



KING COUNTY AUDITOR'S OFFICE

January 11, 2019

Follow-up on Road Services Division Pavement Preservation

TO:

Metropolitan
King County
Councilmembers

Road Services Division has completed or made progress on most of the recommendations from prior audit reports, mitigating deterioration of county arterial roads. Without new funding sources, Road Services Division (RSD) predicts pavement preservation funding will erode to zero before 2030, along with the condition of the County's road assets.




FROM:

Kymber Waltmunson,
County Auditor

RSD has implemented our prior recommendations, which suggested it could make better use of its diminishing resources by employing more pavement preservation techniques than hot mix asphalt (HMA) overlays alone, as had been the prior practice. By adding more chipseal work to pavement preservation methods, performing spot repairs, and exploring alternative technologies, RSD has successfully met the intent of our last audit via improving its life cycle cost approach to selecting pavement resurfacing options and the best locations to use each alternative.

To finish implementing the remaining recommendations, RSD needs to formally document its decision process to capture institutional knowledge from its evaluation of a variety of pavement treatment processes and its improved life cycle cost analysis. Formal documentation would support continuity of knowledge in the long term.

Of the seven prior audit recommendations:

| | | | | | |
|---|-----------|---|---------------|---|-----------|
|  | 5 DONE |  | 2 PROGRESS |  | 0 OPEN |
| Fully implemented Auditor will no longer monitor. | | Partially implemented Auditor will continue to monitor. | | Remain unresolved Auditor will continue to monitor. | |



King County

Please see below for details on the implementation status of these recommendations.

Recommendation 1

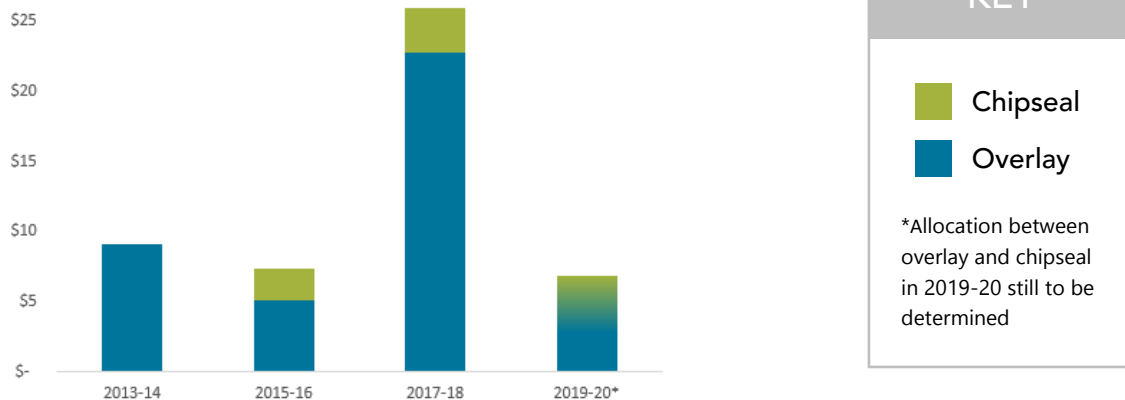
DONE 

RSD should assess the proposed 2015-2016 funding levels for pavement preservation activities and ensure they are consistent with goals and priorities in its SPRS Update. RSD should communicate the proposed spending level and miles of resurfacing planned.

STATUS UPDATE: RSD began publishing its pavement preservation goals in the 2015-16 biennium. Further, RSD published its business line plans created for the 2017-18 and 2019-20 budgets. These documents list achievement targets for hot mix asphalt overlays (HMA) and bituminous surface treatment (BST) or chipseal.

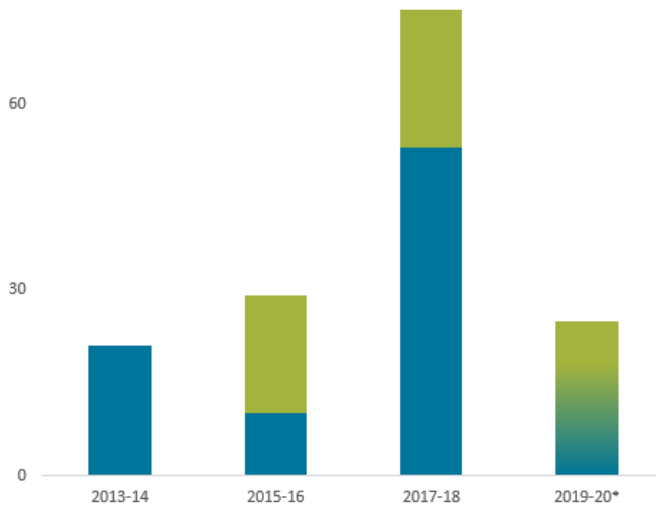
The charts below indicate both the spending levels and pavement preservation work accomplished or to be accomplished from 2013 to 2020, based on declining revenues—except for 2017-18, in which Council redirected \$16 million from RSD contingency accounts toward pavement preservation.

EXHIBIT A: Overlay and chipseal spending



Source: King County Auditor's Office

EXHIBIT B: Overlay and chipseal miles resurfaced



Source: King County Auditor's Office

Consistent with the 2014 Strategic Plan for Road Services (SPRS) update, RSD has principally funded work on heavily traveled main arterial county roads. RSD also began using less costly chipseal techniques in 2015, to resurface roads already in good condition instead of applying the more expensive HMA overlay routinely used in prior years.

In its SPRS update, RSD published the goal to achieve Scenario 3: "Manage risk in a declining system." Despite the generally declining funding available each year for pavement preservation, by implementing this recommendation, RSD has nearly doubled the pavement preservation miles targeted for completion between 2015 and 2020, versus performing solely HMA overlays.

Recommendation 2(a)

DONE 

As RSD defines its new pavement management strategies, it should document how it will identify and apply the most cost-effective approaches by updating its life cycle cost analysis at regular intervals using the best available cost and performance data from King County and peers.

STATUS UPDATE: RSD determines the level of investment—whether asphalt overlay or chipseal—based on the condition assessment and records of the last two preservation treatments the road received. By inspecting 500 miles of roads per year, RSD updates its life cycle database and the forecasted plan annually. In terms of cost and performance data, RSD relies on macro rules of thumb for most key pavement life cycle decisions: an asphalt overlay will cost between \$275,000 and \$550,000 per mile, gaining a life cycle of 12 years, and chipseal for a road in better condition will cost \$85,000 per mile and last about five years. Annual petroleum prices and the volume of the contract for either preservation choice create fluctuating pricing.

By implementing this recommendation, RSD has used improved cost and performance data to make decisions on prudent pavement management strategies to employ given a road's age, condition, prior maintenance history, and traffic demand.

Recommendation 2(b)

DONE 

As RSD defines its new pavement management strategies, it should document how it will identify and apply the most cost-effective approaches by using its life cycle cost analysis to identify the most cost-effective resurfacing options for different types of roads.

STATUS UPDATE: RSD has made several significant adjustments since 2014 to match the most cost-effective preservation technique to a given road. In terms of decision-making, RSD has determined that a road must be in sufficient condition to sustain a 1.5 to 2-inch thick HMA overlay without degrading prematurely for such an expensive investment. Similarly, chipseal treatments can extend the life of a prior asphalt overlay up to two times and approximately 10 to 12 years total before the road would be due its next overlay based on standard pavement maintenance principles. If a county road exceeds 9,000 vehicles per day, and has a high percentage of truck traffic, its priority for treatment is higher than a road of equal condition and age. For roads in poorer condition, RSD has set aside \$2 million per biennium for spot treatments (rectangular isolated dig-outs of distressed sections, treated in order to extend the life of a section of road) which prevent safety hazards and prepare the road for a future overlay or larger rehabilitation project.

By implementing this recommendation, RSD has prioritized its most effective treatment options for a given type of road and its condition.

Recommendation 2(c)

PROGRESS 

As RSD defines its new pavement management strategies, it should document how it will identify and apply the most cost-effective approaches by developing and applying criteria for when and where to use each resurfacing options effectively.

STATUS UPDATE: See status update for recommendations 1, and 2(b). RSD has introduced spot repairs/patching to a greater degree than at the time of our audit, which is less expensive per mile than other overlay alternatives. Since 2014, RSD has spent an average of \$1 million per year on spot repairs and road patching of high hazard, distressed pavement areas.

However, to complete this recommendation, RSD should document its decision-making practices using more formal cost and performance data. In interviews, RSD expressed that in prior years the default practice of applying HMA overlays on poor condition roads with deteriorated subgrade led to earlier failure of the asphalt and a reduced life cycle return on investment. Formal documentation would assist in preventing staff needing to learn this lesson again via turnover.

Recommendation 2(d)

PROGRESS 

As RSD defines its new pavement management strategies, it should document how it will identify and apply the most cost-effective approaches by documenting and applying a formal process for considering developments in overlay and seal technologies.

STATUS UPDATE: Since the last audit, RSD has explored several new approaches using alternatives to past practices. RSD met with Snohomish County and Washington State Department of Transportation representatives in the field to observe different technology chipseal operations. Further, the Small Materials Lab within RSD performed a best practices review of chipsealing. Several alternative pavement preservation methods were evaluated by RSD: Kevlar fibers, fog or slurry seal, recycled shingles, pre-coated chips, and recycled paving. In addition, RSD applied for and received a grant in 2014 to apply a high friction surface treatment (HFST) at 18 locations conducive to vehicle accidents—and this new treatment is performing well. RSD decided that newer technologies, such as Kevlar fibers, are expensive for their life cycle. It also determined that slurry seal is best applied on lighter traffic residential streets. However, recycled shingles used at two locations is holding up very well and has future potential applications in King County preservation work.

By partially implementing this recommendation, RSD has widened the tool kit of preservation technologies available for use in its pavement preservation work. To finish implementing this recommendation, RSD should formally document its decision process to capture institutional knowledge from the experience gained from its evaluation of a variety of pavement treatment processes.

Recommendation 3

DONE 

As RSD moves to implement the SPRS Update scenario described as “manage risk in a declining system,” it should make strategic adjustments to its staffing approach to more cost

effectively satisfy pavement management system regulatory requirements and maximize value to pavement preservation program outcomes.

STATUS UPDATE: Following a review of in-house practices to accomplish road compliance inspections, RSD transitioned its workforce away from performing pavement condition rating by walking and measuring every mile of roadway using a paper-recorded method. In the summer of 2014, RSD added software applications and truck mounted video equipment to record inspection data in a streamlined manner. Additionally, in 2017, RSD developed a software application compatible with Apple, Android, and Windows tablet computers, phones, and other mobile devices. This new lean process allows inspectors to integrate field data in real time with compatible life cycle management software also used for County statewide regulatory reports.

By implementing this audit recommendation, RSD has reduced staffing from five full time equivalents (FTE) to 1.2 FTE collecting 500 miles of visual road distress data annually. The cost and production effort achieved by RSD for this function is in line with those of peer counties compared in the original audit report.

Recommendation 4

DONE 

As RSD implements new pavement preservation strategies, it should establish performance measures, set targets, and monitor and act on the results to guide decision-making, motivate staff, and improve cost-effectiveness.

STATUS UPDATE: RSD has improved its pavement preservation target setting via producing a business line plan each biennium cycle and responded positively to several recommendations in our last audit. Additionally, RSD has continued to monitor the condition of its roads inventory each year via more cost effectively producing a pavement condition report and uploading data that graphically profiles the county's progress against peers at the state level. As an example of making good decisions and setting solid performance measures, RSD decided in its 2014 strategic plan update to take primary care of high capacity Tier 1 and Tier 2 arterials at the expense of low volume rural roads degrading. The chart below demonstrates success in improving the condition scores of heavily used county arterials over four years. Considering RSD staff and funding resources are now one-half that of 2012, it is unlikely RSD will make further progress on creating a best-practices environment until structural funding deficits are resolved.

EXHIBIT C: Percent of Tier 1 and Tier 2 arterial miles by pavement condition score (PCS)

| | 2015 | 2016 | 2017 | 2018 |
|--------------------------|------|------|------|------|
| PCS 80–100 Good & Better | 48% | 55% | 68% | 74% |
| PCS 50–79 Fair | 27% | 20% | 18% | 15% |
| PCS 49–0 Poor | 25% | 25% | 14% | 11% |

Source: King County Auditor's Office

By implementing this recommendation, as shown in Exhibit B, RSD has improved average pavement condition scores on Tier 1 and Tier 2 roads from 75 percent achieving a condition score of 50 or higher in 2015, to 89 percent receiving a condition score of 50 or higher in 2018. As reflected in Exhibit C, pavement scores for all arterials improved in 2017, largely due to a one-time redirection



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of funds into pavement preservation by the County Council. However, the biggest challenge for RSD is that absent a sustainable funding source for roads repair and maintenance, or future one-time sources of capital funding, short-term progress on this audit recommendation is unlikely to continue.

EXHIBIT D: Pavement Condition Ratings for All County Arterial Roads

| Year | Condition Score | Fair and Better % | Good or Better % |
|------|-----------------|-------------------|------------------|
| 2013 | 67 | 71.35 | 60.1 |
| 2014 | 69 | 74.6 | 59.1 |
| 2015 | 66 | 70.78 | 54.4 |
| 2016 | 62 | 63.94 | 54.2 |
| 2017 | 69 | 72.96 | 62 |

Source: King County Auditor's Office

Michael Bowers, Capital Projects Oversight Analyst, conducted this review. Please contact him first at 206-263-6900 if you have any questions about the issues discussed in this letter.

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