2022 Road Management Plan

Town of Grand Valley
5 Main Street North
Grand Valley, ON, L9W 5S6

R.J. Burnside & Associates Limited
15 Townline
Orangeville ON L9W 3R4 CANADA

July 2022
300051682.0000

Distribution List

No. of Hard Copies	PDF	Email	Organization Name
0	Yes	Yes	Town of Grand Valley

Record of Revisions

Revision	Date	Description
0	July 2022	Initial Submission to Town of Grand Valley

R.J. Burnside & Associates Limited

Report Prepared By:

Henry Centen, P.Eng.
Senior Transportation Engineer
HC:sd

Report Reviewed By:

Arunas Kalinauskas, B.Sc.
Business Manager – Asset Management & GIS
AK:sd

Executive Summary

The following Road Management Plan for the Town of Grand Valley (Town) provides an inventory of the asphalt road system and select gravel roads, estimating the costs to address deficiencies in this infrastructure. Potential projects have been identified for consideration in a ten-year program for condition improvements to the road system, for guidance in prioritizing future projects.

Inventory of Roads

Road inventory information was collected, and road condition ratings were established, in October 2020 for the asphalt roads within the Town's road network, as well as for one gravel road, through a field review. Approximately 35.235 km of roads are inventoried in this study, comprised of 17.490 km of asphalt rural roads, 10.147 km of asphalt semi-urban roads, 4.880 km of asphalt urban roads and 2.718 km of gravel roads. Maps of the overall surface types and ID numbers are shown on Figures A1 and A2 in Appendix A, together with an excel spreadsheet.

Traffic volume ranges are estimated for the roads in this study based upon traffic counts at select locations, that were provided by the Town and Dufferin County. Traffic volumes for a ten-year horizon period were also estimated, based on growth forecasts in the Town's Transportation Master Plan and various Traffic Impact Study reports for developments within the Town.

Assessment of Road Needs

A pavement condition index (PCI) was established for each road section, based on rating systems developed by the Ministry of Transportation (MTO) and the Ontario Good Roads Association (OGRA). The condition rating (PCI) has been used to assess the improvement requirements for each segment within the road network, using *Streetlogix* software. An improvement matrix has been developed by Burnside for the Town and programmed into a decision tree within the *Streetlogix* software, for analysis purposes. *Streetlogix* is a road asset management platform that integrates the road inventory and condition geodatabase, road improvement decision criteria and road improvement prioritization. The software allows for forecasting of road condition degradation, as well as an assessment of the future overall condition of the road network, for various budget scenarios. To assist in the completion of this road needs study, a short term *Streetlogix* license was purchased. The results of the *Streetlogix* analysis were modified, where required, based on local knowledge provided by Town staff, to better reflect operational strategies being used by the Town, and to integrate "best practices" road management strategies of implementing earlier maintenance improvement interventions in the lifecycle management of the road asset (i.e., earlier routine maintenance, preventive maintenance and resurfacing, rather than waiting until rehabilitation is required).

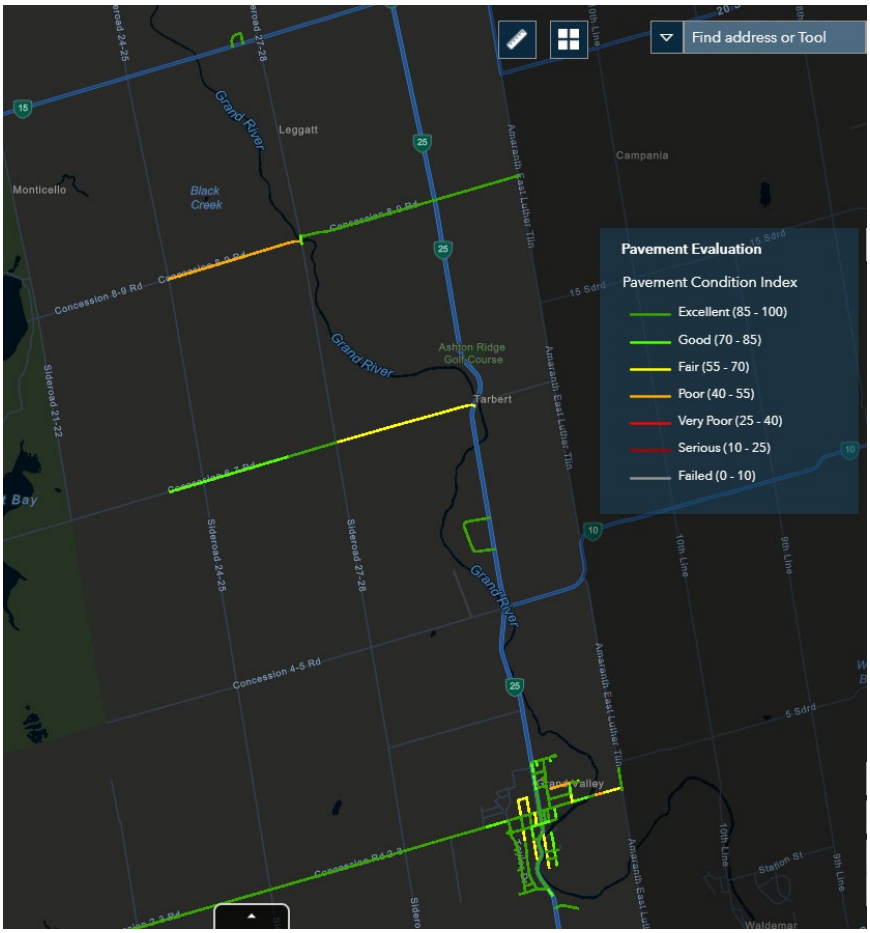
The backlog of road condition needs represents a quantification of the condition needs that currently exist in the road network. Going forward, these needs will constantly change, in response to both the improvement interventions and to ongoing deterioration of the roads. The analysis quantified the value of the current backlog of condition needs for the hardtop roads to equate to about **$1,333,598** for the various improvements identified. The following table provides a breakdown of the current improvement requirements for the asphalt road network:

Table E1: Current Hardtop Road Condition Needs

Road Type	Time Period of Need	Length of Road with Deficient Condition (km)	Cost Estimate to Upgrade Roads With Deficient Condition
Defer Maintenance (i.e., new or nearly new condition)	N/A	14.375	0
Routine Maintenance	NOW	5.685	$29,860
Preventative Maintenance	NOW	8.033	$279,012
Resurfacing	NOW	2.194	$342,226
Rehabilitation	NOW	2.230	$682,500
Total		**32.517**	**$1,333,598**

The pavement conditions are shown schematically on Figure E1 (from Streetlogix) and the existing condition needs (modified by local knowledge, budget constraints and maintenance strategies) are shown in Figures B1 and B2 in Appendix B of this report, along with an excel spread sheet of the road needs.

Figure E1: Road Condition Evaluation



The Town's hard top road network has been determined to have an overall average Pavement Condition Index (PCI) rating of 87, which indicates a very good overall network condition. The addition of new roads to the network in recent years has contributed to this high PCI rating.

The Gravel Condition Index rating for the single gravel road that was reviewed in this study is estimated to be 88, which indicates that this road is in good condition. However, the traffic volumes on this road exceed the volumes that are desirable for a gravel surface, leading to increased maintenance costs and upkeep, and therefore it is recommended that this road be upgraded to an asphalt surface.

Recommended Projects for Consideration in Ten Year Road Condition Improvement Plan

The objective of this Road Management Plan is to assist in Network Level Decision Making, which includes selecting the right road section at the right time for improvement. The inventory and prioritization of pavement needs, together with establishing a level of

service for pavement condition and setting appropriate budgets for improvements, will assist in meeting this objective.

The *Streetlogix* model prioritizes improvements, based on a weighting of pavement condition (PCI) and traffic parameters, as well as lifecycle considerations for the repair of the asset.

Through subsequent discussions with Town staff, additional local knowledge of the road priorities were identified, beyond those that could be discerned through a subjective visual surface condition assessment. The Condition Model and budgets were subsequently revised to reflect this additional local knowledge input. In addition, the Ten-Year Improvement Plan recommends that budgets be applied to the types of lifecycle improvements (i.e., routine maintenance, preventive maintenance and resurfacing), that can effectively delay the need for more costly major rehabilitation or reconstruction work. This approach is considered to be a “best practice” pavement management approach, to achieve reduced costs over the longer term.

A sensitivity analysis was completed to compare the condition impacts and costs for the following scenarios:

- Scenario 1 - Rehabilitation Model – assumes roads are allowed to deteriorate to a condition requiring rehabilitation, without maintenance or resurfacing.
- Scenario 2 - Best Practice Lifecycle Model – assumes budget is applied to routine maintenance, preventive maintenance and resurfacing, at appropriate time in the pavement lifecycle.

The comparative analysis of the two scenarios are summarized in the following table:

Table E2: Comparative Analysis of Improvement Models

Scenario	10-Year Cost	PCI at Year 10
Scenario 1 – Rehabilitation Model	$2,786,880	62.2
Scenario 2 – Best Practices Lifecyle Model	$2,110,090	83.7

As shown in the above table, the Best Practice Model results in an improved condition for the asphalt road network, with lower cost expenditures over the ten-year period, as compared to the Rehabilitation Model. The assumed budget expenditure for the 10-year plan (i.e., 2.1M over ten years) results in a small theoretical decrease in the PCI for the overall road network, although it remains a good condition rating. There are also a significant number of new subdivision roads that have been constructed to base asphalt over the past few years and which have not yet been included in the current study. Once these roads are finalized to surface asphalt, and assumed by the Town, the overall PCI rating for the network is expected to improve beyond the rating forecasted in the current analysis.

The Ten-Year Improvement Plan recommended in this study follows the Best Practice Model, as shown on Maps C1 and C2 in Appendix C, along with an excel spreadsheet. The resulting 10-year improvement plan for the asphalt roads is estimated to cost $2,110,090, with improvements applied to 49.039 km of roads over the ten-year period, including some roads that will receive a second improvement within this time.

Major improvement was also identified for upgrading of the Amaranth / Grand Valley Townline to an asphalt surface, for the section between County Road 109 and Amaranth Street, at an estimated cost of $3M. Given that this road is a boundary road and is subject to Development Charges, it is expected that cost sharing will be applied to these upgrades.

Table E3: Summary of Ten-Year Improvement Types and Cost Estimates

Road Improvement	Time Period of Need	Length of Road with Deficient Condition (km)	Cost Estimate to Upgrade Roads with Deficient Condition
Routine Maintenance of Asphalt Roads	Ten Year Plan	20.06	$107,193
Preventative Maintenance of Asphalt Roads	Ten Year Plan	17.172	$441,163
Resurfacing of Asphalt Roads	Ten Year Plan	9.487	$878,761
Rehabilitation of Asphalt Roads	Ten Year Plan	2.230	$682,500
Total Asphalt Road Improvements		**48.949**	**$2,109,617**
Upgrade Gravel Road to Asphalt Surface	Ten Year Plan	2.718	$3,000,000

In addition to the development of an improvement model for asphalt road, this study has provided factors for consideration in addressing other road management requirements including:

- Criteria for upgrading of gravel roads to hardtop surfaces;
- Road geometric needs;
- Road and shoulder width needs;
- Drainage needs;
- Maintenance considerations;
- Coordination with other projects.

Burnside gratefully acknowledges the assistance and contributions of Town staff in the preparation of this study.

Table of Contents

Tables

Figures

Appendices

Disclaimer

Other than by the addressee, copying or distribution of this document, in whole or in part, is not permitted without the express written consent of R.J. Burnside & Associates Limited.

In the preparation of the various instruments of service contained herein, R.J. Burnside & Associates Limited was required to use and rely upon various sources of information (including but not limited to: reports, data, drawings, observations) produced by parties other than R.J. Burnside & Associates Limited. For its part R.J. Burnside & Associates Limited has proceeded based on the belief that the third party/parties in question produced this documentation using accepted industry standards and best practices and that all information was therefore accurate, correct and free of errors at the time of consultation. As such, the comments, recommendations and materials presented in this instrument of service reflect our best judgment in light of the information available at the time of preparation. R.J. Burnside & Associates Limited, its employees, affiliates and subcontractors accept no liability for inaccuracies or errors in the instruments of service provided to the client, arising from deficiencies in the aforementioned third party materials and documents.

R.J. Burnside & Associates Limited makes no warranties, either express or implied, of merchantability and fitness of the documents and other instruments of service for any purpose other than that specified by the contract.

1.0 Introduction

R.J. Burnside & Associates Limited (Burnside) has been retained by the Corporation of the Town of Grand Valley (Town) to conduct a Road Management Plan (RMP). This RMP provides an inventory and condition rating of the Town's existing asphalt roads, as well as addresses various road maintenance, improvement, and management issues in the Town. One gravel road section was also reviewed, where upgrades to an asphalt surface may be a consideration. This RMP identifies the road capital and maintenance needs for the asphalt roads within the Town over the ten-year period 2022 through 2031.

The overall purpose of the Study is to assist in setting up an integrated program of capital expenditures so that the greatest benefit can be derived from available revenue.

The road inventory has also included the development of GIS mapping, and related database, for the Town's asphalt roads.

We gratefully acknowledge the assistance and contributions of the Town's staff in the preparation of this Study.

2.0 Background Studies

This Study uses modifications of various procedures for the evaluation of the condition of the roads including the following:

- SP-024 Manual for Condition Rating of Flexible Pavements – Distress Manifestations, Ministry of Transportation, 1989;
- SP-025 Manual for Condition Rating of Gravel Surface Roads, Ministry of Transportation, 1989;
- The Formulations to Calculate Pavement Condition Indices, Ministry of Transportation, 2007; and
- Inventory Manual for Municipal Roads, Ministry of Transportation, 1991.

The following previous studies were reviewed for background as part of this present study:

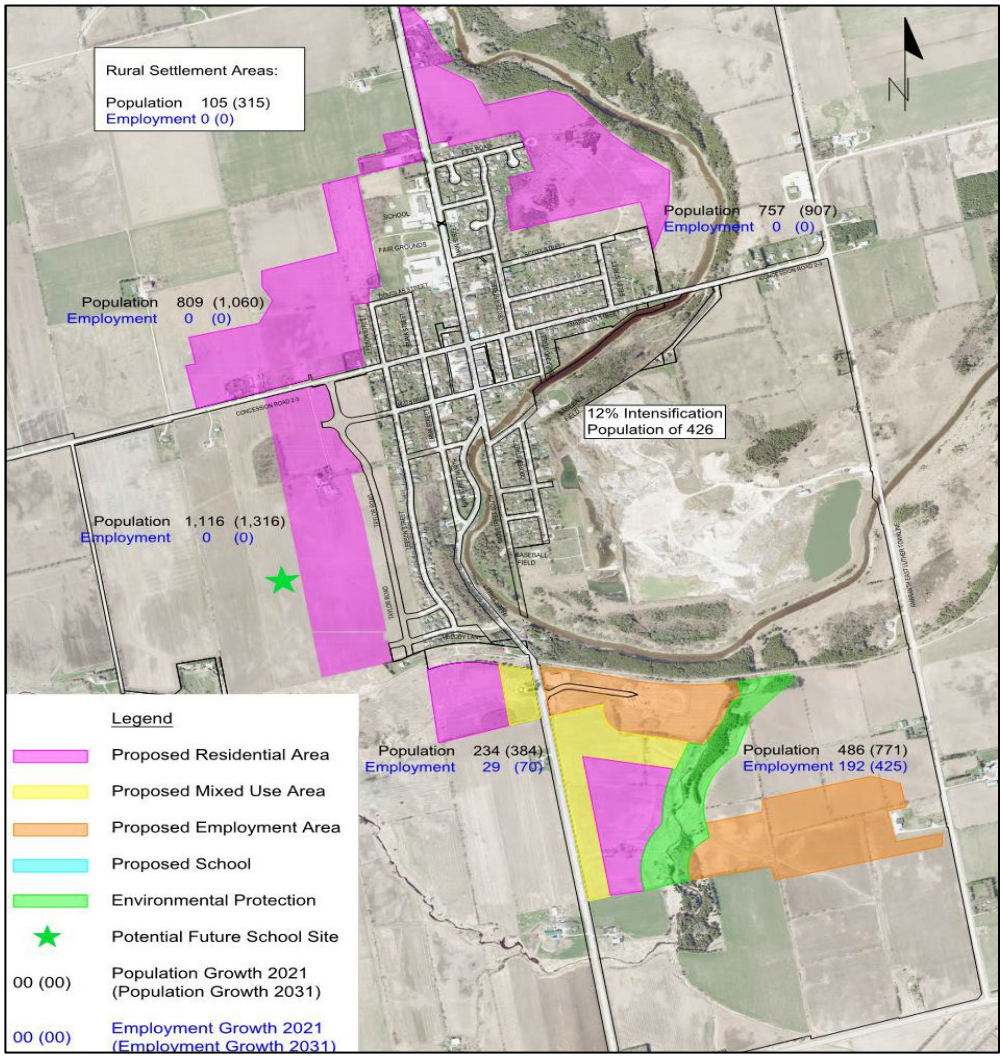
- Official Plan for the Town of Grand Valley (2006); and
- Town of Grand Valley Transportation Master Plan (Burnside, March 2017).

2.1 Transportation Master Plan

The Town's *Transportation Master Plan* (Burnside, March 2017) makes the following conclusions and recommendations related to the Town's road network:

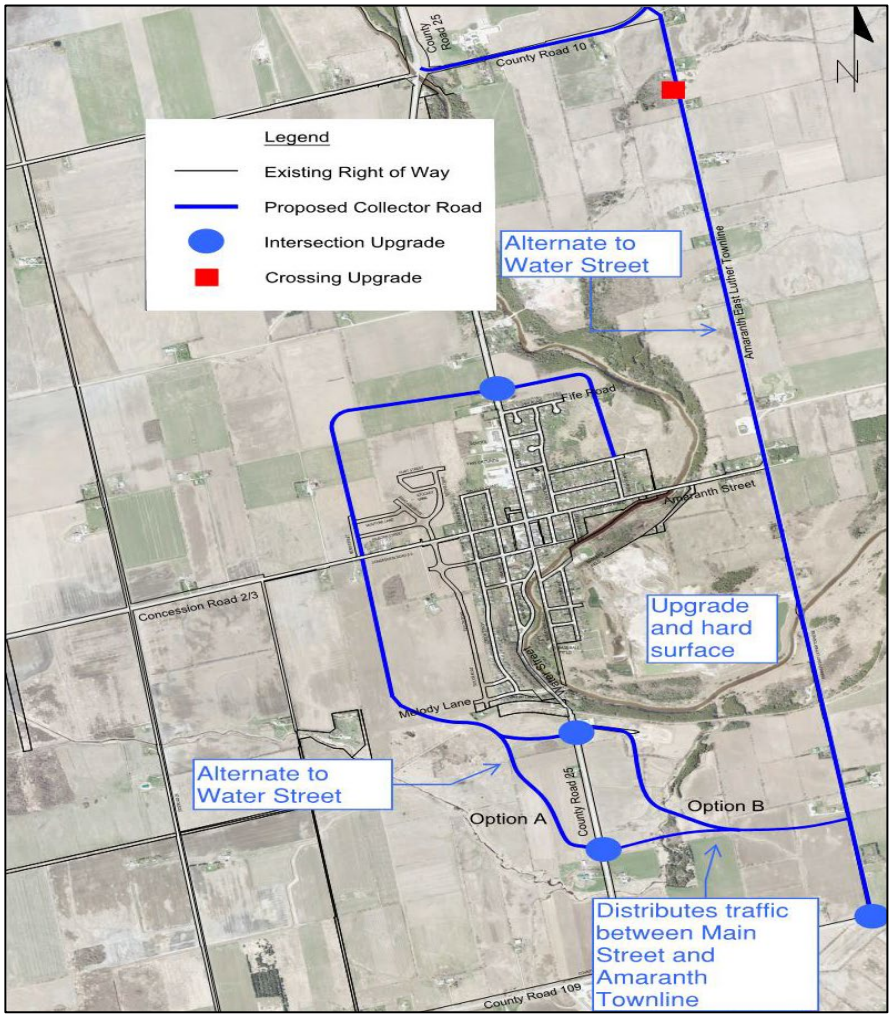
- The Town is served by two main roads – Main Street and Water Street (north-south arterial road) and Amaranth Street (east-west arterial);
- The Settlement Area of the Town is forecasted to grow significantly in the short and medium term, as shown on Figure 1.

Figure 1: Planned Growth Areas



- It is forecasted that the intersection of Amaranth Street / Main Street will exceed capacity and experience high delays in the short term, due to ongoing development, necessitating alternative routes being required. The provision of additional north-south collector road capacity is recommended to address the growth issues on Main Street, as shown in Figure 2.

Figure 2: Proposed Collector Roads



- Areas outside of the Main Settlement Area are expected to have limited growth.

3.0 Select Road Network Inventory

All road section data contained in this RMP is based on a field review conducted in October 2020 by Burnside.

The roadside environment and the surface type for each road section have been identified as shown in the database in Appendix A, with the surface type also shown graphically on the map in Appendix A. For the purposes of this report the roadside environment and surface type have been differentiated as follows:

Roadside Environment

- ***Urban Environment*:** reasonably continuous development occurs along the roadway and the roadway design includes curbs and/or gutters and storm sewers.
- ***Semi-Urban Environment:*** reasonably continuous development occurs along the roadway and the roadway design includes open ditches or swales and does not include curbs and/or gutters or storm sewers.
- ***Rural Environment:*** rural roads which abut scattered rural development and farms.

A total of 35.325 km (centerline) of roads were inventoried and reviewed in this RMP (i.e., 32.517 km of asphalt roads and 2.718 km of gravel roads), as summarized in the following table.

Table 1: Road Summary by Surface Type

Surface Type	Length (centerline km)	Environment	Percent of Hardtop Road
Asphalt (HCB)	4.880	Urban	15.01%
	10.147	Semi-Urban	31.20%
	17.490	Rural	53.79%
Total Hardtop Roads	**32.517**		
Gravel	2.718	Rural	
Total Roads Inventoried	**35.235**		

Roads are identified by their road names and identification numbers, and road segments have been identified by reference to their location, with respect to intersecting roads. For reference, the inventory mapping includes the overall road network within the Town, while the RMP in this study is for the asphalt roads only, plus upgrading of one gravel road. The database and mapping are fully integrated within a GIS and each section has been assigned a unique ID number and GIS reference number. Data related to the road sections was obtained through a new field review of the select roads in the network, including the following:

- Length;
- Surface type – asphalt or gravel;
- Roadside environment – rural, semi-urban and urban;
- Traffic data – estimated annual average daily traffic (AADT), current and 10-year forecast;
- Posted speed;
- Geometric data – road width, shoulder width;
- Roadside issues – drainage, safety;
- Distress Manifestation Index (DMI) – Various types of road distresses, derived from a quantification of the density of distress and the severity of distress;
- Ride Comfort Rating (RCR) – qualitative assessment of ride comfort; and
- Calculation of Pavement Condition Index (PCI), based on the DMI and PCI, using Ministry of Transportation (MTO) and Ontario Good Roads Association (OGRA) formulae.

The full database inventory and assessment is included in the digital GIS geodatabase, that will be provided to the Town as part of the final deliverables for this study.

3.1 Land Use Considerations

Schedule A1 and A2 of the Official Plan for the Town of Grand Valley outlines the existing land uses in the Town, including the built boundary and settlement boundaries, as shown in Figure 3 and Figure 4.

Figure 3: Land Use Map – Rural Area

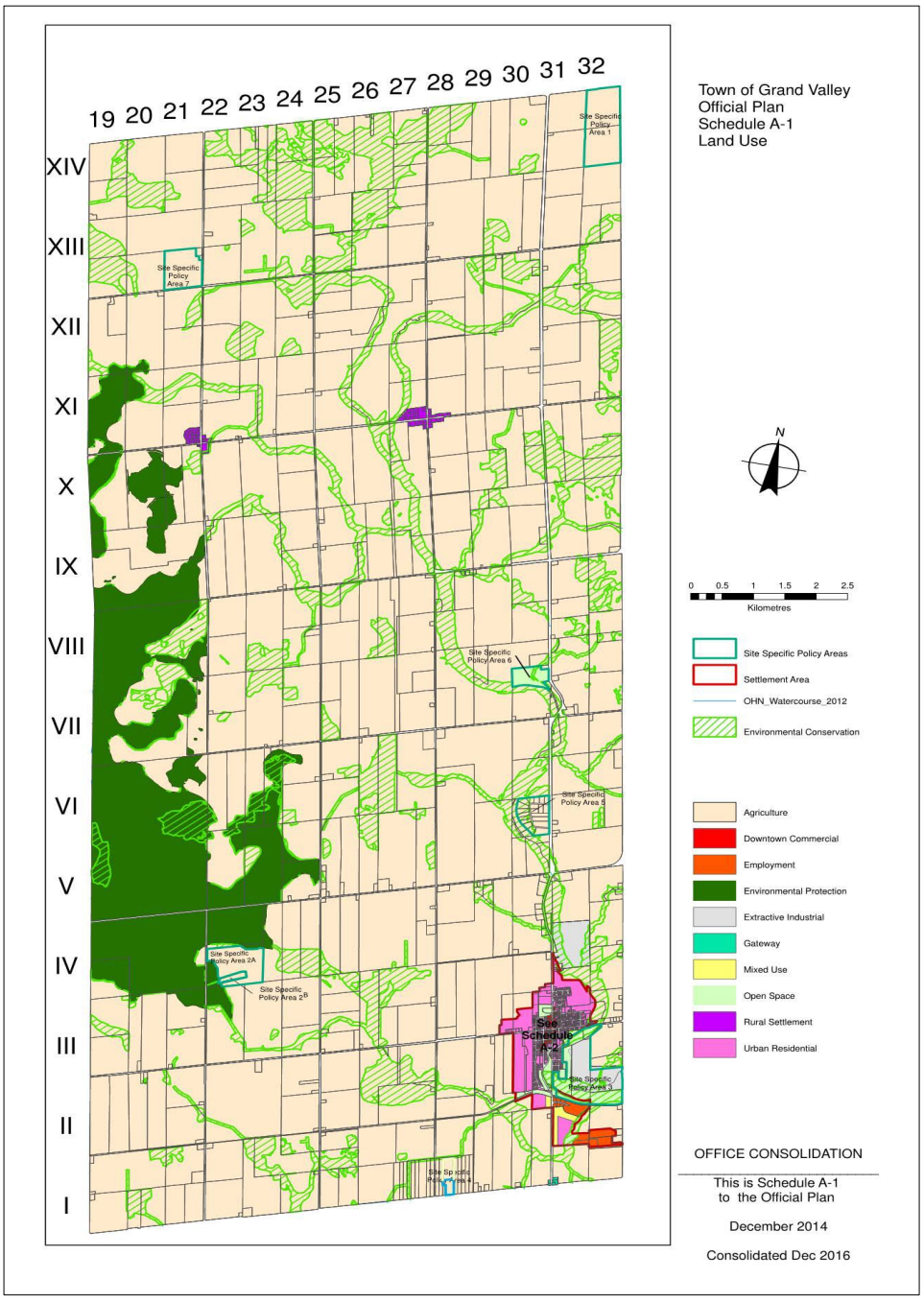
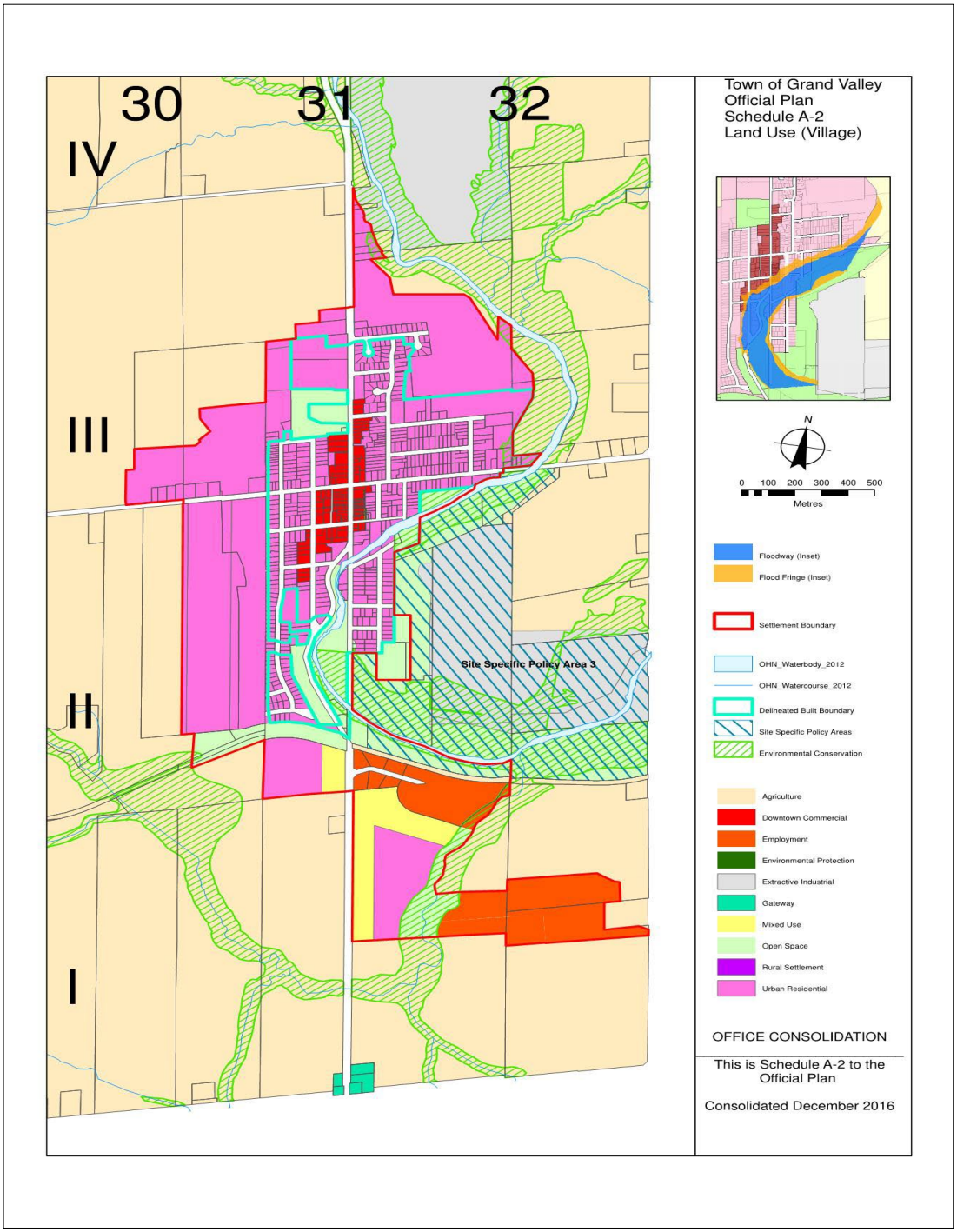


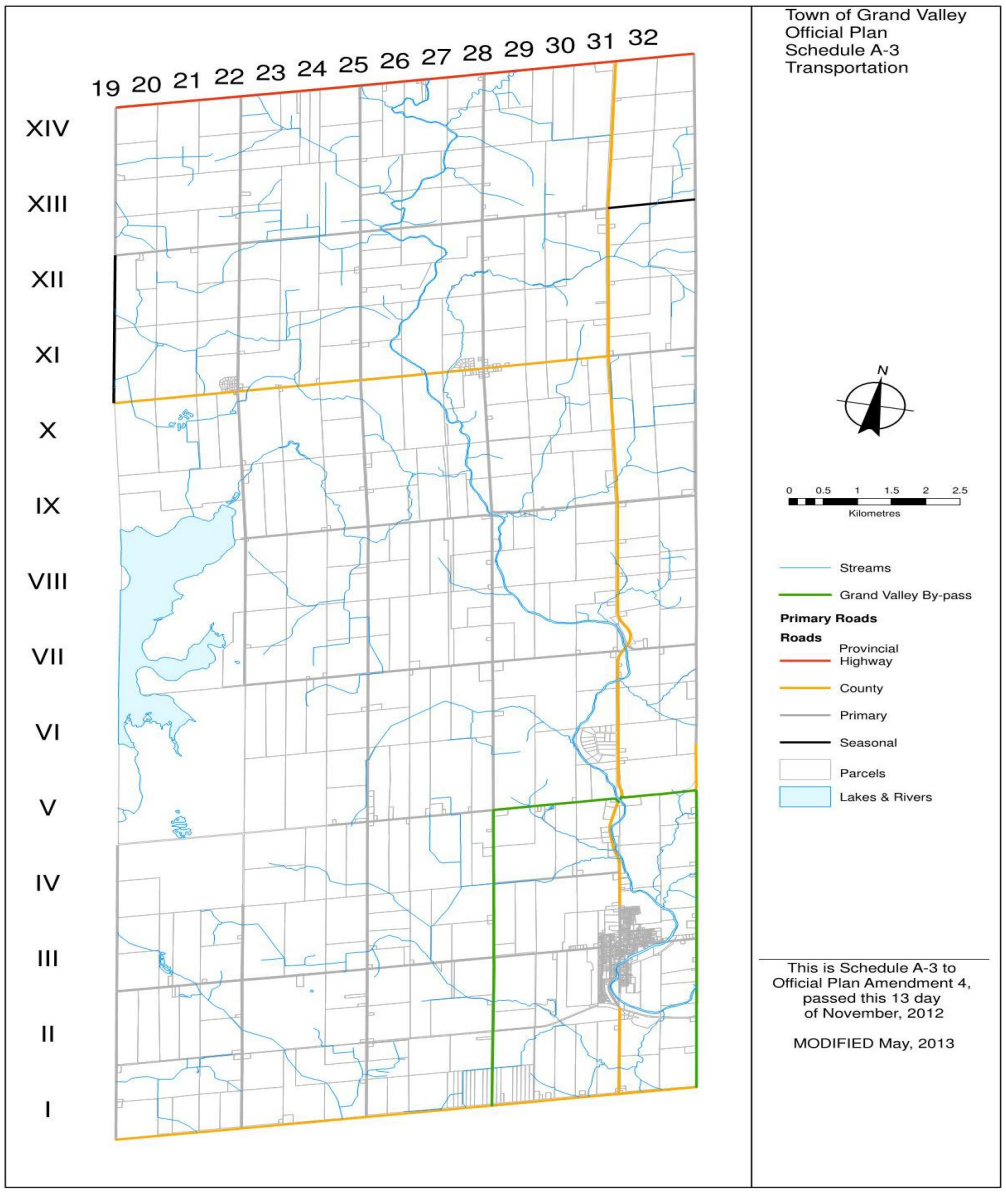
Figure 4: Land Use Map – Settlement Area



3.2 Functional Road Classifications

Schedule A3 of the Official Plan for the Town of Grand Valley outlines the Town's transportation network, delineating the roads as primary or seasonal, also showing a planned Grand Vallely By-pass route, as depicted in Figure 5.

Figure 5: Grand Valley Transportation Plan



Section 7.8 of the Official Plan notes the following, related to the functional road classifications within the Town:

> *The Town has identified a need for arterial and collector roads as the population in the settlement area increases. Some existing roads have naturally become arterial and collector roads over the development of the Settlement Area. Additional future arterial and collector roads may be identified on Schedule A-3 and may also be identified at the time of subdivision/condominium application.*

Grand Valley does not presently differentiate its roads by their functional classification. Functional road classification systems may be considered as a means of implementing land use and access controls, to minimize conflicts between traffic movement and property access. A typical hierarchy of roads is described as follows:

- ***Arterial Roads***: Normally Provincial or County roads, serving high volumes of intra-urban traffic at moderate speeds and with limitations on property access;
- ***Collector Roads:*** May be County or local roads, serving moderate to high volumes of traffic into or out of downtown areas and connecting to other urban areas, as well as collecting local traffic for distribution to the arterial road system. Traffic volumes are typically less than 8,000 vpd; and
- ***Local Roads:*** Roads serving low volumes of local traffic and providing access to individual properties. Desirable traffic volumes are less than 1,000 vpd.

As traffic volumes increase or as truck traffic increases, the potential conflict between the provision of residential access and through traffic mobility also increases. Designation of roads into functional classifications is recommended in areas where additional land use control is required to address such conflicts.

For the purposes of establishing road improvement /costing within this Road Management Plan, functional road classifications have been assigned to the roads, in accordance with the Inventory Manual for Municipal Roads, Ministry of Transportation, 1991, including the following:

- Arterial (ART);
- Collector Commercial (CC);
- Collector Residential (CR);
- Local Commercial (LC);
- Local Residential (LR);
- Rural Agricultural (RA); and
- Rural Residential (RR).

4.0 Growth in Annual Average Daily Traffic (AADT)

4.1 Traffic Growth

The location of various urban areas and developments throughout and adjacent to the Town were reviewed in conjunction with planning-level studies, in order to make 10-year AADT forecasts on roads considered in this RNS. The Province's *Growth Plan for the Greater Golden* Horseshoe (May 2017) allocates population in Dufferin County to grow from 61,735 in 2016 (*Canada Census*) to 80,000 in 2031, which equates to compounded growth of about 1.75%/annum. Between 2011 and 2016 Grand Valley grew from a population of 2,726 to 2,956, which equates to a compounded population growth of about 1.6%/annum (*Census Canada*). Population growth in the settlement area has increased from 1,476 to 1,643 in this time period, equating to a compounded population growth of 2.2%/annum (*Census* Canada).

The rate of population growth in Grand Valley has increased significantly after 2016 and increased growth rates are forecasted to continue to 2031. Most of the growth for Grand Valley is projected to occur in the settlement area, with relatively little in the areas outside of the settlement area. The growth areas in the settlement area were forecasted in the Town's *Transportation Master Plan* (Burnside, 2017), as shown in Figure . Growth rate projections from various planning studies are summarized in Table 2.

Table 2: Growth Rate Projections

Planning Study	Period	Grand Valley Population 2031	Forecasted Growth Rate
Grand Valley Official Plan (2006, consolidated to 2017)	2016 to 2031	7,478	6.4%/annum
Grand Valley Transportation Master Plan	2016 to 2031	8,105	7.0%/annum
2019 Development Charges Background Study	2019 to 2031	7,270	5.9%/annum
2019 Development Charges Background Study	2016 to 2019		7.4%/annum

The traffic volumes on the road network within the Town, primarily on the main roads in the settlement area, are expected to increase at rates which are commensurate with the population growth rates. However, the traffic volume increase on any specific road segment has been based on the location of the road relative to the growth areas and its connections to the arterial road network (i.e., County Roads) or other origin/destination considerations. In addition, the Town's *Transportation Master Plan* has recommended alternate north-south connections around the settlement area, which have been considered in the traffic growth forecasts.

4.2 AADT Traffic Volumes

The Town provided Burnside with traffic volume count data, based on traffic counts the Town collected between 2015 and 2020. The traffic data was collected by the Town's radar speed signs, which were installed to gauge speeding, and do not differentiate vehicle type (i.e., truck volumes). Traffic data was also obtained from the Town's *Transportation Master Plan* (March 2017), from traffic impact studies that were completed for developments within the Town and from traffic data available from the County of Dufferin for the County Roads in the study area. Land developments that have occurred over the past 5 years were also considered in adjusting the traffic count data, using standard trip generation rates provided in the *Trip Generation Manual* (Institute of Transportation Engineers). Based on these data sources Burnside has estimated the Annual Average Daily Traffic (AADT) for the roads being considered within this study. The initial AADT estimates were subsequently reviewed by Town staff and further adjusted, based on local knowledge. The forecasted current and 10-year AADT data is included in the road inventory spreadsheet in Appendix A and the lengths of roads in the various traffic ranges are summarized in Table 3:

Table 3: Traffic Volume Range Summary

AADT Traffic Range (vehicles/day)	Road Length in Range (Existing) (km)	Road Length in Range (10-year forecast) (km)
<50	0.135	0.055
50-199	14.644	14.064
200-399	4.820	3.840
400-999	10.173	7.875
1000-1999	0.900	3.103
2000-2999	1.845	0.900
3000-9000	-	1.185
>9000	-	1.495
Total	**32.517**	**32.517**

As shown in the above table, traffic growth on the road network is forecasted to result in significant shifts of the AADT volumes to higher ranges, which will increase maintenance requirements and their rate of degradation due to the higher volumes. These impacts will particularly impact the roads that provide an arterial function or major collector function, while local roads that are located in mature areas are expected to have lower forecasted traffic volume increases. The improvement model / costs developed in this RNS is based on average degradation rates. For AADT volumes exceeding 3000 vpd it is recommended that geotechnical studies be completed to verify design requirements for resurfacing or rehabilitation at the project design stage.

AADT volumes are one of the factors used in establishing potential improvement / upgrading requirements, as well as the formulation of improvement benchmark costs and road improvement priorities.

A minimum level of service for rural roads may be based on traffic usage, both the overall traffic volumes using the road and the type of traffic (e.g., trucks). For example, to minimize maintenance concerns, it is suggested that roads that have traffic volumes exceeding 500 vpd may be considered for a hard top surface. For those roads where the traffic volumes exceed 1,000 vpd, or where there is a high percentage of truck traffic, the preferred hard top surface design may be increased, to maximize the road life.

Where budgets allow, it is recommended that surface types be upgraded to meet these minimum desirable levels of service for surface type. Where budgets preclude meeting these desirable levels of service, a corresponding reduction in useful life is likely. In some areas, other constraints (e.g., right of way widths, horizontal or vertical curve deficiencies, etc.) may preclude the upgrading of such road sections without first addressing those factors.

5.0 Methodology and Analysis

5.1 Methodology for Establishing Asphalt Road Condition

The asphalt roads in the network have been reviewed in the field in October 2020 to determine their condition ratings. Specific pavement distress ratings were assigned for 15 distress types for all of the hard-top road sections, based generally on the “Flexible Pavement Condition Evaluation Form” developed by the Ontario Good Roads Association (OGRA) and the Ministry of Transportation, as illustrated in Figure 6. Distress Manifestation Index (DMI) and Pavement Condition Index (PCI) values were calculated for all asphalt road sections in the Town, according to formulae developed by MTO and OGRA.

Figure 6: Hardtop Pavement Evaluation Form

HARDTOP PAVEMENT CONDITION EVALUATION FORM

Survey Date: _____ Section ID: _____

Road (Street) Name: _____ Section Length _____ km

Location from: _____ to: _____

Comments:

Ride Comfort Rating (at posted speed)

10	9	8	7	6	5	4	3	2	1
Very Good	Good			Fair			Poor		Very Poor

Pavement				Wi	Severity of Distress (Si)					Density of Distress (Di)				
					Very Slight	Slight	Moderate	Severe	Very Severe	Few	Intermittent	Frequent	Extensive	Throughout
										<10	10-20	20-40	40-80	>80
					0.25	0.5	1	1.5	2	0.25	0.5	1	1.5	2
Surface Defects		Ravelling & loss of surface aggregate	1	1.5										
		Flushing	2	0.5										
Surface Deformations		Rippling and Shoving	3	1.0										
		Wheel Track Rutting	4	3.0										
		Distortion	5	3.0										
Cracking	Longitudinal Wheel Track	Single and Multiple	6	1.0										
		Alligator	7	3.0										
	Centreline	Single and Multiple	8	0.5										
		Alligator	9	2.0										
	Pavement Edge	Single and Multiple	10	0.5										
		Alligator	11	1.5										
	Transverse	Half, full and multiple	12	1.0										
		Alligator	13	3.0										
	Longitudinal – meander or mid-lane		14	1.0										
	Potholes/Patching		15	3.0										

While both OGRA and MTO evaluate the same distress types, the formulae used to establish a Pavement Condition Index varies between these agencies. Considering these variations, this study has used the lowest PCI generated by the respective formulas to determine improvement needs.

As shown in Figure 6, a Ride Comfort Rating (RCR) was also estimated for each road section. The RCR is a subjective measure of ride smoothness on a 1 to 10 rating scale, with 10 representing a very good RCR (i.e., very smooth ride).

The PCI, which is based on the individual distress and RCR values for each road section, results in a rating between 1 to 100. Higher PCI ratings reflect better road conditions.

The PCI ratings for each hard-top road section inventoried are included in the inventory spreadsheet in Appendix A. The distresses and PCI ratings have been updated to reflect the work that was completed in 2020 and 2021, after the period of the field review completed for this study.

Review of all the road distress data and resultant PCI calculations was completed in GIS. This dataset was then delivered to Streetlogix for loading into the Streetlogix Road Asset Management system.

The calculation of the pavement condition indices (PCI) follows the methods outlined by the MTO for such calculations (MTO, 2007) or by OGRA. A pavement condition index (PCI) has been calculated for each road section according to the following formulae:

Asphalt: MTO PCI = 13.75 + (9 x DMI) – (7.5 x $e^{(8.5-RCR)/3.02}$)

OGRA PCI = 100 – (DMI – (10-RCR))

Where:

- DMI = Distress Manifestation Index, which is a systematic method of classifying and assessing the visible consequences of various surface distress mechanisms. The DMI classifies distress manifestations into various categories which are given a weighting factor (W) and which are classified according to their severity (S) and density (D). The total DMI is obtained by summation of the distress manifestations for all of the relevant factors and the following formulae:

  Asphalt: MTO DMI = 10 x (208 – summation of W x (D+S))/208

  OGRA DMI = summation of W x (D+S)

- RCR = Ride Comfort Rating, which is a subjective ride quality assessment as perceived by the traveling public and which has been determined by the field assessment of the roads.

This study has been based on a subjective, surficial, visual assessment of road conditions, along with historical knowledge and estimated AADT ranges. There have been no boreholes taken to confirm gravel structure, or field survey to confirm constraints, and this should be considered before committing to any project-specific design or maintenance plans. It is

recommended that cost estimates be reviewed on a project-specific basis as budgets, standards, designs and methodologies are established.

5.2 Gravel Road Condition Ratings

The review of gravel roads in this RMP has been limited to those gravel roads that may be considered for upgrading, as identified by Town staff. Only one (1) gravel road was identified for review, namely Amaranth/Grand Valley Townline (ID 0001), between Amaranth Street and County Road 109.

Similar to the condition rating system developed for hard-top roads, Burnside developed the "Gravel Condition Evaluation Form" illustrated in Figure 7. The form incorporates rating schema from the *Inventory Manual for Municipal Roads* (Ministry of Transportation Ontario [MTO], 1991), such as the Structural Adequacy and Drainage Rating. The various distress types shown in the Form have been collected in the field to support the overall Structural Adequacy and Drainage Rating values, as well as to provide information on the specific distress observations (if any) on the single gravel road section under review.

Figure 7: Gravel Road Condition Evaluation Form

GRAVEL CONDITION EVALUATION FORM

Survey Date: _____ Section ID: _____

Road (Street) Name: _____ Section Length _____ km

Location from: _____ to: _____

Comments:

Ride Comfort Rating (at posted speed)

10	9	8	7	6	5	4	3	2	1
Very Good	Good			Fair			Poor		Very Poor

Pavement	Rating	Severity of Distress (Si)					Density of Distress (Di)				
		Very Slight	Slight	Moderate	Severe	Very Severe	Few	Intermittent	Frequent	Extensive	Throughout
							<10	10-20	20-40	40-80	>80
Structural Adequacy (1-20)											
Soft Spots											
Spring Breakup											
Potholes											
Washboarding											
Distortion											
Rutting											
Drainage Adequacy (1-15)											
Flat Crown											
High Shoulders											
Deficient Ditching											
Ponding											
Flooding Issues											
Vegetation Encroachment											

In order to forecast the condition of gravel roads, the following equation has been developed:

GCR = 3*(*Structural Adequacy*.) +2*(*Drainage Adequacy*.) + *Ride Comfort Rating*

where:

- GCR is the Gravel Condition Rating, out of 100. The higher the GCR, the better the condition of the gravel road section;
- Structural Adequacy (S.A.) is out of 20, as determined from visible distresses such as soft spots, Spring breakup, potholes, washboarding, distortion, and/or rutting;
- Drainage Adequacy (D.A.) is out of 15, as determined from deficiencies such as flat crowns, high shoulders, deficient ditching, ponding, flooding issues, and/or vegetation encroachment; and
- RCR is the Ride Comfort Rating, out of 10, which follows the descriptions in the *Inventory Manual for Municipal Roads* (MTO, 1991).

In general, the Amaranth / Grand Valley Townline was observed to be in good condition at the time of the field review in October 2020 (i.e., no significant visual distresses, good drainage and good crown). These conditions may not be representative of conditions in the Spring, during periods of increased susceptibility of the road based to traffic loading. The GCR for the single road section inventoried is calculated to be 88.0. Based on a traffic count taken in September 2018, it is estimated that the AADT on this road was about 500 vpd at that time, with peak day counts in the order of 700 vpd. Given these traffic volumes, consideration should be given to upgrading this road to an asphalt surface, as discussed further in a subsequent section of this report. It is recommended that geotechnical investigations be completed to confirm the structural adequacy of the base to support the upgrading to an asphalt surface as part of the detailed designs for these improvements.

5.3 Improvement Types

The road improvement types considered in this study are the following:

- Routine Maintenance (RM) – crack sealing (asphalt surfaces).
- Preventive Maintenance (PM) – micro-surfacing or single surface treatments (SSTs).
  - Routine/Preventive Maintenance can help to delay the need for more extensive rehabilitation or reconstruction. Routine/preventive maintenance is typically done when a road is in good condition. Crack sealing, SST and microsurfacing can prevent water from infiltrating through cracks to the road base, which ultimately helps prevent further deterioration of the road base and increases the length of time before more extensive treatments are required. For gravel roads, routine maintenance consists of applying maintenance gravel, grading and application of dust suppressants.
- Resurface (R) – mill and pave (urban) or FibreMat.

  - Resurfacing treatments are typically done when a road is in fair condition. Given that the road is in fair condition, resurfacing treatments generally consist of replacing the surface of roadways, but minimal (if any) work is done to the base of the road, aside from patching where required. Resurfacing treatments mentioned in this RMP are not to be confused with micro-surfacing treatments, which are considered a form of preventative maintenance, which is applied to roads still in good condition, with only very minor amounts of cracking.

- Rehabilitation (REH) – pulverize, partial base repair, and one or two lifts of hot mix asphalt (HMA) or a double surface treatment (DST).
  - More extensive rehabilitation treatments are applied to pavements in poor condition which have deteriorated to a point where full depth replacement of the pavement surface is required to protect the integrity of the underlying granular base and to delay more extensive reconstruction being required. Pavement rehabilitation extends the service life of a pavement and its load carrying capacity by enhancing its pavement structure. This is achieved by eliminating the age-related deterioration of the pavement or increasing the thickness of pavement layers to address increases in traffic volume.
- Reconstruction (REC) – full depth removal, total base replacement, total curb replacement (if applicable), and one or two HMA or a DST. If grades allow, new base may be placed over existing base, to minimize the extent of removal of the existing base.
  - Reconstructions are typically done when a road is in very poor condition, or if work is being done to infrastructure beneath a road which require that the road be reconstructed. If pavements are left to deteriorate, they become weak and lose their structural integrity. As its structural capacity is weakened, a pavement will begin to disintegrate, resulting in extensive cracking, rutting and potholes being developed. At this point, maintenance, resurfacing, or rehabilitation treatments will not be able to restore its structural integrity. Once a minimum condition level is reached, the pavement and road base may require full reconstruction in order to reestablish the proper base support for the pavement. Applying a lesser degree of rehabilitation may result in premature failure of any newly applied pavement surface. Once the pavement degrades below a minimum recommended condition, ongoing maintenance (e.g., filling of potholes) will typically increase significantly and/or safety or user complaints may become a concern. Reconstruction is also required when the pavement needs to be improved, to cater to significant increases in projected traffic volumes or to accommodate road widening.
- Surface Upgrades (Gravel to HCB or LCB) – for the purpose of assessing potential gravel road upgrades, gravel road sections with AADT volumes exceeding 200 vpd would typically be recommended for consideration for a hardtop surface. Although traffic volumes are only one factor that should be considered when assessing potential gravel road upgrades, it provides a numerical minimum to begin considering and assessing the

other factors, such as network connectivity and truck volumes. Road sections with volumes less than 200 vpd may be considered for upgrading to a hardtop surface, depending on other site-specific factors and conditions. While an assessment of the overall gravel road network is beyond the scope of this RMP, it is recommended that the gravel road network be reviewed as part of future RMPs. Gravel roads, that have traffic volumes of less than 200 vpd and have no site-specific conditions that may warrant hardtop surfaces, are assumed to be maintained via maintenance gravel, and when their condition is poor enough, rehabilitated or reconstructed while maintaining their gravel surface.

To determine improvement types that are warranted for certain road sections, the PCI (hard-top) values collected in the field were assigned to the distress trigger value ranges set for different improvement types. The trigger value ranges set for each improvement type are summarized in Table 4: Road Improvement Matrix, in addition to the improvement effects on road conditions (i.e., the net benefit to the PCI values after a certain improvement type is implemented). Specific details on what each improvement entails are included in Table 4, based not only on the distress trigger ranges but also the surface type, roadside environment and traffic volumes. Estimated benchmark treatment costs are also provided in Table 4.

The identification of improvement needs based on the estimated PCI values from the visual assessment of distresses provides a planning level assessment of needs related to road condition. Other site-specific factors have been considered to further refine the costs for such improvements, based on local considerations and assumptions. In particular, it is understood that surface treatment strategies are not currently used in the Town and therefore the condition improvements noted for these types of treatments have been upgraded to use asphalt strategies. The degradation forecasts have also been adjusted to reflect the increased longevity of such upgrades.

A map showing the improvement needs for the asphalt road network is included in Appendix B.

Table 4: Road Improvement Matrix

Improvement	Urban - Hard Top (HCB)			Semi-Urban or Rural - Hard Top (HCB/LCB)				
	Post-Treatment Condition	**Any AADT**	**Distress Triggers**	**Post-Treatment Condition**	**Rural AADT>=1000 or Semi-Urban**	**Rural 1000>AADT>=400**	**Rural AADT<400**	**Distress Triggers**
Routine Maintenance (RM) [1]	PCI + 5	Crack Sealing [$0.75 per m^2]	95>PCI>=90	PCI + 5	HCB – Crack Sealing [$0.75 per m^2]			95>PCI>=90
Preventive Maintenance (PM)	PCI + 5	Crack Sealing [$0.75 per m^2]	90>PCI>=70	PCI + 10	Micro-Surfacing [$6 per m^2]	Micro-Surfacing [$6 per m^2]	Single Surface Treatment (SST) [$5 per m^2]	90>PCI>=70
Resurface (R)	PCI + 25 max 95	Mill + 1 HMA [$27-$31 per m^2]	70>PCI>=55	PCI + 25 max 95	1 HMA Overlay + patching [$22-$26 per m^2]	1 HMA Overlay + patching [$22-$26 per m^2]	Rural Residential FibreMat [2] + patching [$15 per m^2] Rural Commercial or Rural Arterial -1 HMA Overlay + patching [$26 per m^2]	70>PCI>=55
Rehabilitation (REH) [4]	PCI+40	Full depth asphalt removal + 2 HMA + spot curb replacement [$74-$85 per m^2]	55>PCI>=30	PCI+40	Semi-Urban - Pulverize + Granular A + 2 HMA [$60-$70 per m^2] Asphalt Gutter ($5 per m^2) Rural – Pulverize + Granular A + 2 HMA. [$47-$55]	Rural Residential - Pulverize + Granular A + 1 HMA [$36 per m^2] Rural Commercial or Rural Arterial – Pulverize + Granular A + 2HMA [$55 per m^2]	Rural Residential - Pulverize + Granular A + 1 HMA [$36 per m^2] Rural Commercial or Rural Arterial – Granular A + 2 HMA [$55 per m^2]	55>PCI>=30
Reconstruction (REC) [4]	PCI=100	Full depth asphalt removal + 2 HMA + total base and curb replacement + nominal storm sewer adjustment [$113-$125 per m^2]	PCI<=30	PCI=100	Full depth removal + 2 HMA + total base replacement + nominal shoulder/ditch repair [$111-$120 per m^2] Asphalt Gutters for S.U. ($5 per m^2)	Rural Residential -Full depth removal + 1 HMA + total base replacement + nominal shoulder/ditch repair [$98 per m^2] Rural Commercial or Rural Arterial – Full depth removal + 2 HMA + total base replacement + nominal shoulder/ditch repair [$120 per m^2]	Rural Residential - Pulverize + Granular A + 1 HMA [$97 per m^2] Rural Commercial or Rural Arterial – Pulverize + Granular A + 2 HMA [$117 per m^2]	PCI<=30

1. For crack sealing, single/multiple cracking must be present on the road section (i.e., some types of cracks, such as alligator or block cracking, are more typically related to the road base and are too severe to benefit from crack sealing).
2. Cracks over 0.25 inches wide on asphalt (HCB) roads should be sealed prior to application of a FibreMat treatment, to reduce the potential for reflective cracking.
3. Geotechnical tests should be used at the design stage to determine the condition of the road's base, and road-specific considerations should be made (e.g., traffic types, resident expectations, etc.) to confirm if a Double Surface Treatment (DST) is preferred or, alternatively, whether a single lift of asphalt (1 HMA) is preferred. Improvements to the road section's base and drainage should be made, where required.
4. Either a REH or REC treatment is applied at the end of the road's life, depending on the condition of the road base. Since the number of culverts requiring replacement varies widely from section-to-section, unit costs shown exclude any costs associated with culvert replacements

The hardtop roads within the Town's road network are exclusively High Class Bituminous (HCB) surfaces (i.e. no Low Class Bituminous (LCB) surfaces currently exist in the Town). The Template for Hard-top Lifecycle Improvements that has been developed in this study takes into consideration the following parameters in recommending improvement types:

- Roadside environment (rural, semi-urban or urban);
- Traffic volumes (i.e., AADT volumes); and
- Road condition.

Additional parameters that may be considered in the establishment of surface type and costs include:

- Traffic types (e.g., percentage of trucks); and
- Functional classifications (e.g., local or collector, residential or industrial/commercial).

The Town's urban roads have HCB surfaces, due to the constraints imposed by curbs, storm sewers etc. An urban design standard has been provided in the newer subdivisions, along the arterial roads and in the commercial areas of the Town.

The semi-urban hardtop roads provide access to the development areas (i.e., primarily within the settlement area or within a few rural estate lot developments). The design standard applied to these roads varies considerably and may include roadside swales/ditches or paved shoulders/gutters. Upgrading of semi-urban standards to full urban standards is considered on a case-by-case basis, depending on available drainage outlets, other planned servicing upgrades, budget availability, etc.

The Town's hardtop roads have been developed to respond to additional structural requirements (e.g., higher traffic volumes or truck traffic), to provide connectivity within the overall hardtop road network, to provide smoother surfaces, or for other maintenance or planning reasons.

The template for the life cycle road improvements for rural hard top roads that have traffic volumes of <= 400 vpd has identified a surface treatment strategy as being cost effective. However, since the Town has typically used an asphalt surface strategy in lieu of surface treatment, the improvement costs for improvements to such roads has been based on implementing an asphalt surface strategy.

The road improvement matrix has been programmed into a decision tree within *Streetlogix* software, for analysis purposes. *Streetlogix* is a road asset management platform that integrates the road inventory and condition geodatabase, road improvement decision criteria and road improvement prioritization. The software allows for forecasting of road condition

degradation, as well as an assessment of the future overall condition of the road network, for various budget scenarios.

5.4 Improvement Costs

General improvement benchmark unit costs are for budget planning purposes and have been based on theoretical costs per square metre for the applicable recommended improvement standard. While these unit costs are considered sufficient for planning purposes, actual costs may vary according to the following factors:

- Site-specific requirements/constraints;
- Fluctuations in input costs (such as the price of oil); and
- Budget constraints requiring consideration of lesser standards (such as maintaining vertical profiles to tolerable conditions or reducing overall improvements).

It is recommended that standards be reviewed on a project specific basis as budgets are established.

Benchmark improvement costs (per square metre) are outlined in the following table and are based on recent data provided by the Town as well as available unit cost data from similar lower-tier Ontario municipalities (in terms of location, population, and climate)**.** The unit cost data that have been applied to the cost estimates are shown in the following table:

The improvement types/costs consider surface types, traffic volumes, road conditions and roadside environments. Since the improvement benchmark costs are estimated on a square metre basis, the improvement costs for any particular road section will also capture individual road widths.

The breakdown of the unit costs applied in this RMP is provided in Table 5 and Table 6.

Table 5: Improvement Costs

Functional Class	Cost Estimate Per m^2 of Asphalt Road				
	Routine Maintenance (RM)	Preventive Maintenance (PM)	Resurfacing (R)	Rehabilitation (REH)	Reconstruction (REC)
Urban					
Local Residential	$0.75	$0.75	$27.00	$74.00	$113.00
Local Collector, Collector Residential, Collector Commercial, Arterial	$0.75	$0.75	$31.00	$85.00	$125.00
Semi-Urban*					
Local Residential	$0.75	$6.00	$22.00	$72.00	$108.00
Local Collector, Collector Residential, Collector Commercial, Arterial	$0.75	$6.00	$26.00	$85.00	$133.00
Rural >1000 AADT					
Rural Residential / Farm	$0.75	$6.00	$22.00	$52.00	$98.00
Rural Commercial, Rural Arterial	$0.75	$6.00	$26.00	$63.00	$120.00
Rural 400 - 1000 AADT					
Rural Residential / Farm	$0.75	$6.00	$22.00	$52.00	$98.00
Rural Commercial, Rural Arterial	$0.75	$6.00	$26.00	$74.00	$120.00
Rural 0 - 399 AADT					
Rural Residential / Farm	$0.75	$5.00	$15.00	$42.00	$97.00
Rural Commercial, Rural Arterial	$0.75	$5.00	$26.00	$63.00	$117.00

Table 6: Unit Costs

No.	Item	Unit	2020 RNS
1	Excavation	m^3	**$20.00**
2	Hot Mix Urban or Semi-Urban	tonne	**$125.00**
3	Granular A	tonne	**$24.00**
4	Granular B	tonne	**$20.00**
5	Curb/Gutter Removal	m	**$15.00**
6	Curb/Gutter Placement	m	**$75.00**
7	Subdrains	m	**$20.00**
8	Storm Sewer	m	**$425.00**
9	Catch Basin Leads	m	**$325.00**
10	Manhole Removal	each	**$700.00**
11	Manhole Placement	each	**$5,500.00**
12	Catch Basin Placement	each	**$4,000.00**
13	Manhole Adjustment	each	**$400.00**
14	Catch Basin Adjustment	each	**$400.00**
15	Asphalt Planing	m^2 road	**$6.00**
16	Asphalt Pulverizing	m^2 road	**$2.50**
17	Double Surface Treatment (Fibremat)	m^2 road	**$10.00**
18	Calcium Chloride Flake	kg	**$2.20**
19	Water for Dust Suppresion	m^3	**$15.00**
20	Remove Existing Asphalt	m^2 road	**$5.00**
21	Strip Topsoil	m^2 road	**$3.00**
22	Asphalt driveway removal and reinstatement	m^2 road	**$4.00**
23	Concrete milling	m^2 road	**$17.76**
24	Grading, topsoil, sod	m^2 road	**$5.00**
25	Ditching / Culverts	m	**$30.00**
26	Portland Cement Concrete (PCC), incl. placing+transport	m^3	**$400.00**
27	Concrete Removals	m^2	**$18.00**
28	Hot Mix Rural	tonne	**$90.00**
29	Shoulders	m^2 road	**$2.50**

The cost estimates to address condition deficiencies have been based on bench mark cost for various types of potential road improvements, as shown in the road improvement matrix in Table 4. The improvement types included are intended to establish representative improvement costs, and actual details will vary from road section to road section. General unit costs are for budget planning purposes and have been based on theoretical costs per

square metre for the applicable improvements. While these unit costs are considered sufficient for planning purposes, actual costs may vary according to the following factors:

- Extent of improvement required;
- Site specific requirements;
- Modification of improvement standards; and
- Methodology of completion of the works (e.g., in-house labour, equipment or materials vs. tendered contract).

6.0 Ten Year Road Condition Management Plan

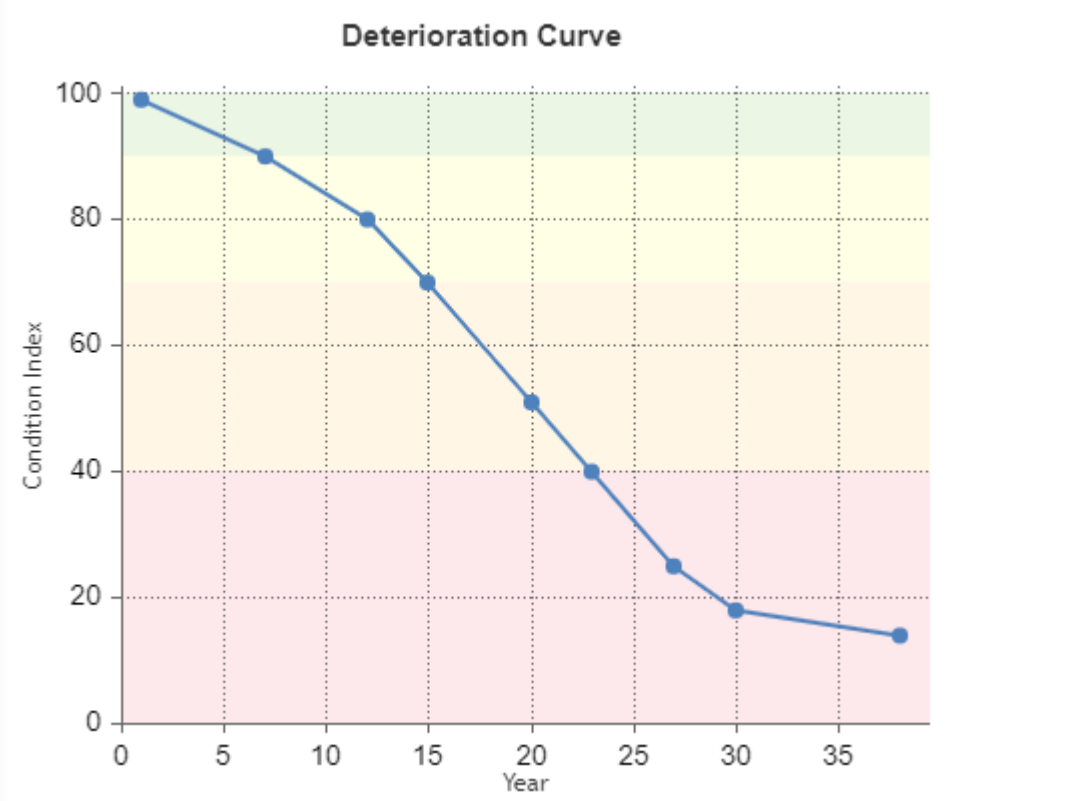
6.1 *Streetlogix* Assessment Methodology

The Road Condition Management Plan has identified and prioritized road improvements, using *Streetlogix* software, programmed by Burnside. The condition improvement matrix that has been developed for Grand Valley road network is shown in Table 4. The condition improvement matrix has been programmed into a condition improvement decision tree in the *Streetlogix* software. Idealized deterioration curves have also been programmed into the software, to allow the software to assign available budgets to the completion of improvements that maximize the return on these investments, over the lifecycle of the road. Estimates are also programmed into *Streetlogix* to reflect the improvement of the road's condition (i.e., PCI) that is forecasted to result from each intervention. Factors that impact the repair priority (e.g., PCI and AADT) have been assigned weighting within the program, to prioritize the improvements within available budgets, and to allow for a sensitivity analysis of budget requirements.

6.2 Deterioration Curve

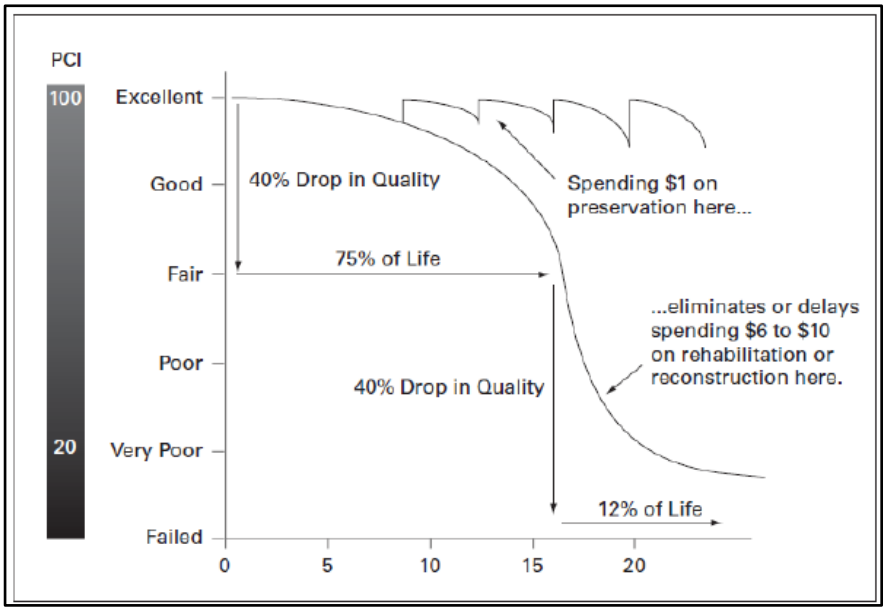
An idealized deterioration curve, that have been programmed into *Streetlogix,* is shown in Figure 8.

Figure 8: Idealized Deterioration Curve



The slope of the line on any point of the deterioration curve is intended to reflect the degradation rate of the road at that point in its life cycle, based on its condition. Improvements that are implemented throughout the life cycle will improve the PCI and thereby shift the curve, to lengthen the overall life of the road asset. It is recommended that multiple interventions occur throughout the assets life, to provide the highest level of service (i.e., maximize the time period with the asset having good condition ratings) and to minimize the expenditures (i.e., preventing roads from deteriorating to a state requiring more expensive interventions, such as major rehabilitation or reconstruction). This road management concept is depicted graphically in Figure 9: Cost Benefits of Preventive Maintenance:

Figure 9: Cost Benefits of Preventive Maintenance



As shown in Figure 9, the rate of downward progression of PCI increases greatly after a certain period of time. Based on this model, the first 40% drop in PCI occurs over the first 75% of life, and the next 40% drop in PCI occurs over the next 12% of life. This acceleration of deterioration indicates that there is compounding of distresses that occurs over time. This observed behaviour can be used to form the basis for an efficient pavement management model. Therefore, the implementation of routine preventive maintenance regularly and early in the life of the pavement's service life can be used to delay the need for rehabilitation or reconstruction.

The types of improvements recommended for the various PCI ranges, along with the PCI increase that is forecasted by these interventions, are summarized in Table 7.

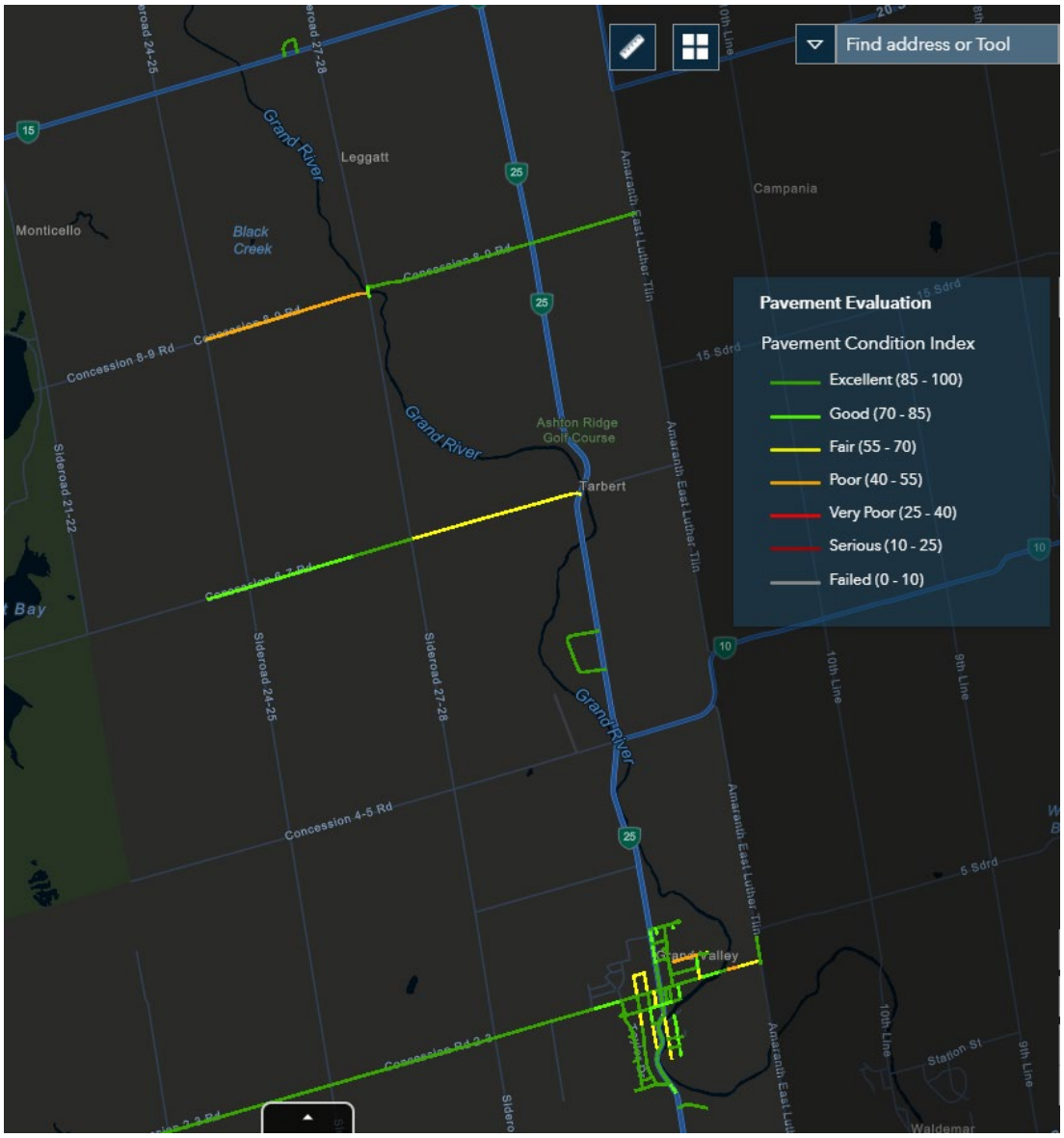
Table 7: Improvement Type PCI Ranges and PCI Increases

Improvement Type	Urban		Semi-Urban		Rural	
	PCI Range	PCI Increase	PCI Range	PCI Increase	PCI Range	PCI Increase
Defer Maintenance	95 - 100	0	95 - 100	0	95 - 100	0
Routine Maintenance	90 - 94	5	90 - 94	5	90 - 94	5
Preventative Maintenance	80 - 89	5	80 - 89	10	80 - 89	10
Resurface	55 - 69	25	55 - 69	25	55 - 69	25
Rehabilitation	31 - 54	40	31 - 54	40	31 - 54	40
Reconstruction	0 - 30	100	0 - 30	100	0 - 30	100

6.3 Existing Pavement Condition Index (PCI) Ratings for Asphalt Roads

The Grand Valley PCI ratings for each asphalt road section shown on Figure 10 (exported from *Streetlogix),* identifying three road segments in poor condition.

Figure 10: PCI Ratings for Asphalt Roads



6.4 Existing Asphalt Road Network Pavement Condition Rating

The Grand Valley asphalt surface road network average pavement condition index (PCI) was calculated to be 87 out of 100. This network condition is calculated using weighted average based on road segment length. This average PCI indicates that the Town's network of paved roads are in good condition, as shown in the standard PCI rating scale in Figure 12.

Figure 11: Pavement Average Condition

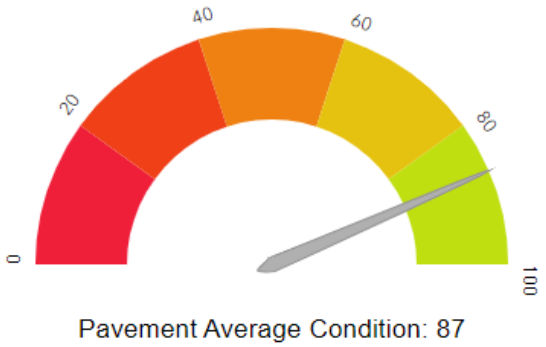
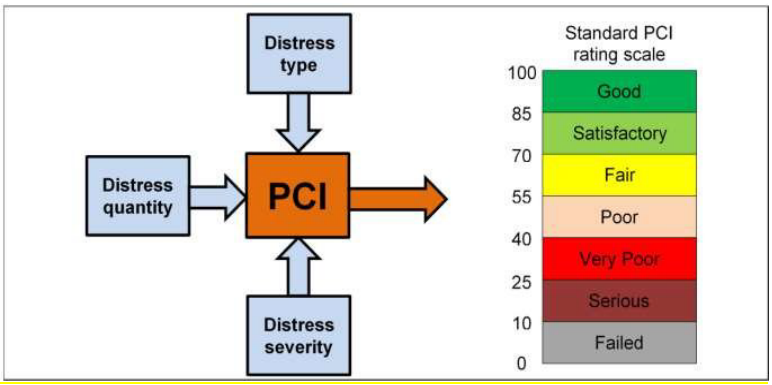


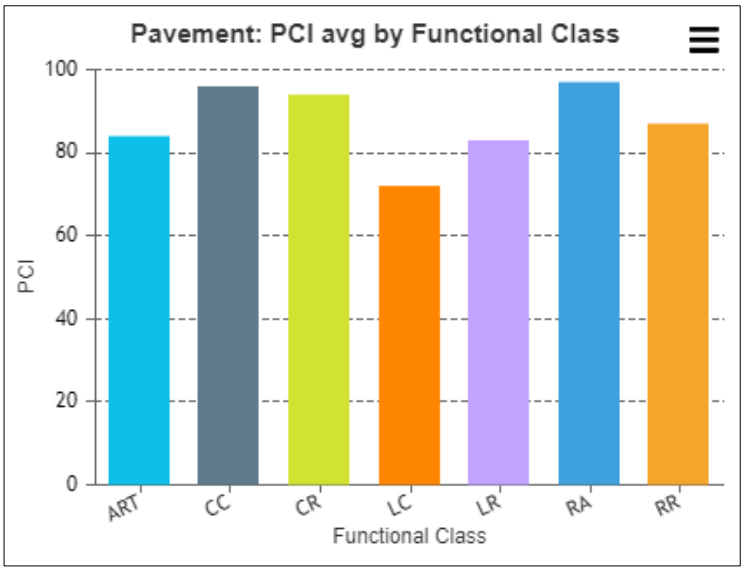
Figure 12: Standard PCI Rating Scale



6.5 Pavement Condition by Functional Class

The average PCI ratings for the various Functional Classes of asphalt roads within the Town is shown on Figure 13.

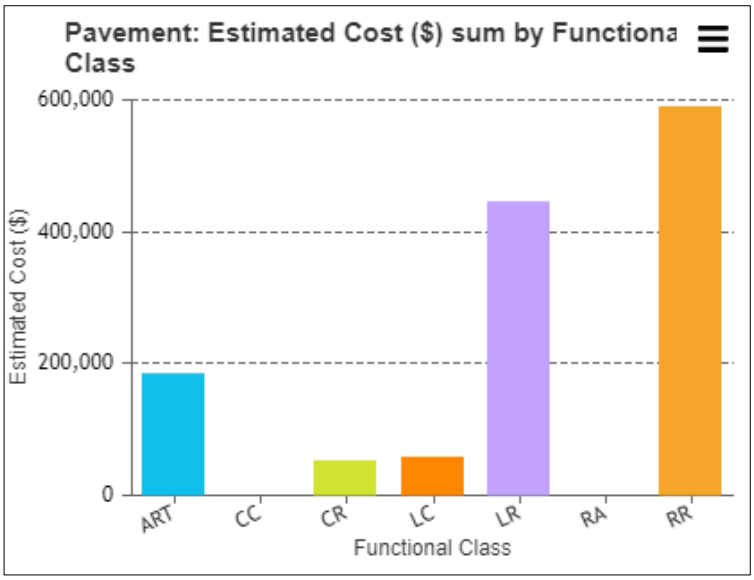
Figure 13: Pavement by Functional Class



As shown on the bar graph, the Local Commercial road segments have the lowest average PCI, although the Town does not have many roads in this functional classification.

Rural and Local Residential roads show the greatest need for investment in road improvements, as shown in Figure 14.

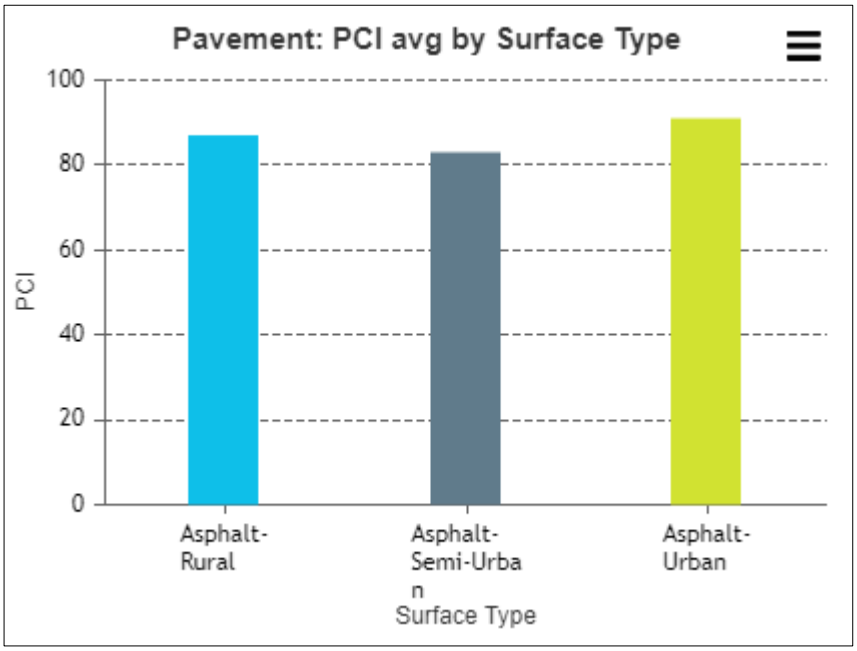
Figure 14: Improvement Cost by Functional Class



6.6 Pavement Condition by Roadside Environment

The PCI of the asphalt roads is summarized in Figure 15 by roadside environment. The Town's urban asphalt roads have the highest PCI which is understandable since the Town has assumed a few large subdivisions over the last few years, which have relatively new paved roads.

Figure 15: PCI by Roadside Environment



6.7 Improvement Needs to Address Road Condition

The improvement needs for the asphalt road network are shown in the Road Improvement Needs spreadsheet in Appendix B, along with the mapping of these needs. The needs were determined through the condition assessment, provided by the *Streetlogix* software, modified by local knowledge of Town staff, budget constraints and maintenance strategies.

The backlog of road condition needs represents a quantification of the condition needs that currently exist in the road network. Going forward, these needs will constantly change, in response to both the improvement interventions and to ongoing deterioration of the roads. The analysis quantified the value of the current backlog of condition needs for the hardtop roads to equate to about **$1,333,598** for the various improvements identified. The breakdown of the current improvement requirements for the asphalt road network is shown in Table 8.

Table 8: Summary of Road Improvement Needs and Costs

Road Type	Time Period of Need	Length of Road With Deficient Condition (km)	Cost Estimate To Upgrade Roads With Deficient Condition
Defer Maintenance (i.e., new, or nearly new condition)	N/A	14.375	0
Routine Maintenance	NOW	5.685	$29,860
Preventative Maintenance	NOW	8.033	$279,012
Resurfacing	NOW	2.194	$342,226
Rehabilitation	NOW	2.230	$682,500
Total		**32.517**	**$1,333,598**

6.8 Prioritization of Road Improvements

The *Streetlogix* model identifies a repair priority number, based on a weighting of condition (PCI) and traffic (AADT) parameters. The model normalizes the data first within the same improvement type and then further normalizes the data within the overall network. Therefore, the priority number is a useful correlation, when applied within a particular improvement type (i.e., routine maintenance, preventive maintenance, resurfacing, rehabilitation or reconstruction).

6.9 Road Budget Considerations to Maintain Road Condition Service Level

The objective of this Road Management Plan is to assist in Network Level Decision Making, which includes selecting the right road section at the right time for improvement. The inventory and prioritization of pavement needs, together with establishing a level of service for pavement condition and setting appropriate budgets for improvements, will assist in meeting this objective.

The *Streetlogix* model prioritizes improvements, based on a weighting of pavement condition (PCI) and traffic parameters, as well as lifecycle considerations for the repair of the asset.

Through subsequent discussions with Town staff, additional local knowledge of the road priorities were identified, beyond those that could be discerned through a subjective visual surface condition assessment. The Condition Model and budgets were subsequently revised to reflect this additional local knowledge input. In addition, the Ten-Year Improvement Plan recommends that budgets be applied to the types of lifecycle improvements (i.e., routine maintenance, preventive maintenance and resurfacing), that can effectively delay the need for costly major rehabilitation or reconstruction work. This approach is considered to be a “best practice” pavement management approach, to achieve reduced costs over the longer term.

A sensitivity analysis was completed to compare the condition impacts and costs for the following scenarios:

- Scenario 1 - Rehabilitation Model – assumes roads are allowed to deteriorate to a condition requiring rehabilitation, without maintenance or resurfacing.
- Scenario 2 - Best Practice Lifecycle Model – assumes budget is applied to routine maintenance, preventive maintenance and resurfacing, at appropriate time in the pavement life cycle.

The comparative analysis of the two scenarios are summarized in Table 9.

Table 9: Comparison of Improvement Models

Scenario	10-Year Cost	PCI at Year 10
Scenario 1 – Rehabilitation Model	$2,786,880	62.2
Scenario 2 – Best Practices Lifecyle Model	$2,110,090	83.7

As shown in the above table the Best Practice Model results in a improved condition for the asphalt road network, with lower cost expenditures over the ten-year period, as compared to the Rehabilitation Model. The assumed budget expenditure for the 10-year plan (i.e., 2.1M over ten years) results in a small theoretical decrease in the PCI for the overall road network, although it remains a good condition rating. There are also a significant number of new subdivision roads that have been constructed to base asphalt over the past few years and which have not yet been included in the current study. Once these roads are finalized to surface asphalt, and assumed by the Town, the overall PCI rating for the network is expected to improve beyond the rating forecasted in the current analysis.

6.10 Recommended Ten-Year Improvement Plan

The Ten-Year Improvement Plan recommended in this study follows the Best Practice Model, as summarized in Table 10 and detailed on the spreadsheet and mapping in Appendix C.

Table 10: Summary of Recommended Ten-Year Improvement Plan

Road Improvement	Time Period of Need	Length of Road with Deficient Condition (km)	Cost Estimate to Upgrade Roads with Deficient Condition
Routine Maintenance of Asphalt Roads	Ten Year Plan	20.06	$107,193
Preventative Maintenance of Asphalt Roads	Ten Year Plan	17.172	$441,163
Resurfacing of Asphalt Roads	Ten Year Plan	9.487	$878,761
Rehabilitation of Asphalt Roads	Ten Year Plan	2.230	$682,500
Total Asphalt Road Improvements		48.949	$2,109,617
Upgrade Gravel Road to Asphalt Surface	Ten Year Plan	2.718	$3,000,000

The recommended Plan is intended to remove the backlog of rehabilitation needs over the earlier years of the Plan, to provide for greater flexibility to implement more cost-effective preventive maintenance and resurfacing work over the later part of the ten-year period, to minimize the need to respond with higher-cost rehabilitation or reconstruction work, over the longer term.

The resulting 10-year improvement plan for the asphalt roads is estimated to cost $2,109.617, with improvements applied to 49.949 km of roads over the ten-year period, including some roads that will receive a second improvement within this time.

Major improvement was also identified for upgrading of the Amaranth / Grand Valley Townline to an asphalt surface, for the section between County Road 109 and Amaranth Street, at an estimated cost of $3M. Given that this road is a boundary road and is subject to Development Charges, it is expected that cost sharing will be applied to these upgrades.

7.0 Gravel Roads

Gravel roads form a significant portion of the Town's road network. Maintaining the condition of gravel roads is typically dealt with as ongoing maintenance work (such as ongoing grading, maintenance gravel, dust control, etc.), unless the structural adequacy of the gravel base is poor or unless upgrading the gravel road to a hard-top surface is required to provide adequate service for the traffic volume/type that it is intended to serve. With the exception of a part of the Amaranth / Grand Valley Townline (ID 0001), a review of the other gravel roads is beyond the scope of this RMP. This section provides additional review of the Amaranth / Grand Valley Townline (ID 0001) and also provides considerations with respect to assessing upgrading needs for gravel roads, in general.

The maintenance/upgrade strategy for gravel roads should be based on the Level of Service that is desired by the municipality, taking into account budget constraints and site-specific criteria which will affect whether any particular road section is a good candidate for any particular strategy. These factors are further considered in the following sections of this report.

7.1 Comparison Between Gravel and Hardtop Roads

A detailed comparison of the overall construction and maintenance costs of hardtop versus gravel roads is beyond the scope of this current study. However, Burnside has completed previous such comparative studies, with the following conclusions:

- The cost comparison for any particular section will be dependent on the condition of the road (i.e., good, fair or poor base), to confirm the site-specific additional work to respond to such condition deficiencies.
- The results of the cost assessment indicate that gravel surface roads may have reduced costs over hardtop roads (i.e., capital and maintenance costs), assuming a 50-year lifecycle and traffic volumes below 400 vpd.

However, there are several other considerations that may also be considered and may influence the decision on which surface type to apply. Some of these other considerations are difficult to associate a value to or may not provide a direct benefit to the Town. Additional considerations may include:

- Level of Service Standard that is desired by the municipality. Hardtop roads will provide improved standards for both access and traffic mobility;
- Budget availability to implement improved service standards;
- Location of any particular road section within the continuity of the overall hardtop road networks (i.e., both internal to the Town and beyond the Town boundaries);

- Potential for a hardtop road to redistribute traffic away from other gravel roads as road users preferentially select paved roads, reducing maintenance requirements;
- Potential for the hardtop road to result in increased traffic volumes and higher travel speeds;
- Hardtop roads effectively waterproof the road base, which can reduce the potential for load related damage;
- Hardtop roads reduce dust emissions;
- Hardtop roads provide for improved vehicular operational characteristics (smoother ride, less noisy, higher skid resistance, reduce vehicular maintenance costs and fuel costs);
- Impact on road maintenance requirements: and
- Possible impact on real estate values for properties along the road.

7.2 Gravel Road Upgrade Pre-Screening Criteria

Some of the primary factors that should be considered when determining if a gravel road warrants upgrading to a hard-top surface are the following:

- Traffic volumes (i.e., AADT volumes);
- Traffic types (e.g., percentage of trucks)
- Functional classifications (e.g., local or collector, residential or industrial/commercial);
- Number of driveways provided with access (residential or business);
- Connectivity to other paved roads and arterials (i.e., Provincial Highways, County Roads)
- Connectivity to facilitate travel between points of increased vehicular demands (e.g., businesses, schools etc.)
- Road platform widths;
- Road structure;
- Drainage;
- Road conditions;
- Road geometry (alignments); and
- Maintenance requirements/frequency.

Based on the factors listed above, the framework in Table 11 provides guidance criteria in the assessment of the gravel road upgrade needs, subject to the budget and Level of Service limitations set by the Town.

Table 11: Guidance Criteria/Considerations for Gravel Road Surface Upgrading (Pre-Screening)

Item No.	Description	Criteria
1	Traffic Volume or Traffic Type	AADT is typically 200 vpd or more. Traffic type (i.e., truck traffic) may be a consideration for lower traffic volume ranges.
2	Network Connectivity	Road provides improved connectivity between existing hardtop roads, particularly for improved access to arterial roads.
3	Land Use Considerations	Road provides access to semi-urban or commercial land uses. The number of driveways served is also a consideration.
4	Road Alignment	Substandard vertical and/or horizonal curves should be improved prior to upgrading of the surface type, to support operating speeds under hard top road conditions. Any cost/benefit analysis should take into consideration such increased costs.
5	Road Width and/or ROW Conditions	Road sections should be widened to a platform width of at least 7.0 metres to support hardtop surfaces. Areas of encroachment of vegetation into the clear zone within the right-of-way should also be addressed prior to upgrading of the surface type. Any cost/benefit analysis should take into consideration the increased costs to mitigate such deficiencies.
6	Drainage	Any significant drainage deficiencies (e.g., flooding, saturated granular base, inadequate ditching etc.) should be remedied prior to upgrading of the surface type. Any cost/benefit analysis should take into consideration the increased costs to mitigate such deficiencies.
7	Road Structure	The road section should be able to support a hard-top surface design (e.g., adequate base and subbase materials, absence of frost boils or soft spots, etc.). Detailed geotechnical investigations are recommended for areas where road structure may be a concern. Base strengthening should be completed prior to any upgrading of the surface type, where required. Any cost/benefit analysis should take into consideration the increased costs to mitigate such deficiencies.

It is expected that the pre-screening criteria, noted the above table, will provide a guide for the consideration of upgrading needs at the project level. Therefore, each criterion should be assessed as part of the detailed design for such upgrading projects.

The Amaranth / Grand Valley Townline (ID 0001) has been reviewed based on the pre-screening criteria shown in Table 12.

Table 12: Pre-screening of Upgrade Criteria for Amaranth / Grand Valley Townline

Pre-screening Criteria for Gravel Road Upgrading	Considerations for Upgrading Amaranth / Grand Valley Townline (ID 0001)
Traffic Volume or Traffic Type	• AADT 500 vpd (peak daily count over 700 vpd). • Truck volume data not available.
Network Connectivity	• Town's TMP has identified this road as a recommended connection between Amaranth Street and County Road 109, providing a bypass to the downtown core of the settlement.
Land Use Considerations	• Potential connection to developing lands located on the south part of the settlement area. • Provides an alternate north-south connection to facilitate ongoing growth in the settlement.
Road Alignment	• No road alignment issues identified.
Road Width and / or Right-of-Way Conditions	• Platform width is 10 m, which is sufficient to accommodate upgrading.
Drainage	• Ditching is adequate; no drainage issues identified.
Road Structure	• Road structure appeared adequate in October field review, however Spring conditions unknown. • Recommend geotechnical investigations to confirm subsurface conditions as part of detailed upgrading design.

Based on the above considerations it is recommended that the Amaranth / Grand Valley Townline (ID 0001) be upgraded to a hard top surface, subject to budget availability.

8.0 Consideration of Other Needs for Establishing Road Network Improvements

In addition to the condition of roads, this study has considered several other road-related needs that may trigger certain improvement requirements for any particular road section. The other needs considered in this RNS include the following:

- Surface Type Needs – based on operational considerations (e.g., hardtop surfaces for urban and semi-urban areas, for sections with high truck traffic or for sections where AADT volumes justify such surfaces;
- Geometric Needs – including deficiencies in horizontal/vertical alignments or surface/platform widths;
- Drainage Needs – based on the frequency of flooding on the roadway or the adequacy of roadside drainage (such as ditching and brushing);
- Maintenance considerations; and
- Coordination with other projects.

It is recommended that these roads be considered independently, rather than collectively. The benefits of this approach include the following:

- Allows for a better integration into a pavement management system, where road condition will form the primary trigger for improvements; and
- Provides clarity in establishing the time of needs, reason for improvement, and appropriate response.

The standards associated with the above road needs are based on the criteria outlined in the *Inventory Manual for Municipal Roads* (MTO, February 1991).

8.1 Surface Type Needs

Surface type should be appropriately designed to accommodate the volume of traffic and type of traffic, according to the MTO guidelines *(Inventory Manual for Municipal Roads*, Ministry of Transportation, 1991) and/or the Template for Life Cycle Road Improvements that has been developed for the Town in this RMP, as follows:

- Gravel roads are typically tolerable for traffic volumes of less than 200 vehicles per day (vpd), however, upgrades to hardtop may be considered if roadside environment is semi-urban or for road network connectivity/hardtop continuity, subject to budget constraints and desired Level of Service, as detailed in a previous section of this report;
- Surface treated roads may be tolerable for traffic volumes of between 200 vpd and 400 vpd, or even higher, and consideration may be given to upgrading to asphalt for such roads, as detailed in a previous section of this report;
- Asphalt roads may be considered where traffic volumes exceed 400 vpd; and
- Upgrading of gravel roads or surface treated roads to asphalt may be considered for roads experiencing high truck volumes or high truck loading, or where high maintenance is an issue. Truck volumes typically range from a low of 3% on low volume residential streets to a high of 15% or more on arterials and collector roads. Information on truck

volumes on the Town's roads was not available for this current study. Similarly, information on traffic volumes for the gravel roads in the Town were not available (with the exception of the one gravel road considered in the scope of this study). It is recommended that future traffic counting work in the Township also delineate truck volumes and volumes on gravel roads, particularly if consideration is being made to upgrade the road's surface type. For low volume rural roads, this study suggests that asphalt surfaces may be economical to consider where the percentage of trucks exceed 10% of the AADT and is over 30 trucks per day, or where the total AADT volumes exceed 400 vpd.

Given that all of the Town's hardtop roads currently have asphalt surfaces, no surface type deficiencies currently exist for these roads. For the gravel road considered in this study (i.e., Amaranth / Grand Valley Townline, ID 0001) the current AADT (500 vpd) justifies upgrading to an asphalt surface.

8.2 Geometrics

8.2.1 Alignments

Road alignments are reviewed to determine the number of substandard horizonal/vertical curves and/or substandard gradients and/or substandard stopping sight distances (i.e., resulting from curves near driveway locations). The following criteria have been applied in the determination of alignment deficiencies, based on 80 km/h design speeds:

- Grades >= 8%; or
- Horizontal curves with radius of <= 250 m or stopping sight distances of <= 135 m; or
- Vertical crest curves with sight distances of <= 130 m.

Deficient horizontal curves are defined as those which do not meet design speeds of 10 km/h over posted speeds. However, the *Inventory Manual for Municipal Roads* (MTO, 1991) defines curves as tolerable when they meet design speeds of 5 to 15 km/h below the posted speeds, assuming they have appropriate warning signs.

Based on the above criteria, none of the roads included in this study have been identified to have alignments that do not meet tolerable standards.

8.2.2 Road Widths

Hard Top Road Widths

Minimum tolerable and recommended minimum road widths for hard-top roads have been assessed according to criteria outlined in the *Geometric Design Guide for Canadian Roads* (Transportation Association of Canada [TAC], June 2017). The surface (i.e., through lane) width requirements for hard-top roads are outlined below in Table 13.

Table 13: Tolerable & Recommended Surface Widths for Hard-Top Roads (Based on Criteria in the TAC *Geometric Design Guide for Canadian Roads*)

Roadside Environment	Design Speed (km/h)	Road Surface Width (Two-Lane Roadways)			
		Tolerable Lower Limit	Recommended Lower Limit	Recommended Upper Limit	Tolerable Upper Limit
Rural or Semi-Urban	60 or less	5.4 m	6.0 m	7.4 m	8.0 m
	70 to 100	6.5 m[1]	7.0 m	7.4 m	8.0 m
Urban	60 or less	5.4 m	6.0 m	7.4 m	8.0 m
	70 to 100	6.0 m	6.6 m	7.4 m	8.0 m

1. For rural or semi-urban roadways with a design speed of 70 to 100 km/h, a minimum tolerable surface width of 3.25 metres per lane was applied, which is consistent with minimum width criteria for secondary highways with an AADT less than 1,000 vpd outlined in the Geometric Design Standards for Ontario Highways (Ministry of Transportation Ontario, 1989).

The Town has set posted speeds in the settlement area to be 40 km/h. In the rural areas the default posted speed applies (i.e., 80 km/h), with the exception of the Amaranth / Grand Valley Townline, which is set at 60 km/h.

The hardtop roads in the Township that have been identified to have widths that currently do not meet the recommended lower width limit are summarized in Table 14.

Table 14: Summary of Roads with Deficient Widths

ID	Road Section	Length (m)	AADT (vpd)	Posted Speed (km/h)	Width (m)
Semi-Urban Hardtop Roads					
0105	Lower Crozier Street (Gier Street to End)	120	200	40	4.2
0076	East Back Lane (Mill Street to Amaranth Street)	170	50	40	4.2

ID	Road Section	Length (m)	AADT (vpd)	Posted Speed (km/h)	Width (m)
Rural Hardtop Roads					
0158	Sideroad 27-28 (Concession 8-9 to 35 m South of Concession 8-9)	35	150	80	6.5
0159	Sideroad 27-28 (Concession 8-9 to Concession 8-9)	70	100	80	6.5
0160	Sideroad 27-28 (Concession 8-9 to 50 m North of Concession 8-9)	50	100	80	6.5
0055	Concession 6-7 (445 m West of Sideroad 24/25 to Sideroad 24/25)	445	50	80	6.6
0056	Concession 6-7 (Sideroad 24-25 to 1,200 m East of Sideroad 24-25)	1200	50	80	6.6

While the widths in the above noted road segments are considered tolerable, it is recommended that the widths on these roads be increased to meet recommended lower width limits as part of any future improvement works.

Gravel Road Widths

The minimum gravel road surface widths (i.e., platform width, including shoulders) have been assessed according to criteria outlined in the *Geometric Guidelines for Municipal Roads* (Ontario Good Roads Association [OGRA], 1998). The recommended minimum platform width requirements for gravel roads are outlined below in Table 14.

Table 15: Recommended Minimum Platform Widths for Gravel Roads (Based on Criteria in the OGRA *Geometric Guidelines for Municipal Roads*)

Design Speed (km/h)	Minimum Platform Width for Varying AADT Traffic Volume Ranges (Vehicles per Day) [1]				
	<50 vpd	50–249 vpd	250–399 vpd	400–999 vpd	1,000–2,000 vpd
80	5.5 m	6.0 m	6.5 m	7.5 m	7.5 m
70				7.0 m	7.0 m
60				6.5 m	6.5 m
50				6.0 m	6.5 m
40				6.0 m	6.0 m

1. Widths outlined in the table exclude road rounding.

The platform width for the gravel road considered in this study (i.e., Amaranth / Grand Valley Townline, ID 0001) is 10 m, which is better than the OGRA requirement, considering its traffic volume (i.e., AADT 500 vpd).

Shoulder Widths

Maintaining appropriate shoulder widths is also important to ensure sufficient edge strength for hardtop roads. Typically, a minimum shoulder width of 0.5 m should be provided to hold hardtop pavements in place. The *Inventory Manual for Municipal Roads* (MTO, February 1991) recommends design shoulder widths of 1.5 m for traffic ranges from 50 to 1000 AADT and 2.5 m for traffic ranges from 1000 to 3000 AADT. Maintaining such shoulder widths is particularly important in the rural areas due to the higher posted speeds. Rural roads that were identified to have shoulder widths lower than 1.0 m are listed in Table 16:

Table 16: Shoulder Width Deficiencies

ID	Road Section	Length (m)	AADT (vpd)	Speed (km/h)	Shoulder Width (m)
0034	Concession 10-11 (County Road 25 to Amaranth / Grand Valley Townline)	1200	250	80	0.5
0055	Concession 6-7 (445 m West of Sideroad 24/25 to Sideroad 24/25)	445	50	80	0.5
0056	Concession 6-7 (Sideroad 24/25 to 1,200 m East of Sideroad 24/25)	1200	50	80	0.75
0062	Concession 8-9 (Sideroad 24-25 to Sideroad 27-28)	1800	100	80	0.5
0065	Concession 8-9 (County Road 25 to Amaranth / Grand Valley Townline)	1200	100	80	0.5
0158	Sideroad 27-28 (Concession Road 8-9 to 35 m South of Concession 8-9)	35	150	80	0.5
0159	Sideroad 27-28 (Concession 8-9 to Concession 8-9)	70	100	80	0.5
0160	Sideroad 27-28 (Concession Road 8-9 to 50 m North of Concession 8-9)	50	100	80	0.5

It is recommended that the shoulders be widened on the above noted roads when future improvements are completed to these roads.

In instances where shoulders are paved in semi-urban areas, it is recommended that the minimum travel lane widths be provided and that the granular shoulder extend a minimum 0.5 metres beyond the hardtop shoulder for edge support, although the gravel surface may be vegetated for aesthetic and/or maintenance reasons.

8.3 Drainage

Maintaining adequate surface drainage, as well as subsurface drainage for the road base, are important considerations to maintain the useful life of the road asset. Drainage review is beyond the scope of this current study, however it is recommended that the Town further review the drainage conditions of the road network. The methodology to establish Drainage Adequacy ratings, as outlined in the *Inventory Manual for Municipal Roads* (Ministry of Transportation Ontario, 1991), may be used to assess the drainage

needs of the roads. Drainage Adequacy ratings (1-15) are summarized in Table 17for reference:

Table 17: Drainage Criteria

Drainage Condition	Point Rating
Rural or Semi-Urban	
Fully adequate ditches and cross-section	15
Ditch/culvert/storm sewer capacity somewhat below standard	12 to 14
Excessive maintenance of drainage system	8 to 11
Flooding Issues	1 to 7
Additional Notes	Note any semi-urban areas where storm sewer may be considered. Note areas where brushing may be required within ROW.
Urban	
Storm sewer fully adequate	15
Minor flooding due to inadequacy of storm sewer	12 to 14
Significant flooding every five years due to inadequacy of storm sewer	8 to 11
Major flooding every year	1 to 7

Formalized policies related to brushing and ditching programs may also be considered.

Where road works are proposed, it is recommended that additional investigations be completed to determine the requirements for drainage improvements. However, it is also recognized that the practicality of achieving sufficient drainage outlets may constrain the opportunities to improve roads in areas with drainage issues. Depending on traffic requirements in those areas, it may be more cost-effective to continue to undertake additional Spring maintenance, on a yearly basis, to address such drainage issues.

8.4 Maintenance Considerations

Maintenance demands (e.g., low, average, high) is not a primary consideration in the prioritization of road sections for improvements, however they may be a consideration in the decision to upgrade gravel surfaces to hardtop surfaces.

The Level of Service for maintenance of the Town's roads follows the Provincial Minimum Maintenance Standards (O. Reg. 239/02 as amended by O. Reg. 366/18). These regulations prescribe required monitoring of the roads and maintenance response

requirements, based on the road's class. The road class is set by its Average Daily Traffic and speed limit. As the Town grows and traffic volume of traffic increases the maintenance requirements to meet the Minimum Maintenance Standards also increase.

8.5 Coordination with Other Projects

For budget allocation and phasing purposes, coordination with planned bridge projects and other infrastructure projects (drainage, water and sewer etc.) should be a consideration. Construction detours may also be a consideration in the scheduling / interface of road projects with these other projects.

The *Grand Valley Water and Wastewater Master Plan 2019 Class Environmental Assessment* (Burnside, March 2019) proposes a strategy to upgrade the water and wastewater infrastructure in the Town to serve the forecasted population growth (i.e., population of 6,145 by 2031). This Class EA identifies the need to upgrade the existing Wastewater Treatment Plant, located at the end of Watson Road (former Industrial Drive), as well as to upgrade to a sewage pumping station on Emma Street.

9.0 Levels of Service and Priority Planning

9.1 Prioritization and Budgeting for Road Improvements

The Government of Canada, in conjunction with the Federation of Canadian Municipalities, have issued a best practice document entitled "Priority Planning and Budgeting for Pavement Maintenance and Rehabilitation (November 2003), as part of their National Guide to Sustainable Municipal Infrastructure (InfraGuide). This document recommends the following yearly management framework for pavement preservation:

Network Level Decision Making (i.e., selecting the right road section at the right time for improvement)

- Establish Level of Service for Pavement Condition (accounting for strategic direction, condition of the pavement network and financial resources);
- Undertake Pavement Inventory (condition assessment and performance prediction);
- Identification of Needs and Listing of Candidate Projects (multi-year planning and short-term planning);
- Prioritization of Improvement Projects; and
- Budgeting (programming of projects taking into account available funding, prioritization of Needs, as well as other factors such as combining adjacent projects to minimize construction disruption and to improve construction efficiency).

Project Level Decision Making (i.e., designing and implementing the right treatment on a project-specific basis)

- Project Design;
- Project Implementation; and
- Performance Monitoring (specific treatments and the entire network).

This Road Management Plan for Grand Valley provides guidance on implementing Network Level Decision Making for improvements to the Town's roads, using a logical, systematic planning and budgeting process. It provides objective information on pavement preservation needs, and on long-term implications of budget decisions, based on the relationship between the budget and the level of service provided to the public. It promotes the cost-effective use of pavement investments to return maximum benefits to the community.

9.2 Network Level Considerations

Integral to the priority planning process is the establishment of the level of service that the road department is expected or mandated to provide. The level of service should be established within the context of the Town's strategic infrastructure planning, to coordinate various infrastructure needs and major infrastructure investments, to achieve the social and economic goals of the Town.

This Road Management Plan for Grand Valley establishes various trigger values and design criteria that support an operational level of service as set out more fully in the Plan and may be used as a guide to decide when an improvement action should be carried out.

9.3 Project Level Considerations

This Road Management Plan is primarily focused on the identification of improvement projects on a Network Level basis. In this respect, the information is a logical first step in prioritizing projects for potential inclusion in a ten-year capital improvement plan.

The Town's hardtop roads are subject to normal weathering and deterioration over their life cycle. The road construction and rehabilitation standards employed will have a direct impact on the Level of Service provided by these roads over their life cycle and of their ultimate longevity. While each road section can be considered to have its own unique needs (i.e., to be verified through more detailed investigations), it should be recognized that pavement rehabilitation strategies are not all equal and many have significant limitations with respect to their ability to solve specific road distresses. A detailed review of the pavement maintenance history may assist in identifying recurring performance problems that are indicative of particular needs.

In addition to consideration of the pavement rehabilitation options, other rehabilitation considerations may include:

- The determination of the most appropriate asphalt mix should consider whether deficiencies are resulting from a breakdown in the performance of the asphalt components (i.e., which may result in wheel track rutting, transverse cracking or loss of surface texture). High performance, rut-resistant mixes may be required to address such conditions.
- Asphalt mix specifications should be based on the anticipated loads and traffic volumes. For heavily travelled roads, stone mastic asphalt may be preferred in order to increase the serviceable life and reduce maintenance, recognizing the premium costs (about 20% above conventional mixes).
- Cold mix produced at a central plant may have more uniform quality than those produced by an in-place recycling train.
- Pavement cracking and/or ride quality, may not be indicative of a structural deficiency. For example, transverse cracking is more likely a result of the asphalt cement binder being too stiff to withstand the internal stresses at very low ambient temperatures. Therefore, improvement of the structural adequacy of the pavements may not correct such distresses. Similarly, longitudinal and meander cracking may be caused by fatigue, by differential subgrade performance or may even be tension cracks due to deep-seated embankment instability. The causes of cracking should be assessed in establishing the most effective rehabilitation strategy.
- Inadequate pavement structure can manifest itself by premature distortions and map cracking, or such distresses can simply be a result of the pavements normal terminal serviceability being reached. The pavement history should be considered to assess the possible causes. Flexible pavement generally needs major rehabilitation every 15 to 18 years.
- Locations of repeated patching may be indicative of an underlying subgrade problem and should be targeted for further investigation.
- Areas of inadequate drainage, which are affecting pavement performance, should be rectified as part of any pavement rehabilitation project.
- Other considerations that may apply to the determination of an optimum pavement rehabilitation strategy include budget limitations, construction costs, life cycle costs, risks of using new technologies, environmental considerations (e.g., maximizing recycling), maintenance requirements, capabilities of local contractors and the size of the project.

The macro level of this study does not allow for a detailed review of pavement rehabilitation options for each specific section, and improvement types and cost estimates for this study have been based on benchmark costs of the rehabilitation strategies that are typically currently used by Grand Valley, as well as those

recommended by life cycle / cost considerations (e.g., emphasizing additional routine maintenance and preventative maintenance rather than waiting until rehabilitation or reconstruction is required). It is expected that more detailed review (i.e., geotechnical investigations including a detailed pavement condition assessment, topographic survey, detailed traffic counting program, detailed cost estimating etc.) would be undertaken prior to committing funds to any particular project.

9.4 Other Considerations in Selecting Roads For Improvement

In addition to the PCI, the other factors that may be considered in establishing roads for potential improvements, as noted previously in this report, include the following:

- Priority based on the need to upgrade the surface type to meet increased traffic volumes (i.e., e.g., gravel roads with AADT > 500 vpd);
- Road continuity and access considerations;
- Roads that have very poor condition ratings and are utilized for residential or commercial access purposes;
- Site-specific conditions (e.g., geometric deficiencies, high maintenance, or the need to upgrade roads to address land use considerations); and
- Roads that have physical constraints (e.g., vertical or horizontal deficiencies, width deficiencies etc.), safety issues (e.g., sight lines) or operational issues (e.g., traffic congestion, high maintenance etc.).

For any particular road section, the above noted factors should be reviewed to determine if one, or more, factors are present and may justify consideration for improving these road sections. These considerations should be made on a section-by-section basis at the time of detailed design or implementation of the maintenance treatments. The timing, and priority, for improvements to address these deficiencies should be determined by a review of the relative magnitude of any particular deficiency vs. the needs to address hard top road surface condition deficiencies and budget availability.

10.0 Future Update Work

It is recommended that the Town completes regular updates to the condition ratings of their road network, to assess ongoing deterioration rates and resulting improvement requirements. It is recommended that such updates be completed every three to five years.

This study has used a manual visual assessment to confirm the road conditions, which is considered to be a subjective review. However, with advancing technologies, there are now a number of new, or developing, methods of completing the road condition reviews. For example, *StreetScan,* the parent company of *Streetlogix*, offers automated collection of pavement distress data, using vehicles that have been specifically designed for this

purpose. In the course of this current study, Burnside identified a number of areas where *Streetlogix* should consider upgrading their software to fully capture ongoing deterioration of road networks. It is our understanding that further upgrades to the *Streetlogix* software are being developed to further enhance the capabilities of this software to assist municipalities in managing their road assets.

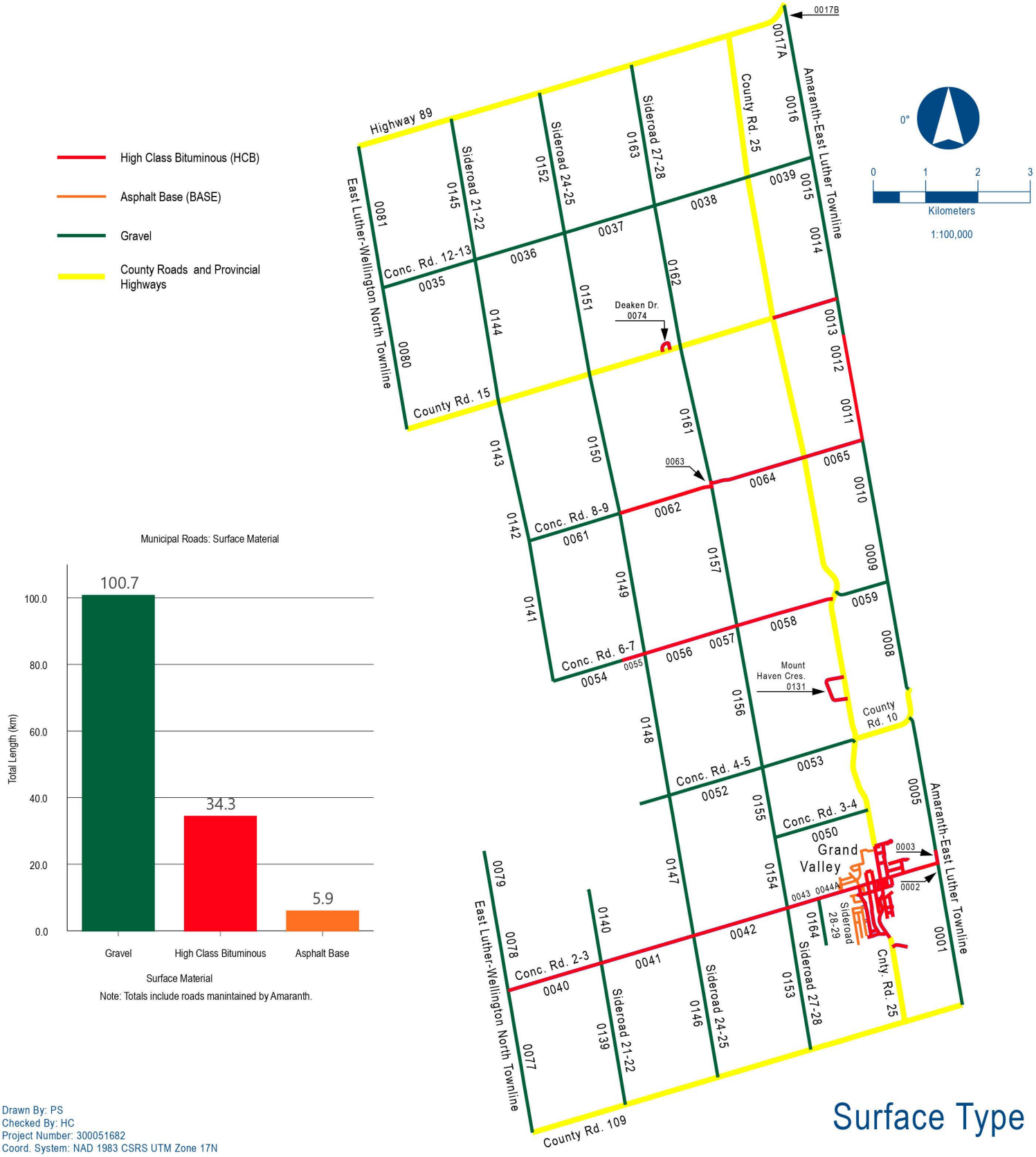
BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix A

Road Inventory Maps and Table

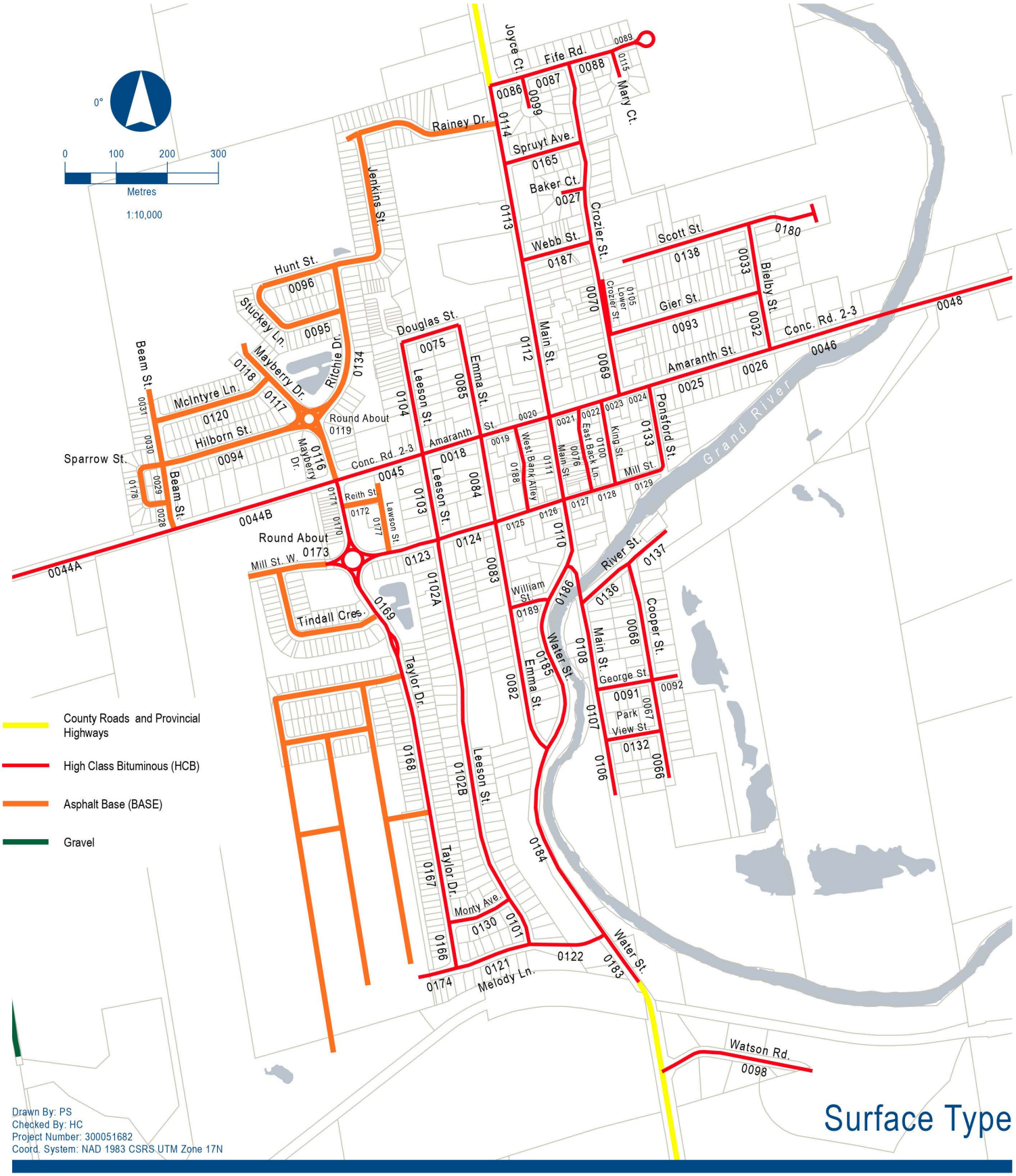
Town of Grand Valley
Roads Needs Study



BURNSIDE

Figure: A1

Town of Grand Valley
Roads Needs Study



Drawn By: PS
Checked By: HC
Project Number: 300051682
Coord. System: NAD 1983 CSRS UTM Zone 17N

Surface Type

BURNSIDE

Figure: A2

File Path: C:\Users\pstubbert\RJB\300051682 - Grand Valley - Road Management Plan - GIS\051682_RNS.aprx Print Date: 2022/06/30 Time: 01:50 PM

objectid	Project & Map ID	Street Name	From Street Name	To Street Name	Functional Class	Surface Type	Width (m)	Length (m)
9		a lane at the east end of Scott St.""	Scott St.	End (North)	LC	Asphalt- Semi-Urban	6	170
4	0044B	Amaranth St.	Beam St	Taylor Dr	ART	Asphalt- Semi-Urban	7	320
69	0046	Amaranth St.	Bielby St	160m to Bridge	ART	Asphalt- Semi-Urban	9	160
14	0024	Amaranth St.	Crozier St	Pondsford St	ART	Asphalt- Semi-Urban	7	60
50	0022	Amaranth St.	East Back Alley	King St.	ART	Asphalt- Semi-Urban	7	60
104	0019	Amaranth St.	Emma St	west Back Alley	ART	Asphalt- Urban	8	70
43	0023	Amaranth St.	King St	Crozier St	ART	Asphalt- Semi-Urban	7	40
36	00018	Amaranth St.	Leeson St	Emma St	ART	Asphalt- Semi-Urban	7	120
15	0021	Amaranth St.	Main St.	East Back Alley	ART	Asphalt- Semi-Urban	7	50
6	0026	Amaranth St.	Park	Bielby St	ART	Asphalt- Semi-Urban	7	240
58	0025	Amaranth St.	Ponsford St	Park	ART	Asphalt- Semi-Urban	7	240
109	0045	Amaranth St.	Taylor Dr	Leeson St	ART	Asphalt- Semi-Urban	8	170
87	0020	Amaranth St.	West Back Alley	Main St.	ART	Asphalt- Urban	8	70
35	0003	Amaranth-East Luther Townline	Amaranth St	5 SR	RA	Asphalt- Rural	7	350
24	0002	Amaranth-East Luther Townline	Amaranth St	Gravel	RA	Asphalt- Rural	7	40
80	0027	Baker Ct.	Crozier St	End of Road	LR	Asphalt- Urban	8	60
28	0032	Bielby St.	Amaranth St	Gier St	CR	Asphalt- Semi-Urban	7	110
44	0033	Bielby St.	Gier St	Scott St	CR	Asphalt- Semi-Urban	6	130
5	0034	Conc. 10-11	Cty Rd 25	Amaranth / Grand Valley TL	RR	Asphalt- Rural	7	1200
3	0048	Conc. 2-3	160m East of Bridge	Top of Hill	ART	Asphalt- Semi-Urban	7	170
90	0047	Conc. 2-3	160m West of Bridge	160m East of Bridge	ART	Asphalt- Semi-Urban	9	160
105	0049	Conc. 2-3	Tope of Hill	Amaranth / Grand Valley TL	ART	Asphalt- Semi-Urban	7	190
94	0041	Conc. 2-3	SR 21-22	SR 24-25	RR	Asphalt- Rural	7	1800
106	0042	Conc. 2-3	SR 24-25	SR 27-28	RR	Asphalt- Rural	7	1900
39	0043	Conc. 2-3	SR 27-28	SR 28-29	RR	Asphalt- Rural	7	600
111	0044A	Conc. 2-3	SR 28-29	Beam St	RR	Asphalt- Rural	7	500
62	0040	Conc. 2-3	Wellington N/Grand Valley TL	SR 21-22	RR	Asphalt- Rural	7	1900
13	0057	Conc. 6-7	1,200m East of SR 24-25	SR 27-28	RR	Asphalt- Rural	7	700
1	0055	Conc. 6-7	445m West of SR 24/25	SR 45-25	RR	Asphalt- Rural	7	445
45	0056	Conc. 6-7	SR 24-25	1,200m East of SR 24-25	RR	Asphalt- Rural	7	1200
21	0058	Conc. 6-7	SR 27-28	Cty Rd 25	RR	Asphalt- Rural	7	1900
54	0065	Conc. 8-9	Cty Rd 25	Amaranth / Grand Valley TL	RR	Asphalt- Rural	7	1200
2	0062	Conc. 8-9	SR 24-25	SR 27-28	RR	Asphalt- Rural	7	1800
65	0064	Conc. 8-9	SR 27-28	Cty Rd 25	RR	Asphalt- Rural	7	1850
67	0066	Cooper St.	End	Park View St	LR	Asphalt- Semi-Urban	6	100
56	0068	Cooper St.	George St	River St	LR	Asphalt- Semi-Urban	6	225
98	0067	Cooper St.	Park View St	George St	LR	Asphalt- Semi-Urban	6	100
23	0069	Crozier St.	Amaranth St	Gier St	CR	Asphalt- Semi-Urban	7	120
20	0072	Crozier St.	Baker Court	Spruyt Ave	CR	Asphalt- Urban	8	90
18	0070	Crozier St.	Gier St	Webb St	CR	Asphalt- Semi-Urban	8	190
31	0073	Crozier St.	Spruyt Ave	Fife Rd	CR	Asphalt- Urban	8	160
68	0071	Crozier St.	Webb St	Baker Court	CR	Asphalt- Urban	8	100
112	0074	Deaken Dr.	Cty Rd 15	Cty Rd 15	LR	Asphalt- Semi-Urban	7	370

objectid	Project & Map ID	Street Name	From Street Name	To Street Name	Functional Class	Surface Type	Width (m)	Length (m)
86	0075	Douglas St.	Leeson St	Emma St	LR	Asphalt- Semi-Urban	7	120
73	0076	East Back Ln.	Mill St	Amaranth St	LC	Asphalt- Semi-Urban	4	170
66	0085	Emma St.	Amaranth St	Douglas St	LR	Asphalt- Semi-Urban	7	220
11	0084	Emma St.	Mill St	Amaranth St	LR	Asphalt- Semi-Urban	6	170
37	0082	Emma St.	Water St	William St	LR	Asphalt- Semi-Urban	6	290
91	0083	Emma St.	William St	Mill St	LR	Asphalt- Semi-Urban	7	170
59	0088	Fife Rd.	Crozier St	Mary Court	CR	Asphalt- Semi-Urban	7	80
71	0087	Fife Rd.	Joyce Court	Crozier St	CR	Asphalt- Semi-Urban	7	100
34	0086	Fife Rd.	Main St.	Joyce Court	CR	Asphalt- Semi-Urban	7	60
55	0089	Fife Rd.	Mary Court	end	CR	Asphalt- Semi-Urban	7	90
61	0092	George St.	Cooper St	End	LR	Asphalt- Semi-Urban	6	55
52	0091	George St.	Main St.	Cooper St	LR	Asphalt- Semi-Urban	6	110
96	0093	Gier St.	Crozier St	Bielby St	LR	Asphalt- Semi-Urban	7	300
114	0098	Watson Road	Cty Rd 25	End	CC	Asphalt- Semi-Urban	6	290
95	0099	Joyce Ct.	Fife Rd	End	LR	Asphalt- Semi-Urban	7	80
83	0100	King St.	Mill St	Amaranth St	LR	Asphalt- Semi-Urban	7	170
40	0104	Leeson St.	Amaranth St	Douglas St	LR	Asphalt- Semi-Urban	7	230
89	0101	Leeson St.	Melody Ln	Monty Ave	LR	Asphalt- Urban	8	90
100	0103	Leeson St.	Mill St	Amaranth St	LR	Asphalt- Semi-Urban	7	170
76	0102B	Leeson St.	Monty Ave	William St (allowance)	LR	Asphalt- Urban	8	530
46	0102A	Leeson St.	William St (allowance)	Mill St	LR	Asphalt- Semi-Urban	7	170
47	0105	Lower Crozier St.	Gier St	end	LR	Asphalt- Semi-Urban	4	120
101	0112	Main St.	Amaranth St	Webb St	ART	Asphalt- Urban	9	310
82	0106	Main St.	End	Park View St	LR	Asphalt- Semi-Urban	6	105
30	0108	Main St.	George St	River St	LR	Asphalt- Semi-Urban	6	175
48	0111	Main St.	Mill St	Amaranth St	ART	Asphalt- Urban	10	170
26	0107	Main St.	Park View St	George St	LR	Asphalt- Semi-Urban	6	100
38	0109	Main St.	River St	Water St	LR	Asphalt- Semi-Urban	6	80
22	0114	Main St.	Spruyt Ave	Fife Rd	ART	Asphalt- Semi-Urban	7	160
74	0110	Main St.	Water St	Mill St	ART	Asphalt- Urban	10	110
99	0113	Main St.	Webb St	Spruyt Ave	ART	Asphalt- Urban	7	190
51	0115	Mary Ct.	Fife Rd	End	LR	Asphalt- Semi-Urban	7	70
19	0174	Melody Ln.	End	Taylor Dr	CR	Asphalt- Urban	8	60
42	0122	Melody Ln.	Leeson St	Water St	CR	Asphalt- Urban	8	150
53	0121	Melody Ln.	Taylor Dr	Leeson St	CR	Asphalt- Urban	8	145
17	0128	Mill St.	East Back Alley	King St.	CR	Asphalt- Semi-Urban	7	110
7	0125	Mill St.	Emma St	West Back Alley	CR	Asphalt- Semi-Urban	9	114
72	0129	Mill St.	King St	Ponsford St	LR	Asphalt- Semi-Urban	6	100
29	0124	Mill St.	Leeson St	Emma St	CR	Asphalt- Semi-Urban	8	115
70	0127	Mill St.	Main St.	East Back Alley	CR	Asphalt- Semi-Urban	7	110
33	0123	Mill St.	Taylor Dr	Leeson St	CR	Asphalt- Urban	8	140
25	0126	Mill St.	West Back Alley	Main St.	CR	Asphalt- Semi-Urban	9	114
113	0130	Monty Ave.	Taylor Dr	Leeson St	LR	Asphalt- Urban	8	125

objectid	Project & Map ID	Street Name	From Street Name	To Street Name	Functional Class	Surface Type	Width (m)	Length (m)
63	0131	Mount Haven Cres.	Cty Rd 25	Cty Rd 25	LR	Asphalt- Semi-Urban	7	1000
60	0132	Park View St.	Main St	Cooper St	LR	Asphalt- Semi-Urban	6	110
41	0133	Ponsford St.	Mill St	Amaranth St	LR	Asphalt- Semi-Urban	6	170
27	0173	Round About (Taylor Dr. - Mill St.)	Mill St Roundabout	Mill St Roundabout	CR	Asphalt- Urban	8	40
78	0190	Round About (Taylor Dr. - Mill St.)	Mill St Roundabout	Mill St Roundabout	CR	Asphalt- Urban	8	40
84	0191	Round About (Taylor Dr. - Mill St.)	Mill St Roundabout	Mill St Roundabout	CR	Asphalt- Urban	8	40
97	0192	Round About (Taylor Dr. - Mill St.)	Mill St Roundabout	Mill St Roundabout	CR	Asphalt- Urban	8	40
79	0180	Scott St.	Bielby St	End (East)	LR	Asphalt- Urban	8	60
64	0138	Scott St.	End (West)	Bielby St	LR	Asphalt- Urban	7	260
81	0165	Spruyt Ave.	Main St	Crozier St	LR	Asphalt- Urban	8	150
12	0158	Sideroad 27-28	Concession 8-9	35 m South of Concession 8-9	RR	Asphalt- Rural	6	35
93	160	Sideroad 27-28 (Bridge)	Concession 8-9	50 m North of Concession 8-9	RR	Asphalt- Rural	6	70
108	0168	Taylor Dr.	Future Road (no name)	Park (at Taylor St)	CR	Asphalt- Urban	8	270
49	0166	Taylor Dr.	Melody Ln	Monty Ave	CR	Asphalt- Urban	8	90
57	0170	Taylor Dr.	Mill St Roundabout	Reith St	CR	Asphalt- Urban	8	140
77	0167	Taylor Dr.	Monty Ave	Future Road (no name)	CR	Asphalt- Urban	8	220
32	0169	Taylor Dr.	Park (at Taylor St)	Mill St	CR	Asphalt- Urban	8	235
92	0171	Taylor Dr.	Reith St	Amaranth St	CR	Asphalt- Urban	8	140
85		unnamed W. of Taylor Dr.""	Taylor Dr	end	LR	Asphalt- Urban	8	40
88		unnamed W. of Taylor Dr.""	Taylor Dr	end	LR	Asphalt- Urban	8	40
75	0185	Water St.	Emma St	William St	ART	Asphalt- Urban	7	300
16	0184	Water St.	Melody Ln	Emma St	ART	Asphalt- Semi-Urban	7	400
102	0183	Water St.	South Limit	Melody Ln	ART	Asphalt- Urban	7	115
103	0186	Water St.	William St	Main St.	ART	Asphalt- Urban	7	90
10	0187	Webb St.	Main St	Crozier St	LR	Asphalt- Semi-Urban	6	140
8	0182	West Back Alley	Mill St	Amaranth St	LC	Asphalt- Semi-Urban	6	234
110	0189	William St.	Emma St	Water St	LR	Asphalt- Semi-Urban	8	80

objectid	Project & Map ID	Area (sm)	Wintermain	Assumed	Boundary Road	min_pci	est_aadt	rcr	rav_wi	rav_si	rav_di	flush_wi	flush_si	flush_di	shov_wi	shove_si
9		1020	Y	Y	N	63.5	100	4	1.5	0	0	0.5	0	0	1	0
4	0044B	2240	Y	Y	N	71	1000	5	1.5	0	0	0.5	0	0	1	0
69	0046	1440	Y	Y	N	81.8	700	6	1.5	0	0	0.5	0	0	1	0
14	0024	420	Y	Y	N	89.3	800	7	1.5	0	0	0.5	0	0	1	0
50	0022	420	Y	Y	N	89.3	800	7	1.5	0	0	0.5	0	0	1	0
104	0019	560	Y	Y	N	99.2	1000	10	1.5	0	0	0.5	0	0	1	0
43	0023	280	Y	Y	N	89.3	800	7	1.5	0	0	0.5	0	0	1	0
36	00018	840	Y	Y	N	99	1000	10	1.5	0	0	0.5	0	0	1	0
15	0021	350	Y	Y	N	89.3	800	7	1.5	0	0	0.5	0	0	1	0
6	0026	1680	Y	Y	N	89.3	800	7	1.5	0	0	0.5	0	0	1	0
58	0025	1680	Y	Y	N	89.3	800	7	1.5	0	0	0.5	0	0	1	0
109	0045	1360	Y	Y	N	96	1000	9	1.5	0	0	0.5	0	0	1	0
87	0020	560	Y	Y	N	99.2	1000	10	1.5	0	0	0.5	0	0	1	0
35	0003	2450	Y	Y	Y	97.4	350	9	1.5	0	0	0.5	0	0	1	0
24	0002	280	Y	Y	Y	97.4	350	9	1.5	0	0	0.5	0	0	1	0
80	0027	480	Y	Y	N	99.2	50	10	1.5	0	0	0.5	0	0	1	0
28	0032	770	Y	Y	N	58.4	200	4	1.5	0	0	0.5	0	0	1	0
44	0033	780	Y	Y	N	80	200	6	1.5	0	0	0.5	0	0	1	0
5	0034	8400	Y	Y	N	97.7	250	10	1.5	0	0	0.5	0	0	1	0
3	0048	1190	Y	Y	N	41.8	700	3	1.5	0	0	0.5	0	0	1	0
90	0047	1440	Y	Y	N	94.5	700	8	1.5	0	0	0.5	0	0	1	0
105	0049	1330	Y	Y	N	61.5	700	4	1.5	0	0	0.5	0	0	1	0
94	0041	12600	Y	Y	N	99.2	500	10	1.5	0	0	0.5	0	0	1	0
106	0042	13300	Y	Y	N	99.2	500	10	1.5	0	0	0.5	0	0	1	0
39	0043	4200	Y	Y	N	99.2	600	10	1.5	0	0	0.5	0	0	1	0
111	0044A	3500	Y	Y	N	99.2	600	10	1.5	0	0	0.5	0	0	1	0
62	0040	13300	Y	Y	N	99.2	500	10	1.5	0	0	0.5	0	0	1	0
13	0057	4900	Y	Y	N	97.1	50	9	1.5	0	0	0.5	0	0	1	0
1	0055	3115	Y	Y	N	71.2	50	5	1.5	0	0	0.5	0	0	1	0
45	0056	8400	Y	Y	N	80.6	50	6	1.5	0	0	0.5	0	0	1	0
21	0058	13300	Y	Y	N	70.2	150	5	1.5	0	0	0.5	0	0	1	0
54	0065	8400	Y	Y	N	99.1	100	10	1.5	0	0	0.5	0	0	1	0
2	0062	12600	Y	Y	N	42.8	100	4	1.5	0	0	0.5	0	0	1	0
65	0064	12950	Y	Y	N	93.9	150	8	1.5	0	0	0.5	0	0	1	0
67	0066	600	Y	Y	N	83.2	50	6	1.5	0	0	0.5	0	0	1	0
56	0068	1350	Y	Y	N	83.2	50	6	1.5	0	0	0.5	0	0	1	0
98	0067	600	Y	Y	N	83.2	50	6	1.5	0	0	0.5	0	0	1	0
23	0069	840	Y	Y	N	64.5	300	4	1.5	0	0	0.5	0	0	1	0
20	0072	720	Y	Y	N	99.2	200	10	1.5	0	0	0.5	0	0	1	0
18	0070	1520	Y	Y	N	24.4	300	2	1.5	0	0	0.5	0	0	1	0
31	0073	1280	Y	Y	N	99.2	200	10	1.5	0	0	0.5	0	0	1	0
68	0071	800	Y	Y	N	99.2	200	10	1.5	0	0	0.5	0	0	1	0
112	0074	2590	Y	Y	N	99	50	10	1.5	0	0	0.5	0	0	1	0

objectid	Project & Map ID	Area (sm)	Wintermain	Assumed	Boundary Road	min_pci	est_aadt	rcr	rav_wi	rav_si	rav_di	flush_wi	flush_si	flush_di	shov_wi	shove_si
86	0075	840	Y	Y	N	59.1	50	4	1.5	0	0	0.5	0	0	1	0
73	0076	680	Y	Y	N	90.7	50	7	1.5	0	0	0.5	0	0	1	0
66	0085	1540	Y	Y	N	62.7	100	4	1.5	0	0	0.5	0	0	1	0
11	0084	1020	Y	Y	N	56.2	200	4	1.5	0	0	0.5	0	0	1	0
37	0082	1740	Y	Y	N	58.6	200	4	1.5	0	0	0.5	0	0	1	0
91	0083	1190	Y	Y	N	72.6	200	5	1.5	0	0	0.5	0	0	1	1.5
59	0088	560	Y	Y	N	93.3	100	9	1.5	0	0	0.5	0	0	1	0
71	0087	700	Y	Y	N	93.3	200	9	1.5	0	0	0.5	0	0	1	0
34	0086	420	Y	Y	N	93.3	200	9	1.5	0	0	0.5	0	0	1	0
55	0089	630	Y	Y	N	93.3	50	9	1.5	0	0	0.5	0	0	1	0
61	0092	330	Y	Y	N	90.6	10	7	1.5	0	0	0.5	0	0	1	0
52	0091	660	Y	Y	N	87.5	50	7	1.5	0	0	0.5	0	0	1	0
96	0093	2100	Y	Y	N	88.8	150	7	1.5	0	0	0.5	0	0	1	0
114	0098	1740	Y	Y	N	96.5	50	9	1.5	0	0	0.5	0	0	1	0
95	0099	560	Y	Y	N	82.9	50	6	1.5	0	0	0.5	0	0	1	0
83	0100	1190	Y	Y	N	99.2	100	10	1.5	0	0	0.5	0	0	1	0
40	0104	1610	Y	Y	N	58.2	250	4	1.5	0	0	0.5	0	0	1	0
89	0101	720	Y	Y	N	91.5	250	8	1.5	0.25	0.25	0.5	0	0	1	0
100	0103	1190	Y	Y	N	92.7	250	8	1.5	0	0	0.5	0	0	1	0
76	0102B	4240	Y	Y	N	91.5	250	8	1.5	0.25	0.25	0.5	0	0	1	0
46	0102A	1190	Y	Y	N	60.1	250	4	1.5	0	0	0.5	0	0	1	0
47	0105	480	Y	Y	N	90	200	7	1.5	0	0	0.5	0	0	1	0
101	0112	2790	Y	Y	N	85.5	2000	8	1.5	0	0	0.5	0	0	1	0
82	0106	630	Y	Y	N	62.9	50	4	1.5	0	0	0.5	0	0	1	0
30	0108	1050	Y	Y	N	62.9	100	4	1.5	0	0	0.5	0	0	1	0
48	0111	1700	Y	Y	N	88.3	2000	8	1.5	0	0	0.5	0	0	1	0
26	0107	600	Y	Y	N	62.9	50	4	1.5	0	0	0.5	0	0	1	0
38	0109	480	Y	Y	N	62.9	200	4	1.5	0	0	0.5	0	0	1	0
22	0114	1120	Y	Y	N	75	2000	5	1.5	0	0	0.5	0	0	1	0
74	0110	1100	Y	Y	N	88.3	2000	8	1.5	0	0	0.5	0	0	1	0
99	0113	1330	Y	Y	N	76.5	2000	5	1.5	0	0	0.5	0	0	1	0
51	0115	490	Y	Y	N	83.8	50	8	1.5	0	0	0.5	0	0	1	0
19	0174	480	Y	Y		99.2	50	10	1.5	0	0	0.5	0	0	1	0
42	0122	1200	Y	Y	N	92.6	1000	8	1.5	0	0	0.5	0	0	1	0
53	0121	1160	Y	Y	N	99.2	750	10	1.5	0	0	0.5	0	0	1	0
17	0128	770	Y	Y	N	83.6	750	6	1.5	0	0	0.5	0	0	1	0
7	0125	1026	Y	Y	N	80.7	750	6	1.5	0	0	0.5	0	0	1	0
72	0129	600	Y	Y	N	92.6	100	8	1.5	0	0	0.5	0	0	1	0
29	0124	920	Y	Y	N	88.5	600	7	1.5	0	0	0.5	0	0	1	0
70	0127	770	Y	Y	N	83.6	750	6	1.5	0	0	0.5	0	0	1	0
33	0123	1120	Y	Y		99.2	500	10	1.5	0	0	0.5	0	0	1	0
25	0126	1026	Y	Y	N	80.7	750	6	1.5	0	0	0.5	0	0	1	0
113	0130	1000	Y	Y	N	97.1	50	9	1.5	0	0	0.5	0	0	1	0

objectid	Project & Map ID	Area (sm)	Wintermain	Assumed	Boundary Road	min_pci	est_aadt	rcr	rav_wi	rav_si	rav_di	flush_wi	flush_si	flush_di	shov_wi	shove_si
63	0131	7000	Y	Y	N	93.8	100	8	1.5	0	0	0.5	0	0	1	0
60	0132	660	Y	Y	N	93.9	50	8	1.5	0	0	0.5	0	0	1	0
41	0133	1020	Y	Y	N	82.6	100	6	1.5	0	0	0.5	0	0	1	0
27	0173	320	Y	Y		99.2	500	10	1.5	0	0	0.5	0	0	1	0
78	0190	320	Y	Y		99.2	500	10	1.5	0	0	0.5	0	0	1	0
84	0191	320	Y	Y		99.2	500	10	1.5	0	0	0.5	0	0	1	0
97	0192	320	Y	Y		99.2	500	10	1.5	0	0	0.5	0	0	1	0
79	0180	480	Y	Y		93.3	50	8	1.5	0	0	0.5	0	0	1	0
64	0138	1820	Y	Y	N	43.3	100	3	1.5	0	0	0.5	0	0	1	0
81	0165	1200	Y	Y	N	99.2	200	10	1.5	0	0	0.5	0	0	1	0
12	0158	210	Y	Y	N	72.9	150	5	1.5	0	0	0.5	0	0	1	0
93	160	420	Y	Y	N	72.9	100	5	1.5	0	0	0.5	0	0	1	0
108	0168	2160	Y	Y		99.2	500	10	1.5	0	0	0.5	0	0	1	0
49	0166	720	Y	Y		99.2	500	10	1.5	0	0	0.5	0	0	1	0
57	0170	1120	Y	Y		99.2	500	10	1.5	0	0	0.5	0	0	1	0
77	0167	1760	Y	Y		99.2	500	10	1.5	0	0	0.5	0	0	1	0
32	0169	1880	Y	Y		99.2	500	10	1.5	0	0	0.5	0	0	1	0
92	0171	1120	Y	Y		99.2	500	10	1.5	0	0	0.5	0	0	1	0
85		320	Y	Y	N	99.2	<50	10	1.5	0	0	0.5	0	0	1	0
88		320	Y	Y	N	99.2	<50	10	1.5	0	0	0.5	0	0	1	0
75	0185	2100	Y	Y	N	92.3	2000	9	1.5	0	0	0.5	0	0	1	0
16	0184	2800	Y	Y	N	93.5	2000	9	1.5	0	0	0.5	0	0	1	0
102	0183	805	Y	Y	N	80.7	2000	6	1.5	0	0	0.5	0	0	1	0
103	0186	630	Y	Y	N	92.3	2000	9	1.5	0	0	0.5	0	0	1	0
10	0187	840	Y	Y	N	87.4	50	7	1.5	0	0	0.5	0	0	1	0
8	0182	1404					100	4	1.5	0	0	0.5	0	0	1	0
110	0189	640	Y	Y	N	97.3	50	9	1.5	0	0	0.5	0	0	1	0

objectid	Project & Map ID	shove_di	wh_rut_wi	wh_rut_si	wh_rut_di	dist_wi	dist_si	dist_di	cr_lwt_sm_	cr_lwt_sm1	cr_lwt_s_1	cr_lwt_all	cr_lwt_a_1	cr_lwt_a_2
9		0	3	0	0	3	0	0	1	0	0	3	1.5	1.5
4	0044B	0	3	0	0	3	0	0	1	1	1.5	3	1	1.5
69	0046	0	3	0	0	3	0	0	1	0	0	3	1	1
14	0024	0	3	0	0	3	0	0	1	0.5	0.5	3	0	0
50	0022	0	3	0	0	3	0	0	1	0.5	0.5	3	0	0
104	0019	0	3	0	0	3	0	0	1	0	0	3	0	0
43	0023	0	3	0	0	3	0	0	1	0.5	0.5	3	0	0
36	00018	0	3	0	0	3	0	0	1	0	0	3	0	0
15	0021	0	3	0	0	3	0	0	1	0.5	0.5	3	0	0
6	0026	0	3	0	0	3	0	0	1	0.5	0.5	3	0	0
58	0025	0	3	0	0	3	0	0	1	0.5	0.5	3	0	0
109	0045	0	3	0	0	3	0	0	1	0	0	3	0	0
87	0020	0	3	0	0	3	0	0	1	0	0	3	0	0
35	0003	0	3	0	0	3	0	0	1	0	0	3	0	0
24	0002	0	3	0	0	3	0	0	1	0	0	3	0	0
80	0027	0	3	0	0	3	0	0	1	0	0	3	0	0
28	0032	0	3	0	0	3	1	1	1	1	1.5	3	1	1.5
44	0033	0	3	0	0	3	0.5	0.5	1	1	0.5	3	1	1
5	0034	0	3	0.5	0.25	3	0	0	1	0.5	0.25	3	0	0
3	0048	0	3	0	0	3	1.5	1.5	1	1.5	1.5	3	1.5	1.5
90	0047	0	3	0	0	3	0	0	1	0	0	3	0	0
105	0049	0	3	0	0	3	0	0	1	1	0.5	3	1	0.5
94	0041	0	3	0	0	3	0	0	1	0	0	3	0	0
106	0042	0	3	0	0	3	0	0	1	0	0	3	0	0
39	0043	0	3	0	0	3	0	0	1	0	0	3	0	0
111	0044A	0	3	0	0	3	0	0	1	0	0	3	0	0
62	0040	0	3	0	0	3	0	0	1	0	0	3	0	0
13	0057	0	3	0	0	3	0	0	1	0	0	3	0	0
1	0055	0	3	0	0	3	0	0	1	1	1.5	3	1	1.5
45	0056	0	3	0	0	3	0	0	1	1	1.5	3	1	1
21	0058	0	3	0	0	3	0	0	1	1	1.5	3	1	1.5
54	0065	0	3	0	0	3	0	0	1	0	0	3	0	0
2	0062	0	3	1.5	1.5	3	1.5	0.5	1	1.5	1.5	3	1.5	1.5
65	0064	0	3	0	0	3	0	0	1	0.5	0.25	3	0	0
67	0066	0	3	0	0	3	1	0.25	1	0.5	0.5	3	0	0
56	0068	0	3	0	0	3	1	0.25	1	0.5	0.5	3	0	0
98	0067	0	3	0	0	3	1	0.25	1	0.5	0.5	3	0	0
23	0069	0	3	0	0	3	0	0	1	0.5	1	3	0.5	1
20	0072	0	3	0	0	3	0	0	1	0	0	3	0	0
18	0070	0	3	0	0	3	1.5	0.5	1	2	1	3	2	1
31	0073	0	3	0	0	3	0	0	1	0	0	3	0	0
68	0071	0	3	0	0	3	0	0	1	0	0	3	0	0
112	0074	0	3	0	0	3	0	0	1	0	0	3	0	0

objectid	Project & Map ID	shove_di	wh_rut_wi	wh_rut_si	wh_rut_di	dist_wi	dist_si	dist_di	cr_lwt_sm_	cr_lwt_sm1	cr_lwt_s_1	cr_lwt_all	cr_lwt_a_1	cr_lwt_a_2
86	0075	0	3	0	0	3	0	0	1	0	0	3	1	1
73	0076	0	3	0	0	3	0	0	1	0	0	3	0	0
66	0085	0	3	0	0	3	0	0	1	1	1	3	1	1
11	0084	0	3	0	0	3	1	0.5	1	0	0	3	1.5	1.5
37	0082	0	3	0	0	3	1	1	1	0	0	3	1.5	1.5
91	0083	0.25	3	0	0	3	0	0	1	0	0	3	1.5	1
59	0088	0	3	0	0	3	0	0	1	0	0	3	0.5	0.5
71	0087	0	3	0	0	3	0	0	1	0	0	3	0.5	0.5
34	0086	0	3	0	0	3	0	0	1	0	0	3	0.5	0.5
55	0089	0	3	0	0	3	0	0	1	0	0	3	0.5	0.5
61	0092	0	3	0	0	3	0	0	1	0.5	0.5	3	0	0
52	0091	0	3	0	0	3	0	0	1	1.5	1.5	3	0	0
96	0093	0	3	0	0	3	0	0	1	0	0	3	0	0
114	0098	0	3	0	0	3	0	0	1	0	0	3	0	0
95	0099	0	3	0	0	3	1	0.25	1	0	0	3	0	0
83	0100	0	3	0	0	3	0	0	1	0	0	3	0	0
40	0104	0	3	0	0	3	0	0	1	0	0	3	1.5	1.5
89	0101	0	3	0	0	3	0	0	1	0	0	3	0.5	0.5
100	0103	0	3	0	0	3	0	0	1	1	1	3	0	0
76	0102B	0	3	0	0	3	0	0	1	0	0	3	0.5	0.5
46	0102A	0	3	0	0	3	1	0.5	1	0	0	3	1.5	1.5
47	0105	0	3	0	0	3	0	0	1	0	0	3	0	0
101	0112	0	3	0	0	3	0	0	1	1	1.5	3	0.5	1.5
82	0106	0	3	0	0	3	1.5	0.25	1	0	0	3	0	0
30	0108	0	3	0	0	3	1.5	0.25	1	0	0	3	0	0
48	0111	0	3	0	0	3	0	0	1	1	1.5	3	0	0
26	0107	0	3	0	0	3	1.5	0.25	1	0	0	3	0	0
38	0109	0	3	0	0	3	1.5	0.25	1	0	0	3	0	0
22	0114	0	3	0	0	3	0	0	1	0	0	3	0	0
74	0110	0	3	0	0	3	0	0	1	1	1.5	3	0	0
99	0113	0	3	0	0	3	0	0	1	0.5	1	3	0	0
51	0115	0	3	0	0	3	0	0	1	0.5	1	3	0.5	1
19	0174	0	3	0	0	3	0	0	1	0	0	3	0	0
42	0122	0	3	0	0	3	0	0	1	1	1	3	0	0
53	0121	0	3	0	0	3	0	0	1	0	0	3	0	0
17	0128	0	3	0	0	3	0	0	1	0	0	3	0	0
7	0125	0	3	0	0	3	0	0	1	1	1	3	1	0.5
72	0129	0	3	0	0	3	0	0	1	0	0	3	0	0
29	0124	0	3	0	0	3	0	0	1	1.5	1.5	3	1	0
70	0127	0	3	0	0	3	0	0	1	0	0	3	0	0
33	0123	0	3	0	0	3	0	0	1	0	0	3	0	0
25	0126	0	3	0	0	3	0	0	1	1	1	3	1	0.5
113	0130	0	3	0	0	3	0	0	1	0	0	3	0	0

objectid	Project & Map ID	shove_di	wh_rut_wi	wh_rut_si	wh_rut_di	dist_wi	dist_si	dist_di	cr_lwt_sm_	cr_lwt_sm1	cr_lwt_s_1	cr_lwt_all	cr_lwt_a_1	cr_lwt_a_2
63	0131	0	3	0	0	3	0	0	1	0	0	3	0	0
60	0132	0	3	0	0	3	0	0	1	0	0	3	0	0
41	0133	0	3	0	0	3	1	0.5	1	0	0	3	0	0
27	0173	0	3	0	0	3	0	0	1	0	0	3	0	0
78	0190	0	3	0	0	3	0	0	1	0	0	3	0	0
84	0191	0	3	0	0	3	0	0	1	0	0	3	0	0
97	0192	0	3	0	0	3	0	0	1	0	0	3	0	0
79	0180	0	3	0	0	3	0	0	1	0	0	3	0	0
64	0138	0	3	0	0	3	1	1	1	0	0	3	1	1.5
81	0165	0	3	0	0	3	0	0	1	0	0	3	0	0
12	0158	0	3	0	0	3	0	0	1	0	0	3	1	1
93	160	0	3	0	0	3	0	0	1	0	0	3	1	1
108	0168	0	3	0	0	3	0	0	1	0	0	3	0	0
49	0166	0	3	0	0	3	0	0	1	0	0	3	0	0
57	0170	0	3	0	0	3	0	0	1	0	0	3	0	0
77	0167	0	3	0	0	3	0	0	1	0	0	3	0	0
32	0169	0	3	0	0	3	0	0	1	0	0	3	0	0
92	0171	0	3	0	0	3	0	0	1	0	0	3	0	0
85		0	3	0	0	3	0	0	1	0	0	3	0	0
88		0	3	0	0	3	0	0	1	0	0	3	0	0
75	0185	0	3	0	0	3	0	0	1	0	0	3	0	0
16	0184	0	3	0	0	3	0	0	1	1.5	1	3	0	0
102	0183	0	3	0	0	3	0	0	1	0.5	0.5	3	0.5	0.5
103	0186	0	3	0	0	3	0	0	1	0	0	3	0	0
10	0187	0	3	0	0	3	0	0	1	0	0	3	0.5	1
8	0182	0	3	0	0	3	0	0	1	0	0	3	1.5	0.5
110	0189	0	3	0	0	3	0	0	1	0	0	3	0	0

objectid	Project & Map ID	cr_cn_sm_w	cr_cn_sm_s	cr_cn_sm_d	cr_cn_all_	cr_cn_all1	cr_cn_al_1	cr_pe_sm_w	cr_pe_sm_s	cr_pe_sm_d	cr_pe_all_	cr_pe_all1
9		0.5	1	1	2	0	0	0.5	1.5	1.5	1.5	1.5
4	0044B	0.5	0.5	1.5	2	0.5	1	0.5	1	1.5	1.5	1
69	0046	0.5	0	0	2	0.5	1	0.5	0	0	1.5	0
14	0024	0.5	0	0	2	0	0	0.5	1	1	1.5	0
50	0022	0.5	0	0	2	0	0	0.5	1	1	1.5	0
104	0019	0.5	0	0	2	0	0	0.5	0	0	1.5	0
43	0023	0.5	0	0	2	0	0	0.5	1	1	1.5	0
36	00018	0.5	0	0	2	0	0	0.5	0.5	0.5	1.5	0
15	0021	0.5	0	0	2	0	0	0.5	1	1	1.5	0
6	0026	0.5	0	0	2	0	0	0.5	1	1	1.5	0
58	0025	0.5	0	0	2	0	0	0.5	1	1	1.5	0
109	0045	0.5	0	0	2	0	0	0.5	1	1	1.5	0
87	0020	0.5	0	0	2	0	0	0.5	0	0	1.5	0
35	0003	0.5	0	0	2	0	0	0.5	0	0	1.5	0
24	0002	0.5	0	0	2	0	0	0.5	0	0	1.5	0
80	0027	0.5	0	0	2	0	0	0.5	0	0	1.5	0
28	0032	0.5	0	0	2	0	0	0.5	1	1	1.5	1
44	0033	0.5	0.5	1	2	0.5	0.5	0.5	0	0	1.5	0
5	0034	0.5	0.25	0.25	2	0	0	0.5	0.25	0.25	1.5	0
3	0048	0.5	0	0	2	1.5	1.5	0.5	1.5	1.5	1.5	1.5
90	0047	0.5	0.5	1.5	2	0	0	0.5	0	0	1.5	0
105	0049	0.5	0	0	2	1	0.5	0.5	0	0	1.5	1
94	0041	0.5	0	0	2	0	0	0.5	0	0	1.5	0
106	0042	0.5	0	0	2	0	0	0.5	0	0	1.5	0
39	0043	0.5	0	0	2	0	0	0.5	0	0	1.5	0
111	0044A	0.5	0	0	2	0	0	0.5	0	0	1.5	0
62	0040	0.5	0	0	2	0	0	0.5	0	0	1.5	0
13	0057	0.5	0	0	2	0	0	0.5	0.5	1	1.5	0
1	0055	0.5	1	1	2	1	1	0.5	1	1.5	1.5	1
45	0056	0.5	1	1	2	0	0	0.5	1	1.5	1.5	1
21	0058	0.5	1	1.5	2	1	1.5	0.5	1	2	1.5	1
54	0065	0.5	0	0	2	0	0	0.5	0.25	0.25	1.5	0
2	0062	0.5	1	1.5	2	1	1.5	0.5	1.5	1.5	1.5	1.5
65	0064	0.5	1	0.25	2	0	0	0.5	0	0	1.5	0
67	0066	0.5	0	0	2	0	0	0.5	0	0	1.5	0
56	0068	0.5	0	0	2	0	0	0.5	0	0	1.5	0
98	0067	0.5	0	0	2	0	0	0.5	0	0	1.5	0
23	0069	0.5	0	0	2	0	0	0.5	1	1.5	1.5	1
20	0072	0.5	0	0	2	0	0	0.5	0	0	1.5	0
18	0070	0.5	1	1	2	0	0	0.5	0	0	1.5	0
31	0073	0.5	0	0	2	0	0	0.5	0	0	1.5	0
68	0071	0.5	0	0	2	0	0	0.5	0	0	1.5	0
112	0074	0.5	0.25	0.25	2	0	0	0.5	0.25	0.25	1.5	0

objectid	Project & Map ID	cr_cn_sm_w	cr_cn_sm_s	cr_cn_sm_d	cr_cn_all_	cr_cn_all1	cr_cn_al_1	cr_pe_sm_w	cr_pe_sm_s	cr_pe_sm_d	cr_pe_all_	cr_pe_all1
86	0075	0.5	0	0	2	1	1	0.5	1	1.5	1.5	1.5
73	0076	0.5	0	0	2	0	0	0.5	0.25	0.25	1.5	0
66	0085	0.5	0	0	2	0	0	0.5	1	1	1.5	1
11	0084	0.5	1	1.5	2	1	1	0.5	1	1	1.5	1
37	0082	0.5	0	0	2	1	0.5	0.5	1	1	1.5	1
91	0083	0.5	0	0	2	1	0.5	0.5	0	0	1.5	1.5
59	0088	0.5	1	1.5	2	0	0	0.5	0	0	1.5	0
71	0087	0.5	1	1.5	2	0	0	0.5	0	0	1.5	0
34	0086	0.5	1	1.5	2	0	0	0.5	0	0	1.5	0
55	0089	0.5	1	1.5	2	0	0	0.5	0	0	1.5	0
61	0092	0.5	0.5	0.5	2	0	0	0.5	0.5	0.5	1.5	0
52	0091	0.5	1.5	1	2	0	0	0.5	1.5	1	1.5	0
96	0093	0.5	0.5	1	2	0	0	0.5	0	0	1.5	1
114	0098	0.5	0.5	2	2	0	0	0.5	0.5	1	1.5	0
95	0099	0.5	0.5	1	2	0.25	1	0.5	0	0	1.5	0
83	0100	0.5	0	0	2	0	0	0.5	0	0	1.5	0
40	0104	0.5	0	0	2	1	1.5	0.5	1	1.5	1.5	1.5
89	0101	0.5	1	1.5	2	0	0	0.5	0	0	1.5	0
100	0103	0.5	0	0	2	0	0	0.5	1	1	1.5	0
76	0102B	0.5	1	1.5	2	0	0	0.5	0	0	1.5	0
46	0102A	0.5	0	0	2	1.5	1.5	0.5	0	0	1.5	1.5
47	0105	0.5	0	0	2	0	0	0.5	0.5	1.5	1.5	0.5
101	0112	0.5	0	0	2	0	0	0.5	0.5	0.5	1.5	0
82	0106	0.5	1	1	2	1	1	0.5	1	1.5	1.5	1
30	0108	0.5	1	1	2	1	1	0.5	1	1.5	1.5	1
48	0111	0.5	0	0	2	0	0	0.5	0.5	1	1.5	0
26	0107	0.5	1	1	2	1	1	0.5	1	1.5	1.5	1
38	0109	0.5	1	1	2	1	1	0.5	1	1.5	1.5	1
22	0114	0.5	0	0	2	0	0	0.5	1	1.5	1.5	1
74	0110	0.5	0	0	2	0	0	0.5	0.5	1	1.5	0
99	0113	0.5	0	0	2	0	0	0.5	0.5	2	1.5	0.5
51	0115	0.5	0.5	1	2	0.5	1	0.5	0.5	1	1.5	0.5
19	0174	0.5	0	0	2	0	0	0.5	0	0	1.5	0
42	0122	0.5	1	1	2	0	0	0.5	1	1.5	1.5	0
53	0121	0.5	0	0	2	0	0	0.5	0	0	1.5	0
17	0128	0.5	0.5	0.25	2	0	0	0.5	0	0	1.5	0.5
7	0125	0.5	0	0	2	0	0	0.5	0	0	1.5	0
72	0129	0.5	0	0	2	0	0	0.5	0.5	0.5	1.5	0
29	0124	0.5	0	0	2	0	0	0.5	0.5	1	1.5	0
70	0127	0.5	0.5	0.25	2	0	0	0.5	0	0	1.5	0.5
33	0123	0.5	0	0	2	0	0	0.5	0	0	1.5	0
25	0126	0.5	0	0	2	0	0	0.5	0	0	1.5	0
113	0130	0.5	0	0	2	0	0	0.5	0.25	0.25	1.5	0

objectid	Project & Map ID	cr_cn_sm_w	cr_cn_sm_s	cr_cn_sm_d	cr_cn_all_	cr_cn_all1	cr_cn_al_1	cr_pe_sm_w	cr_pe_sm_s	cr_pe_sm_d	cr_pe_all_	cr_pe_all1
63	0131	0.5	1	1	2	0	0	0.5	0	0	1.5	0
60	0132	0.5	0	0	2	0	0	0.5	0.5	0.25	1.5	0
41	0133	0.5	0	0	2	0	0	0.5	0.5	1	1.5	0
27	0173	0.5	0	0	2	0	0	0.5	0	0	1.5	0
78	0190	0.5	0	0	2	0	0	0.5	0	0	1.5	0
84	0191	0.5	0	0	2	0	0	0.5	0	0	1.5	0
97	0192	0.5	0	0	2	0	0	0.5	0	0	1.5	0
79	0180	0.5	0.5	1.5	2	0	0	0.5	0.5	1	1.5	0
64	0138	0.5	1	2	2	1	1	0.5	0	0	1.5	1.5
81	0165	0.5	0	0	2	0	0	0.5	0	0	1.5	0
12	0158	0.5	0.5	0.5	2	0.5	0.5	0.5	1	1	1.5	1.5
93	160	0.5	0.5	0.5	2	0.5	0.5	0.5	1	1	1.5	1.5
108	0168	0.5	0	0	2	0	0	0.5	0	0	1.5	0
49	0166	0.5	0	0	2	0	0	0.5	0	0	1.5	0
57	0170	0.5	0	0	2	0	0	0.5	0	0	1.5	0
77	0167	0.5	0	0	2	0	0	0.5	0	0	1.5	0
32	0169	0.5	0	0	2	0	0	0.5	0	0	1.5	0
92	0171	0.5	0	0	2	0	0	0.5	0	0	1.5	0
85		0.5	0	0	2	0	0	0.5	0	0	1.5	0
88		0.5	0	0	2	0	0	0.5	0	0	1.5	0
75	0185	0.5	0	0	2	0	0	0.5	0	0	1.5	1
16	0184	0.5	0	0	2	0	0	0.5	0	0	1.5	0
102	0183	0.5	1	1	2	0.5	1	0.5	1	1.5	1.5	0.5
103	0186	0.5	0	0	2	0	0	0.5	0	0	1.5	1
10	0187	0.5	0	0	2	0.5	1	0.5	0.5	1	1.5	0
8	0182	0.5	1	1	0	0	0	0.5	1.5	1.5	1.5	1.5
110	0189	0.5	0	0	2	0	0	0.5	0.25	0.25	1.5	0

objectid	Project & Map ID	cr_pe_al_1	cr_trv_hfm	cr_trv_h_1	cr_trv_h_2	cr_trv_all	cr_trv_a_1	cr_trv_a_2	cr_lon_wi	cr_lon_si	cr_lon_di	poth_wi	poth_si	poth_di
9		1.5	1	0	0	3	0	0	1	0	0	3	0	0
4	0044B	1.5	1	0.5	1	3	0	0	1	0	0	3	0	0
69	0046	0	1	0.5	1.5	3	0	0	1	0	0	3	0	0
14	0024	0	1	0.5	1	3	0	0	1	0.5	1	3	0	0
50	0022	0	1	0.5	1	3	0	0	1	0.5	1	3	0	0
104	0019	0	1	0	0	3	0	0	1	0	0	3	0	0
43	0023	0	1	0.5	1	3	0	0	1	0.5	1	3	0	0
36	00018	0	1	0	0	3	0	0	1	0	0	3	0	0
15	0021	0	1	0.5	1	3	0	0	1	0.5	1	3	0	0
6	0026	0	1	0.5	1	3	0	0	1	0.5	1	3	0	0
58	0025	0	1	0.5	1	3	0	0	1	0.5	1	3	0	0
109	0045	0	1	0	0	3	0	0	1	1	1	3	0	0
87	0020	0	1	0	0	3	0	0	1	0	0	3	0	0
35	0003	0	1	0	0	3	0	0	1	0	0	3	0	0
24	0002	0	1	0	0	3	0	0	1	0	0	3	0	0
80	0027	0	1	0	0	3	0	0	1	0	0	3	0	0
28	0032	1	1	0.5	1.5	3	0	0	1	0	0	3	1	1
44	0033	0	1	1	1	3	0	0	1	0	0	3	0	0
5	0034	0	1	0	0	3	0	0	1	0	0	3	0	0
3	0048	1.5	1	1.5	1.5	3	0	0	1	0	0	3	0	0
90	0047	0	1	0	0	3	0	0	1	0	0	3	0	0
105	0049	1.5	1	1	1	3	1	1	1	0	0	3	0	0
94	0041	0	1	0	0	3	0	0	1	0	0	3	0	0
106	0042	0	1	0	0	3	0	0	1	0	0	3	0	0
39	0043	0	1	0	0	3	0	0	1	0	0	3	0	0
111	0044A	0	1	0	0	3	0	0	1	0	0	3	0	0
62	0040	0	1	0	0	3	0	0	1	0	0	3	0	0
13	0057	0	1	0	0	3	0	0	1	0	0	3	0	0
1	0055	1.5	1	0	0	3	0	0	1	0	0	3	0	0
45	0056	1	1	0	0	3	0	0	1	0	0	3	0	0
21	0058	2	1	0	0	3	0	0	1	0	0	3	0	0
54	0065	0	1	0	0	3	0	0	1	0	0	3	0	0
2	0062	1.5	1	1.5	1.5	3	1.5	1.5	1	0	0	3	0	0
65	0064	0	1	0	0	3	0	0	1	0.5	0.5	3	0	0
67	0066	0	1	1	2	3	0	0	1	0	0	3	0	0
56	0068	0	1	1	2	3	0	0	1	0	0	3	0	0
98	0067	0	1	1	2	3	0	0	1	0	0	3	0	0
23	0069	1.5	1	0.25	0.25	3	0	0	1	0	0	3	0.5	0.25
20	0072	0	1	0	0	3	0	0	1	0	0	3	0	0
18	0070	0	1	1.5	0.5	3	1.5	0.5	1	1	0.25	3	1	1
31	0073	0	1	0	0	3	0	0	1	0	0	3	0	0
68	0071	0	1	0	0	3	0	0	1	0	0	3	0	0
112	0074	0	1	0	0	3	0	0	1	0	0	3	0	0

objectid	Project & Map ID	cr_pe_al_1	cr_trv_hfm	cr_trv_h_1	cr_trv_h_2	cr_trv_all	cr_trv_a_1	cr_trv_a_2	cr_lon_wi	cr_lon_si	cr_lon_di	poth_wi	poth_si	poth_di
86	0075	1.5	1	1	1	3	1	1	1	1	1.5	3	0	0
73	0076	0	1	0	0	3	0	0	1	0	0	3	0.25	0.25
66	0085	1	1	1	0.5	3	1	0.5	1	0	0	3	0	0
11	0084	1.5	1	1	1	3	1	1.5	1	0	0	3	0	0
37	0082	1	1	0	0	3	0	0	1	0.5	0.5	3	1	0.5
91	0083	1	1	0	0	3	0	0	1	0.5	0.25	3	0	0
59	0088	0	1	0.5	1	3	0	0	1	0	0	3	0	0
71	0087	0	1	0.5	1	3	0	0	1	0	0	3	0	0
34	0086	0	1	0.5	1	3	0	0	1	0	0	3	0	0
55	0089	0	1	0.5	1	3	0	0	1	0	0	3	0	0
61	0092	0	1	0	0	3	0	0	1	0	0	3	0	0
52	0091	0	1	1	0.5	3	0	0	1	1.5	0.5	3	0	0
96	0093	1.5	1	0.5	1	3	0	0	1	0	0	3	0	0
114	0098	0	1	0	0	3	0	0	1	0	0	3	0	0
95	0099	0	1	1	0.5	3	0	0	1	0	0	3	0	0
83	0100	0	1	0	0	3	0	0	1	0	0	3	0	0
40	0104	1.5	1	1	1.5	3	1	1	1	0	0	3	0	0
89	0101	0	1	0.5	1	3	0	0	1	0	0	3	0	0
100	0103	0	1	0	0	3	0	0	1	1	1	3	0	0
76	0102B	0	1	0.5	1	3	0	0	1	0	0	3	0	0
46	0102A	1.5	1	0	0	3	0	0	1	0	0	3	0	0
47	0105	1	1	0	0	3	0	0	1	0	0	3	0	0
101	0112	0	1	1	0.5	3	0	0	1	1	1	3	0	0
82	0106	1.5	1	0	0	3	0.5	0.25	1	0	0	3	0	0
30	0108	1.5	1	0	0	3	0.5	0.25	1	0	0	3	0	0
48	0111	0	1	1.5	2	3	0	0	1	1	2	3	0	0
26	0107	1.5	1	0	0	3	0.5	0.25	1	0	0	3	0	0
38	0109	1.5	1	0	0	3	0.5	0.25	1	0	0	3	0	0
22	0114	1.5	1	1	1.5	3	1	0.25	1	0	0	3	0	0
74	0110	0	1	1.5	2	3	0	0	1	1	2	3	0	0
99	0113	1.5	1	0.5	1.5	3	0	0	1	0	0	3	0	0
51	0115	1	1	0	0	3	0	0	1	0	0	3	0.25	0.25
19	0174	0	1	0	0	3	0	0	1	0	0	3	0	0
42	0122	0	1	0	0	3	0	0	1	0.5	0.5	3	0	0
53	0121	0	1	0	0	3	0	0	1	0	0	3	0	0
17	0128	0.5	1	1	0.25	3	1	0.25	1	0	0	3	0	0
7	0125	0	1	1	1.5	3	0.5	1	1	0	0	3	0	0
72	0129	0	1	0.5	1	3	0.5	0.25	1	0.5	0.5	3	0	0
29	0124	0	1	0	0	3	0	0	1	0	0	3	0	0
70	0127	0.5	1	1	0.25	3	1	0.25	1	0	0	3	0	0
33	0123	0	1	0	0	3	0	0	1	0	0	3	0	0
25	0126	0	1	1	1.5	3	0.5	1	1	0	0	3	0	0
113	0130	0	1	0	0	3	0	0	1	0.25	0.25	3	0	0

objectid	Project & Map ID	cr_pe_al_1	cr_trv_hfm	cr_trv_h_1	cr_trv_h_2	cr_trv_all	cr_trv_a_1	cr_trv_a_2	cr_lon_wi	cr_lon_si	cr_lon_di	poth_wi	poth_si	poth_di
63	0131	0	1	1	0.5	3	0	0	1	0	0	3	0	0
60	0132	0	1	1	1	3	0	0	1	0	0	3	0	0
41	0133	0	1	1	1	3	0	0	1	0.5	1.5	3	0	0
27	0173	0	1	0	0	3	0	0	1	0	0	3	0	0
78	0190	0	1	0	0	3	0	0	1	0	0	3	0	0
84	0191	0	1	0	0	3	0	0	1	0	0	3	0	0
97	0192	0	1	0	0	3	0	0	1	0	0	3	0	0
79	0180	0	1	0.5	0.5	3	0	0	1	0.5	0.5	3	0	0
64	0138	1.5	1	1	2	3	1	1	1	0	0	3	0	0
81	0165	0	1	0	0	3	0	0	1	0	0	3	0	0
12	0158	1.5	1	0.5	1.5	3	0	0	1	0	0	3	0	0
93	160	1.5	1	0.5	1.5	3	0	0	1	0	0	3	0	0
108	0168	0	1	0	0	3	0	0	1	0	0	3	0	0
49	0166	0	1	0	0	3	0	0	1	0	0	3	0	0
57	0170	0	1	0	0	3	0	0	1	0	0	3	0	0
77	0167	0	1	0	0	3	0	0	1	0	0	3	0	0
32	0169	0	1	0	0	3	0	0	1	0	0	3	0	0
92	0171	0	1	0	0	3	0	0	1	0	0	3	0	0
85		0	1	0	0	3	0	0	1	0	0	3	0	0
88		0	1	0	0	3	0	0	1	0	0	3	0	0
75	0185	0.5	1	1	1.5	3	0	0	1	1	1	3	0	0
16	0184	0	1	0.5	1.5	3	0	0	1	0.5	0.5	3	0	0
102	0183	1	1	1	1	3	0	0	1	0	0	3	0	0
103	0186	0.5	1	1	1.5	3	0	0	1	1	1	3	0	0
10	0187	0	1	0	0	3	0	0	1	0.5	0.5	3	0	0
8	0182	1.5	1	0	0	3	0	0	1	0	0	3	0	0
110	0189	0	1	0	0	3	0	0	1	0	0	3	0	0

objectid	Project & Map ID	rcr_1	sum_wi_x_s	sh_wn_mat	sh_wn_wid	sh_es_wid	ten_yr_aad
9		4	16		0	0	110
4	0044B	5	20.5	Gravel	1	1	2300
69	0046	6	11	Grass	0	0	1500
14	0024	7	5	Ashalt	2.8	1.5	2500
50	0022	7	5	Ashalt	2.8	1.5	3000
104	0019	10	0	Concrete Curb	0	0	4500
43	0023	7	5	Ashalt	2.8	1.5	2800
36	00018	10	0.5	Ashalt	1.7	2	4300
15	0021	7	5	Ashalt	2.8	1.5	3200
6	0026	7	5	Ashalt	2.8	1.5	2500
58	0025	7	5	Ashalt	2.8	1.5	2500
109	0045	9	3	Gravel	0.7	0.7	3300
87	0020	10	0	Concrete Curb	0	0	4600
35	0003	9	0	Gravel	1	1	385
24	0002	9	0	Gravel	1	1	1500
80	0027	10	0	Concrete Curb	0	0	50
28	0032	4	28	Ashalt	1	1	700
44	0033	6	15.25	Ashalt	1.5	2.5	700
5	0034	10	3.5	Gravel	0.5	0.5	275
3	0048	3	36	Grass	1	1	1500
90	0047	8	1	Concrete Curb	0	0	1500
105	0049	4	20.75	Gravel	1	1	1500
94	0041	10	0	Gravel	1	1	600
106	0042	10	0	Gravel	1	1	600
39	0043	10	0	Gravel	1	1	700
111	0044A	10	0	Gravel	1	1	850
62	0040	10	0	Gravel	1	1	600
13	0057	9	0.75	Gravel	1	1	55
1	0055	6	20	Gravel	0.5	0.5	55
45	0056	7	13.75	Gravel	0.75	0.75	55
21	0058	7	22.25	Gravel	1	1	165
54	0065	10	0.25	Gravel	0.5	0.5	110
2	0062	4	51.25	Gravel	0.5	0.5	110
65	0064	8	2.375	Gravel	1	1	165
67	0066	7	7.75	Grass	0	0	55
56	0068	7	7.75	Grass	0	0	55
98	0067	7	7.75	Grass	0	0	55
23	0069	6	13.75	Asphalt	3.2	1.5	400
20	0072	10	0	Concrete Curb	0	0	300
18	0070	2	34.25	Grass	0	0	400
31	0073	10	0	Concrete Curb	0	0	300
68	0071	10	0	Concrete Curb	0	0	300
112	0074	10	0.5	Grass	1	1	50

objectid	Project & Map ID	rcr_1	sum_wi_x_s	sh_wn_mat	sh_wn_wid	sh_es_wid	ten_yr_aad
86	0075	4	26.25	Asphalt	0.5	0.5	55
73	0076	7	1.75		0	0	55
66	0085	4	18	Asphalt	1.5	0.5	110
11	0084	4	33	Asphalt	2.7	1	220
37	0082	4	27.5	Gravel	0.5	0.5	220
91	0083	5	16.75	Asphalt	0	0	220
59	0088	9	5.75	Asphalt	0.7	0.7	1200
71	0087	9	5.75	Asphalt	0.7	0.7	1500
34	0086	9	5.75	Asphalt	0.7	0.7	1500
55	0089	9	5.75	Asphalt	0.7	0.7	1200
61	0092	7	2	Grass	0	0	10
52	0091	7	9	Grass	0	0	50
96	0093	7	6	Asphalt	0.7	0.7	165
114	0098	9	2	Grass	0	0	1050
95	0099	6	8.5	Asphalt	0.7	0.7	50
83	0100	10	0	Asphalt	1.7	2	110
40	0104	4	28.25	Asphalt	0.5	0.5	400
89	0101	8	6.5	Concrete Curb	0	0	300
100	0103	8	5	Asphalt	1.8	1	300
76	0102B	8	6.5	Concrete Curb	0	0	300
46	0102A	4	24	Aphalt	1.8	0	300
47	0105	7	3.25	Grass	0	0	200
101	0112	8	12.5	Concrete Curb	0	2	9000
82	0106	4	17.5	Grass	0	0	55
30	0108	4	17.5	Grass	0	0	110
48	0111	8	9.75	Asphalt	2	2	12000
26	0107	4	17.5	Grass	0	0	55
38	0109	4	17.5	Grass	0	0	220
22	0114	6	11.25	Gravel	3	3.5	7500
74	0110	8	9.75	Asphalt	2	2	11000
99	0113	5	7.75	Concrete Curb	0	0	8000
51	0115	8	14.25	Asphalt	0.6	0.6	50
19	0174	10	0	Concrete Curb	0	0	1000
42	0122	8	5.25	Concrete Curb	0	0	3500
53	0121	10	0	Concrete Curb	0	0	3000
17	0128	8	6.875	Asphalt	0	2	1000
7	0125	7	13.5	Asphalt	2.3	2.3	1000
72	0129	8	5.25	Asphalt	0	2	110
29	0124	7	6.75	Asphalt	0.8	0.8	900
70	0127	8	6.875	Asphalt	0	2	1000
33	0123	10	0	Concrete Curb	0	0	750
25	0126	7	13.5	Asphalt	2.3	2.3	1000
113	0130	9	0.75	Concrete Curb	0	0	50

objectid	Project & Map ID	rcr_1	sum_wi_x_s	sh_wn_mat	sh_wn_wid	sh_es_wid	ten_yr_aad
63	0131	8	2.5	Gravel	1	1	100
60	0132	8	2.375	Grass	0	0	50
41	0133	6	9.25	Asphalt	0.5	0	110
27	0173	10	0	Concrete Curb	0	0	1000
78	0190	10	0	Concrete Curb	0	0	1000
84	0191	10	0	Concrete Curb	0	0	1000
97	0192	10	0	Concrete Curb	0	0	1000
79	0180	8	3.75	Concrete Curb	0	0	500
64	0138	3	32.5	Grass	0	0.5	110
81	0165	10	0	Concrete Curb	0	0	220
12	0158	5	16	Gravel	0.5	0.5	165
93	160	5	16	Gravel	0.5	0.5	110
108	0168	10	0	Concrete Curb	0	0	1500
49	0166	10	0	Concrete Curb	0	0	1500
57	0170	10	0	Concrete Curb	0	0	1000
77	0167	10	0	Concrete Curb	0	0	1500
32	0169	10	0	Concrete Curb	0	0	1000
92	0171	10	0	Concrete Curb	0	0	1000
85		10	0	Concrete Curb	0	0	500
88		10	0	Concrete Curb	0	0	500
75	0185	9	6.75	Concrete Curb	0	0.8	11000
16	0184	9	5.5	Asphalt	0.8	1.5	11000
102	0183	7	13.5	Concrete Curb	0	0.5	13500
103	0186	9	6.75	Concrete Curb	0	0.8	11000
10	0187	7	9.25	Asphalt	0.7	0.7	55
8	0182	4	16		0	0	100
110	0189	9	0.25	grass	0	0	55

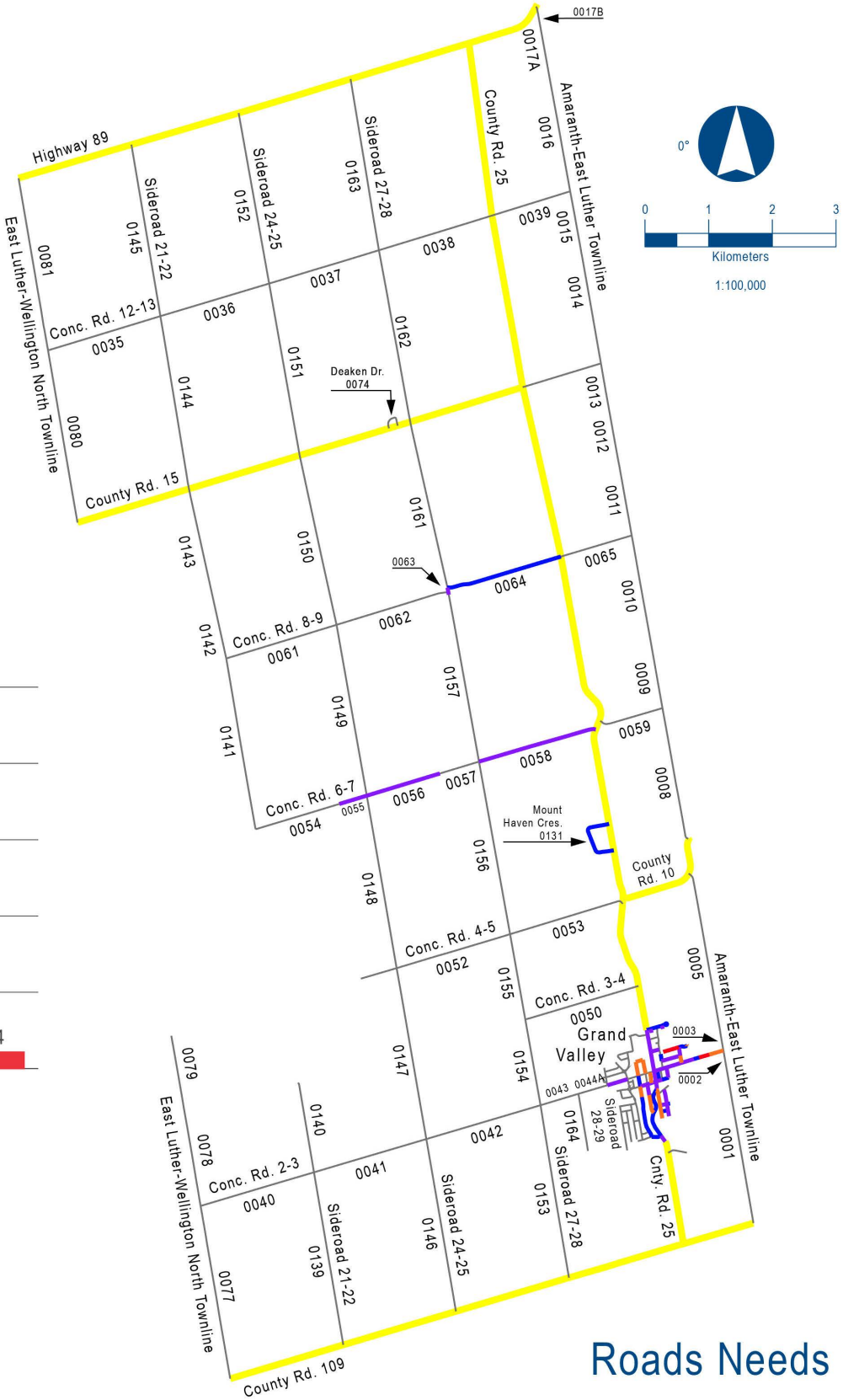
BURNSIDE

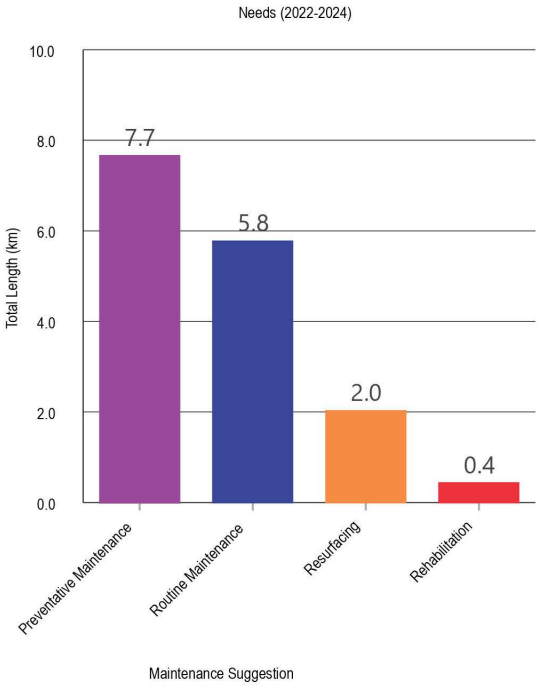
[THE DIFFERENCE IS OUR PEOPLE]

Appendix B

Road Needs Mapping and Table

Town of Grand Valley
Roads Needs Study





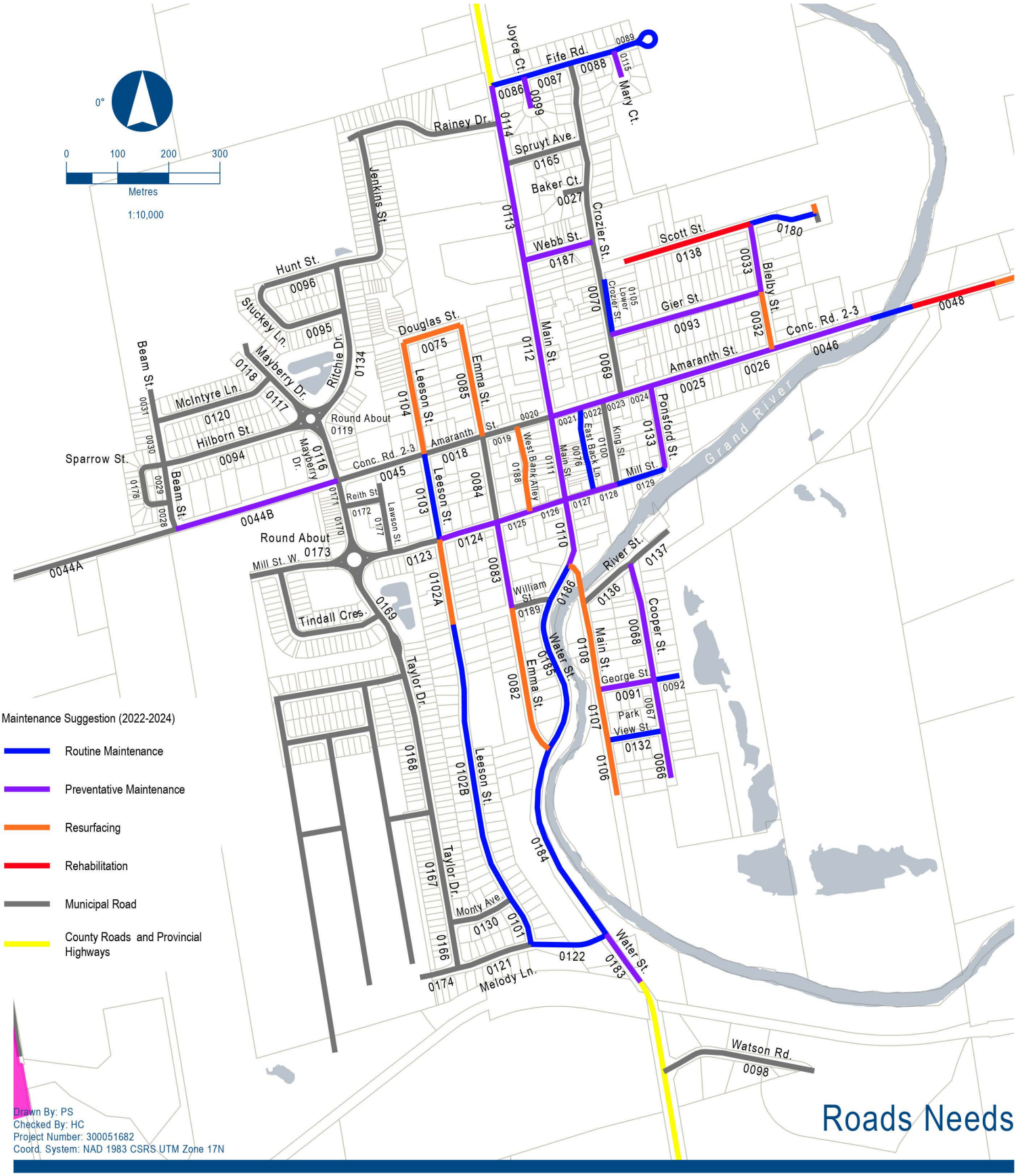
Drawn By: PS
Checked By: HC
Project Number: 300051682
Coord. System: NAD 1983 CSRS UTM Zone 17N

Roads Needs

BURNSIDE

Figure: B1

Town of Grand Valley
Roads Needs Study



Drawn By: PS
Checked By: HC
Project Number: 300051682
Coord. System: NAD 1983 CSRS UTM Zone 17N

Roads Needs

BURNSIDE

Figure: B2

File Path: C:\Users\pstubbert\RJB\300051682 - Grand Valley - Road Management Plan - GIS\051682_RNS.aprx Print Date: 2022/06/30 Time: 01:50 PM

Appendix B: Road Needs

objectid	Project & Map ID	Street Name	From Street Name	To Street Name	Maintenance Suggestion	Estimated Cost ($)	Repair Priority	Year		After Inprovement PCI
9		a lane at the east end of Scott St.""	Scott St.	End (North)	Resurfacing	$24,480	27.54115405	2	2023	88
4	0044B	Amaranth St.	Beam St	Taylor Dr	Preventative Maintenance	$13,440	49.84924623	1	2022	96
69	0046	Amaranth St.	Bielby St	160m to Bridge	Preventative Maintenance	$8,640	33.2178132	2	2023	86
14	0024	Amaranth St.	Crozier St	Pondsford St	Preventative Maintenance	$2,520	31.40530237	2	2023	95
50	0022	Amaranth St.	East Back Alley	King St.	Preventative Maintenance	$2,520	31.40530237	2	2023	94
104	0019	Amaranth St.	Emma St	west Back Alley					0	
43	0023	Amaranth St.	King St	Crozier St	Preventative Maintenance	$1,680	31.40530237	2	2023	94
36	00018	Amaranth St.	Leeson St	Emma St					0	
15	0021	Amaranth St.	Main St.	East Back Alley	Preventative Maintenance	$2,100	31.40530237	2	2023	95
6	0026	Amaranth St.	Park	Bielby St	Preventative Maintenance	$10,080	31.40530237	2	2023	97
58	0025	Amaranth St.	Ponsford St	Park	Preventative Maintenance	$10,080	31.40530237	2	2023	94
109	0045	Amaranth St.	Taylor Dr	Leeson St					0	
87	0020	Amaranth St.	West Back Alley	Main St.					0	
35	0003	Amaranth-East Luther Townline	Amaranth St	5 SR					0	
24	0002	Amaranth-East Luther Townline	Amaranth St	Gravel					0	
80	0027	Baker Ct.	Crozier St	End of Road					0	
28	0032	Bielby St.	Amaranth St	Gier St	Resurfacing	$18,480	34.69416046	2	2023	82
44	0033	Bielby St.	Gier St	Scott St	Preventative Maintenance	$4,680	19.52174666	2	2023	84
5	0034	Conc. 10-11	Cty Rd 25	Amaranth / Grand Valley TL					0	
3	0048	Conc. 2-3	160m East of Bridge	Top of Hill	Rehabilitation	$83,300	60.8040201	1	2022	82
90	0047	Conc. 2-3	160m West of Bridge	160m East of Bridge	Routine Maintenance	$1,080	24.94195113	2	2023	98
105	0049	Conc. 2-3	Tope of Hill	Amaranth / Grand Valley TL	Resurfacing	$33,250	47.01091665	1	2022	86
94	0041	Conc. 2-3	SR 21-22	SR 24-25					0	
106	0042	Conc. 2-3	SR 24-25	SR 27-28					0	
39	0043	Conc. 2-3	SR 27-28	SR 28-29					0	
111	0044A	Conc. 2-3	SR 28-29	Beam St					0	
62	0040	Conc. 2-3	Wellington N/Grand Valley TL	SR 21-22					0	
13	0057	Conc. 6-7	1,200m East of SR 24-25	SR 27-28					0	
1	0055	Conc. 6-7	445m West of SR 24/25	SR 45-25	Preventative Maintenance	$15,575	21.20603015	3	2024	80
45	0056	Conc. 6-7	SR 24-25	1,200m East of SR 24-25	Preventative Maintenance	$42,000	14.30947843	3	2024	83
21	0058	Conc. 6-7	SR 27-28	Cty Rd 25	Preventative Maintenance	$66,500	24.9107607	3	2024	78
54	0065	Conc. 8-9	Cty Rd 25	Amaranth / Grand Valley TL					0	
2	0062	Conc. 8-9	SR 24-25	SR 27-28					0	
65	0064	Conc. 8-9	SR 27-28	Cty Rd 25	Routine Maintenance	$9,713	8.35903656	3	2024	98
67	0066	Cooper St.	End	Park View St	Preventative Maintenance	$3,600	12.93016808	3	2024	84
56	0068	Cooper St.	George St	River St	Preventative Maintenance	$8,100	12.93016808	3	2024	84
98	0067	Cooper St.	Park View St	George St	Preventative Maintenance	$3,600	12.93016808	3	2024	84
23	0069	Crozier St.	Amaranth St	Gier St					0	
20	0072	Crozier St.	Baker Court	Spruyt Ave					0	
18	0070	Crozier St.	Gier St	Webb St					0	
31	0073	Crozier St.	Spruyt Ave	Fife Rd					0	
68	0071	Crozier St.	Webb St	Baker Court					0	
112	0074	Deaken Dr.	Cty Rd 15	Cty Rd 15					0	

Appendix B: Road Needs

objectid	Project & Map ID	Street Name	From Street Name	To Street Name	Maintenance Suggestion	Estimated Cost ($)	Repair Priority	Year		After Inprovement PCI
86	0075	Douglas St.	Leeson St	Emma St	Resurfacing	$20,160	23.27499567	2	2023	92
73	0076	East Back Ln.	Mill St	Amaranth St	Routine Maintenance	$510	7.4129267	3	2024	93
66	0085	Emma St.	Amaranth St	Douglas St	Resurfacing	$36,960	28.23080922	2	2023	87
11	0084	Emma St.	Mill St	Amaranth St					0	
37	0082	Emma St.	Water St	William St	Resurfacing	$41,760	34.00450529	2	2023	82
91	0083	Emma St.	William St	Mill St	Preventative Maintenance	$7,140	24.34933287	2	2023	82
59	0088	Fife Rd.	Crozier St	Mary Court	Routine Maintenance	$420	7.54115405	2	2023	97
71	0087	Fife Rd.	Joyce Court	Crozier St	Routine Maintenance	$525	10.55622942	2	2023	97
34	0086	Fife Rd.	Main St.	Joyce Court	Routine Maintenance	$315	10.55622942	2	2023	97
55	0089	Fife Rd.	Mary Court	end	Routine Maintenance	$473	6.03361636	3	2024	97
61	0092	George St.	Cooper St	End	Routine Maintenance	$248	6.20689655	3	2024	94
52	0091	George St.	Main St.	Cooper St	Preventative Maintenance	$3,960	9.48189222	3	2024	93
96	0093	Gier St.	Crozier St	Bielby St	Preventative Maintenance	$12,600	11.80731242	3	2024	92
114	0098	Watson Road	Cty Rd 25	End					0	
95	0099	Joyce Ct.	Fife Rd	End	Preventative Maintenance	$3,360	12.93016808	3	2024	85
83	0100	King St.	Mill St	Amaranth St					0	
40	0104	Leeson St.	Amaranth St	Douglas St	Resurfacing	$38,640	36.20169815	1	2022	82
89	0101	Leeson St.	Melody Ln	Monty Ave	Routine Maintenance	$540	12.75342228	2	2023	96
100	0103	Leeson St.	Mill St	Amaranth St	Routine Maintenance	$893	12.06376711	2	2023	97
76	0102B	Leeson St.	Monty Ave	William St (allowance)	Routine Maintenance	$3,180	12.75342228	3	2024	95
46	0102A	Leeson St.	William St (allowance)	Mill St	Resurfacing	$28,560	34.8223878	2	2023	83
47	0105	Lower Crozier St.	Gier St	end	Routine Maintenance	$360	12.62519494	1	2022	94
101	0112	Main St.	Amaranth St	Webb St	Preventative Maintenance	$2,093	69.65517241	1	2022	95
82	0106	Main St.	End	Park View St	Resurfacing	$15,120	26.72327153	2	2023	87
30	0108	Main St.	George St	River St	Resurfacing	$25,200	28.23080922	2	2023	87
48	0111	Main St.	Mill St	Amaranth St	Preventative Maintenance	$1,275	68.27586207	1	2022	92
26	0107	Main St.	Park View St	George St	Resurfacing	$14,400	26.72327153	2	2023	87
38	0109	Main St.	River St	Water St	Resurfacing	$11,520	31.2458846	2	2023	87
22	0114	Main St.	Spruyt Ave	Fife Rd	Preventative Maintenance	$6,720	77.24137931	1	2022	85
74	0110	Main St.	Water St	Mill St	Preventative Maintenance	$825	68.27586207	1	2022	98
99	0113	Main St.	Webb St	Spruyt Ave	Preventative Maintenance	$998	76.55172414	1	2022	80
51	0115	Mary Ct.	Fife Rd	End	Preventative Maintenance	$2,940	12.24051291	3	2024	87
19	0174	Melody Ln.	End	Taylor Dr					0	
42	0122	Melody Ln.	Leeson St	Water St	Routine Maintenance	$900	34.67683244	1	2022	98
53	0121	Melody Ln.	Taylor Dr	Leeson St					0	
17	0128	Mill St.	East Back Alley	King St.	Preventative Maintenance	$4,620	33.34604055	1	2022	94
7	0125	Mill St.	Emma St	West Back Alley	Preventative Maintenance	$6,156	35.41500606	1	2022	91
72	0129	Mill St.	King St	Ponsford St	Routine Maintenance	$450	7.54115405	3	2024	96
29	0124	Mill St.	Leeson St	Emma St	Preventative Maintenance	$5,520	26.06480679	2	2023	94
70	0127	Mill St.	Main St.	East Back Alley	Preventative Maintenance	$4,620	33.34604055	2	2023	90
33	0123	Mill St.	Taylor Dr	Leeson St					0	
25	0126	Mill St.	West Back Alley	Main St.	Preventative Maintenance	$6,156	35.41500606	2	2023	90
113	0130	Monty Ave.	Taylor Dr	Leeson St					0	

Appendix B: Road Needs

objectid	Project & Map ID	Street Name	From Street Name	To Street Name	Maintenance Suggestion	Estimated Cost ($)	Repair Priority	Year		After Inprovement PCI
63	0131	Mount Haven Cres.	Cty Rd 25	Cty Rd 25	Routine Maintenance	$5,250	6.85149887	3	2024	96
60	0132	Park View St.	Main St	Cooper St	Routine Maintenance	$495	5.34396119	3	2024	97
41	0133	Ponsford St.	Mill St	Amaranth St	Preventative Maintenance	$6,120	14.43770577	3	2024	86
27	0173	Round About (Taylor Dr. - Mill St.)	Mill St Roundabout	Mill St Roundabout					0	
78	0190	Round About (Taylor Dr. - Mill St.)	Mill St Roundabout	Mill St Roundabout					0	
84	0191	Round About (Taylor Dr. - Mill St.)	Mill St Roundabout	Mill St Roundabout					0	
97	0192	Round About (Taylor Dr. - Mill St.)	Mill St Roundabout	Mill St Roundabout					0	
79	0180	Scott St.	Bielby St	End (East)	Routine Maintenance	$360	6.03361636	3	2024	96
64	0138	Scott St.	End (West)	Bielby St	Rehabilitation	$145,600	42.02391267	1	2022	83
81	0165	Spruyt Ave.	Main St	Crozier St					0	
12	0158	Sideroad 27-28	Concession 8-9	35 m South of Concession 8-9	Preventative Maintenance	$1,050	22.84179518	2	2023	82
93	160	Sideroad 27-28 (Bridge)	Concession 8-9	50 m North of Concession 8-9	Preventative Maintenance	$2,100	21.33425749	2	2023	82
108	0168	Taylor Dr.	Future Road (no name)	Park (at Taylor St)					0	
49	0166	Taylor Dr.	Melody Ln	Monty Ave					0	
57	0170	Taylor Dr.	Mill St Roundabout	Reith St					0	
77	0167	Taylor Dr.	Monty Ave	Future Road (no name)					0	
32	0169	Taylor Dr.	Park (at Taylor St)	Mill St					0	
92	0171	Taylor Dr.	Reith St	Amaranth St					0	
85		unnamed W. of Taylor Dr.""	Taylor Dr	end					0	
88		unnamed W. of Taylor Dr.""	Taylor Dr	end					0	
75	0185	Water St.	Emma St	William St	Routine Maintenance	$1,575	65.51724138	1	2022	97
16	0184	Water St.	Melody Ln	Emma St	Routine Maintenance	$2,100	64.13793103	1	2022	98
102	0183	Water St.	South Limit	Melody Ln	Preventative Maintenance	$604	73.10344828	1	2022	90
103	0186	Water St.	William St	Main St.	Routine Maintenance	$473	65.51724138	1	2022	96
10	0187	Webb St.	Main St	Crozier St	Preventative Maintenance	$5,040	10.17154739	3	2024	95
8	0182	West Back Alley	Mill St	Amaranth St	Resurfacing	$33,696	27.54115405	2	2023	88
110	0189	William St.	Emma St	Water St					0	

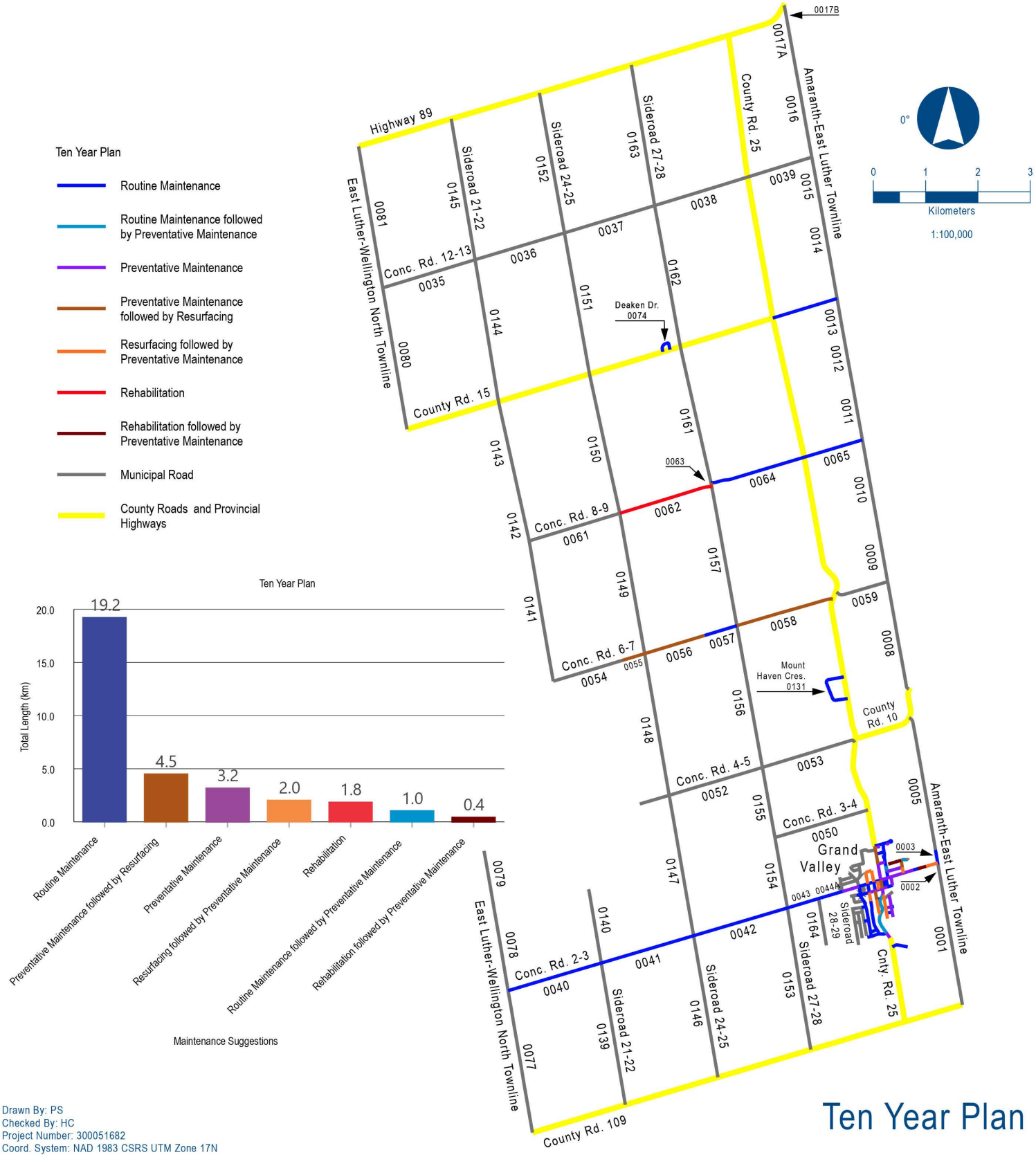
BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix C

Ten-Year Road Improvement Mapping and Table

Town of Grand Valley
Roads Needs Study



Drawn By: PS
Checked By: HC
Project Number: 300051682
Coord. System: NAD 1983 CSRS UTM Zone 17N

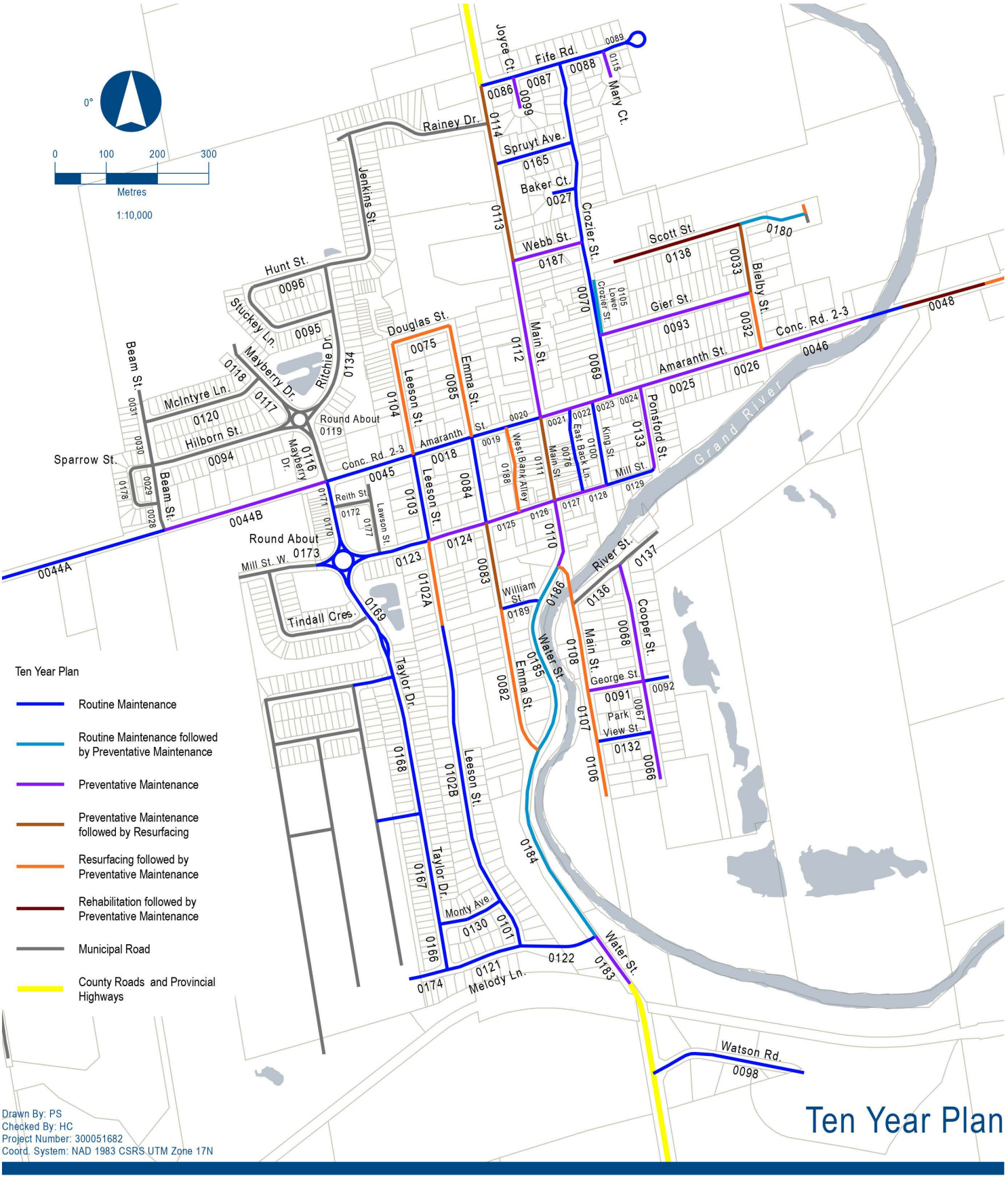
Ten Year Plan

BURNSIDE

Figure: C1

File Path: C:\Users\pstubbert\RJB\300051682 - Grand Valley - Road Management Plan - GIS\051682_RNS.aprx Print Date: 2022/06/30 Time: 01:51 PM

Town of Grand Valley
Roads Needs Study



Drawn By: PS
Checked By: HC
Project Number: 300051682
Coord. System: NAD 1983 CSRS UTM Zone 17N

Ten Year Plan

BURNSIDE

Figure: C2

File Path: C:\Users\pstubbert\RJB\300051682 - Grand Valley - Road Management Plan - GIS\051682_RNS.aprx Print Date: 2022/06/30 Time: 01:51 PM

objectid	Project & Map ID	Street Name	From Street Name	To Street Name	Maintenance Suggestion	Estimated Cost ($)	Repair Priority	Year
9		a lane at the east end of Scott St.""	Scott St.	End (North)	Resurfacing	$24,480	27.54115405	2	2023
4	0044B	Amaranth St.	Beam St	Taylor Dr	Preventative Maintenance	$13,440	49.84924623	1	2022
69	0046	Amaranth St.	Bielby St	160m to Bridge	Preventative Maintenance	$8,640	33.2178132	2	2023
14	0024	Amaranth St.	Crozier St	Pondsford St	Preventative Maintenance	$2,520	31.40530237	2	2023
50	0022	Amaranth St.	East Back Alley	King St.	Preventative Maintenance	$2,520	31.40530237	2	2023
104	0019	Amaranth St.	Emma St	west Back Alley					0
43	0023	Amaranth St.	King St	Crozier St	Preventative Maintenance	$1,680	31.40530237	2	2023
36	00018	Amaranth St.	Leeson St	Emma St					0
15	0021	Amaranth St.	Main St.	East Back Alley	Preventative Maintenance	$2,100	31.40530237	2	2023
6	0026	Amaranth St.	Park	Bielby St	Preventative Maintenance	$10,080	31.40530237	2	2023
58	0025	Amaranth St.	Ponsford St	Park	Preventative Maintenance	$10,080	31.40530237	2	2023
109	0045	Amaranth St.	Taylor Dr	Leeson St					0
87	0020	Amaranth St.	West Back Alley	Main St.					0
35	0003	Amaranth-East Luther Townline	Amaranth St	5 SR					0
24	0002	Amaranth-East Luther Townline	Amaranth St	Gravel					0
80	0027	Baker Ct.	Crozier St	End of Road					0
28	0032	Bielby St.	Amaranth St	Gier St	Resurfacing	$18,480	34.69416046	2	2023
44	0033	Bielby St.	Gier St	Scott St	Preventative Maintenance	$4,680	19.52174666	2	2023
5	0034	Conc. 10-11	Cty Rd 25	Amaranth / Grand Valley TL					0
3	0048	Conc. 2-3	160m East of Bridge	Top of Hill	Rehabilitation	$83,300	60.8040201	1	2022
90	0047	Conc. 2-3	160m West of Bridge	160m East of Bridge	Routine Maintenance	$1,080	24.94195113	2	2023
105	0049	Conc. 2-3	Tope of Hill	Amaranth / Grand Valley TL	Resurfacing	$33,250	47.01091665	1	2022
94	0041	Conc. 2-3	SR 21-22	SR 24-25					0
106	0042	Conc. 2-3	SR 24-25	SR 27-28					0
39	0043	Conc. 2-3	SR 27-28	SR 28-29					0
111	0044A	Conc. 2-3	SR 28-29	Beam St					0
62	0040	Conc. 2-3	Wellington N/Grand Valley TL	SR 21-22					0
13	0057	Conc. 6-7	1,200m East of SR 24-25	SR 27-28					0
1	0055	Conc. 6-7	445m West of SR 24/25	SR 45-25	Preventative Maintenance	$15,575	21.20603015	3	2024
45	0056	Conc. 6-7	SR 24-25	1,200m East of SR 24-25	Preventative Maintenance	$42,000	14.30947843	3	2024
21	0058	Conc. 6-7	SR 27-28	Cty Rd 25	Preventative Maintenance	$66,500	24.9107607	3	2024
54	0065	Conc. 8-9	Cty Rd 25	Amaranth / Grand Valley TL					0
2	0062	Conc. 8-9	SR 24-25	SR 27-28					0
65	0064	Conc. 8-9	SR 27-28	Cty Rd 25	Routine Maintenance	$9,713	8.35903656	3	2024
67	0066	Cooper St.	End	Park View St	Preventative Maintenance	$3,600	12.93016808	3	2024
56	0068	Cooper St.	George St	River St	Preventative Maintenance	$8,100	12.93016808	3	2024
98	0067	Cooper St.	Park View St	George St	Preventative Maintenance	$3,600	12.93016808	3	2024
23	0069	Crozier St.	Amaranth St	Gier St					0
20	0072	Crozier St.	Baker Court	Spruyt Ave					0
18	0070	Crozier St.	Gier St	Webb St					0
31	0073	Crozier St.	Spruyt Ave	Fife Rd					0
68	0071	Crozier St.	Webb St	Baker Court					0

objectid	Project & Map ID	Street Name	From Street Name	To Street Name	Maintenance Suggestion	Estimated Cost ($)	Repair Priority	Year
112	0074	Deaken Dr.	Cty Rd 15	Cty Rd 15				0
86	0075	Douglas St.	Leeson St	Emma St	Resurfacing	$20,160	23.27499567	2	2023
73	0076	East Back Ln.	Mill St	Amaranth St	Routine Maintenance	$510	7.4129267	3	2024
66	0085	Emma St.	Amaranth St	Douglas St	Resurfacing	$36,960	28.23080922	2	2023
11	0084	Emma St.	Mill St	Amaranth St					0
37	0082	Emma St.	Water St	William St	Resurfacing	$41,760	34.00450529	2	2023
91	0083	Emma St.	William St	Mill St	Preventative Maintenance	$7,140	24.34933287	2	2023
59	0088	Fife Rd.	Crozier St	Mary Court	Routine Maintenance	$420	7.54115405	2	2023
71	0087	Fife Rd.	Joyce Court	Crozier St	Routine Maintenance	$525	10.55622942	2	2023
34	0086	Fife Rd.	Main St.	Joyce Court	Routine Maintenance	$315	10.55622942	2	2023
55	0089	Fife Rd.	Mary Court	end	Routine Maintenance	$473	6.03361636	3	2024
61	0092	George St.	Cooper St	End	Routine Maintenance	$248	6.20689655	3	2024
52	0091	George St.	Main St.	Cooper St	Preventative Maintenance	$3,960	9.48189222	3	2024
96	0093	Gier St.	Crozier St	Bielby St	Preventative Maintenance	$12,600	11.80731242	3	2024
114	0098	Watson Road	Cty Rd 25	End					0
95	0099	Joyce Ct.	Fife Rd	End	Preventative Maintenance	$3,360	12.93016808	3	2024
83	0100	King St.	Mill St	Amaranth St					0
40	0104	Leeson St.	Amaranth St	Douglas St	Resurfacing	$38,640	36.20169815	1	2022
89	0101	Leeson St.	Melody Ln	Monty Ave	Routine Maintenance	$540	12.75342228	2	2023
100	0103	Leeson St.	Mill St	Amaranth St	Routine Maintenance	$893	12.06376711	2	2023
76	0102B	Leeson St.	Monty Ave	William St (allowance)	Routine Maintenance	$3,180	12.75342228	3	2024
46	0102A	Leeson St.	William St (allowance)	Mill St	Resurfacing	$28,560	34.8223878	2	2023
47	0105	Lower Crozier St.	Gier St	end	Routine Maintenance	$360	12.62519494	1	2022
101	0112	Main St.	Amaranth St	Webb St	Preventative Maintenance	$2,093	69.65517241	1	2022
82	0106	Main St.	End	Park View St	Resurfacing	$15,120	26.72327153	2	2023
30	0108	Main St.	George St	River St	Resurfacing	$25,200	28.23080922	2	2023
48	0111	Main St.	Mill St	Amaranth St	Preventative Maintenance	$1,275	68.27586207	1	2022
26	0107	Main St.	Park View St	George St	Resurfacing	$14,400	26.72327153	2	2023
38	0109	Main St.	River St	Water St	Resurfacing	$11,520	31.2458846	2	2023
22	0114	Main St.	Spruyt Ave	Fife Rd	Preventative Maintenance	$6,720	77.24137931	1	2022
74	0110	Main St.	Water St	Mill St	Preventative Maintenance	$825	68.27586207	1	2022
99	0113	Main St.	Webb St	Spruyt Ave	Preventative Maintenance	$998	76.55172414	1	2022
51	0115	Mary Ct.	Fife Rd	End	Preventative Maintenance	$2,940	12.24051291	3	2024
19	0174	Melody Ln.	End	Taylor Dr					0
42	0122	Melody Ln.	Leeson St	Water St	Routine Maintenance	$900	34.67683244	1	2022
53	0121	Melody Ln.	Taylor Dr	Leeson St					0
17	0128	Mill St.	East Back Alley	King St.	Preventative Maintenance	$4,620	33.34604055	1	2022
7	0125	Mill St.	Emma St	West Back Alley	Preventative Maintenance	$6,156	35.41500606	1	2022
72	0129	Mill St.	King St	Ponsford St	Routine Maintenance	$450	7.54115405	3	2024
29	0124	Mill St.	Leeson St	Emma St	Preventative Maintenance	$5,520	26.06480679	2	2023
70	0127	Mill St.	Main St.	East Back Alley	Preventative Maintenance	$4,620	33.34604055	2	2023
33	0123	Mill St.	Taylor Dr	Leeson St					0

objectid	Project & Map ID	Street Name	From Street Name	To Street Name	Maintenance Suggestion	Estimated Cost ($)	Repair Priority	Year	
25	0126	Mill St.	West Back Alley	Main St.	Preventative Maintenance	$6,156	35.41500606	2	2023
113	0130	Monty Ave.	Taylor Dr	Leeson St					0
63	0131	Mount Haven Cres.	Cty Rd 25	Cty Rd 25	Routine Maintenance	$5,250	6.85149887	3	2024
60	0132	Park View St.	Main St	Cooper St	Routine Maintenance	$495	5.34396119	3	2024
41	0133	Ponsford St.	Mill St	Amaranth St	Preventative Maintenance	$6,120	14.43770577	3	2024
27	0173	Round About (Taylor Dr. - Mill St.)	Mill St Roundabout	Mill St Roundabout					0
78	0190	Round About (Taylor Dr. - Mill St.)	Mill St Roundabout	Mill St Roundabout					0
84	0191	Round About (Taylor Dr. - Mill St.)	Mill St Roundabout	Mill St Roundabout					0
97	0192	Round About (Taylor Dr. - Mill St.)	Mill St Roundabout	Mill St Roundabout					0
79	0180	Scott St.	Bielby St	End (East)	Routine Maintenance	$360	6.03361636	3	2024
64	0138	Scott St.	End (West)	Bielby St	Rehabilitation	$145,600	42.02391267	1	2022
81	0165	Spruyt Ave.	Main St	Crozier St					0
12	0158	Sideroad 27-28	Concession 8-9	35 m South of Concession 8-9	Preventative Maintenance	$1,050	22.84179518	2	2023
93	160	Sideroad 27-28 (Bridge)	Concession 8-9	50 m North of Concession 8-9	Preventative Maintenance	$2,100	21.33425749	2	2023
108	0168	Taylor Dr.	Future Road (no name)	Park (at Taylor St)					0
49	0166	Taylor Dr.	Melody Ln	Monty Ave					0
57	0170	Taylor Dr.	Mill St Roundabout	Reith St					0
77	0167	Taylor Dr.	Monty Ave	Future Road (no name)					0
32	0169	Taylor Dr.	Park (at Taylor St)	Mill St					0
92	0171	Taylor Dr.	Reith St	Amaranth St					0
85		unnamed W. of Taylor Dr.""	Taylor Dr	end					0
88		unnamed W. of Taylor Dr.""	Taylor Dr	end					0
75	0185	Water St.	Emma St	William St	Routine Maintenance	$1,575	65.51724138	1	2022
16	0184	Water St.	Melody Ln	Emma St	Routine Maintenance	$2,100	64.13793103	1	2022
102	0183	Water St.	South Limit	Melody Ln	Preventative Maintenance	$604	73.10344828	1	2022
103	0186	Water St.	William St	Main St.	Routine Maintenance	$473	65.51724138	1	2022
10	0187	Webb St.	Main St	Crozier St	Preventative Maintenance	$5,040	10.17154739	3	2024
8	0182	West Back Alley	Mill St	Amaranth St	Resurfacing	$33,696	27.54115405	2	2023
110	0189	William St.	Emma St	Water St					0

							2022	2023	2024	2025	2026	2027	2028	2029
objectid	Project & Map ID	After Inprovement PCI	Next Inprovement Type	Year of Next Improvement	PCI at end of 10 Year Period	Cost of Improvement	$342,929	$342,995	$198,514	$453,600	$50,573	$18,593	$88,928	$47,640
9		88	Preventative Maintenance	2029	85	$6,120.00	$0	$24,480	$0	$0	$0	$0	$0	$6,120
4	0044B	96	Preventative Maintenance	2030	88	$13,440	$13,440	$0	$0	$0	$0	$0	$0	$0
69	0046	86	Resurface	2033	65	$34,560	$0	$8,640	$0	$0	$0	$0	$0	$0
14	0024	95	Resurface	2037	82	$10,080	$0	$2,520	$0	$0	$0	$0	$0	$0
50	0022	94	Resurface	2037	82	$10,080	$0	$2,520	$0	$0	$0	$0	$0	$0
104	0019		Routine Maintenance	2027	88	$420	$0	$0	$0	$0	$0	$420	$0	$0
43	0023	94	Resurface	2037	82	$6,720	$0	$1,680	$0	$0	$0	$0	$0	$0
36	00018		Routine Maintenance	2027	88	$630	$0	$0	$0	$0	$0	$630	$0	$0
15	0021	95	Resurface	2037	82	$8,400	$0	$2,100	$0	$0	$0	$0	$0	$0
6	0026	97	Resurface	2037	82	$40,320	$0	$10,080	$0	$0	$0	$0	$0	$0
58	0025	94	Resurface	2037	82	$40,320	$0	$10,080	$0	$0	$0	$0	$0	$0
109	0045		Routine Maintenance	2027	88	$1,020	$0	$0	$0	$0	$0	$1,020	$0	$0
87	0020		Routine Maintenance	2027	88	$420	$0	$0	$0	$0	$0	$420	$0	$0
35	0003		Routine Maintenance	2026	88	$1,838	$0	$0	$0	$0	$1,838	$0	$0	$0
24	0002		Routine Maintenance	2026	88	$210	$0	$0	$0	$0	$210	$0	$0	$0
80	0027		Routine Maintenance	2027	90	$360	$0	$0	$0	$0	$0	$360	$0	$0
28	0032	82	Preventative Maintenance	2030	65	$4,620	$0	$18,480	$0	$0	$0	$0	$0	$0
44	0033	84	Resurface	2030	88	$18,720	$0	$4,680	$0	$0	$0	$0	$0	$0
5	0034		Routine Maintenance	2026	88	$6,300	$0	$0	$0	$0	$6,300	$0	$0	$0
3	0048	82	Preventative Maintenance	2026	65	$7,140	$83,300	$0	$0	$0	$7,140	$0	$0	$0
90	0047	98	Preventative Maintenance	2035	83	$8,640	$0	$1,080	$0	$0	$0	$0	$0	$0
105	0049	86	Preventative Maintenance	2030	70	$7,980	$33,250	$0	$0	$0	$0	$0	$0	$0
94	0041		Routine Maintenance	2026	90	$9,450	$0	$0	$0	$0	$9,450	$0	$0	$0
106	0042		Routine Maintenance	2026	90	$9,975	$0	$0	$0	$0	$9,975	$0	$0	$0
39	0043		Routine Maintenance	2026	90	$3,150	$0	$0	$0	$0	$3,150	$0	$0	$0
111	0044A		Routine Maintenance	2028	90	$2,625	$0	$0	$0	$0	$0	$0	$2,625	$0
62	0040		Routine Maintenance	2026	90	$9,975	$0	$0	$0	$0	$9,975	$0	$0	$0
13	0057		Routine Maintenance	2024	83	$3,675	$0	$0	$3,675	$0	$0	$0	$0	$0
1	0055	80	Resurface	2031	85	$46,725	$0	$0	$15,575	$0	$0	$0	$0	$0
45	0056	83	Resurface	2031	87	$126,000	$0	$0	$42,000	$0	$0	$0	$0	$0
21	0058	78	Resurface	2031	83	$199,500	$0	$0	$66,500	$0	$0	$0	$0	$0
54	0065		Routine Maintenance	2028	90	$6,300	$0	$0	$0	$0	$0	$0	$6,300	$0
2	0062		Rehabilitation	2025	83	$453,600	$0	$0	$0	$453,600	$0	$0	$0	$0
65	0064	98	Preventative Maintenance	2036	85	$64,750	$0	$0	$9,713	$0	$0	$0	$0	$0
67	0066	84	Resurface	2032	65	$14,400	$0	$0	$3,600	$0	$0	$0	$0	$0
56	0068	84	Resurface	2032	65	$32,400	$0	$0	$8,100	$0	$0	$0	$0	$0
98	0067	84	Resurface	2032	65	$14,400	$0	$0	$3,600	$0	$0	$0	$0	$0
23	0069		Routine Maintenance	2027	92	$630	$0	$0	$0	$0	$0	$630	$0	$0
20	0072		Routine Maintenance	2027	90	$540	$0	$0	$0	$0	$0	$540	$0	$0
18	0070		Routine Maintenance	2027	92	$1,140	$0	$0	$0	$0	$0	$1,140	$0	$0
31	0073		Routine Maintenance	2027	90	$960	$0	$0	$0	$0	$0	$960	$0	$0
68	0071		Routine Maintenance	2027	90	$600	$0	$0	$0	$0	$0	$600	$0	$0

							2022	2023	2024	2025	2026	2027	2028	2029
objectid	Project & Map ID	After Inprovement PCI	Next Inprovement Type	Year of Next Improvement	PCI at end of 10 Year Period	Cost of Improvement	$342,929	$342,995	$198,514	$453,600	$50,573	$18,593	$88,928	$47,640
112	0074		Routine Maintenance	2028	92	$1,943	$0	$0	$0	$0	$0	$0	$1,943	$0
86	0075	92	Preventative Maintenance	2029	85	$5,040	$0	$20,160	$0	$0	$0	$0	$0	$5,040
73	0076	93	Preventative Maintenance	2033	80	$4,080	$0	$0	$510	$0	$0	$0	$0	$0
66	0085	87	Preventative Maintenance	2029	77	$9,240	$0	$36,960	$0	$0	$0	$0	$0	$9,240
11	0084		Routine Maintenance	2024	92	$765	$0	$0	$765	$0	$0	$0	$0	$0
37	0082	82	Preventative Maintenance	2029	67	$10,440	$0	$41,760	$0	$0	$0	$0	$0	$10,440
91	0083	82	Resurface	2030	83	$28,560	$0	$7,140	$0	$0	$0	$0	$0	$0
59	0088	97	Preventative Maintenance	2033	83	$3,360	$0	$420	$0	$0	$0	$0	$0	$0
71	0087	97	Preventative Maintenance	2033	83	$4,200	$0	$525	$0	$0	$0	$0	$0	$0
34	0086	97	Preventative Maintenance	2033	83	$2,520	$0	$315	$0	$0	$0	$0	$0	$0
55	0089	97	Preventative Maintenance	2033	83	$3,780	$0	$0	$473	$0	$0	$0	$0	$0
61	0092	94	Preventative Maintenance	2033	80	$1,980	$0	$0	$248	$0	$0	$0	$0	$0
52	0091	93	Resurface	2032	80	$15,840	$0	$0	$3,960	$0	$0	$0	$0	$0
96	0093	92	Resurface	2036	77	$50,400	$0	$0	$12,600	$0	$0	$0	$0	$0
114	0098		Routine Maintenance	2026		$1,305	$0	$0	$0	$0	$1,305	$0	$0	$0
95	0099	85	Resurface	2033	67	$13,440	$0	$0	$3,360	$0	$0	$0	$0	$0
83	0100		Routine Maintenance	2027	90	$893	$0	$0	$0	$0	$0	$893	$0	$0
40	0104	82	Preventative Maintenance	2029	65	$9,660	$38,640	$0	$0	$0	$0	$0	$0	$9,660
89	0101	96	Preventative Maintenance	2033	82	$540	$0	$540	$0	$0	$0	$0	$0	$0
100	0103	97	Preventative Maintenance	2033	82	$7,140	$0	$893	$0	$0	$0	$0	$0	$0
76	0102B	95	Preventative Maintenance	2033	82	$3,180	$0	$0	$3,180	$0	$0	$0	$0	$0
46	0102A	83	Preventative Maintenance	2029	70	$7,140	$0	$28,560	$0	$0	$0	$0	$0	$7,140
47	0105	94	Preventative Maintenance	2030	84	$2,880	$360	$0	$0	$0	$0	$0	$0	$0
101	0112	95	Preventative Maintenance	2030	88	$16,740	$2,093	$0	$0	$0	$0	$0	$0	$0
82	0106	87	Preventative Maintenance	2030	77	$3,780	$0	$15,120	$0	$0	$0	$0	$0	$0
30	0108	87	Preventative Maintenance	2030	77	$6,300	$0	$25,200	$0	$0	$0	$0	$0	$0
48	0111	92	Resurface	2030	90	$40,800	$1,275	$0	$0	$0	$0	$0	$0	$0
26	0107	87	Preventative Maintenance	2030	77	$3,600	$0	$14,400	$0	$0	$0	$0	$0	$0
38	0109	87	Preventative Maintenance	2030	77	$2,880	$0	$11,520	$0	$0	$0	$0	$0	$0
22	0114	85	Resurface	2028	90	$26,880	$6,720	$0	$0	$0	$0	$0	$26,880	$0
74	0110	98	Preventative Maintenance	2030	92	$6,600	$825	$0	$0	$0	$0	$0	$0	$0
99	0113	80	Resurface	2028	80	$39,900	$998	$0	$0	$0	$0	$0	$39,900	$0
51	0115	87	Resurface	2033	70	$11,760	$0	$0	$2,940	$0	$0	$0	$0	$0
19	0174		Routine Maintenance	2026	92	$360	$0	$0	$0	$0	$360	$0	$0	$0
42	0122	98	Preventative Maintenance	2032	82	$900	$900	$0	$0	$0	$0	$0	$0	$0
53	0121		Routine Maintenance	2026	92	$870	$0	$0	$0	$0	$870	$0	$0	$0
17	0128	94	Resurface	2033	74	$18,480	$4,620	$0	$0	$0	$0	$0	$0	$0
7	0125	91	Resurface	2034	70	$24,624	$6,156	$0	$0	$0	$0	$0	$0	$0
72	0129	96	Preventative Maintenance	2033	80	$3,600	$0	$0	$450	$0	$0	$0	$0	$0
29	0124	94	Resurface	2034	77	$22,080	$0	$5,520	$0	$0	$0	$0	$0	$0
70	0127	90	Resurface	2033	70	$18,480	$0	$4,620	$0	$0	$0	$0	$0	$0
33	0123		Routine Maintenance	2027	90	$840	$0	$0	$0	$0	$0	$840	$0	$0

							2022	2023	2024	2025	2026	2027	2028	2029
objectid	Project & Map ID	After Inprovement PCI	Next Inprovement Type	Year of Next Improvement	PCI at end of 10 Year Period	Cost of Improvement	$342,929	$342,995	$198,514	$453,600	$50,573	$18,593	$88,928	$47,640
25	0126	90	Resurface	2034	70	$24,624	$0	$6,156	$0	$0	$0	$0	$0	$0
113	0130		Routine Maintenance	2027	84	$750	$0	$0	$0	$0	$0	$750	$0	$0
63	0131	96	Preventative Maintenance	2035	83	$42,000	$0	$0	$5,250	$0	$0	$0	$0	$0
60	0132	97	Preventative Maintenance	2034	84	$3,960	$0	$0	$495	$0	$0	$0	$0	$0
41	0133	86	Resurface	2034	67	$24,480	$0	$0	$6,120	$0	$0	$0	$0	$0
27	0173		Routine Maintenance	2027	90	$240	$0	$0	$0	$0	$0	$240	$0	$0
78	0190		Routine Maintenance	2027	90	$240	$0	$0	$0	$0	$0	$240	$0	$0
84	0191		Routine Maintenance	2027	90	$240	$0	$0	$0	$0	$0	$240	$0	$0
97	0192		Routine Maintenance	2027	90	$240	$0	$0	$0	$0	$0	$240	$0	$0
79	0180	96	Preventative Maintenance	2028	88	$360	$0	$0	$360	$0	$0	$0	$360	$0
64	0138	83	Preventative Maintenance	2028	65	$10,920	$145,600	$0	$0	$0	$0	$0	$10,920	$0
81	0165		Routine Maintenance	2027	90	$900	$0	$0	$0	$0	$0	$900	$0	$0
12	0158	82	Resurface	2030	84	$3,150	$0	$1,050	$0	$0	$0	$0	$0	$0
93	160	82	Resurface	2030	84	$6,300	$0	$2,100	$0	$0	$0	$0	$0	$0
108	0168		Routine Maintenance	2027	90	$1,620	$0	$0	$0	$0	$0	$1,620	$0	$0
49	0166		Routine Maintenance	2027	90	$540	$0	$0	$0	$0	$0	$540	$0	$0
57	0170		Routine Maintenance	2027	90	$840	$0	$0	$0	$0	$0	$840	$0	$0
77	0167		Routine Maintenance	2027	90	$1,320	$0	$0	$0	$0	$0	$1,320	$0	$0
32	0169		Routine Maintenance	2027	90	$1,410	$0	$0	$0	$0	$0	$1,410	$0	$0
92	0171		Routine Maintenance	2027	90	$840	$0	$0	$0	$0	$0	$840	$0	$0
85			Routine Maintenance	2027	90	$240	$0	$0	$0	$0	$0	$240	$0	$0
88			Routine Maintenance	2027	90	$240	$0	$0	$0	$0	$0	$240	$0	$0
75	0185	97	Preventative Maintenance	2031	80	$1,575	$1,575	$0	$0	$0	$0	$0	$0	$0
16	0184	98	Preventative Maintenance	2031	80	$16,800	$2,100	$0	$0	$0	$0	$0	$0	$0
102	0183	90	Resurface	2033	67	$24,150	$604	$0	$0	$0	$0	$0	$0	$0
103	0186	96	Preventative Maintenance	2031	80	$473	$473	$0	$0	$0	$0	$0	$0	$0
10	0187	95	Resurface	2038	82	$20,160	$0	$0	$5,040	$0	$0	$0	$0	$0
8	0182	88	Preventative Maintenance	2030	77	$8,424	$0	$33,696	$0	$0	$0	$0	$0	$0
110	0189		Routine Maintenance	2027	85	$480	$0	$0	$0	$0	$0	$480	$0	$0

Appendix C: 10-Year Road Improvement

		2030	2031	Total
objectid	Project & Map ID	$174,774	$391,073	$2,109,617
9		$0	$0	$30,600
4	0044B	$13,440	$0	$26,880
69	0046	$0	$0	$8,640
14	0024	$0	$0	$2,520
50	0022	$0	$0	$2,520
104	0019	$0	$0	$420
43	0023	$0	$0	$1,680
36	00018	$0	$0	$630
15	0021	$0	$0	$2,100
6	0026	$0	$0	$10,080
58	0025	$0	$0	$10,080
109	0045	$0	$0	$1,020
87	0020	$0	$0	$420
35	0003	$0	$0	$1,838
24	0002	$0	$0	$210
80	0027	$0	$0	$360
28	0032	$4,620	$0	$23,100
44	0033	$18,720	$0	$23,400
5	0034	$0	$0	$6,300
3	0048	$0	$0	$90,440
90	0047	$0	$0	$1,080
105	0049	$7,980	$0	$41,230
94	0041	$0	$0	$9,450
106	0042	$0	$0	$9,975
39	0043	$0	$0	$3,150
111	0044A	$0	$0	$2,625
62	0040	$0	$0	$9,975
13	0057	$0	$0	$3,675
1	0055	$0	$46,725	$62,300
45	0056	$0	$126,000	$168,000
21	0058	$0	$199,500	$266,000
54	0065	$0	$0	$6,300
2	0062	$0	$0	$453,600
65	0064	$0	$0	$9,713
67	0066	$0	$0	$3,600
56	0068	$0	$0	$8,100
98	0067	$0	$0	$3,600
23	0069	$0	$0	$630
20	0072	$0	$0	$540
18	0070	$0	$0	$1,140
31	0073	$0	$0	$960
68	0071	$0	$0	$600

Appendix C: 10-Year Road Improvement

		2030	2031	Total
objectid	Project & Map ID	$174,774	$391,073	$2,109,617
112	0074	$0	$0	$1,943
86	0075	$0	$0	$25,200
73	0076	$0	$0	$510
66	0085	$0	$0	$46,200
11	0084	$0	$0	$765
37	0082	$0	$0	$52,200
91	0083	$28,560	$0	$35,700
59	0088	$0	$0	$420
71	0087	$0	$0	$525
34	0086	$0	$0	$315
55	0089	$0	$0	$473
61	0092	$0	$0	$248
52	0091	$0	$0	$3,960
96	0093	$0	$0	$12,600
114	0098	$0	$0	$1,305
95	0099	$0	$0	$3,360
83	0100	$0	$0	$893
40	0104	$0	$0	$48,300
89	0101	$0	$0	$540
100	0103	$0	$0	$893
76	0102B	$0	$0	$3,180
46	0102A	$0	$0	$35,700
47	0105	$2,880	$0	$3,240
101	0112	$16,740	$0	$18,833
82	0106	$3,780	$0	$18,900
30	0108	$6,300	$0	$31,500
48	0111	$40,800	$0	$42,075
26	0107	$3,600	$0	$18,000
38	0109	$2,880	$0	$14,400
22	0114	$0	$0	$33,600
74	0110	$6,600	$0	$7,425
99	0113	$0	$0	$40,898
51	0115	$0	$0	$2,940
19	0174	$0	$0	$360
42	0122	$0	$0	$900
53	0121	$0	$0	$870
17	0128	$0	$0	$4,620
7	0125	$0	$0	$6,156
72	0129	$0	$0	$450
29	0124	$0	$0	$5,520
70	0127	$0	$0	$4,620
33	0123	$0	$0	$840

Appendix C: 10-Year Road Improvement

		2030	2031	Total
objectid	Project & Map ID	$174,774	$391,073	$2,109,617
25	0126	$0	$0	$6,156
113	0130	$0	$0	$750
63	0131	$0	$0	$5,250
60	0132	$0	$0	$495
41	0133	$0	$0	$6,120
27	0173	$0	$0	$240
78	0190	$0	$0	$240
84	0191	$0	$0	$240
97	0192	$0	$0	$240
79	0180	$0	$0	$720
64	0138	$0	$0	$156,520
81	0165	$0	$0	$900
12	0158	$3,150	$0	$4,200
93	160	$6,300	$0	$8,400
108	0168	$0	$0	$1,620
49	0166	$0	$0	$540
57	0170	$0	$0	$840
77	0167	$0	$0	$1,320
32	0169	$0	$0	$1,410
92	0171	$0	$0	$840
85		$0	$0	$240
88		$0	$0	$240
75	0185	$0	$1,575	$3,150
16	0184	$0	$16,800	$18,900
102	0183	$0	$0	$604
103	0186	$0	$473	$946
10	0187	$0	$0	$5,040
8	0182	$8,424	$0	$42,120
110	0189	$0	$0	$480