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District of Lake Country

Integrated Transportation Framework






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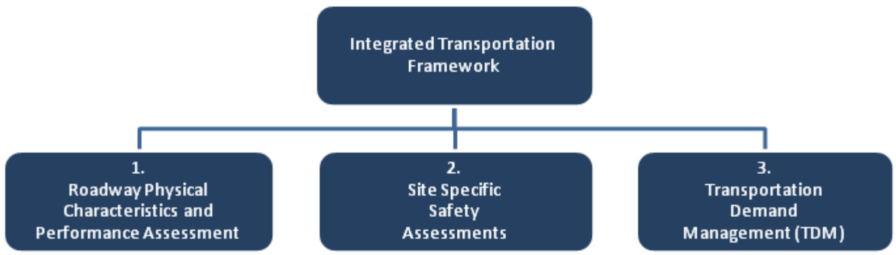
1.0 EXECUTIVE SUMMARY

The Integrated Transportation Framework (ITF) was scoped to identify levels of service, condition and risk for all of the District's road segments and calculate the corresponding improvement, renewal, and maintenance costs based upon the level of functionality each segment needed to provide. The ITF tool was also designed to enable the District to run a wide variety of service, condition and risk scenarios by promoting and demoting road segments in the hierarchy while maintaining a set affordability limit. This allows the District to calculate how much it would cost for their preferred and sustainable roadway vision.

Unlike a traditional transportation plans the ITF is a framework that enables the District to set affordable levels of service for its roadway network segments and assist in managing community expectations.



The basic rationale of the methodology is that each road segment has a preferred function and physical appearance, and the higher the function (category) the higher the cost to maintain, renew and improve the segment. The ITF therefore becomes the catalyst to help the District strategically raise and lower categories (and hence service levels) to meet its affordability range. Ultimately, all ITF recommendations for an affordable roadway network need to be adjusted and accepted by Council.

The ITF looked at 2 scenarios:

1. Targeted Categories using existing $3.0 million/year budget level; and
2. Favoured Categories using a budget of $5.7 million/year to achieve the District's roadway vision.

Under the Targeted Categories, some roadways will increase in operational performance however the overall condition of the roadway network will deteriorate significantly with the current renewal budget level.

To achieve the Favoured Categories over the next 20 years the District would have to increase is roadway budget levels as follows:

- Increase the annual maintenance budget from $1.5 million to $1.7 million;
- Increase the annual improvement budget from $0.70 million to $0.96 million; and
- Increase the annual renewal budget from $0.78 million to $2.35 million (includes the future renewal of the recommended improvements in the second bullet).

2.0 DEFINITIONS

Integrated Asset Management Capital Plan (IAMCP) means the model that presents a sustainable investment scenario for the District's linear and non-linear infrastructure assets over a 20 year period.

Average Annual Life Cycle Investment (AALCI) is the annual depreciation of the replacement value. The AALCI represents the ideal annual budget allocation. Annual surpluses would go into reserves and eventually be tapped. When the annual budget is less than the AALCI, the sustainability gap grows.

Sustainability Gap is the financial shortfall resulting in the inability to be able to fund infrastructure renewal.

Renewal means the rehabilitation, reconstruction or replacement of infrastructure that has reached the end of its service life.

Service Life is an estimate of the life expectancy of an asset, typically longer (more conservative) than PSAB 3150 Tangible Capital Asset (TCA) Useful Life.

Level of Service (LOS) is a scale measure used to determine the effectiveness of elements of transportation infrastructure, and it uses the letters A through F, with A being the best and F being the worst.

Service Level A refers to a very high service level in which the roadway and associated features are in excellent condition. All networks are operational and users experience no delays. At the maintenance service level, very few deficiencies are present and overall appearance is pleasing. Preventative maintenance is practiced resulting in lower life cycle costs.

Service Level B refers to a high service level in which the roadway and associated features are in good condition. All networks are operational and users experience occasional delays. At the maintenance service level, very few deficiencies are present in safety but moderate deficiencies exist in other areas. Corrective maintenance is completed in a timely manner.

Service Level C refers to a medium service level in which the roadway and associated features are in fair condition. Some networks may be inoperable and not available to users. At the maintenance service level, very few deficiencies are present in safety but moderate deficiencies exist for investment protection activities and significant aesthetic related deficiencies. Preventative maintenance is often deferred except for safety related work.

Service Level D refers to a low service level in which the roadway and associated features are in poor condition. At the maintenance service level, moderate deficiencies are present in safety but significant deficiencies exist for investment protection activities and significant aesthetic related deficiencies. Maintenance has become very reactionary and very little preventative maintenance is completed.

Service Level F refers to a very low service level in which the roadway and associated features are in poor and failing condition. A backlog of failure occurs regularly because it is difficult to react in a timely manner. At the maintenance service level, significant deficiencies are present in all maintenance activities. The overall appearance is not aesthetically pleasing. Preventative maintenance is not practiced.

Strategic Category is an identifier for the roadway segment that labels it as urban, suburban, or rural based on the adjacent land use.

Service Category is a process by which roadway segments are grouped into classes: arterial, collector or local, based on the function of the roadway.

Primary Use refers to how a roadway segment is predominantly used. The Integrated Transportation Framework uses will be modified to include: Commuter / School, Connectivity, Personal / Recreational, and Personal / Business.

Primary Function means the predominant function of the roadway have been designated as either access (roadways that primarily connect to trip origins and destinations), mobility (roadways that primarily facilitate travel between origins and destinations), and Mobility/Access (roadways that are a combination of access and mobility travel).

Active Transportation refers to any form of travel that is non-motorized, usually walking, cycling, in-line skating, using a wheelchair, or riding a skateboard.

3.0 BACKGROUND

In October 2010 District staff presented their Integrated Asset Management Capital Plan (IAMCP) and recommendations for 'Next Steps' to Council. With respect to the District's roadway network, Next Steps included the development of an Integrated Transportation Framework (ITF) that would integrate all costs associated with the ongoing maintenance, improvement and renewal of the roadway network components.

The driving factor for the ITF came from the IAMCP's calculation of roadway network renewal deficit (work backlog) of $34 million and the annual reinvestment level for aging roadway infrastructure of approximately $2.0 million (**Figure 1**).

Figure 1: IAMCP Roadway Network Valuation Summary

Description	Quantity	Replacement Value	Remaining Life	Deficit (Backlog)	Annual Reinvestment
Arterial Roads	8 km	$1,550,000	36%	$1,500,000	$60,000
Collector Roads	65 km	$23,000,000	43%	$22,500,000	$900,000
Local Roads	120 km	$53,000,000	58%	$9,200,000	$890,000
Other Associated Assets		$9,000,000	51%	$800,000	$138,000
Total		**$86,550,000**	**53%**	**$34,000,000**	**$1,988,000**

The Annual Reinvestment amount shown in **Figure 1** is for all roadway network assets, including Other Associated Assets (e.g. streetlights, signs, catch basins). For comparison purposes, as the ITF only addresses roadway surface, base and drainage, the Annual Reinvestment amount used in this report for existing infrastructure is $1,850,000 (arterial, collector and local roads).

With the high cost of renewal and growing expectations to improve its roadway network to accommodate Active Transportation the District needed to determine what the competing road priorities were, and identify affordable roadway levels of service and risk.

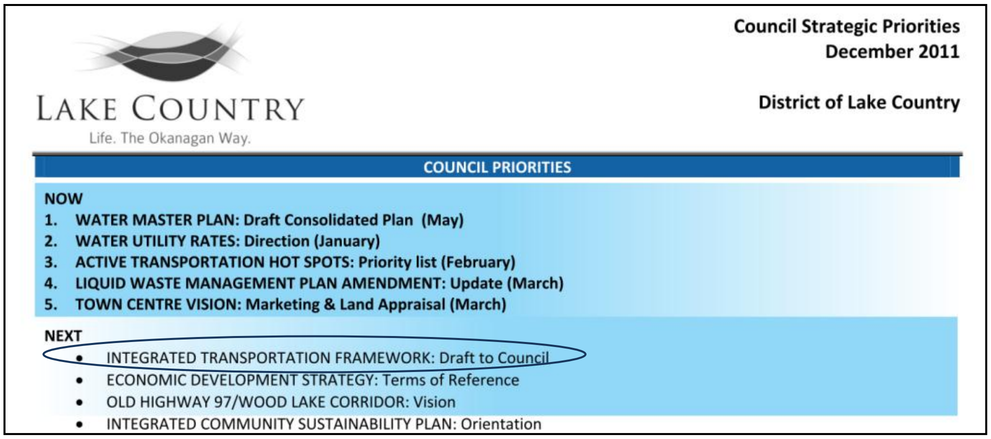
The District of Lake Country's Active Transportation Vision is "Making Lake Country easy to get around in safe and enjoyable ways" is linked to the overall transportation goals in the Official Community Plan (OCP):

- Create a multi-modal transportation network to provide a range of transportation options;
- Provide a safe and efficient transportation network;
- Minimize the environmental impact of the transportation network; and
- Reduce greenhouse gas emissions from the District transportation network.

In order for the Active Transportation vision and the OCP transportation goals to succeed they must be considered in context of the overall management of the District's roadway network.

The ITF was scoped to identify levels of service, condition and risk for all of the District's road segments and calculate the corresponding improvement, renewal, and maintenance costs based upon the level of functionality each segment needed to provide. The ITF tool was also designed to enable the District to run a wide variety of service, condition and risk scenarios by promoting and demoting road segments in the hierarchy while maintaining a set affordability limit, this allows the District to calculate how much it would cost for their ideal roadway vision. In December 2011 Council identified the ITF as one of its Strategic Priorities per **Figure 2**.

Figure 2: District of Lake Country - Council Strategic Priorities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Council Strategic Priorities
December 2011

District of Lake Country

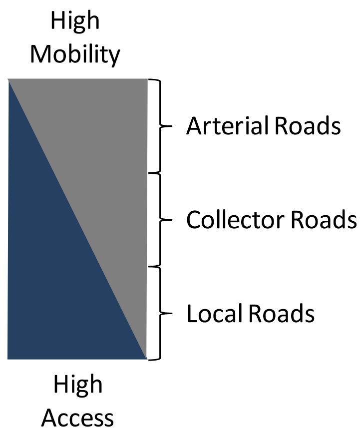
COUNCIL PRIORITIES

NOW
1. WATER MASTER PLAN: Draft Consolidated Plan (May)
2. WATER UTILITY RATES: Direction (January)
3. ACTIVE TRANSPORTATION HOT SPOTS: Priority list (February)
4. LIQUID WASTE MANAGEMENT PLAN AMENDMENT: Update (March)
5. TOWN CENTRE VISION: Marketing & Land Appraisal (March)

NEXT
- INTEGRATED TRANSPORTATION FRAMEWORK: Draft to Council
- ECONOMIC DEVELOPMENT STRATEGY: Terms of Reference
- OLD HIGHWAY 97/WOOD LAKE CORRIDOR: Vision
- INTEGRATED COMMUNITY SUSTAINABILITY PLAN: Orientation

3.1 Roadway Networks

A healthy roadway network provides a balance between mobility and access. High mobility roadway segments allow users to move across the network or between activity centers in a timely manner; these road segments typically have higher speeds and usage. High access roadway segments allow users to access their origin or destination points; these road segments are typically low speed with a multiple access points and greater vehicle, pedestrian and cyclist interaction.



The District's roadway network acts as a system for users. The District's principle responsibility is to provide a road network system that is safe and efficient for both vehicular traffic and vulnerable users (e.g. pedestrian and cyclists). The District undertakes this responsibility through the planning for constructing, maintaining, operating, and regulating the roadway network. The District utilizes maintenance programs and services through a combination of technical engineering and operating staff and private contractors.

The District's roadway network is currently made up of different strategic categories and physical elements to provide users with a balance of mobility and access. These categories are historically categorized as arterial, collector and local roadways. Each of these categories contains functional and physical elements such as travel lanes, shoulders, ditches, sidewalk, curb, gutter, storm sewers, signage and lighting.

In recent years, the District has been subject to significant growth pressures necessitating the need for development of an efficient transportation network and public concern for improved safety for non-motorized methods of travel. The functional and physical needs of the roadway network are integral to a safe and efficient roadway network for all users. Modern roadway and transportation networks are evolving to accommodate all users, no longer just motorized vehicles. Today, pedestrians and cyclists place additional and legitimate safety and mobility requirements on the roadway systems.

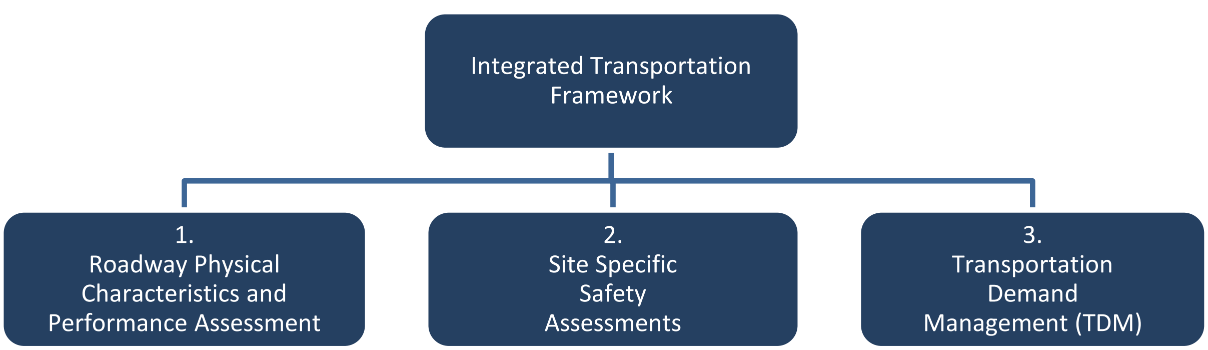
In order to accomplish this, a sound and repeatable analytical framework that is sensitive to the functional and physical elements of the roadway network is needed.

3.2 Integrated Transportation Framework

In order to plan for and implement a balanced and affordable roadway network that meets the goals of the active transportation vision and the OCP transportation goals, the District is undertaking the first component of an Integrated Transportation Framework (ITF), a Roadway Physical Characteristics and Performance Assessment.

The ITF is not a traditional transportation plan, but rather a framework that enables the District to set affordable levels of service for its roadway network segments and assist in managing community expectations. The ITF is comprised of three components as illustrated in **Figure 3** below:

Figure 3: Integrated Transportation Framework



Roadway Physical Characteristics and Performance Assessment is a critical step towards developing an investment decision-making framework for managing the roadway infrastructure. The ITF is both functional and transitional. The transitional capability encourages the District's leadership team to continue to implement changes to the management of the roadway network over the ensuing years at a pace suitable to the District. The roadways safety and efficiency depend on the performance of the roadway physical characteristics. As a result, cost effective maintenance, renewal, and improvements of the roadway elements are vital in creating a safe and efficient network.

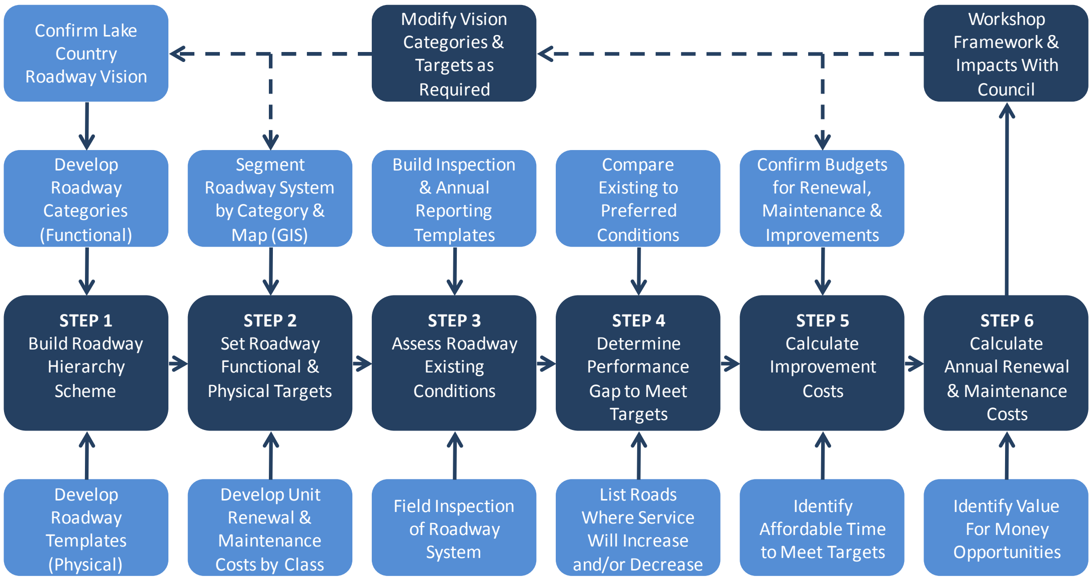
Transportation Demand Management (TDM) supports the goal of improving community health. TDM describes a broad range of policies, programs and services designed to reduce vehicular demand by influencing travel behavior. These programs look to achieve reduced traffic and improved mobility by examining the demand side of transportation. These programs typically seek to improve alternative options such as walking, cycling, transit, carpooling and telecommuting. TDM planning can be completed once the characteristics and performance of the existing roadway physical characteristics is understood.

Site Specific Safety Assessments may also be required once the physical characteristics and performance assessment is completed for identified roadway improvements. While the ITF field inspections do identify potential operational and safety conflicts, a site specific safety assessment may also be required where the District is experiencing a high collision frequency and/or severity.

3.3 Roadway Physical Characteristics and Performance Assessment

This physical assessment component of the ITF is made up of six basic steps that lead to a Workshop with Council and then necessary modifications based upon Council's preferences (**Figure 4**).

Figure 4: Six Step ITF Process for Component 1



This ITF component integrates and presents all of the District's transportation needs so that costs can be estimated, needs prioritized, and all needs balanced against available budget levels for renewal, maintenance and improvements. The framework clearly establishes and presents the levels of service associated with each road segment category level to demonstrate expected long term results for any budget forecast scenario.

To ensure that needs can be balanced against available budget over time the District's roadway network has been segmented and classified hierarchically so that budget gets distributed on a priority basis. The underlying categorization of the roadway network is based upon safe shared use of the roadway network and the inter-connectivity between the roadway networks, schools, transit, parks, trails and recreational areas.

To deliver against the roadway network functional and physical condition objectives, the ITF presents an affordable and balanced roadway network scenario that the District can build towards in annual increments. To ensure the practicality of the vision, a functional category framework scheme was developed which is logical and affordable.

The first component of the ITF comprises of the following four deliverables:

1. Comprehensive database by roadway segment;
2. GIS mapping of road category scenarios;
3. Field inspection report binder; and
4. Context document (this report).

These deliverables allow for a systematic process for decision-making regarding the maintenance, renewal, and improvement of the physical asset, cost effectively.

4.0 CURRENT ROADWAY CONTEXT

In concert with the ongoing renewal and maintenance requirements, the District desires to modify the cross section for segments of its roadway network to encourage active transportation, improve efficiency and protect the environment by:

- Making it safer for multi-use, e.g. vehicles, pedestrians and cyclists;
- Improve connectivity, e.g. access to activity centers and neighbourhoods, exercise/recreational loops, sidewalks; and
- Improving storm water runoff management along roadways to maximize the life of the road surface and base.

The District's annual budget for renewal, maintenance and improvements to the roadway network is approximately $3 million:

- Renewal = $775,000;
- Maintenance = $1,525,000; and
- Improvements = $700,000

4.1 Renewal

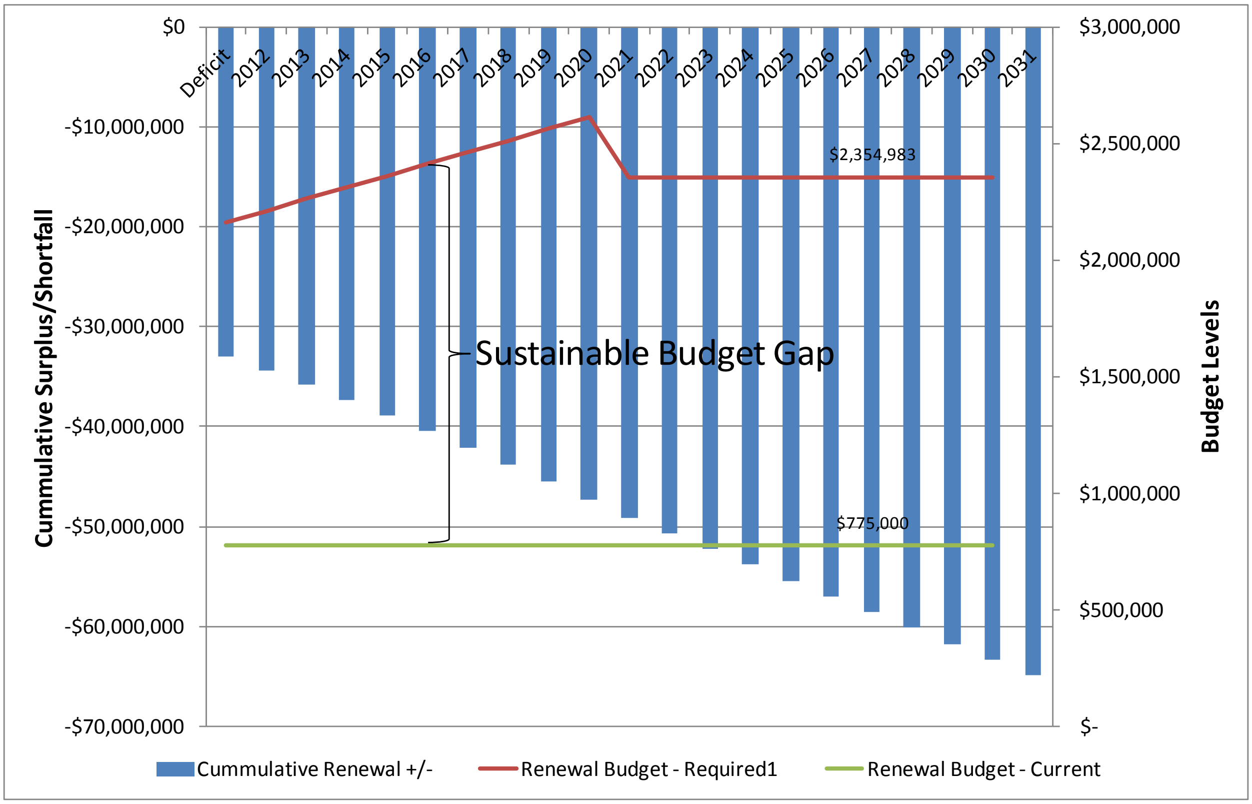
The District's Roadway asset is the one of the largest infrastructure investments in the community. In 2010, the District completed an Integrated Asset Management Capital Plan (IAMCP) for the renewal of its linear and non-linear assets which valued these assets at approximately $250 million. The replacement value of the roadway infrastructure was valued at approximately $90 million.

The IAMCP estimated the Average Annual Life Cycle Investment[1] (AALCI) amount for capital renewal of the roadway surface and base, based upon the weighted life expectancy by individual roadway asset, at $1.85 million excluding deficit. With the $19.1 million in service level improvements recommended in this ITF the AACLI grows to $2.35 million over the next 10 years. Currently, the District has approximately $0.775 million dedicated to its renewal budget. **Figure 5** shows how the existing budget level continues to fall short of a sustainable infrastructure investment level, and the deficit continues to grow from $34 million to $64 million over the next 20 years.

The green line in the chart shows the current budget allocation for renewal ($775k), the red line shows the budget required for AALCI and maintenance deficit, and the blue bars show how the roadway deficit grows based upon current service level expectations and available funding.

[1] AALCI is the annual depreciation of the replacement value of an infrastructure asset.

Figure 5: Sustainable Investment Deficit



The maintenance deficit previously mentioned was assessed during the ITF field inspections. The maintenance deficit discovered is associated with a backlog of drainage and shoulder repair. As both of these are important elements in achieving the full service life of road surface and base ideally they should be addresses before any major roadway surface renewal.

4.2 Roadway Maintenance

The District is responsible for maintaining its roadway network. This consists of work that is performed to care for and maintain the roads and associated facilities so that the roads reach their designed service lives, improve safety and retain their original intended use and function. Examples of road summer and winter maintenance include:

- Pavement patching, crack sealing and pot hole repair;
- Ditch, culvert and catchbasin cleaning:
- Controlling vegetation so it does no block signs or obstruct intersections/roadways:
- Sidewalk repair;
- Line painting; and
- Snow removal/plowing.

The District currently has an annual maintenance budget of approximately $1.5 million and this work is currently contracted out to a third party.

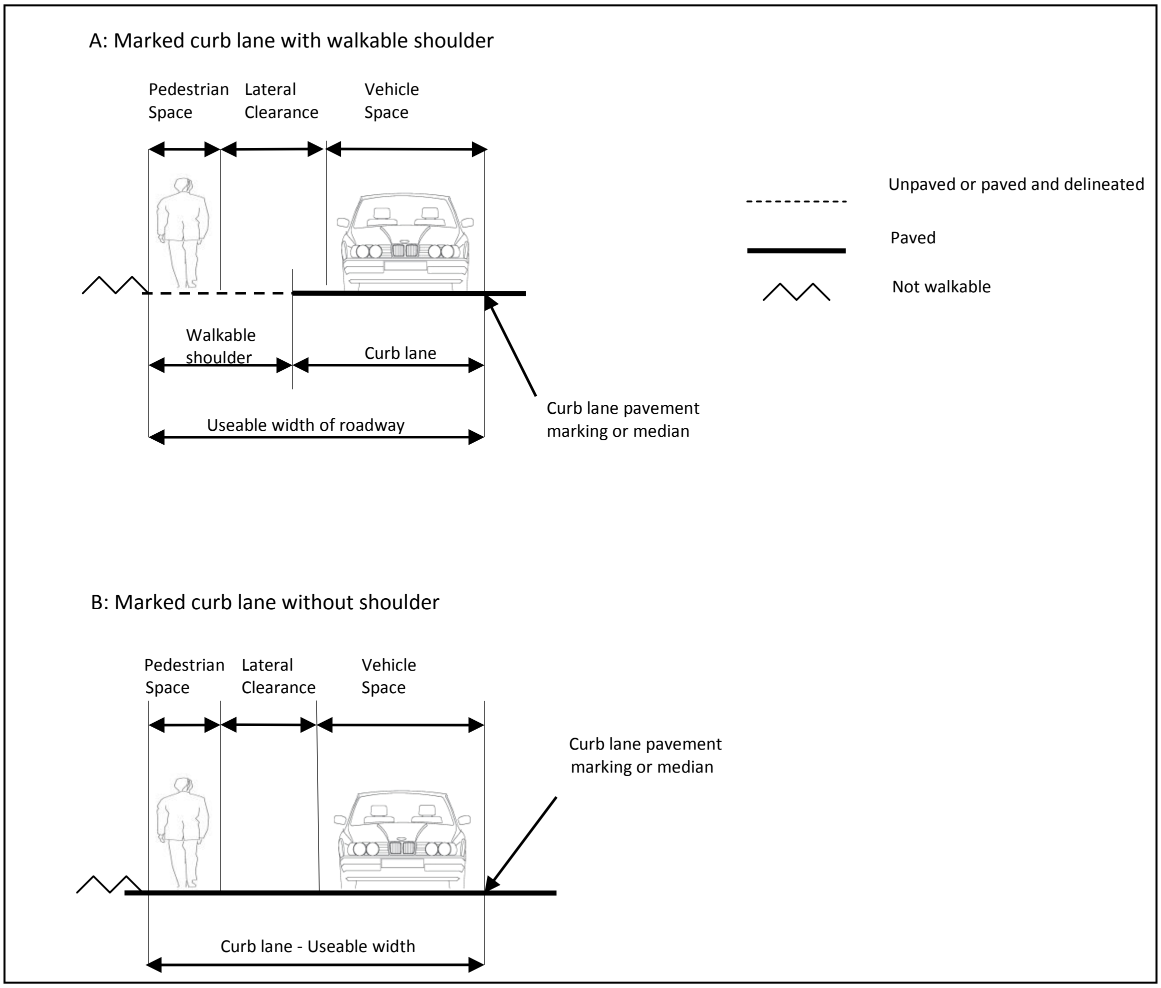
4.3 Improvements (Pedestrian Safety and Active Transportation)

The District desires to improve segments of the roadway network to increase pedestrian safety and promote active transportation. The District currently has a budget of $700k for improvements in which $300k is dedicated to pedestrian safety and active transportation improvements with the remaining $400k allocated to miscellaneous road and drainage improvements.

Research has shown that the safety of pedestrians walking along roadway sections is related to roadway and traffic characteristics. The absence of sidewalks, higher traffic volume, higher speed, and smaller buffer space between vehicles and pedestrians all increase the likelihood that walking-along-roadway pedestrian crash will occur.

On active transportation routes, in some cases, sidewalks are not provided, and vulnerable users must share the roadway with other users. In such cases, the walkable area designated for pedestrians utilizes a wide space with lateral clearance from the vehicle space. Vulnerable users should walk against the traffic. This is shown below in **Figure 6**.

Figure 6: Definition of Roadway Elements



Reference: Canada Post Letter Carrier (Pedestrian) Traffic Safety Risk Rationale Report, June 2008, Michael Trickey, P. Eng., et al.

To determine if a roadway or walking space is wide enough, a detailed analysis of the various components that determine the width of the required road space is required.

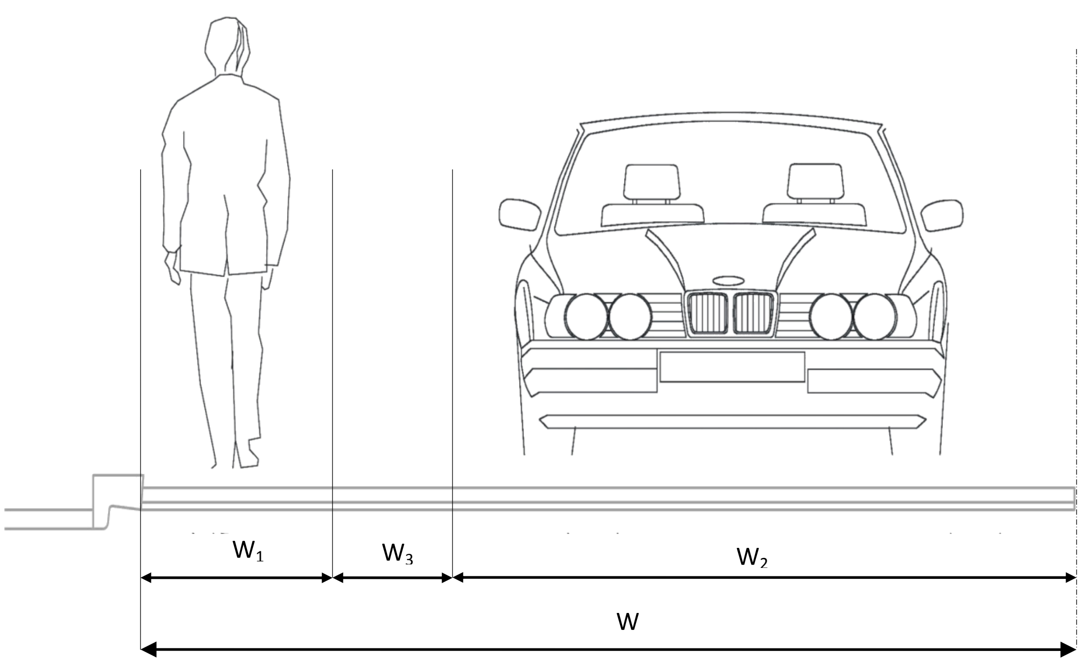
4.4 Pedestrian Space Improvements

The pedestrian space is defined as a one metre paved or unpaved portion of the roadway. The pedestrian space may or may not have the same surface as the adjacent vehicle lane, but it must be a walkable area to be considered pedestrian space. The one metre width represents the width of a person with suitcases.

The width of the vehicle space portion of the roadway is assumed to be the lane width as defined by the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads. The guide specifies lane widths from 3.3m to 3.7m wide depending on design speed. For the improvement projects identified in the ITF, to simply the assessment, the use of 3.5m is reasonable to define the vehicle space.

Lateral clearance represents the distance the vehicle and pedestrian space. The function of the lateral clearance is to reduce the number of severity of collisions between vehicles and pedestrians when vehicles inadvertently stray from the vehicle space and to provide comfort and perceived safety to pedestrians. **Figure 7** illustrates this road section.

Figure 7: Description of Roadway Elements



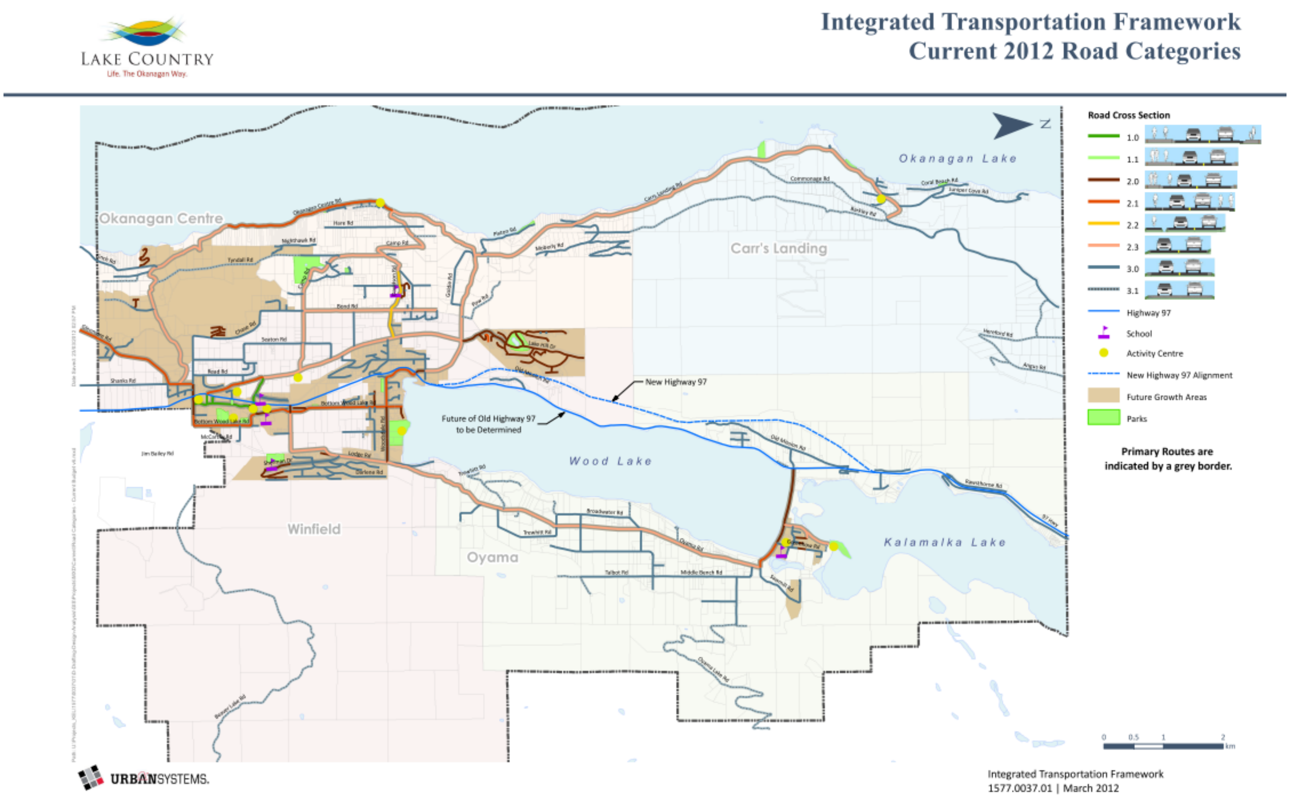
W_1 – Pedestrian space
W_2 – Vehicle space
W_3 – Lateral clearance
W – Useable width

Reference: Canada Post Letter Carrier (Pedestrian) Traffic Safety Risk Rationale Report, June 2008, Michael Trickey, P. Eng., et al

Lateral clearance and pedestrian space can be restricted during winter months with snow build-up which can force vulnerable users into the vehicle space. The District's winter maintenance programs should take this into consideration when budgeting and setting up its snow removal and de-icing priorities.

To modify the cross section for segments of its roadway network to encourage active transportation, the proposed cross sections identified in the ITF look to include lateral clearance and a physical barrier where possible, such as a ditch or curb, to improve perceived pedestrian safety. Current roadway network categories are shown in **Figure 8**.

Figure 8: Current Roadway Categories

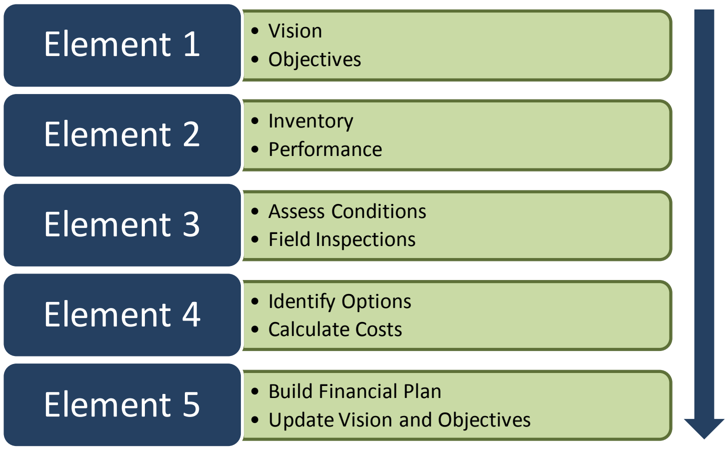


5.0 METHODOLOGY

Developing or re-defining roadway categories to identify affordable ranges of renewal, maintenance and improvement is part of the cost containment and level of service phase of the District's advanced Asset Management implementation.

The basic rationale of the methodology is that each road segment has a preferred function and physical appearance, and the higher the function (category) the higher the cost to maintain, renew and improve the segment. The ITF then becomes the catalyst to help the District strategically raise and lower categories (and hence service levels) to meet its affordability range. **Figure 9** shows the proposed logistical flow of the 5 main elements required for the development ITF starting with Lake Country's Roadway vision. Ultimately, all recommendations for an affordable roadway network needs to be adjusted and accepted by Council.

Figure 9: ITF Elements



This analytical approach is designed for staff, Mayors and Council integrated decision-making and is a summary model of the costs required for the renewal, maintenance and improvement of the roadway network over the next 20 year period. The attributes of the model include:

- Based on very detailed information, this provides a sound basis for credible and defensible decision making;
- It demonstrates the realities of achieving realistic goals with limited financial resources and expected service levels;
- Encourages exploration around sustainable funding levels and funding reform; and
- Provides a basis for discussions on affordable levels of service, and the pace of improvements.

6.0 DEVELOPMENT OF THE ITF MODEL

In order to create and transportation framework that is detailed and flexible, a dynamically linked model of the road hierarchy, function, condition, level of service and costs is required for renewal, maintenance and active transportation improvements of the roadway network over the next 20 year period.

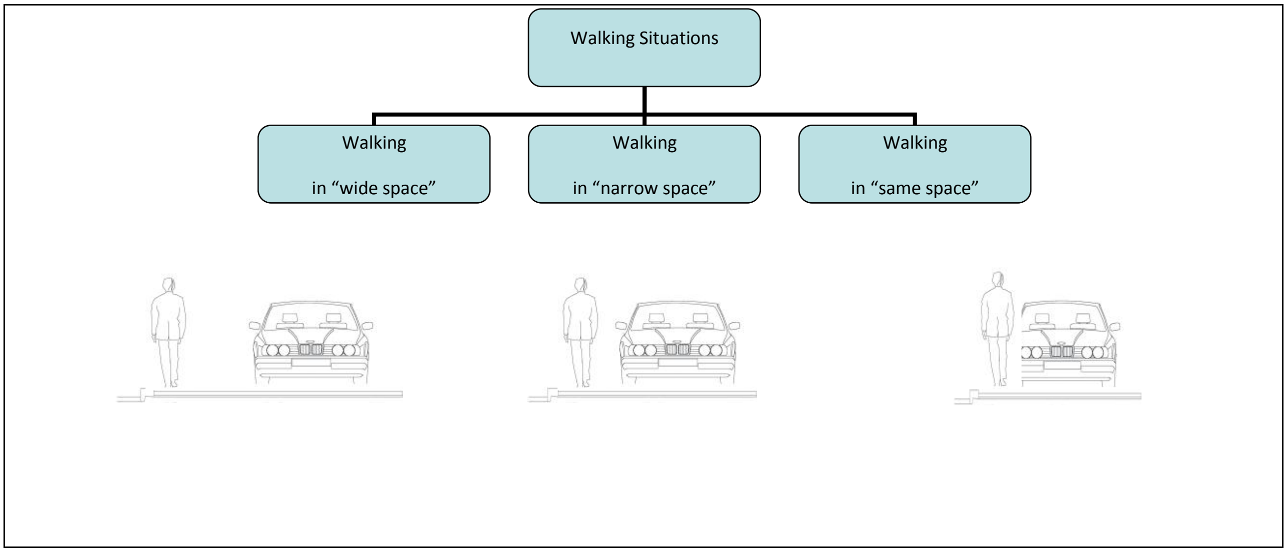
6.1 Roadway Hierarchy

The categorization of each road segment into a hierarchy supports the District's goal of creating an affordable active transportation network. There are three primary categories for the segmentation:

- Category 1 – Vulnerable users out of traffic;
- Category 2 – Vulnerable users beside traffic; and
- Category 3 – Vulnerable users with traffic

This approach is consistent with recent pedestrian road safety research as seen in **Figure 10**.

Figure 10: Walking Situations



Reference: Canada Post Letter Carrier (Pedestrian) Traffic Safety Risk Rationale Report, June 2008, Michael Trickey, P. Eng., et al.

Multi-use roadways that provide safety and encourage active transportation were categorized into either category 1 or 2 based on the following characteristics.

- Routes that vulnerable users share the roadway;
- Shared safe use;
- School bus and walking routes;
- Adjacent land use;
- Activity centre and neighborhood connectivity and recreational active transportation loops; and
- Affordability and managing expectations.

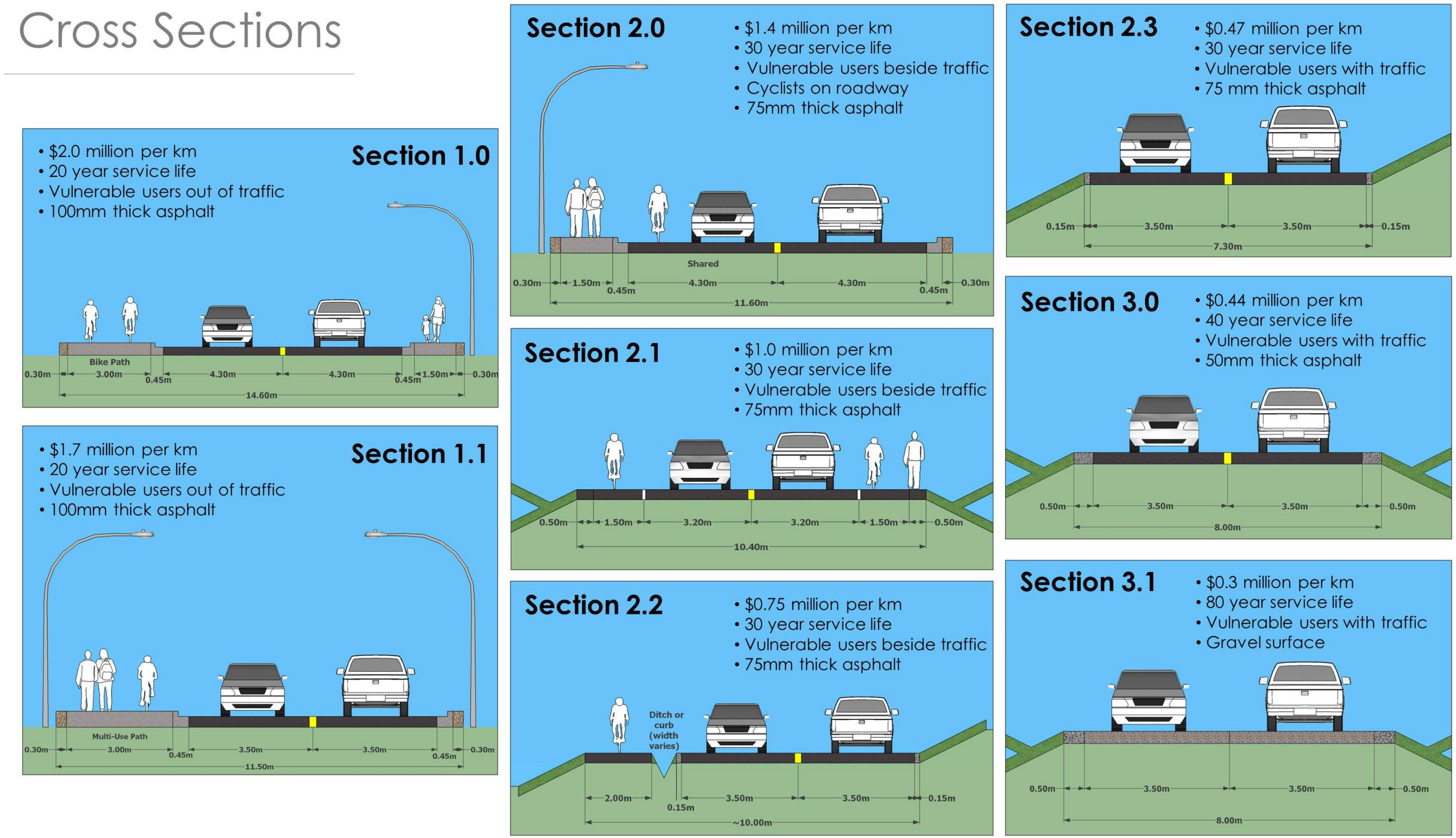
The multi-use roadways in category 1 and 2 have the characteristics to form the basis of the active transportation network.

6.2 Roadway Functional Cross Sections

In reviewing the roadway hierarchy and existing site conditions and affordability, it was determined that the 3 roadway categories be supported with the following design cross section templates for each. **Figure 11** on the following page illustrates the features and function of each cross section.

The cross-sections in each category present options at reduced costs and functionality. Costs for renewal and maintenance also decrease from category 1 to 2 to 3.

Figure 11: Cross Sections for Integrated Transportation Framework



For each roadway cross section, a level of service that describes the renewal, maintenance, and improvement requirements by roadway element was assigned.

As noted earlier, a more comprehensive safety review of these cross sections or site specified roadway elements, the District could undertake a future Crash Modification Factor (CMF) assessment or a Road Safety Audit (RSA) for vulnerable roadway users (pedestrians and cyclists), and intersections to determine additional site specific safety improvements.

6.3 Functional and Physical Targets

The District's activity centers, recreational loops, and any other special interest activities/sites required were mapped and placed in context with existing roadway network, lane widths, shoulders and widths, sidewalks, trails, and District expectations on active transportation routes. A map of the targeted roadway categories (see section 7.0 for more information on the ITF budget scenarios) is illustrated on **Figure 12** and **Figure 13** illustrates the existing primary network and active transportation routes.

With this information, a database was developed that enables segmentation of the District's roads into relatively homogeneous segments based upon the road characteristics identified. **Appendix A** provides a sample of the database fields. The segmentation of an entire street only takes place where the physical characteristics and functionality of the roadway changes materially such as Okanagan Centre Road West.

Performance targets were selected from a list of defined service levels (LOS) that clearly describe what level of performance is achievable for a given budget. Higher levels of performance require higher costs. These ranking levels range from A (excellent) to F (very poor). Level F was not assigned to any roadway since assigning a poor service level should be a discussion with council and staff. The following, **Table 1,** outlines the LOS assigned to each cross section.

Figure 12: Targeted 2031 Road Categories

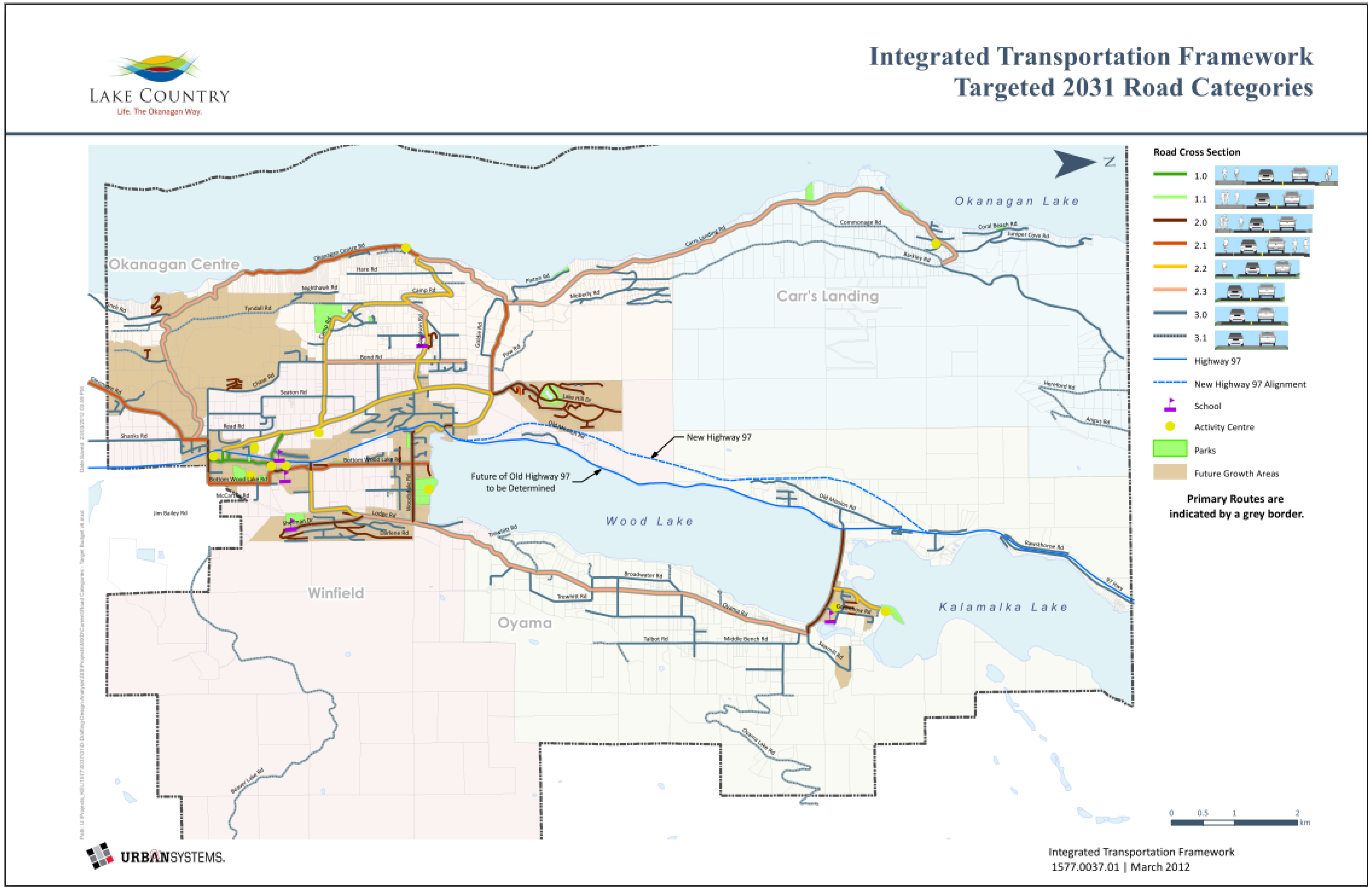


Figure 13: Primary Routes and Active

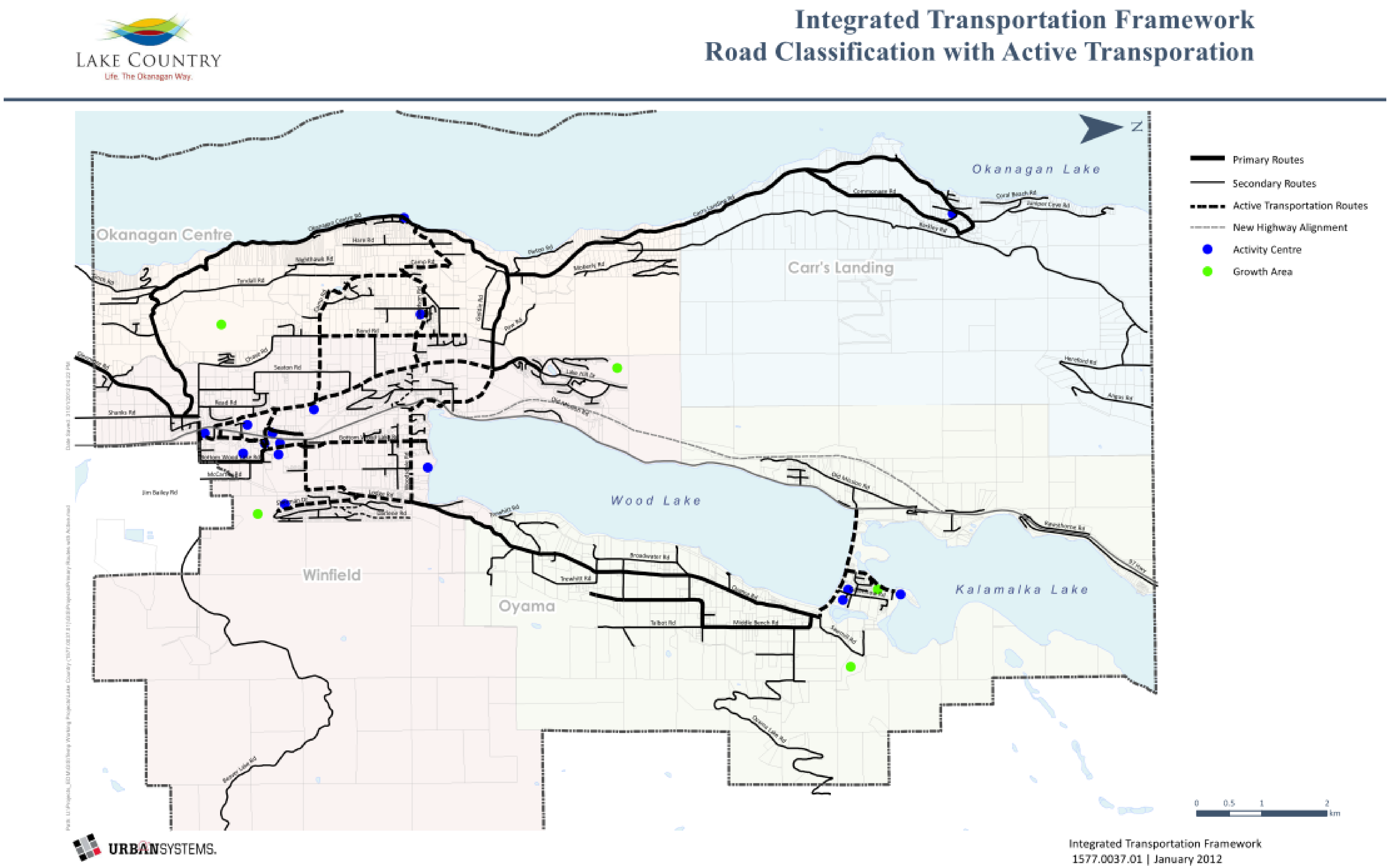


Table 1: LOS and Cross Sections

Cross Section	LOS
1.0	A
1.1	A
2.0	B
2.1	C
2.2	B
2.3	C
3.0	D
3.1	D

With these service levels, the ITF model is able to estimate the ongoing unit costs for renewal and maintenance activities for each roadway segment. The sum of the segments costs then presents annual renewal and maintenance budget amount. For maintenance levels of service, a cost per kilometer was developed. For renewal, a varying service life was assigned, and an average annual cost determined per segment (AALCI).

Roadways included in the active transportation network whose cross section did not provide safety and encourage active transportation were designated for a cross section improvement. Improvement costs were determined based the field inspections and recent tendered prices in the Central Okanagan.

6.4 Field Inspections

An inspection template to capture the existing functional and physical conditions of the District's roadway network was created. A copy of the template is located in **Appendix B**. Accompanying this document is a copy of the roadway inventory and assessment results.

The field work involved visually inspecting to identify the function of the roadway corridor, identify any operational issues and to asses and identify pavement distress, shoulder condition and to identify any issues with surface drainage. It is important to note that ponding of surface water or subsurface water can negatively impact the life of asphalt. Saturating the granular base and subgrade with water below the asphalt will significantly reduce life expectancy of the asphalt. Based on the results of the field work, these assets were clearly not being renewed.

The results of the field work enabled the ITF to compare the existing conditions to the preferred performance targets, and assisted with identifying the segments requiring improvements.

6.5 Calculating Improvements

The existing conditions by roadway element were compared to the preferred performance targets to establish the improvements. The improvement costs assume full reconstruction of the roadway. Based upon the budget allocated to improvements, the ITF suggests a staging of improvements based on a priority ranking scheme (see **Table 7**). The scheme is based upon the District's preferred functionality and service criteria.

6.6 Calculate Annual Renewal and Maintenance Costs

Based upon the performance targets and corresponding LOS for each cross section, the renewal costs and maintenance costs were calculated for each segment.

Using the Maintenance Accountability Process (MAP) developed by the Washington State Department of Transportation, each roadway category (cross section) was assigned a service level and corresponding maintenance cost based on the service level for both winter and summer conditions. In both scenario's, the current maintenance budget is adequate to maintain the existing and proposed service levels.

Table 2 below outlines the maintenance budget allocations.

Table 2: Maintenance Budget Allocations

Level of Service	Winter	Level of Service	Summer	Unit
A	$7,010	A	$13,019	km
B	$5,889	B	$10,936	km
C	$2,804	C	$5,208	km
D	$2,243	D	$4,166	km
F	$561	F	$1,042	km

7.0 SUMMARY OF ITF FINDINGS

The ITF model presents an affordable balance to achieve sustainable service delivery of the District's roadway elements: ongoing renewal requirements, maintenance and improvements.

Two budget scenarios were developed:

- The Targeted Scenario was based on the District's current roadway budget of $3.0 million; and
- The Favoured Scenario was based on a favoured upset budget of $5.7 million.

Table 3 below illustrates the budget allocations for each scenario using the ITF database.

Table 3: Summary of Scenarios Budget Allocations

Description	Favoured Categories	Targeted Categories	Variance
Renewal			
Roadway Renewal	$1,850,000	$775,000	-$1,075,000
Drainage Renewal[2]	$160,000	$0	-$160,000
Shoulder Renewal	$100,000	$0	-$100,000
			Maintenance
Winter Maintenance	$612,000	$533,700	-$78,300
Summer Maintenance	$1,037,000	$991,200	-$45,800
			Improvements
Improvements[3]	$1,910,000	$700,000	-$1,2100,000
Total (rounded)	**$5,670,000**	**$3,000,000**	**$2,670,000**

Figure 14 graphically illustrates the favoured budget scenario and the previous **Figure 12** outlines the targeted budget scenario.

7.1 Maintenance

The targeted budget scenario assumes an annual maintenance budget of approximately $1.5 million. The favoured budget increases annually based on the active transportation improvements and associated improvement in LOS.

Ideally the maintenance budget set should be adequate to optimize asset service lives. Reduced or inadequate maintenance budget levels reduce service life of roadways and increase the costs and frequency of more expensive renewal.

[2] Drainage and shoulder renewal over 10 years
[3] Improvements over 10 years

Table 4 summarizes the overall maintenance costs for the two scenarios.

Table 4: Overall Maintenance Costs for Two Scenarios

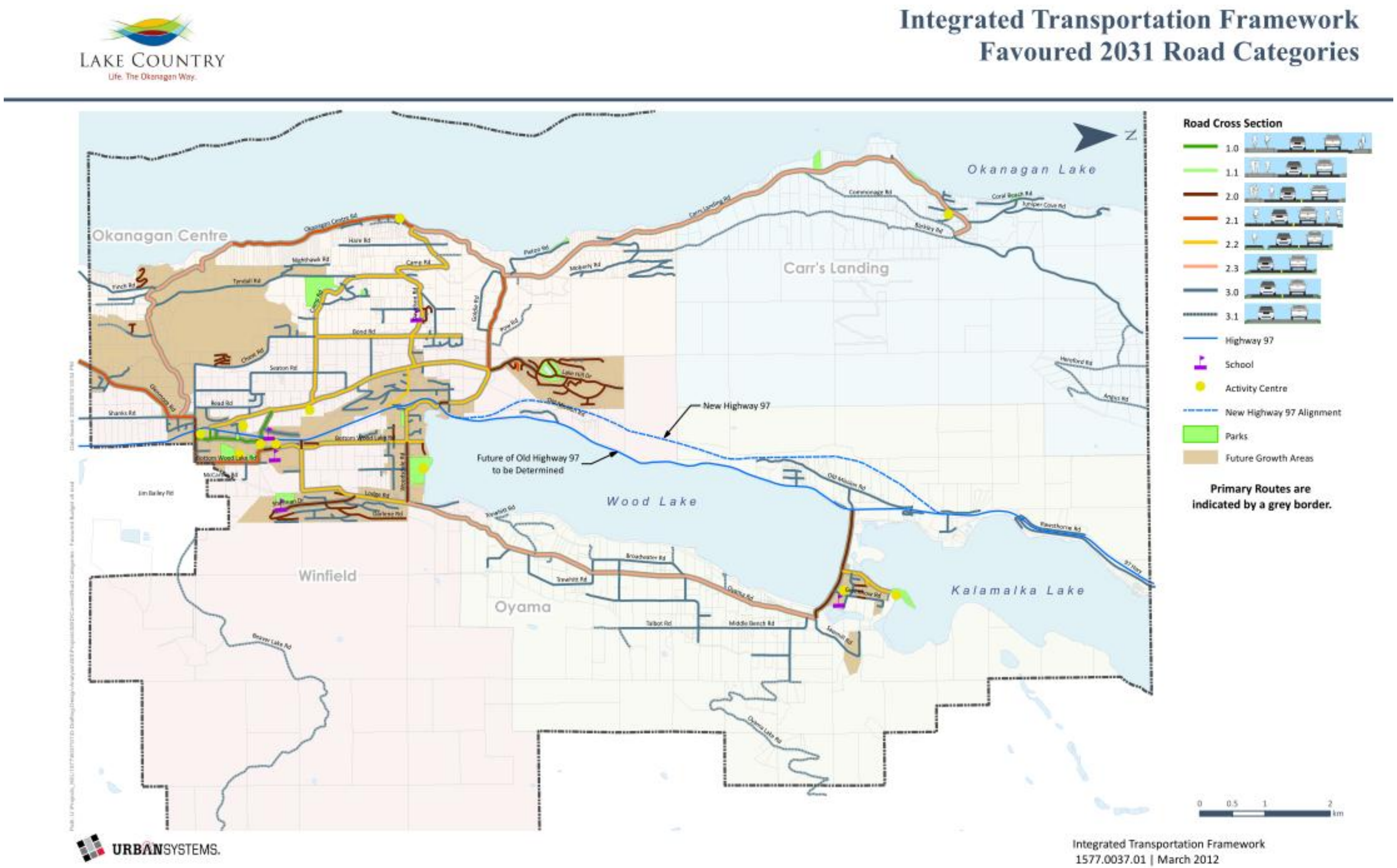
Item	Favoured Categories	Targeted Categories	Variance
Winter Maintenance	$612,000	$533,700	-$78,300
Summer Maintenance	$1,037,000	$991,200	-$45,800

7.2 Renewal

The District of Lake Country is responsible for providing and maintaining approximately 200km of roadways. This infrastructure is vital to the well-being of the residents and businesses in the community, however a significant proportion has reached, or will be reaching, the end of service life very soon.

As previously noted, the current average annual life cycle investment (AALCI) amount for capital renewal is $1.85 million, excluding the backlog (deficit). It is assumed that a portion of the annual roads budget will be allocated to on-going renewal. In the targeted budget scenario, the renewal amount is approximately $775k (42% of the AALCI). In scenario 2, the favoured model, the full amount of $1.85 million is allocated to on-going renewal. However, as improvements are implemented the AALCI will increase and at the end of the 20 year period the amount for road surface and base is $2.35 million.

Figure 14: Favoured 2031 Road Categories



In the targeted scenario, the ongoing renewal budget is not adequate to effectively ensure the service life and use of the roadways can be sustained. This is evident by the condition assessments of the District's drainage and road shoulders, these assets were clearly not being renewed. Based on the field assessments, the roadway drainage and shoulder assets are experiencing a backlog (deficit) of work of approximately $2.6 million.

As a result, it is recommended that an annual drainage and shouldering renewal budget being created, in the amount $160,000 for drainage and $100,000 for shouldering, to renew these assets over a 10 year period in the preferred scenario. This will increase roadway life and reduce future life cycle costs.

7.3 Improvements

To achieve the District's goal of "Making Lake Country easy to get around in safe and enjoyable ways" through the development of an active transportation network, improvements to the function and characteristics of several roadways are required.

The ITF captures the functional need for these improvements by comparing the related function roadway element targets to the existing conditions. More simply put, if the roadway segment category requires sidewalks/pathways for pedestrian safety and there are none, then there is a need for a sidewalk/pathway safety improvement investment. A list of the improvements is shown in **Table 5.**

Table 5: Cross Section Improvements

Name	From	To	Existing Cross Sections	Cross Section Improvement
Okanagan Centre Road E	Berry Road	Oceola Road	2.3	2.2
Darlene Road	Russell Road	Cul-de-sac	3.0	2.0
Okanagan Centre Road E	Oceola Road	Carr's Landing Road	2.3	2.1
Camp Road	Davidson Road	Okanagan Centre Road W	2.3	2.2
Sherman Drive	Lodge Road	370m South of Bonnie Road	3.0	2.0
Tyndall Road	Okanagan Centre Road W	Start of Pavement	3.1	3.0
Bond Road	Camp Road	Davidson Road	2.3	2.2
Camp Road	Bond Road	Tyndall Road	2.3	2.2
Russel Road	Pheasant Road	Sherman Drive	3.0	2.0
Oyama Road	Greenhow Road	Sawmill Road	2.1	2.0
Oceola Road	Pretty Road	Okanagan Centre Road E	2.3	2.2
Lodge Road	50m North of Sherman Drive	Woodsdale Road	2.3	2.2
Robinson Road	Highway 97	Okanagan Centre Road E	3.0	2.2
Camp Road	Tyndall Road	Davidson Road	2.3	2.2
Lodge Road	30m East of Bottom Wood Lake Road	288m East of Meadow Road	2.3	2.2
Lodge Road	288m East of Meadow Road	100m North of Quail Road	2.3	2.2
Camp Road	Seaton Road	Bond Road	2.3	2.2
Trask Road	Ackerman Road	Dead End	2.3	2.2
Camp Road	Okanagan Centre Road E	Seaton Road	2.3	2.2
Davidson Road	McGowan Road	Camp Road	2.3	2.2
Trask Road	Oyama Road	Ackerman Road	2.3	2.2
Bond Road	Amundsen Road	Lacresta Road	2.3	2.2
Bond Road	Davidson Road	Amundsen Road	2.3	2.2
Lodge Road	100m North of Quail Road	50m North of Sherman Drive	2.3	2.2
Bottom Wood Lake Road	Lodge Road	Woodsdale Road	2.1	2.2
Woodsdale Road	Highway 97	50m East of Woodsdale Court	2.1	2.2
Woodsdale Road	50m East of Seymour Road	Bottom Wood Lake Road	2.1	2.2
Bottom Wood Lake Road	270m Northof Berry Road	Lodge Road	2.1	2.2
Woodsdale Road	50m East of Woodsdale Court	50m East of Seymour Road	2.1	2.2
Bottom Wood Lake Road	Woodsdale Road	132m North of Woodsdale Road	2.1	2.2
Bottom Wood Lake Road	132m North of Woodsdale Road	Dead End	2.1	2.2

*Grey hatching denotes decrease in cross section to improve corridor with a separated pedestrian pathway as opposed to wider travel lanes and paved shoulders.

Ideally, these improvements would be completed in the short term. However in the context of developing a budget that is affordable for residents and not predatory on renewal and maintenance needs, these improvements will need to be completed over a 10 year period. These improvements are estimated to cost a total of approximately $19 million.

The targeted budget scenario has an annual budget of $300k for active transportation corridor improvements each year, which equates to approximately 1.0 km of sidewalk annually. The remaining $400k in improvements is for drainage and other roadway improvements. The favoured budget scenario assumes the improvements would be staged over 10 years ($1.9 million/year). **Table 6** outlines the two budget scenarios.

Table 6: Summary of the Annual Improvement Budget Scenarios

Description	Favoured Categories	Targeted Categories	Variance
Improvements	$1,910,000	$700,000	-$1,210,000

7.4 Prioritization of Improvements

The staging of improvements is critical to achieving an affordable plan. A priority ranking scheme based upon the District's preferred levels of functionality and service within annual affordable limits was developed. This ranking can be changed based on the five criteria outlined in **Table 7**, and the priorities resorted within the ITF database.

Table 7: Criteria for Prioritization of Improvements

Criteria	Weighting (0 to 5)
Active Transportation	5
Category Improvement Increase	5
School Route	4
Transit Route	4
Renewal Deficit	3
Service Life	3

Using the weights in **Table 7** the resulting priority ranking is contained in **Appendix C.**

8.0 NEXT STEPS

The development of the ITF for the District is a critical step towards developing an investment decision-making framework for managing the roadway infrastructure. The ITF is both functional and transitional. The transitional capability encourages the District's leadership team to continue to implement changes to the management of the roadway network over the ensuing years at a pace suitable to the District. We recommend that the District undertake the following next steps.

8.1 Refine Annual Renewal and Maintenance Costs

As part of this step we recommend that the District take a look at some renewal and maintenance cost containment ideas, for example:

- On renewal ideas for economies of scale and contingency management; and
- For maintenance modifying the District's existing roadway maintenance contract from full outsourcing to managed outsourcing. Managed outsourcing does not usually reduce annual costs, however it does tend to improve value for money, e.g. repairs last longer.

8.2 Acceptance and Implementation

We recommend the District have a 2 hour session with staff and management to present the framework and capture feedback, then conduct two separate 2 hour workshops with Council to explain the framework and gain buy-in pre and post implementation:

- Workshop 1: to gain an understanding of the ITF, its importance and findings; and
- Workshop 2: to strategically increase and decrease roadway segments, adjust funding priorities and/or increase budget roadway levels to reach an affordable state of ongoing repair.

8.3 Transportation Demand Management and Site Specific Safety Assessments

To improve the health of the transportation network and assist in managing community expectations, we recommend the District undertake a Transportation Demand Management (TDM) plan. Also, for identified corridor improvements with site specific challenges, we recommend the District consider a more comprehensive safety review of these cross sections or site specified roadway elements. The District could undertake a future Crash Modification Factor (CMF) assessment or a Road Safety Audit (RSA) for vulnerable roadway users (pedestrians and cyclists), and intersections to determine additional site specific safety improvements.

9.0 REFERENCES

The Integrated Transportation Framework (ITF) utilized the following background reports/maps as reference.

1 *Official Community Plan Bylaw No. 750 , August 2010, District of Lake Country.*

2 *Walk Around Lake Country (WALC) Trails and Walking Map, 2010.*

3 *Integrated Asset Management Capital Plan (IAMCP) 2010, Urban Systems Ltd.*

4 *Road Inventory Study (2009), CTQ Consultants.*

5 *School Bus Route (2011), School District 23.*

6 *Transit Future Plan, Central Okanagan Region August 2011, BC Transit.*

7 *Maintenance Accountability Process Manual, 2008, Washington State Department of Transportation.*

8 *Canada Post Letter Carrier (Pedestrian) Traffic Safety Risk Rationale Report, June 2008, Michael Trickey, P. Eng, et al.*

9 *Transportation Demand Management – A Small and Mid-size Communities Toolkit, 2009, Fraser Basin Council*

10 *Asset Management Systems for Roadway Safety, 2005, US Department of Transportation, Federal Highway Administration*

Appendix A

ITF – Database Fields

List of ITF database fields

Asset_ID
USL ID (do not delete)
Name
From
To
DLC Classification
Strategic Category
Service Category
Primary Use
Current Sub-Category
Preferred Sub-Category
Primary Function
Truck Route
Transit Route
School Bus Route
Multi Use
Active Transportation
User Interaction
Posted Speed
Volume
Surface Treatment
Length
Lanes
Lane Width
Surface Age
Surface Service Life
Remaining Life
Shoulder Treatment Left
Shoulder Treatment Right
Shoulder Width Left
Shoulder Width Right
Drainage Type Left
Drainage Type Right
Sidewalk Treatment Left
Sidewalk Treatment Right
Sidewalk Width Left
Sidewalk Width Right
Curb Gutter
Parking
Lighting
Operational Issues
Maintenance Deficit
Surface
Base
Shoulder Left
Shoulder Right
Sidewalk Left
Sidewalk Right
Curb Gutter Left
Curb Gutter Right
Drainage Left
Drainage Right
Drainage Renewal
Shoulder Renewal
Drainage Renewal Deficit
Shoulder Renewal Defiicit
Maintenance LOS Rating
Winter Maintenance LOS Cost
Summer Maintenance LOS Cost
AALCI
Improvement Cost
Priority Ranking

Appendix B

Road Inventory and Assessment Data Sheet Sample

ROAD INVENTORY AND ASSESSMENT DATA SHEET

LAKE COUNTRY
Life. The Okanagan Way.

DISTRICT OF LAKE COUNTRY | DATE: | EVALUATOR:

STREET: Pollard Road

FROM: Highway 97 | TO: Cul-de-sac

ITEM	LEFT S/W	LEFT SURFACE DRAINAGE	LEFT SHOULDER	ROAD	RIGHT SHOULDER	RIGHT SURFACE DRAINAGE	RIGHT S/W
CONDITION RATING	☐ YES ☐ NO ☐ CONCRETE ☐ ASPHALT ☐ GRAVEL ☐ 1 ☐ 2 ☐ 3	☐ CURB ☐ CONC. ☐ DITCH ☐ ASPHALT ☐ NONE ☐ 1 ☐ 2 ☐ 3	☐ PAVED ☐ GRAVEL ☐ ANGLE* ☐ PARALLEL* ☐ RT ANGLE* ☐ N/A*	☐ PAVED ☐ GRAVEL ☐ SEAL COAT ☐ 1 ☐ 2 ☐ 3	☐ PAVED ☐ GRAVEL ☐ ANGLE* ☐ PARALLEL* ☐ RT ANGLE* ☐ N/A*	☐ CURB ☐ CONC. ☐ DITCH ☐ ASPHALT ☐ NONE ☐ 1 ☐ 2 ☐ 3	☐ YES ☐ NO ☐ CONCRETE ☐ ASPHALT ☐ GRAVEL ☐ 1 ☐ 2 ☐ 3

*PARKING

LANE WIDTH | S/W | BOULEVARD | PARKING OR SHOULDER | ROAD 15 | PARKING OR SHOULDER | BOULEVARD | S/W

☐ CROWNED
☐ CROSSFALLED

SECTION A-A

DITCH WIDTH (METRES)

LEFT
☐ STREETLIGHTS
☐ ON POWER POLE
☐ SEPARATE POLE

RIGHT
☐ STREETLIGHTS
☐ ON POWER POLE
☐ SEPARATE POLE

PAVEMENT SURFACE

CONDITION	RATING
ALLIGATOR	☐ 1 ☐ 2 ☐ 3
MAP	☐ 1 ☐ 2 ☐ 3
TRAVERSE	☐ 1 ☐ 2 ☐ 3
LONGITUDINAL	☐ 1 ☐ 2 ☐ 3
RUTTING	☐ 1 ☐ 2 ☐ 3
RAVELING	☐ 1 ☐ 2 ☐ 3
FROST HEAVE	☐ 1 ☐ 2 ☐ 3
SETTLING	☐ 1 ☐ 2 ☐ 3
PATCHING	☐ 1 ☐ 2 ☐ 3

SURFACE COMMENTS:

PREVIOUS CONDITION ASSESSMENT

BY: CTQ DATE: 13/05/2009

INVENTORY:
ROAD ID: 1510
ROAD: POLLARD RD
SURFACE: SOUND
FROM: MAIN
TO: POLLARD
KM FROM: 0
KM TO: 0.2
CLASS: LOC
LENGTH: 200
WIDTH: 15

ASSESSMENT:
SURROUNDING: URBAN
DRAINAGE: WELL DRAINING
SURFACE: SOUND
TERRAIN: LOWLANDS/VALLEY
EMBANKMENT FILL: 50
EMBANKMENT CUT: 50

OPERATIONAL ISSUES:

SHEET GRID: 626

100530-04ROAD95-00140

SHOULDERS VARY FROM PAVED SHOULDER RT SIDE FOR PARKING FOR CLINIC.

Appendix C

Summary of Investment Priorities and Results

Criteria	Weight (0 to 5)
Active Transportation	5
Category Improvement Increase	5
School Route	4
Transit Route	4
Renewal Deficit	3
Service Life	3

Scenario Results Summary	
Total Average Annual Cost	$ 4,067,659
Total 20 Year Cost	$ 81,353,175
20 Year Surplus/Shortfall	-$ 27,453,175
% Improvements Achieved	83%
% D&S Renewal Achieved	7%
% D&S AALCI Achieved	49%
% Maintenance Achieved	69%

Appendix D

Roadway Category Maps