V.3.
Cost Estimates

Vérificateur général
de la Ville de Montréal

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LIST OF ACRONYMS

CTA	*Cities and Towns Act*	GDD	decision-making record management system
DCRT	Division conception et réalisation des travaux	SDO	Service du développement et des opérations
DEC	Division de l'estimation des coûts	SEAO	electronic tendering system
DGPRA	Division gestion des projects et relations d'affaires	TCEP	three-year capital expenditures program
DTP	Direction des travaux publics	WRF	work request form

V.3. COST ESTIMATES

1. INTRODUCTION

Every year, the Ville de Montréal (the city) makes substantial investments to improve and rehabilitate its road and underground infrastructures (e.g., water and sewer networks). The three-year capital expenditures program (TCEP) provides for substantial investments in this area—$456 million[1] for 2010, $721 million[2] for 2011, $843 million[2] for 2012 and $812 million[2] for 2013—which are distributed among the central departments and boroughs in accordance with their respective jurisdictions. Since the city does not have the necessary resources and equipment to complete the work planned, this work is generally outsourced to outside contractors that specialize in the field. For some types of work (e.g., road rehabilitation programs, water mains, bicycle paths), central department business units and some boroughs designate the Direction des travaux publics (DTP) of the Service du développement et des opérations (SDO) as internal municipal engineering consulting services.

The function of the DTP is to design, implement and manage city infrastructure projects. Its teams develop innovative ways to carry out infrastructure repair projects, in the best conditions and at the most favourable costs, in order to extend their service life and ensure the protection and entirety of the city's public and private property.

In the course of designing infrastructure projects, the DTP is amongst other things responsible for preparing plans and specifications and managing the awarding of contracts to contractors. In accordance with the *Cities and Towns Act* (CTA), this contract work is awarded to the lowest compliant bidder, generally following public calls for tenders.

When the tenders are analyzed, the DTP must have a detailed cost estimate to judge whether the bids are reasonable. In a context where financial resources are limited compared to the extent of investment needs, it is essential that cost estimates be

[1] TCEP 2010-2012.
[2] TCEP 2011-2013.

reliable at the time contracts are awarded so that authorities can be assured that the city is paying a fair price for the work requested. Reliable cost estimates are also needed to obtain conclusive results when they are compared with actual costs once the work is completed.

During an audit conducted in 2006 in the city's boroughs, we reviewed cost estimates. One of our recommendations was that mechanisms be established for monitoring the prices submitted from time to time in order to have a reasonable degree of assurance that they effectively correspond to the best possible prices.

Moreover, during a 2009 audit of professional contracts management, we had recommended that the Direction générale assess the possibility of forming a team of independent cost estimating experts to ensure that it obtains the best prices for services requested. We had also recommended that the Direction review the extent of responsibilities assigned to outside firms to determine which duties it should reclaim and manage.

In 2010, the municipal administration made its intentions known in this regard. In April 2010, city council adopted a governance framework to consolidate internal municipal expertise, particularly in the areas of cost estimating, project management and work-site supervision. It also provided for third parties, other than those that had prepared the calls for tenders and detailed cost estimates, to draw up control estimates in order to check the prices in bids during the tendering process for all public works projects and complex or high-risk projects. However, other possibilities could be considered as long as the process remains independent.

Since 2010, the DTP has been working to put into place a new business model foreseeing amongst other thing, the creation of an independent cost-estimating unit. From March 2010 to August 2011, until the positions are filled, the DTP entrusted to a firm of construction economists the preparation of detailed control estimates. Although the DTP is currently going through a period of major change in work organization, we believe the timing is right for us to conduct an audit on this important issue to assess the reliability of the detailed cost estimates produced. We believe that the observations and

recommendations in this report will help improve the DTP's cost estimating process, and that it might inspire other business units to improve their management practices.

2. AUDIT SCOPE

The main purpose of our audit was to ensure that the detailed cost estimates used for projects were reliable. For this purpose, we reviewed the establishment of cost estimates produced by both the DTP and by a firm specializing in detailed control estimates. We also compared these estimates with the bids received and their publication in the electronic tendering system (SEAO). Finally, we addressed the DTP's position with respect to a cost estimating methodology.

We began our audit of the DTP of the SDO in the spring of 2011, focusing on the detailed cost estimates that were used when public calls for tenders were issued for awarding project contracts. We selected 11 files taken from public calls for tenders issued throughout 2010 and the first two months of 2011. The estimates involved work of three different types: pavement and sidewalks, sewers and water mains and bicycle paths. The size of the contracts ranged from $0.3 million to $2.2 million. Our audit also took into account information that was sent or communicated to us up to August 22, 2011.

We also conducted comparative analyses of the detailed estimates produced internally and the detailed control estimates with the bids received. The period covered for these analyses was from January 1, 2010 to August 22, 2011.

Note that our audit did not cover cost estimates prepared by the DTP for professional service contracts or the cost estimates that boroughs used when contracts were awarded.

3. FINDINGS, RECOMMENDATIONS AND ACTION PLANS

Despite the large number of infrastructure rehabilitation projects under way in the city, business units have limited means to carry them out given their restricted budgets.

These projects mobilize a large number of market resources, such as contractors, suppliers, labour, materials, etc. It therefore becomes necessary to determine exactly what types of work need to be done and to establish target prices that help contain the risk of overbidding when the market is contacted. It also becomes necessary for the city to make optimum use of its resources in order to obtain the best return on its investment.

A detailed cost estimate is very useful for decision-making before contractors begin a project. First, it is expected to reassure the requesting body that its project is still feasible, given the projected budget. Second, it must make it possible to judge the reasonableness of the bids received when public calls for tenders are issued. Third, it must support the recommendation of awarding the contract to the lowest compliant bidder for the project.

Given the scope of the decisions made, it is understandable that a great deal of importance must be attached to the reliability of these estimates. It is obvious that an unreliable cost estimate would not be conducive to informed decision-making. For example, it would not be possible to optimize work planning when selecting projects. Furthermore, when the bids received are analyzed, erroneous variances could be observed, which would make it impossible to adequately support recommendations to award contracts. It is essential that the detailed estimates be reliable, so that the results when compared with actual costs once the work is completed are conclusive.

In addition to all these measures promoting the reliability of cost estimates, since April 1, 2011, the city has been required to publish a list of contracts over $25,000, as well as a price estimate of any contract of $100,000 or more on the SEAO website (sections. 477.4 and 477.5 of the CTA). The DTP is not exempt from these rules, since most projects it receives involve capital expenditures of over $100,000. The amount of cost estimates published in the SEAO must be reliable, because this information is now easily accessible on the Internet.

In April 2011, the DTP presented its tendering process to the Commission d’examen des contrats. This process referred to the preparation of two detailed cost estimates

produced on two different occasions by two separate divisions and according to different methods. The first, produced by the Division conception et réalisation des travaux (DCRT), was designated as [TRANSLATION] *"a detailed estimate of the cost of work before calls for tenders are issued."* The second, which as of May 2010 was produced under the direct responsibility of the DTP manager, then, since 2011, under the responsibility of the Division de l'estimation des coûts (DEC), was designated as [TRANSLATION] *"a detailed estimate of the cost of work during the tendering period."* This second estimate was produced under a professional services agreement with a construction economist firm until August 2011.

For the purposes of our audit report, cost estimates produced by the DCRT will be considered detailed cost estimates, while those produced by the DEC will be designated as detailed control estimates. In addition, the firm of construction economists will be designated as the specialized firm.

During our audit, we wanted to make sure that cost estimates used by the DTP were sufficiently reliable to enable all stakeholders to make informed decisions. First, we have dealt with the detailed cost estimates produced by the DCRT, as it uses these to ensure that projects are feasible within the budgets presented by requesters and these are the only ones to be prepared before calls for tenders are issued. Although several estimates (of different types) were produced during the design phase of a project, our review concerned only the final versions of the detailed cost estimates. Second, we reviewed the detailed control estimates produced by the specialized firm, since the DTP relies on them when recommendations for awarding contracts are made to authorities. Third, we compared these detailed estimates with the bids received. We also reviewed the amount of cost estimates published in the SEAO. Finally, we addressed the DTP's position with respect to the cost estimating methodology.

We should point out that the recommendations in this report apply to the current operation of the cost estimating process within the DTP. Any necessary adjustments will have to be made along with the guidelines that will be proposed.

3.1. DETAILED COST ESTIMATES PRODUCED BEFORE CALLS FOR TENDERS ARE ISSUED

Reviewing the work to be done and producing cost estimates are both part of project planning. Accordingly, business units (requesters) are responsible for the preliminary planning of their projects, adopting the necessary budgets and obtaining authorizations before issuing calls for tenders. During these steps, they use preliminary cost estimates for budgeting purposes. When their preliminary planning is completed, business units send the projects to the DTP for the design and implementation phases.

The DCRT then prepares a [TRANSLATION] "work request form" (WRF), which includes information such as the type of work to be done, preliminary cost and schedule. Once approved by the requester, each party signs the WRF to indicate that they accept the mandate. Then the DCRT specifies the type of work to be done, usually after conducting an on-site visit as well as the necessary studies or analyses. During this preparatory phase, plans, specifications and tender documents are produced for the process of awarding contracts to contractors. To this end, the DCRT draws up a list of items for the bid form and determines the quantities required. A detailed cost estimate is also prepared to ensure that projects are feasible within the requesters' projected budgets.

For the period under review, the requesters assigned contracts to the DCRT that divided the work among the following three operating units, based on the types of projects:

- Water and sewers
- Roads
- Large-scale projects

Detailed cost estimates are systematically prepared at this division before calls for tenders are issued. For most projects, they are generally produced by internal resources. However, in the event of capacity constraints, some mandates are assigned to engineering firms. In such cases, the detailed cost estimates are carried out by the firms.

Historically, detailed cost estimates were used to analyze the bids received and to recommend that the contract be awarded to the lowest compliant bidder. However, as of March 2010, the DTP has been using the services of a specialized firm to prepare detailed control estimates during the tendering process. According to the DTP manager, it was during this period that DCRT staff members were informed that their detailed cost estimates would no longer be used to support recommendations for awarding contracts, but that those of the specialized firm would be used instead. However, the manager continued to have DCRT resources produce detailed cost estimates to ensure compliance with requesters' allocated budgets. It should be noted, however, that in 2010 a few detailed cost estimates produced by the DCRT were used to support the recommendation of the tenders selected.

No matter what they are used for, reliability of detailed cost estimates is based on the combination of two basic parameters: the quantities established according to the final plans and specifications and the unit prices associated with these. Another parameter is a provision for contingencies.

In the next few sections, we will discuss the main elements (quantities, prices and contingencies) of DCRT's cost estimating process and we will assess the rigour with which these data were determined. We will also discuss certain controls used for the detailed cost estimates, such as approval, confidentiality and information security.

3.1.1. DETERMINATION OF QUANTITIES

3.1.1.A. Background and Findings

A detailed cost estimate contains a description of the items requested, the measuring unit and the projected quantities. These quantities are calculated on the basis of plans and specifications before producing the bid forms used for calls for tenders. It should be noted that these are the same quantities used for the DEC's detailed control estimate. Since bidders, who have access to the plans and specifications, make their own calculations during the tendering period, insufficiently precise quantities is likely to influence the unit prices submitted and consequently the total price of the bids. In fact, for some quantities, an overvaluation could result in bidders submitting below-market

unit prices. Conversely, an undervaluation of the quantities could lead to higher unit prices. Accordingly, it is important that projected quantities be established with sufficient accuracy to minimize contractors' margin of error.

While our audit was not designed to express our view about the types of items appearing on the price schedules, we nonetheless made sure that the projected quantities in detailed cost estimates were based on supporting documents (e.g., project plans signed by an engineer) and that the calculations were documented.

Out of 11 cases reviewed, 7 involved plans signed by an engineer. Four cases involved the reconstruction of water mains and sewers, two cases involved pavement reconstruction and one case involved the reconstruction of an embankment. We used surveys to review the determination of quantities associated with 54 items out of a total of 182 (30%). These items accounted for 54% of the detailed estimates' costs.

Generally, we noted that neither the calculations of audited quantities nor their degree of accuracy were documented, thereby making it more difficult to demonstrate how they were determined. For the purposes of our audit, the project managers we met with reconstructed the quantities entered in the detailed estimates. For 37 items out of the 54 audited (68%), the quantities were effectively based on the project plans. But for the other 17 items out of the 54 audited (32%), there were discrepancies between the quantities measured by the project managers and those entered in the detailed estimates. Accordingly, the quantities for 15 items, taken from four estimates, had been overvalued, while the quantities for 2 items, taken from another estimate, had been undervalued. For each of these items, the variance represented from 0.43% to 6.7% of the estimated cost. The variance for the 17 items represented $46,321, or 1.1% of the estimated cost.

For two other cases, both bicycle path development projects, the information obtained indicated that plans signed by an engineer were produced initially, but we received no evidence of this at the time of our audit. Nevertheless, the quantities projected in the detailed cost estimate were established on the basis of the measured surface areas of

the streets determined by the Direction du transport, which was acting as a requester. There was no documentation on file to support the determination of these quantities.

After one of the bicycle path development projects was awarded, it turned out that some of the boroughs affected by the work did not agree with the initial choice of streets proposed by the requester, and one borough was not even interested in the project. As a result, the requester made a change in its choice of streets. The quantities initially projected in the detailed cost estimate did therefore not correspond to the street that was ultimately chosen. We think that the estimate produced before calls for tenders were issued is of questionable reliability. However, our audit revealed that a WRF had been signed before the detailed estimate was prepared. Nevertheless, the refusal of some boroughs forced the requester to redo the preparatory work, draw up new plans and specifications and review the calculations of quantities. In our opinion, the DTP should take the necessary steps to ensure that the WRF clearly reflects the fact that the requester obtained the agreement of the boroughs concerned when the contract is signed. This evidence could take the form, for example, of a box on the WRF form.

We also noted 2 other cases out of the 11 for which the DTP started preparatory work and produced detailed estimates before obtaining the requester's signature on the WRF. The quantities involved were not disputed after the contract was awarded and therefore did not have to be calculated again by the DTP. However, we think that the absence of an order signed by the parties before the design phase starts exposes the DTP to the risk of allocating resources prematurely, even unnecessarily.

No plans were produced for the last two selections in our sample, which involved pavement-levelling projects. In fact, it was on the basis of the requester's allocated budget for this type of work and a historical total cost per square meter (m^2) that the total surface area was determined. According to the information obtained, since recurring infrastructure work was involved, the projected quantities for the items on the bid form were determined by referral to previous calls for tenders. There was no evidence on file to support the establishment of these quantities. Moreover, when this method is used to establish projected quantities, there is a risk that they will be over- or undervalued, based on the reliability of the overall cost used compared to current

market prices. Accordingly, to determine quantities with greater accuracy when detailed estimates are prepared, we believe that unit costs reflecting market values must be used. The establishment of unit prices will be discussed in more detail in section 3.1.2.

Finally, *addenda* are sometimes sent to those who obtain the tender documents during the tendering period. At the time of our audit, these *addenda* were produced by the DCRT. We compared the quantities appearing on the bids received with those appearing in detailed cost estimates to ensure that they had been updated. In 2 cases out of 11, we noted variances, albeit minor ones, in the quantities for six items grouped together. Our audit revealed that *addenda* were in fact sent to those who obtained the tender documents without the detailed cost estimates being updated. In our opinion, this situation does not allow DCRT resources to have complete information at hand, either to document their files or for future use.

3.1.1.B. Recommendations

We recommend that the Direction des travaux publics take the steps required to improve documentation supporting the determination of quantities of items appearing in detailed estimates and the degree of accuracy with which quantities are established, so the data will be more reliable.

We recommend that the Direction des travaux publics make sure that it obtains the requester's written consent before beginning project design work so that it can allocate its resources effectively. The requester's written consent should also indicate that it obtained the prior consent of the boroughs concerned for the projects.

We recommend that the Division conception et réalisation des travaux update the quantities appearing in the detailed estimates when *addenda* are produced during the public tendering process so that files reflect complete information for future reference.

3.1.1.C. Action Plan of the Relevant Business Unit

- **DIRECTION DES TRAVAUX PUBLICS**

  1) *[TRANSLATION] "The method for establishing quantities will be specified and documented. Each file will be evaluated for its degree of accuracy. This information will be entered in the files."* ***(Planned completion: September 2012)***

  2) *[TRANSLATION] "At present, the plan produced in the winter mainly concerns work to be done during the summer, which makes for a high-pressure situation and reduces overall planning time for work and dividing lots.*

     In the future, TCEP planning should be completed much earlier.

     It is the requesters' responsibility to obtain agreement from the boroughs, and the DTP will require the signature of the WRF." ***(Planned completion: April 2012)***

- **DIVISION CONCEPTION ET RÉALISATION DES TRAVAUX**

  [TRANSLATION] "During the tendering process, the control estimate can help detect any irregularities; where necessary, they are communicated to the DCRT, which will issue addenda *accordingly."* ***(Planned completion: April 2012)***

3.1.2. DETERMINATION OF UNIT PRICES

3.1.2.A. Background and Findings

The unit price estimate should be established by a method that produces reliable information on the most likely cost of the planned work. Rigour is needed to determine unit prices primarily so that requesters can program their projects. It is needed generally, not only because it is the basis for awarding contracts, but also to raise questions about and even challenge bids received when large variances are noted. However, under the guideline adopted by the DTP manager, detailed cost estimates are not used to approve the price of bids.

During our audit, we reviewed the rigour of the method used internally to determine unit prices and their supporting documents. Since detailed cost estimates are prepared by the DCRT before calls for tenders are issued, they are the only estimates that can be communicated to requesters to enable them to review their project planning. According to the information obtained, the DCRT does not communicate the amount of detailed cost estimates to requesters before calls for tenders are issued, in order to keep the information confidential. However, in some cases, large variances between the rough estimates prepared by requesters and the bids selected are noted. Thus, out of the 11 projects selected, 4 showed variances ranging from $637,852 to $1,288,601 (22% to 49% of the rough estimates). Since requesters have limited budgets for the large number of projects to be carried out, it would be desirable for them to be made aware of the most likely cost of a project through detailed cost estimates as promptly as possible. This information would allow requesters to use funds that become available to initiate some projects or postpone others.

According to the information obtained for the period covered by our sample, some of the detailed estimates prepared by the DCRT were used when the bids received were analyzed. However, since November 2010, we found that these detailed cost estimates are no longer cited in decision-making summaries produced by the DTP to make recommendations to authorities for awarding contracts. In fact, since November 2010, decision-making summaries refer instead to detailed estimates produced for the call for tenders by the specialized firm, by outside engineering firms and, more recently, by DEC estimators.

Despite this tendency, especially as it pertains to detailed cost estimates, the people we met with informed us of the method they used to determine unit prices. Unit prices for recurring items are based on various reference lists and the prices are fixed for a one-year period. These unit prices were first calculated using the weighted average of previous bids recorded in GESPRO,[3] then they were revised by engineer team leaders to reflect the market reality. These lists suggest unit prices for each type of work (e.g., roads, lighting and signs, sewers and water mains), without taking into account the seasonal nature and variable conditions of the market.

[3] GESPRO: Project management system. Database used to compile the bids of the last three years.

For nonrecurring items, those that do not appear in a reference price list, unit prices are also generated by GESPRO and adjustments are also made. When no prices are available either in a reference list or in GESPRO, the engineers try to estimate unit prices by comparing them with similar items. When no correlation of existing data is possible, they set the prices according to their judgment.

For aqueduct and sewer projects, unit prices are not only determined using GESPRO, but also take into account historical cost estimates produced by the specialized construction economist firm.

Out of the 11 detailed estimates in our sample, 9 were produced internally. We reviewed both the rigour with which the method had been applied to those 9 estimates and the supporting documents.

First, out of the 196 items appearing in these detailed cost estimates, we noted that 26%, or 52 items, were taken from reference lists. Our audit revealed that the use of unit prices appearing in these reference lists left much room for judgment, since in most cases project engineers adjusted the prices, even if they were not aware of the variables that were initially considered when the unit prices were established. To establish the unit prices of these 52 items, the engineers made upward or downward adjustments ranging from 1% to 100% to account for market variations and special projects characteristics. We did not find any documentation to support the adjustments made. We also noted that not everyone was aware of the existence of these reference lists.

We reviewed the extent unit prices in GESPRO were used for items that did not appear on the reference lists, or 74% of the items audited. Based on surveys, we noted that the unit prices of some items actually appeared in GESPRO, but that they had been adjusted upward or downward, from 0% to 367%. Here again, we noted randomly established prices, and price adjustments that varied from one engineer to another, depending on the perceived risk level or the engineers' level of knowledge or experience. We did not find any documents supporting the establishment of these unit

prices. For the other items not appearing in GESPRO, we were also unable to find any documentation supporting their determination.

For the other 2 cases out of the 11 selected, detailed cost estimates were produced by outside engineering firms, because the project design phase was referred to them. The DCRT project managers were unable to explain to us the procedure these firms used to establish unit prices.

We note a lack of uniformity in practices for all 11 cases selected and insufficient documentation to support the calculations and assumptions made to establish the unit prices of different items appearing in detailed cost estimates. As various adjustments are made to determine the most likely price for the proposed work, in our estimation, the method used leaves a lot of latitude but does not show evidence that much rigour was exercised.

Essentially, using an historical average unit price from previous tenders combines all prices, making no distinctions among the particular conditions that prevailed at the time of the projects under consideration or their varying degrees of complexity. However, when several people use their judgement to make adjustments to unit prices, this method moves away from the historical average unit price and closer to the fair market value, even for budget purposes, provided that the adjustments are representative of those prices.

In conclusion, we believe that the practices used by the different units (aqueduct and sewers, roads and large-scale projects) should be standardized and that unit prices should be better documented. Adequate documentation would demonstrate work performed to new resources or third parties and would facilitate the establishment of unit prices for other detailed estimates.

3.1.2.B. Recommendations

We recommend that the Direction des travaux publics take the necessary steps to:

- **standardize practices among the different sections of the Division conception et réalisation des travaux**
- **document the calculations and assumptions made at the time unit prices are established, according to the method used**

in order to demonstrate the rigour and consequently the reliability of detailed cost estimates.

3.1.2.C. Action Plan of the Relevant Business Unit

[TRANSLATION] "A procedure for using the database to consult unit prices will be written. It will be used by all engineer designers. They will document in the file the ways in which unit prices will be used and the working hypotheses that justify them.

The use of a form for this purpose will be reviewed." ***(Planned completion: September 2012)***

3.1.3. DETERMINATION OF THE PROVISION FOR CONTINGENCIES

3.1.3.A. Background and Findings

A provision for contingencies is established to cover the cost of any unforeseen work that may be required for a project. This item, which is added to the costs of the detailed estimate of the work, must be determined following a risk analysis of unforeseen events arising during the project. At the detailed cost estimate stage, the greater the precision with which quantities were established, the lower the risk that unforeseen events will arise. The amount of the provision for contingencies must be as low as possible to foster tighter cost management.

The purpose of our audit was to ensure provisions for contingences were based on analyses of project-related risks and that documented calculations supported these provisions.

During our audit, DTP engineers mentioned to us that a provision for contingences is determined according to their judgment and based on numerous risk factors and particular characteristics of the project. These risk factors are directly related to the complexity of the work to be done, the geographic location of the project, knowledge of the environment or the precision with which quantities were established.

For the selected sample, we noted that contingency provisions in estimates varied from 5% to 14% of the projected cost of the work. But no documentation existed to support the criteria selected to determine this provision for contingencies. Furthermore, we were given very few explanations to justify the establishment of this provision.

Our observations focused on detailed cost estimates produced before the first guidelines issued by the Direction générale, [TRANSLATION] “Management of Contract Contingencies, Impact and Expenditures”, came into force in July 2011. The provision for contingencies established by the DTP should now comply with this directive, which specifies contingency management standards, particularly for tender documents for contracts for performance of work. One of the sections discusses the establishment of the contingency envelope in greater detail following:

- determination of potential risks related to activities covered in the contract and schedules
- determination of the amounts associated with each risk based on the likelihood of potential mitigation measures, if applicable, and possible scheduling consequences

The total costs associated with each of these risks become the estimated contingency envelope.

The Direction générale stipulates that all managers affected by this directive are responsible for enforcing it, integrating it into their activities, monitoring and reporting on it to their superiors.

3.1.3.B. Recommendations

To promote more rigorous cost management, we recommend that the Direction des travaux publics take the necessary steps to ensure that determination of the

contingency provision is based on an assessment of the risks associated with the project.

To demonstrate the reliability of cost estimates, we recommend that the Direction des travaux publics enter both the determined risk criteria and the calculations made to assess the size of the provision for contingencies in the file, as stipulated in [TRANSLATION] "Management of Contract Contingencies, Impact and Expenditures", which came into force in July 2011.

3.1.3.C. Action Plan of the Relevant Business Unit

[TRANSLATION] "A means of calculating contingencies has already been in place since September 2011, and is supported by tools such as a risk analysis grid." ***(Completed)***

3.1.3.D. Comments from the Auditor General

The files reviewed concern the year 2010 and the first two months of 2011. They do not contain information that can be used to evaluate the risks involved in each project. There will be follow-up for corrective action taken by the DTP, as per our normal auditing process.

3.1.4. Approval of Detailed Cost Estimates and Data Confidentiality

3.1.4.A. Background and Findings

Given the importance of detailed cost estimates in decision-making, aspects other than the establishment of quantities, prices and contingencies should be considered to ensure their reliability. Detailed cost estimates must be approved by a person in authority to confirm the quality of the information they contain. An approval process must be established and followed in order to provide a reasonable degree of assurance about the reliability of detailed estimates. The amounts of detailed cost estimates or their components must not under any circumstances be disclosed to future bidders. It is obvious that confidentiality promotes healthy competition to obtain the best prices on the market for the planned work.

At the time of our audit, detailed cost estimates prepared by project engineers from each of the sections concerned (roads, water and sewers and large-scale projects) were submitted to the engineer team leaders in charge.

In 2010, they were then forwarded for tendering to the DCRT engineer in charge of planning. In 2011, the DTP, in establishing its new business model, separated the duties of the project design phase from the duties related to the tendering process into two separate divisions. This new structure ensured that detailed cost estimates continued to be prepared by each of the DCRT sections. However, from that point, they were sent to the Division gestion des projets et relations d'affaires (DGPRA), which is responsible for market canvassing and communication with bidders. It should be noted that detailed cost estimates were entrusted to limited resources in this division in order to keep them confidential.

According to the information obtained for the audited period, detailed cost estimates were kept under lock and key at this division until the bids were opened. Estimates stored on electronic media were also saved in a secure directory on the server, with access limited to authorized persons. In addition, detailed cost estimates were sent to the DEC starting in May 2011.

With respect to the approval process, we noted that all detailed estimates prepared by the sections concerned were accompanied by a memorandum stating that they had been sent to the engineer in charge of planning for the purpose of issuing calls for tenders. We found evidence that the engineer team leaders of the sections concerned had initialled this memorandum. We think, however, that in view of the important decisions that stem from detailed cost estimates, they should instead be approved systematically by a manager in charge (e.g., section head).

On the subject of confidentiality, the DTP took steps in 2011 to delete messages sent between the technical staff that prepares tender documents (plans and specifications, tender forms) and potential bidders. It was through the creation of the DGPRA that a separation of duties was made possible. It then became responsible for receiving

questions via a special email box from those who received tender documents, sending these questions to project designers and answering bidders' questions anonymously.

However, when the detailed cost estimates were produced, we noticed that sensitive information (e.g., reference price lists, copies of detailed estimates) was kept by several resources within the DCRT.

Moreover, the people we met with mentioned that paper copies of the reference price lists used to determine unit prices were in circulation. In our opinion, this practice can lead to lists easily being copied, misplaced, transferred or handled without regard for their confidentiality.

During the tendering process, the detailed cost estimates also remain accessible in GESPRO by all users with access to the bid forms, although this runs counter to internal instructions given verbally. Not only are detailed estimates available in GESPRO, they also exist in hard copies, which are kept by the engineers in charge. According to the information obtained, written security measures for DCRT staff involved (e.g., shredding, engineers keeping estimates filed under lock and key) were nonexistent at the time of our audit.

Even though the DTP separated project design and market canvassing duties, even though it kept hard copies of detailed cost estimates under lock and key, and even though it created a secure directory for the electronic version, information security risks are still present. We believe it is important that both the data used for detailed cost estimates of projects and the estimates themselves not be easy to access by anyone other than the staff who produce them or ensure that they are kept confidential. If any of this information should be communicated to future bidders, it could jeopardize the independence of the cost estimating process. In this area, clear directives should be issued to the resources concerned.

Finally, considering the DTP manager's guideline on detailed cost estimates produced by the DCRT, these estimates are produced to ensure that the projects are feasible within the budgets allocated by requesters. Yet we noted previously that, based on the

files selected, the amount of detailed cost estimates was not communicated to requesters before calls for tenders were issued to reassure them about the cost of their project. According to the DGPRA manager in charge, meetings with requesters were held from time to time in 2011 to inform them of the progress of their projects. During these meetings, project costs would have been one of the points raised in cases where projects were expected to go over budget. We believe that this practice must be encouraged so that requesters can plan effective use of available budgets. In our opinion, however, the amounts of the latest version of the detailed estimates should be communicated to requesters before calls for tenders are issued—to authorized persons only—since they are in fact the DCRT's clients.

3.1.4.B. Recommendations

We recommend that the Direction des travaux publics systematically show evidence that a manager in charge gave written approval of detailed estimates, in order to confirm the reliability of data that will be used for decision-making.

We recommend that the Direction des travaux publics produce a directive concerning the security of sensitive information in the cost estimating process, whether electronic or hard copy, to limit access to authorized users only and to reinforce the security of the cost estimating process.

Before issuing calls for tenders, we recommend that the Direction des travaux publics communicate to requesters, to authorized persons only, the amount of the latest version of detailed estimates so that they can properly plan the budgeting of available funds.

3.1.4.C. Action Plan of the Relevant Business Unit

1) *[TRANSLATION] "A procedure for estimates produced during the design phase will be written up. It will describe the process for signing documents and comply with the rules set out by the Ordre des ingénieurs du Québec, taking into account the use that will be made of this estimate."* ***(Planned completion: June 2012)***

2) *[TRANSLATION] "To follow up on directive C-OG-SDO-D-12-001, development of a procedure has been under way since February 2012 to establish DTP operating rules."* ***(Planned completion: June 2012)***

3) *[TRANSLATION] "Requesters are kept informed of budgets at every stage of their projects; we plan to hold monthly meetings with all requesters to discuss technical content, budgets and schedules.*

   The estimate referred to is produced a few days before the call for tenders is issued. The tendering period is generally 13 working days. Therefore, this is generally not critical for requesters' planning. Considering the duration of the whole process of implementing a project, there is a very short period between production of the two estimates (detailed estimate and control estimate). However, an operating rule will be put in place giving details on sending total amounts of control estimates to requesters." ***(Planned completion: June 2012)***

3.2. DETAILED CONTROL ESTIMATES PRODUCED DURING THE TENDERING PROCESS

3.2.A. Background and Findings

In addition to separating duties, which was covered in the last section, the DTP created the DEC under its new 2010–2011 business model. This division must ensure that detailed control estimates are prepared for all projects for which the DTP has issued public calls for tenders, at the same time and under the same conditions as potential bidders. These detailed control estimates were to be compared with the price submitted by the lowest compliant bidder.

This division was just being set up at the time of our audit, and the DTP was using the services of a specialized firm as a temporary measure. In December 2009, the DTP recommended that the executive committee award a professional services contract to a specialized firm of construction economists. This contract was for an amount of $450,000 for a period not exceeding three years (2010 to 2012), and its purpose was to confirm the costs of urban infrastructure projects. When the authorities awarded this contract, the DTP reported in the decision-making summary that it engaged construction

economists, because this proved to be an appropriate way of ensuring that both internal project evaluations and bids received reflected the usual market costs for this work. It also stated that it wanted to use the appropriate method to determine the true and fair value to verify that each cost on bids received was valid, based on the market conditions at the time of the call for tenders.

Some of the projects submitted for estimates involved bridges, tunnels, road works and water and sewer systems. They could be either recurring (programs involving road rehabilitation, water mains, bicycle paths, etc.) or one-time, and they involved varying degrees of complexity. The estimate had to be itemized (e.g., direct and indirect labour, material and equipment, direct and indirect costs).

For recurring projects, the specialized firm had to compile various results using software of its own design to create a data warehouse at the end of the contract that would be used by the DTP to estimate the costs of future projects.

For each project submitted, the specialized firm had to produce a cost estimate, based on the plans and specifications prepared by the city, while calls for tenders were being issued. This estimate therefore had to represent the fair price of a given project, based on market conditions and under the same constraints and conditions as the bidders.

In its proposal, the specialized firm mentioned that the methodology used was based on internationally recognized good practices. The main steps are, first, analyzing the tender documents, then visiting the work site, confirming the quantities appearing on the bid form, determining the particular characteristics of the project, confirming the work performance period and time required, reviewing the traffic maintenance requirements, evaluating and comparing supplier or subcontractor prices needed for the estimate.

To establish the prices, the methodology consists in dividing each item on the bid form into daily deliverables and estimating the efforts required for equipment, labour and materials, based on the geographic characteristics of the sites, soils, obstacles or other constraints or conditions affecting the work to be carried out. It also requires gathering the following market information:

- Materials: the prices proposed by several suppliers based on market prices (without discounts) at the time of the bid
- Labour: the direct labour rate according to the relevant collective agreement at the time of the bid
- Equipment: bulk transport rates according to the rates published by the Ministère des Transports du Québec and rates for leasing heavy machinery from the Québec government

Finally, in addition to these direct costs, there are management and administration costs, a profit margin, etc.

From March 2010 to July 2011 (17 months), the DTP used the specialized firm for almost all the projects for which public calls for tenders were issued. Subsequently, in August 2011, the DTP was able to send the specialized firm only a few projects, because the budget available for the contract had been used up. A few requests for detailed control estimates were made to estimators recently hired at the DEC. For the few other projects, the design phase, including the preparation of detailed estimates, was awarded to outside engineering firms, and detailed control estimates were not requested.

During the period in which the DTP used the services of the specialized firm, the DGPRA received the detailed control estimates requested until the DEC took over this task in 2011. As agreed, the specialized firm had to complete the bid form, just like the other bidders. These estimates were based on both the quantities established by the DCRT when tender documents were being prepared and the unit prices established through the specialized firm's methodology. We obtained electronic copies of the detailed control estimates produced by the specialized firm for the files in our sample along with a note confirming that they had effectively been sent to the DGPRA before the end of the tendering period.

However, we noted that reports supporting detailed control estimates produced by the specialized firm were not received for all projects submitted. In fact, the specialized firm produced, at the request of the DEC, 20 or so detailed reports out of a total of 94 files

(21%). According to the information obtained, the DTP did not request all the detailed reports, because it preferred to devote the funding provided for in the contract to the production of detailed control estimates. However, at the time of our audit, the detailed reports received had not been analyzed in whole or in part by a DEC representative, let alone communicated to the DCRT. It should be noted that the few reports sent by the specialized firm included not only the price schedule sent to either the DGPRA or the DEC, but also a breakdown of items on the pricelist, taking into account the estimated efforts and the unit prices used, the comparison of projected quantities appearing on the pricelist with the estimated quantities as well as recommendations for the projects submitted.

As the specialized firm's estimates were supposed to be used to validate the bids received, and they appeared in decision-making summaries on awarding of contracts by authorities, we think these detailed reports would have been useful for backing up the information provided. Accordingly, when recommendations to award contracts were made, the DTP did not have enough background material for all projects to justify the estimated prices or answer any questions on the subject.

Moreover, as the DTP specified only the amount of the detailed estimate prepared by the specialized firm as a reference in decision-making summaries produced as of November 2010, this was the estimate that had to be published in the SEAO to comply with the Act. The resulting lack of background material justifying these estimates runs counter to the directive "Publication des contrats," issued by the city manager in April 2011, which specifies that documents must be prepared to justify quantity estimates and the estimated price of the contract. Given the confidence the DTP places in the detailed control estimates provided by specialized firms, we believe that it is absolutely essential that it obtain detailed reports for each project so that it can support data that are likely to be called into question.

3.2.B. Recommendations

When detailed control estimates are produced by a specialized firm, we recommend that the Direction des travaux publics obtain detailed reports so that it can support the information provided in decision-making summaries, or the

electronic tendering system when requested in accordance with the directive on publication of contracts.

3.2.C. Action Plan of the Relevant Business Unit

[TRANSLATION] "Since the DEC was established, experts have been monitoring all mandates executed by the firm and making sure that they obtain all the information requested. Projects are analyzed by DEC experts, with the firm's support, if necessary.

This clarification with the selected firm was made in early February 2012 during the launch meeting for the new framework agreement and is now in effect." ***(Planned completion: March 2012)***

3.3. COMPARATIVE ANALYSES OF DETAILED COST ESTIMATES AND DETAILED CONTROL ESTIMATES WITH THE BIDS RECEIVED

3.3.A. Background and Findings

When bids are opened, the DGPRA audits their administrative compliance and specifies the lowest compliant bidder. The bids received and the detailed control estimates are then transferred to the DCRT to prepare the decision-making summary for awarding the contract.

We mentioned above that detailed control estimates should have been a reliable reference for judging whether the bids received are reasonable. Reliable cost estimates should therefore be representative of the market. Otherwise, mechanisms should make it possible to recognize variances and provide convincing explanations to reassure authorities when a contract is awarded. In the event that large variances remain unaccounted for or unacceptable, the situation should also be disclosed to authorities to facilitate decision-making.

During our audit, we wanted to assess the reliability of the detailed estimates used to judge the reasonableness of bids. In order to achieve this, we considered it appropriate to use the DCRT detailed cost estimates to confirm or refute the accuracy of the detailed control estimates because detailed cost estimates were used to approve the bids received before detailed control estimates were prepared by the specialized firm.

For our analysis, we compared both the amount of the detailed control estimates and the amount of the detailed cost estimates produced internally (by the DCRT) with the lowest bid selected, as it is recommended to authorities when the contract is awarded.

We found that almost all the detailed estimates for 2010 were higher than the lowest bids selected, both the estimates produced internally (33/36, or 92% of the cases) and those produced by the specialized firm (33/35, or 94% of the cases) (see Table 1).

We also found that most of the detailed estimates for 2011 (January 1 to August 22, 2011) were higher than the lowest bids selected, but to a lesser extent than in 2010. For detailed estimates produced internally, we observed a proportion of 87% of the cases (48/55) were higher, while for detailed control estimates, this proportion was 84% of the cases (41/49) (see Table 1).

Table 1—Comparison of Detailed Estimates with Selected Bid – Distribution of Files

Estimates produced compared to the lowest bid selected	Public calls for tenders – 2010				Public calls for tenders – 2011 (January 1 to August 22)					
	Detailed estimates		Detailed control estimates		Detailed estimates		Detailed control estimates			
	DCRT		Specialized firm		DCRT		Specialized firm		DEC	
	N°	%	N°	%	N°	%	N°	%	N°	%
Undervaluation	3	8%	2	6%	7	13%	8	16%	2	67%
Overvaluation	33	92%	33	94%	48	87%	41	84%	1	33%
Total files	**36***		**35**		**55#**		**49**		**3**	

* Out of 36 public calls for tenders, one file was assessed by an engineering firm, while another file was not sent to the specialized firm (work related to the lighting of building façades).

\# Out of 55 public calls for tenders, three files were assessed by engineering firms and detailed control estimates were not produced.

A situation in which the bids received are lower than the estimates is of course financially advantageous for the work provider; however, the work provider must ensure that the work will be done as planned. Even though this was the case with most files for 2010 and 2011, for the other calls for tenders, the bids received were higher than the detailed control estimates. A work provider that awards a contract in such a situation assumes the risk of paying a higher price than it really should. The city should adopt appropriate measures to mitigate the consequences of these two types of risk. For

example, these measures could ultimately include the rejection of bids received following a call for tenders or intensified efforts to monitor the work. It is obvious that the extent and frequency of variances involved will be the focus of future initiatives proposed.

We reviewed the size of the variances (in absolute relative values) between the detailed estimates and the lowest bids for all public calls for tenders in 2010 and up until August 22, 2011. For our analysis, we chose 10% as an acceptable threshold, as set forth by the Direction du greffe in January 2011 in the guide covering content and presentation of decision-making records submitted to authorities. It should be noted that a 10% threshold is also taken into account in the procedures followed by the Ministère des Transports du Québec when bids are higher than the estimates.

We noted that in 78% (28/36) of the contracts awarded in 2010, the variance between the detailed cost estimate produced internally and the lowest bid was greater than 10%. This proportion is slightly higher, 86% (30/35), for detailed control estimates (see Table 2).

For 2011, we found that the proportion of variances of more than 10% was maintained for 78% (43/55) of detailed cost estimates produced internally. We noted a better situation for the detailed control estimates, with 62% of the cases (30/49) (see Table 2).

Table 2—Distribution of Files Based on Variances Noted Between Detailed Estimates and Bids Selected

Variance percentage noted	Public calls for tenders – 2010						Public calls for tenders – 2011								
	Detailed estimates			Detailed control estimates			Detailed estimates			Detailed control estimates					
	DCRT			Specialized firm			DCRT			Specialized firm			DEC		
	N°	Cumulative		N°	Cumulative		N°	Cumulative		N°	Cumulative		N°	Cumulative	
		N°	%		N°	%		N°	%		N°	%		N°	%
0% to 10%	8	8	22%	5	5	14%	12	12	22%	19	19	38%	3	3	100%
11% to 20%	3	11	31%	6	11	31%	12	24	43%	14	33	67%	0	3	100%
21% to 30%	0	11	31%	4	15	43%	6	30	54%	4	37	75%	0	3	100%
31% to 40%	3	14	39%	6	21	60%	6	36	65%	10	47	95%	0	3	100%
41% to 50%	3	17	47%	3	24	69%	7	43	78%	2	49	100%	0	3	100%
51% to 60%	6	23	64%	1	25	71%	7	50	90%	0	49	100%	0	3	100%
61% and +	13	36	100%	10	35	100%	5	55	100%	0	49	100%	0	3	100%
Total files	**36***			**35**			**55#**			**49**			**3**		

* Out of the 36 public calls for tenders, one file was assessed by an engineering firm, while another file was not sent to the specialized firm (work related to lighting of building façades).

\# Out of the 55 public calls for tenders, three files were assessed by engineering firms and were not covered by detailed control estimates.

Whatever the source of the detailed estimate, results indicate that most files exhibited a variance that was 10% higher than the lowest bid. According to construction economics experts, a comparison of the detailed estimate with the lowest bid is certainly a guide, but the contractor submitting the lowest bid may have taken personal and circumstantial factors into account that could not be considered in the detailed estimate. In view of these results, we took the comparison further, comparing detailed cost estimates and detailed control estimates not only with the lowest bid selected, but also with the average of the bids. According to experts, this average is higher than the market price.

Table 3—Distribution of Files Based on Variances Noted Between Detailed Estimates and Average of Tenders Received

Variance percentage noted	Public calls for tenders – 2010						Public calls for tenders – 2011								
	Detailed estimates			Detailed control estimates			Detailed estimates			Detailed control estimates					
	DCRT			Specialized firm			DCRT			Specialized firm			DEC		
	N°	Cumulative		No	Cumulative		N°	Cumulative		N°	Cumulative		N°	Cumulative	
		N°	%		N°	%		N°	%		N°	%		N°	%
0% to 10%	7	7	20%	11	11	33%	23	23	45%	24	24	51%	3	3	100%
11% to 20%	8	15	44%	8	19	57%	5	28	54%	17	41	87%	0	3	100%
21% to 30%	4	19	55%	5	24	72%	7	35	68%	4	45	95%	0	3	100%
31% to 40%	4	23	67%	2	26	78%	11	46	90%	1	46	97%	0	3	100%
41% to 50%	2	25	73%	2	28	84%	2	48	94%	1	47	100%	0	3	100%
51% to 60%	3	28	82%	1	29	87%	1	49	96%	0	47	100%	0	3	100%
61% and +	6	34	100%	4	33	100%	2	51	100%	0	47	100%	0	3	100%
Average not available	2	36		2	35		4	55		2	49		0	3	
Total files	**36***			**35**			**55#**			**49**			**3**		

* Out of 36 public calls for tenders, one file was assessed by an engineering firm, while another file was not sent to the specialized firm (work related to lighting of building façades).

\# Out of 55 public calls for tenders, three files were assessed by engineering firms and were not covered by detailed control estimates.

We noted that the variance between the detailed cost estimates produced internally for the contracts granted in 2010 and the average of the bids was over 10% in 80% of the cases (27/34). This proportion drops to 67% (22/33) for detailed control estimates.

For 2011, we found that the proportion of variances of more than 10% improved in both cases. Thus, for detailed cost estimates produced internally, the proportion is 55% (28/51 cases), while for detailed control estimates, the proportion is 49% (23/47 cases).

In the light of the variances noted between detailed estimates and the lowest bid or the average of the tenders, we evaluated the extent to which an analysis had been conducted and whether it had provided explanations that were useful for decision-making by authorities.

Referring to our selection of 11 files, we reviewed the variance analysis process. For the nine estimates produced internally (DCRT), we found no evidence that a comparative analysis of the bids received and the detailed cost estimate was conducted. In fact, the people we met with revealed to us that in 2010, a comparative analysis was conducted only when the lowest price submitted was at least 15% higher than the detailed estimate. But when the prices submitted proved to be lower than the detailed estimates,

the comfort level was high enough that no comparative analysis was necessary. The DTP manager explained this situation by the fact that according to a guideline issued in 2010, detailed cost estimates should not be relied upon for recommending contracts.

We found a detailed comparative analysis report that met DTP requirements for professional service contracts in two files sent to outside engineering firms. In both cases, the firm explained the main variances observed and recommended that the contract be awarded to the lowest bidder. In one case, the analysis was based on a comparison of the bids received with the detailed cost estimate, and in the other case, the analysis was based on the comparison of the lowest bid and the detailed cost estimate.

For these same files, we found that no documented analysis was conducted by a DEC representative for variances between the estimates produced by the specialized firm and the lowest bid above 10%. The DCRT project engineer could observe these variances, but could not provide adequate explanations, because they were based on a methodology for establishing unit prices unknown to him, especially as he was not receiving detailed reports to support the data provided.

After analysing the bids received, the DTP justified its choice in decision-making summaries prepared for this purpose. Up until October 2010, these summaries occasionally presented the amounts of the detailed cost estimate produced internally as well as the specialized firm's estimate in comparison with the lowest bid. Starting in November 2010, only the amount of the specialized firm's estimate in comparison with the lowest bid was presented.

When the detailed control estimate was higher than the lowest bid, the DTP mentioned in decision-making summaries that the variance was in the city's favour and therefore recommended that the contracts be awarded at the prices submitted.

When the detailed control estimate was lower than the lowest bid, however, the DTP made the following comment: *[TRANSLATION] "After checking with [the specialized firm] regarding the unit prices used to establish the estimate, they confirmed that the*

estimated prices are accurate and truly reflect the market reality. We can therefore conclude in this context that the difference between the cost of the successful bidder and the amount of the [specialized firm's] detailed estimate is acceptable."

In conclusion, we think that rigorous explanations about the main variances were not provided in the decision-making summaries for the files reviewed. We can therefore not decide, beyond all doubt, on the reliability of the detailed control estimates in judging whether the bids received are reasonable.

As most files in our sample concerned calls for tenders that were issued in 2010 for contracts that were awarded that same year, for our auditor's report we have considered guidelines that were issued subsequently by the Direction du greffe. In March 2011, the importance of setting a threshold used to analyse variances between detailed estimates and the lowest bids was specified in a guide on the content and presentation of decision-making records. According to this guide, business units must present and [TRANSLATION] *"provide a rigorous explanation of any variance of more than 10% between the successful bidder's bid and the last estimate produced."* It also provides business units with guidelines on information that must be presented in the decision-making records:

- amount of each bid received
- last estimate produced
- average cost of the bids received
- difference between the average and lowest bids (as a percentage)
- difference between the highest and the lowest bids (in dollars and as a percentage)
- difference between the lowest compliant bid and the last estimate (in dollars and as a percentage)
- difference between the second lowest and the lowest compliant bids (in dollars and as a percentage)

Business units are also asked to mention in their decision-making summaries any risks related to either awarding the contract or performance of the planned work along with measures to mitigate or counter the risks. The information can be included in a

confidential note if the file is for the executive committee or on a supplementary data sheet if the file is for a council.

As these new guidelines came into force in March 2011 and consequently after the contracts covered by our sample were awarded, we questioned both the DCRT project engineers and a DEC engineer about the variance analysis process in place after this date. We also reviewed the type of information provided in decision-making summaries related to the awarding of contracts after March 2011.

According to the information obtained from the DCRT, tender analysis involves comparing the total of each bid, the total of the detailed cost estimate and the total of the detailed control estimate. When large variances are exhibited, a more detailed comparison is carried out to detect irregularities in the unit prices tendered. While such a comparative analysis runs counter to the guidelines issued by the manager, we were unable to substantiate the evidence of the operation described, since this analysis was not documented.

In our opinion, in view of the large number of data appearing on the bid forms, a visual comparison of tenders with detailed cost estimates and detailed control estimates is insufficient. In fact, when more than 50 items appear on the price schedule for a single project, and when this number is multiplied by the number of bids received and estimates produced internally and by the specialized firm, “visual analysis” becomes very arduous, with inconclusive results for justifying the awarding of a contract.

During our audit, we also questioned the engineer on duty at the DEC. According to the information obtained, no comparative analysis documents were produced there.

After the guidelines came into force, we found that decision-making summaries generally presented the required information on the amount of the bids, cost estimate and variances observed. It should be noted that only the amount of detailed control estimates was provided as a reference and not the amount of the estimates produced internally. This was therefore the basis authorities relied upon in their decisions to award contracts.

We found that general explanations were given for calls for tenders having a variance of more than 10% between the detailed control estimate and the lowest bid selected. Accordingly, the variances noted were not rigorously explained, as required by guidelines. When the specialized firm's estimate was higher than the lowest bid selected, the standard wording of the explanations provided was:

> *[TRANSLATION] "After checking with our independent construction economist firm . . . regarding the unit prices used to establish the estimate, this firm confirmed for us that the prices submitted truly reflect the market reality.*
>
> *Several factors and/or parameters can explain the discrepancies among bid prices: purchase discounts, productivity and production costs, hourly rates for equipment, bulk transport rates, indirect costs, percentages of profit and administration costs applied to project costs and the specific strategy used by each bidder.*
>
> *In view of these statements, we conclude that the variance between the cost of the successful bidder and the amount of the [specialized firm's] detailed estimate is in the city's favour."*

The standard wording used to explain the amount of the detailed estimate when it was lower than the amount of the lowest bid.

> *[TRANSLATION] "After checking with our independent construction economist firm . . . this firm confirmed for us that the prices they submitted currently represent the reference value for implementing this project.*
>
> *Several factors and/or parameters can account for the discrepancies among bid prices: productivity and production costs, hourly rates for equipment, bulk transport rates, indirect costs, percentages of profit and administration costs applied to project costs and the specific strategy used by each bidder.*
>
> *The bid results . . . tend to show an upward market fluctuation that can be explained by several factors intrinsic to the market during the tendering period."*

It is true that, based on the detailed control estimates established for most calls for tenders issued since March 2011, the situation was advantageous to the city financially, because bid prices were lower. In our opinion, however, the explanations provided for variances should have been more rigorous, should have emphasized the particular characteristics of each file more and should have taken into account the information provided on the average of the bids. Also, in a situation in which several of the bids

selected were lower than the detailed control estimates, we think that authorities should have been made aware of the risks that such a situation poses in terms of both completion of the work planned under the contract and measures the DTP planned to adopt to mitigate or counter those risks.

For the calls for tenders where bid prices were higher than the detailed control estimates and the variance accounted for more than 10%, we would have expected the guidelines to specify actions to be taken in the event that the explanations provided did not justify awarding the contract, the rejection of tenders being ultimately one of these actions. Yet we did not find any such guidelines that applied to all the contracts awarded.

Following the creation of the Commission permanente sur l'examen des contrats, whose mandate is to ensure compliance of the tendering process, we noted that in August 2011, a document entitled *Guide d'information à l'intention des unités administratives* was released. This guide gives business units information on the criteria for sending contracts to the Commission. One of these criteria specifically concerns work performance contracts of more than $2 million that have a variance of more than 20% between the internal detailed estimate produced during the tendering process and the successful bid. For these covered, the guide states that business units must provide Commission members with the methodology used to produce estimates as well as the variances between the reference estimate and the amount proposed by the successful bidder. They must also be able to account for any irregularities or peculiarities. After reviewing each of the files submitted, the Commission issues a conclusion about the compliance of the tendering process. It can also suggest improvements to the process through specific recommendations. These measures require business units to conduct a rigorous analysis of the main variances to provide adequate, conclusive explanations.

Our audit leads us to believe that the DTP's current practices to account for variances fall short of the rigorous standards required by the Commission permanente sur l'examen des contrats. We also consider many of the contracts recommended to authorities by the DTP to be exempt from these measures because of their amounts (under $2 million). In fact, for the period from January 1 to August 22, 2011,

14 contracts out of 55 (25%) were under $2 million and showed a variance of more than 20%. In our opinion, guidelines should provide for action to be taken for this type of contract if any variances remain unaccounted for after decision-making summaries are prepared.

In conclusion, our comparative analysis of detailed estimates and bids did not provide us with reasonable assurance that the detailed estimates produced by either the DCRT or the specialized firm were reliable. Even if the specialized firm posted better results for the first eight months of 2011, the DTP was still unable to demonstrate that they were significantly better than those obtained by the DCRT, even if the goals and estimating methods were different. In view of the fact that, since April 2011, the DTP has been required to publish the amount of the cost estimate produced before the bids are opened in the SEAO, and that this information is likely to be compared with both the bid prices and the total amount of actual expenditures, the city urgently needs to take the necessary steps to provide rigorous explanations for large variances. In section 3.5, we will discuss the procedures that will have to be followed to make it possible to evaluate detailed control estimates.

3.3.B. Recommendations

We recommend that the Direction des travaux publics take the necessary steps to document in the files:

- **comparative analyses of bids and detailed control estimates**
- **rigorous explanations for variances exceeding an acceptable threshold**

to justify their choices

When decision-making summaries for awarding contracts are prepared, we recommend that the Direction des travaux publics rigorously explain, any variance above the acceptable threshold established (10%) between the successful bidder's tender and the detailed control estimate, in compliance with the Direction du greffe's guidelines, to facilitate authorities' decision-making.

3.3.C. Action Plan of the Relevant Business Unit

[TRANSLATION] "Comparative analyses will be conducted for all projects when the discrepancy between the DEC estimate and the lowest compliant bidder's bid is greater than 10 %. These analyses will be documented in the file.

Whenever necessary, rigorous analyses and explanations are provided, and these are documented in the file.

Furthermore, our recommendation that the DEC add specific actions in the decision-making record management system (GDD) will be implemented." ***(Planned completion: April 2012)***

[TRANSLATION] "The DEC has established a rigorous analysis process for accounting for variances and entering them in the decision-making record to clarify decisions made by authorities." ***(Planned completion: April 2012)***

3.4. PUBLICATION OF ESTIMATES IN THE ELECTRONIC TENDERING SYSTEM

3.4.A. Background and Findings

As mentioned above, since April 1, 2011, section 477.5 of the CTA stipulates that any municipality must publish on the Quebec-government–approved SEAO website the list of all contracts involving an expenditure of at least $25,000. This list must be updated every month.

To comply with the Act, the following information must be published:

- price of the contract
- name of the successful bidder
- purpose of the contract
- name of each bidder
- amount of each bid
- any bid lower than the one selected that was deemed noncompliant
- total amount of the actual cost once work was completed

Furthermore, for a contract involving an expenditure of $100,000 or more, section 477.4 of the CTA requires all municipalities to produce a contract price estimate before the bids are opened or, if there is no call for tenders, before the contract is awarded. The amount of this estimate must be part of the information published in the SEAO (section 477.5 of the CTA).

In April 2011, the Direction générale produced a directive entitled "Publication des contrats" that specified the standards for publishing contract information in the SEAO. This directive covers subjects such as the roles and responsibilities of business units and mandatory estimates.

The directive states that all borough and central department managers are responsible for enforcing the provisions of the management framework, integrating them into their activities and monitoring them. More specifically, the directive states: *[TRANSLATION] "The borough or department handling the contract is responsible for entering information on the performance of work related to calls for tenders into the SEAO."*

The directive's standards for mandatory estimates includes:

- the requirement to produce an estimate for any contract of $100,000 or more before the bids are opened or, if there is no call for tenders, before the contract is awarded (even if the estimate is produced by an outside consultant)
- the publication of the amount of the estimate in the SEAO only after the bids are opened or, if there was no call for tenders, when the contract is awarded
- the importance of preparing the estimate rigorously

During our audit, we reviewed the information on cost estimates that the DTP entered in the SEAO. For the period from April 1 to September 30, 2011, the DTP entered 44 contracts in the SEAO after they were awarded. These were in fact for calls for tenders issued between April 1 and August 22, 2011. We noted that information on price estimates for these contracts was not published in accordance with the directive issued by the Direction générale. The DTP did not enter cost estimates for the first ten contracts published in the SEAO. For the other 34 contracts, the amount entered as a cost estimate corresponded in fact to the contract price. However, at the time the

contracts were awarded, the DTP reported the detailed control estimate amount in its decision-making summaries. In our opinion, the DTP should have published the amount of these detailed control estimates in the SEAO to comply with the directive issued by the Direction générale, even if they were produced by an outside firm.

3.4.B. Recommendations

We recommend that, for contracts of $100,000 or more, the Direction des travaux publics publish in the electronic tendering system estimated contract prices disclosed in decision-making summaries when the contracts were granted to comply with the *Cities and Towns Act* and with the directive issued by the city manager, "Publication des contrats," in force since April 2011.

3.4.C. Action Plan of the Relevant Business Unit

[TRANSLATION] "SEAO entries are made in accordance with directive C-OG-SDO-D-12-001. A heavy workload can occasionally delay the process a few days longer than the standard 15-day period." ***(Planned completion: March 2012)***

3.5. POSITION OF THE DIRECTION DES TRAVAUX PUBLICS WITH RESPECT TO A COST ESTIMATING METHODOLOGY

3.5.A. Background and Findings

At the time of our audit, the DTP produced two detailed estimates by two separate divisions with different objectives. First, DCRT engineers produce detailed cost estimates before calls for tenders are issued to ensure that the project is still feasible within the allocated budget. They essentially raise questions, since the method used is based on the average historical cost of previous bids and takes into account adjustments made by several resources.

The second detailed cost estimate, or the detailed control estimate, is prepared during the tendering process and is used to verify tender prices. From early 2010 until August 2011, pending the permanent establishment of the DEC, the DTP used the services of a firm specializing in cost estimating to produce these detailed control estimates. Detailed control estimates have been produced at the DEC since August 2011, when the DEC cost estimating positions were filled.

During our audit, we attempted to assess the reliability of detailed estimates as compared to market prices. A comparison of the bids selected reveals that, for 2010, the procedure followed by the specialized firm, like the DCRT's, yielded equivalent results that did not facilitate decision-making. Even if, for the first eight months of 2011, the specialized firm obtained better results than the DCRT, when they were compared with the lowest bids selected, a large number of files (62%) still showed variances exceeding the acceptable threshold (10%) set out in directives issued by the Direction du greffe. Before drawing any hasty conclusions, we must not ignore studies showing that contractors submitting the lowest bid have frequently made allowances for personal and circumstantial factors that cannot be considered when detailed estimates are prepared.

As the averages of the tenders were close to market prices, according to construction economists, we compared the detailed estimates to them. For the period covered by our comparative analysis, better results than those obtained by the DCRT were obtained when detailed control estimates were compared to the average of the tenders. In 2010, 80% of the detailed cost estimates showed a variance that was 10% greater than the average of the tenders received, while for the detailed control estimates, the proportion was 67%. In 2011, these same proportions were 55% for the detailed cost estimates and 49% for the detailed control estimates. However, a large number of files for both types of detailed estimates still showed variances that were 10% higher than the average of the tenders received. With such results, we cannot assert without a doubt that the prices of detailed control estimates are markedly more representative of the market than those of detailed cost estimates, as we would expect, even if the purposes are different.

It should also be noted that some studies prefer using an adjusted bid average to explain the market. This method excludes the lowest and highest bids, which eliminates the disruptive effects of extreme data. According to experts, the adjusted average is closer to the actual cost of the work and would therefore be more representative for comparing detailed estimates.

However, in view of the results observed after comparing the two detailed estimates with both the lowest bid and the average bid, it is reasonable to ask certain questions:

- Did the specialized firm change its procedure during 2011?
- Did market prices change between 2011 and 2010?
- Do the new rules proposed in 2009 and 2010 to counteract collusion lead to lower prices for work?

It is possible that the market is currently in an adjustment period and will regulate itself in the short term as a result of various measures adopted by the city and the provincial legislature. Whatever the reasons for the variances that arose during this period, we believe that both procedures must be reviewed in the light of the actual results.

Of course, the use of a specialized construction economist firm over a 17-month period helped put into perspective the use of a new methodology based on the concept of fair value. Although this method is different from the method that DCRT engineers have been using for several years, we believe that the DTP should further refine its procedure so that detailed control estimates become a more obvious reference for reassuring elected officials when a lowest bidder is recommended.

At the time of our audit, the DEC was not yet fully operational because all the vacant positions had not yet been filled. However, since the end of 2011, the new team of experts under the supervision of an engineer construction economist, consists of four cost estimating experts who are in the process of obtaining a certification from the Association of Estimators and Quantity Surveyors of Québec (AEQSQ). Furthermore, as the specialized firm's contract ended in August 2011, a new $300,000 contract was recently awarded to the same firm after a second public call for tenders was issued in the summer of 2011. According to the DTP, cost estimating contracts will be awarded to the specialized firm when its internal resource capacity is no longer sufficient to handle the scope of the contract, its specific characteristics or the volume of the work to be done. We believe that the DTP must still be responsible for producing detailed control estimates in order to have control over the process.

Furthermore, in view of DEC staff training and expertise and its independence from the other DTP divisions, we believe that its responsibilities are likely to increase over the next few months.

According to the information obtained, when the DEC was created, the DTP wanted to devise a methodology and produce detailed control estimates in a manner totally independent from the methods used previously. However, we think it would perhaps be desirable to include the DEC as soon as possible in the cost estimating process, from the project design phase until the call for tenders is issued. This practice would help differentiate the duties of engineers from those of cost estimating specialists. This would ultimately allow the production of a single, final version of the detailed cost estimate that could be used for both budgeting and tenders analysis. However, if the DTP is still in favour of keeping two divisions for the preparation of detailed cost estimates, the DEC should then provide the necessary tools and expertise to make detailed cost estimates more reliable. The DEC could also supervise quality control of detailed cost estimates produced by the DCRT.

In the short term, it would be desirable for the DEC to analyze the twenty or so detailed reports obtained from the specialized firm to discover possible ways of improving the methodology supporting the cost estimating process (e.g., determining quantities).

In addition, after calls for tenders are issued, the DEC should analyze the bids received. Since under the CTA the contract must be awarded to the lowest bidder, this analysis would of course involve determining and explaining variances between the detailed control estimate and the lowest bid, which is also a requirement of the directives issued by the Direction du greffe. The DEC should also look into the possibility of comparing its detailed control estimates with the adjusted mean when variances are analyzed and accounted for. Moreover, because of the independent nature of the DEC, we think that the manager in charge (construction economist) should confirm the explanations given for variances and add a response to that effect to the decision-making summary produced when recommendation for awarding contracts are given.

We are also think that the DEC should require that the DCRT prepare accurate, detailed site reports over a period considered representative so that it will have reliable databases for producing future detailed cost estimates.

To a preserve the independence of the DEC, we believe that the cost estimating duties within the division itself should be carried out by people other than those conducting the variance analysis. Furthermore, to offset any appearance of a threat to this independence, it would be well to remember that the Service du contrôleur général, because of its contract audit responsibilities, can intervene on an ad hoc basis at any time to ensure that the process is secure.

In conclusion, we believe that the DTP must take the necessary steps, as quickly as possible, to devise a methodology for establishing cost estimates that are representative of the market and useful for decision-making.

3.5.B. Recommendations

We recommend that the Direction des travaux publics take the appropriate steps to design a methodology for establishing detailed cost estimates that reflect the reality of the market to facilitate decision-making. To do this, the Direction des travaux publics must, in particular:

A) specify the responsibilities of engineers within the Division conception et réalisation des travaux, and of specialized resources within the Division de l'estimation des coûts with respect to the preparation of cost estimates

B) analyze items mentioned by the specialized firm in its detailed cost estimate reports for projects covered by its mandate

C) study the possibility of having the Division de l'estimation des coûts confirm explanations for variances in decision-making summaries related to recommendations for awarding contracts

D) take the appropriate steps to ensure that the Division conception et réalisation des travaux sends accurate, detailed site reports to the Division de l'estimation des coûts so that it will have reliable standards for preparing future cost estimates

E) specify the role of the Division de l'estimation des coûts in exercising quality control over the methodology devised with good cost estimation practices, in view of the responsibilities of the Division conception et réalisation des travaux

3.5.C. Action Plan of the Relevant Business Unit

[TRANSLATION] "The process of establishing the new DEC was completed in the fall of 2011. The methodology adopted by the new team will be in accordance with generally recognized good practices in this field."

A) *[TRANSLATION] "Several presentations have already been given by the director and managers in charge of employees to outline DCRT engineers' responsibility vis-à-vis control estimates. Because of the arrival of new staff in 2011, another series of meetings between employees and managers will be held in 2012."* ***(Planned completion: September 2012)***

B) *[TRANSLATION] "Many of the projects that were discussed in the firm's report are completed. The points raised by the firm will be reviewed for processing, if applicable."* ***(Planned completion: September 2012)***

C) *[TRANSLATION] "Efforts are already under way to enable the DEC to include opinions on estimates in the GDD."* ***(Planned completion: September 2012)***

D) *[TRANSLATION] "In January 2012, the DEC and the DCRT began discussions about gathering productivity information from worksites that can be used for DEC estimates. This information will support DEC estimates and, in the long run, the design team's estimates. Several discussions and meetings will be planned to establish a methodology for gathering relevant, sufficient and usable information. The worksite data compiled will later be processed and integrated into cost estimating processes."* ***(Planned completion: August 2013)***

E) *[TRANSLATION] "Since the process of setting up the DEC team was completed in the fall of 2011, its work is now focusing on the last phase of implementation. The DEC will support the DCRT. On the subject of the DEC's role of ensuring quality*

control of DCRT processes and estimates, this point will be clarified when implementation of the cost estimating processes is completed at both the DEC and the DCRT. At present, the DEC does not have sufficient resources for this task, and additional work will be required to establish a quality control system. If this approach is considered, it will be necessary to plan for the additional resources required." ***(Planned completion: August 2013)***