

Implementation Plan for Arterial Road System Infrastructure Work

(Service des infrastructures, du
transport et de l'environnement –
Direction des infrastructures)

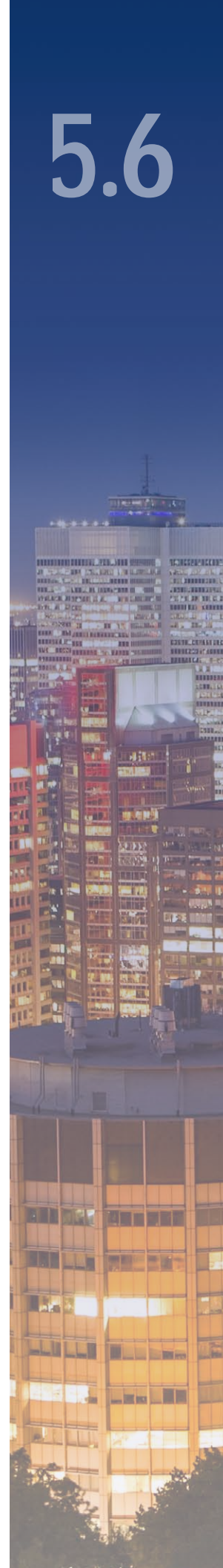


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List of Acronyms

AB	as built	PPI	pavement performance index
CRCAC	Centre de recherche et de contrôle appliqué à la construction	RP	response plan
DGAV	Division de la gestion des actifs de voirie	SGIS	spatial geographic information system
DI	Direction des infrastructures	SITE	Service des infrastructures, du transport et de l'environnement
IDAS	integrated decision aid system	TCEP	three-year capital expenditures program
IRP	integrated response plan		

5.6. Implementation Plan for Arterial Road System Infrastructure Work (Service des infrastructures, du transport et de l'environnement – Direction des infrastructures)

1. Introduction

The *Act respecting the exercise of certain municipal powers in certain urban agglomerations*¹, adopted in December 2004, awarded Ville de Montréal (the city) exclusive jurisdiction, including road maintenance and management, over thoroughfares forming the arterial system in the urban agglomeration. All other thoroughfares, those not belonging to the arterial system, are part of the local system, and they have been under the jurisdiction of borough councils since the new city was created in 2002. On June 20, 2008, the *Act to amend various legislative provisions concerning Montréal*² modified the exclusive jurisdiction of the urban agglomeration council over thoroughfares forming the arterial road system. Subject to certain exceptions, each of the related municipalities, including Ville de Montréal, recovered jurisdiction over the thoroughfares that form the arterial system on its own territory.

In 2010, the city's road system (roads, sidewalks, curbs, manhole heads and sump heads) (local and arterial systems) included a total of 4,058 km of roads and 6,677 km of sidewalks, valued at \$10.9 billion. The arterial system, which accounts for roughly 20% of the entire road system, consists of 845 km of roads and 842 km of sidewalks, and is valued at roughly \$3.4 billion, or 31% of the entire road and sidewalk system. The local system consists of close to 3,213 km of roads and 5,835 km of sidewalks, and is valued at \$7.5 billion, or 69% of the value of the entire road and sidewalk system.

City council is responsible for decisions concerning the arterial system, which is managed by the Division de la gestion des actifs de voirie (DGAV) of the Service des infrastructures, du transport et de l'environnement (SITE). Until December 31, 2012, this division reported to the Direction des transports; since January 1, 2013, it has been under the authority of the Direction des infrastructures (DI). However, maintenance of the arterial system is handled by the boroughs. Each borough is also responsible for managing and maintaining the local system.

¹ RSQ, chapter E-20.001.

² SQ, 2008, chapter 19.

City council is the main source of funding for the implementation of arterial system projects, providing 95% of the funds (2011 TCEP³, \$39.8 million). The amount contributed by the urban agglomeration council refers to the part of the arterial system that is located downtown and accounts for 5% (2011 TCEP, \$1.9 million).

Every day, the arterial system is heavily used by automobile traffic. Its main function is to ensure the smooth flow of traffic, and it is connected to both the highway network, which is administered by the Ministère des Transports du Québec, and to collector streets, which are administered by boroughs. Thoroughfares usually run continuously over a long distance. In Montréal, they are of two types. Secondary thoroughfares carry traffic volumes of between 10,000 and 30,000 vehicles a day, while main thoroughfares can carry more than 30,000 vehicles a day.

A large number of responses implemented by the city's business units also have an impact on the arterial road system because they involve cutting into the pavement in different places (e.g., responses on water systems, sewer systems, electrical conduits), which accelerates the deterioration of the system. Similarly, responses implemented by public utilities also have impacts on the condition of the road system (e.g., burying electric wires, telephone and television cables, gas feed lines).

Various documents produced by the Direction des transports describe the current condition of the road system as follows:

- Aging system, much of which has already reached the end of its useful life and in some cases even exceeded its useful life (a large percentage of the arterial system was built or rebuilt before 1960);
- Condition of the system rapidly deteriorating;
- Heavy demands placed on the system by high volumes of traffic, often greater than what it was designed to carry when it was planned more than 50 years ago;
- Many roads and sidewalks already in poor condition and the subject of numerous complaints.

To assess the extent of deterioration, the city inspects its systems regularly, which enables it to respond to emergencies and plan the responses required to extend the useful life of assets and maintain them in satisfactory condition.

In the current context the planning process is especially important, because the city is running substantial deficits in the maintenance and rehabilitation of roads and sidewalks. In

³ Three-year capital expenditures program.

2010, the Direction des transports estimated that \$326 million in investments would be needed every year for the next 10 years to maintain roads and sidewalks in their current condition. The budget for infrastructure repair on the arterial road system remains insufficient to meet all needs. Stakeholders think these assets will tend to deteriorate as the years go by. It is imperative that the right choices be made and that the effects of the investments made are maximized.

The challenge faced during planning is to determine, as efficiently as possible, the work to be undertaken, to decide on the best time for implementing those responses based on the life cycles of roads and sidewalks, to take into consideration responses to be deployed on water assets while maintaining service for users, all within a limited budget.

The DI, in collaboration with the Service de l'eau, is currently finalizing an integrated response plan (IRP) (water, sewer and road) designed to help prioritize work. Since major water system projects have a direct impact on the road system, such work requires effective coordination among the various business units responsible. To this end, an integrated decision aid system (IDAS) helps identify suggested responses, taking into account the condition of systems.

2. Audit Scope

Our audit focused on the implementation of infrastructure work. The goal was to ensure that responses deployed on the city's infrastructures resulted from priorities established. In view of the substantial investments that will be required in coming years, we targeted infrastructures in three sectors of activity:

- Bridges, tunnels and related structures;
- The infrastructures of secondary water and sewer systems;
- The arterial road system.

In the first phase, an audit report on bridges, tunnels and related structures was produced in March 2011. In the second phase, an audit report on secondary water and sewer systems was produced in January 2013. In the third and final phase, this audit report on the arterial road system (roads and sidewalks) focuses on responses implemented by the city to maintain and renew this system. These responses are strategically important because they are concerned with the safe, efficient transportation of people and goods.

To do this, we reviewed the planning process implemented by the DGAV. This process includes the inventory, assessment of the condition and determination and prioritization of

investment needs. We were also interested in the establishment of a level of service and the planning component that consists in coordinating, organizing and allocating the necessary funds to response implementation.

Our audit focused mainly on data from 2010 and 2011, but we also took into account information from previous years and, when the situation required it, from the year 2012.

3. Findings and Recommendations

The DGAV of the Direction des transports established a project planning process for the arterial road system. At the time of our audit, some aspects of this process were either being implemented, or were about to be, as a result of the integration of the road system (arterial and local) with the response plan (RP) for water systems. We took this into account in conducting this audit.

The city is currently coming to grips with an aging road system in an increasingly dilapidated state, with the result that significantly higher levels of investment are required to renew and maintain the assets in this system. With limited budgets available to meet these investment needs, they are in direct competition with the priorities of the city's other sectors of activity. It is therefore necessary to practise sound management of road assets.

Before addressing each of the improvements that need to be made to the different steps in the planning process and monitoring, we will first discuss the distribution of jurisdictions and responsibilities for the road system (arterial and local systems), which will facilitate an understanding of the various sections of this report.

Distribution of Jurisdictions

Jurisdictions and responsibilities for the road system are distributed among several of the city's administrative units and authorities. From the time the new Ville de Montréal was created (on January 1, 2002), until the *Act to amend various legislative provisions concerning Montréal* came into force, the responsibility for asset maintenance and renewal activities on the Island of Montréal's road system was divided into two major categories:

- Jurisdiction over the arterial road and sidewalk system was granted to the city or related municipalities, and to the urban agglomeration for the downtown area;
- Jurisdiction over the local road and sidewalk system was granted to respective boroughs or to related municipalities, as the case may be.

With regard to the city specifically, responsibility for maintenance activities (regular and preventive) on the arterial road and sidewalk system assets was delegated to each borough council through the *By-law concerning the delegation to borough councils of certain powers relating to the arterial road system (08-055)*.

Although the distribution of powers has changed since the new city was created, Montréal's arterial system was developed in 2001 when the new city was created, then adopted by by-law (02-003)⁴ on January 1, 2002. The streets and roads forming the arterial road system are shown on a map, while all other streets and roads form the local road system. The division of road systems into arterial and local is based on a classification of the road system that the Ministère des Transports du Québec developed in collaboration with the Montréal urban community in August 2000.

In 2006 and 2007, the Commission permanente du conseil municipal sur le transport, la gestion des infrastructures et l'environnement held hearings on the review of the arterial road system. The goal of this review was to reclassify certain pavement sections in order to ensure consistency in transportation management and to define an investment and response plan for those sections. In particular, the SITE had proposed to integrate collector streets of the local road system into the arterial road system. A bus route ran along those collector streets. Following hearings, authorities decided that a reclassification of collector streets would not be part of the review of the arterial system. As a result, the legal framework remained unchanged: collector streets remained part of the local road system and boroughs were still responsible for carrying out all repair work required on those streets.

However, to assist the boroughs and accelerate the work of upgrading the local road system, in 2007 the city council approved a program for repairing the local system's collector streets that covered both the cost of performing the work and professional design and monitoring services. To do this, it mandated the SITE to implement this program and informed the boroughs that the SITE would take responsibility for execution of the work, pursuant to section 85⁵ of the *Charter of Ville de Montréal*. City council had decided that since this was a non-recurring program, there was no guarantee of continuity of funding from one year to the next; nevertheless, work was carried out on collector streets under the program in 2007 and 2009. The program was interrupted in 2010 and 2011, then city council renewed it in 2012, leaving the choice of collector streets up to the boroughs.

⁴ *By-law concerning the arterial and local road systems*, city council, January 1, 2002.

⁵ This section stipulates that “*The city council may, subject to the conditions it determines, provide a borough council with a service related to a jurisdiction of the borough council; the resolution of the city council shall take effect on passage by the borough council of a resolution accepting the provision of services.*”

According to the information obtained, the concept of collector streets was, however, more of a subjective one.

As shown in Table 1, the distribution of responsibilities was based on the jurisdictions prescribed by law, municipal by-laws or decisions made by authorities.

**Table 1 – Distribution of Responsibilities
for Road System Management and Budget Allocations**

	Investments		Maintenance ^a		Inspections	
	Responsibility	Capital budget	Responsibility	Operating budget	Responsibility	Operating budget
Local system	Direction des travaux publics of the boroughs ^b		Direction des travaux publics of the boroughs		Direction des travaux publics of the boroughs	<p>Before 2010: Direction des travaux publics of the boroughs</p> <p>2010 and 2011: Service de l'eau^c</p>
Arterial system	DI of the city ^d		Direction des travaux publics of the boroughs ^e		Direction des transports of the city	<p>Before 2010: Direction des transports of the city</p> <p>2010 and 2011: Service de l'eau^c</p>

^a Maintenance: includes regular and preventive maintenance.

^b Except for a program for repairing collector streets in the local system, approved by city council for 2007, 2009 and 2012. The Direction des transports of the city had been entrusted with the management of this program.

^c Under the IRP project for water, sewer and road systems.

^d The DGAV reported to the Direction des transports until December 31, 2012.

^e Responsibility delegated by city council in accordance with by-law 08-055.

In short, regular and preventive maintenance carried out on the arterial and local road systems is under the responsibility of the boroughs, each of which receives an operating budget for these activities. Rehabilitation and reconstruction responses for these assets are under the purview of the DGAV of the Direction des transports for the arterial system and of the Direction des travaux publics des arrondissements for the local system, except for collector streets for the years in which the program was approved by city council.

In view of these jurisdictions and responsibilities for the road system, we assessed the extent to which work done on the city's arterial road system resulted from the priorities established. To do this, we first examined the inventory in the planning process, then examined the comprehensive response strategy in place, the level of service decided upon, the determination of planning priorities for 2010 and 2011, and, finally, the allocation and use of resources.

3.1. Inventory Data

3.1.A. Background and Findings

Optimal planning of arterial road rehabilitation and reconstruction responses is based primarily on an overview of the system. To achieve this, managers must be able to rely on a complete, up-to-date inventory. One of the objectives of the Politique des équipements et des infrastructures, approved by the city manager in January 2009, was [TRANSLATION] “to compile an inventory of equipment and infrastructure in order to determine the extent, quality and condition of its property holdings.” This objective is also in line with the good practices set out in the *National Guide to Sustainable Municipal Infrastructure*,⁶ which states that “Pavement inventory is the key building block for pavement decision making.”

The first step in developing a road system inventory is to divide it into sections⁷ that correspond to basic units. This inventory is completed by physical and status data. According to the *National Guide to Sustainable Municipal Infrastructure*, a road and sidewalk inventory should include:

- The location of the road, roadway class,⁸ length, width and surface area of the pavement section;
- The date of the original construction and the date(s) of any subsequent rehabilitation treatments;
- A description of the original pavement structure and the subsequent pavement preservation treatments;
- Pavement condition (past and current);
- Traffic data (e.g., estimated annual average daily traffic and the percentage of commercial vehicles).

At the time of our audit, the DGAV had a computerized road management system (produced by the company CRCAC⁹), which was put into operation in 2004 to maintain the arterial road system inventory. This system used a dedicated database containing physical inventory data as well as a pavement condition evaluation represented by the PPI.¹⁰ It was also a geographic visual aid in the form of a map that showed all 8,500 sections of the arterial system, and it contained related data (e.g., test data, type of responses implemented) for each section.

⁶ InfraGuide.

⁷ A section is a segment of a street, usually from one intersection to the next.

⁸ For example, a thoroughfare, a collector street, a residential street.

⁹ Centre de recherche et de contrôle appliqué à la construction.

¹⁰ Pavement performance index. This index results from the combined analysis of three road condition indicators measured by taking readings on all sections. The indicators are the road surface condition, the degree of comfort in driving and the degree of rutting.

Some physical inventory data, however, were not found in the database:

- The date of original construction of a section and the date(s) of any subsequent rehabilitation treatments—according to the information obtained, data prior to 2003, which would nevertheless be useful for determining the useful life of the asset, were not in the system and could not be found in a hard-copy format;
- A description of the original pavement structure and types of subsequent rehabilitations—data prior to 2003 had not been entered;
- Traffic data.

Tests conducted in 2006 were the source of data used to describe road conditions, or PPIs. A complete test of the system was conducted according to a four-year cycle. Within this period, status data were updated by the CRCAC system to account for investments made and aging roads and sidewalks. According to the information obtained, data were no longer considered reliable enough, after this four-year period, to be used as the main indicator for selecting projects to be implemented.

Essentially, data compiled in the CRCAC application could be used to produce a list of sections based on their condition. At the time of our audit, test data were no longer up to date; nevertheless, Table 2 shows the last profile of the condition of the arterial road system, produced in 2010 by the DGAV. This profile is based on a field survey dating from 2006 and for which results were updated to take into account investments made since then and the aging of roads and sidewalks over time.

Table 2 – Condition of the Arterial Road System – 2010

PPI	Condition	No. of km	%
0 – 19	Very poor	46,7	6
20 – 39	Poor	118,5	15
40 – 59	Fair	230,8	28
60 – 79	Good	249,0	30
80 – 100	Very good	171,7	21
Total ^a		816,7	100

^a As a result of the development of the IRP, it was determined that the length of the arterial road system is 845 km.

In view of the urban agglomeration council's decision (August 2008) to include road assets in the water system response plan in order to establish the IRP for water, sewer and road systems, the DGAV has not made any efforts to keep the CRCAC application up to date.

As part of the work of developing the IRP, a project managed by the RP project team of the Service de l'eau, the integration of road assets had to involve both the arterial and local systems. To achieve this, two contracts were awarded following a public tender process, so that new test data would be available for roads and sidewalks. An initial one-year contract of \$1 million was awarded to a firm in 2009 to conduct tests on the local system. Later, in 2010, another one-year contract of \$1.1 million was awarded to another outside firm. Under the terms of this second contract, tests were to be conducted throughout the arterial system and on collector and local streets in some boroughs. It should be mentioned that the RP project team of the Service de l'eau was also responsible for managing these contracts.

After tests were conducted, all the data were transferred into databases used for the IDAS to produce the IRP. These centralized databases include the following features:

- Site of the section and borough in which it is located;
- Geometry (length, width);
- Type of structure (e.g., concrete slab, type of material);
- Year of construction;
- Useful life (reconstruction, rehabilitation);
- Rehabilitation and reconstruction work;
- Costs (construction, rehabilitation, stop-gap maintenance);
- Status active or not (identification of sections that are closed or redesigned);
- Test data;
- PPIs.

When road system data were integrated in databases, a data validation plan was applied by the RP project team of the Service de l'eau. The validation procedures covered physical data, geomatic data and data describing the condition of roads and sidewalks. Thanks to the results of tests that were conducted, the data could be considered valid. The next step will be to maintain up-to-date data. To achieve this, it will be necessary to produce guides and procedures concerning updating, specifying the type of information required and how often it will be needed.

One source of information that can be used to update physical data on the arterial system is provided by as-built (AB) plans, because they describe the composition of roads. AB plans are engineering documents produced following the construction, reconstruction or rehabilitation of an engineering or architectural work, and they take into account changes made to original construction plans. They confirm compliance with plans and specifications and are signed by the person in charge of monitoring the work.

According to the information obtained, to date, few AB plans for the arterial road system were scanned into databases. The consequence of this situation is particularly evident when the projects to be implemented are planned. In fact, the physical inventory data compiled in databases do not take into account certain types of information, such as the composition of materials of sections on which work was performed.

To keep physical inventory data up to date, a process must be put in place to ensure that AB plans are taken into account in the relevant databases.

For this purpose, in July 2011, the Direction générale approved a guideline called “Préparation et transmission des plans tels que construits / Plans TQC,” which applies to all central departments and boroughs when they exercise a delegated power under a central authority. However, this guideline applies to water and sewer systems, but not road systems. The objective is as follows:

[TRANSLATION] The purpose of this guideline is to optimize project costs by maintaining an up-to-date shared central data warehouse, through a spatially referenced geographic information system, of all underground public data, including subsoil on the territory, as well as to enact standards, terms and conditions to be complied with in data identification and the transmission of as-built plans (AB), response sketches and guarantees, in order to ensure data reliability, integrity and longevity.¹¹

According to this guideline, the Division de la géomatique of the DI is responsible for developing terms, conditions and special procedures, for formulating appropriate recommendations to ensure access management and data updating for the spatial geographic information system (SGIS) and optimal implementation of these recommendations for all infrastructures, both existing and planned, of underground public land.

One of the conditions set forth after this guideline was updated was that AB plans and response sketches must be delivered to the Division de la géomatique within six months following provisional acceptance of the work by the manager (or authorized representative) of the unit responsible for execution of the work. The guideline also stipulates that the city manager can request accountability reports on its enforcement at any time from the Division de la géomatique.

¹¹ The guideline is Directive C-OG-SDO-D-11-001 entitled “Préparation et transmission des plans tels que construits / Plans TQC,” July 15, 2011. The updated guideline came into force on October 15, 2012 (C-OG-DG-D-12-011).

According to the information obtained, the development of a guideline on the system is being studied. We think a decision should be made in this area.

Another source of information that can be used for updates is test data. The test data entered in databases used for the IDAS (2010 and 2011 data) will need to be updated to be useful for decision-making. According to the information obtained, road and sidewalk tests are planned according to a three-year cycle.

In closing, at the time of our audit, the DGAV had inventory data (CRCAC databases) that were no longer reliable because they were not kept up to date. As we noted, the CRCAC databases and the databases used by the IDAS contain more or less the same information. It appears, however, that important inventory data are still missing (e.g., AB plans, the history (date and type) of responses implemented prior to 2003 and traffic data).

The difference lies more in the use of the databases. In fact, the IDAS is useful for identifying critical sections based on inventory data as well as for producing cost estimates for planned projects, for purposes of prioritization, planning or estimating investments required in the short, medium and long terms. At the end of our audit, specific IRPs had been submitted to the boroughs' public works directorate. However, according to the information obtained, an overall IRP should be submitted to authorities some time in 2013. Consequently, the results of this IRP can be used only for 2014 planning.

According to the information obtained, another type of data not found in either the CRCAC databases or in databases used by the IDAS would be appropriate for planning purposes. That is socioeconomic data, which include characteristics of the sector served, by-laws in force, zoning, type of population, presence of institutional buildings associated with essential services and sensitive environmental areas. This relatively new concept can be used to fine-tune response planning, thereby alleviating inconveniences to the public. It would seem that most of this information could be collected from the city's business units.

Finally, data on related assets, such as traffic lights and street lighting, are not part of inventory data, even if such assets are integrated into sidewalks, which are considered to be part of road systems. Such data would complete knowledge of road assets. In view of the replacement costs of these assets, it would be to the advantage of the DGAV to know this information at the time of project planning.

Since inventory data are not taken into account, we think that the DGAV should produce a status report for the DI showing how this situation affects the selection of projects to be

implemented or response planning. If applicable, measures for making the necessary data available for proper response planning should be proposed.

3.1.B. Recommendation

We recommend that the Division de la gestion des actifs de voirie produce a report for the Direction des infrastructures, showing:

- A status report on the non-availability of inventory data during the annual planning stage;
- The consequences of not having the data available;

with a view to making the necessary arrangements to obtain these data and support the improvement of project planning.

Business unit's response:

[TRANSLATION] As part of the work of developing the IRP, all inventory data compiled were made available to all asset managers, including borough managers, by means of a cartographic display module that uses a (SGIS). This GIS was also used to enable access to all test (PPI) and photographic surveys by means of a "Viewer" application. The IRP project office also developed a guide concerning updates, specifying the type of information required and how often it will be needed. Funds were allocated to the Division de la géomatique so that it could take on this responsibility.

With respect to incomplete data, the DGAV will produce a report for the DI describing:

- *The current situation regarding inventory data that are useful and necessary for annual planning;*
- *The impacts of non-availability of these data on the annual planning process and the accuracy of estimates;*
- *Recommendations on measures that should be adopted to obtain these data, if applicable. (Planned completion: December 2013)*

3.1.C. Recommendation

We recommend that the Direction générale assess the appropriateness of broadening the scope of its guideline "Préparation et transmission des plans tels que construits / plans TQC," which came into force in July 2011 and was updated in October 2012 to include the arterial road system, so that it would place all physical inventory data at its disposal, thereby improving future responses planning.

Business unit's response:

[TRANSLATION] The Direction générale will assess the appropriateness of broadening the scope of its guideline "Préparation et transmission des plans tels que construits / Plans TQC," which came into force in July 2011 and was updated in October 2012, to include the arterial road system.

If necessary, the Direction générale will have the guideline amended for this purpose. (Planned completion: October 2013)

3.2. Comprehensive Response Strategy

3.2.A. Background and Findings

The determination of asset preservation needs consists in identifying responses considered necessary following tests, then classifying them according to their priority. In the case of the arterial road system, the types of possible responses are shown in Table 3.

Table 3 – Types of Possible Responses on the Arterial Road System

Response	Objective and description	Budget
Preventive maintenance	<ul style="list-style-type: none"> To prevent or slow the progressive degradation that can lead to premature deterioration. Recurring or non-recurring responses. For roads in good condition. Strategy of optimal use of public funds. <p>For example: sealing cracks.</p>	Operating
Current maintenance	<ul style="list-style-type: none"> To correct defects or deteriorations that can pose the risk of an accident or seriously compromise the comfort of users. Minor corrective work. <p>For example: repairing potholes.</p>	Operating
Rehabilitation	<ul style="list-style-type: none"> To maintain or improve the condition and avoid a much greater investment in the future when the asset has reached an advanced state of deterioration. The appropriateness of a repair is based on its ability to extend the useful life of the asset and on its cost. Response methods and response times are generally chosen on the basis of the effectiveness and durability of the repair techniques. <p>For example: thin surfacing, planing or surfacing.</p>	Capital
Reconstruction	<ul style="list-style-type: none"> To restore to new condition or full functionality. 	Capital

According to the *National Guide to Sustainable Municipal Infrastructure* (a reference tool for good practices), it is preferable to follow a comprehensive response strategy by reviewing all the assets of a given system. It is recommended that this strategy be followed for reconstruction, rehabilitation and maintenance responses alike.

The city's Politique des équipements et des infrastructures (which came into force in January 2009) runs along the same lines as these good practices:

[TRANSLATION] In view of the condition of its assets, the Ville de Montréal must assess the risk that components will break down or wear out prematurely. This evaluation will help determine the preventive and corrective measures needed in the short, medium and long terms. The analysis work must include a cost estimate, which is necessary for decision-making. This analysis should also make it possible to classify assets under one category or another, depending on whether the decision made is to:

- *Replace the asset;*
- *Keep the asset, but carry out major short-term or long-term repairs;*
- *Keep the asset and do routine maintenance on it;*
- *Stop maintenance work on the asset, postpone repairs and conduct more in-depth studies.*

The purpose of this classification is to make a decision for each asset as well as to set budget allocation priorities.

The city's policy also recommends the *[TRANSLATION] "design of a structured preventive maintenance program giving specific information on work that must be done to protect and maintain the quality of assets."*

There is partial compliance with the Politique des équipements et des infrastructures, because after tests are conducted, a score is assigned to each road and each sidewalk, providing planners with an index for the choice of responses to be implemented, in the areas of preventive or current maintenance (e.g., sealing cracks, repairing potholes), rehabilitation (e.g., planing and surfacing) or reconstruction (e.g., complete reconstruction) aimed at correcting the defects detected.

However, contrary to the wording of the policy, there is no exhaustive classification of assets into categories based on the types of responses they require. Nor is there any structured preventive maintenance program as such, even if it is acknowledged as the optimal strategy for use of public funds. In fact, for assets that are in good condition, this prevents them from deteriorating prematurely and pushes back the time when more substantial investments will be necessary.

With respect to the arterial road system, the fact that responsibilities are distributed among the DGAV and the 19 boroughs is not helpful in implementing a comprehensive response strategy. As we mentioned above, the DGAV is responsible for deciding on responses that can be considered investments (major repair and rebuilding projects), while the boroughs

are independently responsible for anticipating requirements that are covered under the operating budget (current and preventive maintenance work, and certain minor repairs).

The division of responsibilities, with boroughs in charge of operating budgets and the DGAV in charge of capital budgets, is not either conducive to integrated planning. It is important that a borough handle preventive maintenance through its operating budget, but this may be less obvious when the consequences of failure to do preventive maintenance are reflected in the DGAV's capital budget. The consequences are serious, since, according to the *National Guide to Sustainable Municipal Infrastructure*, \$1 of timely prevention will delay the requirement to spend \$5 of rehabilitation.

In short, asset preservation needs and priority planning are not determined according to a comprehensive response strategy, contrary to the process recommended in:

- The *National Guide to Sustainable Municipal Infrastructure*;
- Management practices prescribed in the city's Politique des équipements et des infrastructures.

In this context, planners (DGAV and boroughs) are not assured of selecting the right responses, on the right arterial road system assets, in a timely manner, and in such a way as to optimize public spending.

By-law 08-055 adopted by city council in December 2008, which concerns the delegation to borough councils of certain powers relating to the arterial road system, could have promoted a more comprehensive approach to the planning process. We noted deficiencies in the areas of preventive maintenance execution and accountability reporting.

First, the by-law refers in particular to maintenance activities that must be carried out in accordance with the prescriptions of an appended maintenance guide. While an example is cited in the area of preventive maintenance (sealing cracks), no activity of this type was performed by Le Plateau-Mont-Royal or Ville-Marie boroughs. In practice, regular maintenance work is occasionally considered as preventive maintenance work (e.g., filling holes in the road). The *National Guide to Sustainable Municipal Infrastructure* defines preventive maintenance as follows: “A treatment performed to prevent premature deterioration of the pavement or to retard the progression of pavement defects. The objective is to slow down the rate of pavement deterioration [...]”

According to the information obtained, since the arterial road system inventory is managed by the DGAV, boroughs do not have the technical means to decide on appropriate types of

responses and materials or to determine favourable times for starting road preservation activities (sealing cracks, thin surfacing, etc.).

Second, under section 6 of by-law 08-055, the borough council must provide the executive committee and the assistant general director of the infrastructures (designated as the senior manager of the SITE in the current structure) with a report on March 15 and another one on November 15 of every year. This report must review the execution of delegated activities and include technical information used to develop production indicators for management and maintenance of the arterial system. This section of the by-law appears never to have been enforced, as no report has been produced since it came into force. In our opinion, the DGAV could use this report as a management tool in its planning process, to keep track of the maintenance activities carried out by boroughs on the arterial system on their respective territories.

3.2.B. Recommendation

We recommend that the Direction des infrastructures, in collaboration with the boroughs:

- **Develop a comprehensive response strategy for determining and prioritizing needs in the area of preservation of arterial road system assets that integrates maintenance (preventive and current), repair and major rebuilding work for the purpose of maintaining road assets in a desirable condition at the best possible cost;**
- **Design, document and implement a structured preventive maintenance program for arterial road system assets in accordance with the Politique des équipements et des infrastructures, which came into force in January 2009, for the purpose of preventing premature deterioration.**

Business unit's response:

[TRANSLATION] As part of the work of developing the IRP, the DGAV conducted tests on the arterial road system in 2011, in order to have updated data (PPI) for the purpose of establishing response priorities for the IRP (capital budgets). However, current and preventive maintenance responses (operating budgets) are left to the discretion of each borough.

With respect to asset preservation needs, the DI will develop:

- *A comprehensive response strategy that will identify the types of responses required based on the PPI score. Since these data will be identified for all sections of the arterial road system, sections can be classified according to their categories, based on the types of responses they require;*

- A proposal to amend Schedule B of by-law 08-055 to be submitted to the Direction générale. This amendment to the “Voirie” section of the Technical Guide (available in French only) will define a structured preventive maintenance program that must be applied to all sections covered by the comprehensive response strategy. This program will be based chiefly on maintenance activities already identified in the Bilan d'état global des actifs de voirie 2011. **(Planned completion: September 2014)**

Remark: The proposal to amend Schedule B of by-law 08-055 must take into account recommendations that could arise from the process of reviewing amounts allocated to boroughs in connection with possible performance criteria.

3.2.C. Recommendation

We recommend that the Direction générale ensure that boroughs comply with the requirements of the *By-law concerning the delegation to borough councils of certain powers relating to the arterial road system (08-055)* in order to produce the information required for road system asset maintenance for the purpose of developing the comprehensive response strategy for the Direction des infrastructures.

Business unit's response:

[TRANSLATION] The Direction générale will assess the appropriateness of submitting to elected officials, for approval, the proposal to amend Schedule B of by-law 08-055 to include implementation of a structured preventive maintenance program.

The Direction générale will develop and implement the control measures required to ensure that boroughs comply with the requirements of by-law 08-055 in its present form or pursuant to the amendments that will be proposed. These control measures will be completed by:

- Training that focuses on reviewing the objectives of the program;
- A guide on gathering requested information;
- A procedure for reminding boroughs. **(Planned completion: September 2014)**

3.3. Level of Service

3.3.A. Background and Findings

According to the *National Guide to Sustainable Municipal Infrastructure* the desired level of service for the condition of roads and sidewalks must be established as a priority, before projects are selected and implementation is prioritized. However, the determination of a level of service is based on an assessment of the condition of the system and its use, the financial resources available, risks associated with the deterioration of the system, the consequences of underfunding and sources of funding. To do this, various scenarios must

be proposed so that informed decisions are made. For instance, in order to have x% of roads and sidewalks in good condition, investments of \$y are needed. If all the resources required are to be channelled towards reaching this targeted condition, it is imperative that authorities make a clear commitment regarding a level of service. Whatever choice is made, there must be a strong correlation between the desired level of service and the level of long-term investment established.

During our audit, we examined the extent to which the level of service had been determined for the arterial road system and whether it had been the subject of presentations made to authorities and their approval.

First, in the June 2005 version of the *Plan de transport*, the SITE reported that an annual investment of \$220 million was required to maintain the condition of road systems (local and arterial).

Later, in a new version of its *Plan de transport*, developed in 2008, the Direction des transports outlined general orientations that it intended to adopt in the coming years. These were intended to [TRANSLATION] “restore and maintain the road system (arterial, local, structures and other components).” We think that the Direction des transports should have specified what is meant by “restore,” in light of the previous version of the *Plan de transport*, in which it was concerned with maintaining road systems.

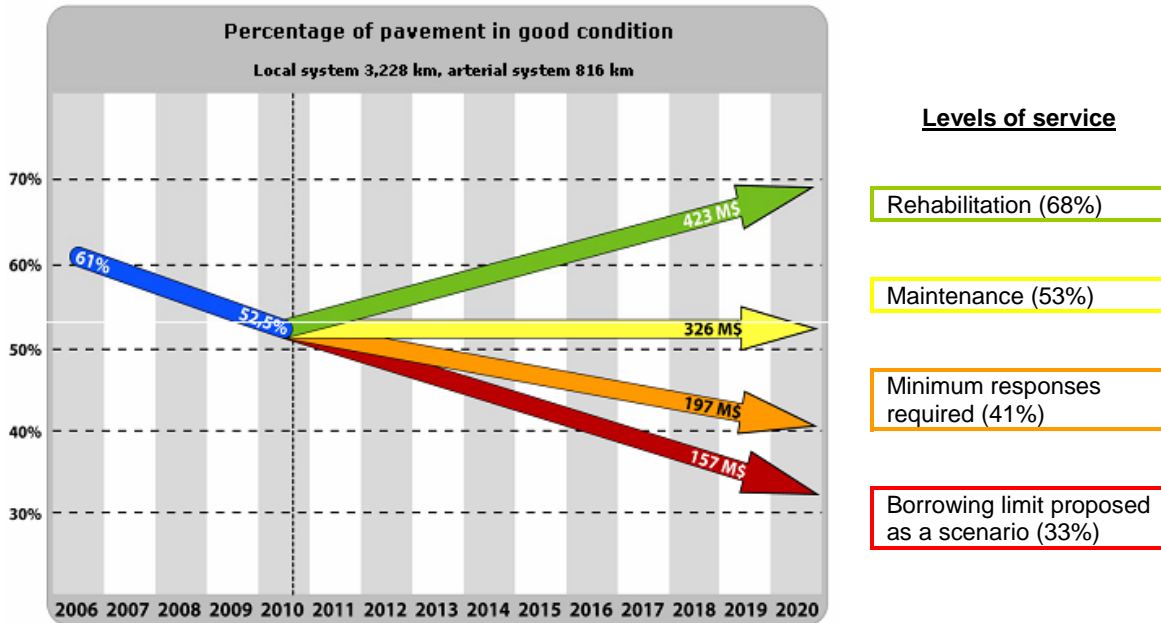
Then, in 2010, the Direction générale launched a project for developing a 10-year investment plan. The mandate of this project, which targeted all business units, including the DGAV, was to establish a planning process for developing:

- The RPs necessary for the maintenance and development of their assets over a 10-year period;
- Investment management policies, to ensure, among other things, maintenance of the condition of assets at an optimum level.

To meet the demand, the Direction des transports produced a document entitled “Planification à long terme des investissements,” which it submitted to joint commissions of the Comité sectoriel – Infrastructures routières in September 2010. The purpose of this presentation was to make elected officials aware of changes in the foreseeable condition of road infrastructures over a 10-year period according to various investment scenarios. All the investments were for the city’s road systems (arterial and local), including road assets (roads and sidewalks), structures (bridges, viaducts and tunnels) and the operating system (traffic lights and street lighting). With respect to road assets, Figure 1 shows the impact of

various levels of investment on the proportion of roads and sidewalks (arterial and local systems) in good condition over a 10-year period.

Figure 1 – Impact of Different Levels of Investment on the Percentage of Roads and Sidewalks in Good Condition



Note: As a result of the development of the IRP, it was determined that the length of the arterial road system is 845 km in length.

Source: "Planification à long terme des investments," document submitted to the Comité sectoriel – Infrastructures routières (September 2010).

In September 2010 the Direction des transports estimated that annual investments of about \$326 million would be required for the next 10 years to keep roads and sidewalks (arterial and local systems) in their 2010 condition. A comparison of this figure with projected investments that appeared in the 2005 *Plan de transport* (\$220 million) five years earlier shows an annual increase of \$106 million, or 48%. We were not able to assess the extent to which the variation in the investment (\$326 million - \$220 million) required to maintain roads and sidewalks was due to deterioration of the condition of roads and sidewalks over the past five years.

Since our audit focused more specifically on the arterial road system, we reconciled the amounts invested in 2010 and 2011 with the levels of investment required to maintain the condition, to implement minimum responses or to align with the proposed borrowing limit. Table 4 shows the percentage of targets reached.

Table 4 – Arterial Road System
Percentage of Targets Reached According to Various Proposed Scenarios
(in millions of dollars)

Year	Total invested	2010 scenario – maintenance of condition ^a		2010 scenario – minimum responses ^b	
		Target	% reached	Target	% reached
2010	19.5	101.1	19	61.1	32
2011	39.8	101.1	39	61.1	65

^a Projected target according to the document “Planification à long terme des investissements,” September 2010, to maintain condition: \$326 million, based on the assumption that the arterial road system accounts for 31% of the replacement value of the road system.

^b Projected target according to the document “Planification à long terme des investissements,” September 2010, to implement the required short-term responses on roads and sidewalks in critical condition: \$197 million, based on the assumption that the arterial road system accounts for 31% of the replacement value of the road system.

We note that the amounts invested in 2010 and 2011 are not nearly enough to meet the needs established with the various targets. They are not sufficient to allow the minimum short-term responses required to be deployed on roads and sidewalks in critical condition, and even less sufficient to allow roads and sidewalks to be maintained in their current condition. Although these are not specific arterial system data, such a situation could cause the percentage of roads and sidewalks “in good condition” to drop from 53% to under 30%, which is well below the 2010 rate, between now and 2020.

No matter what scenario is advanced, we note an underinvestment in the system, and this drives the investment deficit higher every year. The consequences of this underinvestment will be very serious in the years to come if the situation is not rectified, because the number of roads and sidewalks in poor condition will increase and more extensive work will be required, not just because of the types of work involved, but also because of the costs. Indeed, reconstruction is more costly than rehabilitation. What is more, this situation is likely to have major disruptive effects for the public.

The low levels of investment that prevailed over the years are not aligned with the orientations of the 2008 *Plan de transport*, which is aimed at restoring the road system to good condition. Up to now, the funding of road and sidewalk work was dictated by budgetary constraints. To reverse the trend and slow down the deterioration of systems, authorities must approve a level of service and set long-term investment levels accordingly to enable officials to:

- Plan the implementation of priority responses in a timely manner as part of a comprehensive response strategy;
- Assess the attainment of objectives.

Several references agree on the importance of making decisions in these areas:

- According to the *National Guide to Sustainable Municipal Infrastructure*, city council must approve a level of service before formalizing it.
- In June 2010, standing committees on finance and administration established 15 guidelines concerning the municipal administration's orientations and the city's financial framework for 2011. One of these is the need for clearly determining levels of service.
- The Direction générale, in its *Politique des équipements et des infrastructures*, which came into force on January 30, 2009, pointed out the need for setting clear objectives regarding the condition in which property holdings must be kept.
- As part of the work of developing a 10-year investment plan, the Service des finances planned to develop a new financial policy addressing financial goals to help determine a desirable investment level. Such a policy was to be approved in August 2010, but this did not occur.

In conclusion, the level of service (desired condition of the system), like the level of long-term investment, was never confirmed clearly and specifically by municipal authorities, contrary to what key references have suggested. Without specific objectives, it is difficult to determine the needs to be met, to plan appropriate responses to be prioritized on the system with a long-term perspective and to reconcile all this with projected investments.

3.3.B. Recommendation

We recommend that the Direction générale:

- **Express the *Plan de transport* orientations in terms of precise goals concerning level of service;**
- **Set the required long-term investment level for each scenario;**
- **Obtain approval from authorities concerning the targeted level of service and the corresponding long-term investment level and funding method;**
- **Evaluate the results on a yearly basis;**

to enable it to plan and implement responses in a timely manner, slow the further deterioration of the road system and curb the investment deficit, thereby minimizing disruptive effects for citizens.

Business unit's response:

[TRANSLATION] The IRP proposes an approach based on knowledge of each asset of the road system. The investment needs analysis is therefore based on the actual condition of infrastructures at the time of the analysis. To determine investment needs, the IRP developed a decision tree based on response thresholds (level of service). The investment deficit and resulting investment plans will be calculated on the basis of these thresholds. Both the investment deficit and needs must be re-evaluated periodically (five years), so that they take into account actual investments from the previous period.

The Direction générale will submit to elected officials for approval the levels of service recommended for each category of assets and the resulting investment needs. Several proposed scenarios will show the interaction among levels of service and levels of investment at the same time. This discussion could be held in the broader context of the "road strategy" favoured by the Direction des transports.

The Direction générale will keep elected officials informed of the results of investments through an annual investment follow-up report that will be developed by the DI. (Planned completion: March 2014)

3.4. Determination of Priorities

3.4.A. Background and Findings

It is essential that care be exercised in the selection of road projects so that the projects implemented can reach the level of service that municipal authorities have set. This cannot be done effectively without first obtaining an overview of the condition of the system as a whole and without classifying responses according to their priority with a view to their implementation in the short, medium or long term. This task would be arduous without the use of specialized software.

The process that the DGAV had established to select projects in 2010 and 2011 was described to us in the manner set out below. At the time of our audit, a list of the sections in the worst condition had been created. It consisted of 300 sections with a PPI below 40 (sections in poor and very poor condition). Sections were selected from this list according to an equitable distribution among the boroughs, based on both the number of kilometres in the arterial system and the proportion of the system that was in poor condition. The sections were grouped together to form projects and to create a bank of projects called a "project log." At the time of our audit, this project log constituted, in our opinion, all the response priorities established by the DGAV for the arterial system.

When projects are selected for its annual planning, the DGAV takes into account projects listed in the project log to determine those appearing to be high-priority for the proper functioning of the road system. Before selecting the projects to include in annual planning, PPI scores and other observations made during tests (e.g., traffic volume, percentage of commercial vehicles) must be confirmed during visits by staff from the DGAV (engineer and technical officer). Laboratory analyses are also requested to specify the type of work to be carried out (e.g., rehabilitation, reconstruction).

While this exercise is useful for targeting new projects, annual planning must still integrate:

- Projects that compromise minimum safety standards;
- Projects for which the implementation phase has already begun (call for tenders issued, contract already awarded or work under way);
- Projects that had already been planned the previous year and had been postponed.

All this information was used to create a preliminary list for planning for the year (2010 and 2011). The DGAV then took into account lists of projects selected by other business units (e.g., Service de l'eau, Service de la mise en valeur du territoire et du patrimoine [now the Service de la mise en valeur du territoire]), and modified its preliminary list of projects accordingly. A new list of projects was produced and submitted to business units so that they could integrate the projects retained in their planning and conduct any final inspections and analyses that might be necessary. According to the information obtained, annual planning was carried out six to nine months in advance. However, a final list of the projects to be implemented can be accessed only when budgets for the TCEP are confirmed.

According to the information obtained, a high-priority project must involve sections with PPIs lower than 40 over most of their surface. During our audit, we wanted to assess the extent to which projects selected in planning for 2010 and 2011, on the one hand, were in line with the response priorities initially established by the DGAV and, on the other, involved sections with a PPI score below 40. If other selection criteria were used, we wanted proof that they had been documented to support the selection of projects.

Using a sample of 12 projects appearing in 2010 or 2011 planning, we identified PPIs for each section covered by these projects. Our results show that only one project involved a section with a PPI below 40 over most of its surface. For the other projects in the sample, the breakdown of sections with a PPI below 40 is as follows:

- For one project, there was no file backing the PPIs;
- For five projects, fewer than 20% of the sections had a PPI below 40;
- For five projects, 30% to 50% (in terms of surface area) of the sections covered by the project had a PPI below 40.

As a result, almost all the projects reviewed did not involve sections with PPIs below 40 over most of their surface. On first inspection, 11 files out of 12 did not involve projects considered to be in critical condition (very poor and poor).

Since other criteria were considered, we looked for proof of documentation. We located a hard-copy file for each of the 12 projects reviewed. According to the information obtained, the creation of hard-copy files for projects included in planning began in 2010.

First, in reviewing these hard-copy files, we were able to identify the PPI for the sections covered by projects and find lab reports supporting the type of work to be carried out, as well as correspondence with project stakeholders. However, we did not track down any documents that justified the use of the other criteria used to select these projects (e.g., results of on-site visits, tests to determine traffic volume and vehicle categories). Consequently, for 11 out of 12 tests, we did not obtain proof that the sections selected for the purposes of our audit complied with the criteria used.

Moreover, since some of the communication between stakeholders and project managers (engineers) was done electronically, we noted that this information was no longer accessible when resources left the DGAV. At the time of our audit, no procedure was in place for specifying the information that must be archived (hard-copy files and electronic files). In our opinion, such a procedure would help standardize methods and provide evidence of the choices made.

At the time of our audit, the IRP was still being developed and it had not been used for planning purposes in 2010 and 2011. A specific IRP was submitted to each borough in 2012. According to the information obtained, the overall IRP should be submitted to authorities in 2013, so that it will be used by planners in 2014.

Regarding the integration of road systems (arterial and local) into the IRP, the latter's new planned functions will raise each administrative unit's awareness of the need to take into account the priorities of other systems when managing its own system (local and arterial road systems, water and sewers systems).

The review of the IRP first reveals a classification of roads and sidewalks based on their function (local or arterial road system). The threshold criteria used in identifying sections were reviewed. In the IRP are tables listing sections that are critical in "one, two or three" systems. Three tables include one for each system (water, sewer and road) as well as an integrated table of the three systems. The data in this table will be used to select projects to

be reviewed for the purpose of establishing annual planning for 2014. The information presented covers:

- The designation of the section (location) and its length;
- The condition of assets (water, sewer and road). Unlike the first RP, the IRP did not provide an overall condition score, the condition being described instead, if applicable, as “critical”;
- The type of work to be done (rehabilitation or reconstruction) as well as the costs involved, for this section and for each of these assets.

The IRP, which consists of a list of “critical” sections, in a sense becomes the list used for developing the project log. For the DGAV, the IRP is similar to the list of sections with a PPI below 40 produced from the CRCAC database. After that, the planning process remains the same. The only difference is that, from the outset, annual planning (projects launched in 2014 and subsequent years) will take into account the priorities of the Service de l'eau. According to the two methods, the use of the IRP will still require that resources from the DGAV be used to conduct an analysis of sections in order to assess the appropriateness of projects. It should be pointed out that the type of work to be carried out and with the costs involved that are found in the IRP are used to produce an estimate of investments that will be required over the next few years. Before entering a project in a project log, a pre-project analysis must be conducted to confirm or complete the status and functional data, and to specify the type of work to be carried out.

In closing, since not all projects appearing in the project log are analyzed to determine their level of priority, we believe that the DGAV is unable to show that projects retained in its annual planning are those with the highest priority for the arterial road system.

Furthermore, during our audit, since projects selected by other business units compromised the implementation of projects appearing in the project log, we were not given any assurance that work required on roads and sidewalks in poor or very poor condition appearing in this log would be performed shortly or within a limited period. Nor will the IRP give us this degree of assurance.

Considering the large number of potential projects that appear in the project log, we think it is imperative that they be classified according to their priority over a time line of a few years. To do this, this classification must be based on objective criteria, including those outlined in a cost-benefit report for the project, taking into account a favourable time for carrying out the work. For example:

- Compromises between less costly responses, which must be paid for now, and more expensive responses, which must be paid for later, are not evaluated;

- The effects of accelerating or postponing a response on related cost estimates are not evaluated.

This financial information would be useful to planners for evaluating the most favourable time to implement responses.

Furthermore, classification of projects according to their priority could also incorporate the concept of socioeconomic costs, or the costs incurred by citizens. In fact, as a result of greater population density on the territory and the greater number of projects of all types aimed at eliminating infrastructure investment deficits, road systems are afflicted with a great deal of traffic congestion. The negative impacts of these factors has received a great deal of media coverage. The SITE could undertake a process of reflection on this subject to assess whether it is appropriate to integrate the socioeconomic factor into selection criteria.

Finally, a reliable project classification would be useful in the production of an implementation plan to guide annual project planning. Of course, there should be follow-up on this implementation plan to ensure compliance. If work not appearing in the implementation plan needs to be performed, reasons should be provided.

3.4.B. Recommendation

We recommend that the Direction des infrastructures issue guidelines on creating files (hard-copy and electronic) for projects retained in the project log or in the integrated response plan for water, sewer and road systems so that it can show priorities used in decision-making.

Business unit's response:

[TRANSLATION] The first guideline on the method for saving emails in electronic files was issued in March 2009. This method requires the software Adobe Acrobat Professional, which was installed on all DGAV work stations.

A new guideline will be issued on the creation of hard-copy and electronic files specifying the type of information that must be found in the file for each project in the project log or the IRP.

*The implementation of this guideline could take the form of a project information sheet. **(Planned completion: July 2013)***

3.4.C. Recommendation

We recommend that the Direction des infrastructures integrate, in an implementation plan covering a definite timeframe, the responses to be implemented following analysis of the priorities established in the project log or integrated response plan for water, sewer and road systems to guide the selection of projects.

Business unit's response:

[TRANSLATION] The projects found in the DGAV's annual plan are those with the highest priority; their selection takes into consideration all assets found in the public right-of-way rather than just pavement condition. The inclusion of a project in the annual plan also depends on the ability of each asset or program manager to submit a description of its needs and concepts before the prescribed deadline so that it can be included in the pre-project phase.

The DI will establish a five-year planning process with respect to needs identified in the IRP and the project log, failing which stop-gap responses will be considered. This planning will be done concurrently with integrated project planning undertaken by the Direction des transports. (Planned completion: October 2013)

3.4.D. Recommendation

We recommend that the Division de la gestion des actifs de voirie document, during the planning stage, projects selected for implementation so that it can justify the decisions made.

Business unit's response:

[TRANSLATION] A new guideline will be issued on the creation of hard-copy and electronic files, with strong emphasis on the importance of keeping records of any decisions made affecting the selection, priority and timeline for completion of each project. (Planned completion: July 2013)

3.5. Allocation and Use of Resources

3.5.A. Background and Findings

At the time of our audit, the DGAV was establishing its priorities and then submitting them when it requested its capital budget. The budget allocated would help set the limits for projects planned for the coming year.

We assessed the extent to which planned projects were implemented. First, we wanted detailed information on projects that the DGAV planned to implement using the budget

allocated. For 2010, unexpended balances for postponed projects in years prior to 2009 amounted to \$15.4 million, or close to 80% of the budget (\$19.5 million) (see Tables 5 and 6). The difference of \$4.1 million (\$19.5 million - \$15.4 million) was available to launch new projects, but it was not nearly enough to cover road asset maintenance. It should be mentioned that the year 2010 was marked by the freeze on all budgets allocated to construction projects, including those involving road repair.

In 2011, the budget allocated (\$39.8 million) also had to account for postponed projects for 2010. The amount left over was \$8.4 million, or 21% of the budget allocated, which left slightly more leeway for undertaking new projects (\$31.4 million).

According to budget documents consulted, for 2010 and 2011, 58% and 31% of the total budgets available were spent, respectively. The budgets allocated and expenditures made in 2010 and 2011 are shown in Table 5. Over a two-year period, an average of only 40% of the amounts budgeted was used. During our audit, the manager in charge of the DGAV confirmed that the authorized budget could not be used in its entirety.

**Table 5 – Budgets Allocated and Amounts Spent
Road Repair Program (TCEP)
(in millions of dollars)**

2010			2011		
Budget allocated	Amount spent	Amount not spent	Budget allocated	Amount spent	Amount not spent
19.5	11.3	8.2	39.8	12.4	27.4
100%	58%	42%	100%	31%	69%

**Table 6 – Amounts Carried Over
Road Repair Projects
(in millions of dollars)**

	2009 to 2010	2010 to 2011	2011 to 2012
Central city	14.6	6.0	13.2
Agglomeration	0.8	2.4	0.7
Total	15.4	8.4	13.9

In our audit, we were able to identify several large projects involving roads and sidewalks of the arterial road system for which implementation was planned in 2011 but was deferred until 2012. According to a table produced in July 2011 by the DGAV, postponed projects accounted for \$13.9 million.

Generally, the consequences of postponing such responses are serious. Here are a few of them:

- The necessity, in some cases, for follow-up on projects that are under way for longer periods in order to ensure the safety of users until the situation is rectified, which generates additional costs;
- The deterioration of the general condition of roads and sidewalks, which could lead to more costly responses in the future;
- The additional maintenance activities that need to be carried out by boroughs.

In Tables 7 and 8, we reconciled actual expenditures in 2010 and in 2011 with investment scenarios that the Direction des transports submitted to standing committees on finance and administration in September 2010, as part of the work of developing a 10-year investment plan. These scenarios were framed so as to show the cost of maintaining the condition of roads and sidewalks at the 2010 level (\$326 million) or implementing minimum responses required (\$197 million). It can clearly be seen that an investment deficit exists for those two years. For the purposes of this comparison, we assumed that 31% of the targets involved the arterial road system (according to the replacement value percentage).

Table 7 – Investment Deficit Based on the Projected Level of Investment Maintenance of the Proportion of Roads and Sidewalks in Good Condition
(in millions of dollars)

According to the 2010 scenario				
Year	Investment required	Budget allocated	Amount spent	Investment deficit
2010	101.1 ^a	19.5	11.3	89.8
2011	101.1	39.8	12.4	88.7
Total				178.5

^a 31% of the projected \$326 million in investments, according to the 2010 presentation given to standing committees on finance and administration.

Table 8 – Investment Deficit Based on Projected Level of Investment Minimum Responses Required
(in millions of dollars)

According to the 2010 scenario				
Year	Investment required	Budget allocated	Amount spent	Investment deficit
2010	61.1 ^a	19.5	11.3	49.8
2011	61.1	39.8	12.4	48.7
Total				98.5

^a 31% of the projected \$197 million in investments, according to the September 2010 presentation given to standing committees on finance and administration.

According to the two scenarios retained, the investment deficit is between \$98.5 million and \$178.5 million for 2010 and 2011 alone. This amount would be greater if budgets allocated for years prior to 2010 were taken into account because those budgets were also lower than the investments required according to the investment scenarios. Also, since the scenarios were produced in 2010, the estimates will probably need to be reviewed and updated, which could affect the investment deficit amount.

The consequences of underinvestment will be very serious in coming years if the situation is not rectified, because a growing proportion of roads and sidewalks will be in poor condition and the number of emergency responses on the system will also rise. Furthermore, over the years, more work will be required, not only because of the type of work, but because of the costs involved as well. In fact, reconstruction responses are more costly than rehabilitation responses. What is more, this situation could cause major disruptive effects for the public.

During our audit, we also wanted to obtain proof of documented project implementation follow-up to determine the degree of progress of projects and evaluate, in a timely manner, the percentage of postponed projects. We also would have liked to find explanations for the postponement of projects included in planning and locate information on the types of actions taken to improve the situation. At the time of our audit, the DGAV, which at that time reported to the Direction des transports, and the Direction des travaux publics (now the DI) held meetings periodically on the progress status of the work that was contracted. However, this exercise was not intended to allow a structured evaluation of the costs and consequences of project postponements.

This finding led us to review the information submitted by the DGAV within the framework of the TCEP approval process. These documents make no mention of the amounts of work carried over from previous years. In our opinion, such a situation allows elected officials to believe that a greater volume of work is carried out, whereas only part of the budgets is actually used (average of 40% for 2010 and 2011).

In our opinion, an assessment of the costs of project postponements provides important management information that supports accountability reporting on project implementation. It could help provide information periodically to the Direction générale and elected officials on the consequences of these postponements, thereby promoting informed decision-making. The accountability reporting should also show the extent of the investment deficit in light of the level of service decided upon by authorities. Scenarios for recovering this investment deficit should be proposed in order to slow the deterioration of the arterial road system.

3.5.B. Recommendation

We recommend that the Direction des infrastructures document monitoring of the progress status of planned investment projects in terms of work performed and provide reasons for postponements in order to find solutions to irritants that delay project implementation.

Business unit's response:

[TRANSLATION] The DI will overhaul its main project monitoring tool: the control panel. It will be upgraded to include the planning stage (pre-project), thereby giving an overview of all stages of a project.

The DI will issue a guideline on the frequency of updating timelines for completion and on documenting events that have led to postponements. (Planned completion: March 2014)

3.5.C. Recommendation

We recommend that the Direction des infrastructures report periodically to the Direction générale and to authorities on the current situation with respect to management of arterial road system assets. In particular, this accountability reporting should:

- Focus on the degree of implementation of investment projects that were planned originally, including costs incurred;
 - Describe the extent of responses considered high-priority that will be deferred and the reasons for their deferral;
 - Show the future consequences and costs of these project postponements;
 - Demonstrate how the condition of the arterial road system has changed after tests are conducted and responses are implemented;
 - Clearly show any changes in the investment deficit, taking into account the level of service approved by authorities to the arterial road system;
 - Propose scenarios for recovering this investment deficit if applicable;
- so that informed decisions can be made with respect to expected results.

Business unit's response:

[TRANSLATION] Before 2012, the DGAV reported to elected officials on the progress of programs, submitted the planning for the coming year and requested authorization to issue calls for tenders. The last such meeting was held on December 14, 2011, regarding 2012 investments. Since 2012, it has no longer been necessary to request authorization for calls for tenders for programs included in the TCEP, with the result that these submissions stopped.

*The DI will prepare a follow-up report on annual investments and submit it to the Direction générale, which will decide on the appropriateness of forwarding it to elected officials (executive committee, corporate program committees, municipal committees on finances, etc.). This report would be submitted in March of every year, in anticipation of the adoption of the TCEP in the coming year. **(Planned completion: March 2014)***