface condition, as well as providing some indication of what appears to be deficient horizontal and vertical alignment elements per the Ministry of Transportation's manual entitled Geometric Design Standards for Ontario Highways. The study information can be used for programming and budgeting, however, once a road section reaches the project design stage, further detailed review, investigation and design will be required to address the specific requirements of the project. The road needs study is not a road safety audit.

Traffic counts were estimated on the majority of the roads for purposes of this study based on the observations of the rater and/or from information provided by municipal staff. The traffic values established for the purposes of this study are satisfactory. However, from a risk management perspective, the traffic counts entered in the database should *not* be used to establish road classifications for Minimum Maintenance Standards purposes.

It is recommended that the Municipality have traffic counts undertaken on a larger number of selected roads in order that accurate information is used to factor into decision making and that accurate Road Class determination, as per Regulation 239/02, may be established for maintenance and service level purposes. Accurate traffic counts would be a worthwhile risk management exercise from this perspective alone.

Data collection and road ratings were completed generally in accordance with the *MTO Inventory Manual for Municipal Roads (1991)*—hereafter referred to as the Inventory Manual or the manual. Road conditions are rated during a field review, and a score calculated which then categorizes the road section as Adequate, or a 'Now', '1 to 5' or '6 to 10' year need for reconstruction or resurfacing. Priority ratings are established through a further calculation involving the traffic count and the condition rating. Using the priority rating, data has been further sorted by time of need and rehabilitation strategy. The report summarizes the results of the study through a number of tabular appendices and mapping.

Road sections were created that were consistent throughout their length according to: roadside environment, surface type, condition, cross section, speed limit or a combination of these factors. For instance, a road section with a hot mix surface that changes from being in good condition to poor condition would require an additional section to be added to the database. Another example would be a road where speed limit changes as it enters a hamlet; a new section would be created to reflect that change even if no other element had changed. Historically, when the province provided funding for municipal road systems, roads systems were measured by their system adequacy. The system adequacy is the percentage of the road system that is not a "NOW" need.

The current system adequacy of the entire Township of Strong road system is 48.18%. (Re-stated, 51.82% of the roads system is deficient in the NOW time period. The "NOW" needs inventory represents the backlog of work that is required on the road system.) Based on former Ministry of Transportation targets, the minimum target adequacy for the Township of Strong would have been 60%. This calculation does not consider those roads that are deficient that have a traffic count of less than 50 vehicles per day. The Township of Strong Road system includes 16.33 kilometres of road that have an estimated traffic count of less than 50 vehicles per day.

In reviewing the data and the needs for the Township of Strong road network there were several unique aspects of the network that came to light

- A large percentage of roads had definite needs; however, their cross sections in terms of pavement and platform width were adequate for the estimated traffic volumes, which led to a large number of sections (42.77km) having a recommended rehabilitation strategy of BS—Base and Surface Tolerable. This strategy is recommended where the road structure base is showing signs of distress and/or failure but the cross-sectional elements are satisfactory. This may have been resultant from the original construction methodology, which was typical through a lot of rural Ontario, where ditches were created to provide drainage but the material excavated from the ditch area was used for the road bed. That material is generally not suitable for the road bed as it contains high percentages of organic material and other deleterious material.
- A large number of the rural roads have vertical and horizontal curves that do not provide sufficient visibility for safe stopping sight distance and/or cannot be negotiated at the posted speed limits. The Township of Strong should consider a review of signage to ensure that this risk is mitigated to the greatest extent possible. Appendix F provides a summary of those deficiencies.
- AECOM staff were advised that the speed limits were generally 60km/hr in the rural area. To paraphrase the Highway Traffic Act (HTA), unless otherwise posted, the speed limit on a rural road is 80km/hr. Similarly, the HTA provides that the speed limit in built up areas is 50 km/hr unless otherwise posted. It did not appear that there was sufficient signage to indicate the municipal standard was 60km/hr in the rural areas and similarly the limits of the 50km/hr zones in built up areas should be denoted. The Township should review this from a risk management perspective and provide appropriate signage.

The Inventory Manual provides direction with respect to roads with a traffic volume of less than 50 vehicles per day are deemed to be adequate, even if they have structural, geometric or drainage deficiencies that would otherwise rate them as having a need. Deficiencies in roads with low traffic values are to be corrected within the maintenance budget. (Roads with less than 50 vehicles per day, and speed limit of less than 80 km/hr, would be classified as Class 6 roads, as per Regulation 239/02, Minimum Maintenance Standards, which basically do not have a standard for repair.)

This report indicates estimated total cost of improvements for the road system as **$34,974,555** based on calculations using the Municipality's own benchmark costs. Of those needs**, $23,240,171** is for those roads that are already deficient (NOW needs). The remaining **$11,734,384** is for roadworks that are required in the 1 to10 year time period.

Three Public Works Facilities were inspected in August 2008 as part of the project. Required work for the facilities is categorized as essential, required, or desirable. Essential work should be undertaken at the municipality's earliest possible opportunity. The total dollar value of all works required for the facilities is **$336,000**.

Generally, lower volume roads in a lower tier road system have deficiencies with the existing horizontal and vertical alignment. These deficiencies are noted within the database. As the Township of Strong develops its asset management plan, which may include rehabilitations in lieu of full reconstructions as interim measures, consideration should be given to those vertical and horizontal elements that may not be corrected as a result of rehabilitation, and should be addressed through other means such as improved signage.

Based on an analysis of the composition of the Township of Strong's road system, to ensure that the road system adequacy is not further reduced, minimum annual capital expenditure levels in the different roads programming areas are as follows:

- **$538,600** for roads system capital based upon a 50 year life cycle
- **$26,300** for annual hot mix resurfacing based upon a 20 year life cycle

The above noted program values for the road system do not include any replacement costs for sidewalks, street lighting etc. For structures, the dollar value represents an annualized recommended expenditure.

It should be further noted that the above noted capital recommendations do not include programming that is required due to development growth.

Major maintenance for lower volume roads is also often an area of concern for municipalities, particularly for surface treated and gravel roads. Generally, expenditures in this area are funded from the operating budget. Recommended expenditure levels in those program areas are as follows:

- **$95,900** annually, for single surface treatment of existing surface treated roads based on a 7 year cycle (This does not include any gravel road conversion costs; those costs would be additional)

- **$681,400** annually for resurfacing gravel roads on a 3 year cycle (This does not include any gravel road conversion costs; those costs would be additional; also does not include ditching, re-grading, dust control etc…)

AECOM would recommend that Township of Strong consider a gravel road conversion program. Net Present Value analyses of the gravel and hard topped road maintenance programs generally reveals that over the life cycle (typically 20 years) conversion to a surface treated road is generally more cost effective than having a gravel road system. Similar analyses also reveal the benefits of moving to a hot mix asphalt-type surface. A number of road agencies in both the United States and Canada have arrived at the same conclusion. Further geotechnical review of candidate roads should be undertaken before advancing the program.

Careful consideration should be given to the pavement/road management strategy especially where funding is limited. Where there are funding constraints, higher priority should be given to those programs that extend the life cycle of the road by providing the correct strategy at the optimum time. As an example, resurfacing and rehabilitation projects should get a higher priority than reconstruction projects, if road program funding is limited.

The Township of Strong's asset management strategy should focus on utilizing the existing funding to preserve/extend the lives of those assets that are appropriate for these strategies. Many studies have proven that it is far less expensive to keep a good road in good condition than it is to reconstruct a road.

The prime goal of any pavement management strategy should be, as an absolute minimum, to maintain the overall system adequacy. The funding level for the road related programming should be set at a sufficient level so as to ensure that the overall system adequacy does not decrease over time.

PSAB 3150, Accounting for Tangible Assets, comes into effect in 2009 and affects all municipalities in how they report on their capital assets by now moving to full accrual accounting, aligning more with private sector practices.

Implementation of PSAB 3150 will improve transparency, openness and accountability of municipal operations. It effectively also introduces a more tangible realization of the gapping in funding that may be occurring for roads related programming (or any other capital asset) and may better quantify the effect of the change in system adequacy.

Whereas, the system adequacy is certainly indicative of the trend occurring with respect to the condition of the road system, once PSAB 3150 is fully implemented, a dollar value can be assigned to that difference in adequacy, clearly highlighting programming or funding inadequacies, or both.

AECOM makes the following recommendations for management of the Township of Strong's road inventory:

1. A regular traffic counting program should be undertaken in order to have accurate traffic counts on all road sections to reduce the exposure to risk for the municipality
2. Substandard vertical and horizontal alignments should be reviewed and considered for additional signage.
3. Roads should be reviewed to ensure that sufficient and appropriate regulatory signage is in place.
4. When road sections are rehabilitated or reconstructed, substandard vertical and horizontal alignments should be addressed either through spot improvements to the alignments or opportunities for additional signage should be reviewed.

5. Given the length of the gravel road network, consideration should be given to developing and implementing a gravel road conversion program.

6. The opportunity to develop a sustainable asset management/financial plan should be reviewed for implementation over a five to ten year period.

7. The condition of the road system should be reviewed on a regular basis to measure the effectiveness of strategies and funding levels.

8. When roads are constructed/reconstructed/rehabilitated the Ontario Provincial Standards and Specifications (OPSS) should be adhered to with particular attention to construction practices, procedures and standards

9. The asset management strategy for the foreseeable future should be developed along the following lines
   - The reconstruction program should be deferred over the next few years in favour of preservation activities that extend the life of the existing good road sections.
   - Given the existing funding level for roads, the basic strategy should be one of preservation; the top priority is to ‘keep the good roads good’
   - Optimize the hot mix overlay program and the surface treatment program.
   - Ensuring structure inspections are completed every two years.
   - If additional funding becomes available, that should be directed toward reconstruction projects.
   - Defer replacement of structures that are structurally sound that have a geometric need; improve the signage on those structures in the interim.
   - Prioritize structure major maintenance activities such as rehabilitations and resurfacing
   - At the time of structure rehabilitations, review the opportunity for conversion to semi-integral type structures

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1. Background and Introduction

The Township of Strong 2008 Roads Needs Study provides a summary of road condition ratings identified during rating surveys conducted by AECOM, during 2008. All of the Municipality's roads were rated and are included in this report. Gravel roads were evaluated during mid-April in order that spring break-up conditions may be observed. Gravel roads are best reviewed during the spring break-up in order that a more accurate assessment of their condition can be determined, however, the performance of each gravel road section can be inconsistent from spring to spring.

The purpose of the report is to clearly identify the current and future construction and financial needs of the Municipality with respect to its road system. It does not include costing for appurtenant devices or infrastructure such as sidewalks, guiderail and street lighting. The Road Needs Study provides an overview of the overall condition of the road system. The study provides a rating of the general condition of the road system, by road section, including such factors as structural adequacy, drainage, and surface condition, as well as providing some indication of what appears to be deficient horizontal and vertical alignment elements per the Ministry of Transportation's manual entitled Geometric Design Standards for Ontario Highways. The study information can be used for high level programming and budgeting, however, once a road section reaches the project design stage, further detailed review, investigation and design will be required to address the specific requirements of the project.

Traffic counts were estimated on the majority of the roads for purposes of this study based on the observations of the rater or from information provided by municipal staff. The traffic values established for the purposes of this study are satisfactory. However, from a risk management perspective, the traffic counts entered in the database should not be used to establish road classifications for Minimum Maintenance Standards purposes.

It is recommended that the Municipality have traffic counts undertaken on a larger number of selected roads in order that accurate information is used to factor into decision making and that accurate Road Class determination, as per Regulation 239/02, may be established for maintenance and service level purposes. Accurate traffic counts would be a worthwhile risk management exercise from this perspective alone.

Within the body of this report the following information is provided:

- A summary of the road condition ratings, reporting on the results in a tabular format by Road Section, Priority Rating, Time of Need and Rehabilitation Strategy (with associated mapping)
- An overview of the report methodology and evaluation system
- A valuation of the road system
- A Facility Audit of the three Public Works Buildings
- Recommendations for pavement and structure management strategies.
- Recommendations for a gravel road conversion program
- Recommendations for program funding levels.

The Road Needs Study is an important tool for municipalities as it allows municipalities to, in effect, benchmark against themselves, and provides an overview from both programming and financial perspectives.

Structures were not part of this assignment, however, structures form an integral part of the road system. For structures, the Province of Ontario passed amendments in 1997 to existing legislation in the *Highway Traffic Act (HTA), The Bridges Act (BA)* and the *Public Transportation and Highway Improvement Act (PTHIA)* that required all bridge and culvert structures with a span greater than 3m to be inspected under the direction of a Professional Engineer, at no greater than 2 year intervals. The inspection methodology and reporting must be in accordance with the Ontario Structure Inspection Manual (or equivalent). The same high level view of the structures inventory is provided through this exercise, as was for the road inventory.

2. Report Content and Scope

The report was prepared by AECOM for the Township of Strong, generally in accordance with the roads condition rating methodology previously prescribed by the MTO in the *Inventory Manual for Municipal Roads (1991)*.

The scope of the report includes summaries of data collected with discussion and analysis on same.

3. Report Methodology

3.1 Road Condition Ratings

Road section ratings were completed in accordance with the MTO's *Inventory Manual for Municipal Roads (1991).* The condition ratings, priority ratings, and associated costs were calculated in accordance with the Inventory Manual using WorkTech's Asset Foundation software. Benchmark construction costs were developed from input from municipal staff and AECOM's Bracebridge office.

The network is composed of road sections that are consistent throughout their length according to: roadside environment, surface type, condition, cross section, speed limit or a combination of these factors. For instance, a road section with a hot mix surface that changes from being in good condition to poor condition would require an additional section to be added to the database. Another example would be a road where the speed limit changes as it enters a hamlet; a new section would be created to reflect that change even if no other element had changed.

The Condition Ratings developed through the scoring in the Inventory Manual classify roads as 'NOW', '1 to 5', or '6 to 10' year needs for reconstruction or resurfacing. Field data is obtained through a visual examination of the road system including structural adequacy, level of service, maintenance demand, horizontal and vertical alignment, surface and shoulder width, surface condition, and drainage. The Condition Rating is calculated based upon a combination of other calculations and data. In the WorkTech software program, further calculations are also made to determine the priority rating which is a function of the Condition Rating and the Average Annual Daily Traffic (AADT). The Priority Rating may be used as a sorting tool within program areas.

The times of need and the 'ADEQ' rating are defined as follows:

3.1.1 'Now'

The Now needs inventory generally represents the backlog of work required on the road system. Construction improvements identified within this time period should be undertaken immediately (notwithstanding funding levels and pavement management strategy). It should be noted that a resurfacing strategy is never a 'NOW' need. (The exception being when the surface type is inadequate for the traffic volume.)

If a road with a rehabilitation strategy of "resurface" deteriorates too far, it becomes a 'NOW' construction need. A 'NOW" need rating may be triggered by substandard ratings in any of the Structural Adequacy, Surface Type, Surface Width, Capacity, Drainage, or Geometrics data fields.

Figure 1 "Now" Need Road

The Inventory Manual indicates that roads with a traffic volume of less than 50 vehicles per day will be deemed adequate and deficiencies on those roads are to be corrected with the maintenance budgets. In the case of the Township of Strong, there appears to be 16.33 km of roads with an estimated traffic count of less than 50 vehicles per day. Since the counts are estimated, rather than by an actual count, it would be in the best interests of the municipality to undertake a regular traffic counting program in order that the service classes for the roads are accurately established, for risk management and defensibility purposes.

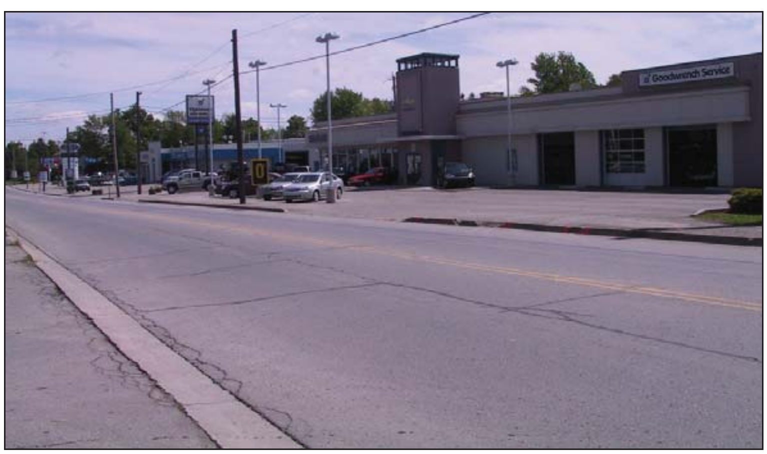
3.1.2 ‘1 to 5’

‘1 to 5’ Identifies road sections where construction and resurfacing improvements are anticipated within the next 5 years, based upon a review of their current condition.

Figure 2 “1 to 5” Year Need Road (Resurfacing)

3.1.3 ‘6 to 10’

Figure 3 “6-10” Year Need Road (Resurfacing)



‘6 to 10’ Identifies improvements expected to be required in the near future.

3.1.4 'ADEQ'

Road section is categorized as adequate by The Inventory Manual rating system. It should be noted that an 'ADEQ' rating encompasses a wide range of conditions.

Figure 4 "Adequate" Road (Approx. 7 year old)

3.2 Types of Improvements – Roads

Deficient sections and structures each have an identified improvement type as part of the rating that is conducted.

On a general basis, one of the key factors in making a decision with respect to an improvement type, and in making a determination of whether the appearance and performance of a road relates to an underlying structural problem or simply to aged surface materials, is the visual survey. A road's structural or drainage problem would tend to lead toward a reconstruction/replacement type of strategy; whereas, aged surface materials would tend toward a resurfacing type of strategy. This determination is critical to the Municipality, as reconstructing a road that should have had some type of resurfacing strategy would be an ineffective use of available resources.

Improvement types include the following:

- R1 - Basic Resurfacing
- R2 - Basic Resurfacing –double lift
- RM - Major Resurfacing
- PR1 - Pulverizing and Resurfacing
- PR2 - Pulverizing and Resurfacing –Double lift
- BS - Tolerable standard for lower volume roads
- RW - Resurface and widen

- REC - Reconstruction
- RNS - Reconstruction Nominal Storm Sewers (Urban- no new sewer, adjust Manholes, catchbasins, add sub-drain, remove and replace curb and gutter, granular and hot mix)
- RSS - Reconstruction including installation of Storm Sewers (New storm sewers and manholes in addition to the above)
- NC - Proposed road Construction
- SRR - Storm Sewer Installation and Road re-instatement.

3.3 Bridge and Culvert Ratings

Bridge and culvert inspections were *not* completed by AECOM staff on Township of Strong's structure inventory as part of this study. However, structures are an important integral part of the road system infrastructure and as such this commentary has been included in the report as the management of the structures within the inventory is critical to the overall function of the road system.

Provincial legislation requires that inspections be undertaken on all structures that have a span greater than 3m in accordance with the OSIM/MBADES inspection manuals. AECOM recommends that these inspections be undertaken by a qualified consultant in order that the municipality demonstrates due diligence in the management of the structure inventory.

Figure 5 "NOW" Need Bridge (*from another municipality*)

In general terms, bridges and culverts are defined as follows:

- Bridge: transfers all live loads through a superstructure to a substructure and to the foundations.
- Culverts: transfers all live loads through fill.

Structures are rated as deficient or become NOW needs due to:

- Insufficient width of structure (6m minimum)
- Vertical clearance
- Level of Service (cannot accommodate peak hour traffic)
- Structural Capacity

3.4 Types of Improvements –Structures

In the MBADES scoring system there is a similarity to the inventory manual in that a time of need and improvement type are established. The OSIM inspection is more detailed, however the data does not follow that same format.

Unlike the roads inventory, a structure may have more than one improvement type and the analysis is divided into two functional categories of evaluation: Material Condition Rating (MCR) and Performance Condition Rating (PCR)

- REB - Remove Existing Bridge
- RSL - Replace Bridge or Culvert – Same Location
- RSP - Rehabilitate Superstructure
- RIR - Railing Improvement/Replacement
- WSR - Wearing Surface Rehabilitation
- PWP - Patch Waterproof and Pave
- CDS - Concrete Deck Soffit Repairs
- CSS - Coating Structural Steel
- IAG - Installation of Approach guiderail
- OTH - Other

It should be noted that a deficient bridge may have a load posting/restriction. The Highway Traffic Act (HTA) provides for municipalities to pass by-laws to restrict loads on a structure. The load restriction must be based on an engineer’s report stamped by two professional engineers. Generally, the load restriction by-laws are only in effect for a maximum of two years, then have to be re-reviewed or improvements undertaken.

4. Road Structure

To better understand the content and methodology of this report, an overview of how a pavement structure is designed and functions is required. The majority of municipal roads are a pavement structure referred to as flexible pavement. As such, the following discussion focuses on flexible pavements. Other pavement structure types include rigid and composite and are more typically found on 400 series highways or on arterial roads of larger urban centres.

4.1 Overview of a Typical Flexible Pavement Road Structure

The pavement/road structure transmits the wheel loads of vehicles from the road surface to the road sub-grade (or native soil). The pavement structure has to be designed such that the load that is transmitted to the sub-grade, is not greater than the sub-grade's ability to support the load. Figure 6 and the accompanying table shows a typical flexible pavement structure.

Figure 6 Typical Wheel Load Stress Distribution for a Flexible Pavement

Source: MTO Soils Manual circa mid 1960's

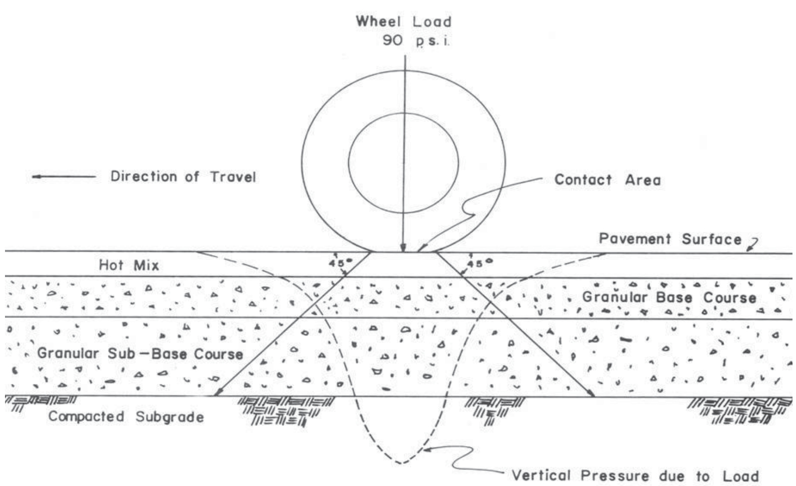


Table 1 Typical Wheel Load Stress Distribution for a Flexible Pavement, Source: MTO Soils Manual circa mid 1960's

Depth Below Surface	Stress (psi)	Stress (Kpa)
At surface	90	620.5
8" (200mm) Below	11	75.84
11"(275mm) Below	7	48.26
16"(400mm) Below	4	27.58

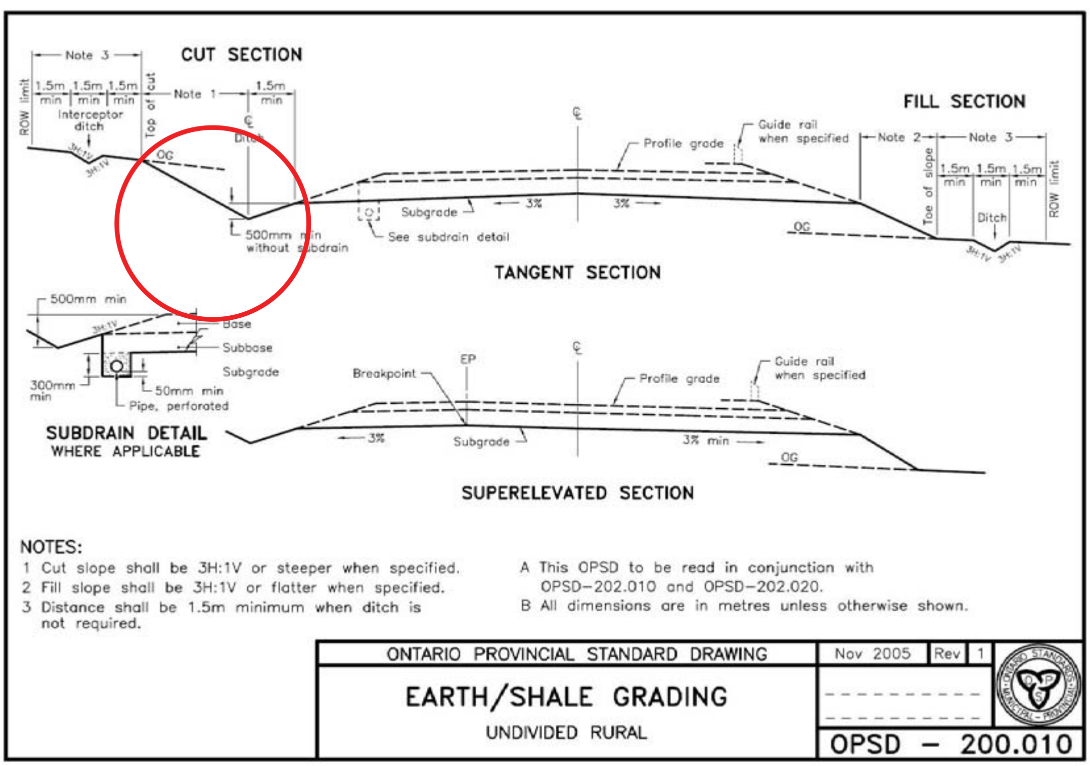
The highest loading is experienced at the point of contact with the vehicle's tire. With modern radial truck tires that run inflated to 110 psi, the loads at the road surface can be over 20 times higher than at the compacted sub-grade. **Figure 6** is a profile view of the way in which the load is distributed through the pavement structure. The loading actually occurs in a conical fashion, dissipating both vertically and horizontally as it passes through the pavement structure, with the highest loading occurring at the point of contact. Loading decreases exponentially as it passes through the road structure. Therefore materials of lesser strength or lesser quality can be used deeper in the road structure. Re-stated, the closer to the surface of the road the road building materials are placed, the higher the quality of road building materials required. Similarly, the poorer the sub-grade or native material, the deeper/stronger the road structure has to be to carry the same loads.

4.2 Drainage

It has often been stated that the 3 most important elements of road building are drainage, drainage and drainage. Proper drainage is imperative in order to maximize the long-term performance of the road structure. Roads are designed, constructed and maintained in order to minimize the amount of water that may enter the road structure.

When water enters a road pavement structure a number of reactions can occur. In summer, the granular road base can become saturated and when too much water displaces the granular material, it removes the material's ability to support the loads it was designed for. Too much water in the granular material actually acts like a lubricant and facilitates the displacement of the material under load. In winter, water in the road structure can cause frost heave, potholes and pavement break-up as the water expands as it freezes. Generally, a saturated granular road base results in structural failure of the road.

Figure 7 OPSS 200.10



Rural road drainage is generally achieved through roadside ditches. The ditches should be a minimum of 500mm below the granular road base to ensure that the road base remains free from moisture and maintains its ability to carry loads.

Figure 8 Inadequate Roadside Drainage

The side slopes of the ditches are also critical to the stability of the road platform. The drawing indicates a 3:1 side slope and this would be ideal. In most cases a 2:1 slope would also be satisfactory. When slopes are too steep the soil will move over time and find its natural angle of repose. The movement of the soil will contribute to an early failure of the pavement structure. Inadequate compaction will also be a contributing factor to early failure. The following pictures illustrating the steep side slope were not taken in the Township of Strong, but illustrate the longer term effect of a road structure with side slopes that are too steep.

Figure 9 Steep Side Slopes -to be avoided in new construction

Maintenance of the drainage system(s) is also critical to the long term performance of the road system. Low volume rural roads tend to have a winter maintenance program that includes the application of sand to improve traction. Over time that sand builds up on the edge of the pavement to a point where it effectively blocks the runoff from getting to the ditch. The runoff is trapped at the edge of pavement where it saturates that area of the road bed contributing to the early failure of the edge of the pavement.

Figure 10 Shoulder Berm contributing to edge failure

Urban roads have a storm sewer pipe network that carries the minor storm event. The roadway itself is often part of the overland flow route for the major event. The drainage of the granular road base is accomplished through sub-drains installed below the curb and gutter, lower than the lowest elevation of the granular base.

4.3 Horizontal and Vertical Alignments

Horizontal and vertical Alignment are the changes in direction and elevation of the road. A large number of roads in rural Ontario, more so further north, were originally constructed along the alignments of the trails from the original settlement of the area. As such they tend to closely follow (or avoid) the existing contours of the land. (In southern Ontario there is a greater tendency to follow the alignments of the original Township surveys due largely to the much flatter landscape.) The result is a road alignment that tends to change vertical and horizontal direction frequently. Those changes generally do not provide sufficient visibility for Safe Stopping Distance (SSD) from the posted speed limit as per the manual entitled Geometric Design Standards for Ontario Highways.

The following table is an excerpt from the Geometric Design Standards for Ontario Highways and indicates the SSD's required for various design speeds.

Table 2 Minimum Stopping Sight Distance on Wet Pavement

Table C2-1
MINIMUM STOPPING SIGHT DISTANCE ON WET PAVEMENTS

Speed v		Perception and Brake Reaction		Coefficient of friction wet pav't	Braking distance on level	S-Min. Stopping sight distance	
Design	Assumed condition	Time	Distance			calculated	rounded
km/h	km/h	s	m	f	m	m	m
40	40	2.5	28	0.380	17	45	45
50	50	2.5	35	0.358	27	62	65
60	60	2.5	42	0.337	42	84	85
70	70	2.5	49	0.323	60	109	110
80	79	2.5	55	0.312	79	134	135
90	87	2.5	60	0.304	98	158	160
100	95	2.5	66	0.296	120	186	185
110	102	2.5	71	0.290	141	212	215
120	109	2.5	76	0.283	165	241	245
130*	116	2.5	81	0.279	190	271	275
140*	122	2.5	85	0.277	211	296	300
150*	127	2.5	88	0.273	232	320	320
160*	131	2.5	91	0.269	251	342	345

**Design Speeds above 120 km/h are beyond the normal range of application*

It would be unrealistic to expect that all substandard alignments could be removed from all roads in a lower tier roads system, particularly those with lower traffic volumes. However, in order to reduce the exposure to risk for the municipality, those road sections with substandard alignments should be reviewed for installing additional advisory signage.

Figure 11 Substandard Vertical Alignment

Figure 12 Substandard Horizontal Alignment

4.4 Pavement Maintenance and Life Cycle

Pavement structure life expectancy will vary dependant on a number of factors including:

- adequacy of initial design
- adequate maintenance programming
- adequate drainage
- traffic volumes
- traffic type

A conventionally designed and constructed flexible road pavement structure for an arterial road should last at least 40 years before it needs to be reconstructed. During that 40 year life span there will be 2 or 3 hot mix overlays required. A local road, carrying less traffic volume and substantially less truck loads, should last at least 50 years before full reconstruction is required. Again, 2 or 3 overlays will be required within this life span. Proper maintenance programming will maximize these life expectancies.

Maintenance programs should include the following components:

- spot improvements to the asphalt surface
- spot improvements to the road drainage system
- crack sealing
- Resurfacing/overlays at the appropriate time.
- Pavement preservation strategies if appropriate:
  - Microsurfacing
  - Surface Treatment
  - Slurry Seals
  - Reclamite

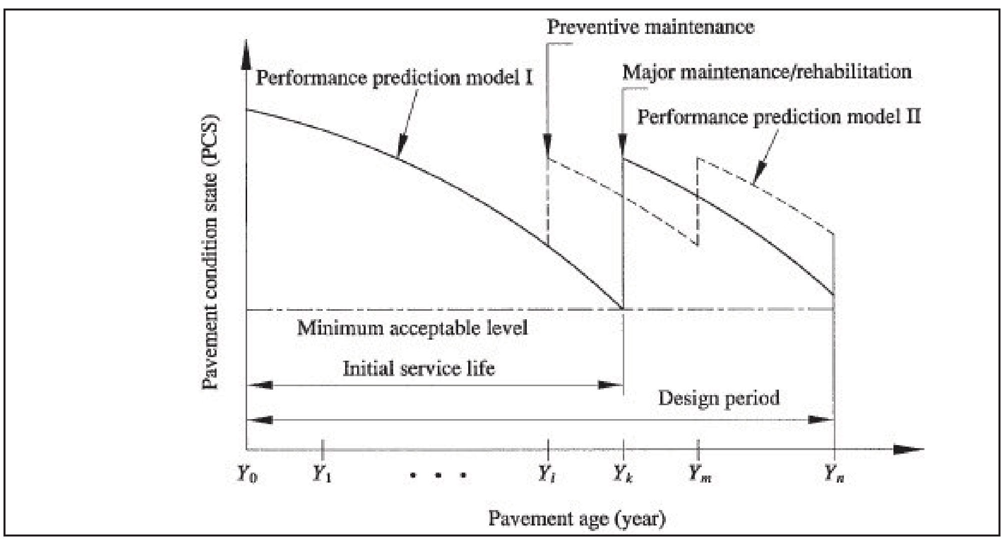
More recently, the concept of perpetual pavements has been the topic of discussion at conferences and seminars. The pavement structure design is different from a conventional flexible pavement design in that it generally requires a greater depth of asphalt. This results in a road structure that is less susceptible to fatigue failure.

The goal of perpetual pavement is to provide a pavement structure that is designed and maintained such that only the top layer of the existing asphalt would ever be replaced/rehabilitated over longer life cycle period. The top layer of asphalt is a ‘replaceable’ wearing surface that protects the underlying road structure, maintaining its structure in perpetuity. An award winning example of perpetual pavement in Ontario is the Don Valley Parkway; constructed in the 1950’s and 1960’s with only resurfacing being done since its construction.

Given the nature of urban roads and the number of other utilities occupying the road allowance, the perpetual pavement concept may lend itself more easily to rural roads. (Urban roads tend to have an increased number of utility cuts and repairs). Initial construction costs of perpetual pavements will be higher; however, they will be more cost effective on a life cycle basis.

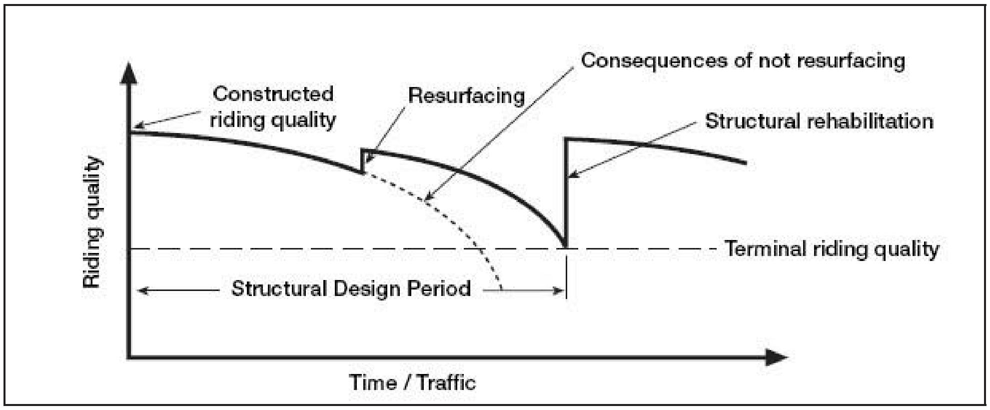
Optimal timing of maintenance and rehabilitation efforts is the key to maximizing life expectancy of the existing pavement structure. A number of road agencies and institutions have developed deterioration curves and/or graphical depictions that illustrate the life cycle of a pavement structure.

Figure 13 Impact of Different Maintenance Strategies on Pavement Performance



Source: *Development of a new asphalt pavement performance prediction model*; Ningyuan Li, Ralph Haas and Wei-Chau Xie

Figure 14 Alternative Maintenance Strategies



Source: *Wirtgen Cold Recycling Manual*

The message, consistent with both graphs in Figures 13 and 14, is that timely, appropriate maintenance and rehabilitation extends the life expectancy of the pavement structure.

Timing of major maintenance such as an overlay is dependant upon the purpose of the road and can vary from 12 to 25 years. However, on average an arterial road requires resurfacing at an age of 16 to 20 years. Other studies have indicated that 17 years is the optimal time interval for resurfacing.

5. REGULATORY AND ADVISORY SIGNAGE

Most municipal road systems have a significant number of signs advising the road user of various aspects of the road section.

Regulatory signage provides advice to the motoring public on regulatory requirements such as speed zones, and stop, and yield requirements. Provincial legislation such as the Highway Traffic Act provides municipalities with the authority to create speed zones and stop and yield conditions. A municipal by-law must be passed by the Council of the municipality to be able to enforce the regulations.

Warning or Advisory signage provides advice to the motoring public on recommended speeds for substandard corners, hazards, areas or reduced visibility etc.

The following are excerpts from the Ontario Traffic Manual (OTM) which further explain signage;

"*The Highway Traffic Act(HTA) Section 182 (R.S.O 1990), provides for the regulation of various signs, their type and location on the roadway. The criteria and specifications for application, dimensions, location and orientation are prescribed and illustrated under Regulations 615,608, 581 and 599 (R.R.O. 1990) and are indicated as such in this manual. Signs erected in accordance with the Regulations, and pursuant to the Highway Traffic Act, are enforceable under various provisions of the Act. Enforcement is* *permitted under the particular section under the authority of which a prescribed sign may be erected to indicate a traffic regulation or HTA Section 182 (R.S.O. 1990), which requires obedience to prescribed signs."*

"Regulatory signs are signs which inform the driver/road user as to things they should or must do (or not do) under a given set of circumstances. They often indicate traffic regulations which apply at any time (or at times specified) or place upon a street or highway, disregard of which may constitute a violation. They may be supported (1) by the Highway Traffic Act or its regulations, (2) by municipal by-law or (3) not at all. In the first two cases the signs are enforceable; in the third case, although the signs advise road users as to what they should do, they are not enforceable"

The foregoing is a very brief overview of signage and how it is used by a municipality. For more detailed information and guidance, the municipality should obtain copies of the manuals and/or seek advice from an appropriately qualified consulting firm.

To paraphrase the Highway Traffic Act, where regulatory speed signs have not been placed in a rural setting, the speed limit shall be assumed to be 80km/hr. Where regulatory speed signs have not been placed in an urban area the speed limit shall be assumed to be 50km/hr. This is significant in that, if the roads are not appropriately signed, or if there is not an appropriate by-law in place, the speed limits are not enforceable, and the roadway classifications for purposes of Regulation 239/02 will be inaccurate, creating additional exposure to risk for the municipality.

When AECOM staff were conducting their inspections of the road system they had assumed that a number of sections were an 80km/hr speed zone in the absence of signage. Subsequently AECOM was advised by municipal staff that the rural roads were 60km/hr speed zones. Although there were a number of 60 km/hr signs it did not appear that there was sufficient signage to indicate the municipal standard was 60km/hr in the rural areas and similarly the limits of the 50km zones in built up areas should be denoted. The Township should review this from a risk management perspective and provide appropriate signage.

Throughout the municipality, there a number of substandard vertical and horizontal curves, which are not signed. The municipality should review the substandard alignment for additional signage to reduce the exposure to risk. Additionally, when the municipality undertakes any rehabilitative or reconstructive activities on a road section, those sub-standard elements should be dealt with either through improved alignment or additional signage, to reduce the exposure to risk.

Regulatory signage that is installed, but not visible or obscured also poses a liability to the municipality.

Figure 15 Obscured Regulatory Signage

Speed Limit Sign

Stop Sign

As part of the road inspection process, signage should be reviewed for visibility

6. Township of Strong Road System Inventory and Classification

6.1 Surface Type and Roadside Environment

The Township of Strong is classified as an Urban and Rural lower tier road system. **Tables 3 & 4** provide information of the composition of the road system by surface type and by roadside environment. **Maps 1 & 2** of this report provide a graphical representation of the information in the tables.

Table 3 indicates that the road surface types throughout the Municipality are composed of primarily three types, these being Gravel, Low Cost Bituminous (Surface Treatment) and High Cost Bituminous (asphalt). **Map 1** shows the road network by road surface type.

Table 4 shows that Township of Strong has a largely rural road system with 93.61% of the road sections having a rural roadside environment. The remainder is semi-urban roadside environments. **Map 2** shows the Township of Strong Road System by roadside environment.

Rural Roads- areas of sparse development or where development is less than 50% of the frontage including developed areas extending less than 300m on one side or 200m on both sides, with no curbs and gutters.

Semi-Urban Roads- areas where development exceeds 50% of the frontage for a minimum of 300m on one side or 200m on both sides and no curbs and gutters, with or without storm/combination sewers or for subdivisions where the lot frontages are 30m or greater.

Urban Roads – Curb and gutter on both sides served with storm or combination sewers or curb and gutter on one side served with storm or combination sewers or reversed paved shoulders with, or served by, storm or combination sewers; subdivisions with frontages less than 30m.

Table 3 System Breakdown by Surface Type

Surface Type	Length (km)	Length (%)
Earth	3.59	2.38
Gravel (G/S)	105.47	69.84
Low Cost Bituminous (LCB) (Surface Treatment)	39.04	25.85
High Cost Bituminous (HCB) Hot Mix Asphalt	2.91	1.93
Totals	151.01	100

Roads are further classified by classes such as Local, Collector, Arterial and Residential or Industrial within the database.

Table 4 System Breakdown by Roadside Environment

Roadside Environment	Length (km)	Length (%)
Rural (R)	141.36	93.61
Semi-urban (S)	9.65	6.39
Urban (U)	0	0

6.2 Boundary Roads

Boundary roads by definition are roads that a municipality would have in common with the abutting municipality and generally involve a Boundary Road Agreement which identifies the responsibilities of both agencies. The agreements are usually in writing, however some are informal.

Boundary Road agreements are useful when costs are identified for maintenance or capital work on the road section, and from a risk management perspective they reduce the risk for one of the parties in the event of a claim, dependant upon the content of the agreement.

When a boundary is reconstructed on a day labour basis by the adjacent municipalities, the project should be treated no differently than if the work were being tendered. The exposure to risk for the municipality is no different. The assignment of the various aspects of the work should be clear and the timing for completion of the tasks clearly identified and adhered to.

Table 5 Boundary Road Lengths (All External)

Adjacent Municipality	Road Name	From	To	Length
Town of Sundridge	Albert Street	HIGHWAY 11	Dunbar Street	0.31
Town of Sundridge	Albert Street	Dunbar Street	Oakridge Drive	0.38
Municipality of Magnetawan	Chapman Strong Road	Brookside Road	Bloomfield Road	2.01
Municipality of Magnetawan	Chapman Strong Road	South End	Brookside Road	1.06
Township of Machar	Machar Strong Boundary Road West ROAD WEST	Old Muskoka Road South	1.15KM West of Albert Road	1.71
Township of Machar	Machar Strong Boundary Road West	Morris Lane	Old Muskoka Road South	3.07
Township of Machar	Machar Strong Boundary Road West	Cheer Lake Road	Park Road South	1.63
Township of Machar	Machar Strong Boundary Road West	Park Road South	Morris Lane	0.65
Township of Machar	Machar Strong Boundary Road West	1.15KM West of Albert Road	Albert Street	1.15
Township of Machar	Machar Strong Boundary Road West	Albert Street	Tower Road	2.04
Township of Armour	Pevensey Road	HIGHWAY 11	Muskoka Road	1.18
Township of Armour	Pevensey Road	Muskoka Road	2.8km East	2.8
Township of Joly	Schmidts Road	Kent Mills Road		0.73
Township of Armour	South Horn Lake Road	Magnetewan Boundary	Rodeo Road	1.16
Township of Armour	South Horn Lake Road	Rodeo Road	Armour Boundary	0.21
Township of Armour	Sterling Creek Road	HIGHWAY 11	West End	0.35
Township of Joly	Strong Joly Road	Peacock Road	175 M North of Forest Lake Road	1.86
Township of Joly	Strong Joly Road	Airport Road	Railway Tracks/Machar Boundary	1.01
Township of Joly	Strong Joly Road	Airport Road	PEACOCK ROAD	0.99
Township of Joly	Strong Joly Road	Forest Lake Road	175 M North of Forest Lake Road	0.18
			TOTAL	**24.48**

Reporting on boundary roads can be dealt with in one of two ways: their length could be split and provide a more accurate depiction of the road system that is actually maintained by the agency, or they may remain with no adjustment. When MTO was providing subsidy, typically the roads were adjusted. For the purposes of this report ***no*** adjustment has been made to the road system sizes to account for the 50% sharing of the length of the boundary roads.

6.3 Road System Value (Excluding Structures)

Section 6 of this report identified the road system breakdown by surface type and by roadside environment. **Table 6** (below) provides a conservative estimate of road replacement costs by those parameters on a per kilometre basis. The costs have been prepared based on weighted average widths of each surface type from the municipal database. The values shown in **Table 6** include the construction costs based on Township of Strong's unit costs obtained from recent contracts, and adjustment factors including basic construction, contingency, engineering, and terrain type.

In rural lower tier municipalities it is common practice to reconstruct or rehabilitate roads on a 'day labour' basis using the municipality's own staff. In order to accurately compare those costs with the costs of using contracted services, it is imperative that the full costs of the municipal operation be accounted for. Those costs should include;

- Equipment time
  - Hourly rates should include fuel, maintenance, repair and capital depreciation
- Manpower costs for Labour and Engineering
  - Hourly rates should include benefits, overhead for housing
- Materials
  - Unit costs for materials such as aggregate should include complete pit operation costs, equipment rentals, site restoration, land costs

Table 6 Road Replacement Costs per Kilometre (Existing System)

Surface Type and Roadside Environment	Replacement Cost per Kilometre
Gravel-Rural	$143,600
Surface Treated (Low Cost Bituminous) - Rural	$260,200
Hot Mix (High Cost Bituminous) - Rural	$425,100
Hot Mix (High Cost Bituminous) – Semi- Urban	$494,400

Based on the above noted per kilometre costs, a conservative estimate of the replacement value of Township of Strong's road system is **$26,932,175 as it exists today**. (This estimate includes contingencies and engineering, but not removals.) **Appendix E** of this report includes the parameters used to develop the value of the Township of Strong road system. The road replacement costs noted in Table 6 are estimated generally in accordance with the Inventory Manual and include adjustment factors for basic construction, contingency, engineering, terrain, and roadside environment. The adjustment factors can add from 18% to over 50% to the construction costs based on the site specific circumstances.

6.4 Public Works Facilities Inventory

AECOM facilities staff inspected two Township of Strong Public Works Facilities in August 2008. The detailed inspection reports can be found in Appendix H of this study.

The following table summarizes the value of the improvements required to the facilities. Essential items reflect costs of Life/Safety needs.

Table 7 Facility Replacement and Needs Summary

Facility	Replacement Cost	Essential	Required	Desirable	Totals
Sundridge Shed	80,000	----------	$14,000	-----------	**14,000**
Sundridge Garage	$430,000	$2,500	$119,000	$50,500	**$172,000**
Sundridge Dome	$330,000	----------	$150,000	------------	**$150,000**
TOTALS	**$840,000**	**$2,500**	**$283,000**	**$50,500**	**$336,000**

6.5 Road System Value- PSAB 3150 Implications

PSAB 3150, Accounting for Tangible Assets, comes into effect in 2009 and affects how all municipalities will report on their capital assets. Implementation of PSAB 3150 will improve transparency, openness and accountability of municipal operations.

Until 2009, municipalities will report on their capital assets as they always have, in the years that the funds are expended.

Beginning in 2009, municipalities will have to report on the amortized value of all of their capital assets. PSAB Section 3150 requires that all tangible capital assets be accounted for and amortized on the books of accounts effective January 1, 2009. This is consistent with the move from the current modified accrual basis of accounting toward full accrual accounting for municipalities. Not only will this allow for the full reflection of the costs of using these assets, it will serve to provide for a move toward comparability with other entities.

Municipalities must review the historical costs of assets and determine the residual value. One of the simpler approaches to determine the residual value is to calculate the current replacement value of the road system and then discount the current value based upon an estimate of the age of the road sections.

Table 8 PSAB 3150 Summary for Roads

Road System	Length	Replacement Cost	Historic Cost	Accumulated Depreciation	Net Book Value
Hot Mix Asphalt Roads	2.91	$1,326,872	$806,419	$446,921	$359,498
Surface Treated Roads	39.04	$10,218,295	$3,182,629	$2,047,387	$1,135,243
Gravel Roads	105.47	$15,330,095	$7,702,297	$3,349,537	$4,352,760
Earth Roads	3.59	$56,913	$6,989	$6,989	$0
Sub Totals	**151.01**	**$26,932,175**	**$11,698,334**	**$5,850,833**	**$5,847,500**

6.6 AECOM PSAB 3150 Model Overview

Overview

The AECOM PSAB 3150 valuation model for roads and structures establishes accrued deprecation for assets using data commonly available in municipal road inventory databases. The model contains a methodology to address the fact that many road inventory databases do not contain construction date information for older infrastructure. The model also provides an opportunity to separately value the road base and road surface for hot-mix asphalt road sections where the two components are of significant value and have different life spans. Most structure inventories do contain a construction date, therefore determination of historic construction date is a non issue.

The following section describes the valuation process, which is based on methodologies developed by AECOM with reference to available documentation including:

- *Assessment of Tangible Capital Assets: Statement of Principles* prepared by the Public Sector Accounting Board (2008); and
- *Municipal Guide To Accounting For Tangible Capital Assets Version 2* prepared by the Ontario Municipal Benchmarking Initiative (2008).

Valuation Process

Step 1: Estimation of Current Replacement Costs

A basic construction cost is estimated for each road section based on current unit prices and quantities. Quantities are calculated with consideration given to the following factors:

- Standard design criteria (i.e. granular depths, asphalt depths, etc.). The design criteria employed are adapted from those found in the *Inventory Manual for Municipal Roads*, MTO (1991).
- Existing road section geometry (length, surface width and platform width).
- Existing cross section/roadside environment type (rural, semi-urban or urban).

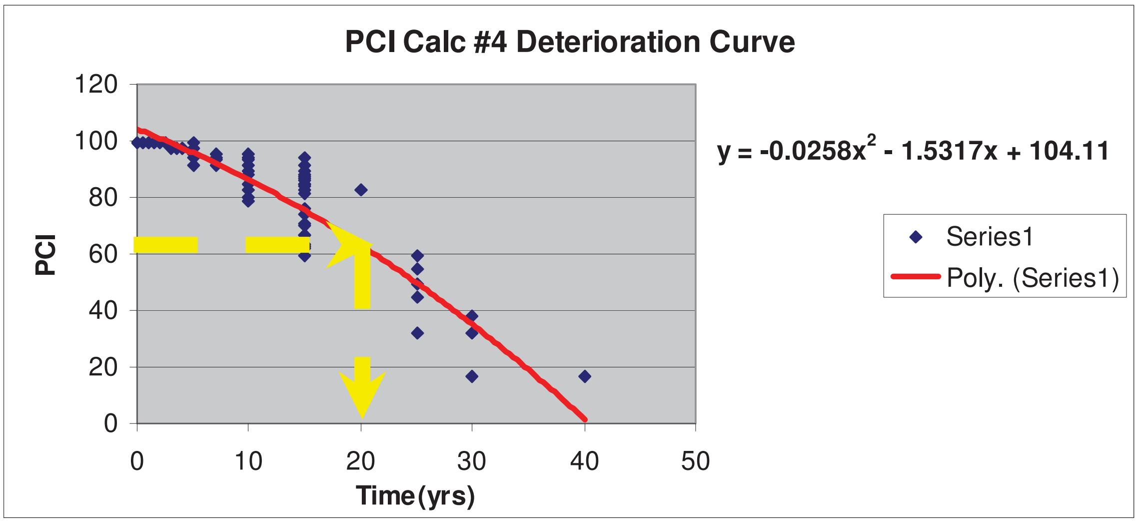
Given that the cost being estimated is the cost to replace the existing asset and not the cost to improve the asset to meet current requirements, no consideration is given to desired geometry or standards. Calculations of this nature are generally performed as part of a road needs study exercise.

For structures, a basic construction cost is estimated based on current unit prices and costing experience. Quantities are calculated based on the 'footprint' of the structure and its' construction type, material, function, area of the province, depth and roadside environment.

Step 2: Establishing Historic Construction Dates

Construction dates for each road section are established from available records or through estimating based on the condition of the road. The condition is determined by developing a Pavement Condition Index (PCI) value that is dependant upon the surface condition and structural adequacy of the respective section. The current condition of the road section reflects the approximate age the road which, using the formulae that AECOM has developed, allows a year of construction to be estimated for the road base, and where appropriate, the road surface.

Figure 16 Deterioration Curve



Step 3: Estimation of Historic Construction Costs

Historic construction costs are estimated by deflating the current replacement cost of each asset. Deflation calculations are based on upon deflation factors obtained from a cost index. Specifically, the appropriate deflation factor for the asset year of construction can be obtained from a number of construction price indices based on data available from the Engineering News Record (ENR), the Federal government and other sources. The data available from the ENR provides deflation factors from 1955 through to present. Alternately the municipality may have elected to use another deflation index such as the NRBCPI index for Construction Assets from the MFOA/AMCTO Deflation Report. This model uses the NRBCPI Index.

Step 4: Depreciation Calculation

Straight line depreciation formulae are used to develop the accumulated depreciation, and subsequently the Net Book value. The calculation relies on the previously determined construction date, which provides the useful life remaining and the associated life expectancy.

General Parameters

The following provides an overview of the major parameters that are used within the model.

Life Expectancies

Tables 9 and 10 below present standard life spans for the surface and base components of common types of road sections and structures. The information presented below is based upon AECOM's experience and information presented in previously accepted PSAB calculations and can be varied as required to meet specific municipal needs.

Table 9 – Road Life Expectancies by Surface Type

Surface Type	Road Base Life Span	Surface Life Span
Hot Mix Asphalt	40yrs	20yrs
Surface Treatment	40yrs	n/a (life span is short and replacement is typically considered an operating cost.)
Asphalt Over Concrete	40yrs	20yrs
Concrete	50yrs	n/a (concrete base acts as surface)
Gravel	40yrs	n/a (no surface, gravel resurfacing costs typically considered an operating cost)

Cost Estimation Items

Replacement cost estimations are based upon the items presented in Table 3 below. Unit costs for each item can be entered into the model and varied as required to meet specific municipal needs.

Table 10 Cost Estimating Items -For Roads

Item	Road Side Environment		
	Rural	Semi-Urban	Urban
Road Bed Excavation	✓	✓	✓
Ditch Excavation	✓		
Granular 'A'	✓	✓	✓
Granular 'B'	✓	✓	✓
Storm Sewer (525mm) [1]			✓
Maintenance Holes [1]			✓
Catch Basins [1]			✓
Curb and Gutter			✓
Sub Drain			✓
Hot Mix Asphalt [2]	✓	✓	✓
Surface Treatment [2]	✓	✓	✓
Concrete Base [2]	✓	✓	✓

Notes:

1. Items can be removed if storm sewer infrastructure is to be separately inventoried and valued. Estimate is for 525mm diameter sewer under 60 percent of the section's length with catch basins and maintenance holes spaced every 90m. Design criteria can be varied if required.

2. Inclusion of items depends on the existing surface type of the road section.

3. No removal costs are included in the calculation.

4. Allowances for engineering, construction contingencies and terrain are included in all cost calculations in accordance with standards presented in the *Inventory Manual for Municipal Roads*, MTO (1991).

7. Road System Time of Need and Adequacy

This section of the report will provide two key pieces of information that have been extracted from and/or calculated from the information collected: Time of Need and System Adequacy.

The tabular information provided in the Time of Need section indicates the dollar value of the backlog of work that should be undertaken and provides an estimate of the work that should be undertaken within the typical capital planning horizon for most municipalities. Cost estimates for the work required are generated by the pavement management software based on road type, class, and current unit costing and such will vary considerably on a section by section basis.

The System adequacy calculation will provide a report card on the adequacy or appropriateness of the road programming since the last roads needs study. A decrease in the system adequacy reflects inadequate funding or an inappropriate pavement management strategy.

This report indicates estimated total cost of improvements for the road system as **$34,974,555** based on calculations using the Municipality's own benchmark costs. Of those needs**, $23,240,171** is for those roads that are already deficient (NOW needs). The remaining **$11,734,384** is for roadworks that are required in the 1 to10 year time period.

7.1 Time of Need -Roads

Table 11 Summary of Costs by Time of Need (Including Contingencies and Engineering)

Item	NOW	1 to 5	6 to 10	Total
Construction Needs	23,240,171	6,786,652	4,835,717	34,862,540
Resurfacing Needs	-------------	60,409	51,606	112,015
Totals	**$23,240,171**	**6,847,061**	**$4,887,323**	**$34,974,555**

Maps 5 & 6 of this report show the road system by time of need. The costs shown in **Table 11** include adjustment factors of basic construction, and engineering.

It should be noted that the Inventory Manual provides direction that roads with a traffic volume of less than 50 vehicles per day are deemed to be adequate, even if they have structural, geometric or drainage deficiencies that would otherwise rate them as having a need. Deficiencies in roads with low traffic values are to be corrected within the maintenance budget.

Table 13 indicates the value of the total construction needs to be $34,974,555 compared to an estimated in-placement value of $26,932,175 in Table 8. Estimated replacement costs are to the standard for the class of road that is required for the traffic volume; In-placement costs are for the dimensions of the road system as it currently exists. As an example, a low volume gravel road should have a platform width of 9m and 550mm of granular base, whereas the average gravel road platform in Strong is 7.5m and there does not appear to be 450mm of gravel base on the roads.

7.2 System Adequacy

The system adequacy is a measure of that portion of the system that is not categorized as a need in the "NOW" time period. The total road system adequacy is calculated as follows:

$$System\ Adequacy = \frac{Total\ System\,(km) - NOW\ \ Deficiencies\,(km)}{Total\ System\,(km)} \times 100$$

The System adequacy calculation provides a report card on the adequacy or appropriateness of the road programming since the last roads needs study. A decrease in the system adequacy reflects inadequate funding or inappropriate pavement management strategy.

As such, measuring and reviewing the trend in the system adequacy calculations over time is one of the most effective measures of the performance of the overall roads program.

The Township of Strong currently has a road system adequacy of 48.18%. From a road system of 151.01 km (unadjusted for boundary roads), 78.25 km are rated as deficient in the 'NOW' time period (with >50aadt). The traditional target adequacy for upper tier road systems (Regions and Counties) is 75% and a lower tier's target adequacy is 60%. Based on these former MTO targets that were in effect when the municipal grant system was in place, the minimum target adequacy for Township of Strong, should be 60% as a minimum. The minimum target adequacies were established by MTO to reflect the nature and purpose of the road system.

8. Recommended Program Funding Levels

Recommended program funding level calculations are based on the length or number of the infrastructure types within the database and average widths of same as also determined from the database.

8.1 Capital Replacement –Roads

Recommended funding for the road system would include sufficient capital expenditures that would allow the replacement of infrastructure as it meets its design life.

For example, a typical road structure is expected to last approximately 50 years before it has to be reconstructed/replaced. If the lifespan is 50 years, then 2% of the replacement cost should be the annual contribution to a capital reserve to ensure that it can be reconstructed in that time frame. From a slightly different perspective, the annual capital program should be reflective of the lifespan of the element being considered.

Based on the foregoing, and the data shown in Section 6 of this report, the estimated minimum annual capital program for roads related infrastructure should be **$538,600** per year for Township of Strong to just maintain the current system adequacy. This estimate does not include bridges, culverts, sidewalks or street lighting.

The recommendation provided is based upon the replacement value of the Township of Strong road system, including adjustment factors, over a 50 year life cycle. Perhaps a simpler explanation would be an analogy to a car. A car is purchased and payments are made throughout the life of the car, which equates to the annual contribution. Throughout that life of the car, maintenance is required such as oil changes, brake and strut replacements and perhaps painting. This would parallel the need on a road to crack seal and overlay during the life cycle. These activities can extend the useful life of the pavement, thereby reducing lifecycle costs.

The calculations provided in this report are based on the total size of the road system. This should represent an opportunity to develop a financial plan to increase the capital and resurfacing budgets in conjunction with longer term program development.

8.2 Hot Mix Resurfacing (major maintenance)

Both roads and bridges require major maintenance activities throughout their life in order to reach those design life spans. Roads require resurfacing and bridges require waterproofing to be replaced and/or bridge deck rehabilitations at the correct interval. Some municipalities include these activities in the operating budget whereas others include them in the capital budget due to the dollar value.

The time interval between hot mix resurfacing cycles is dependant upon traffic loading and more particularly truck loading. Roads with higher percentage truck traffic have a shorter anticipated lifespan than local residential roads. Studies have shown that the optimal timing for a hot mix overlay on a road is between 12 and 20 years, depending on the road type. MTO 400 series roads would tend toward the 12 year cycle, with lower volume county Roads tending toward the 20 year replacement cycle.

Most municipalities resurface their local residential roads over a longer timeframe than they would an arterial road and a 25 year cycle for that activity is more typical. However, with the deferral of resurfacing past the ideal time interval comes risk. At 25 years the pavement surface may require additional rehabilitative effort beyond resurfacing. As such, the optimal budget calculation will focus on the 17 year interval for hot mix roads.

Given the foregoing, and the information with respect to surface type contained in **Table 6**, the funding for the annual resurfacing program size should be **$26,300** per year to maintain the system at its current adequacy level. This estimate is for the major resurfacing work only and does not include any estimated costs for other pavement preservation activities or programs. Given the short length of roads with a hot mix asphalt surface type in the Township of Strong, it would not be expected that this expenditure would occur annually; this dollar value represents the average annual contribution to the program.

8.3 Structure Deck Waterproofing and Rehabilitation (major maintenance)

Similar in nature to the hot mix resurfacing program, generally bridge decks require the waterproofing and pavement to be renewed at regular intervals. Bridge deck rehabilitations would generally be required at every other resurfacing cycle.

Figure 17 Bridge Deck Maintenance

8.4 Surface Treated Roads

On average, the life expectancy of a single surface treatment is 7 years. Following the life cycle replacement scenarios in the other asset areas then, the surface treated road network should be completely re-surfaced every 7 years—approximately 14% of the network per year.

At a unit cost of $2.50 per square metre, including padding, the annual program size should be **$95,900** exclusive of hot mix asphalt padding and other preparatory work. This amount also does not include any surface treatment that would be applied as part of the gravel road conversion program.

8.5 Gravel Surface Roads

The standard practice for gravel road maintenance was that approximately 75mm of gravel be placed on each road section every three years when MTO was providing maintenance subsidy.

Since the conditional grant system was discontinued, a large number of municipalities have reduced the amount of gravel that has been placed on gravel roads to the point where they are a major maintenance problem, particularly in the latter part of the winter and early spring. If the granular base is not replenished the road structure will disappear through normal usage and the remaining gravel generally becomes contaminated with other materials such as the native soil.

The Township of Strong has 105.47 kilometres of gravel surfaced roads as per **Table 3** of this report. At a 3 year cycle, and using the municipality's benchmark costing, the annual gravel resurfacing program size should be **$681,400** per year. This estimate does not include costs for re-grading, dust control or ditching. This amount does not include any costs for a gravel road conversion program.

9. Pavement Management Systems and Strategies

The American Association of State Highway and Transportation Officials (AASHTO) defines asset management as "... a strategic approach to managing transportation infrastructure. It focuses on business processes for resource allocation and utilization with the objective of better decision-making based upon quality information and well-defined objectives."

The document entitled *Managing Public Infrastructure Assets 2001* prepared by AMSA, AMWA, WEF, AWWA, defines asset management as "managing infrastructure assets to minimize the total cost of owning and operating them, while continuously delivering the service levels customers' desire, at an acceptable level of risk."

The absolute minimum objective of any pavement management strategy should be to ensure that the overall system adequacy does not decrease over time.

9.1 Overview of Pavement Management Systems (PMS)

Generally for a municipality, the road related infrastructure represents their largest asset or asset group. Efficient and effective management of the road system involves complex decision-making processes.

Collecting, maintaining, and analyzing, pavement condition data are the objectives of a PMS in order to maximize the performance of the municipal road network.

In practice still today, a large amount of the decision-making with respect to the maintenance of the road system occurs at the road supervisor level, based on their detailed knowledge of the roads system. Funding levels rarely match the demands.

The following table identifies how a pavement management system benefits the many potential user groups and perspectives.

Table 12 Benefits of a Pavement Management System

	Political	Programming	Budgeting & Financial	Engineering
System composition	•			•
Detailed Physical inventory				•
Overall System Adequacy	•			•
Condition Ratings		•		•
Rehabilitation options/costs		•	•	•
Budget Limitation Implications	•	•	•	•
Strategy	•	•		•
Project Coordination/ utilities		•		•
Priorities	•	•		•
Deterioration prediction	•	•	•	•
Managing Cash Flow			•	•
Fiscal Policy development	•	•	•	•

The PMS is another tool in the toolbox to assist municipal Council's and staff in decision-making with the funding available. A PMS is a valuable decision-making tool at a number of levels in an organization including staff from technical, management, financial areas and politicians, who are ultimately responsible for the continued performance of the road system.

A PMS is important in providing analysis of strategies or funding levels and projecting the long term effect on the road system. The PMS provides the means to develop effective pavement management strategies for any agency.

9.2 Hot Mix Roads Pavement Management Strategies

One of the difficulties that road agencies encounter is the parochial nature of direction that can be provided. That direction is often counter to effective pavement management decision making.

There is a strong tendency to adopt a 'worst first' approach to project selection and unless the entire program is adequately funded, then the 'worst first' approach will lead to a further deterioration of the adequacy of the road system. Given the information with respect to system adequacies and effect programming may have on the system adequacy, the 'worst first' approach and its long term consequences should be carefully considered/reconsidered by any municipality before acting on it.

Of course there are other drivers in capital programming decision-making which are unavoidable, such as development demands. However, with a number of these other influencing factors, there should also be an alternate funding source, rather than the roads capital reserve.

As indicated earlier in this report, the minimum objective of any pavement management strategy should be to ensure that the overall system adequacy does not decrease over time. Given that most road agencies are inadequately funded, the majority of the discussion in the hot mix roads pavement management strategies section will focus on a road system with less than optimal funding.

9.3 Hot Mix Roads Pavement Management with Limited Resources

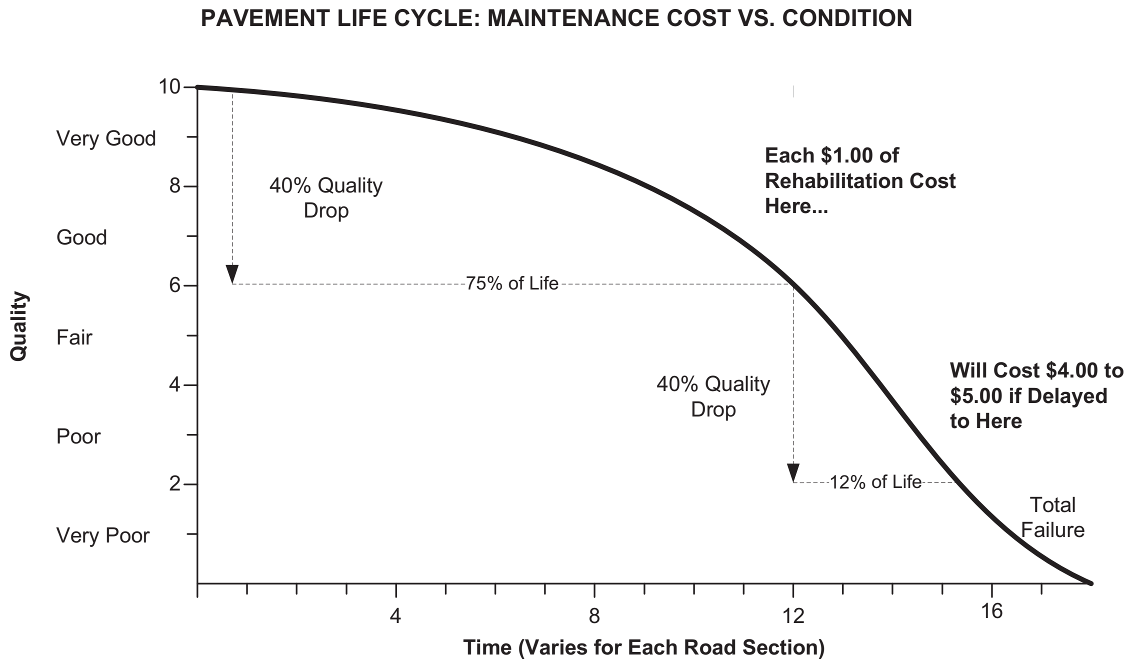
Once again, bearing in mind the minimum objective of maintaining system adequacy, if the overall roads program is not sufficiently funded, then the available funds should be expended on the maintaining the adequacy of the system. More simply stated – 'right size' the hot mix resurfacing program.

If the funding for the hot mix resurfacing program (or rehabilitation projects) is inadequate, then by default some of the **resurfacing candidates will become reconstruction projects at 3 to 4 times the cost for a rural road; up to 7 times as much for an urban section**. Therefore, it is critical that hot mix resurfacing occur in the optimal timeline or there will be deterioration in the overall system adequacy and with that, increased long term costs.

Deferral of a road project that is already categorized as a 'NOW' need, will not result in further deterioration of a road system's adequacy, however there will be increased maintenance costs for the road section and potentially more public complaint. Deferral of a hot mix resurfacing project will result in major cost implications for the road agency and may reduce the overall system adequacy, increased public concern and maintenance costs. Figure 18 from an APWA publication provides a graphical representation of the foregoing discussion.

A hot mix overlay at the optimal point in the deterioration curve is the most cost effective use of available funding. Adequate funding should be provided for the hot mix resurfacing program in order that the annual program is appropriately sized to ensure the continued adequacy of the existing road system and to prevent further deterioration.

Figure 18 Pavement Condition versus Rehabilitation Cost



Adapted From: American Public Works Association, 1983.
The Hole Story: Facts and Fallacies of Potholes

9.4 Pavement Preservation

Given the foregoing discussion, and optimizing the hot mix resurfacing program in order to preserve the system adequacy, the hot mix pavement strategy should also review opportunities for other pavement preservation activities.

Extending the life of an existing pavement further optimizes the usage of available funding. Other strategies that should be considered for integration into road programming include surface treating, micro-surfacing, crack sealing, rejuvenators and other surface seals and treatments.

9.5 Project Prioritization

In a perfect world, with full funding, projects should be undertaken in order of priority, by program. The highest priority is to ensure that the hot mix resurfacing program is adequately funded. If funding is limited, then resurfacing should be prioritized over other programs such as construction. The world isn't perfect and the complexity of projects continues to increase as other agencies and utilities utilize the road allowance.

Projects should generally be undertaken in order of priority ranking by program; however the scoring system utilized in the PMS only rates/ranks more tangible criteria that exist in the database. There may be other criteria that are specific to a municipality that are less tangible, but are important considerations in project prioritization. For example, a municipality may want to advance projects that also include bike lanes ahead of those roads that do not have, or will not have bike lanes.

The Roads Needs Study provides ratings that deal strictly with the condition of the roads and those indications have to be metered with needs that may exist for other utilities. For example, a road that is rated as a resurfacing candidate may have deficient sewers and watermains. The implication is that a significant percentage of the road would be excavated as those utilities are replaced. It would be appropriate then to re-rate the road as a reconstruction project.

The condition of other infrastructure within the road allowance may be the key element in the prioritization. For example, a road rated as a reconstruct project may have a relatively low priority rating but a trunk watermain in the street may require immediate replacement. It would be pragmatic then to advance that road re-construction project ahead of other road projects.

Frequently, a higher priority project may be undertaken adjacent to a much lower priority project that may not be scheduled to occur for years based on its own priority rating. If the lower priority project were to be advanced as a stand-alone project the unit costs may tend to make it disproportionately expensive due to the small quantities and location. Those circumstances may present an opportunity to advance the lower priority project to capture economies of scale that may not exist otherwise.

To summarize then, road projects should generally be undertaken in order of priority, however, in developing the capital program, other factors should also be taken into consideration such as;

- Other ranking criteria that may be specific to the municipality
- The condition of other infrastructure within the road
- Other infrastructure replacements may have a higher priority
- Realize opportunities of proximity and bulk purchasing.

9.6 Surface Treatment Roads Management Strategy

The management of the surface treated roads should be relatively straight forward. An annual schedule based on a 7 year cycle should be established and reasonably adhered to. Each spring, prior to the annual program being undertaken, the roads should be reviewed and program adjusted to reflect roads that are better or worse than anticipated.

Similar to the discussion with respect to the hot mix resurfacing program, a ‘right-sized’ surface treatment program would be key in optimizing funds and extending the life of the road system.

As the traffic grows on a surface treated road, it would be worthwhile to conduct a Net Present Value analysis of the surface treated surface versus a hot mix asphalt surface.

9.7 Gravel Roads Management Strategy

Proper maintenance of a gravel road surface is deceptively expensive. Once the costs of gravel, dust control and grading are considered, often the cost per kilometre of gravel road maintenance is increased to the point where it is greater than the cost to maintain a hard-topped road section. At that point it may be cost effective to convert/upgrade the gravel road to a surface treated road.

Studies from various agencies, both in Canada and the United States, have shown, that dependant upon local unit costs for materials and machinery, conversion of a structurally sound gravel road to a surface treated road can be a cost effective strategy for roads with traffic volumes as low as 100 AADT. Net Present Value and Payback period analysis of this option can be developed that are specific to local material costs.

Once the above noted analysis has been completed and proves viable, candidate project selection could include roads with the following characteristics:

- adequate existing granular base structure (typically a minimum of 450 mm of material in southern Ontario, 550 in northern Ontario; 150mm of Granular A and 300 of Granular B; 400mm of Granular B in Northern Ontario)
- adequate drainage;
- high maintenance costs (frequent complaints and calls);
- isolation from other gravel roads (high deadheading costs);
- sections that would provide continuity in a hard top network;
- proximity to work that is being done in other programs, for example asphalt millings to supplement gravel program.

Typically, a large percentage of gravels roads are indicated as ‘NOW’ needs in most road inventories. It should be noted that a ‘NOW’ rating can be triggered by either sub-standard structure or geometric deficiency such as the surface width.

Conversion of a gravel road to a surface treated road may not necessarily raise the road out of the ‘NOW’ needs category as the inherent geometric and surface width deficiencies would remain. However, over time, converting gravel surfaced roads to surface treated roads will generally reduce overall operating costs.

Benefits to converting a gravel road include:

- customer satisfaction
- reduced maintenance costs for routine maintenance
- reduced maintenance costs for winter maintenance
- reduced complaints.

Another option that the municipality may wish to consider is providing additional funding to add additional gravel to those roads that are not structurally adequate with the intention of surface treating the road in a subsequent year.

9.8 Subdivision Roads/Development Management Strategy

As development occurs, new roads are added to the road network, and thus presents a future financial liability for the municipality.

The capital and operating budget should be adjusted annually to reflect the increased road network. Some municipalities deal with this issue as a system size adjustment, or a base adjustment, over and above any inflationary increases that may be required to manage the road system. For example, if the system size grows by two per cent then the related roads budget items should increase by that same amount over and above all other increases, in order that the same service level is maintained.

9.9 Annual Budget Adjustment

Generally budgets are adjusted on an annual basis by most municipalities and the average Consumer Price Index is usually the targeted amount. Adopting this practice for public works and particularly road infrastructures ensures a continual downward spiral in overall condition of the road system and service levels. Given the increasing litigious nature of our society, decreased and/or inadequate funding increases the exposure to risk for the municipality.

Given the disproportionate increases that have occurred in fuel, asphalt and salt over the last few years, consideration should be given annually to increasing the road funding over and above the CPI in order that service levels may be maintained

10. Township of Strong Pavement Management Strategy Summary

If the capital budget remains at its current level, the Township of Strong will have significant challenges in maintaining the adequacy of its current road system, as evidenced by the difference in current funding versus the recommendations for program funding levels.

The following asset management strategy is recommended:

- Revise the programming to prioritize preservation and life extensions activities for roads and structures. These activities would include
- Deferring the reconstruction program in favour of preservation and life extension activities
- Optimizing hot mix overlay program
- Optimizing the surface treatment program
- Ensuring structure inspections are completed every two years
- Defer replacement of structures that are structurally sound that have a geometric need; improve the signage on those structures in the interim.
- Prioritize structure major maintenance activities such as rehabilitations and resurfacing
- At the time of structure rehabilitations, review the opportunity for conversion to semi-integral type structures
- Review the opportunities for a gravel road conversion program
- If additional funding becomes available, such as through a grant program, it should be directed to a reconstruction project.

Appendix A Reconstruction and Rehabilitation Needs by Time of Need

Township Strong
Improvement Needs

Data Last Refreshed February 18, 2009
10:41:37AM

NOW Construction

Priority Ranking	Section No.	Road Name	From/ To	AADT	Length (km)	Improv. Time	Improv. Type	Improv. Cost ($)
33	00105	STRONG JOLY ROAD	FOREST LAKE ROAD 175M NORTH OF FOREST LAKE ROAD	300	0.18	NOW	REC	59,998
34	00130	FOREST LAKE ROAD	STRONG JOLY ROAD INLET CREEK ROAD	450	0.99	NOW	REC	511,985
31	00140	FOREST LAKE ROAD	INLET CREEK ROAD LAKESHORE DRIVE	450	1.29	NOW	REC	667,131
42	00160	LAKESHORE DRIVE	150M SOUTH OF BERNARD CRESCENT PEVENSEY ROAD	425	1.00	NOW	REC	488,877
21	00170	PEVENSEY ROAD	SUNNY BEACH ROAD 40M WEST OF INLET CREEK ROAD	200	0.66	NOW	REC	219,994
38	00230	PEVENSEY ROAD	MUSKOKA ROAD 2.8km East	190	2.80	NOW	REC	838,824
43	00250	SOUTH LAKE BERNARD ROAD	HIGHWAY 11 MUSKOKA ROAD	750	1.27	NOW	BS	376,056
39	00270	RODEO ROAD	SOUTH HORN LAKE ROAD NORTH HORN LAKE ROAD	150	1.53	NOW	REC	458,357
34	00320	RODEO ROAD	NORTH HORN LAKE ROAD BLACK CREEK ROAD	150	2.06	NOW	REC	617,135
24	00340	BLACK CREEK ROAD	RODEO ROAD HIGHWAY 11	50	1.24	NOW	REC	312,200
25	00350	RODEO ROAD	BLACK CREEK ROAD BROOKSIDE ROAD	150	2.37	NOW	REC	596,706
23	00360	BROOKSIDE ROAD	CHAPMAN STRONG ROAD RODEO ROAD	150	2.03	NOW	BS	304,273
42	00370	CHAPMAN STRONG ROAD	SOUTH END BROOKSIDE ROAD	120	1.06	NOW	REC	317,555
34	00380	CHAPMAN STRONG ROAD	BROOKSIDE ROAD BLOOMFIELD ROAD	100	2.01	NOW	REC	602,156
35	00390	BLOOMFIELD ROAD	CHAPMAN STRONG ROAD HIGHWAY 124	100	1.73	NOW	REC	518,273
20	00470	HORNIBROOK ROAD	ADAMS ROAD PARKES LANE	100	2.03	NOW	BS	266,939

Priority Ranking	Section No.	Road Name	From/ To	AADT	Length (km)	Improv. Time	Improv. Type	Improv. Cost ($)
24	00480	PARKES LANE	WEST END HORNIBROOK ROAD	60	3.05	NOW	REC	913,719
21	00490	HORNIBROOK ROAD	PARKES LANE MACHAR STRONG BOUNDARY ROAD WEST	200	2.05	NOW	BS	366,951
25	00520	HILL VALLEY ROAD	HORNIBROOK ROAD UPLANDS ROAD	100	1.65	NOW	BS	365,685
17	00530	HILL VALLEY ROAD	UPLANDS ROAD ALBERT STREET	100	2.42	NOW	BS	536,337
22	00430	COTTRALL ROAD	HIGHWAY 124 ADAMS ROAD	75	1.55	NOW	REC	2,015,223
27	00050	MACHAR STRONG BOUNDARY ROAD WEST	1.15KM WEST OF ALBERT STREET ALBERT STREET	300	1.15	NOW	BS	203,739
29	00070	MACHAR STRONG BOUNDARY ROAD WEST	ALBERT STREET TOWER ROAD	300	2.04	NOW	BS	415,764
28	00560	TOWER ROAD	MACHAR STRONG BOUNDARY ROAD WEST HILL VALLEY ROAD	200	1.99	NOW	BS	367,173
29	00570	TOWER ROAD	HILL VALLEY ROAD HIGH STREET	200	2.08	NOW	BS	383,779
24	00580	HIGH STREET	TOWER ROAD HIGHWAY 11	100	0.39	NOW	REC	147,546
12	00620	CHERYL CRESCENT	FOREST LAKE ROAD FOREST LAKE ROAD	100	0.56	NOW	BS	146,148
19	00630	BERNARD CRESCENT	FOREST LAKE ROAD LAKESHORE DRIVE	100	0.68	NOW	REC	257,260
17	00640	EVERGREEN LANE	BERNARD CRESCENT EAST END CULDESAC	80	0.09	NOW	REC	34,049
27	00650	HOMESTEAD LANE	BERNARD CRESCENT EAST END	50	0.09	NOW	REC	29,971
30	00660	BUCKO MCDONALD DRIVE	FOREST LAKE ROAD SOUTH/EAST END TURNAROUND	90	0.39	NOW	REC	129,876
31	00680	MALYON DRIVE	FOREST LAKE ROAD SOUTH END	130	0.60	NOW	REC	226,994
32	00720	SUNNY BEACH ROAD	LAKESHORE DRIVE LAKE	50	0.15	NOW	REC	41,635

NOW Construction

Priority Ranking	Section No.	Road Name	From/ To	AADT	Length (km)	Improv. Time	Improv. Type	Improv. Cost ($)
27	00740	ELIZABETH STREET	LAKESHORE DRIVE WEST END	170	0.40	NOW	REC	454,228
25	00710	LAKESHORE DRIVE	PEVENSEY ROAD 170M WEST OF PEVENESY ROAD	225	0.17	NOW	REC	47,187
27	00790	SOUTH LAKE BERNARD ROAD	FLANIGAN TRAIL PIPES O PAN LANE	75	3.21	NOW	REC	961,651
33	00830	SOUTH LAKE BERNARD ROAD	HIGH ROCK DRIVE MUSKOKA ROAD	390	1.53	NOW	BS	335,647
29	00840	CRESCENT ROAD	SOUTH LAKE BERNARD ROAD WEST END	50	0.41	NOW	REC	155,113
27	00850	HIGH ROCK DRIVE	SOUTH LAKE BERNARD ROAD CRESCENT ROAD	390	0.42	NOW	BS	75,180
26	00860	HIGH ROCK DRIVE	CRESCENT ROAD BIRCH LANE	390	1.27	NOW	BS	227,331
33	00940	HIGH ROCK DRIVE	120M NORTH OF BRIDGE TURTLE ROCK LANE	390	2.22	NOW	BS	401,458
30	00960	HIGH ROCK DRIVE	TURTLE ROCK LANE LAYOLOMI DRIVE	390	0.89	NOW	BS	173,046
30	00980	HIGH ROCK DRIVE	LAYOLOMI DRIVE ALBERT STREET	390	1.96	NOW	BS	361,637
29	00990	ALBERT STREET	HIGH ROCK DRIVE 200M SOUTH OF SUNSET DRIVE	390	0.49	NOW	REC	170,937
39	01040	MUSKOKA ROAD	SOUTH LAKE BERNARD ROAD SOUTH LAKE BERNARD ROAD	540	0.91	NOW	BS	269,458
27	01060	MUSKOKA ROAD	SOUTH LAKE BERNARD ROAD ROBINS ROAD	150	1.77	NOW	BS	265,302
17	01080	MUSKOKA ROAD	ROBINS ROAD VALLEY VIEW ROAD	150	2.58	NOW	BS	339,262
42	00900	BIRCH LANE	ASPEN LANE WEST END	100	0.72	NOW	REC	158,331
50	01130	SUNNY RIDGE ROAD	HIGHWAY 11 HIGH ROCK DRIVE	400	1.50	NOW	REC	872,553
25	01150	BUCK HAVEN ROAD	SUNNY RIDGE ROAD HIGHWAY 11	200	0.41	NOW	BS	71,885

NOW Construction

Priority Ranking	Section No.	Road Name	From/ To	AADT	Length (km)	Improv. Time	Improv. Type	Improv. Cost ($)
35	01160	MUNICIPAL LANE	BUCK HAVEN ROAD EAST END	100	0.14	NOW	REC	49,998
31	01220	ALBERT STREET	DUNBAR STREET OAKRIDGE DRIVE	500	0.38	NOW	BS	115,601
34	01230	ALBERT STREET	OAKRIDGE DRIVE ADAMS ROAD	500	0.49	NOW	REC	234,354
39	01240	ALBERT STREET	ADAMS ROAD 500M NORTH OF ADAMS ROAD	200	0.50	NOW	REC	239,136
39	01190	ADAMS ROAD	COTTRELLS ROAD 900M WEST OF ALBERT STREET	200	2.51	NOW	REC	949,126
25	01260	OAKRIDGE DRIVE	ALBERT STREET ADAMS ROAD	150	0.79	NOW	REC	352,566
22	01255	ALBERT STREET	700M SOUTH OF HILL VALLEY ROAD HILL VALLEY ROAD	200	0.70	NOW	BS	131,958
30	01280	HILL VALLEY ROAD	ALBERT STREET TOWER ROAD	100	2.04	NOW	REC	611,143
25	01300	PEVENSEY ROAD	40M WEST OF INLET CREEK ROAD 620M SOUTH OF INLET CREEK ROAD	300	0.69	NOW	BS	139,980
47	01340	PEVENSEY ROAD	MAPLE VALLEY ROAD KENTS MILL ROAD	300	2.17	NOW	REC	820,560
41	01350	GIBBONS ROAD	PEVENSEY ROAD JOLY BOUNDARY	50	0.80	NOW	REC	239,664
42	01400	PEVENSEY ROAD	700M NORTH OF PROUDFOOT ROAD PROUDFOOT ROAD	300	1.00	NOW	REC	277,569
Totals:	**NOW Construction**				**78.25**			**23,240,171**

1-5 Construction

Priority Ranking	Section No.	Road Name	From/ To	AADT	Length (km)	Improv. Time	Improv. Type	Improv. Cost ($)
26	01360	FARM VIEW ROAD	PEVENSEY ROAD WEST END	50	2.45	1-5	REC	733,971
20	01270	HILLCREST STREET	OAKRIDGE DRIVE ALBERT STREET	50	0.14	1-5	REC	52,965
30	01010	ALBERT STREET	SUNSET DRIVE MAIN STREET	390	0.17	1-5	RSS	250,621
31	01120	MAPLE SUGAR LANE	HIGHWAY 11 NORTH END	150	0.12	1-5	REC	156,017
23	00880	BIRCH LANE	HIGH ROCK DRIVE THE POINT TRAIL	120	0.33	1-5	REC	98,861
22	00800	SOUTH LAKE BERNARD ROAD	PIPES O PAN LANE 600M WEST OF PIPES O PAN LANE	200	0.60	1-5	REC	210,671
18	00750	SOUTH LAKE BERNARD ROAD	LAKESHORE DRIVE GILCHRIST TRAIL	50	2.93	1-5	REC	737,700
21	00780	SOUTH LAKE BERNARD ROAD	GILCHRIST TRAIL FLANIGAN TRAIL	50	1.83	1-5	REC	460,747
17	00440	ADAMS ROAD	COTTRELLS ROAD HORNIBROOK ROAD	125	0.81	1-5	REC	203,937
21	00310	NORTH HORN LAKE ROAD	MAGNETAWAN BOUNDARY RODEO ROAD	60	1.64	1-5	REC	2,537,091
20	00040	MACHAR STRONG BOUNDARY ROAD WEST	OLD MUSKOKA ROAD SOUTH 1.15KM WEST OF ALBERT ROAD	300	1.71	1-5	BS	299,812
28	00500	CHEER LAKE ROAD	MACHAR STRONG BOUNDARY ROAD WEST SOUTH END	100	2.25	1-5	BS	337,249
23	00240	MUSKOKA ROAD	PEVENSEY ROAD SOUTH LAKE BERNARD ROAD	110	1.18	1-5	REC	353,504
30	00220	PEVENSEY ROAD	HIGHWAY 11 MUSKOKA ROAD	190	1.18	1-5	REC	353,504
Totals:	**1-5**	**Construction**			**17.34**			**6,786,652**

Priority Ranking	Section No.	Road Name	From/ To	AADT	Length (km)	Improv. Time	Improv. Type	Improv. Cost ($)
19	00100	STRONG JOLY ROAD	PEACOCK ROAD 175 M NORTH OF FOREST LAKE ROAD	300	1.86	6-10	REC	591,102
25	00200	INLET CREEK ROAD	PEVENSEY ROAD FOREST LAKE ROAD	100	1.66	6-10	REC	497,303
26	00260	NORTH HORN LAKE ROAD	HIGHWAY 11 RODEO ROAD	300	1.26	6-10	REC	476,454
13	00280	SOUTH HORN LAKE ROAD	MAGNETEWAN BOUNDARY RODEO ROAD	75	1.16	6-10	REC	347,513
17	00290	SOUTH HORN LAKE ROAD	RODEO ROAD ARMOUR BOUNDARY	75	0.21	6-10	REC	62,912
20	00300	RODEO ROAD	NORTH HORN LAKE ROAD NORTH HORN LAKE ROAD	150	0.86	6-10	BS	113,087
26	00550	ALBERT STREET	HILL VALLEY ROAD MACHAR STRONG BOUNDARY ROAD WEST	100	2.04	6-10	REC	513,620
31	00400	RODEO ROAD	BROOKSIDE ROAD HIGHWAY 124	150	2.05	6-10	REC	614,139
34	00600	BASSO ROAD	EAST SIDE OF RAILWAY TRACKS EAST END	100	1.26	6-10	REC	377,471
19	01000	ALBERT STREET	200M SOUTH OF SUNSET DRIVE SUNSET DRIVE	390	0.20	6-10	REC	99,985
9	00920	HIGH ROCK DRIVE	BIRCH LANE 120M SOUTH OF BRIDGE	390	0.78	6-10	BS	136,756
22	01090	VALLEY VIEW ROAD	HIGHWAY 11 MUSKOKA ROAD	50	0.72	6-10	REC	158,331
14	01110	MUSKOKA ROAD	VALLEY VIEW ROAD HIGHWAY 11	150	1.14	6-10	BS	149,907
13	01250	ALBERT STREET	500M NORTH OF ADAMS ROAD 700M SOUTH OF HILL VALLEY ROAD	200	0.85	6-10	BS	160,235
13	01170	SUNSET DRIVE	HIGHWAY 11 ALBERT STREET	50	0.39	6-10	REC	147,546
13	01140	GOLF LANE	SUNNY RIDGE ROAD SOUTH END	50	0.18	6-10	BS	46,976
17	01370	KENTS MILL ROAD	PEVENSEY ROAD JOLY BOUNDARY	50	0.84	6-10	REC	184,720

6-10 Construction

Priority Ranking	Section No.	Road Name	From/ To	AADT	Length (km)	Improv. Time	Improv. Type	Improv. Cost ($)
21	01210	ALBERT STREET	HIGHWAY 11 DUNBAR STREET	500	0.31	6-10	REC	157,661
Totals:	**6-10**	**Construction**			**17.77**			**4,835,717**

1-5 Rehab

Priority Ranking	Section No.	Road Name	From/ To	AADT	Length (km)	Improv. Time	Improv. Type	Improv. Cost ($)
28	00690	FOREST LAKE ROAD	UNION STREET BUCKO MCDONALD DRIVE	1,500	0.45	1-5	R1	60,409
Totals:	**1-5**	**Rehab**			**0.45**			**60,409**

6-10 Rehab

Priority Ranking	Section No.	Road Name	From/ To	AADT	Length (km)	Improv. Time	Improv. Type	Improv. Cost ($)
28	00700	FOREST LAKE ROAD	BUCKO MCDONALD DRIVE LAKESHORE DRIVE	1,500	0.39	6-10	R1	51,606
Totals:	**6-10**	**Rehab**			**0.39**			**51,606**

6-10 Maintenance

Priority Ranking	Section No.	Road Name	From/ To	AADT	Length (km)	Improv. Time	Improv. Type	Improv. Cost ($)
16	00730	LAKESHORE DRIVE	170M WEST OF PEVENESY ROAD SOUTH LAKE BERNARD ROAD	225	0.62	6-10	SD	0
11	00030	MACHAR STRONG BOUNDARY ROAD WEST	MORRIS LANE OLD MUSKOKA ROAD SOUTH	300	3.07	6-10	SD	0
17	00150	LAKESHORE DRIVE	LAKESHORE DRIVE 150M SOUTH OF BERNARD CRESCENT	425	0.43	6-10	SD	0
14	01200	ADAMS ROAD	900M WEST OF ALBERT STREET ALBERT STREET	200	0.90	6-10	SD	0
Totals:	**6-10**	**Maintenance**			**5.02**			**0**
Grand Total:					**119.22**			**34,974,555**

Appendix B Critical Deficiencies and Recommended Improvements Summary For Roads

Township Strong
Critical Deficiencies and Recommended Improvements

Section No.	Road Name	From/ To	Length (km)	AADT	Critical Deficiency: Geo-metrics	Surf. Type	Surf. Width	Capacity	Struct. Adeq.	Drainage	Improv. Type	Improv. Cost ($)
00010	MACHAR STRONG BOUNDARY ROAD	CHEER LAKE ROAD PARK ROAD SOUTH	1.63	300	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	SD	0
00020	MACHAR STRONG BOUNDARY ROAD	PARK ROAD SOUTH MORRIS LANE	0.65	300	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	SD	0
00030	MACHAR STRONG BOUNDARY ROAD	MORRIS LANE OLD MUSKOKA ROAD SOUTH	3.07	300	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	SD	0
00040	MACHAR STRONG BOUNDARY ROAD	OLD MUSKOKA ROAD SOUTH 1.15KM WEST OF ALBERT ROAD	1.71	300	ADEQ	ADEQ	ADEQ	ADEQ	1-5	6-10	BS	299,812
00050	MACHAR STRONG BOUNDARY ROAD	1.15KM WEST OF ALBERT STREET ALBERT STREET	1.15	300	ADEQ	ADEQ	ADEQ	ADEQ	NOW	6-10	BS	203,739
00070	MACHAR STRONG BOUNDARY ROAD	ALBERT STREET TOWER ROAD	2.04	300	ADEQ	ADEQ	ADEQ	ADEQ	NOW	6-10	BS	415,764
00080	STRONG JOLY ROAD	AIRPORT ROAD RAILWAY TRACKS/ MACHAR BOUNDARY	1.01	300	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	None	0
00090	STRONG JOLY ROAD	AIRPORT ROAD PEACOCK ROAD	0.99	300	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	None	0
00100	STRONG JOLY ROAD	PEACOCK ROAD 175 M NORTH OF FOREST LAKE ROAD	1.86	300	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	REC	591,102
00105	STRONG JOLY ROAD	FOREST LAKE ROAD 175M NORTH OF FOREST LAKE ROAD	0.18	300	ADEQ	ADEQ	ADEQ	ADEQ	NOW	1-5	REC	59,998
00110	PEACOCK ROAD	STRONG JOLY ROAD HIGHWAY 11	0.62	200	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	None	0
00120	BROOKS LANE	PEACOCK ROAD SOUTH END	0.89	20	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	None	0
00130	FOREST LAKE ROAD	STRONG JOLY ROAD INLET CREEK ROAD	0.99	450	ADEQ	ADEQ	ADEQ	ADEQ	NOW	1-5	REC	511,985
00140	FOREST LAKE ROAD	INLET CREEK ROAD LAKESHORE DRIVE	1.29	450	ADEQ	ADEQ	ADEQ	ADEQ	NOW	1-5	REC	667,131
00150	LAKESHORE DRIVE	LAKESHORE DRIVE 150M SOUTH OF BERNARD CRESCENT	0.43	425	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	SD	0
00160	LAKESHORE DRIVE	150M SOUTH OF BERNARD CRESCENT PEVENSEY ROAD	1.00	425	ADEQ	ADEQ	ADEQ	ADEQ	NOW	1-5	REC	488,877
00170	PEVENSEY ROAD	SUNNY BEACH ROAD 40M WEST OF INLET CREEK ROAD	0.66	200	ADEQ	ADEQ	ADEQ	ADEQ	NOW	6-10	REC	219,994
00180	PEVENSEY ROAD	40M WEST OF INLET CREEK ROAD INLET CREEK ROAD	0.06	100	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	SD	0

Section No.	Road Name	From/ To	Length (km)	AADT	Critical Deficiency: Geo-metrics	Surf. Type	Surf. Width	Capacity	Struct. Adeq.	Drainage	Improv. Type	Improv. Cost ($)
00190	OLD RANCH ROAD	INLET CREEK ROAD JOLY BOUNDARY	0.81	5	NOW	ADEQ	NOW	ADEQ	NOW	NOW	None	0
00200	INLET CREEK ROAD	PEVENSEY ROAD FOREST LAKE ROAD	1.66	100	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	REC	497,303
00210	STERLING CREEK ROAD	HIGHWAY 11 WEST END	0.35	30	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	1-5	None	0
00220	PEVENSEY ROAD	HIGHWAY 11 MUSKOKA ROAD	1.18	190	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	1-5	REC	353,504
00230	PEVENSEY ROAD	MUSKOKA ROAD 2.8km East	2.80	190	ADEQ	ADEQ	ADEQ	ADEQ	NOW	NOW	REC	838,824
00240	MUSKOKA ROAD	PEVENSEY ROAD SOUTH LAKE BERNARD ROAD	1.18	110	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	1-5	REC	353,504
00250	SOUTH LAKE BERNARD ROAD	HIGHWAY 11 MUSKOKA ROAD	1.27	750	ADEQ	ADEQ	ADEQ	ADEQ	NOW	ADEQ	BS	376,056
00260	NORTH HORN LAKE ROAD	HIGHWAY 11 RODEO ROAD	1.26	300	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	REC	476,454
00270	RODEO ROAD	SOUTH HORN LAKE ROAD NORTH HORN LAKE ROAD	1.53	150	ADEQ	ADEQ	ADEQ	ADEQ	NOW	NOW	REC	458,357
00280	SOUTH HORN LAKE ROAD	MAGNETEWAN BOUNDARY RODEO ROAD	1.16	75	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	REC	347,513
00290	SOUTH HORN LAKE ROAD	RODEO ROAD ARMOUR BOUNDARY	0.21	75	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	REC	62,912
00300	RODEO ROAD	NORTH HORN LAKE ROAD NORTH HORN LAKE ROAD	0.86	150	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	BS	113,087
00310	NORTH HORN LAKE ROAD	MAGNETAWAN BOUNDARY RODEO ROAD	1.64	60	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	1-5	REC	2,537,091
00320	RODEO ROAD	NORTH HORN LAKE ROAD BLACK CREEK ROAD	2.06	150	ADEQ	ADEQ	ADEQ	ADEQ	NOW	6-10	REC	617,135
00330	BLACK CREEK ROAD	WEST END RODEO ROAD	0.50	25	ADEQ	ADEQ	ADEQ	ADEQ	NOW	1-5	None	0
00340	BLACK CREEK ROAD	RODEO ROAD HIGHWAY 11	1.24	50	ADEQ	ADEQ	ADEQ	ADEQ	NOW	NOW	REC	312,200
00350	RODEO ROAD	BLACK CREEK ROAD BROOKSIDE ROAD	2.37	150	ADEQ	ADEQ	ADEQ	ADEQ	NOW	NOW	REC	596,706
00360	BROOKSIDE ROAD	CHAPMAN STRONG ROAD RODEO ROAD	2.03	150	ADEQ	ADEQ	ADEQ	ADEQ	NOW	6-10	BS	304,273
00370	CHAPMAN STRONG ROAD	SOUTH END BROOKSIDE ROAD	1.06	120	ADEQ	ADEQ	NOW	ADEQ	NOW	1-5	REC	317,555
00380	CHAPMAN STRONG ROAD	BROOKSIDE ROAD BLOOMFIELD ROAD	2.01	100	ADEQ	ADEQ	ADEQ	ADEQ	NOW	1-5	REC	602,156

Section No.	Road Name	From/ To	Length (km)	AADT	Critical Deficiency Geo-metrics	Surf. Type	Surf. Width	Capacity	Struct. Adeq.	Drainage	Improv. Type	Improv. Cost ($)
00390	BLOOMFIELD ROAD	CHAPMAN STRONG ROAD HIGHWAY 124	1.73	100	ADEQ	ADEQ	ADEQ	ADEQ	NOW	1-5	REC	518,273
00400	RODEO ROAD	BROOKSIDE ROAD HIGHWAY 124	2.05	150	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	REC	614,139
00410	BROOKSIDE ROAD	RODEO ROAD HIGHWAY 11	2.25	190	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	None	0
00420	O'BRIEN ROAD	BROOKSIDE ROAD HIGHWAY 124	2.05	150	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	SD	0
00430	COTTRALL ROAD	HIGHWAY 124 ADAMS ROAD	1.55	75	ADEQ	ADEQ	ADEQ	ADEQ	NOW	NOW	REC	2,015,223
00440	ADAMS ROAD	COTTRELLS ROAD HORNIBROOK ROAD	0.81	125	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	1-5	REC	203,937
00450	ADAMS ROAD	HORNIBROOK ROAD 700M EAST OF WEST END	1.20	25	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	None	0
00460	ADAMS ROAD	700M EAST OF WEST END WEST END	0.70	5	ADEQ	ADEQ	NOW	ADEQ	NOW	NOW	None	0
00470	HORNIBROOK ROAD	ADAMS ROAD PARKES LANE	2.03	100	ADEQ	ADEQ	ADEQ	ADEQ	NOW	6-10	BS	266,939
00480	PARKES LANE	WEST END HORNIBROOK ROAD	3.05	60	NOW	ADEQ	ADEQ	ADEQ	ADEQ	6-10	REC	913,719
00490	HORNIBROOK ROAD	PARKES LANE MACHAR STRONG BOUNDARY ROAD WEST	2.05	200	ADEQ	ADEQ	ADEQ	ADEQ	NOW	6-10	BS	366,951
00500	CHEER LAKE ROAD	MACHAR STRONG BOUNDARY ROAD W SOUTH END	2.25	100	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	BS	337,249
00510	UPLANDS ROAD	MACHAR STRONG BOUNDARY ROAD W PARKES LANE	2.29	5	NOW	ADEQ	NOW	ADEQ	NOW	NOW	None	0
00520	HILL VALLEY ROAD	HORNIBROOK ROAD UPLANDS ROAD	1.65	100	ADEQ	ADEQ	ADEQ	ADEQ	NOW	ADEQ	BS	365,685
00530	HILL VALLEY ROAD	UPLANDS ROAD ALBERT STREET	2.42	100	ADEQ	ADEQ	ADEQ	ADEQ	NOW	ADEQ	BS	536,337
00540	PINE LANE	HILL VALLEY ROAD SOUTH END	0.69	10	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	None	0
00550	ALBERT STREET	HILL VALLEY ROAD MACHAR STRONG BOUNDARY ROAD WEST	2.04	100	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	REC	513,620
00560	TOWER ROAD	MACHAR STRONG BOUNDARY ROAD W HILL VALLEY ROAD	1.99	200	ADEQ	ADEQ	ADEQ	ADEQ	NOW	6-10	BS	367,173
00570	TOWER ROAD	HILL VALLEY ROAD HIGH STREET	2.08	200	ADEQ	ADEQ	ADEQ	ADEQ	NOW	6-10	BS	383,779
00580	HIGH STREET	TOWER ROAD HIGHWAY 11	0.39	100	ADEQ	NOW	ADEQ	ADEQ	ADEQ	6-10	REC	147,546

Section No.	Road Name	From/ To	Length (km)	AADT	Critical Deficiency Geo-metrics	Surf. Type	Surf. Width	Capacity	Struct. Adeq.	Drainage	Improv. Type	Improv. Cost ($)
00590	STICK & STONE LANE	HIGH STREET NORTH END	0.14	40	ADEQ	NOW	ADEQ	ADEQ	ADEQ	6-10	None	0
00600	BASSO ROAD	EAST SIDE OF RAILWAY TRACKS EAST END	1.26	100	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	REC	377,471
00610	RONALD STREET	CHERYL CRESCENT BASSO ROAD	0.54	50	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	None	0
00620	CHERYL CRESCENT	FOREST LAKE ROAD FOREST LAKE ROAD	0.56	100	ADEQ	NOW	ADEQ	ADEQ	ADEQ	6-10	BS	146,148
00630	BERNARD CRESCENT	FOREST LAKE ROAD LAKESHORE DRIVE	0.68	100	ADEQ	NOW	ADEQ	ADEQ	ADEQ	1-5	REC	257,260
00640	EVERGREEN LANE	BERNARD CRESCENT EAST END CULDESAC	0.09	80	ADEQ	NOW	ADEQ	ADEQ	ADEQ	6-10	REC	34,049
00650	HOMESTEAD LANE	BERNARD CRESCENT EAST END	0.09	50	ADEQ	NOW	NOW	ADEQ	ADEQ	1-5	REC	29,971
00660	BUCKO MCDONALD DRIVE	FOREST LAKE ROAD SOUTH/EAST END TURNAROUND	0.39	90	ADEQ	NOW	NOW	ADEQ	ADEQ	1-5	REC	129,876
00670	MERRY JO ROAD	FOREST LAKE ROAD NORTH END	0.03	20	ADEQ	NOW	ADEQ	ADEQ	ADEQ	1-5	None	0
00680	MALYON DRIVE	FOREST LAKE ROAD SOUTH END	0.60	130	ADEQ	NOW	NOW	ADEQ	ADEQ	1-5	REC	226,994
00690	FOREST LAKE ROAD	UNION STREET BUCKO MCDONALD DRIVE	0.45	1,500	ADEQ	ADEQ	ADEQ	ADEQ	1-5	6-10	R1	60,409
00700	FOREST LAKE ROAD	BUCKO MCDONALD DRIVE LAKESHORE DRIVE	0.39	1,500	ADEQ	ADEQ	ADEQ	ADEQ	6-10	6-10	R1	51,606
00710	LAKESHORE DRIVE	PEVENSEY ROAD 170M WEST OF PEVENESY ROAD	0.17	225	ADEQ	ADEQ	ADEQ	ADEQ	NOW	1-5	REC	47,187
00720	SUNNY BEACH ROAD	LAKESHORE DRIVE LAKE	0.15	50	ADEQ	ADEQ	NOW	ADEQ	NOW	1-5	REC	41,635
00730	LAKESHORE DRIVE	170M WEST OF PEVENESY ROAD SOUTH LAKE BERNARD ROAD	0.62	225	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	SD	0
00740	ELIZABETH STREET	LAKESHORE DRIVE WEST END	0.40	170	NOW	ADEQ	NOW	ADEQ	ADEQ	1-5	REC	454,228
00750	SOUTH LAKE BERNARD ROAD	LAKESHORE DRIVE GILCHRIST TRAIL	2.93	50	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	1-5	REC	737,700
00760	GILCHRIST TRAIL	SOUTH LAKE BERNARD ROAD TEE INTERSECTION	0.74	40	NOW	ADEQ	ADEQ	ADEQ	NOW	ADEQ	None	0
00770	GILCHRIST TRAIL	SOUTH END NORTH END	0.54	40	NOW	ADEQ	ADEQ	ADEQ	NOW	6-10	None	0
00780	SOUTH LAKE BERNARD ROAD	GILCHRIST TRAIL FLANIGAN TRAIL	1.83	50	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	1-5	REC	460,747

Section No.	Road Name	From/ To	Length (km)	AADT	Critical Deficiency Geo- metrics	Surf. Type	Surf. Width	Capacity	Struct. Adeq.	Drainage	Improv. Type	Improv. Cost ($)
00790	SOUTH LAKE BERNARD ROAD	FLANIGAN TRAIL PIPES O PAN LANE	3.21	75	NOW	ADEQ	ADEQ	ADEQ	ADEQ	1-5	REC	961,651
00800	SOUTH LAKE BERNARD ROAD	PIPES O PAN LANE 600M WEST OF PIPES O PAN LANE	0.60	200	ADEQ	ADEQ	ADEQ	ADEQ	1-5	6-10	REC	210,671
00810	SOUTH LAKE BERNARD ROAD	600M WEST OF PIPES O PAN LANE CRESCENT ROAD	0.49	200	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	None	0
00820	SOUTH LAKE BERNARD ROAD	CRESCENT ROAD HIGH ROCK DRIVE	0.46	200	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	None	0
00830	SOUTH LAKE BERNARD ROAD	HIGH ROCK DRIVE MUSKOKA ROAD	1.53	390	ADEQ	ADEQ	ADEQ	ADEQ	NOW	6-10	BS	335,647
00840	CRESCENT ROAD	SOUTH LAKE BERNARD ROAD WEST END	0.41	50	ADEQ	NOW	NOW	ADEQ	ADEQ	1-5	REC	155,113
00850	HIGH ROCK DRIVE	SOUTH LAKE BERNARD ROAD CRESCENT ROAD	0.42	390	ADEQ	ADEQ	ADEQ	ADEQ	NOW	ADEQ	BS	75,180
00860	HIGH ROCK DRIVE	CRESCENT ROAD BIRCH LANE	1.27	390	ADEQ	ADEQ	ADEQ	ADEQ	NOW	ADEQ	BS	227,331
00870	CRESCENT ROAD	HIGH ROCK DRIVE EAST END	0.18	40	ADEQ	NOW	NOW	ADEQ	ADEQ	1-5	None	0
00880	BIRCH LANE	HIGH ROCK DRIVE THE POINT TRAIL	0.33	120	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	1-5	REC	98,861
00890	ASPEN LANE	BIRCH LANE SOUTH END	0.21	40	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	1-5	None	0
00900	BIRCH LANE	ASPEN LANE WEST END	0.72	100	NOW	ADEQ	NOW	ADEQ	NOW	1-5	REC	158,331
00910	THE POINT TRAIL	BIRCH LANE WEST END	0.12	35	NOW	ADEQ	ADEQ	ADEQ	NOW	1-5	None	0
00920	HIGH ROCK DRIVE	BIRCH LANE 120M SOUTH OF BRIDGE	0.78	390	ADEQ	ADEQ	ADEQ	ADEQ	6-10	ADEQ	BS	136,756
00930	HIGH ROCK DRIVE	120M SOUTH OF BRIDGE 120M NORTH OF BRIDGE	0.20	390	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	None	0
00940	HIGH ROCK DRIVE	120M NORTH OF BRIDGE TURTLE ROCK LANE	2.22	390	ADEQ	ADEQ	ADEQ	ADEQ	NOW	6-10	BS	401,458
00950	TURTLE ROCK LANE	HIGH ROCK DRIVE EAST END	0.32	25	NOW	ADEQ	ADEQ	ADEQ	NOW	1-5	None	0
00960	HIGH ROCK DRIVE	TURTLE ROCK LANE LAYOLOMI DRIVE	0.89	390	ADEQ	ADEQ	ADEQ	ADEQ	NOW	6-10	BS	173,046
00970	LAYOLOMI DRIVE	HIGH ROCK DRIVE SOUTH END	0.26	30	ADEQ	NOW	ADEQ	ADEQ	NOW	6-10	None	0
00980	HIGH ROCK DRIVE	LAYOLOMI DRIVE ALBERT STREET	1.96	390	ADEQ	ADEQ	ADEQ	ADEQ	NOW	6-10	BS	361,637

Section No.	Road Name	From/ To	Length (km)	AADT	Critical Deficiency Geo-metrics	Surf. Type	Surf. Width	Capacity	Struct. Adeq.	Drainage	Improv. Type	Improv. Cost ($)
00990	ALBERT STREET	HIGH ROCK DRIVE 200M SOUTH OF SUNSET DRIVE	0.49	390	ADEQ	ADEQ	ADEQ	ADEQ	NOW	1-5	REC	170,937
01000	ALBERT STREET	200M SOUTH OF SUNSET DRIVE SUNSET DRIVE	0.20	390	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	REC	99,985
01010	ALBERT STREET	SUNSET DRIVE MAIN STREET	0.17	390	ADEQ	ADEQ	ADEQ	ADEQ	1-5	1-5	RSS	250,621
01020	ALBERT STREET	MAIN STREET HIGHWAY 11	0.05	500	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	None	0
01030	MAIN STREET	HIGHWAY 11 ALBERT STREET	0.08	1,000	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	None	0
01040	MUSKOKA ROAD	SOUTH LAKE BERNARD ROAD SOUTH LAKE BERNARD ROAD	0.91	540	ADEQ	ADEQ	ADEQ	ADEQ	NOW	ADEQ	BS	269,458
01050	SCHOOL HOUSE LANE	MUSKOKA ROAD WEST END	0.19	30	ADEQ	ADEQ	NOW	ADEQ	NOW	1-5	None	0
01060	MUSKOKA ROAD	SOUTH LAKE BERNARD ROAD ROBINS ROAD	1.77	150	ADEQ	ADEQ	ADEQ	ADEQ	NOW	1-5	BS	265,302
01070	ROBINS ROAD	HIGHWAY 11 MUSKOKA ROAD	1.42	30	ADEQ	ADEQ	ADEQ	ADEQ	NOW	NOW	None	0
01080	MUSKOKA ROAD	ROBINS ROAD VALLEY VIEW ROAD	2.58	150	ADEQ	ADEQ	ADEQ	ADEQ	NOW	6-10	BS	339,262
01090	VALLEY VIEW ROAD	HIGHWAY 11 MUSKOKA ROAD	0.72	50	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	REC	158,331
01100	MCLARENS LANE	MUSKOKA ROAD EAST END	0.25	15	ADEQ	ADEQ	ADEQ	ADEQ	NOW	1-5	None	0
01110	MUSKOKA ROAD	VALLEY VIEW ROAD HIGHWAY 11	1.14	150	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	BS	149,907
01120	MAPLE SUGAR LANE	HIGHWAY 11 NORTH END	0.12	150	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	1-5	REC	156,017
01130	SUNNY RIDGE ROAD	HIGHWAY 11 HIGH ROCK DRIVE	1.50	400	ADEQ	ADEQ	ADEQ	ADEQ	NOW	6-10	REC	872,553
01140	GOLF LANE	SUNNY RIDGE ROAD SOUTH END	0.18	50	ADEQ	ADEQ	ADEQ	ADEQ	6-10	6-10	BS	46,976
01150	BUCK HAVEN ROAD	SUNNY RIDGE ROAD HIGHWAY 11	0.41	200	ADEQ	ADEQ	ADEQ	ADEQ	NOW	6-10	BS	71,885
01160	MUNICIPAL LANE	BUCK HAVEN ROAD EAST END	0.14	100	ADEQ	ADEQ	NOW	ADEQ	NOW	1-5	REC	49,998
01170	SUNSET DRIVE	HIGHWAY 11 ALBERT STREET	0.39	50	ADEQ	ADEQ	ADEQ	ADEQ	6-10	6-10	REC	147,546
01180	MAPLE SUGAR LANE	HIGHWAY 124 SOUTH END	0.14	40	ADEQ	NOW	NOW	ADEQ	ADEQ	1-5	None	0

Section No.	Road Name	From/ To	Length (km)	AADT	Critical Deficiency Geo-metrics	Surf. Type	Surf. Width	Capacity	Struct. Adeq.	Drainage	Improv. Type	Improv. Cost ($)
01190	ADAMS ROAD	COTTRELLS ROAD 900M WEST OF ALBERT STREET	2.51	200	NOW	ADEQ	ADEQ	ADEQ	NOW	1-5	REC	949,126
01200	ADAMS ROAD	900M WEST OF ALBERT STREET ALBERT STREET	0.90	200	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	SD	0
01210	ALBERT STREET	HIGHWAY 11 DUNBAR STREET	0.31	500	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	REC	157,661
01220	ALBERT STREET	DUNBAR STREET OAKRIDGE DRIVE	0.38	500	ADEQ	ADEQ	ADEQ	ADEQ	NOW	6-10	BS	115,601
01230	ALBERT STREET	OAKRIDGE DRIVE ADAMS ROAD	0.49	500	ADEQ	ADEQ	ADEQ	ADEQ	NOW	1-5	REC	234,354
01240	ALBERT STREET	ADAMS ROAD 500M NORTH OF ADAMS ROAD	0.50	200	ADEQ	ADEQ	ADEQ	ADEQ	NOW	1-5	REC	239,136
01250	ALBERT STREET	500M NORTH OF ADAMS ROAD 700M SOUTH OF HILL VALLEY ROAD	0.85	200	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	BS	160,235
01255	ALBERT STREET	700M SOUTH OF HILL VALLEY ROAD HILL VALLEY ROAD	0.70	200	ADEQ	ADEQ	ADEQ	ADEQ	NOW	6-10	BS	131,958
01260	OAKRIDGE DRIVE	ALBERT STREET ADAMS ROAD	0.79	150	ADEQ	NOW	ADEQ	ADEQ	ADEQ	1-5	REC	352,566
01270	HILLCREST STREET	OAKRIDGE DRIVE ALBERT STREET	0.14	50	ADEQ	ADEQ	ADEQ	ADEQ	1-5	1-5	REC	52,965
01280	HILL VALLEY ROAD	ALBERT STREET TOWER ROAD	2.04	100	ADEQ	ADEQ	ADEQ	ADEQ	NOW	NOW	REC	611,143
01290	HILL VALLEY ROAD	TOWER ROAD EAST END	1.43	30	NOW	ADEQ	ADEQ	ADEQ	ADEQ	1-5	None	0
01300	PEVENSEY ROAD	40M WEST OF INLET CREEK ROAD 620M SOUTH OF INLET CREEK ROAD	0.69	300	ADEQ	ADEQ	ADEQ	ADEQ	NOW	6-10	BS	139,980
01310	PEVENSEY ROAD	620M SOUTH OF INLET CREEK ROAD TRUDGEONS ROAD	1.40	300	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	None	0
01315	TRUDGEONS ROAD	PEVENSEY ROAD EAST END	1.30	5	NOW	ADEQ	NOW	ADEQ	NOW	NOW	None	0
01320	PEVENSEY ROAD	TRUDGEONS ROAD MAPLE VALLEY ROAD	1.98	300	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	None	0
01330	MAPLE VALLEY ROAD	PEVENSEY ROAD WEST END	0.90	10	NOW	ADEQ	ADEQ	ADEQ	NOW	NOW	None	0
01340	PEVENSEY ROAD	MAPLE VALLEY ROAD KENTS MILL ROAD	2.17	300	ADEQ	ADEQ	NOW	ADEQ	NOW	6-10	REC	820,560
01350	GIBBONS ROAD	PEVENSEY ROAD JOLY BOUNDARY	0.80	50	NOW	ADEQ	NOW	ADEQ	ADEQ	1-5	REC	239,664
01360	FARM VIEW ROAD	PEVENSEY ROAD WEST END	2.45	50	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	1-5	REC	733,971

Section No.	Road Name	From/ To	Length (km)	AADT	Critical Deficiency						Improv. Type	Improv. Cost ($)
					Geo-metrics	Surf. Type	Surf. Width	Capacity	Struct. Adeq.	Drainage		
01370	KENTS MILL ROAD	PEVENSEY ROAD JOLY BOUNDARY	0.84	50	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	6-10	REC	184,720
01380	SCHMIDTS ROAD	KENTS MILL ROAD	0.73	20	ADEQ	ADEQ	ADEQ	ADEQ	NOW	6-10	None	0
01390	PEVENSEY ROAD	FARM VIEW ROAD 1KM NORTH OF PROUDFOOT ROAD	1.00	300	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	None	0
01400	PEVENSEY ROAD	700M NORTH OF PROUDFOOT ROAD PROUDFOOT ROAD	1.00	300	ADEQ	ADEQ	ADEQ	ADEQ	NOW	1-5	REC	277,569

Appendix C Sample Road Inventory Appraisal

Municipal Road Appraisal - Sheet 1

A. IDENTIFICATION

1. Control Code 1-S-TP-07
2. Municipal Name/Code 56601 - Township of Augusta
3. Road Name Land O'Nod Rd
4. From County Rd 15
5. To Augusta/Merrickville/Wolford Townline
6. Current Section No. 0890
7. Length 4.3740 Km
   A. Offset From 0 m
   B. Offset To m
8. Old Section No.
9. Boundary Road N
10. Adjacent Municipality Name/Code -
11. Adjacent Road Section Number
12. Local Municipality Code (Upper Tier Only)
13. Special Designation NSD
14. Road Maintenance Area
15. Municipal Ward
16. File System No.
17. Road Maintenance Section No.

B. EXISTING CONDITIONS

21. Bridges

22. Culverts

23. Railway Crossings

Horizontal Alignment
24. Substandard Curves 1
25. Substandard S.S.D 1

Vertical Alignment
26. Substandard Grades 0
27. Substandard S.S.D. 0

Right of Way Width
28. Existing m
29. Desirable 20.0 m

30. Terrain NF
31. Drainage OD

32. Roadside Environment R
33A. Existing Class 200
33B. Highway Classification 4
34. Number of Lanes 2
35. Surface Type G/S
36. Platform Width 8.0 m
37. Surface Width 7.0 m
38. Median Width m
39. Shoulder Type GST
40. Shoulder Width 0.5 m
41. Curb/Gutter Left Right
42 Sidewalk Width Left Right
43. Boulevard Width Left Right
44. Crosswalks
45 Parking Left Restricted, Right Restricted

46. Utilities	LT	RT	OH	UG	Major	Local
Hydro						
Phone						
Gas						
Other						

47a. Existing Hot. Mix. Depth mm
47b. Existing Gran "A". Depth mm
47c. Existing Gran "B". Depth mm
48. Subdrains N

C TRAFFIC DATA

51. Speed Limit 80 km/hr
52. Average Operating Speed 70 km/hr
53. Traffic Operation 2W
54. Route Designation
   Bus N Truck N
   School N Bicycle N
55. Load Restrictions SA

Traffic Count
56. Year A-2007-E
57. AADT 50
58. DHV Factor %
59. DHV vph
60. Trucks 3 %
61. Count Loc.
62. Peak Directional Split %
63. 10 Yr Growth Factor 1.00

10 Year Traffic Forecast
64. Year 2017
65. AADT 50
66. DHV Factor %
67. DHV vph
68. Trucks 3 %

Capacity
69. Midblock vph
70. Intersection vph

71. Traffic Signals No Location
72. Stop Signs No Location
73. Yield Signs No Location
74. Existing Traffic A-2007-E 50
75. Dwelling units dependent upon this road for access No. 0 Per km x2
76. Commercial enterprises dep. upon this road for access No. 0 Per km x4
77. Places of public assembly dep. upon this road for access No. 0 Per km x6
78. Mail Route School Bus Route Bulk Milk Route Truck Total x10
79. Service Rating 50

Municipal Road Appraisal - Sheet 2

D. POINT RATINGS

	MAX. POINTS R	S	U	RATING
81. Horiz. Alignment	10	-	-	9
82. Vert. Alignment	10	-	-	10
83. Surface Condition	10	10	10	7
84. Shoulder Width	10	10	-	
85. Surface Width	15	15	25	
86. Level of Service	20	20	20	
87. Str. Adequacy	20	20	20	9
88. Drainage	15	15	15	13
89. Maint. Demand	10	10	10	5
90. Condition Rating	100	100	100	53
90a. PCI Index				32

E. NEEDS

	Existing Condition	Minimum Tolerable Standard	Time Of Need
91. Geometrics	80	65	ADEQ
92. Surface Type	G/S	G/S	ADEQ
93. Surface Width	7.0 m	5.5	ADEQ
94. Capacity	A	E	ADEQ
95. Struct. Adequacy		Year 2007	ADEQ
96. Drainage		Year 2007	6-10

F. TYPE & TIME OF IMPROVEMENT

101. Year (Re) Constructed	N/A	
102. Year Assumed	N/A	
103. Eligibility for Contribution	NES	
104. Type of Improvement	BS	
105. Design Class	200	
106a. Surface Design Width	7.0	m
106b. Shoulder Design Width	1.5	m
106c. Pavement Design Depth		mm
106d. Pavement Resurfacing Depth		mm
106e. Design Gran "A" Depth	150	mm
106f. Design Gran "B" Depth	150	mm
106g. Design Concrete Depth		mm
107. Improvement Length	4.3740	km
108. Costing Category	BM	
109. Time of Improvement	6-10	
110. Bench Mark Cost	142	($ thousand / km)

H. CONSTRUCTION / IMPROVEMENT HISTORY

	Year	Type	Length	Offset From	Offset To	Act Improv Cost ($1000's)
111.						
112.						
113.						
114.						
115.						
116.						
117						
118.						
119.						
120.						

G. IMPROVEMENT COST ($ THOUSANDS)

121.Construction		621
122. Resurfacing		
123. Drainage		
124. Small Structures		
125. Sidewalk		
126. Traffic Signals (Existing)		
127. Other		
128. Other		
129. Contingencies	10 %	62
130. Total Construction		683
131. Utilities		
132. Right of Way		
133. Engineering Environmental Assessment (E/A) Study		
134. Engineering - Design & Supervision	18 %	123
135. Total Project Cost		806
136. Eligibility for Contribution		
137. Non-Contributable Cost		
138. Contributable Cost		806
139. Municipal Percent of Contributable Cost		100 %
140. Municipal Share of Cost		806
141. Road System Ratings		Y
	Priority Rating	29
	cents / Vehicle km	93.83
	Guide Number	1

150. This appraisal sheet was completed by:
TSH

I. PCI History

	Year	PCI History
161.		0
162.		0
163.		0
164.		0
165.		0
166.		0
167.		0
168.		0
169.		0
170.		0

J. Remarks

Appendix D Sample Structure Appraisal Form

Municipal Bridge Appraisal - Sheet 1

A. IDENTIFICATION

1. Control Code 3-E-UR-03
2. Municipal Name/Code 44402 -
3. Bridge Name Lot 14, Conc XIII/XIV
4. Road Name Thomson Line
5. Location 2.00 km W of 74 - Belmont Road
9 Roadside Environment R
10. Posting t t t
11. Bylaw No.
12. Bylaw Expiry Date y m
13. Posting Sign t t t
14. Low Clearance Sign m
15. Narrow Structure Sign
6. Bridge No. 2
7. Road Section No. 134
8. MTO Site No. 005-0022-
16. Crossing Type O-WAT
17. Federal Navigable Waterway U
18. Bridge Value ($000) 184
19. Latitude
20. Longitude

B. RAILWAY OVERPASS/UNDERPASS

21 Railway Level Crossing Number
22. Railway Company
23. Railway Subdivision
24. Subdivision Mileage mi
25. Transport Canada Crossing No.
26. Number of Tracks
27. Original Board Order Number
Date y m d
28. Current Board Order Number
Date y m d
29. Seniority

C. JURISDICTION

31. Ownership O A MUN
B
32. Heritage Status R
33. Special Designation NSD
34. Suburban Roads Commission Name
35. Boundary Bridge N
36. Adjacent Municipality Name / No
37. Adjacent Bridge No.
38. Local/Area Municipality (Upper Tier Only!)
A.
B.
39. Maintenance Area
40. Municipal Ward

D. EXISTING CONDITIONS **General**

41. Year Constructed A 1967
B
42. Bridge Type C - RF - F
43. Crossing Skew L-30
44. Number of Spans 1
45. Span Length 12.0 m
46. Deck Type TS
47. Deck Length 12.0 m
48. Deck Width 8.5 m
49. Deck Area 102 sm
50. Longitudinal Joint 0
51. Transverse Joints 0
52. Number of Bearings 0
53. Soil Condition U
54. Abutment and Foundation Type C UN

ROAD OVER BRIDGE

55. Existing Road Class 200
55a. Highway Classifications 4
56. Operational Status 2W - OAT
57. Wearing Surface C
58. Travel Deck Width 8.0 m
59. No. of Lanes 2
60. Median Type /Width 0.0 m
61. Safety Curb / Sidewalk A N N 0.0 m
&Curb Barrier B N S 0.0 m
62. Barrier Walls / Railings CR
63. Minimum Vertical Clearance m

ROAD UNDER BRIDGE

64. Existing Road Class
64a. Highway Classifications
65. Operational Status -
66. Opening Width m
67. Surface Width m
68. No. of Lanes
69. Median Type / Width m
70. Safety Curb / Sidewalk A 0.0 m
& Curb Barrier B 0.0 m
71. Traffic Barrier
72. Minimum Vertical Clearance m

E. TRAFFIC DATA

81. Legal Speed Limit 80
82. Route Designations

Transit N Truck N
School Y Bicycle N

Traffic Count

83. Year A-2003-C
84. AADT 55
85. DHV Factor (%) %
86. DHV (vph) vph
87. Trucks (%) %
88. Peak Directional Split (%) %
89. 10 Year Growth Factor 1.10

10 Year Traffic Forecast

90. Year 2013
91. AADT 61
92. DHV Factor (%) %
93. DHV (vph) vph
94. Trucks (%) %
95. Capacity (vph) vph
96. 20 Year AADT 65

F. APPROVALS

101. Date APRIL 2002
102. Professional Engineer Name J.M. SPREIT
103. Municipality / Company SPREIT ASSOCIATES

G. BRIDGE NEEDS

	RATING MCR	PCR	TIME of NEED
111. Superstructure	4	6	1-5
112. Wearing Surface	3	5	1-5
113. Deck Condition	4	6	1-5
114. Expansion Joints	0	0	ADEQ
115. Railings	5	6	6-10
116. Substructure	5	6	6-10
117. Coating	0	0	ADEQ
118. Streams / Waterways	4	6	1-5
119. Curb / Sidewalk	0	0	ADEQ

H. FUNCTIONAL NEEDS

ROAD OVER	Existing Condition	Minimum Tolerable	TIME of NEED
121. Travel Deck Width	8.0 m	6.5 m	ADEQ
122. Level of Service	A	E	ADEQ
123. Min. Vertical Clearance	m	4.5 m	ADEQ
124. Sidewalks	N	N	ADEQ
ROAD UNDER			
125. Surface Width	m	m	
126. Level of Service		E	
127. Min. Vertical Clearance	m	4.5 m	
128. Sidewalks			

I. ENGINEERING RECOMMENDATIONS

131. Bridge Drawings UNK
131a. Structure Dwg No.
131b. Road Dwg No.

132. Engineering Investigations

	Type	Year	Cost ($000)
A	DCS	2004	10
B			
C			
D			

133. Total Cost of Engineering Investigations 10

134. Single Posting t y m d
135. Evaluated Posting t t t
Date y m
136. Monitoring m
137. Closure / Date y m d

J. TYPE & TIME OF IMPROVEMENT

141. Design Class
142. Operational Status
143. Abutment type
144. Design Deck Width m
145. Design Deck Length m

146.	a) Type of Improvement	b) Costing Category	c) Quantity	d) Time of Improvement	e) Cost $000)
A	IAG	PC	4	NOW	30
B	CDS	PC		1-5	8
C	WSR	PC		1-5	30
D					
E					
F					
G					
H					
I					
J					

K. IMPROVEMENT COST

		COST ($000)
151. Construction		68
152. Approaches		10
153. Detours		
154. Traffic Control / Protection		
155. Utilities		
156. Other		
157. Contingencies	10.00 %	8
158. Total Construction		86
159. Right of Way		
160. Engineering Environmental Assessment (E/A) Study		
161. Engineering - Design & Supervision	20.00 %	17
162. Total Project Cost		103
163. Eligibility for Contribution		EFS

164. Non-Contributable Costs

	Contributing Agency	Non-Contributable Cost
A		
B		
C		
D		

165. Total Non-Contributable Cost	
166. Contributable Cost	103
167. Municipal Percent of Contributable Cost	100 %
168. Municipal Share of Cost	103

L. HISTORY

ENGINEERING INVESTIGATIONS

	Type	Year
171.		
172.		
173.		
174.		
175		
176.		
177.		
178.		
179.		
180.		

CONSTRUCTION IMPROVEMENTS

	Type	Year
181.		
182.		
183.		
184.		
185.		
186.		
187.		
188.		
189.		
190.		

M. Remarks

Bridge No. 2, Thomson Line, Lot 14, Conc XIII/XIV, 2.0 km West of 74 - Belmont Road, Municipality of Central Elgin:

Item 146 - Install guiderail on approaches, repair deck soffit and overlay bridge deck.

Appendix E Road Valuation Estimating Parameters

All calculations for costing, program sizing etc. are based upon the following parameters:

Table 1 Unit Costs

Item	Unit	Cost ($)
Excavation	m^3	10
Hot Mix Asphalt	t	100
Single Surface Treatment	m^2	2.5
Granular A	t	13
Granular B	t	10
Conc Base	m^3	1000
Conc- Curb and Gutter-place	linear m	60
Conc- Curb and Gutter-removal	linear m	10
Subdrains	linear m	25
Storm Sewer-525mm	linear m	225
Manholes	ea	3500
manhole removed	ea	1000
manholes-Adjust	ea	1000
Catch Basins	ea	2500
Catch-Basins- removed	ea	1000
Catch Basin Leads	Linear m	150
Catchbasins - adjust	ea	1000
Asphalt Planing	m^2	2
Asphalt Pulverizing	m^2	1.5

All Calculations are based upon volumes, area or lengths and converted to other units as required based upon the following specific gravities derived from unit costs and weighted average widths of surfaces and platforms. Excavation calculations are based on the design road structure and existing weighted average platform and surface widths.

- specific gravity of 2.4 for Granular A
- Specific gravity of 2.1 for Granular 'B'
- specific gravity of 2.45 for HMA
- specific gravity of 2.6 for concrete

All calculations also include adjustment factors for general construction, engineering, terrain and contingency.

Road Cross-Section Assumptions

All rural sections Assumed 500mm ditch depth which equals .55m3 /m road length/side with a 2:1 side slope

Earth Roads
300mm depth of excavation to remove unsuitable materials

Gravel Roads
300mm depth of Granular A

Rural LCB
150mm depth of Granular A
300mm depth of Granular B
Assumed a triple surface treatment was in place (double in year of construction, single year after)

Rural HCB
150mm depth of Granular A,
350mm Granular
100mm of HMA in place

Rural Conc
150mm depth of Granular A;
150mm of Granular B
150mm Conc

SU LCB
150mm depth of Granular A
300mm depth of Granular B
Assumed a triple surface treatment was in place (double in year of construction, single year after)

SU-HCB
150mm depth of Granular A
350mm Granular B
100mm of HMA in place

All urban cross-sections assume curb on both sides, sub-drain on both sides and 525mm pipe through 60% of the length; catchbasins and manholes every 90m

UR LCB
150mm depth of Granular A,
350mm Granular
3 courses of SST in place (double in year of construction, single year after)

UR HCB

150mm depth of Granular A,
350mm Granular B

100mm of HMA in place
UR CONC
150mm depth of Granular A;
150mm of Granular B
150mm of Concrete in place

Appendix F Summary of Vertical and Horizontal Curve Deficiencies

Township Strong
Geometric Deficiencies - Rural Sections Only

Data Last Refreshed February 18, 2009 8:47:07AM

Section No.	Road Name	From/ To	Length (km)	AADT	Roadside Env.	Speed Limit	Avg. Operating Speed	Number of Deficiencies on Section: Horz. Curves	Horz. Stop Sight Dist	Vert. Curves	Vert. Stop Sight Dist.
00010	MACHAR STRONG BOUNDARY ROAD WEST	CHEER LAKE ROAD PARK ROAD SOUTH	1.63	300	R	60	60	0	0	0	0
00020	MACHAR STRONG BOUNDARY ROAD WEST	PARK ROAD SOUTH MORRIS LANE	0.65	300	R	60	60	0	0	0	0
00030	MACHAR STRONG BOUNDARY ROAD WEST	MORRIS LANE OLD MUSKOKA ROAD SOUTH	3.07	300	R	60	60	0	0	0	0
00040	MACHAR STRONG BOUNDARY ROAD WEST	OLD MUSKOKA ROAD SOUTH 1.15KM WEST OF ALBERT ROAD	1.71	300	R	60	60	0	0	0	0
00050	MACHAR STRONG BOUNDARY ROAD WEST	1.15KM WEST OF ALBERT STREET ALBERT STREET	1.15	300	R	60	60	0	0	0	0
00070	MACHAR STRONG BOUNDARY ROAD WEST	ALBERT STREET TOWER ROAD	2.04	300	R	60	60	0	0	0	0
00080	STRONG JOLY ROAD	AIRPORT ROAD RAILWAY TRACKS/ MACHAR BOUNDARY	1.01	300	R	80	80	0	0	0	0
00090	STRONG JOLY ROAD	AIRPORT ROAD PEACOCK ROAD	0.99	300	R	80	80	0	0	0	0
00100	STRONG JOLY ROAD	PEACOCK ROAD 175 M NORTH OF FOREST LAKE ROAD	1.86	300	R	60	60	0	0	0	1
00105	STRONG JOLY ROAD	FOREST LAKE ROAD 175M NORTH OF FOREST LAKE ROAD	0.18	300	R	60	60	0	0	0	1
00110	PEACOCK ROAD	STRONG JOLY ROAD HIGHWAY 11	0.62	200	R	80	80	0	0	0	1
00120	BROOKS LANE	PEACOCK ROAD SOUTH END	0.89	20	R	80	80	1	0	0	0
00130	FOREST LAKE ROAD	STRONG JOLY ROAD INLET CREEK ROAD	0.99	450	R	60	60	1	0	0	1
00140	FOREST LAKE ROAD	INLET CREEK ROAD LAKESHORE DRIVE	1.29	450	R	60	60	0	0	0	0
00160	LAKESHORE DRIVE	150M SOUTH OF BERNARD CRESCENT PEVENSEY ROAD	1.00	425	R	50	50	0	0	0	0

Section No.	Road Name	From/ To	Length (km)	AADT	Roadside Env.	Speed Limit	Avg. Operating Speed	Number of Deficiencies on Section: Horz. Curves	Horz. Stop Sight Dist	Vert. Curves	Vert. Stop Sight Dist.
00170	PEVENSEY ROAD	SUNNY BEACH ROAD 40M WEST OF INLET CREEK ROAD	0.66	200	R	60	60	0	0	0	0
00180	PEVENSEY ROAD	40M WEST OF INLET CREEK ROAD INLET CREEK ROAD	0.06	100	R	60	60	0	0	0	0
00190	OLD RANCH ROAD	INLET CREEK ROAD JOLY BOUNDARY	0.81	5	R	60	30	5	0	0	4
00200	INLET CREEK ROAD	PEVENSEY ROAD FOREST LAKE ROAD	1.66	100	R	80	70	2	0	0	4
00210	STERLING CREEK ROAD	HIGHWAY 11 WEST END	0.35	30	R	80	80	0	0	0	1
00220	PEVENSEY ROAD	HIGHWAY 11 MUSKOKA ROAD	1.18	190	R	80	80	0	0	0	3
00230	PEVENSEY ROAD	MUSKOKA ROAD 2.8km East	2.80	190	R	80	80	4	0	0	6
00240	MUSKOKA ROAD	PEVENSEY ROAD SOUTH LAKE BERNARD ROAD	1.18	110	R	60	50	4	0	0	1
00250	SOUTH LAKE BERNARD ROAD	HIGHWAY 11 MUSKOKA ROAD	1.27	750	R	80	75	1	0	0	2
00260	NORTH HORN LAKE ROAD	HIGHWAY 11 RODEO ROAD	1.26	300	R	80	70	2	0	0	2
00270	RODEO ROAD	SOUTH HORN LAKE ROAD NORTH HORN LAKE ROAD	1.53	150	R	80	65	4	0	0	4
00280	SOUTH HORN LAKE ROAD	MAGNETEWAN BOUNDARY RODEO ROAD	1.16	75	R	50	50	0	0	0	0
00290	SOUTH HORN LAKE ROAD	RODEO ROAD ARMOUR BOUNDARY	0.21	75	R	50	50	0	0	0	0
00300	RODEO ROAD	NORTH HORN LAKE ROAD NORTH HORN LAKE ROAD	0.86	150	R	80	70	0	0	0	2
00310	NORTH HORN LAKE ROAD	MAGNETAWAN BOUNDARY RODEO ROAD	1.64	60	R	80	80	0	0	0	2
00320	RODEO ROAD	NORTH HORN LAKE ROAD BLACK CREEK ROAD	2.06	150	R	80	65	6	0	0	5

Section No.	Road Name	From/ To	Length (km)	AADT	Roadside Env.	Speed Limit	Avg. Operating Speed	Number of Deficiencies on Section: Horz. Curves	Horz. Stop Sight Dist	Vert. Curves	Vert. Stop Sight Dist.
00330	BLACK CREEK ROAD	WEST END RODEO ROAD	0.50	25	R	80	80	0	0	0	3
00340	BLACK CREEK ROAD	RODEO ROAD HIGHWAY 11	1.24	50	R	80	80	0	0	0	0
00350	RODEO ROAD	BLACK CREEK ROAD BROOKSIDE ROAD	2.37	150	R	80	75	2	0	0	1
00360	BROOKSIDE ROAD	CHAPMAN STRONG ROAD RODEO ROAD	2.03	150	R	80	80	0	0	0	4
00370	CHAPMAN STRONG ROAD	SOUTH END BROOKSIDE ROAD	1.06	120	R	80	70	0	0	0	4
00380	CHAPMAN STRONG ROAD	BROOKSIDE ROAD BLOOMFIELD ROAD	2.01	100	R	80	70	1	0	0	6
00390	BLOOMFIELD ROAD	CHAPMAN STRONG ROAD HIGHWAY 124	1.73	100	R	80	75	4	0	0	4
00400	RODEO ROAD	BROOKSIDE ROAD HIGHWAY 124	2.05	150	R	60	60	0	0	0	7
00410	BROOKSIDE ROAD	RODEO ROAD HIGHWAY 11	2.25	190	R	80	80	0	0	0	3
00420	O'BRIEN ROAD	BROOKSIDE ROAD HIGHWAY 124	2.05	150	R	80	80	3	0	0	0
00430	COTTRALL ROAD	HIGHWAY 124 ADAMS ROAD	1.55	75	R	80	80	1	0	0	1
00440	ADAMS ROAD	COTTRELLS ROAD HORNIBROOK ROAD	0.81	125	R	80	80	0	0	0	0
00450	ADAMS ROAD	HORNIBROOK ROAD 700M EAST OF WEST END	1.20	25	R	80	80	0	0	0	1
00460	ADAMS ROAD	700M EAST OF WEST END WEST END	0.70	5	R	80	80	0	0	0	3
00470	HORNIBROOK ROAD	ADAMS ROAD PARKES LANE	2.03	100	R	80	80	0	0	0	3
00480	PARKES LANE	WEST END HORNIBROOK ROAD	3.05	60	R	80	60	9	0	0	6

Section No.	Road Name	From/ To	Length (km)	AADT	Roadside Env.	Speed Limit	Avg. Operating Speed	Number of Deficiencies on Section: Horz. Curves	Horz. Stop Sight Dist	Vert. Curves	Vert. Stop Sight Dist.
00490	HORNIBROOK ROAD	PARKES LANE MACHAR STRONG BOUNDARY ROAD WEST	2.05	200	R	80	80	2	0	0	0
00500	CHEER LAKE ROAD	MACHAR STRONG BOUNDARY ROAD WEST SOUTH END	2.25	100	R	80	65	5	0	0	5
00510	UPLANDS ROAD	MACHAR STRONG BOUNDARY ROAD WEST PARKES LANE	2.29	5	R	80	30	9	0	0	9
00520	HILL VALLEY ROAD	HORNIBROOK ROAD UPLANDS ROAD	1.65	100	R	60	60	0	0	0	3
00530	HILL VALLEY ROAD	UPLANDS ROAD ALBERT STREET	2.42	100	R	60	60	0	0	0	0
00540	PINE LANE	HILL VALLEY ROAD SOUTH END	0.69	10	R	80	70	0	0	0	2
00550	ALBERT STREET	HILL VALLEY ROAD MACHAR STRONG BOUNDARY ROAD WEST	2.04	100	R	80	70	5	0	0	4
00560	TOWER ROAD	MACHAR STRONG BOUNDARY ROAD WEST HILL VALLEY ROAD	1.99	200	R	80	80	0	0	0	3
00570	TOWER ROAD	HILL VALLEY ROAD HIGH STREET	2.08	200	R	60	60	0	2	0	3
00600	BASSO ROAD	EAST SIDE OF RAILWAY TRACKS EAST END	1.26	100	R	80	70	0	0	0	5
00610	RONALD STREET	CHERYL CRESCENT BASSO ROAD	0.54	50	R	80	80	0	0	0	0
00710	LAKESHORE DRIVE	PEVENSEY ROAD 170M WEST OF PEVENESY ROAD	0.17	225	R	80	80	0	0	0	0
00720	SUNNY BEACH ROAD	LAKESHORE DRIVE LAKE	0.15	50	R	80	80	0	0	0	0
00730	LAKESHORE DRIVE	170M WEST OF PEVENESY ROAD SOUTH LAKE BERNARD ROAD	0.62	225	R	80	80	1	0	0	0
00740	ELIZABETH STREET	LAKESHORE DRIVE WEST END	0.40	170	R	50	40	0	0	0	0
00750	SOUTH LAKE BERNARD ROAD	LAKESHORE DRIVE GILCHRIST TRAIL	2.93	50	R	40	40	0	0	0	0

Section No.	Road Name	From/ To	Length (km)	AADT	Roadside Env.	Speed Limit	Avg. Operating Speed	Number of Deficiencies on Section: Horz. Curves	Horz. Stop Sight Dist	Vert. Curves	Vert. Stop Sight Dist.
00760	GILCHRIST TRAIL	SOUTH LAKE BERNARD ROAD TEE INTERSECTION	0.74	40	R	80	60	2	0	0	2
00770	GILCHRIST TRAIL	SOUTH END NORTH END	0.54	40	R	80	60	2	0	0	1
00780	SOUTH LAKE BERNARD ROAD	GILCHRIST TRAIL FLANIGAN TRAIL	1.83	50	R	80	65	3	0	0	3
00790	SOUTH LAKE BERNARD ROAD	FLANIGAN TRAIL PIPES O PAN LANE	3.21	75	R	80	60	8	1	0	6
00810	SOUTH LAKE BERNARD ROAD	600M WEST OF PIPES O PAN LANE CRESCENT ROAD	0.49	200	R	40	40	0	0	0	0
00820	SOUTH LAKE BERNARD ROAD	CRESCENT ROAD HIGH ROCK DRIVE	0.46	200	R	60	60	0	0	0	0
00830	SOUTH LAKE BERNARD ROAD	HIGH ROCK DRIVE MUSKOKA ROAD	1.53	390	R	60	60	0	0	0	3
00850	HIGH ROCK DRIVE	SOUTH LAKE BERNARD ROAD CRESCENT ROAD	0.42	390	R	60	60	0	0	0	0
00860	HIGH ROCK DRIVE	CRESCENT ROAD BIRCH LANE	1.27	390	R	60	60	0	0	0	0
00880	BIRCH LANE	HIGH ROCK DRIVE THE POINT TRAIL	0.33	120	R	80	80	0	0	0	1
00890	ASPEN LANE	BIRCH LANE SOUTH END	0.21	40	R	80	80	1	0	0	0
00900	BIRCH LANE	ASPEN LANE WEST END	0.72	100	R	80	50	3	0	0	1
00910	THE POINT TRAIL	BIRCH LANE WEST END	0.12	35	R	80	50	2	0	0	1
00920	HIGH ROCK DRIVE	BIRCH LANE 120M SOUTH OF BRIDGE	0.78	390	R	60	60	0	0	0	0
00930	HIGH ROCK DRIVE	120M SOUTH OF BRIDGE 120M NORTH OF BRIDGE	0.20	390	R	50	50	0	0	0	0
00940	HIGH ROCK DRIVE	120M NORTH OF BRIDGE TURTLE ROCK LANE	2.22	390	R	60	50	4	0	0	3

Section No.	Road Name	From/ To	Length (km)	AADT	Roadside Env.	Speed Limit	Avg. Operating Speed	Number of Deficiencies on Section: Horz. Curves	Horz. Stop Sight Dist	Vert. Curves	Vert. Stop Sight Dist.
00950	TURTLE ROCK LANE	HIGH ROCK DRIVE EAST END	0.32	25	R	80	40	1	0	0	0
00960	HIGH ROCK DRIVE	TURTLE ROCK LANE LAYOLOMI DRIVE	0.89	390	R	60	55	1	0	0	0
00980	HIGH ROCK DRIVE	LAYOLOMI DRIVE ALBERT STREET	1.96	390	R	60	60	1	0	0	0
00990	ALBERT STREET	HIGH ROCK DRIVE 200M SOUTH OF SUNSET DRIVE	0.49	390	R	50	50	0	0	0	0
01040	MUSKOKA ROAD	SOUTH LAKE BERNARD ROAD SOUTH LAKE BERNARD ROAD	0.91	540	R	60	60	1	0	0	1
01050	SCHOOL HOUSE LANE	MUSKOKA ROAD WEST END	0.19	30	R	80	80	0	0	0	1
01060	MUSKOKA ROAD	SOUTH LAKE BERNARD ROAD ROBINS ROAD	1.77	150	R	60	60	0	0	0	2
01070	ROBINS ROAD	HIGHWAY 11 MUSKOKA ROAD	1.42	30	R	60	60	3	0	0	2
01080	MUSKOKA ROAD	ROBINS ROAD VALLEY VIEW ROAD	2.58	150	R	60	60	0	1	0	1
01090	VALLEY VIEW ROAD	HIGHWAY 11 MUSKOKA ROAD	0.72	50	R	80	65	0	0	1	2
01100	MCLARENS LANE	MUSKOKA ROAD EAST END	0.25	15	R	80	80	0	0	0	1
01110	MUSKOKA ROAD	VALLEY VIEW ROAD HIGHWAY 11	1.14	150	R	60	60	1	0	0	0
01120	MAPLE SUGAR LANE	HIGHWAY 11 NORTH END	0.12	150	R	80	80	0	0	0	0
01130	SUNNY RIDGE ROAD	HIGHWAY 11 HIGH ROCK DRIVE	1.50	400	R	80	80	2	0	0	3
01150	BUCK HAVEN ROAD	SUNNY RIDGE ROAD HIGHWAY 11	0.41	200	R	80	80	1	0	0	0
01190	ADAMS ROAD	COTTRELLS ROAD 900M WEST OF ALBERT STREET	2.51	200	R	80	60	5	0	0	9

Section No.	Road Name	From/ To	Length (km)	AADT	Roadside Env.	Speed Limit	Avg. Operating Speed	Number of Deficiencies on Section: Horz. Curves	Horz. Stop Sight Dist	Vert. Curves	Vert. Stop Sight Dist.
01200	ADAMS ROAD	900M WEST OF ALBERT STREET ALBERT STREET	0.90	200	R	80	80	0	0	0	1
01250	ALBERT STREET	500M NORTH OF ADAMS ROAD 700M SOUTH OF HILL VALLEY ROAD	0.85	200	R	60	60	0	0	0	0
01255	ALBERT STREET	700M SOUTH OF HILL VALLEY ROAD HILL VALLEY ROAD	0.70	200	R	60	60	1	0	0	0
01280	HILL VALLEY ROAD	ALBERT STREET TOWER ROAD	2.04	100	R	80	75	0	1	0	5
01290	HILL VALLEY ROAD	TOWER ROAD EAST END	1.43	30	R	80	60	3	1	0	4
01300	PEVENSEY ROAD	40M WEST OF INLET CREEK ROAD 620M SOUTH OF INLET CREEK ROAD	0.69	300	R	60	60	0	0	0	0
01310	PEVENSEY ROAD	620M SOUTH OF INLET CREEK ROAD TRUDGEONS ROAD	1.40	300	R	60	60	0	0	0	0
01315	TRUDGEONS ROAD	PEVENSEY ROAD EAST END	1.30	5	R	80	20	4	0	0	6
01320	PEVENSEY ROAD	TRUDGEONS ROAD MAPLE VALLEY ROAD	1.98	300	R	60	60	3	0	0	3
01330	MAPLE VALLEY ROAD	PEVENSEY ROAD WEST END	0.90	10	R	60	40	2	0	0	4
01340	PEVENSEY ROAD	MAPLE VALLEY ROAD KENTS MILL ROAD	2.17	300	R	60	60	0	0	0	4
01350	GIBBONS ROAD	PEVENSEY ROAD JOLY BOUNDARY	0.80	50	R	80	60	2	0	0	3
01360	FARM VIEW ROAD	PEVENSEY ROAD WEST END	2.45	50	R	80	80	0	0	0	8
01370	KENTS MILL ROAD	PEVENSEY ROAD JOLY BOUNDARY	0.84	50	R	60	60	2	0	0	0
01380	SCHMIDTS ROAD	KENTS MILL ROAD	0.73	20	R	60	60	0	0	0	0
01390	PEVENSEY ROAD	FARM VIEW ROAD 1KM NORTH OF PROUDFOOT ROAD	1.00	300	R	60	60	0	0	0	0

Section No.	Road Name	From/ To	Length (km)	AADT	Roadside Env.	Speed Limit	Avg. Operating Speed	Number of Deficiencies on Section: Horz. Curves	Horz. Stop Sight Dist	Vert. Curves	Vert. Stop Sight Dist.
01400	PEVENSEY ROAD	700M NORTH OF PROUDFOOT ROAD PROUDFOOT ROAD	1.00	300	R	60	60	2	0	0	1

Appendix G PSAB 3150 Summaries by Surface Type

TOWNSHIP OF STRONG
PSAB 3150 Road Valuation

Low Class Bituminous (Surface Treatment): Semi-urban

Section	Road Name	Dimensions			Index	Road Base					Road Surface					Aggregate Valuation Summary			
		Length (km)	Platfrom Width (m)	Surface Width (m)	PCI	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Total Current Replace Cost	Total Historical Cost	Accrued Depreciation	Net Book Value
00800	SOUTH LAKE BERNARD ROAD	0.60	6.5	6.5	65.5	1989	0.584	$76,948	40	21						$131,694	$76,948	$36,550	$40,398
01010	ALBERT STREET	0.17	8.0	7.0	59.0	1986	0.458	$20,225	40	18						$44,165	$20,225	$11,124	$9,101
01140	GOLF LANE	0.18	7.5	6.0	76.3	1993	0.574	$24,551	40	25						$42,793	$24,551	$9,207	$15,344
01160	MUNICIPAL LANE	0.14	6.5	5.3	32.6	1977	0.237	$6,857	40	9						$28,991	$6,857	$5,314	$1,543
01170	SUNSET DRIVE	0.39	8.0	6.0	73.4	1992	0.570	$55,445	40	24						$97,286	$55,445	$22,178	$33,267
01220	ALBERT STREET	0.38	8.5	6.5	42.9	1981	0.353	$35,762	40	13						$101,207	$35,762	$24,139	$11,623
01230	ALBERT STREET	0.49	8.5	6.5	49.6	1983	0.399	$52,064	40	15						$130,504	$52,064	$32,540	$19,524
01240	ALBERT STREET	0.50	7.0	6.0	25.9	1975	0.243	$27,503	40	7						$113,014	$27,503	$22,690	$4,813
01270	HILLCREST STREET	0.14	7.0	6.0	59.0	1986	0.458	$14,491	40	18						$31,644	$14,491	$7,970	$6,521

Low Class Bituminous (Surface Treatment): Rural

Section	Road Name	Dimensions			Index	Road Base					Road Surface					Aggregate Valuation Summary			
		Length (km)	Platfrom Width (m)	Surface Width (m)	PCI	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Total Current Replace Cost	Total Historical Cost	Accrued Depreciation	Net Book Value
00040	MACHAR STRONG BOUNDARY RO	1.71	8.5	6.0	73.8	1992	0.570	$252,167	40	24						$442,459	$252,167	$100,867	$151,300
00050	MACHAR STRONG BOUNDARY RO	1.15	8.5	6.1	38.9	1979	0.275	$82,238	40	11						$298,750	$82,238	$59,622	$22,615
00070	MACHAR STRONG BOUNDARY RO	2.04	8.5	6.1	32.6	1977	0.237	$125,344	40	9						$529,956	$125,344	$97,142	$28,202
00105	STRONG JOLY ROAD	0.18	8.5	6.5	54.5	1985	0.431	$20,479	40	17						$47,506	$20,479	$11,775	$8,703
00130	FOREST LAKE ROAD	0.99	9.5	7.1	41.6	1980	0.309	$89,302	40	12						$288,566	$89,302	$62,511	$26,791
00140	FOREST LAKE ROAD	1.29	9.5	7.1	32.6	1977	0.237	$88,933	40	9						$376,011	$88,933	$68,923	$20,010
00170	PEVENSEY ROAD	0.66	9.0	6.5	54.5	1985	0.431	$78,125	40	17						$181,234	$78,125	$44,922	$33,203
00250	SOUTH LAKE BERNARD ROAD	1.27	9.0	6.0	54.5	1985	0.431	$147,500	40	17						$342,169	$147,500	$84,813	$62,688
00490	HORNIBROOK ROAD	2.05	9.0	6.2	37.4	1979	0.275	$153,206	40	11						$556,562	$153,206	$111,074	$42,132
00520	HILL VALLEY ROAD	1.65	9.0	6.3	43.8	1981	0.353	$158,892	40	13						$449,671	$158,892	$107,252	$51,640
00530	HILL VALLEY ROAD	2.42	9.0	6.3	44.6	1981	0.353	$233,042	40	13						$659,518	$233,042	$157,303	$75,739

Low Class Bituminous (Surface Treatment): Rural

Section	Road Name	Dimensions			Index	Road Base					Road Surface					Aggregate Valuation Summary			
		Length (km)	Platfrom Width (m)	Surface Width (m)	PCI	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Total Current Replace Cost	Total Historical Cost	Accrued Depreciation	Net Book Value
00560	TOWER ROAD	1.99	8.5	6.5	32.6	1977	0.237	$124,220	40	9						$525,202	$124,220	$96,270	$27,949
00570	TOWER ROAD	2.08	8.5	6.5	32.6	1977	0.237	$129,838	40	9						$548,955	$129,838	$100,624	$29,213
00710	LAKESHORE DRIVE	0.17	8.0	6.0	54.5	1985	0.431	$18,179	40	17						$42,172	$18,179	$10,453	$7,726
00720	SUNNY BEACH ROAD	0.15	6.0	5.0	43.8	1981	0.353	$10,337	40	13						$29,253	$10,337	$6,977	$3,359
00760	GILCHRIST TRAIL	0.74	8.0	6.3	43.8	1981	0.353	$65,677	40	13						$185,869	$65,677	$44,332	$21,345
00770	GILCHRIST TRAIL	0.54	8.0	6.3	49.6	1983	0.399	$54,111	40	15						$135,634	$54,111	$33,819	$20,292
00830	SOUTH LAKE BERNARD ROAD	1.53	8.5	6.2	43.8	1981	0.353	$141,005	40	13						$399,050	$141,005	$95,178	$45,827
00850	HIGH ROCK DRIVE	0.42	8.3	6.2	25.4	1975	0.243	$26,222	40	7						$107,749	$26,222	$21,633	$4,589
00860	HIGH ROCK DRIVE	1.27	8.3	6.2	25.4	1975	0.243	$79,289	40	7						$325,814	$79,289	$65,413	$13,876
00920	HIGH ROCK DRIVE	0.78	9.0	6.0	82.4	1996	0.619	$130,027	40	28						$210,151	$130,027	$39,008	$91,019
00930	HIGH ROCK DRIVE	0.20	8.0	6.3	84.9	1997	0.632	$31,733	40	29						$50,235	$31,733	$8,726	$23,006
00940	HIGH ROCK DRIVE	2.22	8.5	6.3	38.9	1979	0.275	$160,019	40	11						$581,310	$160,019	$116,014	$44,005
00960	HIGH ROCK DRIVE	0.89	8.5	6.3	32.6	1977	0.237	$55,120	40	9						$233,048	$55,120	$42,718	$12,402
00980	HIGH ROCK DRIVE	1.96	8.5	6.5	38.9	1979	0.275	$142,394	40	11						$517,284	$142,394	$103,236	$39,158
00990	ALBERT STREET	0.49	8.6	7.0	43.8	1981	0.353	$46,961	40	13						$132,902	$46,961	$31,699	$15,262
01040	MUSKOKA ROAD	0.91	8.0	6.5	22.0	1974	0.229	$52,799	40	6						$230,452	$52,799	$44,879	$7,920
01130	SUNNY RIDGE ROAD	1.50	7.5	6.0	49.4	1983	0.399	$142,061	40	15						$356,092	$142,061	$88,788	$53,273
01150	BUCK HAVEN ROAD	0.41	8.0	6.0	54.5	1985	0.431	$43,844	40	17						$101,709	$43,844	$25,210	$18,634
01255	ALBERT STREET	0.70	8.0	6.0	54.5	1985	0.431	$74,856	40	17						$173,650	$74,856	$43,042	$31,814
01300	PEVENSEY ROAD	0.69	10.0	7.5	25.4	1975	0.243	$51,432	40	7						$211,344	$51,432	$42,431	$9,001
01400	PEVENSEY ROAD	1.00	7.0	6.0	32.6	1977	0.237	$53,623	40	9						$226,718	$53,623	$41,558	$12,065

High Class Bituminous (Hot Mix Asphalt): Semi-urban

Section	Road Name	Dimensions			Index	Road Base					Road Surface					Aggregate Valuation Summary			
		Length (km)	Platfrom Width (m)	Surface Width (m)	PCI	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Total Current Replace Cost	Total Historical Cost	Accrued Depreciation	Net Book Value
00150	LAKESHORE DRIVE	0.43	9.0	7.0	89.3	2000	0.710	$88,186	40	32	2000	0.710	$52,350	20	12	$197,973	$140,536	$38,577	$101,959

High Class Bituminous (Hot Mix Asphalt): Semi-urban

		Dimensions			Index	Road Base					Road Surface					Aggregate Valuation Summary			
Section	Road Name	Length (km)	Platfrom Width (m)	Surface Width (m)	PCI	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Total Current Replace Cost	Total Historical Cost	Accrued Depreciation	Net Book Value
00690	FOREST LAKE ROAD	0.45	10.0	7.0	66.9	1989	0.584	$82,501	40	21	1989	0.584	$45,093	20	1	$218,373	$127,595	$82,027	$45,568
00700	FOREST LAKE ROAD	0.39	9.0	7.0	79.0	1995	0.607	$68,415	40	27	1995	0.607	$40,613	20	7	$179,557	$109,027	$48,633	$60,394
01000	ALBERT STREET	0.20	8.0	7.0	84.9	1997	0.632	$33,357	40	29	1997	0.632	$21,667	20	9	$87,106	$55,024	$21,090	$33,934
01020	ALBERT STREET	0.05	12.5	9.0	89.3	2000	0.710	$14,004	40	32	2000	0.710	$7,826	20	12	$30,752	$21,830	$5,931	$15,899
01030	MAIN STREET	0.08	11.5	7.5	87.2	1998	0.643	$18,309	40	30	1998	0.643	$9,458	20	10	$43,158	$27,767	$9,306	$18,461
01210	ALBERT STREET	0.31	9.0	7.2	84.9	1997	0.632	$56,938	40	29	1997	0.632	$34,543	20	9	$144,820	$91,481	$34,657	$56,824

High Class Bituminous (Hot Mix Asphalt): Rural

		Dimensions			Index	Road Base					Road Surface					Aggregate Valuation Summary			
Section	Road Name	Length (km)	Platfrom Width (m)	Surface Width (m)	PCI	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Total Current Replace Cost	Total Historical Cost	Accrued Depreciation	Net Book Value
00160	LAKESHORE DRIVE	1.00	8.5	6.1	25.9	1975	0.243	$151,196	40	7	1988	0.548	$81,964	20	0	$425,133	$233,160	$206,701	$26,459

Gravel & Stone: Semi-urban

		Dimensions			Index	Road Base					Road Surface					Aggregate Valuation Summary			
Section	Road Name	Length (km)	Platfrom Width (m)	Surface Width (m)	PCI	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Total Current Replace Cost	Total Historical Cost	Accrued Depreciation	Net Book Value
00580	HIGH STREET	0.39	6.5	5.5	73.8	1992	0.570	$21,284	40	24						$37,346	$21,284	$8,514	$12,770
00590	STICK & STONE LANE	0.14	6.5	5.5	73.8	1992	0.570	$7,640	40	24						$13,406	$7,640	$3,056	$4,584
00620	CHERYL CRESCENT	0.56	7.8	6.0	84.9	1997	0.632	$40,649	40	29						$64,349	$40,649	$11,178	$29,470
00630	BERNARD CRESCENT	0.68	7.0	6.0	73.8	1992	0.570	$39,965	40	24						$70,124	$39,965	$15,986	$23,979
00640	EVERGREEN LANE	0.09	7.5	6.0	73.8	1992	0.570	$5,667	40	24						$9,944	$5,667	$2,267	$3,400
00650	HOMESTEAD LANE	0.09	4.5	3.5	70.3	1991	0.573	$3,418	40	23						$5,966	$3,418	$1,453	$1,966
00660	BUCKO MCDONALD DRIVE	0.39	5.0	4.0	70.3	1991	0.573	$16,459	40	23						$28,727	$16,459	$6,995	$9,464
00670	MERRY JO ROAD	0.03	4.0	4.0	70.3	1991	0.573	$1,013	40	23						$1,768	$1,013	$430	$582
00680	MALYON DRIVE	0.60	6.0	5.0	70.3	1991	0.573	$30,385	40	23						$53,035	$30,385	$12,914	$17,471
00840	CRESCENT ROAD	0.41	6.0	5.0	59.0	1986	0.458	$16,596	40	18						$36,241	$16,596	$9,128	$7,468
00870	CRESCENT ROAD	0.18	6.0	5.0	65.5	1989	0.584	$9,296	40	21						$15,911	$9,296	$4,416	$4,881
00970	LAYOLOMI DRIVE	0.26	4.0	3.0	49.6	1983	0.399	$6,112	40	15						$15,321	$6,112	$3,820	$2,292
01180	MAPLE SUGAR LANE	0.14	5.5	4.5	59.0	1986	0.458	$5,195	40	18						$11,344	$5,195	$2,857	$2,338

Gravel & Stone: Semi-urban

		Dimensions			Index	Road Base					Road Surface					Aggregate Valuation Summary			
Section	Road Name	Length (km)	Platfrom Width (m)	Surface Width (m)	PCI	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Total Current Replace Cost	Total Historical Cost	Accrued Depreciation	Net Book Value
01260	OAKRIDGE DRIVE	0.79	7.0	6.0	59.0	1986	0.458	$37,306	40	18						$81,468	$37,306	$20,519	$16,788

Gravel & Stone: Rural

		Dimensions			Index	Road Base					Road Surface					Aggregate Valuation Summary			
Section	Road Name	Length (km)	Platfrom Width (m)	Surface Width (m)	PCI	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Total Current Replace Cost	Total Historical Cost	Accrued Depreciation	Net Book Value
00010	MACHAR STRONG BOUNDARY RO	1.63	9.0	6.0	84.9	1997	0.632	$173,617	40	29						$274,847	$173,617	$47,745	$125,872
00020	MACHAR STRONG BOUNDARY RO	0.65	9.0	6.0	84.9	1997	0.632	$69,234	40	29						$109,602	$69,234	$19,039	$50,194
00030	MACHAR STRONG BOUNDARY RO	3.07	9.0	6.0	84.9	1997	0.632	$326,996	40	29						$517,657	$326,996	$89,924	$237,072
00080	STRONG JOLY ROAD	1.01	8.5	6.0	87.2	1998	0.643	$104,030	40	30						$161,694	$104,030	$26,007	$78,022
00090	STRONG JOLY ROAD	0.99	8.5	6.0	87.2	1998	0.643	$101,970	40	30						$158,492	$101,970	$25,492	$76,477
00100	STRONG JOLY ROAD	1.86	8.5	6.0	73.8	1992	0.570	$169,708	40	24						$297,773	$169,708	$67,883	$101,825
00110	PEACOCK ROAD	0.62	8.5	6.0	73.8	1992	0.570	$56,569	40	24						$99,258	$56,569	$22,628	$33,942
00120	BROOKS LANE	0.89	8.5	6.0	73.8	1992	0.570	$81,204	40	24						$142,483	$81,204	$32,482	$48,723
00180	PEVENSEY ROAD	0.06	6.5	5.5	73.8	1992	0.570	$4,308	40	24						$7,560	$4,308	$1,723	$2,585
00190	OLD RANCH ROAD	0.81	5.0	4.0	16.5	1968	0.129	$10,530	40	0						$81,340	$10,530	$10,530	$0
00200	INLET CREEK ROAD	1.66	8.0	6.0	62.5	1988	0.548	$137,989	40	20						$251,604	$137,989	$68,995	$68,995
00210	STERLING CREEK ROAD	0.35	7.0	6.0	70.3	1991	0.573	$26,974	40	23						$47,082	$26,974	$11,464	$15,510
00220	PEVENSEY ROAD	1.18	7.0	6.0	70.3	1991	0.573	$90,942	40	23						$158,733	$90,942	$38,650	$52,291
00230	PEVENSEY ROAD	2.80	7.0	6.0	54.5	1985	0.431	$162,366	40	17						$376,653	$162,366	$93,360	$69,005
00240	MUSKOKA ROAD	1.18	9.0	6.0	70.3	1991	0.573	$113,994	40	23						$198,969	$113,994	$48,447	$65,547
00260	NORTH HORN LAKE ROAD	1.26	8.5	6.0	73.8	1992	0.570	$114,963	40	24						$201,717	$114,963	$45,985	$68,978
00270	RODEO ROAD	1.53	7.5	6.0	54.5	1985	0.431	$94,344	40	17						$218,857	$94,344	$54,248	$40,096
00280	SOUTH HORN LAKE ROAD	1.16	8.5	6.0	73.8	1992	0.570	$105,839	40	24						$185,708	$105,839	$42,336	$63,504
00290	SOUTH HORN LAKE ROAD	0.21	7.5	6.0	73.8	1992	0.570	$17,120	40	24						$30,039	$17,120	$6,848	$10,272
00300	RODEO ROAD	0.86	8.5	6.0	73.8	1992	0.570	$78,467	40	24						$137,680	$78,467	$31,387	$47,080
00310	NORTH HORN LAKE ROAD	1.64	7.5	6.0	70.3	1991	0.573	$134,403	40	23						$234,592	$134,403	$57,121	$77,282

Gravel & Stone: Rural

		Dimensions			Index	Road Base					Road Surface					Aggregate Valuation Summary			
Section	Road Name	Length (km)	Platfrom Width (m)	Surface Width (m)	PCI	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Total Current Replace Cost	Total Historical Cost	Accrued Depreciation	Net Book Value
00320	RODEO ROAD	2.06	8.0	6.0	54.5	1985	0.431	$134,595	40	17						$312,231	$134,595	$77,392	$57,203
00330	BLACK CREEK ROAD	0.50	7.0	6.0	54.5	1985	0.431	$28,994	40	17						$67,260	$28,994	$16,671	$12,322
00340	BLACK CREEK ROAD	1.24	7.0	6.0	54.5	1985	0.431	$71,905	40	17						$166,804	$71,905	$41,345	$30,560
00350	RODEO ROAD	2.37	8.5	6.0	58.0	1986	0.458	$173,747	40	18						$379,421	$173,747	$95,561	$78,186
00360	BROOKSIDE ROAD	2.03	8.0	6.0	58.0	1986	0.458	$140,897	40	18						$307,684	$140,897	$77,493	$63,404
00370	CHAPMAN STRONG ROAD	1.06	5.7	4.7	49.6	1983	0.399	$47,513	40	15						$119,096	$47,513	$29,696	$17,817
00380	CHAPMAN STRONG ROAD	2.01	7.0	6.0	32.6	1977	0.237	$63,950	40	9						$270,383	$63,950	$49,562	$14,389
00390	BLOOMFIELD ROAD	1.73	7.0	6.0	49.6	1983	0.399	$92,842	40	15						$232,718	$92,842	$58,026	$34,816
00400	RODEO ROAD	2.05	7.0	6.0	59.0	1986	0.458	$126,280	40	18						$275,764	$126,280	$69,454	$56,826
00410	BROOKSIDE ROAD	2.25	8.0	6.0	84.9	1997	0.632	$215,423	40	29						$341,029	$215,423	$59,241	$156,182
00420	O'BRIEN ROAD	2.05	9.4	6.0	84.9	1997	0.632	$227,184	40	29						$359,647	$227,184	$62,476	$164,708
00430	COTTRALL ROAD	1.55	8.5	6.0	54.5	1985	0.431	$106,969	40	17						$248,144	$106,969	$61,507	$45,462
00440	ADAMS ROAD	0.81	8.5	6.0	62.5	1988	0.548	$71,119	40	20						$129,675	$71,119	$35,560	$35,560
00450	ADAMS ROAD	1.20	8.5	6.0	70.3	1991	0.573	$110,065	40	23						$192,112	$110,065	$46,778	$63,288
00460	ADAMS ROAD	0.70	3.0	2.0	-8.5	1968	0.129	$6,010	40	0						$46,425	$6,010	$6,010	$0
00470	HORNIBROOK ROAD	2.03	7.8	6.0	58.0	1986	0.458	$137,727	40	18						$300,762	$137,727	$75,750	$61,977
00480	PARKES LANE	3.05	8.0	6.0	70.3	1991	0.573	$264,853	40	23						$462,284	$264,853	$112,563	$152,291
00500	CHEER LAKE ROAD	2.25	7.0	6.0	65.5	1989	0.584	$176,848	40	21						$302,668	$176,848	$84,003	$92,845
00540	PINE LANE	0.69	6.5	5.5	73.8	1992	0.570	$49,547	40	24						$86,936	$49,547	$19,819	$29,728
00550	ALBERT STREET	2.04	7.5	6.0	73.8	1992	0.570	$166,309	40	24						$291,809	$166,309	$66,523	$99,785
00600	BASSO ROAD	1.26	6.5	5.5	59.0	1986	0.458	$72,697	40	18						$158,753	$72,697	$39,984	$32,714
00610	RONALD STREET	0.54	9.0	6.0	91.3	2001	0.741	$67,499	40	33						$91,054	$67,499	$11,812	$55,687
00730	LAKESHORE DRIVE	0.62	8.0	6.0	87.2	1998	0.643	$60,459	40	30						$93,972	$60,459	$15,115	$45,345
00740	ELIZABETH STREET	0.40	6.4	5.4	73.8	1992	0.570	$28,334	40	24						$49,716	$28,334	$11,334	$17,000

Gravel & Stone: Rural

Section	Road Name	Dimensions			Index	Road Base					Road Surface					Aggregate Valuation Summary			
		Length (km)	Platfrom Width (m)	Surface Width (m)	PCI	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Total Current Replace Cost	Total Historical Cost	Accrued Depreciation	Net Book Value
00750	SOUTH LAKE BERNARD ROAD	2.93	7.5	6.0	73.8	1992	0.570	$238,865	40	24						$419,118	$238,865	$95,546	$143,319
00780	SOUTH LAKE BERNARD ROAD	1.83	8.0	6.0	73.8	1992	0.570	$158,080	40	24						$277,370	$158,080	$63,232	$94,848
00790	SOUTH LAKE BERNARD ROAD	3.21	8.0	6.0	62.5	1988	0.548	$266,835	40	20						$486,535	$266,835	$133,417	$133,417
00810	SOUTH LAKE BERNARD ROAD	0.49	7.7	6.0	91.3	2001	0.741	$53,198	40	33						$71,762	$53,198	$9,310	$43,888
00820	SOUTH LAKE BERNARD ROAD	0.46	8.0	6.0	91.3	2001	0.741	$51,685	40	33						$69,721	$51,685	$9,045	$42,640
00880	BIRCH LANE	0.33	8.0	6.0	73.8	1992	0.570	$28,506	40	24						$50,018	$28,506	$11,402	$17,104
00890	ASPEN LANE	0.21	6.0	5.0	65.5	1989	0.584	$14,414	40	21						$24,669	$14,414	$6,847	$7,567
00900	BIRCH LANE	0.72	6.0	5.0	49.6	1983	0.399	$33,742	40	15						$84,578	$33,742	$21,089	$12,653
00910	THE POINT TRAIL	0.12	6.0	5.0	49.6	1983	0.399	$5,624	40	15						$14,096	$5,624	$3,515	$2,109
00950	TURTLE ROCK LANE	0.32	6.0	5.0	54.5	1985	0.431	$16,204	40	17						$37,590	$16,204	$9,317	$6,887
01050	SCHOOL HOUSE LANE	0.19	5.5	4.5	32.6	1977	0.237	$4,896	40	9						$20,700	$4,896	$3,794	$1,102
01060	MUSKOKA ROAD	1.77	9.0	6.0	40.9	1980	0.309	$92,362	40	12						$298,454	$92,362	$64,653	$27,709
01070	ROBINS ROAD	1.42	7.0	6.0	9.3	1968	0.129	$24,728	40	0						$191,017	$24,728	$24,728	$0
01080	MUSKOKA ROAD	2.58	9.0	6.0	58.0	1986	0.458	$199,214	40	18						$435,034	$199,214	$109,568	$89,646
01090	VALLEY VIEW ROAD	0.72	7.5	6.0	70.3	1991	0.573	$59,006	40	23						$102,992	$59,006	$25,078	$33,929
01100	MCLARENS LANE	0.25	6.5	5.5	47.3	1982	0.386	$12,171	40	14						$31,499	$12,171	$7,911	$4,260
01110	MUSKOKA ROAD	1.14	9.0	6.0	73.8	1992	0.570	$109,553	40	24						$192,224	$109,553	$43,821	$65,732
01120	MAPLE SUGAR LANE	0.12	7.5	6.0	73.8	1992	0.570	$9,783	40	24						$17,165	$9,783	$3,913	$5,870
01190	ADAMS ROAD	2.51	7.5	6.0	54.5	1985	0.431	$154,773	40	17						$359,040	$154,773	$88,995	$65,779
01200	ADAMS ROAD	0.90	8.5	6.0	84.9	1997	0.632	$91,016	40	29						$144,084	$91,016	$25,029	$65,986
01250	ALBERT STREET	0.85	9.0	6.0	73.4	1992	0.570	$81,684	40	24						$143,325	$81,684	$32,674	$49,011
01280	HILL VALLEY ROAD	2.04	7.5	6.0	54.5	1985	0.431	$125,792	40	17						$291,809	$125,792	$72,330	$53,461
01290	HILL VALLEY ROAD	1.43	6.3	5.3	54.2	1985	0.431	$75,566	40	17						$175,296	$75,566	$43,450	$32,115
01310	PEVENSEY ROAD	1.40	9.0	6.0	87.2	1998	0.643	$151,878	40	30						$236,065	$151,878	$37,970	$113,909

Gravel & Stone: Rural

		Dimensions			Index	Road Base					Road Surface					Aggregate Valuation Summary			
Section	Road Name	Length (km)	Platfrom Width (m)	Surface Width (m)	PCI	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Total Current Replace Cost	Total Historical Cost	Accrued Depreciation	Net Book Value
01320	PEVENSEY ROAD	1.98	9.0	6.0	87.2	1998	0.643	$214,799	40	30						$333,863	$214,799	$53,700	$161,099
01330	MAPLE VALLEY ROAD	0.90	6.5	5.5	49.6	1983	0.399	$45,238	40	15						$113,395	$45,238	$28,274	$16,964
01340	PEVENSEY ROAD	2.17	6.0	5.0	44.6	1981	0.353	$90,073	40	13						$254,909	$90,073	$60,799	$29,274
01350	GIBBONS ROAD	0.80	6.0	5.0	59.0	1986	0.458	$43,034	40	18						$93,976	$43,034	$23,669	$19,365
01360	FARM VIEW ROAD	2.45	7.0	6.0	59.0	1986	0.458	$150,920	40	18						$329,572	$150,920	$83,006	$67,914
01370	KENTS MILL ROAD	0.84	8.0	6.0	73.8	1992	0.570	$72,561	40	24						$127,318	$72,561	$29,024	$43,537
01380	SCHMIDTS ROAD	0.73	8.0	6.0	54.5	1985	0.431	$47,696	40	17						$110,645	$47,696	$27,425	$20,271
01390	PEVENSEY ROAD	1.00	9.0	6.0	87.2	1998	0.643	$108,484	40	30						$168,618	$108,484	$27,121	$81,363

Earth: Rural

		Dimensions			Index	Road Base					Road Surface					Aggregate Valuation Summary			
Section	Road Name	Length (km)	Platfrom Width (m)	Surface Width (m)	PCI	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Year Const.	Deflation Index	Historic Const. Cost	Life Span	Useful Life Remaining	Total Current Replace Cost	Total Historical Cost	Accrued Depreciation	Net Book Value
00510	UPLANDS ROAD	2.29	3.5	2.5	-21.5	1968	0.129	$4,502	40	0						$34,780	$4,502	$4,502	$0
01315	TRUDGEONS ROAD	1.30	4.0	3.0	-21.5	1968	0.129	$2,865	40	0						$22,133	$2,865	$2,865	$0

Appendix H Public Works Building Facilities Audit

Strong Township
Facility Reviews

TSH 36-19679

September 8, 2008

Location: Sundridge Works Garage

Original Construction: 1980 (estimated)

Facility Attributes: Facility is a combination of combustible and non-combustible construction in fair condition.

Summary Observations: the structure is within 25 years of replacement. The framed spaces in the north bay include staff areas below and an office on the mezzanine. Reviews of the structural frame are recommended every three years. Site area is available for expansion.

Replacement Cost: $430,000

**includes design, engineering and construction; excludes equipment, furnishings, land, approvals and GST. All amounts are 2008 dollars.*

Budget for Repairs / Replacements for next 20 years: $172,500

Following are comments on major facility systems based on review of the site August 22, 2008.

Site

The facility addresses one street. Land is available for potential expansion.

Structure

The pre-engineered steel frame was generally found to be in fair condition. The wood frame component including the mezzanine is also in fair condition. In general it is recommended that the structural steel frame be reviewed by a structural engineer every three years. The floor slab is generally in fair to good condition. The replacement horizon for the above-grade steel structure, the concrete foundations and floor slab is projected at 25 years.

Envelope

Metal roofing is in good condition and within 20 years of needing replacement. Windows and doors are in fair condition within 10 years of replacement. Replacement of operating and weather sealing components for the overhead doors is recommended within 5 years. Replacement of the section overhead doors is recommended in 10 years.

Interior

Finishes are minimal for the interior. The wood frame mezzanine in the north bay is painted wall board and is recommended to be repainted every 7 years.

The staff spaces and office are recommended to have doors and windows upgraded to 45 minute rated closures.

The floor slab is recommended to be resealed within 5 years. Ceiling tiles are recommended to be replaced when repainting is done. Washroom accessories are due for replacement within 5 years.

Mechanical

Heating includes electric baseboard units in the staff areas. Natural gas fired suspended radiant heaters provide heat for the garage bays and are reported to be functioning and approximately 15 years old. Natural gas fired hot water heaters are provided at to north and west ends of the garage bays. The exterior portion of the flue vent for the south heater is turned downward and should be repositioned to an upright position. A Carbon monoxide detection system is recommended to be installed for the garage in general. Exhaust fans in the garage are functional and are recommended to be replaced in the next 5 years.

Potable water is supplied from a well adjacent to the garage. The washroom facilities drain to an on site septic system.

Electrical

Main switch and distribution components are estimated at 25 years old and due for replacement within 10 years.

Summary of Priorities and Costs Projected for the Next 20 years

Items are categorized according to priority:

Essential – Life Safety
Required – maintaining facility / operations
Desired – upgrade facility / operations

Essential

Mechanical – provide CO detection for garage	2,000
Mechanical – reposition water heater flue vent to upright position	500
Sub-total – Essential Items	2,500
Required	
Structural – detailed review every 3 years (total amount over 20 years)	$14,000
Envelope – replace operating components and weather seals for overhead doors	3,000
Interior – reseal concrete floors	2,000
Interior – replace doors, windows and frames between staff areas and garage with fire rated closures. Include separation of stair from garage area with direct access to the exterior.	28,000
Mechanical – radiant heating system repairs / replacements	40,000
Mechanical – replace exhaust fans	12,000
Electrical – service replacement	20,000
Sub-total – Required Items	$119,000
Desired	
Envelope - Replace overhead doors and frames.	50,000
Interior – replace washroom accessories	500
Sub-total – Desired Items	50,500

End

Strong Township
Facility Reviews

TSH 36-19679

September 8, 2008

Location: Sand Storage Dome

Original Construction: 1993

The one storey storage dome is 15 years old.

Facility Attributes: The structure is of combustible and non-combustible construction and in fair condition. The envelope is wood sheathing and asphalt shingle. The facility includes at-grade access for vehicles and is not designed for barrier-free access.

Summary Observations: the shed is within 25 years of replacement.

Replacement Cost: $330,000

**includes design, engineering and construction; excludes equipment, furnishings, land, approvals and GST. All amounts are 2008 dollars.*

Budget for Repairs / Replacements for next 20 years: $150,000

Following are comments on major facility systems based on review of the site August 22, 2008.

Site

The facility addresses one street. The facility is not designed for expansion.

Structure

Timber framing, concrete support walls and pilasters are in fair to good condition. Vertical hairline cracks were observed in the west half of the foundation wall. Structural inspection is recommended for every three years. The replacement horizon is projected at 25 years.

Envelope

Roofing is asphalt shingle and also serves generally as the exterior cladding. The roofing will be due for replacement within 10 years. The entry framing and roofing show greater wear and will be due for repair and roofing replacement within 5 years.

Interior

The interior is exposed framing, sheathing and concrete in fair to good condition.

Mechanical

No mechanical services.

Electrical

A sub-panel fed from the Works Garage provide power for lighting in the Dome. The panel and lighting fixtures appear to be in fair condition.

Summary of Priorities and Costs Projected for the Next 20 years

Items are categorized according to priority:

Essential – Life Saftey
Required – maintaining facility / operations
Desired – upgrade facility / operations

Essential

No items

Required

Structural – detailed review every 3 years (total amount over 20 years)	$12,000
Exterior – repairs to entry framing and replacement of roofing for the entry only	8,000
Exterior – asphalt shingle and roofing paper replacement. Includes an allowance for replacement of 10% of the roof sheathing.	130,000
Sub-total – Required Items	$150,000

Desired

No items

End

Strong Township
Facility Reviews

TSH 36-19679

September 8, 2008

Location: Storage Shed

Original Construction: 2008

The one storey storage shed was constructed this year.

Facility Attributes: The shed structure includes two compartments on different levels and is of combustible and non-combustible construction and in good condition. The envelope is prefinished metal. The facility includes at-grade access for vehicles and is not designed for barrier-free access.

Summary Observations: the shed is within 35 years of replacement.

Replacement Cost: $80,000

**includes design, engineering and construction; excludes equipment, furnishings, land, approvals and GST. All amounts are 2008 dollars.*

Budget for Repairs / Replacements for next 20 years: $14,000

Following are comments on major facility systems based on review of the site August 22, 2008.

Site

The facility addresses two streets. The facility includes area adjacent to allow for expansion.

Structure

Timber framing and concrete support walls are in good condition. Structural inspection is recommended for every three years. The replacement horizon is projected at 35 years.

Envelope

Roofing and siding are pre-finished metal in good condition. Overhead doors are in good condition.

Interior

The interior is exposed framing, siding and concrete in good condition.

Mechanical

No mechanical services.

Electrical

A sub-panel fed from the Works Garage provides power for lighting in the Shed. The panel and lighting fixtures appear to be in good condition.

Summary of Priorities and Costs Projected for the Next 20 years

Items are categorized according to priority:

Essential – Life Saftey
Required – maintaining facility / operations
Desired – upgrade facility / operations

Essential

No items

Required

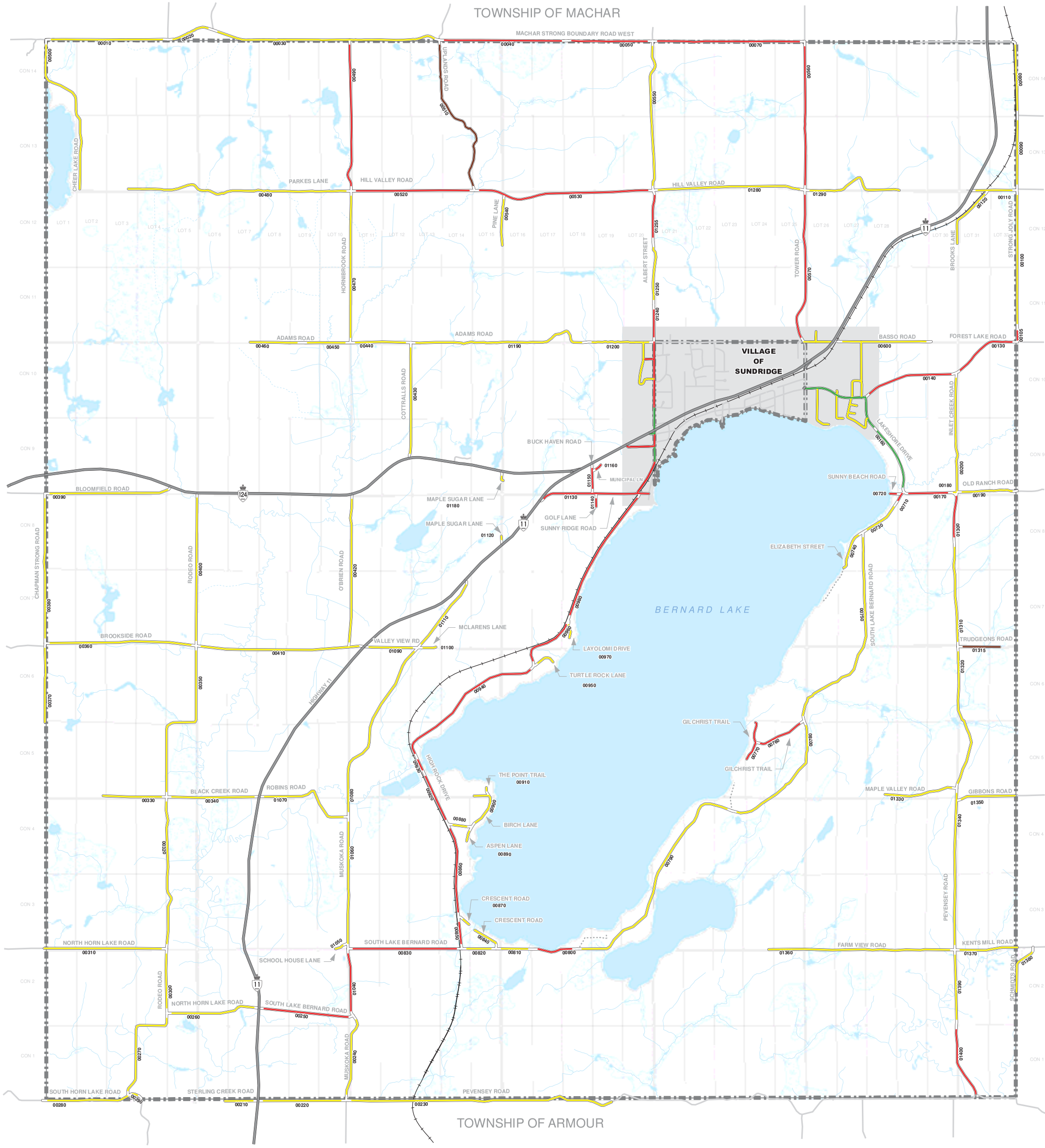
Structural – detailed review every 3 years (total amount over 20 years)	$12,000
Exterior – replacement of door operating components	2,000
Sub-total – Required Items	$14,000

Desired

No items

End

Map 1 **Roads by Surface Type**



Village of Sundridge

LEGEND

SURFACE TYPE
- HIGH CLASS BITUMINOUS
- LOW CLASS BITUMINOUS
- GRAVEL STONE OTHER LOOSE TOP
- EARTH

OTHER FEATURES
- PROVINCIAL HIGHWAY
- ADJACENT MUNICIPAL ROAD
- PRIVATE ROAD
- RAILWAY
- WATER COURSE
- WETLAND
- WATERBODY
- MUNICIPAL BOUNDARY

NOTES:
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CLIENT

TOWNSHIP OF STRONG

PROJECT

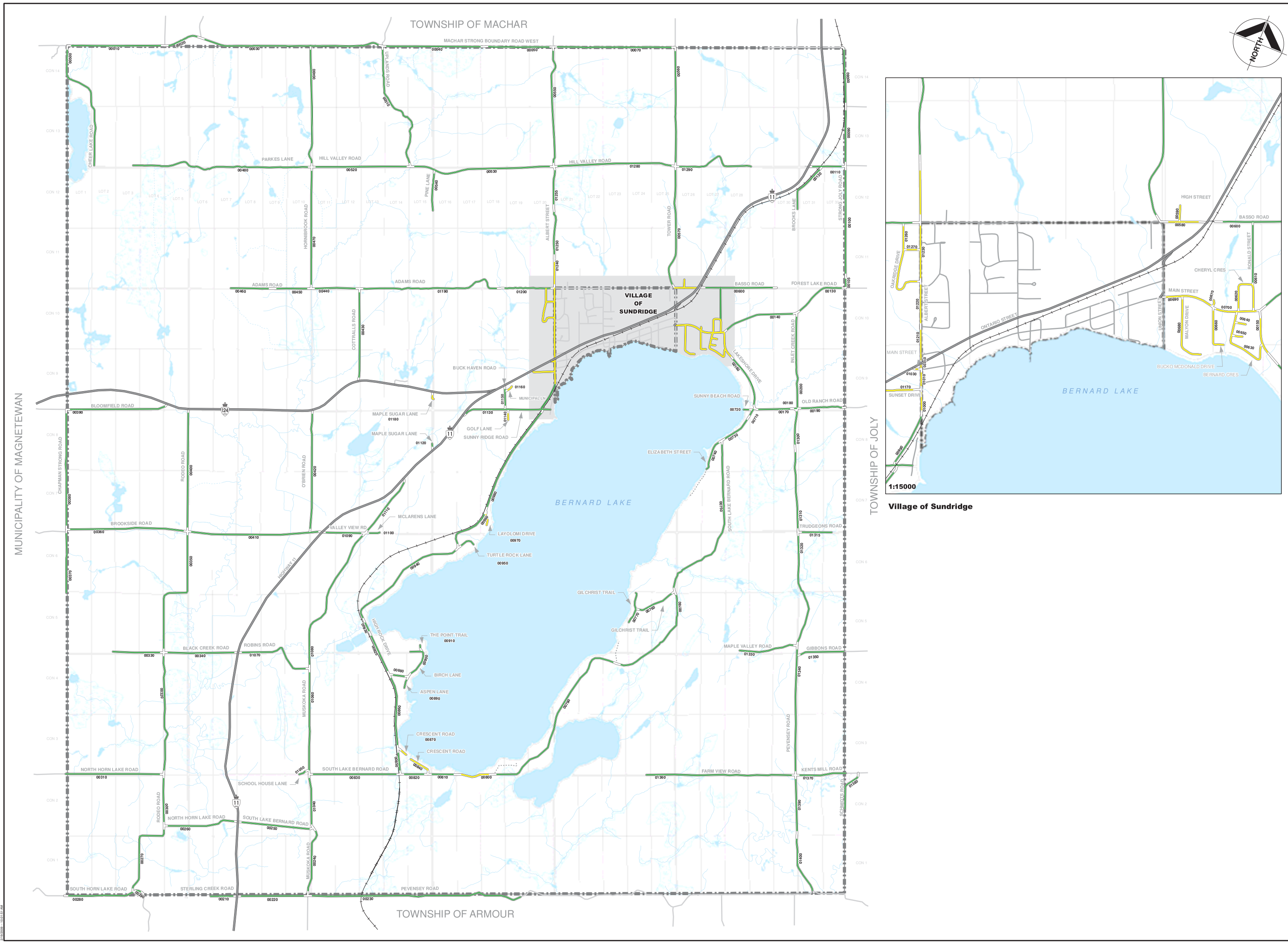
2008 ROAD NEEDS STUDY

DRAWING

SURFACE TYPE

PREPARED BY: A MURRAY	CHECKED BY: ---	PROJECT No. 36-19679
DESIGNED BY: ---	APPROVED BY: ---	DRAWING No. 1
SCALE: 1:30,000	DATE: FEB- 2009	

Map 2 Roadside Environment



LEGEND

ROADSIDE ENVIRONMENT

- URBAN
- SEMI-URBAN
- RURAL

OTHER FEATURES

- PROVINCIAL HIGHWAY
- ADJACENT MUNICIPAL ROAD
- PRIVATE ROAD
- RAILWAY
- WATER COURSE
- WETLAND
- WATERBODY
- MUNICIPAL BOUNDARY

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TOWNSHIP OF STRONG

PROJECT

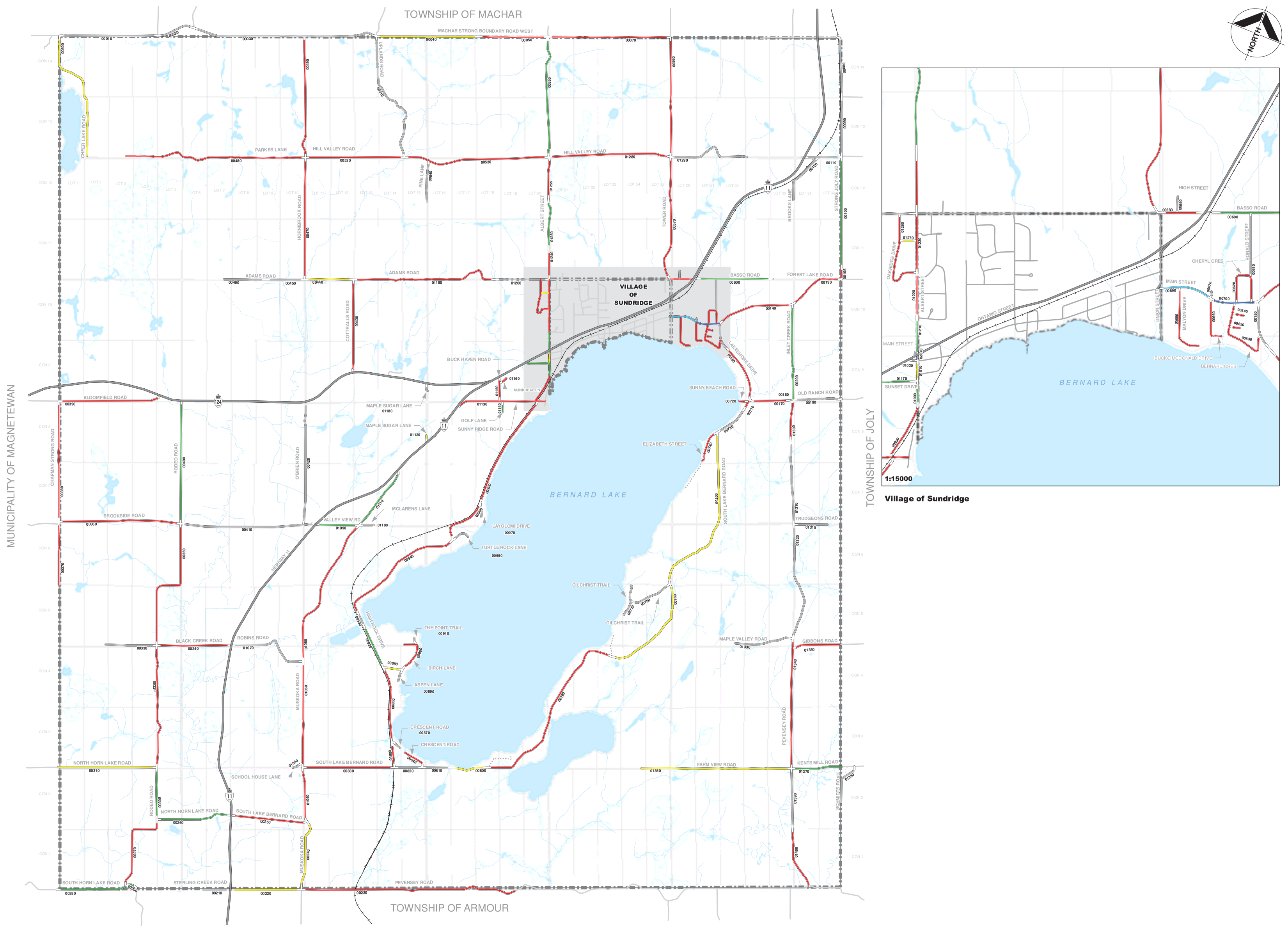
2008 ROAD NEEDS STUDY

DRAWING

ROADSIDE ENVIRONMENT

PREPARED BY: A MURRAY	CHECKED BY: ---	PROJECT No. 36-19679
DESIGNED BY: ---	APPROVED BY: ---	DRAWING No. 2
SCALE: 1:30,000	DATE: FEB- 2009	

Map 3 Roads by Time of Need



LEGEND

CONSTRUCTION AND RESURFACING NEEDS

- NOW CONSTRUCTION NEED
- 1-5yr CONSTRUCTION NEED
- 6-10yr CONSTRUCTION NEED
- 1-5yr RESURFACING NEED
- 6-10yr RESURFACING NEED
- ADEQUATE

OTHER FEATURES

- PROVINCIAL HIGHWAY
- ADJACENT MUNICIPAL ROAD
- PRIVATE ROAD
- RAILWAY
- WATER COURSE
- WETLAND
- WATERBODY
- MUNICIPAL BOUNDARY

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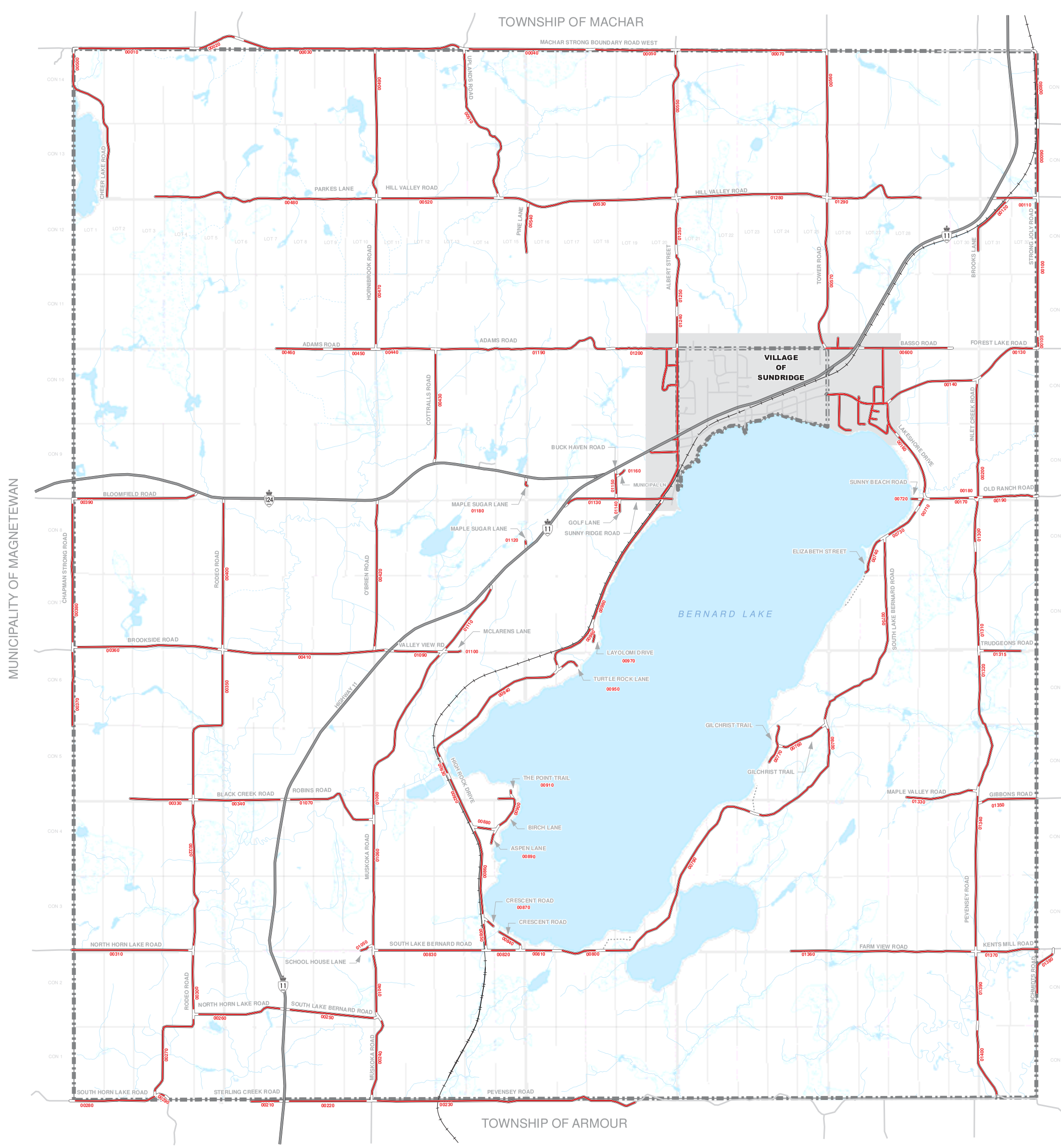
2008 ROAD NEEDS STUDY

DRAWING

CONSTRUCTION AND RESURFACING NEEDS

PREPARED BY: A MURRAY	CHECKED BY: ---	PROJECT No. 36-19679
DESIGNED BY: ---	APPROVED BY: ---	DRAWING No. 3
SCALE: 1:30,000	DATE: FEB- 2009	

Map 4 Roads by Road Inventory Section



Village of Sundridge

LEGEND

- ROAD SECTION
- PROVINCIAL HIGHWAY
- ADJACENT MUNICIPAL ROAD
- PRIVATE ROAD
- RAILWAY
- WATER COURSE
- WETLAND
- WATERBODY
- MUNICIPAL BOUNDARY

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2008 ROAD NEEDS STUDY

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ROAD INVENTORY SECTIONS

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DESIGNED BY: ---	APPROVED BY: ---	DRAWING No. 4
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