



Hamilton

Office of the City Auditor

Roads Value for Money Audit

Roads Quality Assurance

Supplementary Audit Report



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Office of the City Auditor
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Executive Summary

- 1 As noted in our Roads Value for Money Audit Report that was issued in July 2021, with a replacement cost of over \$4B dollars, the City of Hamilton's investment in road assets or pavement is one of its largest. Obtaining optimal value for money in that investment requires a successfully coordinated and effective set of activities. These include asset management, planning, condition tracking, quality assurance, design, management of utility cuts, maintenance, preservation management, procurement, contract administration and financial management.
- 2 This supplementary audit was prompted by confidentially reported concerns about other aspects of roads capital construction not covered by the original audit. Accordingly, OCA focused on completing additional, targeted work in the area of quality assurance related to those concerns.
- 3 Highlights of our findings are as follows:

The two main concerns reported to us and targeted by the audit were the processes for comprehensive weight validation of construction materials and disposed excess contaminated native material, where the contract payments are tied to the weights of such materials, and the processes for testing and validating whether asphalt friction course aggregates used for high volume roads align with contract specifications and job mix formulas.

For two projects reviewed in detail by OCA to evaluate the comprehensiveness of the City's weight validation processes, we were unable to establish if the asphalt quantities charged and paid for, including those for quite substantial overruns, were reasonable due to lack of sufficient evaluation and documentation.
- 4 Though we found instances where there were "red flags" indicative of misstatement of weights (overcharges) by contractors there was insufficient information to evaluate them for potential fraudulent activities.
- 5 We determined that expected processes for administering change orders related to "overrun" quantities that the City pays for were not adhered to.
- 6 We found overrun quantities for the RHVP resurfacing project in 2019 that were necessitated by additional milling and replacement of 60mm of pavement due to the discovery of a large stretch of roadway shoulder that did not have the expected "rich bottom" base as was originally specified in the as-built design plans.
- 7 We also found an instance of a financial penalty being levied against the Contractor for a section of poor quality asphalt constructed during the RHVP resurfacing project that was not administered using the normal, transparent process. This issue was

further compounded by an undisclosed conflict of interest that existed between the Contractor and an employee of the City while the project was underway.

- ⁸ OCA found that established processes for validation and payment of weighed materials were not followed and there was non-compliance with guidelines for dealing with contaminated soils during construction, and only limited testing and validation done to support excess landfill disposal.
- ⁹ OCA found that for one project (Garth) where the City paid a premium for friction course asphalt mix, RAP (recycled asphalt pavement) was likely added as a substitute material causing the City to overpay and not receive the quality it specified which could have repercussions for performance of the pavement. OCA concluded there were minimal processes to ensure that the quality of aggregates being used in construction projects conform to the City's specified requirements.
- ¹⁰ Overall, OCA identified improvement opportunities related to ensuring comprehensive verification of weighed materials, the mitigation of risks of mismanagement and/or overcharges, and for enhancing processes for testing and validating whether premium aggregates used in projects align with contract specifications.

Introduction and Background

- ¹¹ The Office of the City Auditor Work Plan 2019 to 2022 (AUD19007) included the completion of a value for money audit in the area of Road Operations and Construction Programs. The results of this audit were shared via Report AUD21006 in July 2021.
- ¹² Subsequent to the issuance of AUD21006, the Office of the City Auditor (OCA) received a confidential Fraud and Waste report that noted that there were some additional issues that, if resolved, could add value to the City of Hamilton's road infrastructure projects. The OCA assessed the report and decided to investigate these topics further. The items investigated were ultimately found to be process-related and our work did not have a specific respondent, so our work is summarized as a Supplementary Audit Report.
- ¹³ This report summarizes the supplementary work performed in the area of Roads Quality Assurance.

Key Terms

Aggregate – term used for the sand, gravel and crushed stone that is mixed in with asphalt cement to construct flexible pavements.

Asphalt Cement (or binder) - is the liquid bituminous material used to bond together the aggregate to form hot mix, the basic ingredient of flexible pavement.

Asphalt Concrete - the paving material used on roads. It is the dull black mixture of asphalt cement, sand, and crushed rock. After being heated, it is dumped out steaming hot onto the roadbed, raked level, and then compacted by a heavy steamroller.

Stone Mastic Asphalt (SMA) - a type of asphalt concrete where coarser aggregate is used. It allows greater stone on stone contact than conventional dense grade asphalt.

Superpave - an acronym for “Superior Performing Asphalt Pavements” is an asphalt mix design method consisting of specifications, practices, tests, and analytical tools that are used to construct pavements that can accommodate the unique weather and traffic conditions of a given geography and provide predictable performance.

Audit Objective

- ¹⁴ This was a limited scope supplementary audit, where two specific topics were explored. The overall objective of the audit was to assess the management of the City’s road assets in order to identify opportunities for improved economy, efficiency and effectiveness for these two topics.

Audit Scope

- ¹⁵ The topics explored in the OCA’s supplementary work to the Roads Audit included:
1. **Processes for comprehensive weight validation of construction materials and disposed excess contaminated native material where the contract payments are tied to the weights of such materials.** If processes are not adequately designed, this exposes the City to the risk of increased costs due to mismanagement or overstatement of weight for such materials. It also creates potential advantages in the bidding process for Contractors aware of the gaps in the current process.

2. **The process to test and validate if the asphalt friction course aggregates for high volume roads align with contract specifications and job mix formulas.** If processes are not adequately designed, there may have been instances in the past where the City paid for premium aggregates when such aggregates were replaced with cheaper aggregates during construction. In absence of mature processes, there is a risk that the City pays premium cost for high quality aggregates, which Contractors can replace with less expensive aggregates without being detected.

What We Did

- 16 Building on the work that was previously completed in the original Roads Value for Money Audit (AUD21005) that was issued in July 2021, we:
 - Assessed information about the topics that were in-scope for this supplementary audit
 - Analyzed information indicative of whether the City is getting good value for the topics in scope for this supplementary audit
 - Obtained insights from external subject matter experts in the field
- 17 Significant components of the work for Topic # 1 and Topic # 2 relied on review of documents for three projects that were judgmentally selected considering information from the Fraud and Waste report, and a preliminary review carried out by the OCA to identify projects with material overruns as compared to tender documents and projects with specifications that required use of friction course aggregates. The three projects reviewed were:
 - C15-11-19 Ferguson Avenue North Reconstruction (Topic #1)
 - C15-20-19 Red Hill Valley Parkway (RHVP) Resurfacing (Topic #1 and Topic #2)
 - C15-27-16 Rymal Road and Garth Street (Topic #2)
- 18 The first two projects were selected because they both had significant overruns in materials or contaminated soil as compared to the tender documentation. The RHVP Resurfacing contract also called for friction course aggregate (Superpave 12.5 mm FC2) and was also reviewed as part of the work performed for Topic # 2. A third project, (C15-27-16) Rymal Road and Garth Street was reviewed as part of the work performed for Topic # 2.

- ¹⁹ Information about overall processes were obtained via document review and interviews, to obtain a broader perspective beyond the projects selected for detailed review.

How We Did It

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1. Evaluated internal controls and management practices including the inspection of documents.
2. Reviewed a sample of projects with material overruns as compared to tender documents and projects with specifications that required use of friction course aggregates were reviewed.
3. Gathered and performed analysis of data.
4. Reviewed documented policies, procedures, regulations etc.
5. Conducted interviews, reviewed relevant process and project documentation, and email correspondence.
6. Engaged an independent third-party expert (McIntosh Perry Consulting Engineers Ltd.) to assist with the review of the existing processes and technical documentation pertaining to two topics explored and formulation of audit findings.

Not In Scope

What the Scope Did Not Include

- ²¹ Areas that were previously addressed in the original Roads Value for Money Audit Report (AUD21005) were not revisited in this supplementary audit.
- ²² The construction of roads in new development neighborhoods is overseen by the Growth Division in Planning and Economic Development until such time as these roads become operational. After that they become the responsibility of Transportation Operations and Maintenance Division. We did not include the activities of this Division in this audit report.
- ²³ A value for money audit of the Growth Division's oversight of road construction activities in new development neighbourhoods is in progress and the results will be shared when the audit has been completed.

Detailed Findings

Topic #1

Processes for comprehensive weight validation of construction materials and disposed excess contaminated native material where the contract payments are tied to the weights of such materials.

Background

- 24 Construction contracts have different payment measurements for various components of the work, i.e. contract prices for items can be per linear meter, per unit of work, as a lump sum, or be based on the weight of materials (i.e. tonnes) incorporated into the work. In addition, during the process of construction, excess material is generated, some of which is contaminated.
- 25 Contaminated materials are more expensive to transport and dispose of compared to clean excess material. The City usually pays a fixed price of \$60 per tonne for disposal of excavated native material that is contaminated and deemed unsuitable for re-use. Separate payments are not made by the City for removal, transportation and disposal of excavated native materials that are not contaminated.
- 26 Construction materials and disposal of contaminated excavated native materials where the contract payments are tied to their weights are further on referred to as "weighed materials". COH's payments for weighed materials are based on scale tickets that the construction inspectors collect from contractors and calculate them in material summary sheets.
- 27 To a certain extent, the COH as a contract owner can rely on enforcement of the Canada Weight and Measures Act which sets the rules that must be followed by suppliers of weighed material and landfills. However, the City should also have a proper verification process for weighed materials to ensure it receives value for money on its construction projects.
- 28 Many factors, in the design and the construction phase of the contract, can cause overruns of weighed materials. During the design phase, if an accurate assessment of the site and scope of work is not completed, there may be overruns of weighed materials which have to be addressed during the construction phase of the project.
- 29 During construction, the delivery, acceptance, and where applicable, excavation of weighed materials need to be closely monitored and owners need to provide source to site inspection procedures.

³⁰ With regards to the weight validation process in general, staff had differing opinions about the inspection processes in place and the quality and the level of assurance of the current material weight verification process. This, in OCA's opinion, implies that the City does not have clear and consistently enforced processes in place. Common facts that came to light during our interviews which indicate opportunities for improvement include:

- There is no scale verification process or a confirmation process to spot check the accuracy of ticketed weights and ensure the scales are functioning correctly.
- The Engineering Services Division's Construction Section employs 12 full-time contract inspectors who typically inspect 23 to 40 projects annually. This makes it a challenge to provide, full-time, on-site project inspection. Inspectors are moved across projects and staffing levels are modified according to high priority operations, but a full-time inspection approach is not achieved.
- City staff do not accept each load of material, sign weigh tickets, note the location the materials were placed, and confirm the material is incorporated into the work.
- Contractors are not asked to provide Daily Summaries of Weighed Material and Truck Registers with truck numbers, tare, allowable gross weight, and registered gross weight.
- There is no process in place to monitor and address potential truck overloading.
- The level of inspection and validation is dependent on the experience and time availability of the staff assigned to a specific project.
- COH's Contract Inspectors do not independently verify the subgrade, sub-base, and base prior to proceeding with a subsequent stage of the work. The base preparation is reviewed with the Contractor and their equipment.
- While there are very few instances where lump sum and a tonnage-based work with the same material (granular material on road base and trenches) are occurring simultaneously, if this situation occurs on a project, there is no method to separate the two quantities, which can result in a double payment.
- The Engineering Services Division does not have a tracking tool to monitor weighed material overruns and help estimate the amount of any overruns and financial risk exposure. Such records/tools are not available, and records can only be found on a project-by-project basis.

- ³¹ Based on the interview responses from Staff, the description of weight validation processes in use was not always consistent with the existing written procedures or contract provisions. To demonstrate:
- The Contract Inspectors' Guidelines (Red Book) require that material tickets are checked upon delivery to the construction site, but the interviewees indicated that they are not.
 - Contract Provisions require that Contractors provide Daily Summaries of Weighed Material and Truck Registers, which according to the interviews, are requirements that are not enforced.
- ³² The following processes for validation of weighed materials are known by Staff, and are in place based on the interviews conducted by the OCA:
- Inspectors collect material tickets from Contractors daily, input tickets into material summary sheets, and provide material summary sheets to project managers for payment on a monthly basis. All tickets should be barcoded, and a construction technician should scan and validate the tickets and the material summary sheets for accuracy before payment is made.
 - For excavation and disposal of contaminated material when the contaminated area has to be expanded during construction because of unexpected site conditions, soil samples should be tested to validate the contamination, the area of contamination should be delineated, and new quantity estimates should be established. Tickets from the landfills are collected from Contractors in the morning of the following day.
- ³³ Non-compliances with these expectations are noted in our analysis below.

Findings

- ³⁴ **For the two projects reviewed in detail by the OCA for this topic, due to lack of sufficient documentation for the materials and contaminated soil overruns we were unable to establish if the quantities paid were reasonable.**

RHVP Resurfacing Project

- ³⁵ The RHVP Resurfacing Project (C15-20-19) was awarded in 2019 to resurface the RHVP from Pritchard Road to QEW.
- ³⁶ As per the contract documentation, the City's Design Section estimated 40,950 tonnes of Superpave Friction Course Asphalt for the entire project (Item B14 and B18) and the contract price was \$119.75 and \$115.00 per tonne, respectively.

Based on our review and comparison of quantities in contract documentation and the final PPC (Progress Payment Certificates), the OCA identified 7,407 tonnes of overruns in paid quantities compared to the estimated quantities. The overruns resulted in extra asphalt payments of \$851K (see table 1 below).

Table 1: Overruns Estimated vs. Actual Quantities and Payments

Item	Description	Tender QTY	Contract Unit Price	Actual QTY	QTY Difference (tender – actual)	\$ Difference
B.14	Dip Repairs SP12.5FC2 (70mm)	1,050	\$119.75	906.16	(-143.84)	(-\$17,225)
B.18	Surface – SP12.5FC2 (50mm)	39,900	\$115	47,451.68	7,551.68	\$868,443
Total		40,950	-	48,357.84	7,407.84	\$851,218

³⁷ Per the material summary sheets (which totals all weigh tickets and should be used as basis for payment), the total weight of asphalt was 1,534 tonnes less than the weight of asphalt that was paid to the Contractor. This resulted in payment of \$176K more than the quantity supported by the material summary sheets (see Table 2 below).

Table 2: Material Summary Sheets vs. Quantities Paid per Final PPC

Item	Description	Actual QTY per PPC	Contracted Unit Price	QTY Material Summary Sheets	Difference QTY	\$ Difference
B.14	Dip Repairs SP12.5FC2 (70mm)	906.16	\$119.75	945.88	(-39.72)	(-\$4,756.47)
B.18	Surface – SP12.5FC2 (50mm)	47,451.68	\$115	45,877.75	1,573.93	\$181,002
Total		48,357.84	-	48,357.84	1,534.21	\$176,245

³⁸ We found that the material summary sheets were generally supported by barcoded weigh tickets, with the exception of 986.89 tonnes of asphalt that were supported by **hand-written tickets**, which we note as questionable, irregular and not in line with the current process.

- ³⁹ The OCA found that the Contract Inspector's Daily Diary did not have sufficient information to fully evaluate and understand the reasons for the asphalt overrun. Based on the Contract Inspectors' Guidelines (Red Book), the Inspector's Daily Diary should document all important information pertinent to the daily activities of projects, including relevant project related discussions, definitions and/or maps of major activity changes, and material quantities.
- ⁴⁰ The Inspector's Diary had some high-level reference to extra work completed, but this information was not sufficient to evaluate and justify the overruns.
- ⁴¹ We also note that other project documentation in Project Wise (computer application utilized by Public Works) did not have sufficient information to evaluate and understand the reasons for the overrun.
- ⁴² Considering that the RHVP resurfacing was a highly visible project and the RHVP is currently the subject of an ongoing judicial inquiry, having clear and comprehensive project records of all events that took place during the project is critically important.
- ⁴³ We also noted other themes and observations relevant to the RHVP Resurfacing project:
- I. Non-compliance with established process for payment of weighed materials
 - II. Retained documentation is not sufficient to assess if overruns are reasonable and recollections of staff are not consistent
 - III. Other Observations

I. Non-compliance with established process for payment of weighed materials

- ⁴⁴ The current process requires inspectors to collect material tickets from contractors on a daily basis, to input ticket details into material summary sheets, and to provide material summary sheets to the assigned Project Manager for monthly contract payments. All weigh tickets should be barcoded, and a construction technician would scan and validate the tickets and the material summary sheets for accuracy before payments occur. The OCA found that this process was not followed. We confirmed that the value of the payments was determined based on the Contractor's asphalt production sheets, and verbal discussions/negotiations with the Contractor. In other words, production print outs from the contractor were used as a basis for the asphalt payments.
- ⁴⁵ The OCA reviewed the production print outs from the Contractor. The total production was 48,646 tonnes. The production sheet deducted 500 tonnes of asphalt from the quantities with a note indicating that this was a "penalty" and

another deduction of 694 tonnes for a total agreed payment of 47,452 tonnes of asphalt.

- 46 Per staff, the 500 tonnes of asphalt were not paid in lieu of imposing a formal penalty for poor quality asphalt cement and air void issues for a section of the RHVP resurfacing, and that 694 tonnes were not paid because it was estimated and verbally agreed with the Contractor as being the quantity of "test run" production.
- 47 The informal "penalty" was intended as compensation for asphalt that did not meet the City's specifications for the RHVP resurfacing project and was not within OPS specifications. Staff considered having the contractor remove and replace the applicable portion of the road, but they determined that there were no concerns with the performance of the road. The OCA found that based on a verbal agreement, made by the Construction Section with the Contractor, the City did not pay for 500 tonnes of asphalt in lieu of imposing a formal penalty, which resulted in a \$57,500 payment reduction.
- 48 The OCA did not evaluate whether the amount was adequate to compensate the City for its full costs, including degradation of value and higher maintenance. However, the decision to not levy an official penalty and the lack of a sufficient audit trail is concerning to the OCA due to its opaqueness. Further compounding this issue is that OCA was able to substantiate that there was an undisclosed conflict of interest that existed between the contractor performing the RHVP work, and the City, while the RHVP project was being completed and the determination of a penalty was taking place.
- 49 This situation demonstrates the need to develop and adhere to a clear process on penalty applications which incorporates guidelines on when penalties will be applied, how penalties will be calculated and what the circumstances are that shall warrant removal of the pavement versus when it is acceptable to leave the pavement in place.

II. Retained documentation is not sufficient to assess if overruns are reasonable and recollections of staff are not consistent

- 50 The OCA made several attempts to determine if the asphalt overruns for the RHVP resurfacing were reasonable. The interviews with City staff required significant post-interview follow up efforts, which made it more time consuming for the OCA to establish the facts relevant to the audit.
- 51 One particular issued related to the need to mill an additional of 60mm in depth in certain areas because it was found during construction that there was a stretch of shoulder with no base course asphalt. The OCA looked into this, and what this means is that the original as-built drawings received by the City for the RHVP, and relied on for scoping the latest resurfacing project, were not accurate. This also

indicated some potential shortcomings of the City's Quality Assurance and Inspection Process that was in place during the original construction of the RHVP in that what was built did not follow the original design. The total affected shoulder area was 13,087 square meters (60mm depth with average width of 2.85m and length of 4,592m). Based on OCA's calculation and as confirmed by the OCA's engineering consultant, paving that area with an additional 60 mm of asphalt would require a bit less than 2,000 tonnes of asphalt. That amount is far less than the 7,550.68 quantity overage that was actually paid (refer to Table 1).

- ⁵² In addition to the shoulder base deficiencies, the milling area of the project was underestimated because of incorrect design calculations of the resurfacing area. This was acknowledged by design staff who explained that, consistent with the design process for other resurfacing projects, aerial maps were used to estimate the resurface area. Topographic Surveys which would be more accurate are not a common practice for resurfacing projects as the length of the resurfaced roads is not usually large. The OCA finds this explanation reasonable, but considering the size of the RHVP resurfacing project, **it warrants the question – should the design team have considered a more accurate estimating approach for this project?** There were also some inconsistencies in the information provided to the OCA by Construction Section staff.
- ⁵³ Another reason provided to the OCA for the overruns was that there were multiple revisions to the guide rail systems and other safety features that couldn't be forecast and were directed and completed immediately on site. We saw evidence that Council requested additional safety features on the project but did not find sufficient documentation to assess if, and what asphalt overrun quantities relate to these changes.
- ⁵⁴ In the end, due to these inconsistencies and the lack of adequate supporting documentation in the project files we were unable to reliably estimate and attest to the quantity of overruns pertinent to this issue. Overall, we received conflicting explanations, insufficient supporting documentation, and at times, questionable and irregular supporting documentation (e.g. hand-written weigh tickets, weigh tickets for a completely different material for a different lump sum item). Ultimately, the overruns were not able to be adequately supported.

III. Other Observations

- ⁵⁵ As noted above, one RHVP issue related to a requirement for additional milling of 60mm in depth because there was a stretch on the shoulder with no base course asphalt. Based on the original as-built drawings, the road shoulder was supposed to have a rich bottom base lift. However, it was discovered during construction that it did not have the required rich bottom base lift which necessitated remedial action.

- ⁵⁶ To achieve this, the same asphalt mix used for the surface course of the road was also used for the shoulders' asphalt base course. However, the OCA enquired as to the use of friction course (FC2) asphalt mix, which is a more **expensive** mix intended for surface courses, as a base course for the shoulder. The OCA's consultants at McIntosh Perry Ltd. advised us that the direction taken, on the balance of probabilities, was reasonable due to:
- timelines for the project (i.e. additional time would be needed to design and negotiate a price for asphalt mix that is commonly used as a base course).
 - negotiating position (i.e. the price for FC2 mix was obtained in a competitive bidding process and it was likely that the price for a base course mix if subsequently negotiated would not be significantly lower).
- ⁵⁷ Earlier in this report we noted that the aforementioned arbitrary deduction in payment for 500 tonnes of asphalt in lieu of imposing a formal penalty against the Contractor for poor quality asphalt demonstrates that there is a need to develop and adhere to a clear process that would allow for consistent application of penalties, rejections and re-work of pavements with substantial quality issues. The OCA notes that the informal method utilized is not appropriate, and was not transparent.
- ⁵⁸ We also expected to see a Change Order (CO) for the additional quantities of asphalt paid. We noted that there were many COs on this project, but a specific CO for the increased quantities of asphalt was not issued. There were two PO Extensions for the vendor's work on the project. One was for \$120K for additional line painting and guiderail installations, and the second one was for \$450K for the extra milling and over-run of surface course asphalt. We also noted two COs that had the exact same descriptions and amounts (\$13K) and confirmed that they were duplicates.
- ⁵⁹ The OCA inquired if PO Extensions are submitted for approval at the appropriate level and if there were sufficient supporting documents provided to approvers to assist them in their review. Based on the limited work we did, it appears that approval sign offs are completed at the appropriate level, but sufficient supporting analysis to enable an effective approval process was not produced, reviewed, and retained, which the OCA notes as an improvement opportunity. Staff indicated that in the case of RHVP, all parties were verbally told that there would be a need for additional funds before the Purchase Requisitions Forms were submitted for approval.
- ⁶⁰ We note that sign offs and approvals for additional funding on infrastructure projects is an important internal control. However, the answers provided from staff are indicative that the current process may warrant additional attention, documentation, and discipline.

Ferguson Ave N. Reconstruction Project

- ⁶¹ The Ferguson Ave N. Reconstruction Project (C15-11-19) was awarded in 2019 for watermain installation and road reconstruction.
- ⁶² As per the contract documentation, design provisionally estimated 200 tonnes for transportation and disposal of material to a licenced landfill at the standard price of \$60.00.
- ⁶³ Based on our review and comparison of quantities in contract documentation and the Final Progress Payment Certificates, the OCA identified 8,809 tonnes of overruns in paid quantities as compared to the provisional quantities in the tender. The overruns resulted in extra payment of approximately \$528K (see Table 3).

Table 3: Overruns Estimated vs Actual Quantities and Payments

Item	Description	Tender QTY	Contract Unit Price	Actual QTY	QTY Difference (tender – actual)	\$ Difference
C.5	Superpave 9.5 (40 mm) Surface	600	\$98	0**	(-600)	(-\$58,800)
C.6	Superpave 19.0 (80mm) Binder	1200	\$92.85	1,099.46	(-100.54)	(-\$9,335.14)
C.8	Granular "A" 150mm thick.	2443	\$21	2,246.91	(-196.09)	(-\$4,117.89)
C.9	Granular "B" (Type II) 300mm thick.	5520	\$19.30	5,500.23	(-19.77)	(-\$381.56)
E.1	Transp. and disposal of mat. to a licenced landfill (Provisional)	200	\$60	9,009.44	8,809.44	\$528,566.40

**the final PPC for period ending October 2020 provides a \$7.00/t for profit margin on 783.05t of SP9.5 for item C.5

- ⁶⁴ One issue was that the total weight of contaminated material paid did not reconcile to material summary sheets. The difference was not material and the quantity paid was less than the material summary sheet quantities (see Table 4). Therefore, we did not further investigate this difference, but we noted it as an outlier.

Table 4: Material Summary Sheets vs. Quantities Paid per Final PPC

Item	Description	Actual QTY per PPC	Contracted Unit Price	QTY Material Summary Sheets	QTY Difference
C.5	Superpave 9.5 (40 mm) Surface	0**	\$98	0	0
C.6	Superpave 19.0 (80mm) Binder	1,099	\$92.85	1,099	0
C.8	Granular "A" 150mm thick	2,247	\$21	2,247	0
C.9	Granular "B" (Type II) 300mm thick	5,500	\$19.30	5,500	0
E.1	Transp. and disposal of mat. to a licenced landfill (Provisional)	9,009	\$60	9,138	(-129)

**the final PPC for period ending October 2020 provides a \$7.00/t for profit margin on 783.05t of SP9.5 for item C.5

- ⁶⁵ We focused our work around the support and processes for validation of the quantity of disposed contaminated materials (Item E.1, Table 3). Except for Item C.5. (Table 3), the other weighed materials did not have overruns or other apparent irregularities. For Item C.5, the Final PPC had a payment of \$7 dollars per tonne for profit margin on 783.05 tonnes of asphalt (SP9.5), which is discussed later in this Report.
- ⁶⁶ For Item E.1 (as listed in Table 3), the OCA reviewed and analysed all available weigh tickets and compared them to the material summary sheets looking for outliers indicative of process non-compliance and red flags for mismanagement and/or potential fraud.
- ⁶⁷ Based on our document review, the OCA concluded that the **established process for payment of weighed materials was not followed**. We found records to support 8,861.62 tonnes of excavated material, which is 147.82 tonnes less than what the City paid for (and with a negative financial impact of the city of \$8,869). Of the 8,861.62 tonnes that were supported by records, 312.14 tonnes did not have actual weigh scale tickets (i.e. \$18,728). None of the weigh tickets were barcoded and some were hand-written. One of the loads paid under this contract did not pertain to this project. We also found evidence that the weigh tickets were not collected and reviewed daily. Evidence reviewed indicated that weigh tickets were collected more than five days after delivery. We also noted calculation errors in the material summary sheet.
- ⁶⁸ We noted **"red flags" for potential misstatement of weight** but sufficient evidence to evaluate them for potential fraudulent activities was not available. The OCA observed that, on October 28, 2019, the average net weight of tri-axle truck-

loads of contaminated material disposed at one licensed landfill facility (Site A) was 17.8 tonnes, while the average net weight of the loads disposed at a second licensed landfill facility (Site B) was 22.6 tonnes. We expect that the density of the material disposed at both sites on the same date would be approximately the same, and we noted this difference as a "red flag". **Sufficient evidence to evaluate for fraudulent activities was not available, however, we note the above as being irregular and unusual.** The weigh tickets and other documents did not have allowable and registered gross vehicle weight, nor did they specifically indicate the type of trucks used. We attempted to obtain evidence by vehicle licence plate search for a sample of trucks, but the search results were inconclusive.

- ⁶⁹ Currently, in practice, contractors are not required to provide the City with Truck Registers (with information on truck numbers, tare, allowable gross weight, and registered gross weight) which could have been a useful to review the weights and escalate if needed. The OCA further noted that the City does not have a process that would have facilitated following up, asking questions, and spot checking of the weights to address the "red flags" in a timely manner. If tickets were received late, as the evidence above suggested, these follow up procedures were not possible.
- ⁷⁰ Based on the current Inspector's Red Book Guideline for Dealing with Impacted Soils, records pertaining to the location of waste, amount of waste removed from site, and verification testing should all be documented in the Inspector's Daily Diary for this project. The Daily Diary should also have sketches of the area of the site where material was removed, including depth information.
- ⁷¹ The OCA reviewed the Inspector's Daily Diary for this project to assess if its entries adhered to the Guideline and to identify records that would substantiate the overrun of over 8,800 tonnes of disposed landfill material. There was not enough information in the Daily Diary to explain the overrun. We noted that the Inspector's Daily Diary did not have information on daily quantities of excavated material and that it **did not comply with** the existing **guidelines** for dealing with impacted soils.
- ⁷² We also reviewed the construction site meeting minutes which did not have an explicit reference to the quantity of contaminated material. The minutes from October 23, 2019 site meeting noted that "material being excavated as part of the road break-out has been impacted and that tickets will be required for tracking/payment".
- ⁷³ The information in the Geotechnical Report done by a consultant at the design stage was insufficient to know that 9,000 tonnes of contaminated soil was present. We were also advised by our consultant (McIntosh Perry) that the testing was limited and did not include contaminants of potential concern.
- ⁷⁴ Public Works' Project Wise application did not have any documents or records of additional testing to support the extra excavation of contaminated soil quantities.

- ⁷⁵ We also noted other themes and observations relevant to the Ferguson Ave N. project:
- I. Available evidence is not sufficient to establish if overruns were reasonable and recollections of staff were not consistent
 - II. Non-compliance with the established process for testing of unexpected contaminated material during construction
 - III. Other Observations

I. Available evidence is not sufficient to establish if overruns were reasonable and recollections of staff were not consistent

- ⁷⁶ Staff explanation for the overrun in the quantity of contaminated material for this job indicated that the major reasons were the actual field conditions. The OCA asked if there was any additional testing done to support the excess landfill disposal, and staff noted that the extra contaminated material would have been based on soil testing. However, the OCA confirmed that no additional soil testing for this project was commissioned by the City.
- ⁷⁷ Additional testing was completed by a consultant for the contractor - after the contract was awarded and it found more contamination which resulted in a decision to dispose of all excess materials from the road excavation to a licensed landfill site.
- ⁷⁸ Staff did acknowledge that the weigh tickets had higher quantities than expected, but noted that it could not be proven that the weight was overstated. Staff indicated that this was escalated up to more senior staff, but at this point the excavation was almost done and it was hard to prove what happened without hard evidence.
- ⁷⁹ After we observed significant differences between the average net weight of tri-axle truckloads of contaminated material disposed at Site A (average net weight 17.8 tonnes) and the average net weight of the loads disposed at Site B (average net weight 22.6 tonnes) on October 28, 2019, we followed up with staff to ask if based on his recollections the trucks that were used by Site B were tri-axes with similar capacity to the trucks used by Site A. Staff indicated that they could not say with certainty the type (type/max capacity/dimensions) of trucks that were used on this date by Site B, but from what they could recall tri-axes were mainly used throughout the project. This confirmed the validity of our concern.
- ⁸⁰ The OCA noted that, in this particular case, if the City had been receiving and reviewing the weigh tickets daily and comparing them to information on Truck Registers on a daily basis, these red-flags could have been detected and addressed in a timely manner.

- ⁸¹ Staff initially assisting the OCA with this matter were unable to provide the OCA with additional soil testing reports, so we requested additional information from other relevant staff. Staff noted that design made an error in assuming that disposal was required for soil excavated from certain depths (limited to watermain trench excavation) on a portion of the road. They noted that when a "hot spot" like this is encountered, it is the entire width and proposed depth of the excavation that must be removed and disposed of at a landfill site. Staff also noted that the secondary testing completed shows additional locations that had to be disposed at landfill locations. Staff provided two soil testing reports with results from the consultant (commissioned by the Contractor) on October 8 and October 18, 2019. Based on these reports, there was one additional area of contamination.
- ⁸² Staff also provided a calculation to support an excavation and landfill disposal of 5,796 tonnes of contaminated material. The calculation noted that an additional 250 meters of road base excavation was disposed as contaminated. This calculation was prepared in January of 2022 (i.e. not during construction as expected and over two years post-construction) and even though it only accounted for less than 6,000 tonnes of landfill disposal, it appeared over-stated. We also noted that the two reports from the consultant (commissioned by the Contractor) do not support contamination of additional 250 meters of road base.

II. Non-compliance with the established process for testing of unexpected contaminated material during construction

- ⁸³ Per the Inspector's Red Book Guideline for Dealing with Impacted Soils, if there are unexpected site conditions during construction that would result in additional contaminated material, soil samples should be tested to validate the contamination, the area of contamination should be delineated. As per the interviews, new estimates should also be established based on the testing.
- ⁸⁴ The testing done during the design stage and the two reports from the consultant (commissioned by the Contractor) were limited and insufficient to accurately quantify the contaminated material and do not support the 9,000 tonnes of landfill disposal. The OCA concluded that the processes to validate if excess materials are actually contaminated were not adhered to.

III. Other Observations

- ⁸⁵ With regards to Item C.5 in the Contract (40 mm of Surface Superpave 9.5), the contract had a quantity of 600 tonnes at \$98 per tonne (see Table 3). The Final PPC indicates that the actual weight of this item was 783.05 tonnes and that the City paid for 783.05 tonnes at \$7 per tonne to the Contractor, and paid the remaining \$91 per tonne directly to the sub-contractor.

- ⁸⁶ We asked the staff to provide an explanation and they confirmed that the firm paid was a sub-contractor working for the Contractor. Staff explained that there were issues with the Contractor not paying its sub-contractors and that the sub-contractor did not want to do the work without a guarantee of payment. The sub-contractor was already working on another City of Hamilton Contract, and it was decided that they be paid through this other Contract. Staff provided a PPC for the other Contract which we examined. We confirmed that the overall cost to the City of Hamilton did not change the tender price, but we note this as a very questionable and irregular practice, because it misstated the costs for both projects.
- ⁸⁷ We also expected to see a Change Order (CO) for the additional quantities of landfill disposal. We noted that there were many COs on this project, but a specific CO for the increased quantity of disposed contaminated native material was not issued.
- ⁸⁸ The OCA noted that going forward, testing of soil, delineation, and recordkeeping will need to be more robust to comply with Ontario Regulation (O.Reg.) 406/19. This requires more upfront planning and testing for projects and additional oversight of both clean and contaminated excess soil handling. Public Works has updated its Procedure on Excess Soil Management. The OCA did not fully review the Excess Soil Management Procedure for compliance with the Regulation, but we noted that the Procedure talks about assessment of past use of land, soil sampling and analysis plan, estimating the volume and quality of soil before removal, and enhanced recordkeeping and tracking of soil disposal. These procedures, if properly implemented and adhered to may mitigate some of the issues specific to weight validation of contaminated soil.
- ⁸⁹ Considering that the OCA noted instances of non-compliance with existing guidelines and procedures, we note that providing oversight and resources to ensure adherence to these procedures (including responsibilities assigned to Contractors) warrants further management attention.

Summary and Conclusion

- ⁹⁰ The validation of weighed materials on construction projects is vital to ensure the COH receives value for money on its capital construction projects. The OCA noted that the weight validation processes are not comprehensive and are not being adhered to. This may be leaving the City exposed to the risk of mismanagement or overcharges for weighed materials, which is an inherent risk with construction projects.

- ⁹¹ The OCA could not assess the exact magnitude of the risk exposure, because Engineering Services does not have a tool to historically track and assess the amount of the weighed material overruns. Considering that weighed materials are an integral part of most construction projects, it is likely that the risk exposure is significant.
- ⁹² In addition, Contractors with awareness of the gaps in the current weight validation process can use this knowledge to their advantage in the bidding process. They can provide lower total bids and make up for the lower overall price with variations in quantities of weighed materials.
- ⁹³ We concluded that the current inspection levels by the COH Engineering Services Construction Section does not ensure comprehensive verification of weighed materials. The City should give consideration to increasing the level of inspection including the following process improvement opportunities:
- Introduction of a scale verification process and process to spot check weights.
 - Establishing a process to monitor and address potential truck overloading.
 - Providing increased on-site inspection for construction projects.
 - Obtaining Daily Summaries of Weighed Material and Truck Registers.
 - Defining the levels of inspection and validation based on the materiality and the risk of the specific component of the work.
 - Ensuring that COH employees accept and sign the weight tickets for each load of weighed material, and confirm the materials are incorporated into the work.
 - Implementing a consistent process to separate items paid as weighed material from identical material included as all-inclusive lump sum items (granular for road-bed construction versus granular for sewers).
 - Completing an independent verification/audit of the sub-grade, sub-base, and base prior to proceeding with the next stage of work.
 - Establishing a process to revise and document changes in estimates of the expected quantities of weight (including impacted materials) that arise during construction in a timely manner, and to using the estimates to validate that quantities charged are reasonable.
 - Enhancing verification and inspection processes throughout the construction phase to control excavation and ensure that native materials disposed at landfills are truly contaminated.
 - Establishing standard operating procedures for dealing with weight irregularities on a timely basis.

- ⁹⁴ Another option for management to consider is the use of all-inclusive lump sums and square metre payments instead of payments tied to weighed materials. However, this may result in higher tender unit prices, because with lump sum pricing contractors assume the risks involved, which they build into the tender price.
- ⁹⁵ For the two projects reviewed, due to lack of sufficient documentation for the materials and contaminated soil overruns we were unable to establish if the quantities paid were reasonable. While we noted red flags for potential overstatement of weights on the Ferguson Project, we were unable to determine there was fraudulent activity or specific waste. We do note that, based on the gaps in the current weighted material management practices, fraud and waste may have been occurring without being detected by the City, and will continue to be a risk unless significant process improvements are made.
- ⁹⁶ The OCA identified further irregularities relating to issues that were not in the scope of this work, which we note as areas that warrant further management attention. These areas include the following:
- The design process: strengthen estimation of weighed material quantities (including contaminated soil)
 - Reconciliation, recordkeeping, review and approval of Change Orders and Purchase Order extensions
 - Standard Operating Procedures and/or guidelines for the consistent application of penalties and/or rejection of pavement work relating to quality issues
 - Recordkeeping and retention of project documentation
 - Preventing questionable practices, such as paying sub-contractors on projects different than where the work was completed

Detailed Findings

Topic #2

The process to test and validate if the asphalt friction course aggregates for high volume roads align with contract specifications and job mix formulas.

Background

- ⁹⁷ Asphalt is the most common material for upper layers of pavement structures and is a mix of approximately 95% aggregates (the backbone of a pavement) and 5% asphalt cement (the liquid bituminous material that bonds the aggregate together).
- ⁹⁸ The Roads Value for Money Audit Report issued in July 2021 focused on the City of Hamilton process for testing of asphalt cement (AC) quality, because adding cheaper AC additives to save on production cost by suppliers is considered a leading cause of premature pavement cracking.
- ⁹⁹ Asphalt near the road surface needs higher quality aggregates to meet higher pavement stresses and friction requirements than those deeper in the pavement structure. With the Superpave system, as the traffic volumes increase, so does the required quality of both the coarse and fine aggregates in the asphalt mix. Surface course mixes for high volume category roads, require superior skid resistance and are specially designated as 12.5 mm FC1 and 12.5 mm FC2 mixes (FC stands for Friction Course). The Ontario Ministry of Transportation (MTO) requires that the aggregates for these mixes come from designated sources which are more expensive than local aggregates and RAP (reclaimed asphalt recovered from existing pavements and reused as part of the mixes of new or rehabilitated pavements). The lower cost of these alternative sources is an incentive for suppliers to replace contract specified superior surface friction resistance aggregates, with less expensive local aggregates or RAP. The OCA's Roads Value for Money Audit Report did not address the processes in place to mitigate this risk.
- ¹⁰⁰ The OCA was advised by our consultants that potential substitution of aggregates would not likely affect the longevity of the roads. However, aside from the financial cost, such replacement could negatively impact performance including the friction properties of these roads. In 2021, there were six projects using over 11,000 tonnes of friction course mixes which, on average, had an additional cost of \$30 per tonne (as compared to regular Superpave 12.5 mm), which results in an estimated \$330,000 of financial risk exposure annually for the City of Hamilton, assuming that to be a typical year. That risk exposure is significant given there are not documented inspection practices in place to verify compliance with contract specifications for aggregates during production of these types of friction course mixes. This risk exposure could be substantially decreased with consistent inspection practices, but this requires a formal process and resources to be in place to enable consistent application.

Findings

- ¹⁰¹ There is an obvious financial benefit for road construction contractors to substitute aggregates coming from designated sources with local, readily available aggregates that have minimal transportation costs or with RAP. The OCA concludes that:
- **While the COH paid a premium for friction course asphalt mix, on a balance of probabilities, for the 2017 Rymal Road and Garth Street Project (C15-27-16), OCA concluded RAP was added to the mix used for the reconstruction of Garth Street, which was not allowed under the contract.**
 - **The review for the RHVP Resurfacing Project (C15-20-19) did not find any red flags with regard to the aggregates ultimately utilized for this project.**

Garth Street Project

- ¹⁰² This project is the Garth Street Reconstruction from Rymal Road West to Stone Church Road West, which was completed in 2017.
- ¹⁰³ The OCA's qualified consultant from McIntosh Perry reviewed relevant documents related to the Rymal Road and Garth Street Project (C15-27-16). Reviewed documents included contract documentation, mix design, quality testing, compaction testing results, and available photographs from a plant sample. Several irregularities were noted in the course of this review.
- ¹⁰⁴ It was confirmed that the surface asphalt required as per the Contract specifications was a Superpave 12.5 FC2 mix. McIntosh Perry reviewed the mix design and noted that all aggregates were to come from the Ontario Trap Rock site near Bruce Mines, Ontario. The consultant also confirmed that these sources were approved as designated sources by MTO.
- ¹⁰⁵ The available "washout" photographs were examined by McIntosh Perry, and it was noted that while the darker colours of the premium aggregate were evident in much of the sample, there were clearly many questionable lighter coloured aggregates which did not look like Ontario Trap Rock. Also, it was noted by McIntosh Perry that a number of testing samples (field and referee) showed issues with % air voids and % asphalt cement, which could indicate the addition of RAP. Based on these issues, the consultant noted that the longevity of this mix could legitimately be questioned.
- ¹⁰⁶ Currently there is only one full-time quality assurance role in the Construction Section of the Engineering Services Division. This role visits and inspects asphalt

plants, which can present scheduling challenges during the busy construction season. The contract inspection staff typically stays at the actual project locations. The practices that are currently in place that relate to daily asphalt plant visits and inspections, as well as when Petrographic Testing is required for a particular project are based on the judgement and availability of staff and are not documented.

- ¹⁰⁷ The Garth Street project predated the City's use of a full-time quality assurance role. Staff agreed that based on the available "washout" pictures, it was their opinion that RAP had almost certainly been added to the production mix. They also agreed that there were issues with the other test results which confirmed the mix issues.
- ¹⁰⁸ Based on the above, the OCA's consultant concluded that, on the balance of probability basis, RAP was added to the mix, which not only caused the City to overpay for the quality of asphalt mix received, but it also affected the accuracy and integrity of the City's records related to this work, while also raising questions about the longevity of this mix. Our consultant at McIntosh Perry noted that because the RAP is mixed homogeneously in the asphalt production process, the issue would likely not raise significant concerns with the actual skid resistance of the road. However, the only certain method to ensure this would be to have skid testing and analysis performed by a qualified consultant. The OCA did not engage a qualified consultant to perform skid resistance testing and we note that this issue requires further management assessment and attention.

RHVP Resurfacing Project

- ¹⁰⁹ Our engineering consultant also reviewed various documents on the RHVP Resurfacing Project (C15-20-19), which was completed in 2019. The review included contract and tender documents, mix design, job mix formula verification, quality control (QC) results, asphalt compaction and lab testing results, including referee samples. It was confirmed that the contract called for Superpave 12.5 FC2 mix as surface asphalt. The mix designs were reviewed. The coarse aggregate was Ontario Trap Rock and the fine aggregate came from Fowler's Rosewarne Quarry near Bracebridge, Ontario. Our consultant confirmed the sources were designated sources as approved by MTO.
- ¹¹⁰ Our consultant's review of available relevant documentation (QC results, asphalt compaction, lab testing results, referee samples, and petrographic analysis) did not find any red flags with regard to possible improprieties or issues with the aggregates that were provided on the RHVP Resurfacing Project. It was also noted that densities of the mix and the specific gravity of the aggregates appeared consistent with the job mix formula provided. Petrographic Testing to ensure that proper aggregates were utilised was also commissioned by the Engineering Services Division's Construction Section for this project which confirmed that high quality aggregates were used in the production mix on this job.

- ¹¹¹ Per City staff, there are 5 to 10 road projects per year that involve friction course mixes (Superpave 12.5 FC2 or Superpave 12.5 FC1). The remainder of the road projects utilise locally available aggregates.
- ¹¹² When there is a project involving friction course mixes, current staff practice is to visit the specific asphalt production plant on a daily basis during the production to make sure that the aggregates used visually match the contract specifications and that there is no extra hopper adding in RAP to the asphalt mix. According to staff, there had been instances where the RAP belt had been feeding asphalt production where RAP was not indicated as part of the mix design. Staff had refused the acceptance of such asphalt. Staff believes that there is a little recourse if the issue is detected after the asphalt is laid out and therefore these practices predominantly rely on daily plant inspections and refusing the asphalt if irregularities are noted.
- ¹¹³ Staff acknowledged that because RHVP Resurfacing was a very critical project, inspections and testing for the project went above and beyond typical practices in the Construction Section of the Engineering Services Division. Petrographic Testing was also completed for this project.

Summary and Conclusion

- ¹¹⁴ There is an obvious financial benefit for contractors to substitute aggregates coming from designated sources with local, readily available aggregates with minimal transportation costs or with RAP.
- ¹¹⁵ The OCA concludes that while the COH paid a premium for friction course asphalt mix, on a balance of probabilities, for the one of the projects we reviewed (2017 Rymal Road and Garth Street Project, C15-27-16), RAP was added to the mix used for the reconstruction of Garth Street. This not only caused the City to overpay for the quality of asphalt mix received on the project, but it affects the accuracy and integrity of the City's records related to Garth Street and raises legitimate concerns about the longevity of the pavement. While there is a low likelihood that the issue would have a significant adverse effect on the skid resistance of the road, it should be noted that the OCA did not engage a qualified consultant to perform skid resistance testing and therefore notes that this issue requires further management assessment and attention.
- ¹¹⁶ The review for RHVP Resurfacing Project (C15-20-19) did not find any red flags with regards to improprieties in the aggregates ultimately utilized for this project.

- ¹¹⁷ The evidence suggests that the current quality assurance practices that the Construction Section has in place are improved when compared to the controls in place in 2017, but these inspection practices are not documented, and scheduling is a challenge during the busy construction season. Performing plant inspections for verifying compliance with contract specifications for aggregates during production, if done properly and consistently, can substantially decrease the risk of inappropriate cheaper aggregates being added to friction course asphalt mixes. This requires that a formal process and resources be in place to enable consistent application.
- ¹¹⁸ The COH's road network consists of approximately 6,500 lane-kilometers of roadways and the Engineering Services' reconstruction budget ranges from \$66 million to \$99 million annually, which includes roadwork and other infrastructure. Presently there is one full-time quality assurance staff and they perform all quality assurance duties for the Engineering Services Division. For comparison, a MTO's (Ontario Ministry of Transportation) Region responsible for approximately 7,000 lane-kilometers of provincial road network, and annual asphalt reconstruction budget of \$60 million to \$65 million has a Quality Assurance Section with a staff of five.
- ¹¹⁹ Management should give consideration to formalizing the plant inspection process, as needed and based on the type of the asphalt mix, to include the following:
- Inspecting for RAP additions: Because asphalt cement cannot come in contact with the open flame of the aggregate dryer (whether virgin AC or as part of RAP), separate bins and feeder belts are necessary to add RAP downstream of the aggregate drying process which are visually distinguishable from the raw aggregate bins and belts.
 - Inspecting aggregate feed bins: Another point of inspection would be to perform a comparison of the number of active aggregate feed bins as compared to the mix design to determine if aggregates used during production are compliant with the contract specifications.
 - Other inspections: In cases where plants are concurrently producing mixes for other projects (common for urban settings) and storing mixes in silos, the on-site plant inspections can require additional logistical attention. Management should consider implementing additional inspection procedures (including: inspecting computer production control screens, appropriate cut-off and clean up of the drums in continuous flow plants when production switches from one mix to another, observing the flow of asphalt to the appropriate silos, etc.).
- ¹²⁰ For projects deemed to be higher risk due to the use of friction resistant aggregates, Petrographic Analysis can be done in addition to plant visits to provide greater assurance that there is compliance with contract specifications. Petrographic Analysis is a relatively expensive procedure, and its usage should be

commensurate with the risks associated with a project. With Petrographic Testing, samples of raw aggregate should be extracted from plant mix samples or from asphalt cores early in the process of construction (i.e. prior to placement of significant quantities that would be expensive to remove) and submitted to a qualified laboratory for testing.

Recommendations

- ¹²¹ The OCA is making five recommendations to improve the processes and controls in place relating to validation of weighed materials, and premium asphalt aggregates testing. Please refer to Appendix "B" to Report AUD21006(a) for a list of Recommendations and the related Management Responses that will strengthen controls and enhance the value for money achieved in the Roads Program.

Conclusion

- ¹²² The OCA has brought forward several observations and recommendations to strengthen controls and enhance the value for money achieved in the Roads Program. Public Works has another opportunity to undertake transformative change in this area.
- ¹²³ The OCA would like to thank the Engineering Services Division staff and other participants for their contributions throughout this project. We look forward to following up with management in the future to see the progress of their action plans and their impact on achieving value for money in service delivery.