Committee Report

Report TR-TAPS-02-16

To: Chair Bell and Members of the Transportation and Public Safety Committee
From: M.J. Kelly, Director of Transportation Services
Meeting Date: February 18, 2016
Subject: Grey Road Classifications Criteria
Status: Recommendation adopted by Committee as presented per Resolution TAPS28-16; Endorsed by County Council March 1, 2016 per Resolution CC37-16;

Recommendation(s)

WHEREAS as per the Transportation Master Plan recommendations, County Council directed staff to develop road classifications for Grey roads;

AND WHEREAS the classifications are based on vehicle and truck traffic volumes, as well as adherence to County road principles;

AND WHEREAS the Grey Road classifications criteria for capital construction projects will be used as a guideline for scheduling road construction projects;

NOW THEREFORE BE IT RESOLVED THAT Report TR-TAPS-02-16 regarding Grey road classifications criteria for capital construction projects be received;

AND THAT the road classifications as outlined in Report TR-TAPS-02-16 be accepted in principle to establish a map, policy and procedure to be approved in a future report.

Background

On July 7, 2015, County Council supported the recommendation for the creation of functional classifications of County roads.

The classifications were developed based on traffic volumes, truck traffic volumes and adherence to County road principles developed in the Transportation Master Plan. In

addition, the classifications are aligned with the road structure guidelines used by the Transportation Services Department in determining the County road reconstruction structural requirements.

The classifications will provide guidance to staff regarding the timing of reconstruction of County roads.

Reconstruction of the higher class roads will be initiated before lower class roads.

Roads with higher traffic volumes, and in particular truck traffic, will deteriorate more quickly and therefore should be placed on the five year capital plan earlier than a low volume road.

Higher volume roads are typically used for economic reasons and as a result, should be maintained to a higher standard.

The adoption of the classifications will provide the Department with a transparent and consistent methodology for future work.

Financial / Staffing / Legal / Information Technology Considerations

The road classifications criteria will provide rationale for roads to be placed on the five year program based on the usage and as a result, will allow the County to better plan the reconstruction of its roads that will improve overall efficiencies.

Link to Strategic Goals / Priorities

To ensure that Council's goals of financial sustainability and public accountability are maintained.

Attachments

Grey Road Classifications Criteria for Capital Construction Projects

Respectfully submitted by,

M.J. Kelly
Director of Transportation Services

Grey Road Classifications For Capital Construction Projects

Grey County has developed a classification system for rural County roads to assist with the planning of capital construction projects, as part of the Transportation Master Plan.

Urban County roads will be assessed on their individual merits. In the past, all County roads have been assessed equally when scheduling capital construction and repair work. The Transportation Master Plan determined that County roads have various functions and the roads with higher usage and economic importance should be kept in better overall condition. For example, some County roads have more economic impact than others. It is vital for roads with high commercial traffic to be kept at a better overall physical condition level. Roads with significantly less traffic, although still important, can function effectively in slightly more deteriorated condition.

Four classifications have been chosen for rural County roads to harmonize with the Grey County Pavement Structure Design as outlined below.

Grey County Rural Road Classes

Class 1 – Primary County Roads

Roads with high vehicle and truck traffic that meet most County road principles. They are normally major links for the economy and have significant connections to Provincial Highways and other primary County roads.

Class 2 – Secondary County Roads

Roads with moderate vehicle and truck traffic. They meet most County road principles and provide some connections to Provincial Highways and primary County roads.

Class 3 – Tertiary County Roads

Normally used for inter-county travel and meet some County road principles.

Class 4 – Minor County Roads

Normally used for inter-county and local travel. They meet very few County road principles and they do not connect with the County Road network.

How Road Classes Are Set

Each County road will be evaluated on the following criteria:

Class	Daily Traffic Volumes	Daily Truck Volumes	Comply to Principles
1	more than 3,000	more than 300	more than 4
2	2,000 to 3,000	200 to 300	more than 3
3	1,000 to 2,000	150 to 200	more than 2
4	less than 1,000	less than 150	2 or less

County Road Principles

- County roads should provide appropriate service within all areas of the County, with an emphasis on serving established settlements.
- County roads should complement the provincial highway system (Highways 6, 9, 10, 21, 26 and 89).
- County roads are primarily transportation corridors and should provide a high degree of connectivity and service to the road users.
- County roads should follow shortest practical routes, along existing streets and roads.
- County roads should not duplicate services provided by parallel roads.

If an entire County road meets all of the criteria, it will be classified appropriately.

If a section of road fits into two different classes for traffic and truck volumes, the numbers will be assessed and classified by the Director of Transportation Services.

Road classes will be reviewed every four years.

The County inspects road conditions at least every second year. Inspections consider a variety of factors such as pot holes, cracking, distortions and overall ride. They also provide a weighted Pavement Condition Index (PCI) number. Grey County uses the data when setting construction priorities. When a road meets the corresponding PCI identified in the chart below, the Transportation Services Department will consider placing the project in the five year capital program. However, depending on the type of deficiency, a section of road may be included in the capital program when the PCI is higher or lower than identified in the table below. In addition, the PCI will not normally be used for scheduling preventative maintenance work to extend the life of the road.

Category	PCI Trigger
1	65
2	60
3	56
4	52

Grey County Pavement Structure Design

The objective of a pavement design is to develop a cost efficient pavement structure that addresses the site specific performance, serviceability and safety requirements. Pavement design is not an exact science and there are many variables that influence pavement performance, making the analysis complex.

Conventional pavement structure consists of three layers, including subbase (normally Granular B), base (normally Granular A) and a surface course (hot mix or surface treatment). There are a variety of types of surface courses that have different properties. These layers are founded on a subgrade having a sufficient strength to support the traffic and distribute it across the road bed.

Traffic generates pavement distress through fatigue and creep of material, which results in cracking and pavement deformation. As the weight of a vehicle increases, the impact to the road structure increases by the fourth power. In addition, the traffic loading on the roads is accumulated.

It is essential when designing the structural components of a road that it is capable of accommodating the existing and future demands of the road. Since truck traffic will have the most effect on the road structure, it is recommended to design the roads in most cases based on the truck traffic usage.

The load equivalency factor used to characterize the spectrum of axle loads applied to pavement. It is a relative measurement of pavement damaged determined by converting mix vehicle traffic loading into an equivalent single axle. The standard load equivalency factor for a single axle load of 8.2 tonnes is 1.0, which also reference to an Equivalent Single Axle Load (ESAL). ESAL is a means of equating various axle loads and configurations to represent the standard pavement damage of 8.2 tonnes per axle. Axle loads greater or less than 8.2 tonnes have a load equivalent factor of greater or less than 1.0 applied to them respectively. The load equivalency factor or ESAL varies approximately to the forth power law. For example, a 10.2 tonne axle load would result in $(10.2/8.2)^4$ or 2.5 ESAL. Although the load increases by 25% the load equivalency increases by 250%.

It is estimated that the average truck on the road consists of 2.0 EASL, while loaded gravel trucks are 4.0 to 5.0 EASL.

Each of the layers in the conventional pavement structure provides a purpose. The Granular B is for draining the road bed and structural strength, Granular A provides structure and a material that can be graded and the surface course provides a riding surface and structural strength. It is recognized that each one of these layers provide a different amount of structural strength known as the Granular Base Equivalent (GBE). The GBE for 1 mm of Granular A, Granular B, Cold in Place and Hot Mix are 0.67, 1.0, 1.8 and 2.0. The GBE road structural components have been equated to the EASL required to accommodate the traffic demands.

The following equates the number of trucks in one direction to the average EASL anticipated annually and the number of GBE's required accommodating the loading.

If more information is known about the number of trucks or the type of trucks (EASL) a more accurate EASL calculation can be completed and equated to the number of GBE required.

Example 1:

The road is expected to accommodate the following:

AADT 1200
% trucks 7.3%
Normal truck loading in directions or 2.0 EASL/truck

Calculation:

Number of trucks per lane per day	= 1200 AADT x (0.073x.5) trucks/lane
	= 44 trucks/day/lane
Number of EASL per year	= 44 trucks/day x 365 day/year x 2.0 EASL/truck
	= 32,120 EASLs

After interpolating the chart the GBE required will be approximately 385.

Example 2:

The road is expected to accommodate the following:

AADT 800
11% normal truck traffic
A new quarry with production of 100,000 tonnes annually, a loaded is equivalent to 4.5 EASL

Calculation:
Regular traffic

Number of trucks per lane per day normal traffic	= 800 AADT x (0.15x0.5) trucks/lane
	= 60 trucks/day
Number of EASL per year	= 60 trucks/day x 365 day/year x 2.0 EASL/truck

= 43,800 EASL

Quarry Traffic:

Number of loaded trucks per lane per year	= 100,000 tonnes/year/30 tonnes/truck = 3,300 trucks/year
Number of EASL per year	= 3,300 truck/year x 4.5 EASL/truck =14,850 EASL
Total Design EASL	= 43,800 EASL + 14,850 EASL = 58,650 AASL

After interpolating the chart the GBE required will be approximately 480.

In general, County roads will be constructed or rehabilitated to meet the structural strength identified by the anticipated annual EASL. If there is an anticipated short term (3 to 10 year) spike or decline in the anticipated annual EASL, the calculation may be completed on a life cycle analysis (18 years).

All newly constructed roads will be comprised of at least 50 mm of hot mix, 150 mm of Granular A, 300 mm of Granular B, unless approved by the Director.

Grey County Road Structure Table:

AADT	% Trucks	Trucks / Lane / Year	EALS	GBE	Hot Mix (mm)	Granular A (mm)	Granular B (mm)
less than 500	10	9,125	18,250	315	50	150	300
500-1000	10	18,250	36,500	400	50	150	300
1000-1500	10	27,375	54,750	475	65	150	300
1500-2000	10	36,500	73,000	575	100	150	350
2000-3000	10	54,750	109,500	650	100	150	450
3000-4000	10	73,000	146,000	700	100	150	525